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Cancer in Switzerland

Situation and development from 1983 to 2007

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Institut National pour l'Épidémiologie et l'Enregistrement du Cancer
Instituto Nazionale per l'Epidemiologia et la Registrazione del Cancro

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Abbreviations

ACCIS	Automated Childhood Cancer Information System
AIDS	Acquired immunodeficiency syndrome
ALL	Acute lymphocytic leukaemia
AML	Acute myeloid leukaemia
CCR	Cantonal Cancer Registry
CI-Five	Cancer Incidence in Five Continents
CLL	Chronic lymphocytic leukaemia
CML	Chronic myeloid leukaemia
COD	Cause of Death Statistics
EBV	Epstein Barr virus
DRE	Digital rectal examination
ENCR	European Network of Cancer Registries
ENT	Ear, nose and throat (also known as ORL: otorhinolaryngology)
FOPH	Federal Office of Public Health, Bern, Switzerland
FSO	Federal Statistical Office, Neuchâtel, Switzerland
HHV-8	Human herpesvirus 8
HIV	Human immunodeficiency virus
HPV	Human papillomavirus
HRT	Hormone replacement therapy
HTLV-1	Human T cell leukaemia/lymphoma virus type 1
IACR	International Association of Cancer Registries
IARC	International Agency for Research on Cancer, Lyon, France
ICCC-3	International Classification of Childhood Cancer, 3rd revision
ICD-10	International (statistical) Classification of Diseases (and related health problems), 10th revision
ICD-O-3	International Classification of Diseases for Oncology, 3rd revision
NHL	Non-Hodgkin's lymphoma
NICER	National Institute for Cancer Epidemiology and Registration, Zurich, Switzerland
PSA	Prostate specific antigen
SACR	Swiss Association of Cancer Registries (now NICER)
SCCR	Swiss Childhood Cancer Registry
SPOG	Swiss Paediatric Oncology Group
TNM	Tumour-Node-Metastasis
WHO	World Health Organisation, Geneva, Switzerland
YPLL	Years of potential life lost

Forewords

The topic of cancer concerns us all, because the vast majority of us have at some point in our life been confronted with the suffering of a cancer patient in our family or circle of friends and acquaintances. Cancer is the second leading cause of death in Switzerland. Four out of ten people are diagnosed with cancer at some point in their life. Cancer can occur at any age and independently of the environment.

But which types of cancer occur particularly frequently at what age? What are the risk factors and what are the chances of recovery?

This publication addresses such questions by applying epidemiological expertise to analyse data from cantonal cancer registries, the Swiss Childhood Cancer Registry and the Cause of Death Statistics. It provides information about incidence by age, cause and risk factors, about prevention and the chances of cure, and numerous other aspects of cancer. Although many questions about cancer and its causes remain open, this publication makes it possible to chart the spread of cancer in Switzerland.

In order to design health care in a targeted and cost-effective way for the benefit of the population, health care policy makers depend on a statistical processing and analysis of the relevant data. For this reason, the Federal Office of Public Health commissioned the Federal Statistical Office and the National Institute of Cancer Epidemiology and Registration (NICER) to manage cancer monitoring in Switzerland. This report has been coordinated by the Federal Statistical Office and written in close cooperation with NICER and the Swiss Childhood Cancer Registry (SCCR).

The Federal Statistical Office intends to issue this publication every five years from now on. In addition, the Federal Statistical Office makes avaible on its Swiss Statistics web portal cancer statistics that are updated on an annual basis. With this publication, we hope to make a substantial contribution to the fight against cancer.

Neuchâtel, January 2011

Dr. Jürg Marti
Director of the Federal Statistical Office

Every year, more than 35,000 people are diagnosed with cancer and more than 16,000 die of it in Switzerland. Nationally collected epidemiological data are essential to understand the causes of cancer so as to be able to plan targeted preventive measures and introduce effective and efficient treatment strategies. At present, cancer data are systematically registered in 16 cantons and combined for evaluation in the NICER (National Institute for Cancer Epidemiology and Registration) coordination centre.

The report provides an overview of the national cancer landscape and is addressed both to professionals and to an interested lay audience. It was prepared on behalf of the Federal Office of Public Health (FOPH) and is the product of NICER's constructive cooperation with the Federal Statistical Office (FSO). We would also like to thank the cantonal cancer registries most warmly for their support, because without the data they provided, this report would not have been possible.

The next step will be to put the findings of the report into practice. NICER is therefore working closely with its national partners within the framework of the "National Cancer Programme 2011–2015" to contribute to the formulation of a coherent national strategy to fight cancer.

NICER also supports the current efforts of the Federal Office of Public Health to establish federal statutory provisions for the registration of cancers. A law to this effect will make it possible to collect data on new cases throughout Switzerland for the treatment of cancer and to harmonise the framework conditions for monitoring. These data provide the basis for evidence-based health policy decisions and interventions; they are relevant to the health of the entire population as well as to the affected patients.

Zurich, January 2011

Prof. Dr. med. Giorgio Noseda
President of the NICER Foundation

Overview

In 2010, 12 cantonal cancer registries covered 68% of the Swiss population

In Switzerland, cancer registration is organised at the cantonal level by tumour registries. Twelve registries corresponding to 16 cantons cover 68% of the Swiss population. This coverage is now almost complete for French- and Italian-speaking Switzerland, but there are gaps in some major German-speaking regions. Paediatric tumours are registered for the whole country by the Swiss Childhood Cancer Registry. The Causes of Death Statistics of the Federal Statistical Office records, for its part, all deaths of persons resident in Switzerland, particularly those caused by cancer.

Cancers of the prostate, breast, colon-rectum and lung represent half of all new cancer cases

In Switzerland, an estimated 35,000 new tumours occur every year, 19,000 among men and 16,000 among women. In men, cancers of the prostate, lung and colon-rectum account for 53% of new cases. In women, cancers of the lung, colon-rectum and breast account for 51% of cancers. No other site accounts for more than 6% of cancers.

The number of new cases of melanoma is rising in Switzerland

Over the past 15 years, the number of new cases of melanoma (skin cancer) has increased markedly in both sexes. The same has been the case for lung cancer in women, thyroid cancer (particularly among women) and prostate cancer. Better detection methods may partly explain some increases, such as in the case of prostate cancer, thyroid cancer and melanoma. Conversely, a sharp decrease has been observed for cancer of the cervix uteri. The decrease is also considerable for stomach cancer, and lung cancer in men.

Switzerland has high disease rates in international comparison

In international comparison, Switzerland is particularly affected by cancers of the breast, testis and prostate, as well as by melanoma and Hodgkin's disease.

In regards to other cancers, Switzerland is within the average range in Europe: the high average range for cancers of the colon-rectum and corpus uteri, non-Hodgkin lymphomas and leukaemias; and the low average range for cancers of the stomach and cervix uteri.

Some 3000 people die each year from lung cancer

Some 30% of men and 23% of women in Switzerland die of cancer. In men, 23% of cancer deaths are due to lung cancer, 15% to prostate cancer, and 10% to colorectal cancer. In women, breast cancer is responsible for 19% of cancer deaths, lung cancer for 13%, and colorectal cancer for 11%.

Mortality is declining for most cancer sites

Over the past 15 years, this decline has been particularly significant for cancers of the cervix uteri, stomach, lung (in men), colon-rectum, breast and prostate, as well as Hodgkin's disease. The main exception is the sharp increase that has been observed in mortality from lung cancer among women.

Chances of survival differ depending on site

The chances of survival depend not only on the type of cancer, but also on the availability and effectiveness of screening, diagnostic and treatment services. At the European level, the five-year survival rates are the lowest (less than 20%) for cancers of the liver, lung, pancreas, and oesophagus, as well as for acute myeloid leukaemia. Conversely, persons suffering from cancer of the testis, melanoma, thyroid cancer, Hodgkin's lymphoma and breast cancer have a five-year survival probability of 80% or more. The five-year survival rates observed in Switzerland are among the best in Europe.

The vast majority of cancers are due to behavioural and environmental factors

Many risk factors for cancers remain unknown. The risk factors that have been identified are most often linked to lifestyle, consumption habits (e.g. diet, alcohol, tobacco) and environmental or occupational exposure to certain substances or radiation. Lung cancer is strongly associated with exposure to tobacco smoke, ambient pollution, and radon. Ear, nose and throat (ENT) cancers are related to smoking and alcohol consumption. The deleterious effects of alcohol and a diet high in red or processed meat have been shown for colorectal cancer. Stomach cancer, for its part, is linked to a diet rich in smoked, salted, dried, and pickled food. Melanoma is related to overexposure to the sun. However, for many cancers, such as breast cancer, family history and a genetic component have also been identified as risk factors.

Prevention by avoidance of risk factors

The prevention of many cancers depends, first and foremost, on non-exposure to risk factors where possible. It can also be based on beneficial health habits in general, such as the consumption of fruits and vegetables and physical activity. Some medical treatments may also have a preventive effect, such as vaccination against hepatitis B (a risk factor for liver cancer) or the human papillomavirus (HPV; a risk factor for cancer of the cervix uteri) or treatment of infection with *Helicobacter pylori* (a risk factor for stomach cancer).

Childhood cancers are rare but represent the second leading cause of mortality in childhood

Cancer is generally rare in children. There are about 168 new cases and 37 deaths per year. The most common childhood cancers are leukaemia (33%), tumours of the central nervous system (21%) and lymphomas (13%). The chances of cure have improved notably over the past 60 years and have now reached 80%. Switzerland is among the countries with the best treatment outcomes.

1 Introduction

Every year, approximately 35,000 people face a diagnosis of cancer in Switzerland and nearly 16,000 die of the disease. Among causes of death, cancer is responsible for by far the largest number of years lost before age 70. Nevertheless, for some time there has been no detailed report about cancer in Switzerland which makes available for health policy purposes nationwide estimates of morbidity and mortality risks and regional differences.

The "Cancer in Switzerland" report is the result of cooperation between the Federal Statistical Office (FSO), which documents cancer mortality by means of the Cause of Death Statistics (COD), the National Institute for Cancer Epidemiology and Registration (NICER), which is the coordination centre of cantonal cancer registries, and the Swiss Childhood Cancer Registry (SCCR).

The report is based on two sources of data. First, from the Cause of Death Statistics, which provides nationwide information on deaths in the entire Swiss population. Second, from the cancer registries created in the cantons beginning in 1970 and the SCCR founded in 1976. These registries systematically record all cancers that are newly diagnosed (incident) in the cantonal health services sector. Despite the frequency and related cancer burden, not all regions of Switzerland have cancer registries; only 68% of the Swiss population lives in an area covered by a cancer registry. Nonetheless, it is now possible to estimate the annual number of new patients (incidence) and to extrapolate these figures to the whole of Switzerland.

Cancer registration and cause of death statistics complement each other, because different survival and cure probabilities do not make it possible to make direct inferences from the mortality rate to the morbidity rate. Consequently, the aim of cancer registration remains to build an uninterrupted network for the continuous epidemiological monitoring of incident cases, so that even small scale changes in the morbidity risk can be detected without delay. In addition, cancer registration provides evidence on the effectiveness of prevention and early detection measures.

The second chapter describes the sources and quality of data, the survey methods and the indicators used. It is followed by a general overview of cancer in Switzerland: the development of cancer morbidity and mortality since 1983, with an emphasis on the latest trends and regional differences. The next chapter describes the location of selected cancer types (sites). This chapter provides a detailed discussion of various trends, age, sex and regional differences against a backdrop of behavioural and environmental risk factors known from the scientific literature and also presents a series of prevention measures.

Cancer affects mainly older people and occurs relatively rarely during childhood. Nevertheless, cancer is the second leading cause of death in children. Therefore, the situation of cancer in this age group is described in a special chapter (cf. Chapter 5).

Bibliographic references are contained in numbered endnotes, while explanations of the text are found in footnotes below each page. The tables with complete data on which the present report is based are available on the websites of FSO (www.tumours.bfs.admin.ch), NICER (www.nicer.org) and the SCCR (www.childhoodcancerregistry.ch).

2 Data and Methods

2.1 Data Sources

The information used in this report stems primarily from three major databases: cantonal cancer registries (CCR), the Swiss Childhood Cancer Registry (SCCR) and the Federal Statistical Office's Cause of Death Statistics (COD). The various sources, data access procedures and data collection methods are described for each of these databases. Their specific contributions to cancer epidemiology and research are also presented. The information on risk factors and prevention has been drawn from the international scientific literature, while estimates of prevalence and survival rates have been taken from the International Agency for Research on Cancer (IARC[a]).[1]

2.1.1 Tumour Registries

The registration of cancers in Switzerland is organised at the cantonal level by the cancer registries.[b] Each canton has selected the institutional structure of its own registry. To access the data, the registries maintain links with health care facilities, pathology laboratories and any other institution where information on people with cancer can be found. In addition, the registries can contact the civil registry offices to regularly check the status of each patient (i.e. whether he or she is alive or dead). The persons concerned can veto their data from being recorded in the registries' databases. The registries follow the recommendations for data collection procedures and contents established by the IARC. The registration of tumours is done taking into account histological types of tumours defined in the International Classification of Diseases for Oncology (ICD-O-3).

The first tumour registry was created in 1970 in Geneva,[2] followed by the cantonal registries of Vaud and Neuchâtel (1974), Zurich, St. Gallen-Appenzell (1980), Basel-Stadt und Basel-Landschaft[c] (1981), Valais, Graubünden (1989) and Glarus (1992), Ticino (1996) and Fribourg (2005). The cancer registries included in this report cover 62% of the Swiss population. For the Canton of Jura, data have been collected since 2005.[d] The newly founded Swiss Central Cancer Registry started to record the data from the canton of Lucerne in 2010. Thus, in 2010 some 68% of the Swiss population lived in an area where cancers are registered (M 1).

In 1978, the Swiss Association of Cancer Registries (SACR) was formed to harmonise data collection, create an inter-cantonal database and promote research on cancer epidemiology at the national level. In 2007, this association became the National Institute for Epidemiology and Cancer Registration (NICER), based at the University of Zurich (www.nicer.org). Its organisational structure brings together representatives of universities, social and preventive medicine institutions at the federal and cantonal level, registries as well as a scientific advisory committee composed of international experts. Functioning as a central scientific and administrative secretariat, NICER provides assistance to cantonal registries and has the following tasks:

- define standards and recommendations for collecting and coding data,
- check the quality of registered data,
- establish the estimated national incidence,
- ensure the scientific coordination of epidemiological research, particularly in collaborative studies conducted between the registries or external partners.

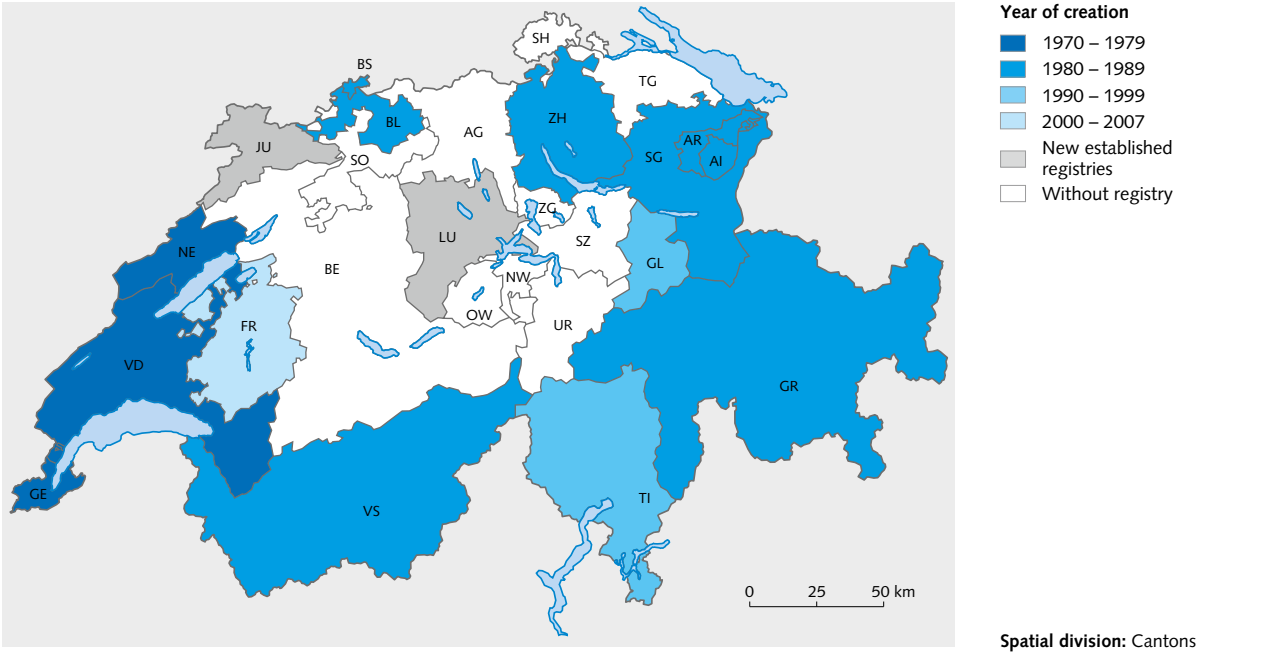
[a] The IARC obtains data from more than 400 population registries from 60 countries across the five continents.

[b] The tumour registries search and record all cases of cancer diagnosis, treatment and death in a defined population (residents of the canton), irrespective their place of care. In contrast, hospital registers only collect information on patients who have been hospitalised in their particular hospital and therefore do not cover all cases within a given population.

[c] The registry of Basel-Stadt and Basel-Landschaft was founded in 1969, but the first available computerised data are from 1981.

[d] The data were not available when this report was printed.

Cantons with cancer registration, 2010 **M 1**



Source: NICER, CCR

Thanks to the network of cantonal registries, their links with university departments and clinics and NICER as a coordination body, Switzerland has the capacity to collect and manage data on the characteristics of cancer patients and their diseases. It also has a reliable database of all cancer cases that have been the subject of a diagnosis, treatment or death certificate in a defined population. By making full use of this database, the objectives of cancer registration, monitoring and epidemiological research are achieved. They include:

- observe and describe the frequency of various cancers according to the socio-demographic characteristics of patients and to regional differences,
- study the relationship between the occurrence of cancers and risk factors (genetic factors, lifestyle, exposure to pollution),
- observe the survival of patients to assess the effectiveness of prevention and screening, as well as of diagnostic and treatment methods,
- estimate the prevalence of cancers in order to determine patients' care needs and organise and plan for their care.

2.1.2 Swiss Childhood Cancer Registry

Childhood cancers throughout Switzerland are registered in the Swiss Childhood Cancer Registry (SCCR) (www.childhoodcancerregistry.ch). The SCCR is based at the Institute of Social and Preventive Medicine of the University of Bern and collaborates closely with the Swiss Paediatric Oncology Group (SPOG; www.spog.ch).

The SCCR was founded in 1976, making it one of the oldest cancer registries in Europe. In the early years the SCCR mainly registered children who took part in clinical trials. Since the late 1980s the nationwide coverage has also been very good for non-trial-included patients. Coverage is mostly complete for the age group 0–15 years; cancers among adolescents (aged 16–20 years at diagnosis) are also registered but to date not nationwide.

The SCCR registers cases of leukaemia, lymphoma, malignant solid tumours, malignant and benign brain tumours, as well as Langerhans cell histiocytosis, the last of which is not considered to be a cancer per se, but it behaves similarly to cancer.

The treating physicians provide information about the Childhood Cancer Registry to patients and their families. If the families do not avail themselves of their veto power, information about the disease, therapy and treatment results are forwarded to the SCCR, where it is registered in accordance with the International Classification of Childhood Cancer (ICCC-3).

Regular comparison of data with cantonal registries, mortality statistics and other data sources (e.g. hospital statistics, laboratory reports) aims to ensure that children who are treated in smaller paediatric hospitals or clinics for adults are also covered by the SCCR.

The Children's Cancer Registry does not limit itself to registering the frequency (incidence) of cancer. Rather, it aims to contribute to the study of the causes of cancer in children and to document and improve the quality of treatment and long-term prognosis. Therefore, the quality of life of patients who have been cured is monitored through long-term follow-up questions to doctors or directly to former patients. This information is evaluated and made available to the treatment centres in anonymous form. Thus, the therapies and follow-up can be continually improved.

The SCCR is a member of the International Association of Cancer Registries (IACR), the European Network of Cancer Registries (ENCR) and the National Institute for Cancer Epidemiology and Registration (NICER). In 2004, it obtained a special authorisation and in 2007 it was granted a general approval to operate a cancer registry by the Federal Expert Commission on Professional Secrecy in Medical Research of the Federal Office of Public Health (FOPH; www.foph.admin.ch).

2.1.3 Cause of Death Statistics

The Cause of Death Statistics has existed since 1876 and has been available in electronic form since 1969. It is based on civil registries and on death certificates indicating the causes of death which are completed by the physicians who declare the death. The coding of death certificates is carried out by the FSO for the whole of Switzerland. The International Classification of Diseases (ICD) provides a standardised system of classification and coding, as well as a format model for the death certificate. An update of the coding rules led to a partial break in the time series,[3] which was offset in this publication by means of correction factors.

The Cause of Death Statistics makes available very long time series of all deaths of persons residing in Switzerland. This makes it possible to monitor the impact of cancers in terms of mortality and years of life lost prematurely. This monitoring can include various types of cancer by comparing their impact and changes based on the socio-demographic characteristics (e.g. gender, age, etc.) of the deceased persons. This statistic also allows comparisons between regions or cantons as well as with other countries. It is, therefore, an important database for epidemiological analysis and the study of risk factors and the causes of cancer.

2.2 Indicators

Indicators from two different areas are used in this report: on the one hand, epidemiological indicators such as cancer incidence, cancer mortality, survival rate and the prevalence of people living with the disease. On the other hand, indicators that reflect the quality of care in the health system, i.e. the cancer stage at diagnosis, the time between diagnosis and start of treatment, and the effectiveness of all interventions.

2.2.1 Incidence

Incidence is the number of new cases (of cancer) occurring in a defined population during a given time period. It is generally expressed as a rate (number of new cases per 100,000 inhabitants per year).

Given the impact of age on the risk of cancer, it is imperative to take into account age when comparing cancer rates between populations and over time. Direct standardisation procedures are used to present standardised rates; rates recalculated on the assumption that the study population represents the age structure of a reference population (e.g. standard population types defined by the World Health Organisation – WHO). Except for international comparison, in the present report the European standard population is used.

In Switzerland, incidence is not collected throughout the country, with the exception of data on children. In fact, it is collected by registries which cover almost all of French-speaking Switzerland and Ticino (Italian-speaking Switzerland) and about half of German-speaking Switzerland. This rate is determined separately by five-year age

group, sex and cancer site. It is applied to the entire region assuming homogeneity of data between the geographical areas that are covered and those that are not covered. The hypothetical number of cases of the total area is obtained in proportion to populations. The Swiss estimate published in this report is the sum of estimated cases for each language region.

Some discontinuities in representativeness are worth mentioning in detail. The fact that the registries began operations progressively over time can have an effect on the published trends, particularly for cancers such as stomach cancer in mountain regions, which were insufficiently covered in the early years and which present differences in risk compared with the Swiss plateau regions. Thus, the registries of Valais and Graubünden were introduced in the 1988–1992 period, those of Glarus and Ticino in 1993–1997, and that of Fribourg in 2006, i.e. during the last period. Incorporating all available data improves the representativeness over time in preference to strict comparability of the periods. The motivating criterion for providing an optimised Swiss estimate for recent periods is that it is more useful for public health bodies.

2.2.2 Mortality

Mortality is the frequency of death in a population during a given time period. Mortality due to a specific disease (e.g. cancer) measures the impact of the disease, expressed either as the number of deaths or as the mortality rate (deaths per 100,000 persons per year). As in the case of incidence, the use of standardised rates is indispensable for comparison between populations or population groups.

2.2.3 Survival

There are several ways to express the survival rate and different methods to calculate it depending on what one wants to measure and on the size of the observed population. Observed survival, or crude survival, is the ratio between the number of deaths that occurred during a period of time (one year, five years. etc.) and the population suffering from a disease. Relative survival measures the excess mortality due to the disease by taking account of the probability of death (from all other causes) in the general population at every age. Relative survival is expressed as the ratio of the observed number of survivors (numerator) after a specified time period (usually five years) and the number of expected survivors (denominator) based on the mortality rate of the general population. This rate is also called net survival.

For a good comparison between two populations, it is preferable to use relative survivals, especially if the populations differ in their age structures and/or their health care systems. In this case, it is necessary to have mortality tables for each population which are as detailed as possible (by age, sex, and for each calendar year).

For a given cancer site, the survival rate depends on several factors: the stage of cancer at the time of diagnosis, the time between onset of the disease and start of treatment, and the effectiveness of the treatment. Survival is used as an indicator of the health care system's quality of cancer care.

To calculate survival it is necessary to know whether, at a given date, a person affected by cancer is alive or dead. However, under data protection regulations, registries may not disclose information indicating that a person is suffering from cancer. Therefore, they have to collect the data indicating whether people are deceased or not in an indirect way. The first method is to go through third parties (e.g. hospital or treating physician) to ask the communes every year whether the persons in question are still alive and, if not, the date of their death. It is a cumbersome process for the communes. Another method consists of obtaining from the FSO general mortality data from which the registries retrieve (via anonymous parameters) the information on the persons they have registered. This method is more complex and less accurate. Lastly, in the canton of Fribourg a system was recently introduced whereby each commune transmits once a year to the cancer registry the list of persons who died or who moved away from the commune during the previous year. Thus, the registry can complement the information it already has, confidentially and without any additional workload for the communes.

2.2.4 Prevalence

Cancer prevalence is the proportion of patients with a diagnosis of cancer in a population at a given moment in time. Like incidence, it is generally represented as a rate (number of cases per 100,000 inhabitants, e.g. on 31.12 of a given year).

This indicator is very difficult to establish. It depends on two parameters that vary significantly depending on cancer sites: incidence and survival. However, while the cancer registries allow a correct estimate of the incidence, survival is more difficult to know precisely for the reasons discussed above. Prevalence cannot be registered continuously. Nonetheless, if a registry has been in existence for a sufficient number of years, it is possible to estimate the prevalence simply by counting the patients who are registered and still alive. But to achieve precision, this method requires a long observation period, because patients who had cancer before the start of registration are not counted. That is why the estimation of prevalence is the subject of specific publications.[4] The estimates presented in this report are drawn from Globocan,[5] and are essentially based on a mortality/incidence ratio.[e] These estimates are approximate for Switzerland and only take account of persons diagnosed over the previous five years.

2.2.5 Stage at Diagnosis

The stage at diagnosis is the degree of spread of the tumour at diagnosis. It is conventionally defined according to four stages (I-IV): The cancer is localized (I), with local invasion (II), with regional invasion (III) or advanced/metastatic (IV). The most frequently used classification system to determine the stage is "TNM", which describes the situation according to the following indicators: the size of the tumour (T0 to T4), lymphnode involvement (N- or N+), and the presence of metastases (M- or M+).
Information on the stage at diagnosis is of great interest for studies of survival: in most cases, an earlier diagnosis increases the chances of survival. The stage is a difficult data item to collect on a routine basis, because it requires access to medical records and consequently collaboration with clinicians, as well as considerable infrastructure and personnel and technical resources. For this reason, certain Swiss cancer registries cannot provide information on the stage at diagnosis.

[e] The Globocan prevalence 2002 was estimated with incidence data provided by the registries of Basel-Stadt and Basel-Landschaft (1996), Geneva (1997–99), Graubünden and Glarus (1997–99), St. Gallen-Appenzell (1997–99), Ticino (1997–98) and Valais (1997–98) and survival data from EUROCARE 3, taking account of the registries of Basel-Stadt and Basel-Landschaft (1990–92) and Geneva (1990–94).

2.2.6 Effectiveness of Treatment

The effectiveness of treatment also depends on many factors, such as the time gap between diagnosis and start of treatment. These data are collected by all registries. The effectiveness of treatment also depends on the type of treatment as well as the multidisciplinary care of the patient; the impact of which is more difficult to quantify.

2.3 Quality of Data

The quality of data from a cancer registry is measured on the basis of at least four criteria: the comparability, completeness, validity, and accuracy of the information it comprises and the results it produces. These criteria are applied and regularly measured by each registry and by NICER. In addition, the ongoing use of data makes it possible to verify their quality by means of a series of analyses.

2.3.1 Comparability

Comparability is based on a set of criteria to ensure consistent coding and to estimate the reliability of a register. These criteria are defined in the International Classification of Diseases (ICD-10, ICD-O-3)[6] and by the IARC.[7] They relate to the topography, morphology, and behaviour of tumours, as well as to the registration process (date of incidence, multiple tumours, and diagnostic mode). All Swiss cancer registries follow international recommendations in this regard.

2.3.2 Completeness

The indicator of completeness of the record is based on the proportion of cases recorded in the registry, compared with the estimated number of all cases occurring in the observed population. A higher level of completeness is obtained by combining multiple data sources (cf. 2.1.1). Thus, the registries periodically check that all cases of death from cancer are also found in their databases. This procedure, combined with the systematic search for duplicates, improves the completeness of the registry and prevents the same case from being recorded several times.

According to the latest assessments of the completeness of registration, it is estimated that approximately 90% of cancers diagnosed are registered within the first year after diagnosis.

2.3.3 Validity

To assess the validity of the data in the registries, two dimensions are taken into account: internal and external validity. Internal validity refers to the plausibility of the information recorded for each case (i.e. the absence of incompatibility in the data). Incompatibilities can be found, for example, between the age of a patient and the date of diagnosis of his or her cancer, between the tumour type, the site and the sex of the patient, between the site and histological type, etc.

External validity concerns the representativeness of the information held by the registries in relation to the general population. Validity is affected inter alia by an uneven distribution of registries across the regions of Switzerland. Thus, at the end of 2009, coverage was 91% for French- and Italian-speaking cantons, but only 47% for German-speaking Switzerland.[f] An optimal external validity implies a lack of information bias between the morbidity documented by the registry and the actual morbidity in the reference population. Such biases may result from patients spontaneously selecting different types of care in the private or public sector, depending on sites and treatments. This self-selection phenomenon may vary from one canton to another. Thus, not all registries have exactly the same index of external validity. That said, in terms of international comparability, all Swiss registries are in the group with very good validity: the data they provide are very representative of the population.

2.3.4 Accuracy

Accuracy is defined by the level of detail contained in the information collected and its precision. For the calculation of rates (e.g. incidence), it is essential to have demographic data on the same periods as those used for the registration of cases. To this end, data from population censuses and intercensal data are used. For a description of cases, all characteristics must be subject to a systematic search for accuracy: site, histological type, results of further laboratory tests, degree of spread of cancer, number of lymph nodes assessed and number of positive lymph nodes.

Based on these elements, the accuracy of the data collected can be expressed by different indicators such as the proportion of cases in which the record contains poorly defined or unknown items, the proportion of autopsies performed, and the proportion of cases defined based on a histological investigation.

[f] New registries are planned, which should improve coverage of German-speaking Switzerland in the coming years.

3 General Remarks about Cancer in Switzerland

3.1 Incidence and Risk of Cancer

During the 2003–2007 observation period, the estimated number of new cases of invasive cancers[a] each year was approximately 19,000 among men and approximately 16,000 among women.[b] Cancer can occur at any age but risk increases with age. Thus, only 13% of cancers occur before age 50 and 54% before age 70. The risk of developing a cancer before the age of 70 years is approximately 25% for men and 20% for women.

Compared with 40 European countries, in 2008[c] Switzerland ranked 16th for men and 15th for women in terms of the frequency of new cases.[d] This places it in the group of countries with high risk especially for following cancer types:

- melanoma (rank 1–2206 cases per year: 1049 in men and 1157 in women)
- breast cancer (rank 5–5900 cases per year) and
- prostate cancer (rank 8–5380 cases per year)[8]

Lung cancer (30th rank in Europe among men and 13th among women) accounts, together with three other cancer sites, for 53% of cancers among men (prostate 30%, lung 13%, colon-rectum 11%) and 51% of cancers among women (breast 32%, colon-rectum 11%, and lung 8%). The other cancers account for less than 6% each.

3.2 Deaths and Years of Life Lost

The number of cancer deaths amounts to approximately 16,000 per year: 9000 men and 7000 women. It is important to note that the classification of the frequency of cancer by mortality differs from the classification by incidence. This difference is due to the prognosis for each type of cancer. Lung cancer is the most frequent cause of death from cancer among men in Switzerland. With 2000 deaths per year (23%), it is followed by prostate cancer, which accounts for 1300 deaths (15%), and colorectal cancer with 860 deaths (10%). In the female population, breast cancer is the leading cause of death, with 1300 deaths each year (13%), followed by lung cancer with 900 deaths (13%), and colorectal cancer with 740 deaths (11%) (G 3.1).

