

Heart Failure Mortality in Spain, 1977-1998

Raquel Boix Martínez, Javier Almazán Isla and M.^a José Medrano Albero

Centro Nacional de Epidemiología. Instituto de Salud Carlos III. Madrid.

Introduction and objectives. Heart failure is now the third leading cause of cardiovascular death in developed countries and is also an important cause of morbidity and hospitalization that now represents the main cause of admissions among the elderly. In this study we present heart failure mortality trends in Spain developing over the last 20 years.

Methods. Data on deaths due to heart failure were obtained from files supplied by the Spanish National Institute for Statistics. We present age-adjusted specific mortality rates over time analyzed by sex and geographic area. Poisson regression models were used to estimate trends.

Results. Heart failure is responsible for 4% to 8% of all-cause mortality in men and women, and for 12% to 20% of cardiovascular mortality overall, the the highest rates seen among the elderly and in Andalusia. The lowest rates are found in the Basque Country and some provinces of Castilla-Leon. Rates have tended to decrease over the last 20 years, but the rate of decrease has been slower in women, such that their mortality began to exceed that of men from 1990 onwards. Mortality among the elderly has not changed significantly but the total number of deaths and morbidity are both increasing.

Conclusions. Because the Spanish population is aging, we can foresee that chronic heart failure will require greater attention in the future.

Mortalidad por insuficiencia cardíaca en España, 1977-1998

Introducción y objetivos. En los países desarrollados, la insuficiencia cardíaca ha pasado a ser la tercera causa de muerte por enfermedades cardiovasculares, además de ser una importante causa de morbilidad y carga hospitalaria, y es el primer motivo de hospitalización en mayores de 65 años. En el presente trabajo presentamos las principales características de la mortalidad por insuficiencia cardíaca en España en los últimos 20 años.

Métodos. Los datos sobre defunciones desde 1977 a 1998 se han obtenido de los Registros individuales facilitados por el Instituto Nacional de Estadística. Se presentan tasas ajustadas y específicas por edad para cada sexo, se analizan las diferencias por provincia y se describe la evolución de mortalidad, tanto para el total como por grupos de edad, mediante modelos de regresión de Poisson.

Resultados. La insuficiencia cardíaca es responsable del 4-8% de la mortalidad total y del 12-20% de la mortalidad cardiovascular en varones y mujeres y afecta principalmente a los grupos de edades más avanzadas. Las tasas más altas se encuentran en Andalucía y las más bajas en el País Vasco y algunas provincias de Castilla-León. Ha habido una disminución de las tasas, estadísticamente significativa, en los últimos 20 años, pero el ritmo de descenso en las mujeres es menor, por lo que la mortalidad en mujeres empieza a ser superior a la de los varones. En los muy ancianos, las tasas están prácticamente estabilizadas; sin embargo, el número total de defunciones y la morbilidad están aumentando.

Conclusiones. Dadas las características demográficas de la población española, es previsible que la insuficiencia cardíaca se convierta en una entidad que demande una atención creciente.

Key words: Heart failure. Mortality. Trends.

Palabras clave: Insuficiencia cardíaca. Mortalidad. Epidemiología.

SEE EDITORIAL ON PAGES. 211-4

INTRODUCTION

As is already known, cardiovascular diseases are the primary cause of mortality in Spain and other developed countries, fundamentally due to ischemic heart disease and cerebrovascular disease. However, heart failure is a condition that is acquiring increasing relevance, currently constituting the third cause of

Correspondencia: Dra. R. Boix.
Centro Nacional de Epidemiología.
Sinesio Delgado, 6. 28029 Madrid. Spain
Correo electrónico: rboix@isciii.es

Received 18 June 2001.
Accepted for publication 30 October 2001.

ABBREVIATIONS

HF: heart failure
 INE: Instituto Nacional de Estadísticas (National Institute of Statistics)
 ICD: International Classification of Diseases
 AHT: arterial hypertension
 AMI: acute myocardial infarction

death due to cardiovascular disease, in addition to being an important cause of morbidity and the hospital workload. In Spain, heart failure is the first cause of hospitalization in persons over 65 years, which represents 5% of all hospital admissions in that age group. In the U.S. heart failure is also the main cause of hospitalization in persons of advanced age, 70% of the persons affected being more than 60 years old. A prevalence of 1% at the age of 50-59 years is estimated, which increases to 10% at the age of 80-89 years. The most common cause of heart failure in 13 studies published in the last 10 years in the *New England Journal of Medicine* was coronary artery disease, which occurred in 70% of 20 000 patients studied. In spite of improvement in the treatment of heart failure, it continues to be a highly lethal disease, with a median survival of 1.7 years for men and 3.2 years for women. Heart failure has been referred to as a public health problem of epidemic proportions, because it is responsible for major human and economic costs. If we add to this the decrease in the quality of life of affected patients, who are mainly persons of advanced age, heart failure is an important public health problem.

