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Cancer mortality in Europe, 2000–2004, and an overview of trends since 1975

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Background: To update the pattern of cancer mortality in Europe.
Materials and methods: We analysed cancer mortality in 34 European countries during 2000–2004, with an overview of trends in 1975–2004 using data from the World Health Organization.
Results: From 1990–1994 to 2000–2004, overall cancer mortality in the European Union declined from 185.2 to 168.0/100 000 (world standard, −9%) in men and from 104.8 to 96.9 (−8%) in women, with larger falls in middle age. Total cancer mortality trends were favourable, though to a variable degree, in all major European countries, including Russia, but not in Romania. The major determinants of these favourable trends were the decline of lung (−16%) and other tobacco-related cancers in men, together with the persistent falls in gastric cancer, and the recent appreciable falls in colorectal cancer. In women, relevant contributions came from the persistent decline in cervical cancer and the recent falls in breast cancer mortality, particularly in northern and western Europe. Favourable trends were also observed for testicular cancer, Hodgkin lymphomas, leukaemias, and other neoplasms amenable to treatment, though the reductions were still appreciably smaller in eastern Europe.
Conclusion: This updated analysis of cancer mortality in Europe showed a persistent favourable trend over the last years.
Key words: cancer, Europe, mortality, trends

introduction

Overall cancer mortality rates have peaked in 1988 in the European Union (EU), and the fall in mortality rates has been ∼10% up to the end of the last century [1, 2]. Trends were, however, different in various countries and geographic areas, with earlier and larger declines in western Europe. Cancer trends were even less favourable in Russia.

In a previous report, we analysed trends in mortality from all cancers and major cancer sites in selected European countries from 1960 to 1999 [1]. To monitor the progress in cancer mortality in Europe, we present here data for the quinquennium 2000–2004, together with an overview of trends over the three last decades. For lung cancer and all neoplasms, we also used joinpoint regression analysis to identify significant changes in trends from 1975 to 2004 [3].

materials and methods

We abstracted official death certification numbers for 25 cancer sites in 34 European countries (including the Russian Federation, Ukraine and other eastern European countries, but excluding a few small countries such as Andorra, and Liechtenstein, as well as Belgium, whose data were available only up to 1997, and Cyprus whose data were not available) from the World Health Organization (WHO) database as available on electronic support [4]. Besides England and Wales, data were also presented for Scotland and Northern Ireland. For Denmark, data were available up to 2001; for Belarus, Italy, Macedonia and Portugal up to 2003. The EU was defined as the 27 member states as since January 2007 (with the exclusion of Belgium and Cyprus).

During the calendar period considered (1975–2004), three different revisions of the International Classification of Diseases (ICD) were used [5–7]. Classification of cancer deaths was recoded, for all calendar periods and countries, according to the 10th revision of the ICD. To improve the validity and comparability of data throughout different countries, we pooled together all intestinal sites (including rectum), all uterine cancers (cervix and endometrium), all skin neoplasms (melanoma and nonmelanomatous), all non-Hodgkin lymphomas (NHL) and all connective and soft tissue sarcomas.

Neoplasms of the brain or nerves are not presented, since it was not possible to consistently pool together subsequent Revisions of the ICD. We were also unable to consider long-term trends in pleural cancer mortality since pleural mesothelioma was unavailable separately in the ICD IX, and the combination of ICD X codes C45.0 (mesothelioma) and C38.4 (other malignant neoplasms of the pleura) is influenced by misclassification by lung cancer, thus introducing spurious trends in men from several countries.

We obtained estimates of the resident population, on the basis of official censuses, from the same WHO database [4]. From the matrices of certified

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deaths and resident populations, we computed age-specific mortality rates for each 5-year age group (from 0–4 to 80–84, and ≥85 years) and calendar period. We computed age-standardised mortality rates per 100 000 population, at all ages and truncated 35–64 years, using the direct method, on the basis of the world standard population [8]. In a few countries, data were missing for one or more calendar years. No extrapolation was made for missing data.

In the interpretation of the data presented, it is important first to consider problems related to random variation, which are clearly greater in relation to smaller populations and rarer cancers. Secondly, and more complex, there are problems of death certification reliability and validity in various countries [9, 10]. For several common cancer sites, including lung, stomach, colorectum and breast, death certification is sufficiently reliable to permit meaningful inference on trends for most European countries, not only those from western Europe but also major central and eastern European countries, and chiefly under the age of 65 years. Some under-recording of cancer deaths was reported for the Russian Federation in the late 1980s and 1990s, due to a fall in precision of coding of causes of death. This was, however, mainly restricted to the elderly living in rural areas [11], and should therefore not have substantially influenced truncated mortality rates. Greater caution is required for a few other countries (such as Albania whose rates were apparently low and a few recent national entities for which no long-term trend was available) and for a few cancer sites, whose diagnosis and certification may be substantially influenced by the availability of diagnostic techniques and the accuracy of death certification, reflecting variable data reliability and different criteria and attitudes towards death certification. These include, among others, liver, bone, soft tissue sarcomas, prostate, multiple myeloma (MM) and other lymphoid neoplasms [9, 10].

To identify significant changes in trends for lung cancer and all cancer mortality, we carried out joinpoint regression analysis [3, 12].

results and discussion

Table 1 includes the age-standardised mortality rates (at all ages and truncated 35–64 years) and the observed average annual number of deaths for major cancer sites in men from 34 European countries and in the EU as a whole, for the period 2000–2004. The corresponding figures in women are given in Table 2.

Figure 1 shows the world standardised mortality rates (at all ages and truncated 35–64 years) from 23 cancer sites plus all neoplasms for men and women in the EU from 1975 to 2004.

Figure 2 includes, for each cancer site, the age-standardised mortality rates (overall and truncated 35–64 years) for 24 countries selected among the largest ones providing long-term trends, and for 5-year calendar periods from 1975 to 2004. Countries are presented in alphabetical order. Different scales have been used for each neoplasm, in order to assist reading and interpretation.

Supplemental Figure S2 (available at Annals of Oncology online) includes corresponding trends for cancers of the liver, gall-bladder, lung, connective and soft tissue sarcomas, thyroid and all neoplasms.

Supplemental Table S1 (available at Annals of Oncology online) gives the major findings from joinpoint regression analysis for mortality from lung cancer in 34 selected European countries and in the EU over the period 1975–2004. The joinpoint analysis for lung cancer mortality is also presented graphically in 24 major European countries separately for men and women (Figure 3).

Supplemental Table S2 (available at Annals of Oncology online) gives the main findings from joinpoint regression analysis for mortality from all neoplasms in 34 selected European countries and in the EU over the period 1975–2004. The joinpoint analysis for total cancer mortality is also presented graphically in 24 major European countries separately for men and women (Figure 4).

mouth and pharynx

From 1990–1994 to 2000–2004, mortality from cancer of the oral cavity and pharynx in the EU as a whole declined by ~10%, from 6.6 to 6.0/100 000 at all ages and from 14.4 to 13/100 000 in middle age (35–64 years). Over the same period, mortality rates increased in women, to reach 1.2/100 000 at all ages and 2.1/100 000 at age 35–64 years during 2000–2004. Tobacco smoking and alcohol drinking (alone and mainly in combination) are the major risk factors for oral cancer in Europe, accounting for >80% of cases [13]. The diverging trends in the two sexes mainly reflect the different patterns in tobacco smoking, which substantially declined in men over the last few decades but rose in women from several countries [14, 15]. Trends in alcohol consumption have also been different in various countries [16], and this is reflected in variable oral cancer trends across Europe. Countries like France and Italy, which had the highest alcohol consumption up to the early 1980s, but where alcohol drinking has substantially declined over the last few decades, showed favourable trends in oral cancer mortality since the mid-/late 1980s, whereas male trends were less favourable in most countries from northern Europe, where alcohol drinking has increased. The most unfavourable trends and the highest mortality from oral and pharyngeal cancer, however, were reported in central and eastern Europe, where mortality rates during 2000–2004 were between 6 and 10/100 000 men at all ages and between 12 and 18/100 000 men at age 35–64 in countries like the Czech Republic, Croatia, Poland and Russia. The highest oral cancer mortality was in Hungary, where mortality rates in the early 2000s were 21.1/100 000 at all ages and 55.3/100 000 at age 35–64, and Slovakia, with an overall mortality rate of 16.9/100 000. Besides the high alcohol and tobacco consumption, this may point to a specific role of fruit-based alcoholic beverages, frequently drunk in those areas [17–19].

oesophagus

This is another neoplasm strongly related to tobacco and alcohol (and their interaction), and its trends across Europe are at least partly similar to those of oral cancer [17, 20, 21]. Oesophageal cancer mortality has been moderately decreasing in EU men from 1990–1994 to 2000–2004, from 5.7 to 5.4/100 000 at all ages and mostly in middle age (from 10 to 9/100 000). In women, over the same period, mortality rates have been stable around 1.1/100 000 at all ages and have increased from 1.4 to 1.5/100 000 in middle age. As for oral cancer, over the last decade, mortality rates were substantially downwards in France, Italy and Spain, following the decline in alcohol consumption in these countries, besides the fall of tobacco smoking in men [21]. Conversely, oesophageal cancer mortality has increased in most northern, central and eastern Europe. Appreciable rises were also observed in Denmark, Scotland and

Table 1. Overall age-adjusted (world population) mortality rates (first row) and average annual number of deaths (second row) from selected cancers per 100 000 men in 34 European countries plus the EU during 2000–2004 (unless otherwise specified)

Countries	Mouth or pharynx	Esophagus	Stomach	Intestines	Liver	Gall-bladder	Pancreas	Larynx	Lung	Bone	Soft tissue	Skin total	Prostate	Testis	Bladder	Kidney	Thyroid	HL	NHL	MM	Leukaemias	All neoplasms
Albania	2.43	1.49	14.78	3.57	–	0.21	4.32	3.37	30.87	1.75	0.42	1.47	9.19	0.28	–	2.61	0.28	0.7	0.87	0.26	3.78	114.25
	37	22	227	55	–	3	66	51	464	27	6	21	137	4	–	40	4	11	13	4	57	1733
Austria	6.36	3.88	9.31	20.09	4.4	2.05	9.08	2.46	35.41	0.49	0.85	2.85	17.63	0.31	5.15	4.36	0.51	0.33	4.23	2.01	5.71	156.76
	362	232	606	1308	397	136	580	146	2319	23	48	174	1170	15	341	280	32	19	269	134	352	9959
Belarus (2000–2003)	9.72	5.27	29.26	18.26	–	–	7.02	8.48	55.23	–	–	1.52	10.63	–	7.5	–	–	–	2.07	0.97	5.59	204.43
	554	305	1754	1099	–	–	208	494	3279	–	–	46	656	–	229	–	–	–	60	30	322	12 067
Bulgaria	4.48	1.99	13.9	17.67	–	0.89	7.38	5.52	39.41	1.06	0.32	1.74	7.4	0.71	4.63	2.75	0.37	0.9	1.73	0.48	3.85	140.28
	265	128	965	1245	–	63	491	334	2496	59	16	111	724	35	331	176	24	48	101	31	219	9201
Croatia	10.43	5.35	17.39	25.78	–	2.17	8.54	6.76	62.11	1.46	0.61	3.5	14.89	0.51	6.43	4.84	0.38	0.45	3.75	2.12	5.53	212.54
	320	219	598	1117	–	77	286	224	2099	43	18	109	525	13	225	164	13	13	120	73	176	7145
Czech Republic	7.19	4.66	11.25	35.77	2.85	3.75	11.12	3.53	58.02	0.9	0.66	3.58	18.63	0.66	7.11	10.5	0.4	0.67	3.63	2.31	6.71	215.93
	515	346	840	2687	297	283	829	260	4330	59	45	253	1409	40	546	789	30	46	265	175	488	16 029
Denmark (2000–2001)	4.99	6.67	5.3	21.91	1.5	0.87	7.98	1.94	43.94	0.51	0.74	3.42	21.92	0.55	7.95	5.1	0.32	0.26	4.59	2.75	5.75	175.98
	204	285	236	1027	62	42	354	87	1977	16	28	147	1105	18	392	228	14	11	204	125	240	8006
Finland	2.35	2.96	7.19	12.94	2.79	1.26	8.86	0.76	31.85	0.43	0.75	2.53	18.32	0.16	3.64	4.85	0.43	0.33	5.38	2.54	4.32	130.85
	94	122	302	536	164	52	366	40	1376	14	30	101	776	5	153	199	18	12	223	111	165	5444
France	8.57	7.19	5.87	17.48	6.72	0.92	7.58	3.34	44.05	0.87	0.76	2.06	14.43	0.29	5.91	3.86	0.28	0.39	4.34	2.38	5.46	178.16
	3691	3358	3111	9623	3975	530	3822	1526	20 894	357	328	1003	9204	101	3326	1987	144	166	2244	1340	2816	90 480
Germany	5.67	4.92	8.69	19.03	2.92	1.62	8.2	1.97	39.17	0.4	0.7	2.06	13.78	0.34	4.56	4.3	0.39	0.3	3.7	2.29	5.02	151.5
	3654	3383	6529	14 467	3039	1334	6035	1352	28 789	222	444	1443	11 265	187	3638	3166	285	197	2689	1759	3550	112 020
Greece	1.89	1.54	8.16	9.78	1.61	0.97	6.7	3	48.5	1.72	0.38	1.61	11.62	0.37	6.92	2.86	0.25	1.43	1.52	1.54	6.36	147.47
	172	150	845	1056	217	105	677	308	4831	159	33	152	1346	26	785	297	27	131	147	159	648	15 074
Hungary	21.12	8.23	15.6	34.56	5.43	3.27	10.86	7.5	78.86	0.98	0.84	3.7	15.63	0.88	7.59	6.11	3.99	0.49	0.61	1.87	7.09	255.19
	1430	572	1217	2706	408	260	814	522	5766	65	53	271	1329	51	606	456	36	40	293	145	519	18 993
Iceland	2.12	3.9	7.99	15.87	2.07	1.23[a]	7.31	0.77[b]	26.71	0.92[b]	0.99[b]	2.33	21.13	0.5[a]	4.03	0.9	6.9	1.06[b]	2.85	1.27	3.28	125.15
	4	8	16	34	3	2	14	2	54	2	2	5	48	1	9	2	13	2	6	3	7	261
Ireland	3.55	7.67	7.54	20.03	0.8	0.61	7.17	1.87	36.41	0.63	1.11	2.63	18.52	0.28	3.84	4.62	0.34	0.46	5.04	2.96	5.74	156
	88	199	198	530	30	16	187	48	954	15	27	67	531	6	108	116	9	12	127	79	151	4113
Italy (2000–2003)	4.38	2.94	11.39	16.9	6.17	2.16	7.6	3.18	46.35	0.61	0.79	2.25	11.55	0.25	6.77	3.73	0.39	0.46	4.65	2.28	5.92	168.51
	2112	1529	6402	9563	3370	1244	4095	1716	25 725	250	352	1125	7225	92	4075	2021	207	208	2416	1311	2990	93 044
Latvia	8.11	5.49	20.69	19.31	–	1.12	10.96	5.6	56.68	1.46	0.85	2.77	18.1	0.8	8.09	7.35	0.54	0.61	3.66	1.47	5.72	203.4
	121	84	318	305	–	18	169	86	892	21	12	41	284	11	127	115	8	8	54	23	83	3134
Lithuania	10.67	6.42	21.56	19.94	1.42	1.42	10.06	5.54	54.81	0.93	0.73	2.38	19.59	0.54	7.55	7.63	0.46	0.83	2.86	1.95	6.77	204.37
	213	134	471	440	36	30	217	116	1203	19	15	50	435	10	167	164	10	16	60	42	139	4414
Luxembourg	7.74	5.09	7.2	19.33	0.28	0.73	8.79	2.35	45.01	0.9	0.89	2.85	13.51	0.32[c]	5.31	3.57	0.6	0.44	3.52	1.94	5.16	157.56
	24	17	23	66	1	5	30	7	150	2	3	9	46	1	18	12	2	1	15	6	17	521
Macedonia (2000–2003)	3.08	1.85	19.19	14.77	–	1.08	6.2	5.96	41.99	1.84	0.26	3.93	8.92	0.69	6.67	2.23	0.31	1.25	1.79	0.92	4.15	153.72
	38	23	239	187	–	13	78	74	521	22	3	46	111	8	83	27	3	15	22	11	49	1897
Malta	2.86	2.41	7.95	15.63	0.78	0.85	8.43	1.62	37.49	0.82[b]	0.58[b]	1.55	10.39	0.52	6.27	3.56	0.51	0.43	4.64	1.73	4.97	134.46
	8	7	24	46	3	3	24	5	109	2	2	5	34	2	20	11	2	2	13	5	13	398
Moldova Republic	11.21	3.06	16.67	18.46	–	0.68	7.55	6.35	34.53	1.72	0.46	2	5.25	0.51	5.61	2.74	0.31	1.32	2.7	0.64	4.09	149.21
	205	56	308	339	–	13	139	114	627	32	9	37	95	9	102	50	6	24	49	11	71	2721
The Netherlands	3	7.29	7.69	20.55	1.07	0.89	7.25	1.57	49.9	0.58	0.86	3.03	18.06	0.31	6.1	4.31	0.24	0.41	5.07	2.79	5.18	171.79
	354	892	963	2577	182	108	901	190	6342	55	92	349	2331	28	789	533	30	45	618	355	607	21 402

Table 1. (*Continued*)

