



National
Cancer
Registry
Ireland

CANCER IN IRELAND 1994-2021

ANNUAL STATISTICAL REPORT

2023

20 23

ANNUAL STATISTICAL REPORT OF
THE NATIONAL CANCER REGISTRY



www.ncri.ie

ABBREVIATIONS

95% CI	95% confidence interval
95% PI	95% prediction interval
APC	Annual percentage change
ASR	Age-standardised rate
CNS	Central nervous system
CSO	Central Statistics Office
ESP	European Standard Population
HPV	Human papillomavirus
IARC	International Agency for Research on Cancer
ICD	International Statistical Classification of Diseases and Related Health Problems
NCCP	National Cancer Control Programme
NCRI	National Cancer Registry Ireland
NHL	Non-Hodgkin lymphoma
NMSC	Non-melanoma skin cancer
NOS	Not otherwise specified
TNM	Tumour, node, metastasis (stage)
WHO	World Health Organisation

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About the National Cancer Registry

The National Cancer Registry was established by the Minister for Health in 1991. It has been collecting comprehensive cancer information for the population of the Republic of Ireland since 1994. This information is used in research into the causes of cancer, in education and information programmes, and in the planning and management of cancer services to deliver the best cancer care to the whole population.

This report should be cited as:

National Cancer Registry Ireland (2023) Cancer in Ireland 1994-2021: Annual statistical report of the National Cancer Registry. NCRI, Cork, Ireland.

Acknowledgments

- This work uses data provided by patients and collected by the health service as part of their care and support.
- The Central Statistics Office and the General Register Office provided access to population and death certificate data.
- The National Cancer Registry is funded by the Department of Health.
- Drafts of this report were circulated to the Department of Health's Cancer Policy Unit; the Health Service Executive's National Cancer Control Programme; and the Board, Advisory Council, and Senior Management Team of the National Cancer Registry.

FOREWORD

The National Cancer Registry of Ireland is now in its 30th year of data collection, and in our 2023 annual statistical report, we summarise cancer data collected up to diagnosis year 2021 with provisional figures for 2022. In addition to the more regular reporting of incidence, mortality and prevalence figures, this year we are focusing on the impact of age and stage at diagnosis on cancer outcomes as well providing updates on the proportion of cancer cases presenting emergently. As with previous years, we are also presenting updated data on the impact of the COVID-19 pandemic on numbers of cancers diagnosed.

Older people experience a higher cancer incidence and lower survival compared to other age groups, with a 5-year net survival ranging from 46% in those aged 75+ year to 86% in the 15 – 44 year age group. Poorer outcomes in older age groups are shown in this report to be particularly true for oesophageal, liver, pancreatic, lung and brain cancers where the 5-year net survival in those aged 75+ years is less than 15%. Internationally, it has been recognised that there are many factors underlying these findings including tumour biology, patient comorbidities which limit treatment options, poorer treatment tolerance, reduced physiological reserve, lack of representation in clinical trials and delayed diagnosis as older people may be less likely to seek and experience delays in seeking medical attention for symptoms.

Early diagnosis improves cancer outcomes and reduces both the complexity of treatments that cancer patients undergo and the cost of those treatments. A high proportion of some cancers (e.g. melanoma skin, uterine and prostate cancers) present at early stage with consequent 5-year net survival of up to 100% in many cases. A previous report [1] highlighted how cancers that are associated with a population screening programme have experienced an increase in the proportion of cancers that are detected early and this report reiterates the importance of early diagnosis with 5-year net survival above 90% for stage I and II breast and colorectal cancers and 95% and 80% for stage I and II cervical cancer, respectively [1]. However, late presentation (stage IV) remains high in other cancers (e.g. head and neck, pancreatic and lung cancers) with consequent poorer outcomes.

Emergency presentation with cancer can result from several factors including tumour biology, health care systems and individual patient characteristics. It is generally associated with more advanced stage, more limited treatment options and poorer survival. The proportion of emergency presentation for all invasive cancers (excl. NMSC) fell from 20% to 14% between 2002 and 2009 after which no further reduction was evident up to 2015 [2]. For the more recent period (2016-2019), there was still no change on 14%. The cancers with the highest rate of emergency presentation were cancers of the brain, pancreas, liver, gallbladder/biliary tract, lung, ovary, and colon.

Based on the emergency presentation rate for the period 2016-2019 and looking at the most common cancers with highest emergency presentation rates, if the emergency presentation rate for colon cancer could be halved, i.e., from 25% to 12.5% and for lung cancer from 26% to 13% it was estimated that the overall rate of emergency presentation could fall from 14% to about 12%.

By the end of 2021, the number of people living after an invasive cancer diagnosis has almost reached 215,000. This is equivalent to 4.3% of the population, or about 1 in 23 persons in Ireland, a 50% increase in the number of cancer survivors compared with one decade ago. This reflects both an increase in the number of people diagnosed with cancer every year and ongoing improvements in cancer survival.

For 2020, the first year of the COVID-19 pandemic, the shortfall of cancer diagnoses due to COVID-19 in 2020 on projected cases for 2020 was estimated at 10% (10% for males; 10% for females) [3]. Cancer

registration for cases diagnosed in 2021 is now deemed to be essentially complete at the time of writing, although some late accruals are still expected as it takes up to five years after the end of a given calendar year before each element of cancer data is received, checked and validated. The shortfall on projected cases in 2021 was 4% (7% for males; 1% for females) where registered cases in females fell within the expected range based on pre-2020 cancer trends (i.e., a negligible shortfall in female cancer cases in 2021).

