

The recent decline in mortality from Hodgkin lymphomas in central and eastern Europe

C. Bosetti^{1*}, F. Levi², J. Ferlay³, F. Lucchini², E. Negri¹ & C. La Vecchia^{1,4}

¹Istituto di Ricerche Farmacologiche "Mario Negri," Milan, Italy; ²Unité d'épidémiologie du cancer et Registres vaudois et neuchâtelois des tumeurs, Centre Hospitalier Universitaire Vaudois et Institut de médecine sociale et préventive, Université de Lausanne, Lausanne, Switzerland; ³International Agency for Research on Cancer, Lyon, France; ⁴Istituto di Statistica Medica e Biometria "G.A. Maccacaro," Università degli Studi di Milano, Milan, Italy

Received 7 April 2008; accepted 12 September 2008

Background: Hodgkin lymphoma (HL) is a largely curable disease and its mortality had steadily declined in western Europe since the late 1960s. Only modest declines were, however, observed in central/eastern Europe.

Materials and methods: We updated trends in mortality from HL in various European areas up to 2004 and analyzed patterns in incidence for selected European countries providing national data.

Results: In most western European countries, HL mortality continued to steadily decline up to the mid 2000s. More recent reductions were also observed in eastern European countries. Overall, mortality from HL declined from 1.17/100 000 (age-standardized, world population) in 1980–1989 to 1.42/100 000 in 2000–2004 in men from the 15 member states of the European Union (EU) from western and northern Europe. In the EU 10 accession countries of central and eastern Europe, male mortality from HL was 1.42/100 000 in 1980–1984, 1.32 in 1990–1994, and declined to 0.76 in 2000–2004. Similar trends were observed in women. No consistent patterns were found for HL incidence.

Conclusions: The present work confirms the persistent declines in HL mortality in western European countries, and shows favorable patterns over more recent calendar years in central/eastern ones, where rates, however, are still at levels observed in western Europe in the early 1990s.

Key words: Europe, Hodgkin lymphoma, incidence, mortality, trends

Introduction

Advancements in integrated chemo- and radiotherapy over the last four decades have made Hodgkin lymphoma (HL) a largely curable disease, and its mortality rates had declined by >75% in the United States, western Europe and Japan between the early 1960s and the late 1990s [1]. However, in former nonmarket economy countries in central and eastern Europe, the fall in rates was much smaller up to the late 1990s when mortality from HL was over two-fold higher in those countries compared with western Europe or the United States [1, 2].

To update trends in mortality from HL in various areas of Europe, we have now considered HL mortality rates up to 2004. We have also contrasted trends in incidence with those in mortality for the 11 countries providing national data on both incidence and mortality.

Materials and methods

Official death certification data from HL for 26 European countries for the period 1980–2004 were derived from the World Health Organization (WHO) database available on electronic support [3].

*Correspondence to: Dr C. Bosetti, Istituto di Ricerche Farmacologiche "Mario Negri," Via Giuseppe La Masa 19, 20156 Milan, Italy. Tel: +39-0239014526; Fax: +39-0233200231; E-mail: bosetti@marionegri.it

Data for Croatia, the Czech Republic and Slovenia were available only since 1985 and data for Estonia, Lithuania and Slovakia since 1990. For Denmark, data were available only up to 2001, for Italy up to 2002 and for Luxemburg and Portugal up to 2003.

The European Union (EU 27) was defined as the 27 member states as since January 2007 (i.e. Austria, Bulgaria, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, The Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, UK), with the exclusion of Cyprus (data not available), Belgium and Latvia (data available only for a limited number of years). The 15 countries of the EU from western and northern Europe as before May 2004 with the exclusion of Belgium (EU 15, i.e. Austria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, Sweden, UK) and the 10 central and eastern accession countries in 2004 and 2007 with the exclusion of Latvia (EU 10, i.e., Bulgaria, the Czech Republic, Estonia, Hungary, Lithuania, Poland, Romania, Slovakia, and Slovenia) were also considered separately.

In the two decades considered, three different Revisions of the International classification of diseases (ICD) were used [4–6]. There were, however, no differences in coding and classification of HL across the three ICD Revisions.

Estimates of the resident population, based on official censuses, were obtained from the same WHO database [3]. From the matrices of certified deaths and resident populations, age-specific rates for each 5-year age group and calendar period were computed. Age-standardized rates per 100 000, at

all ages and in various age groups, were computed using the direct method, based on the world standard population [7]. In a few countries, data were missing for part of one or more calendar years. No extrapolation was made for missing data.