Countries	Mouth or pharynx	Esophagus	Stomach	Intestines	Liver	Gall-bladder	Pancreas	Larynx	Lung	Bone	Soft tissue	Skin total	Prostate	Testis	Bladder	Kidney	Thyroid	HL	NHL	MM	Leukaemias	All neoplasms
Norway	2.8	3.09	6.7	20.56	0.93	1.06	7.44	0.95	31.1	0.44	0.63	4.31	23.56	0.41	5.65	4.12	0.29	0.28	4.69	3.03	4.41	143.76
	96	113	271	832	52	41	287	36	1175	12	21	155	1068	12	252	159	11	9	175	124	164	5691
Poland	6.02	4.95	15.35	20.44	4.2	1.93	8.07	6.25	67.87	1.16	0.48	3.09	13.64	0.52	8.54	6.16	0.33	0.87	3.28	1.89	5.68	209.77
	1412	1166	3757	5022	1025	474	1949	1490	16 401	269	107	721	3394	113	2118	1480	81	202	784	466	1320	50 688
Portugal (2000–2003)	6.83	5.48	17.44	17.24	2.75	1.28	5.79	4.88	28.8	0.92	0.61	1.69	15.93[b]	0.31	4.83	2.26	0.31	0.47	3.76	1.99	4.9	148.79
	497	434	1561	1837	231	122	508	381	2434	66	44	144	1715	20	480	201	27	33	312	184	400	13 341
Romania	10.04	3.03	16.75	14.82	1.55	1.27	8.26	5.62	46.94	2.27	0.86	2.78	9.62	0.58	5.93	1.3	0.33	0.74	2.59	0.71	4.59	165.75
	1416	445	2646	2362	342	199	1281	827	7024	330	119	406	1593	77	959	246	50	103	366	137	634	25 100
Russian Federation	8.86	6.58	28.76	19.08	5.69	–	4.28	6.49	57.17	–	–	1.5	8.84	–	7.11	–	–	–	2.13	0.82	5.1	195.03
	7240	5376	23 900	15 826	4684	–	6499	5363	47 435	–	–	1238	7313	–	5873	–	–	–	1704	680	3951	160 450
Slovakia	16.86	7.24	14.45	33.65	–	2.7	9.78	5.86	53.72	0.82	0.64	2.91	14.45	0.64	5.77	6.73	0.4	0.7	3.14	2.3	5.95	212.75
	538	228	478	1104	–	90	316	187	1724	25	19	94	490	20	195	217	101	22	14	77	187	6888
Slovenia	8.35	4.91	15.29	24.93	–	2.34	8.17	3.88	50.61	0.56	0.64	3.76	18.45	0.47	6.03	4.9	3.81	0.4	0.38	2.17	5.29	192.09
	118	71	226	368	–	35	120	56	747	7	7	52	272	6	90	72	53	5	6	33	72	2799
Spain	6.05	4.89	10.06	19.74	5.22	1.18	6.62	5.1	46.6	0.56	0.72	1.91	13.65	0.16	8.92	3.04	3.67	0.45	0.27	2.14	5	171.44
	1817	1557	3646	7411	2906	472	2290	1668	16 183	154	213	648	5619	43	3468	1074	95	136	1259	816	1664	612 43
Sweden	2.19	3.17	5.41	15.27	0.77	1.99	7.6	0.54	20.89	0.43	0.93	3.04	23.28	0.17	4.33	4.42	0.27	0.3	4.45	2.63	4.58	125.78
	174	269	488	1408	64	182	667	48	1795	24	68	251	2497	10	435	393	25	22	396	253	391	115 50
Switzerland	4.64	4.9	5.25	13.07	5.99	–	6.96	1.41	32.39	–	–	2.3	17.49	–	4.32	–	–	–	4.45	2.27	4.49	136.89
	259	295	339	853	364	–	441	83	1988	–	–	138	1303	–	299	–	–	–	278	150	270	8728
Ukraine	10.55	4.85	22.58	18.15	–	–	–	6.4	47.17	–	–	–	8.24	–	–	–	–	–	–	–	5.5	193.84
	3130	1474	7096	5829	–	–	–	1940	14 755	–	–	–	2746	–	–	–	–	–	–	–	1530	59 386
UK: England and Wales	2.58	8.53	6.71	17.22	1.37	0.35	6.33	1.26	35.79	0.46	0.76	2.42	15.43	0.21	5.35	3.88	0.2	0.39	4.77	2.42	4.68	147.32
	1068	3981	3395	8469	849	179	2982	576	17 420	142	298	1059	8910	66	2899	1760	96	146	2151	1207	2106	71 854
UK: Northern Ireland	2.67	7.8	7.78	20.32	1.17	0.51	6.43	1.32	38.07	0.44	0.68	2.22	14.7	0.37	3.98	4.38	0.24	0.44	5.06	2.35	4.35	150.64
	32	96	101	260	20	6	82	16	490	4	6	27	216	3	56	53	3	5	62	32	52	1939
UK: Scotland	4.19	10.93	8.15	21.48	2.07	0.52	6.71	2.1	49.88	0.54	0.82	2.63	15.49	0.3	5.61	4.4	0.26	0.37	4.59	2.38	4.46	174.78
	163	475	369	973	126	23	290	88	2231	15	29	107	783	10	272	188	10	13	196	111	184	7792
EU	5.97	5.37	9.87	18.82	3.76	1.42	7.69	3.28	44.00	0.74	0.72	2.35	14.31	0.35	6.12	4.2	0.33	0.49	3.99	2.21	5.3	168.03
	20 599	20 187	39 900	77 888	17 169	6031	30 190	12 114	175 195	2384	2433	8842	64 991	997	26 439	16 421	1287	1652	15 440	9099	20 070	667 910

EU, European Union; HL, Hodgkin lymphoma; NHL, non-Hodgkin lymphoma; MM, multiple myeloma.

[a]2000–2002.

[b]2000–2003.

[c]2000–2001.

the Baltic countries. During 2000–2004, the highest mortality rates in men were in Scotland (10.9/100 000), England and Wales and Hungary, though with some hint of levelling off over more recent calendar years. The lowest ones (<3/100 000) were in Greece, Bulgaria, Italy and Finland. In women, the highest oesophageal cancer mortality rates (4/100 000) were in Scotland, followed by England and Wales and Ireland. Part of the rise in northern Europe is due to an increase in oesophageal adenocarcinoma, which is now higher than squamous cell carcinoma in countries like Denmark and Scotland [21–23]. Oesophageal adenocarcinoma is related to tobacco (but not alcohol), overweight and gastro-oesophageal reflux [24, 25]. Therefore, at least part of the rise in oesophageal cancer mortality in northern Europe can be attributed to increased prevalence of overweight and obesity. Squamous cell carcinoma remained the prevalent histological type in southern Europe [21].

stomach

From 1990–1994 to 2000–2004, gastric cancer mortality in the EU declined from 14.1 to 9.9/100 000 men and from 6.4 to 4.5/100 000 women (i.e. by ~30% in both sexes), with similar declines in middle age population for both sexes. Thus, in relative terms, the steady fall in gastric cancer mortality persisted over most recent years [26]. During 2000–2004, the highest mortality rates were in Belarus (29.3/100 000 men, 11.5/100 000 women) and Russia (28.8/100 000 men, 11.8/100 000 women), followed by the Baltic countries (20–21/100 000 men, 9/100 000 women) and Portugal (17.4/100 000 men, 8/100 000 women). The lowest ones were in Switzerland, France, the Nordic countries and England and Wales (5–6/100 000 men, 2–3/100 000 women). Falls in gastric cancer mortality were observed both in high-mortality areas (not only Russia and most other eastern and central European countries, but also Portugal and Italy), and in low-mortality ones (not only most northern Europe, but also France and Greece). Thus, the declines in gastric cancer mortality throughout Europe are likely to continue in the near future. They are mainly attributed not only to improved diet, diet variety and food conservation [27, 28], but also to a declined prevalence of *Helicobacter pylori* infection in more recent generations [29]. A role of improved diagnosis and treatment is also possible, although difficult to quantify on national mortality rates [23, 30].

intestines, chiefly colon and rectum

Mortality from colorectal cancer in the EU has been declining from 13.4 to 11.5/100 000 from 1980–1984 to 2000–2004 in women and from 20.1 to 18.8/100 000 from 1990–1994 to 2000–2004 in men. These falls were somewhat larger in middle age. The favourable trends in colorectal cancer mortality were observed in most western and northern Europe, whereas trends were less favourable in southern (particularly Spain) and most central and eastern European countries, which had lower mortality rates in the past [31]. This likely reflects more uniform dietary and lifestyle habits across Europe over more recent calendar years. There is, however, a persisting substantial excess in colorectal cancer mortality in Hungary and the Czech Republic, with mortality rates during 2000–2004 about 35/100 000 men and about 18/100 000 women. Most other European countries have mortality rates between 17 and 20/100 000 men and between 10 and 13/100 000 women. The lowest mortality rates (10–13/100 000 men, 7–10/100 000 women) are in Greece, Finland, Switzerland, Romania and France. Some of the recent falls in mortality, which have been observed in North America [32, 33] and Japan [34, 35], too, are likely due to improved detection (through screening and early diagnosis) and treatment of the disease [23, 36].

liver

From 1980–1984 to 2000–2004, mortality from primary liver cancer moderately declined in both sexes in the EU, from 4.3 to 3.8/100 000 men and from 1.5 to 1.0/100 000 women. Death certification data from liver cancer, however, are extremely difficult to interpret since liver is one of the most common sites of secondaries and the distinction between primary and metastatic liver cancer is variable across countries, calendar periods and subsequent revisions of the ICD [37]. These major limitations notwithstanding, primary liver cancer mortality rates, after earlier rises, have been declining over more recent years in France and Italy, which had some of the highest mortality rates. This is mainly due to the fall in alcohol consumption in those countries since the early 1980s [18], together with the declined prevalence of hepatitis B and C infection over recent years [38]. In contrast, liver cancer mortality rates tended to increase in several central and northern European countries, reflecting the recent rise in alcohol drinking in these areas of the continent [18]. Still, during 2000–2004, the highest mortality rates were in France, Italy and Switzerland (6–6.7/100 000 men) and the lowest ones in the Nordic countries and the UK. In women, the highest mortality rates (2–2.7/100 000) were in Poland, Russia and Hungary. Some of the recent trends in men may have been favourably influenced by the decline in tobacco smoking, since this is another tobacco-related site [39].

gall-bladder and bile ducts

Mortality from gall-bladder and bile duct cancers is higher in women than in men, and from 1980–1984 to 2000–2004, their mortality rates declined from 2.4 to 1.9/100 000 in EU women and from 1.7 to 1.4/100 000 in EU men. The highest mortality rates during 2000–2004 were in central Europe (the Czech Republic, Hungary, Slovakia and Poland, between 4 and 5/100 000 women). The major cause of gall-bladder cancer is the presence of gallstones [40, 41], which in turn are related to obesity, multiple pregnancies and other hormonal factors. Cholecystectomy in subjects with gallstones is an obvious mean to prevent gall-bladder cancer, and the increased rate of cholecystectomy in Europe is the major determinant of the falls in gall-bladder cancer mortality. Fewer data are available on biliary tract cancers, which are rarer than gall-bladder cancer, and whose incidence has fallen in Denmark over recent years too [41, 42].

pancreas

Mortality from pancreatic cancer, after earlier rises, has been approximately stable from 1980–1984 to 2000–2004 in EU men (~7.6/100 000), while it has steadily risen in women (from 4.8

Table 2. Overall age-adjusted (world population) mortality rates (first row) and average annual number of deaths (second row) from selected cancers per 100 000 women in 34 European countries plus the EU in 2000–2004 (unless otherwise specified)

Countries	Mouth or pharynx	Esophagus	Stomach	Intestines	Liver	Gall-bladder	Pancreas	Larynx	Lung	Bone	Soft tissue	Skin. total	Breast	Uterus	Ovary	Bladder	Kidney	Thyroid	HL	NHL	MM	Leukaemias	All neoplasms
Albania	1.15	0.62	7.07	3.02	–	0.23	2.27	0.79	7.54	1.12	0.34	0.87	7.65	3.36	–	–	1.2	0.24	0.31	0.44	0.28	2.54	60.04
	20	11	121	51	–	4	38	13	127	18	6	15	122	54	–	–	20	4	5	7	3	40	996
Austria	1.4	0.67	5.17	11.44	0.95	2.31	6.71	0.28	11.83	0.25	0.63	1.73	18.57	5.36	6.18	1.45	2.18	0.56	0.22	2.69	1.52	3.39	97.84
	111	60	553	1239	141	249	700	20	1002	16	48	149	1593	487	424	175	227	59	17	267	161	321	9343
Belarus (2000–2003)	0.73	0.36	11.53	10.89	1.34	–	3.23	0.12	3.71	–	–	1.11	14.58	8.28	5.95	0.73	–	–	–	1.01	0.98	3.36	86.6
	69	40	1190	1144	69	–	170	11	383	–	–	48	1256	747	259	44	–	–	–	47	44	287	8147
Bulgaria	0.81	0.48	6.62	10.61	4.49	1.07	3.91	0.31	6.39	0.62	0.15	1.04	14.74	10.17	–	1.04	1.01	0.41	0.46	0.91	0.38	2.55	81.23
	63	45	616	984	363	101	352	24	520	42	10	88	1119	717	–	101	81	35	26	67	30	171	6549
Croatia	1.07	0.64	6.98	12.77	–	2.76	4.71	0.4	10.72	0.79	0.36	2.19	18.2	6.27	6.45	1.35	1.87	0.41	0.29	2.26	1.28	3.16	101.7
	47	33	373	685	–	151	248	19	494	32	13	99	825	297	284	83	93	21	10	104	68	148	4966
Czech Republic	1.09	0.62	5.57	17.94	1.01	4.92	7.22	0.2	12.86	0.54	0.51	2.08	19.02	9.06	7.87	1.73	4.49	0.59	0.52	2.39	1.62	3.9	120.95
	109	66	633	2093	157	578	816	22	1306	48	45	213	1947	902	769	207	498	68	44	257	188	401	12 906
Denmark (2000–2001)	1.68	2.15	2.55	17.29	0.42	0.94	7.03	0.45	28.1	0.21	0.64	2.6	25.91	5.96	9.14	2.85	2.92	0.34	0.24	3.22	1.86	3.31	140.99
	91	120	156	1120	21	60	416	23	1460	3	31	133	1331	318	456	189	170	20	13	182	114	192	7920
Finland	0.88	0.92	4	8.94	0.93	1.89	6.67	0.1	8.23	0.24	0.62	1.37	15.57	3.59	5.6	0.92	2.51	0.37	0.25	3.62	1.93	2.78	85.07
	56	66	262	594	89	128	427	5	485	10	29	83	816	219	304	70	161	27	12	233	130	157	5138
France	1.27	1.01	2.23	10.09	0.95	0.98	4.43	0.27	8.24	0.41	0.56	1.3	18.29	4.43	5.15	1.07	1.55	0.32	0.23	2.61	1.58	3.22	85.99
	734	697	1918	8703	827	863	3518	146	4858	224	314	893	11 080	2900	3261	1051	1148	261	123	2036	1333	2392	61 024
Germany	1.18	1	4.71	12.01	0.76	2.2	5.56	0.2	11.12	0.29	0.53	1.25	18.81	4.47	5.9	1.35	1.91	0.42	0.21	2.41	1.56	3.15	94.48
	1031	1003	5728	15 644	1194	2751	6579	180	10 383	211	475	1263	17 573	4405	5899	2005	2210	507	182	2696	1861	3319	102 085
Greece	0.71	0.34	4.1	7.11	0.32	0.94	4.09	0.23	7.61	1.04	0.23	1.18	15.64	3.32	3.96[a]	1.21	1.15	0.28	0.9	1.03	1.01	3.74	79.68
	81	45	518	931	60	124	530	26	892	194	23	131	1714	369	393	172	150	38	96	121	135	442	9489
Hungary	3.25	1.16	6.73	18.2	1.98	4.39	6.52	0.72	22.13	0.48	0.53	2.18	21.64	9.32	6.21	1.67	2.6	0.54	0.42	2.23	1.17	4.45	131.53
	288	117	867	2353	240	586	810	63	2259	47	49	249	2290	942	653	224	322	66	37	253	144	479	14 775
Iceland	1.58	1.14	3.33	10.58	0.35	1.05[b]	5.56	0.67[c]	25.79	0.51[c]	0.45[b]	1.56	15.78	4.2	7.78	1.72	4.02	0.7	0.26	2.03	3.13	2.25	106.64
	4	3	10	26	2	4	14	1	55	1	1	4	34	9	18	5	9	2	1	5	8	5	245
Ireland	1.15	3.24	3.74	11.51	0.31	0.93	5.44	0.25	17.94	0.42	0.83	1.8	22.77	4.82	8.55	1.35	1.71	0.4	0.29	3.66	1.78	3.26	113
	36	117	130	404	14	32	190	9	577	11	23	58	648	138	223	51	54	12	8	118	66	107	3612
Italy (2000–2003)	1.06	0.6	5.64	10.53	1.78	2.44	5.33	0.22	8.87	0.34	0.61	1.38	18.08	3.96	4.69	1.12	1.45	0.46	0.32	3.07	1.68	3.61	94.78
	728	473	4670	8493	1471	1989	4310	159	6290	177	332	911	11 412	2701	769	1056	1106	360	170	2269	1110	2471	69 665
Latvia	0.95	0.46	9.01	12.29	–	1.12	5.39	0.15	6.16	0.7	0.37	2.34	18.05	10.37	7.35	1.3	2.79	0.68	0.4	1.69	1.18	3.58	98.22
	24	14	260	373	–	34	160	4	175	15	10	60	419	250	178	44	82	20	8	44	33	89	2621
Lithuania	1	0.52	9.05	11.39	0.43	1.77	4.81	0.15	5.55	0.47	0.6	2.09	18.05	12.71	8.35	1.21	3.18	0.61	0.51	1.61	1.62	4.27	101.74
	33	19	339	447	19	71	190	5	213	13	17	68	567	391	273	53	115	23	14	60	61	137	3522
Luxembourg	1.49	1.12	2.62	10.53	0.34	0.6	5.8	0.35	11.02	0.46	0.57	2.2	18.61	3.6	6.43	1.12	1.75	0.38	0.21	2.74	1.9	3.51	90.77
	5	6	14	57	2	4	31	2	45	1	2	9	79	16	27	7	10	2	1	13	9	18	423
Macedonia (2000–2003)	0.85	0.49	8.28	9.05	–	2.18	3.16	0.49	6.58	1.31	0.33	2.33	17.49	8.97	–	0.96	0.62	0.31	0.38	0.76	0.66	2.8	87.82
	12	7	123	132	–	32	48	7	92	17	4	31	236	122	–	15	8	5	5	11	10	35	1223
Malta	0.78	0.41	4.11	11.29	0.56	0.9	6.33	0.43	5.57	0.4	0.42[c]	0.99[c]	21.24	5.15	7.64	1.03	1.62	0.72	0.61	2.18	1.48	3.13	91.03
	3	2	17	44	2	3	25	1	19	1	2	4	74	17	25	6	5	3	2	8	6	10	330
Moldova Republic	1.08	0.43	6.91	10.7	–	0.84	3.61	0.2	6.18	0.88	0.37	1.3	17.04	10.89	3.88	0.81	1.27	0.5	0.65	1.79	0.45	3.09	85.67
	27	12	182	285	–	23	97	5	158	20	8	35	418	270	94	23	31	13	15	42	11	64	2140
The Netherlands	1.31	2.19	3.63	14.64	0.32	1.06	5.61	0.3	18.32	0.34	0.68	1.82	23.06	3.93	6.14	1.73	2.18	0.34	0.21	3.28	1.73	3.22	112.69
	191	365	642	2643	67	189	960	44	2540	40	88	261	3407	621	946	330	363	61	30	531	313	520	17 919

Table 2. (*Continued*)

