

## Task Force Report

# The burden of cardiovascular diseases mortality in Europe

## Task Force of the European Society of Cardiology on Cardiovascular Mortality and Morbidity Statistics in Europe

S. Sans\*, H. Kesteloot†, D. Kromhout‡ on behalf of the Task Force§

\*Institute of Health Studies, Barcelona, Spain; †Department of Epidemiology, University of Leuven, Belgium;  
‡Division of Public Health Research, National Institute of Public Health and the Environment, Bilthoven,  
The Netherlands

### Introduction

Cardiovascular diseases are the major cause of death in adults and the elderly in the majority of the developed countries and in many developing countries. Cardiovascular diseases result in substantial disability and loss of productivity and contribute in large part, to the escalating costs of health care, especially in the presence of an ageing population. Papers published by the World Health Organization of the United Nations (WHO) and others<sup>[1–4]</sup> have previously reported trends in cardiovascular mortality over time. These reports showed large international between-country differences both in the levels and in the trends in mortality from cardiovascular diseases, especially from ischaemic heart disease. More recent analysis of mortality data points to a substantial increase in cardiovascular diseases in countries of Central and Eastern Europe concomitant with recent nutritional, economical and political changes<sup>[5,6]</sup>.

Although most European countries perform analysis of mortality at the sub-national (regional) level, international analysis using sub-national data have been made only for selected diseases, for example cancer mortality by the International Agency for Research on Cancer, Lyon. The advantage of this type of analysis is

that spatial variability in mortality patterns can be shown across borders. This may help in identifying factors responsible for this variation.

The importance of population control of cardiovascular diseases was highlighted by the European Union in article 129 of the Treaty on European Union, which contains specific provisions on public health and focuses on the 'prevention of disease, in particular the major health scourges'<sup>[7]</sup>. The Council Resolution<sup>[8]</sup> recognized the need for monitoring and surveillance of cardiovascular diseases within the general framework of health monitoring. Accordingly, the Board of the European Society of Cardiology upon recommendation from the Committee for Scientific and Clinical Initiatives, set up a Task Force to study the latest available data on cardiovascular mortality and morbidity in order to assess the burden of these diseases in Europe. This report reviews total cardiovascular, ischaemic heart disease, cerebrovascular and all causes mortality in European countries for the years 1990–1992. Regional mortality rates are presented for the years 1990–1991. Finally, the country mortality trends for the period 1970 to 1992 are analysed.

### Methods

#### Mortality data at country level

All European countries submit annual mortality data to WHO. For the present study, age and cause-specific mortality rates by 5-year age classes for each country were obtained from WHO, Geneva.

In this part of the report, analysis has been restricted to the age group 45–74 years. The age of

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*Members of the Task Force listed in the Appendix.*

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*Correspondence:* Dr S. Sans, Institute of Health Studies, Pavelló Del Convent, 2-Hospital de Sant Pau-P. Claret, 167–08025 Barcelona, Spain.

**Table 1(a) Mortality from all causes in European countries. 1990–92. Men. Rates per 100 000**

Country	Age-category (years)			45–74 (age-adjusted)
	45–54	55–64	65–74	
Iceland	379	1072	2901	1169
Sweden	391	1153	3047	1234
Switzerland	415	1149	3050	1244
Greece	442	1159	3000	1248
Spain	509	1267	3038	1323
France	597	1397	2831	1361
Italy <sup>1</sup>	466	1363	3247	1383
Netherlands	412	1272	3554	1395
Norway	433	1319	3442	1396
UK-England & Wales	449	1390	3802	1506
Austria	589	1521	3410	1526
Belgium <sup>2</sup>	538	1501	3819	1587
Germany	619	1551	3596	1591
Denmark	539	1555	3931	1630
Ireland	462	1540	4272	1666
Portugal	674	1602	3782	1673
UK-N. Ireland	510	1569	4244	1691
Finland	666	1641	3945	1718
UK-Scotland	602	1734	4511	1846
Slovenia	807	2079	4105	1966
Bulgaria	934	2084	4460	2101
Romania	1097	2195	4377	2192
Ex-Czechoslovakia	926	2417	5249	2384
Lithuania	1330	2498	4696	2468
Poland	1199	2566	5000	2500
Estonia	1386	2839	5426	2769
Latvia	1500	2875	5362	2817
Hungary	1461	2948	5365	2826
Russian Federation	1544	2963	5427	2881
Ukraine	1516	3000	5693	2940

<sup>1</sup>1989–91<sup>2</sup>1987–89.

74 years was taken as the upper limit because there is a large difference in age structure between men and women in European countries for persons over 74 years. All rates are per a population of 100 000 a year. Age standardization was by the direct method using the old WHO European population as standard<sup>[9]</sup>. Mortality rates for the period 1990–92 were calculated, and averaged.

For recent trends, the data collected for the period 1970–1992 were used. The starting year of 1970 was chosen because the period 1970–92 covers the 8th and 9th revision of the International Classification of Diseases (ICD). No major changes in the classification of the disease groups of interest occurred during the transition from the 8th to the 9th revision of the ICD, which took place around 1980. The following ICD-9<sup>[10]</sup> codes were used:

All causes (AC). ICD codes 001–E999  
 Total Cardiovascular Diseases (CVD). ICD codes 390–459  
 Ischaemic Heart Disease (IHD). ICD codes 410–414  
 Cerebrovascular Accidents (CVA). ICD codes 430–438

**Table 1(b) Mortality from all causes in European countries. 1990–92. Women. Rates per 100 000**

Country	Age-category (years)			45–74 (age-adjusted)
	45–54	55–64	65–74	
France	247	528	1198	552
Spain	213	505	1423	578
Switzerland	233	525	1407	590
Greece	203	518	1731	645
Italy <sup>1</sup>	236	586	1566	647
Sweden	241	618	1607	670
Netherlands	260	656	1661	702
Norway	242	650	1719	705
Iceland	274	671	1641	710
Austria	285	665	1758	738
Finland	266	622	1885	742
Belgium <sup>2</sup>	303	690	1844	773
Germany	300	719	1889	792
Portugal	311	699	1957	805
Slovenia	357	803	2016	873
UK-England & Wales	283	821	2173	882
Ireland	299	854	2344	937
UK-N. Ireland	311	900	2317	952
Denmark	369	1008	2261	1003
Lithuania	431	964	2310	1025
Bulgaria	373	981	2683	1087
Poland	418	1012	2557	1090
Ex-Czechoslovakia	359	1010	2683	1091
UK-Scotland	365	1049	2664	1103
Estonia	458	1090	2656	1156
Latvia	505	1093	2639	1174
Romania	464	1061	2785	1177
Russian Federation	503	1151	2775	1223
Hungary	555	1216	2836	1281
Ukraine	536	1280	3219	1379

<sup>1</sup>1989–91<sup>2</sup>1987–89.

For Denmark and Switzerland, the 8th version of the ICD was used throughout the whole period.

### Regional mortality data

For the present study, regional data for European countries, with the exception of Belgium, were made available from the project 'Spatial patterns of mortality at the sub-national level in Europe' (WHO, Copenhagen, in press). This project was undertaken by the WHO Centre for Environment and Health in collaboration with the United Nations Economic Commission for Europe, the Central Bureau of Statistics Netherlands and the Netherlands National Institute of Public Health and the Environment. Regional data on population structure, all causes and cause-specific mortality by age and gender were provided for that project by the National Statistical Offices and/or other national institutes.

Maps with the age-standardized mortality rates for all ages averaged for the years 1990 and 1991 are presented to obtain more stable rates. The old WHO European population was used as the standard<sup>[9]</sup>. Rates

**Table 2(a) Mortality from cardiovascular disease in European countries. 1990–92. Men. Rates per 100 000**

Country	Age-category (years)			45–74 (age-adjusted)
	45–54	55–64	65–74	
France	102	304	827	330
Spain	126	357	1011	399
Switzerland	108	381	1229	447
Italy <sup>1</sup>	127	413	1166	453
Iceland	133	443	1376	511
Greece	170	476	1340	531
Belgium <sup>2</sup>	152	481	1415	542
Netherlands	137	481	1447	542
Sweden	122	513	1583	576
Portugal	161	512	1586	593
Austria	171	581	1598	624
Denmark	145	579	1705	636
Germany	176	591	1645	640
Norway	152	590	1704	642
Slovenia	210	659	1705	692
UK-England & Wales	187	649	1826	704
Ireland	196	724	2092	792
UK-N. Ireland	225	766	2161	834
Finland	244	809	2067	837
UK-Scotland	256	826	2242	886
Romania	400	1021	2579	1090
Lithuania	466	1070	2491	1117
Bulgaria	412	1096	2757	1160
Ex-Czechoslovakia	346	1132	2849	1163
Poland	458	1162	2663	1182
Hungary	495	1261	2709	1242
Russian Federation	549	1311	2982	1343
Estonia	531	1362	3201	1401
Latvia	602	1384	3043	1405
Ukraine	561	1448	3415	1490

<sup>1</sup>1989–91.<sup>2</sup>1987–89.

were then classified into seven categories using the cause-specific 10th, 25th, 40th, 60th, 75th and 90th percentiles as cutpoints, which are represented by the different tints in the maps. Each map has a legend for these tints which also shows the distribution of the total European population in each category, expressed as the area under the curve. For this later calculation, percentiles were weighted by regional population size. In order to draw more attention to the extreme regions, ratios between the 90th and 10th percentile were calculated for regions with high and low mortality rates.

### Mortality trends in countries

Mortality trends in countries are presented in two ways. Firstly, the percent annual change of the total and cause-specific mortality rates for the age group 45–74 during the period 1970–1992 was calculated using a linear regression model. The annual mortality rates were regressed on calendar year and from the regression coefficient the annual percentage change in mortality rate and its significance level were then obtained.

**Table 2(b) Mortality from cardiovascular disease in European countries. 1990–92. Women. Rates per 100 000**

Country	Age-category (years)			45–74 (age-adjusted)
	45–54	55–64	65–74	
France	30	94	348	122
Switzerland	34	112	496	162
Spain	39	126	545	180
Italy <sup>1</sup>	43	148	595	200
Iceland	39	136	621	200
Netherlands	45	165	634	215
Sweden	39	163	673	220
Norway	36	178	731	237
Belgium <sup>2</sup>	54	179	739	247
Austria	56	206	794	269
Denmark	52	224	799	275
Germany	54	210	824	276
Greece	48	184	891	279
Finland	52	201	938	297
Portugal	68	224	908	305
Slovenia	70	235	920	313
UK-England & Wales	56	252	938	316
Ireland	56	266	1008	337
UK-N. Ireland	76	324	1117	389
UK-Scotland	91	380	1239	441
Lithuania	122	402	1379	494
Ex-Czechoslovakia	96	411	1505	512
Poland	130	430	1432	518
Hungary	163	507	1561	587
Estonia	136	485	1701	598
Latvia	171	519	1675	620
Bulgaria	144	524	1782	633
Russian Federation	166	568	1780	657
Romania	171	530	1868	666
Ukraine	203	717	2261	830

<sup>1</sup>1989–91.<sup>2</sup>1987–89.