Incidence data for 11 European countries providing national data were extracted from the successive volumes of Cancer Incidence in Five Continents [8]. Additional more recent information was found in various national cancer registry reports available in Internet [9–16].

results

Table 1 shows the age-adjusted death rates from HL per 100 000 men and women in selected European countries in 1980–1984, 1990–1994 and 2000–2004, and the corresponding changes in rates. In most western European countries, mortality from HL continued to steadily decline in the last two decades. In proportional terms, the falls were similar in the two subsequent decades, although in absolute terms these were smaller over more recent calendar years. In Bulgaria, Hungary and Romania, HL mortality was still

increasing between 1980–1984 and 1990–1994, but fell thereafter, as in most other eastern European countries. Overall, mortality from HL declined from 0.82/100 000 in 1990–1994 to 0.49 in 2000–2004 (–40.2%) in men from the EU 27 and from to 0.70/100 000 to 0.42 (–40.0%) in those from the EU 15. In men from the EU 10, the decline in HL mortality was modest between 1980–1984 and 1990–1994 (–7.0%, from 1.42/100 000 to 1.32), while it was larger between 1990–1994 and 2000–2004 (–42.4%). However, the rate in the early 2000s (0.76/100 000) was still around the level of the EU 15 in the 1990s. Similar patterns were observed in women, whose mortality rates in 2000–2004 were the 0.31/100 000 in the EU 27 2000–2004, 0.26 in the EU 15 and 0.48 in the EU 10. Thus, for both sexes the highest mortality rates in 2000–2004 were in central and eastern European countries, with the only exception of Slovenia (Figure 1).

The pattern of trends in young adults (aged 20–44 years) across most European countries was similar to that of all ages

Table 1. Overall age-standardized (world population) mortality rates from Hodgkin lymphoma per 100 000 men and women in selected European countries in 1980–1984, 1990–1994 and 2000–2004 (unless mentioned in parentheses) and corresponding change in rates

	Men					Women				
	1980–1984	1990–1994	2000–2004	% Change 1992/1982	% Change 2002/1992	1980–1984	1990–1994	2000–2004	% Change 1992/1982	% Change 2002/1992
Austria	1.33	1.27	0.32	–4.5	–74.8	0.79	0.78	0.22	–1.3	–71.8
Bulgaria	1.02	1.20	0.90	17.6	–25.0	0.47	0.54	0.46	14.9	–14.8
Croatia	–	0.78	0.45	–	–42.3	–	0.49	0.29	–	–40.8
Czech Republic	–	1.39	0.66	–	–52.5	–	0.86	0.52	–	–39.5
Denmark (2000–2001)	1.05	0.71	0.24	–32.4	–66.2	0.50	0.42	0.24	–16.0	–42.9
Estonia	–	1.35	0.61	–	–54.8	–	0.79	0.27	–	–65.8
Finland	1.39	0.67	0.32	–51.8	–52.2	0.68	0.38	0.25	–44.1	–34.2
France	0.88	0.51	0.39	–42.0	–23.5	0.49	0.26	0.23	–46.9	–11.5
Germany	1.42	0.80	0.30	–43.7	–62.5	0.81	0.51	0.21	–37.0	–58.8
Greece	1.26	1.23	1.41	–2.4	14.6	0.56	0.63	0.87	12.5	38.1
Hungary	1.08	1.22	0.61	13.0	–50.0	0.68	0.72	0.42	5.9	–41.7
Ireland	1.49	0.73	0.46	–51.0	–37.0	0.88	0.50	0.29	5.9	–41.7
Italy (2000–2002)	1.48	0.76	0.47	–48.6	–38.2	0.85	0.49	0.32	–42.4	–34.7
Lithuania (1993–1994)	–	1.53	0.83	–	–45.8	–	0.85	0.51	–	–40.0
Luxembourg	0.98	0.91	0.45	–7.14	–50.5	0.88	0.85	0.20	–	–76.5
Malta	1.94	0.85	0.43	–56.2	–49.4	1.19	0.59	0.61	–50.4	3.4
The Netherlands	1.04	0.61	0.40	–41.3	–34.4	0.54	0.37	0.20	–31.5	–45.9
Norway	0.98	0.37	0.28	–62.2	–24.3	0.53	0.26	0.12	–50.9	–53.8
Poland (1995–1996,1999)	1.52	1.40	0.87	–7.9	–37.9	0.81	0.71	0.51	–12.3	–28.2
Portugal (2000–2003)	0.94	0.63	0.47	–33.0	–25.4	0.45	0.39	0.29	–13.3	–25.6
Romania	1.15	1.13	0.74	–1.7	–34.5	0.57	0.61	0.41	7.0	–32.8
Slovakia (1992–1994)	–	0.82	0.70	–	–14.6	–	0.65	0.47	–	–27.7
Slovenia	–	0.82	0.40	–	–51.2	–	0.37	0.26	–	–29.7
Spain	0.97	0.69	0.45	–28.9	–34.8	0.49	0.37	0.27	–24.5	–27.0
Sweden	0.79	0.36	0.29	–54.4	–19.4	0.49	0.22	0.19	–55.1	–13.6
UK	1.05	0.64	0.39	–39.0	–39.1	0.57	0.39	0.24	–31.6	–38.5
European Union (27) ^a	1.20	0.82	0.49	–31.7	–40.2	0.66	0.48	0.31	–27.3	–35.4
European Union (15) ^b	1.17	0.70	0.42	–40.2	–40.0	0.65	0.43	0.26	–33.9	–39.5
European Union (10) ^c	1.42	1.32	0.76	–7.0	–42.4	0.79	0.73	0.48	–7.6	–34.2

^aAs since January 2007 (with the exclusion of Belgium, Cyprus and Latvia).

^bAs before May 2004 (with the exclusion of Belgium).

^cCentral and eastern countries which entered the European Union in 2004 and 2007 (with the exclusion of Latvia).

