Publication Report

Cancer Survival in Scotland

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A National Statistics Publication for Scotland

Contents

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Purpose: To deliver effective national and specialist intelligence services to improve the health and wellbeing of people in Scotland.
Mission: Better Information, Better Decisions, Better Health
Vision: To be a valued partner in improving health and wellbeing in Scotland by providing a world class intelligence service.

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- are well explained and readily accessible;
- are produced according to sound methods, and
- are managed impartially and objectively in the public interest.

Once statistics have been designated as National Statistics it is a statutory requirement that the Code of Practice shall continue to be observed.

Introduction

Cancer survival statistics are important to patients since they give an indication of the likelihood of surviving a given length of time after the diagnosis of a particular cancer. However, the calculated estimates are based on data from a population of cancer patients, and the survival prospects of an individual may vary considerably from the 'average' survival, depending on aspects such as the particular features of their cancer and characteristics of the individual themselves. For example, patients with early stage disease are likely to have survival that is longer than 'average', whereas patients with advanced disease are likely to have survival that is shorter than 'average'.

Cancer survival statistics are also used to monitor trends resulting from a complex mixture of changes in cancer diagnosis and treatment over time, alongside changes in the lifestyle and behaviours of the underlying population.

Survival statistics are typically expressed as a proportion of patients alive at a time point subsequent to the diagnosis of their cancer. This update reports on observed and relative survival for approximately 558,000 patients diagnosed with cancer in Scotland between 1983 and 2007. Please see the glossary below for a description of relative and observed survival.

Key points

· Survival from cancer has, in general, increased between the periods of 1983-1987 and 2003-2007

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· Taking all cancers combined, five year relative survival in the period 2003-2007 is estimated as 46% for males and 54% for females.

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· This represents an increase of 18 percentage points in males and almost 15 percentage points in females when looking at all cancers combined over the study period.

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· The largest absolute increases in survival are found in breast, prostate and colorectal cancers, malignant melanoma of the skin and in lymphomas and leukaemias.

Results and Commentary

Please note that greater statistical detail can be found in the webpages specific to individual cancer types from the Cancer Statistics page.

Data and Methods

Data and methods are described in detail in Trends in Cancer Survival in Scotland 1971-1995. Lifetables for the 2010 analysis were calculated by the Cancer Survival Group at the London School of Hygiene and Tropical Medicine (LSHTM) using a modified *ewblft* algorithm. Relative survival was estimated using the most recent strel algorithm available from LSHTM, and observed survival estimated using SPSS.

In brief, observed survival is an estimate of the probability that a group of patients with a given disease will be alive at a specified time-point after diagnosis, irrespective of cause of death. Observed survival is always likely to be lower in older patients because they are at a greater risk of dying from other causes and therefore makes it difficult to compare survival between age groups or between populations with different rates of competing causes of death.

Relative survival is an estimate of the observed survival divided by the expected probability of survival in the general population. This can be thought of as a measure of the net survival expectation after contracting cancer, or the probability of survival from cancer in the absence of other causes of death.

Data available for analysis

The numbers of cases included in the analyses, by cancer and period of diagnosis, are shown in Table 1. The highest numbers were seen for lung, colorectal, breast, prostate and bladder cancer, accounting for 58% of all malignancies in the period 1983-2007. Even with this large data set covering the whole of Scotland, the number of cases available for analysis was small for some cancers, such as cancer of the thyroid, particularly when broken down by age and sex.

Improvements in diagnostic techniques, or the introduction of screening tests, can lead to the artificial appearance of an increase in risk, with cancers being diagnosed earlier, at a less advanced stage. It is possible that some of these cancers with a favourable prognosis would have never presented clinically during the patient's lifetime. This can impact on the assessment of trends in cancer survival over time so that significant trends in incidence should be taken into account when interpreting cancer survival trends.

