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## Original Paper

# Worldwide Trends in Cancer Mortality in the Elderly, 1955-1992

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**Trends in age-standardised mortality for all cancers and 21 cancers or groups of cancers over the period 1955-1992 were analysed for 33 countries from four continents in a population aged 65-84 years. Mortality from all neoplasms in the elderly showed heterogeneous patterns in various countries and in the two sexes. Trends were generally more favourable for females than for males, reflecting essentially the earlier and more extensive impact of the lung cancer (and other tobacco-related neoplasms) epidemic in elderly males, in addition to the earlier decline of gastric cancer and a widespread decline of cervical cancer rates in females. In several countries, particularly from western Europe, but also Japan, cancer mortality trends were more favourable over the last two decades than in earlier calendar periods. Some countries of northern and central Europe (including Finland, Germany, Austria and Switzerland) showed stable or even downward trends over time for total cancer mortality in both sexes, particularly in males. This reflects the different patterns of the tobacco-related (lung) cancer epidemic in various countries, and the impact of a few other major neoplasms, including in particular the systematic downward trends in stomach cancer. In contrast, rates were moderately upwards in males in North America, and several countries of southern and eastern Europe, where cancer mortality in the elderly was comparatively low in the 1950s, showed appreciable upward trends, mostly in males. Thus, there was a generalised tendency towards a levelling of the differences in certified cancer mortality in the elderly population in various areas of the world. Although there are substantial limits and uncertainties in the reliability and validity of cancer death certification and their trends in the elderly, there is no widespread and generalised upward trend in cancer mortality, with a major exception of lung and other tobacco-related neoplasms. Furthermore, in several countries, cancer mortality trends over the last four decades have been favourable for elderly women. Copyright © 1996 Elsevier Science Ltd**

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## INTRODUCTION

ANALYSIS AND interpretation of international trends of cancer and aging is severely hampered by the major difficulties and greater changes in diagnosis and certification of several cancer sites in the elderly as compared to younger subjects. Thus, the pattern of cancer rates and trends is largely different for populations of young and middle age compared with populations from middle age onwards [1-5].

Thus, for instance, Doll [3] concluded, on the basis of cancer death certification data at age 20-44 years, that patterns of trends were favourable for most cancer sites in

developed countries, with the major exception of eastern Europe. In contrast, Hoel and associates [4] concluded that recent trends in mortality from several common cancers were increasing in most developed countries, on the basis of inspection of rates at ages 45-84 years, and that these trends could not be explained only by changes in cigarette smoking and aging.

The decision to highlight cancer rates in the elderly rather than the young also has different bases and implications. In fact, any aetiological inference and interpretation of trends in cancer mortality is extremely complex, because of the difficulties inherent in understanding and quantifying the reliability and validity of data for various cancer types over time, and between countries and geographical areas [5], as

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well as in defining the major changes in cancer certification accuracy in elderly population. Changes in certified mortality for some sites may indeed partly or largely reflect improved ascertainment, increased use of screening and diagnostic technology and, in general, changes in medical practice. Nonetheless, investigation of cancer in the elderly has relevant public health implications, since rates of most human cancers increase with a power of age and are therefore substantially higher in the elderly [6].

Essentially, with this epidemiological and public health focus, we have systematically reviewed in this paper trends in mortality from major cancer sites over the period 1955–1992 for a population aged 65–84 years in 33 countries from four continents.

## MATERIALS AND METHODS

Official death certification numbers for 23 European countries, counting separately England and Wales and Scotland, excluding the former Soviet Union, Albania and a few countries with a population of less than 1 million (such as Andorra, Iceland, Liechtenstein, Luxembourg and Malta), the United States and Canada, four South American countries (Argentina, Costa Rica, Uruguay and Venezuela), two Asian countries (Hong Kong and Japan), Australia and New Zealand were derived from the World Health Organization (WHO) database. During the calendar period considered 1955–1992, four different Revisions of the International Classification of Diseases (ICD) were used [7–10]. Classification of cancer deaths were thus re-coded, for all the calendar periods, according to the Ninth Revision (ICD-9) [10].

To improve comparability of data [5] throughout different countries and calendar periods, we pooled together all oral cavity and pharynx neoplasms, all intestinal sites including rectum, all uterine cancers (cervix and endometrium), all skin neoplasms (melanoma and non-melanomatous), and all non-Hodgkin's lymphomas. Neoplasms whose classification changed substantially in the examined period, for example liver, pleural or bone cancer, and those which pose major diagnosis and classification problems, particularly in the elderly, such as brain cancer [1, 11], were not considered in the present analysis. Thus, a total of 21 neoplasms and total cancer mortality are included in the present report.

Estimates of the resident population, generally based on official censuses, were obtained from the same WHO databank. From the matrices of certified deaths and resident populations, age-specific rates for each 5-year age group and calendar period considered were computed. For the sake of comparability of rates across countries from various areas of the world, and with other published data [12–14], age-standardised rates were based on the world standard population [15].

In a few countries, data were missing for part of one or more calendar periods. When a single year was missing within a quinquennium, numerators and denominators were interpolated linearly from the previous and subsequent calendar year. No extrapolation was made for missing data at the beginning or the end of the calendar period considered, or when data on one or more quinquennia were not available.

## RESULTS

Tables 1–6 give age-standardised, at age 65–84 years, death certification rates for various cancers in the first (1955–1959, for most countries), or the earliest available period, and last

(1990–1992, or the latest available) calendar period considered, and the corresponding per cent change for each of the 33 countries considered. For selected countries and major cancer sites, including cancers of the stomach, intestines (colon and rectum), lung, breast and prostate, and for total cancer mortality in all countries considered, trends in world-standardised rates at age 65–84 years for each 5-year calendar period and sex in each country are given in Figures 1–6.

Although this is essentially a descriptive report, a short comment is enclosed in order to summarise major patterns of trends for each cancer site. However, this cannot substitute careful inspection of death rates and trends for each country and sex.

### *Oral cavity and pharynx (Table 1)*

Within Europe, a major excess of cancer of the oral cavity and pharynx was observed in France, whose rates were 42.4/100000 males in 1955–1959, and increased by 33% to reach 56.2/100000 in the early 1990s. In the most recent calendar period, death rates from cancer of the oral cavity and pharynx for elderly males were similar in Hungary (54.6/100000) and in France. The upward trend in Hungary (+70.8%) was reflected, to a lesser degree, in most other central and eastern European countries, including Germany (+107.4%) whose rate in 1990–1992 was however only around 25/100000. Oral cancer death rates in elderly males were between 28 and 32/100000 in Portugal, Spain and Italy, with a substantial upward trend in Spain (+72.8%). In contrast, most northern European countries showed some (recent) decline in oral cancer rates not only in males, but also (particularly in Sweden and Norway) in elderly females, reaching values around or below 20/100000 males and 10/100000 females. This includes Ireland, whose rates declined from 62.9 to 28.9/100000 in males, and from 15.1 to 8.5/100000 in females.

Oral cancer death rates in elderly males were moderately declining in North America, and in males and females in Venezuela and New Zealand. Japan had very low oral cancer rates in males in the 1950s (i.e. below 10/100000), but a steady upward trend was observed over the last three decades to reach 14.9/100000 in 1990–1992. This, however, remains one of the lowest worldwide oral cancer death rates in an elderly population.

Oral cancer rates were much (up to 5-fold) lower in females, and showed favourable trends in most countries considered (rates decreased by 50% in Finland, Ireland, Norway, Sweden, Costa Rica and Venezuela).

### *Oesophagus (Table 1)*

As for oral cavity and pharynx, some of the highest oesophageal cancer death rates in elderly males were in France, with a rate of 77.1/100000 in 1955–1959, although at the same time the Swiss rate was over 100/100000, and the Finnish rate was 68/100000. In these countries, as well as in Austria, Germany and Italy, oesophageal cancer rates have been declining over the last few decades in elderly males. In contrast, some (recent) upward trend was registered in Denmark, Hungary, Ireland and the U.K. Thus, in the early 1990s, Scotland had the highest oesophageal cancer rates (75.8/100000) within Europe, followed by France, Ireland and England and Wales, with rates of 62–63/100000. Rates for females were much lower and often unremarkable, except in a few Nordic countries, where oesophageal cancer rates

Table 1. Age-standardised (65-84 years, world standard) death certification rates per 100000 from selected digestive tract neoplasms in various countries, 1955-1992

Country	Mouth or pharynx						Oesophagus						Stomach					
	Males			Females			Males			Females			Males			Females		
	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change
	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change
Austria	22.8	24.0	5.5	5.6	4.6	-18.0	41.9	22.9	-45.4	7.2	2.8	-60.4	401.8	137.4	-65.8	247.6	62.2	-74.9
Belgium†	19.4	19.6	1.0	4.8	4.8	0.0	29.5	30.3	2.7	9.8	8.0	-17.9	269.8	103.0	-61.8	169.1	41.5	-75.5
Bulgaria†	10.8	15.8	46.1	4.5	3.1	-29.9	10.6	21.2	99.0	3.7	8.1	121.0	366.8	149.4	-59.3	250.7	83.7	-66.6
Czechoslovakia	27.9	30.6	9.8	6.1	5.1	-16.5	26.9	24.5	-8.8	6.1	4.1	-32.3	372.0	154.2	-58.5	219.8	69.5	-68.4
Denmark	16.5	22.0	33.4	8.8	9.9	12.2	29.9	40.7	36.2	13.7	10.3	-24.7	255.3	57.1	-77.6	161.9	29.3	-81.9
Finland	28.7	15.3	-46.8	10.4	5.3	-49.3	68.3	22.6	-67.0	53.1	11.8	-77.7	452.3	101.6	-77.5	280.3	44.2	-84.2
France	42.4	56.2	32.6	4.9	5.6	14.1	77.1	63.3	-17.9	9.7	7.1	-26.5	233.4	68.6	-70.6	128.0	26.4	-79.4
Germany	12.0	24.8	107.4	4.5	5.1	13.8	36.1	26.1	-27.6	10.9	5.0	-54.0	369.6	122.3	-66.9	236.6	59.4	-74.9
Greece†	9.5	11.8	24.4	3.7	3.8	2.4	12.9	12.8	-0.5	5.0	3.2	-34.7	127.7	72.6	-43.1	81.1	38.5	-52.5
Hungary	32.0	54.6	70.8	6.2	8.2	31.5	21.4	31.5	47.1	5.2	4.4	-14.0	391.5	194.5	-50.3	235.0	78.1	-66.7
Ireland	62.9	28.9	-54.1	15.1	8.5	-44.1	34.1	62.1	82.2	22.5	29.8	32.2	211.2	98.1	-53.6	153.6	51.5	-66.5
Italy	39.9	32.4	-18.7	6.5	5.9	-8.8	33.0	27.8	-15.5	7.2	5.2	-26.9	282.7	143.4	-49.3	171.2	64.7	-62.2
The Netherlands	13.8	16.0	16.4	5.7	4.2	-25.7	29.2	40.3	38.0	12.4	12.9	3.6	289.1	98.5	-65.9	178.4	36.4	-79.6
Norway	22.6	23.3	3.2	10.5	4.6	-56.0	25.1	22.5	-10.3	7.4	6.2	-16.8	285.6	95.7	-66.5	161.0	41.0	-74.5
Poland	14.8	27.6	85.7	5.8	6.6	12.7	29.6	28.9	-2.4	9.4	5.4	-42.5	255.2	177.1	-30.6	133.9	63.8	-52.3
Portugal	28.0	28.0	-0.1	6.1	6.1	-0.3	31.7	34.4	8.4	12.8	8.8	-31.4	209.1	186.3	-10.9	132.5	91.5	-30.9
Romania	13.9	24.0	72.2	3.8	5.6	47.7	13.0	9.6	-26.6	3.1	2.5	-19.4	261.0	128.5	-50.8	154.6	52.9	-65.8
Spain	17.6	30.5	72.8	3.9	4.5	14.2	20.4	32.4	58.7	5.8	4.2	-28.4	227.7	116.5	-48.8	139.1	52.4	-62.3
Sweden	14.3	16.1	12.8	12.1	6.2	-48.4	20.9	22.5	7.6	12.4	8.1	-34.1	257.1	71.1	-72.3	151.0	33.4	-77.9
Switzerland	48.5	34.2	-29.5	7.9	6.5	-17.5	101.7	35.4	-65.2	12.3	7.5	-39.2	322.4	76.9	-76.2	195.4	30.4	-84.5
U.K., England and Wales	39.8	16.7	-58.0	10.2	7.5	-26.5	40.6	62.1	53.0	18.8	27.2	45.1	216.2	109.6	-49.3	122.0	42.6	-65.1
U.K., Scotland	49.5	24.5	-50.4	12.6	9.0	-28.4	48.0	75.8	57.9	26.5	36.9	39.3	228.2	111.3	-51.2	154.9	51.6	-66.7
Yugoslavia, former†	16.1	32.4	100.6	3.8	6.5	70.9	16.0	18.7	17.3	3.7	4.9	34.0	167.1	138.1	-17.4	97.8	61.4	-37.2
Canada	34.9	26.2	-24.9	8.4	8.2	-1.8	25.2	34.5	36.7	10.1	9.9	-1.9	183.5	57.8	-68.5	93.0	25.9	-72.2
U.S.A.	31.0	22.4	-27.5	7.1	8.9	25.6	25.8	33.3	28.9	6.4	8.4	31.6	116.5	39.4	-66.2	56.9	17.1	-70.0
Argentina*	22.5	22.4	-0.1	5.1	5.1	0.0	95.1	58.5	-38.5	34.6	16.5	-52.2	199.0	92.4	-53.5	103.6	35.9	-65.4
Costa Rica†	17.8	15.6	-12.3	13.7	6.7	-51.1	40.2	35.6	-11.2	12.0	8.8	-27.3	494.9	365.9	-26.1	272.7	147.3	-46.0
Uruguay	26.5	31.4	18.5	6.6	7.0	6.5	117.4	77.7	-33.8	62.5	26.7	-57.2	278.6	114.3	-59.0	163.9	51.0	-68.9
Venezuela†	22.8	15.3	-32.9	31.4	9.6	-69.3	24.4	21.7	-11.3	16.4	10.1	-38.4	203.5	141.1	-30.6	143.3	79.0	-44.9
Hong Kong†,‡	56.8	56.4	-0.8	20.3	17.3	-14.7	67.8	73.1	7.9	18.0	16.4	-9.3	129.0	92.6	-28.2	78.0	41.4	-46.9
Japan	8.6	14.9	73.1	4.1	4.2	3.2	58.2	54.0	-7.2	18.7	7.9	-57.5	508.3	266.1	-47.7	253.6	98.0	-61.3
Australia	28.4	28.2	-0.8	8.5	9.2	8.1	27.6	37.5	35.6	11.8	14.6	23.6	183.7	58.1	-68.4	93.9	22.5	-76.0
New Zealand	29.2	21.7	-25.7	11.3	8.3	-26.6	31.4	43.3	38.0	16.0	16.0	-0.1	181.8	78.8	-56.7	101.7	24.9	-75.5

