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INSTITUTE OF POPULATION-BASED CANCER RESEARCH

Cancer in Norway 2010

2010

Cancer in Norway

Cancer incidence, mortality, survival and prevalence in Norway

Special issue:
Clustering of cancer

Cancer in Norway 2010

Editor-in-chief: Inger Kristin Larsen
Analysis: Bjørge Sæther, Bjarte Aagnes
Layout and design: Gunther Zerener
Correspondence to: Inger Kristin Larsen - inger.kristin.larsen@kreftregisteret.no

Editorial team: Inger Kristin Larsen, Tom Kristian Grimsrud, Tom Børge Johannesen, Aage Johansen, Hilde Langseth, Siri Larønningen, Jan Ivar Martinsen, Christine Mellem, Bjørn Møller, Jan Franz Nygård, Bjørge Sæther, Svein Erling Tysvær, Gunther Zerener, Bjarte Aagnes, Giske Ursin

Recommended reference:
Cancer Registry of Norway. Cancer in Norway 2010 - Cancer incidence, mortality, survival and prevalence in Norway. Oslo: Cancer Registry of Norway, 2012.

Special issue: Clustering of cancer

Editor: Tom K Grimsrud
Writing group: Odd O Aalen, Tom K Grimsrud, Steinar Tretli
Layout and design: Gunther Zerener
Linguistic assistance: Barbara Mortensen
Correspondence to: Tom K Grimsrud – tom.k.grimsrud@kreftregisteret.no

Recommended reference: Cancer in Norway 2010. Special issue: Clustering of cancer. Grimsrud TK (Ed). Oslo: Cancer Registry of Norway, 2012

ISBN: 978-82-90343-3
ISSN: 0332-9631

General requests for cancer information, data or possible research collaborations are welcome, and should be sent to datautlevering@kreftregisteret.no

Cancer in Norway 2010

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Special issue:
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Foreword

This year the Cancer Registry of Norway celebrates its 60th anniversary for recording national data on cancer occurrence. That makes the Registry one of the oldest in the world. One of the activities that more or less define a cancer registry and that remains essential to this date, is the annual report of cancer incidence rates. This Cancer in Norway report contains the most up-to date numbers we have available, that is cancer counts and rates from 2010, as well as trends over time.

As we review the numbers, we look for changes from previous years. Some of the fluctuations are random, while some can signify an important change that we must make the authorities and population aware of. Deciding what is random and what is significant is not obvious when we just compare the numbers for one year with those of the previous year or years. However, given that we have reports on cancer for the past 60 years in Norway, what are some of the important changes in the main cancers over these past decades?

Most cancers have increased. This is to be expected as more people live longer, and cancer becomes more common as a population ages. However, even age-adjusted and age-specific incidence rates have increased. The reasons for this are for some cancers obvious, as they are closely related to changes in lifestyle. Several of the common cancers are predominantly lifestyle-caused cancers, this includes skin cancer, breast cancer, and lung cancer. Without smoking, lung cancer would have been a rare disease. But with the smoking habits of the previous 50 years, our lung cancer rates have, as in the rest of the world, soared. Thankfully, rates fall as the lower or non-smoking generations become older, but this takes time. If we were to select one exposure that we could magically erase, smoking would be our first choice, having the largest impact on incidence and mortality rates of cancer.

Colorectal cancer is another cancer that has increased over time, and we have seen a larger increase in Norway than in many other Western countries. This year we started a pilot project on colorectal cancer screening in part of the country. With time, and once this program becomes national, it should eventually help reduce the incidence rates of this disease. Will colorectal cancer screening be as efficient as cervical cancer screening in reducing incidence? Perhaps not. However, we expect it eventually to affect both incidence and mortality. Colorectal cancer screening may ultimately have as large an effect on mortality from colorectal cancer as mammography-screening has had on mortality from breast cancer. However, it will take time for this effect to appear. As with all screening programs, we may first see an initial burst in colorectal cancer incidence rates.

Breast cancer has in most countries increased during the past 60 years. The increase in the first decades was probably largely due to changing reproductive patterns. After Norwegian women started having children at later ages, and fewer children, breast cancer rates went up. Other lifestyle factors that have changed over time include body weight, alcohol habits, and postmenopausal hormone therapy use. At the time we started screening women for breast cancer with mammography, prescriptions for hormone therapy soared. Consequently, breast cancer rates jumped from the mid 1990s. The past few years we have seen somewhat of a decline in the rates among women above 50. Whether this is predominantly due to mammography screening having overcome the first screening burst, or due to a concurrent decline in hormone therapy use, is less clear.

Prostate cancer is a disease that has increased substantially over time, but where lifestyle factors seem to play less of a role. The increase the past 20 years is probably due mainly to testing with prostate specific antigen (PSA). There is no screening program for prostate cancer in Norway, but since most of the PSA testing is done on presumably healthy men and not because of clinical symptoms, it can be viewed as opportunistic screening. Fluctuations in rates, or even a decline as we see this year, may reflect fluctuations in PSA screening. This screening seems however, never to be negatively featured in the media or to be subject to public concern. This is surprising, as treatment for prostate cancer can be brutal, potentially resulting in incontinence and impotence, side effects that may be quite mutilating, even more than having part of a breast removed. So why does PSA testing not receive the large scandalous headlines or intense negative scrutiny? One might speculate whether this is because it is done privately, and not as part of a governmental screening program? Or is it because it is the only screening that is not done in women? There are not even good data to determine how often PSA tests should be ordered. If we want to understand the changes seen in the prostate cancer rates, we should clearly monitor the frequency and distribution of PSA testing in Norway.

This year´s Special Issue deals with the issue of clustering of cancer, another important aspect of a cancer registry´s activities. Each form of cancer is a rare disease, and when rare events appear to cluster in a community or at a workplace, this often causes concern in the population. It is therefore important to be able to decipher whether an apparent cluster is likely a real cluster signifying a carcinogenic exposure, or whether it is a random aggregation, or not even a cluster, but rather a misreporting and misconception. The complexities of this important issue are discussed by Dr. Grimsrud and his colleagues in the last part of this report.

As we understand more about cancer, we also better grasp the complexity of the disease. Consequently, our demand for more information about each cancer case increases. The Cancer Registry of Norway receives the continuous assistance from a wide network of pathologists and clinicians who wish to improve diagnosis and patient care. There is a strong desire, some would argue an urge, for our registrars to code more information about each cancer, both about the initial tumor and about subsequent treatment and relapses. Such expanded reporting in clinical registries will become simpler once all reporting to the Cancer Registry can be made fully electronic and not paper-based. We are not quite there yet, partly because the electronic systems used in hospitals and pathology laboratories must be modernized for this to take place. However, there is much interest and enthusiasm for better systems, and the work is in progress.

Until then, there is an immense amount of manual and electronic work behind the numbers that we present in this report. Our coders work hard to decipher and enter the information behind each pathology report and each clinical report, and to merge this information into one cancer case registration. Thanks to hours and hours of work from our dedicated staff we are proud to present the numbers to you in this year's report. Thanks to all reporters and our registrars and their leaders, to our information technology staff and to the editorial staff for making this year's report.

Oslo, September 2012

Giske Ursin, MD, PhD
Director & Professor

Cancer in Norway 2010

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Summary

In this annual report the Cancer Registry of Norway provides incidence data on different cancers and the latest survival data.

New Cases

A total of 28 271 new cancer cases were reported in 2010: 53 per cent were among men and 47 per cent among women. The five most common cancer types, in descending order, are for men: prostate, lung, colon, bladder, skin (non-melanoma), and for women: breast, lung, colon, malignant melanoma of the skin and uterus cancer.

Some variation in incidence rates may occur from one year to the next. In addition, the numbers for the preceding year (in this case 2009) will always be slightly higher than in last year`s report due to delayed notification of cancer cases. When interpreting the cancer statistics, one should therefore look at the cancer development over the past several years.

The incidence rate has increased by 7 per cent in men and 3 per cent in women from the past five-year period (2001-2005) until the current one (2006-2010).

In men the largest incidence increase was in cancer of the prostate (21 per cent) and malignant melanoma (15 per cent). On the positive side, the rate for rectal cancer show a small reduction of 4 per cent. The rates for colon, lung and bladder cancer are only slightly changed in the period 2006-2010, compared to 2001-2005.

In women the strongest increase occurred in incidence of lung cancer (16 per cent) and malignant melanoma (15 per cent). For breast cancer, incidence rates increased until 2005, and have declined from 2006 onwards. The rate reduction from 2001-2005 to 2006-2010 was 5 per cent. Norwegian women have one of the world's highest incidence rates of the colon and rectal cancer. However, we are finally seeing a leveling off in the incidence rates of these cancers.

Among children (0-14 years of age) cancer in the central nervous system and leukemia are the most common. They represent 54 and 59 per cent of all cancer cases in boys and girls, respectively. In males aged 15-49 years testicular cancer is most common, but prostate cancer is most common in middle aged and older men.

Cancer in the central nervous system is the most common cancer type in young women 15-24 years old. In the age group 25-69 years breast cancer is most common, and among the oldest women (70+) colon cancer is more common than breast cancer.

Survival

This year's statistics confirm a trend we have seen earlier: Survival continues to increase. At the end of 2010 about 207 000 Norwegians were alive after having had at least one cancer diagnosis at one point in time. This is an increase of more than 60 000 individuals since 2000.

There is an improved survival in all the major cancers: breast, prostate, lung, and colorectal cancer.

This increase is partially due to improved treatment over time, but is probably predominantly due to screening. Increased attention to cancer in the population as well as among health care providers may also play a role.

Relative Survival

Relative survival is the probability of a cancer patient's survival if other causes of death are excluded.

From the period 2001-2005 to 2006-2010 the relative survival increased from:

- 86 to 89 per cent for breast cancer in women
- 80 to 89 per cent for prostate cancer

- 13 to 16 per cent for lung cancer in women
- 9 to 12 per cent for lung cancer in men

- 64 to 66 per cent for rectum cancer in women
- 58 to 64 per cent for rectum cancer in men

- 57 to 63 per cent for colon cancer in women
- 55 to 61 per cent for colon cancer in men

The probability of developing cancer before the age of 75 is 35 per cent in men and 28 per cent in women.

ICD-10 codes where specific morphologies are excluded or included

ICD-10	Site	Comments
C00- 96	All sites	Includes the following D-diagnoses; D32-D33, D35.2-35.4, D42-D43, D44.3-D44.5, D46 and D47
C33	Mediastinum, pleura	Excludes mesotheliomas of pleura
C44	Skin, non-melanoma	Excludes basal cell carcinoma
C56	Ovary	Excludes borderline tumours
C64	Kidney except renal pelvis	Excludes non-invasive papillary tumours
C65	Renal pelvis	Includes non-invasive papillary tumours
C66	Ureter	Includes non-invasive papillary tumours
C67	Bladder	Includes non-invasive papillary tumours
C68	Other and unspecified urinary organs	Includes non-invasive papillary tumours
C70	Meninges	Includes benign tumours (ICD10; D32-33, D42-43)
C71	Brain	Includes benign tumours (ICD10; D32-33, D35.2-35.4, D42-43, D44.3-44.5)
C72	Spinal cord, cranial nerves and other parts of central nervous system	Includes benign tumours (ICD10; D32-33, D42-43)
C75	Other endocrine glands and related structures	Includes benign tumours (ICD10; D44.3-44.5)
C92	Myeloid leukaemia	Includes myelodyplastic syndrome (ICD10; D46)
C95	Leukaemia of unspecified cell type	Includes polycythemia vera (ICD10; D45) and other, and unspecified tumours in lymphatic or hemapoetic tissue (ICD10; D47)

Definitions*

Incidence
The number of new cases (of disease) in a defined population within a specific period of time.

Incidence rate
The number of new cases that arise in a population (incidence) divided by the number of people who are at risk of getting cancer in the same period. The rate is expressed per 100 000 person-years. Person-years is a measurement that combines persons and time (in years) as the denominator in rates.

Crude rate
Rates estimated for the entire population ignoring possible stratifications, such as by age group.

Age-specific rate
A rate calculated on stratifying by age, often based on a five-year interval.

Age-standardised incidence rate
Age-standardised (or age-adjusted) incidence rates are summary rates which would have been observed, given the schedule of age-specific rates, in a population with the age composition of a given standard population. The world standard population (Doll, 1966) is used in this report.

Prevalence
Prevalence is the number or proportion of a population that has the disease at a given point in time.

In this report we use life time cancer prevalence which can be defined as the number of living individuals having ever been diagnosed with cancer.

Relative survival
The observed survival in a patient group divided by the expected survival of a comparable group in the general population with respect to key factors affecting survival such as age, sex and calendar year of investigation. Relative survival is thus a measure of the excess mortality experienced by the patients regardless of whether the excess mortality may be directly or indirectly attributable to the disease under investigation. A key advantage is that it does not require cause of death information.

Conditional relative survival
The probability of surviving an additional number of years given that the person has already survived X years. As the duration from diagnosis lengthens, the statistic becomes more informative to survivors than the conventional relative survival estimate. A 5-year conditional relative survival that reaches close to 100% X number of years after diagnosis indicates that from thereon in, there is little or no excess mortality among the patient group.

* Based on "A Dictionary of Epidemiology, 4th Ed." (Last, 2001).

Data sources and Methods

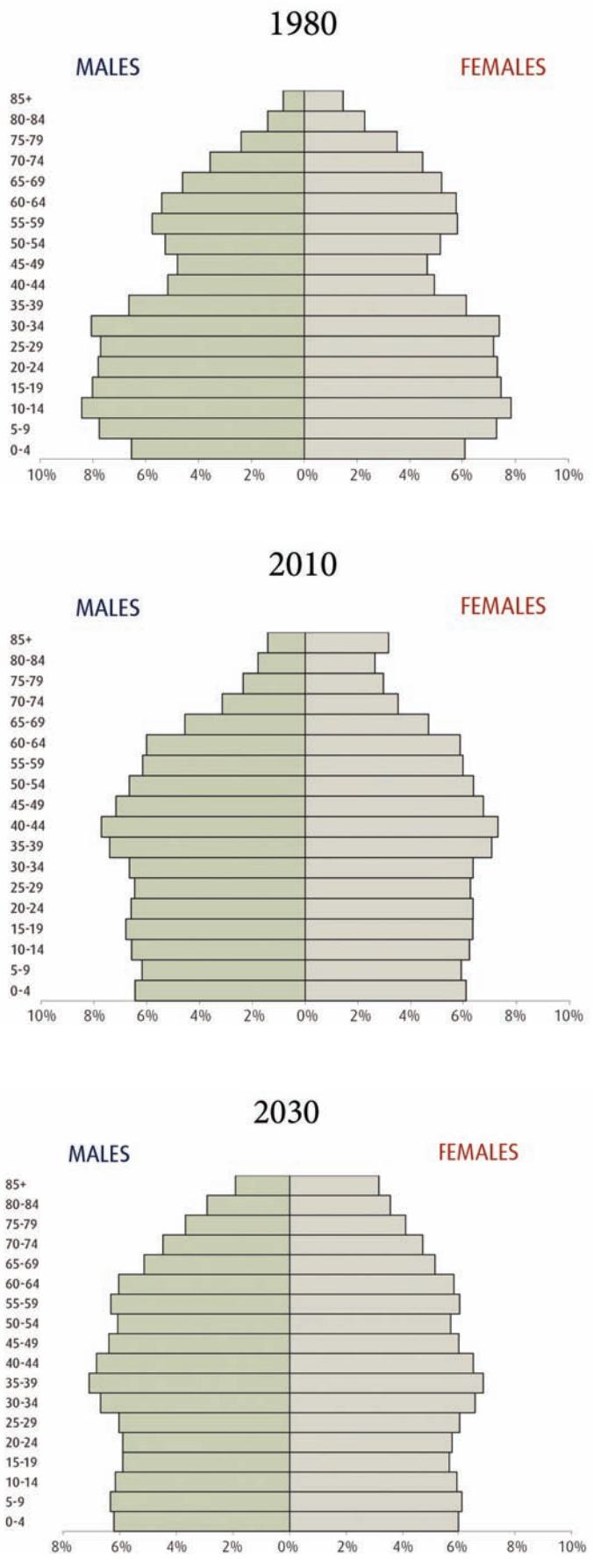
The population of Norway

The Norwegian population is mainly Caucasian. The immigrant population[1] (from over 200 countries) comprised 13.1% of the total population of nearly 5 million per January 2011(Table 1) (Statistics Norway, 2012). Figure 1 illustrates the changing age structure over time, comparing population distributions from 1980 and 2010 with projections for 2030 (Statistics Norway, 2011). The population of Norway has increased since recording began, and this growth is expected to continue the next few decades. The total number of inhabitants in Norway has increased by 19% from 1980 to 2010, largely as a result of rising life expectancy and, more recently due to increases in net immigration. By 2030, the size of the population is expected to increase a further 24% to about 6 million[2] (Statistics Norway, 2012). The elderly will represent an increasingly large proportion of the population of Norway in the next quarter century. It is projected that by 2030 over one million inhabitants or one-fifth of the population will be aged 65 or over.

Table 1. Norwegian population 01.01.2011, 5-year age group and sex

Age group	Males	Females
00-04	158 452	150 374
05-09	151 952	145 827
10-14	161 656	153 448
15-19	167 124	156 500
20-24	162 253	156 763
25-29	158 849	154 261
30-34	163 689	156 786
35-39	182 137	173 902
40-44	189 756	179 727
45-49	176 233	166 258
50-54	163 780	157 085
55-59	151 389	147 453
60-64	147 642	144 766
65-69	111 996	114 771
70-74	77 335	86 441
75-79	57 777	72 770
80-84	43 952	64 879
85+	34 877	77 445
TOTAL	2 460 849	2 459 456

Figure 1. Age structure of the Norwegian population, 1980, 2010 and 2030



Forecast, Statistics Norway 2012.
Considered the scenario of medium national growth

[1] Includes persons born in Norway with both parents from abroad

[2] Considered the scenario of medium national growth

Data sources and registration routines

The Cancer Registry of Norway (CRN) has, since 1952, systematically collected notifications on cancer occurrence for the Norwegian population. This total number of registrations has from 1953 been considered to be very close to complete (Larsen & al, 2009). The reporting of neoplasms has been compulsory since the implementation of a directive from the Ministry of Health and Social Affairs in 1951. The Cancer Registry Regulations came into force in 2002 (Regulations for the collection and processing of data in the Cancer Registry of Norway). The main objectives of the Cancer Registry can be summarised as follows:

- Collect data on cancer occurrence and describe the distribution of cancer and changes over time.
- Provide a basis for research to develop new knowledge on the etiology, diagnostic procedures, the natural course of the disease, and the effects of treatment in order to develop appropriate preventive measures as well as to improve the quality of medical care.
- Provide advice and information to public authorities and the general public on preventive measures.
- Perform epidemiological research of high international quality.

Data items registered in the Cancer Registry of Norway

The following shall be reported by law to the Cancer Registry:

- All definite malignant neoplasms. All precancerous disorders.
- All histologically benign tumours of the central nervous system and meninges.
- All histologically benign transitional cell papillomas of the urinary tract.

Registries

The incidence registry

The incidence registry contains the basic data items collected from clinicians and pathologists, as well as data from administrative patient discharge records and mortality sources. As of September 2012, the incidence registry contained information from 1953 on 1 515 686 cancer cases and premalignant conditions in 1 216 426 persons.

A total of 3 755 749 notifications have been registered since 1969[3]. The incidence registry is updated continuously with information on both new cases, as well as cases diagnosed in previous years.

The present report is based on data from the incidence registry.

Clinical registries

The Statutory Regulations for the Cancer Registry of Norway include the registration of treatment and follow-up of Norwegian cancer patients. Clinical registries – comprehensive registration schemes dedicated to specific cancers – have been established to include detailed information on diagnostic measures, therapy, and follow-up. By fostering strong collaborative links with the clinical community, the aims are to provide an empirical base for scientific studies concerning prognostic factors and treatment outcomes as well as evaluation of quality of cancer care.

The ongoing and expanding activities of these clinical registries are a major focus for the Registry, and several clinical registries are now established. Each clinical register is underpinned by a Reference Group, a panel of multi-disciplinary experts drawn from the clinical and research milieu in Norway, whose remit is to advise on the operations of the registry, and its strategic direction. These newly-established clinical registries will be integrated into the Registry's coding and registration activities. The overview on the next page indicates the status of these clinical registries as of September 2012.

[3] Earlier notifications have not been registered individually

Status of the clinical registries, September 2012

Clinical registry for	Clinical reference group established	Established with extended data*	Clinical parameters for electronical report specified	Electronic report form developed
Colorectal cancer	Yes	Yes	Yes	Yes
Malignt melanoma	Yes	Yes	Yes	Yes***
Breast cancer	Yes	Yes	Yes	Yes
Prostate cancer	Yes	Yes	Yes	Yes***
Lymphoma	Yes	Yes	Yes	Yes
Lung cancer	Yes	Yes**	Yes	No
Childhood cancer	Yes	Yes	Yes	Yes***
Ovarian cancer	Yes	Yes****	Yes	Yes
Leukaemia	Yes	No	Yes	No
Central nervous system	Yes	No	Yes	No
Oesophagus and stomach cancer	Yes	No	Yes	No
Testis cancer	Yes	No	Yes	No

* Either by having a separate clinical report form and/or by having a database with extended information beyond the incidence registry
** Established for surgically treated patients, planned to be extended to all lung cancer patients.
*** Testing in progress, launched for production before 31.12.2012
**** Planned to be extended to all gynecological cancer patients.

Notifications and sources of information

The sources of information and the notification process are illustrated in Figure 2. Hospitals, laboratories, general practitioners and Statistics Norway provide the key information that enables the Registry to collect, code and store data on cancer patients in Norway. Information from clinical notifications, pathological notifications and death certificates are the main reporting sources, and are processed and registered in the clinical registries and the incidence registry. Information from the Patient Administrative Data System in the hospitals and the Norwegian Patient Register has proven an important additional source for identifying patients.

Clinical and pathological notifications

The Cancer Registry Regulations, as issued by the Ministry of Health and Social Affairs, require all hospitals, laboratories and general practitioners in Norway, within two months to report all new cases of cancer to the Registry. The cases should be reported irrespective whether the patient is treated, admitted, or seen only as an outpatient. There are two generic paper-based forms (clinical notifications) for reporting of solid or non-solid tumours. These notifications may provide information on primary site, symptoms, stage of the disease, the basis for the diagnosis and primary treatment given to the patient. Cancers in the clinical registries are reported on separate forms with extended information (see clinical registries). Pathological notifications are received from hospitals and individual laboratories, and may provide either histological, cytological or autopsy information. The information is identified and linked by the personal identifier number system, established in Norway in 1964.

Death certificates

Records held in the Registry are supplemented with relevant information on vital status from the National Population Registry, and are regularly matched with the Cause of Death Registry run by Statistics Norway. The Registry receives and registers the death certificates in one or several batches every year. The automated procedure that matches registered patients to death certificates is important for maintaining quality control, facilitating a high level of completeness and ensuring validity of the Registry data items.

Death certificates also represent a complementary source of information on new cancer cases; those inconsistently specified or unmatched to registry files are subject to further scrutiny. Cancer cases first

identified from death certificates are traced back to the certifying hospital or physician. The Registry needs to ascertain from the registrar completing the certificate whether the patient had been examined and diagnosed when alive or post mortem. A reminder is sent to the physician or institution responsible for the treatment of the patient before death, as indicated on the death certificate. In many cases, a nursing home is the point of contact, and they refer the Registry to the treating physician or hospital where the cancer was diagnosed.

The Norwegian Patient Register

Since 2002, the Registry has received data files from Patient Administrative Data (PAD) System used in all Norwegian hospitals. These files contain information about all patients treated for premalignant and malignant conditions since 1998, and therefore PAD has been a key source in ascertaining information on unreported cases. Since 2010, the Registry has received this information from the Norwegian Patient Register (NPR). The Registry (CRN) recieves all C-diagnoses and some D-diagnoses (ICD-10) from NPR and these can be matched with the current information in the Registry database. Reminders are sent to clinical facilities for those cases where no information about the specific diagnosis exists in the Registry (Figure 2).

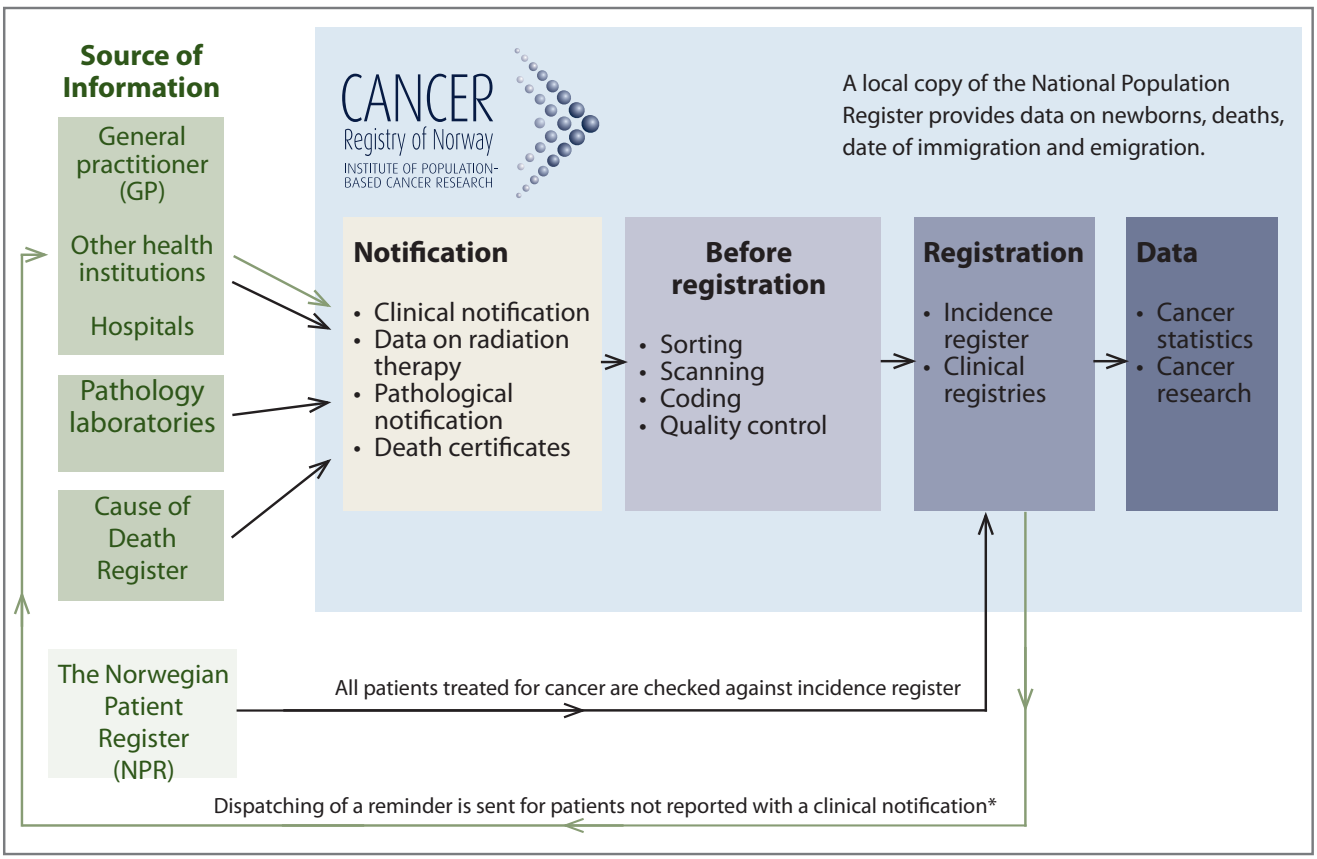
Dispatching of reminders

It is mandatory to report clinical information on new cases of cancer within two months of the diagnosis. Thus, except for some few cases (e.g. the cancer case was diagnosed at autopsy), at least one clinical notification should be registered for each cancer case. The Registry receives information on cancer cases from several sources (clinical notifications, pathological notifications, autopsies, death certificates and NPR). In those cases where the clinical notification is missing for the cancer case notified from one of these other sources, a reminder is sent to the hospital/ward/physician responsible for the diagnosis and treatment. About 40 000 reminders are sent annually, including, in some instances, repeat requests for information. The processes of cancer registration and the dispatching of reminders are illustrated in Figure 2.

Incidence and mortality data

The incidence data presented in the first part of this report are based on an extraction from the incidence registry on 11 September 2012. The tables and figures in general represent either the latest year of complete incidence (2010) or the latest five-year period (2006-10), the latter grouping used when the stratified numbers are too small to warrant presentation for a single year.

Figure 2. Sources of information and the processes of cancer registration at the Registry



* Dispatching of reminders for clinical notifications are sent for unregistred cases (notified from the NPR) or cases that are only registered with a pathological notification/death certificate/data on radiation therapy in the registry.

In the urinary tract benign papillomas and atypical epithelial lesions are included as well as invasive cancers. Further, in the central nervous system both benign and malignant neoplasms are included. Ovarian borderline tumours and basal cell carcinomas of the skin are excluded.

Registered codes (ICD-7, ICD-O-2 and ICD-O-3) are translated to ICD-10 using a combination of topography and morphology. Population data, stratified by year, sex and age, are provided by Statistics Norway. The main cancer forms are tabulated according to their ICD-10 three digit categories. The "all sites" figure comprises all malignant neoplasms (ICD-10 C00-96) plus several benign or precancerous conditions.

A commentary on the inclusion and exclusion criteria applied to several sites with respect to morphology is shown on page 9. Corresponding mortality data coded in ICD-10 were obtained from Statistics Norway and are presented in the same ICD-10 categories as incidence.

Follow-up data

To estimate long-term survival patterns and trends, vital statistics of patients diagnosed with cancer during 1961-2010 were obtained from the National Population Register and Statistics Norway through 31 December 2010.

The 23 most common cancer sites were selected for analysis, and grouped according to their respective ICD-10 categories. About 3.7% of the cases were excluded as they were either registered as DCO cases (Death Certificate Only), diagnosed at autopsy, emigrated before diagnosis, or zero survival time (survival time = 0). It has been shown that exclusion of patients with a prior cancer diagnosis, which often is associated with an inferior prognosis, may give rise to artificially elevated estimates of survival (Brenner & Hakulinen, 2007). Therefore patients with previous cancer diagnoses were included in each site-specific analysis.

On the other hand, to provide an estimate of "all sites" survival (ICD-10 codes defined as above), analysis was restricted to first primary tumours. While the inclusion of multiple primaries has been recommended for comparative purposes, the corresponding reduction in the overall survival estimates has been shown to be rather negligible; the effect of their inclusion has been shown to reduce 5-year survival in Norway (for diagnoses 1995-2009) by less than a percentage point (Rosso & al, 2009).

Results should be interpreted with caution. Survival of the most frequent cancers in men and women, prostate and breast cancer, have been artificially inflated due to the impact of PSA testing and mammographic screening, respectively.

Statistical methods used in this report

Four measures are used in this report to describe the burden and risk of disease: incidence, mortality, survival and prevalence.

Incidence and mortality

Incidence and mortality refer to the number of new cases and deaths occurring, respectively. The latter is the product of incidence and the fatality of a given cancer. Both measures can be expressed as the absolute number of cases (or deaths), or as the incidence (or mortality) rate, taking into account the size of the population at risk. Rates are essential in the comparisons between groups, and within groups over time. The denominator is the underlying person-time at risk in which the cases or deaths in the numerator arose. Cancer incidence and mortality are presented in this report as both numbers and rates. Several types of rates are used in this report

Age-specific rates

There are compelling reasons for adjusting for the effect of age when comparing cancer risk in populations. Age is a very strong determinant of cancer risk. The crude rate, a rate based on the frequency of cancer in the entire population, is calculated ignoring possible stratifications by age. Although the measure can be useful as an indicator of the total cancer burden, its utility in comparing cancer risk between groups is severely limited when the age distributing differs between groups, or where demographic changes have impacted on the size and age structure of a population over time.

To obtain a more accurate picture of the true risk of cancer, rates are calculated for each age strata, usually grouped in five-year intervals. The age-specific rate for age class *i*, denoted as r_i is obtained by dividing the number of events in each age class d_i by the corresponding person-years of observation Y_i and multiplying by 100 000:

$$r_i = d_i / Y_i \times 100\,000$$

Rates are provided separately for males and females, because of the often very different cancer patterns by sex. Age and sex-specific incidence and mortality rates are the foundation of epidemiological analysis of cancer frequency data.

Age-standardised rates

To facilitate comparisons however, a summary rate is required that absorbs the schedule of age-specific rates in each comparison group. The summary measure that appears in this report is the age-standardised rate (ASR), a statistic that is independent of the effects of age, thus allowing comparisons of cancer risk between different groups. The calculation of the ASR is an example of direct standardisation, whereby the observed age-specific rates are applied to a standard population. The populations in each age class of the Standard Population are known as the weights to be used in the standardisation process. Many possible sets of weights, w_i, can be used. The world standard population, a commonly-used reference, is utilised in this report (Doll & al, 1966; Segi, 1960). Although the weights of the world standard fail to resemble those of the Norwegian population in 2010 (Figure 3), this observation is of relatively little importance, since it is the ratio of ASRs, an estimate of the age-adjusted relative risk between populations or within a population over time, that is the focus of interest. This characteristic has been shown to be rather insensitive to the choice of standard (Bray & al, 2002).

For weights w_i in the ith age class of the world standard and for A age classes with i = 1, 2,..., A, as before, r_i is the age-specific rate in the ith age class. The ASR is calculated as:

$$ASR = \frac{\sum_i r_i w_i}{\sum_i w_i} \times 100\,000$$

Cumulative Risk

The cumulative risk is the probability that an individual will develop the cancer under study during a certain age span, in the absence of other competing causes of death (Day, 1992). The age span over which the risk is accumulated must be specified, and in this report, the range 0–74 years is used and provides an approximation of the risk of developing cancer. If before the age of 75 the cumulative risk is less than 10%, as is the case for most cancer forms, it is reasonably approximated by the cumulative rate.

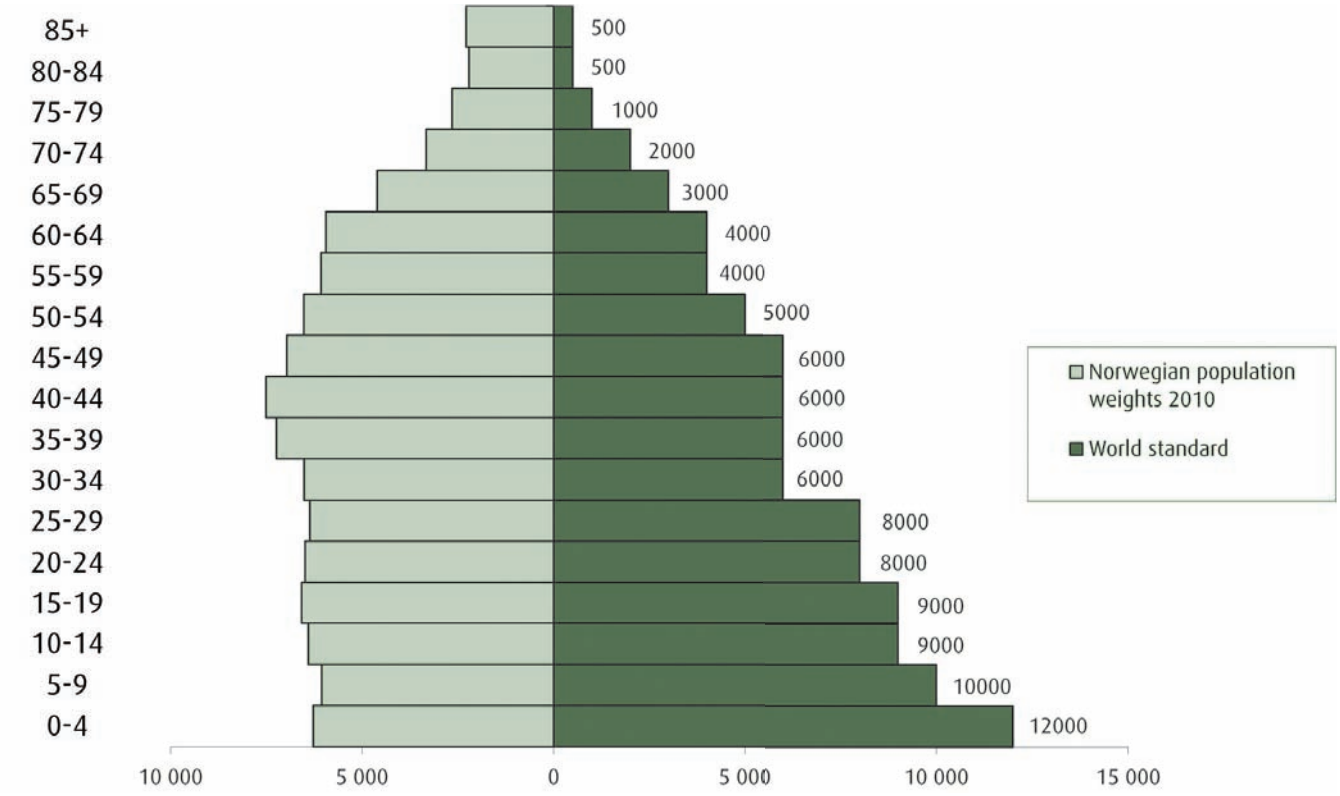
The cumulative rate is the summation of the age-specific rates over each year of age from birth to a defined upper age limit. As age-specific incidence rates are computed according to five-year age groups, the cumulative rate is five times the sum of the age-specific rates calculated over the five-year age groups, assuming the age-specific rates are the same for all ages within the five-year age stratum:

$$5\sum r_i$$

The cumulative rate has several advantages over age-standardised rates. Firstly, as a form of direct standardization, the problem of choosing an arbitrary reference population is eliminated. Secondly, as an approximation to the cumulative risk, it has a greater intuitive appeal, and is more directly interpretable as a measurement of lifetime risk, assuming no other causes of death are in operation. The precise mathematical relationship between the two is:

$$cumulative\ risk = 1 - exp\ (-\ cumulative\ rate)$$

Figure 3. Comparison of population weights



Prevalence

Prevalence is the number or proportion of a population that has the disease at a given point in time. It is a rather complex measure of cancer incidence, mortality, and other factors affecting individuals after diagnosis and treatment.

Prevalence is a useful measure of the number of individuals requiring care for chronic conditions such as hypertension and diabetes. For cancer, on the other hand, many patients diagnosed in the past may now be considered cured, that is to say they no longer have a greater risk of death. However, some residual disability may be present subsequent to for example a specific treatment intervention, thus it is likely that the number of prevalent cancer cases also represents a useful measure.

Lifetime cancer prevalence can be defined as the number of living individuals having ever been diagnosed with cancer. Such a measure can easily be derived from the Registry's data, given the very long-term registration of cases and complete follow up over many years. We provide additional estimates that may be useful for quantifying resource requirements; therefore we have incorporated into this report the numbers of persons who were alive on 31 December 2010, and who were previously diagnosed with cancer within one year, one to four years, five to nine years, and 10 or more years.

Survival

The survival time of a cancer patient is defined as the time that has elapsed between a cancer diagnosis and subsequent death or end of follow-up. The most basic measure of survival is 5-year survival, which represents the percentage of patients still alive 5 years after the date of diagnosis.

Relative Survival

Not all deaths among cancer patients are due to the primary cancer under study. Deaths resulting from other causes will lower the survival and possibly invalidate comparisons between populations. Relative survival is calculated to circumvent this problem by providing an estimate of net survival, and is defined as the observed survival proportion in a patient group divided by the expected survival of a comparable group in the general population with respect to age, sex and calendar year of investigation.

At each time t (year) since diagnosis, the relative survival from the cancer, R(t), is defined as follows:

$$R(t)=So(t)/Se(t)$$

where So(t) is the observed survival of cancer patients while the calculation of expected survival Se(t) is based on matching the major demographic characteristics of the patients to the general population. This requires the Norwegian population life tables from Statistics Norway by 1-year age group, sex, and 1-year calendar period. The method of Hakulinen (Hakulinen, 1982) was used for estimating expected survival.

With traditional cohort-based analyses, the most up-to-date estimates of longer-term survival would have pertained to patients diagnosed in the distant past, with corresponding profiles of prognosis. In contrast, period-based analyses consider the survival experience in recent years, and the survival that would have been observed in a hypothetical cohort of patients who experienced the same interval-specific survival as the patients who were actually at risk during a specific calendar period. Brenner and Hakulinen (Brenner & Hakulinen, 2002) have concluded that period analysis should be used for routine purposes so as to advance the detection of progress in long-term cancer patient survival. Both clinicians and patients are primarily interested in up-to-date estimates of survival, and its incorporation into Cancer in Norway aims to reflect the most recent developments in cancer care.

In this report, we have used a three-year period window (2008-2010) to estimate relative survival up to 15 years, thus patients diagnosed in 2007-2010 contribute with (part of) their survival experience the first year of follow up (part of the first year if they were diagnosed in 2007-2010), patients diagnosed in 2006-2009 contribute to the second year of follow up, patients diagnosed in 2005-2008 contribute to the third year of follow up etc. Thus, the period approach consists of the pieces of survival experience in 2008-2010 for all patients who have been diagnosed 15 years ago or less. The same approach is used to analyse time trends, using a three-year moving period window from 1965 to 2010. To increase stability in the estimates, stage-specific survival is presented using a five-year period window.

A more thorough review of, and rationale for, the utilisation of these survival methods was provided in the Special Issue of Cancer in Norway 2007.

Conditional relative survival

The majority of cancer survivors wish to obtain information on their current prognosis, once they have survived a certain period of time after diagnosis. Conditional survival is a key indicator in this respect, estimating survival proportions given that patients have already survived a certain duration of time (Hankey & Steinhorn, 1982;Janssen-Heijnen & al, 2007). The point at which conditional 5-year relative survival reaches 100% is the point where there is no excess mortality among the cancer patients, and prognosis is equivalent to that experienced in the general population. As with the 15-year relative survival analyses, a three-year period window (2008-2010) is used in this report, and we present estimates of sex-specific 5-year relative survival conditional on being alive 1 to 10 years after diagnosis. Estimates were not plotted when there were too few cancer survivors (n<20).

Data quality, completeness and timeliness

Data quality

Cancer in Norway 2006 included as a Special Issue an overview and comprehensive assessment of the data quality at the Cancer Registry of Norway. The report is available at www.kreftregisteret.no. Subsequently there have been several reports on data quality and completeness. Larsen & al. (Larsen & al, 2009) reported that the coding and classification systems, in general, follow international standards. Estimated overall completeness was 98.8% for the registration period 2001-2005, a lower completeness was observed for haematological malignancies and cancers of the central nervous system. Practical aspects and techniques for addressing the data quality at a cancer registry, including the documentation of comparability, validity and timeliness has recently been reviewed (Bray & Parkin, 2009). Methods for the evaluation of registry completeness have also been assessed recently (Parkin & Bray, 2009).

Two indicators of accuracy are included in Table 2, namely the percentage histologically verified (HV%), and the percentage of death certificate only registrations (%DCO). See Larsen & al, 2009 for further details. The Registry has implemented the rules for registration and reporting of multiple neoplasms as defined jointly by the International Association of Cancer Registries (IACR) and the International Agency for Research on Cancer (IARC) (International Association of Cancer Registries, 2004).

Completeness and timeliness of incidence

Table 3 shows the number of cancer cases diagnosed in 2009 as enumerated on 10th June 2011 (for CiN 2009), and 11th September 2012 (the time of extraction for this report). The number of cancer cases diagnosed in 2009 reported and appearing in this issue (CiN 2010) are 524 (1.9%) more than those registered 15 months ago (in CiN 2009), with the differences varying by site. The largest apparent differences of 12.8% and -12.5% were for malignant immunoproliferative diseases (C88) and other uterus (C55), respectively. The main reason for this is that these cancers are rare, and even small changes in number, would have great impact on the percentage of change. Common cancers such as lung, and breast cancers, however, appear to have been almost complete when CiN 2009 was published.

Table 2. Percentage distribution of HV (histologically verified) and DCO (death certificate only) by primary site 2006-2010*

ICD10	Site	Cases	HV %	DCO %
C00-96	**All sites**	**137143**	**88.8**	**1.7**
C00-14	**Mouth, pharynx**	**2444**	**97.5**	**0.3**
C00	Lip	619	99.2	0.2
C01-02	Tongue	460	98.0	0.2
C03-06	Mouth, other	477	99.0	0.2
C07-08	Salivary glands	219	87.7	0.5
C09-14	Pharynx	669	97.8	0.4
C15-26	**Digestive organs**	**28327**	**89.1**	**2.7**
C15	Oesophagus	1059	95.8	1.4
C16	Stomach	2545	94.9	1.8
C17	Small intestine	630	95.9	1.0
C18	Colon	12228	95.2	1.6
C19-21	Rectum, rectosigmoid, anus	6309	97.5	0.6
C22	Liver	807	69.0	7.8
C23-24	Gallbladder, bile ducts	763	65.1	6.7
C25	Pancreas	3454	58.5	7.7
C26	Other digestive organs	532	66.4	13.5
C30-34, C38	**Respiratory organs**	**14132**	**77.1**	**2.3**
C30-31	Nose, sinuses	216	98.6	0.5
C32	Larynx, epiglottis	588	97.8	0.5
C33-34	Lung, trachea	13234	76.0	2.4
C38	Mediastinum, pleura (non-mesothelioma)	94	59.6	8.5
C40-41	**Bone**	**248**	**96.4**	**0.8**
C43	**Melanoma of the skin**	**6693**	**99.4**	**0.1**
C44	**Skin, non-melanoma**	**7474**	**98.8**	**0.1**
C45	**Mesothelioma**	**387**	**87.6**	**0.0**
C46	**Kaposi's sarcoma**	**49**	**98.0**	**2.0**
C47	**Autonomic nervous system**	**66**	**98.5**	**0.0**
C48-49	**Soft tissues**	**740**	**95.7**	**0.5**
C50	**Breast**	**13918**	**98.1**	**0.3**
C51-58	**Female genital organs**	**7974**	**95.1**	**1.2**
C53	Cervix uteri	1512	98.5	0.3
C54	Corpus uteri	3510	98.8	0.3
C55	Uterus, other	44	54.5	20.5
C56	Ovary	2232	87.9	2.5
C51-52, C57	Other female genital	666	94.9	2.1
C58	Placenta	10	50.0	0.0
C60-63	**Male genital organs**	**23027**	**96.2**	**1.2**
C61	Prostate	21329	96.0	1.3
C62	Testis	1467	99.4	0.1
C60, C63	Other male genital	231	98.3	0.0
C64-68	**Urinary organs**	**10276**	**93.7**	**1.4**
C64	Kidney excl. renal pelvis	3289	87.9	2.9
C65	Renal pelvis	411	92.7	0.7
C66-68	Bladder, ureter, urethra	6576	96.7	0.6
C69	**Eye**	**297**	**50.8**	**0.7**
C70-72	**Central nervous system**	**5215**	**60.4**	**1.5**
C73	**Thyroid gland**	**1228**	**95.2**	**0.4**
C37, C74-75	**Other endocrine glands**	**1177**	**56.2**	**1.4**
C39, C76, C80	**Other or unspecified**	**1963**	**52.4**	**12.5**
C81-96	**Lymphoid and haematopoietic tissue**	**11508**	**74.8**	**2.4**
C81	Hodgkin lymphoma	604	99.3	0.2
C82-85, C96	Non-Hodgkin lymphoma	4338	96.7	0.4
C88	Malignant immunoproliferative diseases	243	73.3	2.1
C90	Multiple myeloma	1807	56.6	5.3
C91-95	Leukaemia	4516	57.9	3.4

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Table 3. Registered cancer cases in Norway, 2009 as obtained from the incidence registry extracted 10th June 2011 and 11th September 2012*

		Cases diagnosed 2009 as of			
ICD10	Site	10.06.2011	11.09.2012	Difference	%
C00-96*	**All sites**	**27520**	**28044**	**524**	**1.9**
C00-14	**Mouth, pharynx**	**509**	**517**	**8**	**1.6**
C00	Lip	122	123	1	0.8
C01-02	Tongue	107	110	3	2.8
C03-06	Mouth, other	109	112	3	2.8
C07-08	Salivary glands	36	37	1	2.8
C09-14	Pharynx	135	135	0	0.0
C15-26	**Digestive organs**	**5583**	**5761**	**178**	**3.2**
C15	Oesophagus	199	201	2	1.0
C16	Stomach	475	479	4	0.8
C17	Small intestine	152	157	5	3.3
C18	Colon	2405	2482	77	3.2
C19-21	Rectum, rectosigmoid, anus	1219	1302	83	6.8
C22	Liver	164	161	-3	-1.8
C23-24	Gallbladder, bile ducts	147	152	5	3.4
C25	Pancreas	691	703	12	1.7
C26	Other digestive organs	131	124	-7	-5.3
C30-34, C38	**Respiratory organs**	**2809**	**2824**	**15**	**0.5**
C30-31	Nose, sinuses	33	34	1	3.0
C32	Larynx, epiglottis	108	109	1	0.9
C33-34	Lung, trachea	2648	2662	14	0.5
C38	Mediastinum, pleura (non-mesothelioma)	20	19	-1	-5.0
C40-41	**Bone**	**62**	**64**	**2**	**3.2**
C43	**Melanoma of the skin**	**1413**	**1436**	**23**	**1.6**
C44	**Skin, non-melanoma**	**1588**	**1618**	**30**	**1.9**
C45	**Mesothelioma**	**81**	**81**	**0**	**0.0**
C46	**Kaposi's sarcoma**	**9**	**10**	**1**	**11.1**
C47	**Autonomic nervous system**	**12**	**12**	**0**	**0.0**
C48-49	**Soft tissues**	**166**	**170**	**4**	**2.4**
C50	**Breast**	**2760**	**2771**	**11**	**0.4**
C51-58	**Female genital organs**	**1558**	**1571**	**13**	**0.8**
C53	Cervix uteri	296	301	5	1.7
C54	Corpus uteri	696	706	10	1.4
C55	Uterus, other	16	14	-2	-12.5
C56	Ovary	419	417	-2	-0.5
C51-52, C57	Other female genital	130	132	2	1.5
C58	Placenta	1	1	0	0.0
C60-63	**Male genital organs**	**4664**	**4741**	**77**	**1.7**
C61	Prostate	4299	4371	72	1.7
C62	Testis	320	323	3	0.9
C60, C63	Other male genital	45	47	2	4.4
C64-68	**Urinary organs**	**2080**	**2108**	**28**	**1.3**
C64	Kidney excl. renal pelvis	663	662	-1	-0.2
C65	Renal pelvis	82	86	4	4.9
C66-68	Bladder, ureter, urethra	1335	1360	25	1.9
C69	**Eye**	**64**	**64**	**0**	**0.0**
C70-72	**Central nervous system**	**961**	**1032**	**71**	**7.4**
C73	**Thyroid gland**	**253**	**257**	**4**	**1.6**
C37, C74-75	**Other endocrine glands**	**237**	**257**	**20**	**8.4**
C39, C76, C80	**Other or unspecified**	**416**	**380**	**-36**	**-8.7**
C81-96	**Lymphoid and haematopoietic tissue**	**2295**	**2370**	**75**	**3.3**
C81	Hodgkin lymphoma	122	124	2	1.6
C82-85, C96	Non-Hodgkin lymphoma	887	889	2	0.2
C88	Malignant immunoproliferative diseases	39	44	5	12.8
C90	Multiple myeloma	361	374	13	3.6
C91-95	Leukaemia	886	939	53	6.0

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Cancer incidence, mortality, survival and prevalence in Norway 2010

Incidence

In 2010, 28 271 new cases of cancer were recorded in Norway, of which 15 110 occurred among men and 13 161 among women (Table 4). Cancers of the prostate, female breast, lung and colon are the most common cancers and comprise almost half of the total cancer burden.

In men, prostate cancer continues to be the most frequent cancer (4 210), followed by colorectal (2 044) and lung cancer (1 559).

Breast cancer remains the most frequent neoplasm in women, with 2 839 new cases in 2010, followed by colorectal and lung cancer, with 1 828 and 1 267 incident cases, respectively.

The vast majority of cancers in Norway- over 90% in men and 85% in women are diagnosed in persons over the age of 50 (Figure 4). About half are diagnosed at ages 70 or older, while 40% of all new cases occur between the ages 50 and 69, in men and women alike. A larger proportion of cancers are diagnosed in women than men at the ages of 25 to 49, while similar proportions, constituting slightly over 1% of the cancer burden, occur in children and young adults.

The relative impact of cancer at different ages varies considerably by cancer site. Figure 5 identifies the cancer types that are the main contributors to the disease burden at different ages. Cancers of the central nervous system are most frequent in children and young female adults, while testicular cancer is by far the most common cancer diagnosed in young men. Prostate cancer is the most frequent cancer in men aged over 50, while breast cancer is the most common cancer diagnosis in women from the ages 25 through to 69.

Figure 4. Percentage distribution of cancer incidence by age, 2006-2010

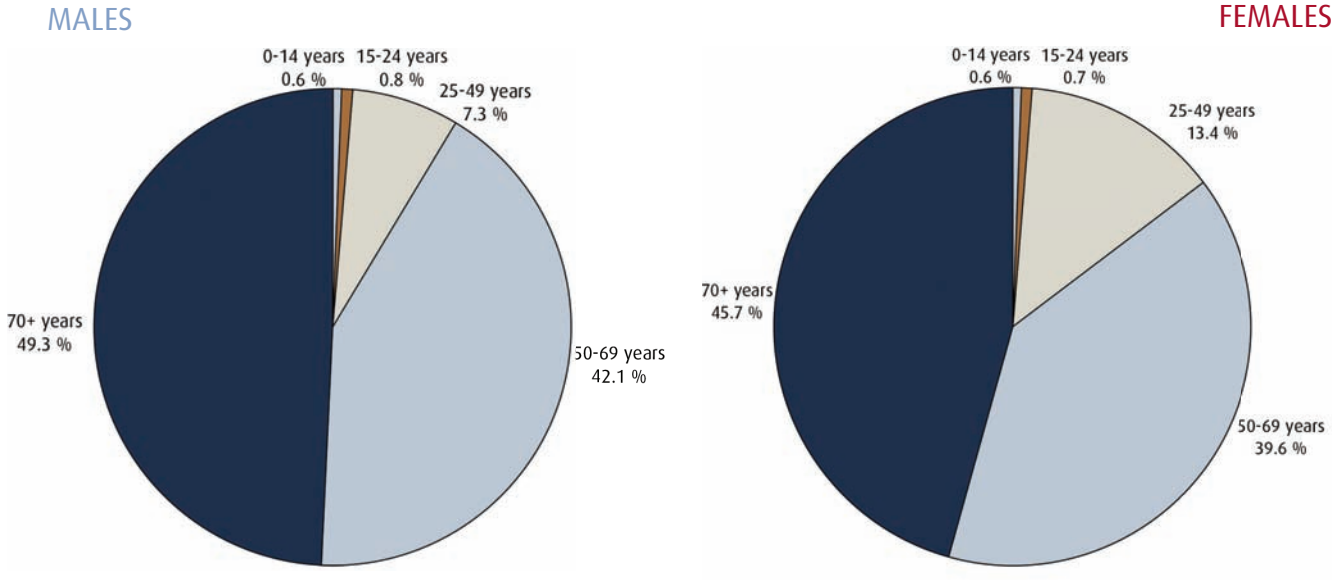


Table 4. Number of new cases by primary site* and sex - 2010

ICD10	Site	Males	Females	Total
C00-96	**All sites**	**15110**	**13161**	**28271**
C00-14	**Mouth, pharynx**	**304**	**206**	**510**
C00	Lip	74	52	126
C01-02	Tongue	59	32	91
C03-06	Mouth, other	50	45	95
C07-08	Salivary glands	27	34	61
C09-14	Pharynx	94	43	137
C15-26	**Digestive organs**	**3205**	**2709**	**5914**
C15	Oesophagus	188	65	253
C16	Stomach	306	176	482
C17	Small intestine	72	57	129
C18	Colon	1284	1259	2543
C19-21	Rectum, rectosigmoid, anus	760	569	1329
C22	Liver	124	75	199
C23-24	Gallbladder, bile ducts	86	99	185
C25	Pancreas	315	335	650
C26	Other digestive organs	70	74	144
C30-34, C38	**Respiratory organs**	**1687**	**1316**	**3003**
C30-31	Nose, sinuses	20	20	40
C32	Larynx, epiglottis	100	20	120
C33-34	Lung, trachea	1559	1267	2826
C38	Mediastinum, pleura (non-mesothelioma)	8	9	17
C40-41	**Bone**	**27**	**25**	**52**
C43	**Melanoma of the skin**	**743**	**775**	**1518**
C44	**Skin, non-melanoma**	**830**	**706**	**1536**
C45	**Mesothelioma**	**77**	**14**	**91**
C46	**Kaposi's sarcoma**	**7**	**4**	**11**
C47	**Autonomic nervous system**	**5**	**5**	**10**
C48-49	**Soft tissues**	**53**	**87**	**140**
C50	**Breast**	**13**	**2839**	**2852**
C51-58	**Female genital organs**		**1689**	**1689**
C53	Cervix uteri		322	322
C54	Corpus uteri		752	752
C55	Uterus, other		10	10
C56	Ovary		456	456
C51-52, C57	Other female genital		146	146
C58	Placenta		3	3
C60-63	**Male genital organs**	**4531**		**4531**
C61	Prostate	4210		4210
C62	Testis	271		271
C60, C63	Other male genital	50		50
C64-68	**Urinary organs**	**1460**	**642**	**2102**
C64	Kidney excl. renal pelvis	483	244	727
C65	Renal pelvis	54	35	89
C66-68	Bladder, ureter, urethra	923	363	1286
C69	**Eye**	**24**	**19**	**43**
C70-72	**Central nervous system**	**454**	**537**	**991**
C73	**Thyroid gland**	**79**	**201**	**280**
C37, C74-75	**Other endocrine glands**	**98**	**93**	**191**
C39, C76, C80	**Other or unspecified**	**144**	**206**	**350**
C81-96	**Lymphoid and haematopoietic tissue**	**1369**	**1088**	**2457**
C81	Hodgkin lymphoma	76	54	130
C82-85, C96	Non-Hodgkin lymphoma	547	417	964
C88	Malignant immunoproliferative diseases	25	20	45
C90	Multiple myeloma	197	180	377
C91-95	Leukaemia	524	417	941

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Figure 5. The most frequent incident cancers by age and sex, 2006-2010

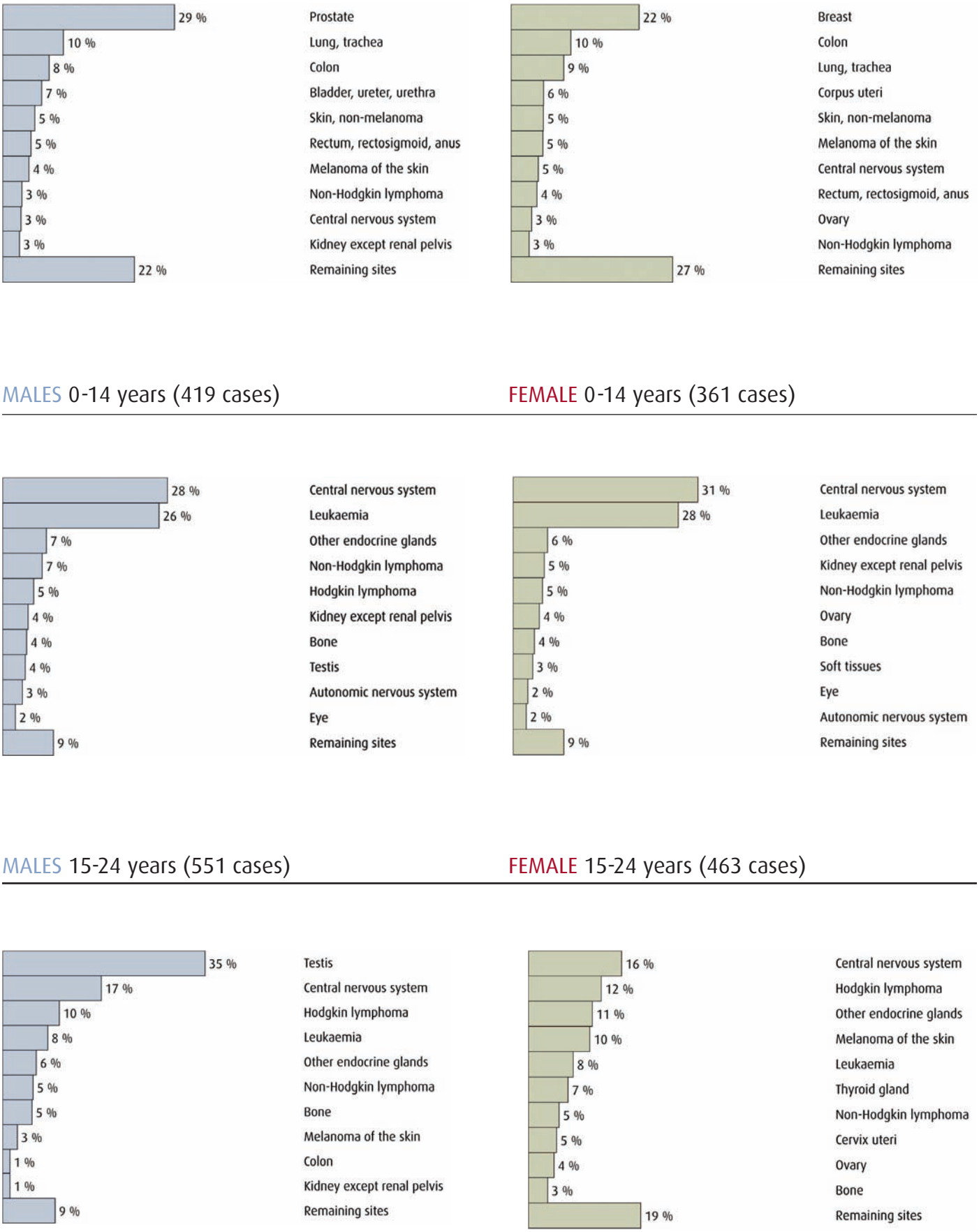
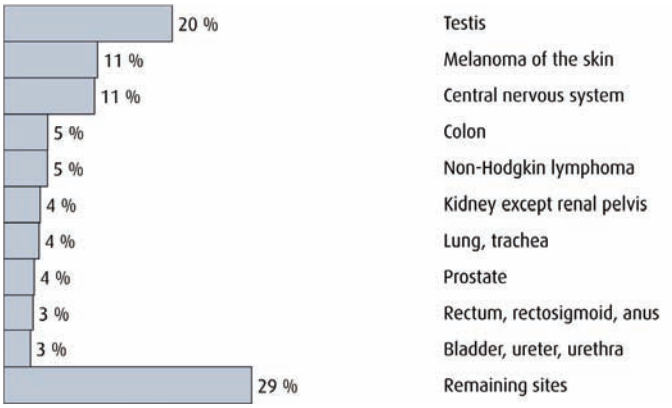
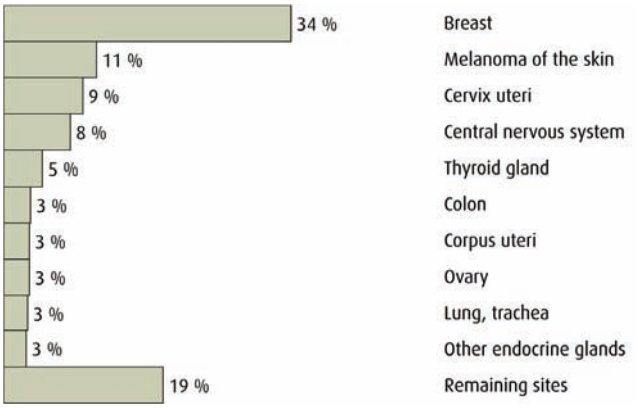


Figure 5. The most frequent incident cancers by age and sex, 2006-2010

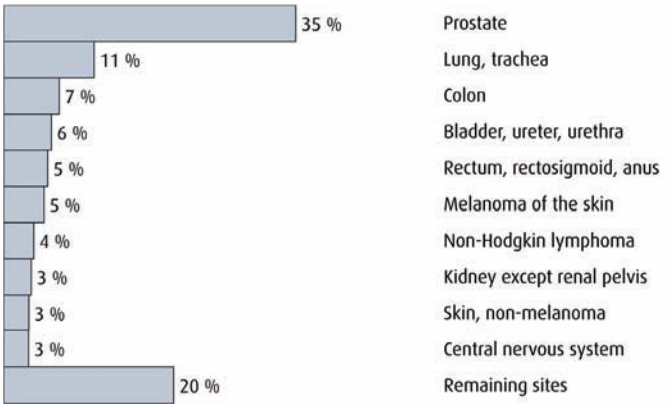
MALES 25-49 years (5 337 cases)



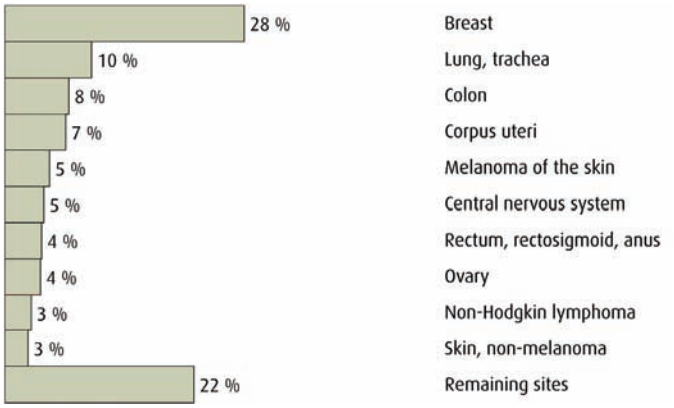
FEMALE 25-49 years (8 550 cases)



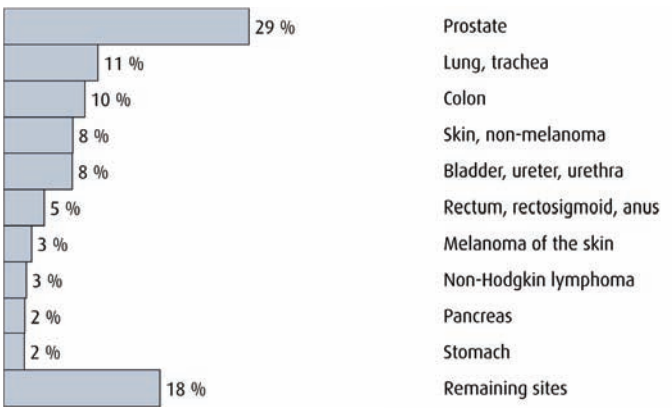
MALES 50-69 years (30 886 cases)



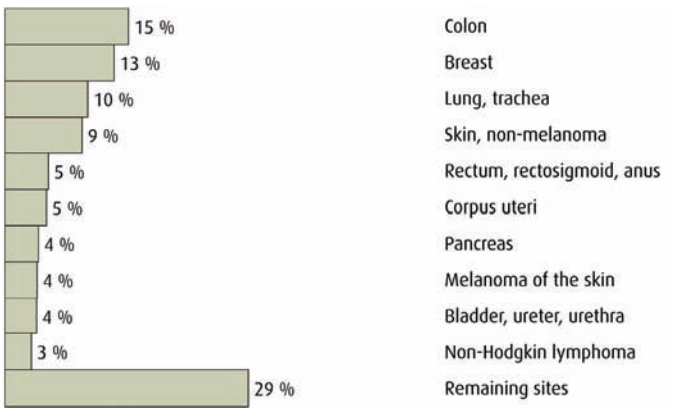
FEMALE 50-69 years (25 298 cases)



MALES 70+ years (36 133 cases)



FEMALE 70+ years (29 145 cases)



The age-standardised rates and male:female (M:F) ratios for selected cancer types in 1978-1982 and 2006-2010 are compared in Table 5. Men tend to have higher rates of incidence for most cancer types in both time periods, with the exceptions of melanoma of the skin and thyroid cancer. The highest M:F ratios are observed for several head and neck cancers, although a number of the most frequent cancer forms - including cancers of the lung, bladder, stomach and rectum- are consistently more common among men.