For 2022, with registration still ongoing, the shortfall on projected cases was estimated to be 9% (11% for males; 7% for females), but microscopically verified cases were within the expected range for males and females for 2022 based on pre-2020 trends. Microscopically verified cases tend to be registered more quickly and have been found to be a good early indicator of cancer trends overall. The return to expected levels in 2022, suggested by the number of microscopically verified cases, will be fully validated in next year's report.

Professor Deirdre Murray
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Deirdre Murray

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REPORT AT A GLANCE

Who are we, and what do we do?

The National Cancer Registry of Ireland (NCRI) works on behalf of the Department of Health and collects information from all hospitals in Ireland on the number of persons diagnosed with cancer and the types of cancer they have. NCRI also follows up the numbers dying from their cancer or from other causes. All patient personal and private information are removed before summary cancer statistics are prepared and made available to the public and health professionals through our annual cancer report and other reports on our website.

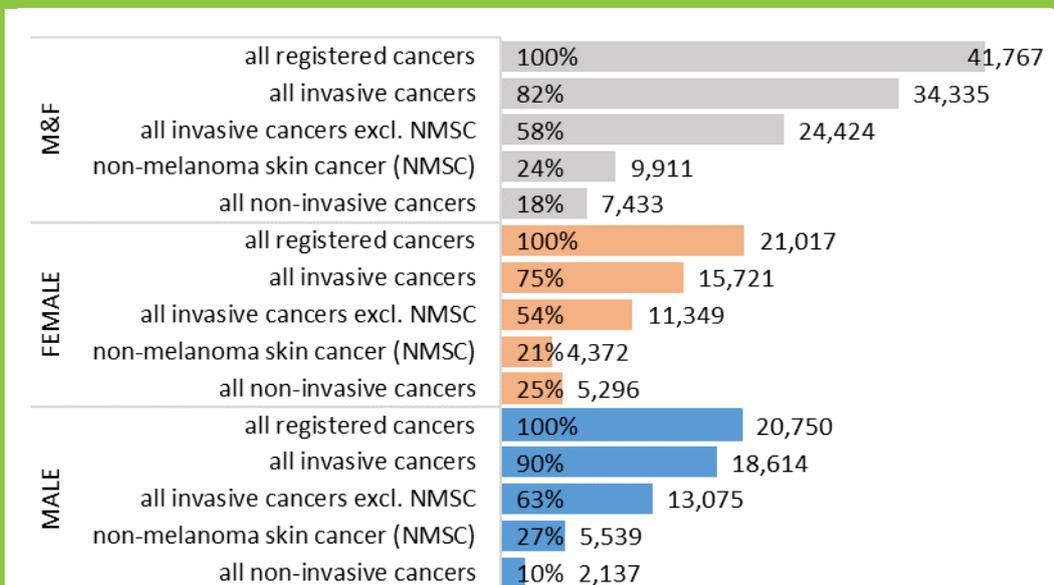
How are the numbers reported?

Collecting and checking all this information is performed by a combination of manual and electronic processes. Our staff collect cancer diagnosis information and then use an agreed system of coding (The International Classification of Diseases) to group the cancers into different types.

After a process of collating diverse information from Irish hospitals and validation for accuracy, the annual cancer report is published following analysis of de-identified data.

What have we found?

Over the years 2019-2021 the average number of 'registered tumours' in males and females is estimated at 41,767 per year. Just over 1 in 2 (24,424 excluding non-invasive tumours and non-melanoma skin cancers) are life-changing invasive cancers which often require extensive treatment.



Cancer cases:
Annual average
2019-2021

Percentages
represent the
proportion of *all*
registered cancers.

For example, non-
melanoma skin
cancer made up 21%
(about 1 in 5) of all
registered tumours
in females and 27%
(almost 1 in 3) in
males

How many people were diagnosed with cancer?

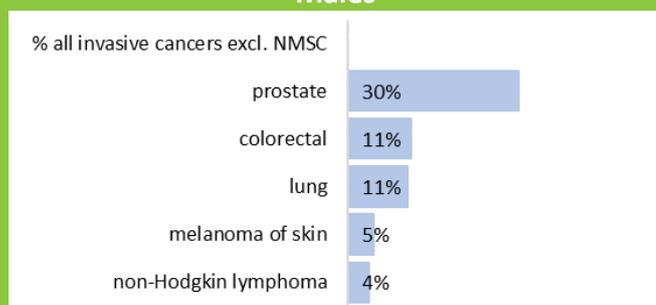
- On average, 41,767 cancers or related tumours were diagnosed each year during 2019-2021.
- The figure most often quoted in international comparisons ('all invasive cancer, excluding NMSC') averaged 24,424 cases (13,075 males and 11,349 females) diagnosed annually during 2019-2021, or 58% of all registered tumours.
- Invasive cancers (including NMSC) averaged 34,335 cases per year during 2019-2021.
- 24% (almost 1 in 4) were non-melanoma skin cancers (NMSC).
- Approximately 18% (almost 1 in 5) of these were non-invasive neoplasms (in situ carcinomas, tumours of uncertain behaviour and benign brain and CNS tumours).

What are the most common cancers?