Secondly, for reasons of clarity we selected a limited number of nine countries to illustrate the different long-term trends in mortality rates since 1970. The following nine indicator countries represent the large variety in trends: for Central and Eastern Europe, the Russian Federation, the former Czechoslovakia and Hungary; for Western Europe, Denmark and England and Wales; for Northern Europe, Finland; and for Southern Europe, Portugal, Spain and Greece. In order to reduce random variation in annual mortality rates in these trend figures, rates are averaged for 3 years with the exception of the first and final years for which mortality rates are based on two years.

### Results

Tables 1–4 show the rates per 100 000 population per year for the age groups 45–54, 55–64 and 65–74 years for different causes of death and for men and women separately. Age-standardized mortality rates for the group 45–74 years are ranked by ascending order of mortality.

**Table 3(a) Mortality from ischaemic heart disease in European countries. 1990–92. Men. Rates per 100 000**

Country	Age-category (years)			45–74 (age-adjusted)
	45–54	55–64	65–74	
France	46	135	343	142
Spain	63	175	426	181
Portugal	74	203	478	207
Italy <sup>1</sup>	72	224	530	224
Switzerland	60	217	657	244
Greece	101	254	562	255
Belgium <sup>2</sup>	84	249	605	255
Slovenia	101	289	608	277
Netherlands	86	301	798	315
Austria	102	341	858	349
Germany	97	339	893	354
Iceland	106	319	978	370
Sweden	82	358	1074	394
Romania	189	408	870	413
Denmark	98	396	1117	423
Bulgaria	174	421	943	427
Poland	234	495	782	444
Norway	116	435	1124	446
UK-England & Wales	146	497	1281	515
Ireland	152	555	1428	570
Finland	159	582	1449	587
Hungary	265	645	1217	604
UK-N. Ireland	184	600	1573	631
UK-Scotland	199	644	1585	655
Ex-Czechoslovakia	226	721	1627	703
Ukraine	291	721	1710	749
Russian Federation	357	765	1592	767
Lithuania	340	774	1827	814
Estonia	334	865	1988	879
Latvia	422	918	1860	907

<sup>1</sup>1989–91<sup>2</sup>1987–89.**Table 3(b) Mortality from ischaemic heart disease in European countries. 1990–92. Women. Rates per 100 000**

Country	Age-category (years)			45–74 (age-adjusted)
	45–54	55–64	65–74	
France	6	27	111	36
Spain	9	38	159	52
Switzerland	9	45	205	64
Italy <sup>1</sup>	12	50	198	65
Portugal	16	59	208	73
Greece	14	58	237	78
Belgium <sup>2</sup>	17	68	257	87
Slovenia	18	78	270	94
Netherlands	18	81	296	101
Austria	19	90	347	115
Germany	18	90	354	116
Iceland	14	85	378	118
Sweden	17	92	380	122
Poland	41	127	306	128
Norway	18	108	397	132
Denmark	22	120	430	145
Finland	19	107	552	166
Bulgaria	34	142	515	176
UK-England & Wales	28	158	565	190
Ireland	25	162	585	195
Romania	45	162	547	195
Hungary	61	207	594	228
UK-N. Ireland	37	209	692	240
Ex-Czechoslovakia	40	206	717	245
UK-Scotland	51	244	762	273
Russian Federation	61	243	811	288
Lithuania	57	224	895	298
Estonia	57	235	928	309
Latvia	80	262	891	320
Ukraine	59	284	1000	342

<sup>1</sup>1989–91<sup>2</sup>1987–89.

### All causes mortality

In 1990, the Ukraine, the Russian Federation and Hungary showed the highest all-causes mortality rates in men aged 45–74 years, followed by other countries of Central and Eastern Europe and by Scotland (Table 1(a)). The lowest all-causes mortality rates were observed in Northern European countries, for example Iceland and Sweden and in Southern European countries, such as Greece and Spain. There is a 2·5 difference in total mortality for men between Iceland and the Ukraine. Between-country differences in total mortality for women aged 45–74 years are similar to men, although total mortality is half that in men (Table 1(b)).

Figures 1(a) and (b) present all-causes mortality at regional level for men and women. They show a clear East–West gradient. Important variations in regional mortality could also be observed within countries. Within the United Kingdom, for example, a distinct North–South gradient is present, with mortality rates in Scotland compared with England being almost 50% higher. An exception to the low all-causes mortality rates in the South of Europe is Portugal, which has a higher total mortality than other Southern European countries.

Figure 2 shows the percent annual change in all-causes mortality for men and women for different countries during the period 1970–1992. The majority of the countries for which data were available for the whole period showed a significant annual decline in mortality of more than 1% among men. Exceptions were Central European countries, i.e. in Hungary a 1·6% increase per year was noted. Among women, mortality from all causes declined in all countries, although non-significantly in Hungary, Poland and Denmark. The decline of total mortality in women was generally larger than in men.

Figures 3(a) and (b) show the trends in mortality from all causes for the nine selected countries. There is a clear decline in countries of Western and Southern Europe with the exception of Danish women. In Central and Eastern European countries a steep increase was observed, especially during the last 6 years.

### Total cardiovascular mortality

There is a fourfold difference in mortality from total cardiovascular diseases in men aged 45 to 74 between the

**Table 4(a) Mortality from cerebrovascular accidents in European countries. 1990–92. Men. Rates per 100 000**

Country	Age-category (years)			45–74 (age-adjusted)
	45–54	55–64	65–74	
Switzerland	10	35	170	54
France	20	57	175	67
Iceland	8	49	249	75
Netherlands	15	55	234	77
Sweden	16	67	240	83
Belgium <sup>2</sup>	20	64	264	89
Norway	15	65	279	90
Spain	24	72	265	93
Denmark	22	77	265	94
Ireland	17	71	303	98
Germany	22	79	286	100
UK-England & Wales	21	78	298	101
Italy <sup>1</sup>	23	82	295	103
Austria	25	87	313	110
UK-N. Ireland	22	90	317	110
Greece	27	94	369	125
Finland	37	110	355	132
UK-Scotland	30	105	408	139
Poland	58	152	353	155
Slovenia	55	178	563	208
Lithuania	71	208	537	220
Portugal	55	206	786	267
Ex-Czechoslovakia	58	227	750	267
Romania	89	269	720	289
Hungary	109	309	752	318
Estonia	104	345	950	372
Latvia	114	360	993	391
Bulgaria	116	360	1012	396
Russian Federation	112	385	1039	409
Ukraine	190	599	1448	606

<sup>1</sup>1989–91<sup>2</sup>1987–89.

Ukraine (1490 deaths/100 000/year) and France (330 deaths/100 000/year) (Table 2(a)). Most countries of Central and Eastern Europe had higher cardiovascular disease mortality compared with the rest of Europe. For women, the differences are even larger, up to sevenfold between France and the Ukraine, although the absolute level of risk is lower than in men (Table 2(b)). A clear East–West gradient was present in regional mortality from total cardiovascular diseases (Fig. 4(a) and (b)). Also within countries remarkable differences were noted, for instance in the United Kingdom.

Between 1970 and 1992, total cardiovascular diseases mortality was decreasing significantly at an average of about 1·5% annually in most countries. Exceptions were Central European countries and Greece in which increasing trends were observed (Fig. 5(a) and (b)). The decline in mortality from all cardiovascular disease in women was more marked than in men. In contrast to men, with the exception of Poland and Hungary, there were no significant changes in Central European women. In Greece, total cardiovascular diseases mortality was increasing in men but decreasing in women.

**Table 4(b) Mortality from cerebrovascular accidents in European countries. 1990–92. Women. Rates per 100 000**

Country	Age-category (years)			45–74 (age-adjusted)
	45–54	55–64	65–74	
Switzerland	8	22	95	32
France	10	27	96	35
Iceland	20	22	144	48
Sweden	12	36	154	51
Netherlands	13	36	152	51
Spain	12	35	179	57
Norway	12	34	188	58
Belgium <sup>2</sup>	16	40	182	61
Germany	13	42	190	62
Austria	15	41	192	63
Italy <sup>1</sup>	15	44	190	63
Denmark	18	53	180	65
Ireland	15	51	227	74
UK-England & Wales	16	54	227	75
Finland	20	55	240	80
UK-N. Ireland	22	59	257	86
Poland	28	82	251	95
Greece	16	61	356	106
UK-Scotland	26	83	307	107
Slovenia	29	82	311	109
Lithuania	39	122	400	147
Portugal	32	107	490	158
Ex-Czechoslovakia	26	113	495	159
Hungary	51	147	482	178
Romania	59	178	584	215
Estonia	47	186	662	229
Latvia	54	200	677	240
Bulgaria	54	211	743	259
Russian Federation	62	232	750	271
Ukraine	103	362	1091	408

<sup>1</sup>1989–91<sup>2</sup>1987–89.

Figures 6(a) and (b) show the long-term trends for total cardiovascular mortality for the selected countries. There is a marked contrast between the general decreasing trend in Western and Southern Europe and the increasing trend in Eastern Europe. Even a rebound upward trend over the past 4–6 years was noted in the Russian Federation and Hungary, especially in men.

### Ischaemic heart disease

In men aged 45–74 years, the age-standardized mortality rates from ischaemic heart disease varied between 907 deaths/100 000/year in Latvia and 142 deaths/100 000/year in France. For women, these figures were 342 deaths/100 000/year in the Ukraine and 36 deaths/100 000/year in France (Tables 3(a) and (b)). The absolute rates are much higher in men than in women. The mortality rate ratio for the age group 45 to 74 years between the country with the highest mortality rate compared with the country with the lowest rate, was 6·4 in men and 9·5 in women.