Table 1. Continued

Country	Intestines			Gallbladder			Pancreas		
	Males		Females	Males		Females	Males		Females
	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change
Austria	170.9	191.7	12.2	117.0	114.7	-2.0	26.4*	22.9	-13.4
Belgium†	189.1	172.8	-8.6	153.5	112.2	-26.9	8.1*	14.9	83.4
Bulgaria‡	50.0	124.7	149.2	42.2	83.9	98.9	9.9*	5.1	-48.9
Czechoslovakia	123.1	287.0	133.2	76.5	155.2	102.8	26.1	34.5	32.1
Denmark	219.9	197.2	-10.3	167.0	132.4	-20.7	10.3*	9.9	-4.2
Finland	81.1	108.8	34.2	72.6	79.2	9.1	11.9	13.6	13.8
France	160.4	178.0	11.0	125.8	94.9	-24.6	7.5	11.7	56.4
Germany	135.6	186.2	37.3	86.3	131.2	52.0	26.7*	20.2	-24.2
Greece†	39.6	72.9	83.9	38.9	59.0	51.8	2.3*	5.6	148.7
Hungary	99.7	259.7	160.4	88.7	155.6	75.5	7.8*	7.4	-5.3
Ireland	177.5	195.0	9.9	127.4	117.0	-8.1	6.9	16.3	138.4
Italy	88.3	164.1	85.9	72.6	100.3	38.1	25.2*	13.6	-45.8
The Netherlands	145.1	165.3	13.9	128.1	114.2	-10.8	7.4*	8.2	10.1
Norway	109.8	160.0	45.8	85.9	114.4	33.2	7.4*	8.2	10.1
Poland	27.0	127.2	371.8	26.1	84.3	222.8	12.2	12.2	12.2
Portugal	74.0	159.7	115.7	74.7	97.5	30.5	8.4*	13.0	54.8
Romania	37.7	75.8	101.4	34.4	55.0	60.0	11.0	20.3	85.0
Spain	60.5	135.5	123.9	59.8	79.6	33.2	17.6*	13.2	-25.1
Sweden	139.7	130.3	-6.7	98.8	95.4	-3.5	10.1*	6.4	-36.8
Switzerland	180.4	151.0	-16.3	116.3	84.6	-27.2	11.2	5.0	-55.6
U.K., England and Wales	208.2	181.9	-12.6	146.6	113.9	-22.3	11.7	9.7	-17.1
U.K., Scotland	245.1	195.2	-20.3	181.8	114.6	-36.9	12.1	7.4	-39.3
Yugoslavia, former†	37.4	122.4	227.6	29.8	81.0	172.2	7.0*	9.3	34.0
Canada	175.2	170.7	-2.6	154.8	110.4	-28.7	11.7	9.7	-17.1
U.S.A.	155.2	144.7	-6.8	129.2	91.9	-28.9	12.1	7.4	-39.3
Argentina*	138.4	116.4	-15.9	114.6	71.3	-37.8	5.1	19.4§	280.2
Costa Rica†	43.3	58.2	34.3	44.9	52.1	15.8	13.8*	24.3	75.7
Uruguay	116.4	129.6	11.3	126.5	109.5	-13.4	13.8*	24.3	75.7
Venezuela†	41.5	40.7	-1.9	46.5	38.4	-17.4	5.1	19.4§	280.2
Hong Kong†,‡	83.6	113.6	35.8	52.2	75.3	44.5	13.8*	24.3	75.7
Japan	64.1	119.8	86.8	43.0	70.0	63.0	9.7	53.2	447.5
Australia	162.9	170.5	4.7	134.6	107.9	-19.8	13.6*	9.2	-32.7
New Zealand	162.8	203.0	24.6	138.8	147.5	6.2	15.0*	6.2	-58.5

\* Rates for 1965-1969 only available; † rates for 1960-1964 only available; ‡ rates for 1985-1989 only available; § rates for 1980-1984 only available.

were relatively high in females in the 1950s and 1960s, and where falls in elderly females paralleled those in males. In those countries, in the past, dietary deficiencies were probably important causes of oesophageal cancer, besides alcohol and tobacco [16].

In North America, oesophageal cancer rates in the elderly were stable or slightly increased (in the U.S.A.) over more recent calendar periods, as were rates in Australia and New Zealand. A substantial fall was reported in Argentina and in Uruguay, starting from rates of 117.4/100000 in males and 62.5/100000 females in Uruguay, where hot beverages are a major cause of oesophageal cancer [17]. Rates were high also in Japan and Hong Kong (around 60 to 70/100000 males aged 65–84 years).

#### *Stomach (Table 1 and Figure 1)*

The fall in stomach cancer rates has been the most favourable pattern in mortality from any common cancer site over the last several decades [18]. In the 1950s, gastric cancer was still by far the most common cause of cancer death in the elderly of both sexes worldwide. In most western and northern European countries, the falls were observed earlier in females, and were steady from the 1960s onwards in both sexes. The overall declines reached 50–70% for males in several countries over the period considered, and were somewhat larger in proportional terms (i.e. 60–80%) in females. In most southern and, chiefly, eastern European countries, however, the falls started in the 1960s or 1970s, after earlier stable rates (e.g. Italy and Czechoslovakia) or even upward trends (Spain, Portugal, Poland, Romania). Substantial declines in both sexes were also observed in North America, Australia and New Zealand, and, starting from the late 1960s or 1970s, South America and Japan. In the early 1990s, Japan had the highest certified mortality from stomach cancer in the elderly (266.1/100000 males, 98.0/100000 females), despite a fall of 47.7% in males and of 61.3% in females from 1965 onwards.

#### *Intestines, mainly colon and rectum (Table 1 and Figure 2)*

Colorectal cancer rates in the elderly were stable, or even moderately decreased, particularly in females, in several countries of northern Europe, America and Australia. In contrast, death rates have tended to increase, often substantially, in most countries of southern and eastern Europe, and in Japan whose rates were particularly low (around 60 and 40/100000 males and females, respectively) in the mid 1950s. Thus, differences in colorectal cancer mortality in the elderly of both sexes across various countries and areas of the world have tended to level off during the last four decades, although an appreciable variation (up to around 6-fold) was still apparent. In most American countries, and also in several large European countries (France, Germany, Italy), colorectal trends have been more favourable over the most recent calendar periods, particularly for females (Figure 2). The reason for these more favourable intestinal cancer rates in elderly females is unclear, although a role of earlier improvements in diet or of hormonal factors [19] in women is plausible.

#### *Gallbladder and bile ducts (Table 1)*

Besides the observation that death rates from gallbladder cancer were systematically higher in elderly females than in males (except in Hong Kong and Japan), the pattern of gallbladder cancer rates in various countries was substantially heterogeneous. Thus, rates were appreciably upwards in

Belgium, France, Greece, Italy, Spain and Sweden, and decreased in Austria, Germany, The Netherlands, Switzerland, the U.K. and North America. Japan showed both a steady and substantial upward trend (+450%), and the highest gallbladder cancer rates in both sexes in the 1990s (53.2/100000 males, 47.8/100000 females). These patterns of trends are partly attributable to difficulties in diagnosis and certification of gallbladder cancer, particularly in the elderly, partly to a levelling of rates in various countries and areas of the world around similar values (with the major exception of the excess in Japan), and partly to the different patterns of cholecystectomy in various countries and calendar years, since gallstones are the major recognised risk factor for gallbladder cancer [20, 21].

#### *Pancreas (Table 1)*

Pancreatic cancer mortality increased appreciably and systematically to reach rates around 70/100000 males and 50/100000 females aged 65–84 years in most countries of the world, most appreciably in Japan (+459.1% in males and +377.8% in females), which has now relatively high pancreatic cancer rates in the elderly. It is, however, unclear how much of this systematic increase is due to improved diagnosis and certification, and how much to tobacco smoking and other potential risk factors for pancreatic cancer [22].

In some Nordic countries, the U.K., Iceland, Germany, Switzerland, The Netherlands, North America, Australia and New Zealand, pancreatic cancer in the elderly, after earlier rises, have tended to level off over the last two decades. Still, mortality rates in 1990–1992 were higher than in 1955–1959 in all countries considered and both sexes, except New Zealand females, although the pattern of trends was somewhat more favourable for females in several countries.

#### *Larynx (Table 2)*

In the elderly, as in other age groups, laryngeal cancer is extremely rare in females (up to 20-fold lower than in males), and its trends were generally favourable in women. In the mid 1950s, France had the highest laryngeal cancer rate in elderly males (49.6/100000), although it declined thereafter to 40.3/100000. Similar patterns were observed in Austria, Finland, Ireland, Switzerland and the U.K., although the absolute values were appreciably lower in these countries. In contrast, Spain showed both high rates and upward trends over time, to reach 44.5/100000 males. Substantial rises were also observed in Poland, Hungary and former Yugoslavia (which, together with France, Italy and Spain, has now the highest rates of laryngeal cancer in elderly males worldwide, around or over 40/100000), and most other eastern European countries. Laryngeal cancer rates in elderly males were approximately stable in the United States, some Latin American countries providing data (i.e. Argentina and Venezuela) and Australia, but appreciably downwards in Japan over the last few years, although absolute values were relatively low in that country (7.4/100000 males in 1990–1992).