In this study we report the mortality due to heart failure in Spain in the last 20 years. The data are grouped in five 5-year periods and one 2-year period, corresponding to the periods 1977-1981, 1982-1986, 1987-1991, 1992-1996, and 1997-1998, the last years for which we have information from the National Institute of Statistics (INE, abbreviation in Spanish).

METHODS

The data on deaths were obtained from individual registries facilitated by the INE, and correspond to deaths of residents in Spain.

To limit the difficulties derived from changes introduced in the coding of heart failure in the ninth revision of the International Classification of Diseases (ICD) with respect to the eighth revision, more specific ICD codes have been selected. The fourth digit of the ICD-8 was used to facilitate study of the temporal series as a homogeneous unit. We included deaths whose code in 1975-1979 (eighth revision) was:

1. 427: symptomatic heart disease:
 - 427.0: congestive heart failure.
 - 427.1: left ventricular failure (codes 427.2, cardiac blockade, and 427.9, other cardiac rhythm disorders, are excluded).
2. 428: myocardial heart failure. Other forms of myocardial insufficiency.

For deaths that occurred after 1980, (ninth revision) the categories coded in section 428 have been selected for analysis: Heart failure, which includes codes 428.0: congestive heart failure, 428.1: left heart failure, and 428.9: unspecified heart failure.

The morbidity data were obtained from the National Minimum Data Set (NMDS), which is available on the web page of the Ministry of Health and Consumption. The NMDS code 428 corresponding to heart failure was collected specifically, which is not the case of the Hospital Morbidity Survey, in which it is grouped in codes 415 to 429.

The national annual rates were adjusted for 18 age groups ranging from 0-4 years to 85 years and over. The direct standardization method was used, taking as reference the standard European population. Rates are presented by 100 000 persons/year. The populations used were elaborated by the National Center of Epidemiology, using the population at mid-period for each 5-year period. The populations used for 1997-1998 were facilitated by the INE.

To analyze the statistical significance of the temporal tendency, linear log regression models were adjusted, assuming that the rates had a Poisson distribution and varied with age and time, using the «generalized linear model» procedure implemented in the S-Plus statistical program. Independent models were adjusted for men and women.

RESULTS

In 1998, heart failure caused induced the death of more than 21 000 people, equivalent to 4%-8% of the mortality due to all causes in men and women, respectively, and 12%-20% of cardiovascular mortality. It is the third cause of cardiovascular mortality after ischemic heart disease and cerebrovascular disease. In women, heart failure in general and cardiovascular mortality are practically twice as high as in men (Table 1).

The distribution by sex and age is shown in Table 2, where it is evident that rates increase with age in both men and women, remaining low until 60 years of age and with the greatest mortality concentrated in the elderly population. In absolute figures, twice as many deaths occur in women as in men; however, this is due to the different age distribution of the populations of each sex, with the feminine population being older. When adjusted for age, the rates become closer, 33 per 100 000 men and 34 per 100 000

TABLE 1. Mortality due to heart failure and other causes. Spain, 1998

	Men			Women		
	Deaths	Percentage of all deaths	Percentage of cardiovascular deaths	Deaths	Percentage of all deaths	Percentage of cardiovascular deaths
All causes	188 421	100		169 529	100	
Tumors	56 170	29.81		33 292	19.63	
Cardiovascular disease	60 254	31.97		72 968	43.04	
Ischemic heart disease	22 352	11.86	37.09	17 090	10.08	23.42
Cerebrovascular disease	15 640	8.30	25.95	22 321	13.16	30.59
Heart failure	7256	3.85	12.04	14 181	8.36	19.43

TABLE 2. Mortality due to heart failure. Spain 1998. Death rates and specific rates per 100,000, by age and sex