Cancer survival trends

Figure 1. Relative survival (%) at 1 and 5 years after diagnosis by cancer and sex; patients diagnosed 2003-2007
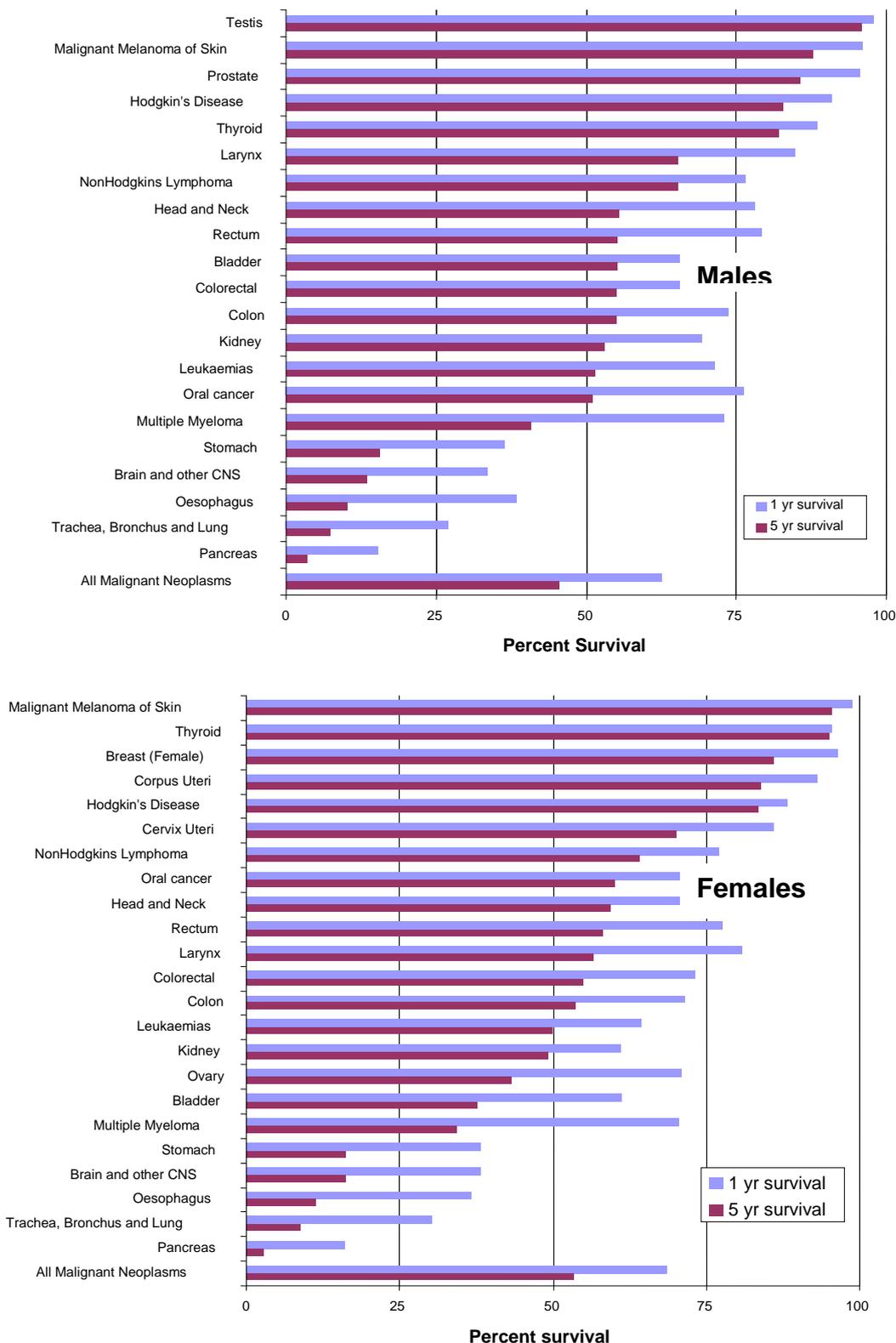
Source: ISD Scotland

