Heterogeneity by age in educational inequalities in cause-specific mortality in women in the Region of Madrid

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ABSTRACT

Background: Within Europe, women in the southern regions have the lowest inequalities in mortality. This study evaluates inequalities in mortality from different causes by educational level and their contribution to total mortality inequalities in adult women in one of these regions.

Methods: The 2001 population census in the Region of Madrid was linked with deaths in the following 20 months according to the mortality registry. The population of women was stratified into three age groups, and the mortality rate ratio and mortality rate difference by educational level were estimated in each age group. The contribution of each cause of death to total mortality inequality was estimated based on the absolute index of inequality.

Results: In women aged 45–64 years, no significant relation was observed between educational level and mortality from the leading causes of death. In women aged 25–44 years and in those aged 65 and over, the mortality rate ratios and differences from the leading causes of death gradually increased from the highest to the lowest educational level. AIDS, respiratory diseases and digestive diseases, in young adult women, and cardiovascular diseases, in older women, were the causes of death that contributed most to inequality in mortality.

Conclusions: At the beginning of the twenty-first century, mortality inequalities by educational level were not seen in middle-aged adult women in the Region of Madrid. In contrast, mortality inequalities were found in young women and in older women, although the main causes of death that contributed to these inequalities were different in each group.

Studies in different settings have consistently shown that lower educational level is associated with higher mortality rates in women.^{1–3} In Europe, the magnitude of inequalities in mortality by educational level shows a geographical gradient, with southern populations having inequalities of smaller magnitude than the European average.⁴ This gradient is caused in part by differences among countries in the magnitude, and even the direction, of inequalities in mortality from the leading causes of death.^{5–7}

The magnitude of these inequalities in adult women also varies depending on the age group, but patterns differ by country. In northern European countries, the largest relative inequalities in mortality by educational level are seen in young women and the smallest in older women.⁸ However, in countries of central and southern Europe, relative inequalities in mortality by educa-

tional level in middle-aged women are lower than those in women of more advanced age. For example, in France, Italy and Spain, a significant relation between educational level and mortality has not been observed in middle-aged women.^{9–13}

Inequalities in mortality by cause of death also help to explain this variability in the pattern of inequalities by age. In each age group, each cause of death has a specific relative weight, magnitude and direction of association with educational level, which determine its contribution to inequalities in mortality in that age group. Furthermore, magnitude and direction of association vary by country. For example, in women aged 45–64 years, cancer is the leading cause of death in all European countries.¹⁴ However, the pattern of the association between educational level and cancer mortality varies by country: in northern European countries, higher cancer mortality rates are seen in women with lower educational level, whereas in southern Europe, either no such association has been observed or higher mortality rates are found in women with higher educational level.⁷

These examples point to the importance of knowing both the population groups with mortality inequalities and the causes of death that contribute to these inequalities when developing and setting priorities for public health policies that aim to reduce inequalities in mortality. Thus, the objective of this work is to estimate the relation between educational level and mortality from the leading causes of death in adult women in different age groups in a region of southern Europe, and to evaluate the contribution of these causes of death to inequalities in mortality.

MATERIALS AND METHODS

The source for the data on the population at risk was the population census of the Region of Madrid (Spain) conducted on 1 November 2001. Deaths were obtained from the mortality registry and refer to people who died between 1 November 2001 and 30 June 2003. The Institute of Statistics of the Community of Madrid linked the two data sources using different personal identifiers common to both. After linkage, information referring to personal characteristics was eliminated from the final file to guarantee protection of confidentiality. It was possible to link 80% of deaths occurring in the Region of Madrid, and no significant variations in this percentage were found in the different groups by age, sex or area-based socioeconomic status. The mortality registry includes the census section of residence (of which the median number

Table 1 Person-years at risk, standardised mortality rates (SMR) per 100 000 person-years, and total deaths and distribution of leading causes of death, according to educational level

