

Original article

Trends in cancer incidence and mortality in Vaud, Switzerland, 1974–1993

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Summary

Background: Comparing incidence of and mortality from cancer within a given population yields several benefits. One of these is the opportunity, when trends in incidence differ from those in mortality, to derive inferences about the potential role of improved diagnosis in the rise of incidence rates, and about therapeutic advancements in reducing mortality.

Materials and methods: Trends in incidence of and mortality from various cancers or groups of cancers (comprising 55,682 new malignant tumours and 26,528 certified cancer deaths) over the period 1974–1993 were compared using, respectively, data from the Cancer Registry of the Swiss Canton of Vaud (with about 600,000 inhabitants) and those provided by the Swiss Federal Statistical Office.

Results: The overall cancer incidence increased by 10% to 30% in both sexes and various age groups, whereas mortality

remained approximately the same. The sites primarily responsible for these divergent trends were breast, prostate and colorectal, three sites where cancers have been less frequently diagnosed since the advent of certain technical advancements and the introduction of screening. Other contributors to the divergent trends were testicular cancer, Hodgkin's disease and leukaemias, i.e., the sites for which the most substantial therapeutic advancements have been achieved.

Conclusions: These data are fairly reassuring, since they are inconsistent with an ongoing cancer epidemic in this European population. However, they are also incompatible with the presence of major advancements in the prevention and treatment of cancer.

Key words: cancer, epidemiology, incidence, mortality, registry, time trends

Introduction

There are several reasons to compare incidence of and mortality from cancer in the same well-defined population. When trends in incidence differ from those in mortality, in fact, it is possible to infer the probable role of improved diagnosis in increasing incidence rates, and the one of therapeutic advancement in reducing mortality [1–12].

Similar comparisons, however, are possible in only a few populations. One of these is that of the Swiss Canton of Vaud, a particularly favourable environment for monitoring incidence, where a cancer registry has been in operation since 1972, and has employed an integrated and homogeneous scheme for cancer registration, follow-up and death certification [3, 13, 14]. This paper systematically reviews trends in cancer incidence and mortality for major sites in this population of about 600,000 inhabitants.

Materials and methods

Since 1972, the Vaud Cancer Registry has been collecting data concerning incidence, mortality and survival with respect to malignant neoplasms in the population of the Canton. The registration scheme was successively implemented during the Registry's first few years. Thus, reliable data have been available since the mid-1970s, and

have been sequentially published in *Cancer Incidence in Five Continents* since Volume IV [14–16].

Information routinely collected includes sociodemographic characteristics, primary site and histological type of the tumours according to the International Classification of Diseases (ICD) for Oncology [17] and time of diagnostic confirmation. Passive and active follow-up are undertaken, and each subsequent item of information is used to complete the individual records [18]. Information from death certificates is routinely integrated in the data file; cases known only through death certificate amount to fewer than 5% of the average number of cases registered per year. Overall histological confirmation exceeds 90%. The registry is tumour-based and multiple primaries occurring in one person are entered separately.

Death certification numbers by cause and estimates of the resident population, stratified by sex and quinquennia of age, were abstracted from files provided by the Swiss Federal Statistical Office. All certified deaths from cancer (ICD-8th Revision: 140–207) were grouped in 32 categories, aside from total cancer mortality and a broad group including 'other and unspecified'. In particular, we grouped together all colorectal sites, all malignant neoplasms of brain and nerves, and all leukaemias and non-Hodgkin's lymphomas. To facilitate comparisons, the same classification and grouping were adopted for incidence and mortality data.

The present series comprises all new malignant tumours (29,131 in males, 26,551 in females) registered and all deaths (15,082 in males, 11,446 in females) certified from 1974 to 1993 in the resident population of the Canton. Incidence and mortality rates were grouped into two five-year periods, from 1974–1978 to 1989–1993, to reduce random variation.

All age and 35- to 64-year age-standardized rates (based on the standard world population [19]), were chosen for presentation to provide summary statistics, and also because of random variations in age- and cohort-specific rates.

Results and comments

Trends in overall- and 35–64-year age-standardized (based on the world population) incidence and mortality from major cancers or groups of cancers in the two sexes are considered in the text. Age-standardized incidence and mortality rates per 100,000 population in the two extreme 5-year calendar periods, and the corresponding percent changes are given in Table 1 for males and Table 2, for females. Corresponding data for mortality are given in Tables 3 and 4.