Countries	Mouth or pharynx	Esophagus	Stomach	Intestines	Liver	Gall-bladder	Pancreas	Larynx	Lung	Bone	Soft tissue	Skin. total	Breast	Uterus	Ovary	Bladder	Kidney	Thyroid	HL	NHL	MM	Leukaemias	All neoplasms
Norway	1.03	0.9	3.28	15.38	0.39	1.06	5.97	0.15	16.59	0.3	0.46	2.54	16.72	5.27	7.35	1.85	2.16	0.41	0.13	3.08	1.9	2.93	103.44
	51	46	185	868	28	58	323	8	691	9	20	110	730	239	318	122	113	24	7	152	117	141	5061
Poland	1.12	0.75	5.57	12.36	2.71	3.87	5.12	0.53	13.39	0.65	0.33	2.15	15.08	9.73	7.01	1.28	2.54	0.51	0.51	1.85	1.42	3.41	111.04
	373	274	2108	4749	1030	1478	1898	165	4424	194	90	762	4838	3091	2198	518	903	200	149	628	529	1126	38 443
Portugal (2000–2003)	0.83	0.73	7.96	11.37	0.67	1.25	3.32	0.2	5.01	0.55	0.48	1.19	15.56	5.89	3.21	1.09	0.83	0.36	0.29	2.41	1.52	3.06	80.86
	93	99	988	1468	75	165	432	24	549	50	43	140	1571	604	176	178	101	44	26	270	189	315	9265
Romania	1.26	0.42	6.27	9.36	0.59	1.24	4.19	0.29	8	1.23	0.57	1.79	16.51	14.65	4.15	1.16	1.3	0.46	0.41	1.41	0.71	3.04	93.28
	231	87	1341	2003	168	267	888	55	1564	212	97	354	3010	2484	749	268	246	95	64	246	137	483	17 666
Russian Federation	1.08	0.99	11.75	12.78	2.52	–	4.28	0.18	5.80	–	–	1.2	17.34	9.45	5.86	0.81	–	–	–	1.13	0.72	3.33	96.19
	1552	1678	17 694	19 634	3631	–	6494	252	8582	–	–	1516	22 076	12 354	7467	1407	–	–	–	1415	959	3864	132 643
Slovakia	1.2	0.62	5.8	15.77	–	4.16	5.04	0.25	7.7	0.49	0.39	1.85	17.4	9.45	6.18	1.11	2.87	0.47	0.47	1.87	1.66	3.64	102.64
	53	28	299	815	–	215	254	10	360	20	17	83	773	418	263	61	138	26	19	87	82	158	4831
Slovenia	1.08	0.67	6.11	12.42	–	2.42	5.14	0.3	11.39	0.38	0.31	2.23	19.15	6.9	6.09	1.25	1.78	0.42	0.26	2.35	1.79	2.79	100.83
	20	16	147	309	–	62	122	6	229	7	7	47	383	141	118	34	42	11	5	55	43	60	2213
Spain	0.89	0.5	4.44	11.06	1.57	1.56	3.95	0.17	5.28	0.35	0.54	1.19	14.52	4.18	4.25	1.19	1.12	0.34	0.28	2.39	1.54	3	78.85
	387	238	2287	5790	1200	868	2006	67	2134	115	192	553	5822	1793	1707	734	550	176	104	1138	817	1303	36 673
Sweden	0.92	0.99	3.03	11.39	0.31	3.06	6.74	0.12	14.4	0.24	0.77	1.99	16.01	4.54	7.04	1.41	2.57	0.37	0.19	2.95	1.76	3	98.72
	98	116	361	1412	32	359	775	12	1350	20	66	189	1514	473	652	198	300	51	17	355	228	316	10 731
Switzerland	1.25	1.06	2.35	8.22	1.79	–	4.97	0.19	11.06	–	–	1.46	17.91	3.41	5.31	1.42	2.5	–	0.67	2.75	1.53	2.86	84.99
	90	96	223	796	160	–	462	14	738	–	–	105	1356	293	427	151	173	–	38	245	147	230	7153
Ukraine	0.88	0.39	8.88	10.78	–	–	–	0.11	5.17	–	–	–	17.9	10.21	–	–	–	–	–	–	–	3.45	95.13
	444	229	4531	5784	–	–	–	55	2677	–	–	–	7871	4579	–	–	–	–	–	–	–	1326	43 961
UK: England and Wales	1.05	3.12	2.79	10.61	0.34	0.51	4.74	0.23	18.76	0.32	0.63	1.59	20.6	4.34	7.49	1.81	1.85	0.27	0.25	2.85	1.63	2.87	107.14
	600	2268	2078	7626	260	345	3174	143	11 326	112	292	897	11 321	2402	4013	1496	1108	183	109	1924	1122	1697	66 475
UK: Northern Ireland	1.12	2.84	3.68	12.69	0.42	0.88	4.76	0.3	19.34	0.23	0.65	1.33	19.88	4.32	7.73	1.43	1.74	0.42	0.24	3.5	1.43	2.22	108.36
	18	56	71	241	9	16	89	5	315	4	8	25	297	69	120	30	32	6	3	61	29	39	1843
UK: Scotland	1.36	4.04	2.87	13.06	0.5	0.65	4.95	0.44	28.86	0.34	0.65	1.44	20.77	4.79	7.43	2.17	2.25	0.3	0.14	3.44	1.69	2.9	123.09
	66	285	202	911	38	42	319	23	1712	12	30	84	1117	255	412	169	136	20	8	213	117	161	7508
EU	1.15	1.14	4.52	11.53	1.03	1.89	5.07	0.26	11.37	0.43	0.55	1.49	18.09	5.7	5.89	1.34	1.83	0.4	0.31	2.5	1.52	3.25	96.91
	5551	6679	27 363	71 942	6819	11 607	30 098	1246	57 166	1729	2346	7741	86 974	27 235	24 086	9455	10 298	2379	1287	14 191	9310	16 944	524 781

EU, European Union; HL, Hodgkin lymphoma; NHL, non-Hodgkin lymphoma; MM, multiple myeloma.

[a]1995–1999.

[b]2000–2002.

[c]2000–2003.

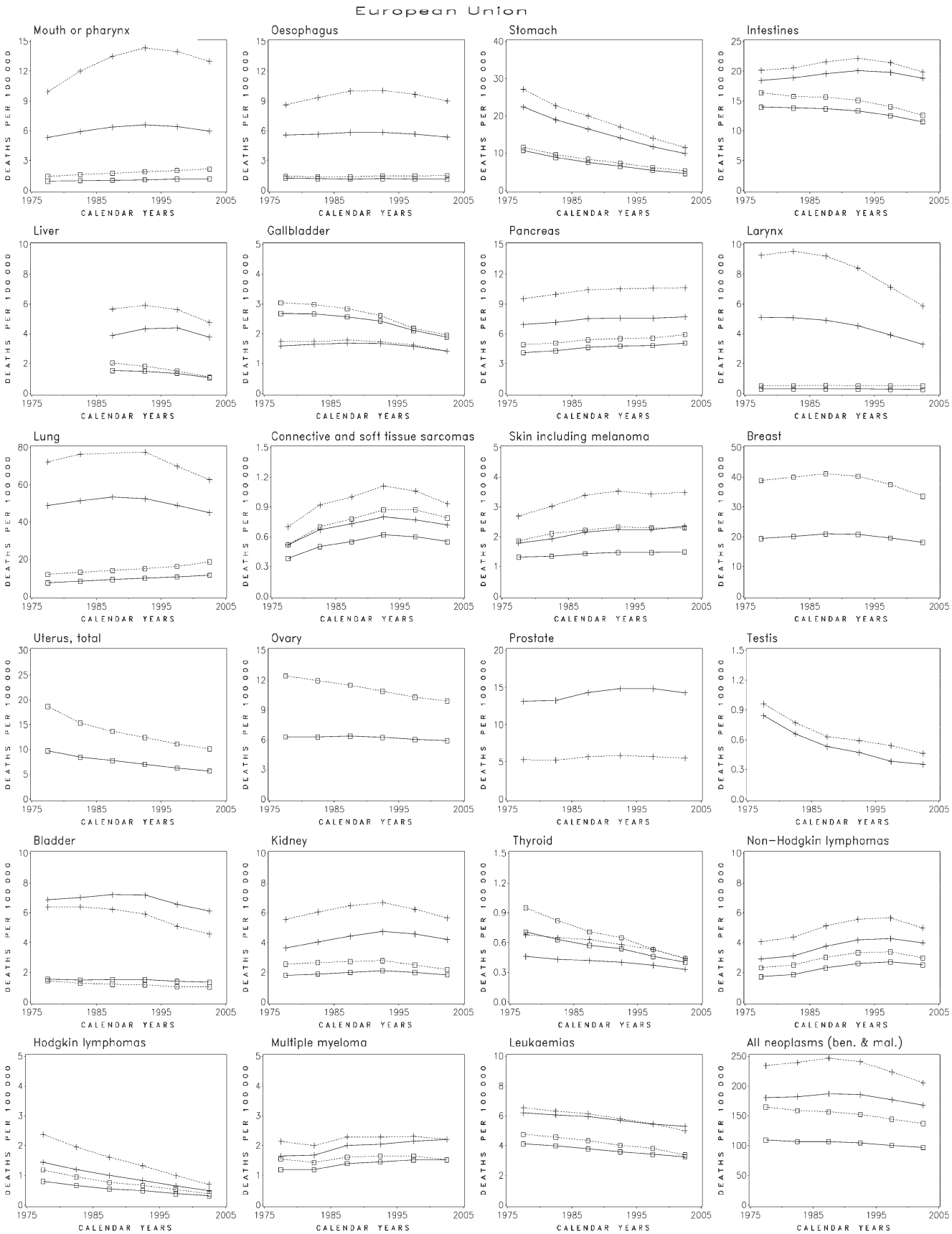


Figure 1. Trends in age-standardised (world population) death certification rates per 100 000 from 23 cancers sites plus all neoplasms in the European Union, 1975–2004. +——+, men, all ages; □—□, women, all ages; +----+ men, 35–64 years; □---□, women, 35–64 years.

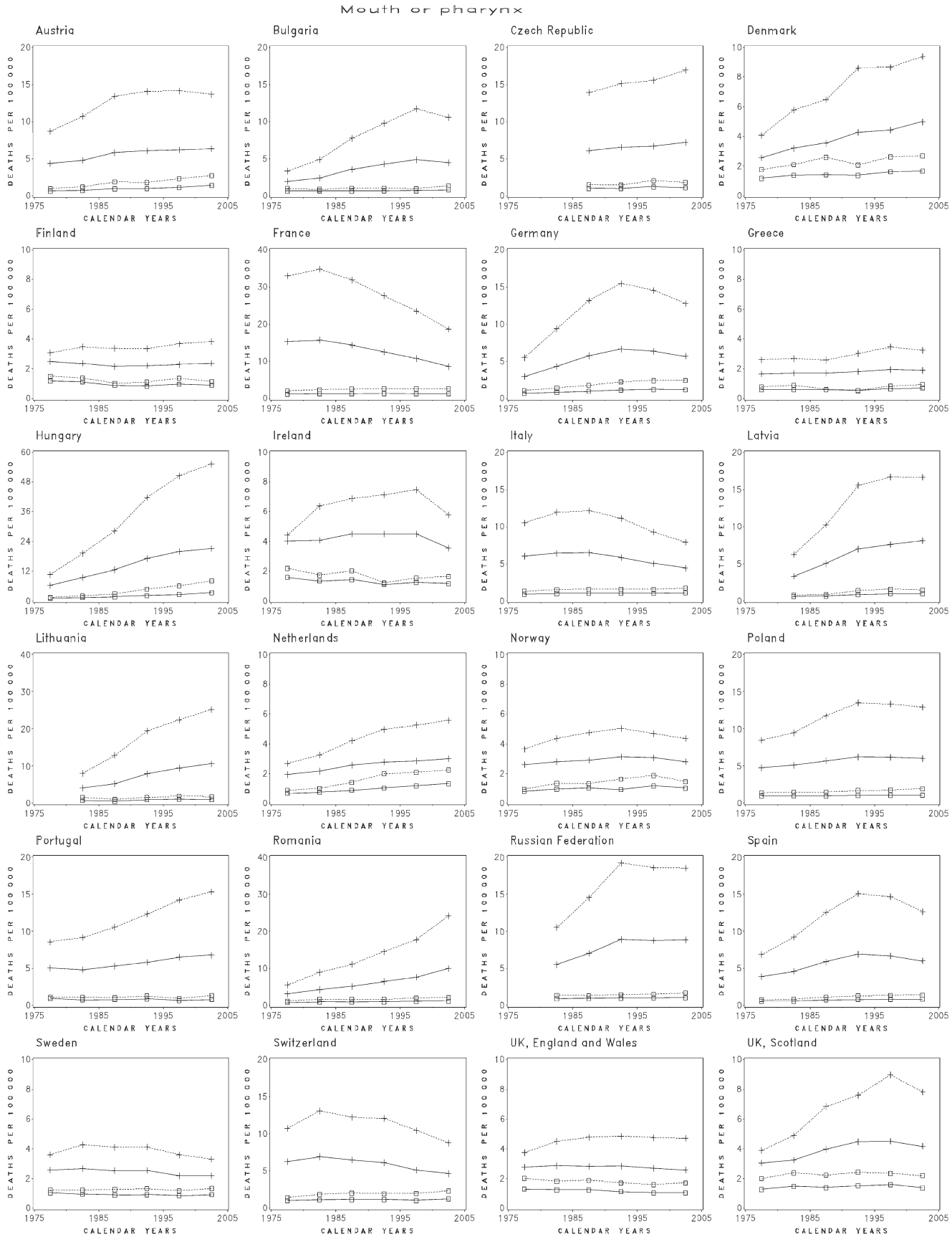


Figure 2. Trends in age-standardised (world population) death certification rates per 100 000, for each cancer site and all neoplasms, in 24 selected European countries, 1975–2004. +——+, men, all ages; □—□, women, all ages; +----+ men, 35–64 years; □---□, women, 35–64 years.

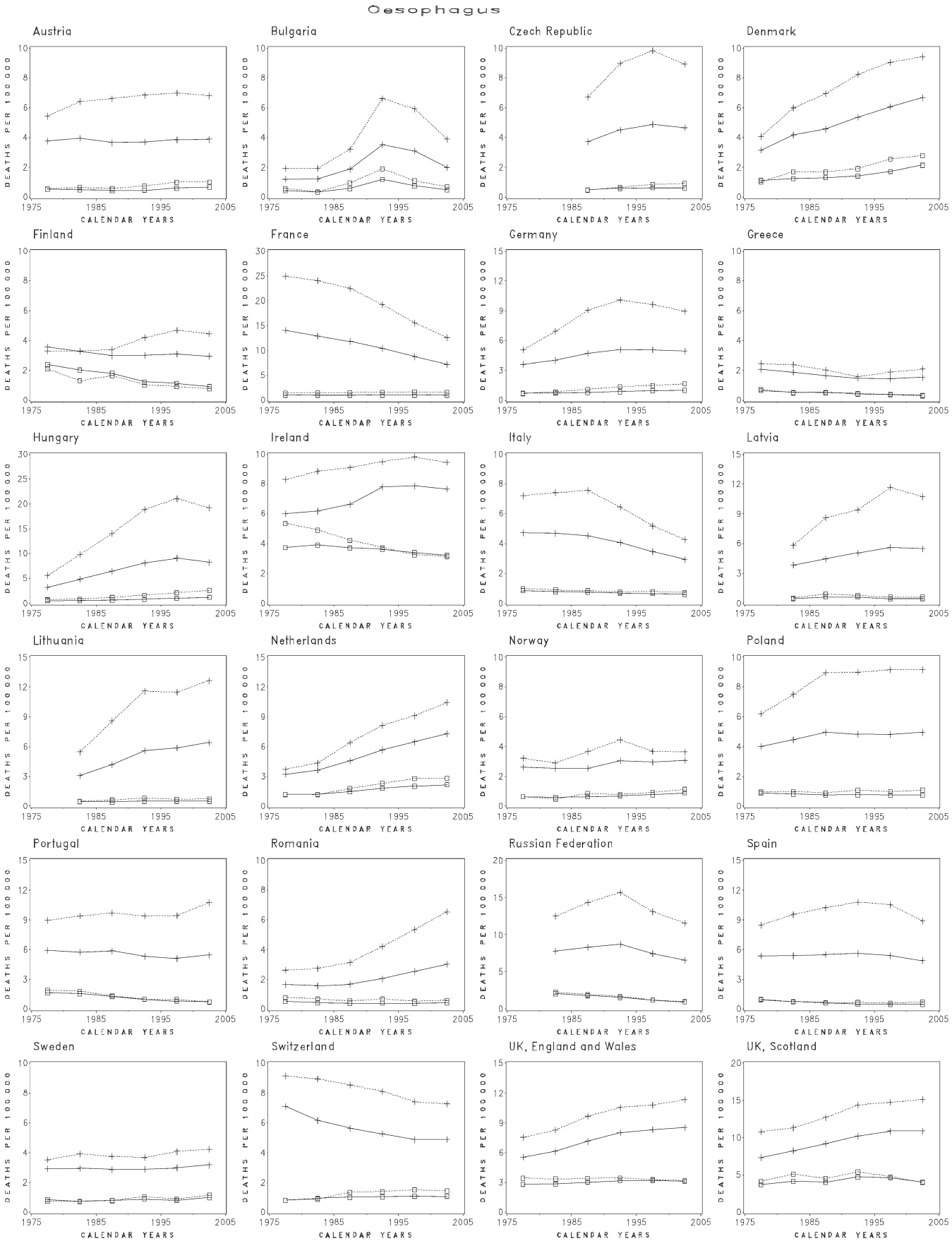
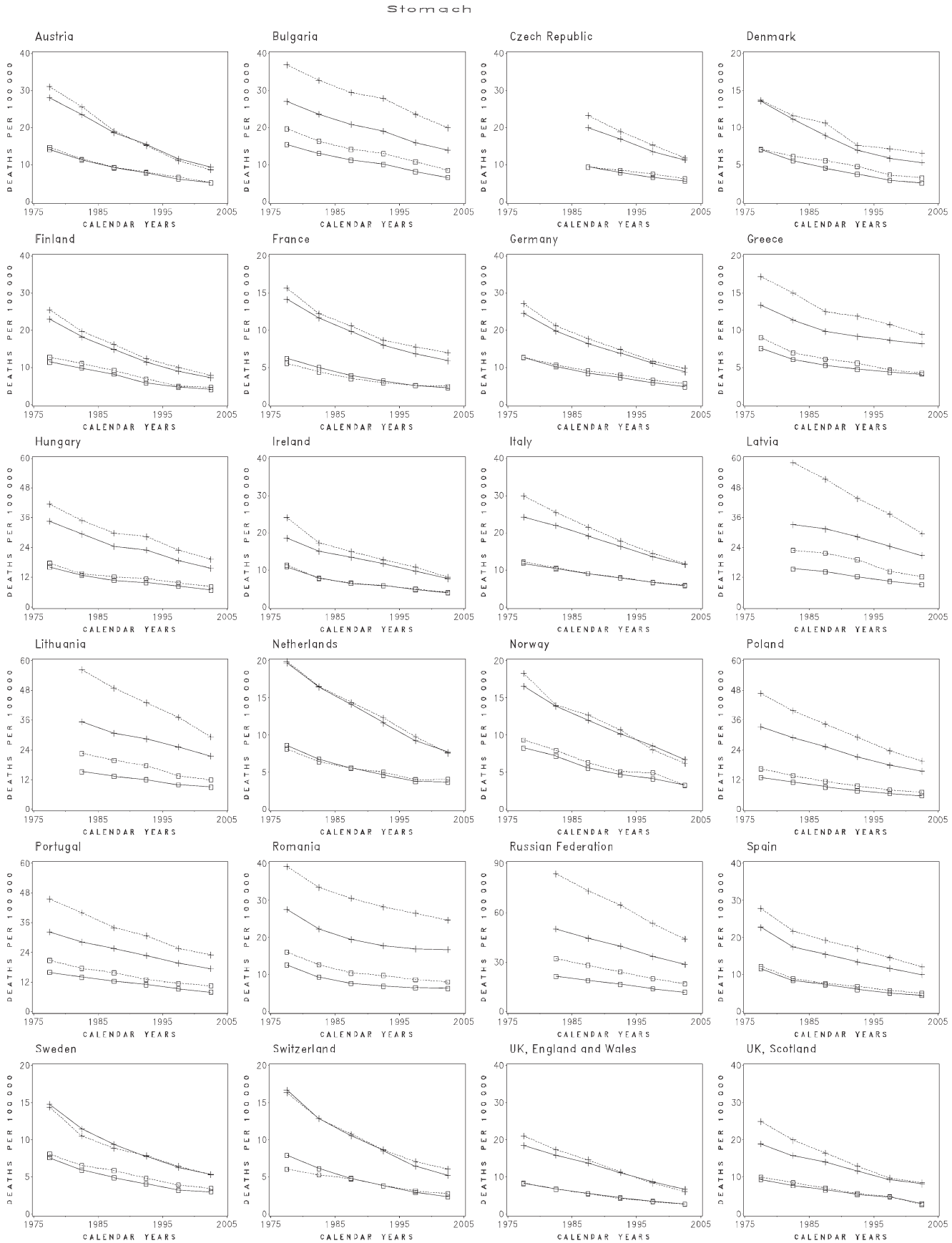