			Total deaths and distribution of leading causes of death*								
Educational level	Person-years	SMR	Total deaths	AIDS (%)	Cancer (%)	Diabetes mellitus (%)	Cardiovascular diseases (%)	Respiratory diseases (%)	Digestive diseases (%)	External causes (%)	Other causes (%)
25–44 years											
First level or no education	176 648	115	215	9.3	33.7	0.0	7.6	8.7	8.1	7.6	25.0
Second level, first cycle	370 318	72	278	9.0	43.6	0.0	9.9	5.8	4.0	10.8	16.6
Second level, second cycle or higher	980 663	56	489	3.9	48.3	0.5	7.9	4.1	3.1	15.3	16.9
Total	1 527 629	66	981	6.5	43.8	0.3	8.4	5.6	4.5	12.4	19.0
45–64 years											
First level or no education	452 691	296	1464	0.5	56.9	0.7	14.7	4.4	5.2	4.1	13.6
Second level, first cycle	309 948	284	829	0.0	62.7	0.5	14.0	2.9	4.7	4.2	11.0
Second level, second cycle or higher	305 351	292	786	0.3	62.7	0.3	9.5	3.2	5.6	4.6	13.8
Total	1 067 989	290	3079	0.3	59.9	0.5	13.2	3.7	5.2	4.3	13.0
65 years and over											
First level or no education	562 411	3095	21 009	0.0	19.1	2.7	38.9	12.9	5.8	1.4	19.3
Second level, first cycle	97 563	2727	2616	0.0	22.9	1.8	35.6	12.0	5.1	1.6	20.9
Second level, second cycle or higher	83 901	2579	2151	0.0	22.7	1.6	38.2	12.5	5.2	1.6	18.2
Total	743 874	3002	25 776	0.0	19.8	2.5	38.5	12.7	5.6	1.4	19.4

Women in the Region of Madrid, 2001–2003.

*The leading causes of death correspond to the following codes of the International Classification of Diseases, 10th revision (ICD-10): AIDS (B20–B24), cancer (C00–C97), diabetes mellitus (E10–E14), cardiovascular disease (I00–I99), respiratory diseases (J00–J99), digestive diseases (K00–K93) and external causes (V00–Y99).

of residents is 1200), which made it possible for us to determine that the percentage of deaths that could be linked was similar in the different categories of two indicators of neighbourhood socioeconomic status: unemployment rate and per capita income.

To avoid underestimating mortality, each death was weighted by multiplying it by a correction factor of 1/0.8.¹⁵ The present study was limited to women aged 25 years and older. Educational level was taken from the census data, and refers to the highest academic qualification achieved; it was grouped into three categories: first level or lower; second level, first cycle; and second level, second cycle or higher. First level or lower education included women with no knowledge of reading and/or writing, women who can read and write but have not finished primary education and women who have finished primary education; second level, first cycle of education corresponds to lower secondary education or the second stage of basic education, and second level, second cycle or higher education includes upper secondary education, post-secondary non-tertiary education and the first and second stage of tertiary education (university degree). All the analyses were made separately for three age groups: 25–44, 45–64 and 65 years and older.

In each age group and in each category of educational level, we first estimated the mortality rates standardised for age and cause of death. The age-standardised mortality rate is a weighted average of the age-specific mortality rates per 100 000 person-years, where the weights are the proportions of people in the corresponding 5-year age groups of the World

Health Organization's European standard population. We then calculated the rate ratios and differences and their 95% confidence intervals by stratified analysis, taking the highest educational level as the reference category.¹⁶ For each cause of death, the trend in the rate ratio was evaluated using Poisson regression models. When the regression coefficient for educational level—introduced into the models as a quantitative variable—had a p value less than 0.10, the relative and absolute inequalities in mortality were estimated by calculating the relative index of inequality (RII) and the slope index of inequality (SII) respectively.^{17 18}

The RIIs were calculated by Poisson regression and the SIIs by linear regression, where mortality by cause of death was related to a measure of the range of educational level. For example, if the category with the highest educational level includes 20% of the population, the range of individuals in this category would be from 0 to 0.20, giving a mean of 0.10, which would be the value assigned to this category; if the next highest educational level category includes 30% of the population, its range is from 20% to 50%; thus it would be assigned a value of 0.35, and so on. A range score was calculated for each age group. The RII and SII represent, respectively, the mortality rate and mortality difference between people with the lowest educational level (range 1) and those with the highest educational level (range 0).^{17 18}

Finally, the SII for each cause of death was calculated as a percentage of the SII in total mortality to reflect the contribution of each cause of death to the total inequality in mortality.