However, the mortality rate says nothing about the age at which death occurred. This information can be provided by means of the "years of potential life lost". This index is calculated from the difference between the age of death and a theoretical life expectancy of 70 years (in number of years). A high index can be obtained in two ways: by a high mortality rate in an elderly population or by an average mortality rate in younger age groups. The proportion of years of life lost by premature death due to cancer is estimated to be 29% among men and 45% among women.[9]

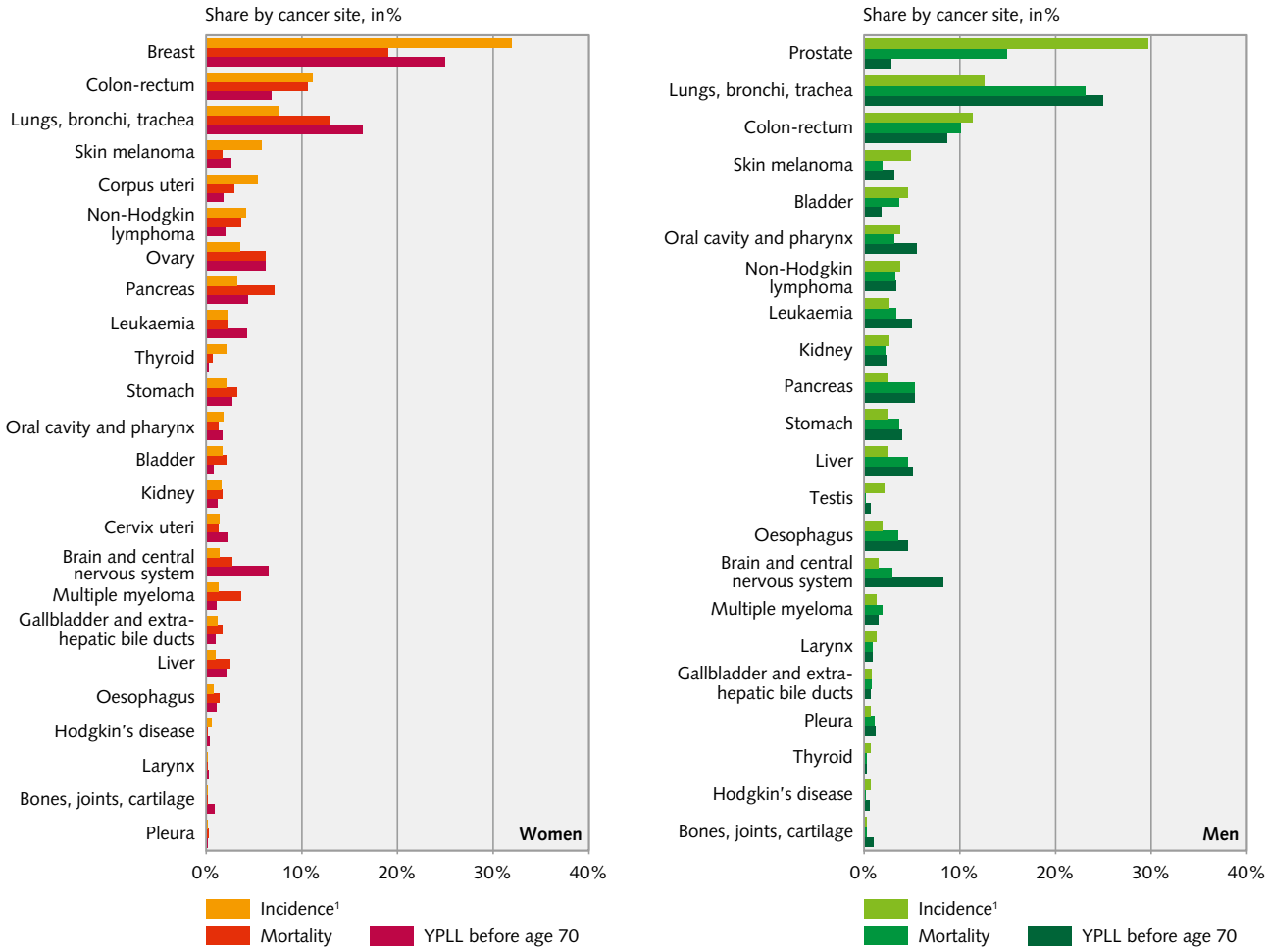
[a] These are "invasive" cases which exclude "in situ" cancers diagnosed very early (usually through screening) at a localised (precancerous) stage.

[b] Incidence estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

[c] To estimate the incidence, Globocan projected the mortality in 1986–2005 (FSO Cause of Death Statistics) to the year 2008 and used the ratio incidence/mortality taking into account the incidence observed in the cantonal registries of Geneva, Graubünden and Glarus, Neuchâtel, St. Gallen-Appenzell, Ticino, Valais and Vaud for the period 2000–02.

[d] Incidence rates standardised to the world population, according to the World Health Organisation (WHO)

Incidence[1], mortality and years of potential life lost (YPLL) by cancer site, 2003–2007 G 3.1



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR

3.3 Survival and Prevalence

For cancer, the only survival data currently available for Switzerland are those obtained for 34,000 patients diagnosed between 1995 and 1999. They were subjected to a specific follow-up procedure by seven cantonal registries: Basel-Stadt and Landschaft, Geneva, Graubünden and Glarus, St. Gallen-Appenzell, Ticino, Valais and Zurich. The results have been published as part of the European EUROCARE 4 study and are available on the internet.[10] This study compared the survival of patients from 23 European countries. Switzerland is often ranked among the countries with the best survival rates. In Switzerland, for all cancers combined, five-year relative survival rate is estimated at 48% for men and 57% for women.

However, survival varies considerably between different cancers. Thus, cancers of the liver, lung, pancreas, brain, central nervous system, and acute leukaemia all have a poor prognosis. In contrast, testicular cancer, melanoma, thyroid cancer, Hodgkin's disease, and breast cancer have good prognoses.

Besides the evolutionary potential of the disease itself, variations in survival may depend on the degree of spread of the disease when it is detected. The degree of spread may in turn depend on the availability of diagnostic and treatment services as well as on their resources and the effectiveness of their interventions. A better survival is usually expected in early detection stages.

Estimating prevalence requires knowing the incidence and survival over a very long period. At present, only estimates for breast and colorectal cancer are available in Switzerland. The most recent publications estimate the prevalence of breast cancer at 72,000 women and colorectal cancer at 32,000 men and women.[11]

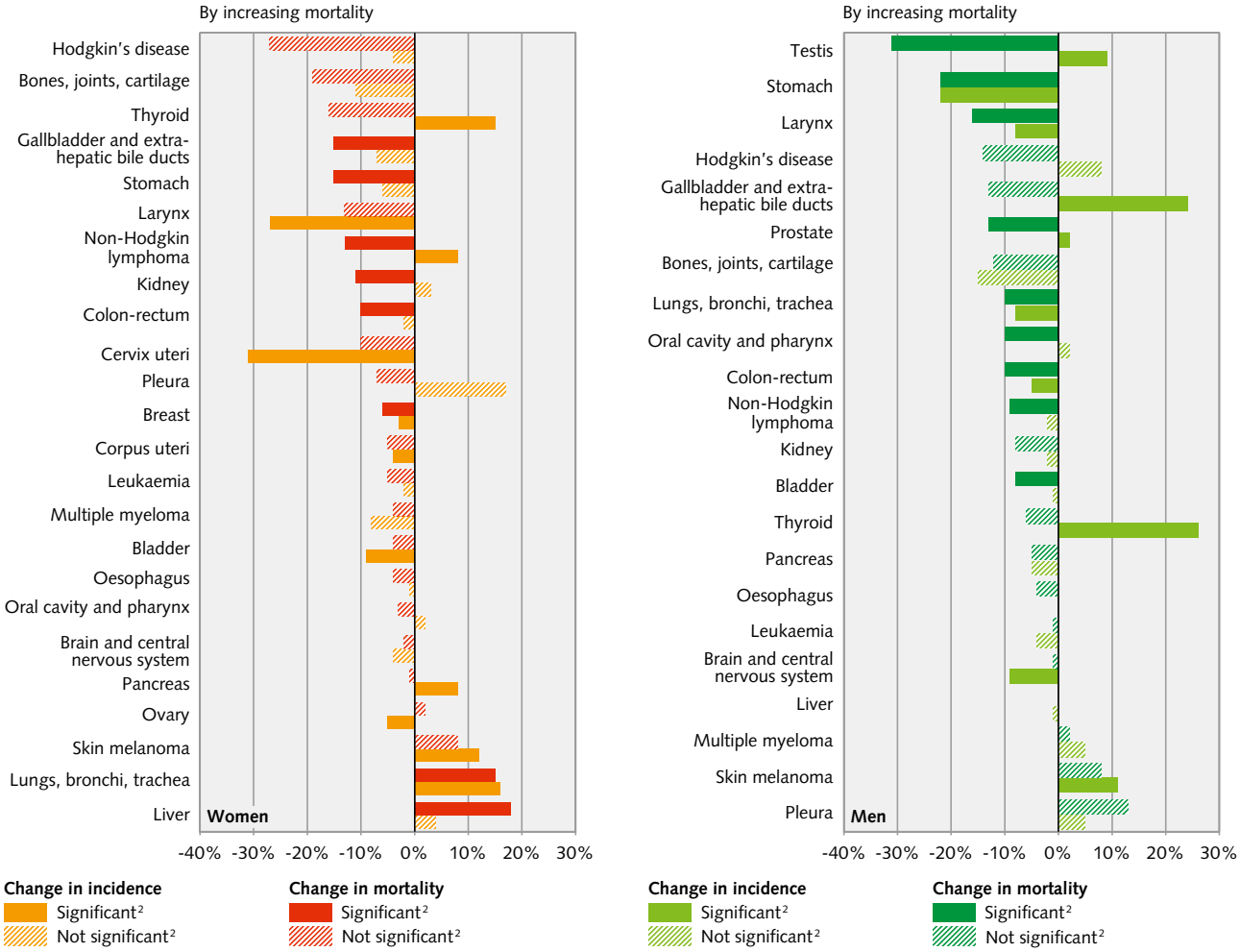
3.4 Time Trends and Regional Comparisons

Cancer risk trends can be identified on the basis of mortality because national data are available over a long period of time. Nevertheless, mortality trends should be interpreted and compared with caution, especially in cancer cases characterised by changes in survival rate over time. It is generally accepted that it is necessary to consider incidence, mortality and survival within the same time periods to understand the complex changes that occur over a long period.[12, 13]

For cancers with short survival times, mortality on its own can be a reliable indicator of changes in risk. Thus, lung cancer mortality has expressed the changing smoking habits over successive generations (i.e. birth cohorts).[14, 15] Among men, the decline in smoking was followed some decades later and in the same generations by a decline in the incidence of lung cancer (-8% between 1998–2002 and 2003–2007) and subsequently in mortality (-10%). Among women, smoking is more recent and is increasing (incidence +16%), a fact that is reflected by an increase in mortality due to lung cancer (+15%) (G 3.2).

For cancers with longer survival times, time trends reflect a complex mix of the effects of incidence (and its determinants), early diagnosis, and recent advances in therapy. In the case of breast cancer, the reduction in mortality (-6% between the last two periods) is likely due to these factors. It is, however, difficult to distinguish between the impact of improved treatment and that of early detection thanks to screening tests.

Trend of incidence[1] and mortality by cancer site between 1998–2002 and 2003–2007 G 3.2



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1
[2] Mantel-Haenszel ratio: increase (> 1) or decrease (< 1) since the previous period, with statistical significance of 95%

Source: FSO: COD, NICER, CCR

The same applies to prostate cancer. It is, in fact, difficult to determine which of the two factors, early diagnosis or better treatment, is responsible for the recent decline in mortality (-13%) (G 3.2), observed especially in German-speaking Switzerland. After a steady increase in prostate cancer mortality until the 1980s, a rapid increase in incidence has been observed simultaneously in many other Western countries. This increase in incidence is largely due to the rapid spread in the use of the PSA (Prostate specific antigen) test, which allows the detection of a disease that is still latent.

Recent changes in mortality and incidence for the other cancer sites are shown in graph G 3.2. These trends, calculated for the whole of Switzerland, ignore heterogeneities between linguistic regions or age groups.

Incidence is a better indicator of change in risk. The use of incidence data, collected by cancer registries for the period 1983–2007, makes it possible to identify trends by age group and language region.[e] The sites whose frequency has increased significantly over the past 15 years are the lung among women, prostate among men, melanoma and thyroid among both sexes.

- Lung cancer among women increased by approximately 3% per year, at an equal rate in German-speaking and in French- and Italian-speaking Switzerland.
- Melanoma also increased by 3% per year on average across Switzerland, but the increase was more significant in French- and Italian-speaking Switzerland (4% per year in men and 5% per year in women).
- Thyroid cancer increased by almost 6% per year among men and by 4% per year among women in French- and Italian-speaking Switzerland. It registered a very small increase in German-speaking Switzerland. In both language regions, the age group that has been most affected by this increase is that of 20–49-year-olds.
- Prostate cancer increased by over 12% per year among men under 50, and by 6% per year among those aged 50–69.

The cancers that showed a decline in incidence over the past 15 years are cancers of the cervix uteri, pleura, and stomach.

- Cancer of the cervix uteri decreased by 5% per year, in a uniform way for all ages and regions.
- Pleural cancer decreased by 10% per year among women in French- and Italian-speaking Switzerland. In the country as a whole, there was practically no decrease, but it actually increased by 2% in German-speaking Switzerland.
- Stomach cancer decreased by 4% per year among men and 3% among women. The decline was observed mainly in people over age 50 and was more pronounced in German-speaking Switzerland.

These observations sometimes reflect a real change in risk over time, sometimes the emergence of new diagnostic methods, and other times the effects of exposure to a factor whose impact has varied between birth cohorts. Chapter 4 discusses this for the individual cancer types.

3.5 Risk, Prevention and Treatment Factors

In many cases, the causes of cancer are not known; where they are known, the international scientific literature often points to specific events, behaviours or prior exposure to carcinogens such as tobacco, alcohol, asbestos, some viruses and especially a combination of these factors. Cancers related to genetic factors represent a small minority of no more than 10% of cancers. But the causes of many cancers remain unknown. Moreover, the risk increases with age for most cancers.

Primary prevention measures such as health education and promotion also have an influence on cancer risk. In the case of some cancers, a better understanding of their causes is increasingly making it possible to intervene before the disease manifests. Thus, primary prevention aims to avoid or at least to reduce exposure to risk, such as smoking, obesity, excessive sun exposure, or the excessive consumption of alcohol. Health promotion as

[e] A table of annual trends between 1993 and 2007 is available at www.tumours.bfs.admin.ch.

primary prevention encourages daily physical activity and increased consumption of fruits and vegetables coupled with a reduced intake of animal fat.[16]

Technological advances improve the effectiveness of secondary prevention, also called "screening". The aim is to identify the disease at a very early stage when the disease has not yet manifested itself with symptoms. Such screening tests are available for cancers of the breast, prostate, colon and cervix uteri.

Technological progress also enables greater efficacy of care and treatments, especially thanks to innovations in imaging, surgery, radiotherapy and chemotherapy. All these methods have and will continue to offer certain cancer patients a higher probability of cure.

In addition, advances in genetics and genetic epidemiology are now opening new perspectives for diagnosis, treatment and (soon) perhaps even prevention. The fight against cancer is therefore based on the synchronisation of programmes and services for primary prevention, screening, diagnosis, treatment, and rehabilitation.

3.6 Swiss Specificities

Similarly to other European countries the incidence of lung cancer in men, stomach cancer in both sexes, and cancer of the cervix uteri in women is declining significantly in Switzerland.[f] Conversely, as in other European countries, the incidence of prostate cancer in men and lung cancer in women is rising.

Compared with the rest of Europe, the mortality rate for melanoma for both sexes in Switzerland is above the average range. Men also have a higher mortality rate for prostate cancer, multiple myeloma and non-Hodgkin lymphomas. Women have a higher than average mortality rate of lung and bladder cancer. Conversely, the mortality rate for Swiss women is lower than the European average for cancers of the cervix uteri and stomach.

Compared with other European countries, the survival rate of people suffering from cancer is particularly high in Switzerland. Survival rates indicate the capacity of the health care system to diagnose cases early and to treat them effectively.

By international comparison the incidence of cancers of the breast, testis and prostate, melanoma, Hodgkin's disease and to lesser extent non-Hodgkin lymphomas is high in Switzerland. The sharp increase in melanoma, observed particularly among young women, underscores the necessity of prevention measures.

Furthermore, some regional differences within Switzerland should be highlighted. Lung cancer and ear, nose and throat (ENT) cancers,[g] which are associated with the consumption of tobacco and alcohol, are more common in French- and Italian-speaking Switzerland. For breast cancer, the incidence is higher in French- and Italian-speaking Switzerland, while the mortality is higher in German-speaking Switzerland. All cantons in French-speaking Switzerland have a breast-cancer screening by mammography programme, compared with only one German-speaking canton. Such a mammography programme is expected to be introduced in the canton of Ticino in 2011. As far as cancer of the cervix uteri is concerned, the incidence rates are twice as high in the cantons of Graubünden and Glarus as in the cantons of Geneva and Fribourg. Lastly, it is worth noting that the incidence of testicular cancer is very high in Switzerland, particularly in Basel-Stadt and Basel-Landschaft. Specific studies would be needed to identify potential causes. For colorectal cancer there is currently no organised screening in Switzerland. However, two screening methods are available (cf. 4.2.6). The value of such screening would be to allow early diagnosis.

[f] International comparisons ought to be considered with caution, particularly because of differences in cancer registration and between health systems.

[g] Also known as ORL cancers, i.e. cancers involving otorhinolaryngology.

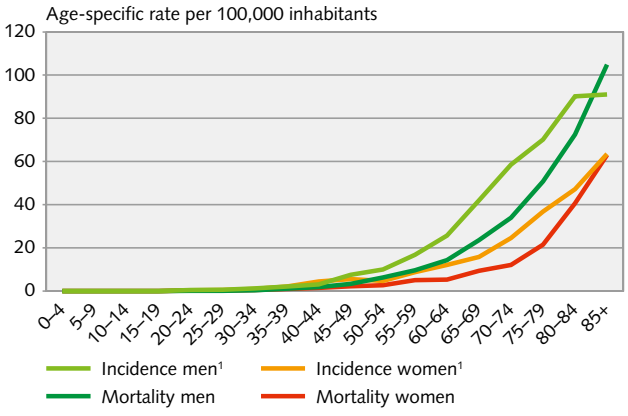
4 Cancer Sites

4.1 Stomach Cancer

4.1.1 General Observations

Approximately 800 stomach cancers are diagnosed each year in Switzerland.[a] This cancer accounts for less than 3% of all new cancer cases in both sexes. It is about twice as common in men than in women and risk increases with age (G 4.1.1). The risk of developing this cancer before the age of 70 is 0.6% in men and 0.3% in women.

Stomach cancer, 2003–2007 **G 4.1.1**



¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

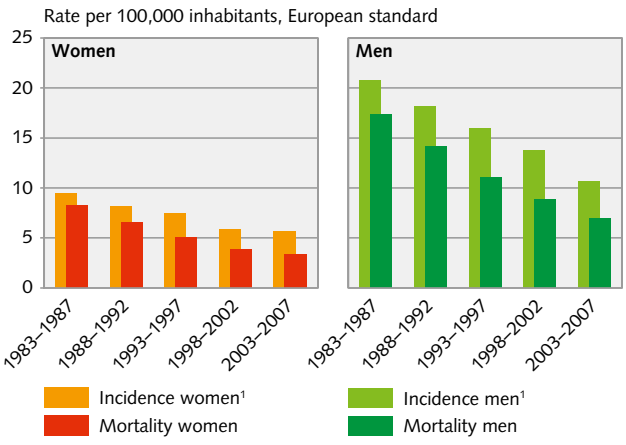
Source: FSO: COD, NICER, CCR © *FSO*

Stomach cancer is responsible for 536 deaths per year, about 3.5% of all cancer deaths in both sexes. In terms of mortality, its impact is somewhat more significant because of its relatively low survival rate.[17] The five-year relative survival rate is 27%, slightly above the European average. In 2002, it was estimated that 1200 men and 650 women diagnosed with stomach cancer during the previous five years were living in Switzerland.[18]

4.1.2 Trends

In Switzerland, as in many parts of the developed world, a significant decrease in the incidence and mortality of stomach cancer is being observed (G 4.1.2). This decrease is more pronounced in men than in women. In French- and Italian-speaking Switzerland, the incidence among women appears to no longer be declining (G 4.1.3).

Stomach cancer: Incidence¹ and mortality trend **G 4.1.2**

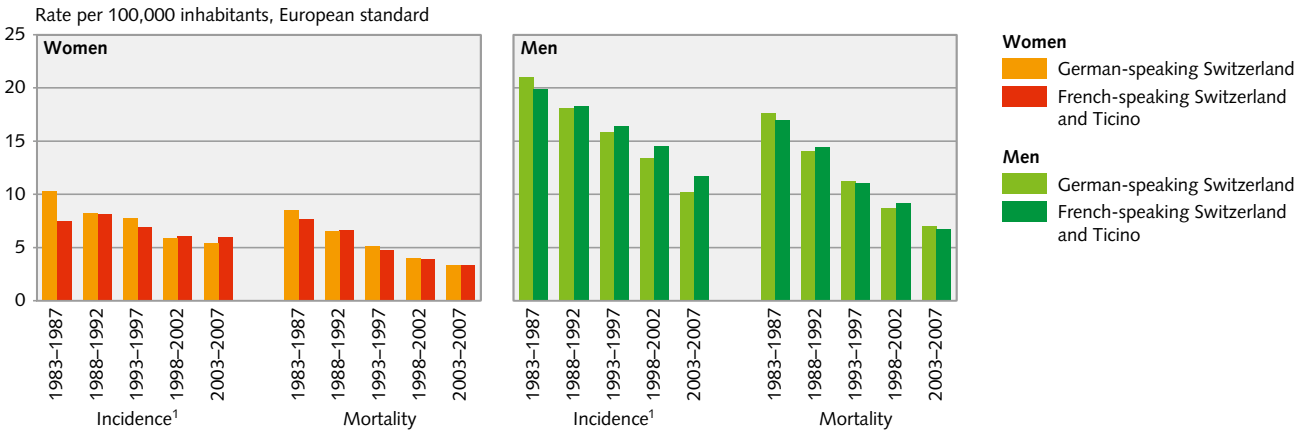


¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

[a] Annual average 2003–2007, estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

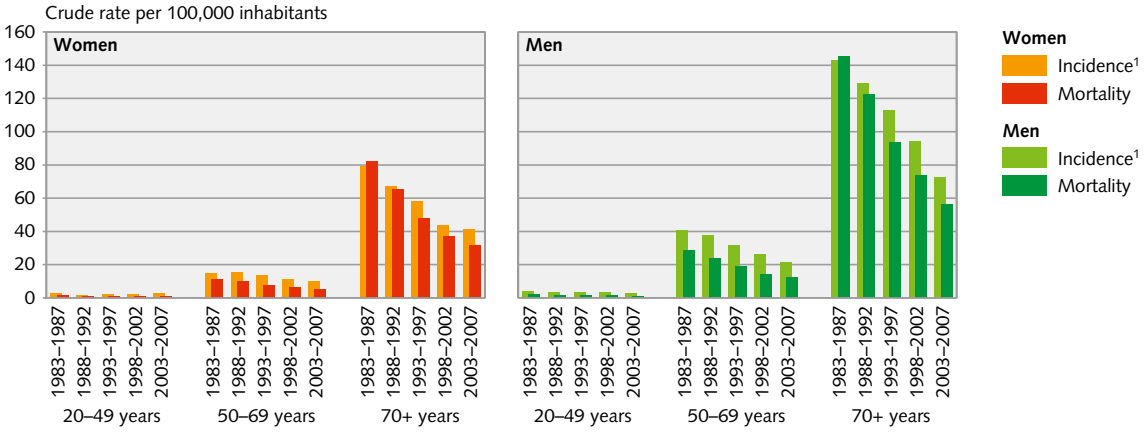
Stomach cancer: Incidence[1] and mortality trend by language region G 4.1.3



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Stomach cancer: Incidence[1] and mortality trend by age group G 4.1.4



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.1.3 Regional Comparisons

There are significant disparities in incidence in Switzerland. This cancer is about twice as common in the cantons of Ticino and Valais and in the region of Graubünden and Glarus than in the canton of Neuchâtel and the registry of Basel-Stadt and Basel-Landschaft, which registers the lowest rates among men and women respectively (G 4.1.5).

4.1.4 International Comparisons

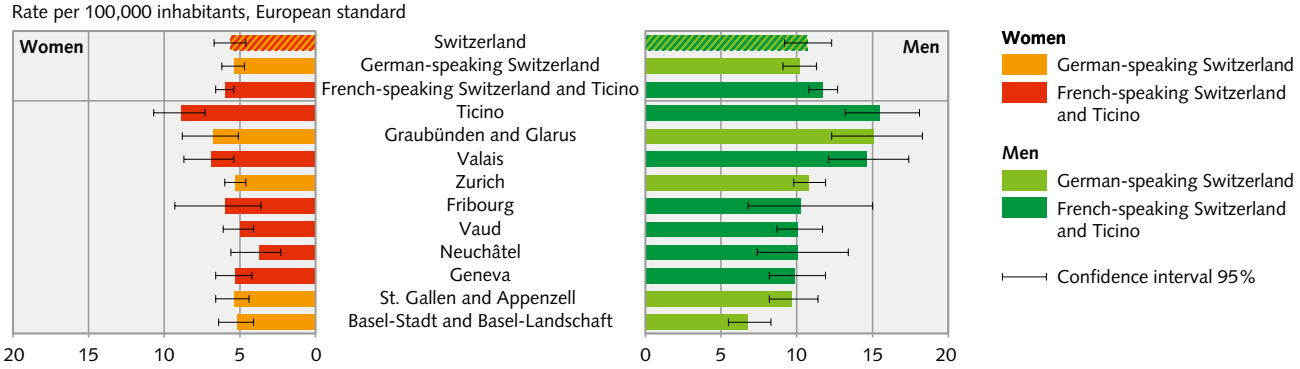
Significant geographic variations in incidence are observed (G 4.1.6). The risk is 10–12 times higher in East Asia (Korea and Japan), which has the highest rates, than in the United States, India and Pakistan, which have the lowest ones. Relatively high rates are also observed in South America, Russia and Eastern Europe, as well as in Portugal. The Swiss incidence rate is within the low average range in Europe.

4.1.5 Risk Factors

The spontaneous and significant decline in stomach cancer in most countries, commonly called the "unplanned triumph", is probably linked to the emergence of refrigerators, which has changed the method of food preservation.

Infection with *Helicobacter pylori* bacterium is known as one of the main risk factors for this cancer. The inflammations it causes (chronic atrophic gastritis) promote the occurrence of precancerous lesions. A diet rich in smoked, salted, dried and pickled food, as well as food containing high levels of nitrates and nitrites, increases the risk. Such a diet may be the cause of the higher rates observed in the cantons in the Alpine Arc. In contrast, the consumption of fruits and vegetables appears to decrease the risk. Pernicious anaemia, blood type A, and a family history are all associated with inreased risk. A family history of stomach cancer is associated with an increased risk of developing it. In particular, some genetic

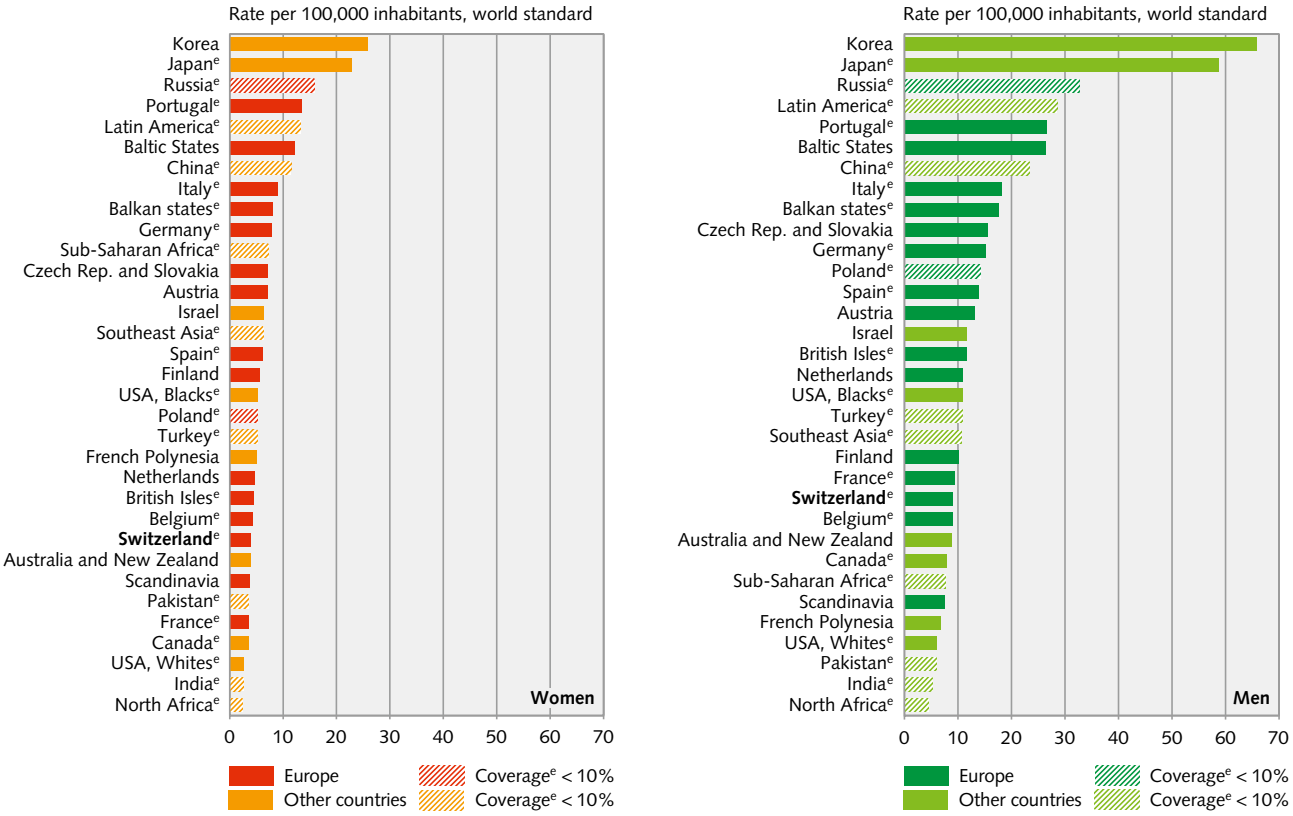
Stomach cancer: Incidence[1] in regional comparison, 2003–2007 **G 4.1.5**



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: NICER, CCR

Stomach cancer: Incidence[1] in international comparison, 1998–2002 **G 4.1.6**



[1] A list of all included cancer registries is presented in Annex 1
[e] Countries and regions with partial coverage: estimate based on registered regions

Source: NICER, CCR, CI-Five Vol.9

predispositions associated with the occurrence of breast or colorectal cancer may also predispose to stomach cancer. It is worth noting that cancer of the upper stomach (cardia), close to the oesophagus, has become more common in some countries. This cancer has risk factors similar to those of cancer of the oesophagus, such as smoking, reflux oesophagitis and obesity.

4.1.6 Prevention and Screening

Avoiding excessive consumption of salty foods such as dried or pickled meats and fish, and regularly consuming fruits and vegetables, is recommended. The treatment of any *Helicobacter pylori* infections is also recommended. To prevent cancers of the cardia, smoking cessation, prevention of gastric reflux (particularly by avoiding weight gain), are recommended. In Asian countries at high risk for stomach cancer, screening has been introduced. Such screening is not envisaged in other regions of the world where the risk is lower, such as Switzerland.