Age (years)	Men		Women	
	Deaths	Rates	Deaths	Rates
0-4	3	0.30	6	0.65
5-9	2	0.20	0	0.00
10-14	6	0.53	1	0.09
15-19	5	0.35	4	0.29
20-24	12	0.72	3	0.19
25-29	21	1.26	3	0.19
30-34	38	2.36	7	0.44
35-39	38	2.54	15	1.01
40-44	50	3.77	14	1.05
45-49	60	4.97	21	1.72
50-54	101	8.90	29	2.48
55-59	118	12.42	48	4.79
60-64	220	22.89	117	10.96
65-69	395	42.17	270	24.77
70-74	629	83.32	612	63.71
75-79	1016	199.05	1382	183.80
80-84	1354	487.35	2648	520.08
85+	3188	1683.64	9001	2128.73
Total	7256	37.69	14 181	70.49
Adjusted or age		35.58		34.48*

women. When each age group is considered independently, the mortality is greater in men until the age of 75-79 years.

The study of the geographic distribution (Table 3; Figure 1), prepared for 1996-1998 to obtain more stable rates, shows that there were important interprovincial differences in Spain, with variations as high as 70%. The highest rates were found in Andalusia, Balearic Islands, Castellón, Girona, and Melilla and the lowest rates in Basque Country, Guadalajara, Segovia, and Soria. In Figure 1, a clear north-south geographic pattern is observed, as in the

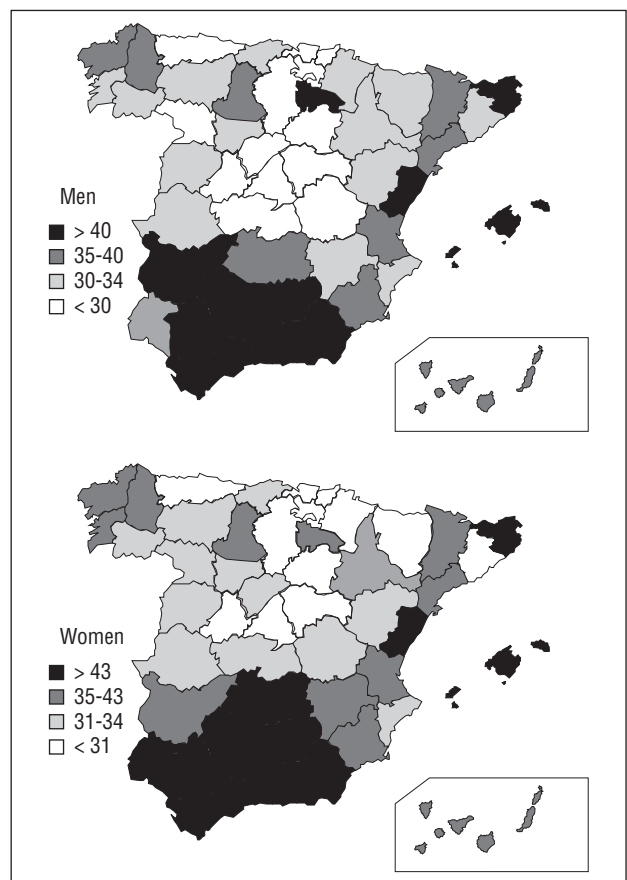


Fig. 1. Geographic distribution of mortality rates due to heart failure. 1996-1998 period. Rates adjusted for age, 100 000 persons/year.

mortality due to ischemic heart disease or cerebrovascular disease.

In Table 4 and Figure 2, the evolution of mortality due to heart failure since 1977 is shown. A decrease in rates is observed the last 20 years, which in men has represented a decrease of 40%. In women, the downward tendency is marked, but even so, a decrease of 30% was reached. The rates adjusted for

TABLE 3. Mortality rates due to heart failure, per 100 000 inhabitants, adjusted for age, by province and sex. Spain 1996-1998