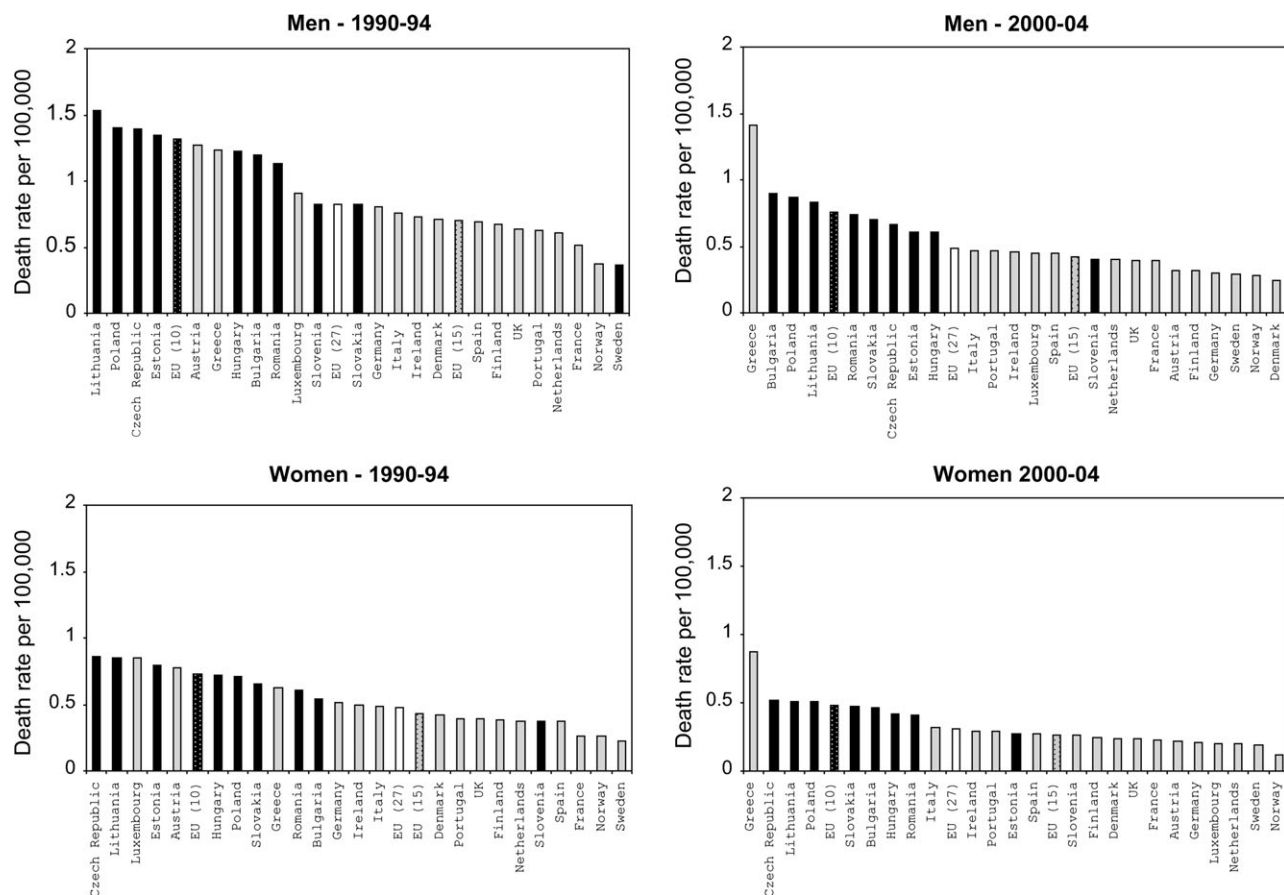


Figure 1. Age-standardized (world population) mortality rates from Hodgkin lymphoma per 100 000 men and women in selected European countries in 1990–1994 and 2000–2004. EU 27: European Union as since January 2007 (with the exclusion of Belgium, Cyprus and Latvia); EU 15; 15 countries of the European Union from western and northern Europe as before May 2004 (with the exclusion of Belgium); EU 10: 10 central and eastern countries which entered the European Union in 2004 and 2007 (with the exclusion of Latvia).

(Table 2). However, in Poland and Romania, decreasing trends were already observed between 1980–1984 and 1990–1994.

The different pattern in overall mortality from HL in the EU 27, EU 15 and EU 10 is showed in Figure 2. Mortality steadily declined in the EU 27 and EU 15 throughout the period 1980–2004, while in the EU 10 comparable reductions were observed only after the mid 1990s.

Table 3 shows the age-standardized mortality rate from HL per 100 000 men and women from the EU 27, the EU 15 and EU 10, in four age groups in the years 1980–1984, 1990–1994 and 2000–2004. In the EU 27 and EU 15, the reductions in HL mortality between 1980–1984 and 1990–1994 were larger in the youngest age groups than in elderly population, while this gradient with age was less evident over recent calendar years. Similarly, in the EU 10 between 1980–1984 and 1990–1994, mortality started to decline first in the younger age group, while upward trends were observed in population aged 65 or more. Reductions similar to those observed in the EU 15 between 1980–1984 and 1990–1994 were observed in the EU 10 between 2000–2004 and 1990–1994.

Table 4 shows the age-standardized incidence rates from HL in 11 European countries. Incidence in men showed no consistent pattern across countries, with slight downward

trends, particularly in the last decade, in men from the Czech Republic, Denmark, Ireland, Slovakia, Sweden and Scotland and upward trends in The Netherlands and Norway. No consistent patterns in incidence were observed in women too, and if anything, slight upward trends were observed.