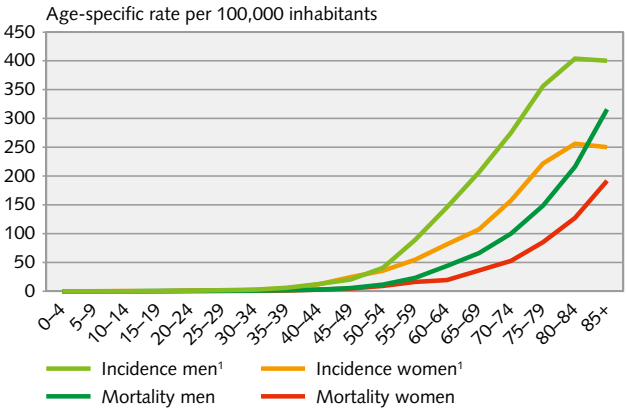
4.2 Colorectal Cancer

4.2.1 General Observations

Colorectal cancer is the second most frequent cancer among women and the third among men. Approximately 4000 patients are diagnosed each year,[b] and accounts for 11% of all cancers in both sexes. It occurs more often in men and risk increases with age (G 4.2.1). The risk of developing colorectal cancer before the age of 70 is 2.6% in men and 1.6% in women. Most often, this cancer develops from a pre-existing benign polyp.

Colorectal cancer is the third leading cause of cancer death, with approximately 1600 deaths per year in both sexes. The five-year relative survival rate is 60%. Switzerland has the best survival rate in Europe.[19] It is estimated that some 8300 men and 6200 women diagnosed with colorectal cancer in the previous five years lived in Switzerland in 2002.[20]

Colorectal cancer, 2003–2007 **G 4.2.1**



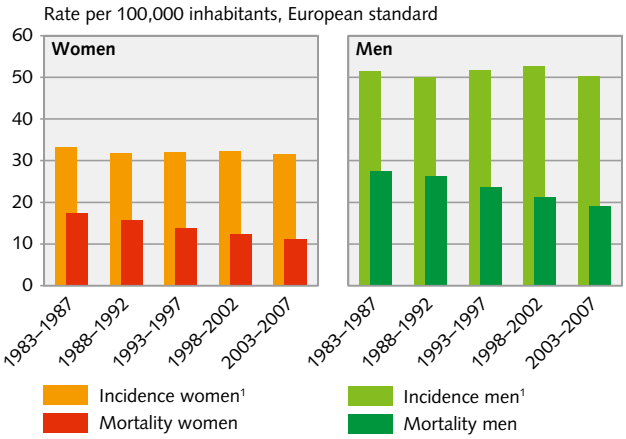
[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.2.2 Trends

In Switzerland, a stabilisation of incidence (G 4.2.2) and even a slight decline among the elderly, coupled with reduced mortality after age 50 (G 4.2.4) are being observed. The latter is attributed to the introduction of screening and therapeutic advances for colorectal cancer. Trends in incidence and mortality are similar in the two language regions (G 4.2.3).

Colorectal cancer: Incidence[1] and mortality trend **G 4.2.2**

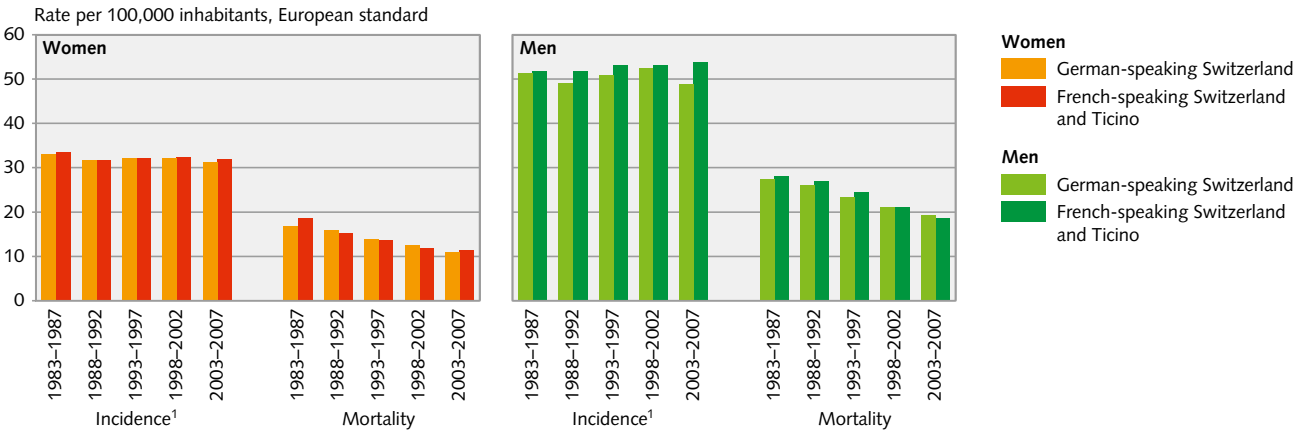


[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

[b] Annual average 2003–2007, estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

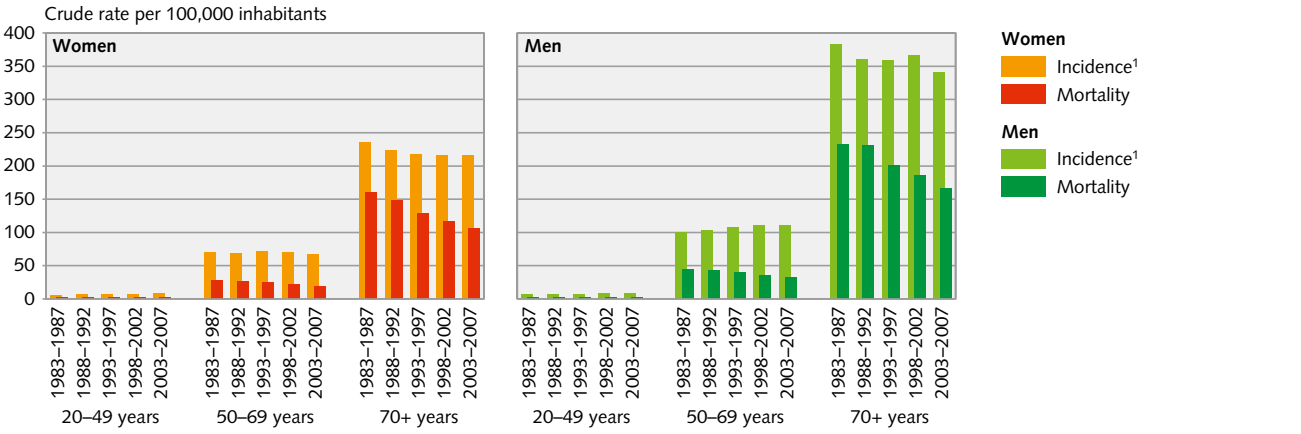
Colorectal cancer: Incidence[1] and mortality trend by language region G 4.2.3



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Colorectal cancer: Incidence[1] and mortality trend by age group G 4.2.4



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.2.3 Regional Comparisons

The highest rates of colorectal cancer in Switzerland are observed in Ticino among men and in Neuchâtel among women. The lowest rates are observed in Zurich among men and in Fribourg among women (G 4.2.5).

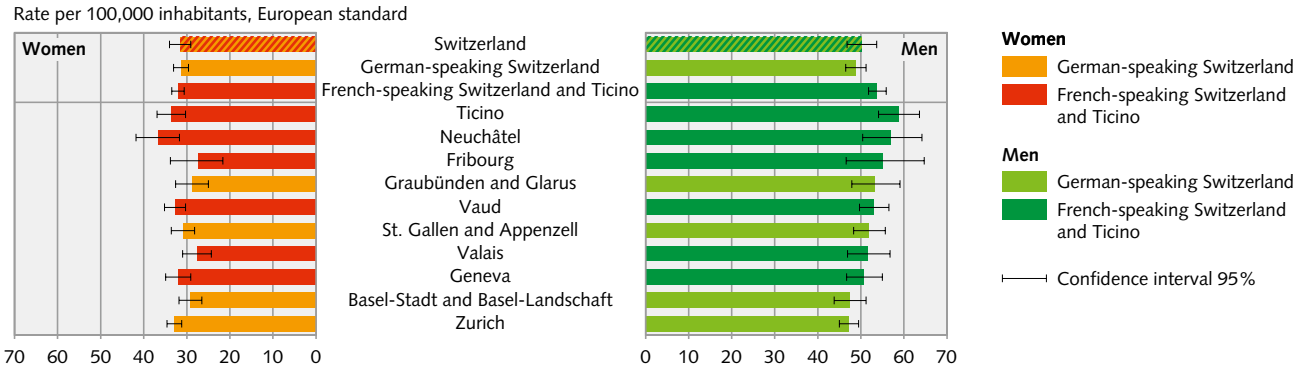
4.2.4 International Comparisons

Large geographic variations in incidence of colorectal cancer rates – of a factor of 15 between high and low risk areas – are observed (G 4.2.6). Among men as well as women, the lowest rates are found in India. The highest rates for men are in the Czech Republic and for women in New Zealand. In general, the highest risks are in Europe, North America and Oceania. In contrast, the risks are lower in Asia, Africa and South America. Colorectal cancer was until recently much more common in developed countries, where rates have now stabilised and/or declined. However, it is becoming much more common in developing countries and in Japan, where the risk was previously low. The incidence rate in Switzerland is within the average range in Europe.

4.2.5 Risk Factors

A diet rich in red meat (e.g. beef, pork, veal, lamb) or processed meat (e.g. hot dogs, ham, salami), alcohol consumption (more than one to two glasses per day), and long-term smoking (30 years and over) increase the risk of colorectal cancer. In contrast, regular exercise, maintaining normal weight, and to a lesser extent high consumption of fruits and vegetables appear to decrease incidence. Taking anti-inflammatory medication (such as aspirin), the contraceptive pill, and hormone replacement therapy (HRT) at menopause have also been associated with a decreased risk of developing colorectal cancer. People with inflammatory bowel disease (e.g. ulcerative colitis or Crohn's disease) have an appreciably higher risk of developing colorectal cancer. People with a close family member (e.g. parent, sibling) who has developed the disease are also at higher risk. It is estimated that approximately 10% of colorectal cancers are hereditary. Some familial cancers occur in the context of a familial disease characterised by the presence of numerous intestinal polyps (familial polyposis).

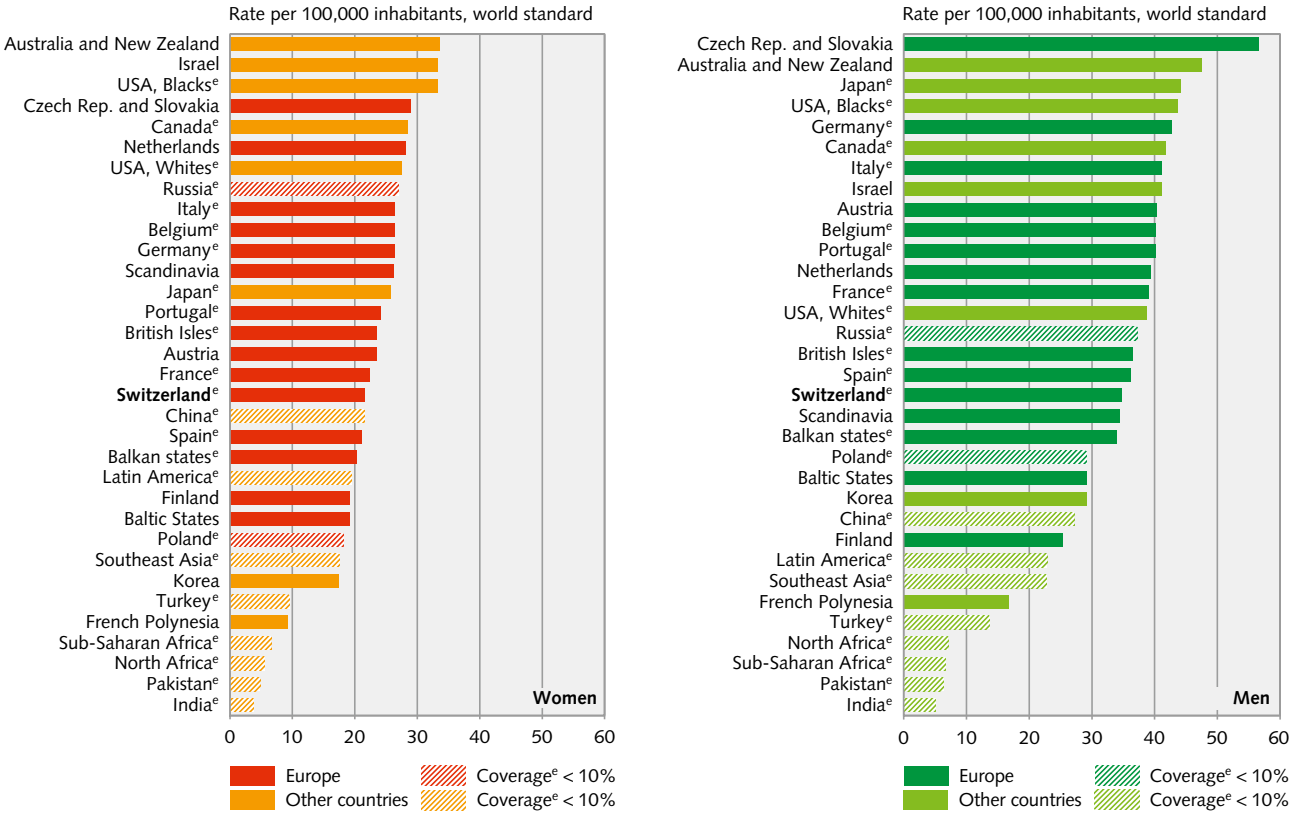
Colorectal cancer: Incidence[1] in regional comparison, 2003–2007 **G 4.2.5**



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: NICER, CCR

Colorectal cancer: Incidence[1] in international comparison, 1998–2002 **G 4.2.6**



[1] A list of all included cancer registries is presented in Annex 1
[e] Countries and regions with partial coverage: estimate based on registered regions

Source: NICER, CCR, CI-Five Vol.9

4.2.6 Prevention and Screening

Besides smoking cessation, it is recommended to moderate the consumption of red and processed meat, and alcohol, and to promote the consumption of fruits and vegetables, physical activity and obesity prevention. Undergoing regular screening tests is the best way to reduce the risk of colorectal cancer by detecting and removing polyps before they become cancerous. Two major screening methods are available and are commonly offered in most developed countries from the age of 50: fecal occult blood test (FOBT; screening for occult blood in the stool) every year, or colonoscopy (a flexible tube inserted in the anus to examine the entire colon) every five years. For persons with a high individual or familial risk, screening should begin earlier and endoscopic examination should be more frequent.

4.3 Lung Cancer

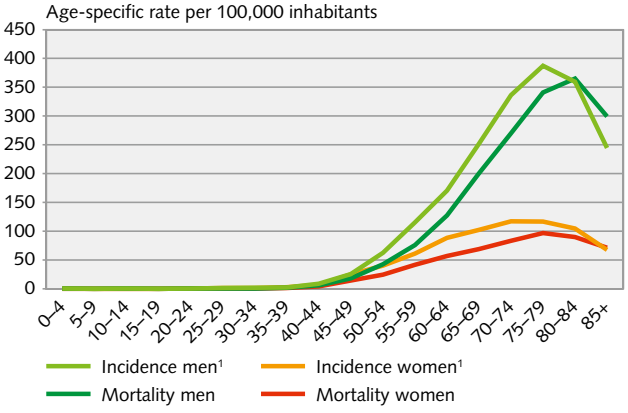
4.3.1 General Observations

Approximately 2500 men and 1200 women get lung cancer each year in Switzerland.[c] This cancer accounts for 13% of cancers in men, among whom it ranks second, and for 8% of cancers in women, among whom it ranks third. The risk of developing lung cancer before the age of 70 is 3.2% in men and 1.7% in women. Lung cancer is about twice as common in men as in women and risk increases with age until the age of 75 and decreases thereafter (G 4.3.1).

In terms of mortality, lung cancer's impact is sizable because of its relatively low survival rate. In men, it remains the leading cause of cancer deaths with 2000 deaths per year, representing 23% of cancer deaths. In women, it is the second leading cause of cancer deaths, with approximately 900 deaths per year, or 13% of all cancer deaths.

The five-year relative survival is 14%, placing Switzerland at the top of the European ranking, with the highest survival rate.[21] In 2002, it was estimated that 3000 men and 1300 women diagnosed with lung cancer during the previous five years were living in Switzerland.[22]

Lung Cancer, 2003–2007 **G 4.3.1**



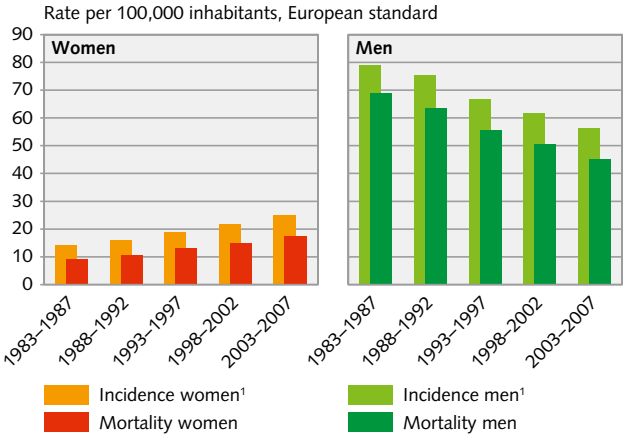
¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.3.2 Trends

In Switzerland, as in many parts of the world, an important decrease in incidence and mortality in men and an important increase in women is being observed (G 4.3.2). The number of women affected doubled between 1983 and 2007. These trends are observed in all regions of Switzerland (G 4.3.3) and in all age groups (G 4.3.4).

Lung Cancer: Incidence[1] and mortality trend **G 4.3.2**

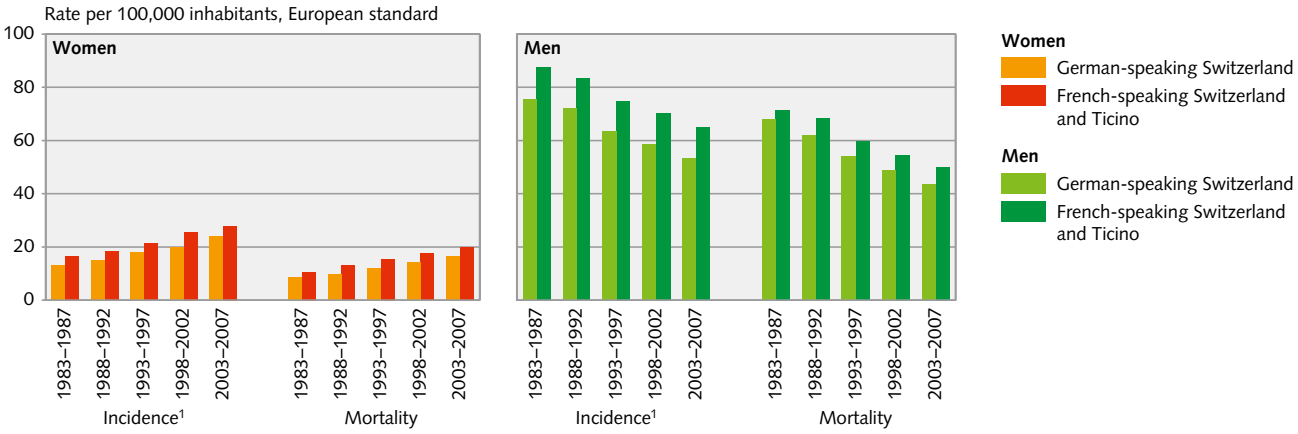


¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

[c] Annual average 2003–2007, estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

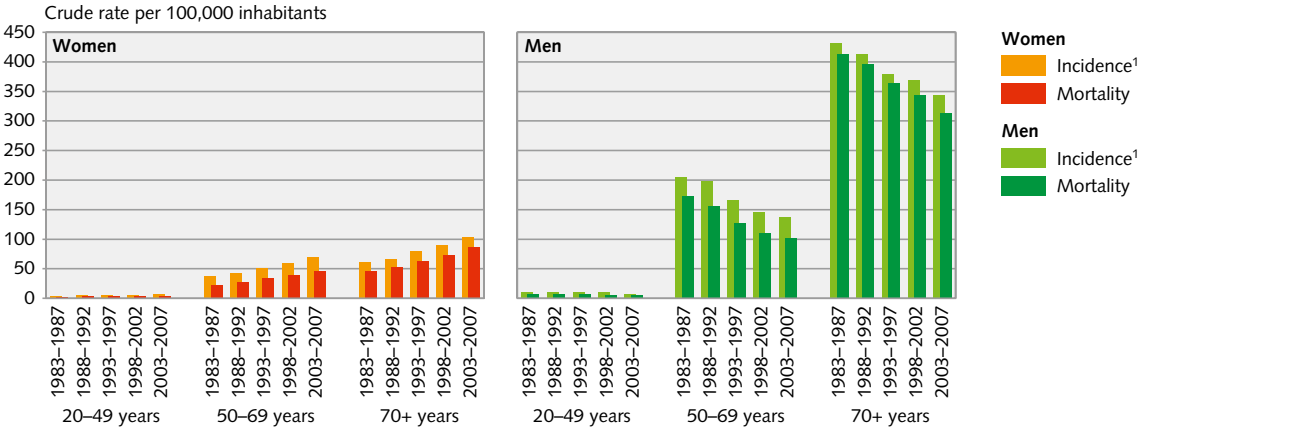
Lung Cancer: Incidence[1] and mortality trend by language region G 4.3.3



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Lung Cancer: Incidence[1] and mortality trend by age group G 4.3.4



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.3.3 Regional Comparisons

The incidence is higher in French- and Italian-speaking Switzerland than in German-speaking Switzerland (G 4.3.3). It is about 50% higher in cantons where it is high (Fribourg and Neuchâtel for men, Neuchâtel and Vaud for women) than in regions where it is low (Zurich and Basel-Stadt and Basel-Landschaft for men, St. Gallen-Appenzell and Basel-Stadt and Basel-Landschaft for women) (G 4.3.5).

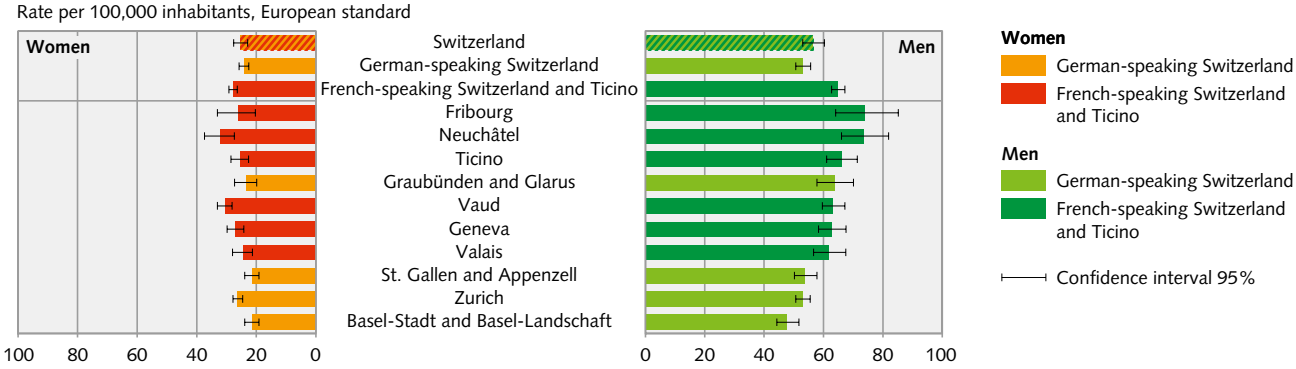
4.3.4 International Comparisons

Just a few decades ago, the highest incidence rates of lung cancer were observed in the United States and England, where the smoking epidemic among both men and women was the highest in the world. Due to preventive measures against smoking, geographic differences have substantially changed. Today, the risk is highest among African-American men in the United States. Their lung-cancer rate remains approximately 10 times higher than among men in Sub-Saharan Africa, who have the lowest rate. In men, high rates are also found in Turkey, the Baltic States, and Eastern Europe (G 4.3.6). The lowest rates are observed in developing countries. In women, the highest rates are observed in both the white and black populations of the United States. The rates remain high among women in the British Isles. Unlike men, women register low rates in the Balkans and in Turkey. The relatively high rates among women in Southeast Asia are worth noting. The lung cancer incidence rate in Switzerland falls within the low average range in Europe among men and within the high range among women.

4.3.5 Risk Factors

Smoking is responsible for more than 80% of lung cancers. The more cigarettes a person smokes per day and the longer he or she smokes, the higher the risk of cancer. Passive smoking is estimated to be responsible for nearly one quarter of lung cancers occurring among people who have never smoked. In men, approximately 10% of lung cancers are of occupational origin. Exposure to high levels of environmental pollution (e.g. particulate matter, hydrocarbons), asbestos dust, silica, some metals (e.g. arsenic and cadmium), and radioactive substances such as radon increases the risk of lung cancer. Among women in Southeast Asia, exposure to fumes when cooking is probably the cause of the excess

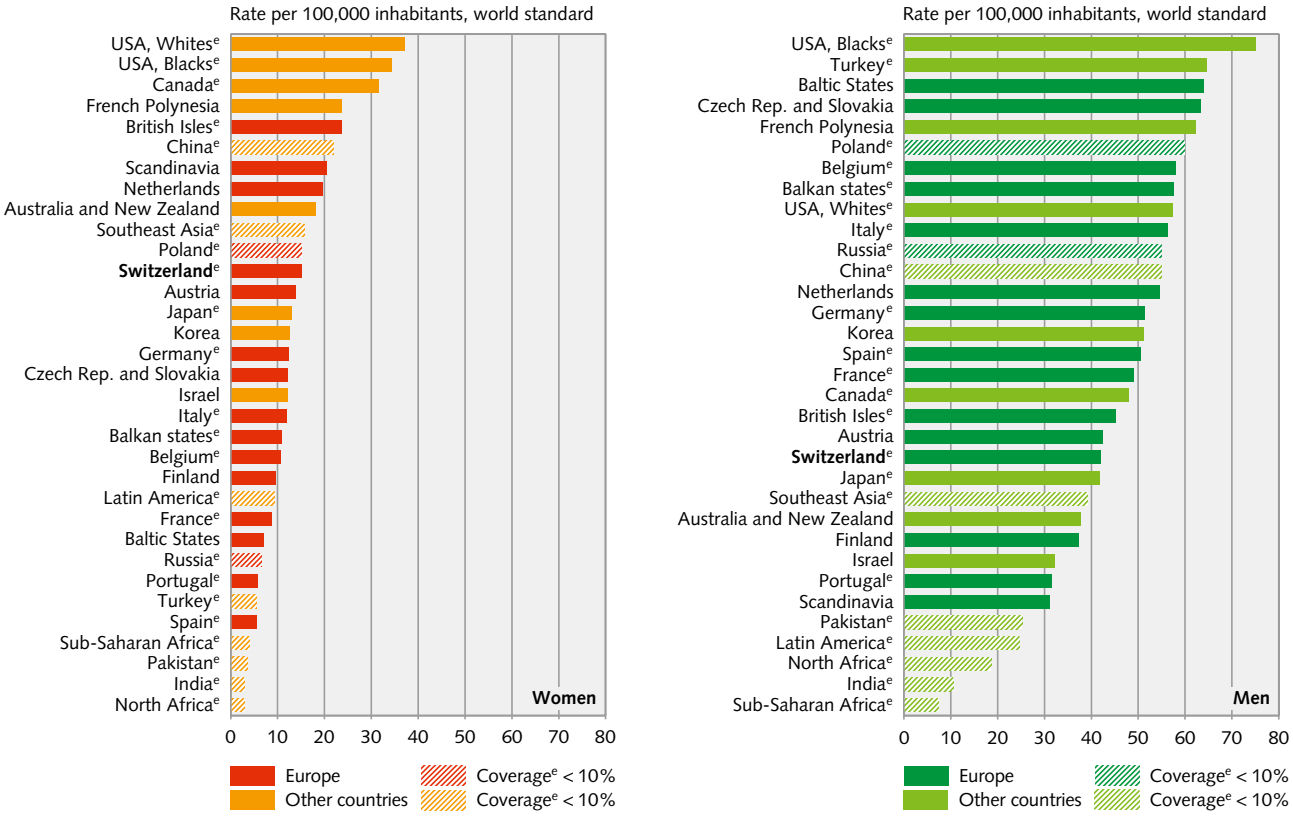
Lung Cancer: Incidence[1] in regional comparison, 2003–2007 **G 4.3.5**



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: NICER, CCR

Lung cancer: Incidence[1] in international comparison, 1998–2002 **G 4.3.6**



[1] A list of all included cancer registries is presented in Annex 1
[e] Countries and regions with partial coverage: estimate based on registered regions

Source: NICER, CCR, CI-Five Vol.9

risk. Air pollution also increases the risk of lung cancer; the extent of this association is currently being scientifically investigated. The protective role of fruits and vegetables, especially those rich in beta-carotene, remains disputed. Certain genetic factors may also increase the risk of lung cancer, especially by interfering with the metabolism of carcinogens contained in tobacco smoke.

4.3.6 Prevention and Screening

Smoking cessation is the single best prevention method. But it is also necessary to protect individuals from exposure to passive smoking, especially in public places, and to take the necessary measures to reduce occupational exposure to carcinogens. Prevention also involves pollution control.

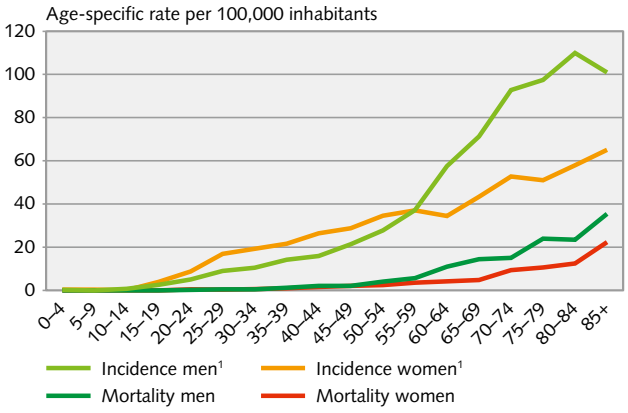
Screening for lung cancer through routine x-ray examinations or by searching for cancerous cells in the sputum of populations of smokers has not proven to be effective.

4.4 Melanoma

4.4.1 General Observations

Of three types of skin cancer, basal cell carcinoma, squamous cell carcinoma and melanoma, only melanoma is discussed in this chapter.[d] Each year, about 1900 melanomas are detected in Switzerland.[e] Melanoma accounts for 5% of new cancer cases among men and 6% among women. Melanoma is as common in men as in women up to the age of 60. From age 60 on, it affects men about twice as frequently as women (G 4.4.4). The risk increases progressively with age (G 4.4.1), but it is worth stressing that this cancer is one of the most common in young adults. Approximately 30% of melanomas occur before the age of 50. The risk of developing one before the age of 70 is 1.4% in both sexes.

Melanoma, 2003–2007 **G 4.4.1**



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

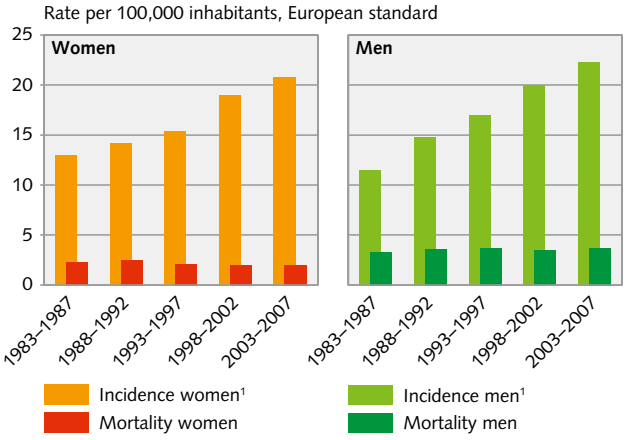
Melanoma is responsible for approximately 270 deaths per year, i.e. less than 2% of all cancer deaths in both sexes. It has one of the best prognoses, with a five-year relative survival of more than 89%. Survival in Switzerland is among highest in Europe.[23] It has a better prognosis in women than in men. In 2002, it was estimated that 2600 men and 3900 women diagnosed with a melanoma in the previous five years were living in Switzerland.[24]

4.4.2 Trends

In recent decades, melanoma has had the sharpest increase in incidence of all cancers in Switzerland – a trend that has also been observed in many other regions of the world. The incidence rates, both for men and women, more than doubled in Switzerland between 1983 and 2007 (G 4.4.2). This increase is larger in French- and Italian-speaking Switzerland than in German-speaking Switzerland (G 4.4.3). The increase in melanoma cases affects all age groups but is particularly marked among men aged 70 and older and women under 50 (G 4.4.4).

In terms of mortality, however, the rates have remained relatively stable. The change in mortality by age has been less positive among people aged over 70, with a considerable increase in men between 1983 and 1992, followed by an increase in women between 1998 and 2007. In contrast, mortality declined in the young population (under age 50) between 1993 and 2002, in both men and women (G 4.4.4). Mortality is slightly higher, but not significantly so, in German-speaking Switzerland (G 4.4.3).