Digestive sites. There were substantial increases in oral and pharyngeal cancer incidence for young and middle-aged (35–64 years) males (from 41.2 in 1979–1983 to 52.8/100,000 in 1989–1993) and females (from 9.1 to 13.3/100,000) over the past two decades, which were partially, although not totally, reflected in mortality rates. In contrast, a greater decline was observed in oesophageal cancer mortality rates among young males (from 15.0 in 1979–1983 to 11.1/100,000 in 1989–1993) as compared to incidence (from 18.1 in 1979–1983 to 16.6/100,000 in 1989–1993). Incidence and mortality from stomach cancer declined in both sexes and various age groups, with the exception

Table 1. Age-standardized* (rates per 100,000 population; all ages and 35–64 years) registered incidence for selected cancers and groups of cancers in 1974–1978 (centered on 1976) and 1989–1993 (1991). Males, Vaud Cancer Registry, Switzerland.

| Anatomical site | ICD-8th rev. | Males all ages | | | Males 35–64 years | | |
|---|--|----------------|-----------|-------------------------|-------------------|-----------|-------------------------|
| | | 1974–1978 | 1989–1993 | 1976–1991 (% change) | 1974–1978 | 1989–1993 | 1976–1991 (% change) |
| Mouth or pharynx | 140-9 | 19.1 | 23.3 | 22.0 | 38.2 | 52.8 | 38.2 |
| Oesophagus | 150 | 8.7 | 9.2 | 5.7 | 13.3 | 16.6 | 24.8 |
| Stomach | 151 | 15.4 | 10.7 | -30.5 | 17.9 | 17.0 | -5.0 |
| Small bowel | 152 | 0.5 | 1.4 | 180.0 | 0.7 | 1.6 | 128.6 |
| Colorectum | 153-4 | 30.1 | 34.2 | 13.6 | 36.9 | 46.7 | 26.6 |
| Liver | 155 | 4.3 | 7.2 | 67.4 | 5.3 | 10.0 | 88.9 |
| Gallbladder and biliary tract | 156 | 1.7 | 2.1 | 23.5 | 2.0 | 2.7 | 34.3 |
| Pancreas | 157 | 6.5 | 9.0 | 38.6 | 11.3 | 13.8 | 22.1 |
| Nose, sinus and ear | 160 | 1.3 | 0.6 | -53.8 | 2.3 | 1.1 | -52.2 |
| Larynx | 161 | 6.4 | 6.2 | -3.1 | 12.5 | 12.6 | 0.8 |
| Trachea, bronchus and lung | 162 | 55.7 | 58.6 | 5.2 | 99.0 | 95.4 | -3.6 |
| Pleura and mediastinum | 163 | 0.6 | 0.7 | 16.7 | 1.3 | 1.5 | 15.4 |
| Bone and joints | 170 | 1.2 | 1.3 | 8.3 | 1.6 | 1.6 | 0.0 |
| Connective and soft tissue sarcomas | 171 | 0.9 | 2.3 | 155.6 | 1.1 | 2.7 | 145.5 |
| Skin melanoma | 172 | 5.9 | 11.8 | 100.0 | 12.3 | 22.2 | 80.5 |
| Skin non melanoma | 173 | 58.5 | 106.2 | 81.5 | 89.0 | 146.5 | 64.6 |
| Breast | 174 | 0.6 | 0.8 | 33.3 | 0.7 | 1.3 | 85.7 |
| Prostate | 185 | 33.9 | 47.7 | 40.7 | 20.6 | 30.1 | 46.1 |
| Testis | 186 | 8.5 | 9.6 | 12.9 | 9.9 | 12.6 | 27.3 |
| Other genital (males) | 187 | 1.4 | 1.4 | 0.0 | 2.5 | 1.9 | -24.0 |
| Bladder | 188 | 11.6 | 14.9 | 28.4 | 16.9 | 17.1 | 1.2 |
| Kidney and other urinary sites | 189 | 6.0 | 9.2 | 53.3 | 10.5 | 13.6 | 29.5 |
| Eye | 190 | 1.0 | 0.8 | -20.8 | 2.2 | 1.3 | -40.9 |
| Brain and nerves | 191-2 | 5.0 | 6.9 | 37.7 | 6.9 | 10.3 | 49.3 |
| Thyroid | 193 | 1.2 | 1.6 | 33.3 | 2.5 | 2.7 | 8.0 |
| Other endocrine glands | 194 | 0.3 | 0.5 | 66.7 | 0.2 | 0.4 | 100.0 |
| Hodgkin's disease | 201 | 3.9 | 2.5 | -35.9 | 4.7 | 2.5 | -46.8 |
| Other lymphomas | 200, 202 | 5.3 | 10.1 | 90.6 | 2.9 | 15.4 | 431.0 |
| Multiple myeloma | 203 | 3.1 | 2.6 | -16.1 | 4.8 | 3.8 | -20.8 |
| Leukaemias | 204-7 | 8.7 | 8.1 | -6.9 | 10.2 | 10.9 | 6.9 |
| Other and unknown sites | O & U | 11.0 | 11.1 | 0.8 | 22.7 | 14.1 | -37.9 |
| Total, all sites | 140-207 | 318.3 | 412.6 | 29.6 | 462.9 | 582.8 | 25.9 |
| All sites (skin non-melanoma excl.) | (140-207)-173 | 259.8 | 306.3 | 17.9 | 373.9 | 436.3 | 16.7 |
| Total, tobacco-related sites | 140-9, 150, 157, 161-2, 188-9 | 114.0 | 130.4 | 14.4 | 201.7 | 221.9 | 10.0 |
| Total, non-tobacco-related sites (skin non-melanoma excluded) | 151-6, 158-60, 163-72, 174, 185-7, 190-207 | 145.8 | 175.9 | 20.6 | 172.2 | 214.4 | 24.5 |