Percentage survival at five years after diagnosis varied from under 5% for cancer of the pancreas in males, to over 95% for testis cancer (Figure 1 and Table 2). Percentage

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survival was lowest in patients with cancers which often present at an advanced stage and are less amenable to treatment (examples being cancers of the pancreas, the lung and the stomach). Percentage survival tended to be better for cancers with which patients are more likely to present at an early stage (for example, cancers of the corpus uteri, thyroid, and malignant melanoma of the skin), for cancers which can be detected early by screening programmes (for example, cancers of the cervix uteri and breast), and for cancers for which there have been major advances in treatment (for example, cancer of the testis).

For the majority of cancers, survival at one year after diagnosis has improved over the period surveyed (Table 2), with the most improvement being seen in some of the lympho-haematopoietic malignancies, probably due to the development and implementation of increasingly effective therapies.

Over the period surveyed, most cancers showed some improvement in survival at five years after diagnosis (Table 2), and for some cancers this improvement was large: for malignant melanoma of the skin, the age-standardised percentage survival at five years after diagnosis in males increased from 64% in the period 1983-87 to 85% in the period 2003-07, an absolute increase of 21%. Over the same period the increase for females was 10%, from 82% (1983-87) to 92% (2003-07). These increases may reflect an increase in diagnosis of early stage disease following health education programmes aimed at encouraging earlier presentation and referral. Large absolute increases in percentage survival at five years were also seen for colorectal cancer (17% and 18% for males and females, respectively), Non-Hodgkins lymphoma (26% for males and 21% for females), and leukaemia (21% for males and 23% for females). The improvement observed for prostate cancer survival (36 percentage points, from 45% to 81% over the study period) is likely to reflect the introduction of prostate-specific antigen (PSA) testing in the most recent periods, resulting in the diagnosis of some less 'aggressive' tumours (Brewster *et al*, 2000).

However, improvements in survival at five years were, in many cases, smaller than at one year indicating that although survival is improving, either because of earlier diagnosis or improved treatment, the majority of cancer patients are not being 'cured'. This is a common finding in studies of cancer survival (Clinical Outcomes Working Group, 1999). Cancers which were exceptions to this rule, and for which the increase over the period surveyed in percentage survival was greater at five years than at one year were malignant melanoma of the skin, Hodgkin's disease, breast cancer, corpus uteri, prostate, testicular cancer and leukaemias. The improvement in survival for malignant melanoma of the skin seems to be only partly explained by an increasing proportion of thinner tumours (MacKie *et al*, 1997). In Hodgkin's disease, there have been major improvements in treatment using combination chemotherapy and radiotherapy (Boyle *et al*, 1988). The improvement in survival for breast cancer is mainly likely to reflect the introduction and increasing use of systemic adjuvant therapy (Scottish Breast Cancer Focus Group *et al*, 1996) as well as the national breast screening programme. Likewise, survival has improved in testis cancer largely because of the advent of effective chemotherapy (Coleman *et al*, 1999).

At the other end of the scale there was either no improvement or a decrease over the period surveyed in survival at five years after diagnosis for cancer of the pancreas, cancers of the larynx, and cancers of the head and neck in males. The lack of improvement for patients with head and neck cancers is largely an artefact of the large decrease in the proportion of lip tumours, which usually have an excellent prognosis; survival at specific sites within the head and neck has generally improved. There may also be an impact of changes over time to a less favourable case-mix, both in terms of the distribution of anatomical subsites and in terms of the proportion of patients from deprived areas

(Macfarlane *et al*, 1996) who tend to have a poorer prognosis. Laryngeal cancers have shown a decrease in survival at five years, possibly due to the increased proportion of supraglottic tumours over recent years; these tumours usually take longer to cause symptoms and so tend to present at a later stage, with decreased survival after diagnosis (Scott *et al*, 1998).