#### *Trachea, bronchus and lung (Table 2 and Figure 3)*

The rise of lung cancer was the single major pandemic registered in cancer mortality among elderly males over the last few decades [23]. Lung cancer death rates in males aged 65–84 years reached 700/100000 in the late 1970s in Scotland, as well as in the early 1980s in the Netherlands and Belgium, and peaked around 600/100000 in the late 1970s in

## Stomach

—○— Males 65 – 84 years  
 - - - □ - - Females 65 – 84 years

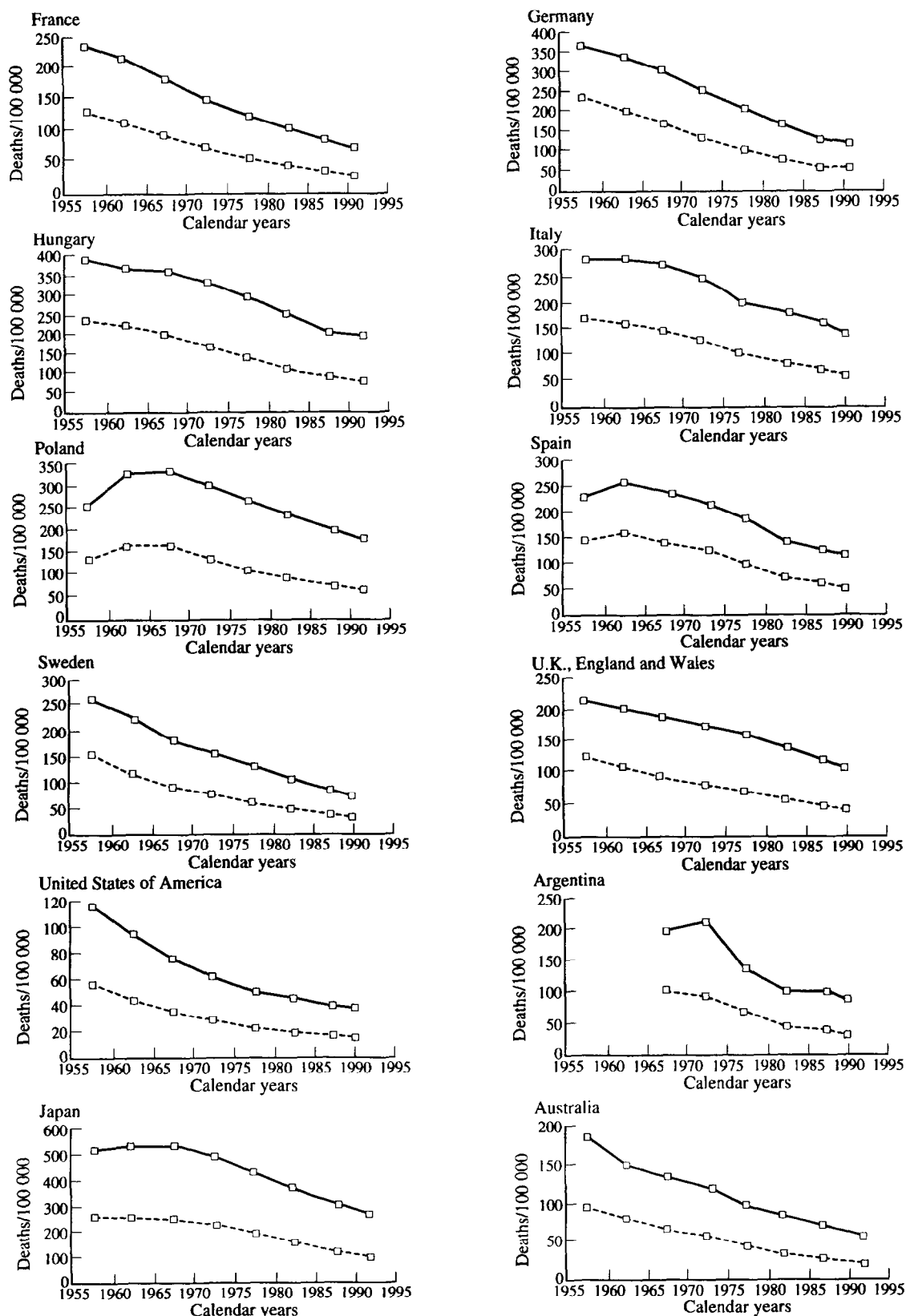


Figure 1. Trends in age-standardised (65–84 years, world standard) death certification rates from gastric neoplasms in selected countries, 1955–1992.

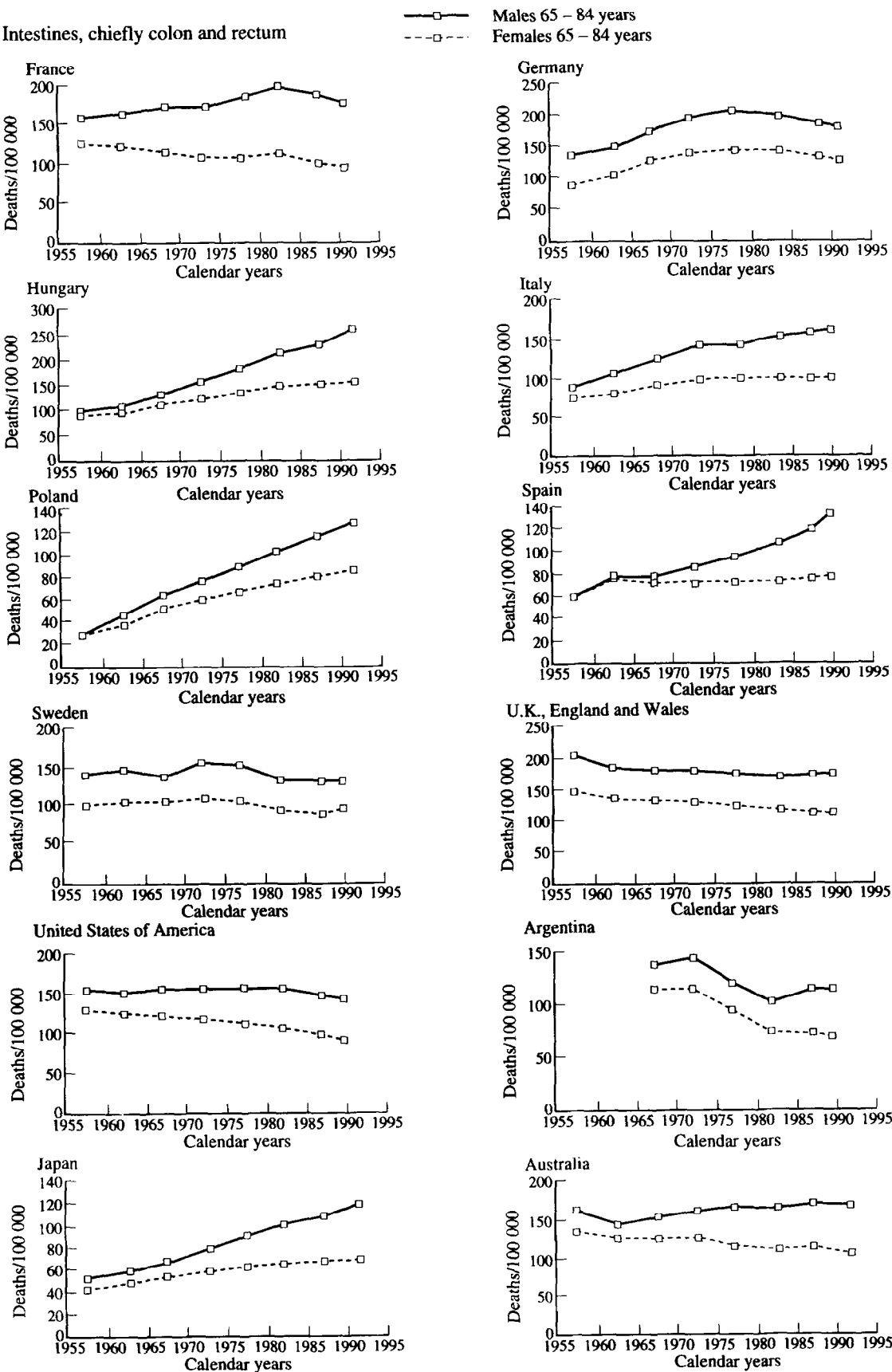


Figure 2. Trends in age-standardised (65–84 years, world standard) death certification rates from intestinal neoplasms in selected countries, 1955–1992.

Table 2. Age-standardised (65-84 years, world standard) death certification rates per 100000 from laryngeal, lung and (total) skin neoplasms in various countries, 1955-1992

Country	Larynx			Lung			Skin		
	Males		Females	Males		Females	Males		Females
	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change
Austria	26.2	20.7	-21.2	1.2	1.2	-4.0	302.3	341.1	12.8
Belgium†	20.2	31.3	54.7	1.7	1.9	12.1	169.2	626.1	270.0
Bulgaria†	21.9	21.4	-2.5	2.4	1.2	-51.9	247.5	216.0	-12.7
Czechoslovakia	19.7	27.6	40.0	1.9	1.8	-5.8	246.7	494.1	100.3
Denmark	7.2	15.7	117.4	1.9	2.6	37.8	142.5	436.3	206.2
Finland	19.9	8.9	-55.5	2.5	0.9	-65.4	340.6	435.2	27.8
France	49.6	40.3	-18.7	2.8	1.6	-42.2	110.5	322.7	192.2
Germany	14.8	15.2	3.1	1.4	1.1	-22.3	182.8	378.2	106.9
Greece†	31.3	30.3	-3.0	2.4	1.7	-28.7	204.1	400.7	96.3
Hungary	29.1	43.2	48.4	3.6	2.6	-26.8	216.9	493.0	127.3
Ireland	21.7	14.0	-35.6	5.8	2.1	-63.4	100.2	409.9	309.2
Italy	21.9	40.4	84.5	1.9	1.4	-24.1	75.2	453.5	503.3
The Netherlands	12.1	13.5	11.4	1.7	1.1	-32.9	202.1	617.5	205.5
Norway	2.9	6.0	109.8	0.1	0.7	928.6	50.3	261.9	420.3
Poland	9.0	41.8	367.5	1.7	2.7	58.3	86.6	473.1	446.5
Portugal	26.0	34.3	32.2	2.7	2.1	-22.3	52.0	194.8	274.3
Romania	18.0	26.4	47.1	3.4	2.1	-36.9	112.3	187.9	67.4
Spain	36.6	44.5	21.6	3.3	1.0	-69.1	87.9	351.2	299.4
Sweden	4.5	5.6	25.6	0.8	0.9	18.7	79.4	194.1	144.6
Switzerland	26.1	15.2	-41.7	1.3	1.7	36.2	178.6	367.0	105.5
U.K., England and Wales	18.9	12.6	-33.3	2.9	2.2	-22.0	348.2	511.2	46.8
U.K., Scotland	16.7	14.2	-14.9	3.4	3.6	7.4	324.8	605.8	86.5
Yugoslavia, former†	20.6	40.3	95.7	2.3	3.4	49.1	144.4	314.5	117.8
Canada	12.8	18.1	41.4	1.9	3.3	72.8	147.4	466.1	216.3
U.S.A.	14.2	13.9	-2.0	1.1	2.7	147.7	164.8	460.7	179.6
Argentina*	30.7	29.1	-5.2	3.2	2.1	-35.1	285.2	250.0	-12.3
Costa Rica†	13.1	21.4	63.8	1.4	5.8	324.1	48.0	134.2	179.6
Uruguay	40.9	50.4	23.2	1.9	1.3	-33.9	214.5	391.2	82.4
Venezuela†	19.1	20.4	6.7	11.3	4.5	-60.3	65.6	127.6	94.5
Hong Kong†,‡	15.6	23.9	52.9	0.8	2.5	202.4	154.4	450.1	191.5
Japan	13.2	7.4	-44.2	3.6	0.6	-84.4	57.1	288.2	405.1
Australia	15.2	15.7	3.4	1.7	1.9	10.7	156.2	353.3	126.2
New Zealand	13.2	8.7	-33.8	1.4	1.9	29.4	201.5	356.2	76.8

\* Rates for 1965-1969 only available; † rates for 1960-1964 only available; ‡ rates for 1985-1989 only available; § rates for 1980-1984 only available.