* On the world standard population.

of middle-aged females, whereas the pattern was heterogeneous for intestinal cancer, with rises in incidence but modest declines in mortality. Overall, intestinal cancer incidence increased by 17.7% in males (from 30.6 to 35.6/100,000) and by 14.2% (from 20.2 to 23.0/100,000) in females, while mortality rates declined by 2.7% (from 18.5 to 18.0/100,000) in males, and by 20% (from 12.1 to 9.7/100,000) in females. No consistent trends were apparent for gallbladder cancer incidence, whereas mortality declined from 2.1 in 1979–1983 to 1.6/100,000 males in 1989–1993, and from 2.7 to 1.7/100,000 females. A tenden-

cy to a slight but steady increase was observed for both incidence and mortality rates for pancreatic cancer.

Respiratory sites. The trends for laryngeal and lung cancer in the two sexes were similar in several aspects for incidence and mortality. Male lung cancer rates, in particular, increased up to the early 1980s, and declined thereafter, particularly at younger and middle age, whereas lung cancer incidence and mortality in females increased steadily. Declines were observed for laryngeal cancer in males, especially with respect to mortality (–41%, from 4.1 in 1976 to 2.4/100,000 in

Table 2. Age-standardized* (rates per 100,000 population; all ages and 35–64 years) registered incidence for selected cancers and groups of cancers in 1974–1978 (centered on 1976) and 1989–1993 (1991). Females, Vaud Cancer Registry, Switzerland.