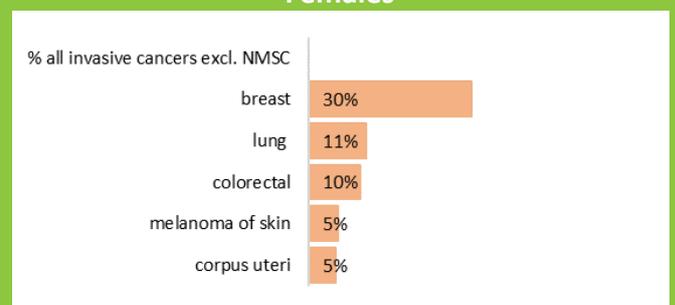
- Excluding non-melanoma skin cancer (NMSC), prostate and female breast cancer were the most commonly diagnosed invasive cancers overall, and each comprised almost one-third of all invasive cancers in men and women respectively during the period 2019-2021.
- Colorectal (bowel) cancer, lung cancer, melanoma of skin and non-Hodgkin lymphoma were the 2nd, 3rd, 4th and 5th most common cancers in males, respectively.
- Lung cancer, colorectal cancer, melanoma of skin, and uterine cancer (corpus uteri) were the 2nd, 3rd, 4th and 5th most common cancers in females respectively

Top five most common incident cancers during 2019-2021

Males



Females



How many people died of cancer?

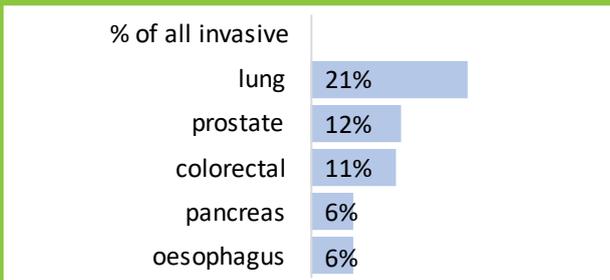
- Of all deaths occurring in 2021 in Ireland, 28% (more than 1 in 4) were attributable to cancer. Another 27% and 9% were attributable to diseases of the cardiovascular and respiratory systems respectively.
- On average during 2019-2021 there were 9,621 deaths per year from invasive cancer (5,184 in males, 4,436 in females), or 9,874 deaths per year across all tumour types.

What are the most common cancers causing death?

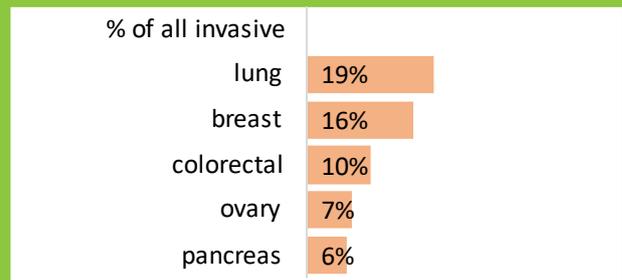
- Lung cancer was the leading cause of cancer death in both sexes during 2019-2021.
- In males, cancer of the prostate, colorectal (bowel), pancreas and oesophagus were the 2nd, 3rd, 4th and 5th most common categories of cancer deaths, respectively.
- In females, cancer of the breast, colorectal (bowel), ovary and pancreas were the 2nd, 3rd and 4th most common categories of cancer deaths, respectively.

Top five most common causes of cancer death during 2019-2021

Males



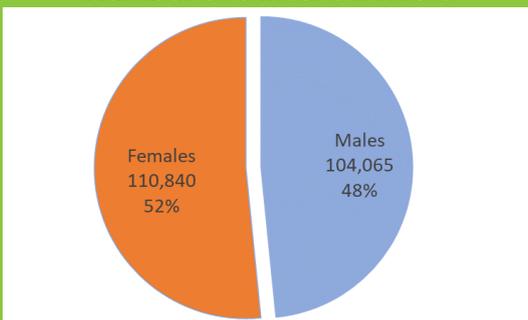
Females



How many previously diagnosed cancer patients are still alive?

- About 215,000 cancer patients or former cancer patients were alive in Ireland at the end of 2021 (about 4.3% or 1 in 23 of the Irish population).
- The top six most common cancers among survivors were: breast cancer (23% of all cancer survivors), prostate cancer (22%), colorectal (bowel) cancer (11%) and skin melanoma (7%), non-Hodgkin lymphoma (4%) and lung cancer (4%) which together account for 71% of all cancer survivors.
- These figures exclude non-melanoma skin cancers, which are rarely fatal.

Number of cancer survivors



Total=214,905 (100%)

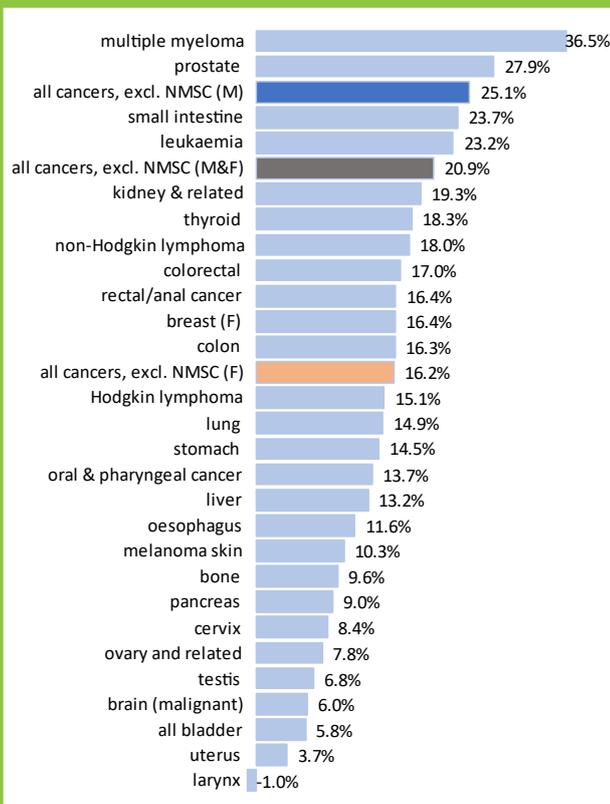
The six most common cancers among cancer survivors