The recent decrease in survival from bladder cancer is an artefact of classification. Over the period 1996 to 1999 there was a marked reduction in the numbers of registrations of invasive bladder carcinoma, reflecting a change in coding practice recommended by the European Network of Cancer Registries (ENCR) and subsequently by the United Kingdom Association of Cancer Registries (UKACR). Some cases classified and coded previously as invasive bladder cancer (ICD-10 C67) are now coded as carcinoma *in situ* of the bladder (D09.0) or neoplasms of uncertain or unknown behaviour of the bladder (D41.4). Survival from non-invasive bladder tumours is usually very high, so the re-classification of such tumours has led to an apparent decrease in survival from invasive bladder cancer.

For 'all malignant neoplasms', percentage survival at one year after diagnosis for males increased from 45% in the period 1983-87 to 62% in the period 2003-07, an absolute increase of 17% (Table 2). The corresponding increase for females was from 55% to 67%, an absolute increase of 12%. This is less than the increase in males because there was a comparatively small improvement in survival over the period for breast and gynaecological cancers, which contribute a large proportion of the cancers in females, and for most of which survival is already relatively high, rather than because cancer survival has improved more in males than in females for specific cancers. The difference in survival between males and females is shown in more detail later in this report. Meanwhile, survival at five years improved by 18% in males and 15% in females. 'All malignant neoplasms' includes a wide mix of cancers with different survival patterns and the improvement may mask a change in the proportions of cancers as well as representing a genuine improvement in survival over time.

The numbers of deaths due to cancer decrease exponentially as time from diagnosis increases. Thus, for example, if the median survival is two years, half the patients will have died within two years of diagnosis, but many of the remainder will survive substantially longer than a further two years. Median survival is highest in those cancers that have a good prognosis and/or are often diagnosed in younger people (for example, cancers of the testis, thyroid, corpus uteri, and Hodgkin's disease) (Table 3). Estimates of the median observed survival broadly support the results shown in Table 2. Over the period surveyed, median survival has doubled, or in some cases, more than doubled, for cancers of the prostate and cervix uteri as well as Non-Hodgkin's lymphoma and leukaemias, and for many cancers median survival has been extended by a year or more. For cancers with a very favourable prognosis, more than half the patients were still alive at the end of the period of follow-up for this analysis and so median survival could not be calculated. For 'all malignant neoplasms' median survival increased from 1.3 to 5.3 years after diagnosis.

Survival was better in younger patients for most cancers ([Table 4]), even though adjustment was made for the higher general mortality in older age groups. This could be due to differences in tumour biology, better general health, earlier diagnosis, or better suitability for, and effectiveness of treatment. Large variations between age groups were seen for many cancers, but please note that in the younger age groups some of these survival estimates are based on quite small numbers of cases.