| Anatomical site | ICD-8th rev. | Females all ages | | | Females 35–64 years | | |
|---|---|------------------|-----------|-------------------------|---------------------|-----------|-------------------------|
| | | 1974–1978 | 1989–1993 | 1976–1991 (% change) | 1974–1978 | 1989–1993 | 1976–1991 (% change) |
| Mouth or pharynx | 140-9 | 2.7 | 5.6 | 107.4 | 4.7 | 13.3 | 183.0 |
| Oesophagus | 150 | 1.5 | 2.2 | 46.7 | 2.1 | 3.2 | 52.4 |
| Stomach | 151 | 6.9 | 4.1 | –40.6 | 8.6 | 4.9 | –43.0 |
| Small bowel | 152 | 0.2 | 1.1 | 450.0 | 0.2 | 2.4 | 1100.0 |
| Colorectum | 153-4 | 20.0 | 21.9 | 9.4 | 25.9 | 29.7 | 14.7 |
| Liver | 155 | 1.1 | 1.6 | 45.5 | 2.0 | 1.2 | –40.3 |
| Gallbladder and biliary tract | 156 | 2.6 | 2.3 | –11.5 | 3.2 | 2.9 | –9.4 |
| Pancreas | 157 | 3.9 | 5.6 | 43.6 | 4.5 | 7.5 | 66.7 |
| Nose, sinus and ear | 160 | 0.2 | 0.4 | 100.0 | 0.2 | 0.5 | 150.0 |
| Larynx | 161 | 0.5 | 0.9 | 80.0 | 1.2 | 1.6 | 33.3 |
| Trachea, bronchus and lung | 162 | 6.6 | 12.6 | 90.9 | 13.7 | 24.3 | 77.4 |
| Pleura and mediastinum | 163 | 0.2 | 0.3 | 50.0 | 0.5 | 0.3 | –40.0 |
| Bone and joints | 170 | 0.6 | 0.2 | –66.7 | 0.2 | 0.4 | 100.0 |
| Connective and soft tissue sarcomas | 171 | 1.6 | 1.8 | 12.5 | 2.6 | 3.5 | 34.6 |
| Skin melanoma | 172 | 7.1 | 13.1 | 84.5 | 12.2 | 26.5 | 117.2 |
| Skin non melanoma | 173 | 34.0 | 80.6 | 137.0 | 51.9 | 139.2 | 168.2 |
| Breast | 174 | 60.0 | 85.5 | 42.5 | 128.1 | 194.5 | 51.8 |
| Cervix uteri | 180 | 13.1 | 6.6 | –49.6 | 30.5 | 13.5 | –55.7 |
| Corpus uteri | 182 | 14.9 | 12.5 | –16.1 | 31.4 | 23.5 | –25.2 |
| Ovaries | 183 | 10.1 | 9.2 | –8.9 | 22.8 | 17.9 | –21.5 |
| Other genital (females) | 184 | 2.1 | 2.0 | –4.3 | 2.7 | 3.9 | 44.4 |
| Bladder | 188 | 2.5 | 3.2 | 28.0 | 3.1 | 4.0 | 29.4 |
| Kidney and other urinary sites | 189 | 3.2 | 5.0 | 56.6 | 5.0 | 7.8 | 55.7 |
| Eye | 190 | 0.5 | 0.8 | 60.0 | 1.4 | 0.5 | –64.3 |
| Brain and nerves | 191-2 | 4.5 | 4.7 | 4.4 | 6.5 | 8.8 | 35.4 |
| Thyroid | 193 | 3.9 | 3.9 | 0.0 | 6.3 | 5.8 | –7.9 |
| Other endocrine glands | 194 | 0.1 | 0.2 | 100.0 | 0.2 | 0.2 | 0.0 |
| Hodgkin's disease | 201 | 2.2 | 2.0 | –8.6 | 3.5 | 1.8 | –48.6 |
| Other lymphomas | 200, 202 | 4.0 | 6.6 | 64.6 | 2.4 | 11.3 | 370.8 |
| Multiple myeloma | 203 | 1.7 | 2.4 | 41.2 | 2.0 | 3.8 | 89.1 |
| Leukaemias | 204-7 | 4.8 | 4.5 | –6.3 | 5.5 | 4.4 | –20.0 |
| Other and unknown sites | O & U | 8.1 | 6.9 | –14.8 | 15.7 | 8.0 | –49.0 |
| Total, all sites | 140-207 | 225.4 | 310.3 | 37.7 | 400.8 | 571.1 | 42.5 |
| All sites (skin non-melanoma excl.) | (140-207)-173 | 191.5 | 229.7 | 19.9 | 348.9 | 431.9 | 23.8 |
| Total, tobacco-related sites | 140-9, 150, 157, 161-2, 188-9 | 20.9 | 35.1 | 68.0 | 34.3 | 61.7 | 79.9 |
| Total, non-tobacco-related sites (skin non-melanoma excluded) | 151-6, 158-60, 163-72, 174, 179-84, 190-207 | 170.6 | 194.6 | 14.1 | 314.6 | 370.2 | 17.7 |

* On the world standard population.

Table 3. Age-standardized* (rates per 100,000 population; all ages and 35–64 years) certified mortality from selected cancers and groups of cancers in 1974–1978 (centered on 1976) and 1989–1993 (1991). Males, Vaud Cancer Registry, Switzerland.