Figure 2. (*Continued*)



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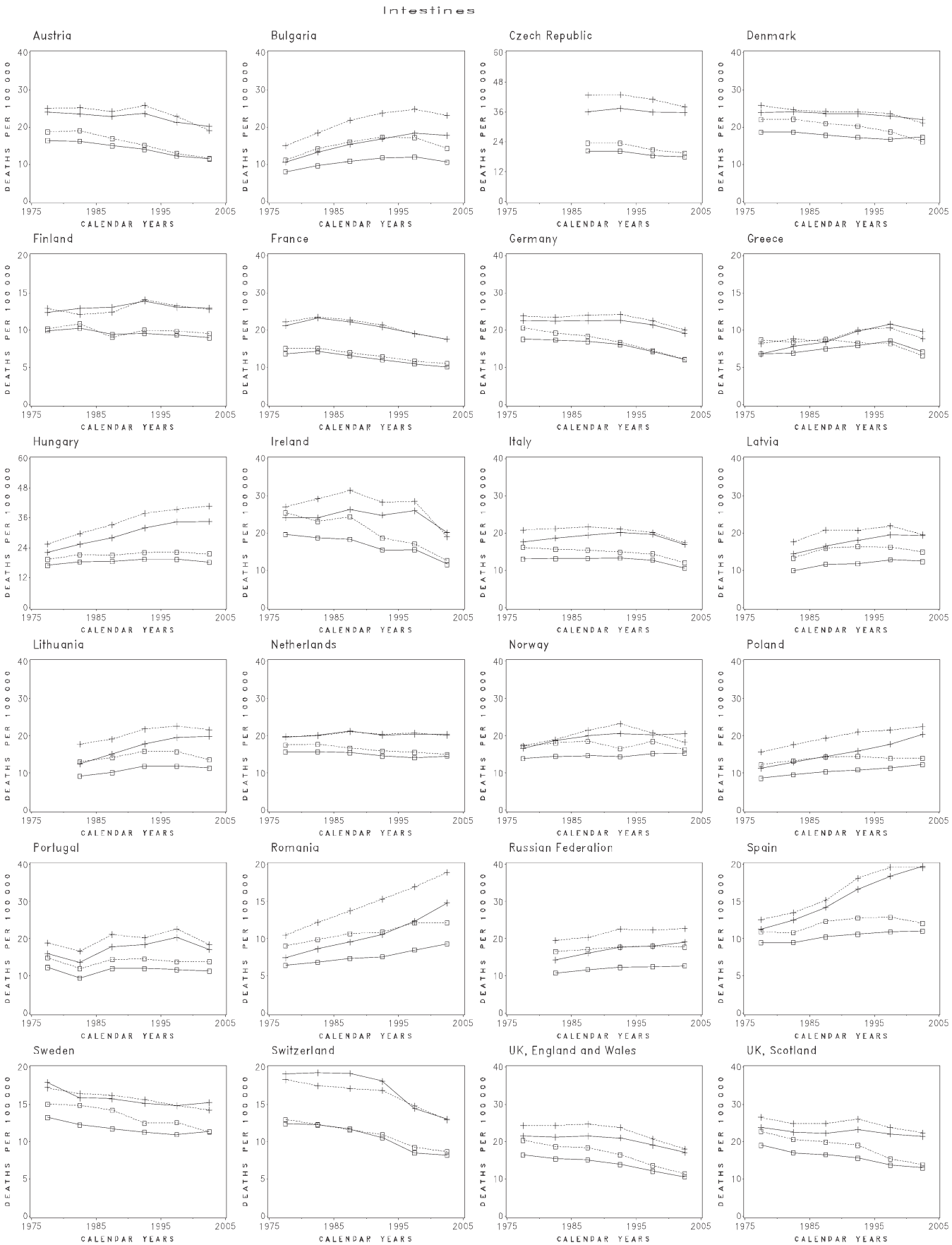

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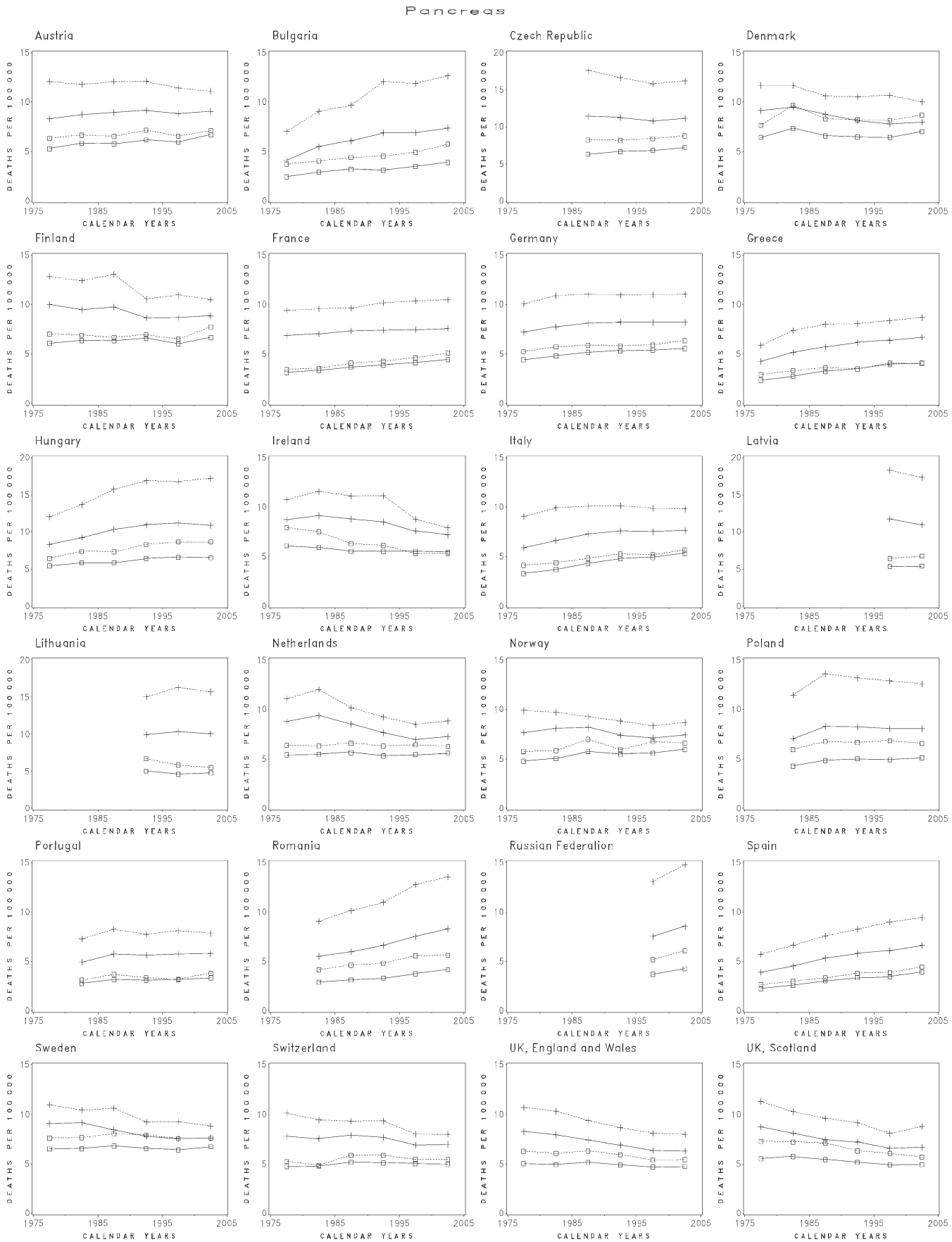

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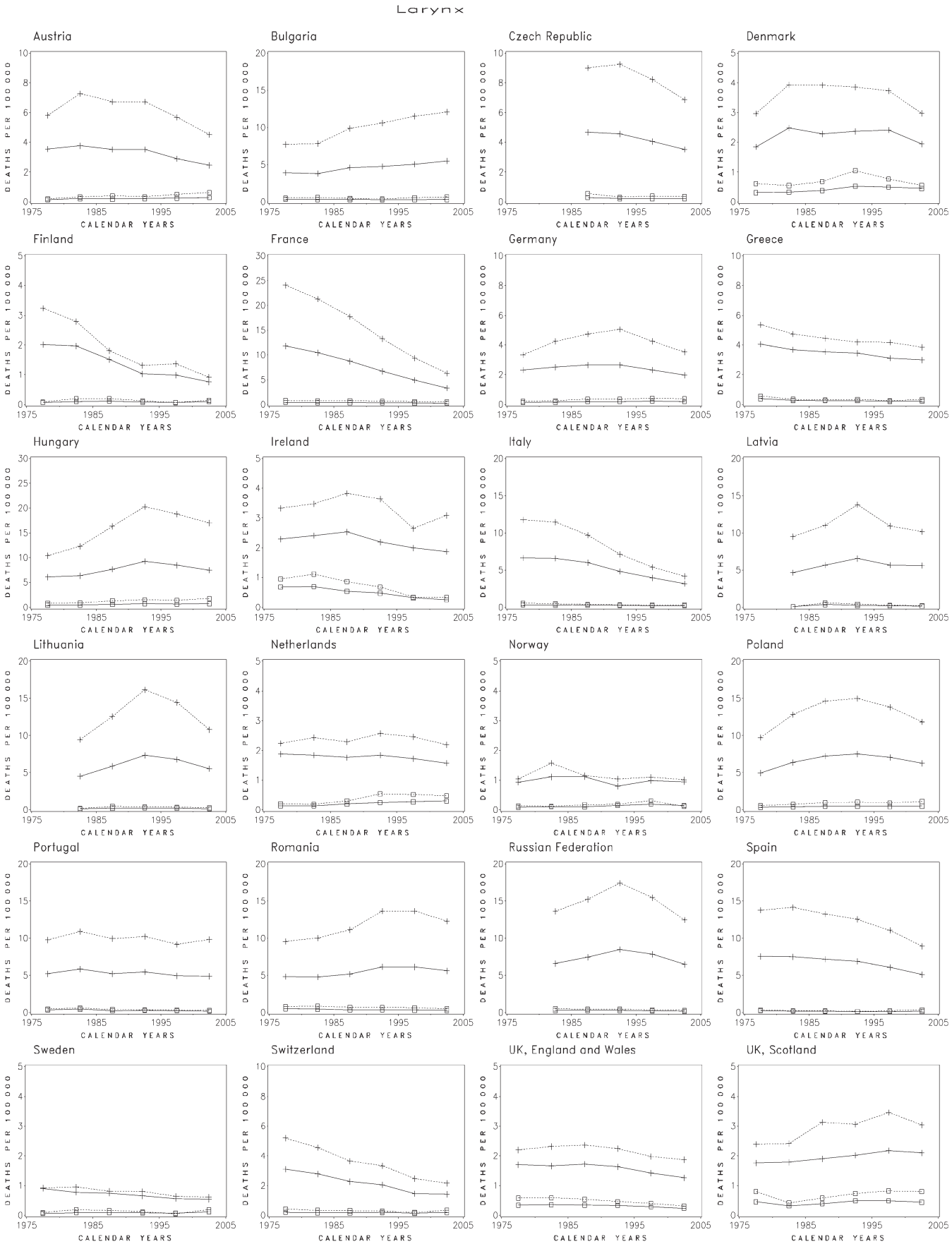

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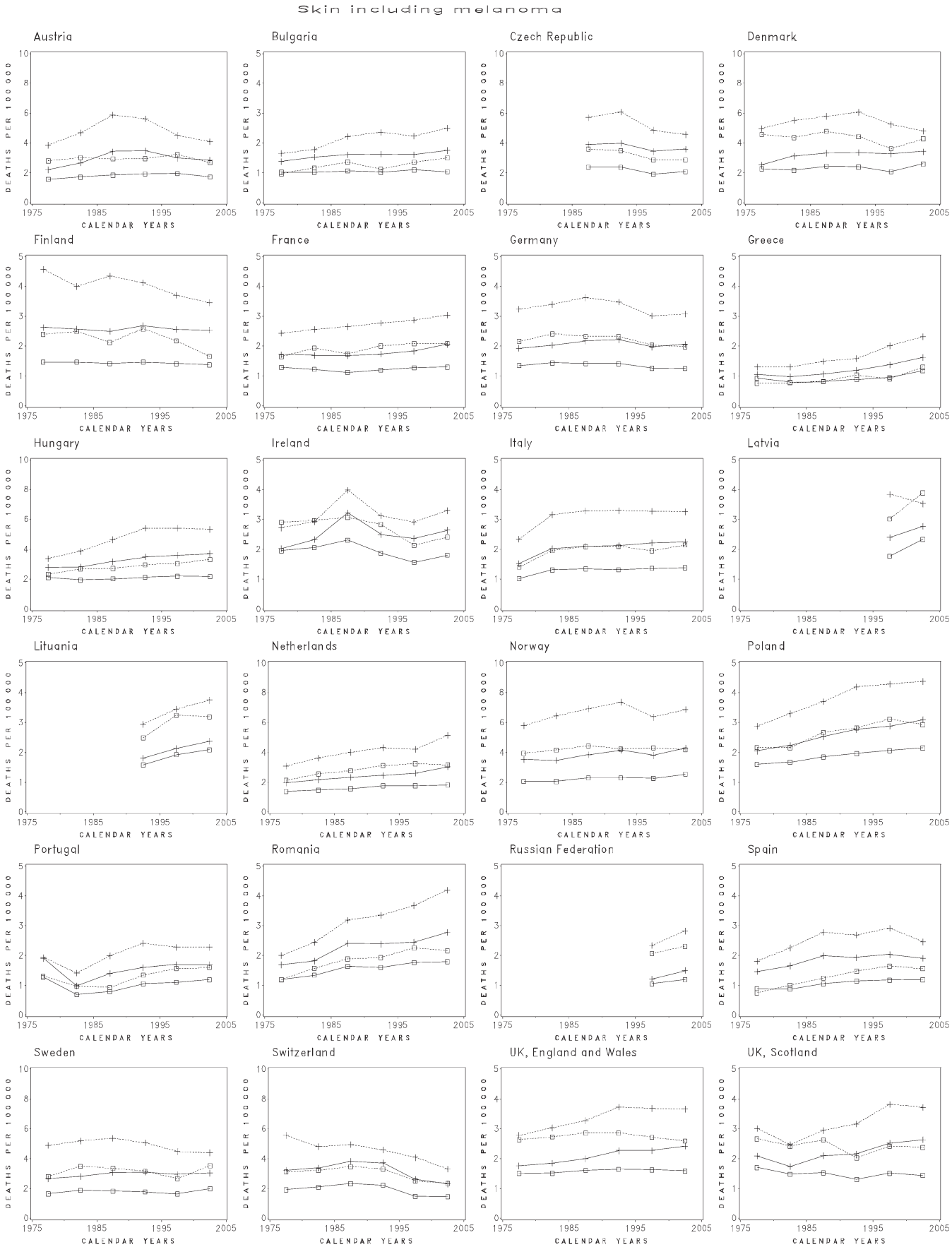

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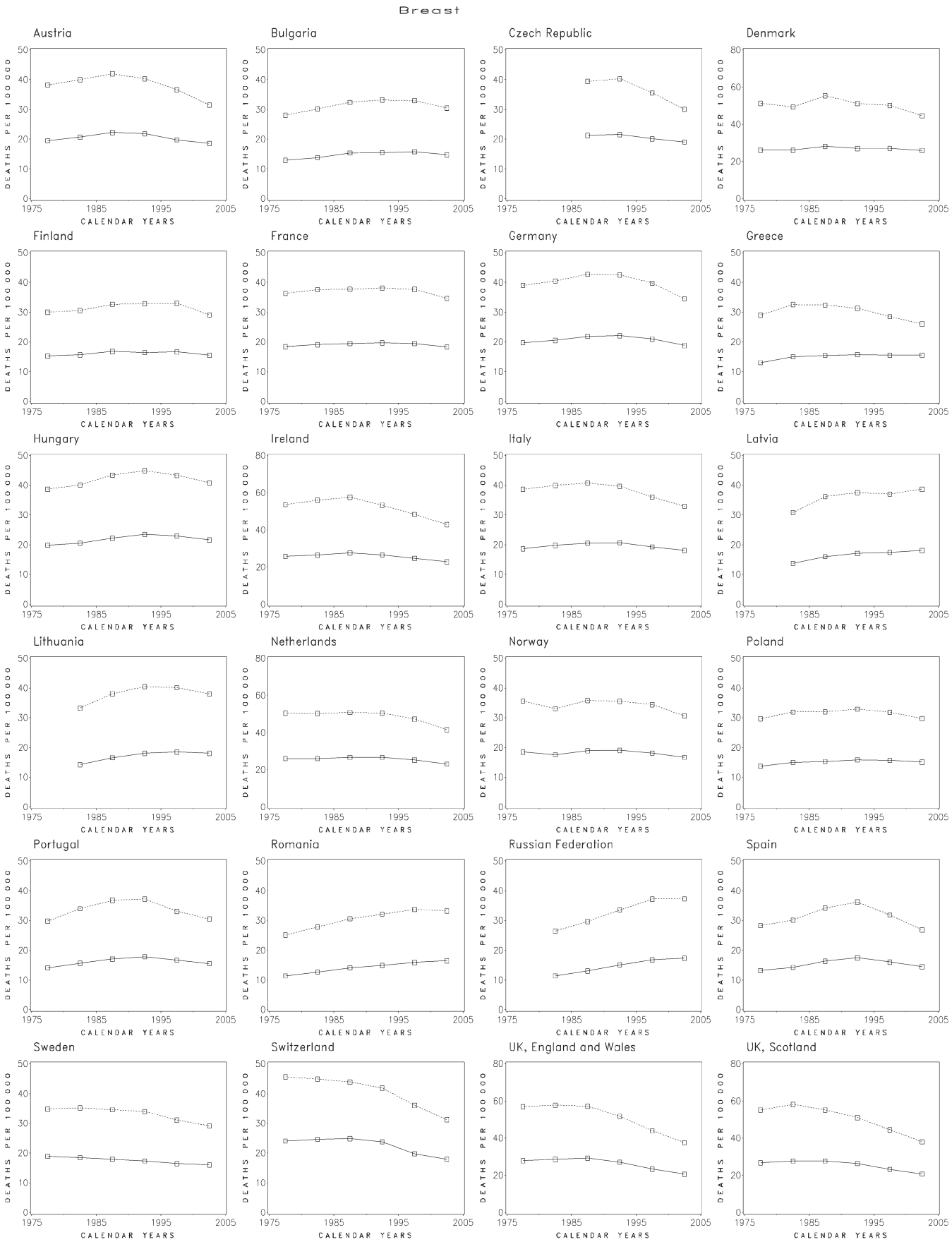