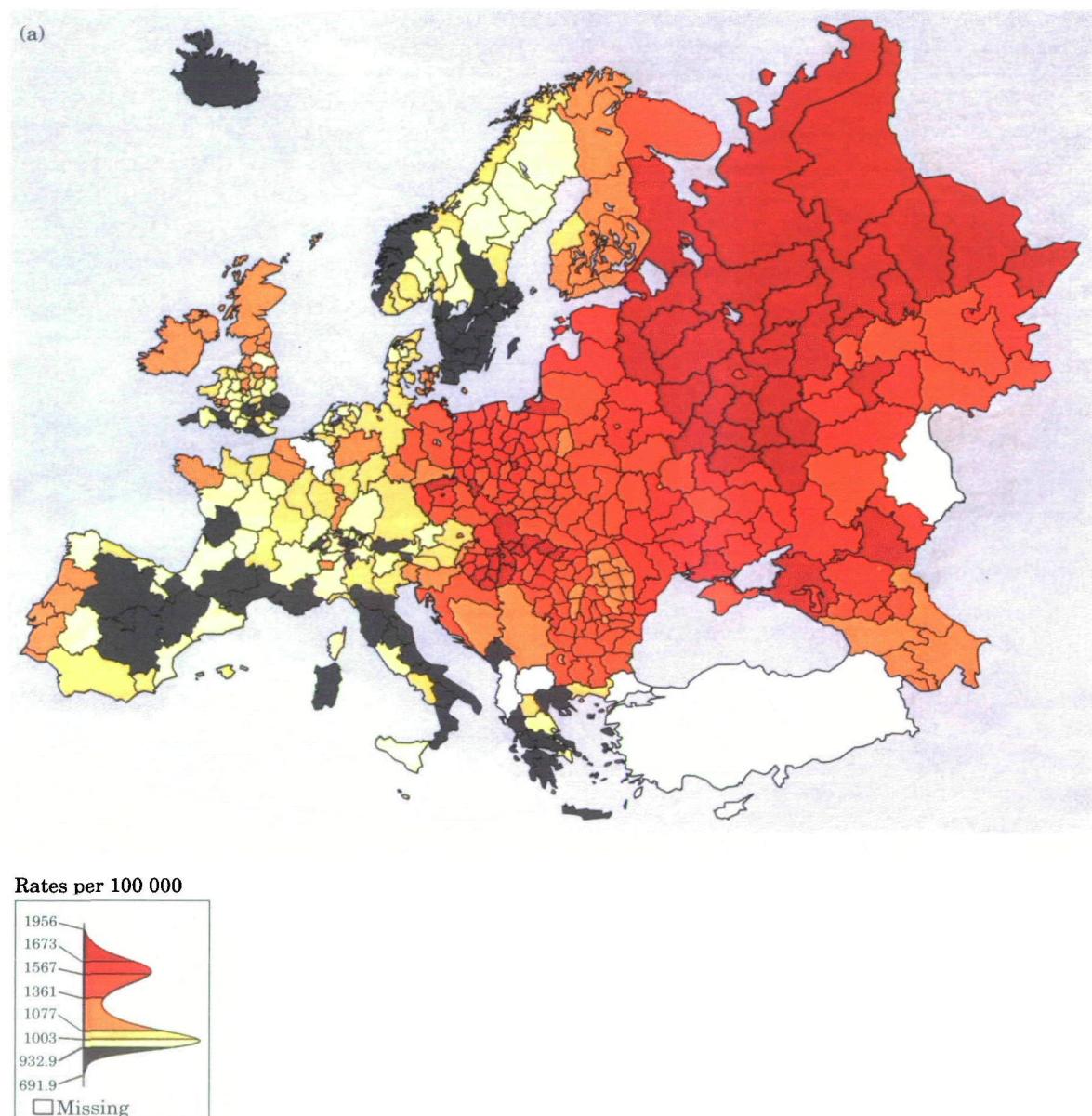


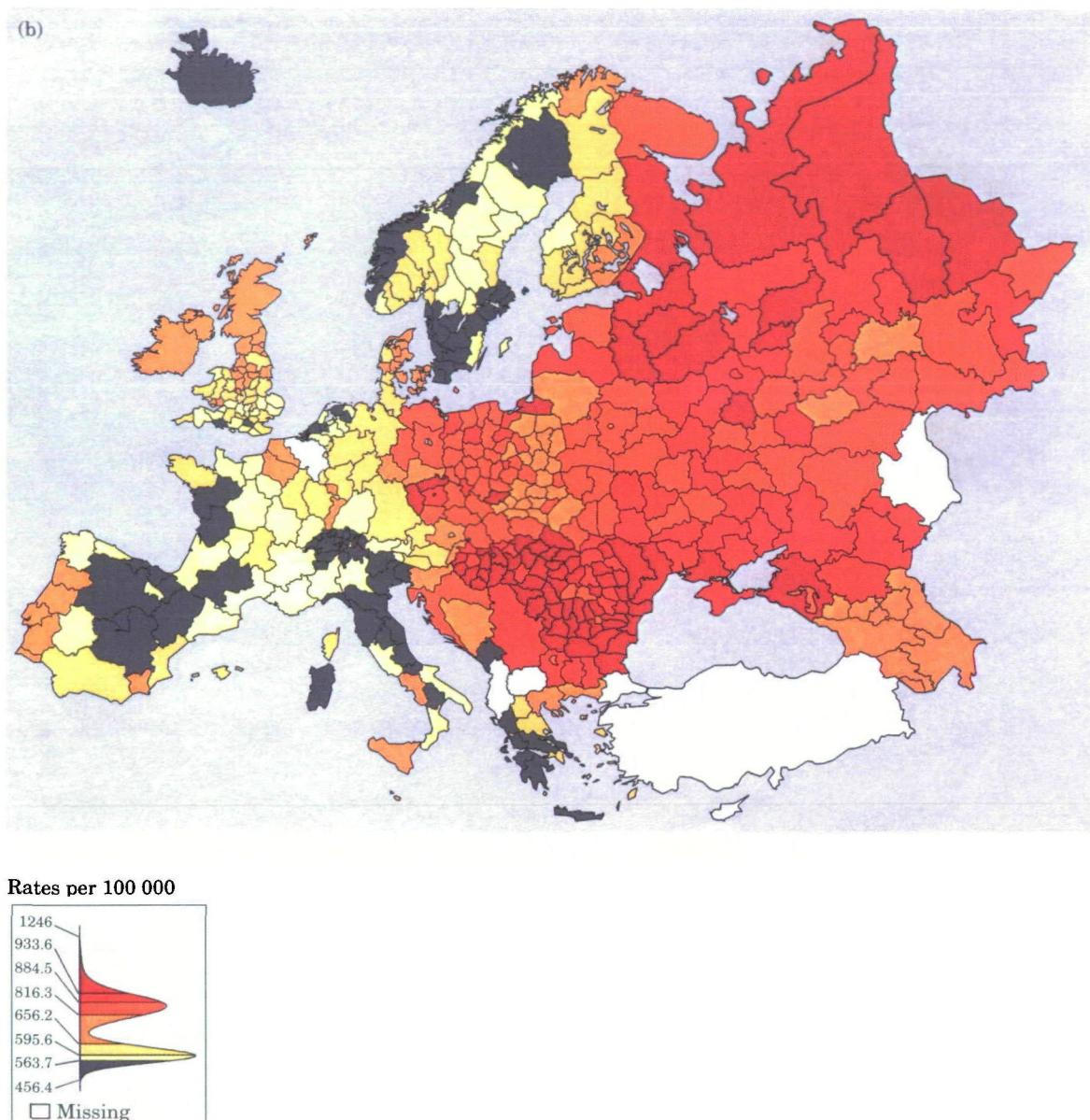
Figure 1(a) Age-standardized mortality from all causes (ICD001-E999) in European regions in 1990–91. Age 0–64 years. Men.

Ischaemic heart disease patterns showed a clear East–West gradient with the highest mortality rates in Eastern Europe (Figs. 7(a) and (b)). The ratio between the 90th and the 10th percentile was about 5. The distribution shows that the differences in regional mortality rates within Western Europe are relatively small compared to those in Eastern Europe.

For the period 1970–1992, major differences between countries in the annual change of ischaemic heart disease mortality rates were observed in men aged 45–74 years. In Eastern European countries, large increases were noted. Romania had the largest increase, with more than 6% per year. Ischaemic heart disease mortality rates decreased in the Northern and Western European countries and in some of the

Southern European countries, such as France and Italy. No change was observed in Spain and an increase of about 1% per year in Greece (Fig. 8(a)). The largest decrease was observed in Belgian men, more than 2% per year. There was a similar pattern in women, although ischaemic heart disease mortality increased significantly in only three Central European countries, namely Romania, Poland and East Germany (former DDR) (Fig. 8(b)).

Figure 9(a) shows ischaemic heart disease mortality trends for the nine selected countries. An average annual decrease of 19 deaths from ischaemic heart disease per 100 000 in men aged 45–74 was observed in Finland. Finland had the highest mortality rate from ischaemic heart disease of all European countries in



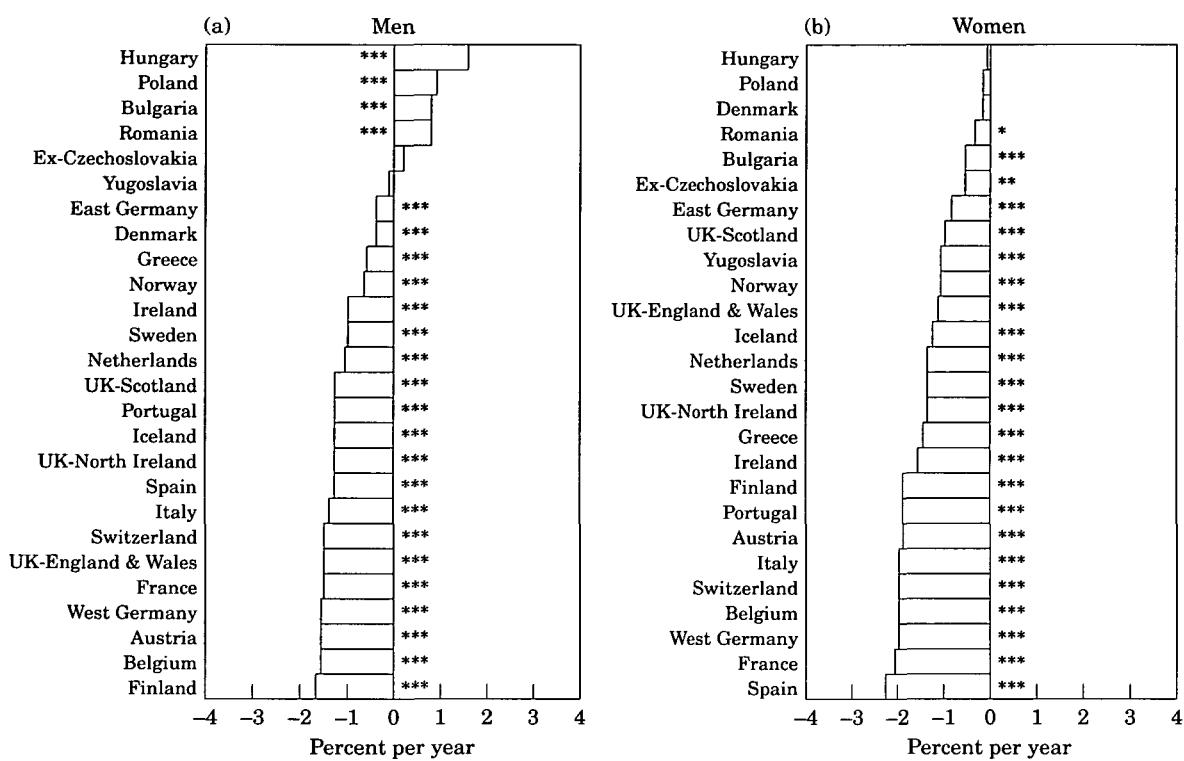
**Figure 1(b)** Age-standardized mortality from all causes (ICD001-E999) in European regions in 1990–91. Age 0–64 years. Women.

1970, but had intermediate rates 22 years later. Decreasing trends were also observed in Denmark and England and Wales, but there the decline started later than in Finland. In contrast to the decreasing trend in Northern and Western European countries, large increases were observed in Central and Eastern European countries, such as Hungary and the former Czechoslovakia. The very high rates in the Russian Federation and the rapid increase since 1990 are noticeable. Portugal, Spain and Greece had very low rates during the whole period. Similar trends were observed in women, although the increasing trend in Central and Eastern Europe was less pronounced in women compared with men (Fig. 9(b)).