The declines in the M:F ratios for several neoplasms over the last 25 years may largely be the result of decreasing incidence trends in men and increasing incidence trends in women for a number of cancer types. For lung cancer, the reduction of the M:F ratios over the last two to three decades points to a differential in sex-specific trends with the rapidly increasing trends in lung cancer rates among women contrasting with the recent declines in the last decade among men.

Table 5. Sex ratios (male:female) of age-adjusted rates (world) in 1978-82 and 2006-2010 by primary site*, sorted in descending order in last period

		1978-1982			2006-2010		
ICD10	Site	M	F	M:F ratio	M	F	M:F ratio
C32	Larynx, epiglottis	3.1	0.3	10.3	2.5	0.4	5.6
C15	Oesophagus	2.7	0.7	3.8	3.8	1.0	3.7
C66-68	Bladder, ureter, urethra	18.1	5.5	3.3	21.8	6.6	3.3
C09-14	Pharynx	1.6	0.5	3.2	2.7	1.0	2.6
C22	Liver	1.8	1.0	1.8	2.6	1.1	2.2
C01-02	Tongue	1.0	0.4	2.7	1.6	0.7	2.2
C65	Renal pelvis	1.0	0.4	2.2	1.2	0.6	2.1
C64	Kidney excl. renal pelvis	7.5	4.0	1.9	10.8	5.5	2.0
C16	Stomach	18.0	9.2	2.0	6.9	3.7	1.9
C00	Lip	3.4	0.4	7.9	1.7	1.0	1.8
C90	Multiple myeloma	4.7	3.0	1.5	4.7	3.2	1.5
C81	Hodgkin lymphoma	2.6	1.6	1.6	2.7	1.8	1.5
C19-21	Rectum, rectosigmoid, anus	14.7	10.1	1.5	17.0	11.6	1.5
C33-34	Lung, trachea	30.9	7.3	4.2	35.8	25.1	1.4
C91-95	Leukaemia	8.1	5.4	1.5	9.4	6.6	1.4
C82-85, C96	Non-Hodgkin lymphoma	6.2	4.5	1.4	12.5	9.1	1.4
C25	Pancreas	8.4	5.3	1.6	7.8	6.4	1.2
C18	Colon	17.1	17.4	1.0	26.2	23.5	1.1
C23-24	Gallbladder, bile ducts	1.1	1.6	0.7	1.6	1.6	1.0
C43	Melanoma of the skin	8.9	10.4	0.8	17.2	18.2	0.9
C73	Thyroid gland	1.6	5.1	0.3	2.0	5.4	0.4

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Figure 6 depicts time trends in incidence for a number of common cancers. Of note are:

1. Since 1990 up to 2007, there has been a continuing upsurge in the prostate cancer incidence, largely the result of an increased use of the Prostate Specific Antigen (PSA) test and subsequent biopsies to detect prostate cancer in Norway. The last three years (2007-2010), we have seen a reduction in the rates. However, due to the previously rapid increase, the incidence rate increased from the past five-year period (2001-2005) to the current on (2006-2010) with 21 percent.

2. For breast cancer, incidence rates increased until 2005, and have declined from 2006 onwards. The rate reduction from 2001-2005 to 2006-2010 was 5 per cent.

3. The increasing rates of melanoma for both sexes

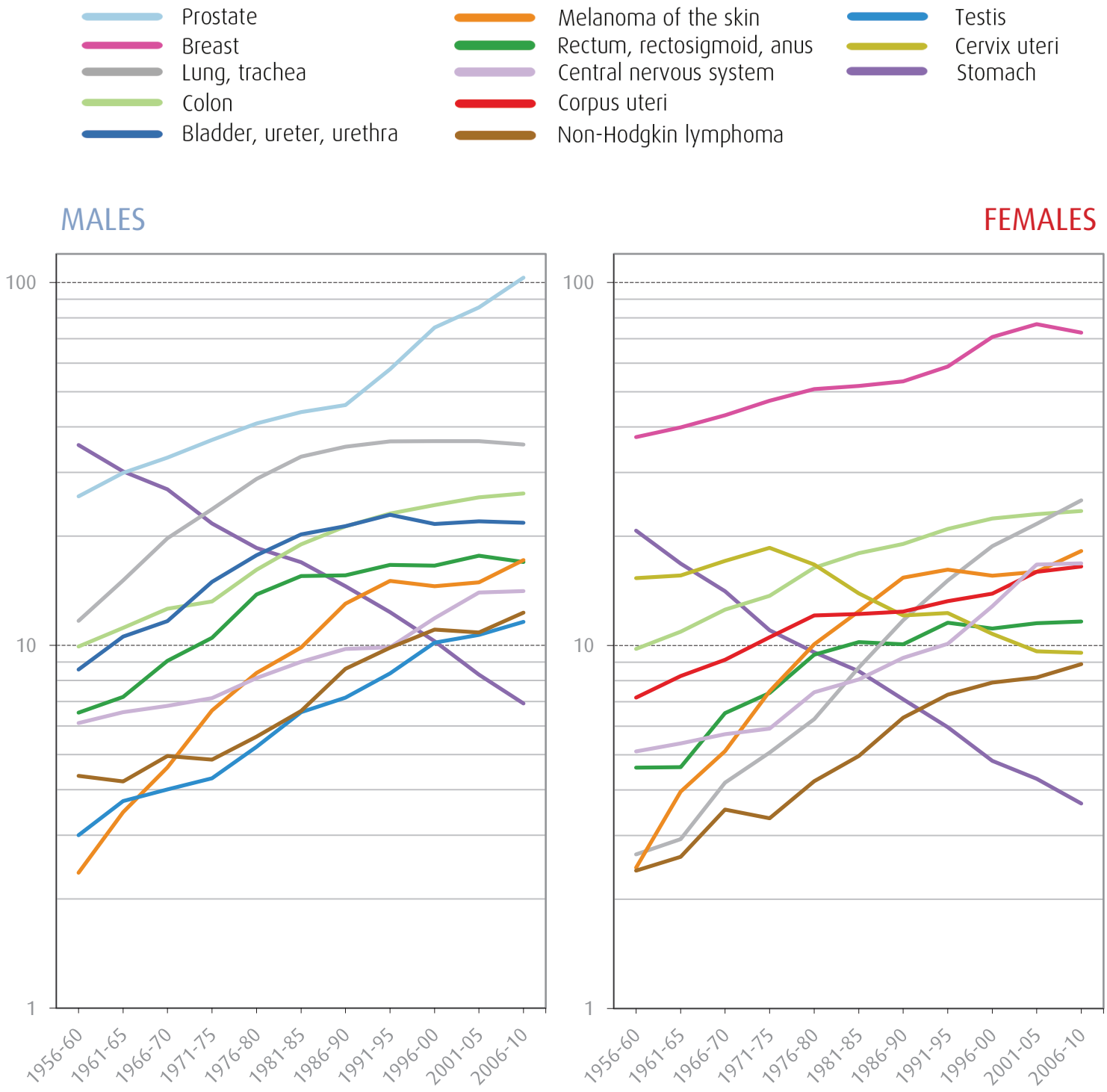
4. The contrasting lung cancer trends in men and women, with a peak and recent flattening observed in men, but rapid increases in women, largely reflecting the respective phases of the smoking epidemic

5. The continuing increase in colon cancer now seems to be stabilising, and thus following the trends that have been observed for rectal cancer in both sexes, these trends possibly reflecting changing lifestyle

6. The continuing declines in stomach cancer in both sexes, reflecting the joint impact of refrigeration and control of H. Pylori infection

7. The rapid increases in a number of cancers for which the underlying determinants remain enigmatic, amongst them testicular cancer in men and non-Hodgkin lymphoma in both sexes

Figure 6. Time trends in age-standardised incidence rates (world) in Norway for selected cancers (semi-log scale)



For men, the total incidence rate has also been increasing since the beginning of reporting in 1953, and since 1990 it has been strongly affected by the rates for prostate cancer with fluctuations related to chances in diagnostic practice (PSA-testing) (Table 8a). For women the incidence rates for all cancers combined have been increasing since 1953, but with a levelling of the last five-year period (Table 8b). While this long-term observation certainly reflects a genuine increase in risk of common cancers such as breast cancer in women, and colorectal and lung cancer in both sexes, an increasing ability to diagnose a number of cancer types with time has also contributed.

Such trends are only partially compensated by decreasing incidence trends of stomach cancer and cervical cancer in women (Figure 6). More detailed trends of incidence, mortality and survival for 23 cancers are provided in a later section of this report.

Even if rates were to remain stable over the next 15 years, the number of new cases would certainly increase as a result of the joint demographic effects of population growth and ageing (see the special issue of CiN 2005 for predictions of cancer in Norway up to 2020, by Health Region.)

The cumulative risk is shown in Table 6 and in Figure 7, for the most common 15 cancers in men and women, respectively. The cumulative risk of 12.8 for prostate cancer ranks highest in males and indicates that, in the absence of competing causes of death, approximately one in eight men will develop this cancer before the age of 75. The corresponding risk of developing lung cancer is considerably lower in comparison, with about one in 25 men estimated to be diagnosed with the disease before the age of 75.

The cumulative risk of breast cancer ranks highest in women, with the figure of 7.9 indicating that about one in 12 Norwegian women develop this disease before the age of 75, in the absence of competing causes. As with men, lung and colon cancers rank second and third. Tables 7-16 provide further information on the distribution of cancer incidence in Norway. The number of incident cases and rates are tabulated according to year of diagnosis, age group, county of residence, and stage.

Further information

The descriptions in this report can be downloaded from the Cancer Registry of Norway website in various formats. The previous and current Special Issue is also avalable online at: www.kreftregisteret.no

Figure 7. Cumulative risk of developing cancer by the age of 75 for selected cancers by sex - 2006-2010 (%)

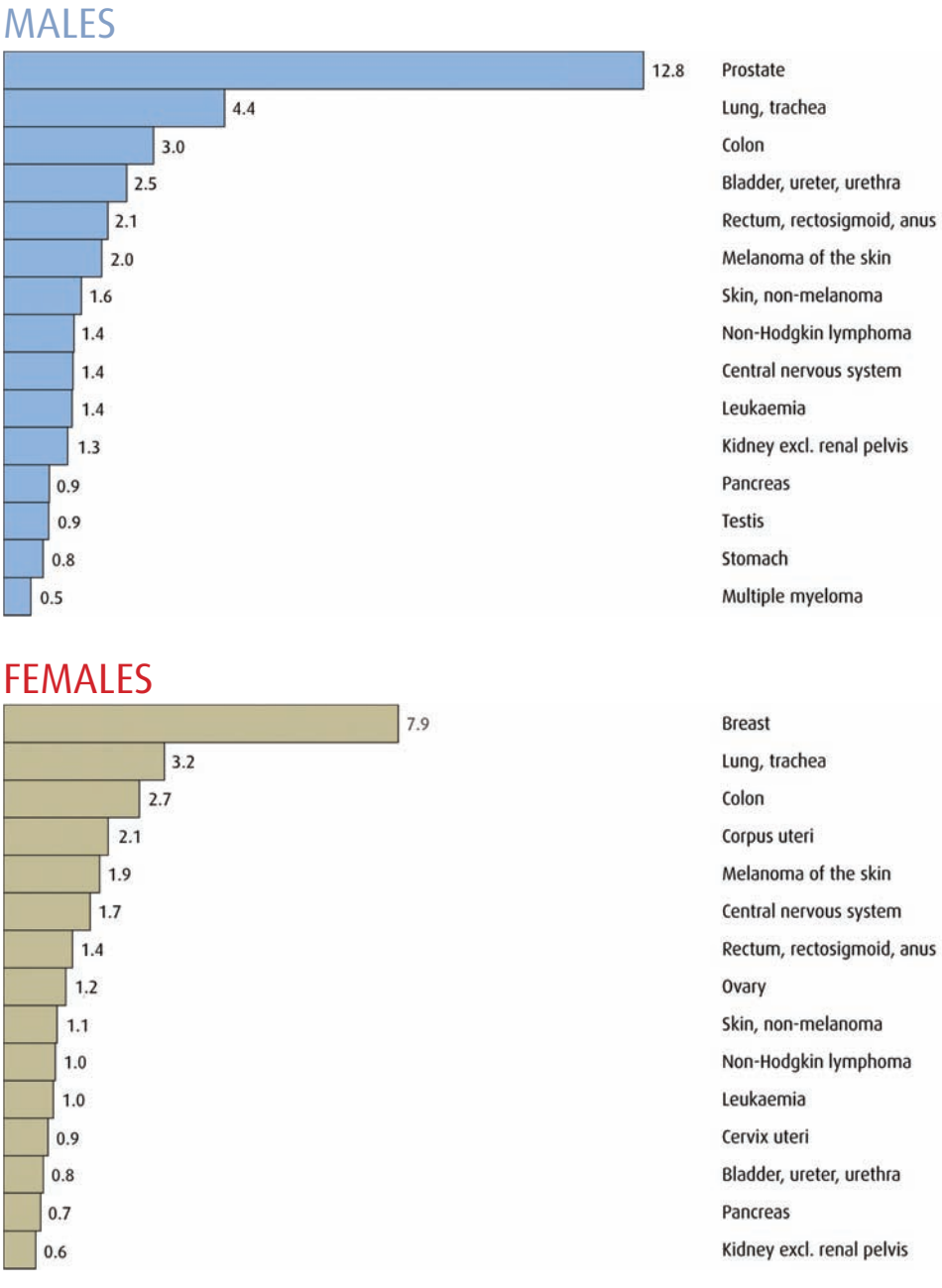


Table 6. Cumulative risk of developing cancer by the age of 75 by primary site* and sex - 2006-2010 (%)

ICD10	Site	Males	Females
C00-96	**All sites**	**34.8**	**28.2**
C00-14	**Mouth, pharynx**	**0.9**	**0.5**
C00	Lip	0.2	0.1
C01-02	Tongue	0.2	0.1
C03-06	Mouth, other	0.2	0.1
C07-08	Salivary glands	0.1	0.1
C09-14	Pharynx	0.3	0.1
C15-26	**Digestive organs**	**7.8**	**5.8**
C15	Oesophagus	0.5	0.1
C16	Stomach	0.8	0.4
C17	Small intestine	0.2	0.2
C18	Colon	3.0	2.7
C19-21	Rectum, rectosigmoid, anus	2.1	1.4
C22	Liver	0.3	0.1
C23-24	Gallbladder, bile ducts	0.2	0.2
C25	Pancreas	0.9	0.7
C26	Other digestive organs	0.1	0.1
C30-34, C38	**Respiratory organs**	**4.8**	**3.3**
C30-31	Nose, sinuses	0.1	0.0
C32	Larynx, epiglottis	0.3	0.1
C33-34	Lung, trachea	4.4	3.2
C38	Mediastinum, pleura (non-mesothelioma)	0.0	0.0
C40-41	**Bone**	**0.1**	**0.1**
C43	**Melanoma of the skin**	**2.0**	**1.9**
C44	**Skin, non-melanoma**	**1.6**	**1.1**
C45	**Mesothelioma**	**0.2**	**0.0**
C46	**Kaposi's sarcoma**	**0.0**	**0.0**
C47	**Autonomic nervous system**	**0.0**	**0.0**
C48-49	**Soft tissues**	**0.2**	**0.3**
C50	**Breast**	**0.1**	**7.9**
C51-58	**Female genital organs**		**4.5**
C53	Cervix uteri		0.9
C54	Corpus uteri		2.1
C55	Uterus, other		0.0
C56	Ovary		1.2
C51-52, C57	Other female genital		0.3
C58	Placenta		0.0
C60-63	**Male genital organs**	**13.7**	
C61	Prostate	12.8	
C62	Testis	0.9	
C60, C63	Other male genital	0.1	
C64-68	**Urinary organs**	**3.8**	**1.5**
C64	Kidney excl. renal pelvis	1.3	0.6
C65	Renal pelvis	0.2	0.1
C66-68	Bladder, ureter, urethra	2.5	0.8
C69	**Eye**	**0.1**	**0.1**
C70-72	**Central nervous system**	**1.4**	**1.7**
C73	**Thyroid gland**	**0.2**	**0.5**
C37, C74-75	**Other endocrine glands**	**0.4**	**0.4**
C39, C76, C80	**Other or unspecified**	**0.4**	**0.4**
C81-96	**Lymphoid and haematopoietic tissue**	**3.6**	**2.6**
C81	Hodgkin lymphoma	0.2	0.1
C82-85, C96	Non-Hodgkin lymphoma	1.4	1.0
C88	Malignant immunoproliferative diseases	0.1	0.0
C90	Multiple myeloma	0.5	0.4
C91-95	Leukaemia	1.4	1.0

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Table 7a. Number of new cases by primary site* and year - 2001-2010

MALES

		Year									
ICD10	Site	2001	02	03	04	05	06	07	08	09	2010
C00-96	**All sites**	**11764**	**11841**	**12761**	**13434**	**13384**	**13709**	**14616**	**14794**	**15097**	**15110**
C00-14	**Mouth, pharynx**	**242**	**258**	**254**	**257**	**250**	**289**	**286**	**274**	**344**	**304**
C00	Lip	52	61	42	37	49	80	71	57	84	74
C01-02	Tongue	51	50	52	53	44	46	57	62	75	59
C03-06	Mouth, other	36	47	56	52	40	53	40	43	65	50
C07-08	Salivary glands	21	23	17	17	26	15	18	18	22	27
C09-14	Pharynx	82	77	87	98	91	95	100	94	98	94
C15-26	**Digestive organs**	**2677**	**2632**	**2689**	**2799**	**2772**	**2730**	**2868**	**2937**	**2933**	**3205**
C15	Oesophagus	122	123	138	149	133	148	133	164	147	188
C16	Stomach	373	335	347	348	302	304	335	301	262	306
C17	Small intestine	67	46	58	44	50	65	67	63	82	72
C18	Colon	1000	972	992	1073	1075	1075	1111	1174	1125	1284
C19-21	Rectum, rectosigmoid, anus	633	682	676	693	690	660	656	694	742	760
C22	Liver	80	83	77	82	77	89	98	99	96	124
C23-24	Gallbladder, bile ducts	70	52	56	67	85	56	61	65	74	86
C25	Pancreas	293	306	307	304	327	302	367	340	348	315
C26	Other digestive organs	39	33	38	39	33	31	40	37	57	70
C30-34, C38	**Respiratory organs**	**1502**	**1520**	**1567**	**1552**	**1556**	**1614**	**1629**	**1629**	**1646**	**1687**
C30-31	Nose, sinuses	23	28	17	25	24	18	28	25	22	20
C32	Larynx, epiglottis	120	115	94	100	101	116	78	113	88	100
C33-34	Lung, trachea	1343	1365	1440	1416	1420	1467	1504	1482	1525	1559
C38	Mediastinum, pleura (non-mesothelioma)	16	12	16	11	11	13	19	9	11	8
C40-41	**Bone**	**22**	**28**	**21**	**28**	**25**	**24**	**21**	**23**	**36**	**27**
C43	**Melanoma of the skin**	**486**	**475**	**480**	**491**	**588**	**561**	**576**	**677**	**704**	**743**
C44	**Skin, non-melanoma**	**598**	**666**	**656**	**693**	**667**	**763**	**751**	**775**	**863**	**830**
C45	**Mesothelioma**	**61**	**51**	**66**	**74**	**72**	**50**	**62**	**59**	**69**	**77**
C46	**Kaposi's sarcoma**	**6**	**6**	**5**	**9**	**9**	**9**	**3**	**5**	**6**	**7**
C47	**Autonomic nervous system**	**4**	**5**	**7**	**3**	**7**	**6**	**7**	**9**	**7**	**5**
C48-49	**Soft tissues**	**50**	**57**	**50**	**51**	**47**	**63**	**62**	**51**	**68**	**53**
C50	**Breast**	**13**	**14**	**20**	**14**	**18**	**14**	**19**	**21**	**15**	**13**
C60-63	**Male genital organs**	**3212**	**3050**	**3723**	**4164**	**4011**	**4193**	**4790**	**4772**	**4741**	**4531**
C61	Prostate	2909	2770	3413	3849	3701	3889	4441	4418	4371	4210
C62	Testis	272	239	257	269	260	263	306	304	323	271
C60, C63	Other male genital	31	41	53	46	50	41	43	50	47	50
C64-68	**Urinary organs**	**1183**	**1244**	**1256**	**1417**	**1308**	**1339**	**1456**	**1457**	**1471**	**1460**
C64	Kidney excl. renal pelvis	322	328	334	395	363	362	399	419	424	483
C65	Renal pelvis	36	37	32	51	28	47	54	58	50	54
C66-68	Bladder, ureter, urethra	825	879	890	971	917	930	1003	980	997	923
C69	**Eye**	**23**	**31**	**42**	**31**	**27**	**37**	**29**	**37**	**27**	**24**
C70-72	**Central nervous system**	**382**	**381**	**424**	**393**	**463**	**427**	**502**	**448**	**443**	**454**
C73	**Thyroid gland**	**53**	**53**	**53**	**50**	**68**	**80**	**67**	**60**	**75**	**79**
C37, C74-75	**Other endocrine glands**	**63**	**88**	**96**	**73**	**96**	**94**	**130**	**129**	**135**	**98**
C39, C76, C80	**Other or unspecified**	**238**	**231**	**246**	**206**	**217**	**204**	**174**	**175**	**176**	**144**
C81-96	**Lymphoid and haematopoietic tissue**	**949**	**1051**	**1106**	**1129**	**1183**	**1212**	**1184**	**1256**	**1338**	**1369**
C81	Hodgkin lymphoma	53	53	84	73	64	67	67	77	79	76
C82-85, C96	Non-Hodgkin lymphoma	354	341	376	410	422	465	419	468	484	547
C88	Malignant immunoproliferative diseases	28	31	35	28	31	31	33	33	24	25
C90	Multiple myeloma	181	165	167	180	222	186	187	207	219	197
C91-95	Leukaemia	333	461	444	438	444	463	478	471	532	524

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Table 7b. Number of new cases by primary site* and year - 2001-2010

FEMALES

		Year									
ICD10	Site	2001	02	03	04	05	06	07	08	09	2010
C00-96	**All sites**	**11026**	**11539**	**11616**	**12043**	**12222**	**12469**	**12536**	**12704**	**12947**	**13161**
C00-14	**Mouth, pharynx**	**140**	**132**	**130**	**133**	**182**	**205**	**169**	**194**	**173**	**206**
C00	Lip	32	25	25	26	41	55	55	52	39	52
C01-02	Tongue	27	27	25	26	32	38	23	33	35	32
C03-06	Mouth, other	34	35	28	40	43	54	37	43	47	45
C07-08	Salivary glands	24	17	20	11	26	22	23	25	15	34
C09-14	Pharynx	23	28	32	30	40	36	31	41	37	43
C15-26	**Digestive organs**	**2470**	**2547**	**2548**	**2570**	**2624**	**2676**	**2692**	**2749**	**2828**	**2709**
C15	Oesophagus	52	48	57	54	60	45	56	59	54	65
C16	Stomach	209	257	223	218	235	217	215	212	217	176
C17	Small intestine	47	63	46	49	41	44	54	51	75	57
C18	Colon	1139	1135	1234	1187	1197	1284	1270	1289	1357	1259
C19-21	Rectum, rectosigmoid, anus	513	520	505	574	566	557	549	562	560	569
C22	Liver	47	46	41	42	58	43	54	64	65	75
C23-24	Gallbladder, bile ducts	62	80	83	65	82	78	83	83	78	99
C25	Pancreas	346	351	317	333	325	369	356	367	355	335
C26	Other digestive organs	55	47	42	48	60	39	55	62	67	74
C30-34, C38	**Respiratory organs**	**845**	**862**	**936**	**977**	**991**	**1079**	**1157**	**1197**	**1178**	**1316**
C30-31	Nose, sinuses	17	16	12	27	17	22	33	16	12	20
C32	Larynx, epiglottis	22	18	18	13	17	12	17	23	21	20
C33-34	Lung, trachea	797	824	904	925	950	1040	1100	1153	1137	1267
C38	Mediastinum, pleura (non-mesothelioma)	9	4	2	12	7	5	7	5	8	9
C40-41	**Bone**	**21**	**21**	**19**	**15**	**17**	**19**	**22**	**23**	**28**	**25**
C43	**Melanoma of the skin**	**533**	**556**	**552**	**561**	**575**	**660**	**638**	**627**	**732**	**775**
C44	**Skin, non-melanoma**	**485**	**522**	**566**	**576**	**677**	**658**	**680**	**693**	**755**	**706**
C45	**Mesothelioma**	**5**	**8**	**11**	**10**	**9**	**20**	**14**	**10**	**12**	**14**
C46	**Kaposi's sarcoma**	**0**	**3**	**2**	**3**	**2**	**5**	**3**	**3**	**4**	**4**
C47	**Autonomic nervous system**	**5**	**4**	**3**	**7**	**4**	**8**	**6**	**8**	**5**	**5**
C48-49	**Soft tissues**	**69**	**64**	**69**	**88**	**85**	**83**	**91**	**80**	**102**	**87**
C50	**Breast**	**2638**	**2716**	**2745**	**2805**	**2821**	**2728**	**2750**	**2763**	**2756**	**2839**
C51-58	**Female genital organs**	**1500**	**1538**	**1498**	**1573**	**1578**	**1569**	**1550**	**1595**	**1571**	**1689**
C53	Cervix uteri	302	312	295	270	306	312	282	295	301	322
C54	Corpus uteri	594	588	630	685	680	660	672	720	706	752
C55	Uterus, other	6	10	13	8	6	9	4	7	14	10
C56	Ovary	451	522	428	467	433	457	449	453	417	456
C51-52, C57	Other female genital	144	103	128	139	147	127	141	120	132	146
C58	Placenta	3	3	4	4	6	4	2	0	1	3
C64-68	**Urinary organs**	**518**	**585**	**565**	**579**	**602**	**594**	**601**	**619**	**637**	**642**
C64	Kidney excl. renal pelvis	188	214	202	211	242	213	253	254	238	244
C65	Renal pelvis	26	30	37	27	18	26	23	28	36	35
C66-68	Bladder, ureter, urethra	304	341	326	341	342	355	325	337	363	363
C69	**Eye**	**28**	**34**	**34**	**37**	**24**	**30**	**29**	**28**	**37**	**19**
C70-72	**Central nervous system**	**480**	**527**	**529**	**595**	**596**	**622**	**623**	**570**	**589**	**537**
C73	**Thyroid gland**	**130**	**144**	**133**	**173**	**165**	**149**	**162**	**173**	**182**	**201**
C37, C74-75	**Other endocrine glands**	**70**	**83**	**98**	**97**	**101**	**116**	**115**	**145**	**122**	**93**
C39, C76, C80	**Other or unspecified**	**286**	**308**	**298**	**283**	**271**	**244**	**236**	**200**	**204**	**206**
C81-96	**Lymphoid and haematopoietic tissue**	**803**	**885**	**880**	**961**	**898**	**1004**	**998**	**1027**	**1032**	**1088**
C81	Hodgkin lymphoma	33	42	53	46	49	48	49	42	45	54
C82-85, C96	Non-Hodgkin lymphoma	334	343	334	369	331	385	378	370	405	417
C88	Malignant immunoproliferative diseases	17	20	15	21	20	25	17	15	20	20
C90	Multiple myeloma	175	161	151	154	157	143	167	166	155	180
C91-95	Leukaemia	244	319	327	371	341	403	387	434	407	417

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Table 8a. Age-adjusted (world) incidence rates per 100 000 person-years by primary site* and year - 2001-2010

MALES

		Year									
ICD10	Site	2001	02	03	04	05	06	07	08	09	2010
C00-96	**All sites**	**323.6**	**322.5**	**343.3**	**354.1**	**347.4**	**351.1**	**369.7**	**366.9**	**367.8**	**355.7**
C00-14	**Mouth, pharynx**	**7.2**	**7.8**	**7.7**	**7.6**	**7.0**	**7.8**	**7.8**	**7.3**	**8.8**	**7.5**
C00	Lip	1.4	1.7	1.1	1.0	1.2	1.9	1.7	1.3	1.9	1.6
C01-02	Tongue	1.6	1.6	1.7	1.6	1.3	1.2	1.6	1.7	2.1	1.6
C03-06	Mouth, other	1.1	1.4	1.7	1.5	1.1	1.5	1.1	1.2	1.6	1.2
C07-08	Salivary glands	0.6	0.7	0.5	0.5	0.7	0.4	0.5	0.5	0.6	0.6
C09-14	Pharynx	2.5	2.4	2.7	2.9	2.7	2.8	2.9	2.6	2.6	2.6
C15-26	**Digestive organs**	**69.8**	**68.5**	**68.8**	**70.3**	**68.4**	**66.1**	**68.7**	**69.3**	**67.5**	**72.0**
C15	Oesophagus	3.2	3.5	3.8	4.0	3.5	3.9	3.3	4.1	3.6	4.4
C16	Stomach	9.1	8.6	8.6	8.2	7.1	7.1	7.8	7.0	5.8	6.9
C17	Small intestine	2.0	1.3	1.7	1.2	1.3	1.8	1.7	1.6	2.2	1.8
C18	Colon	25.5	24.8	24.7	26.5	26.4	25.2	25.8	27.0	25.2	27.8
C19-21	Rectum, rectosigmoid, anus	17.3	18.0	17.8	17.9	17.3	16.2	16.5	16.6	17.8	17.7
C22	Liver	2.0	2.3	2.2	1.9	2.1	2.4	2.5	2.6	2.3	2.9
C23-24	Gallbladder, bile ducts	1.9	1.3	1.4	1.7	2.1	1.3	1.5	1.5	1.6	2.0
C25	Pancreas	7.8	7.9	7.9	8.0	7.9	7.6	8.7	8.0	7.7	7.1
C26	Other digestive organs	0.9	0.8	0.9	1.1	0.7	0.7	0.8	0.8	1.4	1.5
C30-34, C38	**Respiratory organs**	**40.7**	**41.2**	**41.7**	**39.9**	**39.1**	**40.8**	**39.5**	**39.0**	**38.6**	**37.9**
C30-31	Nose, sinuses	0.6	0.9	0.5	0.7	0.7	0.4	0.8	0.7	0.6	0.5
C32	Larynx, epiglottis	3.1	3.3	2.8	2.8	2.7	3.2	2.0	2.8	2.1	2.3
C33-34	Lung, trachea	36.4	36.8	38.0	36.2	35.4	36.9	36.3	35.3	35.6	34.9
C38	Mediastinum, pleura (non-mesothelioma)	0.5	0.3	0.4	0.3	0.3	0.3	0.4	0.2	0.3	0.2
C40-41	**Bone**	**0.9**	**1.2**	**0.8**	**1.1**	**0.9**	**1.1**	**0.7**	**1.0**	**1.3**	**1.0**
C43	**Melanoma of the skin**	**14.8**	**14.3**	**14.4**	**14.6**	**16.6**	**15.4**	**15.7**	**17.7**	**18.1**	**19.0**
C44	**Skin, non-melanoma**	**14.3**	**15.6**	**14.8**	**15.0**	**14.4**	**16.2**	**15.3**	**15.6**	**17.1**	**16.3**
C45	**Mesothelioma**	**1.6**	**1.4**	**1.7**	**1.9**	**1.7**	**1.2**	**1.5**	**1.4**	**1.5**	**1.6**
C46	**Kaposi's sarcoma**	**0.2**	**0.1**	**0.1**	**0.3**	**0.2**	**0.2**	**0.1**	**0.1**	**0.2**	**0.2**
C47	**Autonomic nervous system**	**0.2**	**0.3**	**0.4**	**0.1**	**0.4**	**0.2**	**0.3**	**0.5**	**0.5**	**0.3**
C48-49	**Soft tissues**	**1.6**	**1.8**	**1.5**	**1.6**	**1.4**	**2.0**	**1.8**	**1.6**	**1.8**	**1.3**
C50	**Breast**	**0.4**	**0.3**	**0.5**	**0.3**	**0.5**	**0.3**	**0.5**	**0.5**	**0.4**	**0.3**
C60-63	**Male genital organs**	**88.5**	**82.3**	**99.0**	**110.7**	**105.7**	**108.4**	**124.0**	**120.1**	**118.7**	**108.7**
C61	Prostate	76.4	71.2	87.1	98.7	93.4	96.6	110.4	106.9	104.9	97.1
C62	Testis	11.1	10.0	10.4	11.0	10.9	10.8	12.5	11.9	12.6	10.3
C60, C63	Other male genital	0.9	1.2	1.5	1.0	1.4	1.0	1.1	1.2	1.1	1.3
C64-68	**Urinary organs**	**31.0**	**32.4**	**32.5**	**35.2**	**32.3**	**32.4**	**35.0**	**34.9**	**34.0**	**32.9**
C64	Kidney excl. renal pelvis	9.4	9.5	9.4	10.9	9.7	9.8	10.4	11.0	11.0	12.0
C65	Renal pelvis	0.9	0.9	0.7	1.3	0.8	1.1	1.3	1.4	1.1	1.2
C66-68	Bladder, ureter, urethra	20.7	22.0	22.3	23.0	21.8	21.5	23.3	22.4	22.0	19.7
C69	**Eye**	**0.7**	**1.0**	**1.2**	**1.1**	**0.8**	**1.1**	**0.8**	**1.1**	**0.8**	**0.6**
C70-72	**Central nervous system**	**13.2**	**13.6**	**15.1**	**12.9**	**15.2**	**13.6**	**16.3**	**14.0**	**13.4**	**13.2**
C73	**Thyroid gland**	**1.8**	**1.7**	**1.7**	**1.5**	**2.1**	**2.4**	**1.8**	**1.7**	**2.1**	**2.2**
C37, C74-75	**Other endocrine glands**	**2.3**	**2.9**	**3.3**	**2.5**	**2.8**	**3.2**	**4.1**	**3.9**	**4.4**	**3.0**
C39, C76, C80	**Other or unspecified**	**5.5**	**5.6**	**5.6**	**4.6**	**4.8**	**4.7**	**3.8**	**3.8**	**3.6**	**3.0**
C81-96	**Lymphoid and haematopoietic tissue**	**28.9**	**30.5**	**32.4**	**32.9**	**32.9**	**34.0**	**31.9**	**33.4**	**35.0**	**34.6**
C81	Hodgkin lymphoma	2.1	2.2	3.4	3.0	2.7	2.5	2.4	2.9	2.9	2.8
C82-85, C96	Non-Hodgkin lymphoma	10.6	9.8	11.0	11.9	11.5	12.6	11.4	12.2	12.5	13.6
C88	Malignant immunoproliferative diseases	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.6	0.5
C90	Multiple myeloma	5.0	4.3	4.3	4.5	5.4	4.7	4.5	4.9	5.1	4.3
C91-95	Leukaemia	10.4	13.3	12.8	12.7	12.5	13.4	12.9	12.7	13.9	13.4

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Table 8b. Age-adjusted (world) incidence rates per 100 000 person-years by primary site* and year - 2001-2010 **FEMALES**

		Year									
ICD10	Site	2001	02	03	04	05	06	07	08	09	2010
C00-96	**All sites**	**277.1**	**286.7**	**284.0**	**292.2**	**291.6**	**296.7**	**292.9**	**292.0**	**294.3**	**295.8**
C00-14	**Mouth, pharynx**	**3.1**	**3.3**	**3.2**	**3.2**	**4.1**	**4.9**	**3.7**	**4.2**	**3.8**	**4.7**
C00	Lip	0.7	0.6	0.5	0.6	0.7	1.2	1.0	1.0	0.7	1.0
C01-02	Tongue	0.5	0.7	0.6	0.7	0.7	0.9	0.5	0.8	0.8	0.7
C03-06	Mouth, other	0.6	0.9	0.7	0.9	0.9	1.2	0.7	0.8	0.9	1.0
C07-08	Salivary glands	0.7	0.5	0.6	0.2	0.7	0.5	0.6	0.6	0.4	0.8
C09-14	Pharynx	0.6	0.8	0.9	0.8	1.1	1.1	0.8	1.1	1.0	1.2
C15-26	**Digestive organs**	**50.1**	**50.7**	**49.8**	**51.6**	**50.5**	**52.0**	**51.0**	**50.7**	**52.5**	**49.6**
C15	Oesophagus	1.1	0.9	1.1	1.1	1.1	0.9	1.0	1.2	1.0	1.1
C16	Stomach	3.9	4.7	4.0	4.5	4.4	4.1	4.0	3.5	3.8	3.0
C17	Small intestine	1.1	1.6	1.0	1.2	1.0	1.0	1.2	1.2	1.6	1.2
C18	Colon	22.8	22.5	23.8	23.4	22.6	24.1	23.6	23.3	23.9	22.4
C19-21	Rectum, rectosigmoid, anus	11.3	11.5	10.9	12.1	11.8	11.9	11.8	11.4	11.7	11.3
C22	Liver	1.0	1.0	0.9	1.0	1.3	0.8	1.0	1.2	1.3	1.3
C23-24	Gallbladder, bile ducts	1.4	1.4	1.4	1.2	1.5	1.5	1.6	1.5	1.5	1.9
C25	Pancreas	6.5	6.4	6.2	6.3	5.7	6.9	6.0	6.5	6.6	6.0
C26	Other digestive organs	0.8	0.7	0.6	0.9	1.0	0.6	0.8	0.9	1.2	1.3
C30-34, C38	**Respiratory organs**	**21.7**	**21.5**	**23.1**	**23.4**	**23.4**	**24.9**	**26.1**	**26.3**	**25.3**	**28.1**
C30-31	Nose, sinuses	0.4	0.5	0.3	0.5	0.4	0.5	0.8	0.3	0.3	0.4
C32	Larynx, epiglottis	0.6	0.5	0.5	0.3	0.5	0.3	0.4	0.6	0.5	0.5
C33-34	Lung, trachea	20.5	20.5	22.4	22.4	22.4	24.0	24.8	25.4	24.3	27.0
C38	Mediastinum, pleura (non-mesothelioma)	0.2	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.2	0.2
C40-41	**Bone**	**0.8**	**1.0**	**0.8**	**0.6**	**0.6**	**0.7**	**0.8**	**0.7**	**1.0**	**1.0**
C43	**Melanoma of the skin**	**15.7**	**16.3**	**15.9**	**15.9**	**16.1**	**18.7**	**16.9**	**16.6**	**19.3**	**19.6**
C44	**Skin, non-melanoma**	**8.6**	**8.5**	**9.1**	**9.5**	**10.3**	**10.3**	**10.3**	**10.9**	**11.2**	**10.7**
C45	**Mesothelioma**	**0.1**	**0.2**	**0.2**	**0.1**	**0.2**	**0.4**	**0.3**	**0.2**	**0.3**	**0.3**
C46	**Kaposi's sarcoma**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**	**0.1**	**0.1**	**0.0**
C47	**Autonomic nervous system**	**0.2**	**0.3**	**0.1**	**0.3**	**0.2**	**0.3**	**0.3**	**0.4**	**0.2**	**0.2**
C48-49	**Soft tissues**	**2.1**	**1.6**	**1.9**	**2.5**	**2.6**	**2.2**	**2.5**	**2.1**	**2.6**	**2.2**
C50	**Breast**	**75.7**	**77.3**	**77.2**	**77.4**	**76.7**	**73.8**	**73.0**	**72.9**	**71.0**	**73.0**
C51-58	**Female genital organs**	**40.8**	**41.7**	**39.9**	**41.1**	**41.0**	**39.7**	**39.6**	**39.9**	**39.0**	**41.0**
C53	Cervix uteri	9.8	10.3	9.5	8.7	9.9	9.8	9.0	9.2	9.7	10.1
C54	Corpus uteri	15.0	15.1	16.1	17.0	16.6	15.6	16.5	17.4	16.2	16.9
C55	Uterus, other	0.1	0.2	0.2	0.2	0.1	0.1	0.0	0.1	0.2	0.2
C56	Ovary	12.6	13.8	11.1	12.3	11.0	11.2	11.1	10.9	10.1	10.7
C51-52, C57	Other female genital	3.1	2.2	2.8	2.7	3.2	2.8	2.9	2.3	2.7	2.9
C58	Placenta	0.1	0.1	0.1	0.2	0.3	0.2	0.1	0.0	0.0	0.1
C64-68	**Urinary organs**	**11.2**	**12.3**	**11.7**	**11.3**	**12.7**	**12.4**	**12.5**	**12.8**	**13.0**	**12.7**
C64	Kidney excl. renal pelvis	4.2	4.8	4.8	4.8	5.6	5.0	5.8	5.6	5.6	5.4
C65	Renal pelvis	0.6	0.6	0.8	0.4	0.3	0.5	0.4	0.5	0.8	0.6
C66-68	Bladder, ureter, urethra	6.4	6.9	6.0	6.0	6.8	6.8	6.3	6.6	6.7	6.7
C69	**Eye**	**0.7**	**1.0**	**0.8**	**1.0**	**0.8**	**0.9**	**0.8**	**0.8**	**1.1**	**0.6**
C70-72	**Central nervous system**	**14.7**	**17.2**	**16.1**	**17.6**	**18.1**	**17.6**	**18.3**	**16.5**	**16.6**	**15.2**
C73	**Thyroid gland**	**4.3**	**4.6**	**4.3**	**5.4**	**5.1**	**4.8**	**5.0**	**5.3**	**5.8**	**6.3**
C37, C74-75	**Other endocrine glands**	**2.8**	**2.8**	**3.7**	**3.2**	**3.8**	**4.1**	**4.0**	**4.8**	**4.6**	**3.0**
C39, C76, C80	**Other or unspecified**	**4.5**	**5.1**	**4.5**	**4.7**	**4.4**	**4.0**	**3.6**	**3.3**	**3.1**	**3.2**
C81-96	**Lymphoid and haematopoietic tissue**	**19.9**	**21.3**	**21.6**	**23.3**	**20.9**	**24.9**	**24.1**	**23.5**	**23.8**	**24.5**
C81	Hodgkin lymphoma	1.4	1.5	2.1	1.7	2.0	2.1	1.9	1.4	1.8	1.9
C82-85, C96	Non-Hodgkin lymphoma	8.3	8.2	7.9	9.1	7.8	9.2	9.1	8.5	9.2	9.3
C88	Malignant immunoproliferative diseases	0.4	0.4	0.3	0.4	0.3	0.6	0.3	0.3	0.4	0.4
C90	Multiple myeloma	3.5	3.3	2.8	3.1	3.3	2.7	3.3	3.3	3.2	3.3
C91-95	Leukaemia	6.4	7.9	8.6	9.0	7.6	10.4	9.4	9.9	9.2	9.6

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Table 9a. Average annual number of new cases by primary site* and five-year age group - 2006-2010

ICD10	Site	0-4	5-9	10-14	15-19	20-24	25-29
C00-96	**All sites**	**39**	**17**	**28**	**43**	**68**	**99**
C00-14	**Mouth, pharynx**	**0**	**0**	**0**	**1**	**1**	**1**
C00	Lip	0	0	0	0	0	0
C01-02	Tongue	0	0	0	0	0	0
C03-06	Mouth, other	0	0	0	0	0	0
C07-08	Salivary glands	0	0	0	0	0	1
C09-14	Pharynx	0	0	0	0	0	0
C15-26	**Digestive organs**	**1**	**0**	**1**	**1**	**1**	**4**
C15	Oesophagus	0	0	0	0	0	0
C16	Stomach	0	0	0	0	0	0
C17	Small intestine	0	0	0	0	0	1
C18	Colon	0	0	1	1	1	2
C19-21	Rectum, rectosigmoid, anus	0	0	0	0	0	1
C22	Liver	1	0	0	0	0	1
C23-24	Gallbladder, bile ducts	0	0	0	0	0	0
C25	Pancreas	0	0	0	0	0	0
C26	Other digestive organs	0	0	0	0	0	0
C30-34, C38	**Respiratory organs**	**0**	**0**	**0**	**1**	**0**	**1**
C30-31	Nose, sinuses	0	0	0	0	0	0
C32	Larynx, epiglottis	0	0	0	0	0	0
C33-34	Lung, trachea	0	0	0	0	0	1
C38	Mediastinum, pleura (non-mesothelioma)	0	0	0	0	0	0
C40-41	**Bone**	**0**	**1**	**2**	**3**	**3**	**1**
C43	**Melanoma of the skin**	**0**	**0**	**0**	**1**	**2**	**5**
C44	**Skin, non-melanoma**	**1**	**0**	**0**	**0**	**1**	**1**
C45	**Mesothelioma**	**0**	**0**	**0**	**0**	**0**	**0**
C46	**Kaposi's sarcoma**	**0**	**0**	**0**	**0**	**0**	**0**
C47	**Autonomic nervous system**	**2**	**0**	**0**	**0**	**1**	**0**
C48-49	**Soft tissues**	**1**	**0**	**0**	**1**	**0**	**1**
C50	**Breast**	**0**	**0**	**0**	**0**	**0**	**0**
C60-63	**Male genital organs**	**1**	**0**	**2**	**7**	**31**	**52**
C61	Prostate	0	0	0	0	0	0
C62	Testis	1	0	2	7	31	52
C60, C63	Other male genital	0	0	0	0	0	0
C64-68	**Urinary organs**	**3**	**1**	**0**	**1**	**2**	**2**
C64	Kidney excl. renal pelvis	2	1	0	0	1	1
C65	Renal pelvis	0	0	0	0	0	0
C66-68	Bladder, ureter, urethra	0	0	0	0	1	1
C69	**Eye**	**2**	**0**	**0**	**0**	**0**	**0**
C70-72	**Central nervous system**	**9**	**6**	**8**	**10**	**9**	**11**
C73	**Thyroid gland**	**0**	**0**	**0**	**0**	**1**	**1**
C37, C74-75	**Other endocrine glands**	**3**	**1**	**2**	**3**	**4**	**4**
C39, C76, C80	**Other or unspecified**	**0**	**0**	**0**	**0**	**0**	**0**
C81-96	**Lymphoid and haematopoietic tissue**	**16**	**7**	**10**	**14**	**12**	**13**
C81	Hodgkin lymphoma	0	1	3	4	7	6
C82-85, C96	Non-Hodgkin lymphoma	3	1	2	4	2	3
C88	Malignant immunoproliferative diseases	0	0	0	0	0	0
C90	Multiple myeloma	0	0	0	0	0	0
C91-95	Leukaemia	13	5	5	6	3	4

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

MALES

Age											
30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
145	**189**	**255**	**379**	**698**	**1257**	**2072**	**2151**	**2094**	**2098**	**1743**	**1291**
2	**3**	**9**	**14**	**31**	**41**	**49**	**43**	**34**	**32**	**22**	**16**
0	0	2	2	4	7	7	11	11	13	8	8
0	1	2	4	6	7	12	10	8	4	4	1
0	1	1	1	4	6	10	9	7	6	4	2
1	1	1	1	1	1	2	2	2	2	2	2
0	1	3	6	15	19	18	12	7	8	3	2
13	**24**	**44**	**75**	**142**	**242**	**365**	**413**	**439**	**459**	**403**	**307**
0	1	3	5	8	16	25	25	24	21	15	12
1	3	4	8	16	20	35	38	44	48	45	38
1	1	2	2	4	8	10	11	11	10	6	2
6	8	16	24	48	79	126	151	180	197	179	136
3	6	10	16	37	74	101	108	106	103	82	54
1	1	3	7	8	7	13	11	14	12	13	9
0	0	1	2	3	6	10	8	10	11	8	9
0	3	3	9	16	29	41	55	44	51	47	37
1	0	1	1	2	3	3	8	7	7	6	8
2	**6**	**12**	**29**	**77**	**146**	**254**	**254**	**268**	**273**	**207**	**110**
0	0	1	1	1	2	4	4	3	3	2	1
0	0	1	2	8	14	15	19	12	12	10	5
2	5	10	26	68	128	233	230	252	256	192	102
0	0	0	0	0	1	2	2	1	2	2	1
1	**1**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**3**	**2**	**0**
13	**25**	**37**	**39**	**54**	**72**	**89**	**79**	**75**	**67**	**57**	**39**
4	**4**	**6**	**9**	**15**	**33**	**54**	**81**	**106**	**137**	**164**	**182**
0	**0**	**0**	**1**	**2**	**3**	**10**	**10**	**10**	**12**	**8**	**6**
1	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**1**
0	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
1	**2**	**3**	**4**	**4**	**6**	**6**	**6**	**7**	**7**	**4**	**4**
0	**0**	**0**	**2**	**0**	**2**	**3**	**2**	**2**	**2**	**1**	**1**
52	**49**	**44**	**59**	**162**	**395**	**786**	**845**	**712**	**618**	**466**	**323**
0	0	6	32	144	381	773	833	705	612	460	318
51	48	37	24	14	8	6	5	2	1	1	1
0	1	1	3	3	5	7	7	5	6	5	4
5	**11**	**24**	**41**	**71**	**120**	**182**	**194**	**205**	**244**	**197**	**135**
2	7	14	22	35	44	63	57	54	49	43	21
0	0	0	2	2	4	7	7	9	10	7	4
2	4	10	16	34	72	113	129	142	185	147	110
0	**0**	**1**	**2**	**3**	**2**	**6**	**4**	**3**	**4**	**2**	**2**
20	**24**	**26**	**35**	**35**	**48**	**55**	**43**	**36**	**31**	**27**	**24**
5	**5**	**7**	**5**	**8**	**8**	**8**	**4**	**5**	**8**	**4**	**3**
4	**7**	**5**	**9**	**9**	**10**	**19**	**8**	**12**	**10**	**6**	**3**
0	**1**	**2**	**5**	**8**	**10**	**15**	**19**	**24**	**27**	**30**	**34**
24	**28**	**32**	**48**	**77**	**118**	**168**	**147**	**153**	**163**	**142**	**101**
9	6	6	4	5	5	4	4	3	3	2	1
7	12	13	20	34	51	72	61	55	59	45	32
0	0	0	0	1	2	5	5	3	4	5	4
0	2	4	6	14	17	24	27	28	34	28	17
7	9	9	18	23	43	63	50	64	63	62	48

Table 9b. Average annual number of new cases by primary site* and five-year age group - 2006-2010

ICD10	Site	0-4	5-9	10-14	15-19	20-24	25-29
C00-96	**All sites**	**33**	**20**	**20**	**36**	**57**	**102**
C00-14	**Mouth, pharynx**	**0**	**0**	**0**	**0**	**1**	**2**
C00	Lip	0	0	0	0	0	0
C01-02	Tongue	0	0	0	0	0	0
C03-06	Mouth, other	0	0	0	0	0	1
C07-08	Salivary glands	0	0	0	0	1	1
C09-14	Pharynx	0	0	0	0	0	0
C15-26	**Digestive organs**	**0**	**1**	**1**	**2**	**3**	**5**
C15	Oesophagus	0	0	0	0	0	0
C16	Stomach	0	0	0	0	0	0
C17	Small intestine	0	0	0	0	0	0
C18	Colon	0	0	0	1	2	3
C19-21	Rectum, rectosigmoid, anus	0	0	0	0	1	1
C22	Liver	0	0	0	1	0	0
C23-24	Gallbladder, bile ducts	0	0	0	0	0	0
C25	Pancreas	0	0	0	0	0	0
C26	Other digestive organs	0	0	0	0	0	0
C30-34, C38	**Respiratory organs**	**0**	**1**	**0**	**0**	**1**	**1**
C30-31	Nose, sinuses	0	0	0	0	0	0
C32	Larynx, epiglottis	0	0	0	0	0	0
C33-34	Lung, trachea	0	0	0	0	1	1
C38	Mediastinum, pleura (non-mesothelioma)	0	0	0	0	0	0
C40-41	**Bone**	**0**	**1**	**1**	**2**	**1**	**1**
C43	**Melanoma of the skin**	**0**	**0**	**0**	**2**	**7**	**17**
C44	**Skin, non-melanoma**	**1**	**0**	**0**	**1**	**2**	**1**
C45	**Mesothelioma**	**0**	**0**	**0**	**0**	**0**	**0**
C46	**Kaposi's sarcoma**	**0**	**0**	**0**	**0**	**0**	**0**
C47	**Autonomic nervous system**	**1**	**0**	**0**	**1**	**0**	**0**
C48-49	**Soft tissues**	**0**	**1**	**1**	**1**	**1**	**2**
C50	**Breast**	**0**	**0**	**0**	**0**	**2**	**8**
C51-58	**Female genital organs**	**1**	**0**	**2**	**2**	**7**	**21**
C53	Cervix uteri	0	0	0	0	4	18
C54	Corpus uteri	0	0	0	0	0	1
C55	Uterus, other	0	0	0	0	0	0
C56	Ovary	1	0	2	2	2	2
C51-52, C57	Other female genital	0	0	0	0	0	1
C58	Placenta	0	0	0	0	0	0
C64-68	**Urinary organs**	**2**	**1**	**0**	**0**	**1**	**1**
C64	Kidney excl. renal pelvis	2	1	0	0	0	1
C65	Renal pelvis	0	0	0	0	0	0
C66-68	Bladder, ureter, urethra	0	0	0	0	0	0
C69	**Eye**	**2**	**0**	**0**	**0**	**0**	**1**
C70-72	**Central nervous system**	**9**	**6**	**7**	**7**	**8**	**11**
C73	**Thyroid gland**	**0**	**0**	**0**	**2**	**5**	**9**
C37, C74-75	**Other endocrine glands**	**2**	**1**	**1**	**4**	**6**	**8**
C39, C76, C80	**Other or unspecified**	**0**	**0**	**0**	**0**	**0**	**0**
C81-96	**Lymphoid and haematopoietic tissue**	**13**	**6**	**6**	**13**	**12**	**11**
C81	Hodgkin lymphoma	0	0	0	6	6	6
C82-85, C96	Non-Hodgkin lymphoma	1	1	1	2	3	4
C88	Malignant immunoproliferative diseases	0	0	0	0	0	0
C90	Multiple myeloma	0	0	0	0	0	0
C91-95	Leukaemia	12	5	4	5	4	2

