Sex differentials in Swiss cancer mortality

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Introduction

Trends in cancer incidence and mortality are usually analysed in terms of age-specific or age-standardized rates for each sex separately and, although inter-sex differences are occasionnally considered and discussed, relatively little attention has been paid to systematic consideration of trends in sex ratios. The latter statistic, although clearly a relative rather than an absolute measure, has some obvious interesting property for the purpose of aetiological inferences, since it is unlikely to be substantially affected by changes in certification accuracy or reliability of information on exposure to risk factors.

Historically, a systematic revision of sex ratios in mortality from cancer of the upper digestive tract in France (1) has provided important clues to the definition of the major role of alcohol on the risk of oesophageal or gastric cardia as compared to other localizations in the stomach.

More recently, the observation that lung cancer in the United States, once largely restricted to males, is becoming the first cause of cancer death in women (2) has been taken as a further confirmation of the determinant role of smoking in this neoplasm, independently from any other intrinsic or environmental risk factor. Along the line of hypothesis generation, the observation that mortality from cancer of the intestines has been declining in American females but not in males may well open interesting perspectives of research (3,4).

It is important, moreover, that data and inferences from a situation are not acritically applied to other countries. For instance, the observation that the lung is now becoming the leading site of cancer death among American women has general implications in terms of risk assessment, but, on a public health scale, should not be simply applied to Switzerland (5), France (6) or various other European countries (7), where there is still an over fourfold difference between mortality from cancer of the breast and of the lung in females.

Thus, in this paper, we present trends in sex ratios in mortality from major cancer sites in Switzerland over recent decades. These data are discussed in terms of trends in exposures to known or potential risk factors, and are confronted with information on differential survival from cancer in the two sexes based on the Cancer Registry of the Canton of Vaud.

Materials and methods

Cancer death certifications by site, stratified for sex and quinquennium of age for the period 1951–1984 were abstracted from files kindly provided by the Swiss Federal Office of Statistics.

All cancer deaths were recoded according to the Eighth Revision of the International Classifications of Diseases (ICD) and all cancers or groups of cancers were grouped in 30 categories (5).

In order to optimize comparability over time, all intestinal sites, melanoma and non-melanomatous skin neoplasms, all uterine neoplasms (cervix and corpus), all neoplasms of the brain and nerves (benign and malignant), all leukaemias and all non-Hodgkin's lymphomas were grouped together (5).

Resident population estimates for the calendar period considered were also provided by the Swiss Federal Office of Statistics (8).

Age-standardized mortality rates per 100,000 population truncated from 35 to 64 years were computed by the direct method using the European standard population (9). On the basis of these rates, mortality sex ratios (males/females) were further calculated for each of the quinquennial calendar periods (except for the first one which was quadriennial) and cancers or groups of cancers considered.

Moreover, data on cancer survival were derived from the Vaud Cancer Registry datafile, which includes incident cases of malignant neoplasms in the Canton (10, 11). Cases detected either at autopsy or registered from death certificate alone were excluded, and only invasive neoplasms considered. The vital status of each case registered within the period 1974–1980 was verified through an active follow-up to December 31, 1984 (12,13).

Five-year relative survival rates (14) were computed after allowance for the general lifetables of the Canton for each sex separately and presented together with the corresponding ratios between sexes (males/females). Only cancer sites whose 5-year rates were based on 5 or more deaths were considered.

Results

Figure 1 shows the trends in overall age-standardized cancer mortality in Swiss population aged 35 to 64 from 1951 to 1984. In males, only a moderate decline was evident (from 230 to 221/100,000), while in fe-

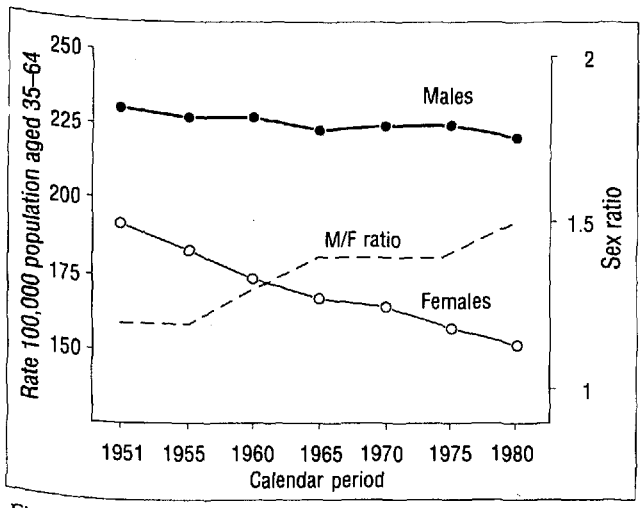

Fig. 1. Trends in overall age-standardized cancer mortality and sex ratios (male to female) in Switzerland, 1951-84.