RESULTS

The number of at-risk person-years, deaths and the age-adjusted mortality rate in each category of educational level are shown in table 1. The leading cause of death varies by age group: it is cancer in women in the 25–44 and 45–64 age groups, and cardiovascular diseases in women aged 65 years and over (table 1).

The magnitude of the mortality rate ratios and differences from all causes of death showed a gradient in young adult women and in older women, with the highest magnitude seen in women with the lowest educational level (table 2). The magnitude of the ratio was higher in young adult women, and the magnitude of the difference was higher in older women. In women with the lowest educational level, the mortality rate ratio from all causes was 2.06 (95% confidence interval (95% CI) 1.74 to 2.43) in the 25–44 year group and 1.20 (95% CI 1.15 to 1.25) in the 65 years and over age group, while the mortality rate difference per 100 000 person-years from all causes was 59 (95% CI 42 to 76) and 516 (95% CI 405 to 627) respectively.

In both age groups, the magnitude of the mortality rate ratio and difference for the leading causes of death showed a similar gradient, although for some causes, the relation was not significant in young adult women (table 2). In women aged 25–44 years, the causes of death with the highest mortality rate ratios and differences were AIDS, respiratory diseases and digestive diseases, whereas in those aged 65 years and over, diabetes mellitus and cardiovascular diseases showed the highest mortality rate ratio and difference respectively.

As seen in table 3, mortality from some specific causes of death in young adult women and in older women did not show the gradient observed for the leading causes of death; the gradient of the rate ratio and differences even goes in the opposite direction for some of these causes of death. This is the case for some cancer sites, such as the lung, for which mortality is higher in women with the highest educational level.

In contrast, in women aged 45–64 years, no significant relation was observed between educational level and mortality from all causes of death (table 2). Mortality from cancer, digestive diseases and from external causes was higher in women with the highest educational level, although the relation was not significant. Among the leading causes of death, only mortality from cardiovascular diseases showed a significant association with educational level. In the specific causes of death (table 3), the magnitude and direction of the relation were heterogeneous and, except in the case of lung cancer, not significant. Compared with women with the highest educational level, the mortality rate ratio for lung cancer in women with the lowest educational level was 0.31 and the mortality rate difference was –22 per 100 000 person-years.

Table 4 shows the indices of mortality inequality by educational level for the leading causes of death and the contribution of these causes of death to absolute inequalities in mortality from all causes. In the middle age group, these indices could be estimated only in the case of cardiovascular mortality because of the absence of association between educational level and mortality from the rest of the causes of death. In the 25–44 year age group, mortality from AIDS was responsible for 19% of the mortality inequality, followed by mortality from respiratory diseases (15%), digestive diseases (12%) and cancer (10%). In those aged 65 years and over, mortality from cardiovascular diseases was responsible for 38% of the inequality in mortality from all causes, followed by mortality from respiratory diseases (12%).

DISCUSSION

Main findings

At the beginning of the present decade, mortality inequalities by educational level in women residing in the Region of Madrid were observed in the 25–44 years and in the 65 years and over age groups, but not in women aged 45–64 years. Relative inequalities were of a higher magnitude in young adult women than in older women, whereas the reverse occurred with absolute inequalities. About 50% of the mortality difference was due to four causes of death—AIDS, respiratory diseases, diseases of the digestive system and cancer—in young adult women, and to two causes of death—cardiovascular and respiratory diseases—in older women.