| Anatomical site | ICD-8th rev. | Males all ages | | | Males 35–64 years | | |
|-------------------------------------|---------------------------------------|----------------|-----------|-------------------------|-------------------|-----------|-------------------------|
| | | 1974–1978 | 1989–1993 | 1976–1991 (% change) | 1974–1978 | 1989–1993 | 1976–1991 (% change) |
| Mouth or pharynx | 140-9 | 8.0 | 8.3 | 3.6 | 17.7 | 17.3 | -2.3 |
| Oesophagus | 150 | 8.7 | 7.7 | -11.5 | 11.6 | 11.1 | -4.3 |
| Stomach | 151 | 13.0 | 6.4 | -50.8 | 11.3 | 8.5 | -24.8 |
| Intestines, total | 152-4 | 18.5 | 18.0 | -2.6 | 19.4 | 16.9 | -12.9 |
| Liver | 155 | 4.5 | 7.1 | 57.8 | 6.8 | 9.8 | 44.1 |
| Gallbladder and biliary tract | 156 | 1.7 | 1.6 | -5.9 | 2.0 | 1.7 | -15.4 |
| Pancreas | 157 | 7.6 | 9.2 | 21.1 | 10.7 | 12.1 | 13.1 |
| Nose, sinus and ear | 160 | 1.1 | 0.3 | -72.7 | 1.6 | 0.0 | -99.4 |
| Larynx | 161 | 4.1 | 2.4 | -41.5 | 6.9 | 3.8 | -44.9 |
| Trachea, bronchus and lung | 162 | 45.1 | 49.9 | 10.6 | 68.0 | 75.0 | 10.3 |
| Pleura and mediastinum | 163 | 0.8 | 1.6 | 100.0 | 1.3 | 3.0 | 131.5 |
| Bone and joints | 170 | 0.3 | 0.6 | 100.0 | 1.1 | 0.9 | -18.2 |
| Connective and soft tissue sarcomas | 171 | 0.6 | 0.4 | -33.3 | 0.7 | 0.9 | 28.6 |
| Skin melanoma | 172 | 1.8 | 3.3 | 83.3 | 3.1 | 5.0 | 61.6 |
| Skin non melanoma | 173 | 0.8 | 1.1 | 37.5 | 1.2 | 0.7 | -41.7 |
| Breast | 174 | 0.4 | 0.2 | -50.0 | 0.4 | 0.2 | -50.0 |
| Prostate | 185 | 19.4 | 20.8 | 7.2 | 6.3 | 5.2 | -17.5 |
| Testis | 186 | 1.8 | 0.9 | -50.0 | 1.1 | 1.5 | 36.4 |
| Other genital (males) | 187 | 0.0 | 0.1 | 900.0 | 0.0 | 0.0 | - |
| Bladder | 188 | 7.1 | 7.9 | 11.3 | 7.3 | 6.0 | -17.7 |
| Kidney and other urinary sites | 189 | 3.6 | 3.8 | 5.6 | 4.6 | 4.2 | -8.7 |
| Eye | 190 | 0.3 | 0.2 | -33.3 | 0.7 | 0.0 | -98.6 |
| Brain and nerves | 191-2 | 4.6 | 4.3 | -6.5 | 6.4 | 7.3 | 14.1 |
| Thyroid gland | 193 | 0.4 | 0.3 | -25.0 | 0.4 | 0.6 | 50.0 |
| Other endocrine glands | 194 | 0.3 | 0.3 | 0.0 | 0.2 | 0.5 | 150.0 |
| Hodgkin's disease | 201 | 4.1 | 0.9 | -78.0 | 7.5 | 1.1 | -85.3 |
| All other lymphomas | 200, 202 | 1.7 | 4.9 | 188.2 | 1.1 | 4.8 | 336.4 |
| Multiple myeloma | 203 | 2.2 | 2.4 | 9.1 | 2.2 | 3.2 | 45.5 |
| Leukaemias | 204-7 | 6.3 | 5.3 | -15.9 | 7.0 | 4.9 | -30.1 |
| Other and unknown sites | O & U | 4.8 | 6.5 | 35.4 | 12.5 | 6.2 | -50.4 |
| Total, all sites | 140-207 | 173.6 | 176.7 | 1.8 | 221.1 | 200.1 | -9.5 |
| Total, tobacco-related sites | 140-9, 150, 157, 161-2, 188-9 | 84.2 | 89.2 | 5.9 | 126.8 | 129.5 | 2.1 |
| Total, non-tobacco-related sites | 151-6, 158-60, 163-74, 185-7, 190-207 | 89.4 | 87.5 | -2.1 | 94.3 | 70.6 | -25.1 |

* On the world standard population.

1991). Thus, the incidence/mortality ratio of laryngeal cancer increased from 1.6 to 2.6.