Men	Women		
Melilla	57.89	Málaga	54.52
Balearic Islands	50.52	Granada	53.69
Cádiz	50.43	Castellón	49.80
Castellón	47.70	Jaén	48.34
Córdoba	44.79	Córdoba	47.70
Málaga	44.73	Almería	45.48
Sevilla	44.69	Girona	44.74
Almería	44.07	Balearic Islands	44.71
La Rioja	43.84	Huelva	44.71
Girona	43.08	Ciudad Real	44.65
Jaén	42.85	Sevilla	44.43
Granada	42.83	Cádiz	44.25
Badajoz	41.25	Meiilla	43.92
Lugo	40.29	Lugo	42.95
Ceuta	39.98	La Rioja	42.69
Lleida	39.04	Badajoz	41.69
Murcia	38.77	Murcia	41.62
Palencia	38.38	Lleida	40.82
La Coruña	37.87	La Coruña	40.00
Huelva	37.86	Ceuta	38.83
Tarragona	37.82	Valencia	38.21
Ciudad Real	37.15	Santa Cruz	36.76
Santa Cruz	36.53	Pontevedra	36.40
Valencia	36.13	Albacete	36.34
Las Palmas	35.95	Tarragona	36.14
Pontevedra	35.28	Palencia	35.62
Cantabria	35.00	National total	35.39
National total	34.38	Alicante	34.40
Orense	32.71	Teruel	34.39
Albacete	32.50	Zaragoza	33.43
Valladolid	31.81	Cantabria	33.34
Teruel	31.53	Cáceres	33.04
Zaragoza	31.33	Toledo	32.39
Navarra	31.17	León	32.24
Barcelona	31.00	Orense	32.01
Cáceres	30.92	Salamanca	31.94
Salamanca	30.87	Segovia	31.92
Huesca	30.64	Valladolid	31.82
Alicante	30.38	Zamora	31.48
León	29.61	Las Palmas	31.21
Burgos	28.61	Cuenca	31.16
Ávila	28.39	Huesca	30.12
Cuenca	27.82	Navarra	29.27
Madrid	27.37	Barcelona	29.19
Asturias	27.28	Burgos	28.90
Guipúzcoa	27.07	Madrid	28.57
Vizcaya	27.02	Asturias	28.44
Guadalajara	26.29	Ávila	26.91
Zamora	24.51	Guipúzcoa	26.38
Toledo	24.36	Guadalajara	25.86
Soria	23.74	Vizcaya	25.66
Álava	21.53	Soria	23.14
Segovia	20.84	Álava	15.54

age are slightly higher in men than in women in the first three 5-year periods; Nevertheless, from the 1992-1996 five-year period, rates in women exceeded those of men. The decrease in mortality was

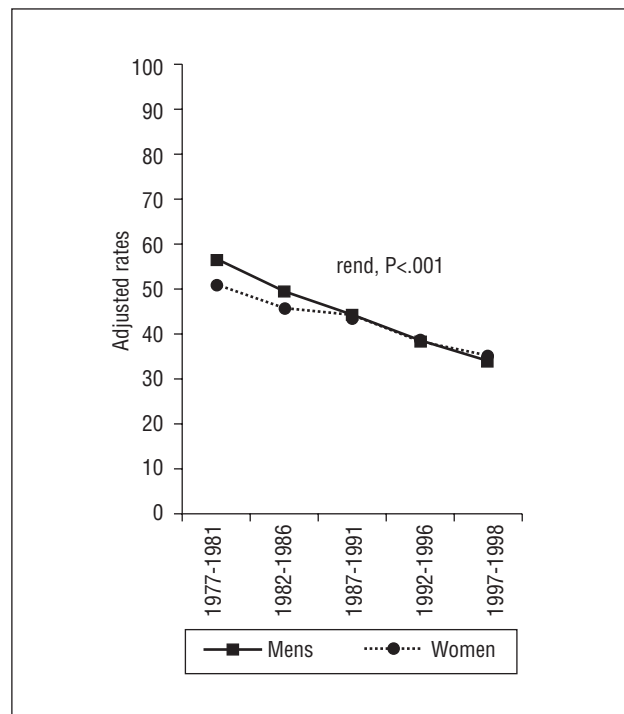


Fig. 2. Temporal evolution of mortality due to heart failure. Rates adjusted for age, 100 000 persons/year.

confirmed statistically by fitting a Poisson regression model. The data collected reveal that the downward tendency is greater in men than in women, with a (coefficient of -0.14 in men and -0.009 in women, a standard error of 0.002 in men and 0.001 in women, and statistical significance in both cases of $P < .001$ (Figure 2). The general decrease in mortality due to heart failure occurred in all the age groups, with two exceptions that we considered relevant. On the one hand, the mortality in the population over 85 years is almost the same as it was 20 years ago. From 1977 to 1991, mortality in the very elderly increased slightly in men (2.2%) and very significantly in women (11%), but since 1991 it has descended 5% in men. Among very elderly women, the variation in recent years is minimal (Table 4; Figure 3).

In spite of the general decrease in mortality rates, the absolute number of deaths (Table 4) in men has remained practically constant, whereas in women it has increased at the expense of the oldest age groups. If the morbidity data of the NMDS are also taken into consideration, which specify the number of hospital releases due to heart failure (Figure 4), an important increase in both sexes is observed.