Figures 3 and 4 contrast trends in age-adjusted mortality and incidence rates from HL in men and women from 11 European countries providing also incidence data. Mortality consistently decreased in all countries considered, although in most countries mainly from northern Europe the decline tended to slow down in most recent years. The pattern of HL incidence was less clear, with no consistent trends in various calendar years, across the countries examined and between sexes.

discussion

The present report shows that the decline in the mortality from HL observed in western and northern Europe since the 1960s has continued over more recent calendar years [1]. More important, over the last years, HL mortality has started to decline also in the EU 10 accession countries from central and eastern Europe, which were characterized by unfavorable trends up to the 1990s. The mortality rates of the EU 10 countries in

Table 2. Age-standardized (world population) mortality rates from Hodgkin lymphoma per 100 000 men and women aged 20–44 years in selected European countries in 1980–1984, 1990–1994 and 2000–2004 (unless mentioned in parentheses) and corresponding change in rates

	Men					Women				
	1980–1984	1990–1994	2000–2004	% Change 1992/1982	% Change 2002/1992	1980–1984	1990–1994	2000–2004	% Change 1992/1982	% Change 2002/1992
Austria	1.52	0.77	0.22	-49.3	-71.4	0.82	0.70	0.19	-14.6	-72.9
Bulgaria	1.13	1.40	1.09	23.9	-22.1	0.46	0.60	0.53	30.4	-11.7
Croatia	-	0.66	0.37	-	-43.9	-	0.56	0.38	-	-32.1
Czech Republic	-	1.01	0.51	-	-49.5	-	0.85	0.50	-	-41.2
Denmark (2000–2001)	1.13	0.65	0.04	-42.5	-93.8	0.51	0.34	0.24	-33.3	-29.4
Estonia	-	1.82	0.80	-	-56.0	-	0.93	0.18	-	-80.6
Finland	1.33	0.71	0.27	-46.6	-62.0	0.57	0.28	0.32	-50.9	14.3
France	0.95	0.52	0.37	-45.3	-28.8	0.64	0.33	0.24	-48.4	-27.3
Germany	1.25	0.67	0.22	-46.4	-67.2	0.71	0.44	0.18	-38.0	-59.1
Greece	0.92	0.78	0.64	-15.2	-17.9	0.60	0.40	0.47	-33.3	17.5
Hungary	0.98	1.21	0.62	23.5	-48.8	0.77	0.64	0.48	-16.9	-25.0
Ireland	1.38	0.73	0.21	-47.1	-71.2	0.73	0.43	0.25	-16.9	-25.0
Italy (2000–2002)	1.28	0.67	0.36	-47.7	-46.3	0.93	0.53	0.38	-43.0	-28.3
Lithuania (1993–1994)	-	1.54	0.88	-	-42.9	-	1.07	0.72	-	-32.7
Luxembourg	0.53	0.60	0.52	-	-13.3	1.11	1.31	0.00	18.0	-100.0
Malta	1.28	0.40	0.41	-68.8	2.5	0.75	0.00	1.06	-100.0	-
The Netherlands	0.95	0.55	0.30	-42.1	-45.5	0.57	0.42	0.18	-26.3	-57.1
Norway	0.82	0.26	0.15	-68.3	-42.3	0.44	0.33	0.08	-25.0	-75.8
Poland (1995–1996,1999)	1.37	1.17	0.72	-14.6	-38.5	0.86	0.75	0.52	-12.8	-30.7
Portugal (2000–2003)	0.87	0.76	0.50	-12.6	-34.2	0.53	0.37	0.30	-30.2	-18.9
Romania	1.19	1.17	0.65	-1.7	-44.4	0.73	0.72	0.49	-1.4	-31.9
Slovakia (1992–1994)	-	0.90	0.50	-	-44.4	-	0.39	0.42	-	7.7
Slovenia	-	0.47	0.26	-	-44.7	-	0.39	0.28	-	-28.2
Spain	0.93	0.65	0.41	-30.1	-36.9	0.57	0.36	0.28	-36.8	-22.2
Sweden	0.64	0.36	0.18	-43.8	-50.0	0.40	0.14	0.18	-65.0	28.6
UK	1.24	0.73	0.37	-41.1	-49.3	0.71	0.52	0.27	-26.8	-48.1
European Union (27) ^a	1.14	0.76	0.41	-33.3	-46.1	0.71	0.49	0.31	-31.0	-36.7
European Union (15) ^b	1.12	0.65	0.34	-42.0	-47.7	0.69	0.43	0.26	-37.7	-39.5
European Union (10) ^c	1.28	1.12	0.65	-12.5	-42.0	0.84	0.73	0.50	-13.1	-31.5

^aAs since January 2007 (with the exclusion of Belgium, Cyprus and Latvia).

^bAs before May 2004 (with the exclusion of Belgium).

^cCentral and eastern countries which entered the European Union in 2004 and 2007 (with the exclusion of Latvia).