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

FEMALES

Age											
30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
174	**296**	**457**	**682**	**955**	**1164**	**1530**	**1410**	**1326**	**1432**	**1446**	**1625**
3	**2**	**4**	**9**	**17**	**16**	**21**	**25**	**22**	**20**	**21**	**26**
0	0	1	2	3	3	5	6	6	7	7	11
1	0	1	1	3	2	5	4	3	4	4	4
0	0	1	1	3	3	4	6	7	5	7	7
1	1	1	2	1	1	3	3	3	3	2	2
1	1	1	3	6	7	4	6	3	2	2	2
10	**19**	**34**	**66**	**117**	**177**	**274**	**304**	**339**	**409**	**464**	**506**
0	0	1	1	2	5	6	6	6	11	6	12
1	2	2	6	10	12	16	20	22	31	38	47
1	0	1	2	5	6	7	7	8	8	7	5
4	8	16	24	47	74	116	146	171	194	237	250
2	6	9	21	34	45	73	68	67	80	75	78
0	0	0	3	2	3	5	4	7	11	11	11
0	1	1	2	3	7	9	10	10	13	16	12
1	2	4	6	12	24	38	38	43	52	61	75
0	0	1	1	2	2	4	5	6	9	12	17
2	**6**	**10**	**31**	**67**	**119**	**183**	**169**	**185**	**185**	**136**	**88**
0	0	0	1	1	2	2	3	2	2	3	3
0	0	0	0	3	3	2	2	3	3	1	1
2	6	10	30	62	114	178	165	179	179	130	83
0	0	0	0	1	1	0	0	2	1	1	1
1	**1**	**1**	**1**	**1**	**3**	**3**	**1**	**2**	**1**	**1**	**1**
24	**43**	**51**	**51**	**61**	**67**	**74**	**66**	**55**	**55**	**51**	**61**
2	**3**	**8**	**9**	**20**	**28**	**40**	**51**	**73**	**98**	**122**	**240**
0	**0**	**1**	**0**	**0**	**1**	**1**	**2**	**2**	**2**	**3**	**1**
0	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**2**
0	**0**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
1	**4**	**3**	**4**	**5**	**8**	**12**	**12**	**9**	**11**	**8**	**6**
35	**78**	**171**	**287**	**353**	**357**	**402**	**319**	**180**	**173**	**192**	**208**
38	**60**	**71**	**87**	**143**	**174**	**210**	**187**	**162**	**155**	**137**	**137**
31	44	35	31	32	21	23	12	13	15	12	11
2	7	16	26	60	89	109	106	91	78	64	54
0	0	0	0	0	0	1	0	1	1	1	4
3	7	16	24	41	52	63	56	42	48	42	42
1	2	3	6	10	11	13	12	16	12	18	27
1	0	0	0	0	0	0	0	0	0	0	0
2	**4**	**11**	**19**	**28**	**41**	**80**	**72**	**85**	**93**	**87**	**92**
1	3	7	12	14	19	35	26	33	34	26	27
0	0	0	0	1	2	4	4	4	6	4	3
1	1	4	7	13	20	41	42	48	52	56	62
0	**1**	**1**	**1**	**1**	**4**	**4**	**2**	**3**	**3**	**2**	**2**
19	**28**	**30**	**45**	**54**	**60**	**65**	**54**	**55**	**45**	**43**	**40**
14	**18**	**19**	**18**	**15**	**17**	**16**	**9**	**11**	**9**	**6**	**6**
7	**8**	**10**	**11**	**10**	**9**	**11**	**8**	**8**	**6**	**5**	**2**
1	**1**	**2**	**4**	**6**	**10**	**17**	**18**	**20**	**31**	**40**	**67**
14	**18**	**28**	**37**	**55**	**74**	**115**	**112**	**117**	**136**	**125**	**138**
6	4	2	1	3	2	1	2	3	2	2	1
3	7	12	16	27	32	51	47	45	52	45	42
0	0	1	0	1	1	3	2	2	5	1	2
0	1	3	6	8	12	19	17	19	31	24	23
5	7	10	13	16	26	40	44	48	47	53	69

Table 10a. Age-specific incidence rates per 100 000 person-years by primary site* and five-year age group - 2006-2010

ICD10	Site	0-4	5-9	10-14	15-19	20-24	25-29
C00-96	**All sites**	**25.4**	**11.1**	**17.3**	**26.1**	**44.6**	**65.0**
C00-14	**Mouth, pharynx**	**0.0**	**0.0**	**0.1**	**0.4**	**0.5**	**0.7**
C00	Lip	0.0	0.0	0.0	0.0	0.0	0.0
C01-02	Tongue	0.0	0.0	0.0	0.0	0.1	0.3
C03-06	Mouth, other	0.0	0.0	0.0	0.0	0.0	0.0
C07-08	Salivary glands	0.0	0.0	0.1	0.1	0.1	0.4
C09-14	Pharynx	0.0	0.0	0.0	0.2	0.3	0.0
C15-26	**Digestive organs**	**0.8**	**0.1**	**0.5**	**0.9**	**0.8**	**2.9**
C15	Oesophagus	0.0	0.0	0.0	0.0	0.0	0.0
C16	Stomach	0.0	0.0	0.0	0.2	0.1	0.0
C17	Small intestine	0.0	0.0	0.0	0.0	0.0	0.5
C18	Colon	0.0	0.0	0.4	0.4	0.5	1.2
C19-21	Rectum, rectosigmoid, anus	0.0	0.0	0.0	0.0	0.1	0.7
C22	Liver	0.8	0.1	0.0	0.1	0.0	0.4
C23-24	Gallbladder, bile ducts	0.0	0.0	0.0	0.0	0.0	0.0
C25	Pancreas	0.0	0.0	0.0	0.1	0.0	0.1
C26	Other digestive organs	0.0	0.0	0.1	0.0	0.0	0.0
C30-34, C38	**Respiratory organs**	**0.0**	**0.1**	**0.1**	**0.5**	**0.3**	**0.6**
C30-31	Nose, sinuses	0.0	0.1	0.0	0.2	0.1	0.0
C32	Larynx, epiglottis	0.0	0.0	0.0	0.0	0.0	0.0
C33-34	Lung, trachea	0.0	0.0	0.0	0.2	0.1	0.6
C38	Mediastinum, pleura (non-mesothelioma)	0.0	0.0	0.1	0.0	0.0	0.0
C40-41	**Bone**	**0.0**	**0.8**	**1.4**	**1.8**	**1.7**	**0.9**
C43	**Melanoma of the skin**	**0.0**	**0.0**	**0.2**	**0.5**	**1.3**	**3.6**
C44	**Skin, non-melanoma**	**0.4**	**0.0**	**0.2**	**0.2**	**0.4**	**0.5**
C45	**Mesothelioma**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
C46	**Kaposi's sarcoma**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**
C47	**Autonomic nervous system**	**1.6**	**0.1**	**0.1**	**0.1**	**0.4**	**0.1**
C48-49	**Soft tissues**	**0.9**	**0.0**	**0.2**	**0.5**	**0.3**	**0.9**
C50	**Breast**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
C60-63	**Male genital organs**	**0.4**	**0.3**	**1.4**	**4.5**	**20.9**	**34.3**
C61	Prostate	0.0	0.0	0.0	0.1	0.0	0.0
C62	Testis	0.4	0.3	1.4	4.4	20.9	34.3
C60, C63	Other male genital	0.0	0.0	0.0	0.0	0.0	0.0
C64-68	**Urinary organs**	**1.8**	**0.5**	**0.2**	**0.4**	**1.2**	**1.3**
C64	Kidney excl. renal pelvis	1.6	0.5	0.2	0.2	0.7	0.5
C65	Renal pelvis	0.0	0.0	0.0	0.0	0.0	0.0
C66-68	Bladder, ureter, urethra	0.3	0.0	0.0	0.1	0.5	0.8
C69	**Eye**	**1.2**	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**
C70-72	**Central nervous system**	**6.2**	**3.9**	**4.9**	**5.9**	**6.1**	**6.9**
C73	**Thyroid gland**	**0.0**	**0.0**	**0.0**	**0.0**	**0.7**	**0.9**
C37, C74-75	**Other endocrine glands**	**2.0**	**0.7**	**1.4**	**1.7**	**2.3**	**2.3**
C39, C76, C80	**Other or unspecified**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
C81-96	**Lymphoid and haematopoietic tissue**	**10.2**	**4.6**	**6.4**	**8.7**	**7.7**	**8.6**
C81	Hodgkin lymphoma	0.1	0.7	2.0	2.4	4.4	3.8
C82-85, C96	Non-Hodgkin lymphoma	1.7	0.5	1.4	2.6	1.0	1.7
C88	Malignant immunoproliferative diseases	0.0	0.0	0.0	0.0	0.0	0.0
C90	Multiple myeloma	0.0	0.0	0.0	0.0	0.0	0.3
C91-95	Leukaemia	8.4	3.4	3.1	3.7	2.2	2.9

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

MALES

Age											
30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
88.9	**102.8**	**138.8**	**223.9**	**436.0**	**839.3**	**1455.7**	**2184.2**	**2907.2**	**3545.1**	**3955.8**	**3930.2**
1.0	**1.7**	**5.0**	**8.6**	**19.2**	**27.1**	**34.6**	**44.1**	**47.7**	**54.9**	**49.4**	**48.6**
0.0	0.1	0.9	0.9	2.5	4.4	5.0	11.3	15.8	22.0	19.0	25.6
0.1	0.4	1.1	2.6	3.7	4.7	8.2	10.1	10.4	6.4	9.5	4.4
0.1	0.3	0.5	0.8	2.6	4.1	7.1	8.7	9.2	9.9	8.6	5.3
0.5	0.5	0.6	0.5	0.8	0.9	1.4	1.6	3.0	3.4	5.5	6.7
0.2	0.3	1.8	3.7	9.6	13.0	12.9	12.4	9.3	13.2	6.8	6.7
7.9	**13.0**	**23.8**	**44.2**	**88.8**	**161.7**	**256.6**	**417.0**	**609.2**	**775.5**	**915.4**	**935.4**
0.2	0.3	1.6	3.0	5.3	10.7	17.8	25.1	33.8	34.8	34.5	37.6
0.5	1.9	2.4	4.8	9.9	13.5	25.0	38.2	61.5	80.3	103.0	116.1
0.7	0.7	1.3	1.4	2.4	5.1	7.2	10.9	14.6	17.2	14.1	7.4
3.7	4.1	8.6	14.3	30.3	53.0	88.2	152.5	250.2	332.3	407.1	413.0
2.0	3.3	5.5	9.7	23.0	49.7	71.3	108.6	146.9	173.6	186.4	166.4
0.4	0.8	1.7	3.9	4.9	4.4	9.2	10.8	19.3	20.6	30.4	28.0
0.0	0.2	0.7	1.2	2.0	3.9	6.9	7.8	13.3	19.0	18.2	28.5
0.1	1.5	1.6	5.6	9.8	19.4	28.7	55.6	60.5	86.1	107.2	112.7
0.4	0.2	0.3	0.4	1.4	2.1	2.3	7.5	9.0	11.6	14.5	25.7
1.5	**3.0**	**6.7**	**17.3**	**48.2**	**97.5**	**179.0**	**258.5**	**373.0**	**460.9**	**469.3**	**332.8**
0.0	0.2	0.6	0.4	0.5	1.3	2.9	3.9	3.9	4.4	5.0	4.4
0.0	0.1	0.5	1.4	4.9	9.5	10.7	19.2	17.0	19.9	23.6	14.5
1.5	2.7	5.6	15.3	42.8	85.8	163.9	233.6	350.7	433.3	436.6	309.5
0.0	0.0	0.0	0.2	0.0	0.9	1.4	1.8	1.4	3.3	4.1	4.3
0.6	**0.7**	**0.9**	**1.0**	**0.5**	**0.9**	**1.1**	**0.6**	**1.9**	**4.4**	**3.6**	**1.2**
7.7	**13.5**	**20.0**	**22.7**	**33.5**	**47.9**	**62.3**	**78.9**	**103.2**	**112.6**	**130.3**	**119.3**
2.2	**2.0**	**3.3**	**5.1**	**9.2**	**21.9**	**38.1**	**81.8**	**147.6**	**230.9**	**372.5**	**553.3**
0.0	**0.0**	**0.0**	**0.5**	**1.1**	**2.3**	**7.2**	**10.2**	**14.2**	**21.0**	**18.6**	**18.7**
0.4	**0.2**	**0.4**	**0.1**	**0.0**	**0.1**	**0.1**	**0.6**	**0.6**	**1.0**	**0.9**	**3.7**
0.2	**0.1**	**0.2**	**0.4**	**0.1**	**0.1**	**0.4**	**0.0**	**0.0**	**0.0**	**0.0**	**1.3**
0.6	**1.1**	**1.6**	**2.5**	**2.6**	**4.1**	**4.4**	**6.0**	**9.2**	**12.5**	**10.0**	**10.8**
0.0	**0.0**	**0.2**	**1.1**	**0.2**	**1.1**	**2.0**	**2.5**	**3.0**	**4.1**	**2.7**	**3.7**
31.6	**26.6**	**24.0**	**34.8**	**101.1**	**264.0**	**552.1**	**859.7**	**989.9**	**1043.5**	**1057.0**	**984.0**
0.0	0.1	3.1	19.1	90.0	254.8	542.9	847.5	980.4	1032.7	1042.9	971.2
31.3	25.9	20.3	14.2	9.0	5.6	4.4	5.4	2.8	1.4	3.2	1.8
0.2	0.5	0.6	1.5	2.1	3.6	4.8	6.9	6.7	9.4	10.9	10.9
2.8	**5.9**	**12.9**	**24.0**	**44.6**	**79.9**	**127.8**	**197.3**	**284.3**	**412.4**	**447.5**	**411.2**
1.3	3.6	7.5	13.2	22.0	29.5	44.1	58.0	74.6	83.1	97.6	63.4
0.0	0.1	0.1	1.2	1.5	2.4	4.6	7.5	12.8	16.9	15.4	12.8
1.5	2.2	5.3	9.6	21.1	48.0	79.1	131.8	196.9	312.3	334.5	335.1
0.2	**0.1**	**0.5**	**1.2**	**1.6**	**1.3**	**4.2**	**3.7**	**4.5**	**7.1**	**4.5**	**4.9**
12.1	**12.9**	**14.1**	**20.4**	**21.6**	**32.2**	**38.6**	**43.2**	**49.5**	**53.1**	**60.4**	**73.1**
2.9	**2.8**	**3.8**	**3.1**	**4.8**	**5.3**	**5.7**	**3.7**	**7.2**	**13.5**	**10.0**	**8.6**
2.6	**3.7**	**2.7**	**5.5**	**5.6**	**6.7**	**13.0**	**7.7**	**16.9**	**16.5**	**13.6**	**7.9**
0.0	**0.3**	**1.2**	**2.9**	**4.9**	**6.4**	**10.6**	**19.5**	**33.8**	**46.3**	**68.5**	**103.8**
14.6	**15.2**	**17.6**	**28.7**	**48.2**	**78.5**	**117.9**	**149.1**	**211.6**	**274.9**	**321.5**	**307.8**
5.8	3.0	3.2	2.6	3.1	3.1	3.0	4.0	4.1	5.1	4.5	3.7
4.4	6.3	7.3	12.0	21.5	34.3	50.3	61.6	76.4	100.1	103.1	97.3
0.0	0.0	0.0	0.2	0.9	1.5	3.4	5.0	4.3	6.4	11.3	11.0
0.1	1.0	2.1	3.3	8.5	11.2	17.0	27.6	38.2	57.4	62.7	51.1
4.3	4.9	5.0	10.5	14.2	28.5	44.2	51.0	88.6	105.8	139.8	144.8

Table 10b. Age-specific incidence rates per 100 000 person-years by primary site* and five-year age group - 2006-2010

ICD10	Site	0-4	5-9	10-14	15-19	20-24	25-29
C00-96	**All sites**	**22.3**	**13.4**	**13.1**	**23.3**	**39.2**	**68.3**
C00-14	**Mouth, pharynx**	**0.0**	**0.1**	**0.1**	**0.0**	**0.7**	**1.5**
C00	Lip	0.0	0.0	0.0	0.0	0.0	0.3
C01-02	Tongue	0.0	0.0	0.0	0.0	0.1	0.1
C03-06	Mouth, other	0.0	0.0	0.0	0.0	0.0	0.4
C07-08	Salivary glands	0.0	0.0	0.1	0.0	0.4	0.5
C09-14	Pharynx	0.0	0.1	0.0	0.0	0.1	0.1
C15-26	**Digestive organs**	**0.3**	**0.4**	**0.5**	**1.0**	**1.8**	**3.2**
C15	Oesophagus	0.0	0.0	0.0	0.0	0.0	0.0
C16	Stomach	0.0	0.0	0.0	0.0	0.1	0.3
C17	Small intestine	0.0	0.0	0.0	0.1	0.0	0.1
C18	Colon	0.0	0.1	0.1	0.5	1.1	1.9
C19-21	Rectum, rectosigmoid, anus	0.0	0.0	0.0	0.0	0.4	0.7
C22	Liver	0.3	0.3	0.3	0.4	0.0	0.0
C23-24	Gallbladder, bile ducts	0.0	0.0	0.0	0.0	0.1	0.1
C25	Pancreas	0.0	0.0	0.0	0.0	0.0	0.0
C26	Other digestive organs	0.0	0.0	0.1	0.0	0.0	0.1
C30-34, C38	**Respiratory organs**	**0.0**	**0.4**	**0.1**	**0.1**	**0.4**	**0.9**
C30-31	Nose, sinuses	0.0	0.3	0.0	0.0	0.0	0.1
C32	Larynx, epiglottis	0.0	0.0	0.0	0.0	0.0	0.0
C33-34	Lung, trachea	0.0	0.1	0.1	0.1	0.4	0.8
C38	Mediastinum, pleura (non-mesothelioma)	0.0	0.0	0.0	0.0	0.0	0.0
C40-41	**Bone**	**0.1**	**0.8**	**0.8**	**1.3**	**0.6**	**0.7**
C43	**Melanoma of the skin**	**0.1**	**0.1**	**0.0**	**1.4**	**5.1**	**11.6**
C44	**Skin, non-melanoma**	**0.4**	**0.1**	**0.3**	**0.5**	**1.1**	**0.4**
C45	**Mesothelioma**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
C46	**Kaposi's sarcoma**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**
C47	**Autonomic nervous system**	**0.8**	**0.3**	**0.0**	**0.4**	**0.1**	**0.0**
C48-49	**Soft tissues**	**0.3**	**0.7**	**0.7**	**0.6**	**0.6**	**1.1**
C50	**Breast**	**0.0**	**0.0**	**0.0**	**0.3**	**1.6**	**5.6**
C51-58	**Female genital organs**	**0.8**	**0.3**	**1.2**	**1.3**	**5.0**	**14.4**
C53	Cervix uteri	0.0	0.0	0.0	0.0	3.0	11.9
C54	Corpus uteri	0.0	0.0	0.0	0.0	0.0	0.4
C55	Uterus, other	0.0	0.0	0.0	0.0	0.0	0.0
C56	Ovary	0.7	0.3	1.2	1.2	1.5	1.3
C51-52, C57	Other female genital	0.1	0.0	0.0	0.0	0.3	0.4
C58	Placenta	0.0	0.0	0.0	0.1	0.1	0.3
C64-68	**Urinary organs**	**1.7**	**0.7**	**0.3**	**0.1**	**0.6**	**0.8**
C64	Kidney excl. renal pelvis	1.7	0.7	0.3	0.0	0.3	0.5
C65	Renal pelvis	0.0	0.0	0.0	0.0	0.0	0.0
C66-68	Bladder, ureter, urethra	0.0	0.0	0.0	0.1	0.3	0.3
C69	**Eye**	**1.2**	**0.0**	**0.0**	**0.1**	**0.0**	**0.8**
C70-72	**Central nervous system**	**6.4**	**4.4**	**4.4**	**4.3**	**5.6**	**7.7**
C73	**Thyroid gland**	**0.0**	**0.0**	**0.3**	**1.0**	**3.1**	**6.2**
C37, C74-75	**Other endocrine glands**	**1.2**	**0.8**	**0.8**	**2.3**	**4.4**	**5.5**
C39, C76, C80	**Other or unspecified**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.3**
C81-96	**Lymphoid and haematopoietic tissue**	**8.9**	**4.2**	**3.7**	**8.3**	**8.4**	**7.5**
C81	Hodgkin lymphoma	0.0	0.1	0.3	3.8	3.9	3.8
C82-85, C96	Non-Hodgkin lymphoma	0.7	0.8	0.9	1.4	1.8	2.4
C88	Malignant immunoproliferative diseases	0.0	0.0	0.0	0.0	0.0	0.0
C90	Multiple myeloma	0.0	0.0	0.0	0.0	0.0	0.0
C91-95	Leukaemia	8.3	3.3	2.5	3.1	2.8	1.3

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

FEMALES

Age											
30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
109.9	**168.3**	**262.4**	**424.0**	**616.7**	**802.9**	**1093.5**	**1370.7**	**1611.5**	**1898.6**	**2149.9**	**2156.9**
1.6	**1.2**	**2.4**	**5.5**	**10.7**	**10.8**	**15.2**	**23.8**	**27.3**	**26.7**	**31.9**	**34.5**
0.3	0.2	0.4	1.1	1.9	1.8	3.3	5.7	7.3	8.7	10.2	15.1
0.4	0.1	0.7	0.9	2.1	1.5	3.5	3.6	3.9	5.1	5.7	4.8
0.1	0.2	0.3	0.4	1.7	2.2	3.2	6.2	9.0	6.6	10.4	9.0
0.5	0.3	0.3	1.4	0.9	0.5	2.1	2.5	3.1	4.2	3.3	2.9
0.4	0.3	0.6	1.7	4.1	4.7	3.1	5.8	3.9	2.1	2.4	2.7
6.2	**11.0**	**19.7**	**40.9**	**75.5**	**122.2**	**196.2**	**296.2**	**412.4**	**542.2**	**690.2**	**671.9**
0.0	0.0	0.5	0.6	1.4	3.2	4.3	5.7	7.8	14.3	9.5	15.3
0.9	0.9	1.3	3.9	6.2	8.0	11.6	19.7	26.5	40.8	57.1	62.4
0.4	0.2	0.5	1.1	3.0	4.0	4.9	6.8	9.4	10.4	10.7	6.8
2.4	4.4	9.0	14.9	30.4	50.9	83.5	142.5	207.6	257.8	351.8	331.1
1.5	3.3	5.2	13.0	21.9	31.3	52.1	66.6	80.9	106.1	111.3	103.4
0.1	0.2	0.1	1.6	1.4	1.8	3.7	3.8	9.0	14.9	17.0	14.5
0.1	0.7	0.7	1.0	2.1	5.0	6.1	9.8	11.7	17.0	24.1	15.7
0.6	1.1	2.3	4.0	7.9	16.4	27.2	36.7	52.2	69.4	91.0	99.8
0.1	0.1	0.3	0.7	1.3	1.7	2.8	4.5	7.2	11.5	17.6	22.8
1.5	**3.5**	**6.0**	**19.3**	**43.4**	**82.3**	**130.7**	**164.0**	**224.5**	**246.3**	**202.6**	**116.5**
0.2	0.1	0.2	0.4	0.9	1.4	1.6	2.6	2.0	3.1	4.8	4.0
0.3	0.2	0.1	0.1	1.7	1.9	1.7	1.5	3.6	3.5	1.8	1.6
1.0	3.2	5.6	18.6	40.3	78.4	127.2	160.0	217.0	238.3	194.3	110.1
0.0	0.0	0.0	0.2	0.5	0.6	0.3	0.0	1.9	1.3	1.8	0.8
0.8	**0.5**	**0.6**	**0.7**	**0.5**	**1.8**	**1.9**	**1.4**	**2.2**	**1.9**	**0.9**	**1.8**
15.4	**24.2**	**29.5**	**31.9**	**39.3**	**46.2**	**52.7**	**63.0**	**66.4**	**72.7**	**76.6**	**81.0**
1.1	**1.8**	**4.6**	**5.8**	**13.0**	**19.2**	**28.5**	**49.6**	**88.2**	**129.9**	**181.6**	**318.5**
0.0	**0.1**	**0.5**	**0.1**	**0.3**	**0.7**	**0.7**	**2.0**	**2.9**	**2.6**	**4.1**	**1.6**
0.0	**0.0**	**0.1**	**0.0**	**0.1**	**0.0**	**0.4**	**0.0**	**0.0**	**0.0**	**1.2**	**2.1**
0.1	**0.0**	**0.3**	**0.5**	**0.3**	**0.4**	**0.3**	**0.0**	**0.2**	**0.0**	**0.6**	**0.5**
0.8	**2.2**	**1.8**	**2.6**	**3.2**	**5.4**	**8.6**	**11.3**	**10.5**	**14.1**	**12.5**	**8.5**
22.3	**44.5**	**98.3**	**178.5**	**228.4**	**246.2**	**287.6**	**310.2**	**218.0**	**229.4**	**285.7**	**276.0**
23.8	**33.9**	**40.7**	**54.2**	**92.7**	**120.0**	**149.7**	**181.7**	**196.9**	**204.6**	**203.9**	**181.6**
19.7	25.0	20.2	19.4	20.5	14.5	16.7	12.0	15.4	19.2	18.1	14.1
1.1	4.0	9.3	16.1	38.5	61.5	77.4	102.9	110.7	103.7	95.0	71.1
0.0	0.0	0.0	0.0	0.3	0.3	0.8	0.2	0.7	1.9	1.5	4.8
1.6	3.9	9.2	15.1	26.7	36.1	45.4	54.6	51.3	63.7	61.9	55.7
0.8	1.0	2.0	3.5	6.5	7.6	9.4	12.0	18.8	16.1	27.4	36.0
0.5	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	**2.5**	**6.3**	**11.8**	**18.0**	**28.1**	**57.3**	**70.2**	**103.0**	**123.0**	**128.9**	**122.0**
0.4	1.6	3.9	7.2	8.8	13.1	24.9	25.7	39.8	45.6	38.6	35.3
0.1	0.2	0.1	0.2	0.5	1.2	3.0	3.7	4.6	8.5	6.3	4.5
0.5	0.7	2.3	4.3	8.7	13.8	29.4	40.8	58.6	69.0	84.0	82.1
0.2	**0.7**	**0.6**	**0.8**	**0.8**	**3.0**	**3.0**	**2.3**	**3.2**	**3.5**	**3.0**	**2.9**
12.3	**16.1**	**17.2**	**28.2**	**34.9**	**41.7**	**47.0**	**52.4**	**66.7**	**59.7**	**63.5**	**53.7**
8.9	**10.4**	**10.6**	**11.1**	**9.5**	**11.6**	**11.7**	**8.4**	**13.1**	**12.5**	**9.5**	**7.7**
4.7	**4.8**	**6.0**	**6.6**	**6.7**	**5.9**	**7.9**	**8.0**	**9.5**	**7.9**	**7.4**	**2.7**
0.5	**0.5**	**1.3**	**2.6**	**4.0**	**6.6**	**12.3**	**17.8**	**24.9**	**40.4**	**59.2**	**89.7**
8.7	**10.5**	**15.9**	**22.8**	**35.5**	**50.9**	**81.8**	**108.5**	**141.7**	**181.1**	**186.8**	**183.6**
3.7	2.2	1.3	0.8	1.8	1.7	1.0	2.1	3.4	2.6	3.3	1.6
2.2	4.1	6.8	9.9	17.4	22.1	36.7	45.6	54.7	68.4	66.4	56.0
0.0	0.0	0.3	0.3	0.8	1.0	2.0	1.9	2.2	7.2	2.1	3.2
0.0	0.3	1.8	3.6	5.0	8.0	13.4	16.1	23.6	40.8	35.6	30.9
2.9	3.9	5.7	8.4	10.5	18.2	28.7	42.9	57.8	62.0	79.3	91.8

Table 11a. Average annual number of new cases by primary site* and five-year period 1956-2010

ICD10	Site	1956-60	1961-65	1966-70
C00-96	**All sites**	**3971**	**4613**	**5405**
C00-14	**Mouth, pharynx**	**189**	**188**	**203**
C00	Lip	101	93	103
C01-02	Tongue	18	21	21
C03-06	Mouth, other	22	22	32
C07-08	Salivary glands	12	13	14
C09-14	Pharynx	35	39	32
C15-26	**Digestive organs**	**1642**	**1725**	**1865**
C15	Oesophagus	74	80	77
C16	Stomach	851	794	769
C17	Small intestine	10	11	18
C18	Colon	236	291	357
C19-21	Rectum, rectosigmoid, anus	155	189	257
C22	Liver	19	23	36
C23-24	Gallbladder, bile ducts	17	22	27
C25	Pancreas	143	176	218
C26	Other digestive organs	137	140	106
C30-34, C38	**Respiratory organs**	**327**	**451**	**633**
C30-31	Nose, sinuses	20	22	21
C32	Larynx, epiglottis	32	46	67
C33-34	Lung, trachea	263	373	532
C38	Mediastinum, pleura (non-mesothelioma)	12	11	13
C40-41	**Bone**	**13**	**16**	**18**
C43	**Melanoma of the skin**	**51**	**76**	**103**
C44	**Skin, non-melanoma**	**84**	**73**	**90**
C45	**Mesothelioma**	**0**	**3**	**3**
C46	**Kaposi's sarcoma**	**2**	**4**	**4**
C47	**Autonomic nervous system**	**20**	**14**	**16**
C48-49	**Soft tissues**	**21**	**24**	**34**
C50	**Breast**	**7**	**8**	**9**
C60-63	**Male genital organs**	**728**	**932**	**1109**
C61	Prostate	654	841	1012
C62	Testis	55	68	75
C60, C63	Other male genital	18	24	22
C64-68	**Urinary organs**	**304**	**411**	**501**
C64	Kidney excl. renal pelvis	95	124	155
C65	Renal pelvis	9	12	18
C66-68	Bladder, ureter, urethra	200	275	329
C69	**Eye**	**20**	**18**	**23**
C70-72	**Central nervous system**	**120**	**136**	**146**
C73	**Thyroid gland**	**20**	**23**	**35**
C37, C74-75	**Other endocrine glands**	**5**	**11**	**16**
C39, C76, C80	**Other or unspecified**	**54**	**85**	**125**
C81-96	**Lymphoid and haematopoietic tissue**	**362**	**416**	**473**
C81	Hodgkin lymphoma	44	52	59
C82-85, C96	Non-Hodgkin lymphoma	97	107	138
C88	Malignant immunoproliferative diseases	0	0	2
C90	Multiple myeloma	72	83	90
C91-95	Leukaemia	150	175	185

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

MALES

Period							
1971-75	1976-80	1981-85	1986-90	1991-95	1996-2000	2001-05	2006-10
6305	**7440**	**8503**	**9227**	**10316**	**11291**	**12637**	**14665**
245	**240**	**248**	**255**	**256**	**268**	**252**	**299**
121	117	99	95	75	66	48	73
25	29	36	35	41	47	50	60
29	34	46	47	55	52	46	50
14	14	14	15	21	22	21	20
56	45	53	63	63	81	87	96
1952	**2153**	**2362**	**2373**	**2469**	**2519**	**2714**	**2935**
84	87	87	99	107	118	133	156
662	603	589	529	460	400	341	302
16	19	31	25	32	40	53	70
402	521	649	741	844	918	1022	1154
317	438	520	537	583	598	675	702
55	50	66	59	61	68	80	101
28	39	43	49	54	57	66	68
250	264	299	292	281	274	307	334
140	132	79	42	47	44	36	47
788	**1009**	**1197**	**1298**	**1372**	**1434**	**1539**	**1641**
22	24	22	24	21	23	23	23
70	90	105	107	103	107	106	99
679	876	1056	1160	1229	1288	1397	1507
17	20	15	7	19	17	13	12
22	**20**	**24**	**21**	**22**	**21**	**25**	**26**
157	**206**	**254**	**352**	**435**	**454**	**504**	**652**
171	**223**	**270**	**357**	**471**	**558**	**656**	**796**
8	**19**	**25**	**39**	**34**	**49**	**65**	**63**
6	**6**	**8**	**12**	**14**	**6**	**7**	**6**
11	**9**	**8**	**8**	**7**	**7**	**5**	**7**
43	**52**	**45**	**43**	**46**	**48**	**51**	**59**
9	**10**	**13**	**13**	**13**	**15**	**16**	**16**
1336	**1612**	**1869**	**2051**	**2576**	**3152**	**3632**	**4605**
1227	1478	1695	1860	2344	2879	3328	4266
85	107	143	165	199	240	259	293
24	27	31	26	33	34	44	46
646	**798**	**964**	**1042**	**1140**	**1143**	**1282**	**1437**
174	199	246	255	271	285	348	417
27	31	34	32	39	37	37	53
445	568	684	754	830	821	896	967
18	**26**	**25**	**24**	**26**	**30**	**31**	**31**
161	**189**	**220**	**247**	**261**	**330**	**409**	**455**
35	**43**	**45**	**50**	**45**	**47**	**55**	**72**
26	**27**	**44**	**42**	**52**	**63**	**83**	**117**
146	**182**	**222**	**270**	**292**	**289**	**228**	**175**
525	**616**	**659**	**731**	**787**	**858**	**1084**	**1272**
63	67	56	50	50	57	65	73
136	165	210	273	310	355	381	477
6	7	10	8	16	20	31	29
117	150	152	162	160	162	183	199
202	227	232	238	251	264	424	494

Table 11b. Average annual number of new cases by primary site* and five-year period 1956-2010

ICD10	Site	1956-60	1961-65	1966-70
C00-96	**All sites**	**4142**	**4581**	**5315**
C00-14	**Mouth, pharynx**	**60**	**67**	**74**
C00	Lip	8	9	10
C01-02	Tongue	10	13	17
C03-06	Mouth, other	11	13	17
C07-08	Salivary glands	8	14	14
C09-14	Pharynx	23	19	17
C15-26	**Digestive organs**	**1384**	**1436**	**1579**
C15	Oesophagus	23	29	30
C16	Stomach	595	538	501
C17	Small intestine	10	11	13
C18	Colon	273	337	427
C19-21	Rectum, rectosigmoid, anus	127	138	214
C22	Liver	11	14	19
C23-24	Gallbladder, bile ducts	47	52	61
C25	Pancreas	97	119	156
C26	Other digestive organs	202	198	158
C30-34, C38	**Respiratory organs**	**89**	**108**	**156**
C30-31	Nose, sinuses	13	13	12
C32	Larynx, epiglottis	2	4	6
C33-34	Lung, trachea	70	84	131
C38	Mediastinum, pleura (non-mesothelioma)	4	7	6
C40-41	**Bone**	**9**	**11**	**12**
C43	**Melanoma of the skin**	**55**	**88**	**120**
C44	**Skin, non-melanoma**	**53**	**47**	**49**
C45	**Mesothelioma**	**0**	**1**	**1**
C46	**Kaposi's sarcoma**	**0**	**1**	**2**
C47	**Autonomic nervous system**	**17**	**11**	**14**
C48-49	**Soft tissues**	**17**	**26**	**27**
C50	**Breast**	**921**	**1045**	**1201**
C51-58	**Female genital organs**	**865**	**952**	**1101**
C53	Cervix uteri	341	358	396
C54	Corpus uteri	175	216	260
C55	Uterus, other	23	21	14
C56	Ovary	259	286	358
C51-52, C57	Other female genital	66	69	69
C58	Placenta	3	2	4
C64-68	**Urinary organs**	**197**	**219**	**262**
C64	Kidney excl. renal pelvis	75	89	110
C65	Renal pelvis	6	5	12
C66-68	Bladder, ureter, urethra	115	125	140
C69	**Eye**	**15**	**18**	**17**
C70-72	**Central nervous system**	**105**	**120**	**131**
C73	**Thyroid gland**	**53**	**58**	**85**
C37, C74-75	**Other endocrine glands**	**7**	**7**	**10**
C39, C76, C80	**Other or unspecified**	**47**	**70**	**97**
C81-96	**Lymphoid and haematopoietic tissue**	**248**	**298**	**377**
C81	Hodgkin lymphoma	31	37	45
C82-85, C96	Non-Hodgkin lymphoma	63	76	117
C88	Malignant immunoproliferative diseases	0	0	0
C90	Multiple myeloma	37	58	77
C91-95	Leukaemia	116	126	137

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

FEMALES

Period							
1971-75	1976-80	1981-85	1986-90	1991-95	1996-2000	2001-05	2006-10
6035	**7039**	**7788**	**8487**	**9392**	**10425**	**11689**	**12763**
78	**88**	**100**	**111**	**122**	**132**	**143**	**189**
10	16	20	27	29	26	30	51
16	18	22	24	22	27	27	32
17	21	24	28	36	34	36	45
12	13	14	13	17	20	20	24
22	21	20	19	19	25	31	38
1691	**1986**	**2146**	**2208**	**2341**	**2455**	**2552**	**2731**
30	31	35	37	42	47	54	56
423	411	391	353	306	255	228	207
19	19	28	28	31	40	49	56
495	657	772	874	986	1098	1178	1292
266	359	419	441	498	506	536	559
30	34	44	41	45	44	47	60
49	69	83	78	72	83	74	84
183	218	266	287	303	318	334	356
195	188	109	70	58	64	50	59
195	**242**	**332**	**455**	**589**	**746**	**922**	**1185**
14	13	12	16	17	16	18	21
7	10	12	11	18	20	18	19
165	213	303	423	548	702	880	1139
8	6	5	4	6	7	7	7
13	**13**	**13**	**15**	**17**	**20**	**19**	**23**
178	**259**	**338**	**431**	**485**	**502**	**555**	**686**
107	**146**	**207**	**275**	**384**	**467**	**565**	**698**
2	**3**	**4**	**6**	**9**	**8**	**9**	**14**
4	**3**	**5**	**6**	**6**	**5**	**2**	**4**
10	**7**	**5**	**9**	**7**	**7**	**5**	**6**
35	**42**	**45**	**46**	**46**	**56**	**75**	**89**
1380	**1565**	**1698**	**1830**	**2028**	**2437**	**2745**	**2767**
1221	**1296**	**1288**	**1308**	**1389**	**1425**	**1537**	**1595**
437	410	365	336	354	318	297	302
310	370	383	408	454	506	635	702
9	7	6	6	8	9	9	9
340	377	416	445	458	466	460	446
122	130	114	108	111	123	132	133
3	2	4	5	5	4	4	2
316	**373**	**413**	**462**	**488**	**515**	**570**	**619**
117	137	149	180	188	191	211	240
16	17	17	21	21	24	28	30
183	219	246	261	279	299	331	349
18	**23**	**21**	**23**	**30**	**28**	**31**	**29**
140	**186**	**214**	**255**	**293**	**397**	**545**	**588**
107	**129**	**142**	**136**	**139**	**122**	**149**	**173**
15	**28**	**48**	**37**	**48**	**58**	**90**	**118**
103	**162**	**221**	**270**	**311**	**311**	**289**	**218**
422	**490**	**551**	**604**	**661**	**734**	**885**	**1030**
41	45	37	36	31	43	45	48
111	145	194	237	280	312	342	391
4	3	6	7	14	10	19	19
106	125	129	138	137	143	160	162
160	173	185	186	199	226	320	410

Table 12a. Age-adjusted (world) incidence rates per 100 000 person-years by primary site* and five-year period 1956-2010

ICD10	Site	1956-60	1961-65	1966-70
C00-96	**All sites**	**171.1**	**181.8**	**197.4**
C00-14	**Mouth, pharynx**	**8.0**	**7.4**	**7.4**
C00	Lip	4.2	3.7	3.7
C01-02	Tongue	0.8	0.9	0.8
C03-06	Mouth, other	0.9	0.8	1.2
C07-08	Salivary glands	0.5	0.5	0.6
C09-14	Pharynx	1.5	1.6	1.2
C15-26	**Digestive organs**	**69.1**	**65.9**	**65.5**
C15	Oesophagus	3.1	3.1	2.6
C16	Stomach	35.6	30.2	26.9
C17	Small intestine	0.5	0.4	0.7
C18	Colon	9.9	11.2	12.6
C19-21	Rectum, rectosigmoid, anus	6.5	7.2	9.1
C22	Liver	0.8	0.9	1.3
C23-24	Gallbladder, bile ducts	0.7	0.9	0.9
C25	Pancreas	6.2	6.8	7.6
C26	Other digestive organs	5.7	5.3	3.7
C30-34, C38	**Respiratory organs**	**14.5**	**18.2**	**23.6**
C30-31	Nose, sinuses	0.8	0.8	0.8
C32	Larynx, epiglottis	1.4	1.8	2.6
C33-34	Lung, trachea	11.7	15.1	19.7
C38	Mediastinum, pleura (non-mesothelioma)	0.6	0.4	0.5
C40-41	**Bone**	**0.8**	**0.8**	**0.8**
C43	**Melanoma of the skin**	**2.4**	**3.5**	**4.6**
C44	**Skin, non-melanoma**	**3.5**	**2.7**	**3.1**
C45	**Mesothelioma**	**0.0**	**0.1**	**0.1**
C46	**Kaposi's sarcoma**	**0.1**	**0.1**	**0.1**
C47	**Autonomic nervous system**	**1.0**	**0.7**	**0.7**
C48-49	**Soft tissues**	**1.0**	**1.0**	**1.4**
C50	**Breast**	**0.3**	**0.3**	**0.3**
C60-63	**Male genital organs**	**29.5**	**34.5**	**37.7**
C61	Prostate	25.7	29.9	32.9
C62	Testis	3.0	3.7	4.0
C60, C63	Other male genital	0.7	0.9	0.8
C64-68	**Urinary organs**	**13.2**	**16.1**	**18.1**
C64	Kidney excl. renal pelvis	4.3	5.1	5.8
C65	Renal pelvis	0.4	0.5	0.6
C66-68	Bladder, ureter, urethra	8.6	10.6	11.7
C69	**Eye**	**0.9**	**0.8**	**1.0**
C70-72	**Central nervous system**	**6.1**	**6.5**	**6.8**
C73	**Thyroid gland**	**0.9**	**1.0**	**1.4**
C37, C74-75	**Other endocrine glands**	**0.3**	**0.5**	**0.8**
C39, C76, C80	**Other or unspecified**	**2.4**	**3.4**	**4.5**
C81-96	**Lymphoid and haematopoietic tissue**	**17.2**	**18.1**	**19.2**
C81	Hodgkin lymphoma	2.3	2.6	2.7
C82-85, C96	Non-Hodgkin lymphoma	4.5	4.5	5.6
C88	Malignant immunoproliferative diseases	0.0	0.0	0.1
C90	Multiple myeloma	3.1	3.2	3.2
C91-95	Leukaemia	7.3	7.8	7.7

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

MALES

Period							
1971-75	1976-80	1981-85	1986-90	1991-95	1996-2000	2001-05	2006-10
215.8	**239.8**	**260.6**	**273.4**	**296.2**	**318.8**	**338.2**	**362.2**
8.5	**8.0**	**8.1**	**8.3**	**8.2**	**8.4**	**7.4**	**7.9**
4.2	3.8	3.0	2.8	2.2	1.8	1.3	1.7
0.9	1.0	1.2	1.3	1.4	1.5	1.6	1.6
1.0	1.2	1.5	1.6	1.8	1.7	1.4	1.3
0.5	0.5	0.5	0.5	0.6	0.7	0.6	0.5
2.0	1.5	1.8	2.2	2.2	2.7	2.6	2.7
64.3	**66.8**	**69.2**	**67.6**	**68.5**	**67.6**	**69.2**	**68.7**
2.7	2.7	2.7	3.0	3.2	3.4	3.6	3.8
21.7	18.6	16.9	14.6	12.4	10.3	8.3	6.9
0.5	0.7	1.0	0.8	1.0	1.1	1.5	1.8
13.2	16.2	19.0	21.3	23.1	24.4	25.6	26.2
10.5	13.8	15.5	15.6	16.7	16.6	17.7	17.0
1.9	1.7	2.1	1.8	1.8	1.9	2.1	2.6
0.9	1.1	1.3	1.3	1.5	1.5	1.7	1.6
8.2	8.2	8.7	8.2	7.7	7.3	7.9	7.8
4.6	3.9	2.1	1.1	1.2	1.1	0.9	1.1
27.6	**33.3**	**37.9**	**39.7**	**41.0**	**41.0**	**40.5**	**39.2**
0.8	0.8	0.7	0.7	0.6	0.7	0.7	0.6
2.5	3.1	3.5	3.4	3.3	3.2	2.9	2.5
23.7	28.8	33.2	35.3	36.5	36.6	36.6	35.8
0.7	0.7	0.5	0.2	0.6	0.5	0.3	0.3
1.0	**0.9**	**1.1**	**0.9**	**0.9**	**0.9**	**1.0**	**1.0**
6.6	**8.4**	**9.9**	**13.0**	**15.1**	**14.6**	**14.9**	**17.2**
5.4	**6.6**	**7.5**	**9.6**	**11.8**	**13.8**	**14.8**	**16.1**
0.3	**0.6**	**0.8**	**1.2**	**1.0**	**1.4**	**1.6**	**1.4**
0.2	**0.2**	**0.2**	**0.3**	**0.4**	**0.2**	**0.2**	**0.2**
0.5	**0.5**	**0.5**	**0.4**	**0.3**	**0.3**	**0.3**	**0.4**
1.7	**2.0**	**1.7**	**1.5**	**1.6**	**1.6**	**1.6**	**1.7**
0.3	**0.3**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**
42.0	**47.1**	**51.5**	**53.9**	**67.0**	**86.2**	**97.3**	**116.0**
36.9	40.9	44.0	46.0	57.7	75.1	85.4	103.2
4.3	5.3	6.5	7.2	8.4	10.2	10.7	11.6
0.8	0.9	1.0	0.8	0.9	0.9	1.2	1.2
22.2	**25.6**	**29.5**	**30.3**	**32.2**	**31.1**	**32.7**	**33.8**
6.3	6.8	8.3	8.0	8.2	8.5	9.8	10.8
0.9	1.0	1.0	0.9	1.1	1.1	0.9	1.2
15.0	17.7	20.2	21.3	22.9	21.6	22.0	21.8
0.7	**1.0**	**1.0**	**0.9**	**1.0**	**1.0**	**1.0**	**0.9**
7.2	**8.1**	**9.0**	**9.8**	**9.9**	**11.9**	**14.0**	**14.1**
1.4	**1.6**	**1.6**	**1.8**	**1.6**	**1.6**	**1.8**	**2.0**
1.2	**1.3**	**1.9**	**1.8**	**2.0**	**2.4**	**2.8**	**3.7**
4.9	**5.8**	**6.5**	**7.5**	**7.9**	**7.3**	**5.2**	**3.8**
19.7	**21.8**	**22.4**	**24.3**	**25.2**	**27.1**	**31.5**	**33.8**
2.7	2.7	2.3	2.0	2.1	2.4	2.7	2.7
5.0	5.8	7.2	9.1	10.1	11.1	11.0	12.5
0.2	0.2	0.3	0.2	0.5	0.5	0.8	0.7
3.8	4.7	4.5	4.7	4.4	4.3	4.7	4.7
7.9	8.4	8.1	8.2	8.2	8.7	12.3	13.2

Table 12b. Age-adjusted (world) incidence rates per 100 000 person-years by primary site* and five-year period 1956-2010

ICD10	Site	1956-60	1961-65	1966-70
C00-96	**All sites**	**163.7**	**168.3**	**181.3**
C00-14	**Mouth, pharynx**	**2.3**	**2.3**	**2.3**
C00	Lip	0.3	0.3	0.3
C01-02	Tongue	0.4	0.4	0.4
C03-06	Mouth, other	0.4	0.4	0.5
C07-08	Salivary glands	0.3	0.5	0.5
C09-14	Pharynx	0.9	0.7	0.6
C15-26	**Digestive organs**	**48.8**	**45.8**	**45.4**
C15	Oesophagus	0.8	0.9	0.8
C16	Stomach	20.7	16.8	14.1
C17	Small intestine	0.4	0.4	0.4
C18	Colon	9.8	10.9	12.6
C19-21	Rectum, rectosigmoid, anus	4.6	4.6	6.5
C22	Liver	0.4	0.6	0.6
C23-24	Gallbladder, bile ducts	1.6	1.7	1.7
C25	Pancreas	3.5	3.9	4.5
C26	Other digestive organs	6.9	6.1	4.3
C30-34, C38	**Respiratory organs**	**3.4**	**3.8**	**5.0**
C30-31	Nose, sinuses	0.5	0.4	0.4
C32	Larynx, epiglottis	0.1	0.2	0.2
C33-34	Lung, trachea	2.7	2.9	4.2
C38	Mediastinum, pleura (non-mesothelioma)	0.2	0.3	0.2
C40-41	**Bone**	**0.5**	**0.5**	**0.6**
C43	**Melanoma of the skin**	**2.4**	**4.0**	**5.1**
C44	**Skin, non-melanoma**	**1.9**	**1.5**	**1.4**
C45	**Mesothelioma**	**0.0**	**0.0**	**0.0**
C46	**Kaposi's sarcoma**	**0.0**	**0.0**	**0.1**
C47	**Autonomic nervous system**	**0.8**	**0.5**	**0.7**
C48-49	**Soft tissues**	**0.7**	**1.1**	**1.1**
C50	**Breast**	**37.5**	**39.9**	**43.1**
C51-58	**Female genital organs**	**37.1**	**38.2**	**42.3**
C53	Cervix uteri	15.3	15.6	17.1
C54	Corpus uteri	7.2	8.2	9.1
C55	Uterus, other	0.8	0.7	0.4
C56	Ovary	11.1	11.2	13.3
C51-52, C57	Other female genital	2.5	2.3	2.1
C58	Placenta	0.2	0.2	0.2
C64-68	**Urinary organs**	**7.5**	**7.4**	**7.9**
C64	Kidney excl. renal pelvis	3.0	3.2	3.6
C65	Renal pelvis	0.2	0.2	0.4
C66-68	Bladder, ureter, urethra	4.2	4.0	4.0
C69	**Eye**	**0.7**	**0.8**	**0.7**
C70-72	**Central nervous system**	**5.1**	**5.4**	**5.7**
C73	**Thyroid gland**	**2.2**	**2.4**	**3.3**
C37, C74-75	**Other endocrine glands**	**0.3**	**0.3**	**0.5**
C39, C76, C80	**Other or unspecified**	**1.8**	**2.5**	**3.0**
C81-96	**Lymphoid and haematopoietic tissue**	**10.7**	**11.9**	**13.3**
C81	Hodgkin lymphoma	1.5	1.7	1.9
C82-85, C96	Non-Hodgkin lymphoma	2.6	2.8	4.1
C88	Malignant immunoproliferative diseases	0.0	0.0	0.0
C90	Multiple myeloma	1.4	2.0	2.2
C91-95	Leukaemia	5.2	5.3	5.0

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

FEMALES

Period							
1971-75	1976-80	1981-85	1986-90	1991-95	1996-2000	2001-05	2006-10
195.4	**213.2**	**221.6**	**229.9**	**248.1**	**267.2**	**286.3**	**294.3**
2.3	**2.3**	**2.7**	**2.8**	**3.2**	**3.4**	**3.4**	**4.3**
0.3	0.4	0.5	0.6	0.7	0.6	0.6	1.0
0.4	0.5	0.6	0.6	0.6	0.7	0.6	0.7
0.5	0.5	0.6	0.7	0.9	0.9	0.8	0.9
0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.6
0.7	0.5	0.6	0.6	0.5	0.7	0.8	1.0
45.2	**48.4**	**48.6**	**47.3**	**49.5**	**49.6**	**50.5**	**51.2**
0.7	0.7	0.7	0.8	0.8	1.0	1.1	1.0
11.0	9.6	8.5	7.1	6.0	4.8	4.3	3.7
0.6	0.5	0.7	0.7	0.8	1.0	1.2	1.2
13.7	16.4	18.0	19.1	21.0	22.4	23.0	23.5
7.4	9.4	10.2	10.1	11.6	11.1	11.5	11.6
0.9	0.9	1.1	1.0	1.0	1.0	1.0	1.1
1.2	1.6	1.8	1.6	1.5	1.6	1.4	1.6
4.8	5.2	5.7	5.9	6.0	5.9	6.2	6.4
4.8	4.1	1.9	1.1	0.9	0.9	0.8	0.9
6.0	**7.1**	**9.4**	**12.6**	**16.2**	**19.9**	**22.6**	**26.1**
0.5	0.3	0.3	0.4	0.4	0.4	0.4	0.5
0.2	0.3	0.3	0.3	0.5	0.5	0.4	0.4
5.1	6.3	8.7	11.7	15.1	18.8	21.6	25.1
0.3	0.2	0.1	0.1	0.2	0.2	0.1	0.1
0.6	**0.6**	**0.6**	**0.6**	**0.7**	**0.8**	**0.8**	**0.8**
7.5	**10.1**	**12.4**	**15.4**	**16.2**	**15.6**	**16.0**	**18.2**
2.7	**3.4**	**4.3**	**5.2**	**7.1**	**8.0**	**9.2**	**10.7**
0.1	**0.1**	**0.1**	**0.2**	**0.2**	**0.2**	**0.2**	**0.3**
0.1	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.1**
0.4	**0.3**	**0.3**	**0.4**	**0.3**	**0.3**	**0.2**	**0.3**
1.3	**1.5**	**1.5**	**1.4**	**1.5**	**1.6**	**2.1**	**2.3**
47.2	**50.9**	**51.9**	**53.5**	**58.7**	**70.8**	**76.9**	**72.7**
45.2	**45.8**	**42.9**	**41.0**	**42.1**	**40.8**	**40.9**	**39.8**
18.6	16.7	13.9	12.1	12.3	10.8	9.6	9.6
10.5	12.1	12.2	12.4	13.2	13.9	16.0	16.5
0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1
12.3	13.2	13.6	13.6	13.7	13.1	12.2	10.8
3.4	3.4	2.9	2.6	2.5	2.7	2.8	2.7
0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1
8.9	**9.8**	**10.0**	**10.8**	**10.9**	**11.3**	**11.8**	**12.7**
3.6	4.0	4.0	4.6	4.6	4.7	4.8	5.5
0.4	0.4	0.4	0.5	0.4	0.5	0.6	0.6
4.9	5.4	5.6	5.7	6.0	6.1	6.4	6.6
0.7	**0.7**	**0.9**	**0.8**	**1.0**	**0.8**	**0.9**	**0.8**
5.9	**7.4**	**8.1**	**9.3**	**10.1**	**12.8**	**16.7**	**16.9**
4.2	**5.0**	**5.1**	**4.8**	**4.8**	**4.1**	**4.8**	**5.4**
0.7	**1.2**	**2.1**	**1.6**	**1.9**	**2.2**	**3.3**	**4.1**
2.8	**4.1**	**4.8**	**5.6**	**6.2**	**5.7**	**4.7**	**3.5**
13.6	**14.7**	**15.7**	**16.6**	**17.4**	**19.3**	**21.4**	**24.2**
1.6	1.8	1.4	1.4	1.3	1.8	1.7	1.8
3.5	4.4	5.4	6.6	7.4	8.0	8.2	9.1
0.1	0.1	0.2	0.1	0.3	0.2	0.4	0.4
3.0	3.1	3.0	3.0	2.8	2.9	3.2	3.2
5.4	5.4	5.8	5.4	5.6	6.4	7.9	9.7

Table 13a. Average annual number of new cases by primary site* and county - 2006-2010

ICD10	Site	Norway	Østfold	Akershus	Oslo	Hedmark	Oppland	Buskerud
C00-96	**All sites**	**14665**	**907**	**1471**	**1355**	**669**	**627**	**859**
C00-14	**Mouth, pharynx**	**299**	**20**	**30**	**31**	**16**	**9**	**14**
C00	Lip	73	5	8	4	5	2	4
C01-02	Tongue	60	3	7	8	3	2	2
C03-06	Mouth, other	50	4	4	6	2	2	2
C07-08	Salivary glands	20	2	3	1	1	1	0
C09-14	Pharynx	96	6	9	12	5	2	6
C15-26	**Digestive organs**	**2935**	**175**	**296**	**267**	**135**	**130**	**163**
C15	Oesophagus	156	9	17	17	8	7	10
C16	Stomach	302	15	27	31	11	14	15
C17	Small intestine	70	4	6	5	3	3	3
C18	Colon	1154	71	110	95	52	52	64
C19-21	Rectum, rectosigmoid, anus	702	47	72	59	34	29	43
C22	Liver	101	5	12	15	6	4	4
C23-24	Gallbladder, bile ducts	68	3	7	7	3	5	3
C25	Pancreas	334	19	38	33	16	13	17
C26	Other digestive organs	47	3	7	5	3	2	3
C30-34, C38	**Respiratory organs**	**1641**	**105**	**146**	**139**	**79**	**69**	**88**
C30-31	Nose, sinuses	23	1	3	2	1	1	1
C32	Larynx, epiglottis	99	7	7	10	6	5	4
C33-34	Lung, trachea	1507	96	135	127	72	63	82
C38	Mediastinum, pleura (non-mesothelioma)	12	1	1	1	0	0	0
C40-41	**Bone**	**26**	**1**	**2**	**4**	**0**	**1**	**1**
C43	**Melanoma of the skin**	**652**	**47**	**82**	**62**	**26**	**24**	**46**
C44	**Skin, non-melanoma**	**796**	**55**	**77**	**70**	**37**	**26**	**69**
C45	**Mesothelioma**	**63**	**3**	**7**	**4**	**1**	**2**	**4**
C46	**Kaposi's sarcoma**	**6**	**0**	**1**	**2**	**0**	**0**	**0**
C47	**Autonomic nervous system**	**7**	**0**	**0**	**0**	**0**	**0**	**1**
C48-49	**Soft tissues**	**59**	**3**	**8**	**5**	**4**	**2**	**2**
C50	**Breast**	**16**	**1**	**2**	**2**	**0**	**0**	**1**
C60-63	**Male genital organs**	**4605**	**273**	**441**	**400**	**201**	**217**	**277**
C61	Prostate	4266	254	407	357	190	205	261
C62	Testis	293	16	29	39	9	11	14
C60, C63	Other male genital	46	3	4	4	2	1	2
C64-68	**Urinary organs**	**1437**	**102**	**150**	**134**	**66**	**56**	**75**
C64	Kidney excl. renal pelvis	417	31	50	38	18	17	25
C65	Renal pelvis	53	4	6	5	2	2	1
C66-68	Bladder, ureter, urethra	967	67	94	91	46	36	49
C69	**Eye**	**31**	**3**	**4**	**3**	**1**	**1**	**1**
C70-72	**Central nervous system**	**455**	**27**	**43**	**44**	**19**	**17**	**22**
C73	**Thyroid gland**	**72**	**3**	**7**	**11**	**3**	**2**	**5**
C37, C74-75	**Other endocrine glands**	**117**	**6**	**12**	**12**	**6**	**3**	**6**
C39, C76, C80	**Other or unspecified**	**175**	**12**	**17**	**20**	**9**	**8**	**9**
C81-96	**Lymphoid and haematopoietic tissue**	**1272**	**70**	**149**	**145**	**67**	**59**	**75**
C81	Hodgkin lymphoma	73	6	7	10	4	3	4
C82-85, C96	Non-Hodgkin lymphoma	477	24	53	57	28	27	21
C88	Malignant immunoproliferative diseases	29	2	4	3	1	2	1
C90	Multiple myeloma	199	10	24	21	8	8	13
C91-95	Leukaemia	494	29	60	53	26	19	36

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

MALES

Vestfold	Telemark	Aust-Agder	Vest-Agder	Rogaland	Hordaland	Sogn og Fjordane	Møre og Romsdal	Sør-Trøndelag	Nord-Trøndelag	Nordland	Troms	Finnmark
803	**584**	**381**	**506**	**1193**	**1405**	**398**	**873**	**789**	**400**	**800**	**452**	**193**
16	**15**	**8**	**10**	**25**	**26**	**7**	**17**	**18**	**7**	**20**	**9**	**3**
5	4	2	4	8	7	1	3	4	1	5	1	1
4	2	2	2	3	5	1	5	3	1	5	1	1
2	2	1	1	5	5	2	3	2	1	3	2	0
2	2	0	1	2	2	0	1	1	0	1	0	0
4	5	2	3	6	8	2	5	8	3	7	4	1
152	**109**	**62**	**93**	**230**	**313**	**80**	**180**	**163**	**85**	**161**	**103**	**39**
6	6	4	6	10	14	4	8	8	4	10	5	2
14	11	5	9	21	33	10	23	17	9	17	12	8
5	3	2	2	6	7	0	4	8	3	4	2	1
66	43	22	38	98	130	32	71	59	37	67	36	11
35	22	17	23	56	78	21	44	35	15	36	27	10
4	5	2	4	6	9	2	4	7	3	5	3	1
3	3	2	2	5	7	2	3	5	2	3	2	1
17	15	7	8	26	33	6	20	22	10	16	13	5
2	1	1	1	3	2	1	3	3	2	2	2	1
90	**60**	**49**	**69**	**130**	**156**	**44**	**99**	**93**	**43**	**89**	**58**	**34**
1	0	0	1	2	3	0	1	1	0	2	1	1
5	6	3	5	8	9	1	6	5	2	6	3	1
84	54	45	62	119	142	42	91	86	40	81	53	32
1	1	0	0	1	2	0	1	1	0	1	1	0
1	**2**	**1**	**1**	**3**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**1**
45	**27**	**12**	**22**	**69**	**63**	**12**	**26**	**36**	**14**	**20**	**14**	**4**
52	**44**	**29**	**42**	**72**	**72**	**14**	**30**	**40**	**19**	**29**	**15**	**4**
7	**4**	**2**	**2**	**6**	**8**	**2**	**2**	**4**	**1**	**3**	**1**	**1**
0	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**
0	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**
3	**2**	**2**	**1**	**6**	**6**	**2**	**3**	**2**	**2**	**3**	**2**	**1**
2	**0**	**0**	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**0**	**0**
240	**183**	**127**	**153**	**390**	**416**	**151**	**305**	**231**	**121**	**285**	**138**	**55**
224	173	120	141	359	381	145	285	210	112	266	127	49
13	8	7	11	27	30	5	16	18	8	16	10	5
3	2	1	2	4	6	1	3	2	1	3	1	1
82	**55**	**36**	**40**	**107**	**136**	**35**	**89**	**79**	**40**	**86**	**47**	**22**
20	15	7	12	32	42	8	26	24	12	21	11	7
5	2	2	2	3	5	2	3	5	2	2	2	1
57	38	27	26	72	89	25	60	50	27	64	33	14
3	**1**	**1**	**1**	**3**	**3**	**1**	**2**	**1**	**0**	**1**	**0**	**1**
21	**17**	**13**	**15**	**38**	**47**	**11**	**24**	**34**	**14**	**25**	**17**	**7**
3	**3**	**1**	**3**	**4**	**6**	**2**	**6**	**7**	**1**	**3**	**2**	**1**
6	**4**	**3**	**4**	**9**	**15**	**3**	**8**	**6**	**4**	**6**	**3**	**2**
10	**7**	**5**	**5**	**12**	**15**	**5**	**9**	**8**	**6**	**9**	**5**	**3**
69	**50**	**30**	**42**	**87**	**116**	**29**	**69**	**64**	**40**	**57**	**37**	**16**
3	2	2	2	6	8	1	3	5	2	3	3	1
24	17	12	17	33	42	11	27	23	15	22	15	7
2	1	0	1	1	3	0	1	2	2	1	1	0
12	9	6	5	15	17	5	12	10	6	9	6	4
29	21	10	17	32	46	11	26	24	15	22	12	5