On the other hand, the mortality rates in young men 25 to 34 years-old increased strongly in 1980-1990, a phenomenon that is not observed in women (Table 4).

DISCUSSION

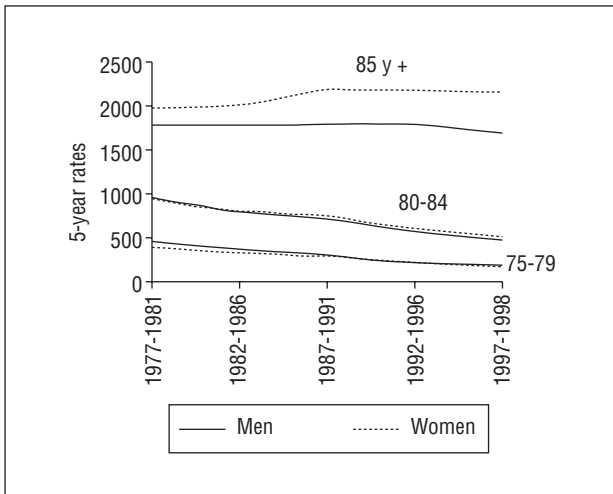


Fig. 3. Temporal evolution of mortality due to heart failure in older people. Specific rates by age, per 100 000 persons/year.

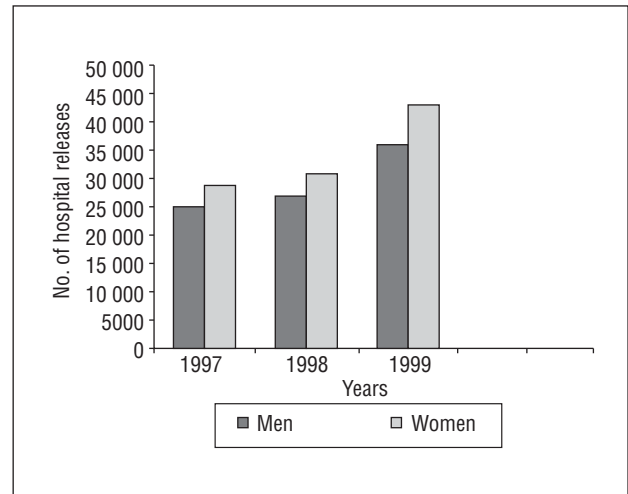


Fig. 4. Temporal evolution of morbidity due to heart failure. 1997-1999 period. Number of hospital releases.

Before making any interpretation of these results, some methodological points must be considered. In spite of being a very frequent cause of death, few studies have been published on mortality due to heart failure. It is likely that this is because the analysis of mortality due to heart failure is difficult due as much to the certification as to the coding of this cause of death. On the one hand, the certification of the basic cause of death in patients with heart failure is

difficult because this condition is common in the terminal stage of many different diseases. On the other hand, the coding of heart failure was modified substantially in the ninth revision of the ICD, which came into effect in 1980, which represented a change in nomenclature that affected the homogeneity of the temporal series. These difficulties have made it impossible to know the characteristics of mortality due to heart failure. We think, however, that the

TABLE 4. Evolution of mortality due to heart failure 1977-1998. Specific rates per 100 000 inhabitants and absolute number of deaths, by age and sex