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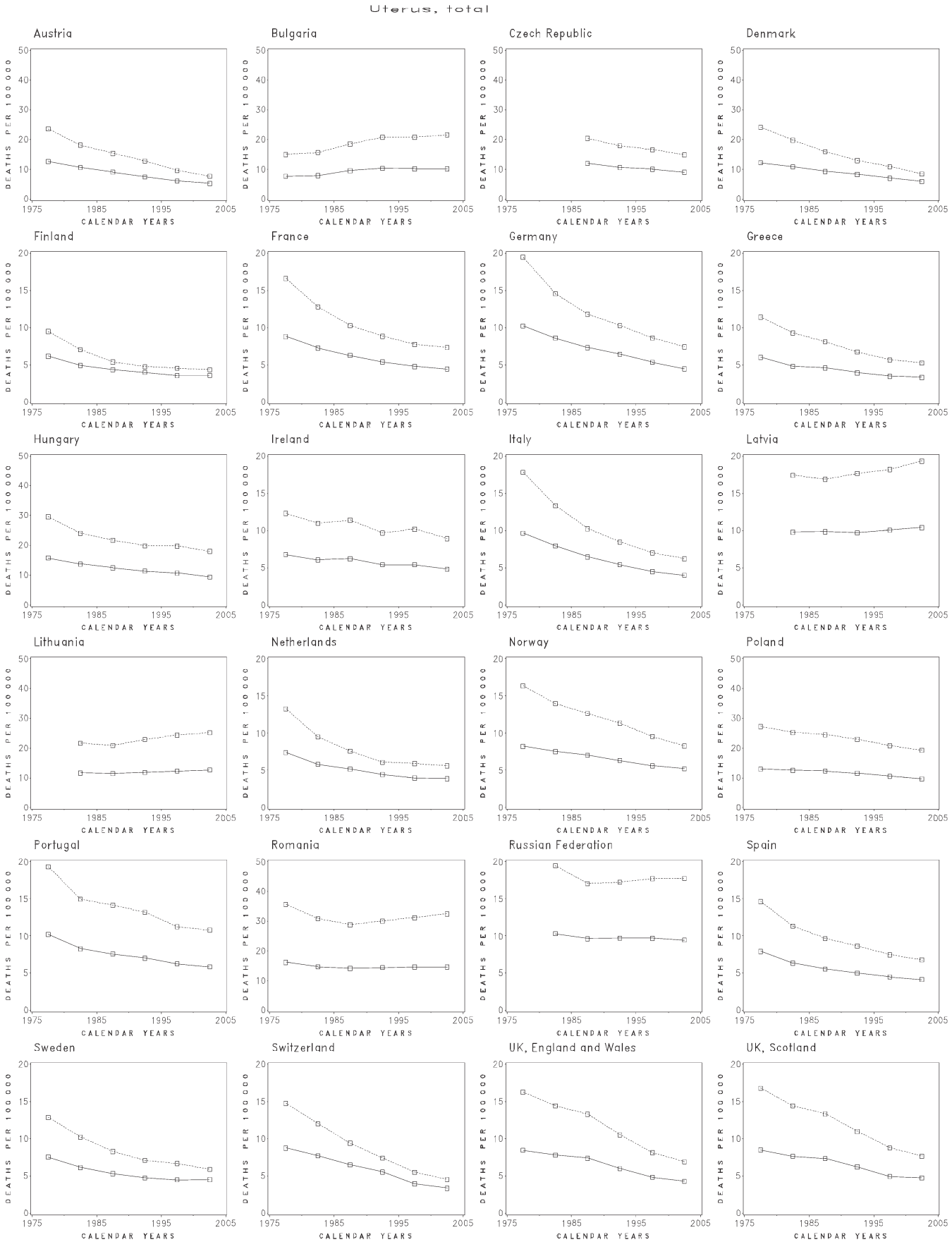

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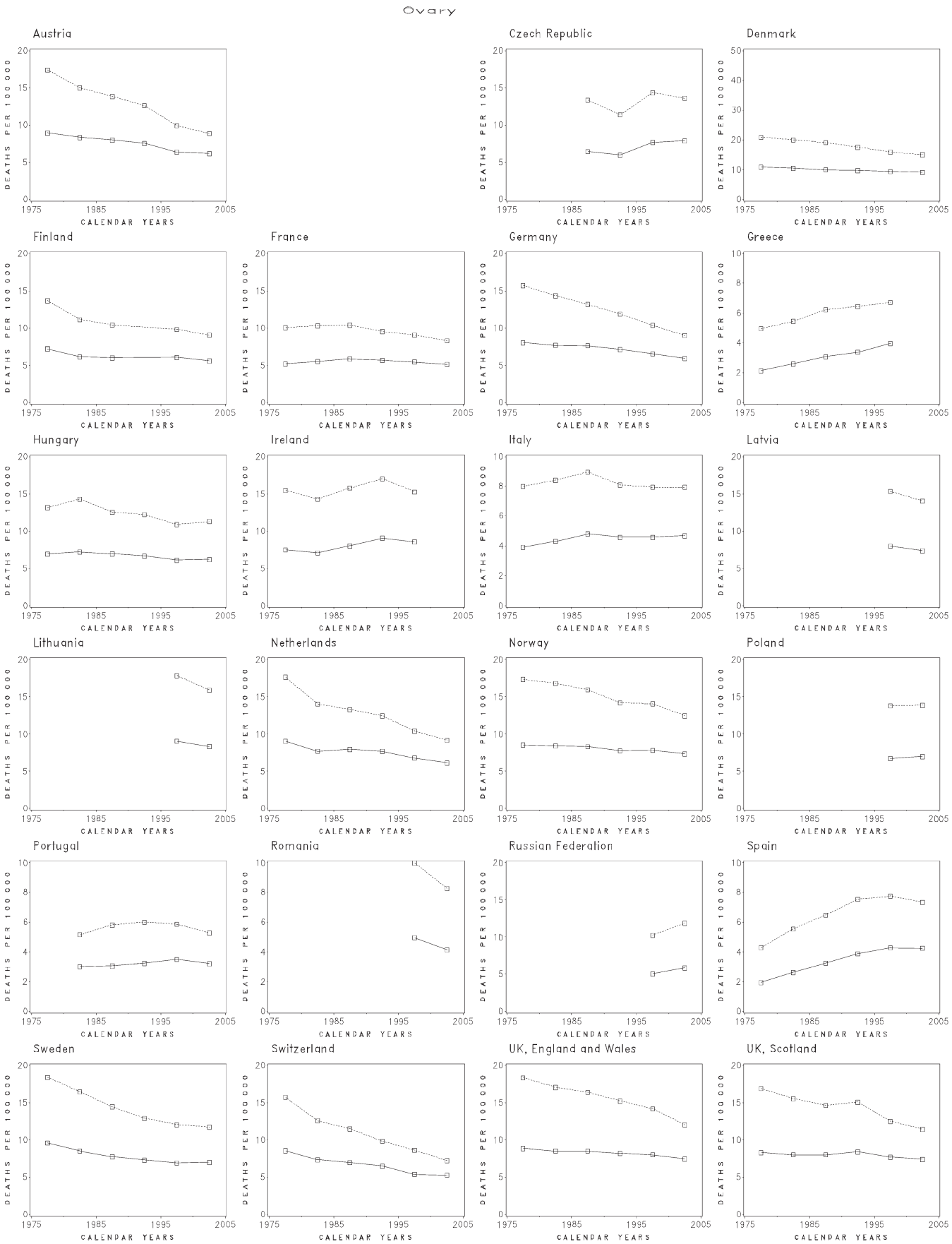

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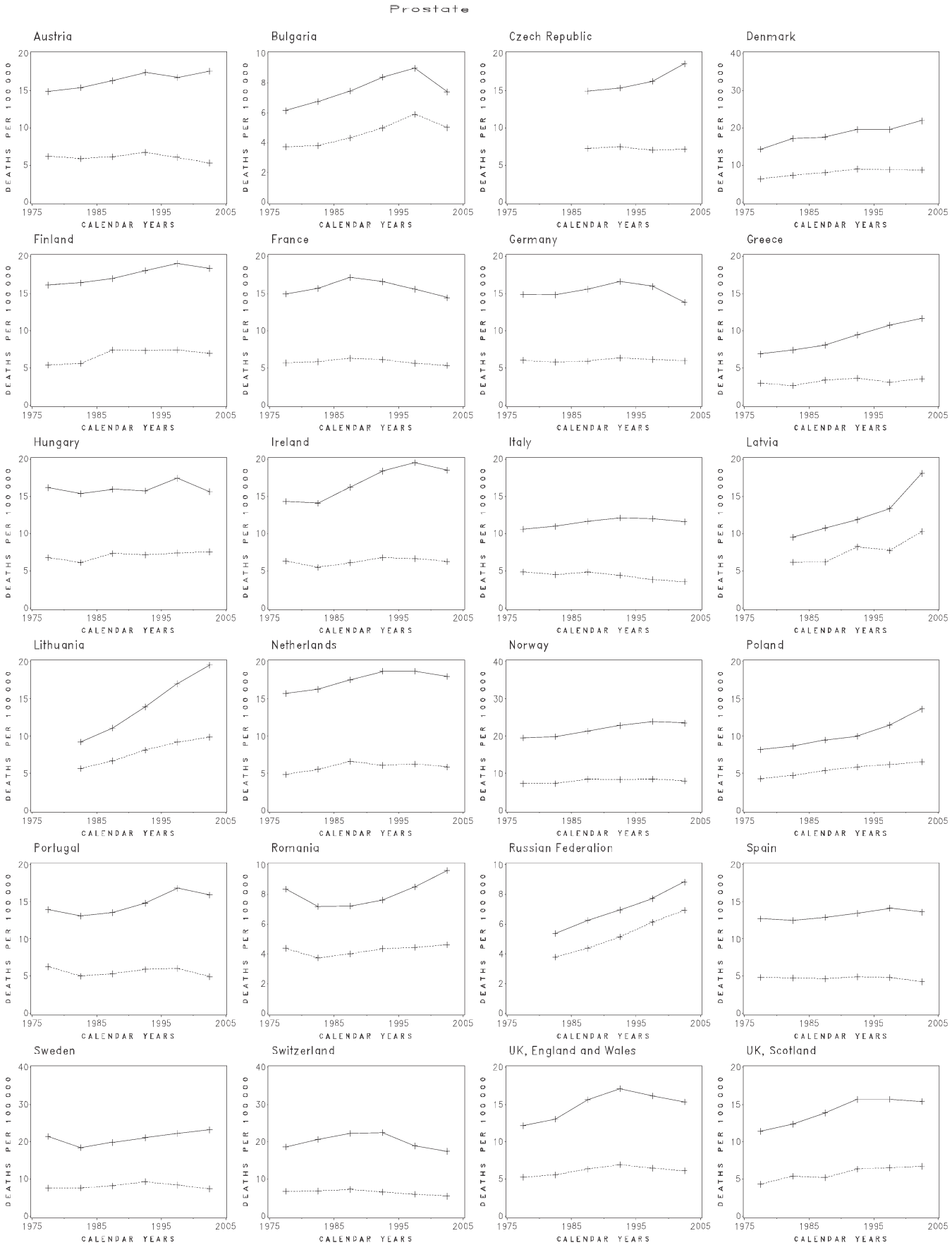

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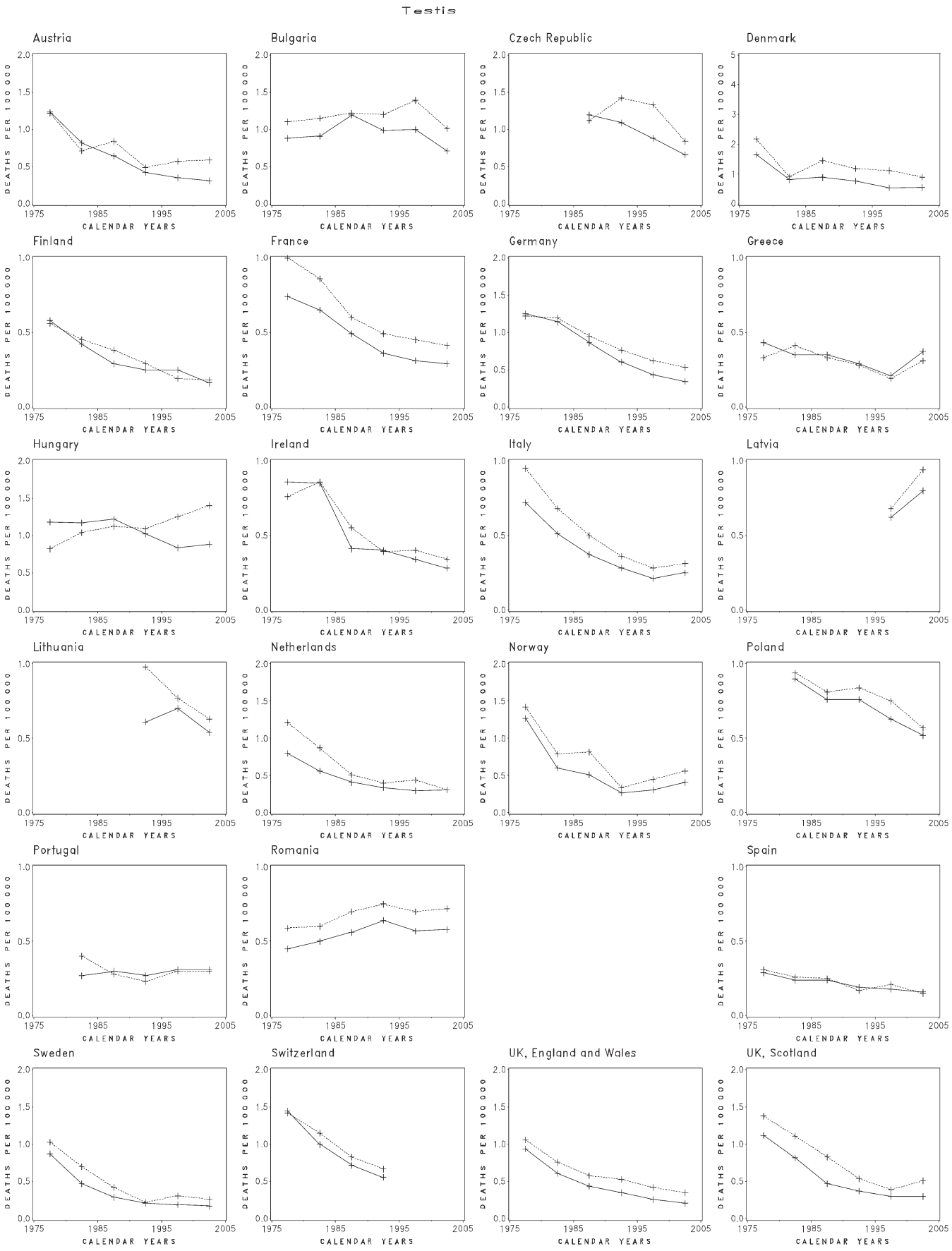

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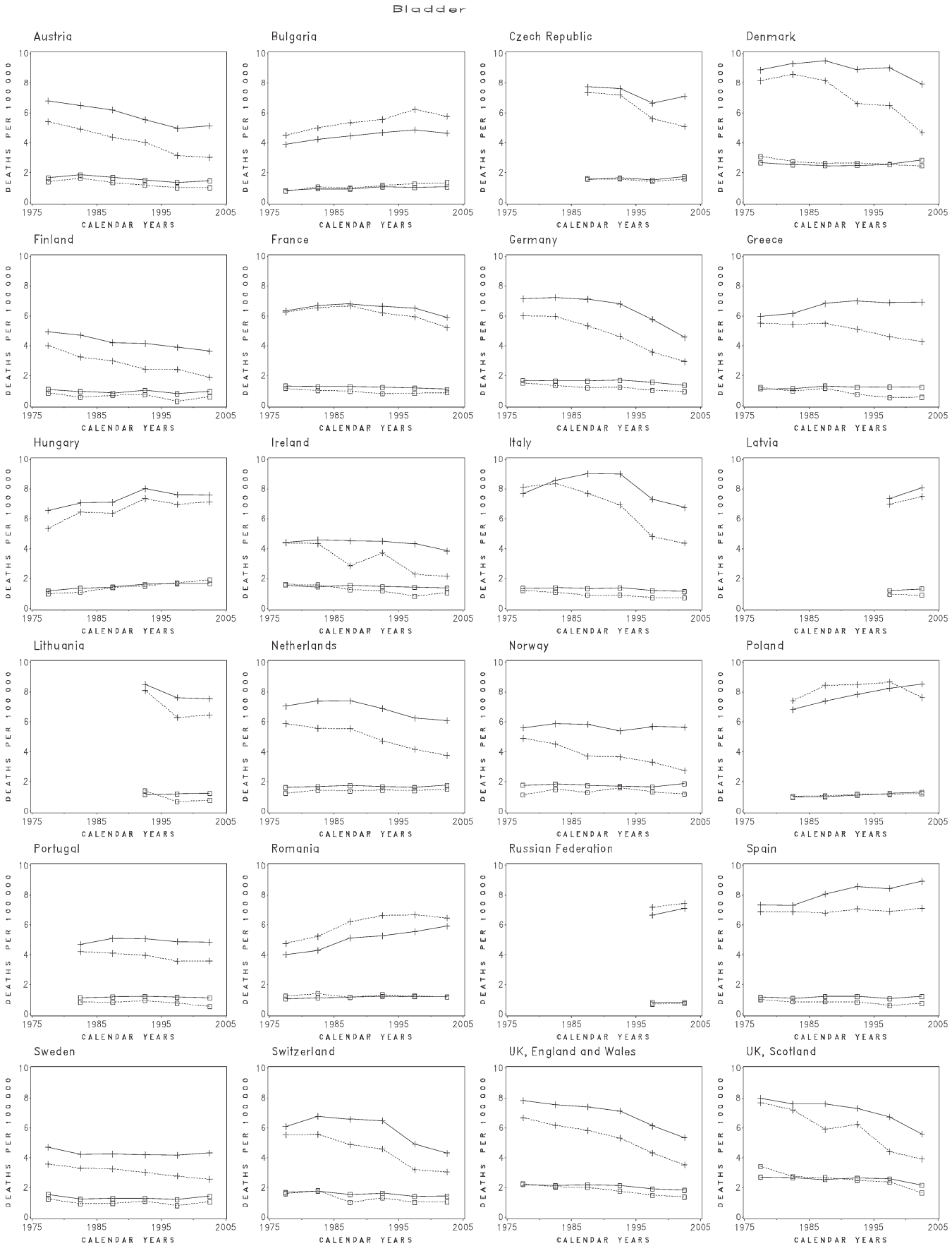