Skin, including melanoma. There were substantial rises in registered incidence of skin neoplasms (around or over 2-fold for non-melanomatous cancers in both sexes), particularly at younger and middle ages and in females. Trends in mortality were also appreciably upward for melanoma in both sexes, but discontinuous and only modestly upward for non-melanomatous neoplasms. This is not surprising, since these rates were based on much smaller numbers, and reliability of death certification for non-melanomatous skin cancer remains open for discussion.

Breast and female genital tract. Female breast cancer incidence rates showed substantial upward trends (with rises of 42.5% overall, and, particularly in middle age, of 52% from 128.1 to 194.5/100,000) over those of mortality, which since the early 1980s had showed some decline in younger and middle-aged (from 48.8 in 1981 to 40.3/100,000 in 1991). Thus, the incidence/mortality ratio increased from 3.1 to 4.8 at age 35–64, and from 2.8 to 3.8 at all ages. Downward trends were observed for uterine (50% decline for cervix, and 16% for corpus) and ovarian cancer incidences (-9%), and were somewhat larger for mortality (-29%).

Male genital tract. Incidence of cancer of the prostate increased steadily and appreciably, by over 40%, from 34 to 48/100,000 at all ages, mostly over the most

Table 4. Age-standardized* (rates per 100,000 population; all ages and 35–64 years) certified mortality from selected cancers and groups of cancers in 1974–1978 (centered on 1976) and 1989–1993 (1991). Females, Vaud Cancer Registry, Switzerland.

| Anatomical site | ICD-8th rev. | Females all ages | | | Females 35–64 years | | |
|-------------------------------------|--|------------------|-----------|-------------------------|---------------------|-----------|-------------------------|
| | | 1974–1978 | 1989–1993 | 1976–1991 (% change) | 1974–1978 | 1989–1993 | 1976–1991 (% change) |
| Mouth or pharynx | 140-9 | 1.1 | 1.8 | 63.6 | 1.2 | 3.4 | 183.3 |
| Oesophagus | 150 | 1.6 | 1.7 | 6.2 | 2.3 | 2.3 | 0.0 |
| Stomach | 151 | 4.9 | 3.1 | -36.7 | 4.8 | 4.2 | -12.5 |
| Intestines, total | 152-4 | 12.1 | 9.7 | -19.8 | 13.4 | 10.4 | -22.4 |
| Liver | 155 | 1.5 | 1.7 | 13.3 | 1.8 | 1.2 | -33.3 |
| Gallbladder and biliary tract | 156 | 2.2 | 1.8 | -18.2 | 2.6 | 1.2 | -53.8 |
| Pancreas | 157 | 4.5 | 5.4 | 20.0 | 4.1 | 6.8 | 65.9 |
| Nose, sinus and ear | 160 | 0.5 | 0.2 | -60.0 | 0.9 | 0.2 | -77.8 |
| Larynx | 161 | 0.2 | 0.2 | 0.0 | 0.4 | 0.2 | -50.0 |
| Trachea, bronchus and lung | 162 | 5.7 | 10.2 | 78.9 | 10.7 | 18.0 | 68.3 |
| Pleura and mediastinum | 163 | 0.2 | 0.5 | 150.0 | 0.4 | 0.9 | 125.0 |
| Bone and joints | 170 | 0.5 | 0.1 | -80.0 | 0.4 | 0.2 | -50.0 |
| Connective and soft tissue sarcomas | 171 | 0.5 | 0.5 | 0.0 | 0.6 | 0.9 | 50.0 |
| Skin melanoma | 172 | 1.6 | 1.8 | 12.5 | 2.7 | 3.2 | 18.5 |
| Skin non melanoma | 173 | 0.5 | 0.4 | -20.0 | 0.8 | 0.0 | -98.8 |
| Breast | 174 | 21.4 | 22.8 | 6.5 | 41.9 | 40.3 | -3.8 |
| Uterus, total (cervix and corpus) | 180, 182 | 7.5 | 5.3 | -29.3 | 14.1 | 6.6 | -53.2 |
| Ovaries | 183 | 7.7 | 5.5 | -28.6 | 14.8 | 7.6 | -48.6 |
| Other genital (females) | 184 | 0.9 | 0.8 | -11.1 | 1.1 | 0.9 | -18.2 |
| Bladder | 188 | 1.7 | 1.6 | -5.9 | 1.6 | 1.9 | 18.7 |
| Kidney and other urinary sites | 189 | 1.6 | 2.0 | 25.6 | 2.4 | 2.1 | -12.5 |
| Eye | 190 | 0.3 | 0.4 | 33.3 | 0.5 | 0.7 | 40.0 |
| Brain and nerves | 191-2 | 3.1 | 3.7 | 19.4 | 4.3 | 6.9 | 60.5 |
| Thyroid gland | 193 | 0.9 | 0.7 | -22.2 | 0.8 | 0.7 | -12.5 |
| Other endocrine glands | 194 | 0.4 | 0.2 | -50.0 | 0.6 | 0.5 | -16.7 |
| Hodgkin's disease | 201 | 2.5 | 0.5 | -80.0 | 4.7 | 0.9 | -80.9 |
| All other lymphomas | 200, 202 | 0.9 | 2.7 | 200.0 | 0.2 | 3.3 | 1550.0 |
| Multiple myeloma | 203 | 1.2 | 1.9 | 58.3 | 1.1 | 2.6 | 136.4 |
| Leukaemias | 204-7 | 3.9 | 3.2 | -17.9 | 4.2 | 2.6 | -38.1 |
| Other and unknown sites | O & U | 5.5 | 4.6 | -16.4 | 4.6 | 4.8 | 4.3 |
| Total, all sites | 140-207 | 97.1 | 95.0 | -2.2 | 144.0 | 135.5 | -5.9 |
| Total, tobacco-related sites | 140-9, 150, 157, 161-2, 188-9 | 16.4 | 22.9 | 39.7 | 22.7 | 34.7 | 52.9 |
| Total, non-tobacco-related sites | 151-6, 158-60, 163-74, 179-84, 190-207 | 80.7 | 72.1 | -10.7 | 121.3 | 100.8 | -16.9 |