cancer of the lung increased between the early 1950's and the mid 1960's, but noticeably declined thereafter (from 13.8 to 7.5). The pattern was less consistent for other tobacco-related neoplasms, although for some of them (e.g., mouth or pharynx, kidney or bladder) some decline in the sex ratio was observed in more recent calendar periods, too. The sex ratio for most other sites, including intestines, pancreas, skin, brain and lympho-reticular neoplasms showed no consistent pattern over time.

Table 2 gives the five-year relative survival estimates for selected cancer sites from the Cancer Registry of the Canton Vaud. For most sites considered, including mouth or pharynx, colorectum, skin, brain and all lympho-reticular neoplasms, survival was appreciably lower in males than in females.

Tab. 1. Age-standardized[a] Swiss mortality sex ratios (male to female) for people aged 35–64, from selected cancers or groups of cancers, 1951–84.

Type of Cancer	1951–4	1955–9	1960–4	1965–9	1970–4	1975–9	1980–4
Mouth or pharynx	5.9	8.7	8.0	7.3	8.8	7.6	6.9
Oesophagus	12.7	12.2	10.7	10.1	9.9	10.8	10.5
Stomach	2.0	2.0	2.2	2.3	2.3	2.7	2.4
Intestines, chiefly large intestines	1.5	1.2	1.5	1.5	1.5	1.4	1.4
Liver	1.6	2.2	2.1	3.2	3.3	2.9	5.7
Gallbladder and bile ducts	0.5	0.5	0.4	0.5	0.5	0.5	0.7
Pancreas	1.7	1.6	1.7	1.6	1.9	1.9	2.0
Trachea, bronchus and lung	10.7	12.0	13.8	13.4	11.0	9.6	7.5
Skin, including melanoma	1.7	1.9	1.4	1.6	1.4	1.8	1.5
Bladder	3.3	3.5	3.8	4.1	3.9	3.5	3.1
Kidney	1.7	1.8	1.7	1.9	2.1	1.8	1.8
Brain or nerves, benign or malignant	1.4	1.6	1.7	1.3	1.2	1.5	1.4
Thyroid	0.8	0.9	0.7	0.9	0.6	0.9	0.8
Hodgkin's disease	1.7	1.3	1.7	1.6	1.6	1.6	1.5
All other lymphomas	1.5	1.6	1.9	1.6	1.6	1.4	1.7
Multiple myeloma	1.3	0.9	1.3	1.3	1.4	1.6	1.5
Leukaemias	1.3	1.3	1.4	1.3	1.4	1.4	1.2
Total, all sites, all histologies	1.2	1.2	1.3	1.4	1.4	1.4	1.5

[a] Based on the European standard population.

males the downward trend was steady and much more pronounced, being over 20% in the 30-year period considered (from 191 to 152/100,000) (5).

Consequently, the male/female sex ratio in overall cancer mortality increased from 1.2 to 1.5.

Table 1 gives the sex ratios for each separate selected cancer site and calendar period. Mortality was higher in males than in females for all sites considered, except gallbladder and thyroid. Among other sites, the sex ratios ranged between 1.5 for intestines, skin, brain and lympho-reticular neoplasms to about 2 for stomach or pancreas, up to 7–10 for lung and neoplasms related to tobacco and alcohol (e.g., mouth or pharynx, oesophagus). There were increases in ratios for cancer of the stomach (from 2.0 to 2.4) and, most clearly, of the liver (from 1.6 to 5.7). The sex ratio for

Tab. 2. Five-year relative survival estimates for selected cancers or groups of cancers in each sex separately and expressed as male to female ratios. Vaud Cancer Registry, Switzerland, 1974–80.