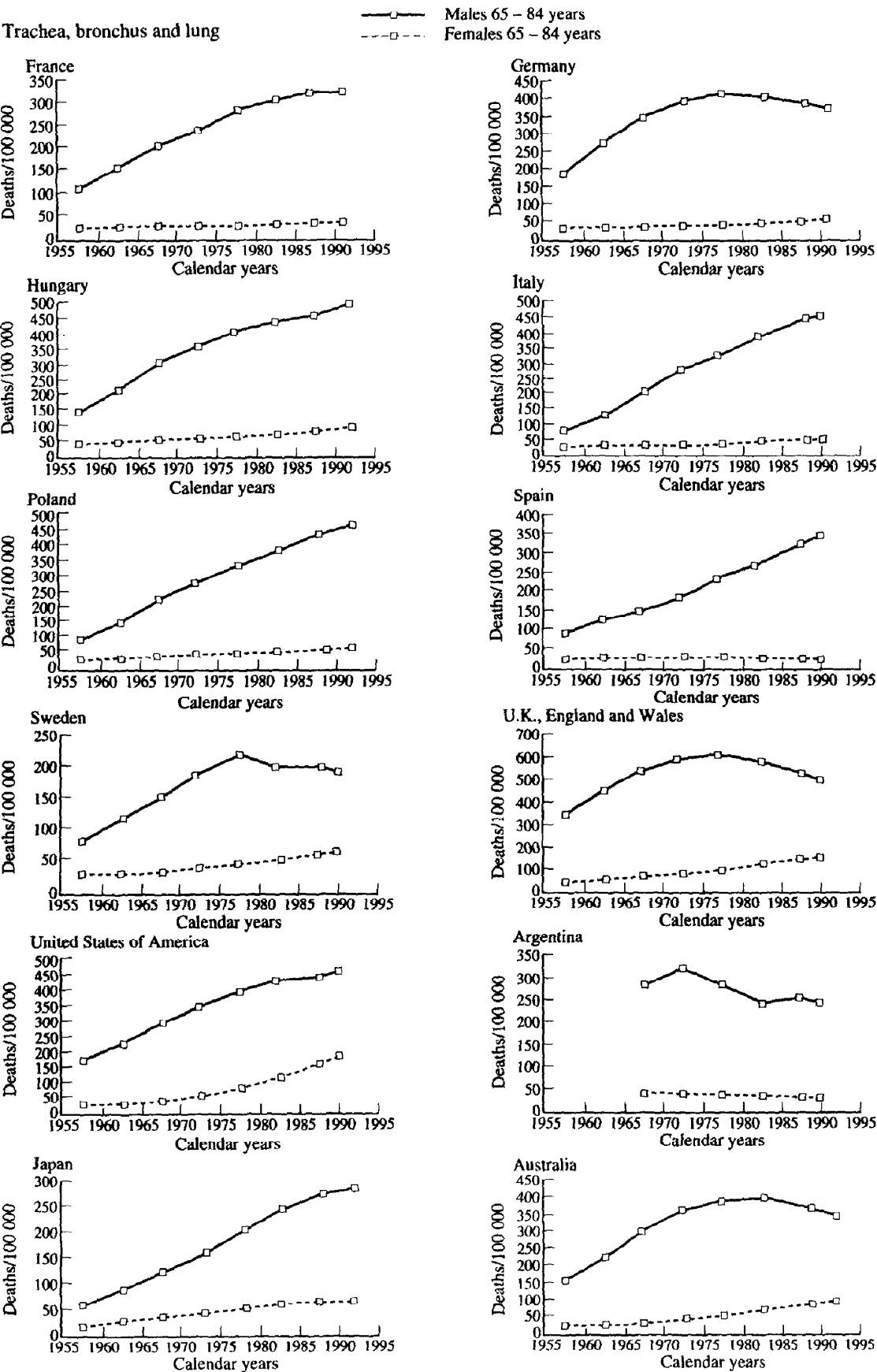


Figure 3. Trends in age-standardised (65–84 years, world standard) death certification rates from lung neoplasms in selected countries, 1955–1992.

England and Wales (Figure 3). In most of these countries, lung cancer rates in elderly males have now started to level off or decline, but the epidemic is still expanding in eastern Europe, approaching in 1990–1992 500/100000 in Poland and Hungary, and in southern Europe (400–450/100000 in Italy and Greece). In the United States and Canada lung cancer rates were around 460/100000 males aged 65–84 years. Some downward trend was observed in elderly males in Argentina. In 1990–1992, the highest lung cancer rates (over 600/100000) were in Belgium, The Netherlands and Scotland. In North America, the start, since the early 1960s, of an important epidemic of lung cancer in elderly females has also become evident, with rates for the U.S.A. around 180/100000 women aged 65–84 years in the early 1990s, and appreciable rises in females have also been seen in Denmark, Ireland, the U.K. (with the highest rate of 222.8/100000 in Scotland), Hong Kong, Australia and New Zealand. A steady and substantial rise in lung cancer in the elderly has also been registered in Japan, although absolute values remained appreciably lower than in most other areas of the world (288.2/100000 males and 67.3/100000 females).

#### *Skin, including melanoma (Table 2)*

Trends in skin cancer mortality in the elderly are very difficult to interpret, since (i) skin cancer deaths include various histotypes (mainly melanoma and squamous cell carcinoma) and (ii) only a fraction of all skin cancers is the direct and underlying cause of death, thus leaving ample scope for variable completeness and validity of death certification in various countries. These cautions notwithstanding, it is nonetheless clear at inspection of skin cancer rates in the elderly that no major and systematic epidemic has been observed over the last few decades, when substantial rises were evident in the younger–middle age population of both sexes, largely or totally attributable to increased mortality from melanoma of the skin [24]. Major exceptions were some countries in Scandinavia and central Europe, and, mostly, Australia and New Zealand, where an over 2-fold rise in skin cancer rates has been registered, and skin cancer death rates were over 40/100000 in males and around 20/100000 in females aged 65–84 years in recent years, together with some rise in North America, particularly for males (+40% and +23.6% in the U.S.A. and Canada, respectively).

#### *Breast (Table 3 and Figure 4)*

There were at least two different patterns in breast cancer mortality among elderly women. One was typical of several northern European countries, North America, Australia and New Zealand, with rates around 100–140/100000, approximately stable between the late 1950s and the early 1990s. A second one was observed in most southern and eastern European countries, and Latin America, and was characterised by appreciably lower rates in earlier calendar periods, but substantial rises thereafter to reach values around or over 100/100000 in the late 1980s or early 1990s. For most countries, there was therefore a systematic tendency towards levelling of rates around higher values over most recent calendar periods, with a decline of the international variation in breast cancer death rates in elderly women over the last four decades. Norway and Sweden had, however, relatively low rates (around 85–95/100000) and were constant over time, but the most peculiar pattern was in Japan, whose rates started at 14.9/100000 women aged 65–84 years in the early 1950s and reached only 20.7 in 1990–1992 [19, 25].

#### *Uterus (cervix and corpus) (Table 3)*

Mortality from uterine cancer declined in most countries of the world, particularly since the late 1960s or early 1970s onwards. This is likely attributable to reduced incidence and/or early detection and diagnosis of cervical cancer, a result of changed sexual habits, improved personal hygiene and adoption of cervical screening [26]. Thus, the declines in cervical cancer rates are one of the major determinants of the more favourable trends in cancer mortality rates in females over the last four decades. The only area of the world where uterine cancer death rates were not consistently and appreciably downwards was eastern Europe, thus indicating a delay in the adoption of adequate prevention measures in these countries.

#### *Ovary (Table 3)*

Certified mortality rates from ovarian cancer in women aged 65–84 years were between 30 and 50/100000 in most northern European and American countries, Australia and New Zealand, with some inconsistent rise, but in the absence of systematic trends in rates. In the 1950s and 1960s, rates were much lower in southern and eastern Europe and Japan. Appreciable rises over time were registered in these areas, although the size of the upward trends may well suggest that these were partly or largely artefactual, but the rates in the late 1980s or early 1990s remained generally lower than those of North America or Europe.

#### *Prostate (Table 3 and Figure 5)*

Prostatic cancer mortality in elderly males has risen in all countries of the world, although the patterns of trends over time have been somewhat heterogeneous in various countries (Figure 5) and in the early 1990s substantial differences remained, with the rates around 150–220/100000 males aged 65–84 years in North America, most northern European countries and Oceania, around 100–150/100000 in eastern and southern Europe, and around 30–40/100000 in Japan or Hong Kong. Certified mortality from prostatic cancer, particularly in the elderly, is strongly influenced by diagnostic and certification accuracy; it is however, difficult to understand how much of the apparent increase is real, and how much is attributable to improved ascertainment and diagnosis of the disease [27, 28].

#### *Testis (Table 3)*

An appreciable decline in testicular cancer rates was observed for elderly males in most countries of western Europe, North America (where the decline reached 74.7%), Japan (–67.9%) and Oceania (–34.5%). Little evidence of decline was evident in eastern Europe or South America. As in younger males [16, 29], this diverging pattern of trends probably reflects the impact of newer platinum-based chemotherapy schemes in reducing testicular cancer mortality, and the delay of adequate adoption of these therapies in a few areas of the world [29].

#### *Bladder (Table 4)*

This is another neoplasm related to tobacco smoking, as well as to occupational exposure to chemical carcinogens [30]. Not surprisingly, therefore, the trends in elderly males largely reflect those of lung cancer, with some recent decline in most northern European and American countries, Japan, and the presence of substantial rises in southern and eastern Europe

Table 3. Age-standardised (65–84 years, world standard) death certification rates per 100000 from breast and genital neoplasms in various countries, 1955–1992