Melanoma: Incidence[1] and mortality trend **G 4.4.2**



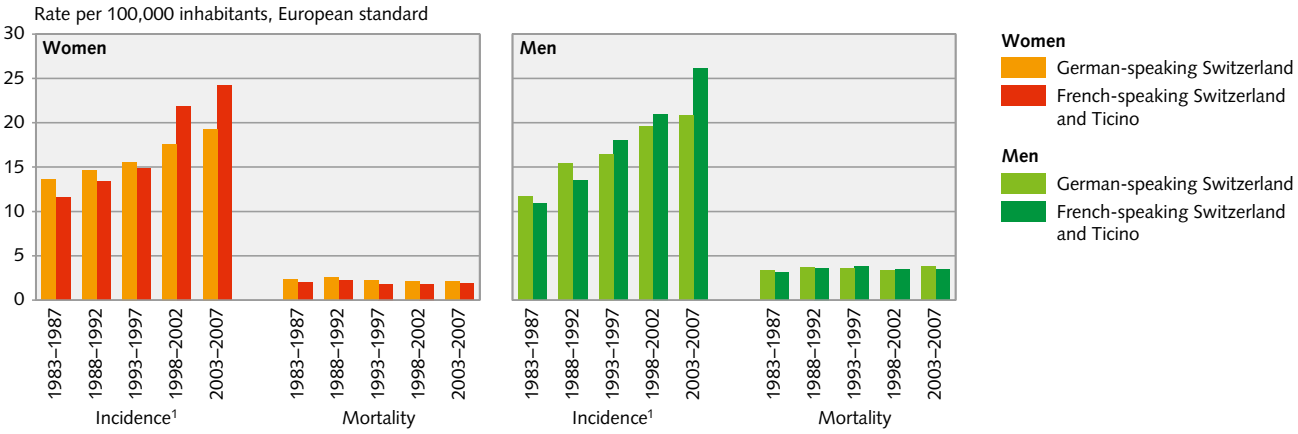
[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

[d] Rare forms of melanoma which occur in organs other than the skin are not included in this chapter.

[e] Annual average 2003–2007, estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

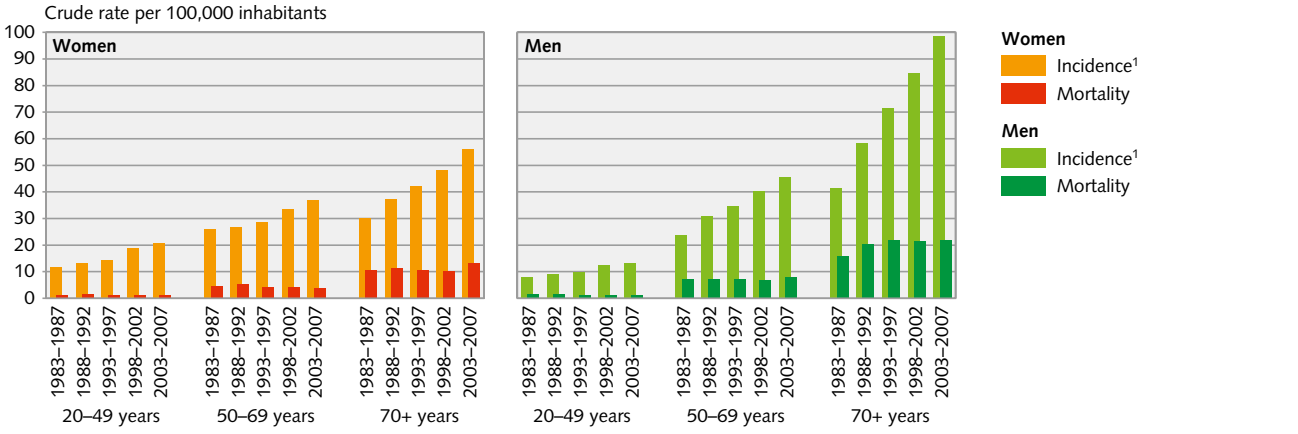
Melanoma: Incidence[1] and mortality trend by language region G 4.4.3



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Melanoma: Incidence[1] and mortality trend by age group G 4.4.4



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.4.3 Regional Comparisons

Disparities in incidence are observed. In men, the highest incidence rates are found in the cantons of Neuchâtel, Vaud and Geneva. The lowest rates have been registered by the registries of St. Gallen-Appenzell, Graubünden, Glarus, Basel-Stadt and Basel-Landschaft. Among women, the data are very similar, but the canton of Fribourg has the highest incidence (G 4.4.5).

4.4.4 International Comparisons

Geographic disparities can be seen in Melanoma incidence rates worldwide. It is virtually nonexistent in black and Asian populations. The highest rates in the world are found in Caucasians living in New Zealand and Australia. The second highest rates are found in Switzerland, although the values are half of what they are in the Austral continent. The United States (white population only), Scandinavia, and the Netherlands also have a particularly high risk (G 4.4.6).

4.4.5 Risk Factors

The dramatic rise in melanoma in Switzerland and around the world is mainly due to two phenomena: one related to exposure to the sun for fashion and recreation, and the other to better detection. More naevi (moles or beauty marks/spots) are being systematically screened and analysed by pathologists.

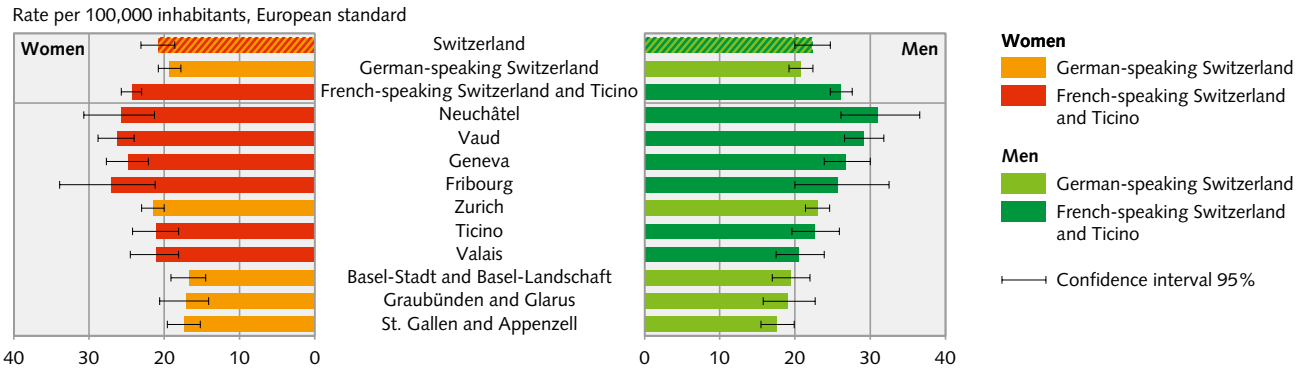
The main risk factor for melanoma is exposure to ultraviolet radiation, particularly type B, whose main sources are the sun, tanning lamps and solariums. Ultraviolet rays cause damage to the DNA of the skin, especially during acute exposure (sunburn) in childhood. The lighter the skin, the more intense the exposure, the less the skin is protected the greater the risk of melanoma. It is therefore not surprising that the Swiss population, which is fair-skinned is particularly at risk for this cancer.

Ethnicity and skin colour are significant risk factors. White populations have on average a ten times higher risk of developing cancer than black or mixed-race populations, which are protected by a high concentration of skin melanin (skin pigment). The presence of numerous naevi, is a risk factor. The vast majority of naevi do not develop into melanoma, but almost all melanomas develop within a preexisting nevus.

Individuals with congenital naevi and particularly with multiple dysplastic naevi are at higher risk. A history of melanoma in one or more family members increases the risk of developing it. Approximately 10% of melanomas occur in a familial context. In some families at high risk of melanoma, certain specific genes are mutated.

People who have been diagnosed with a first melanoma are more likely to develop a second. The risk is also higher in immunosuppressed populations, particularly in organ transplant recipients. Lastly, it is worth mentioning a rare genetic syndrome called *xeroderma pigmentosum,* which consists of a genetic deficiency in an enzyme responsible for repairing damaged DNA. Patients with this syndrome are at high risk of developing multiple skin tumours from childhood.

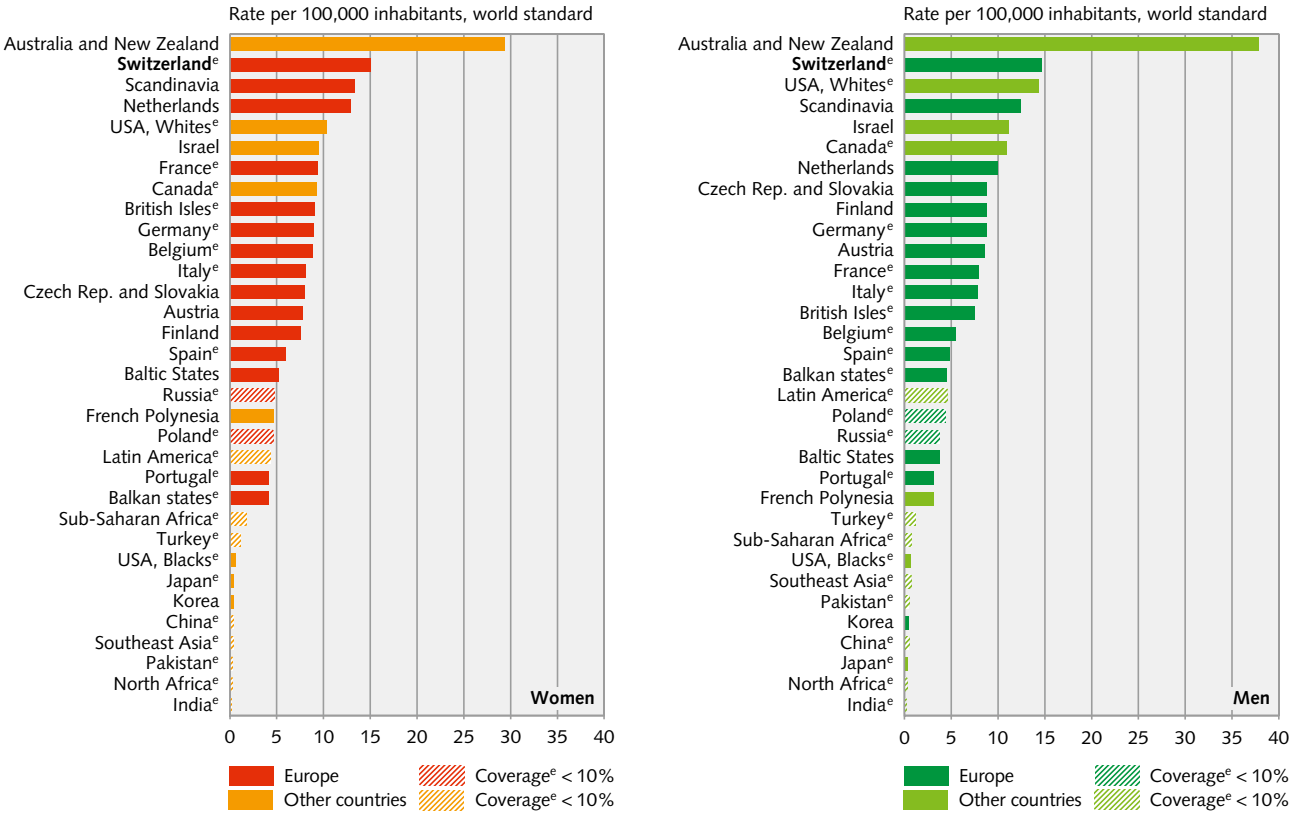
Melanoma: Incidence[1] in regional comparison, 2003–2007 **G 4.4.5**



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: NICER, CCR

Melanoma: Incidence[1] in international comparison, 1998–2002 **G 4.4.6**



[1] A list of all included cancer registries is presented in Annex 1
[e] Countries and regions with partial coverage: estimate based on registered regions

Source: NICER, CCR, CI-Five Vol.9

4.4.6 Prevention and Screening

To prevent melanoma, it is necessary to prevent sunburn, particularly in childhood. It is recommended that sun exposure be avoided between 10 a.m. and 4 p.m. People ought to protect themselves by using sunscreen with a sun protection factor (SPF) of 30 or more. An even more effective method is to wear appropriate clothing (e.g. T-shirt, shorts, hat, sunglasses with ultraviolet absorption > 400nm). Solariums and tanning lamps ought to be avoided.

The systematic removal of naevi is generally not recommended except in special situations (e.g. congenital naevi on areas subject to friction). In contrast, for early detection of a melanoma, it is necessary to monitor naevi and consult a physician in case of changes (e.g. redness, hardness, changes in shape or pigmentation or bleeding). If there are many naevi, it is recommended that the patients be examined on a regular basis by a dermatologist. Techniques for microscopic examination of the skin have been developed to facilitate clinical monitoring. Prevention campaigns and testing are regularly organised by the Swiss Cancer League which also provides informational brochures.

Persons who are members of a family at high risk for melanoma can have specific genetic testing. But such genetic testing only makes sense for few people.

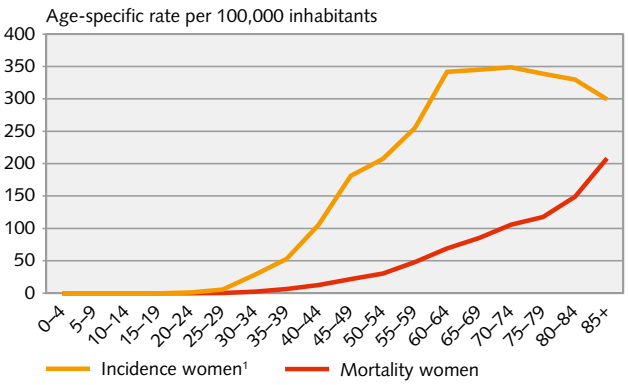
4.5 Breast Cancer

4.5.1 General Observations

Breast cancer is the most common cancer in women. 5250 women develop it each year in Switzerland,[f] which represents 32% of new cancer cases in women. A woman's risk to develop breast cancer before the age of 70 is 7.6%. This cancer is very rare before the age of 25. Approximately 20% of cases occur before age 50. Until 2002, the risk of breast cancer increased steadily with age. Since then, a bell-shaped curve has been observed, with an increase in rates until age 60, followed by a plateau and a decrease from age 70 (G 4.5.1). As discussed below (cf. 4.5.4 and 4.5.5), this decrease in the frequency of cases is probably related to changes in the use of hormone replacement therapy (HRT). Taken at menopause, HRT may increase the risk of breast cancer. But it also accelerates the growth of existing tumours, thus reducing the age of diagnosis by several years.

Approximately 1350 women die from this cancer each year in Switzerland which corresponds to 20% of all cancer deaths in women. The impact of breast cancer in terms of mortality is less significant than the impact in terms of incidence because survival is often favourable.

Breast cancer, 2003–2007 **G 4.5.1**

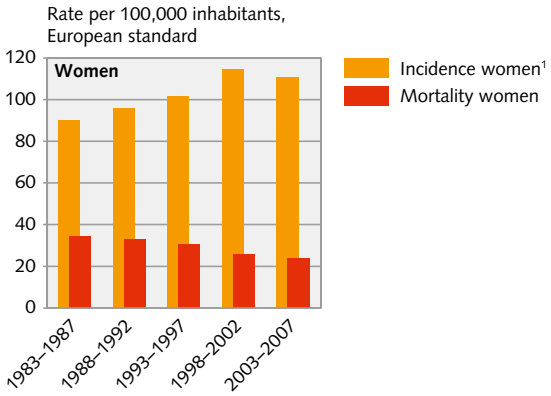


¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

With a five-year relative survival of 82%, Switzerland ranks among the countries with the best prognosis.[25] It is estimated that in 2002, some 22,000 women diagnosed with breast cancer in the previous five years were living in Switzerland.[26]

Breast cancer: Incidence[1] and mortality trend **G 4.5.2**



¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

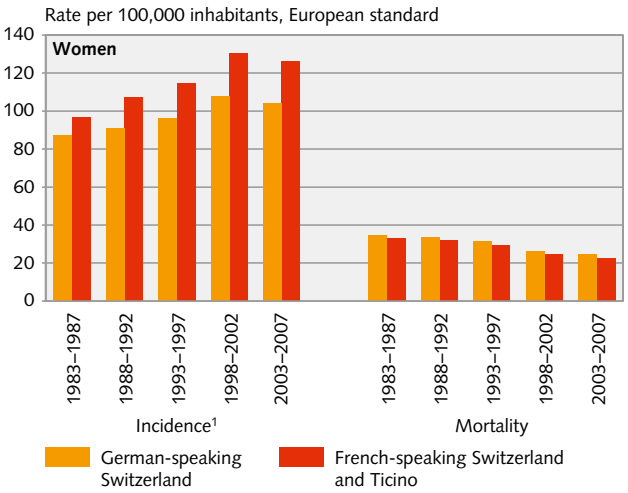
4.5.2 Trends

In Switzerland, as in the United States and in several European countries, the number of women affected by breast cancer has recently declined after decades of increase (G 4.5.2). This decrease involves post-menopausal women aged 50–69. It is attributable to the decline in the number of women taking HRT which occurred after the publication (in 2002) of the results of a large clinical study that showed that these hormones increase the risk of breast cancer.[27] On the other hand, there is an increased incidence rate in women under the age of 50. The incidence is stable in women aged 70 and older (G 4.5.4).

Mortality from breast cancer is decreasing. This decrease is particularly pronounced among women aged 50 and older (-25% between 1983–1987 and 2003–2007). A study conducted five years after the systematic introduction of screening in Switzerland showed that the decrease in mortality among women aged 55–74 occurred earlier and was larger in French-speaking cantons than in German-speaking cantons.[28] This is attributable to disparities in screening mammography, which is much more widespread in French-speaking than in German-speaking Switzerland.[29]

[f] Annual average 2003–2007, estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

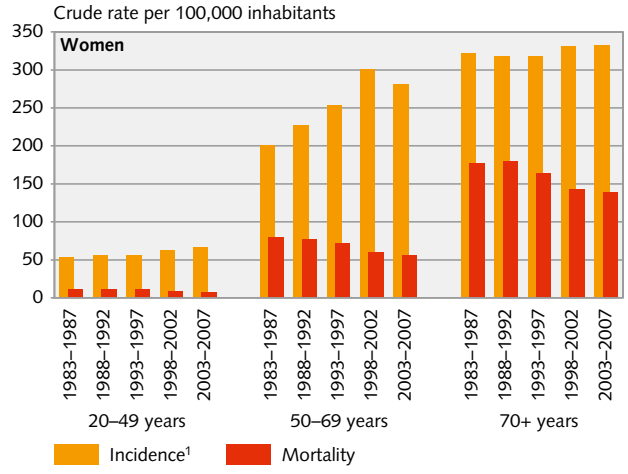
Breast cancer: Incidence[1] and mortality trend by language region **G 4.5.3**



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Breast cancer: Incidence[1] and mortality trend by age group **G 4.5.4**



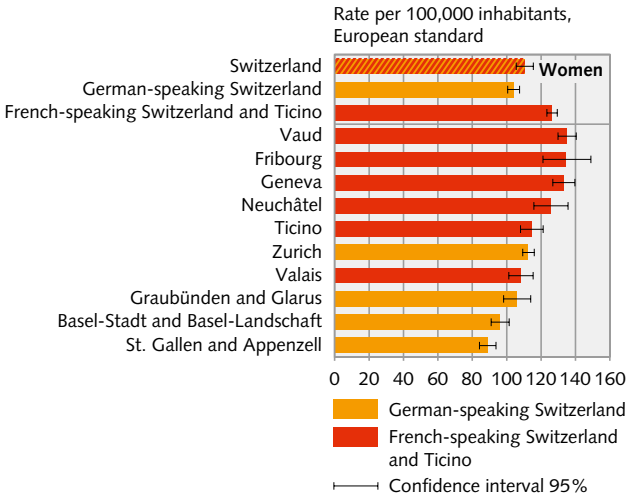
[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.5.3 Regional Comparisons

Breast cancer is more common in French- and Italian-speaking than in German-speaking Switzerland (G 4.5.3). Until recently, the highest incidence rate in Switzerland, and also among the highest in the world, was in the canton of Geneva. Because of the recent and large decline in the number of breast cancers in this canton, Geneva is now preceded by the cantons of Vaud and Fribourg. The lowest rates are found in the registries of St. Gallen-Appenzell, Basel-Stadt and Basel-Landschaft. The rates are approximately 50% higher in the registries with high incidence than in those where it is low (G 4.5.5).

Breast Cancer: Incidence[1] in regional comparison, 2003–2007 **G 4.5.5**



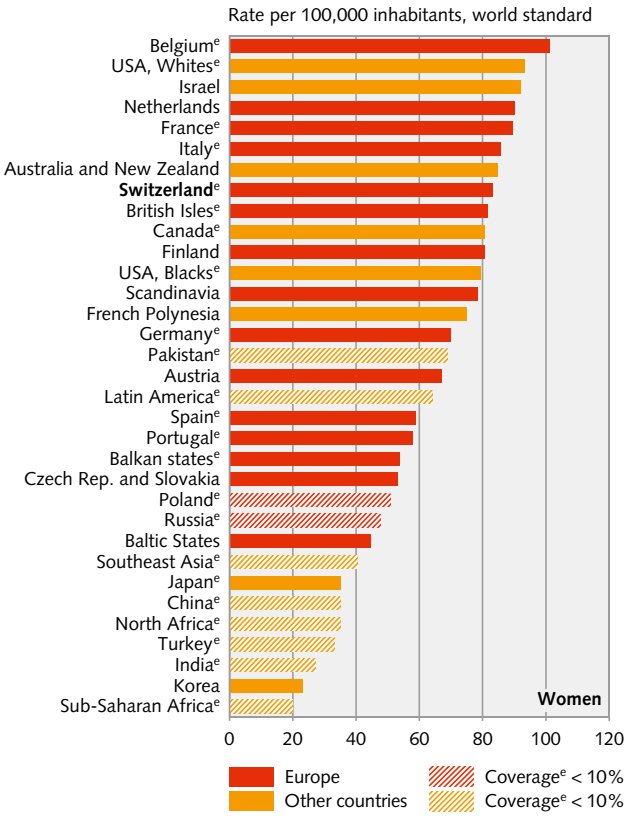
[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: NICER, CCR © *FSO*

4.5.4 International Comparisons

Considerable geographic variations exist throughout the world. The United States, particularly the white population, Canada, Belgium, and Switzerland have the highest incidence rates. In contrast, Southeast Asia, China, India, and North Africa, have the lowest rates. At the European level, the lowest rates are observed in Eastern Europe, Portugal, and Spain (G 4.5.6).

Breast cancer: Incidence[1] in international comparison, 1998–2002 **G 4.5.6**



[1] A list of all included cancer registries is presented in Annex 1
[e] Countries and regions with partial coverage: estimate based on registered regions

Source: NICER, CCR, CI-Five Vol.9 © *FSO*

4.5.5 Risk Factors

Breast cancer is linked to female hormones and factors that modify them. In particular, the risk increases with the lifetime number of menstrual cycles. Thus, an early age at menarche and/or late age at menopause are associated with an increased risk. On the other hand, an early age at first childbirth, a large number of childbirths, as well as breastfeeding protect against the occurrence of breast cancer. High levels of endogenous hormones such as oestrogen and testosterone increase the risk of breast cancer after menopause. The role played by endogenous hormones in breast cancer occurring before menopause is less clear. Regarding exogenous hormones, taking the pill and HRT for more than five years increases the risk of breast cancer by approximately 20% and 70%, respectively. This increased risk is temporary and returns to normal five years after cessation of the pill and/or HRT. The risk associated with HRT is higher for therapies that include a combination of oestrogen and progestin than for therapies containing oestrogen alone. It also appears to be higher in thin women. Conversely, anti-hormonal therapies reduce the risk of breast cancer.

Women with dense breast tissue have a higher risk of developing breast cancer. The same applies to women who have previously had breast cancer or have had previous breast problems, such as proliferative lesions or lesions with atypia.

Obesity (and to a lesser extent tallness) is a risk factor for breast cancer but only after menopause. This is because postmenopausal women transform oestrogen precursors into oestrogen in proportion to their body fat.

Alcohol consumption, particularly among young women, and physical inactivity are also risk factors for breast cancer. A great deal of research has been done on the relationship between diet and breast cancer. The only correlation supported by current literature is that eating foods rich in fat increases the risk of breast cancer.

Some studies show that working at night may increase the risk of breast cancer, probably due to lower secretion of melatonin, a hormone that can modify the secretion of other hormones.

Ionizing radiation is another established risk factor for breast cancer. The younger the age at which a woman is exposed the greater the risk. In particular, women who have received radiation treatment for Hodgkin's disease (a type of lymphoma) have a higher risk of breast cancer. The same applies, albeit with a lower risk, to women who have had numerous chest x-rays (e.g. for tuberculosis or a disease of the spinal column).

Also worth mentioning is the role of a family history. Women who have a mother or sister with breast cancer before age 50, or multiple women with breast cancer in their immediate family, are at higher risk for breast cancer. An estimated 5–10% of breast cancers are hereditary. Two genes, BRCA1 and BRCA2, are responsible for approximately half of the familial breast cancer cases. These genes regulate the DNA repair system. Women carrying a mutation on one of these genes have a 50–65% risk of developing breast cancer before age 70. Women with the BRCA1 mutation also have a higher risk of ovarian cancer. Other rare familial syndromes associate breast cancer with other cancers such as brain cancer, sarcomas, leukaemia (Li Fraumeni syndrome), gastrointestinal and thyroid tumours (Cowden syndrome), ovarian cancer (Peutz-Jeghers syndrome), and Hodgkin's disease (Ataxia telangiectasia).

Other gene mutations increase only slightly the risk of breast cancer. These include genes involved in hormone metabolism or in the process of cellular repair.

4.5.6 Prevention and Screening

Few risk factors for breast cancer can be modified. A moderate consumption of fat and alcohol, physical exercise, breastfeeding, and the prevention of obesity after menopause are recommended. Discussions about the possibility of undergoing hormone therapy ought to take into account the increased risk of breast cancer. If hormone therapy is needed, it should be given for less than five years. The same applies to the contraceptive pill, whose benefits and risks should also be discussed.

A large scale clinical study showed that among women with an increased risk of developing breast cancer, anti-hormonal therapy (tamoxifen) resulted in a 50% decline in the risk of developing this cancer. This preventive effect was accompanied, however, by significant adverse effects, such as increased risk of cancer of the corpus uteri (cancer of the body of the uterus). More recently, another clinical study showed that raloxifene, a selective modulator of oestrogen receptors, showed the same efficacy with fewer adverse effects. At present in Switzerland, women at high risk are only taking these drugs within the framework of specific studies.

Genetic screening is available for women at high familial risk through specialised genetic counselling. For women with BRCA1 or BRCA2 mutations, a preventive bilateral mastectomy (removal of both breasts), with or without removal of the ovaries, can be proposed. An alternative is careful monitoring with alternating MRI (Magnetic resonance imaging) and ultrasound every six months starting five years before the youngest age of breast cancer diagnosis in the youngest member of the family.

Biennial screening mammography reduces mortality from breast cancer by about 30% after age 50. The benefit/harm-cost ratio of mammography screening in women under age 50 still has to be examined in more detail. In Europe, routine screening mammography every two years from age 50 on is recommended. For women with dense breast tissue, the benefit of combining regular mammography with ultrasound should be discussed. Individual screening of younger women is left to the initiative of the woman and her treating physician.

Several screening programmes have been available in French-speaking Switzerland for several years. They ensure that women are sent invitations to get screened, that mammograms are read by two separate radiologists, and that the quality is evaluated. The pilot phase of the first screening programme in German-speaking Switzerland was launched in 2010. In Ticino systematic screening has been approved and should begin in 2011.

4.6 Uterine Cancer

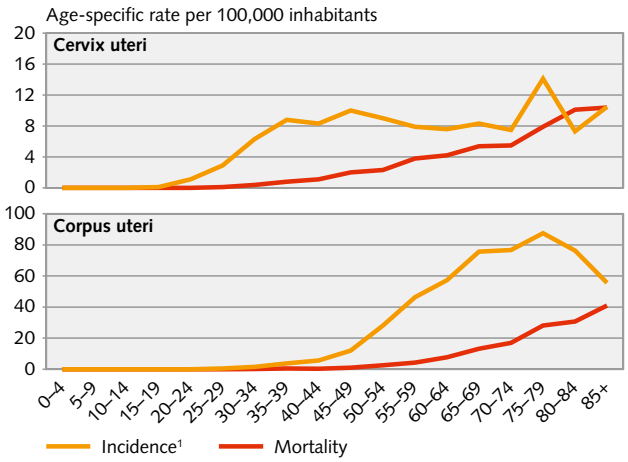
4.6.1 General Observations

The uterus has two distinct parts: the cervix ("neck of the uterus") and the corpus uteri ("body of the uterus"). Cancers of the cervix (1.4% of cancers in women) and of the corpus uteri (5.4% of cancers in women, often called endometrial cancer), have different risk factors, characteristics and prognoses.

Cancer of the cervix uteri (i.e. cervical cancer) develops gradually and goes through stages of precancerous lesions. These lesions are registered by some Swiss tumour registries, but are not described herein. About 240 patients each year develop cervical cancer.[g] The risk of developing it before age 70 is 0.4%. About half of all cervical cancers occur before age 50, but is rare before the age of 20. The incidence rates increase between the ages of 20 and 35 years, and then stabilise and increase again around age 70; reaching a peak around age 75 and declining thereafter (G 4.6.1).

With a five-year relative survival of 68% for cervical cancer, Switzerland ranks second among European countries.[30] Approximately 90 women die each year from this cancer, which accounts for 1.3% of cancer deaths in women.

Uterine cancer, 2003–2007 **G 4.6.1**



¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

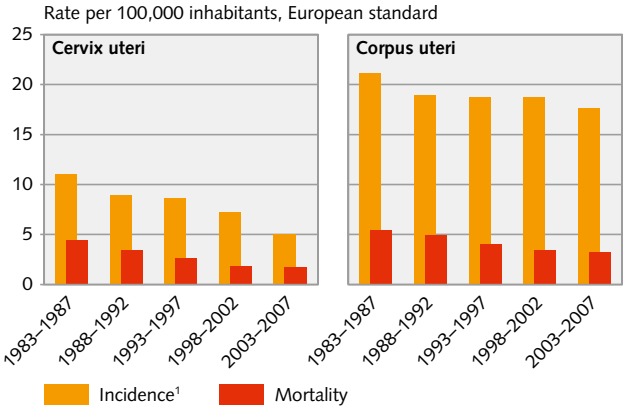
Source: FSO: COD, NICER, CCR © *FSO*

Cancer of the corpus uteri (i.e. uterine cancer) affects about 900 women each year in Switzerland.[g] The risk of developing it before the age of 70 is 1.2%. This cancer affects older women, with nearly half of cases occurring after age 70. The frequency of the cancer of the corpus uteri increases with age until 75 years, and decreases thereafter (G 4.6.1).

Survival after cancer of the corpus uteri is 79%, slightly above the European average.[31] This cancer causes about 200 deaths per year, or approximately 3% of all cancer deaths in women.