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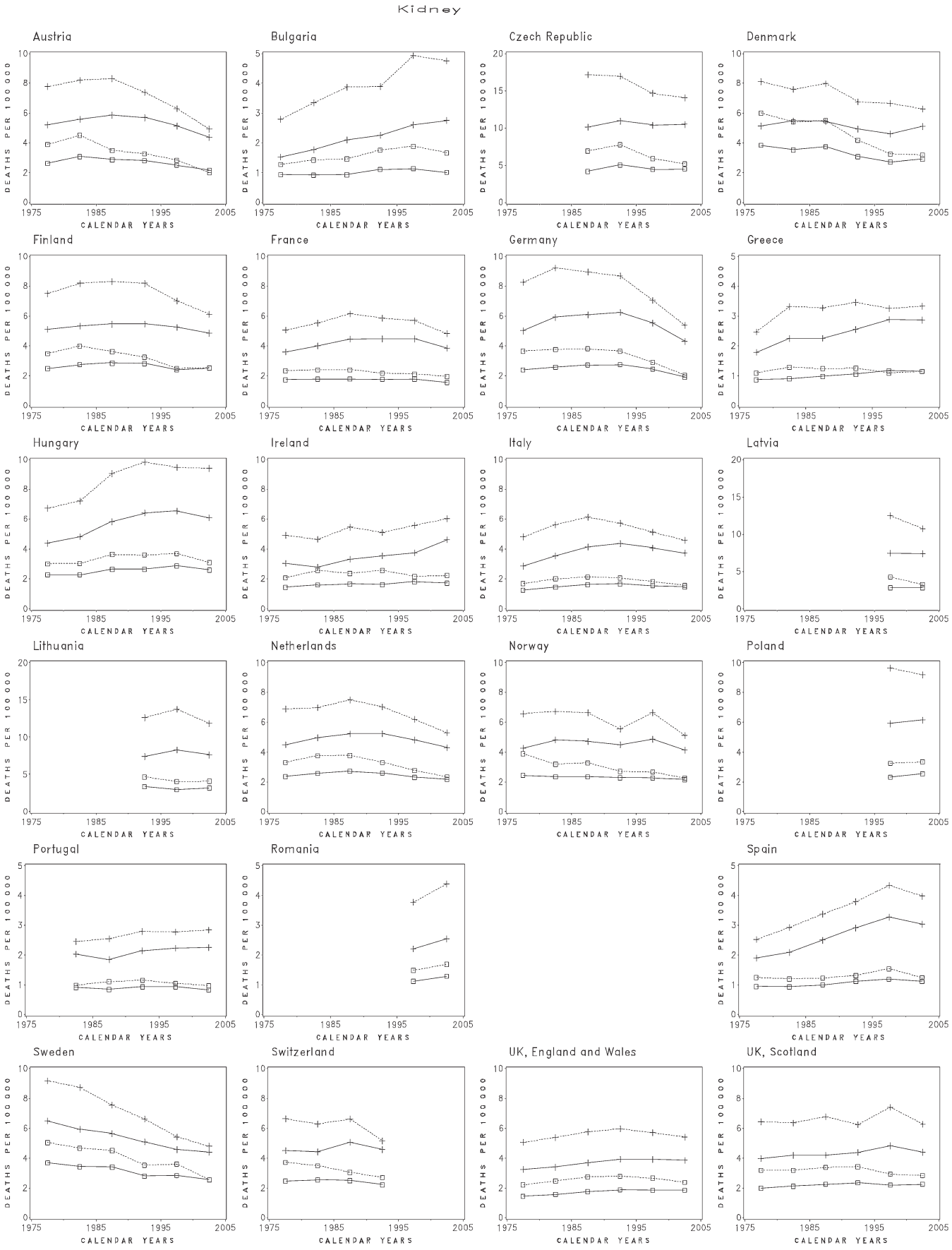

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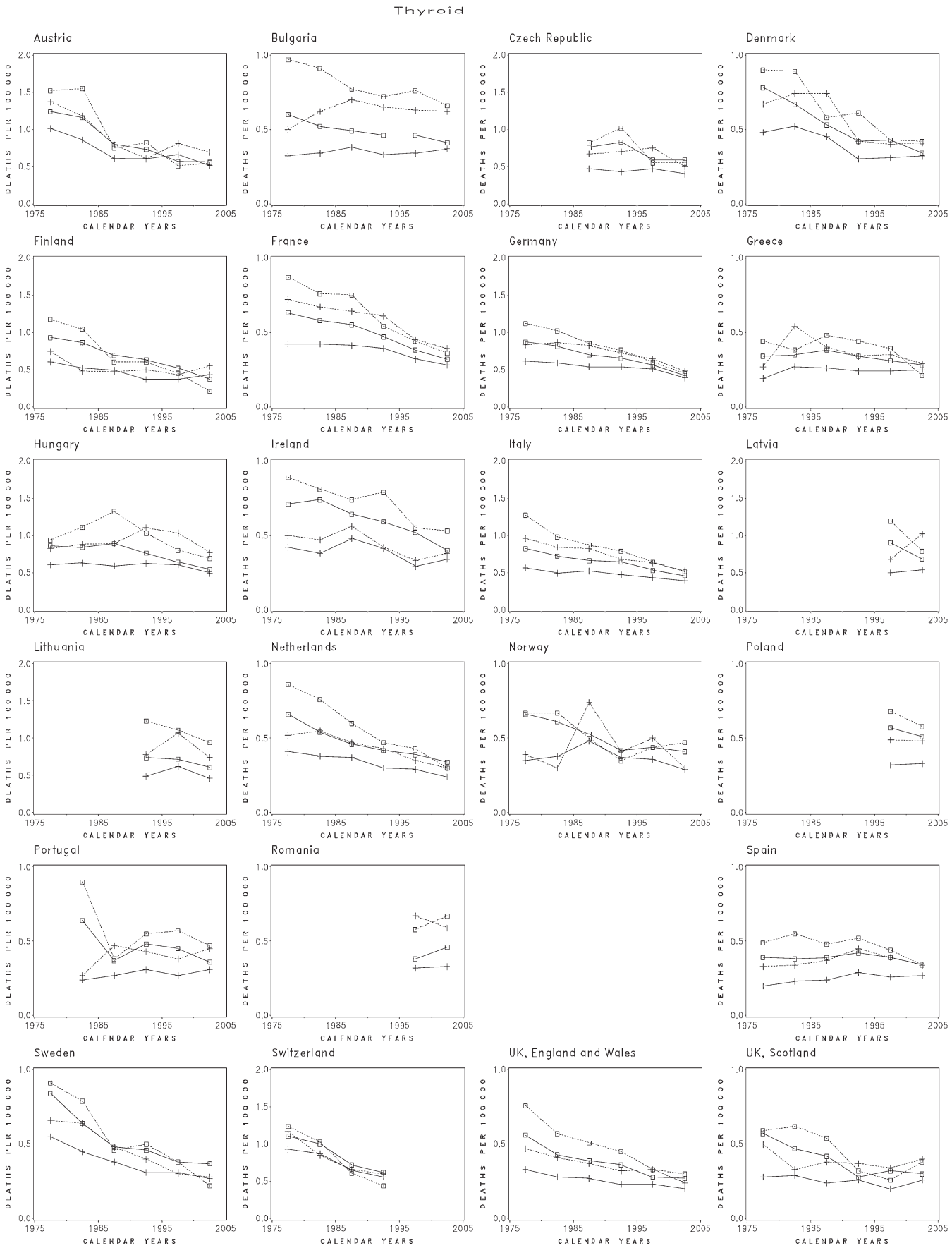

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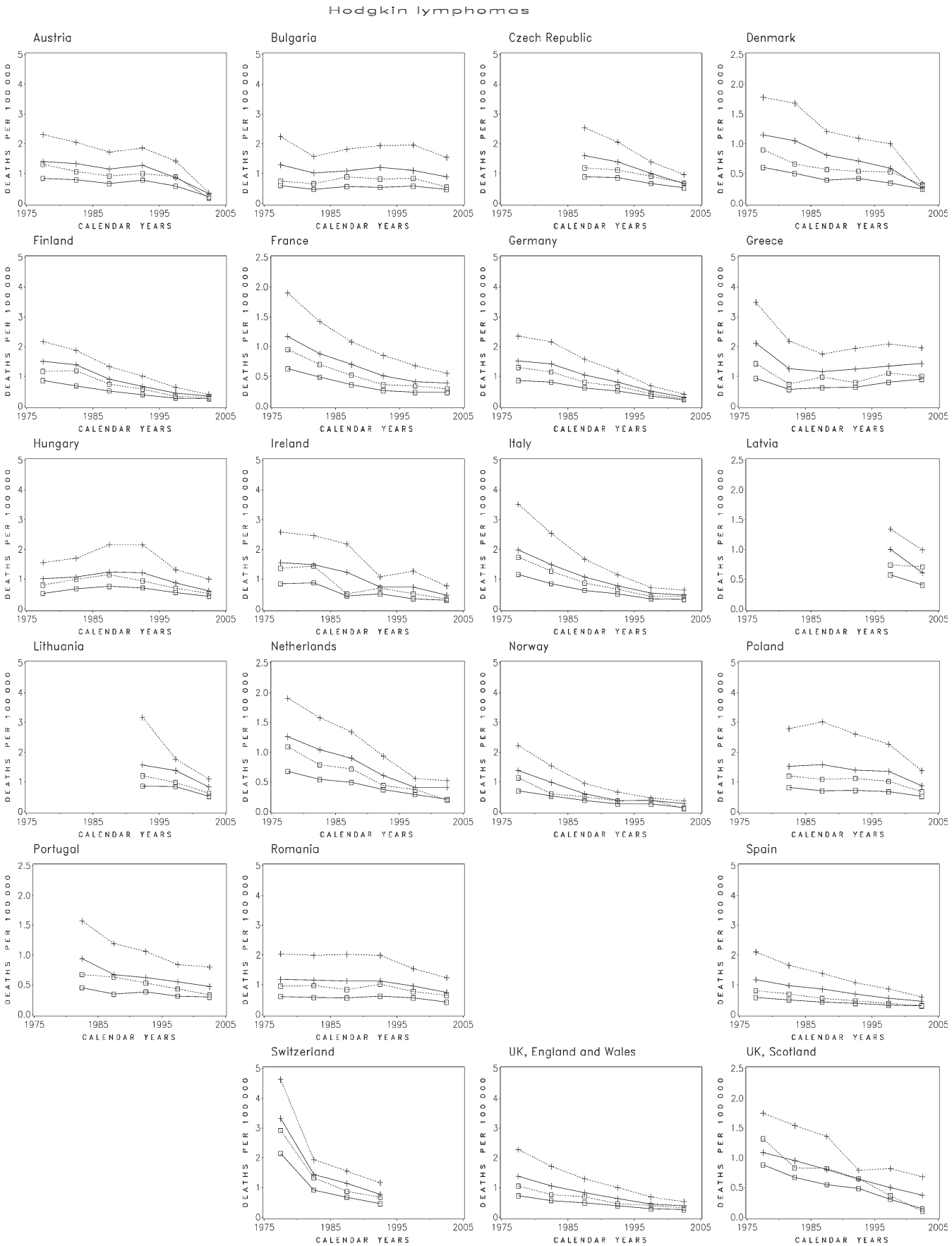

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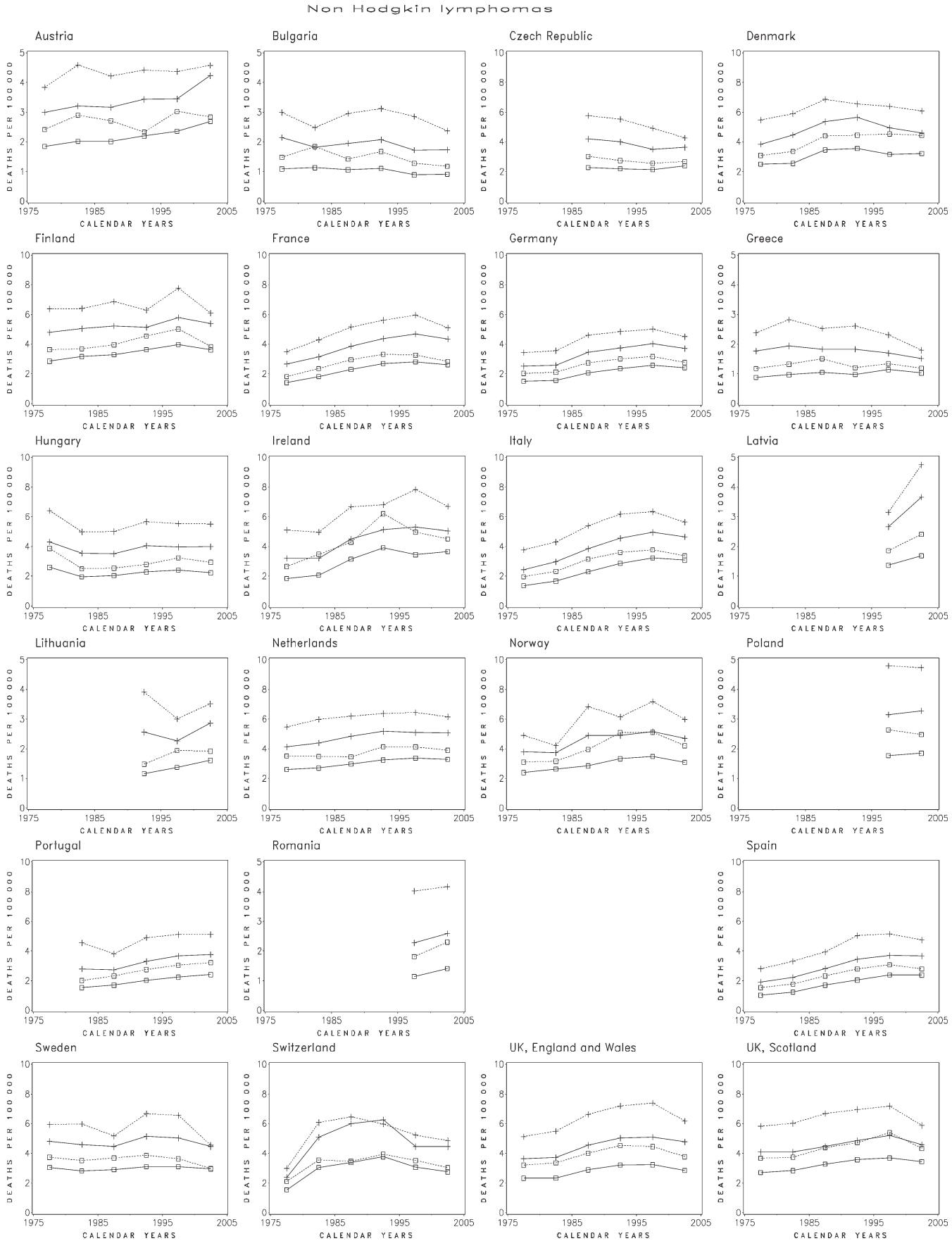

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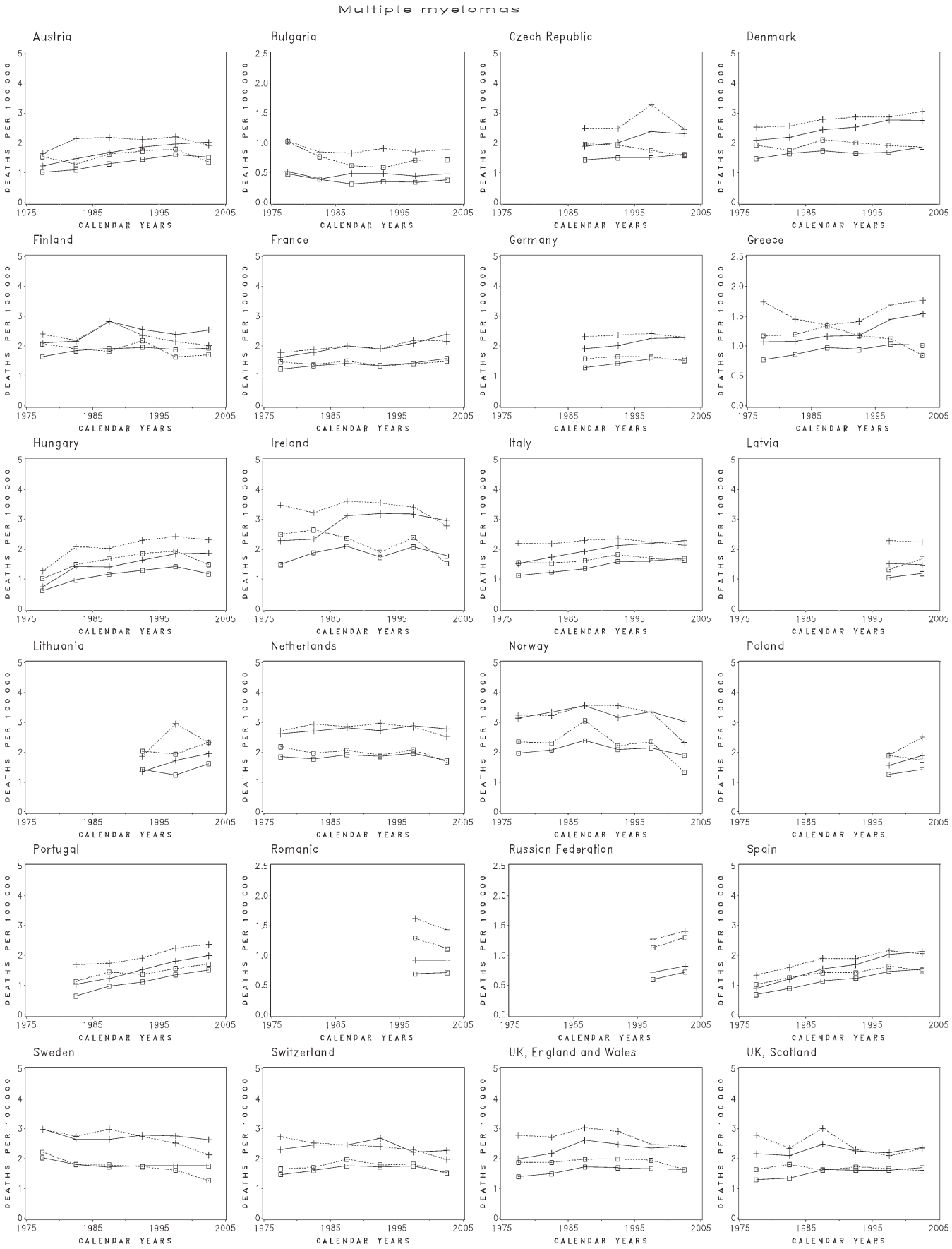

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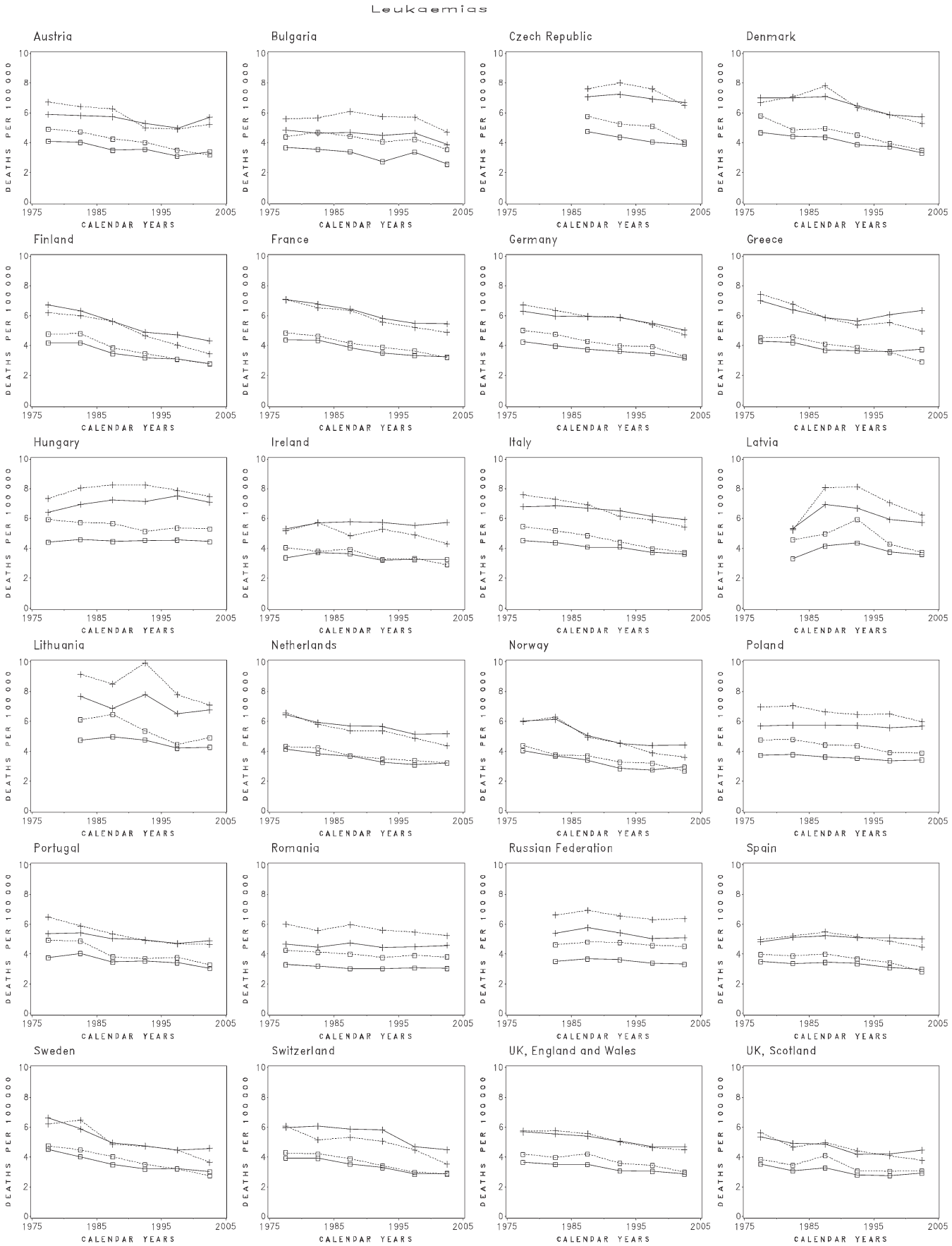