Table 13b. Average annual number of new cases by primary site* and county - 2006-2010

ICD10	Site	Norway	Østfold	Akershus	Oslo	Hedmark	Oppland	Buskerud
C00-96	**All sites**	**12763**	**794**	**1336**	**1408**	**581**	**521**	**752**
C00-14	**Mouth, pharynx**	**189**	**13**	**18**	**23**	**9**	**10**	**11**
C00	Lip	51	3	5	4	2	3	3
C01-02	Tongue	32	2	3	4	1	2	2
C03-06	Mouth, other	45	3	4	5	3	2	3
C07-08	Salivary glands	24	2	2	3	1	1	1
C09-14	Pharynx	38	3	4	5	1	2	2
C15-26	**Digestive organs**	**2731**	**179**	**259**	**276**	**119**	**108**	**147**
C15	Oesophagus	56	2	6	8	3	2	3
C16	Stomach	207	10	14	20	8	8	11
C17	Small intestine	56	4	6	6	3	1	3
C18	Colon	1292	89	120	133	57	49	73
C19-21	Rectum, rectosigmoid, anus	559	37	61	56	22	25	28
C22	Liver	60	4	6	6	4	2	3
C23-24	Gallbladder, bile ducts	84	5	6	7	5	4	3
C25	Pancreas	356	24	32	35	14	15	19
C26	Other digestive organs	59	4	7	6	3	3	3
C30-34, C38	**Respiratory organs**	**1185**	**74**	**127**	**138**	**59**	**43**	**71**
C30-31	Nose, sinuses	21	1	2	2	1	1	2
C32	Larynx, epiglottis	19	0	2	4	1	1	1
C33-34	Lung, trachea	1139	72	122	131	56	42	68
C38	Mediastinum, pleura (non-mesothelioma)	7	0	1	1	0	0	0
C40-41	**Bone**	**23**	**2**	**1**	**3**	**1**	**1**	**1**
C43	**Melanoma of the skin**	**686**	**48**	**74**	**74**	**29**	**26**	**45**
C44	**Skin, non-melanoma**	**698**	**48**	**58**	**68**	**28**	**21**	**68**
C45	**Mesothelioma**	**14**	**1**	**2**	**1**	**0**	**1**	**1**
C46	**Kaposi's sarcoma**	**4**	**0**	**0**	**0**	**0**	**0**	**0**
C47	**Autonomic nervous system**	**6**	**0**	**0**	**0**	**0**	**0**	**1**
C48-49	**Soft tissues**	**89**	**5**	**9**	**8**	**4**	**4**	**4**
C50	**Breast**	**2767**	**162**	**315**	**329**	**119**	**110**	**156**
C51-58	**Female genital organs**	**1595**	**93**	**169**	**175**	**86**	**86**	**92**
C53	Cervix uteri	302	15	35	34	16	15	16
C54	Corpus uteri	702	39	80	75	39	37	39
C55	Uterus, other	9	0	0	0	1	0	1
C56	Ovary	446	30	45	53	24	26	29
C51-52, C57	Other female genital	133	7	9	12	7	8	7
C58	Placenta	2	0	0	0	0	0	0
C64-68	**Urinary organs**	**619**	**48**	**59**	**72**	**27**	**24**	**32**
C64	Kidney excl. renal pelvis	240	22	21	24	9	8	13
C65	Renal pelvis	30	2	3	3	2	0	2
C66-68	Bladder, ureter, urethra	349	24	35	44	15	15	17
C69	**Eye**	**29**	**2**	**3**	**4**	**2**	**2**	**1**
C70-72	**Central nervous system**	**588**	**30**	**60**	**58**	**25**	**24**	**30**
C73	**Thyroid gland**	**173**	**7**	**22**	**19**	**11**	**5**	**10**
C37, C74-75	**Other endocrine glands**	**118**	**8**	**14**	**16**	**4**	**3**	**5**
C39, C76, C80	**Other or unspecified**	**218**	**13**	**21**	**28**	**12**	**10**	**13**
C81-96	**Lymphoid and haematopoietic tissue**	**1030**	**62**	**124**	**116**	**47**	**43**	**63**
C81	Hodgkin lymphoma	48	2	6	5	3	1	3
C82-85, C96	Non-Hodgkin lymphoma	391	21	44	44	20	17	23
C88	Malignant immunoproliferative diseases	19	2	3	3	1	1	1
C90	Multiple myeloma	162	9	19	19	8	8	9
C91-95	Leukaemia	410	28	52	45	16	16	28

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

FEMALES

Vestfold	Telemark	Aust-Agder	Vest-Agder	Rogaland	Hordaland	Sogn og Fjordane	Møre og Romsdal	Sør-Trøndelag	Nord-Trøndelag	Nordland	Troms	Finnmark
712	**506**	**300**	**465**	**992**	**1201**	**279**	**669**	**732**	**359**	**634**	**362**	**161**
10	**8**	**5**	**7**	**12**	**14**	**4**	**9**	**12**	**4**	**11**	**7**	**2**
3	2	2	3	6	4	2	2	2	1	2	1	0
2	1	1	1	2	2	1	2	3	1	2	1	1
3	2	1	1	1	3	1	2	3	1	4	2	0
1	1	0	1	1	2	1	2	2	1	1	1	0
2	2	1	1	2	4	0	1	3	0	2	2	1
146	**89**	**61**	**85**	**209**	**286**	**76**	**177**	**169**	**78**	**146**	**83**	**37**
3	2	2	2	3	4	2	2	4	1	3	3	1
10	9	4	5	16	25	7	16	14	5	13	7	6
2	1	1	2	4	5	1	3	6	2	4	0	0
67	42	28	41	102	139	35	88	73	39	67	39	11
35	14	14	17	43	61	17	31	34	14	28	16	8
2	1	1	2	5	5	2	4	4	1	4	3	1
4	4	2	3	5	7	4	6	6	4	3	3	1
19	13	8	11	27	35	8	23	24	10	21	11	9
3	2	2	2	4	4	1	4	3	3	4	2	0
67	**47**	**31**	**52**	**81**	**94**	**22**	**57**	**66**	**35**	**65**	**36**	**20**
2	1	0	0	0	2	0	1	0	0	1	1	1
1	1	0	1	1	1	0	0	1	0	1	1	0
64	45	30	51	80	90	21	56	63	34	63	34	19
0	0	0	0	0	1	0	0	1	0	0	0	1
2	**1**	**1**	**1**	**2**	**3**	**0**	**1**	**1**	**1**	**0**	**0**	**0**
42	**29**	**20**	**25**	**71**	**69**	**10**	**29**	**41**	**18**	**16**	**13**	**7**
39	**43**	**27**	**42**	**72**	**61**	**11**	**20**	**36**	**19**	**25**	**9**	**3**
1	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**0**
0	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**
0	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4	**4**	**2**	**2**	**6**	**7**	**2**	**5**	**6**	**4**	**7**	**4**	**2**
167	**104**	**55**	**100**	**218**	**248**	**58**	**153**	**148**	**78**	**136**	**79**	**34**
79	**69**	**33**	**60**	**131**	**140**	**31**	**73**	**87**	**40**	**80**	**49**	**20**
13	11	5	10	25	31	6	11	15	9	21	11	4
37	34	15	29	60	61	13	29	40	15	31	20	8
0	0	0	0	1	1	0	0	0	1	0	1	0
20	17	10	17	34	35	9	23	23	11	21	13	7
9	7	2	4	11	12	4	9	8	4	7	4	1
0	0	0	0	0	0	0	0	0	0	0	0	0
29	**22**	**18**	**21**	**43**	**54**	**12**	**32**	**42**	**15**	**41**	**22**	**7**
9	10	6	10	15	21	6	11	18	9	16	9	4
3	1	1	1	2	2	0	2	2	0	2	1	0
17	11	11	10	25	30	6	19	22	6	23	13	3
1	**1**	**0**	**0**	**3**	**3**	**1**	**2**	**1**	**0**	**1**	**1**	**0**
34	**24**	**12**	**20**	**43**	**66**	**16**	**27**	**39**	**25**	**30**	**16**	**8**
9	**10**	**2**	**7**	**8**	**18**	**3**	**11**	**10**	**4**	**10**	**5**	**2**
7	**3**	**2**	**3**	**6**	**17**	**3**	**8**	**7**	**3**	**7**	**2**	**1**
13	**9**	**5**	**6**	**15**	**18**	**5**	**7**	**12**	**8**	**12**	**8**	**3**
62	**44**	**25**	**31**	**70**	**101**	**23**	**55**	**53**	**26**	**46**	**27**	**13**
2	1	1	2	3	5	1	3	5	1	1	1	1
24	16	11	14	29	36	7	22	19	9	21	9	5
1	1	0	0	0	2	1	2	1	1	1	0	1
10	7	3	4	10	17	4	9	6	4	8	6	1
25	18	9	12	27	42	10	19	23	11	14	11	5

Table 14a. Age-adjusted (world) incidence rates per 100 000 person-years by county and primary site* - 2006-2010

ICD10	Site	Norway	Østfold	Akershus	Oslo	Hedmark	Oppland	Buskerud
C00-96	**All sites**	**362.2**	**374.1**	**350.2**	**346.4**	**350.6**	**343.8**	**380.6**
C00-14	**Mouth, pharynx**	**7.9**	**8.6**	**7.4**	**8.4**	**8.9**	**5.7**	**6.5**
C00	Lip	1.7	2.0	1.8	1.0	2.4	1.1	1.6
C01-02	Tongue	1.6	1.2	1.7	2.2	1.9	1.5	1.1
C03-06	Mouth, other	1.3	1.9	1.0	1.4	1.3	0.7	0.7
C07-08	Salivary glands	0.5	0.8	0.7	0.4	0.2	0.7	0.2
C09-14	Pharynx	2.7	2.7	2.2	3.3	3.1	1.7	2.9
C15-26	**Digestive organs**	**68.7**	**68.7**	**66.7**	**65.7**	**65.1**	**67.9**	**68.9**
C15	Oesophagus	3.8	3.6	4.1	4.4	3.9	3.9	4.6
C16	Stomach	6.9	5.5	6.0	7.6	5.3	7.0	6.3
C17	Small intestine	1.8	1.8	1.3	1.4	1.6	1.8	1.4
C18	Colon	26.2	27.3	24.4	22.7	23.4	26.4	26.8
C19-21	Rectum, rectosigmoid, anus	17.0	18.6	16.6	14.5	16.8	16.3	18.2
C22	Liver	2.6	2.3	2.9	3.8	3.1	1.7	2.1
C23-24	Gallbladder, bile ducts	1.6	1.1	1.6	1.8	1.5	2.7	1.2
C25	Pancreas	7.8	7.3	8.4	8.3	8.3	7.0	7.3
C26	Other digestive organs	1.1	1.1	1.4	1.3	1.2	1.2	1.1
C30-34, C38	**Respiratory organs**	**39.2**	**42.0**	**32.7**	**35.4**	**40.4**	**35.6**	**37.6**
C30-31	Nose, sinuses	0.6	0.4	0.8	0.5	0.3	0.6	0.5
C32	Larynx, epiglottis	2.5	2.9	1.6	2.5	3.3	2.3	1.7
C33-34	Lung, trachea	35.8	38.4	30.0	32.1	36.8	32.5	35.3
C38	Mediastinum, pleura (non-mesothelioma)	0.3	0.4	0.3	0.3	0.0	0.1	0.1
C40-41	**Bone**	**1.0**	**0.8**	**0.7**	**1.4**	**0.4**	**0.7**	**0.8**
C43	**Melanoma of the skin**	**17.2**	**21.0**	**20.3**	**15.8**	**14.7**	**15.1**	**21.3**
C44	**Skin, non-melanoma**	**16.1**	**18.5**	**14.9**	**14.4**	**14.5**	**10.8**	**25.6**
C45	**Mesothelioma**	**1.4**	**1.3**	**1.4**	**0.8**	**0.6**	**0.9**	**1.6**
C46	**Kaposi's sarcoma**	**0.2**	**0.0**	**0.1**	**0.5**	**0.0**	**0.0**	**0.1**
C47	**Autonomic nervous system**	**0.4**	**0.4**	**0.1**	**0.2**	**0.6**	**0.2**	**0.7**
C48-49	**Soft tissues**	**1.7**	**1.3**	**2.0**	**1.4**	**2.6**	**1.5**	**1.7**
C50	**Breast**	**0.4**	**0.6**	**0.6**	**0.6**	**0.1**	**0.1**	**0.4**
C60-63	**Male genital organs**	**116.0**	**112.1**	**108.5**	**105.2**	**105.6**	**120.2**	**125.9**
C61	Prostate	103.2	98.9	96.4	93.4	93.1	106.4	114.5
C62	Testis	11.6	11.8	11.1	10.7	11.2	13.1	10.4
C60, C63	Other male genital	1.2	1.3	1.0	1.1	1.3	0.7	1.0
C64-68	**Urinary organs**	**33.8**	**41.5**	**34.4**	**33.8**	**31.5**	**28.4**	**32.1**
C64	Kidney excl. renal pelvis	10.8	13.9	12.3	10.2	10.2	9.8	11.5
C65	Renal pelvis	1.2	1.6	1.5	1.3	0.6	1.1	0.7
C66-68	Bladder, ureter, urethra	21.8	25.9	20.6	22.3	20.7	17.5	20.0
C69	**Eye**	**0.9**	**1.4**	**1.0**	**1.1**	**0.5**	**0.8**	**0.3**
C70-72	**Central nervous system**	**14.1**	**14.9**	**13.0**	**12.7**	**13.6**	**11.7**	**12.6**
C73	**Thyroid gland**	**2.0**	**1.2**	**1.9**	**2.8**	**2.1**	**1.2**	**2.5**
C37, C74-75	**Other endocrine glands**	**3.7**	**3.1**	**3.6**	**3.6**	**5.4**	**2.8**	**3.1**
C39, C76, C80	**Other or unspecified**	**3.8**	**4.3**	**3.6**	**4.8**	**3.9**	**3.6**	**3.5**
C81-96	**Lymphoid and haematopoietic tissue**	**33.8**	**32.5**	**37.2**	**38.1**	**40.2**	**36.6**	**35.4**
C81	Hodgkin lymphoma	2.7	3.4	2.6	3.0	4.2	3.0	3.0
C82-85, C96	Non-Hodgkin lymphoma	12.5	11.4	12.8	15.1	16.2	16.2	9.7
C88	Malignant immunoproliferative diseases	0.7	0.8	1.0	0.7	0.6	0.8	0.7
C90	Multiple myeloma	4.7	3.9	5.4	5.5	4.1	4.1	5.5
C91-95	Leukaemia	13.2	13.0	15.4	13.8	14.9	12.4	16.5

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

MALES

Vestfold	Telemark	Aust-Agder	Vest-Agder	Rogaland	Hordaland	Sogn og Fjordane	Møre og Romsdal	Sør-Trøndelag	Nord-Trøndelag	Nordland	Troms	Finnmark
391.0	**364.5**	**406.2**	**371.5**	**382.2**	**365.4**	**394.1**	**381.4**	**337.8**	**327.1**	**362.2**	**343.2**	**308.2**
8.1	**9.8**	**8.9**	**7.9**	**8.0**	**7.0**	**7.9**	**8.3**	**8.2**	**6.2**	**9.4**	**6.8**	**5.5**
2.2	1.9	1.8	2.7	2.3	1.7	1.6	1.3	1.8	0.9	2.0	0.8	0.9
2.0	1.7	2.8	1.3	1.0	1.3	1.1	2.3	1.4	1.2	2.4	1.2	2.2
1.1	1.5	1.3	0.7	1.8	1.6	2.6	1.5	0.9	1.1	1.2	1.3	0.4
0.8	1.1	0.2	0.9	0.5	0.4	0.3	0.3	0.4	0.3	0.4	0.5	0.5
2.0	3.5	2.7	2.3	2.3	2.1	2.3	2.9	3.8	2.7	3.4	2.9	1.4
70.1	**66.0**	**62.9**	**64.5**	**70.5**	**77.7**	**74.7**	**72.4**	**64.8**	**64.5**	**67.5**	**75.1**	**59.0**
3.2	4.2	4.2	4.1	3.2	3.6	4.7	3.6	3.4	2.9	4.5	4.2	3.0
6.3	6.3	5.1	5.9	6.2	8.1	9.5	9.5	6.4	6.7	6.6	8.7	13.3
2.4	2.0	1.9	1.5	2.0	1.8	0.4	1.9	3.2	2.7	2.1	1.4	0.9
29.7	24.7	21.4	25.4	29.0	31.3	28.6	27.7	22.5	27.8	27.2	25.8	15.8
16.2	13.5	18.0	16.1	18.0	20.1	19.8	18.6	14.6	12.1	16.1	20.1	14.5
2.1	3.3	2.2	3.5	1.9	2.6	2.1	1.5	2.7	2.6	2.2	2.6	0.9
1.4	1.7	2.0	1.4	1.4	1.7	2.4	1.1	2.3	1.2	1.3	1.4	1.0
8.1	9.5	7.2	5.8	7.9	7.9	6.1	7.6	8.6	7.1	6.7	9.3	7.7
0.9	0.7	0.8	0.8	0.9	0.5	1.0	1.0	1.0	1.5	0.9	1.6	2.1
43.2	**37.4**	**50.2**	**51.2**	**41.3**	**39.8**	**42.0**	**41.7**	**36.9**	**33.5**	**37.6**	**41.1**	**49.9**
0.6	0.3	0.4	0.8	0.6	0.8	0.6	0.5	0.7	0.1	0.8	0.5	1.1
2.3	3.5	3.4	3.8	2.7	2.5	1.1	3.1	2.1	1.8	2.7	2.6	2.2
40.0	33.3	46.2	46.5	37.8	36.1	40.1	37.9	33.7	31.4	33.8	37.5	46.2
0.4	0.3	0.2	0.2	0.2	0.4	0.2	0.3	0.4	0.1	0.4	0.5	0.4
0.9	**2.0**	**0.8**	**1.1**	**1.3**	**0.7**	**1.3**	**1.2**	**0.6**	**0.8**	**1.2**	**1.0**	**2.1**
24.4	**19.4**	**13.0**	**16.6**	**22.9**	**17.6**	**12.8**	**12.1**	**16.8**	**12.4**	**10.0**	**11.6**	**8.2**
21.3	**22.1**	**26.2**	**25.3**	**19.9**	**15.3**	**10.2**	**9.8**	**14.6**	**12.1**	**11.3**	**10.2**	**6.4**
3.0	**2.1**	**1.8**	**1.3**	**1.7**	**2.1**	**1.9**	**0.8**	**1.5**	**1.0**	**1.1**	**1.1**	**1.3**
0.2	**0.2**	**0.2**	**0.3**	**0.0**	**0.1**	**0.1**	**0.0**	**0.3**	**0.0**	**0.1**	**0.1**	**0.0**
0.5	**0.0**	**0.0**	**0.0**	**0.5**	**0.5**	**0.0**	**0.1**	**0.9**	**1.2**	**0.1**	**0.0**	**1.1**
1.4	**1.4**	**2.5**	**1.2**	**2.4**	**1.7**	**2.0**	**1.4**	**1.1**	**2.3**	**1.5**	**2.0**	**1.3**
0.8	**0.1**	**0.4**	**0.7**	**0.3**	**0.4**	**0.0**	**0.5**	**0.4**	**0.2**	**0.4**	**0.2**	**0.7**
118.8	**114.1**	**138.3**	**116.0**	**127.1**	**110.8**	**148.8**	**137.2**	**102.0**	**100.0**	**132.4**	**105.5**	**88.1**
106.0	103.3	126.1	102.4	114.3	97.9	138.9	121.6	89.3	87.4	116.6	92.5	73.0
11.4	9.6	11.7	12.1	11.5	11.4	9.1	14.2	11.7	12.1	14.5	11.9	13.8
1.3	1.2	0.5	1.4	1.4	1.5	0.9	1.4	0.9	0.4	1.3	1.1	1.3
37.0	**33.1**	**37.3**	**27.7**	**32.5**	**33.5**	**32.5**	**36.8**	**31.9**	**31.1**	**37.4**	**32.3**	**34.0**
9.9	10.4	7.6	9.2	10.4	11.4	9.4	12.4	11.1	10.5	10.2	8.2	11.3
2.0	1.0	1.7	1.2	1.0	1.2	1.1	1.2	1.7	1.2	0.6	1.6	1.0
25.1	21.7	28.0	17.3	21.1	20.9	21.9	23.3	19.1	19.4	26.6	22.6	21.7
1.4	**0.7**	**1.6**	**1.3**	**1.0**	**0.8**	**1.5**	**0.7**	**0.4**	**0.2**	**0.7**	**0.7**	**0.8**
13.4	**12.9**	**18.7**	**14.3**	**14.5**	**14.9**	**14.3**	**14.8**	**17.5**	**15.1**	**14.4**	**16.1**	**12.7**
1.7	**1.7**	**0.9**	**3.0**	**1.5**	**1.7**	**2.4**	**3.4**	**3.6**	**0.9**	**1.3**	**1.4**	**1.7**
3.7	**3.7**	**3.7**	**3.6**	**3.5**	**4.8**	**3.8**	**4.8**	**3.3**	**4.6**	**3.7**	**2.5**	**4.7**
4.0	**3.7**	**4.6**	**3.5**	**3.7**	**3.3**	**4.6**	**3.2**	**3.0**	**4.0**	**3.3**	**3.1**	**4.1**
37.3	**33.9**	**34.3**	**31.8**	**29.3**	**32.5**	**33.4**	**32.0**	**29.8**	**37.0**	**28.9**	**32.3**	**26.6**
2.1	1.8	3.0	2.7	2.6	2.7	2.0	2.3	2.7	3.0	1.8	3.2	1.1
12.4	12.4	13.4	12.9	10.8	11.8	12.0	12.5	10.3	12.4	10.8	13.1	11.5
0.8	0.5	0.0	0.6	0.2	0.8	0.4	0.4	0.7	1.9	0.4	0.6	0.2
5.9	5.8	5.7	3.2	4.6	4.0	5.0	4.5	4.2	4.5	3.9	4.6	5.6
16.2	13.4	12.3	12.4	11.1	13.1	14.0	12.3	11.8	15.3	11.9	10.7	8.2

Table 14b. Age-adjusted (world) incidence rates per 100 000 person-years by county and primary site* - 2006-2010

ICD10	Site	Norway	Østfold	Akershus	Oslo	Hedmark	Oppland	Buskerud
C00-96	**All sites**	**294.3**	**303.1**	**298.3**	**297.7**	**295.5**	**278.4**	**311.7**
C00-14	**Mouth, pharynx**	**4.3**	**4.7**	**4.1**	**5.2**	**4.1**	**4.9**	**4.0**
C00	Lip	1.0	0.7	1.1	0.8	0.7	1.3	1.0
C01-02	Tongue	0.7	0.7	0.8	1.2	0.7	0.9	0.9
C03-06	Mouth, other	0.9	1.1	0.8	1.2	1.3	1.0	0.8
C07-08	Salivary glands	0.6	0.9	0.5	0.6	0.5	0.7	0.2
C09-14	Pharynx	1.0	1.3	1.0	1.5	0.9	1.0	1.1
C15-26	**Digestive organs**	**51.2**	**55.5**	**49.7**	**48.3**	**46.2**	**47.0**	**49.6**
C15	Oesophagus	1.0	0.8	1.2	1.4	1.0	0.9	1.0
C16	Stomach	3.7	2.7	2.6	3.6	2.8	3.3	3.9
C17	Small intestine	1.2	1.2	1.3	1.3	1.4	0.5	1.5
C18	Colon	23.5	26.9	22.5	22.4	21.9	21.4	23.9
C19-21	Rectum, rectosigmoid, anus	11.6	12.7	12.6	10.8	9.5	11.5	10.6
C22	Liver	1.1	1.2	0.9	1.2	1.7	0.9	0.9
C23-24	Gallbladder, bile ducts	1.6	1.8	1.2	1.2	1.7	1.9	0.9
C25	Pancreas	6.4	7.4	6.1	5.4	5.2	5.9	6.0
C26	Other digestive organs	0.9	0.8	1.2	1.0	0.9	0.7	0.9
C30-34, C38	**Respiratory organs**	**26.1**	**26.9**	**26.7**	**27.7**	**28.3**	**22.1**	**27.4**
C30-31	Nose, sinuses	0.5	0.5	0.6	0.4	0.6	0.3	0.6
C32	Larynx, epiglottis	0.4	0.1	0.4	1.1	0.6	0.3	0.6
C33-34	Lung, trachea	25.1	26.3	25.5	26.0	26.9	21.5	26.1
C38	Mediastinum, pleura (non-mesothelioma)	0.1	0.1	0.2	0.2	0.1	0.1	0.0
C40-41	**Bone**	**0.8**	**0.8**	**0.5**	**1.1**	**0.7**	**0.6**	**0.7**
C43	**Melanoma of the skin**	**18.2**	**22.1**	**17.7**	**17.0**	**16.7**	**16.9**	**22.2**
C44	**Skin, non-melanoma**	**10.7**	**12.2**	**8.6**	**8.7**	**8.8**	**6.5**	**21.5**
C45	**Mesothelioma**	**0.3**	**0.4**	**0.4**	**0.2**	**0.1**	**0.3**	**0.6**
C46	**Kaposi's sarcoma**	**0.1**	**0.0**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**
C47	**Autonomic nervous system**	**0.3**	**0.2**	**0.1**	**0.2**	**0.0**	**0.0**	**0.4**
C48-49	**Soft tissues**	**2.3**	**2.8**	**2.3**	**1.8**	**2.2**	**2.0**	**2.1**
C50	**Breast**	**72.7**	**71.2**	**77.2**	**80.3**	**68.9**	**68.4**	**72.7**
C51-58	**Female genital organs**	**39.8**	**39.3**	**40.1**	**40.1**	**46.7**	**46.8**	**42.0**
C53	Cervix uteri	9.6	8.5	9.9	9.1	11.5	11.3	10.4
C54	Corpus uteri	16.5	16.0	17.7	17.3	18.6	18.0	16.5
C55	Uterus, other	0.1	0.1	0.0	0.1	0.2	0.1	0.2
C56	Ovary	10.8	12.0	10.7	11.4	12.7	13.4	12.5
C51-52, C57	Other female genital	2.7	2.4	1.9	2.2	3.7	3.9	2.5
C58	Placenta	0.1	0.3	0.0	0.1	0.0	0.0	0.0
C64-68	**Urinary organs**	**12.7**	**16.0**	**11.4**	**13.5**	**11.4**	**10.9**	**11.7**
C64	Kidney excl. renal pelvis	5.5	7.7	4.5	5.2	4.2	4.1	5.5
C65	Renal pelvis	0.6	0.4	0.6	0.7	1.0	0.2	0.6
C66-68	Bladder, ureter, urethra	6.6	7.8	6.3	7.6	6.2	6.5	5.6
C69	**Eye**	**0.8**	**0.9**	**0.7**	**1.2**	**1.2**	**0.8**	**0.7**
C70-72	**Central nervous system**	**16.9**	**15.0**	**15.6**	**14.4**	**17.8**	**18.9**	**17.2**
C73	**Thyroid gland**	**5.4**	**3.2**	**6.5**	**5.0**	**8.2**	**4.0**	**5.7**
C37, C74-75	**Other endocrine glands**	**4.1**	**5.1**	**4.4**	**4.5**	**3.5**	**2.6**	**2.9**
C39, C76, C80	**Other or unspecified**	**3.5**	**3.4**	**3.2**	**3.9**	**4.4**	**3.4**	**3.3**
C81-96	**Lymphoid and haematopoietic tissue**	**24.2**	**23.5**	**29.1**	**24.6**	**26.1**	**22.3**	**27.2**
C81	Hodgkin lymphoma	1.8	1.4	2.3	1.7	3.0	1.2	1.9
C82-85, C96	Non-Hodgkin lymphoma	9.1	7.5	10.3	9.1	10.2	8.1	10.3
C88	Malignant immunoproliferative diseases	0.4	0.5	0.6	0.5	0.3	0.4	0.4
C90	Multiple myeloma	3.2	2.8	3.7	3.7	3.0	4.0	3.3
C91-95	Leukaemia	9.7	11.2	12.2	9.7	9.6	8.6	11.4

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

FEMALES

Vestfold	Telemark	Aust-Agder	Vest-Agder	Rogaland	Hordaland	Sogn og Fjordane	Møre og Romsdal	Sør-Trøndelag	Nord-Trøndelag	Nordland	Troms	Finnmark
321.3	**301.3**	**298.4**	**310.1**	**294.8**	**291.0**	**272.7**	**284.4**	**292.7**	**286.6**	**284.1**	**266.1**	**268.6**
4.3	**4.3**	**5.2**	**5.0**	**3.6**	**3.3**	**3.7**	**3.3**	**4.9**	**3.1**	**4.7**	**5.3**	**3.4**
0.8	0.7	2.0	1.9	1.7	0.8	1.8	0.6	0.6	0.5	1.0	0.9	0.1
0.9	0.4	0.4	0.4	0.6	0.4	0.6	0.6	0.9	0.5	1.1	0.8	0.9
1.1	1.3	0.9	1.1	0.4	0.6	0.5	0.8	0.8	0.8	1.3	1.3	0.3
0.6	0.2	0.6	0.7	0.4	0.4	0.9	0.7	1.3	0.9	0.4	0.7	0.7
1.0	1.8	1.2	0.9	0.6	1.0	0.0	0.6	1.3	0.4	0.9	1.6	1.3
53.5	**41.4**	**51.0**	**46.9**	**52.3**	**55.6**	**58.0**	**58.7**	**54.8**	**50.0**	**50.8**	**46.7**	**50.6**
1.2	0.9	1.5	1.0	0.9	0.7	1.6	0.5	1.4	0.5	0.7	2.0	0.8
3.5	4.5	2.4	3.5	3.7	4.1	4.9	4.9	4.3	2.5	4.1	4.0	7.5
1.0	0.7	1.6	1.4	0.9	1.3	1.1	1.4	2.2	1.7	1.7	0.2	0.5
23.1	19.3	22.6	21.6	24.4	26.5	24.1	28.6	22.6	23.4	22.7	22.4	15.8
13.7	7.2	11.9	10.0	11.9	13.4	16.2	11.5	12.2	10.4	11.3	9.3	11.8
1.2	0.7	1.1	0.8	1.2	1.0	1.9	1.1	1.5	1.1	1.4	1.3	0.7
1.4	1.9	1.8	2.0	1.6	1.3	2.6	2.1	1.9	2.6	1.3	1.7	1.8
7.3	5.4	6.7	5.6	6.8	6.8	5.1	7.6	7.8	6.3	6.5	5.1	11.2
1.1	0.8	1.4	1.0	0.8	0.5	0.6	1.1	1.1	1.5	1.2	0.7	0.5
28.1	**26.6**	**31.8**	**34.2**	**24.3**	**22.4**	**21.8**	**22.9**	**24.8**	**26.0**	**27.2**	**24.4**	**31.0**
0.7	0.6	0.1	0.4	0.1	0.5	0.2	0.5	0.0	0.2	0.6	0.7	0.3
0.6	0.5	0.0	0.2	0.3	0.3	0.4	0.2	0.5	0.3	0.2	0.6	0.2
26.7	25.3	31.7	33.6	23.8	21.4	21.1	22.1	23.9	25.3	26.4	23.2	29.4
0.1	0.2	0.0	0.0	0.1	0.1	0.1	0.0	0.4	0.2	0.0	0.0	1.0
1.0	**0.8**	**1.8**	**1.1**	**1.1**	**1.2**	**0.1**	**0.9**	**0.6**	**1.0**	**0.3**	**0.0**	**0.8**
20.8	**20.5**	**19.3**	**20.4**	**22.4**	**19.0**	**12.2**	**14.8**	**19.6**	**20.6**	**9.6**	**12.5**	**15.1**
11.4	**16.9**	**19.1**	**17.5**	**13.6**	**9.6**	**6.1**	**5.8**	**10.4**	**10.8**	**7.9**	**5.6**	**4.1**
0.5	**0.4**	**0.2**	**0.0**	**0.3**	**0.1**	**0.4**	**0.4**	**0.1**	**0.7**	**0.1**	**0.0**	**0.4**
0.0	**0.0**	**0.1**	**0.2**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.3**	**0.0**	**0.1**
0.0	**0.2**	**1.0**	**0.8**	**0.1**	**0.7**	**0.8**	**0.5**	**0.4**	**0.0**	**0.2**	**0.0**	**0.0**
2.7	**2.7**	**1.6**	**1.9**	**2.0**	**2.1**	**2.0**	**2.2**	**2.6**	**2.8**	**3.1**	**3.0**	**3.8**
86.1	**68.9**	**63.2**	**75.1**	**74.4**	**69.7**	**68.0**	**74.7**	**66.8**	**69.2**	**70.2**	**65.3**	**61.0**
37.8	**45.3**	**35.3**	**44.2**	**42.1**	**37.6**	**33.7**	**33.0**	**37.1**	**35.7**	**40.7**	**40.8**	**36.9**
8.0	9.2	7.5	9.3	9.6	9.9	8.4	7.3	7.7	10.5	14.3	11.8	9.9
16.8	21.3	15.2	20.0	18.3	15.5	13.1	12.1	16.0	12.3	14.2	15.5	15.3
0.2	0.1	0.2	0.1	0.2	0.2	0.0	0.0	0.1	0.3	0.0	0.3	0.1
9.3	10.8	10.1	12.2	11.0	9.1	8.6	9.9	10.3	9.9	9.7	10.1	10.5
3.3	3.8	2.3	2.6	2.9	2.8	3.5	3.6	2.9	2.7	2.4	2.7	1.1
0.3	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.6	0.0
11.3	**11.0**	**16.8**	**12.3**	**11.9**	**11.5**	**9.9**	**12.4**	**15.5**	**11.2**	**15.6**	**15.1**	**12.3**
4.4	5.3	6.6	6.4	5.0	5.1	4.3	5.0	7.0	6.7	6.9	6.2	7.1
1.1	0.2	1.3	0.5	0.5	0.5	0.4	0.5	0.7	0.3	0.6	0.7	0.4
5.9	5.5	8.9	5.4	6.5	5.8	5.2	7.0	7.8	4.2	8.2	8.3	4.8
0.4	**0.8**	**0.3**	**0.3**	**1.0**	**1.0**	**1.7**	**1.1**	**0.8**	**0.3**	**0.6**	**0.5**	**0.4**
19.5	**20.3**	**15.6**	**15.5**	**15.9**	**18.5**	**20.2**	**15.0**	**19.1**	**23.1**	**17.1**	**14.4**	**17.0**
5.5	**8.5**	**3.3**	**7.2**	**2.9**	**6.3**	**4.3**	**6.5**	**4.9**	**5.4**	**5.6**	**4.9**	**3.8**
5.4	**2.9**	**2.9**	**2.5**	**2.2**	**5.7**	**5.7**	**5.8**	**4.1**	**3.7**	**5.2**	**2.4**	**2.8**
4.0	**3.3**	**3.8**	**2.5**	**3.3**	**3.0**	**3.2**	**2.1**	**3.2**	**4.8**	**4.0**	**4.7**	**3.3**
28.7	**26.5**	**26.2**	**22.6**	**21.2**	**23.6**	**20.9**	**24.2**	**22.7**	**18.0**	**20.6**	**20.3**	**21.7**
1.8	1.3	2.0	2.7	1.5	1.8	1.9	2.1	2.8	0.9	1.3	1.4	2.4
10.9	9.0	10.5	8.3	8.9	8.8	7.2	9.4	8.3	7.0	9.2	7.0	9.1
0.3	0.7	0.1	0.4	0.0	0.3	0.6	0.8	0.3	0.4	0.2	0.0	1.0
4.1	3.2	3.0	1.9	2.6	3.2	2.5	3.3	2.1	2.9	2.7	3.4	2.1
11.6	12.3	10.6	9.2	8.0	9.6	8.7	8.7	9.4	6.8	7.1	8.5	7.0

Table 15a. Average annual number of new cases for selected primary sites*, stage and period of diagnosis 1956-2010

MALES

ICD10	Site	Stage	Period											
			1956-60	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991-95	1996-00	2001-05	2006-10	% 2006-10
C00-14	Mouth, pharynx	Total	189	188	203	245	240	248	255	256	268	252	299	*100.0*
		Localized	131	131	132	161	155	151	161	145	108	82	121	*40.5*
		Regional	45	45	44	65	70	87	81	90	100	113	137	*45.6*
		Distant	3	6	9	10	9	5	8	12	12	12	13	*4.3*
		Unknown	10	5	18	9	6	4	5	8	48	45	29	*9.6*
C15	Oesophagus	Total	74	80	77	84	87	87	99	107	118	133	156	*100.0*
		Localized	46	47	43	39	42	42	41	46	29	26	49	*31.7*
		Regional	10	11	10	18	18	20	24	25	26	33	42	*26.8*
		Distant	12	18	18	22	22	22	30	28	33	44	41	*26.4*
		Unknown	5	4	6	5	5	3	3	8	31	30	24	*15.1*
C16	Stomach	Total	851	794	769	662	603	589	529	460	400	341	302	*100.0*
		Localized	241	221	200	165	176	183	185	153	79	61	77	*25.5*
		Regional	182	175	152	149	146	163	144	133	116	105	82	*27.1*
		Distant	348	346	333	302	244	211	181	149	136	122	96	*31.8*
		Unknown	80	52	85	46	37	31	18	26	68	53	47	*15.6*
C18	Colon	Total	236	291	357	402	521	649	741	844	918	1022	1154	*100.0*
		Localized	91	118	141	140	155	200	228	260	176	185	206	*17.8*
		Regional	66	70	81	116	194	264	284	328	444	505	611	*52.9*
		Distant	66	90	117	131	152	163	203	222	239	262	276	*23.9*
		Unknown	13	13	19	15	20	22	26	35	60	70	61	*5.3*
C19-21	Rectum, rectosigmoid, anus	Total	155	189	257	317	438	520	537	583	598	675	702	*100.0*
		Localized	74	94	118	150	198	243	227	252	194	177	178	*25.4*
		Regional	39	48	70	87	145	171	204	209	232	285	344	*48.9*
		Distant	29	41	56	71	86	94	96	106	114	137	127	*18.1*
		Unknown	13	8	13	9	9	12	10	16	58	75	53	*7.5*
C22	Liver	Total	19	23	36	55	50	66	59	61	68	80	101	*100.0*
		Localized	9	11	19	26	24	35	33	36	25	27	39	*38.9*
		Regional	1	1	1	4	4	5	4	3	5	6	10	*10.1*
		Distant	7	9	14	21	18	18	13	11	15	19	25	*24.7*
		Unknown	2	1	3	4	4	8	9	10	24	27	27	*26.3*
C23-24	Gallbladder, bile ducts	Total	17	22	27	28	39	43	49	54	57	66	68	*100.0*
		Localized	8	9	8	9	11	14	20	16	9	12	13	*19.0*
		Regional	3	3	5	5	9	10	10	10	11	22	24	*34.5*
		Distant	6	10	11	12	17	15	13	16	17	18	19	*27.5*
		Unknown	1	1	2	1	2	4	6	12	20	14	13	*19.0*
C25	Pancreas	Total	143	176	218	250	264	299	292	281	274	307	334	*100.0*
		Localized	41	54	55	51	41	58	65	53	21	24	31	*9.2*
		Regional	15	19	28	34	34	42	29	31	35	67	72	*21.5*
		Distant	74	94	119	144	159	159	158	134	132	161	184	*55.1*
		Unknown	12	9	15	22	29	41	41	64	86	56	47	*14.2*
C33-34	Lung, trachea	Total	263	373	532	679	876	1056	1160	1229	1288	1397	1507	*100.0*
		Localized	76	130	172	218	289	352	384	393	243	188	248	*16.5*
		Regional	54	80	103	129	155	198	241	240	320	389	430	*28.5*
		Distant	112	141	226	285	372	433	458	473	544	666	683	*45.3*
		Unknown	21	22	31	48	60	73	77	123	181	154	146	*9.7*
C43	Melanoma of the skin	Total	51	76	103	157	206	254	352	435	454	504	652	*100.0*
		Localized	31	49	64	121	170	209	301	377	305	289	368	*56.4*
		Regional	10	10	13	16	16	19	16	16	14	23	33	*5.0*
		Distant	7	16	15	15	16	16	22	25	26	34	25	*3.9*
		Unknown	3	1	10	5	4	10	13	17	110	158	227	*34.7*
C61	Prostate	Total	654	841	1012	1227	1478	1695	1860	2344	2879	3328	4266	*100.0*
		Localized	388	547	647	811	995	1137	1250	1623	1097	1386	2246	*52.6*
		Regional	29	31	36	67	69	64	57	98	112	188	621	*14.6*
		Distant	174	205	229	262	315	416	484	400	407	409	355	*8.3*
		Unknown	63	57	100	87	99	78	70	224	1263	1345	1044	*24.5*
C62	Testis	Total	55	68	75	85	107	143	165	199	240	259	293	*100.0*
		Localized	38	43	49	45	61	77	109	135	137	145	197	*67.1*
		Regional	2	4	5	16	22	40	30	36	35	47	39	*13.2*
		Distant	14	19	18	23	22	23	23	23	32	28	31	*10.6*
		Unknown	2	2	2	1	1	3	2	5	35	40	27	*9.1*
C64	Kidney except renal pelvis	Total	95	124	155	174	199	246	255	271	285	348	417	*100.0*
		Localized	49	66	77	71	80	108	116	139	110	156	219	*52.4*
		Regional	8	16	20	37	48	47	48	37	43	42	38	*9.2*
		Distant	34	38	53	62	66	81	80	70	75	80	85	*20.4*
		Unknown	4	4	5	3	4	10	11	25	57	70	76	*18.1*
C66-68	Bladder, ureter, urethra	Total	200	275	329	445	568	684	754	830	821	896	967	*100.0*
		Localized	156	234	264	354	474	586	661	739	485	490	637	*65.9*
		Regional	15	22	33	52	52	56	51	42	43	65	73	*7.5*
		Distant	19	13	17	26	31	27	30	25	34	34	37	*3.9*
		Unknown	10	6	15	13	10	15	12	23	260	307	220	*22.7*
C70-72	Central nervous system	Total	120	136	146	161	189	220	247	261	330	409	455	*100.0*
		Non-malignant	30	38	41	44	57	71	74	104	139	201	229	*50.4*
		Malignant	90	97	104	117	132	149	173	156	191	207	225	*49.6*
C73	Thyroid gland	Total	20	23	35	35	43	45	50	45	47	55	72	*100.0*
		Localized	6	5	12	15	21	20	27	21	19	19	24	*33.5*
		Regional	10	11	13	15	16	16	14	14	16	23	34	*47.4*
		Distant	4	7	9	5	6	8	8	8	7	7	8	*11.6*
		Unknown	0	0	1	1	0	1	1	2	5	7	5	*7.5*

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Table 15b. Average annual number of new cases for selected primary sites*, stage and period of diagnosis 1956-2010

FEMALES

ICD10	Site	Stage	Period											
			1956-60	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991-95	1996-00	2001-05	2006-10	% 2006-10
C00-14	Mouth, pharynx	Total	60	67	74	78	88	100	111	122	132	143	189	*100.0*
		Localized	35	39	43	41	51	56	73	79	62	52	90	*47.7*
		Regional	19	22	27	27	29	39	32	34	40	53	70	*36.9*
		Distant	3	4	1	5	4	2	5	3	6	6	5	*2.6*
		Unknown	3	3	2	5	5	2	2	5	24	32	24	*12.8*
C15	Oesophagus	Total	23	29	30	30	31	35	37	42	47	54	56	*100.0*
		Localized	15	19	18	15	18	18	19	25	12	12	19	*34.8*
		Regional	3	3	3	6	5	9	8	7	8	13	12	*20.8*
		Distant	3	4	6	5	7	6	9	7	10	13	11	*19.4*
		Unknown	2	3	3	3	2	3	2	4	17	16	14	*25.1*
C16	Stomach	Total	595	538	501	423	411	391	353	306	255	228	207	*100.0*
		Localized	169	153	117	102	114	131	136	109	57	44	57	*27.6*
		Regional	99	97	90	84	104	96	93	74	63	66	43	*20.7*
		Distant	240	224	226	203	158	131	110	103	81	77	74	*35.7*
		Unknown	87	64	67	35	35	33	14	20	53	42	33	*16.0*
C18	Colon	Total	273	337	427	495	657	772	874	986	1098	1178	1292	*100.0*
		Localized	106	141	165	172	190	234	263	301	215	218	229	*17.7*
		Regional	70	78	107	150	252	316	355	397	539	585	702	*54.4*
		Distant	74	100	131	153	187	187	217	230	250	287	277	*21.4*
		Unknown	23	18	24	21	28	35	38	58	95	89	83	*6.5*
C19-21	Rectum, rectosigmoid, anus	Total	127	138	214	266	359	419	441	498	506	536	559	*100.0*
		Localized	59	67	96	127	163	195	200	236	168	154	159	*28.4*
		Regional	33	34	57	78	115	136	149	164	188	216	262	*46.9*
		Distant	28	29	49	55	71	74	78	79	92	94	94	*16.9*
		Unknown	6	8	11	6	10	14	14	20	58	72	44	*7.9*
C22	Liver	Total	11	14	19	30	34	44	41	45	44	47	60	*100.0*
		Localized	5	6	8	15	16	18	23	21	12	12	21	*34.6*
		Regional	0	0	1	1	1	4	1	3	4	6	8	*13.0*
		Distant	4	7	9	12	14	16	10	8	10	8	13	*21.6*
		Unknown	2	1	1	2	3	7	7	12	18	20	19	*30.9*
C23-24	Gallbladder, bile ducts	Total	47	52	61	49	69	83	78	72	83	74	84	*100.0*
		Localized	13	15	15	14	20	25	28	20	13	13	16	*19.0*
		Regional	8	9	8	10	11	19	14	12	16	15	23	*27.3*
		Distant	23	26	36	22	34	33	25	22	27	27	29	*34.2*
		Unknown	2	2	2	3	4	7	11	17	28	19	16	*19.5*
C25	Pancreas	Total	97	119	156	183	218	266	287	303	318	334	356	*100.0*
		Localized	29	38	43	42	46	55	74	65	26	28	43	*12.0*
		Regional	9	11	16	24	28	34	31	31	37	62	71	*19.8*
		Distant	48	63	83	98	121	137	140	119	144	164	172	*48.2*
		Unknown	11	7	14	20	23	40	42	88	112	80	71	*20.0*
C33-34	Lung, trachea	Total	70	84	131	165	213	303	423	548	702	880	1139	*100.0*
		Localized	18	25	42	50	63	86	132	162	116	126	225	*19.8*
		Regional	8	11	19	27	31	49	80	107	158	227	291	*25.6*
		Distant	35	42	62	77	101	142	184	216	307	434	517	*45.4*
		Unknown	9	6	8	12	18	26	28	63	120	93	105	*9.3*
C43	Melanoma of the skin	Total	55	88	120	178	259	338	431	485	502	555	686	*100.0*
		Localized	42	73	85	154	233	301	399	442	348	342	415	*60.5*
		Regional	7	6	8	9	8	16	12	11	11	14	22	*3.2*
		Distant	6	6	13	10	13	12	12	15	21	21	16	*2.3*
		Unknown	2	3	13	5	5	9	9	16	121	178	233	*34.0*
C50	Breast	Total	921	1045	1201	1380	1565	1698	1830	2028	2437	2745	2767	*100.0*
		Pagets stage 0	0	0	3	19	23	34	37	21	20	18	16	*0.6*
		I	407	487	579	668	834	895	767	631	742	1062	1136	*41.0*
		II	349	348	373	431	433	487	691	766	888	1113	1094	*39.5*
		III	44	89	79	105	96	95	119	91	85	92	137	*4.9*
		IV	93	95	119	111	114	108	122	134	123	133	104	*3.7*
		Unknown	28	27	47	46	65	80	95	384	579	326	281	*10.1*
C53	Cervix uteri	Total	341	358	396	437	410	365	336	354	318	297	302	*100.0*
		I	144	149	199	233	233	209	184	224	186	171	179	*59.3*
		II	114	125	130	116	89	75	73	58	66	55	58	*19.0*
		III	52	54	41	62	56	54	46	39	35	33	24	*7.9*
		IV	23	23	19	23	23	23	28	27	25	25	31	*10.1*
		Unknown	7	7	7	3	10	4	5	5	6	12	11	*3.6*
C54	Corpus uteri	Total	175	216	260	310	370	383	408	454	506	635	702	*100.0*
		Localized	139	181	204	259	291	288	306	346	337	400	496	*70.6*
		Regional	9	11	16	21	41	46	48	44	58	75	65	*9.2*
		Distant	19	20	37	27	33	36	48	55	68	82	93	*13.2*
		Unknown	7	3	4	4	4	13	6	9	42	78	49	*7.0*
C56	Ovary	Total	259	286	358	340	377	416	445	458	466	460	446	*100.0*
		Localized	83	95	111	141	107	113	121	127	92	86	85	*19.1*
		Regional	24	14	19	22	30	37	23	15	13	13	14	*3.0*
		Distant	142	166	220	173	235	252	287	293	310	309	303	*68.0*
		Unknown	10	11	7	5	5	13	14	23	51	53	44	*9.9*
C64	Kidney except renal pelvis	Total	75	89	110	117	137	149	180	188	191	211	240	*100.0*
		Localized	42	52	59	59	65	67	88	104	76	93	133	*55.2*
		Regional	8	9	13	23	27	32	28	21	22	23	20	*8.2*
		Distant	21	27	34	30	42	44	50	44	51	42	40	*16.7*
		Unknown	4	2	4	4	3	7	14	20	43	53	48	*19.9*
C66-68	Bladder, ureter, urethra	Total	115	125	140	183	219	246	261	279	299	331	349	*100.0*
		Localized	73	79	93	122	160	193	221	231	155	168	220	*63.0*
		Regional	12	20	19	26	27	26	18	16	18	29	29	*8.4*
		Distant	19	18	19	23	21	15	15	15	22	22	19	*5.5*
		Unknown	12	8	9	11	11	12	7	16	105	111	80	*23.1*
C70-72	Central nervous system	Total	105	120	131	140	186	214	255	293	397	545	588	*100.0*
		Non-malignant	42	53	59	58	80	94	131	162	246	380	418	*71.0*
		Malignant	63	67	71	82	106	119	124	131	151	166	171	*29.0*
C73	Thyroid gland	Total	53	58	85	107	129	142	136	139	122	149	173	*100.0*
		Localized	22	26	47	59	84	95	92	88	58	70	90	*51.7*
		Regional	15	22	26	30	30	34	31	37	37	46	55	*31.8*
		Distant	12	9	9	14	12	10	9	11	11	10	7	*4.2*
		Unknown	3	1	3	3	2	4	4	4	16	22	21	*12.3*

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Table 16a. Age-adjusted (world) incidence rates per 100 000 person-years for selected primary sites*, stage and period of diagnosis 1956-2010

MALES

			Period									
ICD10	Site	Stage	1956-60	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991-95	1996-00	2001-05	2006-10
C00-14	Mouth, pharynx	Total	8.0	7.4	7.4	8.5	8.0	8.1	8.3	8.2	8.4	7.4	7.9
		Localized	5.5	5.2	4.9	5.7	5.1	4.9	5.1	4.6	3.3	2.4	3.1
		Regional	1.9	1.8	1.6	2.2	2.4	2.9	2.8	3.0	3.3	3.4	3.7
		Distant	0.1	0.3	0.3	0.4	0.3	0.2	0.3	0.4	0.4	0.4	0.3
		Unknown	0.4	0.2	0.6	0.3	0.2	0.1	0.1	0.3	1.4	1.3	0.7
C15	Oesophagus	Total	3.1	3.1	2.6	2.7	2.7	2.7	3.0	3.2	3.4	3.6	3.8
		Localized	1.9	1.8	1.4	1.2	1.3	1.2	1.1	1.3	0.8	0.7	1.2
		Regional	0.4	0.4	0.4	0.6	0.6	0.6	0.8	0.8	0.8	1.0	1.1
		Distant	0.5	0.7	0.6	0.7	0.7	0.7	1.0	0.9	1.0	1.2	1.0
		Unknown	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.8	0.7	0.6
C16	Stomach	Total	35.6	30.2	26.9	21.7	18.6	16.9	14.6	12.4	10.3	8.3	6.9
		Localized	9.8	8.1	6.8	5.3	5.3	5.1	4.9	3.8	2.0	1.4	1.7
		Regional	8.0	6.9	5.4	5.0	4.6	4.9	4.1	3.8	3.1	2.7	1.9
		Distant	14.8	13.4	11.8	10.0	7.6	6.2	5.1	4.1	3.6	3.1	2.3
		Unknown	3.1	1.8	2.9	1.4	1.1	0.8	0.5	0.6	1.5	1.1	1.0
C18	Colon	Total	9.9	11.2	12.6	13.2	16.2	19.0	21.3	23.1	24.4	25.6	26.2
		Localized	3.8	4.5	4.9	4.5	4.8	5.8	6.3	7.0	4.7	4.6	4.6
		Regional	2.8	2.7	2.9	3.9	6.2	7.8	8.4	9.0	11.8	12.5	13.8
		Distant	2.8	3.5	4.1	4.3	4.7	4.8	5.9	6.3	6.5	6.8	6.6
		Unknown	0.5	0.5	0.6	0.5	0.6	0.6	0.6	0.8	1.4	1.7	1.2
C19-21	Rectum, rectosigmoid, anus	Total	6.5	7.2	9.1	10.5	13.8	15.5	15.6	16.7	16.6	17.7	17.0
		Localized	3.1	3.5	4.1	4.9	6.2	7.2	6.4	7.1	5.3	4.6	4.3
		Regional	1.7	1.8	2.6	3.0	4.6	5.2	6.2	6.0	6.4	7.5	8.4
		Distant	1.2	1.6	2.0	2.3	2.7	2.9	2.8	3.1	3.3	3.8	3.1
		Unknown	0.5	0.3	0.4	0.3	0.3	0.3	0.3	0.4	1.5	1.8	1.2
C22	Liver	Total	0.8	0.9	1.3	1.9	1.7	2.1	1.8	1.8	1.9	2.1	2.6
		Localized	0.4	0.5	0.7	0.9	0.8	1.0	1.0	1.0	0.8	0.7	1.0
		Regional	0.0	0.0	0.0	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.3
		Distant	0.3	0.4	0.5	0.7	0.6	0.6	0.4	0.3	0.4	0.5	0.6
		Unknown	0.1	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.6	0.7	0.6
C23-24	Gallbladder, bile ducts	Total	0.7	0.9	0.9	0.9	1.1	1.3	1.3	1.5	1.5	1.7	1.6
		Localized	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.4	0.2	0.3	0.3
		Regional	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.6	0.6
		Distant	0.2	0.4	0.4	0.4	0.5	0.4	0.4	0.5	0.5	0.5	0.5
		Unknown	0.0	0.0	0.1	0.0	0.0	0.1	0.2	0.3	0.5	0.3	0.2
C25	Pancreas	Total	6.2	6.8	7.6	8.2	8.2	8.7	8.2	7.7	7.3	7.9	7.8
		Localized	1.7	2.0	1.9	1.6	1.2	1.6	1.7	1.4	0.5	0.6	0.7
		Regional	0.7	0.8	1.0	1.1	1.1	1.3	0.9	0.9	1.1	1.8	1.7
		Distant	3.3	3.6	4.2	4.8	5.1	4.8	4.6	3.9	3.7	4.3	4.4
		Unknown	0.5	0.3	0.5	0.7	0.9	1.1	1.0	1.5	2.0	1.2	0.9
C33-34	Lung, trachea	Total	11.7	15.1	19.7	23.7	28.8	33.2	35.3	36.5	36.6	36.6	35.8
		Localized	3.4	5.2	6.3	7.5	9.1	10.4	10.9	11.2	6.9	4.9	5.8
		Regional	2.4	3.3	4.0	4.7	5.5	6.6	7.7	7.4	9.2	10.1	10.3
		Distant	5.0	5.7	8.5	10.0	12.4	14.1	14.5	14.8	16.0	17.9	16.5
		Unknown	0.9	0.9	1.1	1.5	1.8	2.0	2.1	3.1	4.5	3.6	3.2
C43	Melanoma of the skin	Total	2.4	3.5	4.6	6.6	8.4	9.9	13.0	15.1	14.6	14.9	17.2
		Localized	1.4	2.2	2.9	5.1	7.0	8.2	11.2	13.1	9.9	8.7	9.7
		Regional	0.4	0.5	0.6	0.7	0.6	0.7	0.6	0.6	0.4	0.7	0.8
		Distant	0.3	0.7	0.6	0.6	0.6	0.6	0.8	0.9	0.8	1.0	0.6
		Unknown	0.1	0.1	0.5	0.2	0.2	0.4	0.5	0.6	3.4	4.6	6.0
C61	Prostate	Total	25.7	29.9	32.9	36.9	40.9	44.0	46.0	57.7	75.1	85.4	103.2
		Localized	15.2	19.3	21.0	24.2	27.5	29.3	30.4	39.6	29.9	37.6	56.5
		Regional	1.2	1.1	1.2	2.1	1.9	1.7	1.7	3.2	3.8	5.3	14.8
		Distant	6.9	7.4	7.5	8.0	8.8	10.9	12.2	9.8	9.7	9.2	7.3
		Unknown	2.4	2.1	3.2	2.6	2.7	2.0	1.6	5.1	31.8	33.3	24.6
C62	Testis	Total	3.0	3.7	4.0	4.3	5.3	6.5	7.2	8.4	10.2	10.7	11.6
		Localized	2.0	2.4	2.6	2.3	3.0	3.5	4.7	5.7	5.8	6.0	7.8
		Regional	0.1	0.2	0.3	0.8	1.1	1.9	1.3	1.5	1.5	1.9	1.5
		Distant	0.8	1.1	1.0	1.2	1.1	1.1	1.0	1.0	1.4	1.2	1.3
		Unknown	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	1.5	1.6	1.1
C64	Kidney except renal pelvis	Total	4.3	5.1	5.8	6.3	6.8	8.3	8.0	8.2	8.5	9.8	10.8
		Localized	2.2	2.7	2.9	2.6	2.8	3.7	3.7	4.4	3.4	4.5	5.8
		Regional	0.4	0.7	0.8	1.4	1.7	1.6	1.5	1.2	1.3	1.2	1.0
		Distant	1.5	1.5	2.0	2.2	2.2	2.6	2.5	2.1	2.2	2.2	2.1
		Unknown	0.2	0.2	0.2	0.1	0.1	0.3	0.3	0.6	1.6	1.9	1.9
C66-68	Bladder, ureter, urethra	Total	8.6	10.6	11.7	15.0	17.7	20.2	21.3	22.9	21.6	22.0	21.8
		Localized	6.7	9.0	9.4	12.0	14.9	17.4	18.7	20.5	13.1	12.2	14.3
		Regional	0.6	0.8	1.1	1.7	1.6	1.6	1.4	1.2	1.1	1.7	1.7
		Distant	0.8	0.5	0.6	0.9	0.9	0.8	0.9	0.7	0.9	0.8	0.9
		Unknown	0.4	0.2	0.5	0.4	0.3	0.4	0.3	0.6	6.5	7.3	4.8
C70-72	Central nervous system	Total	6.1	6.5	6.8	7.2	8.1	9.0	9.8	9.9	11.9	14.0	14.1
		Non-malignant	1.5	1.8	1.9	1.9	2.3	2.7	2.7	3.7	4.9	6.7	7.0
		Malignant	4.6	4.7	4.9	5.3	5.8	6.3	7.1	6.2	7.0	7.3	7.2
C73	Thyroid gland	Total	0.9	1.0	1.4	1.4	1.6	1.6	1.8	1.6	1.6	1.8	2.0
		Localized	0.3	0.2	0.5	0.6	0.8	0.7	1.0	0.8	0.7	0.6	0.7
		Regional	0.4	0.5	0.5	0.6	0.6	0.6	0.5	0.5	0.5	0.7	1.0
		Distant	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Table 16b. Age-adjusted (world) incidence rates per 100 000 person-years for selected primary sites*, stage and period of diagnosis 1956-2010 **FEMALES**