It is estimated for 2002, that approximately 1500 women diagnosed with cancer of the cervix uteri and 3500 with cancer of the corpus uteri in the previous five years were living in Switzerland.[32]

Uterine cancer: Incidence[1] and mortality trend **G 4.6.2**

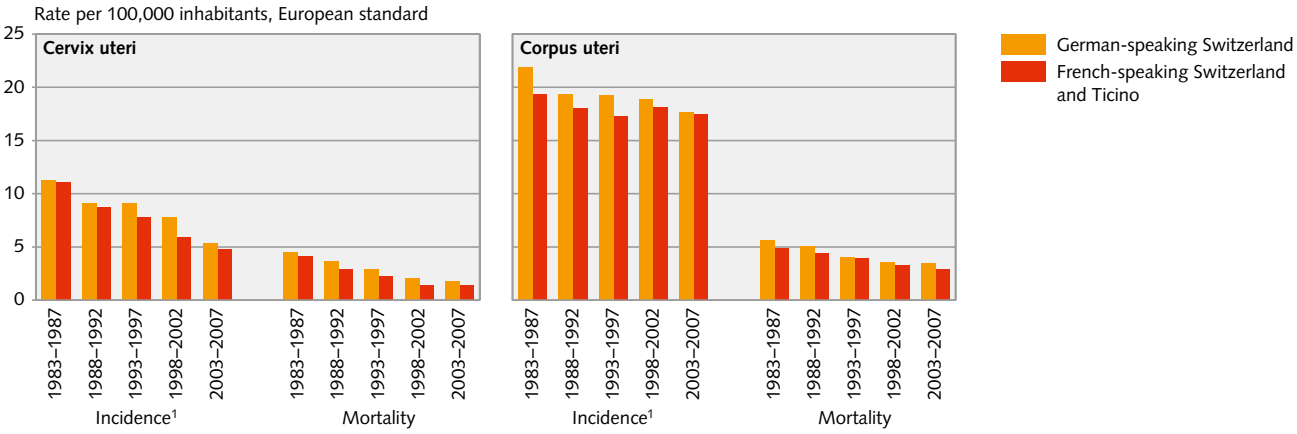


¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

[g] Annual average 2003–2007, estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

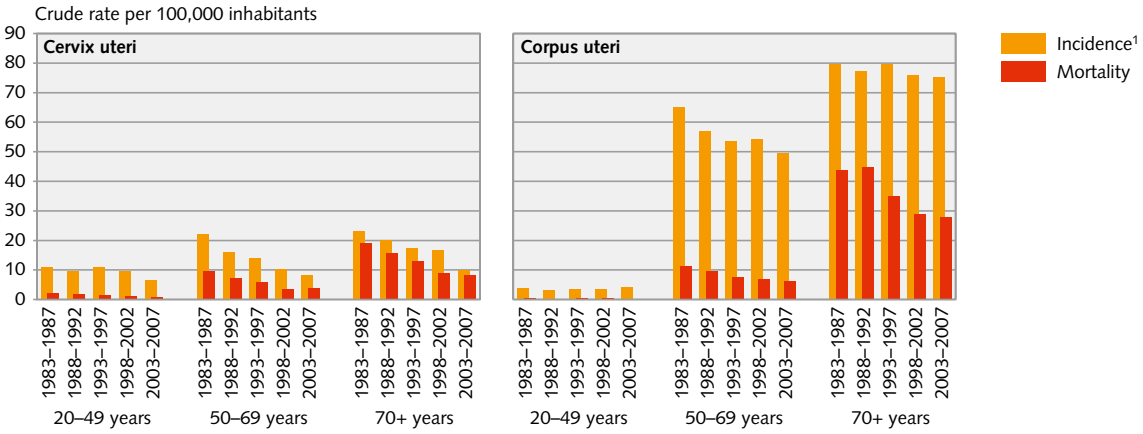
Uterine cancer: Incidence[1] and mortality trend by language region G 4.6.3



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Uterine cancer: Incidence[1] and mortality trend by age group G 4.6.4



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.6.2 Trends

In Switzerland, as in all industrialised countries, the incidence and mortality of *cancer of the cervix uteri* has decreased markedly (G 4.6.2). Between 1980 and 2007, the number of new cases per year fell from 440 to 210 and the number of deaths from 200 to 90. The decline in incidence was higher among women over age 50 than among younger women (G 4.6.4) and was somewhat more pronounced in French- and Italian-speaking Switzerland than in German-speaking Switzerland (G 4.6.3).

The incidence and mortality of *cancer of the corpus uteri* have also declined, but much less markedly (G 4.6.2). The decline in incidence was limited to women aged 50–59 and the decline in mortality to women aged 70 and over (G 4.6.4).

4.6.3 Regional Comparisons

The incidence of *cancer of the cervix uteri* also shows variations between regions, with rates about two times higher in the region of Graubünden and Glarus than in the cantons of Geneva and Fribourg (G 4.6.5).

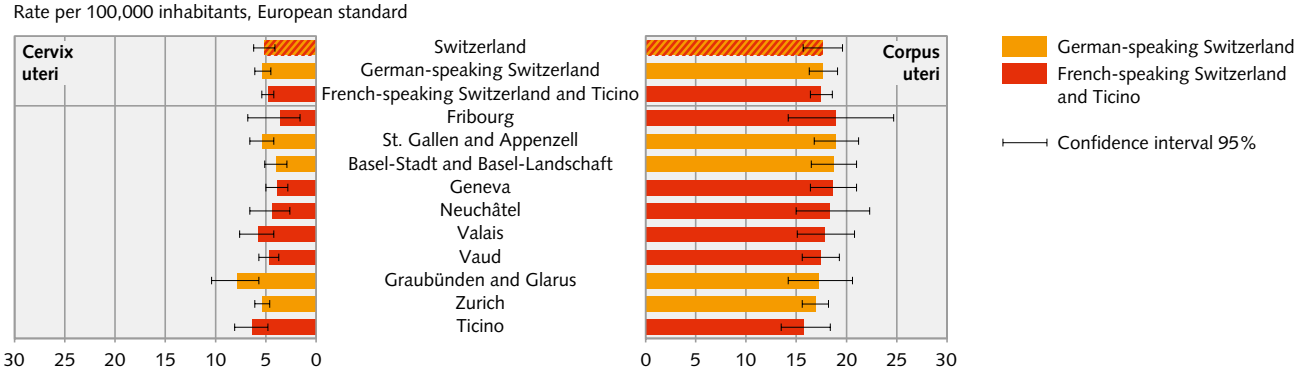
In contrast, the incidence of *cancer of the corpus uteri*, is relatively uniform across Switzerland. The highest rates are observed in Fribourg and the lowest in Ticino (G 4.6.5).

4.6.4 International Comparisons

Cancer of the cervix uteri is the second most common cancer in women worldwide, with very large geographic differences. Approximately 83% of these cancers occur in developing countries. The incidence rates vary by a factor 10 between the areas with the highest and the lowest risk. Sub-Saharan Africa is the region of the world most affected, followed by Latin America, South Asia, and Southeast Asia. The Balkans and Eastern Europe also have especially high rates compared with Western Europe. The lowest rates are observed in Switzerland, Israel, and Finland. Also worth noting are the particularly low rates in North Africa (G 4.6.6).

Cancer of the corpus uteri, it is more common in industrialised countries. The highest rates are found among white women in certain regions of the United States. High levels are also observed in Eastern Europe. The lowest rates are in East Asia (Japan, China, Korea), in India and in North Africa and Sub-Saharan Africa. Switzerland is within the average range in Europe (G 4.6.6).

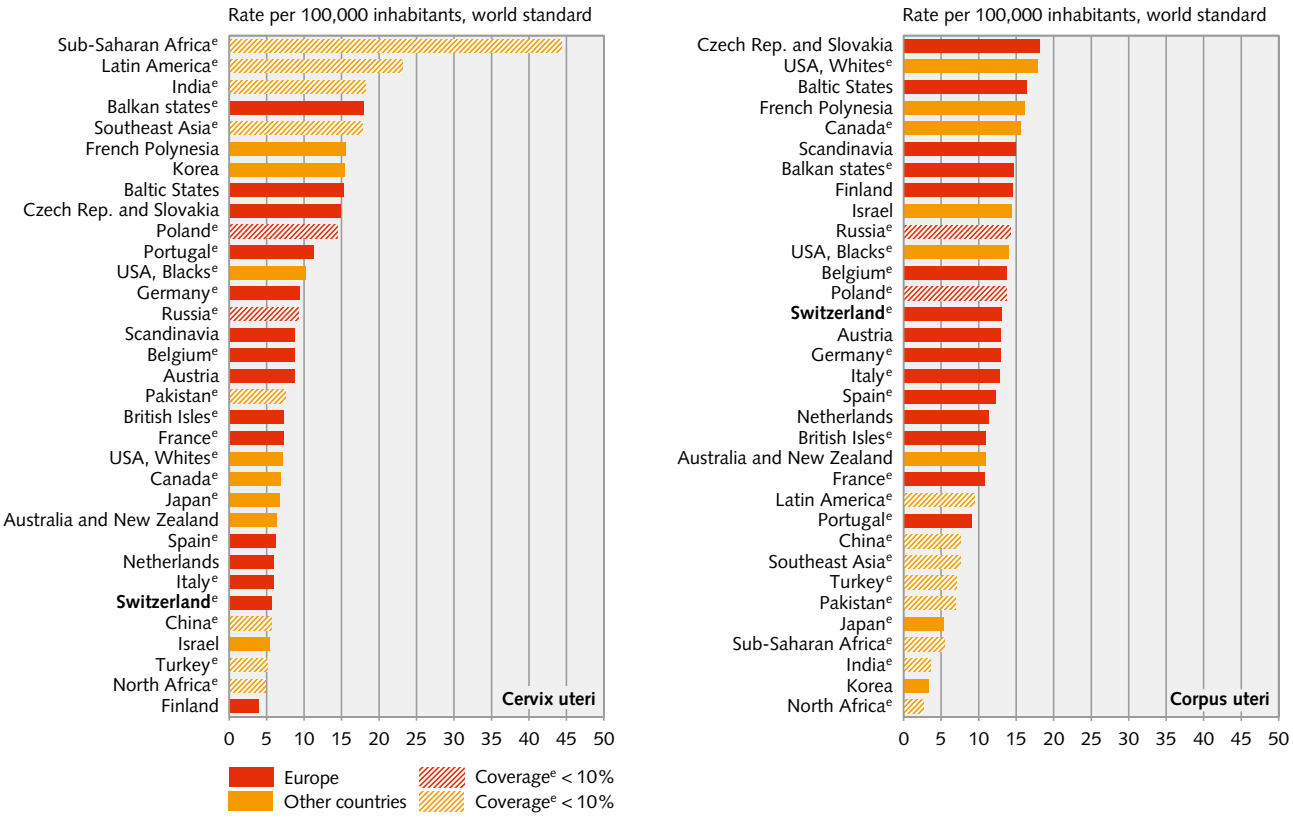
Uterine cancer: Incidence[1] in regional comparison, 2003–2007 **G 4.6.5**



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: NICER, CCR

Uterine cancer: Incidence[1] in international comparison, 1998–2002 G 4.6.6



[1] A list of all included cancer registries is presented in Annex 1
[e] Countries and regions with partial coverage: estimate based on registered regions

Source: NICER, CCR, CI-Five Vol.9

4.6.5 Risk Factors

The biggest risk factor for *cancer of the cervix uteri* is infection with the human papillomavirus (HPV), which is transmitted during sexual intercourse. There are a hundred different HPV types, some of which are associated with a high risk for cervical cancer. Specifically, types 16 and 18 are responsible for two thirds of cancer of the cervix cases. Other types, such as 31 or 33, are more related to precancerous cervical lesions. Factors promoting cervical cancer are those that lead to infection by HPV (e.g. early age at first intercourse, a significant number of partners of the woman or her partner, and multiple pregnancies). Condoms reduce the risk only partially, because they do not cover the entire genital area.

Among other risk factors worth mentioning is infection with the human immunodeficiency virus (HIV) which, by reducing immunity, increases the risk of cervical cancer.

Taking oral contraceptives is associated with an increased risk if they are taken for more than five years. The risk returns to normal 10 years after cessation of oral contraceptive use. It is difficult to know whether this is a true risk factor or a confounding factor just indicating the existence of sexual activity.

Long-term smoking increases the risk; a diet rich in fruits and vegetables decreases it. Obesity increases the risk of cervical cancer of a particular histological type (Adenocarcinoma).

From a historical perspective, it is worth recalling that taking diethylstilbestrol, which used to be prescribed during pregnancy to prevent miscarriage, increases the risk of a rare form of cervical cancer (Clear-cell adenocarcinoma). Moreover, there is an increased risk among women whose mother or sister has had cervical cancer, but it has not been possible to prove a specific genetic component.

The main risk factor for *cancer of the corpus uteri* is exposure to oestrogen (which cause a proliferation of the mucous membrane of the uterine wall, known as the endometrium) when not counterbalanced by exposure to progestins (which stop the proliferation of the endometrium by maturing its cells). This risk is typically due to taking oestrogen alone as hormone replacement in menopause. This practice was discontinued in the 1980s (except for women who have no uterus) when progesterone was systematically introduced in hormone replacement therapy (HRT). Taking birth control pills containing progesterone protects women from developing this cancer.

Significant exposure to oestrogens also explains other recognised risk factors, such as early age at menarche, late menopause, nulliparity, endometrial hyperplasia, and obesity. Obesity may be responsible for 40% of cancers of the corpus uteri worldwide. After menopause, women convert oestrogen precursors to active oestrogen molecules in fat tissue. Obese women thus produce high levels of endogenous oestrogen and are at higher risk of endometrial cancer. Women with breast cancer who are receiving certain types of anti-hormonal therapy (e.g. tamoxifen) are at higher risk of cancer of the corpus uteri.

Diabetes and hypertension are also risk factors for cancer of the corpus uteri. Similarly, the rare disease polycystic ovary syndrome, and a family history of cancer of the corpus uteri increase the risk of developing this cancer. Women with hereditary colorectal cancer (Lynch syndrome) are also at higher risk of developing cancer of the corpus uteri.

4.6.6 Prevention and Screening

HPV vaccines for girls under 19 years are now available.[33] These vaccines ought to prevent 80% of *cancer of the cervix uteri*, but they are not a substitution for pap smear screening. The vaccination campaign began in Switzerland in 2009. It will be necessary to assess its acceptance, cost, and effectiveness.

The sharp decrease in the incidence and mortality of cervical cancer is attributable to widespread screening in developed countries. This screening makes it possible to detect precancerous lesions and to treat them, thereby preventing the cancer from developing. The pap smear test for cervical cancer consists of taking a sample of cells from the cervix to analyse them. After onset of initial sexual activity, a pap smear is performed annually during the first three years, and every three years thereafter. Currently, screening tests can detect the infection and HPV type. They therefore make it possible to identify women at high or low risk and thus allow adjustment in the frequency of screening.

For *cancer of the corpus uteri*, the primary means of prevention is to prevent obesity, particularly after menopause. Taking oestrogen alone should no longer be prescribed as HRT. No screening is available for cancer of the corpus uteri. Because the lining of the uterus is rich in blood vessels, the most frequent symptom of this cancer is bleeding after menopause. Women should consult a doctor when these symptoms occur so that an early diagnosis can be made.

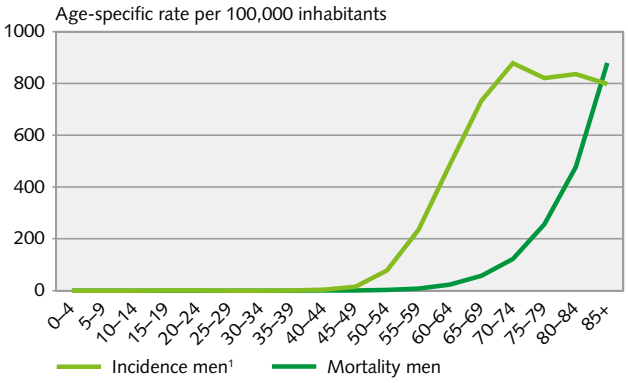
4.7 Prostate Cancer

4.7.1 General Observations

Prostate cancer is the most common cancer in men. Approximately 5700 men are affected each year in Switzerland.[h] This cancer accounts for 30% cancers diagnosed in men. Until 2002, the risk increased linearly with age. Since then, for the first time there has been a decrease in incidence rates in men after the age of 70 (G 4.7.1). The risk that a man will develop prostate cancer before the age of 70 is 7.8%. This cancer is very rare before the age of 50. Approximately 50% of prostate cancers occur between 50 and 70 years and half after 70.

The impact of prostate cancer mortality is less because survival is often favourable. With a five-year-relative survival rate of 82%, Switzerland ranks first among the countries with the best prognosis.[34] Nevertheless, this cancer is the second leading cause of death in men, with approximately 1300 deaths per year in Switzerland, and it represents 15% of male deaths from cancer. In 2002, the number of men living in Switzerland diagnosed with prostate cancer during the previous five years was estimated at about 19,000.[35]

Prostate cancer, 2003–2007 **G 4.7.1**



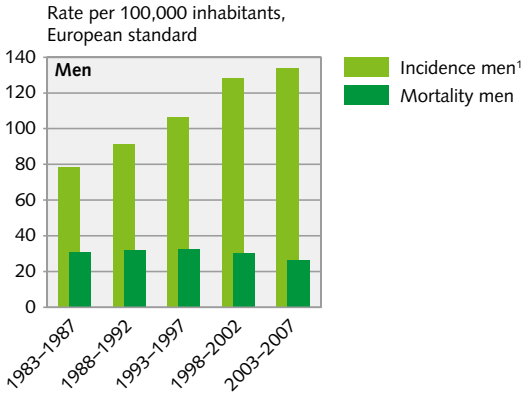
[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.7.2 Trends

In Switzerland, as in many other parts of the world, a large increase in the incidence of prostate cancer is observed (G 4.7.2). This increase primarily involves men aged 50–69, an age group targeted by screening with the prostate specific antigen (PSA) test. Among this age group, the incidence rate tripled between 1983 and 2007. In men over 70 years, rates rose between 1983 and 1997, but have steadily declined since then. The decline in cases in men aged 70 and over is probably related to PSA testing, which leads to diagnosis at a younger age (G 4.7.4).

Prostate cancer: Incidence[1] and mortality trend **G 4.7.2**



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

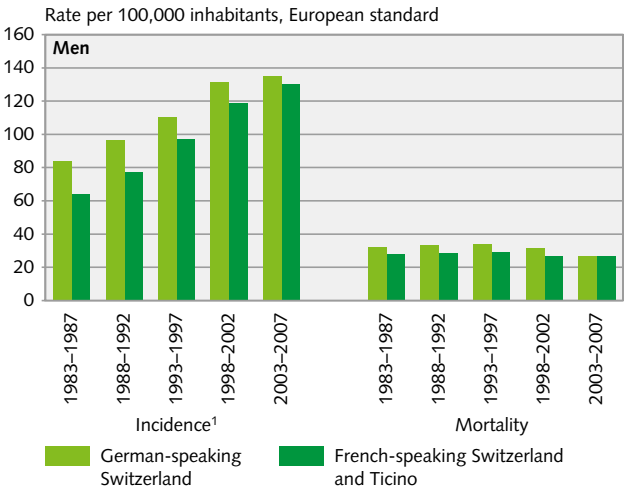
Source: FSO: COD, NICER, CCR © *FSO*

In Switzerland, prostate cancer mortality rose annually until 1993, and has fallen appreciably since. This drop, involving all ages, was approximately 18% between 1993–1997 and 2003–2007. A significant decline in mortality from prostate cancer was first observed in the United States and subsequently in other European countries.

The increase in incidence was particularly marked in French- and Italian-speaking Switzerland. The rates were lower in German-speaking Switzerland in the early 1980s, but are now similar rates in French- and Italian-speaking Switzerland (G 4.7.3).

[h] Annual average 2003–2007, estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

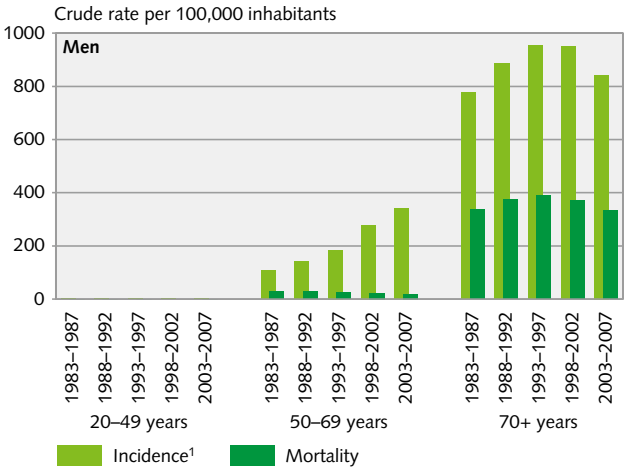
Prostate cancer: Incidence[1] and mortality trend by language region G 4.7.3



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Prostate cancer: Incidence[1] and mortality trend by age group G 4.7.4



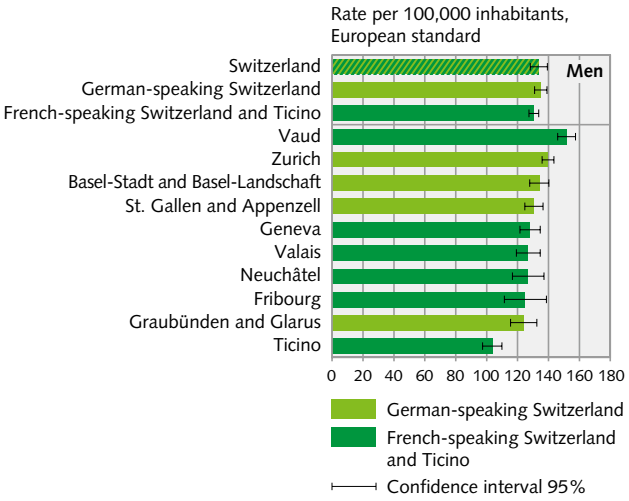
[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.7.3 Regional Comparisons

Prostate cancer is approximately 50% more common in the canton of Vaud, which has the highest incidence, than in the canton of Ticino which has the lowest. Among the other cantons, however, the differences in incidence are relatively small (G 4.7.5).

Prostate cancer: Incidence[1] in regional comparison, 2003–2007 G 4.7.5



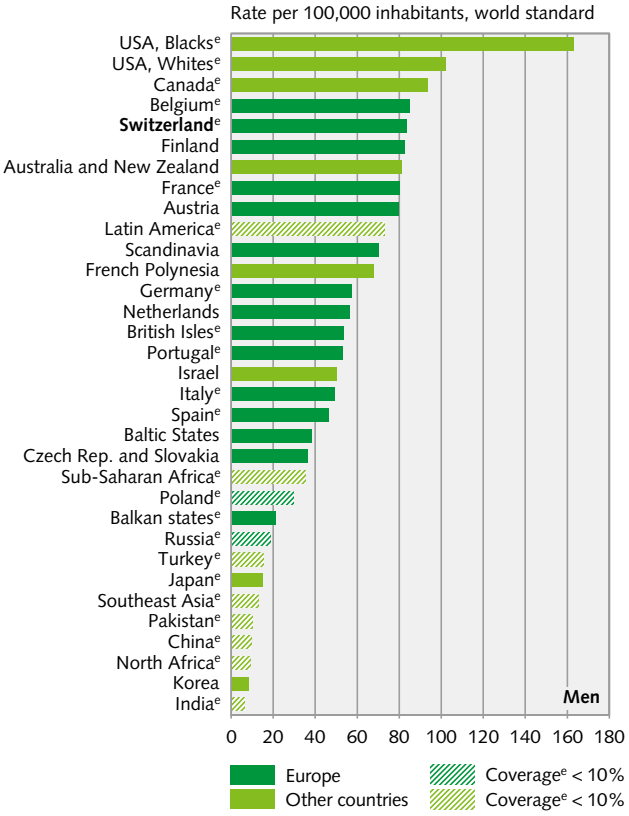
[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: NICER, CCR © *FSO*

4.7.4 International Comparisons

There are significant geographic variations throughout the world. The United States particularly the African-American population, Canada, Belgium, and Switzerland have the highest incidence rates in the world. In contrast, Southeast Asia, China, India, and North Africa have the lowest rates. At the European level, the lowest rates are observed in Eastern Europe, Italy, and Spain (G 4.7.6).

Prostate cancer: Incidence[1] in international comparison, 1998–2002 **G 4.7.6**



[1] A list of all included cancer registries is presented in Annex 1
[e] Countries and regions with partial coverage: estimate based on registered regions

Source: NICER, CCR, CI-Five Vol.9 © *FSO*

4.7.5 Risk Factors

African-American men in the United States have a 20% higher risk of developing this cancer than whites. Studies of migrants from low risk areas (such as Japan) who have settled in high-risk areas (such as the United States) show that after one generation their risk catches up with that of the host country. This demonstrates the important role of the environment, including lifestyle in the occurrence of this cancer. However, to date no specific risk factors have been identified. No clear relationship between diet and prostate cancer has been established despite many studies. The protective effect of tomato consumption, which is often mentioned, is far from proven. Male hormones probably play an important role. It is known, for example, that men with congenital hormone deficiencies and individuals castrated at a young age do not develop prostate cancer. However, studies have failed to show any relationship between circulating levels of male hormones (testosterone and specifically its active derivative dihydrotestosterone) and the risk of prostate cancer.

Having a first-degree relative who has had prostate cancer increases the risk. It is estimated that approximately 5–10% of prostate cancers are linked to heredity.[36] As is the case in breast cancer, the BRCA1 and BRCA2 genes, which are linked to the cellular repair process, play a role in the occurrence of this cancer, albeit a less pronounced one. Other genes, namely those involved in the metabolism of hormones, may also play a role.

4.7.6 Prevention and Screening

A Mediterranean type diet rich in olive oil, garlic, tomato, and a moderate consumption of animal fat can only be beneficial to men's health in general. However, the impact of such a diet on the prevention of prostate cancer remains unquantifiable.

A large scale clinical study showed that taking a dietary supplement of vitamin E did not reduce the risk of developing prostate cancer. The same applies to taking a folic acid supplement which may even be associated with an increased risk. A clinical study is under way to evaluate the preventive role of lycopene, the main antioxidant found in tomatoes.

A recent study showed a 30% decline in the occurrence of prostate cancer among men at high risk who took anti-hormone drugs. But these drugs have side effects and should not be prescribed as a preventive measure without specific indication.

The effectiveness of screening by detecting PSA in the blood, with or without a digital rectal examination (DRE), is disputed. PSA screening allows diagnosis of prostate cancer at an early stage. However, it is not certain that this earlier detection makes it possible to effectively change the natural course of the cancer and reduce mortality. The decline in mortality observed in industrialised countries, as well as that observed in a randomized European study, point to the effectiveness of screening. But the adverse effects of PSA screening are not insignificant because it detects non-progressive cancers that would not have surfaced clinically without screening. This leads to potentially unnecessary treatments (e.g. removal of the prostate, radiotherapy) that result in subsequent clinical consequences (e.g. erectile dysfunction, urinary incontinence). It is mainly the adverse effects associated with such over-diagnosis and over-treatment that constitute a major obstacle to the implementation of routine PSA screening for prostate cancer. It is therefore important to inform men both about the benefits and risks of screening, so they can make an informed decision about whether or not to be screened. PSA screening can be performed annually from the age of 50 (or earlier if a family member has been diagnosed with prostate cancer or for high risk populations) until age 75 or until the man has a life expectancy of less than 10 years.

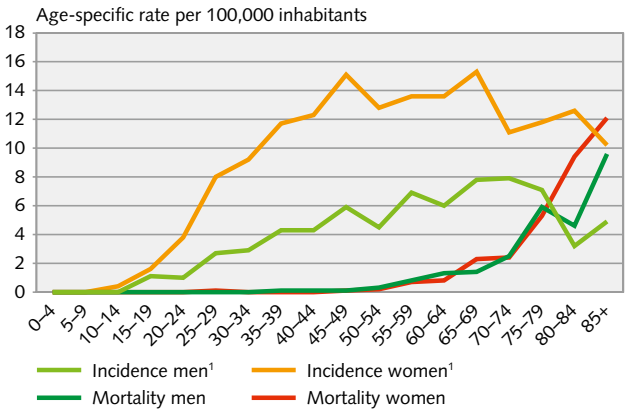
4.8 Thyroid Cancer

4.8.1 General Observations

With about 480 new cases each year, thyroid cancer accounts for approximately 1% of cancers in men and 2% of cancers in women.[i] It is about twice as common in women as in men. In men, the risk increases with age until age 70. In women, the risk also increases with age but stabilises at the age of 45 (G 4.8.1). The risk of developing thyroid cancer before the age of 70 is 0.2% in men and 0.6% in women. However, half the cases occur before age 50 (46% for men and 49% for women).

Because of its favourable prognosis, mortality from thyroid cancer is low. With fewer than 70 deaths per year, it accounts for less than 0.5% of cancer deaths in both sexes. With a five-year relative survival of 86%, Switzerland is one of the European countries with the highest survival rates.[37] It is estimated that 380 men and 930 women diagnosed with thyroid cancer during the previous five years were living in Switzerland in 2002.[38]

Thyroid cancer, 2003–2007 **G 4.8.1**



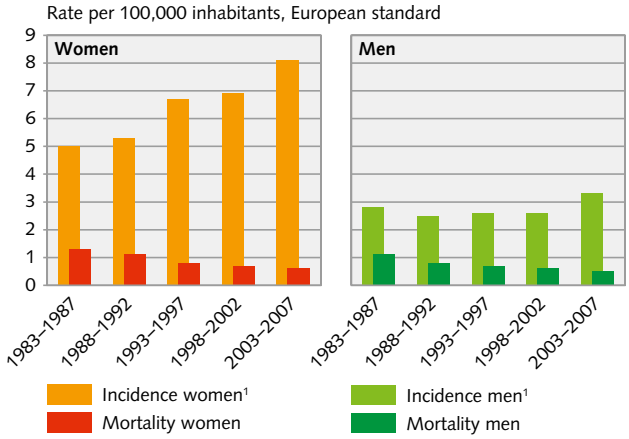
¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.8.2 Trends

In Switzerland, the incidence of thyroid cancer is increasing among women and, to a lesser extent, among men (G 4.8.2). An increase has also been observed throughout the world, particularly in Europe and North America, but also and especially in Belarus.[j] The increase in the number of cases of thyroid cancer worldwide has been largely attributed to the growing and now widespread use of advanced diagnostic methods (e.g. ultrasound and needle biopsies for removal of tissue samples) which are carried out much more systematically during the investigation of thyroid problems. Consequently, cancers that previously went undetected are now being discovered. Because benign thyroid disorders are much more common in women, the increase in detection of thyroid cancer is subsequently higher among women.

Thyroid cancer: Incidence¹ and mortality trend **G 4.8.2**



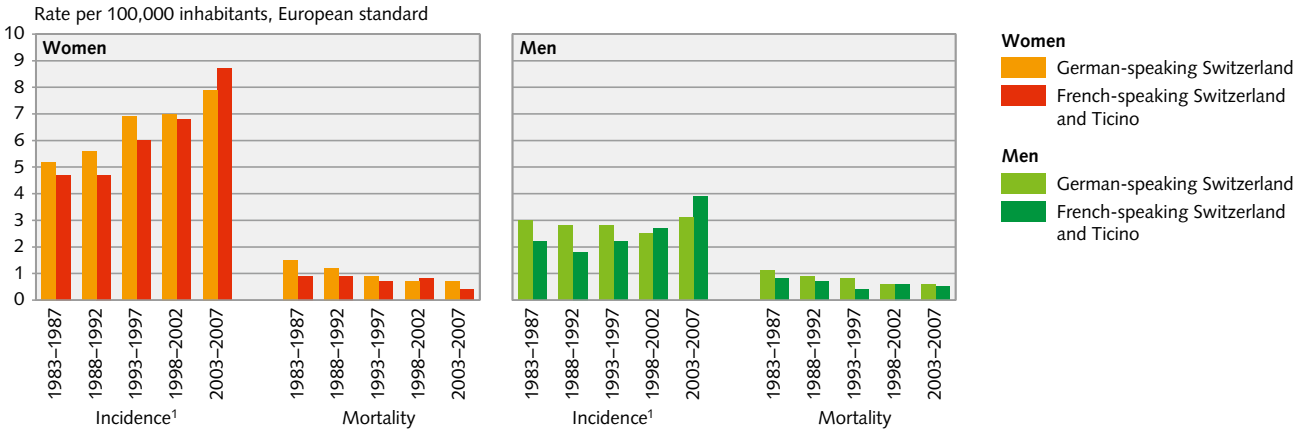
¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

[i] Annual average 2003–2007, estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

[j] This increase is attributable to the accident at the Chernobyl nuclear power plant in April 1986.

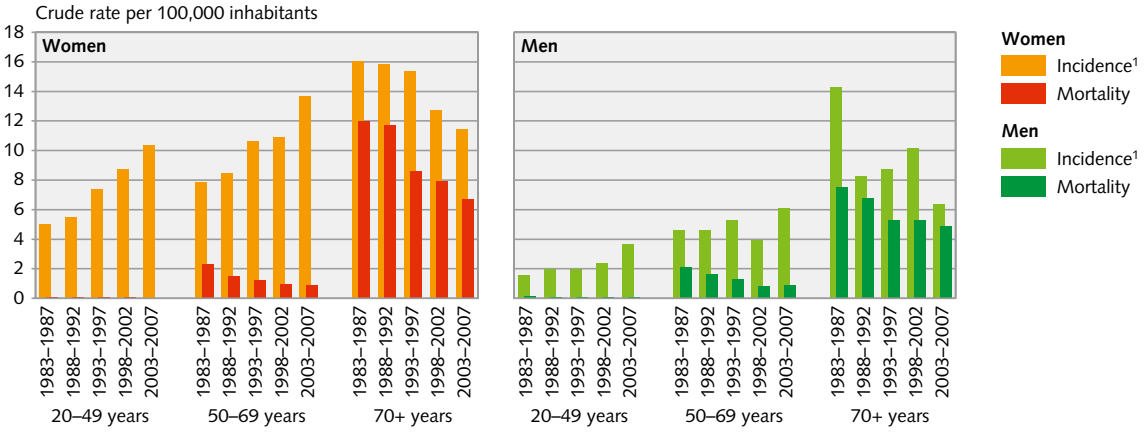
Thyroid cancer: Incidence[1] and mortality trend by language region G 4.8.3



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Thyroid cancer: Incidence[1] and mortality trend by age group G 4.8.4



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

In Switzerland, the increase in both sexes is restricted to persons under age 70. In contrast, after 70 there is a decrease in incidence rates (G 4.8.4). The increase is greater in French- and Italian-speaking Switzerland than in German-speaking Switzerland (G 4.8.3).