Age (years)	Men					Women				
	1977-1981	1982-1986	1987-1991	1992-1996	1997-1998	1977-1981	1982-1986	1987-1991	1992-1996	1997-1998
0-4	1.60	2.33	1.75	1.00	0.35	1.59	1.95	1.95	0.70	0.54
5-9	0.37	0.28	0.19	0.20	0.24	0.40	0.21	0.19	0.12	0.05
10-14	0.51	0.41	0.30	0.18	0.30	0.48	0.30	0.14	0.14	0.13
15-19	1.03	1.07	0.85	0.63	0.30	0.57	0.65	0.31	0.28	0.18
20-24	1.49	2.33	2.42	1.20	0.68	0.85	0.94	0.71	0.33	0.22
25-29	1.88	2.35	2.97	2.74	1.11	1.06	0.90	0.84	0.73	0.25
30-34	2.19	2.38	3.19	3.81	2.13	1.27	1.45	1.04	0.88	0.67
35-39	3.85	3.90	3.32	3.24	2.73	2.09	1.83	1.12	1.05	0.96
40-44	6.21	5.35	4.73	5.38	3.95	3.08	2.69	1.83	1.70	0.85
45-49	9.64	9.25	7.04	6.33	5.21	5.93	4.26	2.89	2.36	1.65
50-54	17.78	15.10	12.24	9.52	7.77	11.16	6.91	4.67	3.61	2.57
55-59	32.01	24.98	20.37	15.52	12.49	18.61	13.14	8.96	6.16	4.75
60-64	58.71	46.18	35.03	27.37	21.71	39.99	28.74	19.44	13.18	10.89
65-69	116.86	89.68	65.83	47.78	40.94	77.89	58.79	44.52	31.79	24.38
70-74	233.78	178.16	141.25	101.25	85.52	181.66	140.00	114.72	81.13	63.95
75-79	468.01	379.20	311.04	238.64	200.03	403.91	349.25	294.58	233.34	188.03
80-84	957.72	791.52	723.43	589.47	497.32	932.24	807.06	767.70	627.41	531.95
More than 85	1779.37	1790.36	1818.83	1808.21	1722.01	1979.62	2013.86	2195.96	2203.19	2187.10
Total*	56.55	49.30	44.24	38.40	33.97	50.89	45.54	43.38	38.55	35.24
No. of deaths	36 339	37 338	38 578	37 860	35 858**	50 777	56 984	66 064	69 565	70 408**

*Adjusted for age. **Estimation for a 5-year period. Data of the 2-year period: 14 343 men, 28 163 women.

TABLE 5. ICD codes used in different studies of mortality due to heart failure

	Period	ICD-8* codes	ICD-9** codes
Canada ¹⁰	1970-1975	402, 404, 425, 427.0, 427.1, 429	
	1976-1989		402, 404, 425, 428, 429.1, 429.3
Spain ²	1980-1993		398, 402, 404, 416, 425, 428, 429
U.S. ¹¹	1980-1993		428
Catalonia ¹²	1975-1979	428	
	1980-1994		428

*ICD-8: 402, hypertensive heart disease; 404, hypertensive cardiorenal disease; 425, myocardial infarction; 427.0, congestive heart failure; 427.1, left ventricular failure; 428, other forms of myocardial insufficiency; 429, poorly defined diseases of the heart that include cardiac enlargement.

**ICD-9: 398, other rheumatic heart diseases; 402, hypertensive heart disease; 404, hypertensive cardiorenal disease; 416, chronic cardiopulmonary disease; 425, myocardial infarction; 428, heart failure; 429, poorly defined complications and descriptions of heart diseases; 429.1, myocardial degeneration; 429.3, cardiomegaly.

present magnitude of the problem justifies its study in spite of these limitations, as long as methods are used to limit these difficulties and they are considered in the interpretation.

Different studies of tendencies in mortality due to heart failure use disparate criteria for avoiding these problems. For that reason, they cannot be compared directly (Table 5). In the present study, we used the criterion of studies referring to the U.S. and Catalonia, selecting ICD-9 code 428 since 1980. Before 1980, codes 427.0 and 427.1 were added to code 428, a criterion that has been followed in part in another study. Our results show that this criterion resulted in a homogeneous series from 1975, one that did not present the typical disturbances due to changes in nomenclature, 12 which is why we propose that this method be used in the future.

The certification of heart failure as the cause of death, as noted, entails problems. In fact, in some countries, like the United Kingdom, it is expressly prohibited to list heart failure as the primary cause of death on death certificates and the underlying cause is specified instead. There is no universal agreement regarding the definition of heart failure even in clinical practice, and there is a widely recognized need for clinical, epidemiological, and investigational criteria to facilitate comparisons between different studies. In this sense, the European Society of Cardiology has published guidelines for the diagnosis of heart failure. In Spain, similar initiatives have been undertaken by the Heart Failure Working Group of the Spanish Society of Cardiology, which has developed guidelines for the diagnosis, classification, and treatment of heart failure and cardiogenic shock, the aim of which is to improve the classification of heart failure in order to know the true incidence and prevalence of this disease and to better classify patients.

The results of our study reveal that mortality due to heart failure in Spain has similar epidemiological characteristics as in the U.S., Canada, and Catalonia, although the characteristics have varied with respect to

an earlier study of Spain in 1993. The downward trend and distribution by sex and age have remained unchanged, but there are two new features in the pattern previously described. The first is that, due to the smaller decrease in women, the mortality of women now surpasses that of men. It is dangerous to conjecture as to reasons why the mortality due to heart failure has decreased less in women, but one possible reason is that death due to this cause now comes later. The second novelty is the stabilization of rates in persons over 85 detected from 1987-1991 in men and 6 years later in women. These findings suggest that therapeutic improvements in ischemic heart disease and in arterial hypertension have been able to delay the appearance of heart failure until more advanced ages. This effect could be more evident in women due to their greater longevity. It should be noted that in the U.S. mortality due to heart failure in persons over 65 years has also decreased at a rate of 1% a year in the 1990s.