Cancer Type	Percentage	Number of Survivors
all invasive cancers excl. NMSC	100%	214,905
breast	23%	49,164
prostate	22%	46,417
colorectal	11%	24,426
melanoma of skin	7%	15,699
non-Hodgkin lymphoma	4%	9,047
lung	4%	7,607

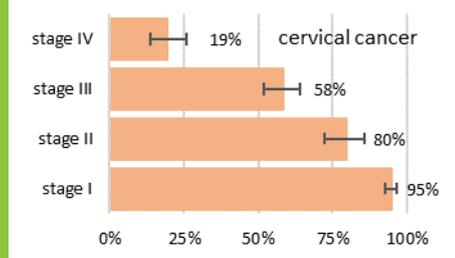
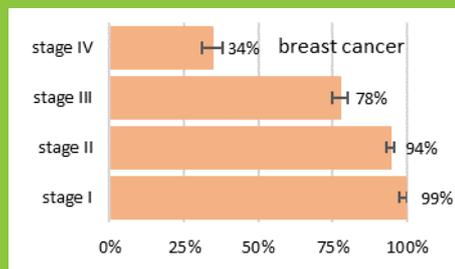
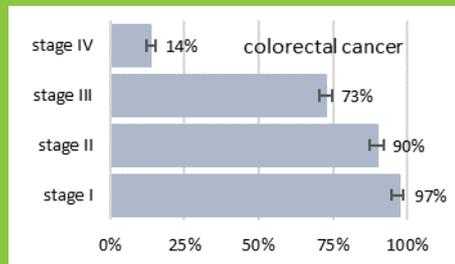
Is cancer survival improving?

- For all invasive cancers (excluding non-melanoma skin cancers), five-year net survival averaged 65% for patients diagnosed during 2014-2018, compared with only 44% for those diagnosed during 1994-1998, an improvement of 21 percentage points.
- Major improvements in survival have also been seen for most forms of cancer between 1994-1998 and 2014-2018. For the most common cancers, prostate cancer survival improved by 28 percentage points, colorectal cancer by 17 percentage points, breast cancer by 16 percentage points, and lung cancer by 15 percentage points.

Percentage point improvement in 5-year net survival: 1994-1998 vs. 2014-2018



5-year net survival (%), 2014-2018: colorectal, breast and cervical cancer, by stage at diagnosis



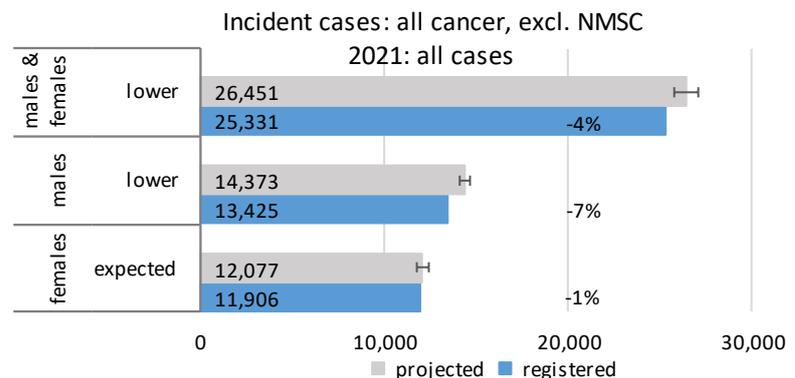
(Graphic on the left) 5-year net survival is one of the main metrics used by cancer registries, based on observed survival of cancer patients scaled against survival in the general population of the same age and sex (expressed as percentage). Between 1994-1998 and 2014-2018 there have been substantial improvements in survival for most cancers, e.g., for multiple myeloma there was an improvement of 37 percentage points in 5-year net survival between 1994-1998 (27%) and 2014-2018 (64%).

(Graphic on the right) For any person diagnosed with cancer, the stage at which their cancer is discovered greatly affects survival prospects. Discovering a cancer earlier (at stage I/II) before it has spread greatly improves survival prospects. Participation in the screening programmes for colorectal, breast and cervical cancers increases the chances of these cancers being detected earlier, reducing the complexity of treatment, and increasing long-term survival prospects.

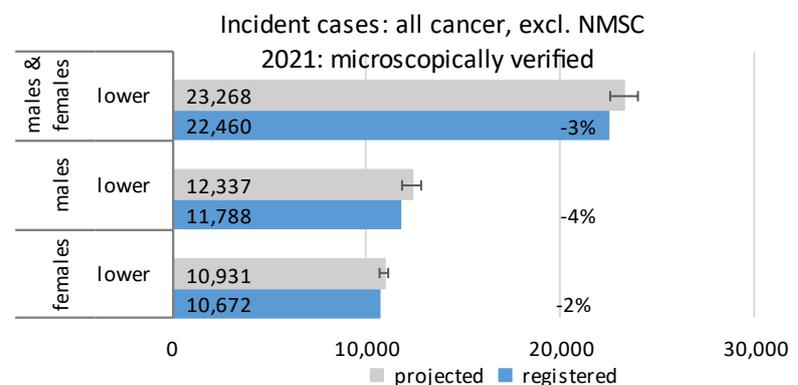
Has the COVID-19 pandemic affected cancer registration?

- The COVID-19 pandemic affected cancer registration in 2020 and to a lesser extent in 2021.
- We employ cancer data registrars embedded in the hospital system. Using active case-finding and electronic records, it normally takes up to two years before complete details of a case are fully registered.
- Cancer registration of incident cases for 2020 & 2021 is now essentially complete. Some *late registrations* may still emerge as it takes up to five years after the end of a given calendar year before each element of cancer data is received, checked and validated. Registration for 2022 is not yet complete. The figures presented below summarise registration status as of September 2023.
- Using projections, we can estimate the numbers of cases that would have been expected for 2020, 2021 & 2022 assuming that cancer trends for the years leading up to 2019 still applied, i.e., as if the COVID-19 pandemic had not occurred in early 2020.
- Microscopically verified cases are typically registered more quickly by NCRI than cases based on clinical findings only. An earlier indication of changes over time may be obtained by looking at the microscopically verified subset only.