Country	Breast Females			Uterus			Ovary			Prostate			Testis		
	%			%			%			%			%		
	1955–1959	1990–1992	% Change	1955–1959	1990–1992	% Change	1955–1959	1990–1992	% Change	1955–1959	1990–1992	% Change	1955–1959	1990–1992	% Change
Austria	77.3	116.2	50.3	84.2	46.8	-44.4	47.4*	49.2	3.9	139.3	169.8	21.9	0.9	0.7	-17.2
Belgium†	97.9	130.4	33.2	73.3	39.0	-46.8	21.2	44.7	110.9	139.9	172.4	23.2	1.6	1.4	-13.3
Bulgaria‡	36.9	67.4	83.0	31.2	46.1	47.8	12.2*			62.0	87.7	41.4	1.5*	1.5	2.0
Czechoslovakia	60.5	106.3	75.9	68.0	64.3	-5.4	24.4	31.6	29.7	91.7	147.3	60.7	1.7	1.5	-7.3
Denmark	135.9	143.0	5.2	71.0	57.3	-19.3	49.7	59.2	19.3	152.9	198.2	29.6	1.9	2.0	5.2
Finland	60.8	82.3	35.3	48.4	31.5	-34.9	26.0	37.1‡	42.8	116.5	176.6	51.6	1.3	0.9	-26.8
France	78.6	100.3	27.6	60.2	34.7	-42.3	12.9	36.6	182.7	142.6	163.9	14.9	1.4	0.7	-51.4
Germany	81.8	113.2	38.3	52.4	41.6	-20.7	36.1*	45.8	26.7	128.5	162.2	26.2	2.1	1.2	-42.4
Greece†	26.6	70.0	162.8	29.5	22.5	-23.7	2.9*	15.7	435.0	49.0	85.0	73.3	0.7*	0.8	20.6
Hungary	56.5	117.7	108.3	98.0	64.2	-34.5		38.5		94.0	157.1	67.1		1.8	
Ireland	85.6	128.9	50.5	38.7	28.9	-25.2	14.1	48.9	246.2	96.9	187.4	93.4	1.5	2.1	38.3
Italy	66.5	101.5	52.6	58.7	35.7	-39.3	10.2	24.4	140.0	81.1	122.0	50.4	1.7	1.2	-33.9
The Netherlands	122.9	140.2	14.1	47.9	33.0	-31.0	35.3	53.1	50.3	134.6	171.3	27.3	1.3	0.9	-33.1
Norway	86.8	98.2	13.1	38.9	33.5	-13.9	32.4	44.5	37.3	159.3	222.0	39.4	1.3	0.6	-54.6
Poland	23.5	76.3	225.1	40.6	59.6	47.0	11.0†			31.1	105.5	239.4	1.1	2.0	76.1
Portugal	51.5	82.0	59.3	61.4	39.4	-35.8		17.7		97.9	154.3	57.7		1.0	
Romania	27.7	63.0	127.6	73.3	60.4	-17.6				78.7	80.1	1.8	1.3*	1.5	16.4
Spain	29.5	77.8	164.1	41.5	32.6	-21.3	1.8	18.4	920.6	78.8	135.1	71.4	0.6	0.4	-37.1
Sweden	94.6	86.4	-8.7	48.7	33.5	-31.2	39.2	44.5	13.6	163.6	212.9	30.2	1.1	0.4	-59.0
Switzerland	117.5	135.2	15.1	75.8	41.3	-45.5	40.0	48.0	20.0	164.1	222.6	35.7	1.6	1.0	-40.1
U.K., England and Wales	115.4	144.5	25.3	53.8	37.3	-30.7	33.9	49.1	44.6	129.6	173.5	33.8	1.6	0.6	-60.5
U.K., Scotland	115.4	133.2	15.4	51.6	34.1	-33.9	30.1	55.8	85.7	130.3	157.5	20.9	0.8	0.4	-52.4
Yugoslavia, former†	33.2	73.9	122.4	50.1	47.1	-6.1	9.4			59.3	94.8	59.9	0.9	0.6	-35.2
Canada	111.0	126.2	13.7	61.3	30.6	-50.1	35.2	37.0	4.9	133.3	169.5	27.2	1.6	0.5	-69.8
U.S.A.	100.9	118.8	17.8	66.2	30.8	-53.5	33.5	41.2	22.9	144.4	173.5	20.1	0.9†	0.2	-74.7
Argentina*	87.5	116.1	32.7	62.6	49.5	-21.0				129.4	132.8	2.6			
Costa Rica†	39.3	55.7	41.7	129.2	68.8	-46.7				77.6	139.4	79.6			
Uruguay	90.6	133.9	47.7	76.7	50.0	-34.8				150.1	217.8	45.1	1.1	0.5§	-54.5
Venezuela‡	38.1	44.1	15.8	130.1	85.2	-34.6	4.1			70.2	125.8	79.3		0.4	
Hong Kong†,‡	39.3	41.8	6.5	42.9	30.2	-29.7	12.2*			18.9	25.7	36.1		0.2	-67.9
Japan	14.9	20.7	39.1	69.6	24.5	-64.7	3.2	14.5	358.2	12.4	38.4	210.9	0.5	0.7	-34.5
Australia	102.0	100.4	-1.5	57.3	24.7	-56.8	28.2	36.2	28.6	158.9	182.0	14.5	1.1	1.0	-38.4
New Zealand	112.5	128.4	14.2	55.8	41.0	-26.6	34.1	44.9	31.9	147.8	188.4	27.5	1.6	1.0	

\* Rates for 1965–1969 only available; † rates for 1960–1964 only available; ‡ rates for 1985–1989 only available; § rates for 1980–1984 only available.

## Breast

---□--- Females 65 – 84 years

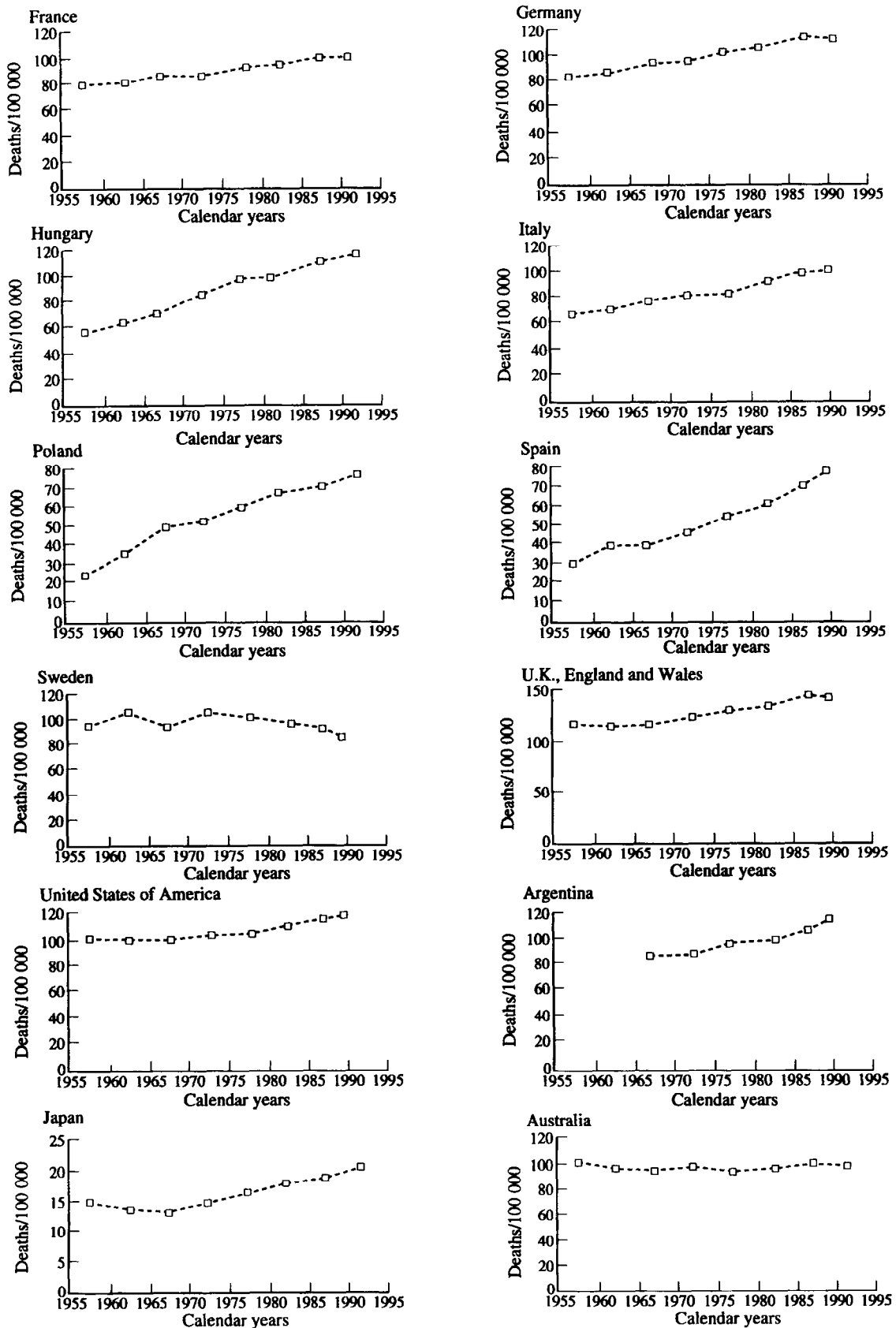


Figure 4. Trends in age-standardised (65–84 years, world standard) death certification rates from female breast neoplasms in selected countries, 1955–1992.

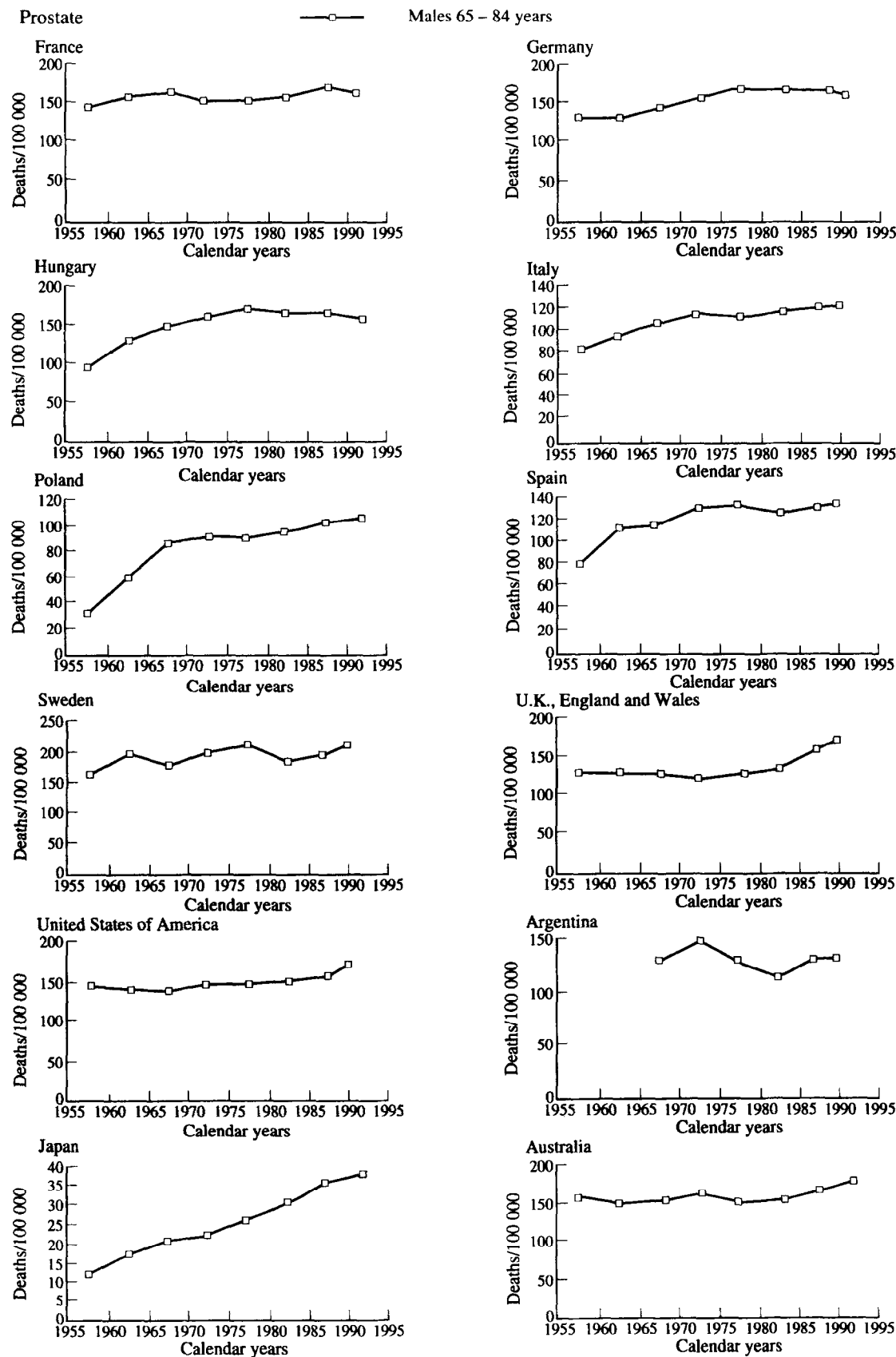


Figure 5. Trends in age-standardised (65–84 years, world standard) death certification rates from prostate neoplasms in selected countries, 1955–1992.