			Period									
ICD10	Site	Stage	1956-60	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991-95	1996-00	2001-05	2006-10
C00-14	Mouth, pharynx	Total	2.3	2.3	2.3	2.3	2.3	2.7	2.8	3.2	3.4	3.4	4.3
		Localized	1.3	1.4	1.4	1.2	1.4	1.6	1.8	2.1	1.6	1.3	2.0
		Regional	0.7	0.7	0.8	0.8	0.7	1.0	0.9	0.9	1.0	1.3	1.7
		Distant	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.2	0.1	0.1
		Unknown	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.6	0.7	0.5
C15	Oesophagus	Total	0.8	0.9	0.8	0.7	0.7	0.7	0.8	0.8	1.0	1.1	1.0
		Localized	0.5	0.6	0.5	0.3	0.4	0.3	0.4	0.4	0.3	0.2	0.3
		Regional	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.3	0.3
		Distant	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.3	0.2
		Unknown	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.3	0.3	0.2
C16	Stomach	Total	20.7	16.8	14.1	11.0	9.6	8.5	7.1	6.0	4.8	4.3	3.7
		Localized	5.6	4.6	3.1	2.4	2.5	2.7	2.5	1.9	1.0	0.8	1.0
		Regional	3.8	3.3	2.8	2.3	2.6	2.2	2.1	1.5	1.3	1.3	0.7
		Distant	8.8	7.2	6.6	5.6	3.8	3.1	2.3	2.2	1.8	1.6	1.5
		Unknown	2.6	1.7	1.6	0.7	0.7	0.6	0.2	0.3	0.7	0.6	0.5
C18	Colon	Total	9.8	10.9	12.6	13.7	16.4	18.0	19.1	21.0	22.4	23.0	23.5
		Localized	3.8	4.5	4.8	4.8	4.6	5.3	5.7	6.3	4.5	4.1	4.0
		Regional	2.6	2.6	3.3	4.2	6.5	7.6	7.9	8.6	11.1	11.5	12.9
		Distant	2.7	3.3	3.9	4.2	4.7	4.5	5.0	5.3	5.4	5.9	5.6
		Unknown	0.7	0.5	0.6	0.5	0.5	0.6	0.6	0.8	1.4	1.4	1.0
C19-21	Rectum, rectosigmoid, anus	Total	4.6	4.6	6.5	7.4	9.4	10.2	10.1	11.6	11.1	11.5	11.6
		Localized	2.1	2.3	3.0	3.5	4.2	4.9	4.5	5.3	3.9	3.4	3.3
		Regional	1.3	1.2	1.7	2.3	3.1	3.4	3.6	4.2	4.2	4.8	5.5
		Distant	1.0	1.0	1.5	1.5	1.9	1.8	1.8	1.8	2.1	2.1	2.1
		Unknown	0.2	0.2	0.3	0.1	0.2	0.2	0.2	0.3	1.0	1.3	0.8
C22	Liver	Total	0.4	0.6	0.6	0.9	0.9	1.1	1.0	1.0	1.0	1.0	1.1
		Localized	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.3	0.3	0.4
		Regional	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.2
		Distant	0.2	0.3	0.3	0.3	0.4	0.4	0.3	0.2	0.3	0.2	0.3
		Unknown	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.2	0.3	0.4	0.3
C23-24	Gallbladder, bile ducts	Total	1.6	1.7	1.7	1.2	1.6	1.8	1.6	1.5	1.6	1.4	1.6
		Localized	0.5	0.5	0.4	0.4	0.5	0.5	0.5	0.4	0.2	0.2	0.3
		Regional	0.3	0.3	0.2	0.3	0.3	0.5	0.3	0.3	0.4	0.3	0.5
		Distant	0.8	0.8	1.1	0.5	0.8	0.6	0.5	0.5	0.6	0.6	0.6
		Unknown	0.1	0.1	0.0	0.1	0.1	0.1	0.2	0.3	0.4	0.3	0.2
C25	Pancreas	Total	3.5	3.9	4.5	4.8	5.2	5.7	5.9	6.0	5.9	6.2	6.4
		Localized	1.0	1.2	1.2	1.0	1.0	1.0	1.4	1.2	0.5	0.4	0.7
		Regional	0.4	0.4	0.5	0.7	0.7	0.8	0.7	0.7	0.8	1.3	1.4
		Distant	1.8	2.1	2.4	2.6	2.9	3.1	3.1	2.8	3.0	3.4	3.4
		Unknown	0.4	0.2	0.4	0.5	0.5	0.7	0.7	1.3	1.6	1.2	0.9
C33-34	Lung, trachea	Total	2.7	2.9	4.2	5.1	6.3	8.7	11.7	15.1	18.8	21.6	25.1
		Localized	0.7	0.8	1.4	1.5	1.8	2.3	3.4	4.4	3.1	3.1	5.0
		Regional	0.3	0.4	0.6	0.9	1.0	1.6	2.4	3.1	4.4	5.6	6.6
		Distant	1.4	1.5	2.0	2.5	3.0	4.3	5.3	6.4	8.6	11.0	11.7
		Unknown	0.3	0.2	0.2	0.3	0.5	0.5	0.6	1.3	2.7	1.9	1.9
C43	Melanoma of the skin	Total	2.4	4.0	5.1	7.5	10.1	12.4	15.4	16.2	15.6	16.0	18.2
		Localized	1.8	3.3	3.8	6.6	9.3	11.2	14.5	14.9	11.2	10.0	11.1
		Regional	0.3	0.3	0.3	0.4	0.3	0.5	0.3	0.3	0.3	0.4	0.4
		Distant	0.2	0.3	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.4
		Unknown	0.1	0.1	0.5	0.2	0.2	0.3	0.2	0.5	3.6	5.0	6.3
C50	Breast**	Total	37.5	39.9	43.1	47.2	50.9	51.9	53.5	58.7	70.8	76.9	72.7
		Pagets stage 0	0.0	0.0	0.1	0.7	0.7	1.0	1.1	0.6	0.5	0.4	0.4
		I	16.5	18.5	20.7	22.7	26.7	26.6	22.6	18.9	23.1	32.1	31.8
		II	14.7	13.9	14.2	15.6	15.0	16.0	21.4	23.8	27.2	32.5	29.7
		III	1.6	3.2	2.6	3.2	2.7	2.3	3.3	2.3	2.2	2.3	3.4
		IV	3.6	3.4	4.0	3.5	3.5	3.2	3.3	3.9	3.2	3.2	2.4
		Unknown	1.1	0.9	1.6	1.6	2.3	2.8	1.8	9.3	14.5	6.3	5.1
C53	Cervix uteri	Total	15.3	15.6	17.1	18.6	16.7	13.9	12.1	12.3	10.8	9.6	9.6
		I	6.7	6.9	9.3	11.0	10.6	8.7	7.2	8.3	6.8	6.1	6.2
		II	5.1	5.4	5.3	4.5	3.3	2.7	2.5	1.9	2.1	1.6	1.7
		III	2.2	2.1	1.5	2.2	1.8	1.7	1.5	1.2	1.0	0.9	0.7
		IV	0.9	0.9	0.7	0.8	0.7	0.6	0.8	0.7	0.7	0.7	0.8
		Unknown	0.3	0.2	0.3	0.1	0.3	0.2	0.2	0.1	0.2	0.3	0.3
C54	Corpus uteri	Total	7.2	8.2	9.1	10.5	12.1	12.2	12.4	13.2	13.9	16.0	16.5
		Localized	5.8	7.0	7.3	9.0	9.8	9.6	9.5	10.3	9.6	10.5	11.9
		Regional	0.4	0.4	0.5	0.6	1.2	1.3	1.4	1.3	1.5	1.8	1.5
		Distant	0.8	0.8	1.2	0.8	1.0	1.0	1.4	1.5	1.8	2.0	2.1
		Unknown	0.3	0.1	0.1	0.1	0.1	0.3	0.1	0.2	1.0	1.8	1.0
C56	Ovary	Total	11.1	11.2	13.3	12.3	13.2	13.6	13.6	13.7	13.1	12.2	10.8
		Localized	3.8	3.9	4.3	5.4	4.0	4.0	4.0	4.2	3.0	2.7	2.4
		Regional	1.0	0.5	0.7	0.8	1.0	1.3	0.7	0.4	0.4	0.3	0.3
		Distant	5.9	6.3	8.1	5.9	8.0	8.0	8.6	8.6	8.5	8.0	7.3
		Unknown	0.4	0.4	0.2	0.2	0.2	0.3	0.3	0.4	1.2	1.2	0.8
C64	Kidney except renal pelvis	Total	3.0	3.2	3.6	3.6	4.0	4.0	4.6	4.6	4.7	4.8	5.5
		Localized	1.7	1.9	1.9	1.9	2.0	1.9	2.3	2.8	2.1	2.4	3.2
		Regional	0.3	0.3	0.4	0.7	0.8	0.9	0.8	0.5	0.6	0.5	0.5
		Distant	0.8	1.0	1.1	0.9	1.2	1.1	1.3	1.0	1.2	0.9	0.8
		Unknown	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.9	1.0	1.0
C66-68	Bladder, ureter, urethra	Total	4.2	4.0	4.0	4.9	5.4	5.6	5.7	6.0	6.1	6.4	6.6
		Localized	2.6	2.5	2.7	3.3	3.9	4.4	4.9	5.0	3.3	3.4	4.2
		Regional	0.4	0.7	0.6	0.7	0.6	0.6	0.4	0.4	0.4	0.6	0.6
		Distant	0.8	0.6	0.5	0.6	0.5	0.3	0.3	0.3	0.5	0.4	0.4
		Unknown	0.4	0.2	0.2	0.3	0.2	0.2	0.1	0.2	1.9	2.0	1.4
C70-72	Central nervous system	Total	5.1	5.4	5.7	5.9	7.4	8.1	9.3	10.1	12.8	16.7	16.9
		Non-malignant	2.0	2.2	2.4	2.3	3.1	3.3	4.4	5.2	7.5	11.3	11.6
		Malignant	3.1	3.1	3.3	3.6	4.4	4.8	4.9	4.9	5.3	5.5	5.2
C73	Thyroid gland	Total	2.2	2.4	3.3	4.2	5.0	5.1	4.8	4.8	4.1	4.8	5.4
		Localized	0.9	1.1	1.9	2.6	3.5	3.6	3.4	3.2	2.1	2.4	2.9
		Regional	0.7	1.0	1.0	1.1	1.1	1.2	1.1	1.3	1.3	1.5	1.7
		Distant	0.4	0.3	0.3	0.4	0.3	0.2	0.2	0.3	0.2	0.2	0.2
		Unknown	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.4	0.6	0.6

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

**The stage classification on the basis of TNM was revised between the 2009 and 2010 CiN issue and results therefore differ especially for stage I. A more strict treatment of NX and MX has been introduced with the result of a higher proportion of unknown stage but higher validity of stages I-IV.

Mortality

There were 11 036 deaths from cancer in Norway in 2010, of which 5 872 were among men and 5 164 among women (Table 17). Cancers of the lung, colorectal, prostate and female breast account for half of the total cancer mortality. As previously, lung cancer ranked first in men in terms of cancer mortality numbers, responsible for 1 242 deaths, followed by prostate cancer (1 043 deaths) and colorectal cancer (773 deaths).

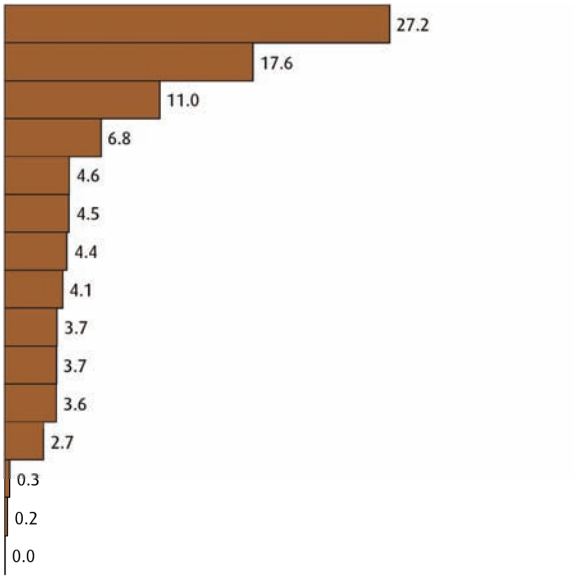
Lung cancer mortality (925 deaths) also ranks highest among women. Colorectal cancer (816 deaths) and breast cancer (673 deaths) rank as the second and third most frequent cause of cancer deaths among women.

Figure 8 shows the distribution of age-standardised mortality rates for selected cancer sites. There is at least a 100-fold variation in rates across these cancers, with lung cancer as the leading cause of cancer death in both sexes. Given the very poor prognosis for pancreatic cancer, it ranks among the top 5 causes of cancer death among both men and women.

The Trends section in this report examines the mortality time trends in relation to those of incidence and survival for 23 selected cancer sites.

Figure 8. Age-standardised (world) mortality rates per 100 000 person-years in Norway 2010 for selected cancers (Source: Statistics Norway)

Males



Females

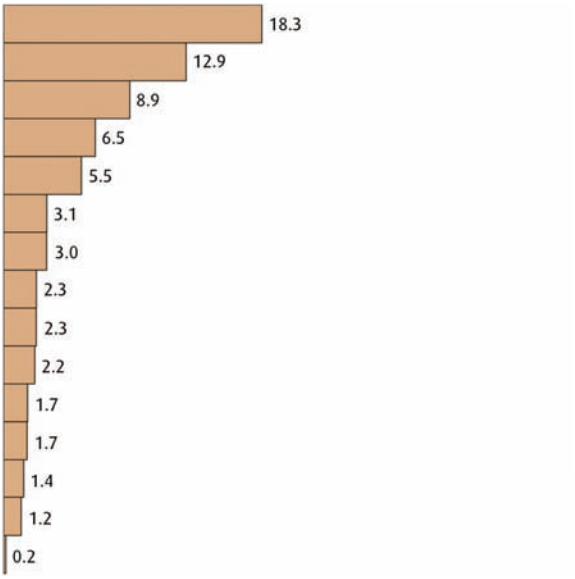


Table 17. Number of cancer deaths in Norway by primary site and sex - 2010

ICD10	Site	Males	Females	Total
C00-96	**All sites**	**5872**	**5164**	**11036**
C00-14	**Mouth, pharynx**	**92**	**47**	**139**
C00	Lip	2	1	3
C01-02	Tongue	17	8	25
C03-06	Mouth, other	25	18	43
C07-08	Salivary glands	9	5	14
C09-14	Pharynx	39	15	54
C15-26	**Digestive organs**	**1646**	**1532**	**3178**
C15	Oesophagus	165	57	222
C16	Stomach	199	146	345
C17	Small intestine	26	34	60
C18	Colon	559	629	1188
C19-21	Rectum, rectosigmoid, anus	214	187	401
C22	Liver	117	86	203
C23-24	Gallbladder, bile ducts	25	39	64
C25	Pancreas	313	317	630
C26	Other digestive organs	28	37	65
C30-34, C38	**Respiratory organs**	**1275**	**946**	**2221**
C30-31	Nose, sinuses	5	8	13
C32	Larynx, epiglottis	25	7	32
C33-34	Lung, trachea	1242	925	2167
C38	Mediastinum, pleura (non-mesothelioma)	3	6	9
C40-41	**Bone**	**13**	**8**	**21**
C43	**Melanoma of the skin**	**198**	**140**	**338**
C44	**Skin, non-melanoma**	**31**	**19**	**50**
C45	**Mesothelioma**	**56**	**10**	**66**
C46	**Kaposi's sarcoma**		**1**	**1**
C47	**Autonomic nervous system**	**2**	**1**	**3**
C48-49	**Soft tissues**	**42**	**46**	**88**
C50	**Breast**	**2**	**673**	**675**
C51-58	**Female genital organs**		**575**	**575**
C53	Cervix uteri		78	78
C54	Corpus uteri		78	78
C55	Uterus, other		42	42
C56	Ovary		323	323
C51-52, C57	Other female genital		54	54
C58	Placenta			
C60-63	**Male genital organs**	**1065**		**1065**
C61	Prostate	1043		1043
C62	Testis	13		13
C60, C63	Other male genital	9		9
C64-68	**Urinary organs**	**424**	**221**	**645**
C64	Kidney excl. renal pelvis	166	95	261
C65	Renal pelvis	12	1	13
C66-68	Bladder, ureter, urethra	246	125	371
C69	**Eye**	**3**		**3**
C70-72, D32-33	**Central nervous system**	**184**	**155**	**339**
C73	**Thyroid gland**	**14**	**19**	**33**
C37, C74-75	**Other endocrine glands**	**6**	**5**	**11**
C39, C76, C80	**Other or unspecified**	**290**	**336**	**626**
C81-96	**Lymphoid and haematopoietic tissue**	**529**	**430**	**959**
C81	Hodgkin lymphoma	8	7	15
C82-85, C96	Non-Hodgkin lymphoma	165	137	302
C88	Malignant immunoproliferative diseases	4	2	6
C90	Multiple myeloma	142	113	255
C91-95, D45-47	Leukaemia	210	171	381

Survival

Long-term estimates of survival are becoming increasingly relevant as life expectancy amongst cancer patients increases and cancer care continues to advance (Brenner & Hakulinen, 2002). Given that cancer patients survive longer, there is a need to communicate information not only on prognosis at the time of diagnosis, but for a period of time thereafter, among those who survive their cancer diagnosis (Janssen-Heijnen & al, 2007). Figures 9-A to 9-X overleaf aim to depict these two aspects of cancer survival in Norway for all cancers combined and for 23 specific cancer types. Relative survival estimates are presented by sex and age, 1 to 15 years after diagnosis, with age strata determined cancer-specifically according to relevant biological and/or clinical criteria. Table 18 provides the 5-year relative survival estimates over the last four decades by stage, as well as for cancer site and sex. Table 19 gives the 1-, 5-, 10- and 15-year relative survival estimates (with 95% confidence intervals) for the follow-up period 2008-10 by cancer site and sex.

For some sites, these cumulative survival curves tend to level off a certain number of years after diagnosis, indicating that from this point forward, the cancer patient group has a similar mortality to the group without cancer, or in other words, statistical cure is reached (Lambert, 2007). This concept - involving attributes of survival observed among patients as a group - should be distinguished from clinical cure, as is determined on the basis of a lack of specific symptoms in an individual.

Estimates of 5-year relative survival conditional on being alive 1 to 10 years after diagnosis are included in the sex-specific figures, and better quantify the prognosis of cancer patients beyond their initial diagnosis (Figure 9-A to 9-X, dashed lines). When conditional 5-year relative survival reaches beyond 90-95%, we commonly say that there is little or no excess mortality among the cancer patients, with mortality equivalent to that experienced in the general population, analogous to the notion of cure that may be observed in the long-term relative survival estimates.

The overall profile of the sex- and age-specific survival of all cancer patients 1 to 15 years after diagnosis in Norway is captured in Figure 9-A. The levelling-off of the 5-year relative survival occurs some 8 to 10 years after diagnosis, while the attainment of 5-year conditional relative survival estimates of 90-95% is reached in patients alive 3-5 years after diagnosis (dashed lines). Cure appears to be attained more rapidly in women than men. As was mentioned in the Trends section, the combined-cancer estimates are an aggregate of many different cancer forms with contrasting diagnostic and treatment capacities. Sex-specific survival estimates will be particularly influenced by PSA testing for prostate cancer and mammographic screening for breast cancer, respectively.

The cumulative 5-year relative survival described by cancer site, sex and age, and 5-year conditional relative survival by site and age (Figures 9-B to 9-X) are fairly self-explanatory and highlight the wide variations in patient survival according to these three variables. The 90 percentage point difference in 5-year survival among patients with testicular (Figure 9-Q) or pancreatic cancer (Figure 9-I) strikingly illustrates the wide differential in prognosis according to the type of cancer diagnosed. Long-term survival following diagnoses of melanoma and cancers of the oral cavity, central nervous system and thyroid clearly varies in men and women, and contributing factors may be biological or anatomical, or may relate to sex-specific differences in stage at presentation, subsite or histological type, and levels of co-morbidity.

The overall cancer survival tends to diminish with increasing age at diagnosis, yet the age-specific differences are rather narrow for the likes of colon cancer (Figure 9-E) relative to, for example, ovarian cancer (Figure 9-O) or leukaemia (Figure 9-X). For certain cancers including breast and prostate cancer, long-term survival among patients diagnosed aged under the age of 50 is actually lower than for patients diagnosed aged 50-59. This in part represents the diagnosis of more aggressive tumours in the younger age group, but also the impact of screening on the older group.

The figures also illustrate a very positive aspect of cancer survival; cancer patients who are alive for a certain time after diagnosis show good prospects of surviving their cancer and becoming cured. In fact, for about two-thirds of the cancer types diagnosed in Norway, the 5-year conditional relative survival reaches 90% 2-5 years after diagnosis. This means that in general terms, survivors of these cancers, will, within a few years of diagnosis have mortality rates similar to that of the general population, and would be considered (statistically) cured. The extent to which survivors may be considered cured does however vary; 5-year conditional survival from breast cancer reaches 90% 2 years after diagnosis (Figure 9-L) and slowly increases to 94% 10 years from diagnosis. As is evident from the continual decline in long-term breast cancer survival by age however, the cancer represents a disease for which a proportion may be considered cured long-term, but for which there remains a group of survivors with a persistent excess mortality. There is also a spectrum of cancers associated with particularly poor survival on diagnosis, and for which cure is not indicated, including cancers of the oesophagus (Figure 9-C), liver (Figure 9-G) and pancreas (Figure 9-I).

Table 18a Five-year relative survival (period approach) by primary site*, stage and period of follow up, 1971-2010

MALES

ICD10	Site	Stage	Relative survival (%)							
			1971-75	1976-80	1981-85	1986-90	1991-95	1996-00	2001-05	2006-10
C00-96	All sites	Total	33.2	37.6	41.2	43.3	48.8	53.4	59.3	67.1
C00-14	Mouth, pharynx	Total	63.8	64.4	58.1	56.0	56.3	57.3	56.9	60.3
		Localized	81.5	84.4	80.1	73.9	78.9	78.9	83.3	77.5
		Regional	27.6	27.1	24.8	27.0	28.2	36.1	41.5	49.3
		Distant	3.3	-	-	-	8.4	10.2	13.5	14.5
		Unknown	54.7	-	-	-	-	58.7	57.0	74.0
C15	Oesophagus	Total	2.5	4.0	2.6	4.8	4.3	7.7	8.5	10.1
		Localized	4.4	3.7	3.8	7.2	6.6	20.1	18.0	25.2
		Regional	0.5	3.3	4.5	5.5	5.2	7.1	10.0	12.5
		Distant	0.0	0.0	0.0	0.0	0.3	0.9	1.2	0.1
		Unknown	-	-	-	-	-	0.0	10.6	5.6
C16	Stomach	Total	12.5	14.0	16.6	16.2	18.2	16.6	18.0	23.9
		Localized	39.2	37.6	37.8	36.2	34.7	52.6	51.2	55.2
		Regional	13.7	15.4	20.6	19.6	22.5	16.2	22.3	22.5
		Distant	1.7	1.1	1.0	0.6	0.5	1.0	1.2	2.7
		Unknown	2.8	4.2	2.8	2.1	4.4	5.3	18.2	32.1
C18	Colon	Total	36.4	41.4	47.2	47.0	48.4	52.2	55.4	60.9
		Localized	68.3	70.4	76.3	78.2	78.1	86.4	87.6	85.7
		Regional	42.4	48.1	57.7	56.8	55.7	66.4	69.1	75.6
		Distant	4.3	6.3	3.9	4.6	4.7	4.6	7.6	9.5
		Unknown	8.1	17.4	17.9	9.6	13.7	24.4	53.5	60.3
C19-21	Rectum, rectosigmoid, anus	Total	32.8	39.2	43.6	45.5	48.0	55.4	58.2	64.1
		Localized	57.2	60.2	65.1	66.4	67.6	80.4	85.1	82.6
		Regional	21.1	31.0	39.8	43.8	45.3	59.9	66.0	73.9
		Distant	3.5	3.9	3.7	2.0	4.8	4.8	10.1	15.2
		Unknown	14.4	-	21.9	-	33.9	28.2	54.6	52.3
C22	Liver	Total	0.0	1.7	1.1	1.6	3.7	4.4	4.6	13.4
		Localized	0.0	4.7	1.1	3.2	5.8	12.0	13.2	24.4
		Regional	-	-	-	-	-	-	-	5.1
		Distant	0.0	0.6	1.0	0.0	0.0	0.8	0.0	2.7
		Unknown	-	-	-	-	-	0.7	1.8	11.2
C23-24	Gallbladder, bile ducts	Total	3.2	8.3	6.3	10.2	8.3	8.5	14.4	14.8
		Localized	8.9	18.2	10.4	17.5	18.1	20.6	36.9	30.3
		Regional	-	15.3	11.4	17.8	14.2	21.2	18.7	19.9
		Distant	0.4	1.2	0.4	0.9	1.4	1.4	2.6	1.2
		Unknown	-	-	-	-	0.0	0.0	6.5	-
C25	Pancreas	Total	1.2	1.1	0.7	1.3	1.7	1.5	3.1	5.1
		Localized	4.3	4.7	1.5	2.9	2.1	6.1	13.8	18.8
		Regional	3.4	2.1	2.4	4.2	9.0	4.0	5.3	10.7
		Distant	0.1	0.2	0.2	0.2	0.6	0.6	1.3	1.4
		Unknown	0.0	0.7	1.7	3.2	1.1	1.5	2.4	5.4
C33-34	Lung, trachea	Total	7.9	7.2	7.4	7.8	7.2	8.3	9.0	11.7
		Localized	19.2	16.3	18.1	17.8	15.5	27.3	38.8	41.4
		Regional	10.5	10.7	8.6	9.9	10.8	9.0	10.8	14.1
		Distant	0.6	0.7	0.6	0.5	0.6	0.7	0.8	1.5
		Unknown	1.9	2.9	3.8	1.6	4.9	6.2	8.7	13.2
C43	Melanoma of the skin	Total	57.2	67.5	69.9	73.0	78.7	78.4	77.5	77.2
		Localized	68.1	76.3	78.3	82.0	86.2	85.5	88.9	85.4
		Regional	31.9	28.8	35.9	26.2	40.4	27.8	45.2	43.1
		Distant	9.0	12.5	3.5	2.8	11.5	10.9	9.1	6.6
		Unknown	-	-	59.8	45.3	46.5	73.4	75.0	79.0
C61	Prostate	Total	51.1	52.8	56.9	56.7	61.4	70.3	80.4	88.5
		Localized	64.6	66.2	72.4	70.9	73.4	81.5	95.8	97.2
		Regional	38.2	39.8	36.8	47.4	64.8	74.9	77.8	87.1
		Distant	17.1	18.9	19.6	23.1	23.7	23.4	26.5	32.8
		Unknown	49.0	35.1	40.1	45.5	56.4	76.4	81.9	89.6
C62	Testis	Total	66.4	75.9	92.2	94.3	96.1	95.5	96.7	97.3
		Localized	86.2	90.7	97.1	99.7	99.0	99.1	98.8	99.7
		Regional	75.8	78.2	95.3	95.2	97.8	97.5	95.8	97.8
		Distant	20.8	32.4	74.2	72.7	77.9	78.2	86.0	84.5
		Unknown	-	-	-	-	-	90.0	97.9	96.0
C64	Kidney except renal pelvis	Total	34.0	37.9	36.3	41.3	47.0	46.6	58.1	65.0
		Localized	62.7	71.9	66.3	69.9	70.9	75.0	84.1	85.9
		Regional	41.2	40.6	46.1	47.4	53.9	50.9	56.3	55.3
		Distant	4.5	5.6	3.5	5.9	6.0	3.4	8.1	10.5
		Unknown	-	-	-	-	22.8	39.0	63.8	76.0
C66-68	Bladder, ureter, urethra	Total	56.8	64.0	67.1	68.2	71.9	71.8	72.3	74.5
		Localized	66.5	73.5	75.4	74.7	77.6	80.9	84.4	83.5
		Regional	13.2	23.3	26.9	25.3	27.8	22.1	28.0	28.7
		Distant	4.0	4.7	0.2	5.2	5.3	5.2	3.8	4.5
		Unknown	48.8	25.3	31.6	56.4	40.9	70.4	69.4	76.2
C70-72	Central nervous system	Non-malignant	52.0	55.1	69.3	71.5	81.0	91.4	93.2	94.0
		Malignant	14.7	22.0	22.4	27.3	28.5	27.5	26.0	31.0
C73	Thyroid gland	Total	75.0	75.5	81.7	74.0	80.1	78.3	88.2	81.0
		Localized	85.6	92.2	96.2	91.2	97.3	99.1	97.8	98.2
		Regional	78.7	77.4	90.1	84.1	83.9	82.8	91.5	85.4
		Distant	-	-	-	-	-	-	-	-
		Unknown	-	-	-	-	-	-	-	-
C81	Hodgkin lymphoma	Total	48.5	55.1	62.5	74.7	83.8	86.9	89.4	88.9
C82-85, C96	Non-Hodgkin lymphoma	Total	32.2	38.0	44.2	45.1	49.6	52.0	58.4	68.3
C91-95	Leukaemia	Total	14.9	22.4	25.2	30.0	41.6	44.3	54.2	59.6

- : Not estimated due to few patients in the group (<50 patients at start of first interval/year)

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Table 18b Five-year relative survival (period approach) by primary site*, stage and period of follow up, 1971 -2010

FEMALES

ICD10	Site	Stage	Relative survival (%) 1971-75	1976-80	1981-85	1986-90	1991-95	1996-00	2001-05	2006-10
C00-96	All sites	Total	46.7	49.5	52.5	53.7	57.9	60.8	64.6	68.6
C00-14	Mouth, pharynx	Total	55.4	59.9	58.8	56.1	68.9	60.3	63.7	70.2
		Localized	72.2	71.6	80.0	68.7	81.9	81.9	82.8	84.4
		Regional	35.5	42.0	31.1	38.6	48.6	32.4	50.1	53.4
		Distant	-	-	-	-	-	-	-	-
		Unknown	-	-	-	-	-	63.3	59.4	80.8
C15	Oesophagus	Total	4.3	7.2	9.2	8.4	8.6	8.2	9.0	10.3
		Localized	5.7	10.8	10.7	11.8	12.6	16.2	21.1	20.0
		Regional	-	-	-	-	-	-	4.7	12.1
		Distant	-	-	-	-	-	0.0	0.0	1.3
		Unknown	-	-	-	-	-	10.9	6.9	6.3
C16	Stomach	Total	10.6	14.0	17.7	20.6	20.7	21.8	21.7	24.0
		Localized	31.1	36.0	44.3	39.6	39.0	56.8	57.4	57.2
		Regional	13.7	17.3	18.7	22.8	25.9	27.8	24.9	23.7
		Distant	1.8	2.1	0.5	1.0	0.8	1.2	3.5	3.1
		Unknown	5.0	3.8	3.9	7.1	13.3	7.3	15.7	30.6
C18	Colon	Total	39.3	40.4	47.5	49.0	53.1	56.6	57.2	62.7
		Localized	69.1	69.9	77.3	78.6	83.2	88.7	89.3	89.9
		Regional	41.9	49.3	57.2	58.4	60.1	67.7	70.2	74.0
		Distant	5.9	3.3	4.0	4.3	5.4	7.5	8.2	12.3
		Unknown	30.1	13.7	16.0	14.1	17.3	37.3	52.8	46.5
C19-21	Rectum, rectosigmoid, anus	Total	37.2	44.4	48.1	49.2	55.4	58.6	63.8	66.4
		Localized	60.3	70.8	70.5	69.9	75.5	82.2	90.3	89.6
		Regional	25.0	32.3	42.0	47.1	53.2	62.0	68.4	71.8
		Distant	3.6	5.5	5.7	5.2	4.5	6.6	10.0	13.3
		Unknown	-	-	20.1	18.6	30.8	47.2	54.4	63.9
C22	Liver	Total	3.1	1.1	1.4	5.5	5.0	6.8	11.6	13.9
		Localized	7.6	2.8	3.8	9.8	7.4	17.9	24.3	20.6
		Regional	-	-	-	-	-	-	-	-
		Distant	0.3	0.0	0.0	1.1	-	-	-	0.7
		Unknown	-	-	-	-	-	3.3	7.9	16.4
C23-24	Gallbladder, bile ducts	Total	4.9	7.1	8.3	8.5	7.5	9.4	9.8	14.2
		Localized	16.1	24.0	24.0	15.8	19.1	27.7	24.3	28.5
		Regional	-	12.3	6.1	21.2	10.3	17.0	27.2	22.1
		Distant	0.2	0.0	0.3	0.0	0.0	5.3	0.2	0.0
		Unknown	-	-	-	2.4	5.6	2.3	5.9	11.0
C25	Pancreas	Total	1.0	0.9	1.4	1.4	2.0	2.4	2.9	3.8
		Localized	4.1	4.0	2.0	3.1	6.0	11.8	11.9	17.9
		Regional	1.5	1.5	5.1	4.4	5.2	5.5	5.1	4.5
		Distant	0.2	0.2	0.6	0.4	0.3	0.4	0.8	1.0
		Unknown	0.0	0.0	0.0	0.9	0.7	2.9	2.9	6.0
C33-34	Lung, trachea	Total	10.6	10.6	9.2	7.5	10.4	11.8	12.9	16.4
		Localized	27.2	30.0	25.6	19.1	24.7	40.1	50.3	50.5
		Regional	13.4	13.6	10.7	8.3	12.2	12.7	14.0	18.7
		Distant	1.1	0.7	0.9	0.4	1.2	1.4	1.8	2.1
		Unknown	8.4	8.3	7.4	7.7	5.7	7.0	16.2	20.1
C43	Melanoma of the skin	Total	77.9	83.9	84.2	86.8	90.2	88.5	88.1	89.5
		Localized	87.6	88.9	89.5	90.8	94.0	93.7	94.3	93.9
		Regional	36.3	-	45.2	47.3	45.7	47.8	57.6	53.3
		Distant	16.9	22.8	11.9	4.9	20.0	14.9	15.4	27.2
		Unknown	-	-	61.0	74.1	71.4	86.9	87.3	89.5
C50	Breast**	Total	66.5	69.1	73.5	74.3	76.1	81.3	85.9	88.7
		Pagets stage 0	79.7	76.0	73.7	75.7	80.6	92.6	98.8	96.1
		I	84.8	84.5	86.6	88.9	91.8	95.6	97.9	98.8
		II	55.8	59.3	64.9	70.7	74.3	78.8	84.5	88.0
		III	43.5	49.1	49.9	51.8	48.6	59.3	65.4	71.6
		IV	12.8	13.7	15.2	13.5	21.6	18.0	16.9	21.1
		Unknown	77.5	78.5	85.2	65.2	67.5	85.0	84.5	71.4
C53	Cervix uteri	Total	70.0	70.8	69.0	67.1	69.6	71.4	75.8	77.5
		I	88.0	90.0	86.6	84.8	85.2	89.7	93.3	93.6
		II	64.2	64.0	61.1	58.9	61.1	54.7	67.4	70.4
		III	31.8	28.5	34.4	31.0	30.0	39.0	39.0	52.4
		IV	9.3	10.2	5.2	13.0	23.8	11.5	15.0	19.9
		Unknown	-	-	-	-	-	-	55.7	66.6
C54	Corpus uteri	Total	75.4	77.2	76.5	75.7	77.9	81.0	83.0	84.4
		Localized	82.9	85.2	87.0	86.7	86.4	90.8	93.9	93.3
		Regional	37.7	60.8	60.4	59.0	70.1	74.1	75.3	75.6
		Distant	24.0	20.3	22.9	23.7	32.6	38.5	35.5	42.5
		Unknown	-	-	41.4	-	-	50.9	81.3	85.6
C56	Ovary	Total	38.8	38.8	38.0	36.8	40.0	42.2	45.7	43.8
		Localized	70.4	76.8	81.9	80.3	83.0	90.0	92.4	85.1
		Regional	38.0	39.9	48.2	46.1	53.3	53.3	63.8	72.9
		Distant	14.3	17.2	17.9	17.6	20.6	24.9	28.6	29.1
		Unknown	-	-	40.6	22.1	14.8	39.1	60.2	46.5
C64	Kidney except renal pelvis	Total	42.3	38.9	43.1	45.8	52.1	51.6	57.9	71.2
		Localized	65.6	69.1	70.1	74.8	77.3	80.7	85.3	87.3
		Regional	46.7	39.2	49.5	49.8	52.3	52.0	43.2	52.2
		Distant	4.5	4.5	3.3	7.1	6.1	2.4	9.7	11.1
		Unknown	-	-	-	13.6	18.5	43.4	58.3	74.6
C66-68	Bladder, ureter, urethra	Total	48.5	49.7	55.7	60.8	62.7	60.5	64.9	67.3
		Localized	67.1	64.0	68.1	69.8	71.4	76.7	83.1	80.6
		Regional	15.7	13.9	15.7	13.6	22.1	27.0	22.4	21.0
		Distant	3.7	3.8	2.9	5.4	5.1	4.3	1.8	7.7
		Unknown	29.4	-	15.8	-	25.4	51.7	60.4	65.2
C70-72	Central nervous system	Non-malignant	64.8	71.8	83.5	83.3	83.3	92.1	94.1	95.5
		Malignant	15.8	18.8	21.9	29.2	33.9	28.1	32.6	33.4
C73	Thyroid gland	Total	73.6	84.4	87.2	86.7	90.9	88.3	91.1	94.9
		Localized	89.8	95.6	96.5	94.1	98.7	99.7	101.8	101.1
		Regional	73.7	83.0	81.5	83.9	86.8	86.8	85.5	93.1
		Distant	9.8	13.4	14.2	11.6	26.2	32.7	31.4	-
		Unknown	-	-	-	-	-	68.8	87.3	91.7
C81	Hodgkin lymphoma	Total	49.6	55.9	63.2	73.2	81.9	87.9	87.1	88.9
C82-85, C96	Non-Hodgkin lymphoma	Total	37.1	43.1	47.1	51.5	55.8	54.9	60.4	71.4
C91-95	Leukaemia	Total	18.0	20.1	29.3	27.6	40.0	50.0	54.0	62.1

See footnote in Table 18a

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

**The stage classification on the basis of TNM was revised between the 2009 and 2010 CiN issue and results therefore differ especially for stage I. A more strict treatment of NX and MX has been introduced with the result of a higher proportion of unknown stage but higher validity of stages I-IV.

Table 18 describes the stage-specific relative survival, 5 years after diagnosis for selected cancers in consecutive 5-year periods of follow-up 1971 to 2010. While the stage-specific count of cases by period of diagnosis in Tables 15a and b are not equivalent to the size of patient groups used in the survival calculations, the underlying numbers do provide a reasonable indication of the absolute number of patients involved in the survival analyses at different time periods and their relative distribution. In general, caution is required in interpreting cancer-specific incidence and survival according to stage, particularly given the time-varying proportion of staging recorded as unknown. A visual description of survival trends in colon, breast and prostate cancer by stage was provided in the Special Issue included in Cancer in Norway 2007

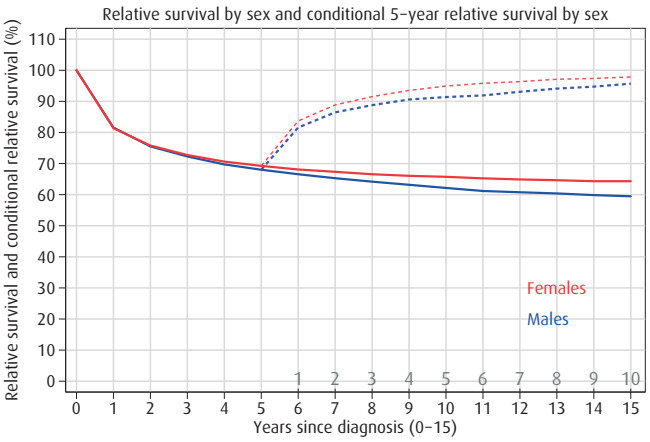
Table 19 1-, 5-, 10-, and 15-year relative survival proportions (95% CI) by cancer site* and sex, period approach 2008 - 2010

ICD10	Site	Sex	1-year		5-year		10-year		15-year	
C00-14	Mouth, pharynx	M	85.4	(82.6, 87.8)	62.0	(57.9, 66.0)	52.2	(47.3, 57.1)	43.8	(38.3, 49.6)
		F	85.5	(81.8, 88.6)	72.0	(66.7, 76.9)	65.2	(58.1, 72.0)	63.1	(54.2, 72.0)
C15	Oesophagus	M	41.6	(37.1, 46.1)	11.4	(8.2, 15.2)	10.8	(7.0, 15.6)	5.0	(1.6, 11.9)
		F	34.4	(27.5, 41.4)	9.2	(5.0, 15.0)	9.8	(4.9, 17.1)	4.5	(0.8, 15.2)
C16	Stomach	M	50.0	(46.5, 53.5)	24.5	(21.1, 28.0)	22.9	(19.0, 27.2)	21.6	(17.0, 26.9)
		F	44.1	(40.0, 48.2)	24.0	(20.3, 27.9)	23.1	(18.7, 27.9)	21.8	(16.8, 27.7)
C18	Colon	M	77.8	(76.2, 79.3)	60.6	(58.4, 62.8)	55.5	(52.5, 58.4)	55.0	(51.0, 59.1)
		F	77.3	(75.8, 78.7)	62.1	(60.0, 64.1)	56.9	(54.3, 59.6)	54.1	(50.8, 57.5)
C19-21	Rectum, rectosigmoid, anus	M	85.0	(83.3, 86.7)	65.1	(62.3, 67.8)	57.1	(53.5, 60.7)	56.0	(51.3, 60.7)
		F	86.0	(84.1, 87.8)	67.5	(64.6, 70.4)	61.4	(57.6, 65.1)	60.0	(55.2, 64.8)
C22	Liver	M	33.2	(27.5, 39.0)	12.5	(8.3, 17.6)	7.3	(3.1, 14.3)	7.0	(2.5, 15.4)
		F	33.4	(26.2, 40.8)	14.8	(8.9, 22.2)	10.9	(5.5, 18.8)	14.3	(7.2, 24.7)
C23-24	Gallbladder, bile ducts	M	45.3	(37.8, 52.5)	15.7	(10.3, 22.5)	14.4	(8.4, 22.6)	12.9	(6.2, 23.2)
		F	42.4	(35.7, 48.9)	17.4	(12.2, 23.5)	16.3	(9.9, 24.5)	19.6	(11.3, 30.7)
C25	Pancreas	M	21.2	(18.7, 23.8)	5.0	(3.6, 6.6)	3.9	(2.4, 5.9)	3.9	(2.0, 6.9)
		F	19.2	(16.9, 21.7)	4.4	(3.1, 6.0)	3.9	(2.5, 5.9)	3.8	(2.0, 6.5)
C33-34	Lung, trachea	M	34.7	(33.3, 36.2)	11.7	(10.7, 12.8)	9.1	(8.0, 10.3)	7.6	(6.3, 9.0)
		F	42.2	(40.5, 43.9)	16.8	(15.4, 18.3)	12.6	(11.1, 14.2)	9.9	(8.2, 11.8)
C43	Melanoma of the skin	M	92.9	(91.5, 94.2)	76.9	(74.3, 79.4)	71.5	(68.1, 74.8)	71.2	(67.2, 75.2)
		F	96.5	(95.4, 97.4)	89.4	(87.3, 91.3)	84.6	(81.7, 87.3)	82.6	(79.2, 85.9)
C50	Breast	F	97.1	(96.6, 97.6)	89.3	(88.3, 90.2)	82.6	(81.2, 83.9)	77.6	(75.9, 79.3)
C53	Cervix uteri	F	90.0	(87.7, 91.9)	76.6	(73.4, 79.6)	74.9	(71.2, 78.3)	74.7	(70.6, 78.6)
C54	Corpus uteri	F	92.8	(91.5, 94.0)	85.2	(83.0, 87.2)	81.5	(78.5, 84.4)	80.6	(76.7, 84.4)
C56	Ovary	F	76.6	(74.0, 78.9)	44.6	(41.6, 47.6)	36.4	(33.2, 39.6)	35.5	(32.1, 39.1)
C61	Prostate	M	98.0	(97.6, 98.4)	89.6	(88.6, 90.6)	79.6	(77.8, 81.3)	69.2	(66.2, 72.3)
C62	Testis	M	98.9	(97.9, 99.5)	97.5	(96.0, 98.6)	96.2	(94.2, 97.8)	94.6	(92.1, 96.7)
C64	Kidney except renal pelvis	M	82.2	(79.8, 84.5)	66.7	(63.1, 70.1)	58.9	(54.2, 63.5)	56.4	(50.1, 62.8)
		F	83.7	(80.5, 86.5)	71.7	(67.2, 75.9)	65.6	(59.3, 71.7)	62.4	(54.2, 70.6)
C66-68	Bladder, ureter, urethra	M	87.4	(85.8, 88.8)	73.1	(70.7, 75.5)	68.1	(64.8, 71.5)	65.5	(61.0, 70.0)
		F	81.9	(79.1, 84.4)	68.1	(64.1, 72.0)	68.3	(63.0, 73.6)	65.1	(58.1, 72.2)
C70-72	Central nervous system	M	75.2	(72.7, 77.5)	61.0	(57.9, 63.9)	57.5	(53.9, 60.9)	57.1	(52.8, 61.3)
		F	85.0	(83.1, 86.7)	77.0	(74.5, 79.3)	77.4	(74.4, 80.3)	77.5	(73.6, 81.3)
C73	Thyroid gland	M	89.2	(83.4, 93.2)	82.0	(74.4, 88.2)	81.3	(72.1, 89.2)	78.2	(66.5, 88.8)
		F	95.8	(93.4, 97.4)	94.9	(91.4, 97.6)	94.8	(90.1, 98.7)	96.1	(90.1, 101.3)
C81	Hodgkin lymphoma	M	91.4	(86.5, 94.7)	87.9	(81.9, 92.4)	87.0	(80.1, 92.4)	89.1	(81.6, 95.1)
		F	92.4	(86.0, 96.1)	89.3	(81.8, 94.6)	91.3	(82.5, 97.7)	88.8	(78.5, 96.7)
C82-85, C96	Non-Hodgkin lymphoma	M	79.3	(76.9, 81.5)	68.6	(65.4, 71.7)	60.9	(56.7, 65.0)	57.7	(52.4, 63.1)
		F	82.0	(79.4, 84.3)	73.5	(70.1, 76.7)	69.2	(64.7, 73.7)	67.0	(61.1, 72.9)
C91-95	Leukaemia	M	78.0	(75.5, 80.2)	62.9	(59.6, 66.2)	56.8	(52.2, 61.3)	58.2	(52.3, 64.2)
		F	76.7	(74.0, 79.2)	62.6	(59.0, 66.1)	56.3	(51.5, 61.0)	55.0	(48.9, 61.2)

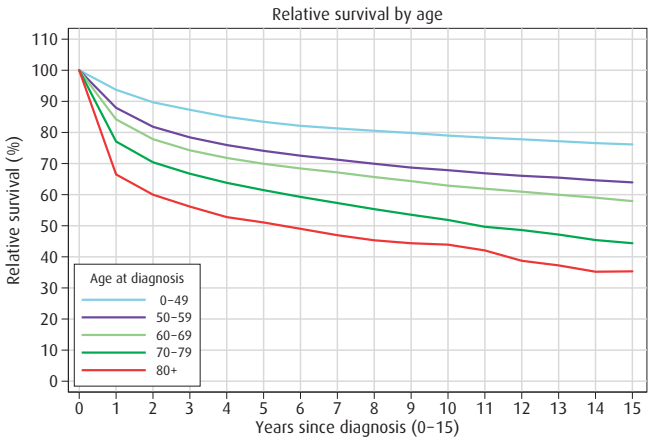
* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Relative survival (RS) up to 15 years after diagnosis by sex and age (2008–10)

Figure 9A: All sites (ICD10 C00–96, D32–33, D35.2–35.4, D42–43, D44.3–44.5, D46, D47)

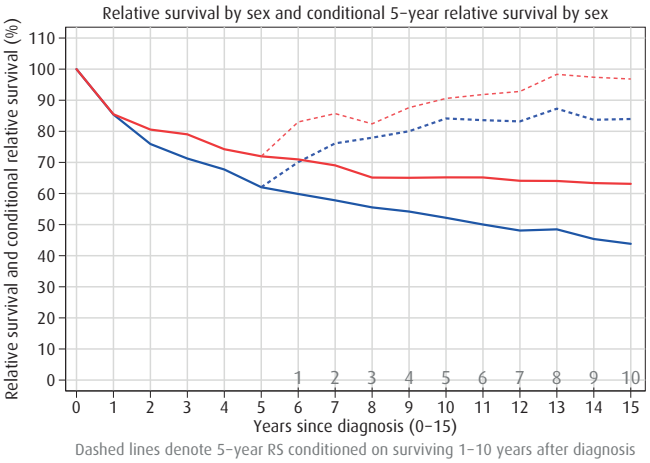


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

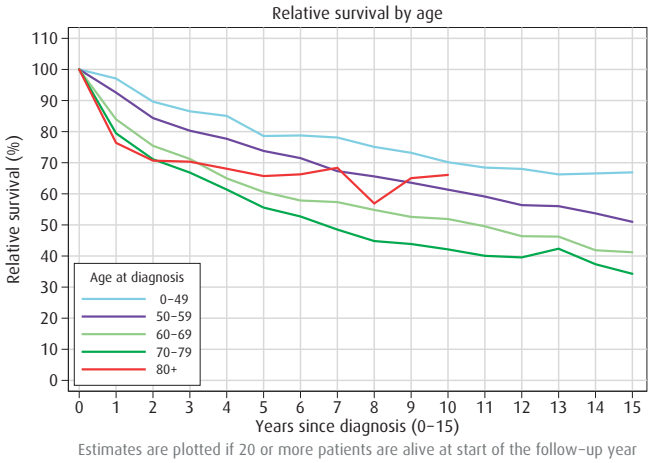


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9B: Mouth, pharynx (ICD-10 C00–14)

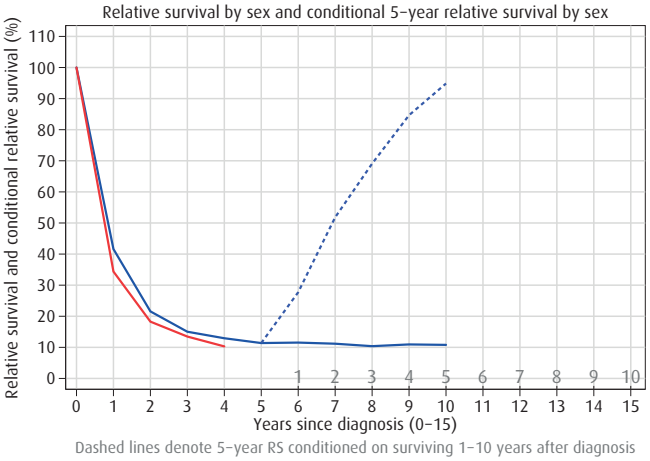


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

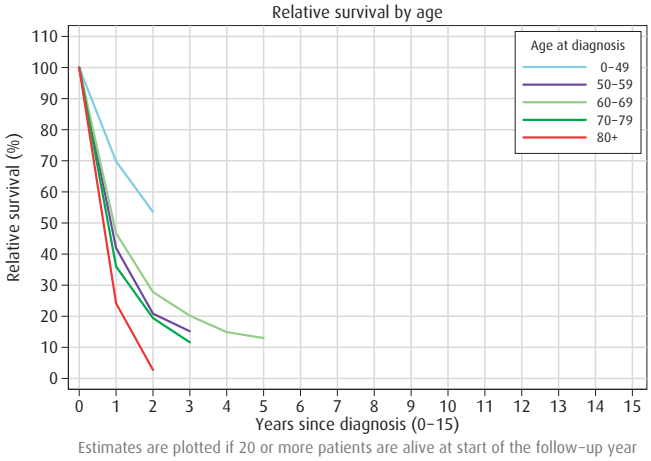


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9C: Oesophagus (ICD-10 C15)



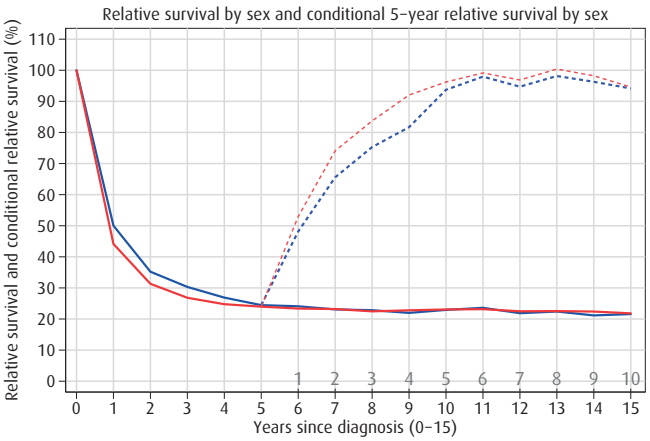
Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis



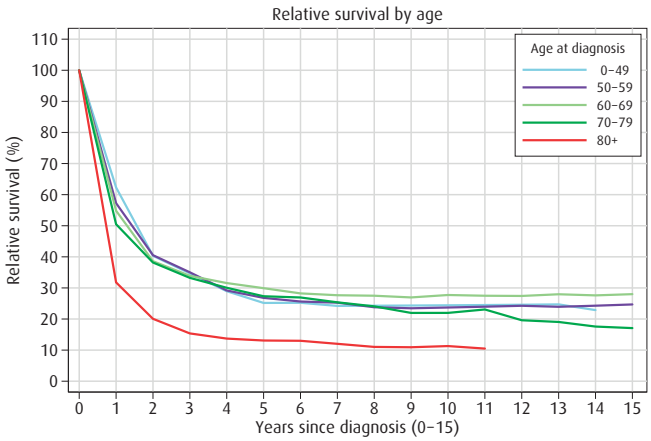
Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Relative survival (RS) up to 15 years after diagnosis by sex and age (2008–10)

Figure 9D: Stomach (ICD-10 C16)

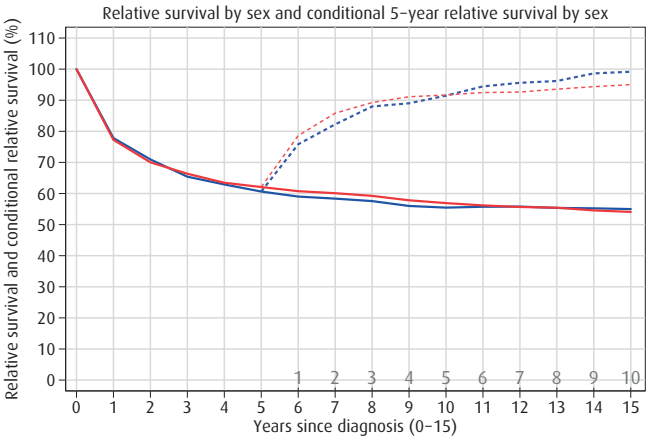


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

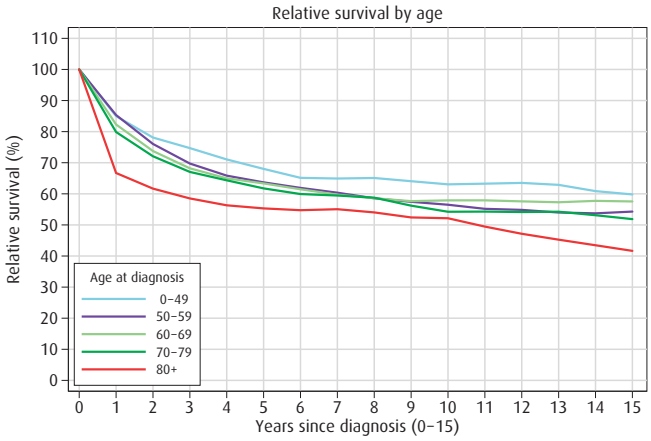


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9E: Colon (ICD-10 C18)

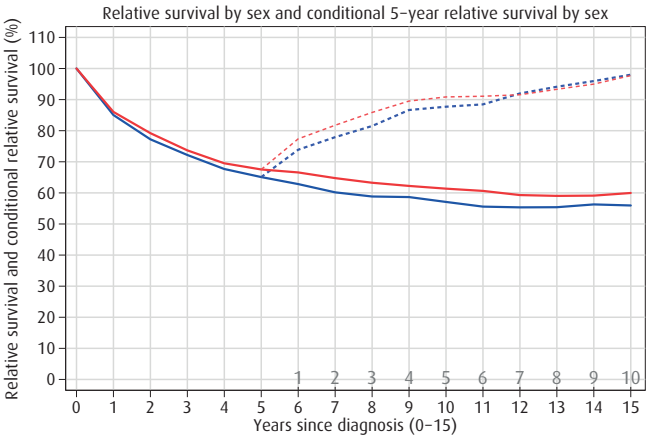


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

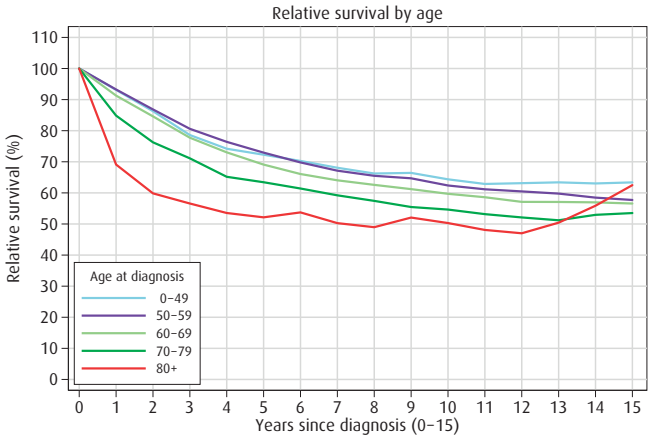


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9F: Rectum, rectosigmoid, anus (ICD-10 C19–21)



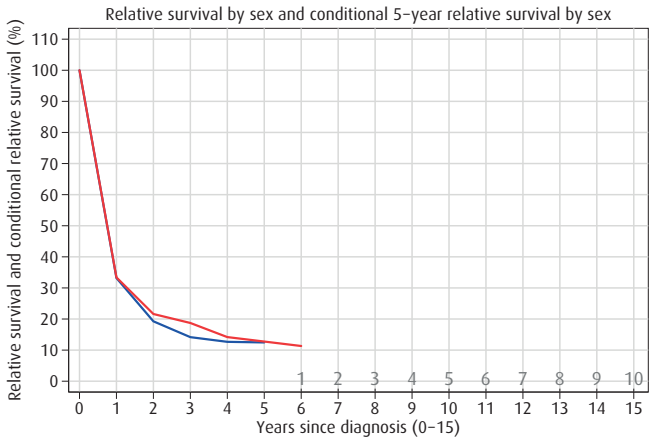
Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis



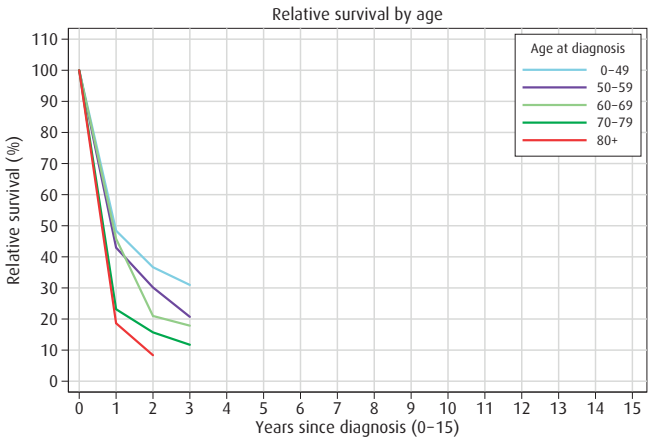
Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Relative survival (RS) up to 15 years after diagnosis by sex and age (2008–10)

Figure 9G: Liver (ICD-10 C22)

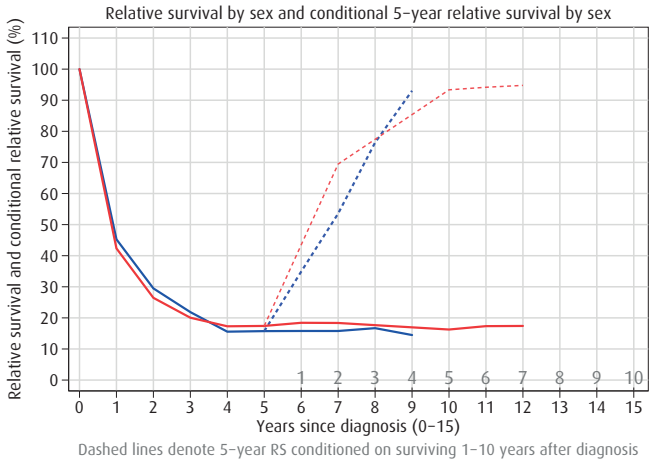


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

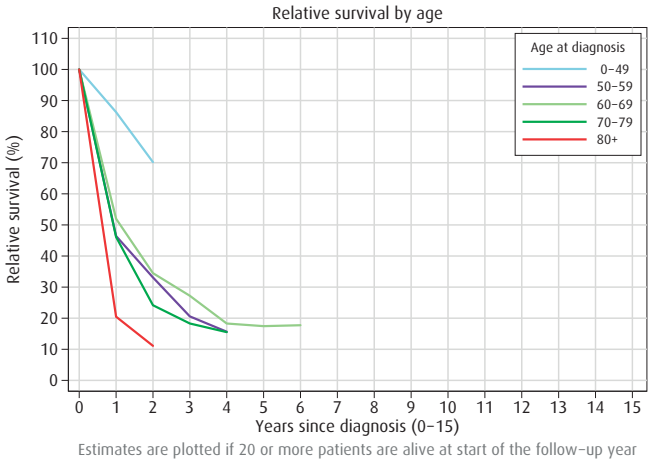


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9H: Gallbladder, bile ducts (ICD-10 C23–24)