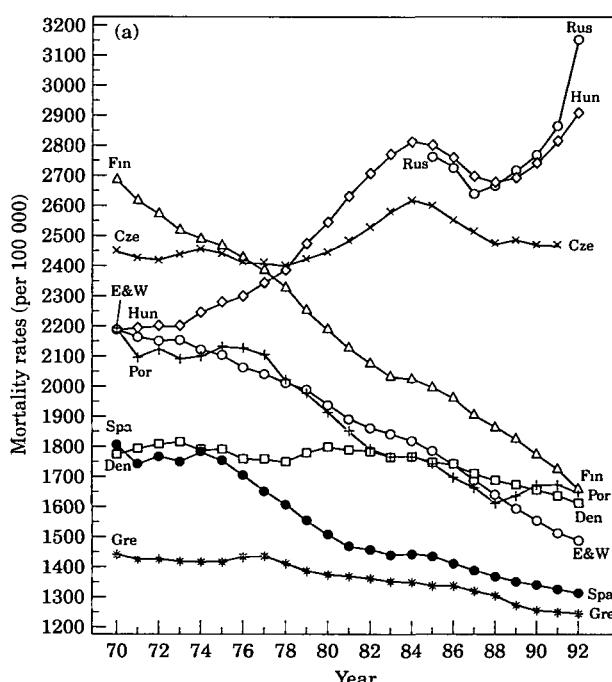
### Cerebrovascular accidents

In men aged 45–74 years, the age-standardized mortality rates varied between 606 deaths/100 000/year in the Ukraine and 54 deaths/100 000/year in Switzerland and between 408 deaths/100 000/year and 32 deaths/100 000/year in women. The absolute rates are much higher in men compared to women. The ratio between the country with the highest mortality rate compared to the country with the lowest rate is 11 in men and 13 in women (Tables 4(a) and (b)).

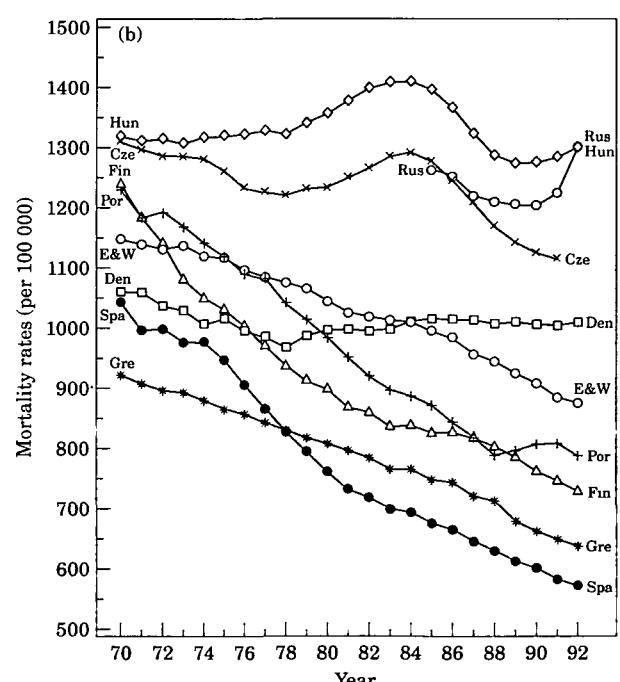
For cerebrovascular accident mortality, an East-West pattern can be observed in both men and women. There are, however, exceptions. High cerebrovascular



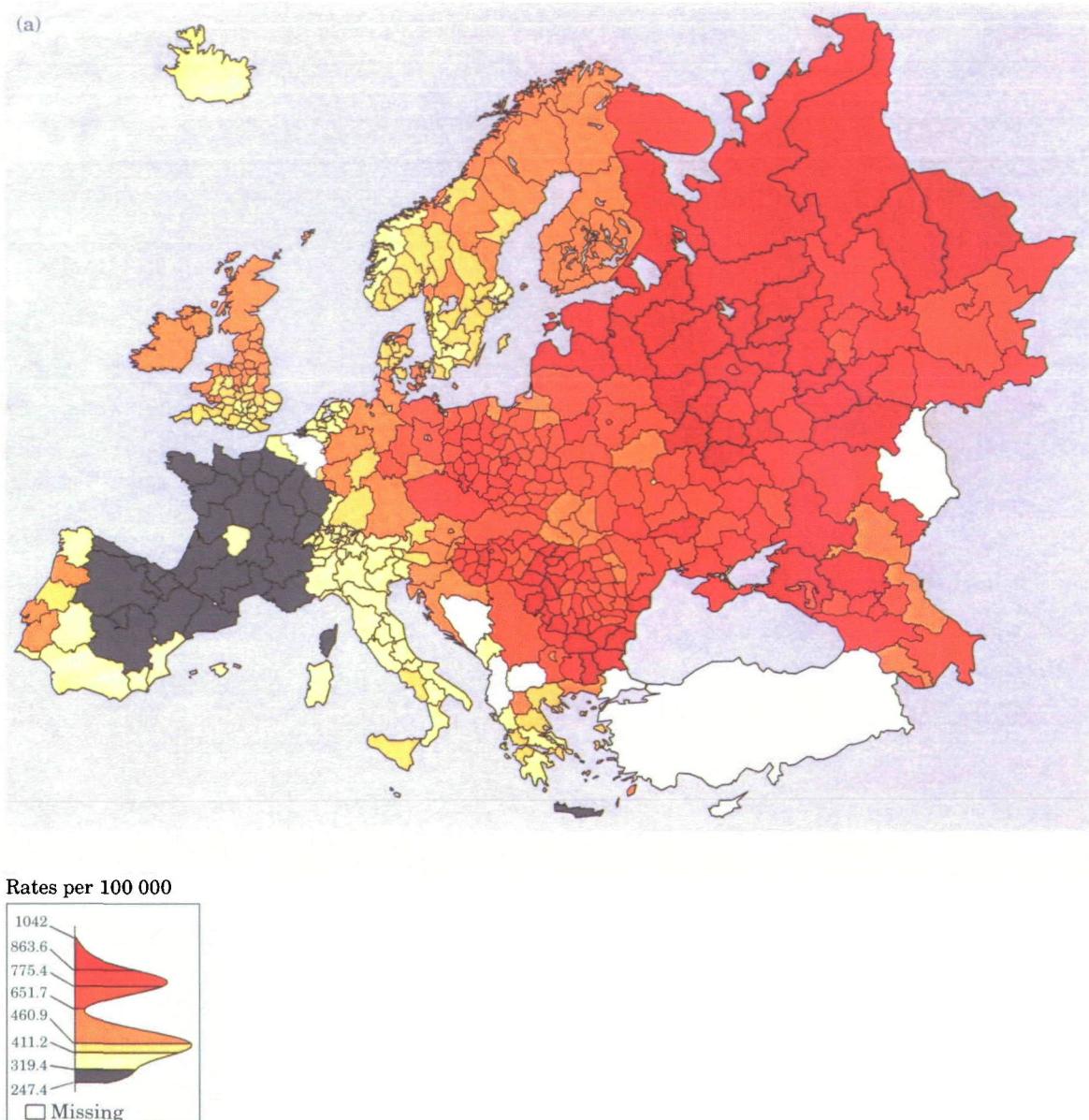
**Figure 2** Annual percent change in mortality rates from all causes in 1970–92 in European countries. Age 45–74 years. \* $P<0.01$ , \*\* $P<0.001$ , \*\*\* $P<0.0001$ .



**Figure 3(a)** Time trends in mortality from all causes in selected countries. 1970–92. Age 45–74 years. Men.



**Figure 3(b)** Time trends in mortality from all causes in selected countries. 1970–92. Age 45–74 years. Women.



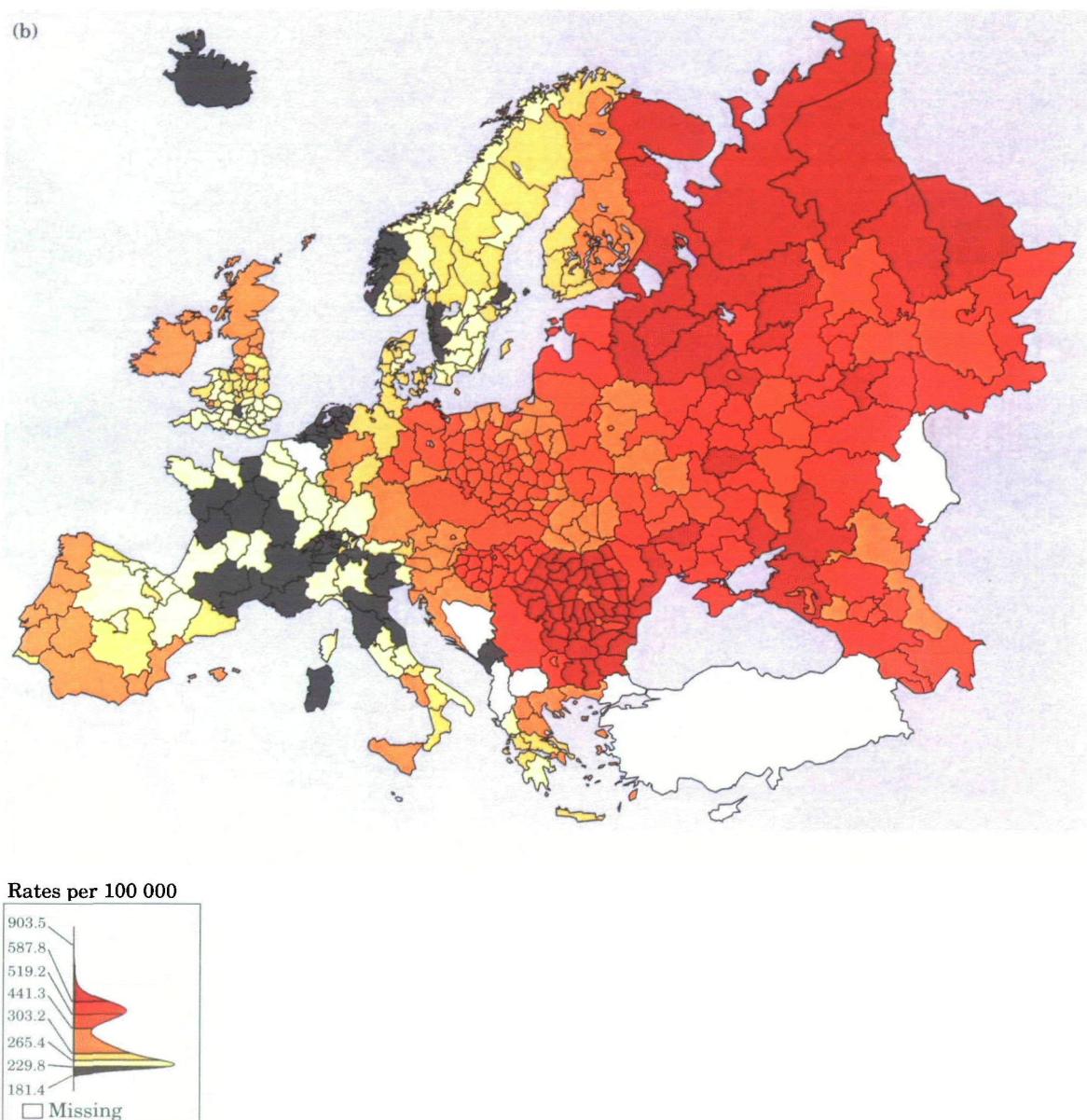
**Figure 4(a)** Age-standardized mortality from cardiovascular diseases (ICD390-459) in European regions in 1990-91. Age 0-64 years. Men.

accident rates are still observed in Portugal and to a lesser extent in other mediterranean regions. In contrast to ischaemic heart disease, the lowest cerebrovascular accident rates were observed in Northern and Western European countries, for example Sweden, Denmark, The Netherlands and Germany. The ratio between the 90th and the 10th percentile was about 5 in both men and women (Fig. 10(a) and (b)).