[Figure 2]. Absolute difference[1] in relative survival between males and females at 5 years after diagnosis, by cancer
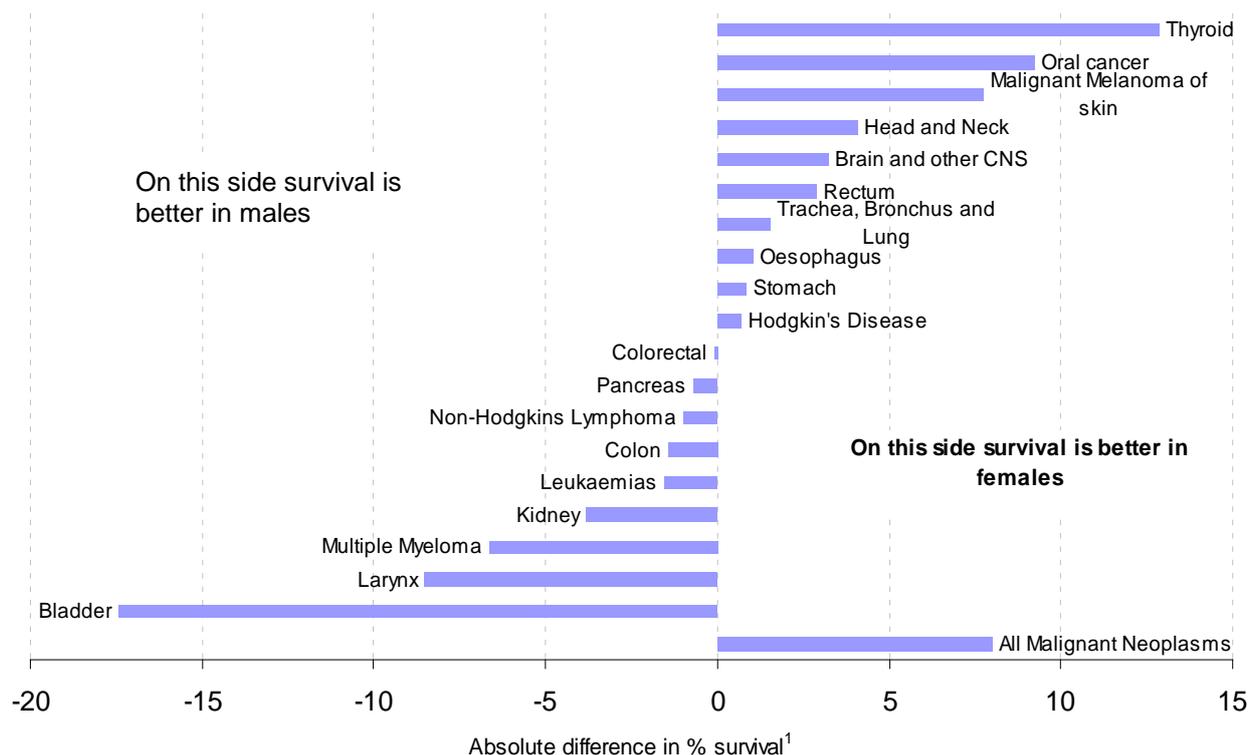
1 Absolute differences in survival between males and females are shown; for example, the % survival for Kidney cancer was 49.3% in females and 53.1% in males. Subtraction gives a difference of 3.8%.
Note: patients aged 15-99, diagnosed 2003-2007
Source: ISD Scotland

For many cancers, survival prospects differed between males and females (Figure 2). Cancers where the difference was comparatively large included oral cavity, thyroid and malignant melanoma of the skin, for all of which females had better survival than males. Males had a higher survival than females in larynx, bladder and kidney cancers. Survival for 'all malignant neoplasms' was higher in females than in males, the primary reason being that lung cancer, which has low survival, is at present more common in men than in women, although this will change over the next decade or so as the number of females diagnosed with lung cancer is approaching that of males. On the other hand, breast cancer, the most common cancer in females, has a relatively good prognosis.

Summary

Current findings, 2003-2007
Estimated five year relative survival from the most cancers, for the period 2003-2007 are:
- cancers of the lung, including trachea and bronchus: 7% for males, 9% for females.
- cancer of the female breast: 86%
- colorectal cancers: 55% for both males and females
- prostate cancer: 86%

In addition to breast and prostate cancers, the cancers with the highest five year relative survival are:
- testicular cancer: 96%
- malignant melanoma of the skin: 96% for females, 88% for males
- cancer of the thyroid: 95% for females, 83% for males
- cancer of the uterus: 84%
- Hodgkin's Disease: 84% for females, 83% for males

In addition to lung cancer, the cancers with the lowest five year relative survival rates are:
- cancer of the pancreas: 3% for females, 4% for males
- cancer of the oesophagus: 11% for females, 10% for males
- cancer of the brain and central nervous system: 16% for females, 13% for males

Trends from 1983-1987 to 2003-2007
Survival has generally increased for almost all cancers:
- for all cancers (excluding non-melanoma skin cancers) male five year relative survival has increased 18 percentage points between 1983-1987 and 2003-2007 (from 27% to just over 45%), with female five year survival increasing almost 15% in the same time period (from almost 39% to approximately 54%).