Study strengths and limitations

The results of this study show that consensus about the existence of a social gradient in mortality is not completely accurate, as the magnitude and direction of the association between educational level and mortality vary depending on the cause of death, and even the same cause of death can vary depending on the age cohort.¹⁹

Our analyses are based on the weighted number of deaths, as only 80% of the deaths could be linked with the population census. The proportion of deaths that could be linked could conceivably differ depending on the educational level of the deceased. However, this eventuality is highly unlikely given that there were no significant variations by age, sex or area-based socioeconomic status. Furthermore, our findings are similar to those obtained in studies in other regions of Spain.^{13 20}

Educational level can have a different meaning across birth cohorts.²¹ For example, in Spain, a low level of education in women aged 25–44 years probably reflects much more adverse environmental circumstances than it would in older women—circumstances that would have prevented these younger women from benefiting from the greater educational opportunities in Spain in the last two decades of the twentieth century. So, although education is a good socioeconomic indicator to show people with different mortality risk in each age group, comparison of the magnitude of the association between education and mortality in young and older women is not appropriate because of the different meaning of educational level across generations.

Possible explanations

The high percentage of deaths from AIDS—similar to the average in Spain and higher than the European average¹⁴—and the great magnitude of inequalities in AIDS mortality—consistent with estimates from other Spanish regions^{13 20}—explain the contribution of AIDS deaths to mortality inequalities in young women. AIDS deaths were mainly in cases related to intravenous drug use;²² therefore, inequalities in mortality due to AIDS by educational level can be related to social patterns associated with this risk behaviour in Spain.^{23 24} Another likely factor related to mortality inequalities due to AIDS is access to highly effective antiretroviral therapies. However, the results of a recent study in the Region of Madrid ruled out the hypothesis that access to these types of therapies had increased inequalities in mortality from AIDS.²⁵

Social patterns in intravenous drug use could also be responsible for inequalities in mortality from digestive diseases observed in young women. Chronic hepatitis C—related to intravenous drug use—is the leading cause of liver cirrhosis in Spain,²⁶ and the findings of the present study show a high magnitude of

Table 2 Mortality rate ratio and difference per 100 000 person-years adjusted for age and leading causes of death, by educational level