For the period 1970-1992, large differences in the annual change in mortality from cerebrovascular accident were observed. In Central Europe, increases of up to more than 2% per year were noted in, for example Poland. In contrast, decreases were observed in Northern, Western and Southern Europe. The largest decrease was observed in France and amounted

to more than 3% per year (Fig. 11(a)). A similar pattern was observed in women (Fig. 11(b)) although a significant increase was found in East Germany only. In Bulgaria, cerebrovascular accident mortality was increasing in men but decreasing in women.

Substantial differences in long-term cerebrovascular accident mortality trends were observed between different countries. Cerebrovascular accident mortality rates increased until about 1985 in Hungary and the former Czechoslovakia. Among men, the cerebrovascular accident mortality rates declined in Hungary, the former Czechoslovakia and the Russian Federation until about 1990. After 1990, the rates started to increase again in Hungary and the Russian Federation. Consistently decreasing trends were observed in



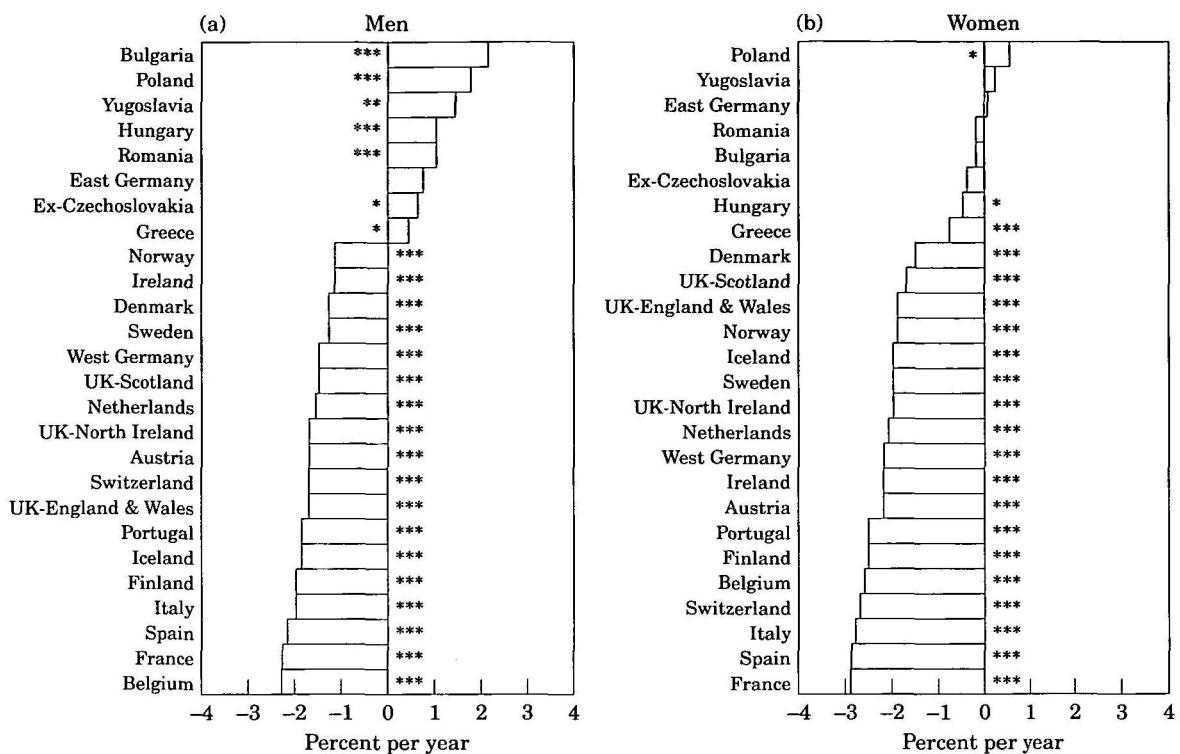
**Figure 4(b)** Age-standardized mortality from cardiovascular diseases (ICD390-459) in European regions in 1990-91. Age 0-64 years. Women.

Portugal, Finland, Spain, England and Wales. During the 23 year period, persistent low rates were observed in Greece and Denmark. Similar trends were observed in women (Fig. 12(a) and (b)).

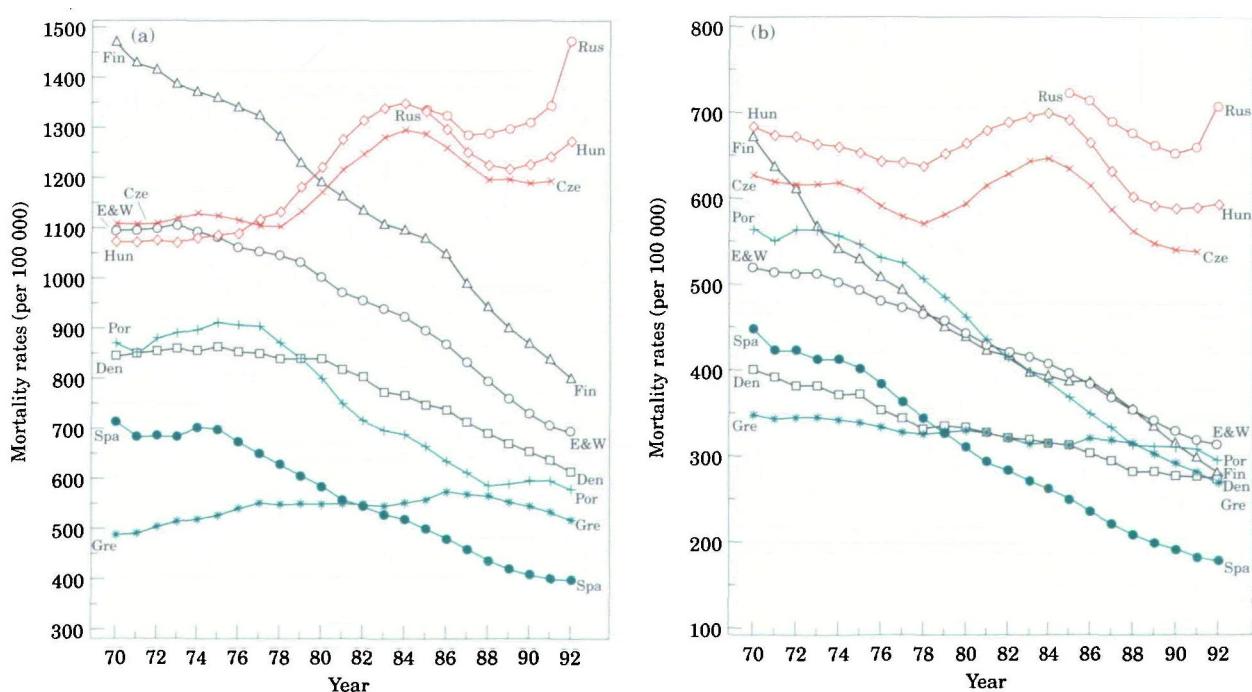
## Discussion

This report describes the burden of cardiovascular diseases mortality in Europe. In nearly all European countries, cardiovascular mortality represents around 40% of all-causes mortality before the age of 74 years. In spite of decreasing age-specific cardiovascular disease mortality rates in Western European countries

there has been no decrease in the absolute number of people who die from cardiovascular diseases. The number of chronically ill cardiovascular patients may even be increasing in these countries due to the ageing of the population. Currently available treatment for diseases such as acute myocardial infarction because of a fall in early mortality, may lead to an increase in the number of patients who reinfarct and of patients with congestive heart failure. For this reason and because of the increasing trend in cardiovascular mortality in Central and Eastern European countries, the burden of cardiovascular diseases in European societies will not decrease but may even increase in the forthcoming decade.

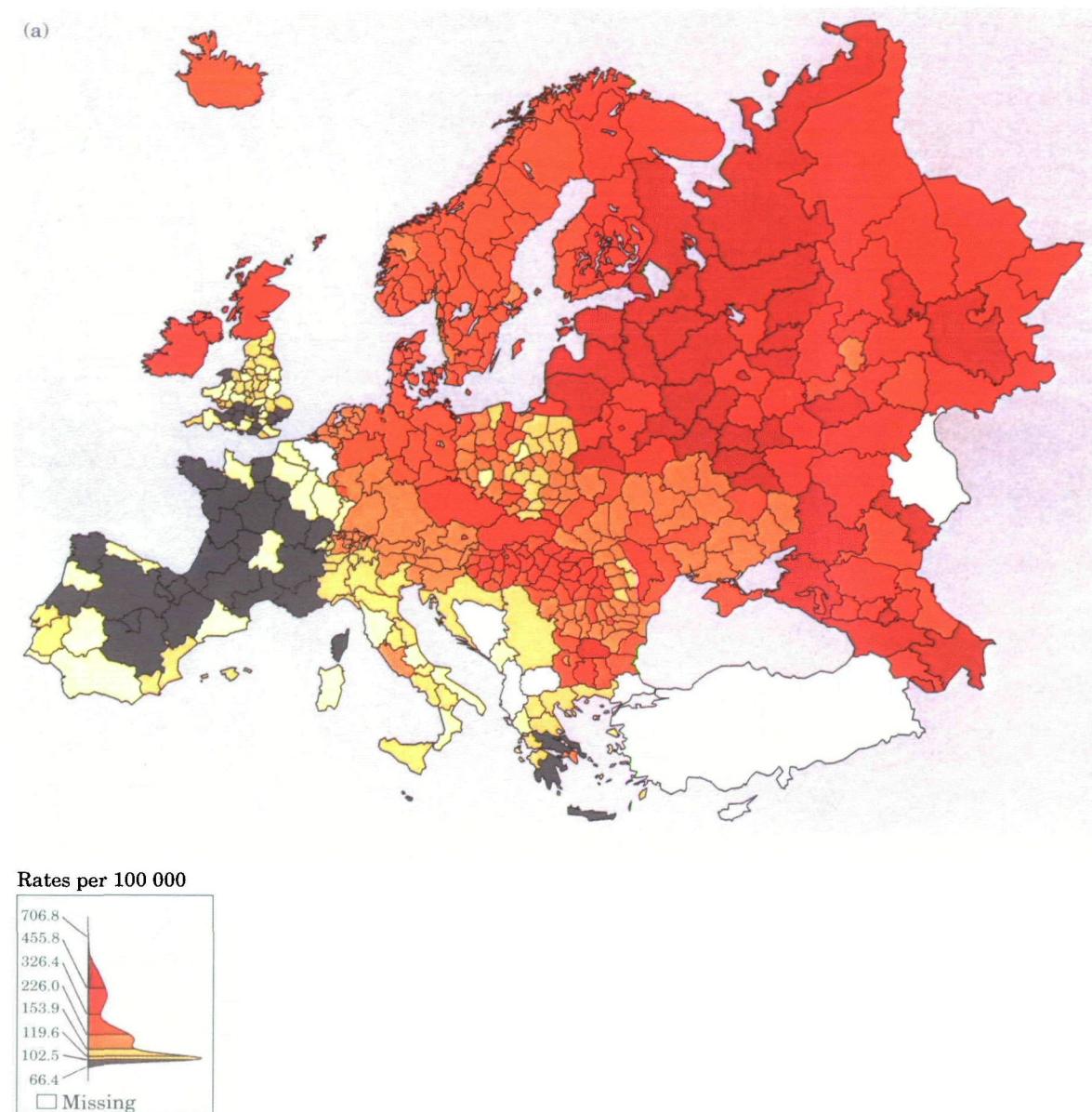


**Figure 5** Annual percent change in mortality rates from cardiovascular diseases in 1970–92 in European countries. Age 45–74 years. \* $P<0.01$ , \*\* $P<0.001$ , \*\*\* $P<0.0001$ .