The greatest increases in five year relative survival were found in:
- the haematological malignancies, including the lymphomas (Hodgkin's Disease, Non-Hodgkin's), myelomas and leukaemias with increases varying from 11 to 24 percentage points over the study period.
- prostate cancer, with an increase of 39% (from 47% to approximately 86%)
- malignant melanoma of the skin, increasing 21 percentage points in males and 9 in females, with females starting from a much higher survival rate: survival increased from 86% to 95% in females, and from 67% to 88% in males over the study period.

The smallest changes or slight decreases in five year survival between 1983-1987 and 2003-2007 were found in:
- cancer of the pancreas: -0.6 (male) and 0 (female) percentage points change
- cancers of the brain and central nervous system: 2 (male) and 3 (female) percentage points improvement over time
- cancer of the larynx: decreasing from 68% to 65% in males, and from 65% to 57% in females.

Conclusions

This was a large population-based survival analysis which included all patients diagnosed with cancer in Scotland between 1983 and 2007, about half a million patients in all. Over this period improvements in survival were seen for the majority of cancers, and for several cancers the improvement was substantial. For many cancers there were major advances in therapy over the period, but unfortunately this did not apply to all cancers. Because the mix of cancers differs between males and females, and survival prognosis is different for different cancers, overall survival was higher in females than in males, whereas the improvement in survival over the period was greater in males than in females. Younger patients generally had more favourable survival than older patients.

Glossary

Observed Survival	See Appendix 1. Background Information
Relative Survival	See Appendix 1. Background Information

	the oesophagus		
25	Rates of survival from oral cavity cancers	1983	Excel [47kb]
26	Rates of survival from cancer of the ovary	1983	Excel [27kb]
27	Rates of survival from cancer of the pancreas	1983	Excel [47kb]
28	Rates of survival from cancer of the prostate	1983	Excel [27kb]
29	Rates of survival from cancer of the rectum and rectosigmoid junction	1983	Excel [47kb]
30	Rates of survival from cancer of the skin	1983	Excel [47kb]
31	Rates of survival from cancer of the stomach	1983	Excel [47kb]
32	Rates of survival from cancer of the testis	1983	Excel [27kb]
33	Rates of survival from cancer of the thyroid	1983	Excel [20kb]

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Further Information

Further information on cancer statistics can be found on the Cancer Information Programme website.

For information on other health topics, please see the ISD website

Appendix

A1 – Background Information

Survival is lowest in patients with cancers that often present at an advanced stage and are less amenable to treatment. Survival tends to be better for cancers with which patients are more likely to present at an early stage, for cancers that can be detected early via screening programmes, and for cancers in which there have been major advances in treatment.

The decrease in survival from bladder cancer is an artefact of classification, reflecting a change in coding practice recommended by the European Network of Cancer Registries and subsequently by the UK Association of Cancer Registries.

Direct age standardisation of survival figures, using the European patient population standard weights as per EUROCARE-4, allows comparison with other similarly standardised populations such as other European countries, and also allows comparison over time as the population age structures change.

Cancer survival statistics are typically expressed as the proportion of patients alive at a time point subsequent to the diagnosis of their cancer.

Observed survival is the actual percentage of patients still alive at a specified time after diagnosis of cancer.

One limitation of observed survival is that it reflects deaths from all causes. Therefore, changes in rates of death from other causes affect observed survival, even if there has been no change in the likelihood of a person surviving from the cancer itself.

Relative survival attempts to overcome this problem by calculating survival as the ratio of observed survival divided by expected survival, where the expected survival is based on the life expectancy of the population. This can be thought of as a measure of the survival expectation after developing cancer, or the probability of survival from cancer in the absence of other causes of death.