Age and cause of death	Rate ratio (95% CI)			Rate difference (95% CI)		
	Second level, second cycle or higher	Second level, first cycle	First level or no education	Second level, second cycle or higher	Second level, first cycle	First level or no education
25–44 years						
All causes	1.00	1.29 (1.11 to 1.49)	2.06 (1.74 to 2.43)	0	16 (6 to 26)	59 (42 to 76)
AIDS	1.00	3.08 (1.68 to 5.63)	5.85 (3.08 to 11.1)	0	5 (2 to 7)	11 (5 to 16)
Cancer	1.00	1.10 (0.88 to 1.37)	1.21 (0.92 to 1.58)	0	3 (–4 to 9)	6 (–3 to 15)
Diabetes mellitus	1.00	–	–	0	–	–
Cardiovascular diseases	1.00	1.56 (0.95 to 2.55)	2.00 (1.10 to 3.64)	0	2 (0 to 5)	4 (0 to 9)
Respiratory diseases	1.00	1.91 (0.98 to 3.69)	5.37 (2.81 to 10.3)	0	2 (0 to 4)	9 (4 to 15)
Digestive diseases	1.00	1.78 (0.81 to 3.88)	5.51 (2.73 to 11.2)	0	1 (–1 to 3)	8 (3 to 12)
External causes	1.00	1.01 (0.66 to 1.56)	1.26 (0.72 to 2.20)	0	0 (–3 to 4)	2 (–3 to 7)
Other causes	1.00	1.33 (0.93 to 1.91)	3.1 (2.18 to 4.42)	0	3 (–1 to 7)	19 (11 to 28)
45–64 years						
All causes	1.00	0.97 (0.88 to 1.07)	1.01 (0.93 to 1.11)	0	–8 (–37 to 21)	4 (–22 to 31)
AIDS	1.00	–	4.07 (0.97 to 17.8)	0	–	2 (0 to 4)
Cancer	1.00	0.96 (0.84 to 1.09)	0.93 (0.82 to 1.04)	0	–8 (–30 to 159)	–13 (–34 to 7)
Diabetes mellitus	1.00	1.42 (0.28 to 7.30)	1.70 (0.40 to 7.12)	0	0 (–2 to 3)	1 (–1 to 3)
Cardiovascular diseases	1.00	1.49 (1.11 to 2.02)	1.46 (1.11 to 1.92)	0	14 (4 to 24)	13 (4 to 21)
Respiratory diseases	1.00	1.00 (0.56 to 1.78)	1.46 (0.90 to 2.36)	0	0 (–5 to 5)	4 (–1 to 9)
Digestive diseases	1.00	0.84 (0.54 to 1.31)	0.98 (0.66 to 1.44)	0	–3 (–9 to 4)	0 (–7 to 6)
External causes	1.00	0.85 (0.53 to 1.38)	0.97 (0.63 to 1.49)	0	–2 (–8 to 4)	0 (–6 to 5)
Other causes	1.00	0.77 (0.58 to 1.02)	0.98 (0.77 to 1.25)	0	–10 (–20 to 1)	–1 (–11 to 9)
65 years and over						
All causes	1.00	1.06 (1.00 to 1.12)	1.20 (1.15 to 1.25)	0	147 (3 to 291)	516 (405 to 627)
AIDS	1.00	–	–	0	–	–
Cancer	1.00	1.07 (0.96 to 1.19)	1.12 (1.03 to 1.21)	0	40 (–23 to 104)	67 (18 to 116)
Diabetes mellitus	1.00	1.25 (0.81 to 1.93)	2.08 (1.47 to 2.92)	0	10 (–10 to 29)	43 (29 to 58)
Cardiovascular diseases	1.00	0.99 (0.90 to 1.08)	1.19 (1.11 to 1.27)	0	–12 (–101 to 79)	187 (116 to 257)
Respiratory diseases	1.00	1.02 (0.87 to 1.20)	1.17 (1.04 to 1.33)	0	6 (–46 to 59)	57 (16 to 98)
Digestive diseases	1.00	1.02 (0.80 to 1.28)	1.33 (1.12 to 1.59)	0	2 (–29 to 33)	45 (20 to 69)
External causes	1.00	1.06 (0.70 to 1.60)	1.10 (0.79 to 1.51)	0	2 (–15 to 20)	4 (–9 to 17)
Other causes	1.00	1.21 (1.06 to 1.37)	1.24 (1.12 to 1.37)	0	97 (33 to 162)	113 (65 to 162)

Women residing in Madrid, 2001–2003.

inequalities in mortality from liver cirrhosis. Likewise, the mortality rate ratio for all cases of viral hepatitis in young women is six times higher in those with low educational level than in those with high educational level (data not shown).

The contribution of deaths from respiratory diseases to mortality inequalities in young women is largely due to inequalities in mortality from pneumonia and influenza. One of the main risk factors for pneumococcal disease in young people is smoking.²⁷ It has been observed that, since the end of the 1970s, smoking initiation rates in Spanish women have been higher in groups with low educational level.²⁸ In the case of cancer, most sites—except for cancer of the lung and breast—showed a higher mortality rate in women with lower educational level; for this reason, cancer deaths overall also contributed to mortality inequalities in young adult women.

In women aged 45–64 years, the highest rate of mortality from cancer, digestive diseases and external causes was observed in those with the highest educational level. These findings, especially in relation to cancer, which represents 60% of deaths, explain the absence of mortality inequalities by educational level in this age group. Cardiovascular disease and diabetes mellitus, for which the highest mortality rates were seen in women with the lowest educational level, represented barely 14% of deaths.

The findings on cancer mortality in this age group result from the fact that mortality from various cancer sites either was not associated with educational level or was higher in women with higher educational level. The most noteworthy among these sites is lung cancer, as it shows the greatest relative and absolute differences in mortality. This socioeconomic pattern of lung cancer mortality, similar to what has been observed in other regions of southern Europe,²⁹ reflects the greater prevalence of smoking in women with high educational level in this age group.³⁰ In contrast, in northern European countries, where the highest prevalence of smoking is found in women with a lower level of education, the socioeconomic pattern of lung cancer mortality is the reverse.²⁹

Several studies comparing data from different European countries indicate that the contribution of cardiovascular disease mortality to inequalities in total mortality is lower in regions in the south of Europe.^{4–8} These findings may be because these investigations were made in women aged 45 years and over and, as seen in our study, the percentage of cardiovascular deaths is small in women between 45 and 64 years of age.