Unlike incidence, mortality from thyroid cancer is falling sharply, particularly among women. The very low mortality rate among individuals under age 50 is also worth noting (G 4.8.4).

4.8.3 Regional Comparisons

The differences are greatest between the cantons of French- and Italian-speaking Switzerland. Among men, the highest incidence rates are found in Fribourg and Geneva, the lowest in the cantons of Vaud and Ticino. Among women, the cantons of Geneva and Ticino have the highest rates, whereas the canton of Vaud and the region of Graubünden and Glarus register the lowest rates (G 4.8.5).

4.8.4 International Comparisons

In both sexes, the highest incidence rates in the world are found in French Polynesia (cf. 4.8.5), where women have rates five times higher than the European average. The lowest rates are observed in India, Pakistan, and Sub-Saharan Africa. Switzerland is within the world average, with a relatively high rate among men and a relatively low rate among women (G 4.8.6).

4.8.5 Risk Factors

As mentioned above (cf. 4.8.2), the increase in thyroid cancer is probably due to better detection. However, a greater frequency in the population of one or more risk factors associated with this cancer cannot be excluded. Established risk factors for thyroid cancer include exposure to ionizing radiation, excessive or inadequate intake of iodine, a history of goitre, and genetic factors.

The irradiated survivors of Hiroshima and Nagasaki[k] have an increased risk of thyroid cancer. The same applies to the population of Belarus after the Chernobyl disaster in 1986. The younger people are when exposed, the higher the risk. Studies evaluating the impact in Europe of the radioactive cloud released by the Chernobyl disaster on the occurrence of thyroid cancers are generally relatively reassuring, in that they attribute the observed increase to the development of improved diagnostic methods not to radiation exposure.[39]

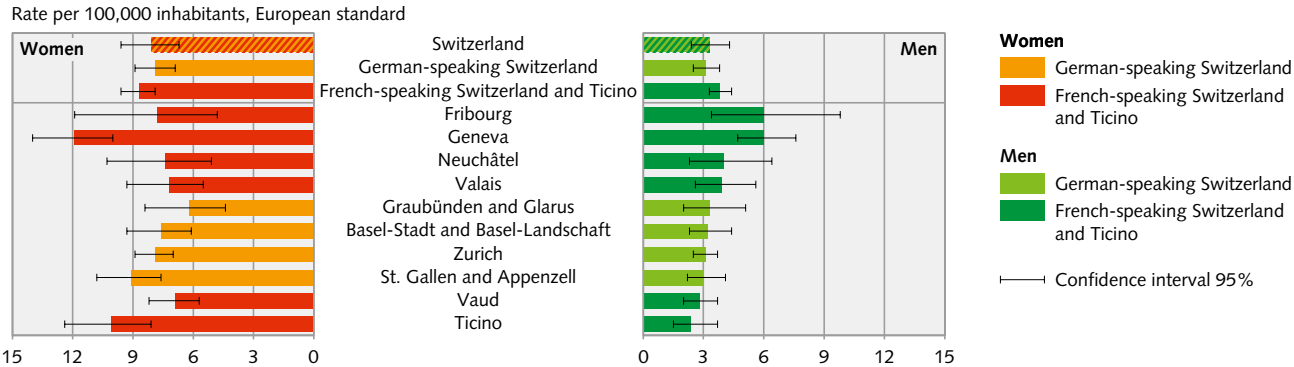
The high rates of thyroid cancer in French Polynesia are currently the subject of several studies attempting to establish or exclude a link with the nuclear tests which were carried out in the Mururoa Atoll in 1966–1996. The risk of thyroid cancer also increases after radiation treatment of the head and neck (e.g. for Hodgkin's disease) in children.

Populations living in regions with dietary iodine deficiency, such as rural and mountainous areas, present an excess of goitre and sometimes thyroid cancer (follicular type). But a diet too rich in iodine may also increase the risk of this cancer (papillary type).

Persons with a goitre or thyroid nodule have a slightly higher risk of developing thyroid cancer. An association between an overactive thyroid (hyperthyroidism) and thyroid cancer has not been established.

Some types of thyroid cancer are hereditary. Several types of familial syndromes associated with thyroid cancer alone or with tumours of other glands (e.g. adrenal and parathyroid glands) or of the intestine are known.

Thyroid cancer: Incidence[1] in regional comparison, 2003–2007 **G 4.8.5**

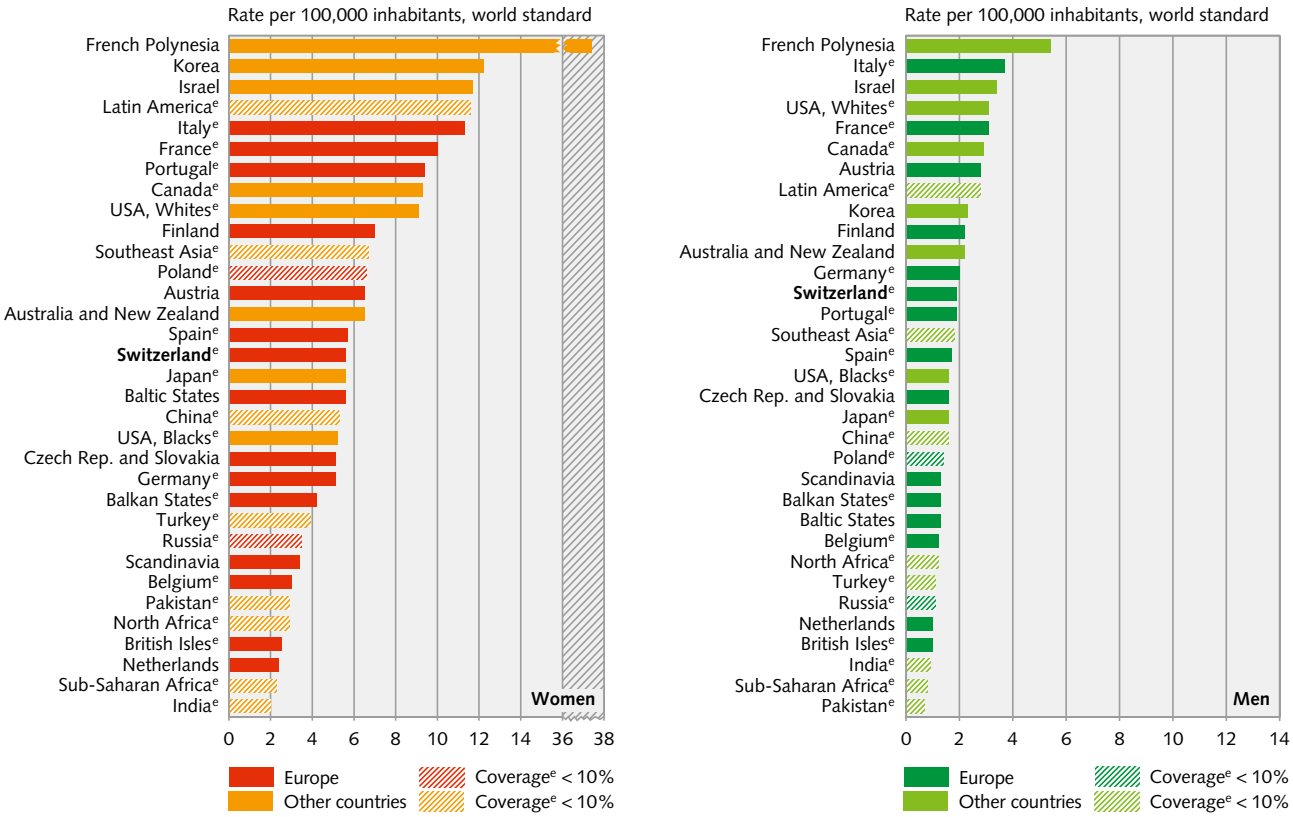


[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: NICER, CCR

[k] Atomic bombings of Hiroshima and Nagasaki in August 1945

Thyroid cancer: Incidence[1] in international comparison, 1998–2002 **G 4.8.6**



[1] A list of all included cancer registries is presented in Annex 1
[e] Countries and regions with partial coverage: estimate based on registered regions

Source: NICER, CCR, CI-Five Vol.9

4.8.6 Prevention and Screening

There are few prevention or screening methods for thyroid cancer. In Switzerland, iodine supplementation in table salt has made it possible to combat iodine deficiency, especially in mountain populations.

The exposure of children to radiation ought to be avoided or kept as low as possible. Children exposed to high doses should be monitored. Providing iodine supplementation to irradiated populations could reduce the risk of thyroid cancer.

Palpation of the thyroid to detect goitre or nodules is part of the general clinical examination performed in particular during an initial medical consultation. Further investigations are only carried out if an anomaly is detected. Genetic testing for familial cancers is now possible as part of highly specialised consultations.

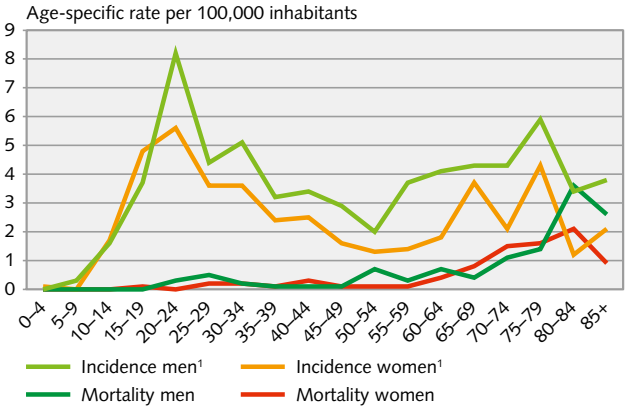
4.9 Hodgkin's Disease

4.9.1 General Observations

Hodgkin's disease is a type of lymphoma. Lymphomas include various groups of cancers arising from the cells of the lympho-hematopoietic system, which produces the lymph fluid and blood cells. Hodgkin's disease or Hodgkin's lymphoma accounts for approximately 12% of all lymphomas and 0.6% of cancers in men and women. Hodgkin's disease is about 1.5 times more common in men than in women. The distribution of incidence is bimodal with a first and largest peak between ages 15 and 35 and a second peak after age 60 (G 4.9.1).

Approximately 220 new cases of Hodgkin's disease are diagnosed annually.[l] The risk of developing this disease before the age of 70 is 0.2% in both sexes.

Hodgkin's lymphoma, 2003–2007 **G 4.9.1**



¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

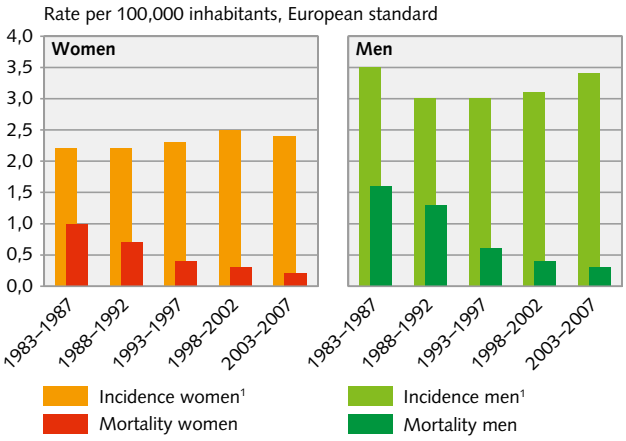
Source: FSO: COD, NICER, CCR © *FSO*

Mortality from Hodgkin's disease is low because of very good prognosis at least in adolescents and younger adults. It accounts for fewer than 30 deaths per year, or less than 0.2% of cancer deaths in both sexes. The five-year relative survival in Switzerland is 83%, which is higher than the European average.[40] According to estimates, in 2002 approximately 450 men and 330 women diagnosed with Hodgkin's disease over the previous five years were living in Switzerland.[41]

4.9.2 Trends

An increased incidence was observed worldwide in the late 1990s, but it was probably due to changes in the pathological classification of lymphomas and leukaemias. In Switzerland, the development of the rate of new cases is uneven; the overall incidence remained relatively stable in both sexes (G 4.9.2). The average annual number of deaths in both sexes in Switzerland fell from 138 in 1983–1987 to 27 in 2003–2007 (G 4.9.2). The decrease of 70% can partly, but not entirely, be attributed to a break in the series following a coding rule change between 1994 and 1995.[m] The very low mortality rate among people under age 50 during the last period is worth noting (G 4.9.4).

Hodgkin's lymphoma: Incidence¹ and mortality trend **G 4.9.2**



¹ Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

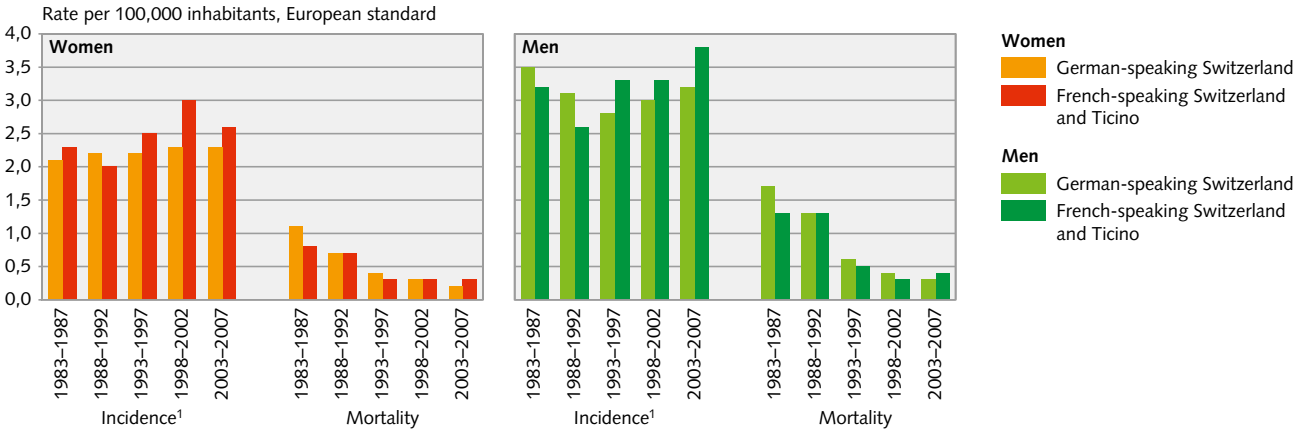
Source: FSO: COD, NICER, CCR © *FSO*

Mortality from Hodgkin's disease is declining appreciably in men and in women in all age groups (G 4.9.4). The decline in mortality is similar in French- and Italian-speaking Switzerland and in German-speaking Switzerland (G 4.9.3). A similar decline in mortality is found in most industrialised countries. It is attributable to significant therapeutic advances.

[l] Annual average 2003–2007, estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

[m] For Hodgkin's lymphoma it was not possible to calculate correction factors because of the small number of cases (cf. 2.1.3).

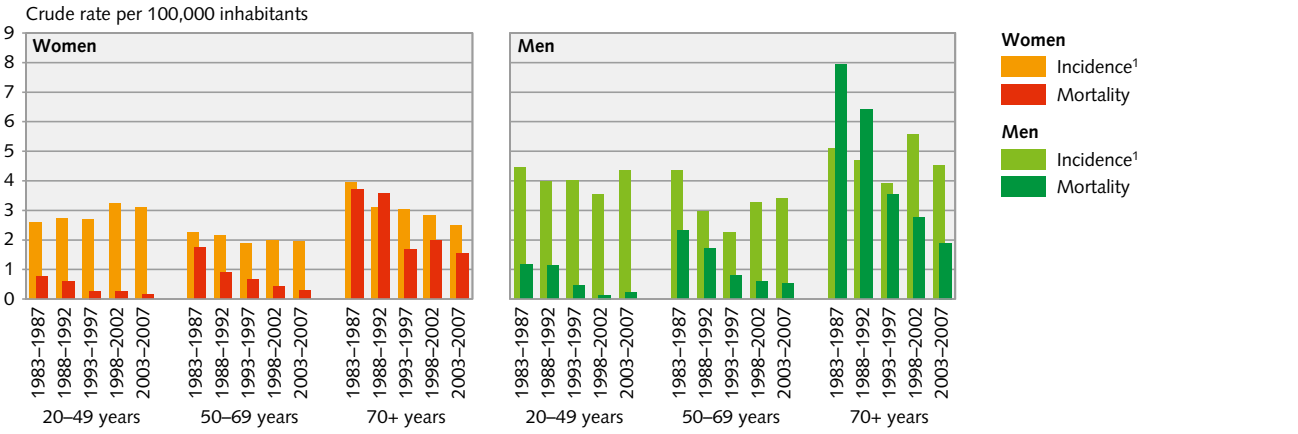
Hodgkin's lymphoma: Incidence[1] and mortality trend by language region G 4.9.3



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Hodgkin's lymphoma: Incidence[1] and mortality trend by age group G 4.9.4



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.9.3 Regional Comparisons

In men, rates are about twice as high in cantons with a high incidence (Fribourg and Ticino) as in the canton with a low incidence (Neuchâtel). In women, geographical disparities exist but are less pronounced. The cantons of Fribourg and Geneva have the highest risk, while the canton of Valais as well as the Basel-Stadt and Basel-Landschaft region have the lowest rates (G 4.9.5).

4.9.4 International Comparisons

For both sexes, the highest incidence rates in the world are found in Israel, Italy, Switzerland, Finland, the United States, and Canada. In women, high rates are observed in Russia and the Baltic States. Hodgkin's disease is rare in China, Korea, Southeast Asia, and Japan with rates 8–10 times lower than regions with high incidence (G 4.9.6).

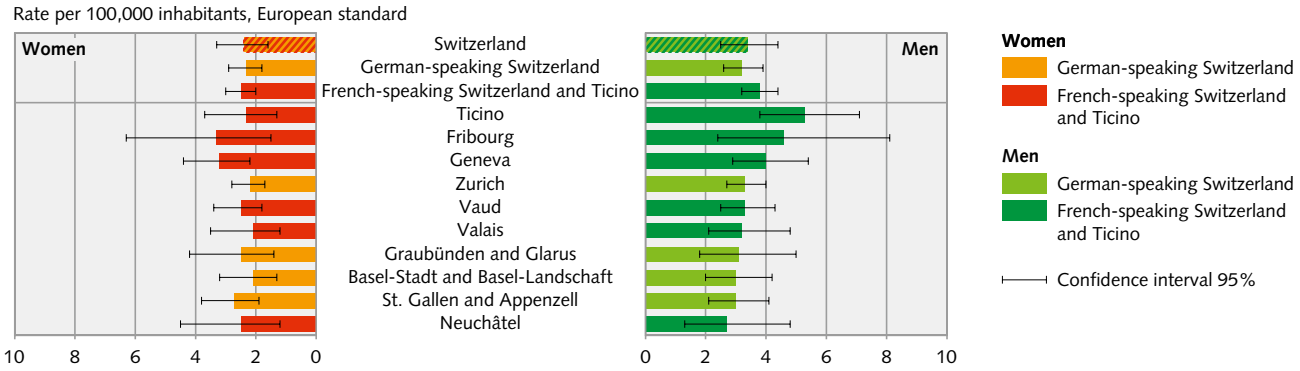
4.9.5 Risk Factors

Risk factors for Hodgkin's disease are age, sex, infections, certain medical problems, and heredity.

Two age groups are at risk: young people aged 15–35, and people over age 60. The aetiology of cancers in adolescents and young adults probably differs from that of older adults.

It is unknown why this cancer is generally more common in men than in women. Some evidence indicates that children from large families or who have had contact with other children in a childcare centre or kindergarten have a lower risk, probably related to early exposure to childhood infections which boosted their immunity. Hodgkin's disease is more common in people who have been infected with the Epstein Barr virus (EBV). This virus infects B lymphocytes and causes the disease known as infectious mononucleosis. This antecedent infection is found in 50% of patients with Hodgkin's disease. Carriers of hepatitis C are reported to be at higher

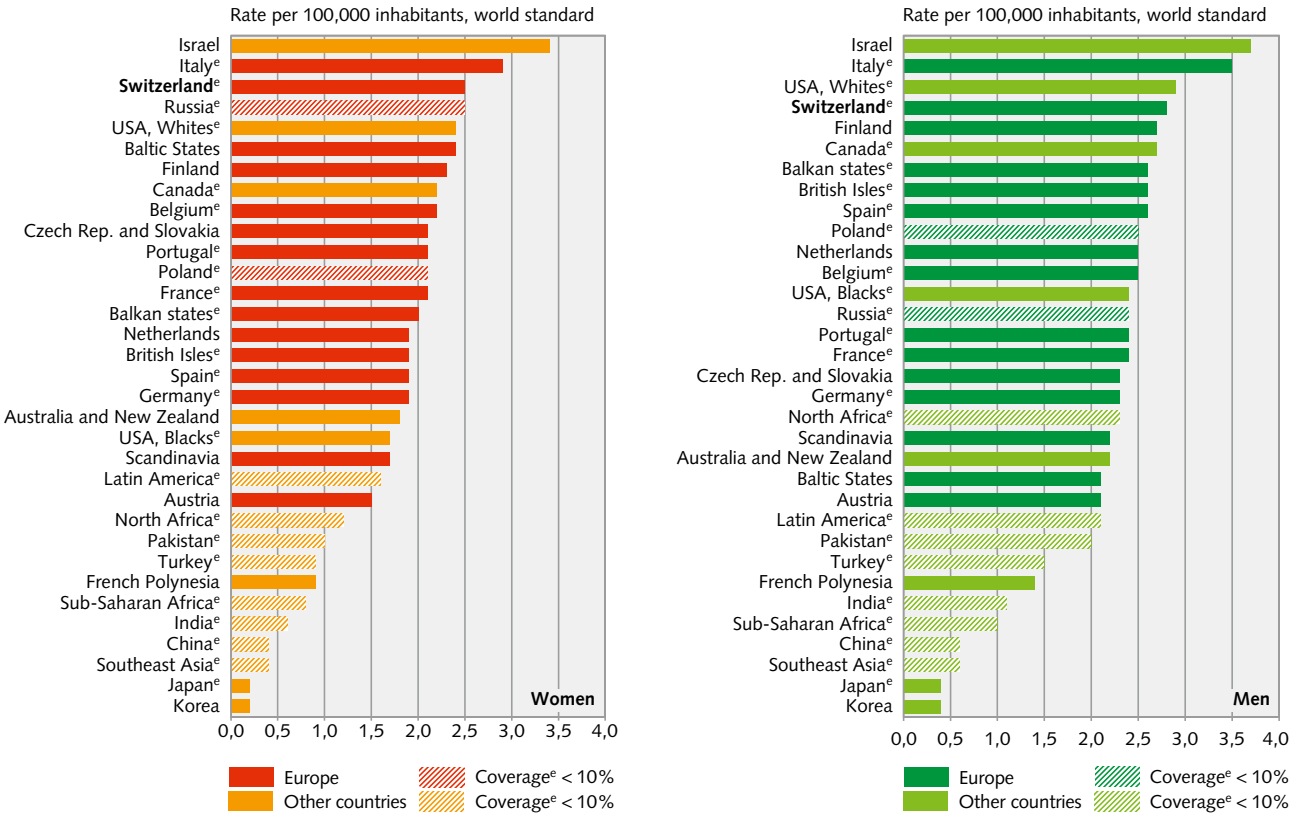
Hodgkin's lymphoma: Incidence[1] in regional comparison, 2003–2007 **G 4.9.5**



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: NICER, CCR

Hodgkin's lymphoma: Incidence[1] in international comparison, 1998–2002 **G 4.9.6**



[1] A list of all included cancer registries is presented in Annex 1
[e] Countries and regions with partial coverage: estimate based on registered regions

Source: NICER, CCR, CI-Five Vol.9

risk of developing the disease as well. Hodgkin's disease is also more common in individuals with reduced immunity, particularly in the context of infection with the HIV, of an autoimmune disease (e.g. rheumatoid arthritis, lupus, thyroiditis), of hereditary immunodeficiency syndrome (e.g. ataxia telangiectasia), or of an organ transplant requiring immunosuppressive treatment.

A recent study reported an increased risk among workers exposed to pesticides, though this link has yet to be confirmed.

The risk is higher in individuals with a first-degree relative diagnosed with Hodgkin's disease or another lymphoma or chronic lymphocytic leukaemia. However, a family link is found in only about 5% of cases. It is difficult to determine whether this family link is due to a common exposure to environmental risk factors (e.g. exposure to the Epstein Barr virus), to a genetic predisposition, or to both factors. In the case of twins, if one has Hodgkin's disease, the probability that the second twin will develop it is much higher in identical twins (monozygotic) than in fraternal (dizygotic) twins. This suggests that a genetic component exists. Some studies have shown genetic changes in certain genes involved in immune regulation among patients with Hodgkin's disease.

4.9.6 Prevention and Screening

Currently no prevention method is known, except the prevention of HIV infection. It is not possible to protect oneself from exposure to the widespread EBV (more than 80% of people infected before the age of 30).[42] No screening methods for Hodgkin's disease are available.

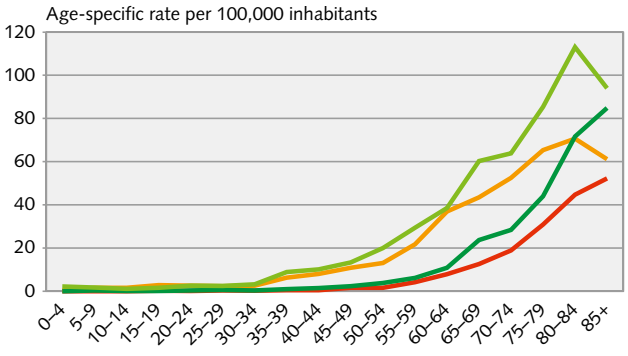
4.10 Non-Hodgkin Lymphoma

4.10.1 General Observations

Lymphomas are cancers of the immune system. They are broadly classified into two main types: Hodgkin's disease (cf. 4.9) and non-Hodgkin lymphoma (NHL). While the majority of NHLs occur in the lymph nodes, a smaller proportion (approximately 20%) occur elsewhere (e.g. stomach, intestine, bone, and breast). NHLs account for approximately 80% of all lymphomas.

Some 1400 new patients develop non-Hodgkin's lymphoma each year in Switzerland.[n] NHLs represent approximately 4% of cancers in men and in women. Their frequency increases gradually with age, with 83% of cases occurring after age 50 (G 4.10.1). NHLs are slightly more common in men than in women. The risk of developing non-Hodgkin's lymphoma before the age of 70 is 1.0% in men and 0.8% in women.

Non-Hodgkin's lymphoma, 2003–2007 **G 4.10.1**



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

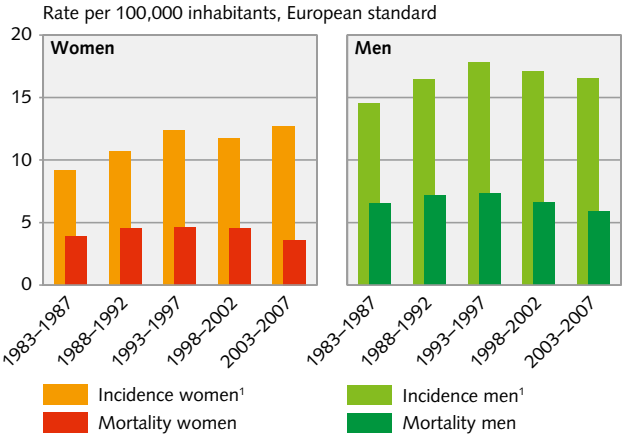
Source: FSO: COD, NICER, CCR © *FSO*

In Switzerland, approximately 500 patients die each year of NHL. These NHL cases account for approximately 6.2% of cancer deaths in men and 3.7% in women. The prognosis for NHL depends on age of onset and cellular characteristics. Some NHLs have a very good prognosis while others do not. The five-year relative survival in Switzerland is 56%, placing Switzerland within the high average range in Europe.[43] In 2002, the number of persons living in Switzerland diagnosed with NHL during the previous five years was estimated at about 2200 men and 1800 women.[44]

4.10.2 Trends

In Switzerland, as in other regions of the world, the incidence of NHL has been rising for several decades both in men and in women. This increase in incidence stabilised after the 1993–1997 period, whereas mortality began to decrease after the same period (G 4.10.2). The average annual number of deaths from NHL has been approximately 530 over the past 10 years. Given that the elderly population is growing, this corresponds to an actual decrease in mortality rates. This decrease is most likely related to improvements in the effectiveness of treatments. The rise in the incidence and the decline in the mortality rate are similar in the two language regions (G 4.10.3). These changes in incidence are observed in all age groups (G 4.10.4).

Non-Hodgkin's lymphoma: Incidence[1] and mortality trend **G 4.10.2**

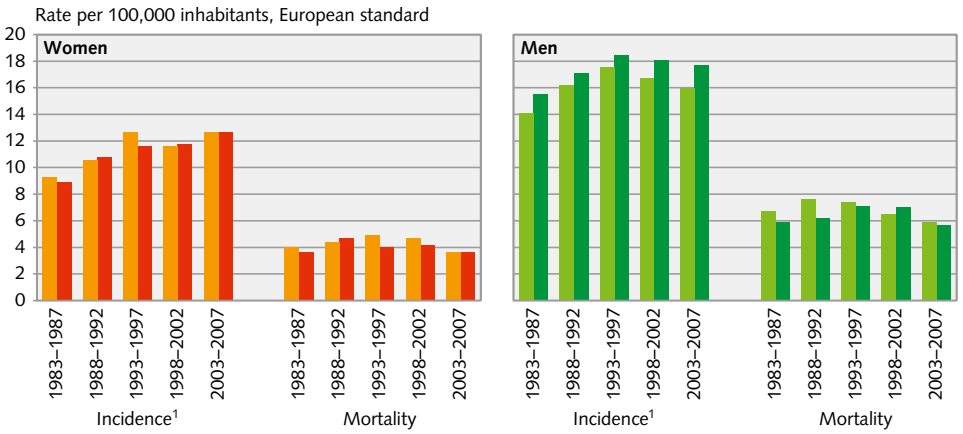


[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

[n] Annual average 2003–2007, estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

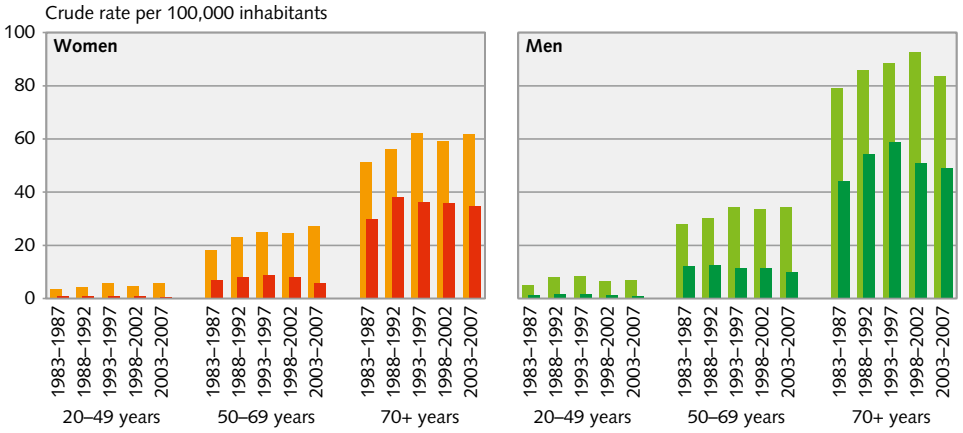
Non-Hodgkin's lymphoma: Incidence[1] and mortality trend by language region G 4.10.3



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Non-Hodgkin's lymphoma: Incidence[1] and mortality trend by age group G 4.10.4



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

4.10.3 Regional Comparisons

In men, the incidence rates are approximately 60% higher in the canton of Ticino than in the Basel-Stadt and Basel-Landschaft region. Apart from these two regions, the rates are relatively similar between the cantons. In women, the cantons of Fribourg and Ticino have the highest incidences, and the canton of Neuchâtel and the Basel-Stadt and Basel-Landschaft region the lowest (G 4.10.5).