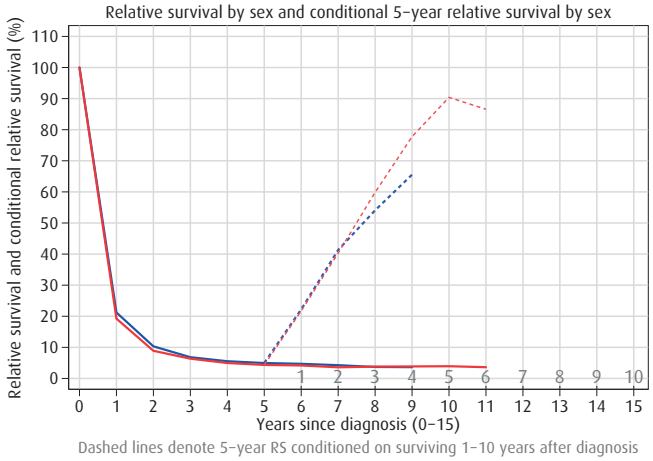


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

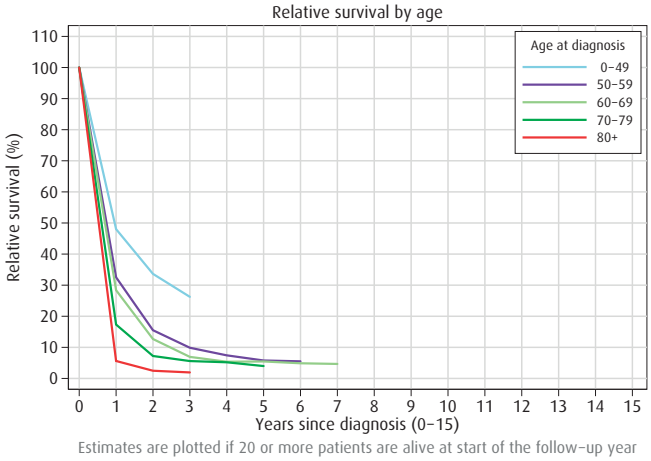


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9I: Pancreas (ICD-10 C25)



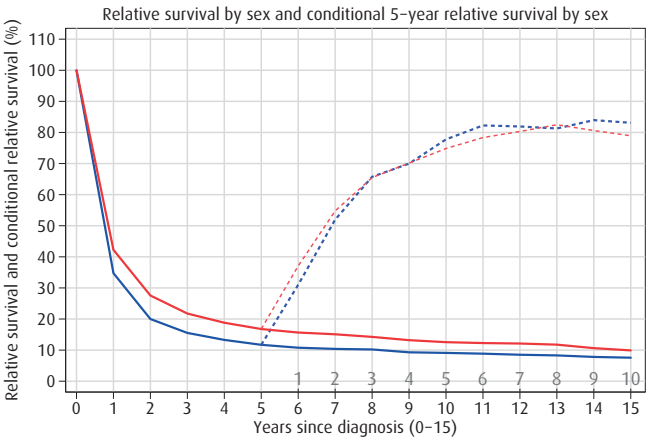
Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis



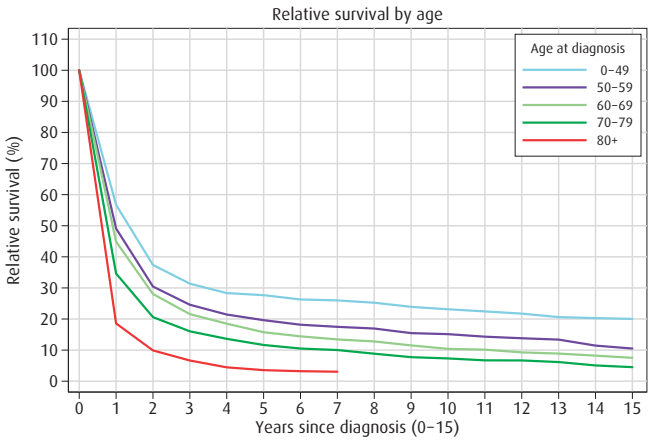
Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Relative survival (RS) up to 15 years after diagnosis by sex and age (2008–10)

Figure 9J: Lung, trachea (ICD-10 C33–34)

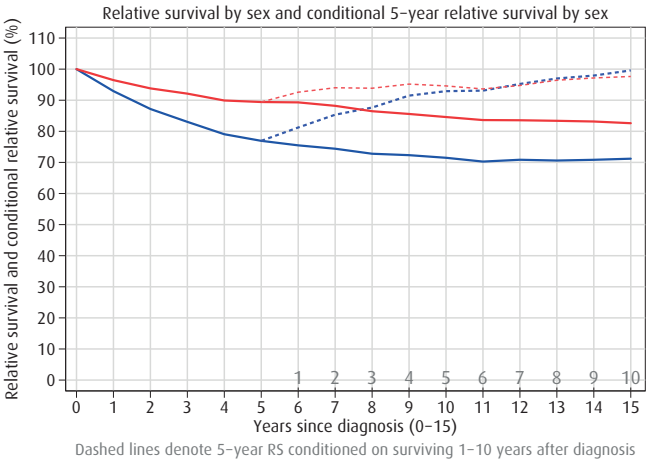


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

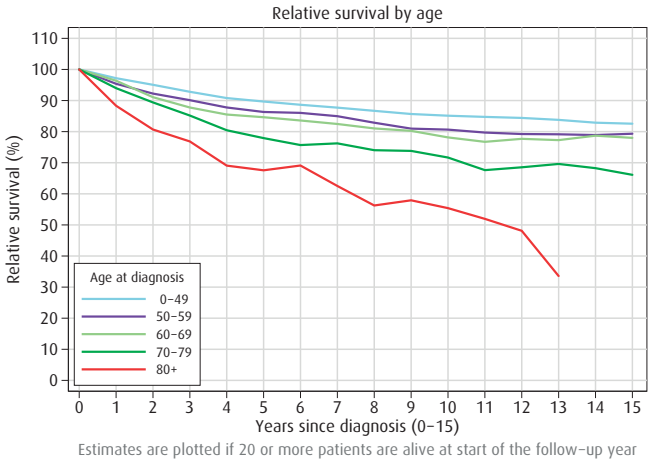


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9K: Melanoma of the skin (ICD-10 C43)

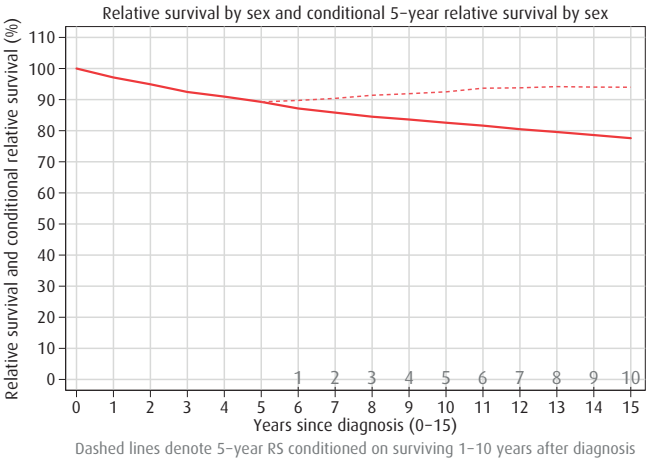


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

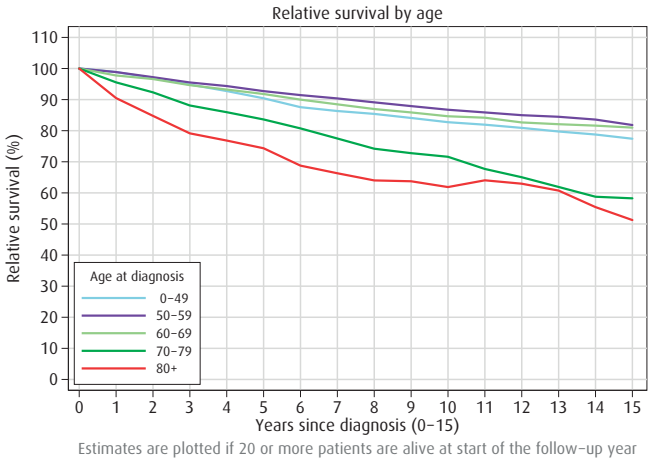


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9L: Breast (ICD-10 C50)



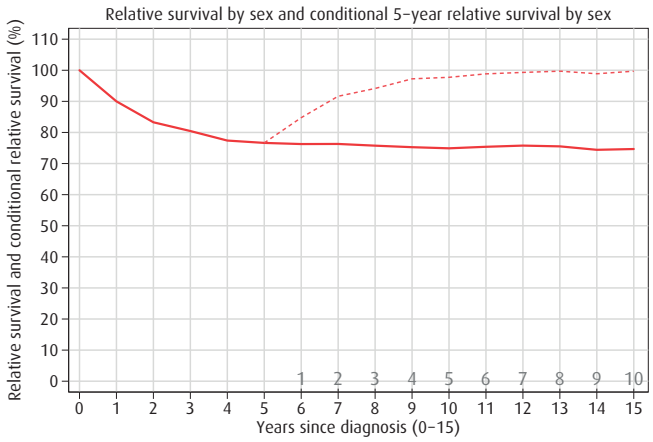
Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis



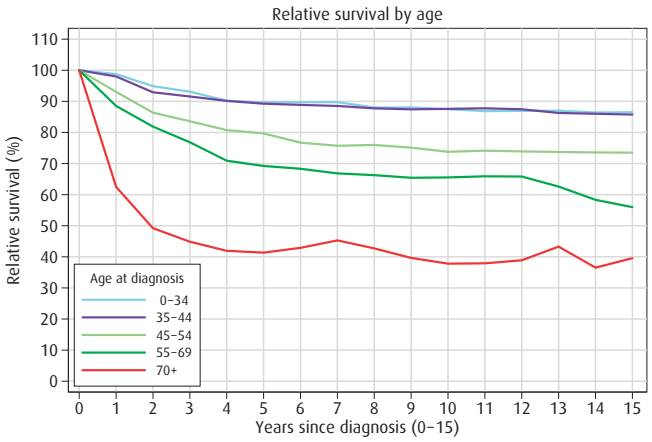
Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Relative survival (RS) up to 15 years after diagnosis by sex and age (2008–10)

Figure 9M: Cervix uteri (ICD-10 C53)

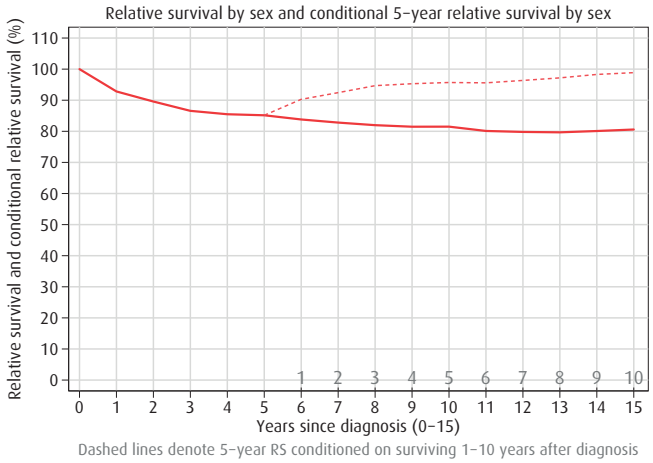


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

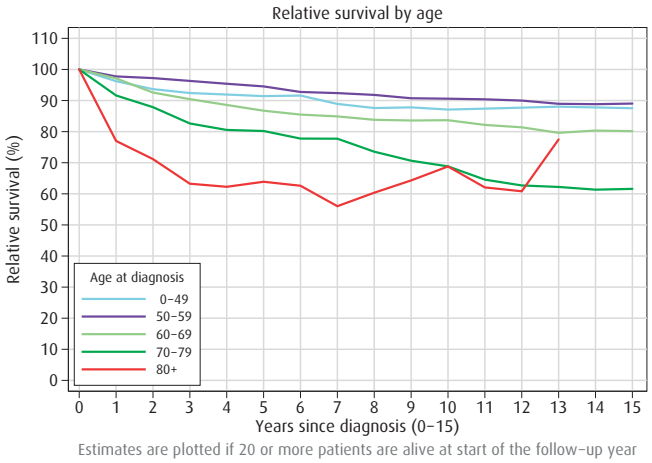


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9N: Corpus uteri (ICD-10 C54)

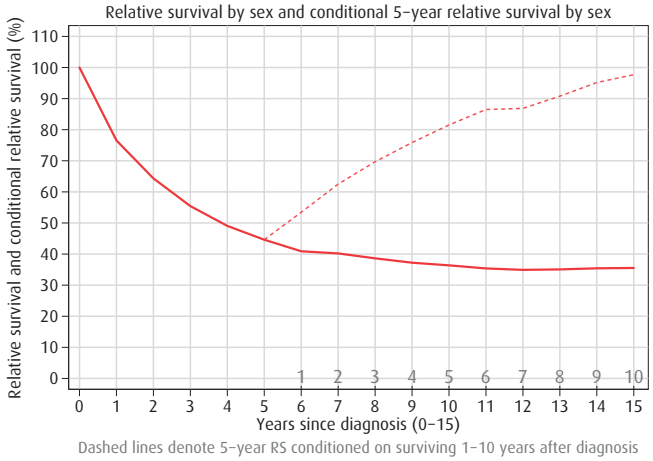


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

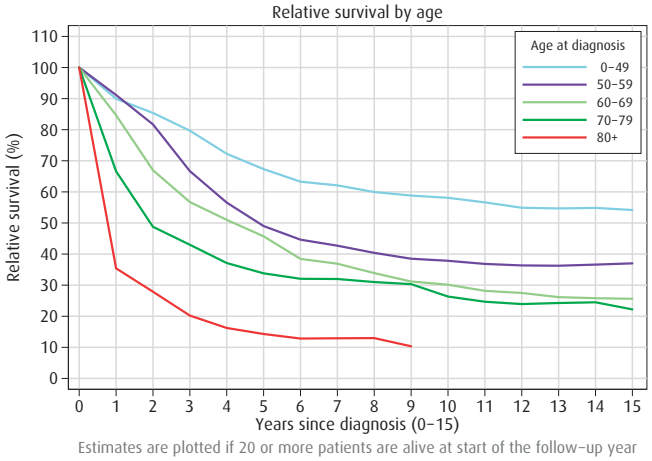


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9O: Ovary (ICD-10 C56)



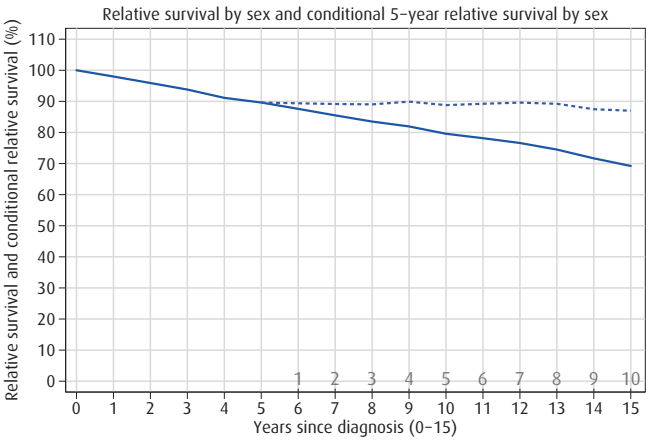
Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis



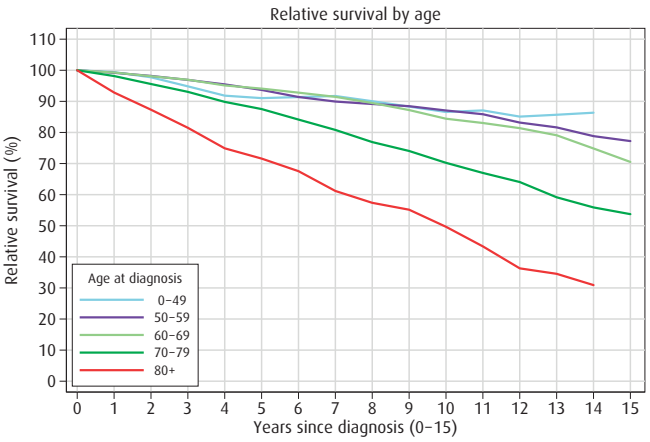
Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Relative survival (RS) up to 15 years after diagnosis by sex and age (2008–10)

Figure 9P: Prostate (ICD-10 C61)

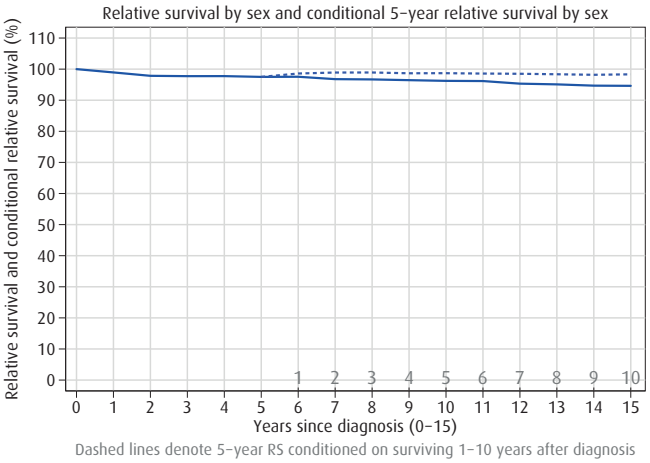


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

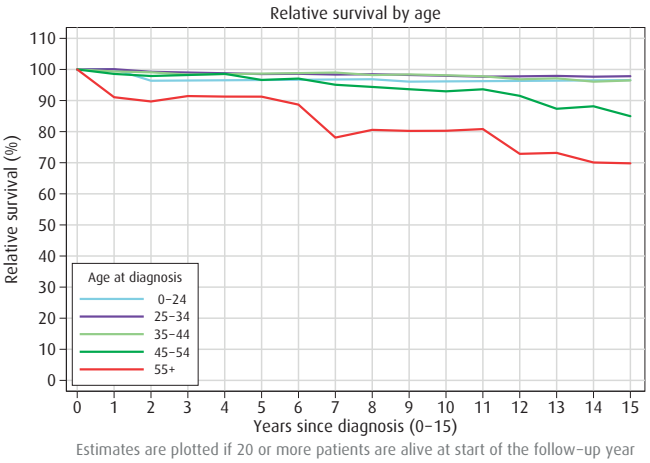


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9Q: Testis (ICD-10 C62)

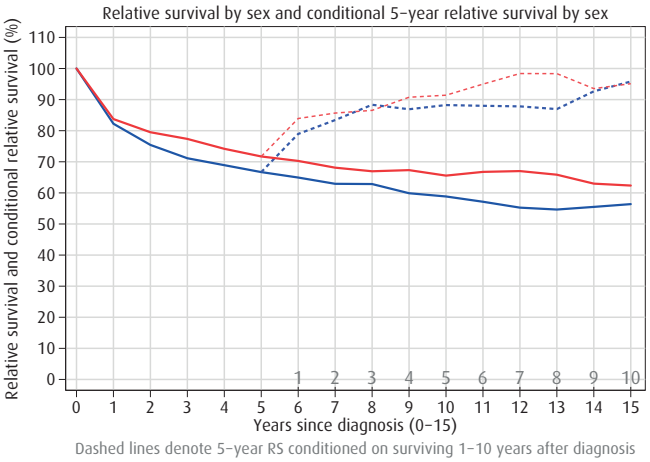


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

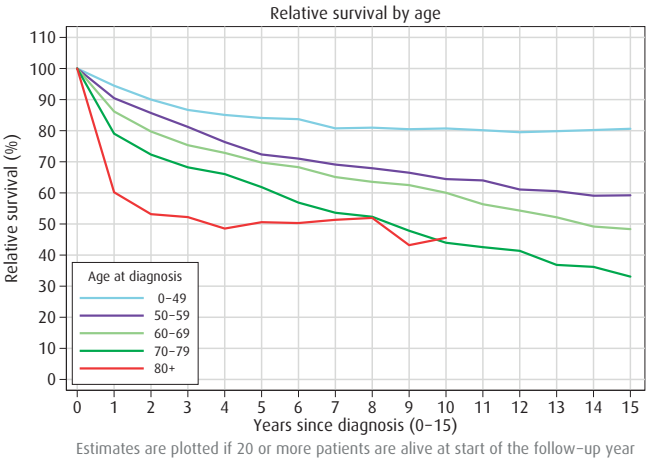


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9R: Kidney excluding renal pelvis (ICD-10 C64)



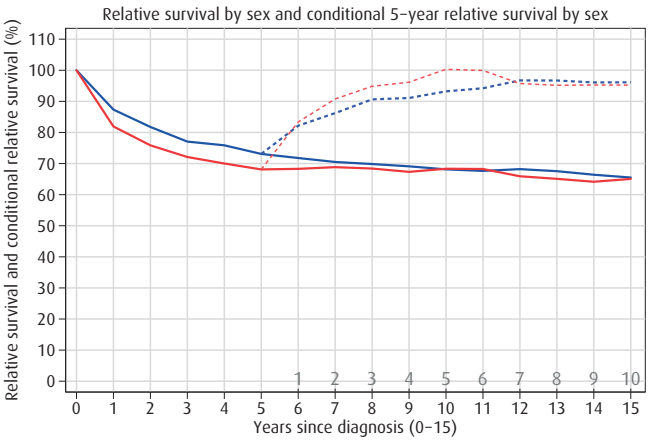
Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis



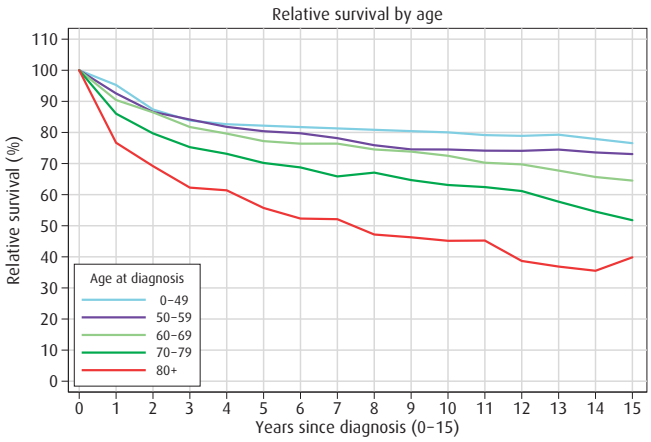
Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Relative survival (RS) up to 15 years after diagnosis by sex and age (2008–10)

Figure 9S: Bladder, ureter, urethra (ICD-10 C66–68)

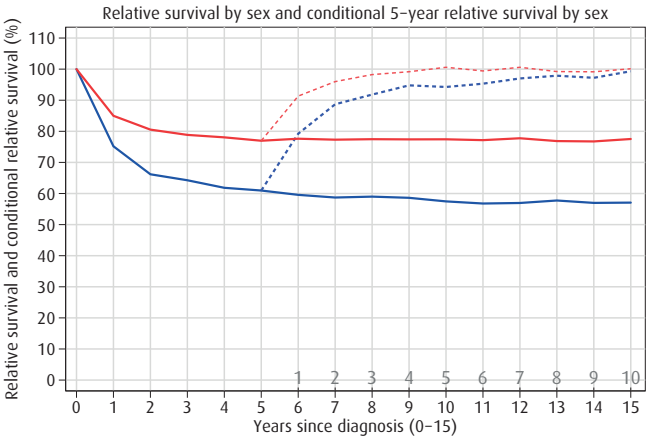


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

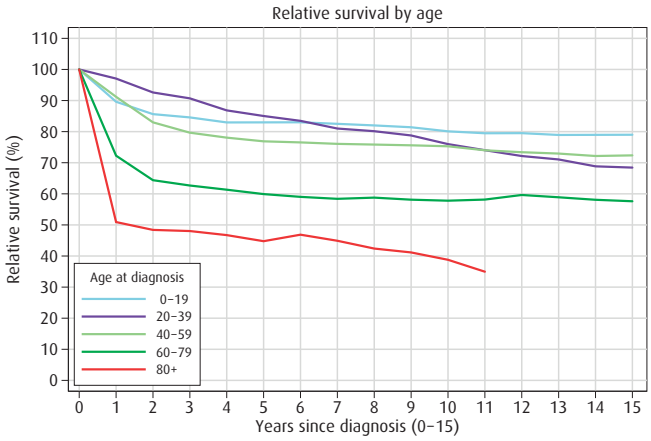


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9T: Central nervous system (ICD-10 C70–72, D32–33, D35.2–35.4, D42–43, D44.3–44.5)

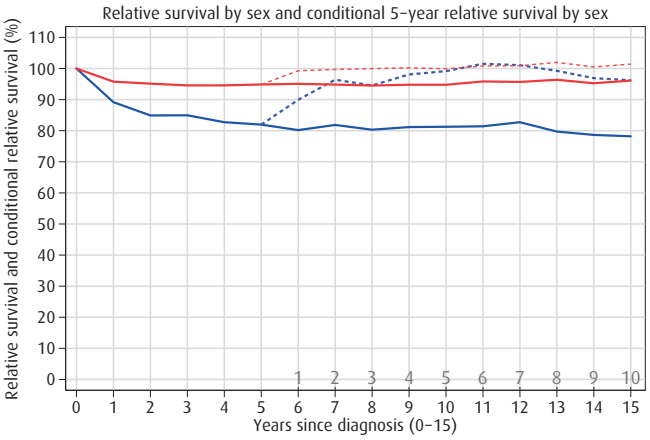


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

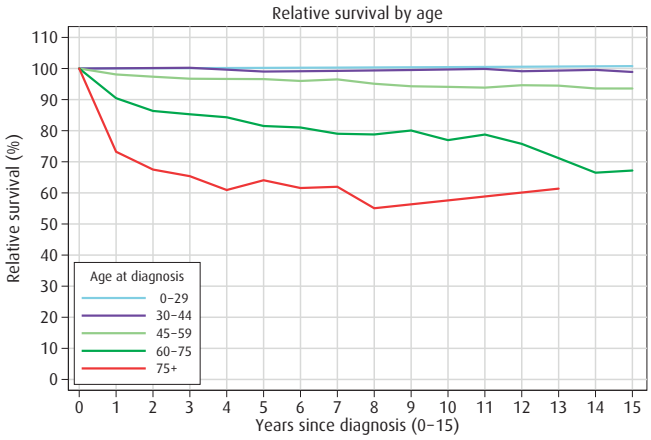


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9U: Thyroid gland (ICD-10 C73)



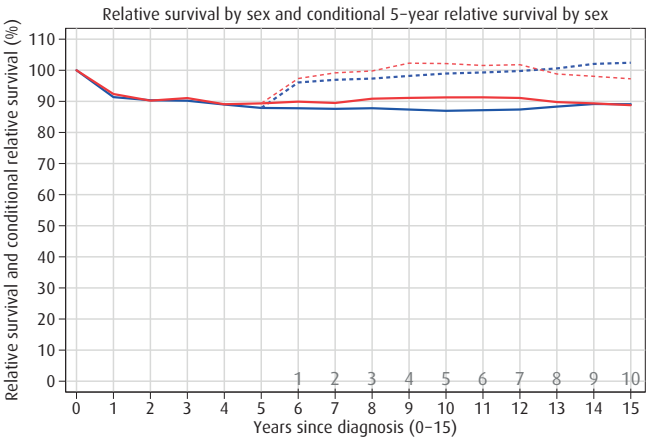
Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis



Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Relative survival (RS) up to 15 years after diagnosis by sex and age (2008–10)

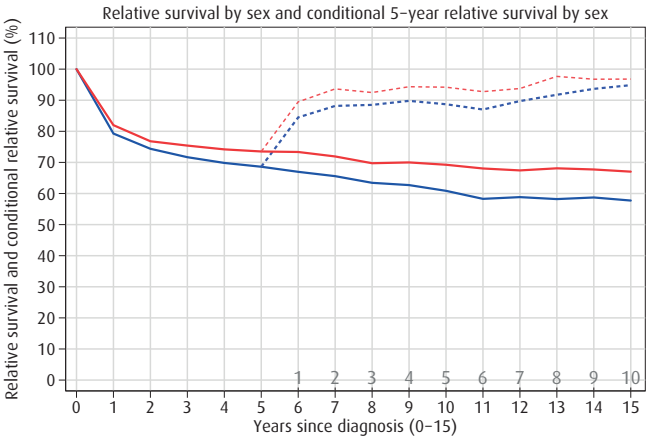
Figure 9V: Hodgkin lymphoma (ICD-10 C81)



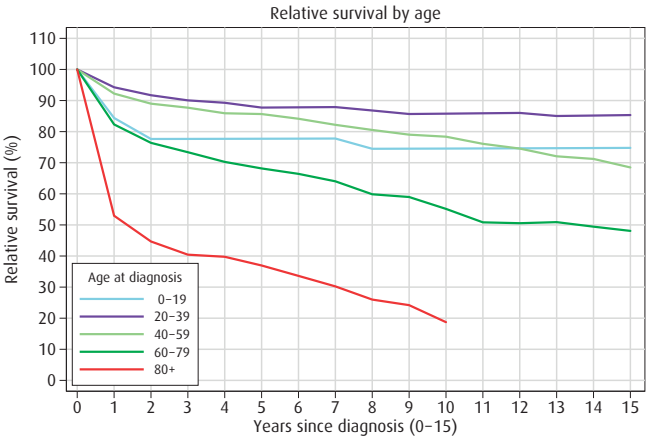
Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9W: Non-Hodgkin lymphoma (ICD-10 C82–85, C96)

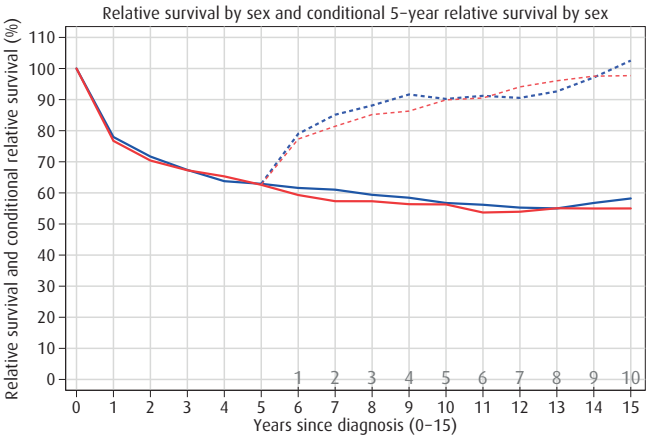


Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis

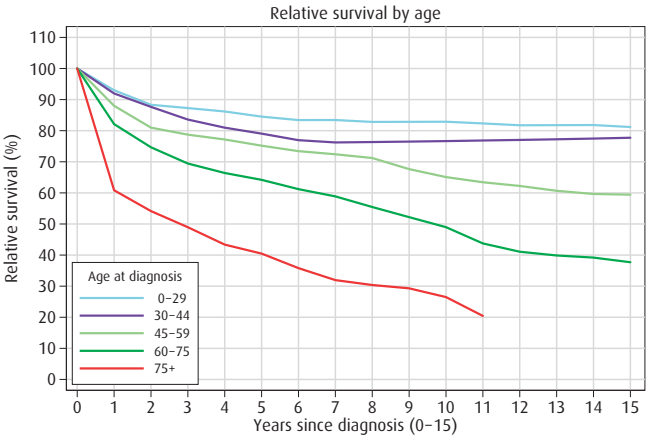


Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Figure 9X: Leukaemia (ICD-10 C91–95, D45–47)



Dashed lines denote 5-year RS conditioned on surviving 1–10 years after diagnosis



Estimates are plotted if 20 or more patients are alive at start of the follow-up year

Prevalence

As of 31 December 2010, more than 207 000 persons were alive and previously diagnosed with cancer in Norway. The cancer prevalence in Table 20 provides the numbers of cancer survivors a given number of years after diagnosis (<1, 4-9, 5-9 and ≥10 years), and approximates the number of patients in Norway (of both sexes) potentially requiring some form of cancer care. Breast, colorectal and prostate cancer, commonly-diagnosed cancers with reasonable 5-year patient survival, have the highest 10-year prevalence in Norway.

The 9 210 persons alive and diagnosed with melanoma of the skin 10 or more years after diagnosis ranks second only to breast cancer (15 147 persons), while the prevalence of melanoma is eleven times that of lung cancer (846 persons). Differences in prognosis - rather than incidence - may explain much of the site-specific variability in prevalence. Lung cancer in terms of new cases, for example, almost doubles that of melanoma in Norway, and the considerably higher melanoma prevalence reflects the vast difference in survival between those two cancers.

Table 20. Prevalence of cancer* 31.12.2000 and 31.12.2010, both sexes

		Total no. of persons alive		Years after diagnosis			
ICD10	Site	31.12.00	31.12.10	<1	1-4	5-9	10+
C00-96	**All sites**	**143612**	**207224**	**20237**	**60778**	**48717**	**77492**
C00-14	**Mouth, pharynx**	**3134**	**3883**	**451**	**1218**	**827**	**1387**
C00	Lip	1320	1318	122	402	214	580
C01-02	Tongue	431	658	85	222	149	202
C03-06	Mouth, other	563	650	79	202	155	214
C07-08	Salivary glands	398	498	56	114	114	214
C09-14	Pharynx	462	810	121	306	201	182
C15-26	**Digestive organs**	**23345**	**31351**	**4190**	**10005**	**7282**	**9874**
C15	Oesophagus	214	376	151	125	57	43
C16	Stomach	2187	1940	305	537	371	727
C17	Small intestine	419	790	109	303	206	172
C18	Colon	12623	17311	2073	5590	4136	5512
C19-21	Rectum, rectosigmoid, anus	7607	10270	1178	3236	2487	3369
C22	Liver	142	277	74	105	32	66
C23-24	Gallbladder, bile ducts	245	365	112	115	59	79
C25	Pancreas	385	629	273	213	72	71
C26	Other digestive organs	76	149	45	36	40	28
C30-34, C38	**Respiratory organs**	**4597**	**6707**	**1752**	**2390**	**1196**	**1369**
C30-31	Nose, sinuses	258	305	33	106	64	102
C32	Larynx, epiglottis	1028	1103	105	318	279	401
C33-34	Lung, trachea	3275	5284	1616	1965	857	846
C38	Mediastinum, pleura (non-mesothelioma)	50	47	9	10	6	22
C40-41	**Bone**	**487**	**686**	**49**	**142**	**122**	**373**
C43	**Melanoma of the skin**	**12967**	**18356**	**1454**	**4199**	**3493**	**9210**
C44	**Skin, non-melanoma**	**8051**	**12257**	**1453**	**4417**	**3066**	**3321**
C45	**Mesothelioma**	**67**	**113**	**58**	**43**	**4**	**8**
C46	**Kaposi's sarcoma**	**99**	**88**	**9**	**23**	**18**	**38**
C47	**Autonomic nervous system**	**229**	**256**	**10**	**39**	**28**	**179**
C48-49	**Soft tissues**	**943**	**1257**	**116**	**351**	**225**	**565**
C50	**Breast**	**26026**	**37079**	**2726**	**9568**	**9638**	**15147**
C51-58	**Female genital organs**	**17993**	**20864**	**1477**	**4346**	**4042**	**10999**
C53	Cervix uteri	6720	6803	302	913	1029	4559
C54	Corpus uteri	6706	8960	707	2254	2060	3939
C55	Uterus, other	45	41	3	7	11	20
C56	Ovary	3751	4088	363	908	731	2086
C51-52, C57	Other female genital	935	1162	122	329	272	439
C58	Placenta	130	146	3	6	17	120
C60-63	**Male genital organs**	**20222**	**38218**	**4269**	**15193**	**10142**	**8614**
C61	Prostate	15840	31728	3979	13983	8866	4900
C62	Testis	4123	6167	264	1134	1193	3576
C60, C63	Other male genital	302	448	47	138	116	147
C64-68	**Urinary organs**	**11976**	**16055**	**1731**	**5059**	**3914**	**5351**
C64	Kidney excl. renal pelvis	2956	4786	587	1634	1162	1403
C65	Renal pelvis	431	558	80	172	113	193
C66-68	Bladder, ureter, urethra	8767	10987	1105	3370	2695	3817
C69	**Eye**	**779**	**917**	**42**	**201**	**187**	**487**
C70-72, D32-33	**Central nervous system**	**5624**	**10307**	**826**	**2837**	**2696**	**3948**
C73	**Thyroid gland**	**3392**	**4411**	**249**	**778**	**771**	**2613**
C37, C74-75	**Other endocrine glands**	**1560**	**2911**	**179**	**865**	**681**	**1186**
C39, C76, C80	**Other or unspecified**	**495**	**556**	**130**	**159**	**102**	**165**
C81-96	**Lymphoid and haematopoietic tissue**	**9808**	**16915**	**1983**	**5635**	**3951**	**5346**
C81	Hodgkin lymphoma	1575	2216	121	409	439	1247
C82-85, C96	Non-Hodgkin lymphoma	4343	7079	812	2268	1703	2296
C88	Malignant immunoproliferative diseases	234	388	42	155	114	77
C90	Multiple myeloma	1046	1569	296	737	325	211
C91-95, D45-47	Leukaemia	2629	5759	739	2113	1389	1518

* A list of ICD-10 codes where morphologies are excluded or included is given on page 9 in this report.

Trends in Incidence, Mortality and Survival, Norway 1966-2010

There has been considerable discussion as to the relative merits of incidence, mortality and survival in cancer research generally, and in time trend analyses specifically (Boyle, 1989; Coleman, 2000; Doll & Peto, 1981; Peto & al, 2000). Analysing trends in incidence may provide some insight into changes in the incidence and distribution of risk factors, and to the impact of interventions aimed at prevention and early diagnosis. Mortality rates and survival proportions are both key measures of disease outcome, and may alert us to the beneficial effects of screening, or to the introduction of more effective therapies and better disease management.

The importance of determining artefacts and considering their contribution to observed cancer incidence and mortality trends have been comprehensively addressed by Saxen (Saxen, 1982) and Muir et al. (Muir & al, 1994), while many studies have investigated the accuracy of death certificates (e.g. (Percy & al, 1981; Alfsen & al, 2010)). Other than artefacts related to registration practices, many of the factors that affect incidence equally apply to mortality, given that both rely on the accuracy of the initial cancer diagnosis. As with incidence, survival estimates are susceptible to changes in diagnostic practices and disease classifications, as well as the spread of screening tools that detect cases earlier.

There is a general consensus that a combined description of trends in incidence, mortality and survival often serves to confirm and clarify understanding of the underlying biological, epidemiological and clinical processes. As each indicator is subject to unique or shared artefacts that tend to vary according to cancer type over time, their simultaneous assessment often enables the identification of systematic deviations in one or more of the three measures. Figure 10-A to 10-X present annual age-standardised (world) incidence (1966-2010) and mortality (1966-2010) rates together with period-based (3-year window 1966-2010) 5-year relative survival probabilities for all cancers combined and for 23 specific cancer sites. The survival trends are plotted as crude rather than age-adjusted estimates for purposes of consistency; the age-specific numbers were sparse for certain neoplasms for certain years, and thus standardised estimates could not be calculated. It should be noted that these summary measures will often fail to reflect true underlying age-calendar year interactions for specific cancers, such as differentials in survival and mortality trends by age with respect to calendar time, or the presence of strong birth cohort influences in incidence trends.

The trends for "all sites" in Figure 10-A conveys a general picture of uniform increases in cancer incidence and survival in Norway over the last four decades, coupled with fairly constant mortality trend up until the early-1990s. The decline in mortality that follows is more evident in men than in women. The interpretation of these aggregated estimates is evidently a non-trivial exercise, in that they comprise many different cancer forms variable in terms of their capacity to be diagnosed as well as treated. In combination however, prostate, breast, lung and colorectal cancer represent half of the total incidence and mortality burden, specifically, 48.7% of the new cancers cases in Norway in 2010, and 49.6% of the deaths in 2010.

For men, more than one-fourth of all cancers diagnosed in 2010 were prostate cancers. The marked increases in both incidence and 5-year relative survival from 1990 (Figure 10-O) reflects the availability of the PSA test and the upsurge in its use in the detection of the disease in a subsequent biopsy. Mortality has declined from around 1996 and both early diagnosis and improved and more active treatment may have had an impact.

Breast cancer among women comprises more than 20% of all female cancer cases. There has been a notable decline in the incidence rate of breast cancer since 2005. The 5-year relative survival has increased in the last two decades, while mortality began declining around 1996 (Figure 10-M).
The Norwegian Breast Cancer Screening Programme began screening women aged 50-69 at the end of

1995 as a four-year pilot project in four of the 19 Norwegian counties, and gradually expanded to become national by 2005. The implementation of screening may explain much of the recent year's trend with increases in incidence from the mid-1990s to 2005 with subsequent declining rates and, partly as a consequence of advancing time of diagnosis, the increasing survival. The recent declines in mortality in Norway most likely reflect a number of interventions acting in combination, amongst them improvements in breast cancer therapy and management from the 1990s, as well as the increasing screening coverage.

Trends in lung cancer incidence and mortality are quite similar and reflect the uniformly poor survival over time, whereas the varying trends by sex reflect the differing phases of the smoking epidemic in Norwegian men and women (Figure 10-J). Overall lung cancer incidence and mortality rates among males began to plateau in the early-1990s, in contrast to the continuing increases in female rates. As these rates are for all ages however, they do not capture a possible recent plateau in trends among generations of women born around 1950. While five-year relative survival for lung cancer patients has not changed substantively, the observation of moderately increasing survival in the 1990s, more evident in women, is intriguing. It is not clear as to the degree to which these changes are real and might reflect genuine improvement of lung cancer management, earlier stage at presentation, less co-morbidity, or changes in other factors that contribute to improved life expectancy.

Both colon and rectal cancer incidence has been increasing for many decades, but the overall picture the last decade is one of stabilisation (Figure 10-E and 10-F). Of particular note is the increasing survival and declining mortality following rectal cancer in Norway in both sexes. Among the likely determinants is the introduction of total mesorectal excision, increasing specialisation, and use of preoperative radiation.

Among specific sites, several are worthy of note. The constant decline in stomach cancer incidence and mortality, for example, is considered part of an unplanned success of primary prevention of the intestinal type, with survival only moderately increasing over time (Figure 10-D). In contrast, the uniform and presently-unexplained increases in testicular cancer incidence in the last decades (Figure 10-Q) are contrary to the rapid increases in survival (and concomitant declines in mortality) in the 1970s following the introduction of cisplatin therapy for advanced germ-cell tumours, and a correspondingly improved prognosis in these young- and middle-aged men.

In summary, the overall trends in cancer survival probably reflect both artifacts (screening and improved diagnostics) as well as improvements in treatment. For prostate and breast cancer both early diagnosis and improvements in treatment are likely to have played a role. The recent increments in rectal cancer survival in both sexes will also have partially contributed to the recently overall decline in cancer mortality.

The remaining cancer types also contribute substantially to explaining the overall trends.

Trends in incidence and mortality rates and 5-year relative survival proportions

Figure 10-A: All sites (ICD10 C00–96, D32–33, D35.2–35.4, D42–43, D44.3–44.5, D46, D47)

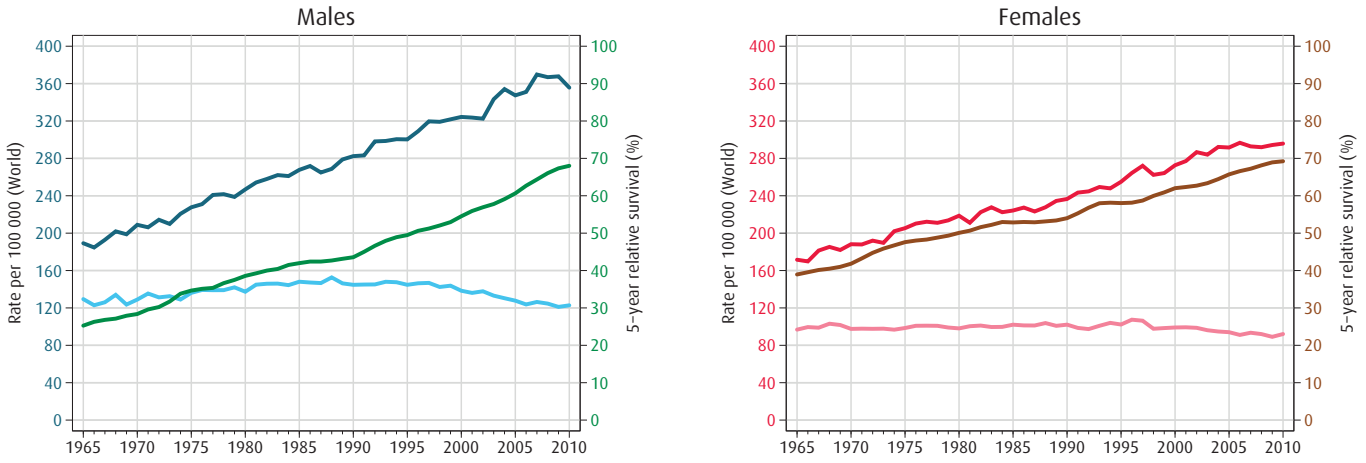


Figure 10-B: Mouth, pharynx (ICD-10 C00–14)

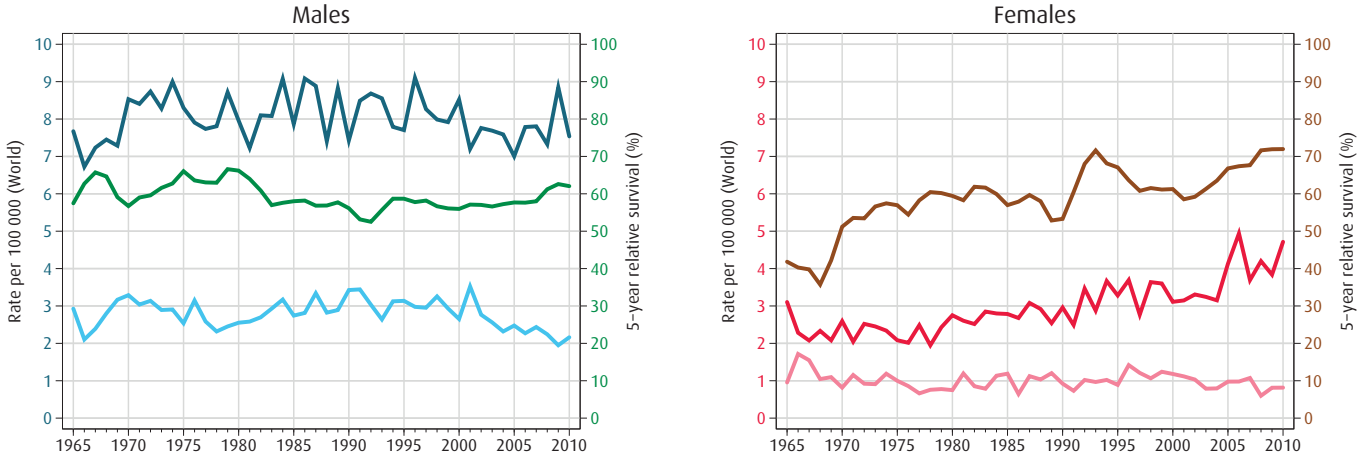
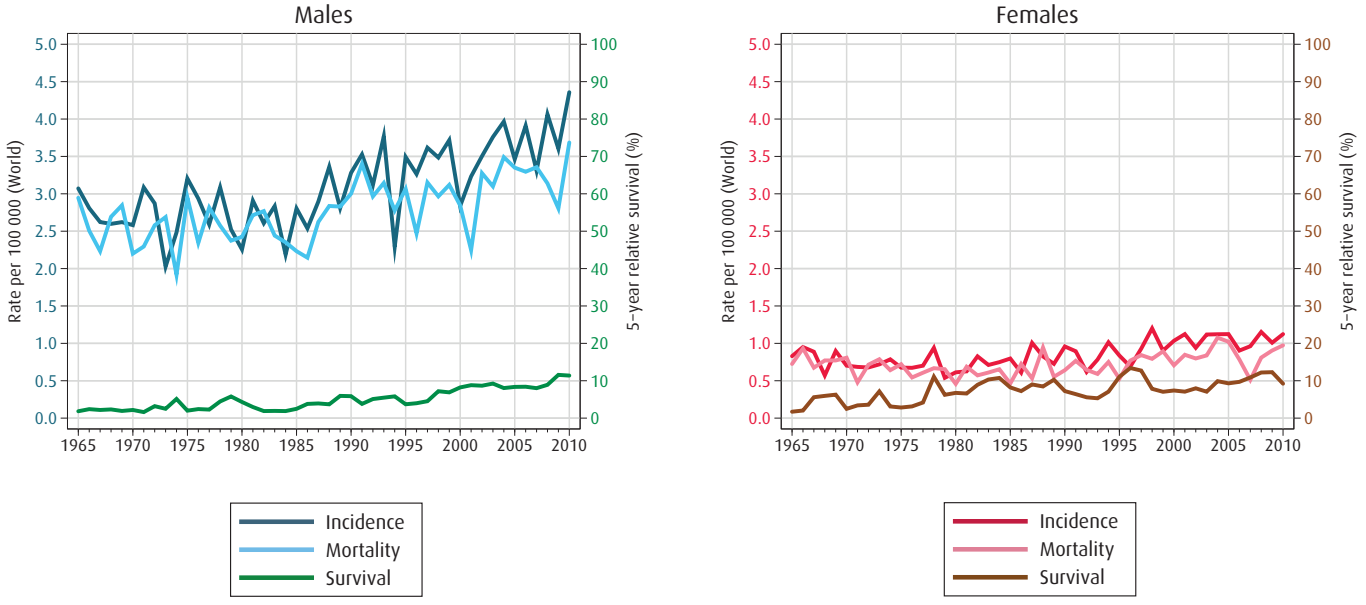


Figure 10-C: Oesophagus (ICD-10 C15)



Trends in incidence and mortality rates and 5-year relative survival proportions

Figure 10-D: Stomach (ICD-10 C16)

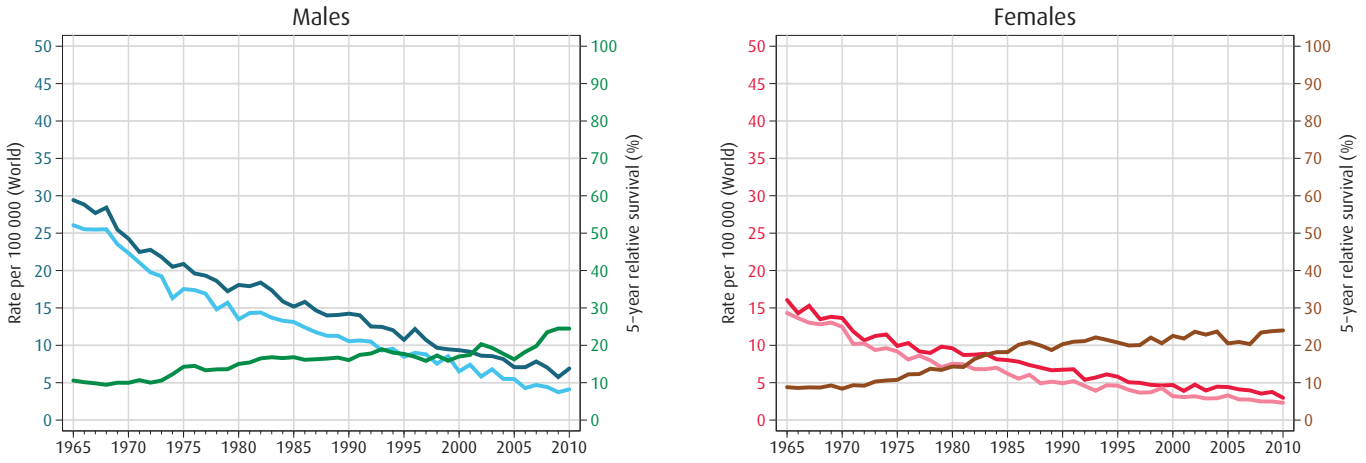


Figure 10-E: Colon (ICD-10 C18)

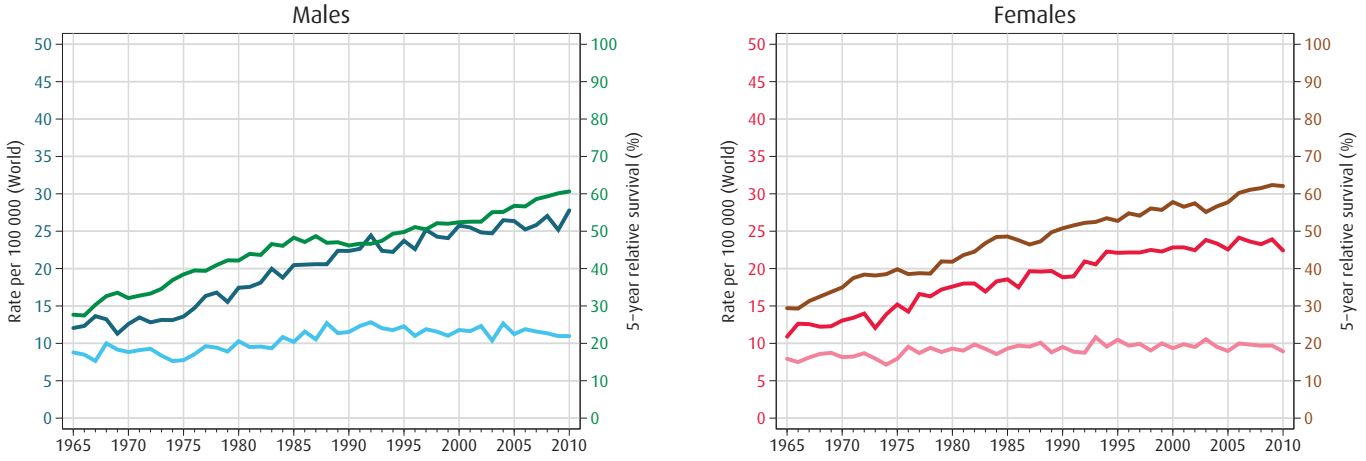
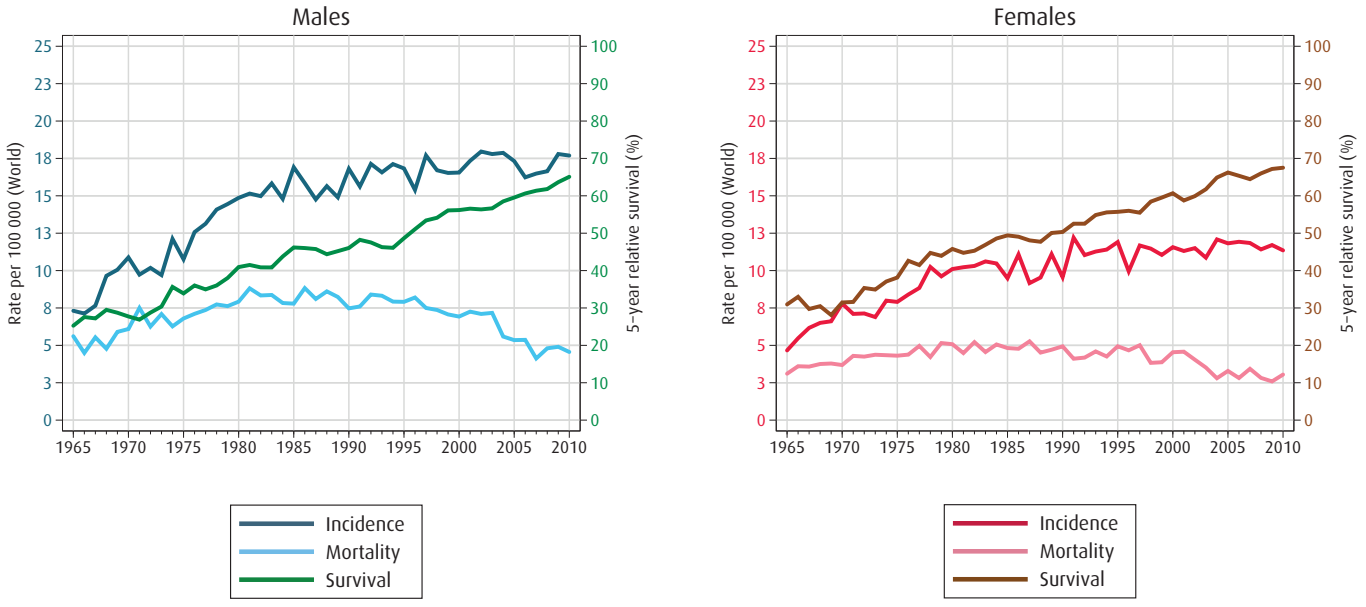


Figure 10-F: Rectum, rectosigmoid, anus (ICD-10 C19–21)



Trends in incidence and mortality rates and 5-year relative survival proportions

Figure 10-G: Liver (ICD-10 C22)

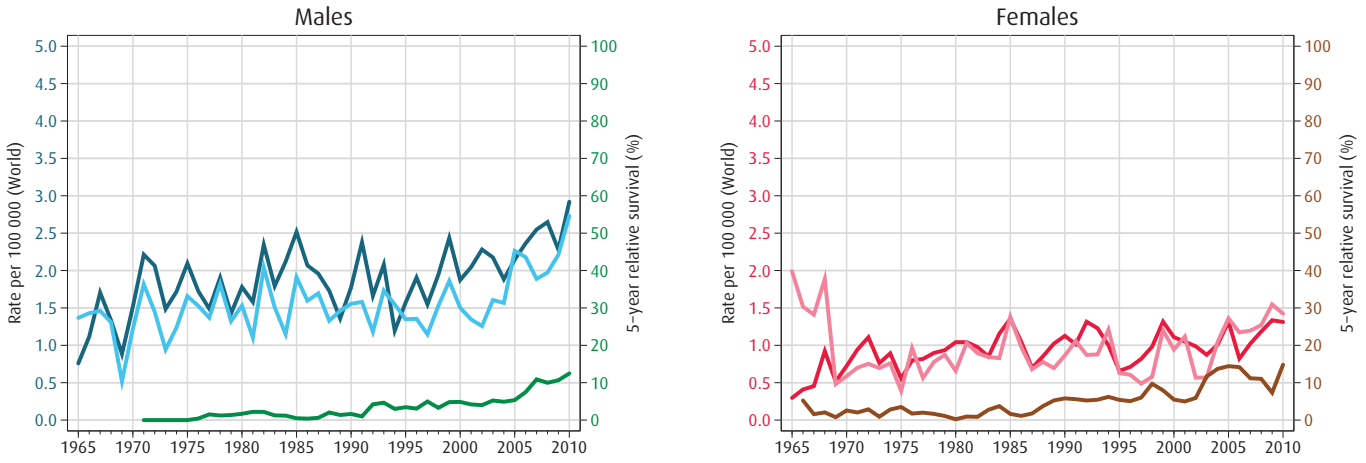


Figure 10-H: Gallbladder, bile ducts (ICD-10 C23–24)

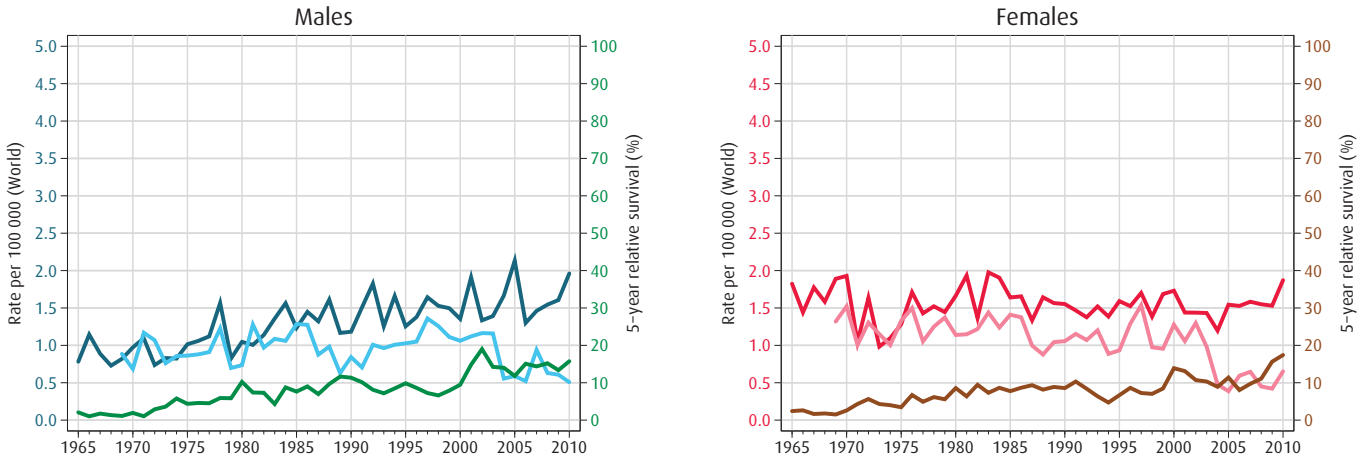
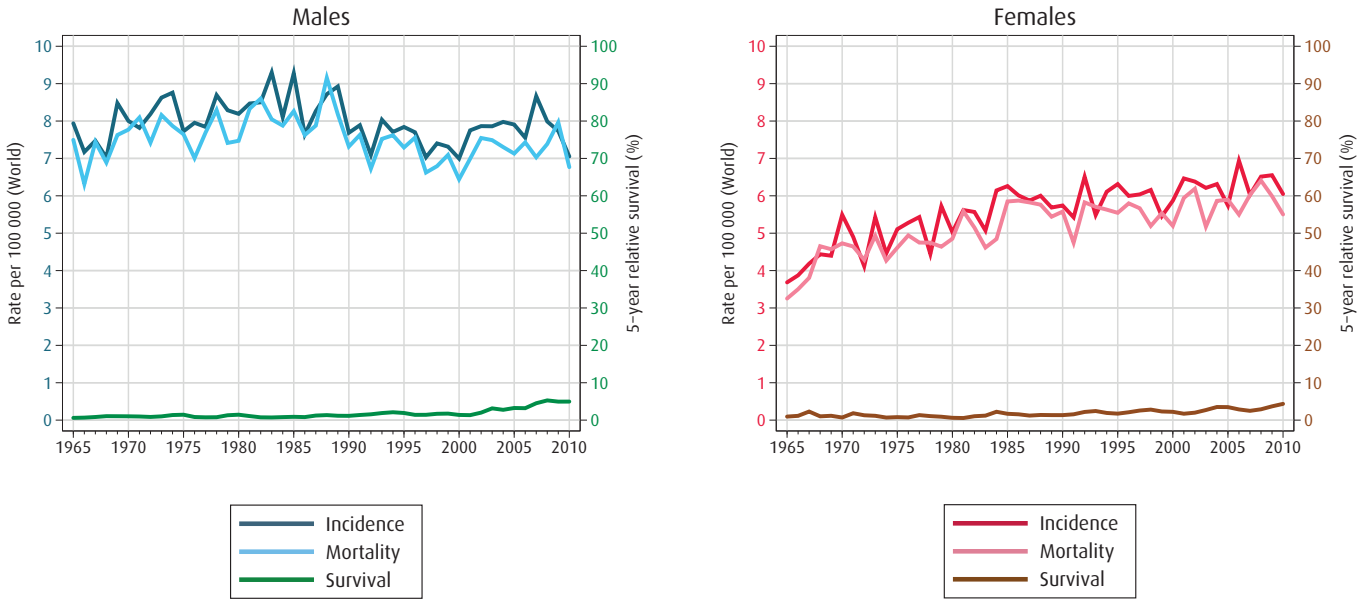