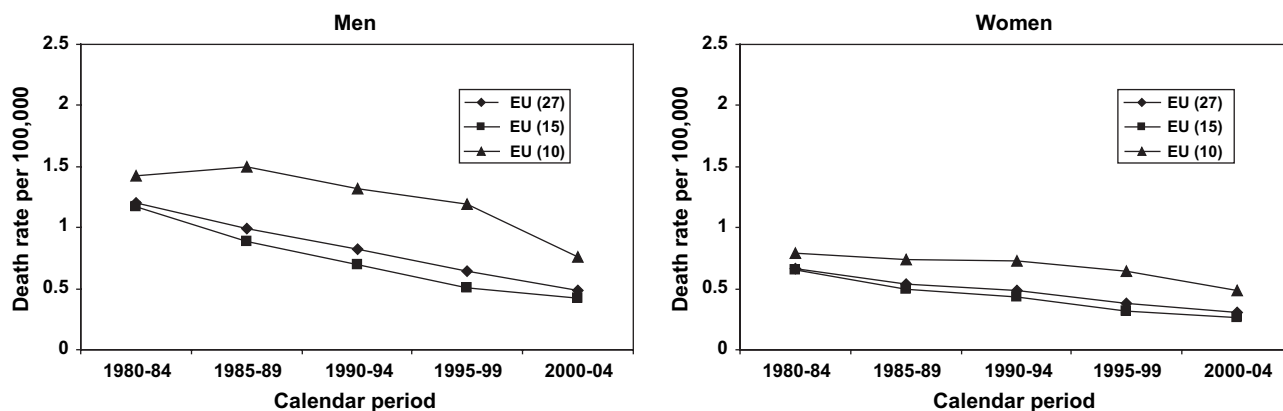


Figure 2. Trends in age-standardized (world population) mortality rates from Hodgkin lymphoma per 100 000 men and women in the European Union (EU), the EU 15 and the EU 10. EU 27: European Union as since January 2007 (with the exclusion of Belgium, Cyprus and Latvia); EU 15; 15 countries of the European Union from western and northern Europe as before May 2004 (with the exclusion of Belgium); EU 10: 10 central and eastern countries which entered the European Union in 2004 and 2007 (with the exclusion of Latvia).

Table 3. Age-standardized (world population) mortality rate from Hodgkin lymphoma per 100 000 men and women in the European Union as since January 2007 (EU 27), in the EU as before May 2004 (EU 15) and in 10 countries which entered the EU in 2004 and 2007 (EU 10), in four age groups in 1980–1984, 1990–1994 and 2000–2004

	Age group (years)	Men					Women				
		1980–1984	1990–1994	2000–2004	% Change 1992/1982	% Change 2002/1992	1980–1984	1990–1994	2000–2004	% Change 1992/1982	% Change 2002/1992
EU (27) ^a	0–19	0.17	0.10	0.05	–41.2	–50.0	0.10	0.07	0.05	–30.0	–28.6
	20–44	1.14	0.76	0.41	–33.3	–46.1	0.71	0.49	0.31	–31.0	–36.7
	45–64	2.31	1.53	0.84	–33.8	–45.1	1.06	0.73	0.42	–31.1	–42.5
	≥65	4.33	3.31	2.42	–23.6	–26.9	2.57	2.11	1.45	–17.9	–31.3
EU (15) ^b	0–19	0.14	0.06	0.05	–57.1	–16.7	0.08	0.05	0.04	–37.5	–20.0
	20–44	1.12	0.65	0.34	–42.0	–47.7	0.69	0.43	0.26	–37.7	–39.5
	45–64	2.23	1.26	0.68	–43.5	–46.0	1.03	0.61	0.34	–40.8	–44.3
	≥65	4.46	3.10	2.24	–30.5	–27.7	2.65	2.03	1.34	–23.4	–34.0
EU (10) ^c	0–19	0.21	0.12	0.06	–42.9	–50.0	0.16	0.12	0.05	–25.0	–58.3
	20–44	1.28	1.12	0.65	–12.5	–42.0	0.84	0.73	0.50	–13.1	–31.5
	45–64	3.11	2.83	1.42	–9.0	–49.8	1.33	1.23	0.71	–7.5	–42.3
	≥65	4.44	5.09	3.44	14.6	–32.4	2.62	2.84	2.15	8.4	–24.3

^aWith the exclusion of Belgium, Cyprus and Latvia.

^bWith the exclusion of Belgium.

^cWith the exclusion of Latvia.

Table 4. Age-standardized (world population) incidence rates from Hodgkin lymphoma per 100 000 men and women in selected European countries in 1980–1984, 1990–1994 and 2000–2004 (unless mentioned in parentheses) and the corresponding change in rates

	Men					Women				
	1980–1984	1990–1994	2000–2004	% Change 1992/1982	% Change 2002/1992	1980–1984	1990–1994	2000–2004	% change 1992/1982	% change 2002/1992
Czech Republic (1983–1984, 2000–2003)	3.12	2.93	2.40	2.4	–18.1	2.03	2.45	1.98	20.7	–19.2
Denmark (2000–2003)	2.76	2.57	2.43	–6.9	–5.4	1.71	1.67	1.87	–2.3	12.0
Finland	2.72	2.68	2.76	–1.5	3.0	1.59	1.92	2.10	20.8	9.4
Ireland (1994)	–	2.55	2.37	–	–7.1	–	1.89	1.91	–	1.1
The Netherlands (2000–2003)	–	2.40	2.56	–	6.7	–	1.77	1.82	–	2.8
Norway	2.32	2.13	2.71	–8.2	27.2	1.48	1.40	1.87	–5.4	33.6
Slovakia (1983–1984, 2000–2003)	2.40	2.70	1.92	12.5	–28.9	1.53	1.79	2.06	17.0	15.1
Slovenia (1983–1984)	2.53	2.22	2.36	–12.3	6.3	1.34	1.74	2.09	29.9	20.1
Sweden	1.99	1.95	1.76	–2.0	–9.7	1.23	1.46	1.69	18.7	15.8
UK, England	2.76	2.45	2.58	–11.2	5.3	1.71	1.71	1.86	0.0	8.8
UK, Scotland	2.99	2.81	2.68	–6.0	–4.6	1.99	1.94	2.25	–2.5	16.0