However, consistent with what has been described in other European studies, inequalities in cardiovascular mortality and the large percentage that cardiovascular deaths represent in older women explain the large contribution of cardiovascular

Research report

Table 3 Mortality rate ratio and difference by specific causes of death per 100 000 person-years adjusted for age and educational level*

Cause of death†	Age group (years)					
	25–44		45–64		65 and over	
	Second level, first cycle	First level or no education	Second level, first cycle	First level or no education	Second level, first cycle	First level or no education
Rate ratio						
Cancer sites						
Stomach	1.73	1.81	1.34	1.48	1.03	1.39
Colorectal	1.68	2.80‡	1.44	1.2	0.95	1.28‡
Lung	0.79	0.49	0.70‡	0.31‡	0.72	0.78
Breast	0.96	0.84	1.04	1.13	1.00	1.00
Cervix	0.58	1.60	1.00	1.43	—	—
Uterus	—	—	1.02	0.8	1.49	2.21‡
Ovary	1.22	2.09	1.21	1.07	1.36	1.80‡
Liver	—	—	2.34	2.59	0.88	0.91
Pancreas	0.42	1.49	0.56	0.83	0.93	0.71‡
Haematological	0.90	2.12	0.96	0.93	0.98	0.87
Ischaemic heart disease	2.16	1.03	1.21	1.4	1.05	1.15‡
Cerebrovascular disease	0.94	1.65	0.89	1.05	0.80‡	1.04
Pneumonia and influenza	1.67	3.45	0.77	1.03	0.82	0.94
COPD	—	—	1.47	1.92	0.98	1.14
Cirrhosis of the liver	1.86	2.77	0.6	1.33	0.88	1.25
Traffic accidents	1.14	0.63	0.73	0.94	1.26	1.61‡
Suicide	1.75	1.39	1.12	0.57	2.64	2.76
Rate difference						
Cancer sites						
Stomach	1	1	2	3	1	11
Colorectal	1	2	6	3	−3	18‡
Lung	−1	−1	−10‡	−22‡	−14	−11
Breast	0	−1	2	6	0	0
Cervix	−1	1	0	2	—	—
Uterus	—	—	0	−1	4	9‡
Ovary	0	2	3	1	6	13‡
Liver	—	—	2	3‡	−5	−4
Pancreas	0	0	−4	−1	−4	−15‡
Haematological	0	2	0	−1	−2	−9
Ischaemic heart disease	1	0	2	3	13	39‡
Cerebrovascular disease	0	1	−1	0	−58‡	12
Pneumonia and influenza	0	1	−1	0	−19	−6
COPD	—	—	1	1	−1	8
Cirrhosis of the liver	1	1	−2	2	−2	4
Traffic accidents	0	−1	−1	0	1	2‡
Suicide	1	1	0	−2	2	3

Women residing in the Region of Madrid, 2001–2003.

*The reference category is women with the lowest educational level (first level or no education).

†The ICD-10 codes and the number of death for cancer sites are: stomach (C16, 846 deaths), colorectal (C18–C20, 531 deaths), lung (C33–C34, 1261 deaths), breast (C50, 114 deaths), cervix (C53, 154 deaths), uterus (C54, 378 deaths), ovary (C56, 369 deaths), liver (C22, 416 deaths), pancreas (C25, 635 deaths) and haematological (C81–C85, C91–C95, 785 deaths). The codes and the number of deaths for the other causes of death are: ischaemic heart disease (I20–I25, 2708 deaths), cerebrovascular disease (I60–I69, 2706 deaths), pneumonia and influenza (J10–J18, 907 deaths), chronic obstructive pulmonary disease (COPD) (J40–J47, 598 deaths), cirrhosis of the liver (K70, K73, K74, 226 deaths), traffic accidents (V02–V04, V09.0, V09.2, V12–V14, V19.0–V19.6, V20–V79, V80.3, V80.5, V81.0–V81.1, V82.0–V82.1, V83–V86, V87.0–V87.8, V88.8–V88.9, V89.0–V89.2, 184 deaths) and suicide (X60–X84, Y87.0, 90 deaths).