Figure 10-I: Pancreas (ICD-10 C25)



Trends in incidence and mortality rates and 5-year relative survival proportions

Figure 10-J: Lung, trachea (ICD-10 C33–34)

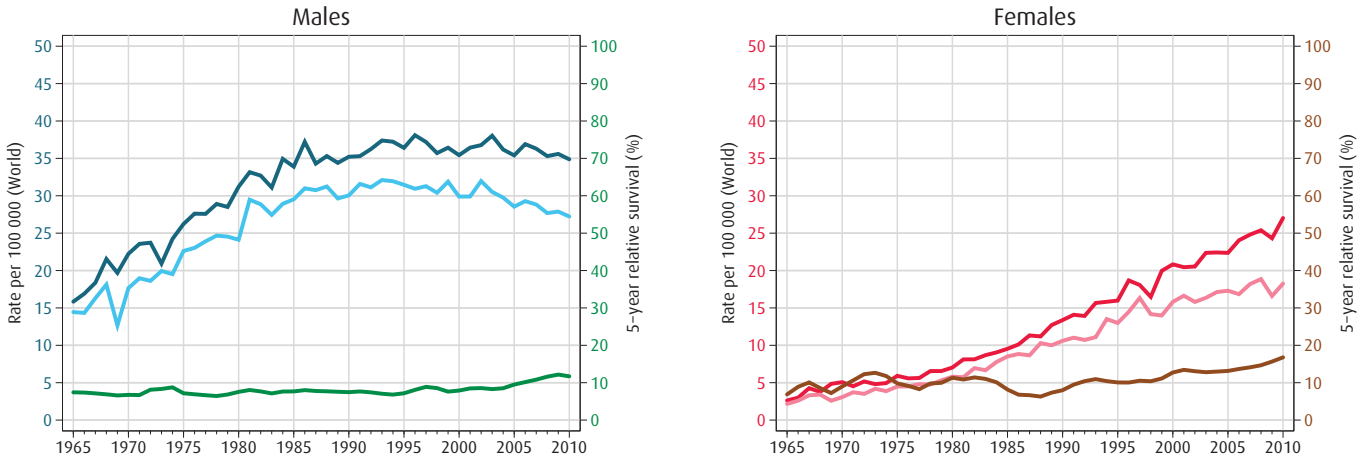


Figure 10-K: Melanoma of the skin (ICD-10 C43)

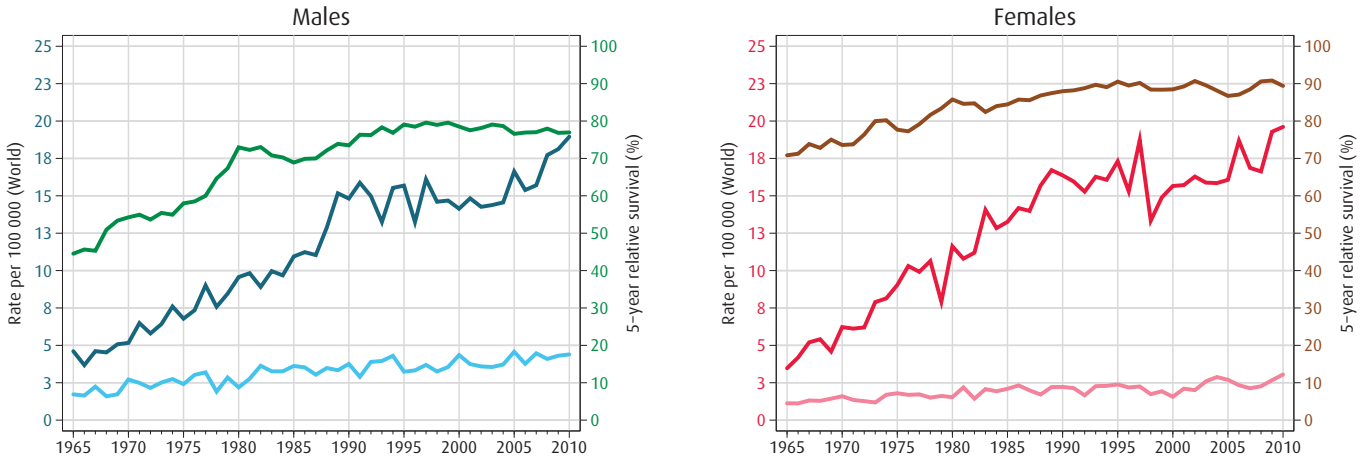
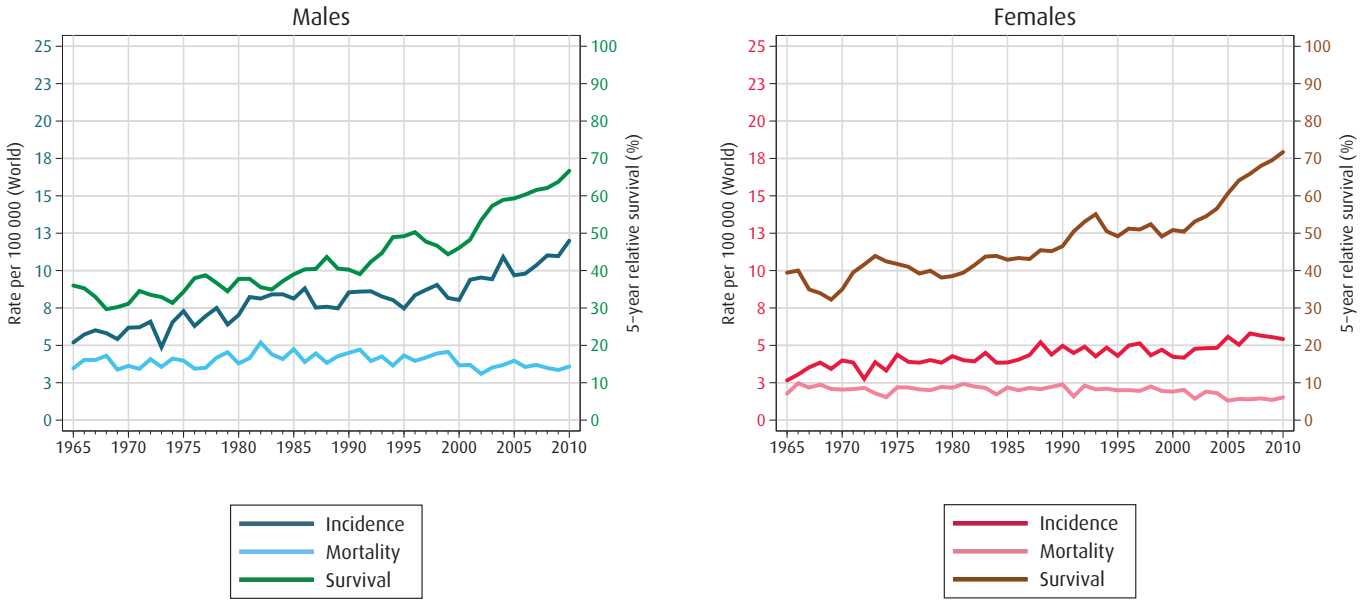


Figure 10-L: Kidney excluding renal pelvis (ICD-10 C64)



Trends in incidence and mortality rates and 5-year relative survival proportions

Figure 10-M: Breast (ICD-10 C50)

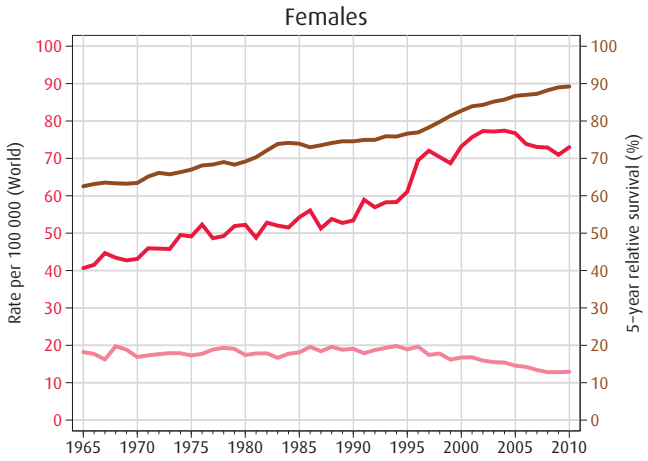


Figure 10-N: Cervix uteri (ICD-10 C53)

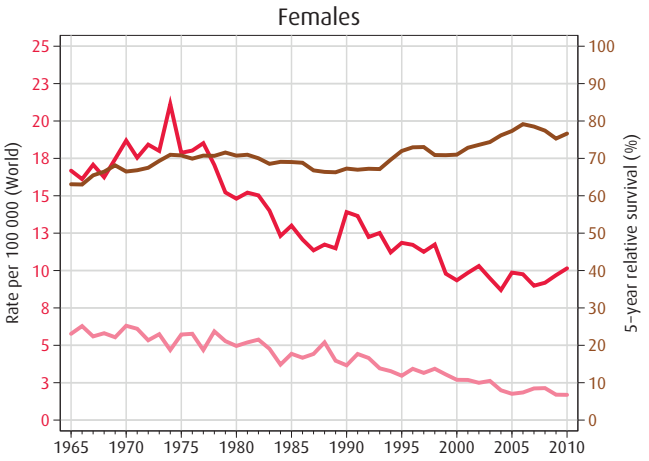


Figure 10-O: Prostate (ICD-10 C61)

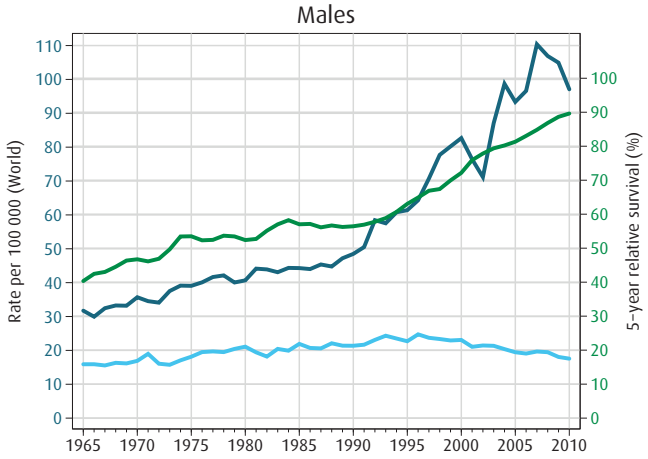


Figure 10-P: Corpus uteri (ICD-10 C54)

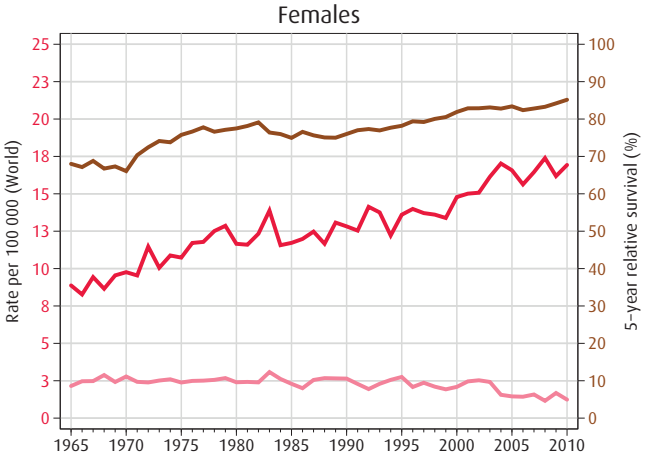


Figure 10-Q: Testis (ICD-10 C62)

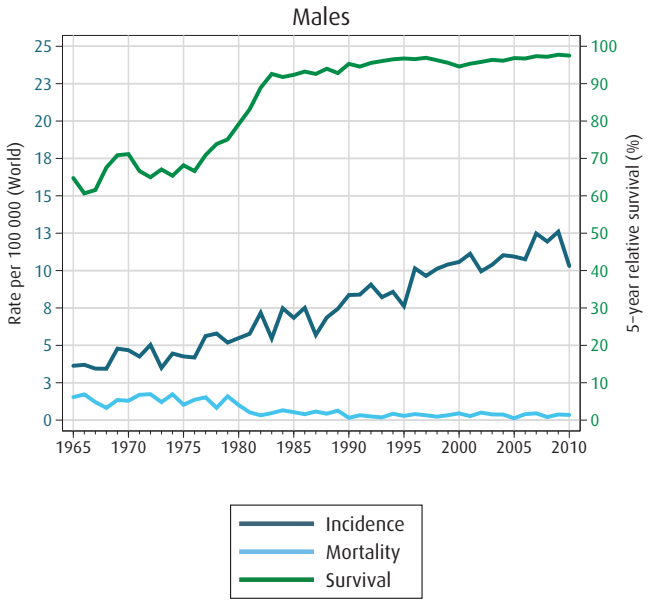
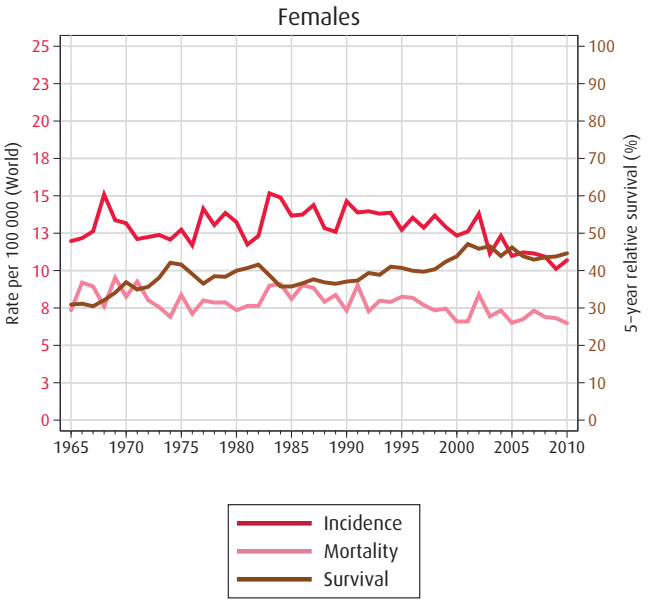


Figure 10-R: Ovary (ICD-10 C56)



Trends in incidence and mortality rates and 5-year relative survival proportions

Figure 10-S: Bladder, ureter, urethra (ICD-10 C66–68)

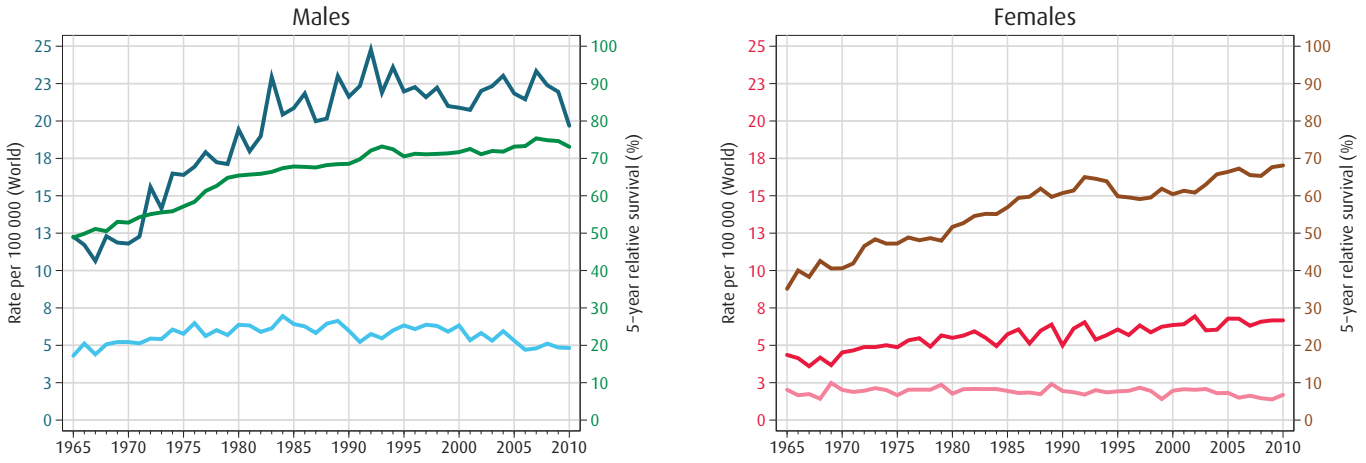


Figure 10-T: Central nervous system (ICD-10 C70–72, D32–33, D35.2–35.4, D42–43, D44.3–44.5)

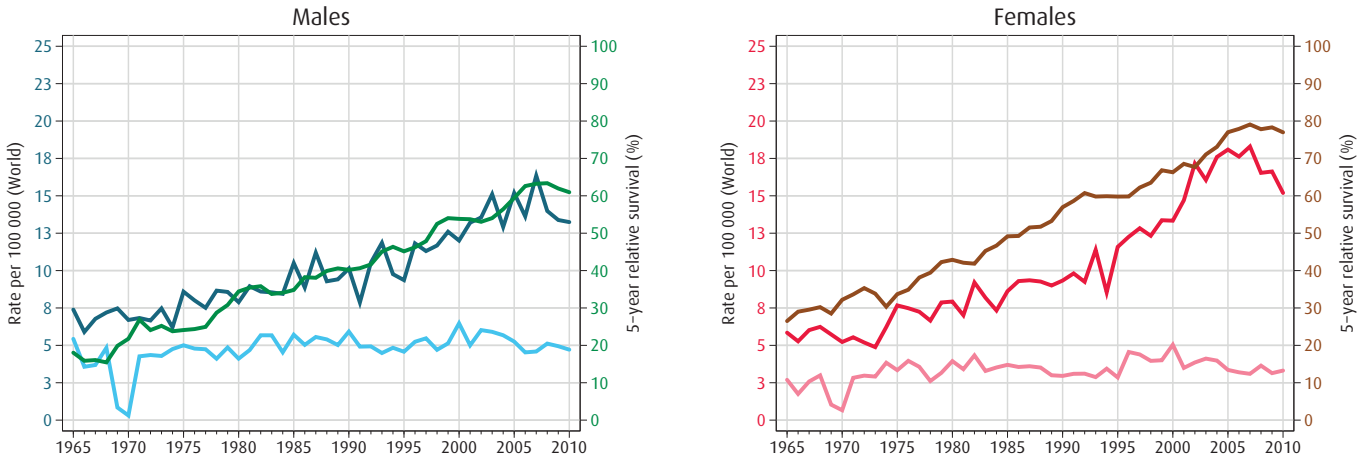
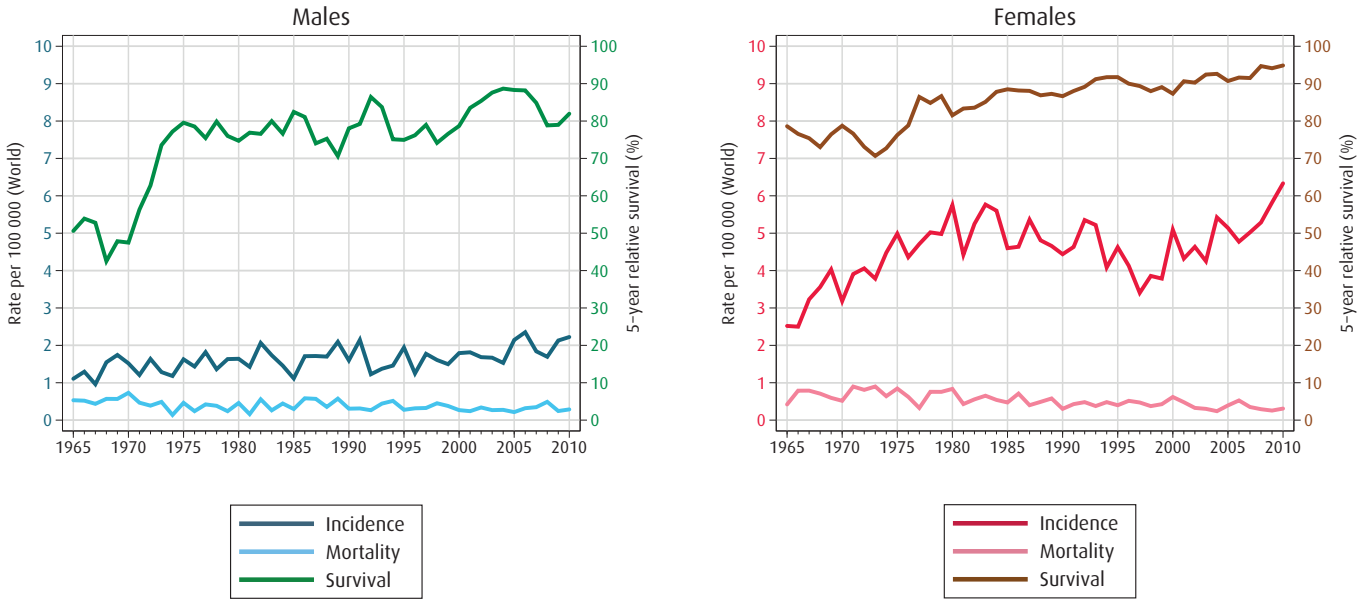


Figure 10-U: Thyroid gland (ICD-10 C73)



Trends in incidence and mortality rates and 5-year relative survival proportions

Figure 10-V: Hodgkin lymphoma (ICD-10 C81)

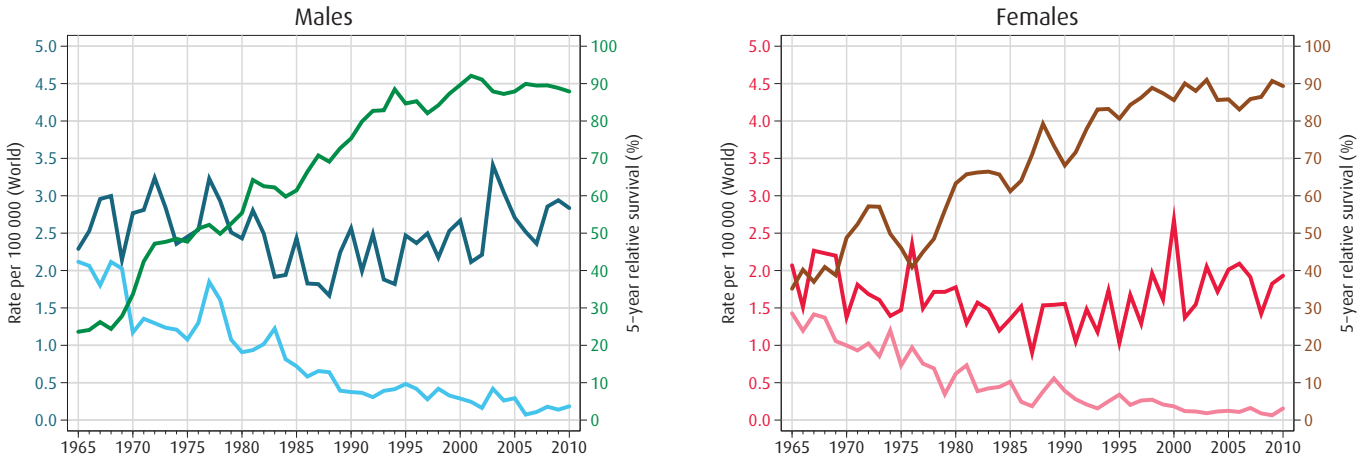


Figure 10-W: Non-Hodgkin lymphoma (ICD-10 C82–85, C96)

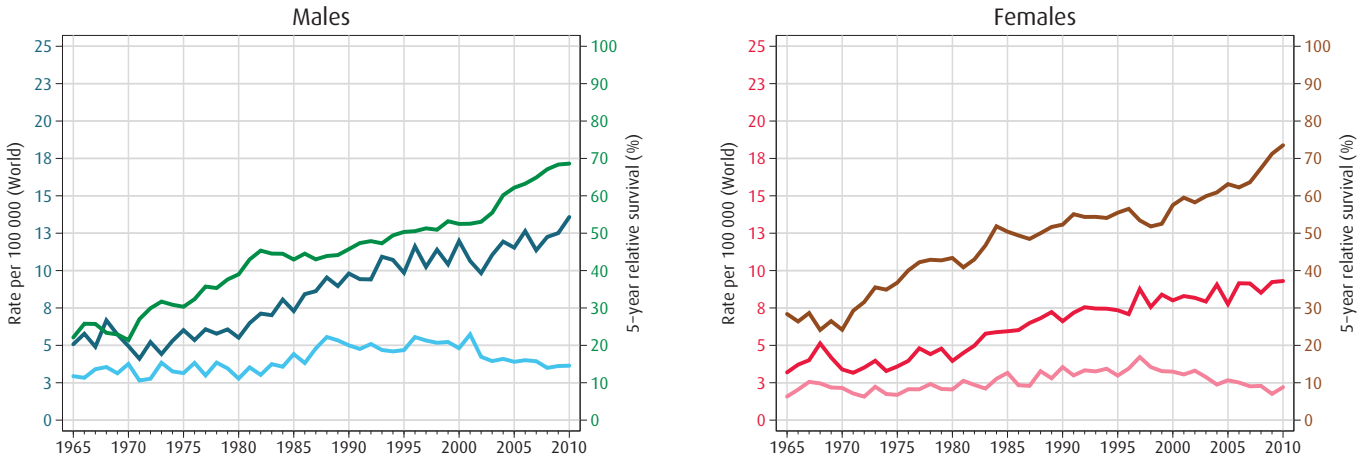
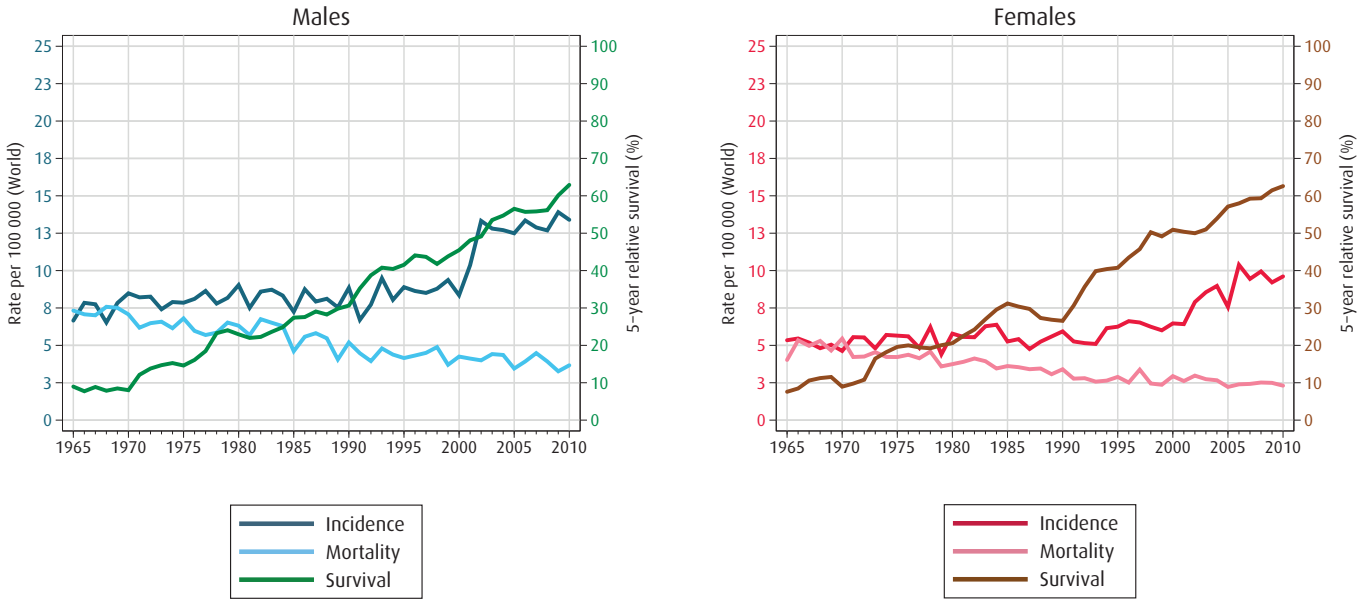


Figure 10-X: Leukaemia (ICD-10 C91–95, D45–47)



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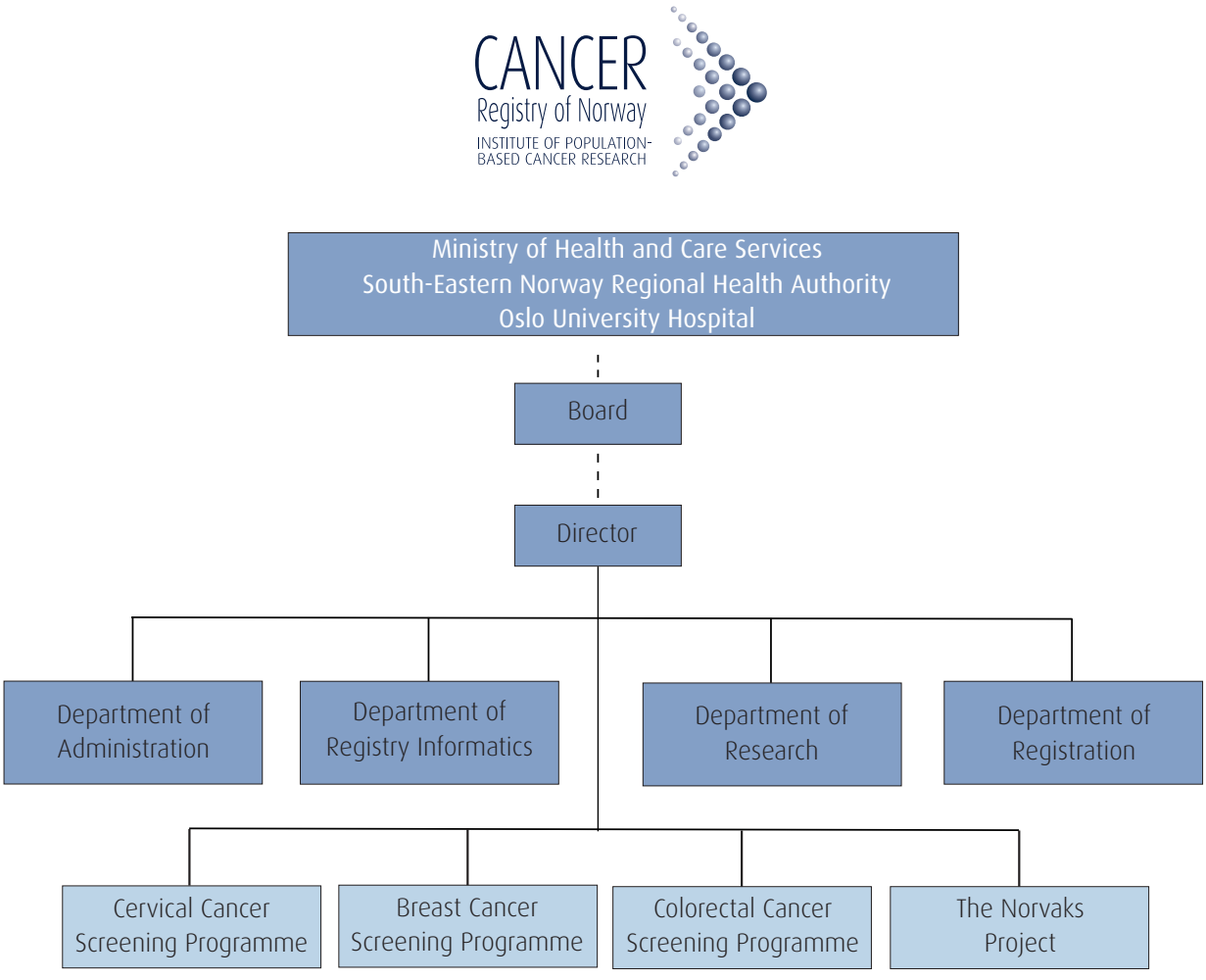
Research activities at the Registry

Organisation and founding principles

The Cancer Registry of Norway is a national, population-based cancer research institute, which was founded and financed by the Cancer Society 1951-1979. Since then the institution has been governmental, with a board (except for the period 1994-2002) and a chapter in the National Budget plan. Since 2002 it has been allied to the Norwegian Radium Hospital and from 2009 to Oslo University Hospital Trust. This organisational platform signals the importance attached to close links with cancer research milieus and cancer clinics. It also increases the possibilities for Norway as a nation to move towards the Comprehensive Cancer Centre organisational model.

As early as 1951, reporting of cancer and some precancers has been mandatory from all milieus that diagnose and treat cancer. From 2002 however, new regulations have strongly enforced the legal premises, substantially improving the Registry's capacity to perform clinical population-based research and evaluate the quality control of health care. Comparative advantages are compulsory reporting without patients' consent and the uniquely identifying personal number. As a result of these advantages, organ-specific treatment quality registries (Clinical registries) are increasingly part of the Registry's duties, in close collaboration with the clinical milieus.

Structure of the Cancer Registry of Norway (September 2012)



Department of Research

Head: Steinar Tretli Professor PhD

Department objectives

The principal goal of the Department of Research is to bring forth new knowledge on carcinogenesis and the causes of cancer. In recent years the Department has covered several topics within epidemiological cancer research, such as: heredity, infectious diseases, biomarkers, occupation, lifestyle, and environmental factors. The main objectives of the Department in years to come, are:

- To initiate/stimulate new research of high quality by use of registry data and biobanks
- To contribute to the development of bio-statistical methods in cancer epidemiology
- To initiate, lead and participate in national and international research collaborations
- To maintain our position as a leading research institution on cancer epidemiology in Norway

Current research priorities

Research on long-term effects of exposures during fetal life, childhood, youth and adult life ("life course epidemiology") will have high priority in the Department. Several of our studies have already investigated the impact of early life on adult cancer risk, specifically for hormone related cancers such as breast, prostate, and testicular cancer. Studies on cancer development related to life style and environmental and societal factors will also be emphasised. This life course epidemiology will often include the study of molecular, genetic, and hereditary aspects of cancer development, in for instance the study of gene-environment interactions.

Research on cancers associated with occupational and environmental exposures has a long tradition in the Department, and the identification and quantification of such risks will still be important. Studies on working populations may often be the only method to obtain knowledge of possible population effects of low-dose exposures. Occupation is also an important classification variable concerning the knowledge on differences in cancer risk by social class.

The understanding of the carcinogenic process has traditionally been based on experimental research. New bio-statistical methods have been developed in recent years in order to assess the importance of different mechanisms in the disease process. Currently, the Department is focusing on research related to statistical modelling and simulation.

Biorepositories have become an important resource in medical research. In the Department, this research activity is related to the Janus Serum Bank with studies on the quality of the samples and the component stability in relation to long time storage. The Janus Serum Bank is utilised in a large number of national and international research collaborations. Cancer survivorship is a relatively new research area, and in addition to the Cancer Registry, several population based Norwegian registries are very well suited for this kind of research. In the Department, studies on marriage, divorce, parenthood and employment and earnings among cancer survivors, have been performed. These studies have received much attention internationally.

Recent important results

In 2010, the research activity at the Department led to 45 scientific publications in national and international journals, some from international collaborations. In addition, one doctoral dissertation was defended.

In addition to research activities, the Department is running, in collaboration with the Norwegian Labour and Welfare Administration (NAV), a project to improve the utilization of the compensation scheme for occupational cancer. This project has led to an increased number of claims and that claims were made more quickly after diagnosis. Also, the Department has assisted in the response to a number of cancer cluster inquiries (see special issue).

Theses published in 2010

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Department of Registration

Head: Bjørn Møller PhD

Department objectives

The Department of Registration has a broad remit. One of its fundamental responsibilities is the continued collection, storage and quality control of data on all cases of cancer in Norway, as defined by the Statutory Regulations. This information is collected from clinicians, pathologists, administrative patient discharge files, and the Cause of Death Registry. The Department provides relevant information on cancer patterns and changes in cancer over time in Norway, via various dissemination routes including scientific publications and reports such as the Cancer in Norway series. The Department has put an emphasis on initiating and collaborating in good research projects at the national and international level, in-house, or via external requests or invitations, focusing on building strong ties with the clinical community in Norway.

The Department is organised into two sections, according to the key areas of ongoing activity:

1. Section for Registration. Management of the incidence register and development of the clinical registries. The section is divided into four broader organ groups, which manages all the cancer types within the group. The clinical registries offer novel opportunities for population-based research into cancer care (see below).
2. Section for Research. Research using the incidence register, focusing on areas of particular public health importance alongside the application of appropriate methodologies.

In addition, the Department has a medical advisory group, responsible for guidance in medicine coding and revision of in-house coding procedures.

Current research priorities

Research on time trends in cancer incidence, mortality and survival is important for the management of cancer treatment, and is therefor given high priority in the Department. The establishment of clinical registries for the most common cancers is of great importance for evaluation of the outcome of different treatments. A lot of effort has been devoted to obtain full funding for these registries. The Department has also had an increased focus on data-quality projects. Recently, we have been involved in a data-quality project for evaluating the validity and completeness of cancer data in the National Patient Register, by linkage of the registries. This linkage enables evaluation of data validity in both registries, and is helping to improve the overall data quality.

Recent important results

In 2010, the research activity in the Department led to 34 scientific publications in national and international journals, some from international collaborations. In addition, one doctoral dissertation was defended. About half of the papers described and interpreted trends in survival of cancer patients in Norway. In addition, research on data from the clinical registries was published for prostate and lung cancer.

Theses published in 2010

Kvåle R. Changing Epidemiological Patterns of Prostate Cancer: A Nordic Perspective. Incidence, Mortality, Diagnostic Procedures and Treatment. Faculty of Medicine, University of Oslo, 2010

Colorectal Cancer Screening Programme

Leader: Geir Hoff, Professor, MD, PhD

Section objectives

In 2010, the colorectal cancer (CRC) screening section administered two screening trials – the follow-up phase of the NORCCAP randomised trial on flexible sigmoidoscopy screening (www.kreftregisteret.no/norccap) and the ongoing NordICC randomized trial on colonoscopy screening in Poland, the Netherlands, Sweden and Norway (www.nordicc.org). In 2010, it was decided to initiate a pilot study of a colorectal cancer programme with an organising secretariat located at the Cancer Registry of Norway. During 2010, it was decided to leave the original plan of piloting screening using only an immunochemical test for occult blood in stool (iFOBT) and randomize invitees to two arms - screening with iFOBT or flexible sigmoidoscopy. The concept of comparative effectiveness research (CER) was launched as a prerequisite for a future

CRC screening programme to take responsibility for continuously optimizing this health-service-to-be. Through 2010, an understanding and realization developed that much of the scientific proof to achieve this goal will have to be produced within the framework of future screening programmes themselves. The one major objective for years to come is to extract as much scientific proof of benefits and drawbacks with different screening modalities from ongoing trials and to design future CRC screening activities in Norway to be based on CER principles to further optimize the validity of findings.

Current research priorities

Our top priority is to contribute to the development of CRC screening modalities and targeting strategies - to continuously develop the best possible screening service on a population level. This implies research on possible unwanted effects of screening (e.g. lifestyle and other lifestyle-related disease than CRC). Long-term (10-year follow-up) results from the NORCCAP trial are expected by 2013. The NordICC trial is still recruiting and the first results are not expected to emerge for more than 10 years from now. The quality assurance (QA) aspect of screening is taken care of through the Gastronet QA programme (Gastronet leader is Geir Hoff). There has been much research activity within this programme in the interval between reporting baseline findings and follow-up results from the screening trials.

Recent important results

There have been no original publications from the CRC screening trials in 2010, but many published contributions from our group to promote the CER concept for screening programmes in general. In 2010, two PhD candidates have been working on Gastronet data (Birgitte Seip and Tom Glomsaker) and one on NORCCAP data (Øyvind Holme) and one (Magnus Løberg) was granted funding to work on NORCCAP data as from January 2011.

Cervical Cancer Screening Programme

Leader: Stefan Lönnberg, MD

Section objectives

The Norwegian cervical cancer screening programme is a joint programme of the Cancer Registry, the Institute of Public Health and the Directorate of Health. The cervical cancer screening section at the Cancer Registry administers central registers of all cervical cytology tests, cervical HPV tests, cervical histology results, and treatments for any cervical intraepithelial lesions in Norway. These screening registers allow monitoring and evaluation of screening, quality assurance feed-back to screening providers and the provision of information used for informed decisions about programme modifications and development. The section also provides information to women about the programme, with the aim of ensuring high programme coverage while maintaining informed choice to participate. Information to professionals involved in the screening infrastructure is provided through screening recommendations and the publication of quality assurance manuals. Women aged 25-69 are recommended to undergo conventional or liquid-based cytology every three years; personal reminder letters are sent out if the interval is exceeded. The main objectives of the programme include high coverage of three-yearly screening tests in the target population and a reduction of cervical cancer incidence and mortality in the population to a level equivalent or lower than countries with comparable resources. The research activities of the section are aligned with these overarching objectives.

Current research priorities

The analysis of the screening history of cervical cancer cases in the population provides valuable data on barriers to effectiveness in cervical cancer prevention. A failure audit of cervical cancer cases diagnosed in 2000-2009 is underway.

Further evaluations of policies for triage of minor cytological changes are needed in order to optimise the triage algorithm and risk stratification.

Solutions to overcome barriers to participation can provide avenues to improve the effectiveness of the programme. The investigation of reasons for non-participation in the Norwegian setting is important for a rational direction of efforts.

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http://dx.doi.org/10.1016/j.ejca.2010.08.004

Special Issue:
Clustering of cancer

Editor: Tom K Grimsrud
Writing group: Odd O Aalen, Tom K Grimsrud, Steinar Tretli
Layout and design: Gunther Zerener
Linguistic assistance: Barbara Mortensen
Correspondence to: Tom K Grimsrud – tom.k.grimsrud@kreftregisteret.no

Recommended reference: Cancer in Norway 2010. Special issue: Clustering of cancer. Grimsrud TK (Ed). Oslo: Cancer Registry of Norway, 2012

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Cancer clustering, a challenge for laymen and scientists

Tom K Grimsrud
Cancer Registry of Norway, Department for research

Abstract

The public concern following a clustering of cancer cases represents a challenge for health workers, media, and politicians. There is no easy way to sort random clustering from an effect of carcinogenic exposure. Historically, some cancer clusters have provided clues that later led to the identification of cancer causes. Most perceived cancer clusters, however, are assumed to be a result of random variation. Still, the worry and questions caused by a perceived cluster need to be handled carefully, with epidemiological skills, and public health experience. The paper describes why scientific expectations from present-day cluster investigations in general should be low.

1 Introduction

Most people correctly interpret a high frequency of disease or death as a possible sign of a health hazard. Everyone is familiar with the synchronous attacks of chickenpox, or the common fate shared by guests after food poisoning. This type of insight has been used as a guide for prevention of death and disease since ancient times. In modern western societies, monitoring of disease, accidents, and mortality—based on reporting of diseased individuals or aggregated data—is an important tool for protection of health and maintaining of security in the population.

Through the ages, the societal responsibility for correct handling of health threats has been transferred from religious authorities, to sovereigns assisted by astrologers, to health professionals, and ultimately to politicians. During recent decades, we have seen a growing public awareness of health issues, and the media involvement has increased. The necessary action against a health threat may be obvious in some situations, but often a fundamental uncertainty remains.

2 What is a cluster?

A confirmed disease cluster may be defined as "the occurrence of more than the expected number of people diagnosed with a certain disease within a specific group, a geographic area or a period of time" (California DPH, 2012). The "expected" number is often derived from disease rates in the general population or another comparable group, usually adjusted for age distribution and sex.

Some illnesses, such as contagious diseases, may present a short time after exposure, which, combined with a usual large number of cases, easily will produce clusters. But even rare diseases with no common cause may be found to have a clustered distribution. In fact, it can be shown statistically that random and rare events—characteristic of many diseases—tend to occur irregularly, meaning that cases are not evenly distributed in time and space. The cases rather tend both to aggregate and to leave open spaces between them. A clustering of disease may therefore be observed even in the total absence of any common cause. This inherent link between randomness and irregular distribution is often perceived as counterintuitive.

Rothman defined a cluster as an aggregation of cases by season, year, time of day, sex, age, race, occupation, diet, or any environmental or genetic circumstance (Rothman, 1990). The approach alludes to a general discussion of contrast and variation, which is fundamental for all epidemiological research.

2.1 Cancer clusters

Chronic diseases may develop over time (years or decades) and they may have a complex set of causes. For some cancer forms, there is no known cause at all, and in a population, most cancers are explained only in part by known or suspected carcinogenic exposures. In the situation where a group of people are exposed to a common carcinogen, there may be different timing and degree of exposure, the disease may need additional exposures or the occurrence of random cell events to develop, and, ultimately, there may be differences in growth rate between tumours of the same type of cancer. Such a variation in timing and disease development will easily result in an apparent pattern of randomness, with cases occurring at different times and at different ages, despite the existence of a common cause.

Cancer may be seen as common and rare at the same time depending on the definition. All cancer diseases carry some common features such as uncontrolled growth of cells, and the tendencies to destroy adjacent tissue and spread to other organs or parts of the body. Still, a cancer can belong to one out of many rare types and subgroups according to its origin (organ, or part of the body), its appearance in the microscope, or the functional or genetic makeup. These quite different types of cancer usually have their own sets of risk factors.

Most cancers occur late in life (after 50), which leads to the fact that people over time normally face a marked increase in cancer incidence among their peers. About half of the cancer cases in a western population belong to the most frequent types, including cancers of the colon, rectum, lung, prostate, and female breast. The regular statistical reports from the Cancer Registry (Cancer in Norway, 2010) provide data for some 40 different types or subgroups of cancer. The cumulative risk for most cancer forms is less than 10 percent before age 75, and the occurrence of a single type of cancer therefore represents a quite rare event.

In total, cancer constitutes one of the most common causes of death. A potentially severe illness is more easily recalled by family, neighbours, and colleagues, and the dramatic aspect of losing a friend or family member may induce fear and increase the awareness of any sign of clustering. It may also stimulate the interest in avoidable exposures and prevention, which is often shared by media and the scientific audience. Norwegian doctors were engaged in these questions in the early 1900s, see Figure 1. Given the mechanisms for cancer development described above, it is, however, fairly unlikely that a common cause should lead to synchronous outbreaks, even if the timing of the causal exposure is the same.

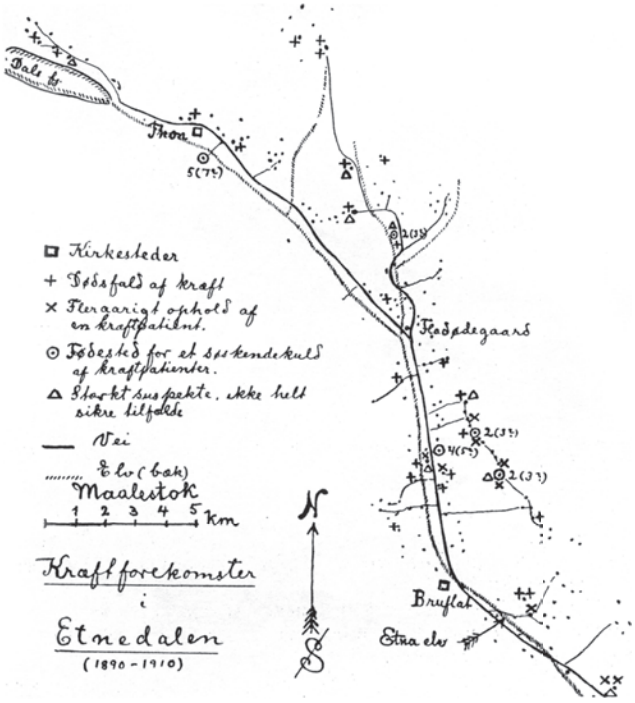


Figure 1. Mapping of cancer cases in the valley of Etnedalen 1890–1910. A hundred years ago, Norwegian doctors reported perceived cancer clusters in the Journal of the Norwegian Medical Association (Lunde, 1910)

The more remarkable it will appear when several cases of the same rare cancer are seen within a small geographical area or a short time interval, and even more so if the patients are young. A closer look into clusters of this kind would therefore be reasonable, even if we know that clustering commonly is a result of random events.

A cancer may spread (metastasise) to other parts of the body, such as lung, liver, brain, and skeleton, making it difficult to ascertain what type of cancer it is. Medical skills are therefore indispensable in the evaluation of a perceived cancer cluster, already from the descriptive stage.

2.2 Clustering of exposure

When health-care workers detect a cluster, often called a medical cluster, the apparent link to a common and localised *exposure* may be more striking than the aggregation of the disease itself. Typical examples are cases of food poisoning from a single party or restaurant, or traffic accidents occurring along a perilous stretch of a road.

Acute or short-term effects of a chemical or nuclear disaster will occur more closely in time than chronic

diseases. Health consequences in terms of cancer may develop over years or decades, and they can be difficult to detect, both among workers, rescue personnel, and local residents. In 1976, an unfortunate episode produced a cloud with very toxic chlorinated organic compounds (among them tetrachlorodioxins, TCDD) contaminating the local surroundings of a chemical factory in Seveso, Italy. Local inhabitants were highly exposed, but it was necessary with some 20 years of observation until an increased risk of cancer could be identified (Bertazzi & al, 2001).

Still, there are a number of historical examples of medical cancer clusters that have proven to be very useful for the understanding of cancer causes. In fact, a potential clustering of *exposure* may appear as the most interesting part of a cluster inquiry, both for the scientific community and for the public, as the underlying concern often includes idea that the disease incidents have a common origin.

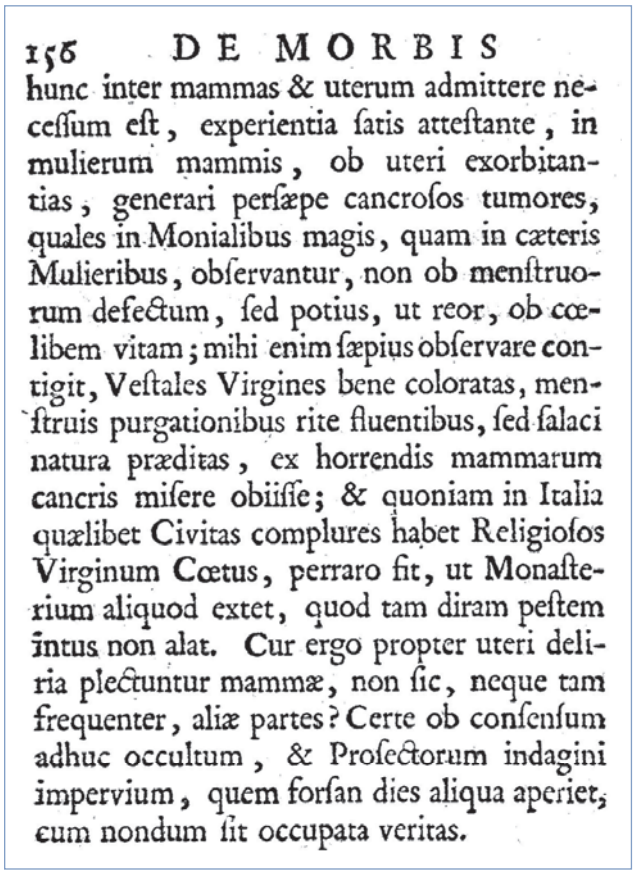
2.3 Induction time and latency

The length of induction time (from exposure to onset of disease) or latency period (from start of disease to diagnosis) may vary according to the disease itself and the individual characteristics of the patient. Possibly, it may also vary according to the intensity and duration of the exposure. Some cancers may reach their peak occurrence within 2–15 years after exposure (leukaemia caused by radiation or benzene), while other cancers may develop up to 6 decades later (mesothelioma caused by asbestos). A long delay between exposure and disease may hamper the identification of an association.

3 Clusters pointing at causes

The frequency of illness has been commented on since Hippocrates (400 BC) (Merrill, 2010). Equally a long, high number of fatal or disabling diseases has generated fright, and increasingly so during times when there was no knowledge of what we would call a cause or a risk factor.

Through the last centuries, some observations of cancer clustering have prompted the search for an explanation. A few clusters eventually led to the identification of specific carcinogenic exposures, or a general description of conditions or activities associated with elevated risk.



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hunc inter mammas & uterum admittere neceſſum eſt, experientia ſatis atteſtante, in mulierum mammis, ob uteri exorbitantias, generari perſæpe cancroſos tumores, quales in Monialibus magis, quam in cæteris Mulieribus, obſervantur, non ob menſtruorum defectum, ſed potius, ut reor, ob cœlibem vitam; mihi enim ſæpius obſervare contigit, Veſtales Virgines bene coloratas, menſtruis purgationibus rite fluentibus, ſed ſalaci natura prædita, ex horrendis mammarum cancris miſere obiiſſe; & quoniam in Italia quælibet Civitas complures habet Religioſos Virginum Cœtus, perraro fit, ut Monaſterium aliquod extet, quod tam diram peſtem intus non alat. Cur ergo propter uteri deliria plectuntur mammæ, non ſic, neque tam frequenter, aliæ partes? Certe ob conſenſum adhuc occultum, & Proſectorum indagini impervium, quem forſan dies aliqua aperiet, cum nondum ſit occupata veritas.

Figure 2. Bernardino Ramazzini (Ramazzini, 1703) wrote in his second edition of "Diseases of workers" about nuns (Monialibus, Vestales Virgines) suffering from dreadful breast cancers (horrendis mammarum cancris) assumed to be caused by a life in celibate (cælibem vitam), and commonly seen in convents in Italian cities. Courtesy of Internet Archive

The striking occurrence of breast cancer in Italian nunneries was noted by Ramazzini in the early 1700s (Ramazzini, 1703), see Figure 2. The identification of a "cause" in the sense of modern evidence-seeking medicine was, of course, far out of Ramazzini's reach, but in retrospect, he was probably facing a twin effect from bearing no children: The avoidance of childbirth eliminated a hazardous situation in most women's life (pregnancy and birth), and thereby led to a longer life and a higher risk of contracting any cancer. Later, bearing no child has been found to increase the risk of breast cancer, and the contrast between nuns and moms probably was more striking in earlier centuries when most women delivered a high number of children. Ramazzini's observation has proven to be in line with later findings (Fraumeni & al, 1969).

3.1 Important occupational cancer clusters

A number of other cancer causes have been detected as a result of occupational cancer clusters. Scrotal skin cancer in chimney sweeps appeared to be quite well understood by Pott when he published his observations in 1775 (Pott, 1775), although the suggested chemical origin of the disease was confirmed some 140 years later by the first successful experiment demonstrating an animal carcinogen by painting tar on the ears of rabbits (Yamagiwa & Ishikawa 1915).

In the nineteenth century, the deadly Schneeberg lung disease occurred with extreme frequency among miners in the small town Schneeberg in Saxony, Germany (Figure 3). It caused 50–75 percent of the deaths of local miners. Some victims were autopsied, and the disease was found to be a form of cancer in the lung (Härting & Hesse, 1879). A general understanding of the true cause of this highly evident occupational and neighbourhood cancer cluster did not emerge until several decades later (Greenberg & Selikoff, 1993): The lung cancers were caused by extremely high levels of radon gas in the mines, emerging from uranium-containing ore.

Figure 3. The small town of Schneeberg in the Ore mountains (Erzgebirge), Saxony, Germany. Photo: André Karwath (Aka)

In 1895, three cases of cancer in the urinary bladder were reported in men younger than 50 years among 45 workers at a German plant producing fuchsine, also known as rosaniline hydrochloride, or magenta, an organic dye. The occurrence was taken to represent an occupational disease (Rehn, 1895). Additional epidemiological evidence came from UK in the 1950s, and later from Italy; and the manufacture of magenta is now considered carcinogenic for humans although the exact chemical to blame is not known (IARC, 1987; IARC, 2012).

A cluster of two cancers of the interior cavities of the nose was seen among nickel-refinery workers in South Wales in the 1920s (Doll, 1984). Soon after, more cases were reported in this quite obvious occupational cluster, but it took more than 60 years before nickel compounds were identified as the chemical cause of lung cancer and nasal cancer (IARC, 1990). An investigation at a nickel refinery in Norway by the Cancer Registry was also prompted by a perceived cluster, and it offered important contributions to the evidence (Pedersen & al, 1973).

Women who painted watches and other equipment with a luminescent radium-containing material in the 1920s suffered a subsequent highly increased risk of bone sarcoma and cancer of the nasal sinuses (Brues & Kirsh, 1977). The carcinogenic effect of ionising radiation was already recognised, but the link between these cancer types and oral exposure had not been observed earlier.

3.2 Important non-occupational clusters

In the 1960s, a medical cluster of eight girls at the age of 15–22 were diagnosed with vaginal cancer, and a tiny case-control study revealed that the mothers had used hormone tablets (diethylstilbestrol) in order to protect against bleeding during pregnancy (Herbst & al, 1971).

In the early 1980s, a cluster of the rare cancer Kaposi's sarcoma appeared among young homosexual men with immune deficiency. Investigation of the cluster (Marmor & al, 1982) represented an important step towards identification of the AIDS syndrome, and Kaposi's sarcoma was later proven to be caused by human herpesvirus infection.

Investigation of clustering of cancer in families- preferably the same kind of cancer or combinations of certain types- has resulted in important knowledge of hereditary genetic conditions. During the 1990s, several genes responsible for inherited cancer risk were identified. The most common are the mismatch repair genes associated with Lynch syndrome (hereditary non-polyposis colorectal cancer, HNPCC) and the breast cancer and ovarian cancer genes BRCA1 and BRCA2 (Lynch & al, 2004). Familial clustering of cancer can probably be caused by other genetic risk factors than those identified to date, and by a combination of unknown genetic factors and environmental or lifestyle factors. Genetic mutation testing as a part of the health care system is available in Norway for persons with clustering of relevant cancers in their family.

The lifetime risk may be substantial in carriers of mutations in genes linked to hereditary risk of breast and ovarian cancer, some 10 times higher than that of the general population. On the population level, however, these conditions are rare, and estimated to explain less than 5–10% of the cases. Geographical clustering of mutation carriers has been reported by Norwegian geneticists (Møller & al, 2007).

We can conclude that historical examples from three centuries illustrate the role of cancer clustering for the advancement of human knowledge of cancer causes. For most cases, a long time elapsed between the initial suspicion and the recognition of a carcinogen. More precise characterisation of the causal associations has emerged with modern epidemiological methods developed after World War II, with increasing availability of high-quality animal experiments, or more recently, with biomolecular techniques.

3.3 What was special with the "useful" historical cancer clusters?

Three features were common for many of the informative historical cancer clusters. The absolute or relative risks were high, the exposures were rare and high, and some of the cancers (although not all) were rare. These qualities may all suggest an unusual hazard. The relative risk of a rare disease may reach higher levels than that of a more common disease, which can be helpful for the investigation. Among the Welsh nickel-refinery workers, the overall risk of the rare cancer of the nose and nasal sinuses was 200 times higher among exposed workers than expected from national rates (74 deaths observed against less than 1 expected) (Doll & al, 1990). Even higher relative risk estimates were reported in workers with extensive exposure.

A deviating age pattern among the cancer patients may also suggest an unusual hazard. Low age at diagnosis can be seen for hereditary cancers or diseases following exposures early in life. Normally, vaginal cancer affects women above 50, but rarely women in the age group typical for the diethylstilbestrol cases (Herbst & al, 1971).

Through the last decades, improved knowledge of cancer causes and an increasing interest in environmental issues may have escalated public awareness and lowered the threshold for reporting perceived clusters.

4 Identification of human carcinogens

Typically, a cluster investigation will be a single study within a small population. As such it has limited statistical power and restricted scientific impact. In recent years, most advances in the knowledge of human carcinogenesis have come from multiple large studies with good data on exposure, and results from laboratory analyses of chemical and biological samples. Some expert evaluations of potential human carcinogens have relied heavily on mechanistic data and animal experiments. The WHO International Agency for Research on Cancer (IARC) has defined a set of criteria for classification of human carcinogens, found in the Preamble to its monographs (IARC, 2006) (see also Figure 4).

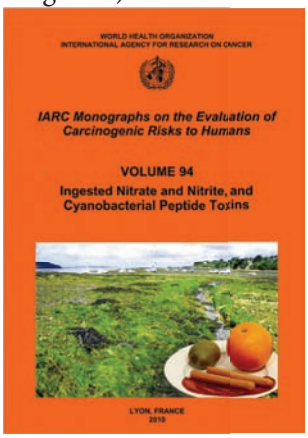

Figure 4. The International Agency for Research on Cancer (IARC) seeks to identify the causes of human cancer, and publishes authoritative monographs with evaluations conducted by international working groups (IARC, 2006).