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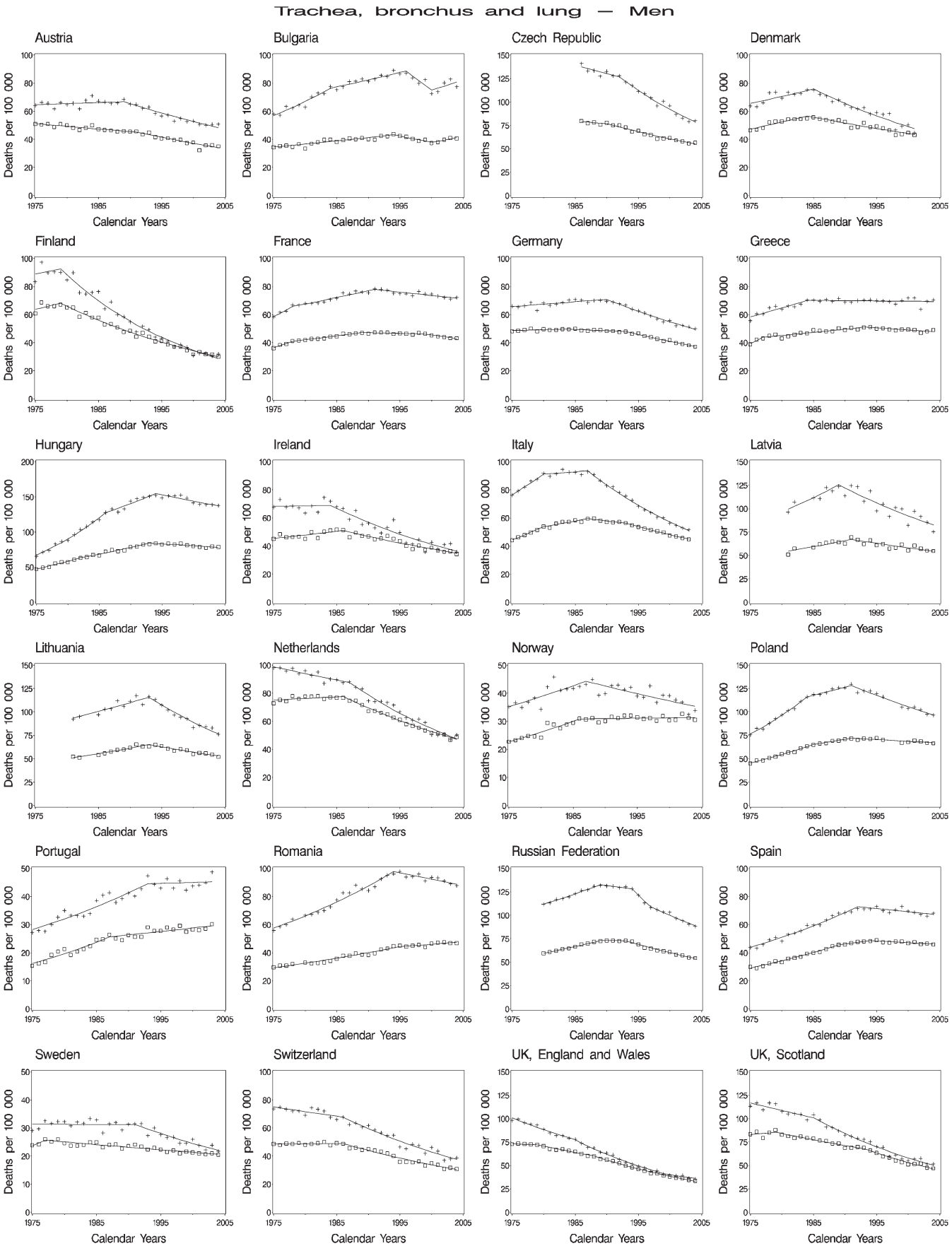
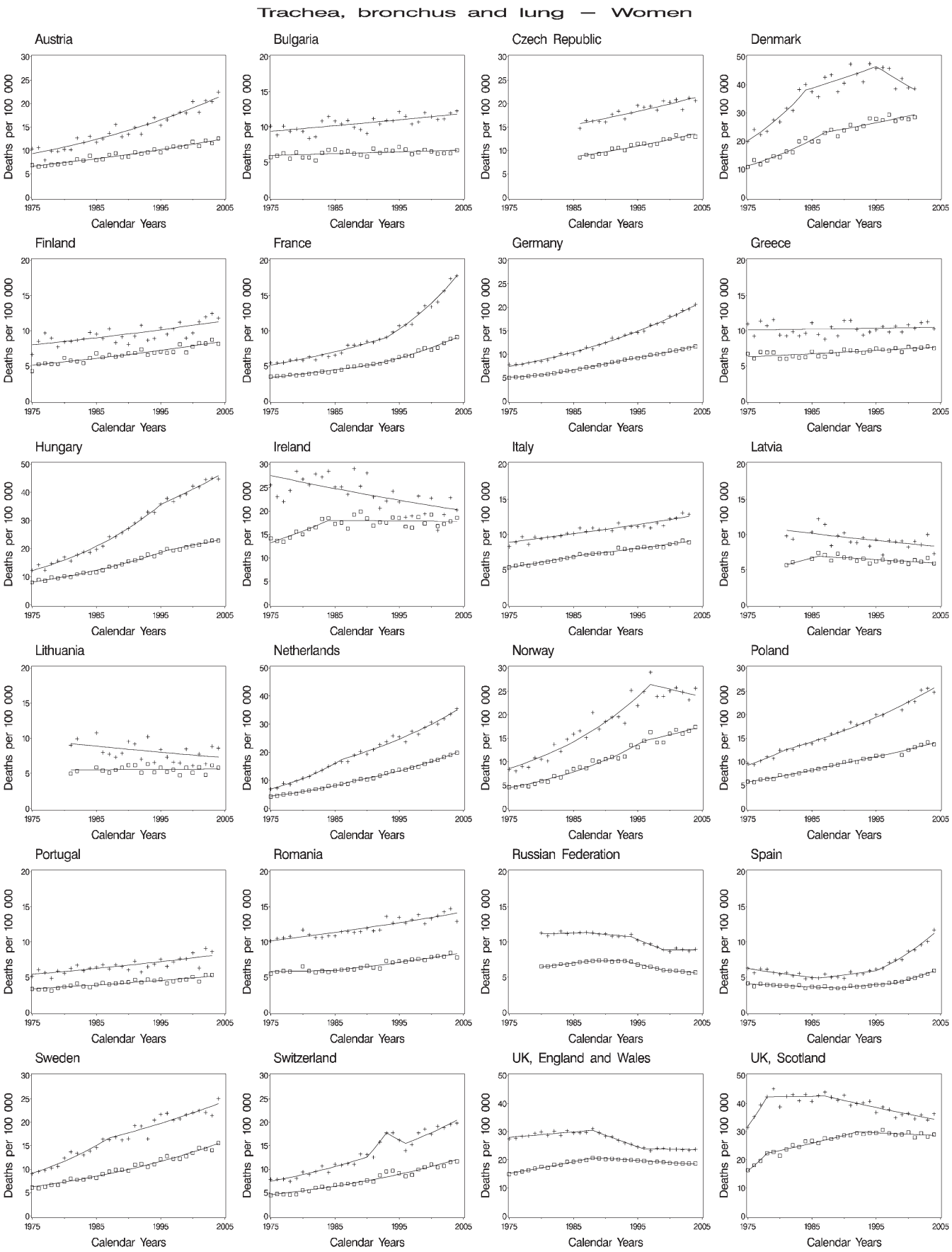


Figure 3. Joinpoint analysis for lung cancer mortality in men and women from 24 selected European countries, 1975–2004. □—□, all ages; +———+, 35–64 years.



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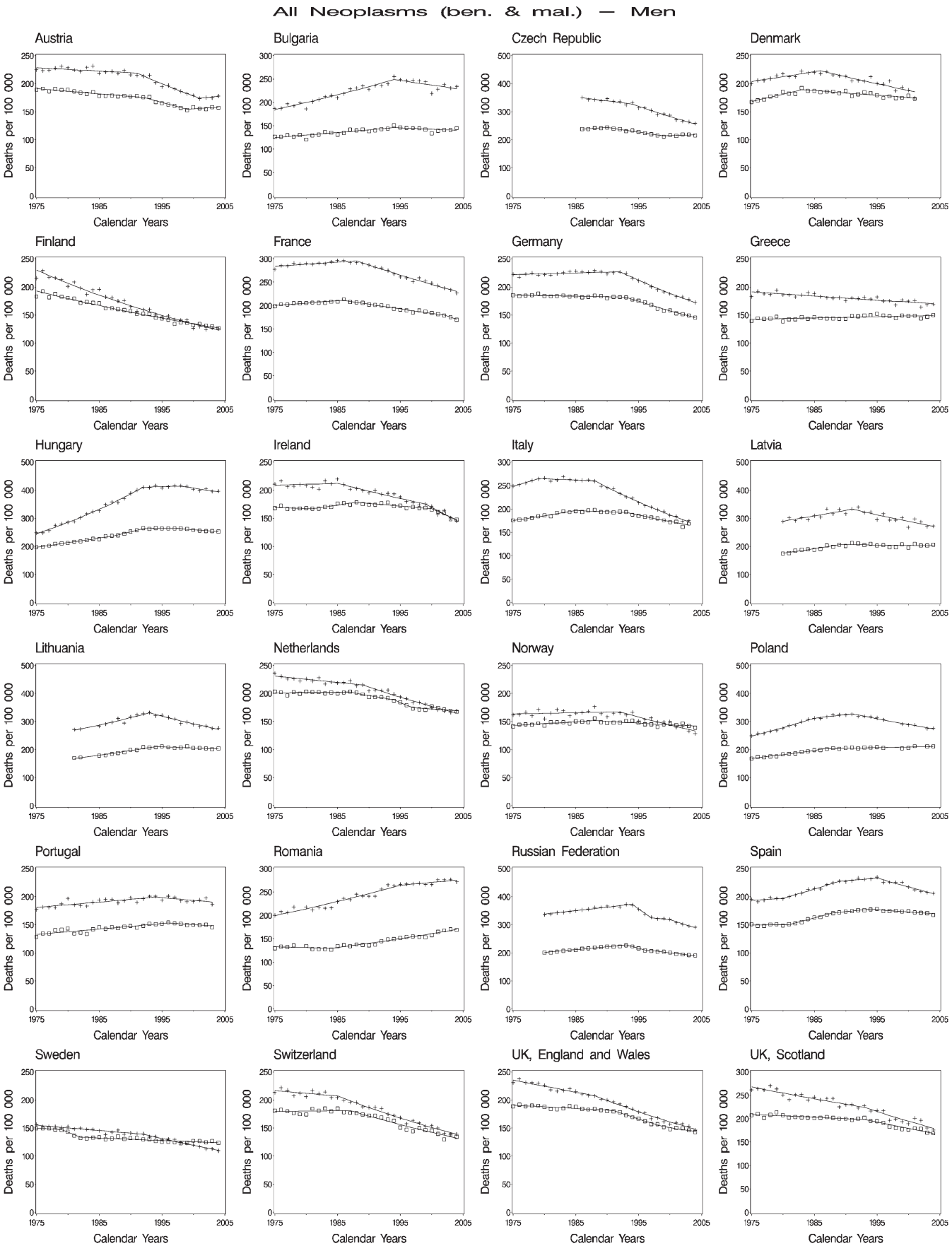

Figure 4. Joinpoint analysis for all neoplasm mortality in men and women from 24 selected European countries, 1975–2004. □—□, all ages; +———+, 35–64 years.

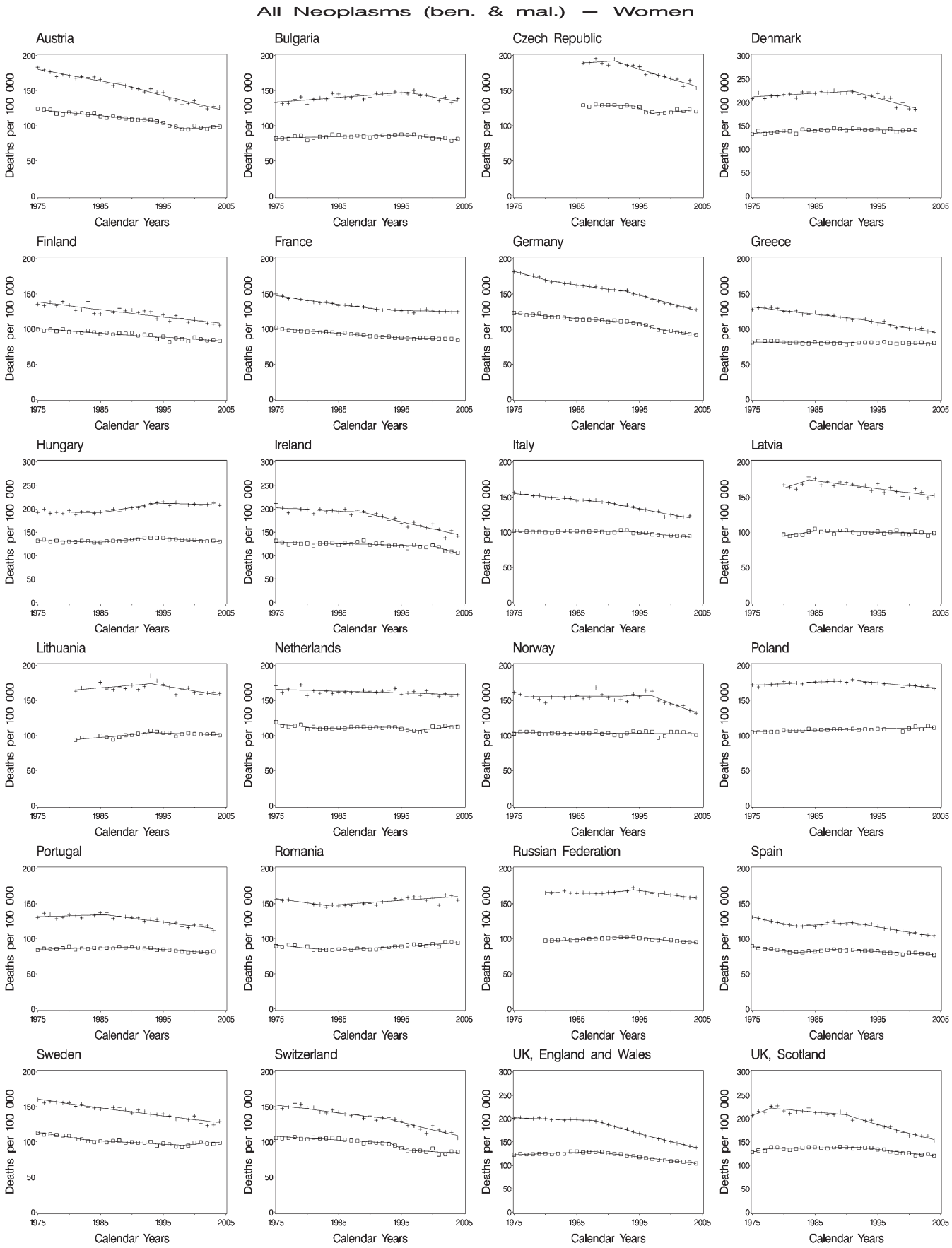

Figure 4. (*Continued*)

to 5.1/100 000). As for other tobacco-related neoplasms, this reflects the different spread of tobacco over the last decades in European men and women [43]. The risk of pancreatic cancer is, in fact, about twofold higher in smokers than in nonsmokers [44]. The geographic distribution of pancreatic cancer partly reflects the different prevalence of tobacco use among men and women in different areas of the continent, since the highest mortality rates in men (>10/100 000) were in the Czech Republic, the Baltic countries and Hungary, while in women the highest mortality rates were in the Czech Republic, Denmark and Sweden (6–7/100 000). Likewise, recent male trends were favourable in the UK, The Netherlands, the Czech Republic and Nordic countries, but unfavourable in most central, eastern and southern Europe. Pancreatic cancer has also been related to diabetes and selected nutritional and dietary factors, including obesity, high intake of (saturated) fats and low intake of vegetables and fruits [45, 46], but the potential impact of these factors on national mortality remains unquantified.

larynx

Most laryngeal cancers in Europe are due to tobacco smoking, alcohol drinking and their interaction [46]. The decline in smoking prevalence in men can largely explain the fall in male laryngeal cancer mortality rates in the EU since the mid-1980s, particularly in middle age [47]. Tobacco prevalence also largely explains the geographic distribution of laryngeal cancer in Europe, with the highest mortality rates during 2000–2004 (5.5–8.5/100 000) in Belarus, Hungary, Russia, Poland, Romania, the Baltic countries and Bulgaria. Moreover, mortality rates have been appreciably declining in the last two decades, particularly in France and Italy, due to the fall in alcohol drinking in these countries [16], but also, though more recently and to a much smaller degree, in Hungary and other high-mortality areas of central and eastern Europe. Laryngeal cancer mortality rates have not been declining in Scotland likely because of the increase in alcohol consumption over recent decades [16]. Laryngeal cancer mortality rates are very low, and largely unremarkable in women, though some modest rises have been observed in Hungary, Poland, Denmark and Scotland over recent years in women too.

trachea, bronchus and lung

In the EU as a whole, lung cancer mortality has been declining in men from the overall peak of 53.3/100 000 in the late 1980s to 44.0/100 000 in the early 2000s (−17%, and −10% from 1995–1999 to 2000–2004, only). The fall was even larger in middle age, from 80.4 to 61.3/100 000 (−24%, −12% over the last 5 years only). In women, in contrast, over the same calendar period, lung cancer mortality increased from 9.0 to 11.4/100 000 (+27%) at all ages and from 13.9 to 18.5/100 000 (+33%) at age 35–64. Corresponding percent changes were +17% in middle age and +25% over the last decade alone. Over the last few years, the annual percent change (APC) for men in major western European countries were between −2% and −4% and were appreciably negative in most central and eastern European countries, too. In women, the recent APCs were variable between −0.7% in England and Wales and +4% in France, up to +6% in Spain. Over the last few years, falls in male lung cancer mortality were observed in all European countries (except Portugal, which had, however, relatively low rates) including those with the highest mortality rates and the most unfavourable trends until the late 1990s such as Hungary, Russia and the Baltic countries. During 2000–2004, the highest male lung cancer mortality rates were in Hungary (78.9/100 000) followed by Poland, Croatia, the Czech Republic, Russia and the Baltic countries with mortality rates between 55 and 68/100 000; the lowest lung cancer mortality rates were in Sweden (21/100 000) and Portugal (29/100 000). The largest EU countries (Italy, France, Germany and the UK) had mortality rates between 35 and 46/100 000. In women, the highest mortality rates during 2000–2004 were in Scotland and Hungary (>28/100 000), and the lowest ones (5–6/100 000) in Portugal and Spain but also in Russia and the Baltic countries. Lung cancer mortality rates and trends in various countries essentially reflect the different spread, and the subsequent decline of cigarette smoking in successive generations of men and women in various countries [15, 44, 48]. Occupational agents, including mainly asbestos, were responsible for an estimated 5%–10% of lung cancers in industrialised countries [49, 50]. It is likely that the control of asbestos and other carcinogenic exposures in the workplace has contributed to the fall in male lung cancer mortality rates over the last decades, whereas the role of indoor [51] and outdoor [52] air pollution remains difficult to quantify in Europe.