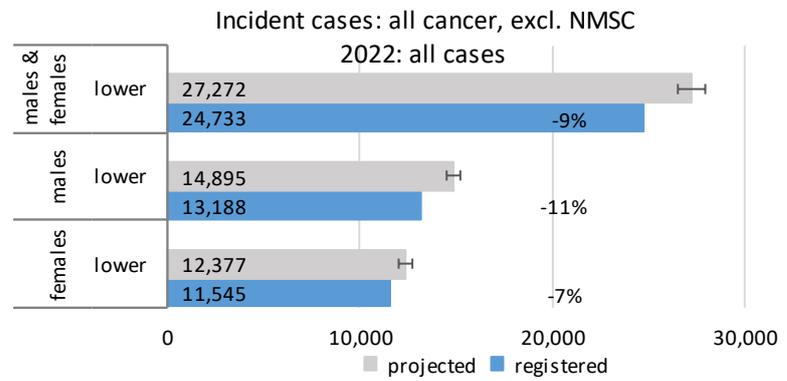
- The graph on the right shows the registered and projected cases in 2021.
- Overall, 96% of the cases that were projected for 2021 have been registered to date (Sept 2023).
- *i.e. 4% shortfall overall; 7% shortfall for males and 1% shortfall for females. Female cases fell within the expected range in 2021*



- The graph on the right shows the registered and projected microscopically verified cases in 2021.
- Overall, 97% of the cases that were projected for 2021 have been registered to date (Sept 2023).
- *i.e. 3% shortfall overall; 4% shortfall for males and 2% shortfall for females.*

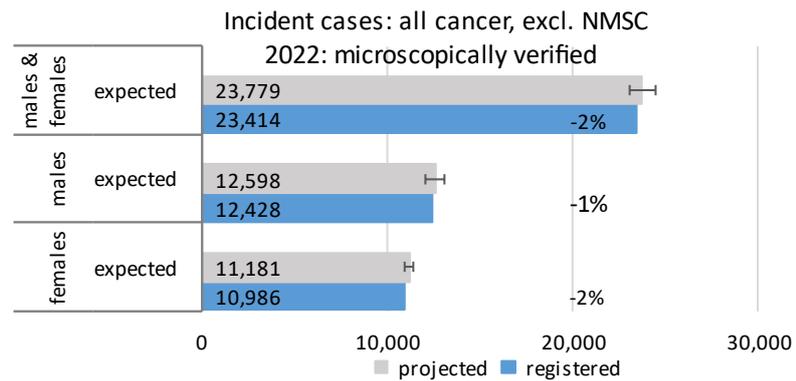


- The graph on the right shows the registered and projected cases in 2022.
- Overall, 91% of the cases that were projected for 2022 have been registered to date (Sept 2023).
- *i.e. 9% shortfall overall; 11% shortfall for males and 7% shortfall for females.*



Note: registration of cases diagnosed in 2022 is not complete and is still ongoing

- The graph on the right shows the registered and projected microscopically verified cases in 2022.
- Overall, 98% of these cases that were projected for 2022 have been registered to date (Sept 2023).
- *i.e. 2% shortfall overall; 1% shortfall for males and 2% shortfall for females, but within the expected range for microscopically verified case overall, and for males and females*



Microscopically verified cases are typically registered more quickly

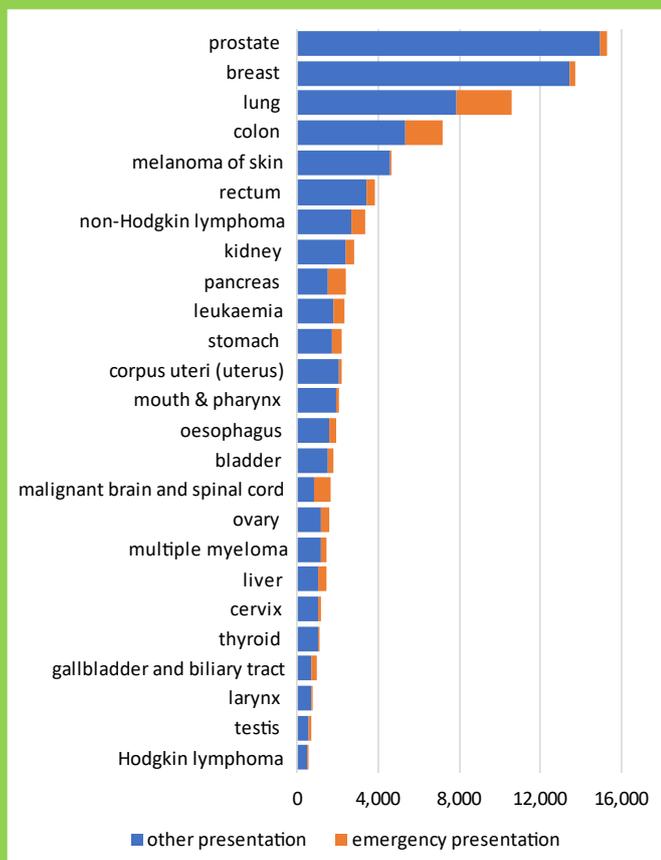
Effect of COVID-19 pandemic on cancer diagnoses