4.10.4 International Comparisons

In both sexes, the highest incidence rates in the world are found in Israel, the United States (white population), Canada, Australia, New Zealand, and Italy. The lowest rates are observed in India, Russia, Turkey, and Korea. Unlike Hodgkin's disease, low rates are observed in the Balkans and Baltic States. Switzerland is within the high average range in Europe and the world. The worldwide rates are about three times higher in regions with high incidence than in regions with low incidence (G 4.10.6).

4.10.5 Risk Factors

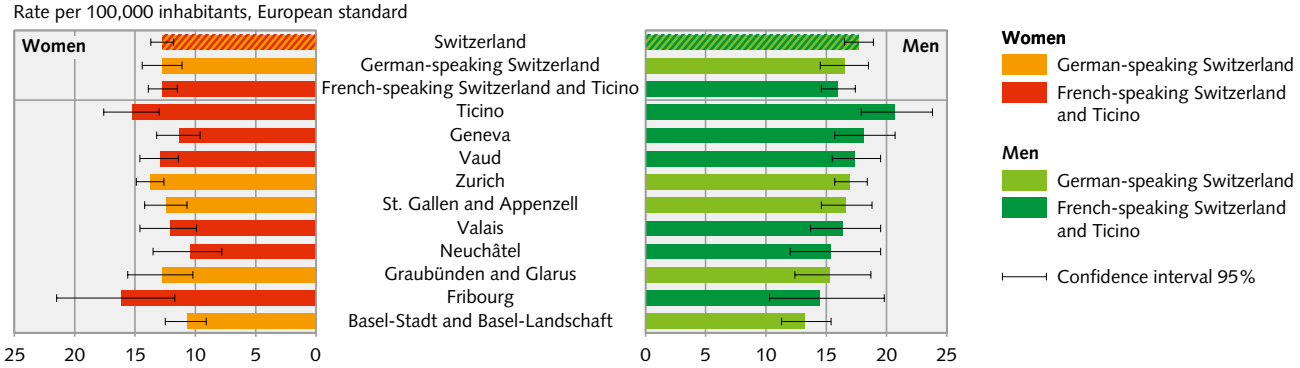
The risk factors for NHL vary depending on the subtypes concerned. In general, risk of NHL increases with age and is higher in men than in women.

The relationship between NHL and radiation has been shown in survivors of Hiroshima and Nagasaki.[o] Occupational exposure to radiation is also associated with an increased risk. Occupational exposure to herbicides and pesticides increases the risk of NHL. A relationship with domestic exposure to these substances remains uncertain. Some studies have shown an increased risk linked to benzene based solvents (also associated with leukaemia risk). A number of reviews have combined the results of studies on the possible relationship between NHL risk and use of hair dyes, but a relationship has not been confirmed.

Cancer treatments may increase the risk of NHL many years later. Patients who have received radiation treatment for other cancers such as Hodgkin's disease have a slightly increased risk of developing NHL. The risk is higher for patients who have received both chemotherapy and radiotherapy.

People with immune deficiency have an increased risk of NHL. This applies in particular to people with hereditary immunodeficiency or to people who are receiving immunosuppressive treatment (e.g. to prevent rejection of transplanted organ). By altering immunity, the HIV increases the risk of NHL. Part of the increased incidence of lymphoma is probably related to the acquired immunodeficiency syndrome (AIDS) epidemic related to the HIV

Non-Hodgkin's lymphoma: Incidence[1] in regional comparison, 2003–2007 G 4.10.5

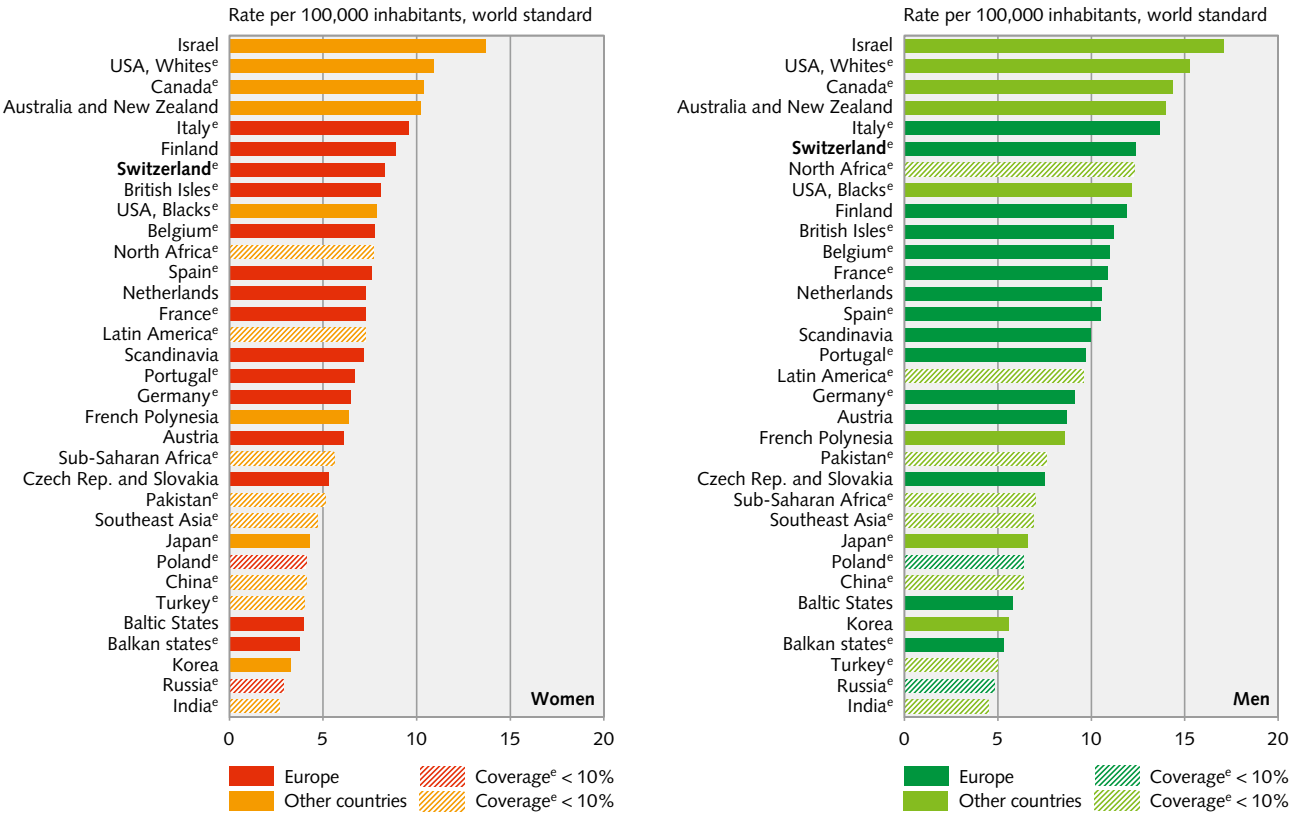


[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: NICER, CCR

[o] Atomic bombings of Hiroshima and Nagasaki in August 1945

Non-Hodgkin's lymphoma: Incidence[1] in international comparison, 1998–2002 **G 4.10.6**



[1] A list of all included cancer registries is presented in Annex 1
[e] Countries and regions with partial coverage: estimate based on registered regions

Source: NICER, CCR, CI-Five Vol.9

virus. Other viruses that can transform lymphocytes also increase NHL risk. In particular, the Human T cell leukaemia/lymphoma virus type 1 (HTLV-1) and the Epstein Barr virus (EBV). HTLV-1 transmitted through sexual contact or blood, is common in some parts of Japan and the Caribbean. In certain regions of Africa, EBV associated with a high prevalence of malaria causes a specific lymphoma called Burkitt's lymphoma.

In addition, certain chronic infections can boost immunity and increase the risk of lymphoma. Infection with hepatitis B has been associated with an increased risk of NHL. *Helicobacter pylori* which causes chronic stomach ulcers is also associated with the occurrence of lymphoma of the stomach.

Autoimmune diseases (e.g. rheumatoid arthritis or lupus erythematosus) are associated with increased NHL risk. There is no increased risk of lymphoma in first-degree relatives of a person diagnosed with NHL.

4.10.6 Prevention and Screening

To prevent occupational risks, it is necessary to protect workers exposed to radiation, herbicides/pesticides, and/or benzene-based solvents associated with increased NHL risk.

As for other forms of risk, the best method to prevent NHL is to take appropriate measures to prevent HIV infection. Importantly, treatment for HIV-infected persons has decreased the risk of developing NHL. The prevention of HTLV-1 infection in at-risk regions (Japan and the Caribbean) is also recommended. Antibiotic treatment of *Helicobacter pylori* is one means of preventing the occurrence of lymphoma and stomach cancer.

There is no recommended screening, but regular monitoring of people at risk may allow early diagnosis.

4.11 Leukaemias

4.11.1 General Observations

Leukaemias are cancers of white blood cells. They are broadly classified into two types, with a further distinction between acute and chronic characteristics: acute lymphocytic leukaemia (ALL), chronic lymphocytic leukaemia (CLL), and acute myeloid leukaemia (AML), chronic myeloid leukaemia (CML).

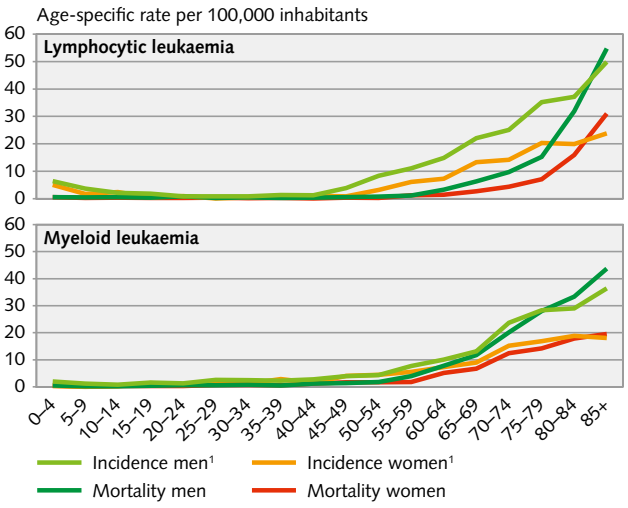
Leukaemias are slightly more common in men than in women. In Switzerland, approximately 900 people, (500 men and 400 women) develop leukaemia each year.[p] Leukaemias account for slightly less than 3% of cancers in men and slightly more than 2% of cancers in women. The risk of leukaemia increases with age, after a peak in childhood in the case of lymphocytic leukaemias (G 4.11.1). The risk of developing a lymphocytic leukaemia before the age of 70 is 0.9% in men and 0.4% in women. Approximately 80% of leukaemia cases in children are ALL, while 85% of cases after the age of 15 are AML.

In Switzerland, approximately 500 people a year die from leukaemia. Leukaemias are responsible for 3.3% of cancer deaths in both sexes. The prognosis for leukaemia depends on age of onset and type of the disease. The five-year relative survival is 50%, ranking Switzerland second among European countries.[45] There are, however, large disparities between the different types of leukaemia, ranging from 19% for AML to 75% for CLL. In 2002, it was estimated that 1500 men and 1000 women diagnosed with leukaemia during the previous five years were living in Switzerland.[46]

4.11.2 Trends

The incidence of leukaemia is showing a slight decline in Switzerland. The decrease in the number of leukaemias is accompanied by an increase in certain types of lymphoma. The decrease in incidence is probably linked more to the change in the classification of these diseases than to a reduction in exposure to risk factors.[q] In the case of *lymphocytic leukaemias,* the decrease is observed

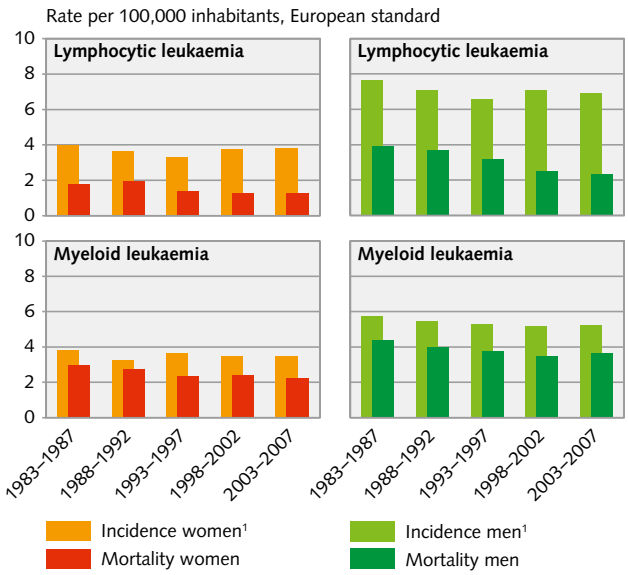
Leukaemias, 2003–2007 **G 4.11.1**



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Leukaemias: Incidence[1] and mortality trend **G 4.11.2**



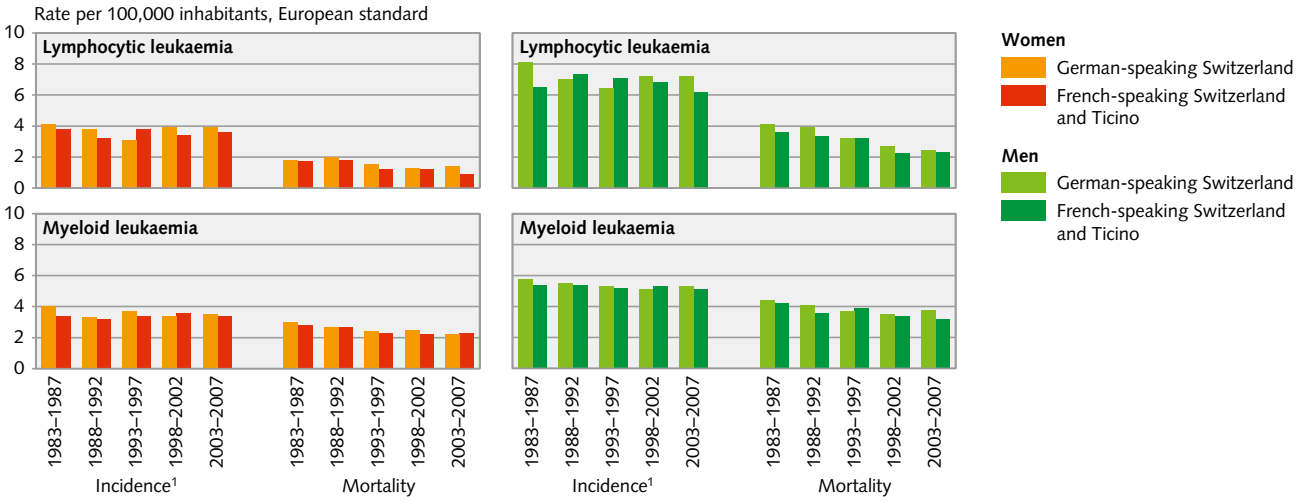
[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

[p] Annual average 2003–2007, estimated based on cancer registry data, cf. 2.1.1 and 2.2.1

[q] For leukaemias it was not possible to calculate correction factors because of the small number of cases (cf. 2.1.3).

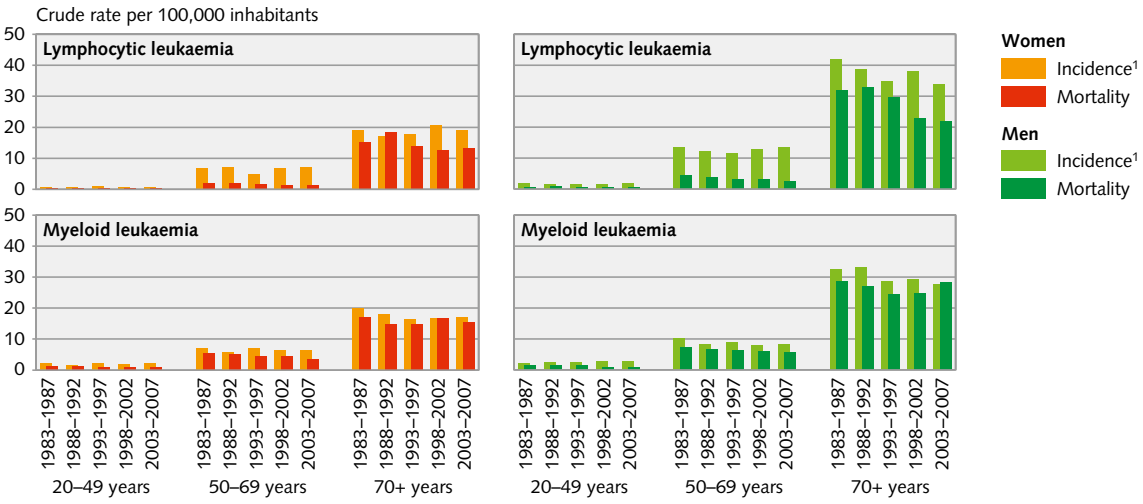
Leukaemias: Incidence[1] and mortality trend by language region G 4.11.3



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

Leukaemias: Incidence[1] and mortality trend by age group G 4.11.4



[1] Incidence estimate based on cancer-registry data; cf. 2.1.1 and 2.2.1

Source: FSO: COD, NICER, CCR © *FSO*

among men in the age 70 over. For *myeloid leukaemias,* the decline is seen in both sexes but is more pronounced in men than in women and occurs primarily from the age of 70 on (G 4.11.4). As in other regions of the world, the decline is more significant in terms of mortality. It was approximately 35% for *lymphocytic leukaemias* between 1983 and 2007. In Switzerland, the average annual number of deaths from lymphocytic leukaemias was 195 between 2003 and 2007. The decline in mortality is less pronounced for *myeloid leukaemias* at around 20% between 1983 and 2007 (G 4.11.2).

The decrease in mortality from lymphocytic and myeloid leukaemias is similar in the two language regions. It is considered to be associated with improved therapies (G 4.11.3).

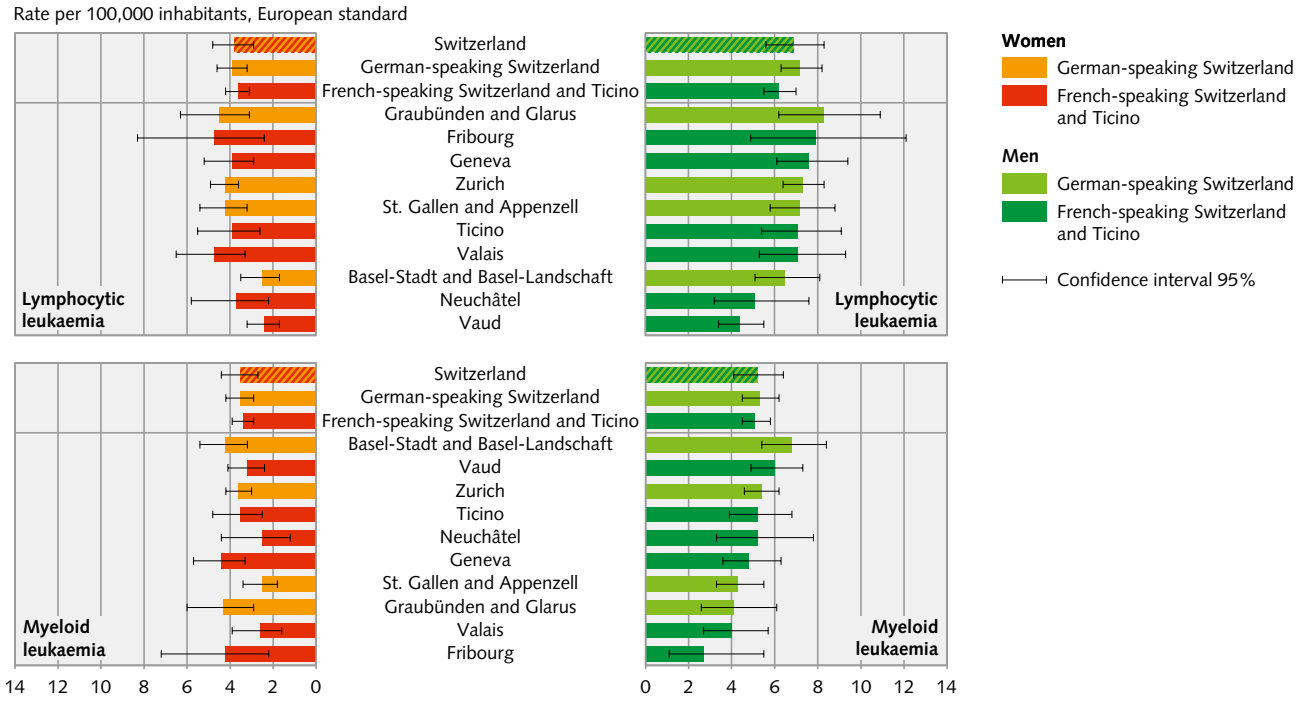
4.11.3 Regional Comparisons

In men the highest incidence rates of *lymphocytic leukaemias* are in the registries of Graubünden and Glarus, and Fribourg, and the lowest in the registries of Vaud and Neuchâtel. In women, the highest rates are found in the same regions as men plus in the canton of Valais, while the lowest rates are observed in the cantons of Vaud and in the Basel-Stadt and Basel-Landschaft region. In the case of *myeloid leukaemias,* the Basel-Stadt and Basel-Landschaft region and the canton of Vaud have the highest rates in men and the cantons of Valais and Fribourg the lowest. In women, the highest rates are observed in the registries of Graubünden and Glarus and Geneva, while the lowest are found in the registries of Neuchâtel and St. Gallen-Appenzell (G 4.11.5).

4.11.4 International Comparisons

Worldwide disparities are very similar for both sexes. For *lymphocytic leukaemias,* Australia, New Zealand, and Canada have the highest incidence rates in the world, while Sub-Saharan Africa, Korea, India, Pakistan, and Southeast Asia have the lowest. For *myeloid leukaemias,* the highest rates are found in French Polynesia, Australia, New Zealand, and in the white population in North America. Very low rates are observed in Sub-Saharan Africa and India. Incidence rates vary by a ratio of one to five (myeloid leukaemias) and one to seven (lymphocytic leukaemias) between regions with the lowest and the highest risk. Switzerland is generally within the average range within Europe (G 4.11.6).

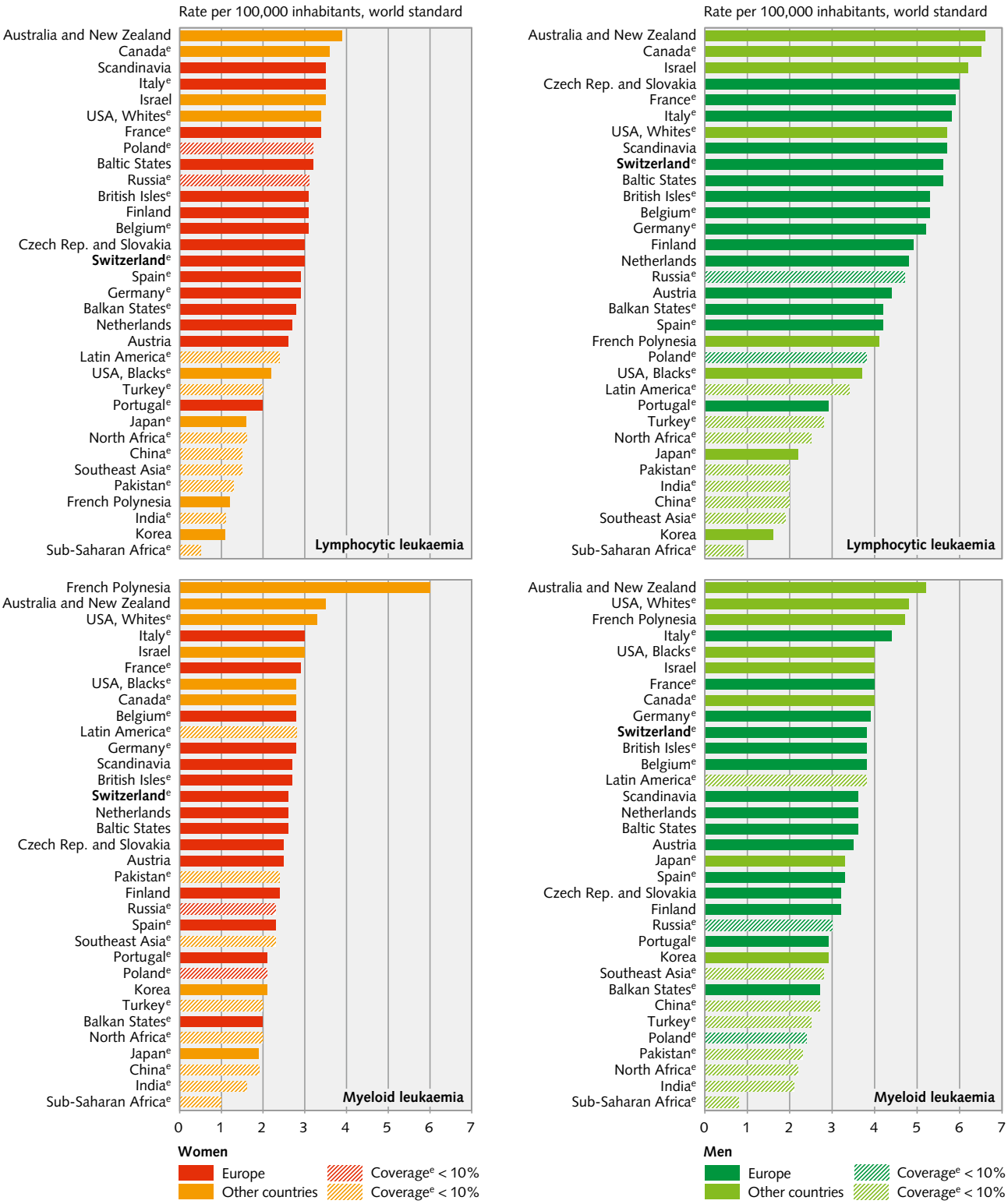
Leukaemias: Incidence[1] in regional comparison, 2003–2007 **G 4.11.5**



[1] Incidence estimated based on data from registries in the cantons of AI, AR, BL, BS, GL, GR, SG and ZH for German-speaking Switzerland and FR, GE, NE, TI and VS for French- and Italian-speaking Switzerland; cf. 2.1.1 and 2.2.1

Source: NICER, CCR

Leukaemias: Incidence[1] in international comparison, 1998–2002 G 4.11.6



[1] A list of all included cancer registries is presented in Annex 1
[e] Countries and regions with partial coverage: estimate based on registered regions

Source: NICER, CCR, CI-Five Vol.9

4.11.5 Risk Factors

Ionizing radiation is recognised as a primary cause of certain leukaemias. The survivors of Hiroshima and Nagasaki[r] have a higher risk of ALL, AML, and CML, but not of CLL. Their increased risk began two years after irradiation and is greater for persons who were near the centre of the explosion. Radiation therapy, which was used in the past for the treatment of ankylosing spondylitis (a chronic inflammatory rheumatic disease with pain and stiffness of joints), also increases the risk. Radiation exposure during pregnancy increases the risk of childhood leukaemia, particularly myeloid leukaemia.

Another risk factor for leukaemia (principally AML) is cancer treatments, especially for Hodgkin's disease, non-Hodgkin lymphomas, childhood leukaemias, and breast and ovarian cancers. The increased risk depends on the type of chemotherapy. Alkylating agents and agents containing epipodophyllotoxins are primarily responsible for the increased risk. The risk is particularly high in patients who were treated at a young age. Leukaemias induced by cancer treatments often present an anomaly induced by chromosome 11.

The Human T cell leukaemia/lymphoma virus type 1 (HTLV-1) (common in some parts of Japan and the Caribbean), and the EBV (Epstein Barr virus) responsible for infectious mononucleosis, transform lymphocytes and thereby increase the risk of leukaemia. EBV in particular increases the risk of ALL in the regions of Africa highly endemic for malaria. (It also increases the risk of a particular form of lymphoma: Burkitt's lymphoma.)

Occupational exposure to benzene is associated with increased risk of leukaemia, mainly AML. Benzene is used as a solvent in the rubber, footwear, and dry cleaning industries, as well as in laboratories and the chemical industry (e.g. in paints, varnishes, printing inks, etc.) Benzene is also contained in premium-grade unleaded petrol. Tobacco, probably because of its high benzene content, increases the risk of leukaemia, mainly AML.

Some genetic abnormalities such as Down syndrome (Trisomy 21) increase the risk of leukaemia particularly ALL. Fanconi anaemia and ataxia telangiectasia are associated with an increased risk of both AML and ALL. An increased risk of CLL has been observed in families with a first-degree family member diagnosed with CLL. The genetic component of other forms of leukaemia, notably CML, is low.

The association between exposure in pregnancy to marijuana smoke or to benzene and the occurrence of childhood leukaemia is still being researched. As yet unconfirmed other factors worth mentioning include exposure to electromagnetic fields, diesel fuel, pesticides, hair dye, and viruses that cause leukaemia in animals.

[r] Atomic bombings of Hiroshima and Nagasaki in August 1945

4.11.6 Prevention and Screening

The prevention of leukaemia is linked to radiation protection. It is also necessary to take precautionary measures to protect workers who are in contact with solvents known to be associated with increased risk of leukaemia. Protective measures against HTLV-1 infection are recommended in areas at risk. Smoking cessation is in any case a beneficial measure.

5 Childhood Cancers

5.1 General Observations

Cancers in children are rare. Only about 0.5% of all tumours worldwide occur during childhood. In Switzerland there are about 170 new cases of childhood cancer every year.

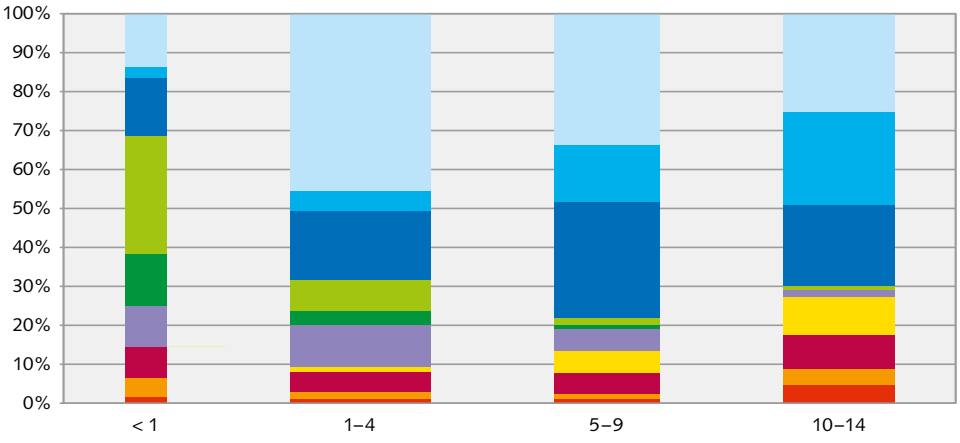
Interdisciplinary therapy, mostly in the context of international clinical trials, has steadily improved treatment success. Currently the cure rate is 80%, which is significantly higher than in adults (cf. 3.3). Nevertheless, after accidents, cancers are the second leading cause of death among children in Switzerland.

Childhood Tumour Types
Childhood cancers are different from adult forms of the disease. Common cancers in adults are breast, lung, prostate, and colorectal cancer. These are carcinomas (i.e. cancers that spread from cells in the tissue that lines the skin or mucous membranes called epithelium). In children, on the other hand, tumours arise from a variety of tissue types and carcinomas are rare. Therefore, childhood cancers are classified according to their histology (tissue type), not according to the site.

The International Classification of Childhood Cancer (ICCC-3)[47] distinguishes 12 groups of cancers (G 5.1). The most common are leukaemias (33% of all cancers), followed by tumours of the central nervous system (especially brain tumours) (21%), and lymphomas (13%). Other cancers arise from embryonic tissue. These include neuroblastomas (7%) from primitive neural tissue, nephroblastomas (6%) from renal tissue, hepatoblastomas (1%) in the liver, retinoblastomas (3%) from cells of the retina, as well as germ cell tumours (3%). The latter may arise in the gonads (ovaries and testes), or in other sites, for example in the brain. In older children, malignant bone tumours (5%) and soft tissue sarcomas (7%), which arise from abnormal connective tissue, are occurring with increasing frequency. Furthermore, sometimes children also develop melanomas and other rare tumours (2%).