**Figure 6(a)** Time trends in mortality from cardiovascular diseases in selected countries. 1970–92. Age 45–74 years. Men.

**Figure 6(b)** Time trends in mortality from cardiovascular diseases in selected countries. 1970–92. Age 45–74 years. Women.

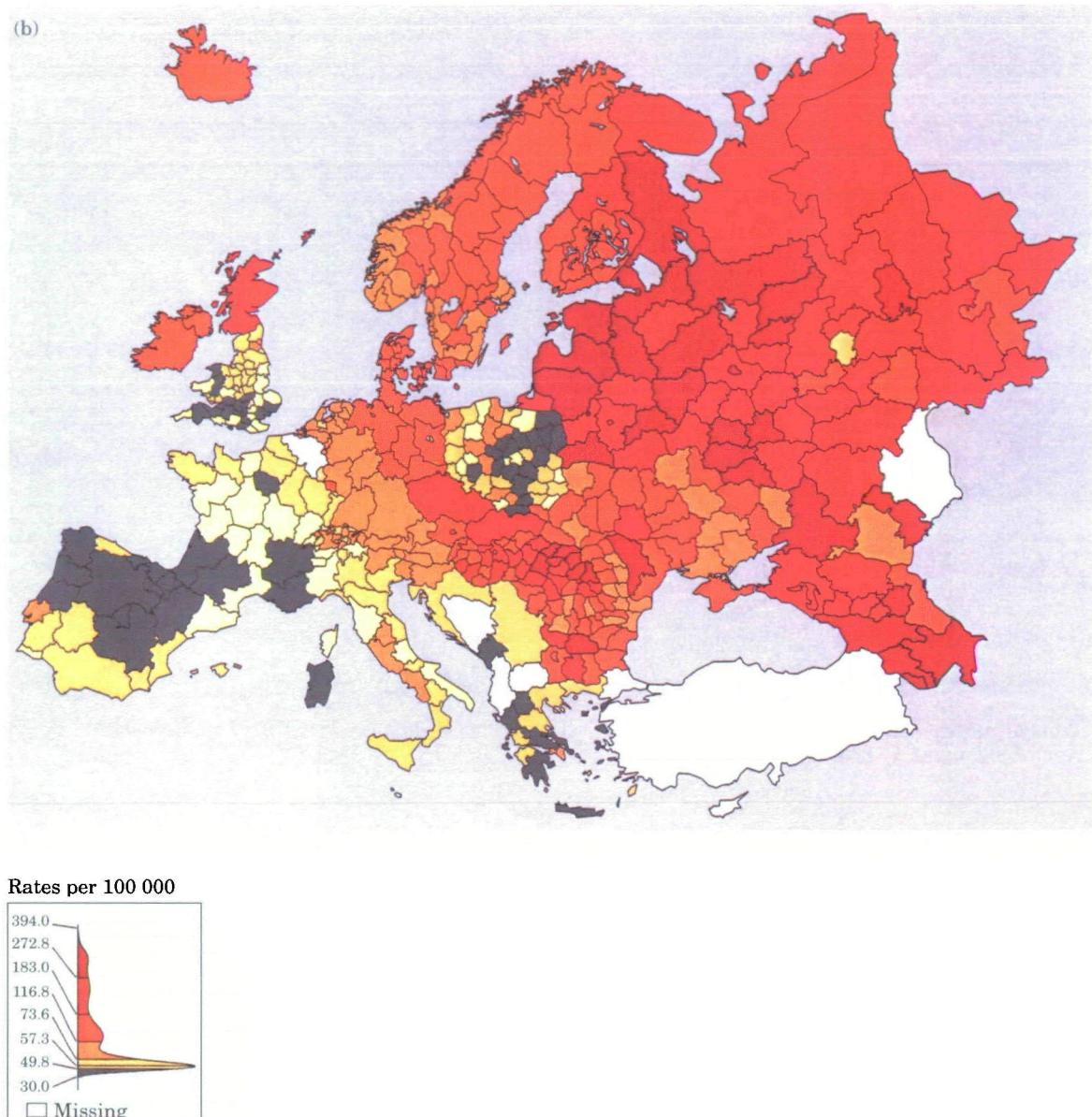


**Figure 7(a)** Age-standardized mortality from ischaemic heart diseases (ICD410-414) in European regions in 1990–91. Age 0–64 years. Men.

An evaluation of the current cardiovascular mortality pattern in Europe and its trends is crucial to the assessment of population and individual strategies for prevention and treatment<sup>[11,12]</sup>. In order to assess fully the burden of cardiovascular diseases and its future impact, information is needed not only on mortality but also on morbidity and risk factors.

The only measure of mortality rates which is indisputable and non-controversial is all-causes mortality, provided that the population base is known. Total cardiovascular mortality, encompassing all cardiovascular causes of mortality, is also a relatively robust diagnostic group. However, differences in coding, for example the coding of diabetes mortality, massive pulmonary embolism in cancer patients, etc. may affect the

values<sup>[13]</sup>. The diagnosis of ischaemic heart disease is particularly challenging and some of the differences between countries may be artificial. There is reason to doubt whether the lower ischaemic heart disease mortality in Belgium compared to the Netherlands, in East Germany compared to West Germany, in France compared to other European countries, is factual or due to differences in coding habits. Thus, the percentage of death certificates with acute myocardial infarction as the underlying cause of death that could not be clearly classified as such ranged from 1% in Finland to 72% in Switzerland<sup>[14]</sup>. However, the official mortality rates from vital statistics and the attack rates of non-fatal definite myocardial infarction in different MONICA areas are strongly correlated in both men and women<sup>[14]</sup>.



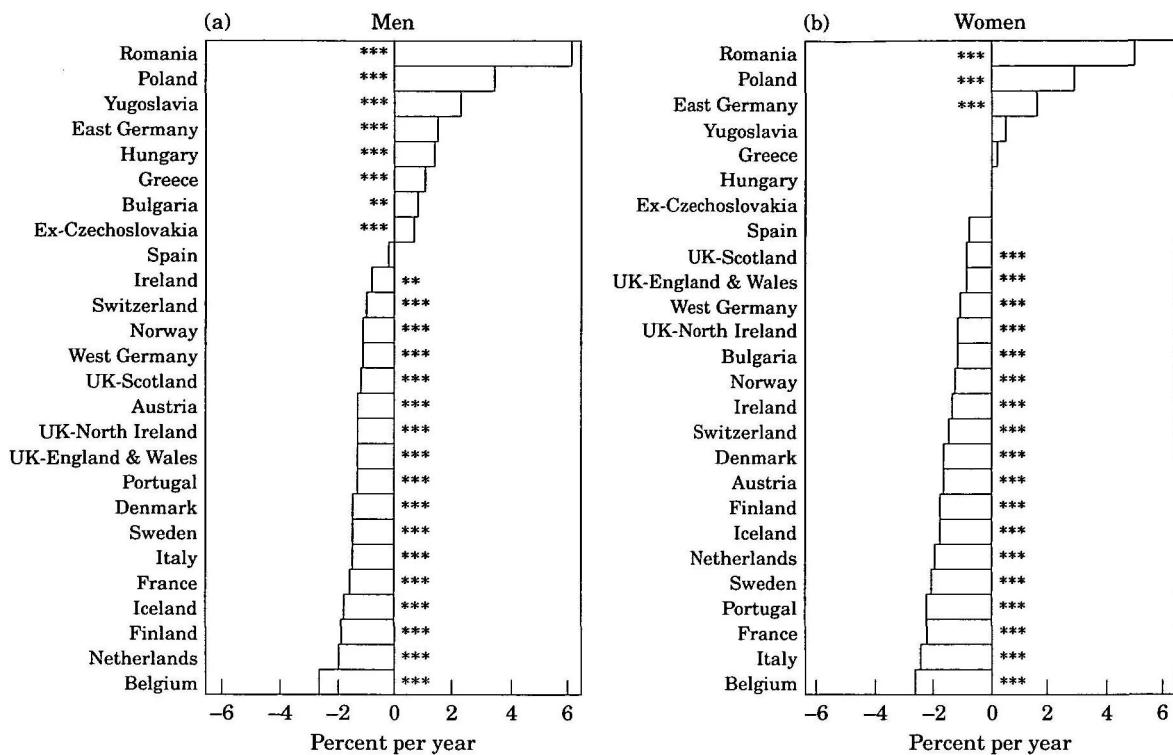
**Figure 7(b)** Age-standardized mortality from ischaemic heart diseases (ICD410-414) in European regions in 1990-91. Age 0-64 years. Women.

On the other hand, from analysis of consistency between ischaemic heart disease and other causes of death in different countries, it has been concluded that ischaemic heart disease mortality statistics are useful for epidemiological analysis<sup>[15]</sup>. Improved diagnostic methods could also lead to changes in coding, for instance coronary angiography, echo-Doppler, magnetic resonance and positron emission tomography, especially during the period under consideration (1970-1992).