Type of cancer	5-year survival rates for: males	females	Sex ratio (M/F)
Mouth or pharynx	.34	.51	.67
Stomach	.24	.24	1.00
Colon	.48	.53	.91
Rectum	.45	.56	.80
Trachea, bronchus and lung	.09	.10	.09
Melanomatous skin cancer	.63	.77	.80
Bladder (invasive)	.29	.32	.91
Kidney	.45	.44	1.02
Brain or nerves	.22	.22	1.00
Thyroid	.80	.83	.96
Non-Hodgkin's lymphoma	.48	.52	.92
Hodgkin's disease	.62	.73	.85
Multiple myeloma	.36	.46	.78
Leukaemias	.28	.32	.87

Tab. 3. Lifetime prevalence of smoking by birth cohort and sex in Switzerland (prevalence of ever smokers corrected for excess mortality of smokers).

	Males			Females		
Birth cohort	Ever smokers	Current smokers	Ex-smokers	Ever smokers	Current smokers	Ex-smokers
1900–09	63.7	26.2	32.2	14.1	4.9	8.5
1910–19	67.1	28.1	36.1	18.5	11.1	6.8
1920–29	68.5	32.8	34.1	23.8	15.9	7.5
1930–39	63.7	39.2	23.6	31.9	21.1	10.7
1940–49	63.1	44.2	18.6	44.3	28.0	16.3
1950–59	52.8	40.9	11.9	49.1	36.8	12.3

Source: Swiss National Health Survey, "Somipops" 1981–3 (16).

Discussion

The present analysis of cancer death certification and population-based survival data confirms that mortality from most cancer sites (except gallbladder and thyroid) were persistently higher in males than in females, and that survival rates tended to be higher in females. However, the sex differentials in survival rates were generally smaller than those in mortality, thus indicating that better survival is not the sole (or major) explanation for the lower death rates from most cancer sites in females.

Some of the inter-sex differences in cancer mortality and of the corresponding trends over time can be explained in terms of well known risk factors. This is the case of lung cancer, whose ratios reflect trends in smoking prevalence among subsequent generations of Swiss males and females, the reduced ratios over most recent periods being clearly related to the increased smoking prevalence among most recent generations of Swiss females (Table 3) (15, 16). Likewise, the major differentials in mortality from mouth or pharynx or oesophagus are obviously attributable to the combined role of alcohol and tobacco on the risk of these neoplasms (17), and a role of tobacco is probable for pancreas, bladder and kidney (18), too.

It is clearly more difficult to explain the persisting sex differential for several other sites, including stomach, intestines, brain and lympho-reticular neoplasms. Even more complex is the interpretation of the substantial increase in the sex ratios for liver cancer death rates (from 1.6 in 1951–1954 to 5.7 in 1980–1984). These trends, which are similar to those observed in France over the same calendar period (6), are probably affected by misclassification biases, since the liver is a common site of secondaries, particularly from the lung, and by more accuracy certification of cancer arising on liver cirrhosis. Nonetheless, they were evident even in younger middle age (i.e., below age 50), thus suggesting that at least part of the diverging trends in liver cancer mortality in the two sexes may be real.

The analysis of cancer survival data indicates that part of the advantage in cancer mortality for women is probably due to better survival, although there is no single explanation for this observation, which is common to most population-based data sources (13,19,20). Earlier diagnosis, better compliance or responsiveness to treatment are plausible hypotheses for an overall pattern common to most cancer sites, but not to other important causes of death. For instance, it has been suggested that survival after acute myocardial infarction is better in females than in males, although in this case, too, no obvious epidemiological or biological explanation is available (G. Mezzanotte, personal communication from ref. 21).

It is nonetheless clear that a deeper understanding of the underlying biological reasons for these sex differentials in mortality from major causes of death may well open important perspectives for biological interpretations and potential therapeutic interventions.

Summary

Swiss national cancer mortality statistics from 1951 to 1984 and survival rates from the Vaud Cancer Registry datafile over the period 1974–1980 were considered in terms of sex ratios. Overal age-standardized cancer mortality for population aged 35–64 showed only a moderate decline in males (from 230 to 221/100,000), but a substantial one in females (from 191 to 152/100,000). Mortality from most cancer sites (except gallbladder and thyroid) was persistently higher in males, the male/female ratio ranging between 1.2 for intestines, skin, brain and lympho-reticular neoplasms to about 2 for stomach or pancreas, up to 7–10 for lung and cancers related to tobacco and alcohol (mouth or pharynx, oesophagus). The sex ratio for lung cancer increased between the early 1950's and the mid 1960's, but noticeably declined thereafter, probably reflecting trends in smoking prevalence among subsequent generations of Swiss males and females. Less obvious is the substantial increase in the sex ratio for liver cancer (from 1.6 to 5.7), which was evident in younger middle age, too. Population-based cancer survival statistics indicated that for most common sites rates were appreciably higher in females than in males. Thus, better survival explains part of the advantage in cancer mortality for women. This can be related to earlier diagnosis, better compliance or responsiveness to treatment, although there is no obvious single interpretation for this generalized more favourable pattern in females.