- In 2020, the first year of the COVID-19 pandemic, a preliminary analysis estimated that the shortfall of cancer diagnoses due to COVID-19 in 2020 was no greater than **14%** [4]. After one further year of registration activity, the shortfall on projected cases for 2020 was estimated to be **10%** (10% for males; 10% for females) [3].
- For 2021, a preliminary analysis published in March 2023 showed that the estimated shortfall was **6%** (9% in males; 3% in females) [4]
- For 2021, with registration essentially complete at the time of writing, the shortfall on projected cases was estimated to be **4%** (7% for males; 1% for females). The case count for females was within the expected range for 2021.
- For 2022, with registration still ongoing at the time of writing, the shortfall on projected cases is currently estimated to be **9%** (11% for males; 7% for females). For *microscopically verified cases* the shortfall on projected cases is currently estimated to be **2%** (1% for males; 2% for females), but within the prediction limits overall and for males and females.
- The reductions in cancer diagnoses during 2020 & 2021 are likely a result of pandemic-related impacts on health-seeking behaviour among the public, disruptions to cancer control services and COVID-19 related deaths among people who would otherwise have gone on to be diagnosed with cancer [5].

How many cancer patients present as an emergency?

- ‘Emergency presentation’ refers to a cancer first diagnosed via a hospital emergency department.
- Emergency presentation is generally associated with more advanced stage, older age, more limited treatment options and poorer survival outcomes.
- Certain cancers are more likely to present as an emergency (e.g., brain, pancreatic and liver cancer)
- Achieving a reduction in the proportion of cancer patients presenting as an emergency is one of the goals for improving cancer care in Ireland.

Mode of presentation by cancer type: sorted by number of cases diagnosed 2016-2019: emergency vs. other presentation.



% emergency presentation by cancer type: sorted in order of % presenting emergently.

malignant brain and spinal cord	48.5%
pancreas	35.2%
liver	28.7%
gallbladder and biliary tract	28.4%
lung	26.1%
ovary	25.2%
colon	25.0%
leukaemia	23.4%
stomach	22.0%
non-Hodgkin lymphoma	20.3%
multiple myeloma	19.3%
testis	18.2%
oesophagus	18.0%
Hodgkin lymphoma	16.6%
bladder	15.9%
kidney	15.7%
all invasive cancers excl. NMSC	14.4%
rectum	10.6%
larynx	8.7%
cervix	8.3%
mouth & pharynx	7.5%
corpus uteri (uterus)	5.4%
thyroid	2.7%
prostate	2.5%
breast	1.7%
melanoma of skin	1.3%

- Prostate and breast cancer are the most common cancers accounting for almost 1 in 3 (30%) invasive cancers in males and females respectively (excl. NMSC). These two common cancers are rarely diagnosed as an emergency (2.5% and 1.7% respectively).
- Brain tumours are relatively uncommon accounting for less than 2% of all newly diagnosed invasive cancers (excl. NMSC), yet 1 in 2 (49%) brain tumour cases present as an emergency. Similarly, pancreatic cancer accounts for 2.4% of all invasive cancers, yet over 1 in 3 (35%) pancreatic cancer cases present as an emergency.
- For all invasive cancers (excl. NMSC) diagnosed during 2016-2020, about 1 in 7 (14.4%) were diagnosed as an emergency during 2016-2019.

CANCER INCIDENCE 2019-2021

- On average, 41,767 cancers or other (non-invasive) tumours were diagnosed annually during the period 2019-2021 (Table 2-1).
- Approximately 18% of these were non-invasive tumours (*in situ* carcinomas, tumours of uncertain behaviour and benign brain and CNS tumours) and 24% were invasive non-melanoma skin cancers (NMSC, estimated 9,911 cases per year) (Table 2-1).
- Invasive cancers (incl. NMSC) averaged 34,335 cases per year during 2019-2021, or an age-standardised rate of 1000 male and 744 female cases per 100,000 per year.
- For all invasive cancers excluding NMSC, the figures most often quoted in international comparisons, 24,424 cases (13,075 males and 11,349 females) were diagnosed annually during 2019-2021, or 58% of all registered cancers.
- This is equivalent to an incidence rate of 697 cases per 100,000 males and 534 cases per 100,000 females per year, applying the 2013 European standard population [6].
- The cancer incidence rate (excl. NMSC) was 31% higher in males relative to females during 2019-2021.
- The annual average number of invasive cancers excluding NMSC during 2019-2021 (24,424) was double the average for 1994-1996 (12,270 – 6,350 male and 5,920 female).
- The cumulative risk (to age 75 years) of being diagnosed with an invasive cancer other than NMSC during 2019-2021 was approximately 1 in 3 for men and 1 in 4 for women.
- The cumulative lifetime risk of being diagnosed with an invasive cancer other than NMSC during 2019-2021 was approximately 1 in 2 (48%) for men, and 1 in 2 (43%) for women.
- These rate and risk statistics are based on the NCRI registered case counts and Irish population estimates available at the time of writing [7].