A2 – Publication Metadata (including revisions details)

Metadata Indicator	Description
Publication title	**Cancer Survival in Scotland**
Description	Estimates of 1, 3, 5 and 10 year survival for patients diagnosed with cancer in Scotland, for approximately 25 cancer types. The estimates are broken down by age group, sex, and period of diagnosis, with trends over the diagnosis period 1983 to 2007.
Theme	Health and Social Care
Topic	Conditions and Diseases
Format	Excel workbooks
Data source(s)	The Scottish Cancer Registry, with deaths linked from the General Register Office for Scotland
Date that data was acquired	June 2010 (registrations), July 2009 (deaths)
Release date	31 August 2010
Frequency	Biennial
Timeframe of data and timeliness	Registrations are up to 31 December 2007, with follow-up (deaths) to 31 December 2008. This publication was delayed from December 2009, so that the Cancer Incidence publication of December 2009 could take place, representing an improvement in timeliness of Incidence data.
Continuity of data	Trends report data since 1983. GROS coded deaths with ICD-9 until 1999, ICD-10 from 2000 onward. ICD-10 codes were back-mapped onto 1999 for consistency; see information on the Scottish Cancer Registry data.
Revisions statement	As with other population-based cancer registries, the Scottish Cancer Registry is dynamic, with ongoing updating of records. Each year's release includes a refresh of the previous years, and as new registrations from previous years come to light, or changes in the coding are taken into account, the numbers may change. Deaths data tend to be static over time.
Concepts and definitions	Cancer Information FAQs
Relevance and key uses of the statistics	Cancer survival estimates allow service providers to evaluate and monitor alterations in cancer diagnoses and treatments, or in changes in the public health of the associated population.
Accuracy	Registry data are subject to validation at data entry and quality assurance

	procedures. See the Cancer Information FAQs. Data are compared with previous publications on Scotland's cancer survival estimates.
Completeness:	At time of extraction, data for the most recent year are estimated to be complete. See above note on Revisions.
Comparability	Observed survival, particularly standardised observed survival, may be compared with the analogous statistics provided for other UK and international countries. Relative survival, because of the variety of ways that the underlying life tables can be produced and the permutations possible in the modelling process, may be very difficult to compare reasonably with relative survival produced separately by any other organisation – including those produced for Scotland - except in a general sense. The best use of these estimates is for comparison of cancer sites and time periods within this analysis. EUROCARE is an international organisation that provides comparable survival estimates by country, by standardising the approach taken. Scotland is available as a separate country within their online database, for comparison. Note that the data are reliant on availability from all participating countries and so, accounting for that and the work involved, the most recent data online (for EUROCARE-4) is for the period of diagnosis 1995-99.
Accessibility	It is the policy of ISD Scotland to make its web sites and products accessible according to published guidelines. For further details go to our accessibility page.
Coherence and clarity	All Cancer tables are accessible via the Cancer page on the ISD website.
Value type and unit of measure	Number of cases included in the analysis as count; survival expressed as percentages. Number, eg 1.1
Disclosure	The ISD protocol on Statistical Disclosure Protocol is followed. For this publication, at the levels of aggregation presented, the risk of disclosure was assessed as being low risk and so no further statistical disclosure control methods

	were employed.
Official Statistics designation	National Statistics
Help email	nss.isdcancerstats@nhs.net
Date form completed	20 August 2010

A3 – Early Access details (including Pre-Release Access)

Pre-Release Access
Under terms of the "Pre-Release Access to Official Statistics (Scotland) Order 2008", ISD are obliged to publish information on those receiving Pre-Release Access ("Pre-Release Access" refers to statistics in their final form prior to publication). The standard maximum Pre-Release Access is five working days. Shown below are details of those receiving standard Pre-Release Access and, separately, those receiving extended Pre-Release Access.

Standard Pre-Release Access:
Scottish Government Health Department
NHS Board Chief Executives
NHS Board Communication leads

Extended Pre-Release Access
Extended Pre-Release Access of 8 working days is given to a small number of named individuals in the Scottish Government Health Department (Analytical Services Division). This Pre-Release Access is for the sole purpose of enabling that department to gain an understanding of the statistics prior to briefing others in Scottish Government (during the period of standard Pre-Release Access).

Scottish Government Health Department (Analytical Services Division)