Résumé

Les différences entre sexes de la mortalité cancéreuse en Suisse

Les statistiques suisses de mortalité par cancer 1951–1984 et les taux de survie estimés par le Registre Vaudois des Tumeurs pour la période 1974–1980 sont considérés sous la forme de rapports entre sexes (H/F). La mortalité cancéreuse globale corrigée pour l'âge n'a diminué de façon substantielle que chez la femme (de 191 à 152/100 000 versus de 230 à 221/100 000 pour les hommes). A l'exception de la vésicule biliaire et de la thyroïde, la mortalité liée à la plupart

des localisations cancéreuses s'est maintenue constamment plus élevée chez l'homme, les rapports H/F allant de 1.2 pour les intestins, la peau, le cerveau et les néoplasies lympho-réticulaires à environ 2 pour l'estomac ou le pancréas et jusqu'à 7–10 pour le poumon et les cancers liés au tabac et à l'alcool (buccopharynx, oesophage). Le rapport H/F pour le cancer pulmonaire a augmenté entre le début des années 50 et la moitié des années 60, pour décroître nettement par la suite, ce qui reflète probablement les tendances de la prévalence de la consommation de tabac au sein des générations successives d'hommes et de femmes suisses. Moins évidente est l'interprétation de l'accroissement substantiel des rapports H/F pour le cancer hépatique (de 1.6 à 5.7), confirmé aussi dans les classes d'âge moyennes. Pour la plupart des localisations cancéreuses, les estimations de survie dans la population générale sont apparues nettement plus favorables chez les femmes, ce qui peut en partie expliquer la moindre mortalité cancéreuse de ces dernières. Ce tableau généralement plus favorable au sexe féminin ne trouve pas d'explication unique ou évidente, bien qu'il puisse être lié à un diagnostic plus précoce, à une meilleure «compliance» ou réponse au traitement.

Zusammenfassung

Geschlechtsunterschiede der Krebssterblichkeit in der Schweiz

Die Schweizerische Krebsmortalitätsstatistik von 1959 bis 1984 und Überlebensziffern aus dem Waadtländer Krebsregister von 1977 bis 1980 werden auf Geschlechtsverhältnisse untersucht. Die altersstandardisierte Krebssterblichkeit für die 35- bis 64jährigen zeigte eine geringe Abnahme bei den Männern (von 230 auf 221 pro 100 000), aber einen starken Rückgang bei den Frauen (von 191 auf 152 pro 100 000). Die Mortalität der meisten Krebslokalisationen (mit Ausnahme der Gallenblase) blieb immer höher bei den Männern, das Verhältnis Männer/Frauen variierte zwischen 1,2 für Darm-, Haut-, Hirn- und lympho-reticuläre Neoplasien und etwa 2 für Magen- und Pankreascarzinom bis zu 7 bis 10 für Carzinome mit Beziehung zu Alkohol- und Tabakkonsum (Mund oder Pharynx, Oesophagus). Das Geschlechtsverhältnis für Lungencarzinome vergrösserte sich zwischen den frühen fünfziger Jahren und Mitte der sechziger Jahre, aber verringert sich seither deutlich, was wahrscheinlich die Veränderungen in der Häufigkeit des Rauchens späterer Generationen von Schweizer Männern und Frauen widerspiegelt. Weniger leicht zu verstehen ist die starke Zunahme des Geschlechtsverhältnisses für Lebercarzinome (von 1,6 zu 5,7), welches auch im jüngeren Alter deutlich ist. Bevölkerungsbezogene Krebsüberlebensstatistiken zeigen für die meisten häufigen Lokalisationen deutlich höhere Ziffern für Frauen als für Männer. Damit scheint eine bessere Überlebenschance einen Teil der geringeren Krebsmortalität der Frauen zu erklären. Möglicherweise ist dies die Folge früherer Diagnose, besserer «compliance» oder von besserem Behandlungserfolg, obschon kaum eine gemeinsame offensichtliche Erklärung für diese allgemein bessere Überlebensstatistik bei den Frauen gefunden werden kann.

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