TABLE 2-1 ANNUAL AVERAGE INCIDENCE, RATE AND CUMULATIVE RISK OF THE MOST COMMON CANCERS: 2019-2021

	case count			rate ‡ * per 100,000		risk # 1 in... to age 75		risk # 1 in... lifetime	
	male	female	all ●	male	female	male	female	male	female
** C00-96 all invasive cancers	18,614	15,721	34,335	999.7	743.7				
C00-43 C45-96 all invasive cancers excl. NMSC	13,075	11,349	24,424	696.9	533.8	3	4	2	2
C00-D48 all registered cancers	20,750	21,017	41,767	1,113.6	970.9				
D00-48 all non-invasive cancers	2,137	5,296	7,433	113.9	227.1	20	7	11	5
C01-14 mouth & pharynx	397	165	562	20.0	7.8	92	253	65	144
C15 oesophagus	358	161	519	19.4	8.1	111	339	63	118
C16 stomach	362	206	568	20.4	10.1	133	257	58	98
C18-20 colorectum	1,466	1,093	2,560	79.9	52.9	30	43	15	19
C22 liver and intrahepatic bile ducts	228	103	331	12.5	5.0	185	462	95	200
C25 pancreas	309	288	597	17.2	14.3	143	175	68	67
C34 bronchus and lung	1,386	1,199	2,586	77.4	59.6	31	35	15	18
C43 melanoma of skin	608	603	1,211	32.7	27.6	73	68	37	40
C44 other skin	5,539	4,372	9,911	302.9	210.0	8	10	4	5
C50 breast	30	3,422	3,452	1.6	156.0	1,408	11	728	7
C53 cervix uteri		250	250		10.4		141		124
C54 corpus uteri		556	556		26.4		64		44
C56 ovary		387	387		18.2		101		61
C61 prostate	3,980		3,980	207.5		9		6	
C62 testis	169		169	6.7		206		201	
C64 kidney, except renal pelvis	423	231	654	21.8	10.9	91	168	57	101
C67 bladder (invasive)	390	147	537	22.9	7.3	135	370	50	132
C67 (T0, T1, Tis), D090, D414, NMIBC °	470	151	621	26.3	7.4	99	281	45	143
D090 carcinoma in-situ of bladder	224	66	290	12.2	3.2	200	581	98	358
D414 neoplasm of uncertain behaviour of bladder	111	43	155	6.3	2.2	421	994	182	472
C71-72 brain and spinal cord	263	208	471	12.9	9.4	144	186	97	120
C70-72 malignant meninges brain & CNS	268	215	484	13.1	9.8	141	179	95	116
D32-33 benign meninges, brain & CNS	79	182	261	4.1	8.5	540	234	292	129
D42-43 uncertain meninges, brain & CNS	45	44	90	1.9	1.9	800	886	643	592
C70-72, D32-33, D42-43 all meninges, brain and CNS	393	442	835	19.2	20.1	98	91	65	56
C73 thyroid	85	223	308	3.9	9.4	412	160	335	135
C81 Hodgkin lymphoma	83	73	156	3.6	3.0	439	491	348	391
C82-85 all non-Hodgkin lymphoma	479	353	833	25.3	17.0	88	119	48	63
C90 multiple myeloma	229	163	392	12.5	7.9	190	269	96	129
C91-95 leukaemia	330	213	542	17.2	9.8	132	194	68	107

‡ Average age-standardised rates for 2019-2021, the most recent years for which case registration is complete. ● male + female case counts ('all') are subject to rounding of annual averages.

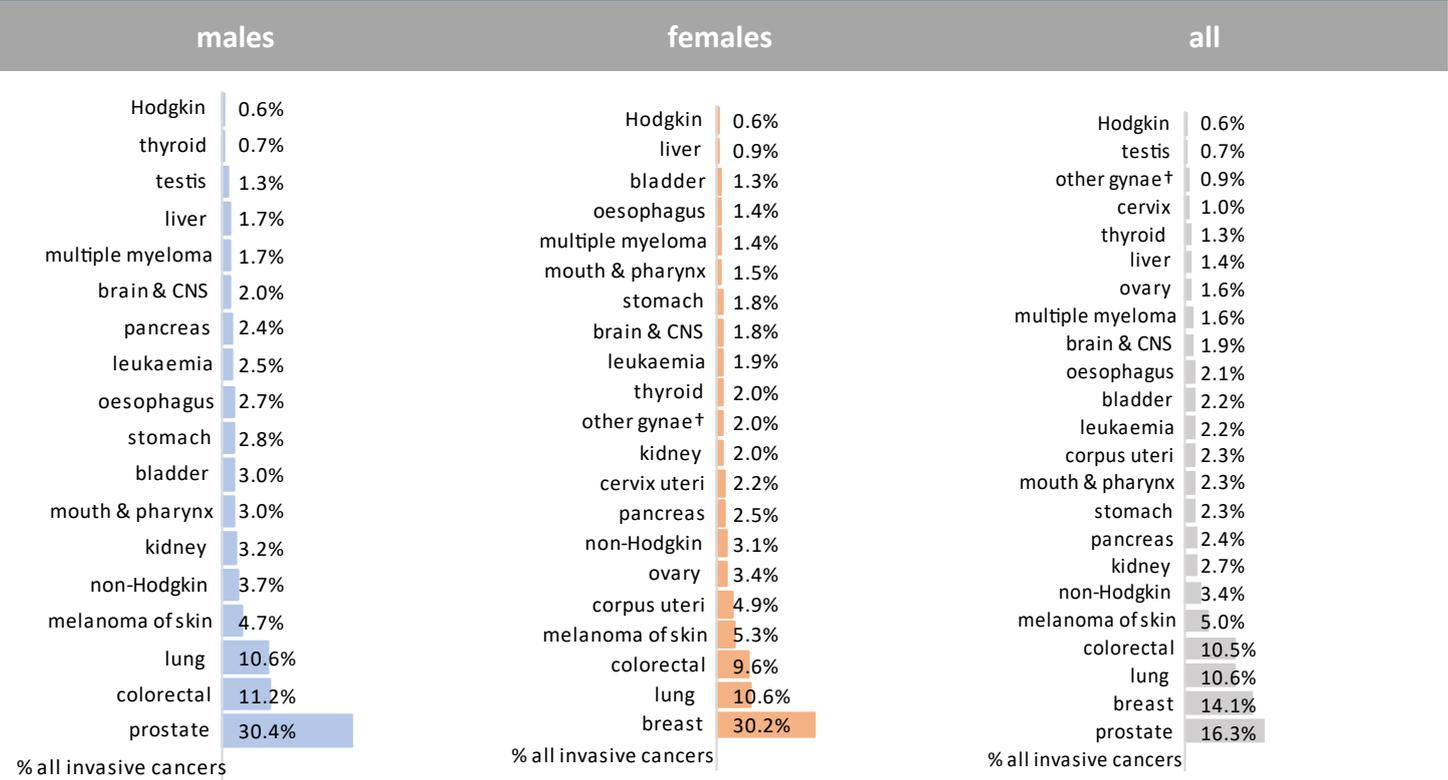
* Rates are weighted according to the 2013 European standard population (ESP); therefore, caution is advised if comparing these rates to rates in previous NCRI reports; see Appendix II for rates standardised to the 1976 ESP (which were used for the main tabulations in previous annual reports).