* On the world standard population.

recent calendar period and among males below age 65. Overall mortality, however, was stable, and even somewhat in decline in younger age groups (from 7.5 in 1981 to 5.2/100,000 in 1991 at age 35–64). This indicates that the apparent increases in incidence are largely or totally attributable to more accurate diagnosis of the disease [20, 21]. Testicular cancer incidence also showed an upward trend, mostly over the most recent calendar period (from 8.2 in 1984–1988 to 9.6/100,000 in 1989–1993), whereas mortality tended to decline (from 1.8/100,000 in 1976 to 0.9/100,000 in 1991), probably in response to improved treatment of the disease [22].

Urinary tract. In males, after early increases, bladder cancer mortality rates tended to level off and decline

over recent years (from 9.2 in 1979–1983 to 7.9/100,000 in 1989–1993). Some decline in incidence was also observed, but only in younger- and middle-aged groups. A steady rise was observed for kidney cancer rates (for incidence, from 6.0/100,000 in 1974–1978 to 9.2/100,000 in 1989–1993 in males, and from 3.2 to 5.0/100,000 in females), except for mortality in the younger-middle aged group for both sexes over the most recent calendar periods (from 5.8 to 4.2/100,000 males and from 2.7 to 2.1/100,000 females, between 1986 and 1991, respectively).

Lympho-haemopoietic neoplasms. Hodgkin's disease rates declined in both sexes with respect to both incidence (by about 40% in males and 10% in females) and mortality (by about 80% in both sexes). While trends

in incidence are difficult to explain, although attributable at least in part to changes in diagnostic classification [23], the declines in mortality are largely due to improved treatment of the disease [22]. In contrast, incidence (90% increase in males) and mortality rates (3-fold increase in both sexes) from all other lymphomas were appreciably on the rise, although this may be partly due to changed criteria for diagnosis and classification among the lymphomas, and between lymphomas and chronic lymphoid leukaemias as well. Both incidence and mortality from multiple myeloma were stable (around 2–2.5/100,000 in 1989–1993), confirming the absence of steady epidemic rise from myeloma in this population [24]. For leukaemias, trends in mortality were generally more favourable than for incidence, probably reflecting some improvement in the treatment of the disease [22].

All neoplasms. There was a steady upward trend in certified incidence for all cancers over the past two decades, particularly in younger and middle age. Overall cancer incidence (excluding non-melanomatous skin cancers) increased by 18%, from 259.8 to 306.3/100,000 in males, and by 20%, from 191.5 to 229.7/100,000 in females, and by over 30% in both sexes, when non-melanomatous skin cancers were included. In contrast, mortality was stable at all ages in both sexes, and, if anything, declined in young and middle age (mostly in males, by 14%) over the past decade. Overall cancer mortality increased by 1.8% in males, and decreased by 2.2% in females. A large proportion of these diverging trends between incidence and mortality is attributable to the rising incidence but stable mortality for prostatic and breast cancers in males and females, and for colorectal cancer in both sexes, and to the few neoplasms, such as testicular cancer, Hodgkin's disease and leukaemias, where the impact of treatment on mortality has been noticeable. The remaining part is probably due to a wide spectrum of moderately heterogeneous trends for a number of different neoplasms, including, among others, intestines, stomach, skin, and cervix uteri.