Some authors have argued that the decrease in mortality might not be real, but due to the replacement of the diagnosis of heart failure by more specific diagnoses on death certificates. Nevertheless, the parallel decrease in mortality due to other cardiovascular causes and the finding of similar decreases when other categories are considered with heart failure, such as hypertensive cardiorenal disease, chronic cardiopulmonary disease, myocardial infarction, poorly defined descriptions, complications of heart diseases, myocardial degeneration, and cardiomegaly, suggest that the decrease is real and not due to changes in the guidelines for death certificates.

The geographic differences have been examined widely in previous studies in which the geographic variation in hospitalization and mortality due to heart failure in Spain was analyzed for the period 1980-1993. In these years the geographic differences decreased, although the authors estimate that it is still possible to reduce hospitalization by 60% and mortality due to heart failure by 30% in persons over

45 years-old. In our study we also observed important regional differences that could be reduced by approximately 30%.

The phenomenon of increased mortality in young men in our study has not been described in other similar studies of mortality due to heart failure. This distribution by age, sex, and time period coincides with the distribution of drug use and the incidence of AIDS in Spain. A possible explanation of this excess mortality can therefore be found in drug consumption, specifically cocaine. This can cause acute myocardial infarction, myocarditis and cardiomyopathy, and left ventricular hypertrophy, all diseases that can present with acute lung edema and heart failure. On the other hand, it has been reported that some deaths due to an acute reaction to opiates are recorded as heart failure, probably due to the cardiovascular clinical manifestations of this reaction. In the municipality of Madrid, this percentage was 40% of overdoses in 1988. Although in later studies an improvement in the National Death Registry in detecting deaths due to acute reaction to psychoactive substances has been observed, such deaths continue to be underestimated.

Finally, we note that the decrease in mortality does not involve a decrease in the incidence. The number of deaths and hospital admissions has been increasing, which is explained only partially by the aging of populations. On the other hand, according to reviews of studies on heart failure made in the last 40 years, in spite of advances in treatment the prognosis of heart failure does not seem to have improved. For that reason, aside from continuing to investigate new treatments to improve the quality of life of patients, it is necessary to examine the prevention of heart failure by means of primary and secondary prevention of ischemic heart disease and adequate control of arterial hypertension.

In addition, according to United Nations population projections, in the year 2050 Spain will be the most elderly country in the world. The future scenario that these data sketch is an increasing number of older people with heart failure, which is why both healthcare and social needs may increase in the future.

CONCLUSIONS

In Spain, as in other countries, mortality due to heart failure continues to decrease and affect persons of more advanced ages. Nevertheless, an increasing number of deaths are detected in the population of very elderly women and an increased morbidity in both sexes. Given the demographic characteristics of the Spanish population, it is foreseeable that heart failure will become a condition demanding increasing attention.

ACKNOWLEDGMENTS

We would like to thank Drs. Luis de la Fuente, José Ramón Banegas, and Fernando Rodríguez Artalejo for their advice in the preparation of this study.