Table 4. Age-standardised (65-84 years, world standard) death certification rates per 100000 from urinary tract and thyroid neoplasms in various countries, 1955-1992

Country	Bladder			Kidney			Thyroid		
	Males		Females	Males		Females	Males		Females
	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change
Austria	72.0*	52.1	-27.6	13.0*	13.9	7.3	33.8*	42.5	25.8
Belgium†	38.9	74.5	91.5	13.3	16.0	20.1	13.8	34.0	145.6
Bulgaria†	38.3*	40.7	6.3	7.1*	8.4	18.9	6.5*	13.1	102.3
Czechoslovakia	38.4	74.0	92.4	9.4	13.8	47.8	17.8	63.4	255.7
Denmark	49.3	87.5	77.5	19.4	19.2	-0.9	28.6	35.8	25.4
Finland	38.0	39.6	4.0	8.8	8.2	-6.4	16.3	39.8	144.3
France	30.3	58.2	92.4	9.8	11.2	13.6	13.7	33.8	147.1
Germany	65.4*	65.3	-0.2	14.1*	15.0	6.0	27.1*	46.6	71.8
Greece†	44.0*	67.1	52.5	11.1*	9.9	-11.3	10.3*	16.8	62.5
Hungary		70.1			14.3			44.6	
Ireland	24.1	39.9	65.5	11.3	9.5	-16.6	7.7	25.6	230.6
Italy	32.6	84.8	160.2	9.8	12.2	25.5	8.8	32.8	273.7
The Netherlands	39.8	65.3	64.0	16.3	13.9	-14.7	15.3	38.9	153.7
Norway	31.2	50.4	61.5	16.7	14.9	-10.8	23.2	37.8	62.8
Poland	38.7†	68.9	78.1	6.6†	9.5	43.1	7.0†		
Portugal		45.9			10.7			16.5	
Romania	31.2*	43.4	39.2	7.1*	10.7	51.6			
Spain	35.5	77.6	118.7	6.5	11.2	72.9	8.2	21.4	159.7
Sweden	24.0	36.8	53.2	11.1	13.7	23.6	31.4	39.5	26.0
Switzerland	39.6	61.6	55.4	14.1	15.4	9.7	23.8	39.2	64.6
U.K., England and Wales	59.9	66.9	11.7	17.8	20.4	14.2	15.0	27.1	80.3
U.K., Scotland	51.8	63.3	22.3	16.7	23.6	41.2	22.9	31.8	39.1
Yugoslavia, former†	27.1	43.8	61.7	5.2	11.3	119.0	6.2	13.9	125.8
Canada	46.8	39.2	-16.2	18.0	11.3	-37.1	20.6	31.1	50.9
U.S.A.	45.8	34.6	-24.4	17.2	10.2	-40.3	18.2	28.5	56.9
Argentina*		53.0			9.3				
Costa Rica†	20.4*	14.6	-28.4	9.8*	5.6	-42.8			
Uruguay	74.1*	65.3	-11.8	9.5*	15.3	61.2			
Venezuela†	18.7	15.9	-14.7	8.6	7.4	-13.2	5.0	9.0§	81.0
Hong Kong†,‡	28.5	40.2	41.2	14.5	13.4	-7.1	3.0*	11.6	284.2
Japan	17.4	20.7	19.1	7.1	5.9	-17.2	2.6	18.8	623.8
Australia	41.9	37.3	-11.0	13.8	11.8	-14.8	17.6	28.6	62.5
New Zealand	37.6	41.8	11.1	12.6	14.1	11.9	20.2	25.7	27.4

\* Rates for 1965-1969 only available; † rates for 1960-1964 only available; ‡ rates for 1985-1989 only available; § rates for 1980-1984 only available.

(except Bulgaria), whereas rates remained relatively stable in Finland and Germany across the calendar period considered.

#### *Kidney (Table 4)*

Kidney cancer rates increased substantially in most countries considered, except a few Nordic countries (i.e. Denmark, Norway and Sweden), whose rates were particularly high and had reached a peak in the late 1970s or early 1980s. In these areas, the increase between the late 1950s and the early 1990s was modest. This steady and substantial rise in most areas of the world is in part attributable to the delayed effects of cigarette smoking—the single well recognised risk factor in kidney cancer [31]—and in part to improved diagnosis and certification mostly in the elderly, but remains, at present, open to interpretation. As for most other (tobacco-related) neoplasms, the rise was generally larger for males than for females.

#### *Thyroid (Table 4)*

Thyroid cancer mortality in the 1950s was elevated, particularly in elderly females, in central Europe, including the Alpine areas of Austria and Switzerland [32]. Over the last four decades, steady and substantial declines in thyroid cancer rates were observed for both sexes in these areas, as well as in most western European countries, North America and Oceania, although the downward trends were generally larger in females. These favourable trends are likely attributable to the reduction of iodine deficiency, and hence of the prevalence of related benign thyroid conditions [32]. In Japan, thyroid cancer rates were low in the 1950s, increased up to the mid 1970s, and levelled off thereafter (data not shown).

#### *Hodgkin's disease (Table 5)*

In most (developed) countries of the world, Hodgkin's disease mortality in population aged 65–84 years declined appreciably (by 20–70%) from the late 1950s to the early 1990s. These generalised downward trends are likely attributable to improved treatment of the disease, following newer and integrated chemo- and radiotherapy schemes [29]. Exceptions to this favourable pattern are a few countries of southern and eastern Europe (i.e. Greece, Poland and the former Yugoslavia), where treatment of this disease appears to be unsatisfactory [29].

#### *Non-Hodgkin's lymphomas (Table 5)*

Mortality from non-Hodgkin's lymphomas in the elderly increased several-fold in most countries, to reach values around 30–40/100000 in males aged 65–84 years and 15–30/100000 in females. The upward trends are, at least in part, attributable to changed criteria of diagnosis, classification (with Hodgkin's disease, leukaemias as and other causes of death) and, hence, certification [33]. Whether improved diagnosis and certification largely explains the extent of the upward trends, or whether there are other relevant causes of the systematic increase in non-Hodgkin's lymphomas observed in most countries over the world, remains presently an open issue [33–35].

#### *Multiple myeloma (Table 5)*

This is another lymphohaemopoietic neoplasm showing substantial and systematic upward trends in certified mortality in the elderly in most areas of the world. Since diagnosis and hence certification of multiple myeloma substantially

improved after the introduction of serum electrophoresis and other new diagnostic techniques, it is unclear how much of the increase is real and how much is due to changed criteria of classification [1, 36]. Indeed, countries such as Sweden or Norway, where better diagnostic procedures for the disease have been in place for longer, showed a tendency towards levelling of death certification rates over the last decade (data not shown).

#### *Leukaemias (Table 5)*

Certified mortality for leukaemias in elderly males and females increased appreciably in most countries across the calendar period considered. These generalised rises registered for elderly males and females in most areas of the world are at least partly attributable to improved diagnosis and certification, and a levelling off, or even a decline of rates, was observed in several countries. Nevertheless, leukaemia mortality rates in the early 1990s were higher than in the 1950s in all countries considered, except New Zealand and Bulgarian females. It is possible that some of the (mostly recent) declines observed in Norway, Sweden and Finland are due to improved treatment of the disease, but the interpretation of this pattern remains open to discussion [37].

#### *All neoplasms, benign and malignant (Table 6 and Figure 6)*

Certified mortality for all neoplasms for populations aged 65 to 84 years showed a heterogeneous pattern in the two sexes and various geographical areas. In general, trends were systematically more favourable for females than for males, reflecting the earlier and more extensive lung cancer (and other tobacco-related neoplasms) epidemic in elderly males, in addition to the widespread decline of cervical cancer in females.

In several countries, particularly from western Europe (but also Japan), the trends in both sexes were more favourable over the last one or two decades than in earlier calendar periods. Furthermore, some areas of northern and central Europe, including among others Finland, Austria, Switzerland and Germany, as well as Argentina, showed stable or even favourable trends over time for total cancer mortality in both sexes.

This reflects the different pattern of the tobacco-related (lung) cancer epidemic in various countries, as well as the role of a few other major neoplasms, including in particular the generalised downward trends in stomach cancer rates.

In contrast, rates were moderately upwards for males in North America. Furthermore, several countries of southern and eastern Europe, whose rates in the 1950s and 1960s were relatively low, showed appreciable upward trends, mostly in males, with a general tendency towards a levelling of the differences in overall registered cancer mortality in elderly population in various areas of the world.

The heterogeneous pattern of trends in various countries and in the two sexes contrasts with the generalised increase in the number of certified cancer deaths in elderly population over the last four decades, which is essentially attributable to the aging of the population, and hence to the increased number of elderly. These absolute numbers of deaths from all cancers are a major factor on a health care and public health level, and are therefore given in parentheses in Table 6.

## DISCUSSION

It is important to stress the limits and uncertainties of cancer death certification and their trends over time, particularly for

Table 5. Age-standardised (65-84 years, world standard) death certification rates per 100000 from lymphohaemopoietic neoplasms in various countries, 1955-1992