In 1975, Doll reviewed known occupational cancer risks and concluded tentatively that only 4 out of more than 20 known carcinogenic exposures had been discovered in the course of initial evidence from laboratory experiments (Doll, 1975). In fact, observed clustering of cancer cases (or cancer deaths) in occupational groups continued to offer important clues and incentives for cancer research through the 1970s. For the role of asbestos in mesothelioma patients, the first described clustering included residents who had lived near open asbestos mines in childhood (Wagner & al, 1960).

Similarly, Neutra reviewed an updated list of recognised human carcinogens published by IARC in 1987. He found 26 out of 47 exposures or exposure situations to be discovered by medical or occupational clusters (Neutra & al, 1992). Only a single exposure was detected on the basis of a residential cluster alone (mesothelioma from erionite, a fibrous mineral used in house-building).

In line with these notions, the association between exposure to vinyl chloride monomer and angiosarcoma of the liver has been claimed to be detected as a cluster observation (Rothman, 1990). Strictly speaking, though, there were animal experiments that prompted the first evaluation of cancer risk among exposed workers (Doll, 1975; Maltoni & Lefemine, 1975). Still, it is fair to give the epidemiological results attention, as the relevance to humans always can be questioned for animal experiments.

4.1 Active search for cancer causes

A prerequisite for cluster evaluations, and a great help for aetiological cancer research, is the availability of background disease rates. An active search for cancer causes started in Norway in the last decades of the nineteenth century in the form of descriptive studies of the frequency of cancer deaths. The first attempt of establishing a national registration of cancer cases came in 1908 from a committee under the Norwegian Medical Association, led by the pathologist Fredrik Georg Gade. Cancer of the stomach was reported to be the dominating type of cancer in women and men combined, while breast cancer and gynaecological cancer were the second most frequent cancers in women (Gade, 1916).

A Norwegian national Cancer Registry was founded in 1952, with mandatory reporting of cancer from pathology laboratories and physicians. Valuable data on trends in incidence, on regional differences, and on survival have been produced during the subsequent six decades based on virtually complete data with increasing diagnostic ascertainment (Larsen & al, 2009).

Important contributions to the identification of cancer causes have been produced by Norwegian epidemiologists based on data from large population-based surveys and health examinations, data on occupational exposures from industrial plants, workers' unions, official statistics, and census data, all with subsequent linkage to the Cancer Registry data base.

5 Challenges and limitations in cluster inquiries

The reactive character of a cluster inquiry is not a good starting point for a scientific evaluation. Good epidemiological science should ideally start with a hypothesis—such as a suggested carcinogen or a risk factor—and proceed with the choice of the best population to test the hypothesis. Subsequently, one should choose a reliable way to identify cases in the study group and in the reference population, find means to avoid selection and misclassification, and collect data to obtain control for potential confounders that may disturb the statistical analysis.

A cluster inquiry, on the other hand, is often driven by a local request for an explanation of a perceived local excess of cancer. The expectations may create an unfavourable situation in a number of respects.

5.1 Study size

The problem with undersized studies has already been commented on. Typically, a cancer cluster is based on low numbers, often fewer than 10 cases, and the study population would not be selected after an independent evaluation, but rather suggested by the occurrence of the cases in time and space. Additionally, it is often difficult to decide the exact outline of the source population—or study population—considered to be relevant or "at risk".

If the area or period defined by the perceived cluster is small a clustering of cases produced by random will give a falsely inflated (artificially high, not representative) relative risk. On the other hand, a comprehensive population or longer period of observation may dilute the risk estimate, and these issues may be highly controversial if a strong local cause is suspected by the public. Additionally, some of the common statistical tools meant for testing of hypotheses are not appropriate and remain less useful when there is an *a priori* knowledge or suspicion of a cluster. One should therefore bear in mind that clustering of cases also can be an indication of a generally increased risk in a larger area or a larger population group, and that it can be appropriate to widen the scope.

Epidemiological studies rely heavily on comparisons of groups of people. In most situations it is impossible to determine the cause of disease for a single individual or even a small group, unless there is a highly specific exposure with a strong effect, such as the biological agent for an infectious disease. The number of cases included in a study is the main factor restricting statistical power, and important comparisons between subgroups according to different levels of exposure may be impossible when too few cases are included. A small study of weak carcinogens is bound to be uninformative.

Interestingly, Norwegian geneticists have shown that restricting genetic testing to families with observed clustering of breast and ovarian cancer limits the detection rate to less than 50% of all BRCA mutation carriers in the population (Møller & al, 2007). Their findings illustrate the fact that a quite high relative risk in small groups (families) may materialise as clusters, but the identification and distribution of the clusters are an unreliable measure of the size of the problem at the population level. The parallel to other cluster inquiries is evident: Although a small cluster may need attention, it can be important and rewarding to allocate resources to well-designed large studies.

5.2 Diagnostic considerations

The knowledge of cancer causes is not equally distributed between the different types of cancer. For many of the common cancers—or groups of cancer—such as female breast, large bowel, prostate, and lympho-hematopoietic cancers, the proportion explained by known external or environmental exposures is low. Prostate cancer and large bowel cancer suffer from a striking paucity of recognised causes. A well-known exception is lung cancer, for which smoking tends to overshadow other potentially important causes such as occupational exposures, indoor radon exposure, and air pollution.

Some carcinogens may increase the risk of two or more different cancer forms. This is seen for tobacco (smoking and smokeless tobacco, snus), ionising radiation, arsenic, asbestos, alcohol, dioxins, and nickel compounds. Still, the size of the risk may vary between the cancer types. When facing a perceived cancer cluster, it is often useful to discuss the cancer pattern along with known explanatory factors.

Historically, the clusters that proved to be scientifically rewarding, were often picked up by health professionals with knowledge of background rates, either general practitioners, hospital doctors, researchers, or public health officers. We should also be aware the historical examples of serious delays in the identification of carcinogens and unreasonable rejection of new hypotheses. This has been seen both from the medical establishment (tobacco smoking and lung cancer) (Wynder, 1986) and from industry with strong economical interests (Michaels, 2008).

In advanced stages, a cancer disease may change its appearance. Tumour cells may spread to other organs or parts of the body, leaving it difficult to decide in what organ the cancer originally developed. In some cluster situations, local people may have collected individual information on disease and death, while the determination of exact diagnoses and identity remains a demanding task with erroneous and incomplete data. Additionally, ascertainment of cancer diseases by means of registry data may require permission from ethical boards for research, which may be reluctant to licence a public health activity with only questionable scientific value.

5.3 Scarce exposure information

Sometimes a cluster inquiry comes from an area where a potential health hazard from pollution has been debated for years. A cluster may also emerge where no cause has been suspected. In the latter situation, a long list of proposed causes may exist. It is often useful to discuss exposure and disease at a general level, but an in-depth evaluation requires good exposure data of candidate causes and potential confounders. The quality of the exposure information is often a limiting factor in an epidemiological study, both for the validity and for the possibility to explore dose-response relationships.

Some of the most frequent non-occupational environmental carcinogens are ultra-violet radiation, some virus infections, in-door radon from the soil, and ambient air pollution. Potential confounding from exposures linked to lifestyle may be difficult to control, the most important ones being use of tobacco, alcohol consumption, excessive sunbathing, sexual activity, and handling of carcinogens associated with house-building materials. Some lifestyle habits are known to be unevenly distributed, sometimes according to socio-economic status, and they may vary with time, fashion, social norms, and with place of residence.

5.4 Bias

If a potential hazard or health problem has received much attention it can be difficult to collect unbiased information from the population. The situation may be particularly challenging if no independent data are available neither for the health outcome nor for the relevant exposures.

Sometimes outcome and exposure data have been collected from the same individuals by interview or questionnaire. This approach gives ample room for selection bias in participation, for recall bias, reporting bias, and attribution that can mimic or mask any true association. Claims and expectations of compensation might further compromise the validity of survey data, and can easily introduce distrust in the process. News media have an interest of their own to keep up the drama, discussion, and conflict of interest, and by these mechanisms, a suggested causal relationship in a perceived cluster may remain almost inaccessible for research—unless independent sources exist for exposure and health outcome.

Other expectations—in terms of a specific wanted explanation, a request for clean-up of local sources of pollution, or even improved house prices—can also make it hard for health professionals to establish a climate with enough trust from local inhabitants, enough empathy towards patients and relatives, and a satisfactory distance for an independent evaluation. When a question of clustering is linked to a political

agenda transparency and good communication skills are mandatory. The process may be time-consuming, but time and attention are important remedies that may help to save resources in the long run.

5.5 Science or social mission?

A successful handling of a perceived cluster would—as seen from the health care system—communicate a balanced picture of potential health threats, meaning that unreasonable fright is reduced, and focus is directed towards the most important determinants for health and disease. Skills and experience, available data sources, appropriate timing, and an empathetic approach can improve the process. Hurt feelings and distrust in the population, or even mindless presentation by a news agency can increase toll and stress. It may be beneficial for all parties if a cluster is reacted upon properly from the beginning, in the sense that the basic aspects and questions are addressed with an evidence- and knowledge-based attitude, calling for a combination of scientific and public health approach. Lastly, on the national scale, one should remember that out of the 28 000 new cases of cancer registered in Norway every year, only a small proportion is perceived to emerge as clusters. Still, there are ample contrasts within the population, as well as changing time trends, that could be worthy of a closer description or an aetiological pursuit.

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Can we draw causal conclusions from unexpected clusters of disease?

Odd O Aalen[a,b], Steinar Tretli[b]
[a]Department of Biostatistics, Institute of Basic Medical Sciences, University of Oslo, Norway
[b]Cancer Registry of Norway, Department for research

Abstract

Clusters of disease are often brought to the attention of health authorities. Some of these cases appear in the media, and create quite a stir. How do we interpret disease clusters in an epidemiological and statistical setting? Many disease clusters are due to random variation and we demonstrate the ability of randomness to produce clustering. When evaluating a cluster, Bonferroni type corrections can be made, but the degree of correction is often arbitrary and can only give a rough idea about whether the cluster in question could emerge by chance. A specific and localized cause could lead to clustering if the development of the disease has a short duration. Whether one should expect clustering in time depends on the length of the latency period of the disease, but also on variation in the latency period between individuals. For cancer, latency time is typically long, and usually one would not expect clustering of cases in time even in the presence of a common cause. When evaluating clusters there is a strong tendency to look for causal agents in the local environment. However, it may be more likely that the cluster points to a smaller increase of risk in a larger part of the population.

1 Introduction

Clusters of disease cases are a common phenomenon. These clusters may be found in neighbourhoods, at the work place or in the local community. It is often tempting to interpret a disease cluster as caused by an increased risk for a sub-population, due to specific chemicals, radiation or other exposures, affecting this sub-population. Still, in many of the supposed cluster situations it is more or less impossible to find a common cause. A critical review of clusters was given by Rothman (1990). A recent assessment was given in an editorial in The Lancet Oncology (2009), where they point out the fact that most cancer clusters will be random occurrences, but that one still has to be on the lookout for the rare cases where there could be some substance behind the findings. Also, there is a responsibility to the public to make a thorough evaluation when an apparent cluster causes great attention. We would like to point out that there is a further aspect, namely that a cluster, although a random occurrence, may still signal a moderate underlying increase in incidence.

The issue of cancer clusters often occurs in the news media and popular literature, and a somewhat sophisticated discussion was given in The New Yorker (Gawande, 1999). A Norwegian disease cluster that has been given much attention over several years was the occurrence of congenital anomalies in the offspring of personnel serving aboard a missile torpedo boat (Magerøy & al, 2006).

In the present paper we consider clusters that are unexpected. Clusters that arise around a focus point where there exists a prior suspicion of increased risk are not the subject of this study. An example of the latter type might be clustering of leukaemia cases close to an atomic processing plant, like Sellafield (Draper, 1993).

An unexpected cluster will typically be informally detected by individuals in a local environment and then occasionally be reported to the health authorities, for example a cancer registry. These clusters are usually not well documented by the observer, and different interests, motives and limited knowledge about the disease might be the reason for the claim.

Most events within such clusters would not only be geographically close, but also close in time. In fact, the closeness in both place and time is often a prerequisite for the cluster to become an object of attention because the observer needs a reasonable overview of the population where the cluster is observed.

An evaluation of a cluster situation will therefore include several steps: 1. Are the observed number of cases more than expected in a comparative reference population? 2. What could be the reason for a changed disease incidence rate? 3. Is the suggested reason plausible? 4. Do other observations exist that support the explanation of the cluster occurrence?

For most disease clusters one would imagine a chemical, physical or biological cause, if there is any common cause present at all. Speculations often comprise effects of human activity such as radiation. It should be noted, in passing, that also clusters of a different nature exist. Internationally there are several known cases where clusters of deaths in nursery homes or hospitals have led to suspicions of criminal acts, and indeed nurses, in particular, have been charged with murder, see the Nature paper by Buchanan (2007). The considerations in these cases have similarities with evaluations of ordinary disease clusters, for example cancer clusters, but they also clearly have their own aspects. In particular, one would need far stronger evidence to conclude that there is a real cluster.

In the present paper we shall discuss the concept of cause in clustering and the possibilities and power to detect anomalies.

2 The concept of cause in disease clustering

The fundamental issue in assessing disease clusters is to judge whether there could be some common cause behind the cases that constitute the cluster. But it is not immediately obvious what is meant by cause in this context and we shall discuss certain aspects of this.

The situation is closely connected to epidemiological association studies where we attempt to decide whether an observed association between exposure and disease is causal. A set of criteria is usually considered (Hill, 1965) and a couple of them might be informative in the discussion of causality in the cluster context.

2.1 Hills criteria

One of the criteria is *biological plausibility*. This might be more important in the causality discussion of clusters than in epidemiological association studies. This is because the typical epidemiological studies are carried out by researchers who have considerable knowledge about the disease in question, and the biological plausibility is a part of the hypotheses that form the basis of the study. Disease clusters, which are often claimed by people without professional medical knowledge, may include different sub-diagnoses which are connected to different known risk patterns. Cancer is an example: The outcome variable(s) in an epidemiological study is usually one or a few specific types of cancer while in many reported unexpected clusters all types of cancer could be included. Therefore, a discussion of the plausibility of a cluster will also include whether the cluster situation is in conflict with what is known about risk factors for the involved types of cancer and what is known about the cancer disease process -especially the length of the process and the variation between individuals (this is part of the *coherence* criterion). Biological plausibility is also related to the concept of mechanistic understanding. Do we have any sense of the mechanisms that might lead to a cluster?

Another of Hill's criteria is *temporality*. In a discussion of causality, it is obvious that the cause shall precede the effect in time. The same necessary temporality exists for clusters, but the time frame is not always clear. Development of cancer, for instance, is a long process and it may not be clear when in the disease process the exposure has an effect. The authors' experience is that the general public tend to look for exposure

taking place in a rather short time before the cluster is claimed, and hence the suggested cause may not be realistic in the sense of temporality.

2.2 Counterfactual causality

The modern literature of causal inference is largely based on a counterfactual causality concept. This means that there is one factor that can be changed, keeping everything else equal, and such that one sees a clear difference in effect. When disease clusters are observed there is often a strong suspicion of a specific culprit. An example is given by Gavin and Catney (2006) where local concern over a cancer cluster in Northern Ireland lead to the unauthorized felling of a telecommunications mast. The authors show that in actual fact the incidence and mortality of cancer were within or lower than expected and so the suspicion harboured by members of the community was not justified.

Cancer clusters only rarely lead to the discovery of a specific counterfactual cause. One example is the cluster of 25 cases of mesothelioma in the Turkish village Karain, which turned out to be due to a mineral (erionite) and possibly asbestos as well (Honjo & al, 1982).

Even if there is a real increase in incidence, there may not be any clear counterfactual cause of this. The fact is that for a number of reasons the incidence of disease such as cancer varies between geographical areas, communities, professions and other groups. We shall show below that this could produce clusters, but there would be no one specific cause of this, but rather a complex web of causal elements combined with randomness.

There is a distinction in the causal literature between necessary and sufficient causes (Rothman & al, 2008). As regards clustering, does one imagine that a specific necessary cause exists in the local community, that is, a condition or an event, without which none of the cases would have arisen? This could for instance be a strong source of pollution, such as radiation or asbestos. Or does one mean a factor that increases the risk without being a necessary cause, such that the disease cases could have arisen anyway but that the factor in question increases the risk of this happening? Such a factor could be a part of a multifactorial set of causal influences where it might be impossible to say which factor is the major cause in a given case.

This is also related to the issue of insurance or compensation which would sometimes be an aspect of the investigation. In order to give compensation, it is not a necessary requirement that one can prove that one specific cause is the guilty one. Rather one would make statistical requirements, for instance that the risk of disease is at least twice as large as it would have been without the putative cause, see for example Palmer & al (2007).

3 The impact of randomness

3.1 Random clustering

It is important to understand the power of randomness to induce clustering between events that are independent of one another, see also Aalen (1986). Independent events do not occur in a regular manner; rather the natural irregularity of randomness produces, so to speak, accidental clusters. This can be demonstrated by mathematical calculations or by simulation.

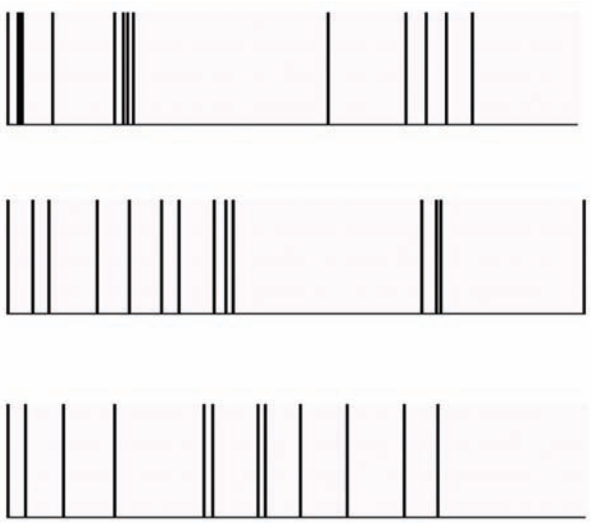

Figure 1. Simulation of a Poisson process with a constant rate. The horizontal line is the time axis, divided into three parts. The vertical line pieces indicate occurrence of events.

The Poisson process is the mathematical description of events occurring randomly and completely independent of one another. A simulation of a Poisson process with a fixed rate is demonstrated in Figure 1. The bottom line indicates time, divided into three panels, and the bars indicate the occurrence of events. One clearly sees the clustering. Indeed, the second bar in the top panel consists of two or three events that are almost simultaneous, and also in the rest of the figure there is considerable clustering and long and empty intervals in between. Figures 2 to 4 give similar demonstrations with a Poisson process over the plane. Again one sees the clustering and

the empty spaces in between. In Figure 4 the plane is divided in 25 grids with an expected rate of two events per grid. The observed occurrences in the grids vary from 0 to 6 occurrences. These simulations demonstrate that a considerable degree of clustering would be a natural phenomenon due to pure randomness, and that an understanding of this issue is a prerequisite for analyzing disease clusters.

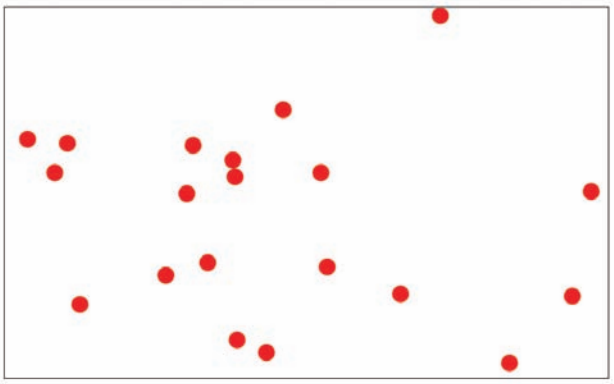

Figure 2. Simulation of a Poisson process over a plane with 20 points

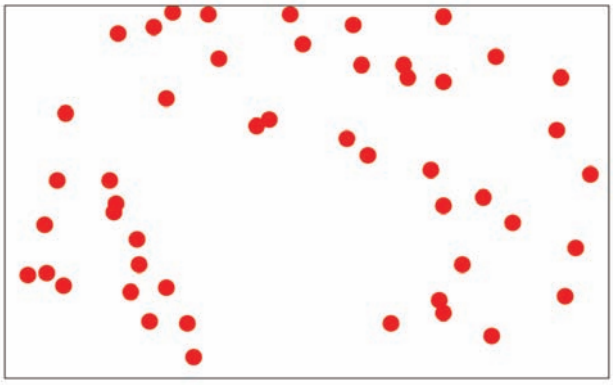

Figure 3. Simulation of a Poisson process over a plane with 50 points

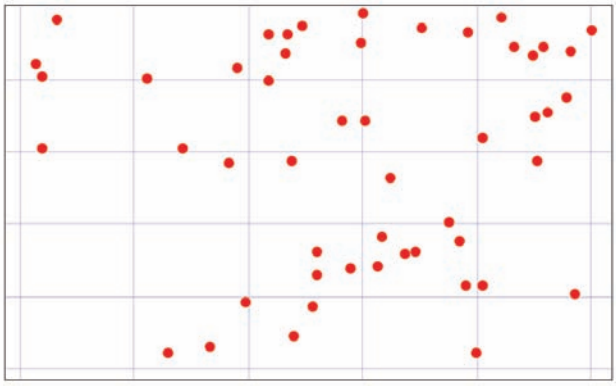

Figure 4. Simulation of a Poisson process over a plane with a grid

3.2 On the maximum of a set of observations

The observations that will cause special attention and give a basis for further investigations will be those that deviate strongly from what is expected. Usually the maximal number will be of greatest interest. We imagine that we observe occurrences of a rare condition over numerous small areas, and will consider the maximum number of occurrences in any single area. As a matter of simplicity we shall imagine that all areas are of the same size. The expected number, or rate, for each area is denoted λ. If the numbers of occurrences in different areas are independent, then the occurrences will form a Poisson process.

For those interested in the mathematics, the relevant formulas are as follows (standard probability theory): The point probability of a Poisson distribution (that is the probability of observing exactly x occurrences within a specific area) is given by $\lambda^x e^{-\lambda}/x!$ with cumulative distribution function

$$\sum_{y=0}^{x} \frac{\lambda^y}{y!} e^{-\lambda} = \frac{\Gamma(x+1,\lambda)}{x!}$$

where $\Gamma(x+1,\lambda)$ is the incomplete gamma function.

Consider n independent areas, each with a Poisson distributed number of occurrences with rate λ. Let U be the observed maximum number of occurrences (cases) in a single area. The cumulative distribution function of U follows from the Poisson distribution formula, and is given by

$$F(u,\lambda,n) = P(U \le u) = \left(\sum_{y=0}^{u} \frac{\lambda^y}{y!} e^{-\lambda}\right)^n = \left(\frac{\Gamma(u+1,\lambda)}{u!}\right)^n$$

where u is a fixed value of the random variable U, λ is the rate, and n is the number of disjoint areas.
The point probability is

$$P(U = u) = F(u,\lambda,n) - F(u-1,\lambda,n)$$

and the expectation is

$$E(U) = \sum_{u=0}^{\infty} \big(1 - F(u,\lambda,n)\big).$$

Figure 5 presents the expectation of the maximum number of occurrences (cases), U, for various values of n and λ. The figure shows that the expected maximum is large compared to the expected number per area. For instance, the latter may equal 1, and still the expected maximum is almost 6 for 1000 areas. So, in a mathematical way, this shows that the maximum number of occurences (cases), which is likely to get attention, may by pure chance be much higher than the average number.

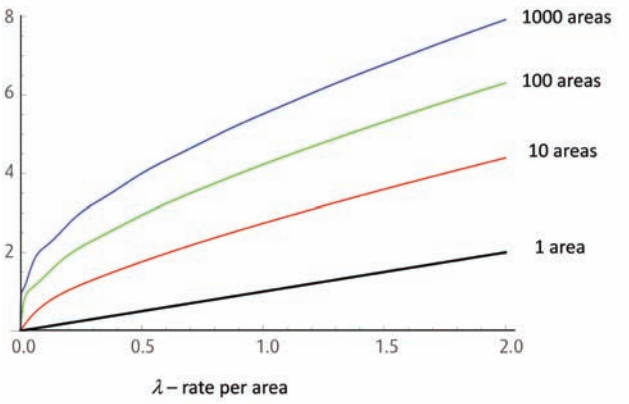

Figure 5. The expectation of the maximum number of occurences (cases) over n disjoint areas, with n equal to 10, 100 and 1000.

4 Analysis of clusters to assess for randomness

4.1 Cluster of stillbirths

This example is inspired by a real occurrence, but modified somewhat. Although it is not about cancer, it illustrates important principles. During a five year period ten employees in a kindergarten became pregnant. Three of them had a stillborn child. This was a striking occurrence in a small group of colleagues and was reported to the authorities. A question was whether this could be due to something in the environment. There was no particular theory for how this could come about and statistical advice was sought in order to evaluate the likelihood that it could be a random occurrence. We shall do some calculations for this example.

We assume the probability of stillbirth to be 1% (which was a realistic value in the 1980s when this cluster was observed). We can then compute the probability that 3 out of the 10 pregnancies give a stillborn child:

$$\binom{10}{3} \times 0.01^3 \times 0.99^7 = 0.00011 = \underline{0.011\%}$$

4 out of 10 cases are even much less likely and when added to the above does not change the result and it turns out that the p-value equals 0.011 % for the occurrence of 3 or more stillborn.

Here we have computed a p-value for a hypothesis that was suggested by the data. One way to handle such post hoc hypotheses is to use a Bonferroni type correction. The idea is that such a cluster will be brought to attention if it is observed in one out of a large number of kindergartens or other small offices or working places of about same size and where the employers knew each other well enough to have the information that a college has received a diagnosis. The big question is how many units (kindergartens and possibly other work places) that one should reasonably consider within a time period and a geographic defined area. We rather arbitrarily choose 1000. The probability that at least 3 stillbirths occur one or more times among 10 employees would then be

$$1-(1-0.00011)^{1000} = 0.10 = 10\%$$

However, it could easily be argued that 1000 could be increased to 5000 and then the probability would be about 42%. A look into the post hoc situation often changes the view that the unexpected cluster is very striking. It is, however, not so easy to communicate this view to the general population, and it typically remains uncertain how many "similar units" one should correct for.

4.2 Cancer cluster

A cancer cluster was observed among women working in a Norwegian library. During a period from 1980 to 1997 five cases of breast cancer were diagnosed in female employees. The total number of person years under risk was 818, and from Norwegian general population cancer data, considering the ages of the employees, the expected number of cases among employees at the library was 0.73. Hence, the observed to expected ratio was 5/0.73 = 6.85. The p-value, that is the probability of observing 5 or more cases when the expected number is 0.73, may be calculated from a Poisson distribution yielding 0.00094 = 0.094%. Considering 1000 similar units gives Bonferroni adjusted p-value of 61%, hence the cluster would not be unreasonable as a chance occurrence. In this case, no common risk factor or other reasonable explanation was found in spite of extensive investigation.

5 The aspect of time

Clusters of disease cases are often expected to be close in time as well as in space. This may be reasonable when the development of the disease or condition from exposure to the observed effect has a short duration, as would be expected for the cases of stillbirth or a contagious disease, for instance. However, in the case of cancer there may be a long delay, from several years up to several decades, between initiating cause and effect, and therefore one would not expect cases to cluster in time. In fact, in the cancer cluster discussed above, the cases stretched in time of diagnosis from 1980 to 1997, but still this cluster got attention because it was in a library in a small town, and with many long-term employees.

Expecting a cluster of cancer cases to be close in time is therefore generally unrealistic. If the cause that creates the cluster has an impact at an early stage of the cancer process, then there would be a large variation in time before a clinical cancer would arise. So closeness in time at initiation would not translate into closeness in time at the diagnosis of cancer. The only exception from this would be if the cause in question affected the cancer process at a very late stage. This would require a sufficient number of individuals in the community with latent tumours at such a late stage. In this case, it is disputable whether the putative cause can be said to cause the cancer, since latent tumours have to exist. But, conceivably, the cause may speed up the development of cancer. Even in this situation it might be difficult to observe a cluster effect because of variation in cancer growth rate between individual tumours.

Hence, a cluster of cancer cases that are close in time are not likely to have a common cause. This shows that the whole notion of cancer cluster as something that is also close in time is an unrealistic concept. This clearly points to the need for great caution in interpreting cancer clusters.

6 Variation in risk: Clustering as a signal

Although cancer cases with a common specific cause would not be expected to cluster in time, as explained above, there is another aspect to this. Often there is a variation in risk between communities; some have a higher risk than others. The simple fact which we shall explain is that the high risk communities have a higher probability of producing random clusters than a low risk community. Hence, although the cluster will give a far too high incidence, it might still signal an actual increased risk. This is also a question of how sensitive the probability of clustering is to the underlying assumptions in the calculation.

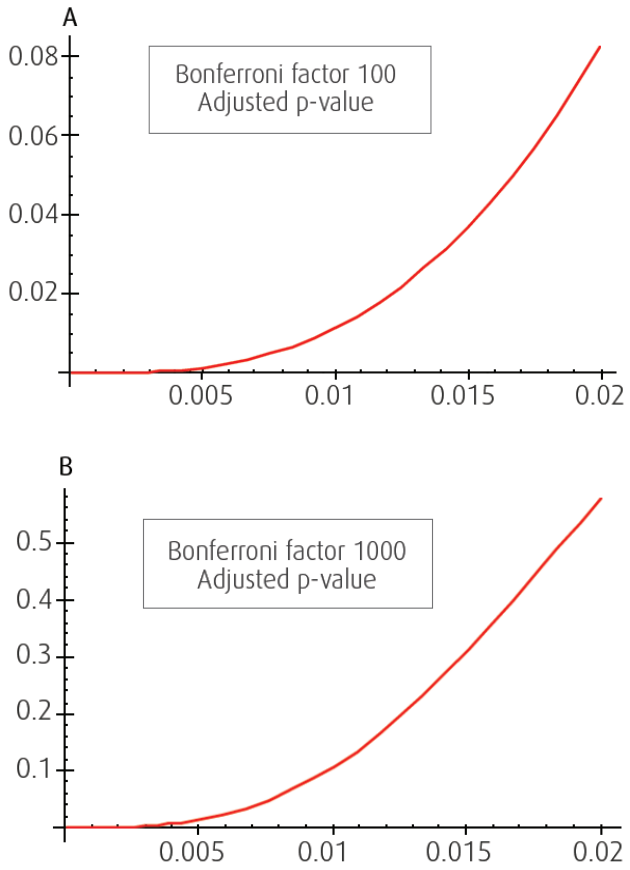

Figure 6 A and B. Kindergarten stillbirth example: Adjusted p-value of cluster as a function of background probability of stillbirth for two Bonferroni factors, 100 (A) and 1000 (B).

6.1 Stillbirth example

This is true not only for cancer but for any condition, and we shall demonstrate it for the kindergarten stillbirth example. We then make the same calculations as above (probability of 3 or more stillborn in 10 pregnancies), but for different values of the underlying probability of stillbirth. We also use two different values for the numbers of "similar units" to be corrected for, namely 1000 (as used previously) and 100. The results are given in Figure 6 where one sees that the adjusted p-value is strongly dependent on the underlying risk of stillbirth. Clusters of stillbirth are much more likely when the risk of stillbirth increases. This means that a cluster would be a much more probable event in a subgroup of the population with a generally higher risk. Hence one would think that a cluster could be seen as a signal of a generally increased risk.

6.2 Cancer cluster

Here we could also allow for the possibility of an increased risk. Possibly, the librarians as a group could have somewhat higher risk than the general population (this is here just used as a computational example with no implied suggestion of a general effect for this profession). Assume, for instance that they have twice the risk such that the expected number of cases rises from 0.73 to 1.46. Using the latter number as the expectation of a Poisson distribution yields a p-value (probability of 5 or more cases) of 0.0168 which is about 18 times the value computed previously in Section 4.2.

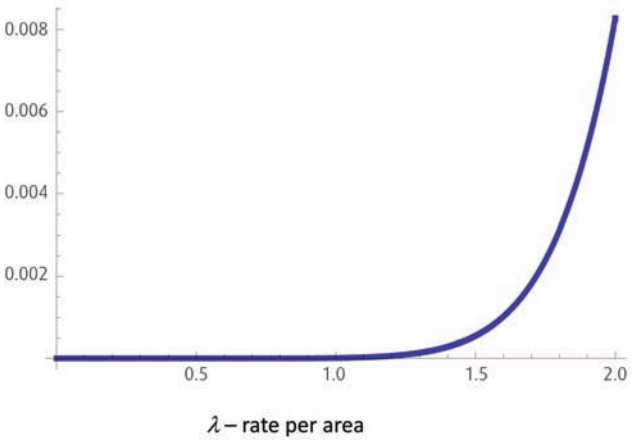

Figure 7. Probability of observing 11 cases or more in at least one out of 1000 units when expectation per unit, λ, varies from 0 to 2

If a cluster consists of more events (than the present five) the effect of increasing the underlying risk could be much stronger. Figure 7 shows an example where, using a Poisson distribution, we look at the probability of observing 11 cases or more in at least one out of 1000 units when expectation per unit, λ, varies from 0 to 2. There is a very strong increase after λ passes 1 and goes towards 2, in fact, the value at 2 is 823 times the value at 1. The reason for this can be seen from the Poisson formula $\lambda^x e^{-\lambda}/x!$. When x is (reasonably) large and λ is small, then the power λ^x implies a large effect of increasing λ.

Varying risk in populations is very common, and certainly a doubling in risk in some parts of the population compared to other parts is by no means extreme; see for example Sweeney & al (2008) regarding variation in breast cancer risk. We see here that such an increase can to a very large extent influence the likelihood of random clustering. Hence, although the cluster may be a random event and should not be interpreted as indicating a large local risk, it can still be a signal of a moderately increased general risk in parts of the population.

Notice that the cluster may itself be a very unlikely event, still it may contain important information. Using Bayes' law we may write

$$P(I|C) = \frac{P(I)P(C|I)}{P(C)}$$

where I denotes a raised general incidence and C denotes a cluster. Hence, the probability of a raised incidence given a cluster may be great even though the cluster may be an unlikely event because $P(C|I)$ is measured against $P(C)$.

7 Power to detect anomalies

We have so far focused on the interpretation of an observed apparent cluster. A closely related issue is to which extent an increased risk in a subgroup would be expected to result in a recognizable cluster. This is a question of statistical power. This calculation is only relevant for effects that arise over a short time, consider the discussion of time effects above.

Consider now the same Poisson process as in Section 3.2, but with the difference that one of the areas has a higher expectation $a\lambda$ where a>1. Then the probability that the one with the higher expectation shall exhibit the largest number of occurrences can be derived from the previous formulas as:

$$P = \sum_{y=1}^{\infty} \frac{e^{-a\lambda}(a\lambda)^y}{y!} \left(\frac{\Gamma(y,\lambda)}{(y-1)!}\right)^{n-1}$$

To illustrate this we shall consider the following example: Assume that one area out of 10, or a 100, has a larger risk than the other areas. What is the probability that this shall stand out, that is being the one with the maximal number of cases? Consider two situations: (i) special area has twice the expected rate of the others; (ii) special area has five times the rate of others. The probability (power) that this area stands out from the others is demonstrated in Figures 8 and 9. In the case of merely a doubling of the risk the power is low, while it is relatively higher when the rate is multiplied by five in the special area. The figures also demonstrate the natural fact that correct discovery of the area with increased risk is easier when just a few areas are considered as compared to many (in the figures 10 and 100 areas are compared).

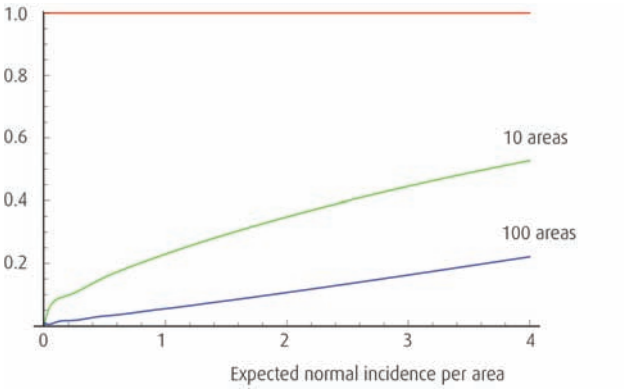

Figure 8. The probability for one area out of 10 or 100 to have the maximum number of cases, when the rate of this area is twice that of the others.

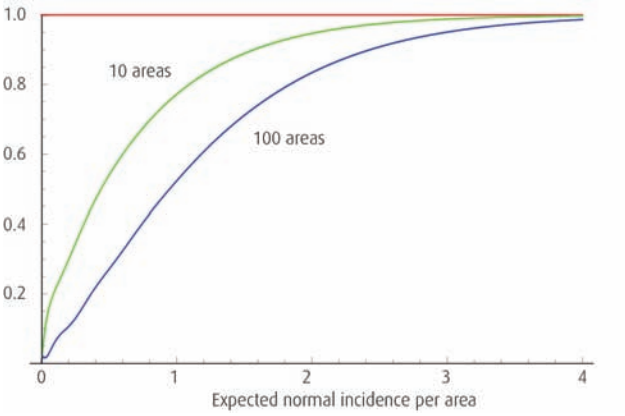

Figure 9. The probability for one area out of 10 or 100 to have the maximum number of cases, when the rate of this area is five times that of the others.

8 Final comments

Clusters of disease would often be expected to represent merely random variation. Whether they can be indicative of a real increase in disease risk, depends on whether the disease would develop fast (in which case they can), or slowly (in which case clustering in time is much less likely). In any case, a disease cluster could be a signal, not of a true cluster but of a generally increased risk level in a population. Clearly, clusters should be interpreted with caution.

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Cluster inquiries, guidelines and lessons to learn

Tom K Grimsrud, Steinar Tretli, Tor Haldorsen
Cancer Registry of Norway, Department for research

Abstract

The attitude and approach towards perceived cancer clusters, and the scientific expectations from cluster investigation have changed materially during the last hundred years. In this article we refer some of the aggregated experience from the USA through recent decades, and we present selected examples of cluster inquiries addressed by the Cancer Registry of Norway. We also briefly refer to guidelines and factsheets provided by health authorities in the UK and the USA. Finally, we discuss the more general issue of resources, and we give a short presentation of emergency facilities for cluster investigation as they exist in the UK and Finland.

1 Introduction

During recent decades—in parallel with an increasing life expectancy and improvements in the health care system—we have seen a growing public awareness of health issues and environmental issues. Every month, the Cancer Registry of Norway receives questions from residents, health personnel, and media about local aggregation of cancer and potential environmental causes. Sometimes it is difficult to distinguish what comes first, the worry of a cluster, or an independent concern related to environmental exposure, such as electric high-voltage power lines, industrial pollution, radon, or garbage dumps. Common for these inquiries is the need for a qualified answer, and the opportunity it provides for health care workers to share their knowledge and become familiar with public concern.

One hundred years ago, doctors had virtually no knowledge of cancer causes. Encouraged by a Norwegian national committee for cancer research (Den norske komité for kræftforskning) general practitioners actively registered and reported cases in what they perceived as clustering of cancer (Gade, 1916). They discussed the possibility that some of the cancers be caused by contagious agents (Hvoslef, 1903), see figure 1. The approach of these doctors is not unlike those we see from the public today, when people are faced with a perceived cluster.

Figure 1. Investigation of a local "cancer epidemic", printed 1903 in the Journal of the Norwegian Medical Association (Hvoslef, 1903). Note display of names and residences —contrasting present-day standards of personal secrecy.

The scientific and public health challenges linked to clustering of disease has been extensively discussed through the last three decades. In this paper, we will relate recent experience from handling of perceived cancer clusters, specifically from the USA, and we will refer to available guidelines and factsheets in the USA and the UK. Further, we will present some selected cluster inquiries that have been addressed by the Cancer Registry of Norway. Finally, from our neighbouring countries Finland and UK, we briefly describe systems for emergency handling of geographical clusters established during the 1980s and 1990s.

2 Reported experience from cluster inquiries in the USA

Towards the end of the 1980s, handling of cluster inquiries was recognised as a challenge needing operating procedures, and the US Centers for Disease Control and Prevention (CDC) arranged a national conference on clustering of health events with an international group of delegates in 1989. The proceedings from the meeting were published as a supplement to the American Journal of Epidemiology (Editorial Am J Epidemiol, 1990). A description of the CDC experience from 1961–1982, showed that the expectations by the public were largely shared by the health community, in the belief that investigation of cancer clusters would offer a clue towards unknown cancer causes (Caldwell, 1990). Initially, as referred from Norway (above), there was an anticipation of finding infectious causes to cancer clustering, which gradually were replaced by a suspicion of environmental contamination. However, the CDC experience from 108 cancer cluster investigations 1961–1982 did not provide a clear-cut explanation to any of the cancer clusters.

The CDC experience was in line with the provocative keynote presentation at the cluster meeting provided by the renowned epidemiologist KJ Rothman. He called it "a sobering start for the cluster busters' conference" (Rothman, 1990), and his main point was to lower the scientific expectations to cluster investigations. Still, public concern can neither be denied nor rejected, and some of the less cited responses to Rothman's "sobering start" may deserve attention. Neutra's insightful "counterpoint" (Neutra, 1990) demonstrated that some cluster investigations indeed have been rewarding, although some researchers run the risk of ending up like Cervantes's "Don Quichote" or Ibsen's "An enemy of the people" (Norwegian: "En folkefiende"). The discussion shows that a cluster inquiry can be discussed with two different approaches, the scientific one, and the public health approach. Obviously, the latter challenge cannot be met with advanced statistics alone.

Recently, another review was published of 567 perceived residential cancer cluster addressed by US federal and state agencies during the period 1990–2011 (Goodman & al, 2012). There was enough data to evaluate 428 of the reports, but for only 73 of the 428 (17%), the number of cancers exceeded the expected one and thus proved to be a confirmed cluster. For three of the clusters, there was some evidence of association with a suspected exposure, and for a single cluster, a clear cause was identified. Five of the investigations had been published in peer-reviewed literature.

The latter review by Goodman & al (2012) was funded by the Chlorine Chemistry Division of the American Chemistry Council—which remind us that industrial interests are not always compatible with those of the scientific community, nor with those of public health. Still, the described problems are in line with what should be expected from a scientific point of view: a mediocre scientific yield. For the sake of science, the advice may therefore be well-founded when the authors suggest (as did Rothman , two decades earlier (Rothman, 1990)) to give priority to larger studies with good exposure data to test more specific hypotheses. Nevertheless it may be necessary to address the question of perceived clusters.

3 Guidelines and information on cancer clusters

The US CDC provide useful general information about cancer clustering on the website of the National Center for Environmental Health (NCEH) (Centers for Disease Control and Prevention, 2012). The website provides definitions, advice on the interpretation of clusters, and information on the nature of cancer. Furthermore, the website offers link to the US Agency for Toxic Substances and Disease Registry (ATSDR) for guidelines in evaluation of perceived clusters. A stepwise approach is advised: case definition, case confirmation, population denominator, review of literature, exposure assessment, plausible hypotheses, and risk communication) (Agency for Toxic Substances and Disease Registry, 2000). A cluster inquiry may stop at any of these steps, for instance when an apparent cluster is not confirmed. The alleged cluster may often be based on a mix of different and non-related diagnoses, or enough information may be provided to show that the number

of observed cancers is not outside the range of the expected one.

Brief and well-written advice and descriptions of the cancer cluster issue are provided from several health authorities and textbooks. We would like to point at those of the US National Cancer Institute (National Cancer Institute, 2006), and the South West Public Health Observatory (SWPHO) in UK (South West Public Health Observatory, 2007). The latter is a National Health Service (NHS) organisation dedicated to help people access information about public health and improve the understanding of factors which influence health.

Figure 2. Map showing the localisation of some perceived clusters addressed by the Cancer Registry of Norway and briefly described in this article. Underlying map: Kartverket, Norwegian Mapping Authority, Norway

4 Perceived clusters addressed by the Cancer Registry of Norway

A cancer registry would be expected to provide useful data to the public and to a health worker facing a suspected or confirmed cancer cluster. Through the decades, a number of questions have reached the Cancer Registry from residents, health care workers, journalists, employees, and employers, see Figure 2 for the geographical distribution of selected inquiries presented in this article. In some cases, there is an underlying worry of a more or less poorly defined cancer hazard, and even other motives may be present, such as those of making a good story, economical interests in compensation, or a need to respond to an accusation of causing harm.

4.1 The Sømna story

An inquiry that really put clustering on the agenda was a suspected clustering of brain cancer in the municipality of Sømna in northern Norway. The story has been described (in Norwegian) by the former director of the Cancer Registry, Dr Frøydis Langmark (Langmark, 1994), and we shall refer only the main points here.

The Chernobyl disaster in April 1986 spread radioactive downfall in several directions, and some municipalities in northern Norway were among those perceived as more than average exposed. There was a marked public awareness, and countermeasures involved restrictions on intake of fish and meat from affected areas. In Sømna, cancer data were collected locally by a lay person, and the information was interpreted and disseminated as a dramatic cancer situation—even broadcasted on national television news on a Saturday evening (January 1993). No central expertise had been given the chance or time to evaluate the situation adequately.

There proved to be no increase in the total cancer incidence, but an update of the incidence at the Cancer Registry confirmed the suspected cluster, with six cases of cancer in the central nervous system against 1.6 expected from the background rates (standardised incidence ratio (SIR) = 6 / 1.6 = 3.8; 95% confidence interval (CI) 1.4–8.3) for the six years combined following the Chernobyl disaster). However, the probability of observing one cluster of this size would be around 26 percent among 50 municipalities of the same size, a situation taken to be close to the real-life situation as 43 municipalities had been found to have a relatively high exposure. Three of the greatest challenges in the Sømna story were the delay in the production of quality-secured cancer data, the signs of media and population distrust in the health authorities, and the low interest among journalists in relating correct data to the public.

4.2 The oil refinery at Sola

Figure 3. Emissions from oil refineries have caused concern. A slight excess of total cancer was found among residents of Sola municipality, mainly involving cancers with no expected link to oil-refinery exposures. Picture from Mongstad, Hordaland county. Photo: Nina Aldin Thune

Between 1967 and 2000, an oil refinery was in operation in the municipality of Sola, situated between Stavanger and the North Sea, in south-western Norway. Former employees and local residents in the rural surroundings reported concern about the cancer incidence, and suspected that local pollution (smell, gas, and smoke) might have caused the cancers (figure 3). An epidemiological report was commissioned by the owner of the oil refinery, and the Cancer Registry studied the cancer incidence among employees, as well as the incidence among present and former residents in Sola. Estimates of residential exposure were provided by the Norwegian Institute for Air Research (NILU), and lists of residents and addresses in the municipality on the first of January for each year 1967–2000 were provided by the National Population Registry. Follow-up for cancer was obtained by linkage to national data in the Cancer Registry of Norway(Skog & al, 2009).

The oil refinery cohort counted only 450 individuals available for follow-up. A 10 percent excess was found for all cancers compared with the national population (SIR = 1.1; 95% CI 0.9–1.4; based on 67 cases), and no evidence emerged for an increase of cancers of the bone marrow, lymphomas, skin cancer, lung cancer, or cancer of the urinary bladder; cancers that might be of relevance in the oil industry.

The number of residents in Sola municipality rose from 8 000 to 19 000 during the period when the refinery was operated, and a total of nearly 44 000 people were available for a national follow-up after a minimum of 1 year's residence in the municipality. The entire resident cohort also showed a slight excess of total cancer (SIR = 1.08; 95% CI 1.0–1.1; based on 3018 cases), but the excess mainly involved cancers with no expected link to oil-refinery exposures, such as breast cancer and ovarian cancer in women, prostate cancer in men, and skin cancers and bowel cancers in both sexes.

The estimated exposures from ambient air were quite low, and comparisons of groups with different cumulative exposure to benzene, polycyclic aromatic hydrocarbons (PAHs), or particles from the refinery displayed no clear pattern of dose-related incidence of relevant cancer forms. Separate analyses were conducted for women, and for children and adolescents in order to avoid confounding from occupational exposures. No specific data on potential confounding variables were available.

It should be underscored that the Sola oil refinery study was planned with 2.3 full-time equivalents (FTE) for skilled personnel over a period of two years, so the project was demanding and expensive.

4.3 Lung cancer in a municipality with iron and coke works


MILJØ-BOMBEN I RANA

MILJØ-BOMBEN I RANA

Fyrbøter i Statens HELVETE

Nå er Gunnar et kreftoffer

MILJØ-BOMBEN

Figure 4. "Stoker in the State's inferno; Now Gunnar is a cancer victim". The presence of carcinogens may lead to speculations when colleagues or neighbours are diagnosed with cancer, ideas that are often amplified in the media. Printed with permission from Verdens gang, VG

During the 1950s through the 1980s there was a marked increase in the national lung cancer rate among Norwegian men. In the municipality of Rana—known for its coke works and iron smelter, both established after World War II—the rates for lung cancer and urinary bladder cancer among men surpassed the national rates in the 1980s showing no sign of levelling off. A reasonable question could be whether occupational exposures in the local industry could have contributed to the aberrant trends (figure 4). The two main employers were both run by the government, which secured funding for an

examination through a population-based case-control study. Cases of lung and unrinary bladder cancer were identified in the Cancer Registry and controls were drawn among local residents according to the National Population Register.

Occupational history and smoking habits were collected by interviews with participants or next-of-kin, and work histories were supplied with personnel data from the coke works and iron smelter. The study identified an increased risk of lung cancer among pig iron smelter workers, possibly related to exposure to PAHs and asbestos. The investigation was published as a report and in a peer-reviewed journal (Grimsrud & al, 1998). Ironically, the local rate returned to the national level some years after the study was finished (figure 5), illustrating the problems of evaluating a recent shift in trends in a small area or small population.

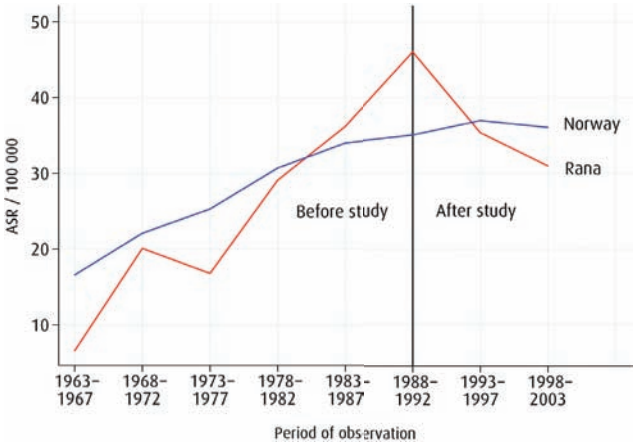

Figure 5. Age-adjusted rates (ASR, World standard) for lung cancer among men in Norway and in Rana municipality 1963–2003. The alarming rise until 1992 prompted a case-control study (Grimsrud & al, 1998), but later, the rates became non-excessive.

4.4 Breast cancer among teachers at a school

Several times, the Cancer Registry has been approached by teachers questioning the existence of an increased risk of breast cancer among their colleagues. Typically, they observe between 5 and 10 cases in the workforce consisting of 20 to 60 women through a decade or two. Below, we will refer some of the deliberations that have proved valuable in addressing these and similar cluster inquiries.
Breast cancer is the most common cancer among women, and some 8 percent of women are expected to have a diagnosis of breast cancer before age 75. Among, say, 50 female teachers employed at a school through 15 years, of whom half have attained the age of 75, we assume that about 2 cases of breast cancer would be reasonable to expect.

If we broaden our scope and assume that 2 breast cancers would be expected in each of 1000 schools during the same period, it can be shown mathematically that we should expect—by random, in line with a Poisson distribution—to observe a maximum of 8 cases in one school (see figure 5 in ref (Aalen & Tretli, 2012)). With another mathematical approach, it can be shown that the probability of observing 11 cases or more in one out of 1000 schools, given that 2 is the expected number, is approximately 0.008 (see figure 7 in ref (Aalen & Tretli, 2012)), that is, a quite unlikely situation. In Norway, there are nearly 3000 schools for children and/or adolescents (school year 1–10) (Statistics Norway, 2011), suggesting that the observation of 4 to 5 times the expected number of 2 cases would be likely to occur at a few schools.

The most important risk factors of breast cancer are being female, increasing age, not breastfeeding long term, current use of hormone replacement therapy, having no children or having no child before age 30, obesity (for post-menopausal women only), and a high consumption of alcohol. These risk factors may be more or less relevant for a group of teachers, but indeed, a large study of cancer risk by occupation (as noted in national censuses) demonstrated a 16 percent higher incidence of breast cancer among Norwegian female teachers (SIR = 1.16) compared to the general population (Pukkala & al, 2009). For the large group of economically inactive women, among them housewives, the breast cancer risk was in line with the population average (SIR = 0.99).

4.5 Increased cancer incidence in an area of a town (Mortensnes, Tromsø)

The Cancer Registry was contacted by the chief municipal medical officer in Tromsø, a town with 63 000 citizens in 2005, on the basis of repeated inquiries about a perceived increased cancer risk in a residential area (Mortensnes) of the town (figure 6). As routine data at the Cancer Registry are only reported at the municipality level, a simplified and coarse approach was explored in an attempt to give some idea of the size of the alleged cancer problem. Approximate numbers of person-years were derived from data on year of birth and sex for present-day citizens within the actual area postcode, and also from individuals who had died during the preceding 15 years with the same postcode as their last

address. Numbers of cancer cases diagnosed in the same period and carrying the area postcodes were provided from the Cancer Registry data base.

Figure 6. No evidence was found to suspect any strong cancer hazard in the Mortensnes area of Tromsø. Panoramic view of Tromsø from Fløya. Photo: Ragnilius

By this approach, we lost data for individuals moving out of the area in the observation period. The evaluation involved less than 3000 men and women, but it had some interest for a coarse evaluation of cancer incidence. The proportion of people above 60 years of age was higher than that of the national population, and the observed to expected number of all cancers taken together was slightly above 1, which is often seen in Norwegian urban populations. Cancer in the airways and digestive system was 30 percent above the national level, but within the limits of what could be expected by random variation. The evaluation gave no evidence to suspect any strong cancer hazard, and it had insufficient statistical power to identify weak effects (Grimsrud & Martinsen, 2006).

4.6 The Rosenborg laboratories

An indication of a cancer cluster emerged from the mid-1990s onwards among former students and colleagues at the governmental Norwegian University of Science and Technology (NTNU), Trondheim. Lymphohaematopoietic cancers were ascribed to work at the now demolished Rosenborg laboratories, and some patients were compensated by the Attorney General of Civil Affairs (Regjeringsadvokaten), despite substantial uncertainty whether there had been relevant exposures, or whether an increased risk did exist. No funding was obtained for an epidemiological investigation. The emergence of additional cases caused national media to roar in 2006, and an audit committee and a medical expert group were appointed by the government. The audit report was published as a Norwegian Official Report (NOU, 2007) and contained criticism against the university, and harsh criticism against the ministry.

Figure 7. Example of laboratory work (not the Rosenborg laboratories). Photo: Walkerma

In parallel, an epidemiological study was conducted by a team from the National Institute of Occupational Health, Trondheim University Hospital (St. Olavs Hospital), and the Cancer Registry of Norway. For the study, lists of students, fellows, and employees amounting to 7000 people were linked to data from the Cancer Registry. The risk of lymphohaematopoietic cancers in the entire group was close to that expected. However, the standardised incidence ratios in the subgroups of PhD students and participants in organic chemistry courses were increased, although based on small numbers (figure 7). The findings were in line with the assumption that PhD students and employees would experience higher laboratory exposures than undergraduate students. The study was published as a report (in Norwegian) and as a peer-reviewed article (Kristensen & al, 2007a; Kristensen & al, 2008).

A second investigation of students and personnel at the laboratories during the preceding 17 years (1960–1976, 900 individuals) confirmed the findings from the first report (Kristensen & al, 2007b). Despite the lack of good exposure data, the two reports left the impression of a causal link between long-term work at the Rosenborg laboratories and increased risk of lymphohaematopoietic cancers.

5 Cancer cluster resources

Mass media have the power to influence what is acceptable in society. Media pressure can be substantial and call for immediate action even in a question of chronic diseases. Some countries have established systems to address such situations.

5.1 Small area emergency units

In the UK, a Small Area Health Statistics Unit (SAHSU) was established 25 years ago, in 1987, in the wake of a cluster of leukaemia in children and young adults neighbouring the Sellafield nuclear plant (Small Area Health Statistics Unit, homepage). The SAHSU project started at London School of Hygiene and Tropical Medicine, and was later transferred to Imperial College (1995). An important purpose of the SAHSU unit is to serve health authorities and public with rapid evaluation of health risk in relation to environmental exposure based on routine statistics.

The SAHSU takes advantage of UK's mostly small-area postcodes combined with statistics on environment, health, and social characteristics. The data are used for research on potential associations between environment, socio-economic factors, and health, in the form of in-house or collaborative projects. The SAHSU has the advantage of serving a population of 60 million people living in a quite densely populated country.

Finland has another emergency system for small area analyses: Small Area Statistics on Health (SMASH). Data are organised according to a grid with 500 m times 500 m units, inclusive of population data on cancer incidence, residence, sex, age, and socio-economic status. Individual geographical information is provided at 2 points in time, and additionally, at time of a cancer diagnosis (Kokki & al, 2001). Different reference populations can be chosen according to the available parameters. The system does not reflect all dynamics linked to change of residence, and it has limited data on individual exposures, but it has been a useful tool for risk assessment and provides data for research. SMASH is involved in a number of international cooperative studies and networks.

5.2 Norwegian resources

There is no formalised system for the handling of cancer clusters in Norway, and no emergency unit exists. The Cancer Registry activity reported in this article represents only a fraction of the inquiries made to the Registry every year, and additional numbers are probably handled by municipality health officers, health authorities, and other research institutions. The need for an emergency unit is, of course, greater for more acute forms of disease and death, such as those caused by contagious, infectious, or poisonous agents.

The Cancer Registry of Norway has been a central institution for aetiological cancer research in Norway. This experience has been useful in the evaluations of suspected cancer hazards. Traditionally, the Cancer Registry would prefer to link an investigation-prompted by a cluster or not-to an external health officer, public or occupational, that may be involved in long-term follow-up of residents or workers. The Registry publishes routine statistics of cancer incidence and survival every year, with recent and historical data on counties and the nation as a whole. More rarely, statistical reports have addressed regional or municipal rates, but the Registry regularly serves health officers and authorities with cancer data for a variety of purposes, among them for the evaluation of perceived cancer clusters. Personal secrecy can limit the degree of detail that can be provided when the number of cases is below 5 within a group. These challenges can often be overcome by merging of groups.

Strict rules for personal secrecy require licenses to be applied for, and regional committees for medical research must evaluate the project when sensitive data from different sources are to be linked and analysed. This procedure is time-consuming, and subject to application deadlines, committee deliberations and collection of additional information, and formal reporting. It is our experience that the generally low scientific value expected from small cluster investigations has the potential to hamper the approval by the ethical and legal boards, and to restrict the possibilities of quality control of a study. Countries with established emergency systems for cluster evaluations may have the advantage of a running license that allows for rapid investigations within defined guidelines.

Evaluation and communication of observational data on rates of rare diseases in small areas is a challenging task, but clearly an important public health issue. This activity has an educational side, and some skills in statistics, epidemiology, aetiological research, and public health issues are mandatory. The Norwegian population is well described, followed as it is by a National Population Register (identity, birth date, details on residence), and by Statistics Norway for a number of parameters (occupation, income, education).

In Norway, important health parameters at the county level, as well as general information on health issues are provided by authorities and non-governmental organisations. Information on cancer, cancer causes, and cancer occurrence may also be collected on the internet from foreign health authorities and cancer societies, such as those in the UK and the USA.

An epidemiological study with a unique design should be expected to last 2 years as a minimum after funding is granted, as it may include application and evaluation of licenses; appointing of qualified personnel; collection of background information, research data, and consent; linkage to existing registry files; quality control; statistical analyses; interpretation; and reporting. Qualified personnel is obviously needed, but not always readily available, and the price for a study is often linked to the quality of the work.

In a discussion of what would be a reasonable level of emergency preparedness to address a cancer cluster inquiry, one will have to weigh the costs against other funding of medical research. Furthermore, one has to evaluate potential consequences from lack of timeliness when there is an urgent question of a suspected health hazards. Politicians are often faced with the choice between a higher degree of certainty resulting from properly conducted research with good design and appropriate dimensioning—a time and money-consuming task—and less certainty resulting from quick cluster assessments, which often remain inconclusive and much less penetrating. The educational sides of cancer clusters may be equally challenging for politicians, for the judicial system, and for media, as they are for the general public.

Abbreviations

SIR: Standardised incidence ratio; the observed number of cases divided by the expected number of cases, usually expected on the basis of age-, sex-, and period-specific rates in the national population

CI: Confidence interval, a range calculated to give a measure of how accurate your answer is, or of the uncertainty of the result.

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Return address:
Kreftregisteret
P.O. box 5313 Majorstuen
N-0304 Oslo
Norway

Cancer Registry of Norway
Institute of Population-based Cancer Research

Postal address:
P.O. box 5313 Majorstuen
N-0304 Oslo
Norway

Office address:
Fr. Nansens vei 19, Oslo

Telephone: +47 22 45 13 00
Telefax: +47 22 45 13 70

E-mail: kreftregisteret@kreftregisteret.no
Internet: www.kreftregisteret.no