‡The confidence interval of the estimator does not include 1 (in the case of rate ratios) and does not include 0 (in the case of rate differences).

What is already known on this subject

- In Europe, the magnitude of inequalities in mortality by educational level in women varies depending on the age group, but patterns differ by country.
- In northern European countries, the largest relative inequalities in mortality are seen in young women and the smallest in older women.
- However, in countries of central and southern Europe, relative inequalities in mortality in middle-aged women are lower than those in women of more advanced age.

What this study adds

- The existence of a social gradient in mortality is not completely accurate, as the magnitude and direction of the association between educational level and mortality vary depending on the cause of death, and even the same cause of death can vary depending on the age cohort.
- At the beginning of the twenty-first century, mortality inequalities by educational level were not seen in middle-aged adult women in the Region of Madrid.
- Mortality inequalities were found in young women and in older women, although the main causes of death that contributed to these inequalities were different in each group.

Table 4 Relative and absolute inequalities in mortality from the leading causes of death by educational level and the contribution of these causes to general inequality in mortality

Age and cause of death	Relative index of inequality	Slope index of inequality	Contribution of the leading causes of death to inequality in mortality
25–44 years			
All causes	2.50	84	100
AIDS	16.14	16	19
Cancer	1.32	8	10
Diabetes mellitus	—	—	—
Cardiovascular diseases	2.59	7	8
Respiratory diseases	8.86	13	15
Digestive diseases	12.21	10	12
External causes	*	*	*
Other causes	4.89	28	33
45–64 years			
All causes	*	*	*
AIDS	—	—	—
Cancer	*	*	*
Diabetes mellitus	*	*	*
Cardiovascular diseases	1.52	20	20
Respiratory diseases	*	*	*
Digestive diseases	*	*	*
External causes	*	*	*
Other causes	*	*	*
65 years and over			
All causes	1.36	1.482	100
AIDS	—	—	—
Cancer	1.17	143	10
Diabetes mellitus	3.40	132	9
Cardiovascular diseases	1.42	562	38
Respiratory diseases	1.36	180	12
Digestive diseases	1.68	154	10
External causes	*	*	*
Other causes	1.25	293	20

Women residing in the Region of Madrid, 2001–2003.

*p for trend of the mortality rate ratio >0.10.

—, insufficient number of deaths to evaluate association in one or more strata.

mortality to total mortality inequalities observed in this age group. Inequalities in cardiovascular mortality can be attributed to the unequal distribution of different risk factors associated with the development of cardiovascular diseases, such as sedentarism, obesity and hypertension, which are more frequent in women with less education.^{4 30 31}

Social patterns of sedentarism, obesity and hypertension can also be related to mortality inequalities from some cancer sites such as colorectal cancer and endometrial cancer, which represent a considerable portion of cancer deaths in this group of women.^{32 33} Similarly, the higher frequency of obesity in women with the lowest educational level can be related to high inequality in mortality from diabetes mellitus, although its contribution to total mortality inequality is limited due to the small weight of deaths from this cause.

Finally, our finding of inequalities in mortality from chronic obstructive pulmonary disease in older women was surprising, considering the low prevalence of smoking in these cohorts in Spain.³⁴ These results may be due to passive exposure to tobacco smoke,³⁵ as these women are likely to have lived with men with low educational level, who have a higher prevalence of smoking than more highly educated men.

In summary, this study shows that, at the beginning of the twenty-first century, mortality inequalities were not seen in

adult middle-aged women residing in a region in the south of Europe. In contrast, mortality inequalities were observed in young women and in older women, although the causes of death that contributed to these mortality inequalities were different in each group.

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