the early 2000s were, however, still higher than those of the EU 15 ones and were comparable to those observed in the EU 15 countries almost a decade earlier.

HL incidence showed no consistent patterns, with stable or slightly downward trends in men and less favorable ones in women [17, 18]. This indicates that no important new causes of HL have been introduced on population level over the last few decades.

The dynamic and evolving classification of lymphomas and the consequent changes in HL registration may have had some contribution in temporal trends [19, 20]. However, the absence of appreciable changes in incidence suggests that they are

unlikely to appreciably account for such generalized favorable trend in HL mortality observed in European countries, as well as other areas of the world.

The persistence of favorable trends in HL mortality in countries from western and northern Europe indicates, therefore, that advancements in diagnosis and treatment for these neoplasms—with a consequent favorable impact on survival [17, 18]—are still in course. During the past two decades, staging by means of laparotomy and splenectomy has been abandoned, and new and better methods have been introduced, including the use of a more sensitive metabolic imaging technique, the positron emission tomography with

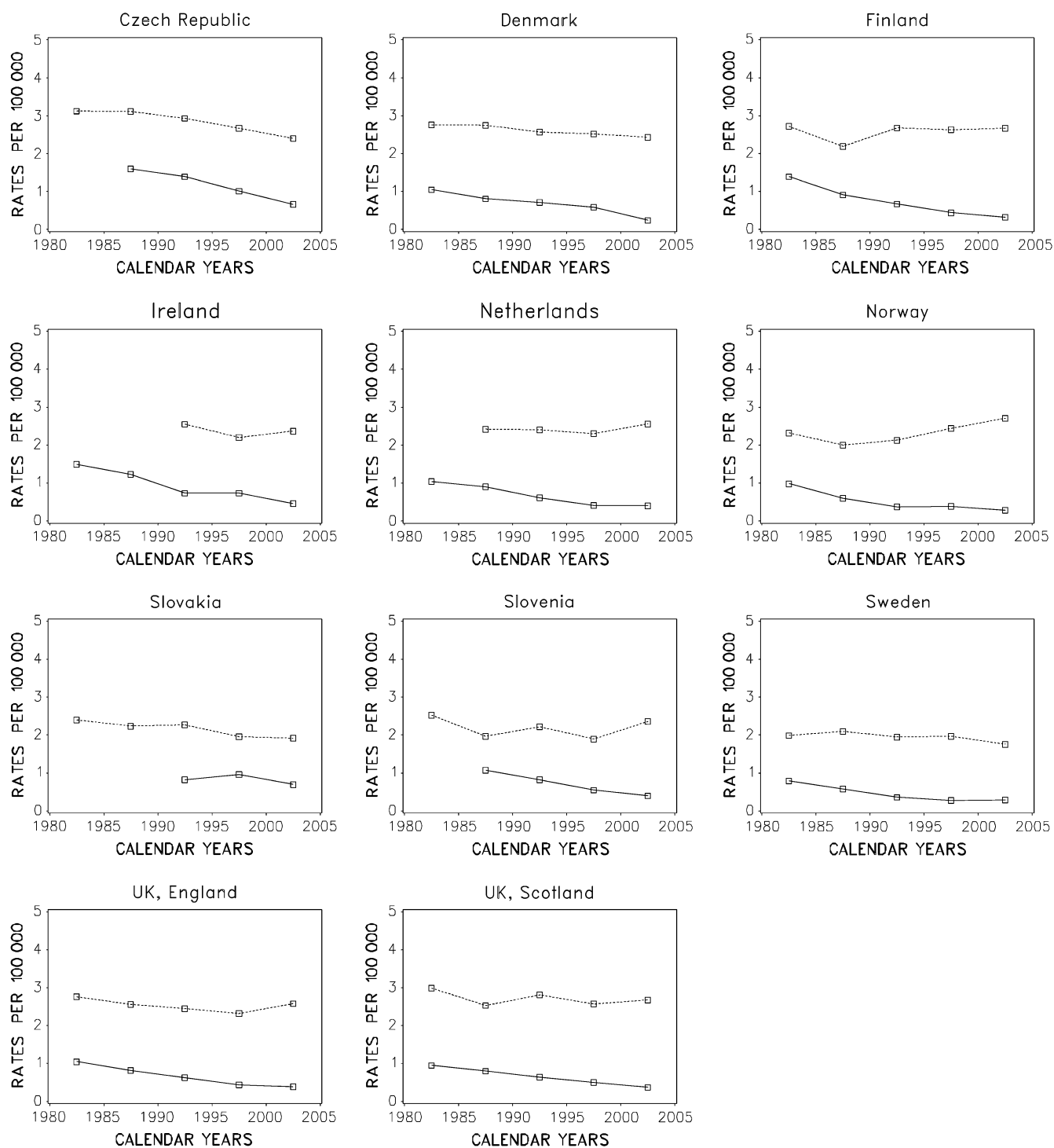


Figure 3. Trends in age-standardized (world population) mortality and incidence rates from Hodgkin lymphoma per 100 000 men in 11 Northern and Eastern European countries between 1980 and 2004 (incidence; mortality).