Country	Hodgkin's disease						Lymphomas						Multiple myeloma						Leukaemias					
	Males			Females			Males			Females			Males			Females			Males			Females		
	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change	1955-1959	1990-1992	% Change
Austria	8.0	7.1	-11.2	4.6	4.0	-13.3	7.5	24.9	231.9	5.9	18.0	202.2	7.1*	15.1	110.9	5.7*	12.0	109.1	24.9	35.7	43.4	15.6	20.5	31.2
Belgium†	6.2	4.6	-25.4	2.6	2.2	-15.6	7.9	21.0	165.7	5.0	13.3	168.3	3.8	14.8	291.0	3.2	13.3	319.5	14.0	42.1	201.0	11.0	22.5	105.5
Bulgaria†	4.8*	2.5	-48.2	2.5*	1.7	-34.6	9.3*	9.6	2.8	5.6*	5.3	-4.0	2.3*	2.0	-15.0	1.5*	1.6	8.9	16.7	18.1	8.3	10.3	9.0	-13.0
Czechoslovakia	7.8	6.0	-23.0	4.7	3.2	-31.7	7.3	24.0	227.5	5.3	12.9	143.5	3.3	13.8	319.8	2.5	10.9	342.1	16.3	44.8	174.5	9.3	23.4	151.2
Denmark	5.5	3.7	-32.1	3.4	2.3	-33.0	16.2	45.1	178.3	12.0	28.5	137.3	15.8	21.6	36.6	10.0	14.6	45.9	34.7	45.7	31.6	22.3	22.7	1.7
Finland	4.6	3.4	-26.7	3.0	1.9	-35.3	11.9	37.6	215.9	4.9	29.4	494.5	3.8	23.3	509.9	4.6	17.3	273.4	10.6	33.1	212.7	7.6	17.4	129.9
France	3.7	2.3	-36.2	1.9	1.0	-48.7	6.0	29.4	392.3	3.6	18.1	399.4	1.8	15.0	756.0	1.4	11.6	743.1	12.6	38.5	204.8	7.5	20.6	175.5
Germany	4.9	4.3	-12.7	2.8	2.9	6.2	5.3	25.8	384.4	3.4	17.0	403.6	10.7*	17.6	64.5	7.5*	12.5	66.9	18.7	40.8	118.1	11.0	22.5	103.6
Greece†	4.9	5.9	20.7	2.7	3.3	21.4	5.5*	9.7	76.8	2.9*	7.5	159.7	6.2†	9.3	50.4	3.1†	8.5	176.5	26.2	37.3	42.4	16.2	16.9	4.5
Hungary	4.2				2.7			23.9			14.3			12.4			9.4		17.0	45.9	170.1	8.8	26.9	204.9
Ireland	3.5	2.4	-33.6	2.4	1.7	-30.2	3.2	33.9	955.5	1.9	23.4	1106.2	2.0	31.0	1471.1	2.8	16.1	482.3	9.2	39.5	328.0	5.6	23.7	324.4
Italy	5.9	3.9	-34.1	3.8	1.9	-49.6	9.6	27.7	189.0	5.6	18.6	230.7	2.0	17.3	777.2	1.5	12.2	740.7	11.0	42.2	284.0	6.5	22.8	252.5
The Netherlands	4.1	2.5	-37.9	2.6	1.5	-41.4	12.9	37.5	190.0	7.5	24.0	218.3	12.4	23.1	87.2	8.0	17.5	120.4	20.7	38.4	85.4	14.5	19.9	37.1
Norway	5.3	1.6	-69.3	3.6	1.0	-73.6	14.0	35.8	155.3	9.5	22.5	137.6	19.9	27.8	40.3	10.2	21.3	109.3	26.4	31.1	17.8	15.8	16.7	5.1
Poland	3.2†	5.1	60.3	1.5†	2.7	78.1	3.7†			2.2†			1.7†				0.9†		12.5	36.5	193.1	7.5	19.7	162.3
Portugal	1.6				1.6			19.4			12.8			12.5			10.6		8.1	29.3	263.6	6.5	16.2	149.5
Romania	3.0*	2.5	-16.6	1.8*	1.4	-22.3												10.3	18.6	80.5	4.3	9.8	128.0	
Spain	2.9	2.4	-17.7	1.7	2.2	32.7	1.8	19.7	1015.3	1.3	13.1	919.5	0.3	15.5	5450.0	0.1	10.4	7876.9	4.8	28.9	507.6	3.6	16.4	361.0
Sweden	7.5	1.9	-75.2	4.4	0.8	-82.5	9.2	34.4	273.8	8.0	23.1	188.5	12.9	25.6	99.5	10.1	18.9	86.5	26.2	32.6	24.1	15.4	18.0	16.8
Switzerland	3.9	3.3	-14.3	3.4	2.2	-35.7	14.7	50.9	246.0	9.7	31.5	223.0	9.5	24.8	162.3	5.8	14.6	152.4	22.3	37.0	65.6	13.3	20.8	55.5
U.U.K., England and Wales	5.1	1.7	-66.4	2.8	1.7	-40.8	10.0	32.3	222.9	7.0	21.5	205.8	5.6	20.4	264.0	4.9	14.5	197.5	16.0	31.5	97.2	11.2	17.3	54.7
U.U.K., Scotland	5.2	2.3	-54.7	3.4	1.9	-44.0	11.1	34.7	212.7	8.8	22.9	161.2	6.5	18.1	179.6	5.8	11.8	102.2	18.0	30.1	67.0	9.4	17.0	81.4
Yugoslavia, former†	2.9	3.3	13.6	1.7	2.1	21.1	7.4	11.4	53.2	4.7	8.1	73.0	1.3	6.6	423.8	1.0	6.2	527.6	11.8	26.3	123.2	6.2	14.3	131.0
Canada	4.8	2.5	-47.9	3.5	1.7	-50.9	29.6*	38.1	29.0	21.5*	28.4	31.6	14.8*	24.5	65.7	12.0*	14.8	23.5	21.6	42.1	95.1	15.4	21.7	41.3
U.S.A.	6.3	2.0	-67.8	3.9	1.5	-61.2	19.3*	41.6	115.6	14.0*	29.0	108.0	15.4*	23.4	51.6	10.5*	15.4	47.1	32.5	43.8	34.7	19.3	22.9	18.8
Argentina*																								
Costa Rica†																								
Uruguay																								
Venezuela†	3.0	4.4§	48.0	2.2	2.6§	21.1		9.9§			7.8§			9.7§			5.3§		4.4	15.3	248.9	5.3	11.9	124.6
Hong Kong†,†	1.9	0.4	-77.8	0.4	0.2	-65.9	23.6*	19.7	-16.8	9.0*	12.1	33.6	6.1*	8.7	42.7	2.0*	5.3	166.5	3.9	14.4	271.0	3.7	9.9	164.9
Japan	3.3	0.4	-87.2	1.6	0.2	-89.4	10.9*	25.5	134.2	5.4*	12.9	137.2	3.6*	10.7	197.8	2.1*	7.4	252.1	3.5	18.8	441.1	2.4	10.2	328.6
Australia	6.6	1.6	-76.5	3.4	1.6	-53.3	28.4*	39.7	39.6	21.2*	30.3	43.3	12.2*	20.7	70.0	7.3*	14.7	102.5	24.9	38.9	56.4	17.8	21.5	21.0
New Zealand	2.3	1.6	-28.9	5.3	2.2	-58.5	31.8*	37.1	16.4	25.7*	27.1	5.6	15.4*	23.0	49.5	8.6*	15.0	74.6	41.2	37.7	-8.5	27.6	23.3	-15.6

\* Rates for 1965-1969 only available; † rates for 1960-1964 only available; ‡ rates for 1985-1989 only available; § rates for 1980-1984 only available.



Table 6. Age-standardised (65–84 years, world standard) death certification rates per 100000 and average number of deaths ( $\times 1000$ ) per year from all neoplasms in various countries, 1955–1992

	Total all sites									
	Males					Females				
	1955–1959		1990–1992		% Change	1955–1959		1990–1992		% Change
	Rate	<i>n</i> (× 1000)	Rate	<i>n</i> (× 1000)		Rate	<i>n</i> (× 1000)	Rate	<i>n</i> (× 1000)	
Austria	1486.0	(4.83)	1355.6	(5.76)	–8.8	929.3	(4.67)	737.8	(5.87)	–20.6
Belgium‡	1150.4	(5.29)	1658.7	(9.48)	44.2	820.6	(5.03)	705.0	(6.31)	–14.1
Bulgaria‡	1059.1	(3.01)	875.5	(4.42)	–17.3	625.1	(2.24)	489.1	(3.16)	–21.7
Czechoslovakia	1234.0	(5.61)	1679.9	(11.78)	36.1	777.0	(5.00)	817.6	(9.47)	5.2
Denmark	1208.0	(2.60)	1494.6	(5.02)	23.7	956.6	(2.35)	936.6	(4.29)	–2.1
Finland	1411.8	(1.56)	1294.8	(3.18)	–8.3	810.8	(1.55)	650.1	(2.94)	–19.8
France	1184.6	(23.26)	1431.2	(47.18)	20.8	729.4	(24.01)	583.6	(29.32)	–20.0
Germany	1268.3	(28.27)	1399.5	(58.25)	10.3	906.6	(27.54)	760.8	(62.68)	–16.1
Greece†	898.3	(2.76)	1147.8	(7.24)	27.8	471.4	(1.88)	501.3	(4.08)	6.3
Hungary	1063.7	(3.74)	1730.4	(9.20)	62.7	775.6	(3.72)	877.0	(7.72)	13.1
Ireland	940.8	(1.45)	1428.9	(2.51)	51.9	680.7	(1.11)	823.8	(1.91)	21.0
Italy	906.7	(17.19)	1525.1	(51.87)	68.2	640.9	(15.71)	673.1	(34.96)	5.0
The Netherlands	1122.9	(5.12)	1617.6	(12.58)	44.1	831.6	(4.23)	724.8	(8.45)	–12.8
Norway	945.7	(1.55)	1217.8	(3.61)	28.8	682.6	(1.38)	680.6	(2.74)	–0.3
Poland	714.1	(4.36)	1433.5	(20.24)	100.8	494.7	(4.91)	688.6	(16.35)	39.2
Portugal	677.1	(1.68)	1119.1	(6.17)	65.3	460.7	(1.78)	567.8	(4.55)	23.2
Romania	805.0	(3.98)	809.3	(7.92)	0.5	527.8	(3.75)	453.3	(6.28)	–14.1
Spain	819.9	(7.82)	1317.7	(28.11)	60.7	530.3	(7.32)	540.8	(17.08)	2.0
Sweden	986.4	(3.83)	1081.6	(7.32)	9.7	740.6	(3.32)	692.0	(6.06)	–6.6
Switzerland	1329.8	(2.87)	1381.4	(5.67)	3.9	831.1	(2.52)	677.7	(4.15)	–18.5
U.K., England and Wales	1268.1	(25.93)	1513.1	(49.88)	19.3	715.3	(22.99)	860.1	(40.51)	20.2
U.K., Scotland	1324.5	(2.85)	1665.7	(4.93)	25.8	817.1	(2.61)	941.8	(4.33)	15.3
Yugoslavia, former†	713.7	(3.45)	1097.6	(9.55)	53.8	439.2	(3.10)	579.5	(7.76)	32.0
Canada	1009.6	(6.34)	1356.6	(17.60)	34.4	718.1	(4.56)	754.6	(13.22)	5.1
U.S.A.	987.6	(68.17)	1306.1	(162.04)	32.2	661.6	(54.02)	754.1	(133.91)	14.0
Argentina*	1302.8	(9.57)	1124.9	(13.81)	–13.7	758.8	(6.29)	631.4	(10.60)	–16.8
Costa Rica†	1093.7	(0.22)	1106.3	(0.66)	1.1	839.1	(0.17)	672.1	(0.46)	–19.9
Uruguay	1287.0	(1.08)	1537.4	(2.24)	19.5	840.8	(0.86)	758.5	(1.55)	–9.8
Venezuela‡	626.7	(0.42)	720.8	(2.02)	15.0	642.8	(0.59)	532.4	(1.78)	–17.2
Hong Kong‡,‡	791.1	(0.12)	1230.9	(2.29)	55.6	470.8	(0.16)	650.4	(1.62)	38.1
Japan	950.3	(19.84)	1213.8	(76.84)	27.7	587.3	(16.22)	532.8	(50.80)	–9.3
Australia	1008.0	(3.56)	1280.9	(10.74)	27.1	643.1	(2.90)	676.1	(7.43)	5.1
New Zealand	1058.1	(0.97)	1338.4	(2.11)	26.5	687.8	(0.75)	820.3	(1.72)	19.3

\* Rates for 1965–1969 only available; † rates for 1960–1964 only available; ‡ rates for 1985–1989 only available; § rates for 1980–1984 only available.

the elderly. Although the exact influence of changed certification accuracy over time on trends in cancer rates in various areas of the world is uncertain, undoubtedly this has implied some systematic upward trends over time, following generalised improvement of diagnosis and certification of selected cancer sites, including particularly prostate and multiple myeloma [1].

Brain cancer was not included in this analysis because of (i) major difficulties in classifying and distinguishing malignant, benign and undefined malignancy brain cancers at death, particularly in the elderly [111], (ii) the impact of a newer diagnostic technology and changed attitudes towards the elderly in the medical environment [38, 39] and (iii) the relatively modest impact in absolute terms of even substantial proportional rises in brain cancer rates in overall cancer mortality in the elderly [13, 14].

These cautions notwithstanding, it is clear that there is no

single and simple pattern of cancer mortality in the elderly in various areas of the world, aside the major impact of the widespread epidemic of lung cancer and other tobacco-related sites at its various phases [40]. Other established or likely risk factors for selected cancer sites, such as alcohol (for cancers of the upper digestive and respiratory tract), improved food storage and preservation (for the generalised declines in gastric cancer), changes in diet composition (for intestines, other digestive sites, breast, prostate and possibly a few other sites), and a generalised influence of improved socio-economic and lifestyle habits in selected countries considered have also somewhat influenced the observed cancer trends [41, 42]. However, the role of each one of these factors is less clearly discernible on national mortality trends as compared to the impact of smoking on lung and other tobacco-related sites.