Total cancer rates were also subdivided into the seven major tobacco-related sites (lung, oral cavity and pharynx, oesophagus, larynx, pancreas, bladder and kidney) and all other sites ('non-tobacco-related sites'). Among males, a greater increase in incidence (+21% at all ages, +25% at age 35–64) was observed for non-tobacco-related cancers, whereas mortality declined for non-tobacco-related cancers, mostly in middle age (–25%), but increased for tobacco-related ones (+6% at all ages, +2% at age 35–64). In females, both incidence and mortality increased substantially for tobacco-related sites, mostly in middle age (+80% incidence, +53% mortality), but declined by 11% to 17% for non-tobacco-related ones.

Discussion

This systematic analysis of trends in cancer incidence and mortality between 1974 and 1993 in a well-defined and uniformly controlled population has shown a substantial stability in death rates. This is due to a leveling off in the long-term increase of lung and other tobacco-related neoplasms, and to the relatively modest – as of now in absolute terms – increase in mortality from tobacco-related neoplasms in females.

Thus, the different pattern of the tobacco-related cancer epidemic in the two sexes and in various age groups is a major determinant of cancer rates in this population, and a simple distinction of major tobacco-related sites shows a much more favourable pattern of trends in both sexes, at least for mortality. With reference to specific cancer sites, some persisting upward trends in mortality (e.g., for oral and pharyngeal cancers in males, for pancreatic, kidney cancers or lymphomas) were counterbalanced by persisting declines in mortality from stomach cancer in both sexes, cervical cancer in females, as well as from testicular cancer, leukaemias, and Hodgkin's disease, i.e., the main sites where substantial therapeutic improvements have been achieved [22].

In contrast, overall cancer incidence increased by 20% to 30% in both sexes and various age groups. Two major determinants of these diverging trends have been identified, namely, breast and prostate cancers. This illustrates the impact of screening and diagnostic advancements on overall cancer rates over the last few decades [25]. In fact, breast cancer treatment has only moderately improved over the last calendar period considered [26], and prostate cancer therapy has seen only minor changes [27, 28]. The diagnosis of these neoplasms, in contrast, has largely improved, due to the introduction and widespread adoption of mammography [25], prostate-specific antigen (PSA) [29] and other diagnostic techniques.

Data from Washington State [30] and metropolitan Atlanta [31] indicate that mammography partly accounts for the increase in disease incidence, and the impact of mammography on breast cancer detection may reach 30% [32, 33]. Although the data are not totally consistent [34], indirect evidence of the influence of mammography on breast cancer incidence derives from the observation that breast cancer incidence rates are now consistently higher in North America, where mortality rates are higher in Britain and a few other European countries [35, 36]. If screening and earlier detection confer a survival benefit, screening may account not only for an early increase in incidence, but also for a subsequent decline in mortality, since the median survival for these neoplasms is relatively high [33, 37]. Thus, the recent apparent increases in the incidence of these neoplasms are probably largely or altogether artifactual.

A similar pattern, with increasing incidence but stable or declining mortality, has been observed for

colorectal cancer as well, although the divergence is smaller than for breast or prostate, and can also be attributed to the impact of screening on incidence, together with some improvement in survival [38].

Similar trends were observed in other developed countries. For instance between 1973 and 1989, cancer incidence in the United States increased by 20.2% in males and 22.6% in females, and mortality by only 5.9% in males and 6.2% in females [37]. Rises in cancer incidence were also observed in more recent Swedish cohorts, but they were not reflected in mortality trends [39].

In a sense, the present data are reassuring, since they are inconsistent with the existence of an ongoing cancer epidemic in this European population. However, they are also incompatible with the presence of major advancements in the prevention and treatment of cancer. More generally, after due consideration of the variable time lag between incidence and mortality for different neoplasms [37, 39], these data underscore the complementary nature of cancer incidence and mortality rates, and hence the importance of combining information derived from incidence and mortality in order to clarify the significance of complex underlying cancer trends at the population level.

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