¹⁸F-fluorodeoxyglucose as a tracer [21, 22]. Treatment of the disease has also improved, through advancements in combined radiotherapy and chemotherapy. Moreover, prognostic factors have been identified which impact survival and may help tailoring the treatments [23–25].

More important, the recent favorable patterns in central and eastern Europe indicate that—after substantial

delays—progresses in the treatment of HL have also been made in those countries. However, the persistence of higher rates in eastern as compared with western European countries indicates that there is still scope for advancements in HL control and treatment in those countries, simply by widespread adoption of available and up to date medical treatment and/or radiotherapy. As for other lymphoid

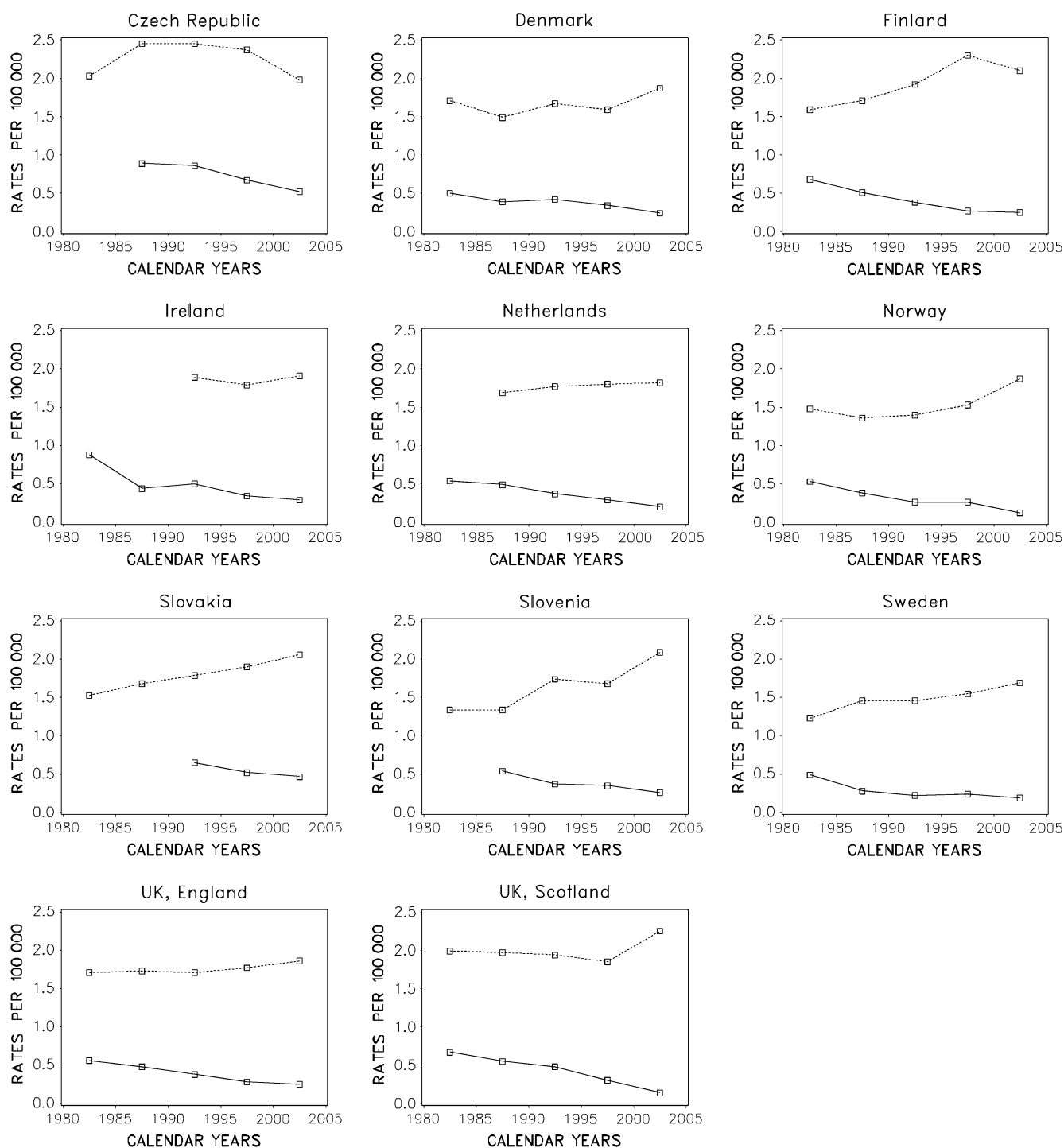


Figure 4. Trends in age-standardized (world population) mortality and incidence rates from Hodgkin lymphoma per 100 000 women in 11 Northern and Eastern European countries between 1980 and 2004 (incidence; mortality).

neoplasms [26], this has to be extended in middle-aged and elderly individuals, too, since the difference in mortality between western and central/eastern European countries is greater in those age groups.