REFERENCES

1. Boix R, Medrado MJ, Almazán J. Actualización de la mortalidad por enfermedades cardiovasculares arterioscleróticas: enfermedad cerebrovascular y enfermedad isquémica del corazón. *Bol Epidemiol Sem* 2000; 8: 77-80.
2. Rodríguez-Artalejo F, Guallar-Castillón P, Banegas Banegas JR, Del Rey Calero J. Trends in hospitalization and mortality for heart failure in Spain, 1980-1993. *Eur Heart J* 1997; 18: 1771-1779.
3. Gheorghiadu M, Bonow RO. Chronic heart failure in the United States. A manifestation of coronary artery disease. *Circulation* 1998; 97: 282-289.
4. Garg R, Packer M, Pitt B, Yusuf S. Heart failure in the 1990s: evolution of a major public health problem in cardiovascular medicine. *J Am Coll Cardiol* 1993; 22 (Supl A): 3-5.
5. Ho K, Pinsky J, Kannel W, Levy D. The epidemiology of heart failure: The Framingham Study. *J Am Coll Cardiol* 1993; 22 (Supl A): 6-13.
6. Bourassa M, Gurné O, Bangdiwala S, Ghali J, Young J, Rousseau M et al. Natural history and patterns of current practice in heart failure. *J Am Coll Cardiol* 1993; 22 (Supl A): 14-19.
7. Massie BM, Shah N. The heart failure epidemic: magnitude of the problem and potential mitigating approaches. *Curr Opin Cardiol* 1996; 11: 221-226.
8. Organización Panamericana de la Salud. Clasificación Internacional de Enfermedades Revisión 1965. Vol. 1. Ginebra, 1968.
9. Organización Panamericana de la Salud. Clasificación Internacional de Enfermedades Revisión 1975. Vol. 1. Washington, 1978.
10. Brophy JM. Epidemiology of congestive heart failure: Canadian data from 1970 to 1989. *Can J Cardiol* 1992; 8: 495-498.
11. CDC. Changes in mortality from heart failure—United States, 1980-1995. *MMWR* 1998; 47: 633-637.
12. Brotons C, Moral I, Ribera A, Pérez G, Cascant P, Bustins M et al. Tendencias de la morbimortalidad por insuficiencia cardíaca en Cataluña. *Rev Esp Cardiol* 1998; 51: 972-976.
13. Love MP, Dacie AP, Cowen SJ, McMurray JJV. Mortality from heart failure in Scotland. *Heart Failure '95, International Meeting of the working Group on Heart Failure of the European Society of Cardiology, Amsterdam, Holanda: 1-4 de abril, 1995.*
14. The Task Force on Heart Failure of the European Society of Cardiology. Guidelines for the diagnosis of heart failure. *Eur Heart J* 1995; 16: 741-751.
15. Navarro-López F, De Teresa E, López-Sendón JL, Castro-Beiras A. Guías del diagnóstico, clasificación y tratamiento de la insuficiencia cardíaca y del shock cardiogénico. Informe del Grupo de Trabajo de Insuficiencia Cardíaca de la Sociedad Española de Cardiología. *Rev Esp Cardiol* 1999; 52 (Supl 2): 1-54.
16. Cowie M, Mosterd A, Wood D, Deckers J, Poole-Wilson P, Sutton G et al. The epidemiology of heart failure. *Eur Heart J*

- 1997; 18: 208-225.
17. Rodríguez-Artalejo F, Guallar-Castillón P, Banegas Banegas JR, Rey Calero J. Variación geográfica en las hospitalizaciones y en la mortalidad por insuficiencia cardíaca congestiva en España, 1980-1993. *Rev Esp Cardiol* 2000; 53: 776-782.
 18. Sánchez J, Rodríguez B, De la Fuente L, Barrio G, Vicente J, Royuela L. Opiates or cocaine: mortality from acute reactions in six major Spanish cities. State Information System on Drug Abuse (SEIT) Working Group. *J Epidemiol Community Health* 1995; 49: 54-60.
 19. Castilla J, De la Fuente L. Evolución del número de personas infectadas por el virus de la inmunodeficiencia humana y de los casos de sida en España: 1980-1988. *Med Clin (Barc)* 2000; 115: 85-89.
 20. Freire Castroseiros E, Penas Lado M, Castro Beiras A. Patología del corazón de origen extracardíaco (VIII) cocaína y corazón. *Rev Esp Cardiol* 1998; 51: 396-401.
 21. Rodríguez Ortiz de Salazar B, Rodríguez Artalejo F, Fuentes Leal C, Sánchez Payá J, De la Fuente de Hoz L, Rey Calero J. Calidad de la certificación de la muerte por reacción aguda a opiáceos y cocaína entre residentes del municipio de Madrid. *Rev San Hig Pub* 1993; 67: 401-407.
 22. Brugal MT, Barrio G, Regidor E, Mestres M, Caylà JA, De la Fuente L. Discrepancias en el número de muertes por reacción aguda a sustancias psicoactivas registradas en España. *Gac Sanit* 1999; 2: 79-81.
 23. Lopera G, Castellanos A, De Marchena E. Nuevos fármacos en insuficiencia cardíaca. *Rev Esp Cardiol* 2001; 54: 624-634.
 24. Ferreira Montero II. Insuficiencia cardíaca: mayor morbilidad, menor mortalidad, ¿vamos por el buen camino? *Rev Esp Cardiol* 2000; 53: 767-769.
 25. United Nations Population Information Network (POPIN). Disponible en: www.undp.org/popin.