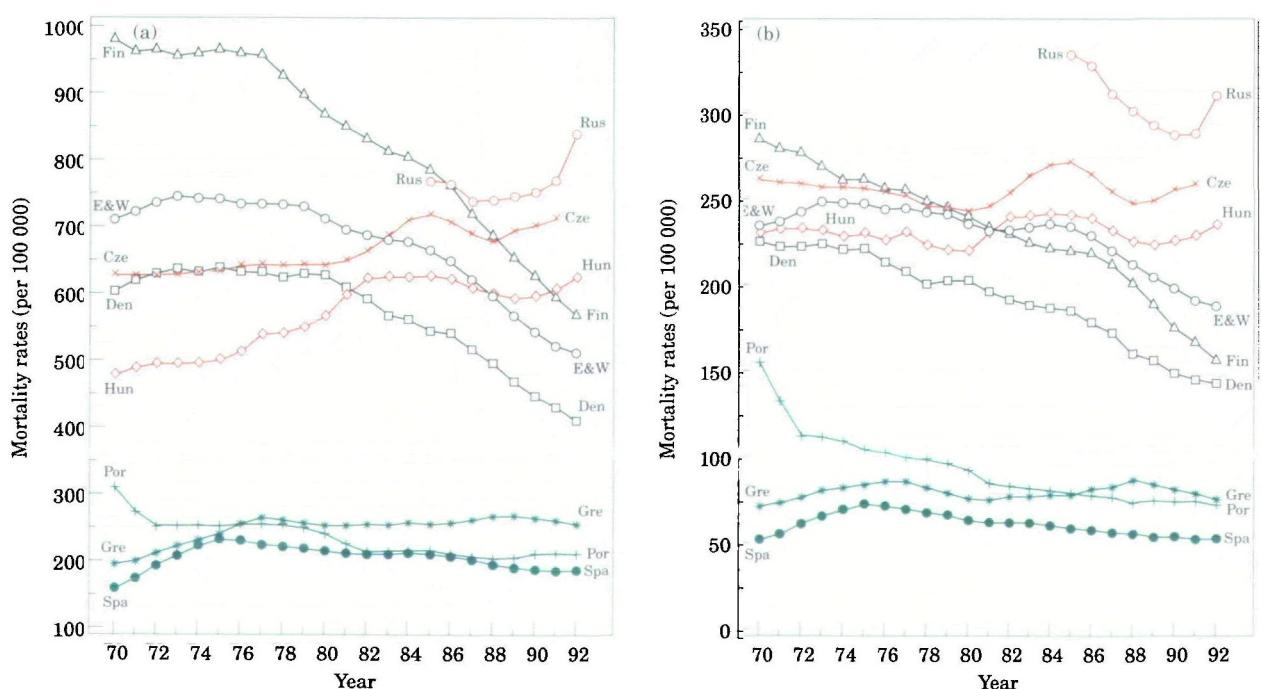
These new diagnostic methods were introduced into the countries of Europe at various time periods and in different degrees. It could be expected, however, that this increase in diagnostic precision would increase the number of deaths attributed to ischaemic heart disease. This is not borne out by the decreasing trends in most European populations.

One of the most important findings in this report is the diverging trend in mortality in different parts of Europe. In general, all-cause and cardiovascular mortality is decreasing in Western and increasing in Central and Eastern Europe. These inequalities in mortality are spectacular and reach dramatic proportions. The rapidity of the rise in mortality, for instance in the Russian Federation, especially after 1990, is also alarming. Equally intriguing are the marked differences in mortality between Switzerland, Austria and Hungary, three neighbouring countries with high levels of education and low mortality rates from infectious diseases.

In all countries, age-specific mortality is lower in women than in men. Mortality trends are also more favourable in women. As a result, in nearly all countries, the age-specific sex ratio of mortality is increasing and



**Figure 8** Annual percent change in mortality rates from ischaemic heart diseases in 1970–92 in European countries. Age 45–74 years. \*\* $P<0.001$ , \*\*\* $P<0.0001$ .



**Figure 9(a)** Time trends in mortality from ischaemic heart diseases in selected countries. 1970–92. Age 45–74 years. Men.

**Figure 9(b)** Time trends in mortality from ischaemic heart diseases in selected countries. 1970–92. Age 45–74 years. Women.

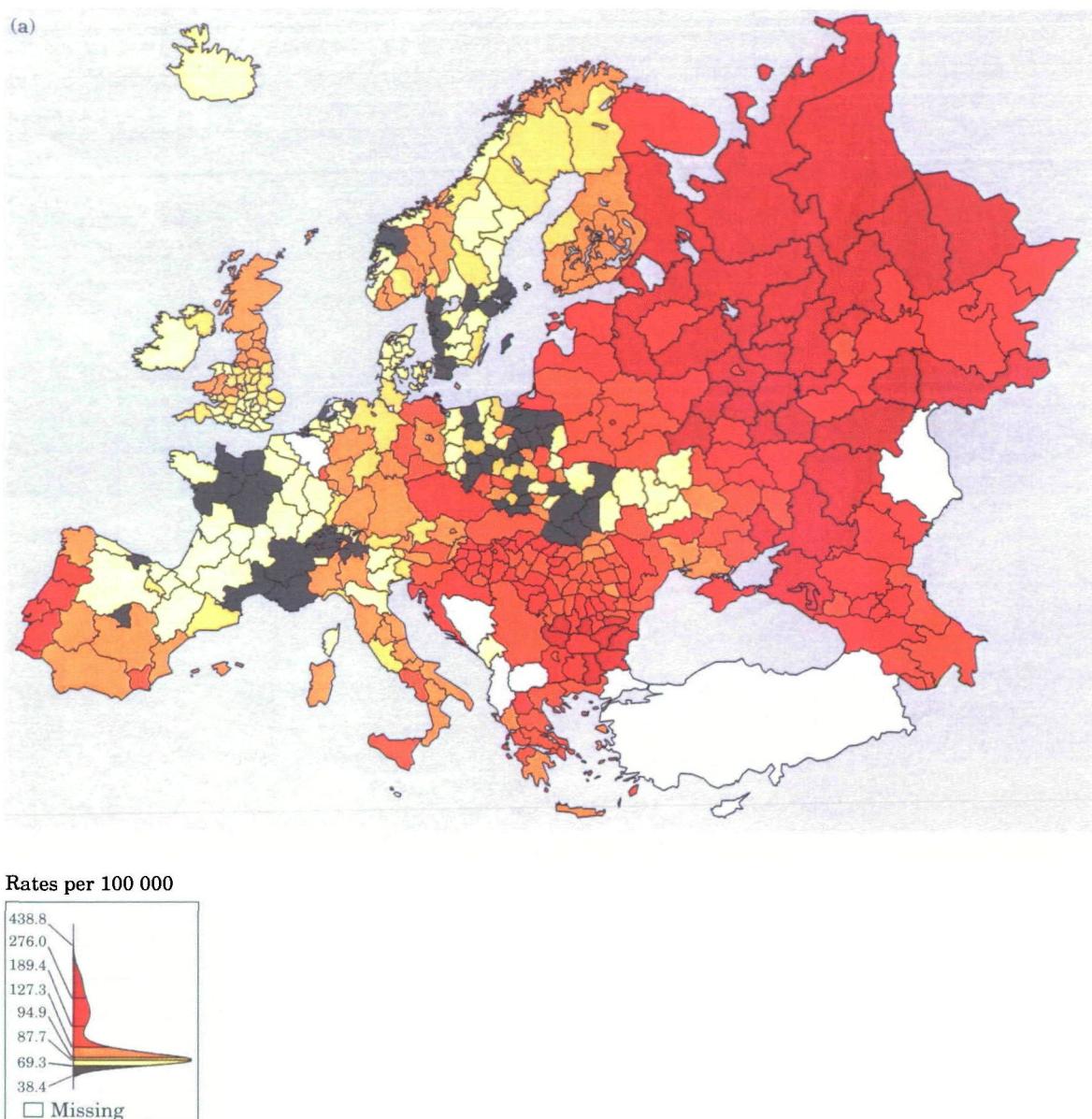


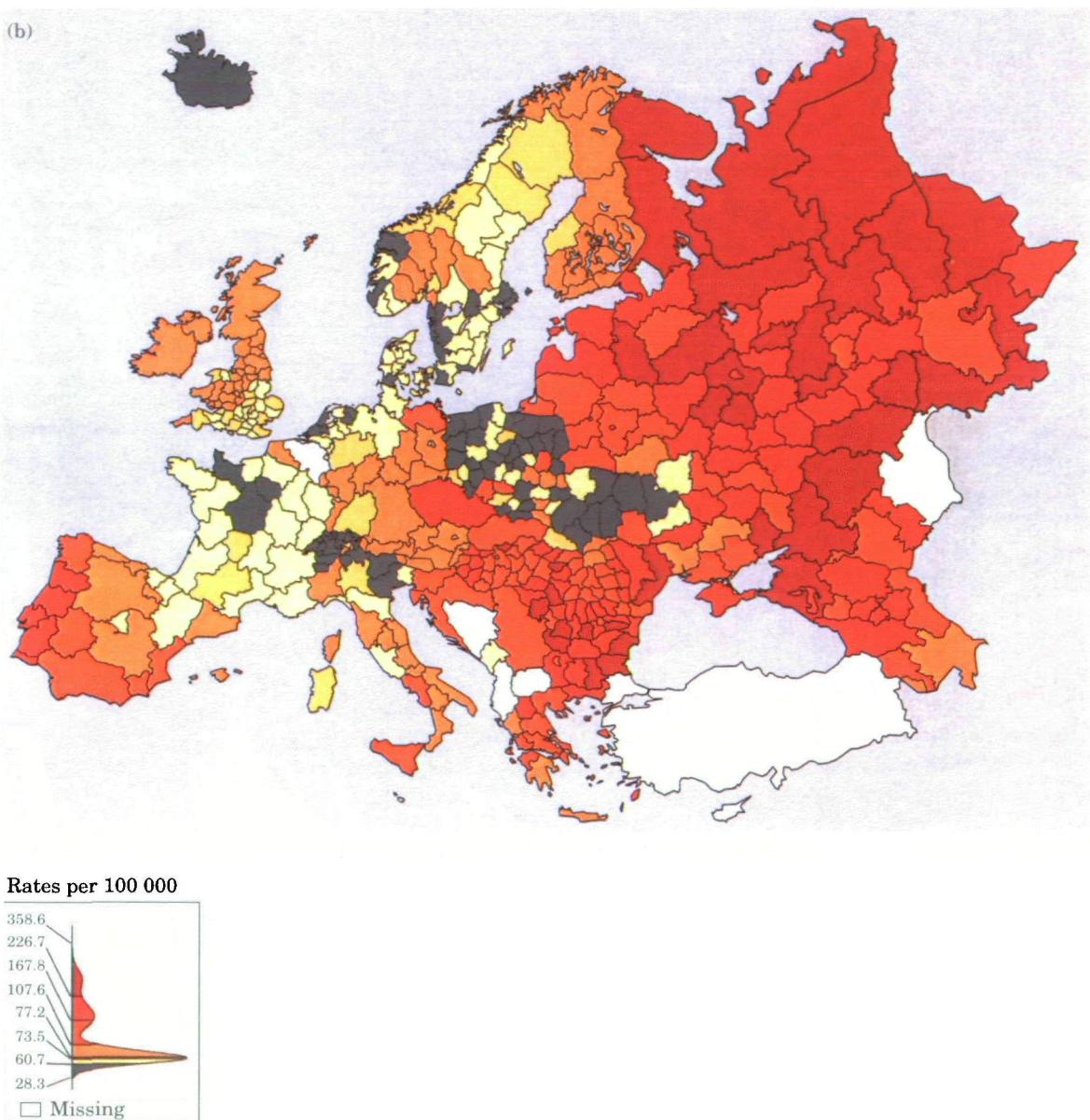
Figure 10(a) Age-standardized mortality from cerebrovascular accidents (ICD430-438) in European regions in 1990–91. Age 0–64 years. Men.

the highest value is now obtained in France<sup>[16]</sup>. For cerebrovascular accidents mortality, sex ratios are also increasing<sup>[17]</sup>. In certain countries, mortality in women is high in comparison with neighbouring countries, for example Denmark and Scotland, while in others, it is relatively low compared to mortality in men, for example, the Russian Federation. Mortality in women is especially low in France and Switzerland.