Thus, the present work confirms the persistent favorable trends in HL mortality in western European countries and indicates recent improvements in central/eastern European countries, though the gap in HL mortality across various areas

of Europe is still considerable and calls for urgent interventions to control this largely avoidable cause of death.

funding

Italian and Swiss Leagues Against Cancer; the Swiss Foundation for Research Against Cancer; the Italian Association for Cancer Research.

acknowledgements

The work of this paper was undertaken while CLV was a senior fellow at the International Agency for Research on Cancer. The authors thank Mrs I. Garimoldi for editorial assistance.

references

- Levi F, Lucchini F, Negri E et al. Trends in mortality from Hodgkin's disease in western and eastern Europe. *Br J Cancer* 2002; 87: 291–293.
- Bosetti C, Bertuccio P, Levi F et al. Cancer mortality in the European Union, 1970–2003, with a joinpoint analysis. *Ann Oncol* 2008; 19: 631–640.
- World Health Organization Statistical Information System. WHO Mortality Database. 2007 <http://www3.who.int/whosis/menu.cfm> (accessed November 2007).
- World Health Organization. International Classification of Disease: 8th revision. Geneva: World Health Organization 1967.
- World Health Organization. International Classification of Disease: 9th revision. Geneva: World Health Organization 1977.
- World Health Organization. International Statistical Classification of Disease and related Health Problems: 10th revision. Geneva: World Health Organization 1992.
- Doll R, Smith PG. Comparison between registries: age-standardized rates. Vol. IV. IARC Sci Publ No. 42. In Waterhouse JAH, Muir CS, Shanmugaratnam K et al. (eds): *Cancer Incidence in Five Continents*. Lyon: IARC 1982; 671–675.
- Parkin DM, Whelan SL, Ferlay J, Storm H. *Cancer Incidence in Five Continents. Volume I to VIII. [Cancer base No.7]*. Lyon, France: International Agency for Research on Cancer 2005.
- Engholm G, Storm HH, Ferlay J et al. NORDCAN: Cancer Incidence and Mortality in the Nordic Countries, Version 3.0. Association of Nordic Cancer Registries. Danish Cancer Society. 2007 <http://www.ancr.nu> (accessed September 2007).
- Swedish Cancer Registry. <http://www.socialstyrelsen.se/> (accessed October 2006).
- Information Services Division (ISD). www.isdscotland.org (accessed April 2007).
- National Statistics. <http://www.statistics.gov.uk> (accessed April 2007).
- Dutch Comprehensive Cancer Centres. <http://www.iKcnet.nl> (accessed October 2006).
- Institute of Oncology Ljubljana. http://www.onko-i.si/en/sectors_of_the_institute_of_oncology/epidemiology/ (accessed September 2007).
- National Cancer Registry Ireland. <http://www.ncri.ie/ncri> (accessed February 2008).
- Ondrusova M, Plesko I, Safaei-Diba Ch et al. Comprehensive Analysis of Incidence and Mortality in the Slovak Republic, 1978–2003. Bratislava: National Health Information Center of the Slovak Republic, [cit. 2007-10-01] 2007 <http://www.nor-sk.org> (accessed September 2007).
- Adamson P, Bray F, Costantini AS et al. Time trends in the registration of Hodgkin and non-Hodgkin lymphomas in Europe. *Eur J Cancer* 2007; 43: 391–401.
- Karim-Kos HE, de Vries E, Soerjomataram I et al. HLA class II expression by Hodgkin Reed-Sternberg cells is an independent prognostic factor in classical Hodgkin's lymphoma. *Eur J Cancer* 2008.
- Gil-Delgado MA, Khyat D, Johnson SAN. Chapter 30. Lymphomas. In Pollock RE (ed): *UICC Manual of Clinical Oncology, Eighth Edition*. Hoboken, New Jersey: John Wiley & Sons, Inc 2004; 671–689.
- Mueller NE, Grufferman S. Hodgkin lymphoma. In Schottenfeld D, Fraumeni JF (eds): *Cancer Epidemiology and Prevention*, 3rd edition. New York: Oxford University Press 2006; 872–897.
- Diehl V. Hodgkin's disease—from pathology specimen to cure. *N Engl J Med* 2007; 357: 1968–1971.
- Cheson BD, Pfistner B, Juweid ME et al. Revised response criteria for malignant lymphoma. *J Clin Oncol* 2007; 25: 579–586.
- Fermé C, Eghbali H, Meerwaldt JH et al. Chemotherapy plus involved-field radiation in early-stage Hodgkin's disease. *N Engl J Med* 2007; 357: 1916–1927.
- Maucort-Boulch D, Djeridane M, Roy P et al. Predictive and discriminating three-risk-group prognostic scoring system for staging Hodgkin lymphomas. *Cancer* 2007; 109: 256–264.
- Han X, Kilfoy B, Zheng T et al. Lymphoma survival patterns by WHO subtype in the United States, 1973–2003. *Cancer Causes Control* 2008.
- Levi F, Lucchini F, Negri E et al. Trends in mortality from leukemia in subsequent age groups. *Leukemia* 2000; 14: 1980–1985.