connective and soft tissue sarcomas

This is a heterogeneous group of neoplasms, showing low mortality rates and variable trends over time. Thus, over recent years, their mortality rates have been rising in Italy but declining in Germany and most other central and northern European countries. Some of these falls may be due to the recent control of the acquired immunodeficiency syndrome-related epidemic of Kaposis sarcoma due to the administration of highly active antiretroviral therapy [53], but this can account for a small proportion of the trends only.

skin, including melanoma

Mortality from all skin cancers (including melanoma and nonmelanomatous skin neoplasms) was moderately, but steadily, upwards in the EU, particularly in men and in the elderly, over the last decade. During 2000–2004, overall mortality rates in the EU reached 2.4/100 000 men and 1.5/100 000 women. Mortality rates in middle age were stable over the last decade, confirming that the upward trends are levelling off in young generations [54]. The recent rises were larger in eastern Europe (Poland, Romania and Russia), while levelling off and declines were observed in Austria, Denmark, Germany, Italy, Spain and Switzerland. During 2000–2004, the highest mortality rates (>4/100 000 men, >3/100 000 women) were in Denmark, Norway, Slovenia, Hungary and the Nordic and Baltic countries; the lowest ones were in Greece, Portugal, Spain, Bulgaria and Russia. Mortality rates and trends for skin cancer are influenced by variation in skin cancer diagnosis and certification across countries and calendar years. There is strong evidence of a carcinogenic role of ultraviolet radiation in skin cancer [46, 55, 56]. Intermittent exposure to sunshine appears

to play a more important role than cumulative exposure in melanoma (but not squamous cell cancers) risk. Changing patterns of exposure to sunshine over time and in different generations are related to time trends in skin cancer mortality [57], whereas phenotype characteristics of various European populations are strong determinants of geographic variation, since light colour of hair and eyes and skin complexion are risk factors for skin cancer, including melanoma [55].

breast

From 1990–1994 to 2000–2004, breast cancer mortality in the EU declined from 20.8 to 18.1/100 000 (−13%) at all ages and from 40.3 to 33.6/100 000 (−17%) at age 35–64 years. An even larger decline, from 16.7 to 12.6/100 000 (−25%), was registered at age 35– 44 years, whereas the falls were modest (−6%) at age ≥65. During 2000–2004, the range of variation across Europe was relatively limited, i.e. between 25.9/100 000 in Denmark and 14.5/100 000 in Spain. The largest EU countries (UK, Germany, France and Italy) had mortality rates between 18 and 20.5/100 000 and Russia of 17.3/100 000. In the UK and most other western European countries, mortality rates have been substantially declining over the last two decades, whereas they have been stable or upwards in Russia and most eastern European countries. This has led to a levelling of breast cancer mortality rates across the continent. Improved treatment through antiestrogens and chemotherapy had a major role in the favourable breast cancer mortality trends in western Europe [58, 59], but a favourable impact of screening mammography is also likely over recent years [58, 60, 61]. The decline in the use of menopause hormone replacement therapy after the publication of the Women's Health Initiative study during 2002 [62] has been suggested to have an impact on breast cancer incidence [63], but the issue remains open to discussion [64], and its impact on mortality is still undefined.

uterus (cervix and corpus)

In several countries it is not possible to distinguish, on the basis of death certification, cervical and endometrial cancer, but the trends in uterine cancer mortality have likely been affected mostly by the fall in cervical cancer. The long-term decline in (cervix) uterine cancer mortality has continued over the last decade (from 1990–1994 and 2000–2004), with a fall from 7.1 to 5.7/100 000 (−19%) in overall mortality rates, and from 12.5 to 10.1/100 000 (−19%) at age 35–64 years. This is essentially due to a wider adoption of cervical screening programmes in western and northern Europe [65]. During 2000–2004, all western European countries had uterine cancer mortality rates <6/100 000, and most of them between 4 and 5/100 000. Uterine cancer mortality rates were, however, not favourable in Russia, Romania, Bulgaria and the Baltic countries, and were only moderately downwards in the Czech Republic, Hungary and Poland over the last decades. Consequently, in those countries, mortality rates during 2000–2004 (as in the past [66]) were extremely high, i.e. between 9.1/100 000 in the Czech Republic and 14.7/100 000 in Romania. This calls for urgent adoption of organised cervical screening programmes in eastern Europe, too [67, 68]. Data are inadequate to evaluate trends in mortality from endometrial cancer, but there is little indication of major changes over time, unless the increased prevalence of obesity has unfavourably influenced its incidence [46].

ovary

From 1990–1994 to 2000–2004, in the EU as a whole, ovarian cancer mortality declined from 6.2 to 5.9/100 000 at all ages (−5%) and from 10.9 to 9.9/100 000 (−9%) at age 35–64 years. The falls were larger and started earlier in Austria, Germany, Switzerland, The Netherlands, the Nordic countries and the UK, i.e. in countries where oral contraceptives (OC)—known to have a long-term favourable effect on ovarian cancer risk [69–71]—had been used earlier and most widely. Ovarian cancer trends, in contrast, were less or not favourable in most southern and eastern Europe, where OC had been less extensively used. During 2000–2004, the highest mortality rates were in Denmark, Ireland and Lithuania (8–9/100 000) and the lowest ones in Portugal and Romania (3–4/100 000), and France and Italy also had relatively low mortality rates. Some of the recent decline, mostly in young and middle age, may be due to improved diagnosis and treatment (particularly for germ-cell tumours [72]) and consequent increased survival [23].

prostate

In the EU as a whole, prostate cancer mortality showed a modest decline from 1990–1994 to 2000–2004 (from 14.9 to 14.3/100 000, −4% at all ages and from 5.9 to 5.5/100 000, −7% at age 35–64). Both in western Europe [73] and in the United States [58, 74], peak mortality rates for prostate cancer were observed in the 1990s, with a levelling off thereafter. Falls were observed in the last decade in France, Germany and the UK, whereas prostate cancer mortality rates were still upwards in Russia, the Baltic countries, Poland and other central and eastern European countries. Since Bulgaria, Ukraine and Russia had the lowest prostate cancer mortality rates (<10/100 000, as compared with 22–23/100 000 in the Nordic countries during 2000–2004), the apparent upward trends in these countries are likely due, at least in part, to improved diagnosis and certification of prostate cancer deaths over more recent calendar years. The recent trends in prostate cancer mortality in western Europe are consistent with a favourable impact of advancements in treatment—including hormone therapy (androgen blockage), wider adoption of radical prostatectomy in the elderly and radiotherapy for patients with locally advanced diseases [75–77]—and less likely to the introduction of prostate-specific antigen test [78, 79].

testis

Testicular cancer mortality has steadily declined in the EU from 1990–1994 to 2000–2004, from 0.47 to 0.35/100 000 (−26%) at all ages and from 0.59 to 0.46/100 000 (−22%) at age 35–64. This follows a favourable trend observed since the 1970s, which was, however, delayed as compared with that observed in the United States [80, 81]. The largest declines were in adolescent and young adults below age 35 [82], but falls were also observed in subsequent age groups. The declines were observed in most European countries, major exceptions being Hungary, Latvia and Romania. Consequently, the highest mortality rates during

2000–2004 were in those countries, as in Bulgaria, Macedonia and the Czech Republic (0.6–0.9/100 000), while testicular cancer mortality rates in most western European countries ranged between 0.2 and 0.3/100 000. Testicular cancer—particularly seminomas and teratomas in young men—is one of the most curable neoplasms if adequate treatment is adopted. Still, even in more recent years, substantial differences persisted in mortality from this neoplasm between western and eastern European countries, due to inadequate availability of platinum-derived and other expensive drugs required to treat testicular cancer [80]. Likewise, mortality from testicular cancer substantially declined in North America but less so in Latin America [81]. Widespread adoption of efficacious therapy is therefore a priority to avoid unnecessary deaths from testicular cancer worldwide, and specifically in several areas of central and eastern Europe.

bladder

Bladder cancer mortality in the EU declined from 1990–1994 to 2000–2004, mostly in men, from 7.2 to 6.1/100 000 (−15%) at all ages and from 5.9 to 4.6/100 000 (−23%) at age 35–64, while the falls in women were around 10%, to reach 1.3/100 000 at all ages and 1.0/100 000 at age 35–64 during 2000–2004. Bladder cancer is related to tobacco smoking and occupational exposure to aromatic amines, particularly in the past [83]. Not surprisingly, therefore, the falls in men were larger in western and northern Europe, where the decline in tobacco consumption among men and the control of occupational carcinogens were earlier [15, 83]. During 2000–2004, the highest bladder cancer mortality rates in men were in Spain, Poland, Latvia and Denmark (8–9/100 000), and lowest ones (∼4/100 000) in Sweden, Switzerland and Ireland. In women, the highest mortality rates were in Denmark and the UK, and the lowest ones in southern Europe and Romania, again reflecting the different patterns of tobacco smoking in various generations of men and women across Europe. The recent fall in women may, at least in part, be due to improved control of urinary tract infections, which are another recognised risk factor for bladder cancer [46], while the role of diet and other potential urinary tract carcinogens in national bladder cancer mortality remains undefined [84].

kidney and other urinary organs

Mortality from kidney cancer has increased throughout Europe until the early 1990s, but has tended to stabilise and decline thereafter. From 1990–1994 to 2000–2004, the decline was from 4.8 to 4.2/100 000 (−12%) in men at all ages and from 6.7 to 5.7/100 000 (−15%) at age 35–64. In women, corresponding falls were from 2.1 to 1.8/100 000 (−14%) and from 2.8 to 2.2/100 000 (−21%). In men, the highest mortality rates during 2000–2004 were in the Czech Republic (10.5/100 000) and the Baltic countries (>7/100 000) and the lowest ones (<3/100 000) in Greece, Portugal, Bulgaria and Romania. Tobacco smoking is the best recognised risk factor for kidney cancer [85]. Consequently, the reduced prevalence of smoking in most European countries can explain, at least in part, the recent favourable trends in men, but they cannot account for female trends. Other risk factors for kidney cancer are overweight and hypertension [86]. Trends in overweight and obesity cannot explain the favourable trends observed in kidney cancer mortality as, if anything, overweight and obesity have tended to increase over the last few years in several European countries [87]. Hypertension has also been related to kidney cancer, although it remains unclear whether pharmacological control of hypertension might have had some effect on kidney cancer mortality [87–89]. The impact of reduced occupational exposure on kidney cancer risk remains unquantified but is smaller than for bladder cancer [87].

thyroid

Thyroid cancer is more common in women than in men during 2000–2004. The highest mortality rates in women, around 0.6/100 000, were in Malta, Iceland, the Baltic countries, the Czech Republic and Austria, whereas most other European countries had mortality rates around 0.3/100 000. The geographic pattern of thyroid cancer mortality was similar in men, though mortality rates were somewhat lower. Contrary to incidence, which has been steadily rising [90], thyroid cancer mortality has declined in the EU from 1990–1994 to 2000–2004. The fall was from 0.54 to 0.40/100 000 in women (−26%) and from 0.40 to 0.33/100 000 in men (−17%) and was larger in middle age, approaching 40% in women and 25% in men. Ionising radiation, particularly in childhood, is the best established risk factor for thyroid cancer, together with history of goitre and other benign thyroid diseases [90]. Nutrition and dietary factors may also have some role [91]. The main reasons for the decline in mortality over the last decades, however, are improved diagnosis and treatment, particularly in younger women [46].

Hodgkin lymphomas

Mortality from Hodgkin lymphomas (HL) continued to decline across Europe. From 1990–1994 to 2000–2004, in the EU as a whole, the fall was from 0.82 to 0.49/100 000 (−40%) in men and from 0.48 to 0.31/100 000 (−35%) in women. In both sexes, the falls approached 50% in young and middle age. Appreciable declines in HL mortality were observed in central and eastern Europe too, where substantial delays were present in previous decades [92]. The only country not showing favourable trend over the last decade was Greece, possibly due to misclassification with NHL (see below). Thus, during 2000–2004, the highest HL mortality rates over recent calendar years were in Greece (1.4/100 000 men, 0.9/100 000 women) and central and eastern European countries (0.6–.9/100 000 men, 0.4–0.5/100 000 women), while most western and northern Europe had mortality rates of 0.3–0.4/100 000 for men and 0.2–0.4/100 000 for women. Trends were downwards also in the Nordic countries, Germany and the UK, showing already the lowest mortality rates in the past. Thus, areas of central and eastern Europe still in more recent years had HL mortality rates comparable to those observed in western Europe in the early 1990s [92], reflecting a delay in the adoption of efficacious integrated therapies for this highly curable disease. There is therefore still a considerable gap in HL mortality across various areas of Europe, which calls for urgent interventions to control this largely avoidable cause of death.

non-Hodgkin lymphomas

NHL was one of the few groups of neoplasms showing upward trends up to the late 1990s in Europe, as well as in North America and Japan [93–95]. In the EU as a whole, the peak for NHL mortality was reached in the late 1990s at 4.3/100 000 men and 2.7/100 000 women. The decline in the subsequent quinquennium (from 1995–1999 to 2000–2004) was ∼7% for both sexes at all ages, to 4.0/100 000 men and 2.5/100 000 women, and >10% at age 35–64. During 2000–2004, the highest mortality rates (∼5/100 000 men, 3.5/100 000 women) were in Finland, The Netherlands, Britain and Ireland, the Nordic countries and Italy, and the lowest ones (around or below 2/100 000 men and 1.5/100 000 women) were in Greece (possibly due to substantial misclassification with HL), Russia and eastern Europe. Over the last few years, trends were variable across European countries, but they were downwards in larger ones. The steady rises registered in NHL mortality rates up to the late 1990s partly or largely reflect real increases in disease incidence, though their reasons remain largely undefined, and improved diagnosis and classification of lymphomas and leukaemias may have played some role too. The recent falls in mortality are also likely to reflect some improvement in disease management and treatment, though their impact on national mortality rates remains unquantified [95].

multiple myeloma

After long-term rises, mortality from MM has stabilised in the EU over the last few years, around 2.2/100 000 men and 1.5/100 000 women, while a modest decline (∼5%) was observed in middle age. Death certification rates from MM have been considerably influenced by improvements in diagnosis and classification. Thus, countries like Sweden and other Nordic countries or Switzerland [96], where diagnosis and certification of MM has long been more reliable, showed declines in mortality in the last decade, particularly in middle age, whereas mortality rates have been upwards at least up to the late 1990s in most southern and eastern Europe. Still, during 2000–2004, the highest MM mortality rates were observed in the Nordic countries and the lowest ones in eastern and southern Europe, indicating that there is still scope for diagnostic improvements. Some of the recent declines may be due to therapeutic advancements [97–99], which are, however, difficult to quantify on national mortality.

leukaemias

Mortality from leukaemias continued its long-term favourable trends, essentially due to persistent therapeutic advancements [100]. From 1990–1994 to 2000–2004, the overall fall in leukaemia mortality in the EU was 8% in both sexes (from 5.7 to 5.3/100 000 men, from 3.6 to 3.3/100 000 women). The falls were larger at younger age, i.e. ∼15% in young adults, but were observed up to age 65. The declines were later and smaller in eastern and southern Europe, and the highest mortality rates during 2000–2004 (>6/100 000 men, >3.5/100 000 women) were in Hungary, the Baltic countries, the Czech Republic and Greece. The lowest ones (<5/100 000 men and <3/100 000 women) were in the Nordic countries, the UK and Switzerland. As for HL, most eastern European countries had leukaemia mortality rates comparable to those of western Europe in the 1990s. Although national death certification data do not allow to distinguish various types of leukaemias, they point to a relevant delay in the adoption of modern effective treatment in several areas of the continent and hence underline the importance and the urgency of the adoption of up-to-date knowledge on the treatment of leukaemia in southern and, mostly, in eastern Europe, which may lead to the avoidance of several hundred deaths per year in the EU as a whole.

all neoplasms

From 1990–1994 to 2000–2004, overall cancer mortality in the EU declined from 185.2 to 168.0/100 000 (−9%) in men and from 104.8 to 96.9/100 000 (−8%) in women. The falls were larger in middle age, i.e. from 240.8 to 204.2/100 000 (−15%) in men and from 152.3 to 137.0/100 000 (−10%) in women. These falls were of comparable magnitude as those observed over the last decade in the United States (−0.8% per year in men, −0.4% in women) [33] and in Japan [35]. The falls in the EU approached 25% in men and 20% in women at age 35–44 years. These particularly favourable trends in the young are of major importance since they shed light on likely trends in future generations [101]. Over the last decade, overall cancer mortality trends were favourable, though to a variable degree, in all European countries, including Russia, with the sole exception of Romania. Over the last few years, the APCs in major western European countries were between −0.5% (in Spain) and over −2% (in France and Germany), but were considerably less favourable in women, and in both sexes in central and eastern Europe.

conclusions

This updated analysis of the mortality from cancer in Europe showed persistent favourable trends over the last years, whose major determinants were the decline of lung and other tobacco-related cancers in men since the early 1990s, together with the persistent steady falls in gastric cancer, and the recent appreciable falls in colorectal cancers, particularly in women. In women, relevant contributions came from the persistent decline in cervical cancer and—mainly from the more recent falls—in breast cancer mortality, particularly in northern and western Europe. Both these declines were related to screening and early diagnosis, although the fall in breast cancer mortality is mainly due to improved treatment [58, 102]. Adoption of standard therapeutic protocols has also played a role in the reduced mortality from testicular cancer, HL, leukaemias and other neoplasms amenable to treatment, although the declines in mortality from these cancers were substantially delayed and much smaller in eastern European countries [103]. Advancements in integrated treatments have also likely played a role in colorectal, ovarian and prostatic cancer mortality trends, among others, though they are difficult to quantify [23]. These advancements notwithstanding, in the early 2000s, there remains an approximately twofold difference in cancer mortality—as in incidence [23, 104]—across European countries. For men, the highest mortality rates during 2000–2004 were in Hungary (255.2/100 000), the Czech Republic (215.9/100 000) and Poland (209.8/100 000), and the lowest

ones in Sweden (125.8/100 000), Finland (130.9/100 000) and Switzerland (136.9/100 000). For women, the highest mortality rates were in Denmark (141.0/100 000), Hungary (131.5/100 000) and Scotland (123.1/100 000), and the lowest ones in Spain (78.9/100 000), Greece (79.7/100 000) and Portugal (80.9/100 000), again reflecting the different spread of cigarette smoking among men and women across various European countries in the past. Thus, further reduction of tobacco smoking remains the key priority for cancer control in Europe. Interventions in alcohol drinking, aspects of nutrition, including overweight and obesity [105], and more widespread adoption of screening, early diagnosis and therapeutic advancements for treatable cancers would contribute to further reduce European cancer burden in the near future [65].

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disclosure

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