Impressive time trends are occurring in opposite directions in for example Finland and Hungary. The magnitude of these changes demonstrate that they cannot be of genetic origin as the genetic constitution of a population cannot change over a time span of only 23 years. It should also be mentioned that in some

countries, for example Denmark, only small changes in all-causes mortality occurred over a period of 23 years. Contrary to common belief, important mortality changes are also apparent in the elderly from 75–84 years (data not shown), suggesting that the determinants of cardiovascular diseases are operating at the population level.

Within countries there may be significant differences in mortality rates, for example the differences between the North and South of Belgium<sup>[18]</sup>. In France and in the United Kingdom, a distinct North–South gradient is also present. Regional differences in mortality also occur in several other countries, like Spain<sup>[19]</sup>. These differences are especially interesting; they are



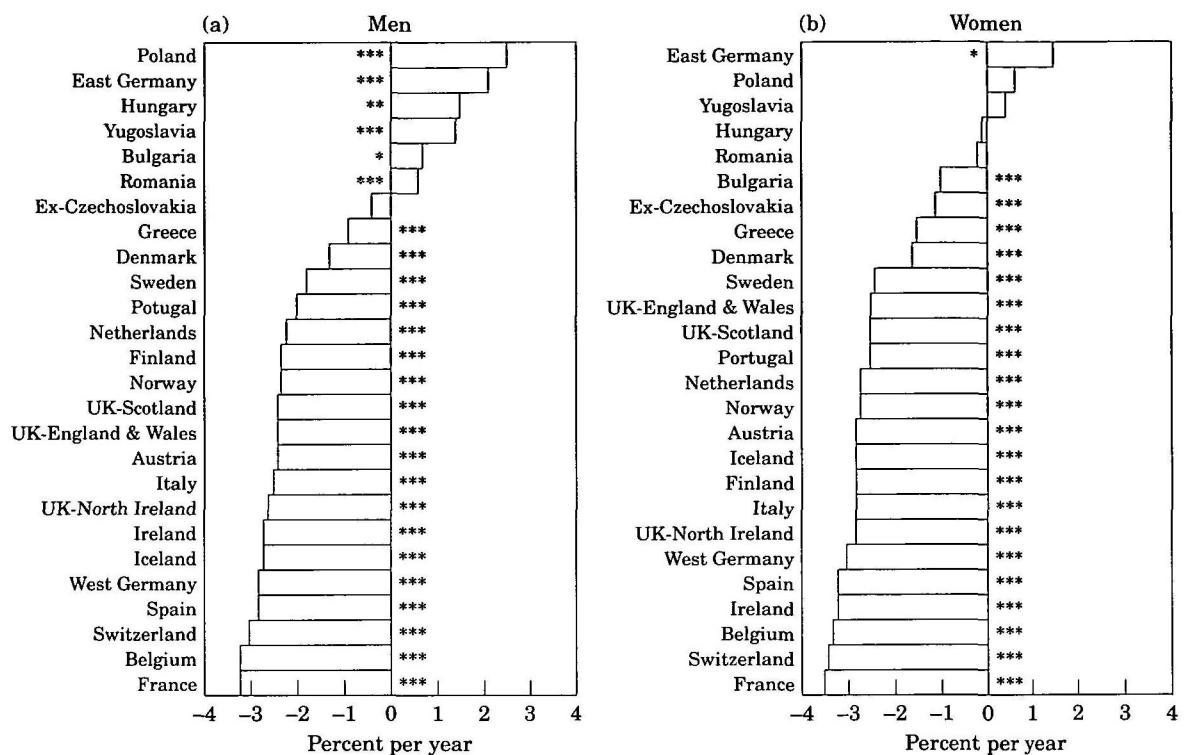
**Figure 10(b)** Age-standardized mortality from cerebrovascular accidents (ICD430-438) in European regions in 1990–91. Age 0–64 years. Women.

more readily explainable since they occur in a limited geographic area and within a similar socio-economic and legal frame.

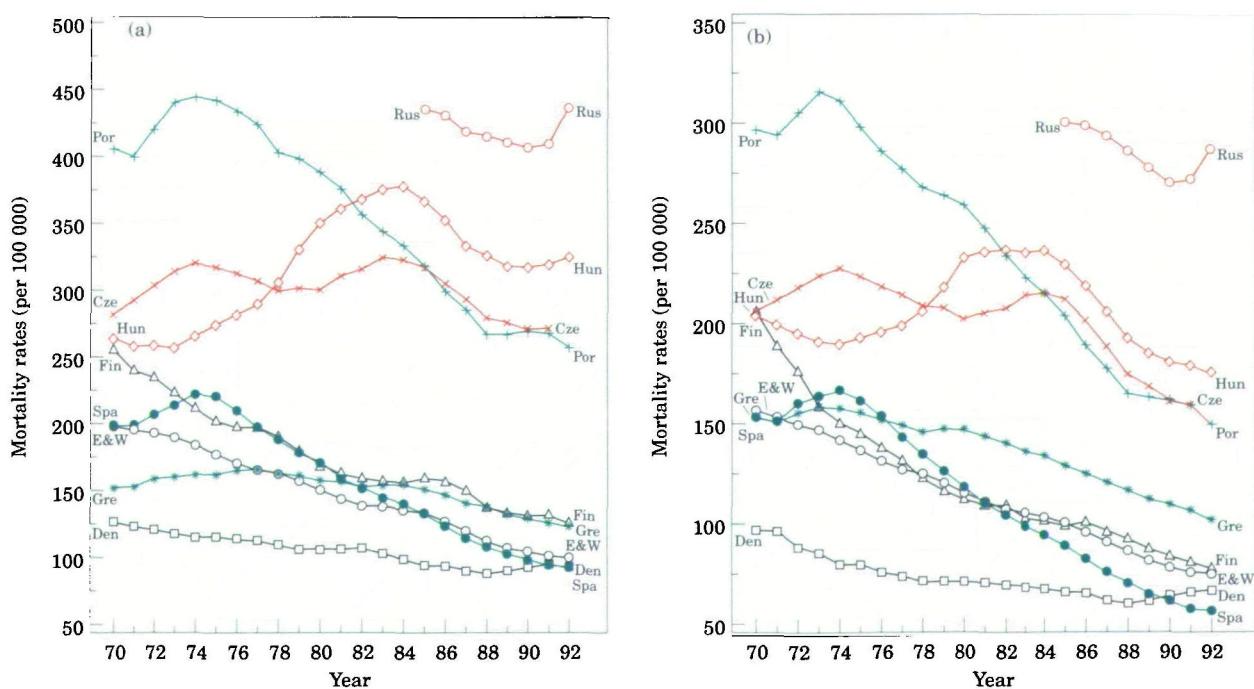
The study of the possible explanations for the observed differences in all-causes and cause-specific mortality is not the purpose of this report. Differences in nutrition, smoking habits, level of medical care, genetics, stress, level of physical exercise, obesity, socio-economic factors, for example poverty, level of pollution, birth weight and others are frequently suggested as determinants of mortality<sup>[5]</sup>. There is now sound evidence that diet, such as saturated fatty acids and antioxidants, and smoking, are major causes of ischaemic heart disease<sup>[20,21]</sup>. Furthermore, the trends in mortality from

ischaemic heart disease, cerebrovascular accident, lung and less distinctively other cancers tend to be similar in different countries, leading to a corresponding similarity in total mortality trends. This concordance of trends suggests the existence of common causes amenable to prevention<sup>[22]</sup>.

The goal of medicine should be to provide the community with the lowest possible mortality rates coupled with the best quality of life. Quality and duration of life, however, are closely intertwined as shown by European and other populations with a high life expectancy, for example Sweden, Spain and Japan where people remain healthy up to old age. It should be the goal of all populations to decrease their mortality



**Figure 11** Annual percent change in mortality rates from cerebrovascular accidents in 1970–92 in European countries. Age 45–74 years. \* $P<0.01$ , \*\* $P<0.001$ , \*\*\* $P<0.0001$ .



**Figure 12(a)** Time trends in mortality from cerebrovascular accidents in selected countries. 1970–92. Age 45–74 years. Men.

**Figure 12(b)** Time trends in mortality from cerebrovascular accidents in selected countries. 1970–92. Age 45–74 years. Women.

levels, at least to the level of the countries above. Solving the riddle of the existing differences in mortality should be one of the priorities of medical research.

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## Appendix

This report is the first outcome of the work of the Task Force on Cardiovascular Mortality and Morbidity Statistics of the European Society of Cardiology (ESC). This Task Force was created by the Committee for Scientific and Clinical Initiatives after subsequent approval by the Board of the ESC. A draft document was prepared by the Writing Group and circulated to all members. The Task Force Report was approved by the Board of the ESC on 8 February 1997, and it was sent for publication to the *European Heart Journal*. The Task Force consisted of a Writing Group and Advisory Body.

### Members of the Task Force

#### Writing Group

Dr Susana Sans (*Barcelona, Spain*), Chair of the Task Force, Clinical and Scientific Initiatives Committee; Prof. Hugo Kesteloot (*Leuven, Belgium*), ESC Working Group on Epidemiology and Prevention; Prof. Daan Kromhout (*Bilthoven, The Netherlands*), ESC Working Group on Epidemiology and Prevention.

#### Advisory Body

Prof. Günter Breithardt (*Münster, Germany*), President ESC; Prof. Felix Gutzwiller (*Zurich, Switzerland*), Chair ESC Working Group on Epidemiology and Prevention; Prof. Ulrich Keil (*Münster, Germany*), ESC Working Group on Epidemiology and Prevention; Dr Kari Kuulasmaa (*Helsinki, Finland*), ESC Working Group on Epidemiology and Prevention; Prof. Philip Poole-Wilson (*London, United Kingdom*), Past-President ESC; Prof. Kalevi Pyörälä (*Kuopio, Finland*), ESC Working Group on Epidemiology and Prevention; Prof. Stephan Rywik (*Warsaw, Poland*), ESC Working Group on Epidemiology and Prevention; Dr Aushra Shatchkute (*Copenhagen, Denmark*), WHO; Dr Jorgen Videbaek (*Copenhagen, Denmark*), European Heart Network; Prof. Lars Wilhemsen (*Göteborg, Sweden*), ESC Working Group on Epidemiology and Prevention; Prof. David Wood (*London, United Kingdom*) Past Chair, ESC Working Group on Epidemiology and Prevention.