A further common pattern is a systematic tendency towards increasing certified cancer mortality in the elderly—and parti-

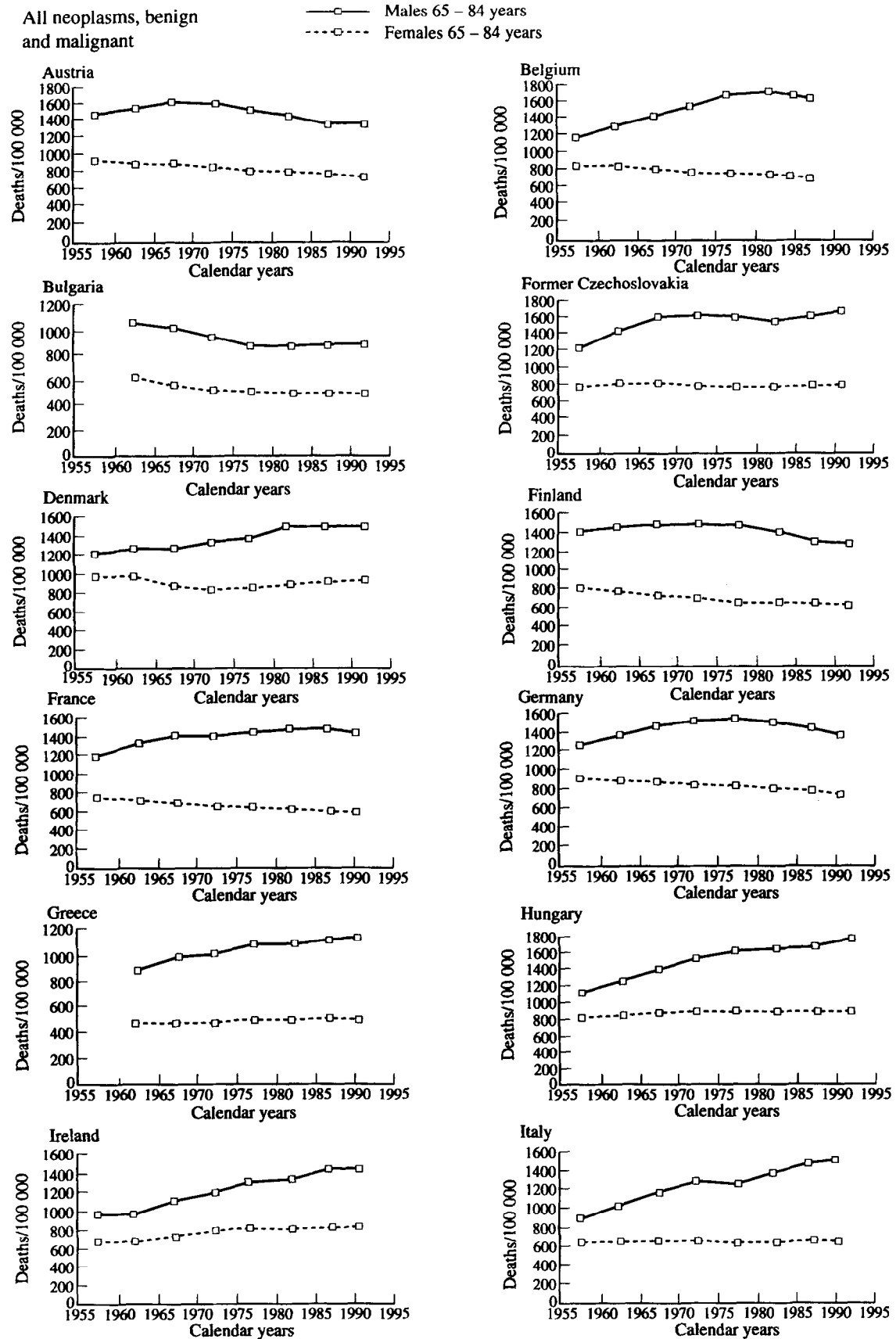


Figure 6 (a).

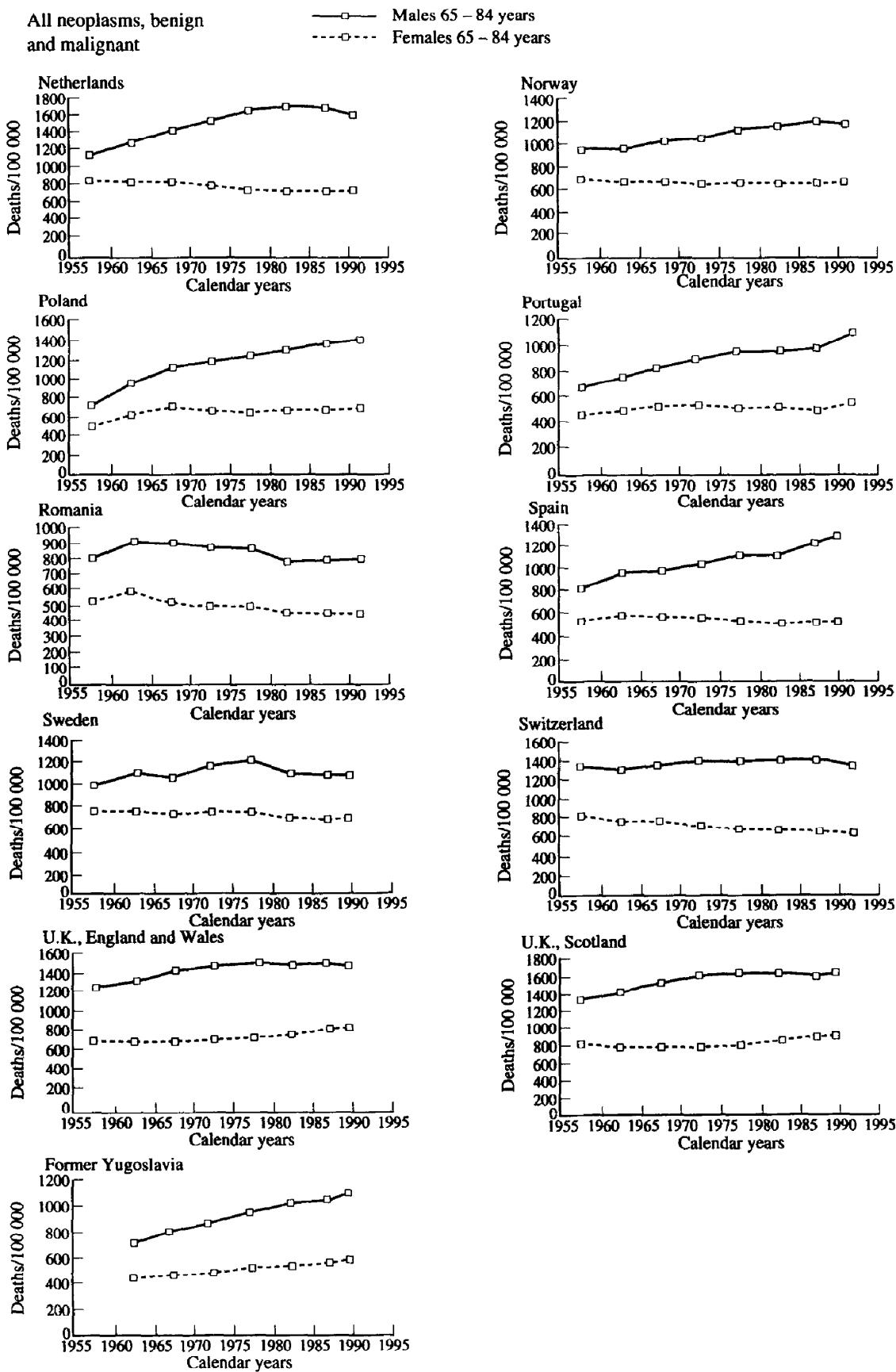


Figure 6 (b).

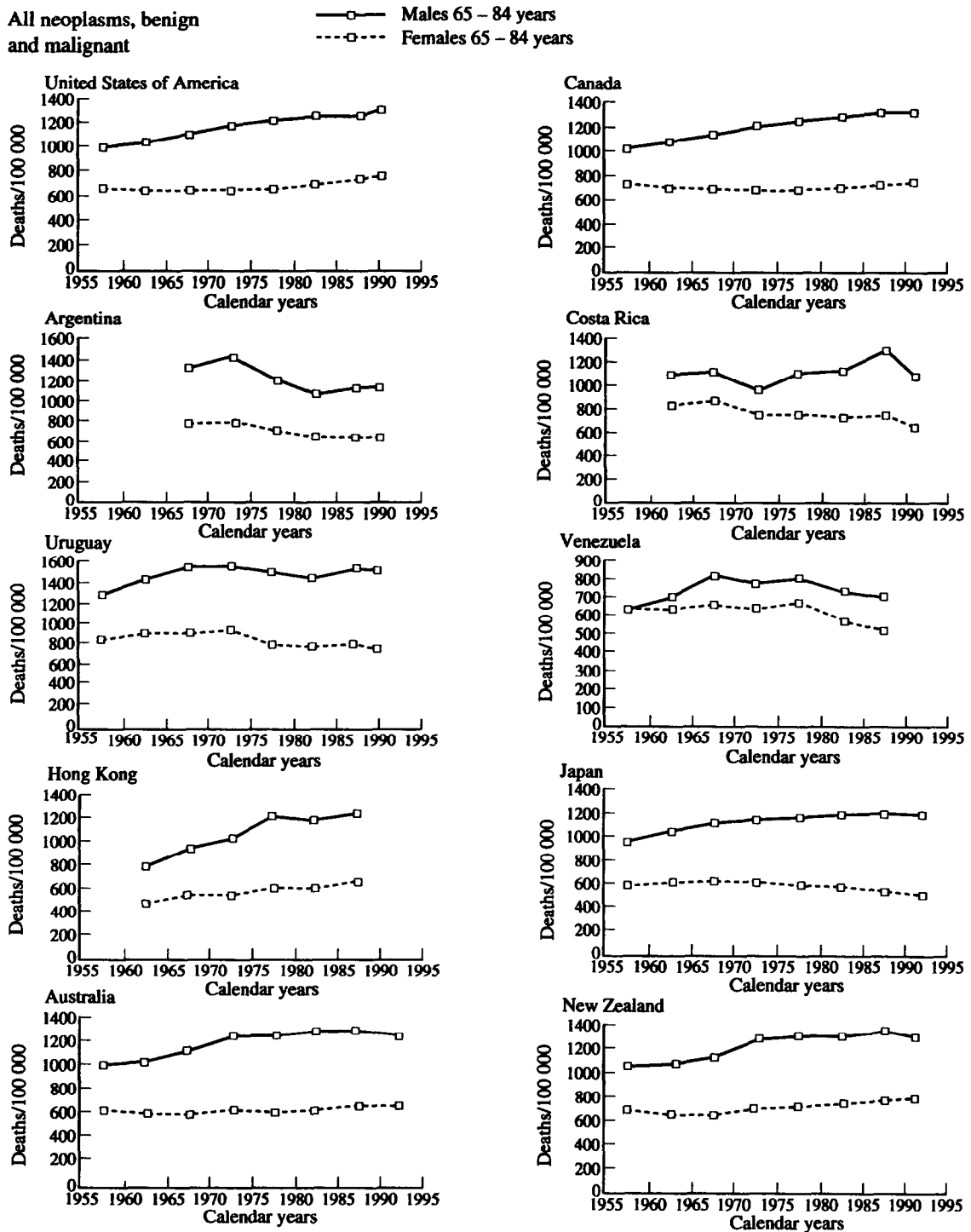


Figure 6 (c).

Figure 6. Trends in age-standardised (65–84 years, world standard) death certification rates from all neoplasms in various countries, 1955–1992.

cularly in elderly males—in areas where rates were lower in the 1950s and 1960s, thus leading to a levelling of differences in cancer mortality values in various areas of the world.

Finally, there is the presence of a more favourable pattern in females, whose lung cancer epidemic in the elderly is still in its early phases in most countries, and for whom the downward trends in stomach and cervical cancer mortality are particularly relevant. Furthermore, trends in several other

major cancer sites, and particularly other tobacco-related sites and the intestines, were generally more favourable for females in most countries. This probably reflects different patterns of exposure in the two sexes, not only to tobacco, but also to other relevant risk factors for major cancer sites, such as diet, alcohol and other environmental and lifestyle habits.

In conclusion, even in the elderly and after expressing the due cautions on death certification reliability particularly in

this age group [43], there is no widespread and generalised upward trend in cancer mortality, with a major exception of substantial increases in lung and other tobacco-related neoplasms.

Age-standardised cancer rates in the elderly, however, have essentially an epidemiological interest. On a public health scale, in contrast, the aging of the population and hence the increased proportion and number of elderly people in all (developed) countries imply *per se* an increased number of cancer cases in the elderly, and hence a substantially increased health care and socio-economic burden [44–46].

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