An intermediate position is occupied by Langerhans cell histiocytoses, which are not officially counted as malignant diseases and are therefore not included in the graphs below. But since they are treated similarly to cancer and in rare cases also result in death, they are recorded in the Swiss Childhood Cancer Registry. On average, five such cases occur each year in Switzerland.

Cancer in children: diagnoses by age group, 1988–2007 G 5.1



The surfaces are proportional to the number of cases.

Source: SCCR

Treatment

Most children who develop cancer in Switzerland are treated in one of nine clinics specialising in paediatric oncology. These are the departments of paediatric oncology in the paediatric clinics in Aarau, Basel, Bern, Geneva, Lausanne, Lucerne, St. Gallen, Zurich, and Ticino (until 2008 in Locarno, since then in Bellinzona), which are summarised in the website of the Swiss Paediatric Oncology Group (SPOG; www.spog.ch). These clinics are working closely together to provide the highest level of treatment. Where possible, all children are included in international treatment studies. This guarantees standardised therapy at the cutting edge of current research. At the same time, the results can be evaluated to improve knowledge about the tumours and to further improve treatment. In addition to improved effectiveness, the focus is on the reduction of short- and long-term side effects.

For some tumours, surgical treatment is sufficient (e.g. benign brain tumours or early-stage melanomas). Most cases, however, require complex combination therapy consisting of several cycles of chemotherapy, surgery and sometimes radiation or bone marrow transplants. Therefore, treatment often lasts one to two years, and after the children are cured, they are followed up for several years. Even children who suffer a relapse have a good chance of a complete cure. But in such cases the therapy is adapted and intensified.

Unless children or their parents avail themselves of their veto power, information on the child's tumour, treatment and course of treatment are documented in the Swiss Childhood Cancer Registry (www. childhoodcancerregistry.ch).[48] This allows for quality control and rapid feedback of results to the treating hospitals.

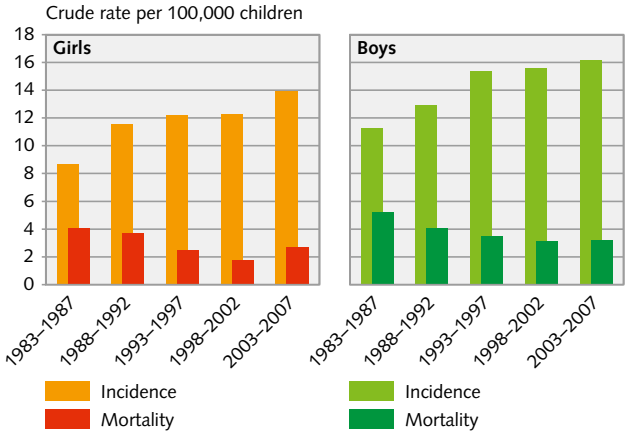
5.2 Cancer Cases and Deaths

On average over the 1998–2007 period, 168 new childhood cancer cases occurred each year in Switzerland (14 new diagnoses per 100,000 children per year). Over the same period on average 37 children died each year (3 per 100,000). The annual number of new cancer cases remained relatively stable from the early 1990s (G 5.2). Mortality decreased slightly during the same period, from 5 per 100,000 per year (1983–87) to 3 per 100,000 per year in the years 2003–2007 (G 5.2). Given the small number of cases, slight variations from period to period may also be due to chance.

Cancers occur in infants and children aged one to four years more frequently than during early school age (G 5.3). Among adolescents, the incidence increases again slowly, and continues to rise into adulthood.

Practically all types of tumours occur more frequently among boys than among girls, but sex differences are less pronounced than later in life (G 5.4).

Cancer in children: incidence and mortality trend G 5.2

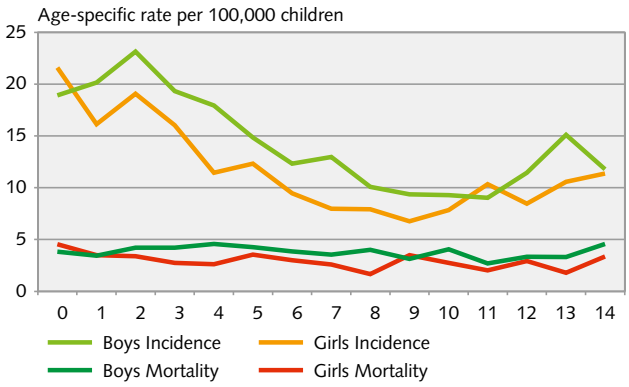


Source: SCCR, FSO: COD © FSO

5.3 Cure and Survival Rates

Thanks to intensive treatment, the chances of cure for children with cancer have improved dramatically over the past 60 years and have now reached 80%, compared with below 20% in 1950. All survival rates improved significantly for all tumours, although marked differences remain between the various diagnoses.[49] The best results are obtained for Hodgkin lymphomas (over 95% cured), and are worse for acute myeloid leukaemia and for brain tumours and sarcomas (G 5.5).

Cancer in children by age group, 1993–2007 G 5.3



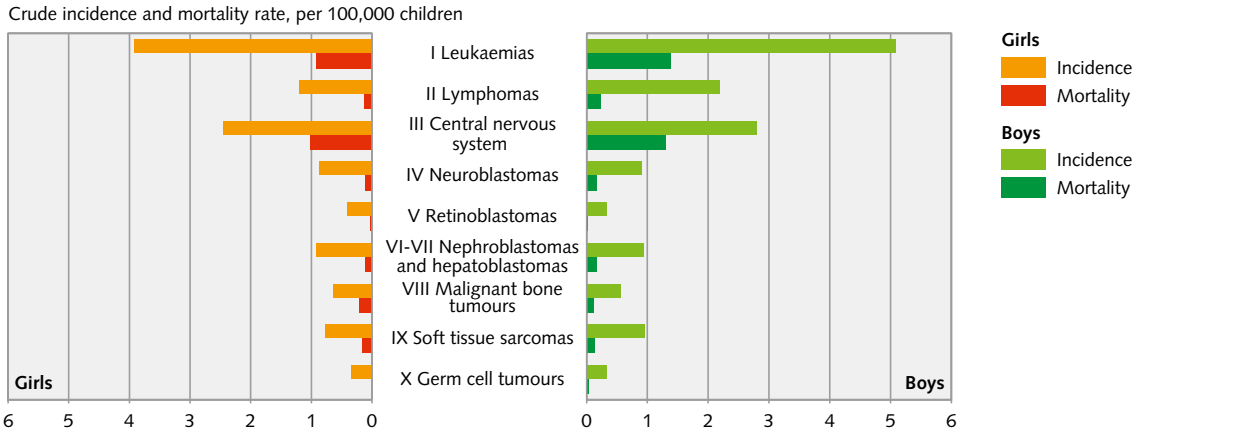
Source: SCCR, FSO: COD © FSO

In Switzerland, the 10-year survival rate was 72% for children who were diagnosed in the 1980s, 76% for those who were diagnosed in the 1990s and 82% for children who were diagnosed in 2000–2009 (G 5.6). With Germany, Austria and Finland, Switzerland is among the countries with the best treatment results.[50]

International studies show that survivors have a higher risk of secondary tumours, for example breast cancer after Hodgkin's disease. Survivors also have an increased risk of hormonal problems, cardiovascular diseases, osteoporosis, and a slightly higher overall mortality. Therefore, it is important that follow-up check-ups continue long after the patient is cured.[a]

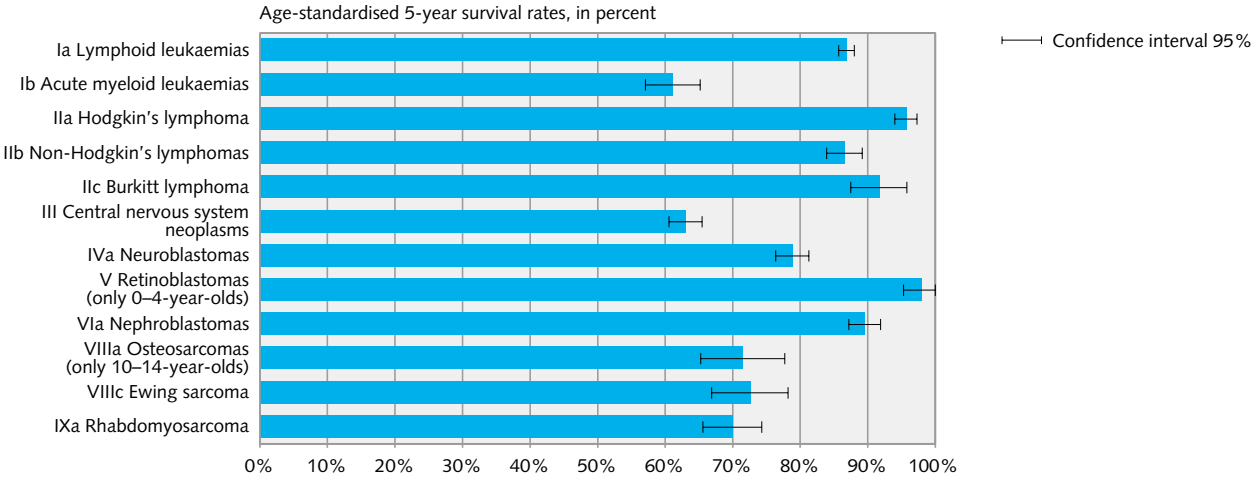
[a] A national Swiss strategy to effectively organise such follow-ups is currently being elaborated in collaboration among the Swiss Paediatric Oncology Group (www.spog.ch), the "Kinderkrebshilfe Schweiz" (www.kinderkrebshilfe.ch), the network childhood cancer survivors (www.survivors.ch.vu) and the Swiss Childhood Cancer Registry.

Cancer in children by diagnosis, 1983–2007 G 5.4



Source: SCCR, FSO: COD

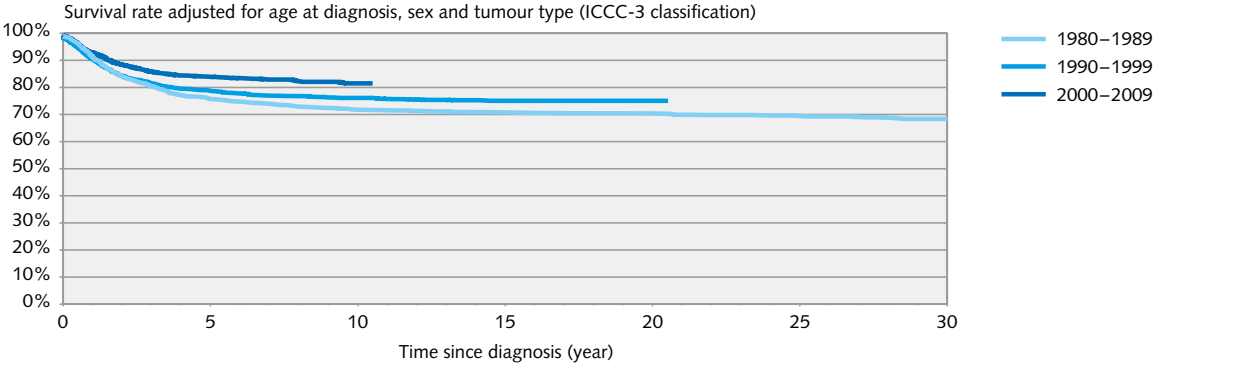
Cancer in children: five-year survival rates in Central Europe[1], diagnosis years 1995–1999 G 5.5



[1] Belgium, Germany, France, Netherlands, Austria, Switzerland; a list of the registries included is presented in Annex 2

Source: EUROCARE-4, European Journal of Cancer 45 (2009) 992–1005

Survival over time by period of diagnosis G 5.6



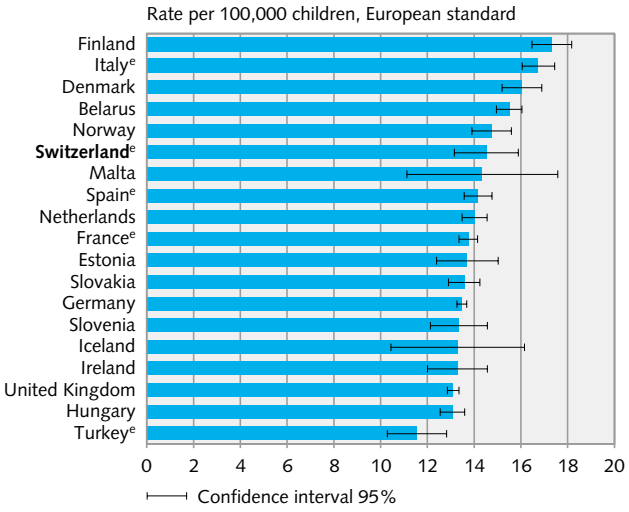
Source: SCCR

Because of the high cure rates and the young age at disease onset, quality of later life is very important for children who have been cured. A national follow-up study of long-term survivors was conducted for the first time in Switzerland in the 1990s.[51] A second study is currently under way. The findings of these two studies show that most children who have been cured have good physical and mental health and good quality of life. There are nonetheless some young adults with chronic illnesses or emotional problems.[52]

5.4 International Comparisons

Within Europe, the incidence of cancer in children varies between about 13 cases per 100,000 children per year in Great Britain and 16 cases per 100,000 in Northern Europe.[53] With 14 cases per 100,000, Switzerland is in the mid-range (G 5.7).[54] Worldwide the differences are even greater with a total variation of 7 to 16 cases per 100,000.[55] However, regional comparisons are made difficult by differences in cancer registrations.

Cancer in children: incidence in international comparison[1], 1988–1997 **G 5.7**



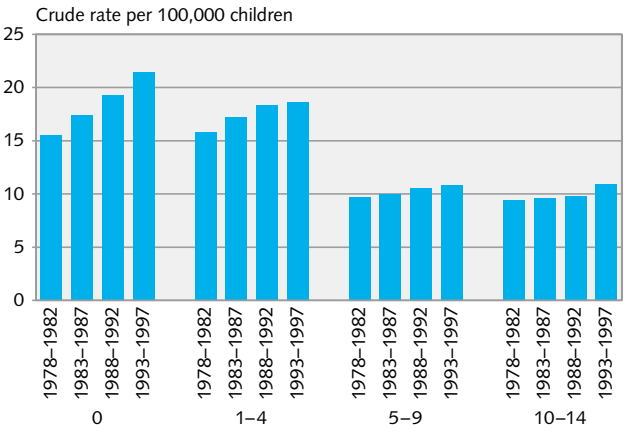
[1] A list of all included registries is found in Annex 3
[e] Countries with sub-national coverage: estimate based on the registered areas

Source: ACCIS, European journal of Cancer 42 (2006) 1952–1960 © *FSO*

Greater than the differences in the total number of cancers are regional differences for certain cancer types. For example, acute lymphocytic leukaemia (ALL) occurs particularly frequently among fair-skinned peoples with a Western lifestyle. Melanomas are most common in Oceania, where strong sunlight, an ozone hole, and a light-skinned population are found together. In Africa there are many virus-associated tumours, such as Burkitt's lymphoma, Kaposi's sarcoma, and nasopharyngeal cancer.

Data from Europe and North America but also from within certain large countries (e.g. Great Britain) consistently show a slight increase of childhood cancer over the last three decades for all age groups (G 5.8[b]).[56] The number of new cancers also appears to be increasing slightly in the Swiss Childhood Cancer Registry (G 5.2). But the numbers are small and not statistically significant, and the increase may be at least partly attributable to improved registration.

Cancer in children: incidence trend in Europe[1] by age group[b] **G 5.8**



[1] A list of all included registries is found in Annex 4

Source: ACCIS, European Journal of Cancer 42 (2006) 1961–1971 © *FSO*

[b] With thanks to Dr. Eva Steliarova-Foucher (IARC) and the ACCIS Working Group

5.5 Causes and Risk Factors

Little is known about the causes of cancers in children. Their aetiology is multifactorial. This means that they have different causes and that both environmental influences and a genetic predisposition play an important role. Cancers in infants and young children are probably caused by risk factors present before birth or even before conception.

A series of familial and genetic syndromes are associated with increased cancer incidence. These include familial neoplastic syndromes such as familial retinoblastoma, familial Wilms tumour, Li Fraumeni syndrome, neurofibromatosis, and multiple endocrine neoplasia. An increased risk of cancer is also found in children with congenital immunodeficiency or bone marrow diseases, and in children with genetic diseases or chromosomal anomalies. Children with Down syndrome (Trisomy 21) have an increased risk of acute leukaemia, but a reduced risk for solid tumours.

Family members of children with cancer (siblings and offspring) only have an increased cancer risk if they suffer from one of the aforementioned familial syndromes or from genetic diseases.

Increasing maternal age at birth is associated with a slight increase in cancer risk among children, especially for ALL. The data are less consistent regarding the father's age.

Although environmental factors certainly play a role in the development of cancer in children, there is little definite knowledge about this. Because of the extreme rarity of childhood cancer and the relatively long latency period between exposure and onset of the disease, research in this area is much more difficult.

Ionizing (radioactive) radiation in higher doses promotes the development of cancer. Consequently, in past years, the routine x-ray examination of pregnant women resulted in cancers in children. The increase in thyroid cancers among children in Belarus after the Chernobyl accident in 1996 is also well documented.

The effect of low doses of radiation (radon) and electromagnetic radiation (power lines, mobile phones, radio stations) is still unclear. There is also little clarity regarding the effects of pesticides, benzene, or parents' occupational exposure to chemicals.

Certain viruses, particularly HIV, hepatitis B, Epstein Barr virus (EBV), and HHV-8, contribute to international variation in cancer incidence among children, especially for lymphomas, nasopharyngeal carcinomas, liver carcinomas and Kaposi's sarcomas. On the other hand, there are studies that indicate a possible protective effect of early exposure to common cold viruses through contact with older siblings or other children in childcare centres or kindergartens.

Three studies are currently examining the effect of environmental factors on the development of cancer in children in Switzerland. A national study (www.canupis.ch) is comparing the place of residence of children with cancer with the place of residence of healthy children. The aim is to investigate whether children with cancer live closer to nuclear power plants, power lines, radio transmitters, and/or main roads. A second international case-control study with Switzerland's participation (CEFALO) examines risk factors for brain tumours in children.
A third study examines whether cancer risk and chances of cure in Switzerland are affected by social class.

5.6 Prevention and Early Detection

As summarised above, to date there is little reliable knowledge about preventable risk factors. A generally healthy lifestyle is certainly a sensible measure. Some tumours in infancy and early childhood (e.g. retinoblastoma) can be detected during routine paediatric examinations. However, except for families with hereditary syndromes, specific screening tests are not a reasonable measure. For example, a laboratory screening test for neuroblastoma (concentration of certain substances in the urine) has not proved useful. Such screening identified a number of tumours that would have regressed without treatment. As a result, some children were unnecessarily subjected to such treatment, and for other affected children with larger tumours the chances of survival did not improve because of the earlier diagnosis.

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Annex

Annex 1: List of registries for international comparison graphs (chap. 4)

Australia and New Zealand	Australia: New South Wales, Northern Territory, Queensland, South, Tasmania, Victoria, Western, Capital Territory; New Zealand
Austria	Austria
Baltic States	Estonia; Latvia; Lithuania
Belgium	Flanders
British Isles	Ireland; United Kingdom: East of England, Merseyside and Cheshire, North Western, Northern and Yorkshire, Oxford Region, South and Western, Thames, Trent, West Midlands, Northern Ireland, Scotland
Canada	Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Northwest Territories, Nova Scotia, Ontario, Prince Edward Island, Saskatchewan
China	Guangzhou, Hong Kong, Jiashan, Harbin, Shangha, Zhongshan
Czech Republic and Slovakia	Czech Republic; Slovak Republic
Finland	Finland
France	Bas-Rhin, Calvados, Doubs, Haut-Rhin, Hérault, Isère, Loire-Atlantique, Manche, Somme, Tarn, Vendée
French Polynesia	French Polynesia
Germany	Brandenburg, Saxony, Hamburg, Mecklenburg-Western Pomerania, Munich, Munster, Saarland
India	Chennai, New Delhi, Karunagappally, Mumbai, Nagpur, Poona, Trivandrum
Israel	Israel
Italy	Biella, Brescia, Ferrara, Florence and Prato, Genoa, Macerata, Milan, Modena, Naples, Parma, Ragusa, Reggio Emilia, Romagna, Salerno, Sassari, Syracuse, Sondrio, Torino, Umbria, Varese, Veneto
Japan	Aichi, Fukui, Hiroshima, Miyagi, Nagasaki, Osaka, Yamagata
Korea	South Korea
Latin America	Argentina: Bahia Blanca; Brazil: Brasilia, Cuiaba, Goiania, Sao Paulo; Chile: Valdivia; Colombia: Cali; Costa Rica; Ecuador: Quito; France: La Martinique; Peru: Trujillo
Netherlands	Netherlands

North Africa	Algeria: Setif; Egypt: Gharbiah; Tunisia: Sousse
Pakistan	Karachi South
Poland	Cracow, Kielce, Warsaw City
Portugal	Porto, South
Russia	Saint Petersburg
Scandinavia	Denmark; Norway; Sweden
Southeast Asia	Malaysia: Penang, Sarawak; Philippines: Manila; Singapore (Chinese, Indian and Malaysian population); Thailand: Chiang Mai, Lampang, Songkhla
Spain	Albacete, Asturias, Basque Country, Canary Islands, Cuenca, Girona, Granada, Murcia, Navarra, Tarragona, Zaragoza
Sub-Saharan Africa	Uganda: Kyadondo; Zimbabwe: Harare (African population)
Switzerland	Basel-Stadt and Basel-Landschaft, Geneva, Graubünden and Glarus, Neuchâtel, St. Gallen-Appenzell, Ticino, Valais, Vaud, Zurich
Balkan States	Bulgaria; Croatia; Serbia; Slovenia
Turkey	Antalya, Izmir
USA, Blacks, USA, Whites	Alabama, Alaska, Arizona, California, Colorado, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Missouri, Montana, New Jersey, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Texas, Vermont, Washington, West Virginia, Wisconsin

Annex 2: List of registries for Central Europe (G 5.5)

Austria	Austria
Belgium	Flanders
France	Bas-Rhin, Brittany, Calvados, Côte d'Or (hematologic), Doubs, Haut-Rhin, Hérault, Isère, Lorraine, Manche, Somme, Tarn
Germany	German childhood cancer registry (in German: Deutsches Kinderkrebsregister)
Netherlands	Amsterdam, Eindhoven, North Holland
Switzerland	Basel-Stadt and Basel-Landschaft, Geneva, St. Gallen-Appenzell, Ticino, Valais

Annex 3: List of registries and period covered[a] (G 5.7)

Belarus	Belarus (since 1989)
Denmark	Denmark
Estonia	Estonia
Finland	Finland
France	Bas-Rhin (until 1996), Brittany (since 1991), PACA and Corsica (until 1996), Doubs (until 1996), Haut-Rhin ,Hérault, Lorraine, Manche (1994 to 1996), Rhône-Alpes, Somme (until 1996), Tarn
Germany	NCR: National Cancer Registry (national cancer registry of the former East Germany) until 1989; GCCR: German Childhood Cancer Registry (childhood cancer registry of the former West Germany) from 1983 until 1990; GCCR (East and West) since 1991
Hungary	Hungary
Iceland	Iceland
Ireland	Ireland (since 1994)
Italy	Piedmont paediatric registry, Marches (since 1990), Ferrara (1991 to 1995), Latina, Liguria (until 1995), Lombardy, Umbria (1994 to 1996), Parma (until 1995), Ragusa, Sassari (1992 to 1995), Tuscany, Veneto (1990 to 1996)
Malta	Malta (since 1991)
Netherlands	Netherlands (1989 to 1995; except for leukaemias) DCOG: Dutch Childhood Oncology Group (only for leukaemias)
Norway	Norway
Slovakia	Slovakia
Slovenia	Slovenia
Spain	Spain (1990 to 1995): when periods overlap, only records from this registry are used, Albacete (since 1991), Asturias, Canary Islands (1993 to 1996), Girona (since 1994), Granada, Mallorca (until 1995), Navarra (until 1996), Tarragona, Basque country (until 1994), Zaragoza (until 1996)
Switzerland	Basel-Stadt and Basel-Landschaft, Geneva, Graubünden and Glarus (since 1989), St. Gallen-Appenzell, Valais (since 1989)
Turkey	Izmir (1993 to 1996)
United Kingdom	England and Wales (until 1995), Scotland, Northern Ireland (1993 to 1996)

[a] The coverage period is only indicated if the registry does not cover the entire 1988–1997 period.

Annex 4: List of registries and period covered[a] (G 5.8)

Denmark	Denmark
Estonia	Estonia
Finland	Finland
France	Lorraine (since 1983), PACA and Corsica (1984 to 1996), Doubs (until 1996), Isère (since 1979), Bas-Rhin (until 1996), Somme (1983 to 1996) Tarn (since 1983)
Germany	NCR: National Cancer Registry (national cancer registry of the former East Germany) until 1989; GCCR: German Childhood Cancer Registry (childhood cancer registry of the former West Germany) from 1983 to 1990; GCCR (East and West) since 1991
Hungary	Hungary
Iceland	Iceland
Italy	Piedmont paediatric registry, Latina (since 1983), Lombardy, Parma (until 1995), Ragusa (since 1983)
Netherlands	DCOG: Dutch Childhood Oncology Group (only for leukaemias), Eindhoven (for other cancers)
Norway	Norway
Slovakia	Slovakia
Slovenia	Slovenia
Spain	Asturias (since 1983), Navarra (until 1996), Tarragona (since 1983), Zaragoza (until 1996)
Switzerland	Basel-Stadt and Basel-Landschaft (since 1983), Geneva, St. Gallen-Appenzell (since 1983)
United Kingdom	England and Wales (until 1995), Scotland

[a] The coverage period is only indicated if the registry does not cover the entire 1978–1997 period.

Glossary

Adenocarcinoma	A cancer of epithelia originating in glandular tissue.
Benign polyp	A non-malignant growth that protrudes from a mucous membrane.
Biopsy	The removal of cells or tissues for microscopic examination by a pathologist.
Birth cohort	A group of people born on a particular day or during a particular period or year who are followed up over time.
BRCA1 and BRCA2	Human gene that belongs to a class of genes known as tumour suppressors. Women with a mutation of the BRCA1 or BRCA2 gene have a higher risk of breast cancer.
Cancer site	Site or organ affected by cancer.
Carcinogen	Substances or exposures in the environment that may cause cancer.
Carcinoma	A malignant new growth of epithelial cells that begins in skin or tissues that line the inside or cover the outside of internal organs.
Colonoscopy	A procedure that allows visual observation of the large intestine (rectum and colon) with a flexible probe.
Congenital naevus (or mole)	Naevus present at birth.
Dysplastic naevus (also called atypical mole)	Naevus with birth or developmental abnormalities which occurred during the embryonic period or after birth.
Endometrium	The inner lining of the uterus (womb).
Goitre	Enlargement of the thyroid.
Health education	The process of teaching people about and how to improve their health and to give them the means to control it more effectively.
Health promotion	Actions to improve the health of the population (cf. health education).
Helicobacter pylori	The bacteria responsible for most ulcers and many cases of stomach inflammation (chronic gastritis).
Histological investigation	The study of the form of structures of tissue seen under the microscope.
Histological type	Classification of cancers according to their cellular characteristics.
Hormone replacement therapy (HRT)	Treatment generally used to limit troubles associated with menopause.
Human papillomavirus (HPV)	There are different types of sexually transmitted viruses, some of which are associated with cancer and precancerous lesions of the cervix uteri.
Hyperplasia	Increase in the number of cells in a tissue.
In situ	A cancer that has remained within the tissue in which it originated (i.e. localised or non-invasive cancer that has not begun to spread).
Incidence	Frequency of new cases of a disease in a defined population during a given period. The incidence of cancer is often expressed as annual rates over 100,000 inhabitants (cf. 2.2).
International Classification of Childhood Cancer (ICCC)	The classification system for childhood cancers based on tumour morphology and primary site with emphasis on morphology rather than the emphasis on primary site.

International Classification of Diseases (ICD)	The classification used to code and classify diseases. Uniformly revised and published by the World Health Organisation (WHO) since the19th century; the tenth revision has been in use since 1994.
International Classification of Diseases for Oncology (ICDO)	A classification system that extends the ICD and is used principally in tumour or cancer registries for coding the site (topography) and the histology (morphology) of neoplasms. The 3rd revision is currently in force.
Invasive cancer	A cancer spread beyond the layer of tissue in which it originated and growing into surrounding healthy tissue.
Major regions	– Lake Geneva region: Vaud (VD), Valais (VS), Geneva (GE) – Espace Mittelland: Bern (BE), Fribourg (FR), Solothurn (SO), Neuchâtel (NE), Jura (JU) – Northwest Switzerland: Basel-Stadt (BS), Basel-Landschaft (BL), Aargau (AG) – Zurich: Zurich (ZH) – Eastern Switzerland: Glarus (GL), Schaffhausen (SH), Appenzell Ausserrhoden (AR), Appenzell Innerrhoden (AI), St. Gallen (SG), Graubünden (GR), Thurgau (TG) – Central Switzerland: Lucerne (LU), Uri (UR), Schwyz (SZ), Obwalden (OW), Nidwalden (NW), Zug (ZG) – Ticino: Ticino (TI)
Mammography	An x-ray imaging test performed to examine breast tissue and detect breast cancer.
Mastectomy	Partial or total surgical removal of the breast.
Melanin	The pigment that gives skin colour.
Melatonin	"Sleep" hormone that regulates biological rhythms.
Metastasis	The spread of cancer from the primary site (place where it started) to other places in the body via blood or lymphatic vessels.
Morbidity	The frequency or rate at which (an) illness occurs in a particular area or population during a specific period (includes prevalent and incident disease).
Mortality	The frequency or rate at which death occurs in a particular population during a specific period. Cancer mortality is often expressed as annual rates over 100,000 inhabitants (cf. Chapter 2).
Naevus	Mole or beauty mark/spot.
Nodule	A growth or lump that may be malignant (cancerous) or benign (noncancerous) and that develops in or under the skin.
Occult blood	Blood present in the stool which is not visible to the naked eye.
Over-diagnosis	Detection of an asymptomatic disease that would not have spontaneously presented symptoms and that would not have had consequences during the patient's lifetime.
Pap smear	A screening test based on microscopic examination of cervical cells to detect cancer of the cervix uteri.
Precancerous lesion	Abnormal cells characterised by a disruption of the mechanisms of cell renewal. At this stage, the risk that a cancer will develop is higher.

Prevalence	The frequency of cases of a disease in a given population at a specific time (can be expressed by a number, proportion or rate). The prevalence is sometimes limited to a particular period of time after diagnosis, for example the prevalence at age 5 (cf. Chapter 2).
Prevention	Measures to limit the impact of a disease by avoiding its occurrence (primary prevention) or by limiting its consequences (secondary prevention).
Primary Prevention	Strategies performed to decrease the chance of getting a disease or condition such as cancer (e.g. exposure to tobacco for lung cancer).
Prostate specific antigen (PSA)	A protein produced by cells of the prostate gland. The PSA test measures the level of PSA in the blood to help detect prostate cancer.
Relative survival rate	Survival rate estimated by taking into account the deaths occurring in the general population at each age.
Risk factor	Any characteristic of a person or a person's environment or life style that increases the likelihood that the person will eventually develop a disease.
Risk	The probability of an event occurring such as developing or dying from a disease in a population or subpopulation.
Sarcoma	A cancer of the bone, cartilage, fat, muscle, blood vessels, or other connective or supportive tissue.
Screening	Procedures which can help find diseases (at an early stage) before symptoms appear and which can be widely applied to an entire "target population" in good health.
Secondary prevention	Strategies performed that focus on early diagnosis, symptoms, and treatment to minimise and/or stop the progress of diseases such as cancer.
Stage	Degree of spread of cancer at the time of diagnosis: the cancer is localized (I), with local invasion (II), with regional invasion (III) or advanced/metastatic (IV) (cf. 2.2).
Standardised rate	The standardised rate is a rate recalculated on the assumption that the study population presents the age structure of a standard population. The standardised rate makes it possible to compare the incidence or mortality between populations, while controlling for differences due to age structure. The standard populations generally used correspond to a European or world average.
Survival rate	The percentage of people who are alive for a certain period of time after they were diagnosed with a disease such as cancer.
Ulcer	A break on the skin, in the lining of an organ, or on the surface of a tissue (e.g. in skin, eyes, or mucous membrane) which sometimes appears not to heal.
Years of Potential Life Lost (YPLL)	The sum of the differences between the age of death and a theoretically defined "acceptable" age limit; in the existing report age 70 years. YPLL is a measure of premature mortality and can also be expressed as a rate.

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FSO, IARC, Swiss Cancer League (www.liguecancer.ch)
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