** Invasive cancers included all tumours classified as behaviour 3 in ICD-O-3 classification, including some neoplasms previously classified as uncertain behaviour, e.g., polycythaemia vera.

Cumulative risk of developing a type of cancer before age 75 and full lifetime risk (both adjusted for population mortality), expressed as a proportion, e.g. lifetime risk of developing an invasive cancer (excluding NMIBC) was approximately 1 in 2 in males (probability=48%) and 1 in 2 in females (probability=43%), applying current probability method [2, 3].

° NMIBC, non-muscle invasive bladder cancer

FIGURE 2-1
ESTIMATED PERCENTAGES AND RANK OF THE MOST COMMONLY DIAGNOSED INVASIVE CANCER
(EXCLUDING NMSC): ANNUAL AVERAGE 2019-2021



Low-incidence invasive cancers are not shown (c.10%), therefore percentages do not sum to 100%.
 †Other gynaecological cancers: vulva, vagina, uterus (NOS) and placenta. % – percent of all invasive cancers, excl. NMSC.

- If NMSC cases are excluded, prostate and female breast cancer were the most commonly diagnosed invasive cancers overall, each comprising almost one-third of all invasive cancers in men and women respectively, during the period 2019-2021 (Figure 2-1).
- Colorectal cancer, lung cancer, melanoma of skin and non-Hodgkin lymphoma were the 2nd, 3rd, 4th and 5th most common cancers in males respectively.
- Lung cancer, colorectal cancer, melanoma of skin, and uterine cancer (corpus uteri) were the 2nd, 3rd, 4th and 5th most common cancers in females respectively.

A more detailed breakdown of incidence statistics by cancer site is given in Appendix I & II.

CANCER MORTALITY 2019-2021

- Of deaths occurring in 2021, 64% were attributed to three main chapters in the ICD-10 classification: II (C00-D48) neoplasms (28%), IX (I00-I99) diseases of the circulatory system (27%) and X (J00-J99) diseases of the respiratory system (9.2%) [10].
- An annual average of 9,621 deaths from invasive cancer occurred during the period 2019-2021 (5,184 in males, 4,436 in females), or 9,874 deaths from any neoplasm (Table 3-1).
- This represents an estimated age-standardised mortality rate of 219 invasive cancer deaths per 100,000 females and 335 deaths per 100,000 males per year, based on the newer (2013) European Standard Population (Table 3-1).

TABLE 3-1
ANNUAL AVERAGE MORTALITY ATTRIBUTABLE TO CANCER: 2019-2021

	deaths			rate* per 100,000		risk # 1 in... to age 75	
	males	females	all●	males	females	males	female
C00-97, D00-D48 all neoplasms	5,320	4,554	9,874	344.3	225.3	10	12
C00-97 all invasive cancers	5,184	4,436	9,621	334.9	219.3	10	12
C01-14 mouth & pharynx	141	58	199	7.5	2.8	250	913
C15 oesophagus	293	141	434	17.4	7.1	133	405
C16 stomach	196	107	303	12.6	5.3	254	544
C18-20 colorectum	582	430	1,012	38.2	21.5	81	137
C22 liver	258	153	411	15.6	7.6	156	329
C25 pancreas	296	273	569	18.2	13.7	136	190
C34 lung	1,081	865	1,946	65.8	43.1	37	50
C43 melanoma of skin	103	59	162	6.6	2.8	437	857
C50 breast	7	723	730	0.4	35.0	6,074	67
C53 cervix uteri		82	82		3.7		446
C54 corpus uteri		112	112		5.6		445
C56 ovary		307	307		15.0		138
C61 prostate	623		623	50.3		138	
C62 testis	5		5	0.3		8,313	
C64 kidney	145	71	216	9.0	3.5	310	852
C67 bladder	166	71	236	12.7	3.6	426	1,170
C71-72 brain & CNS	191	121	312	9.6	5.7	185	305
C73 thyroid gland	12	13	25	0.6	0.6	3,930	4,045
C81 Hodgkin lymphoma	11	11	22	0.7	0.6	4,687	5,552
C82-85 non-Hodgkin lymphoma	158	127	285	10.2	6.4	346	551
C90 multiple myeloma	110	80	190	7.4	4.1	469	765
C91-95 leukaemia	176	99	276	11.8	5.0	285	583

Source of data: Central Statistics Office, Ireland. ●male and female totals are subject to rounding of annual averages.

*Rates are standardised to the 2013 European Standard Population (ESP), see Appendix II for rates standardised to 1976 ESP.

Cumulative risk of dying of cancer before 75th birthday calculated using method as described [11], expressed as a proportion, e.g. 1 in 10 in males; 1 in 12 in females.

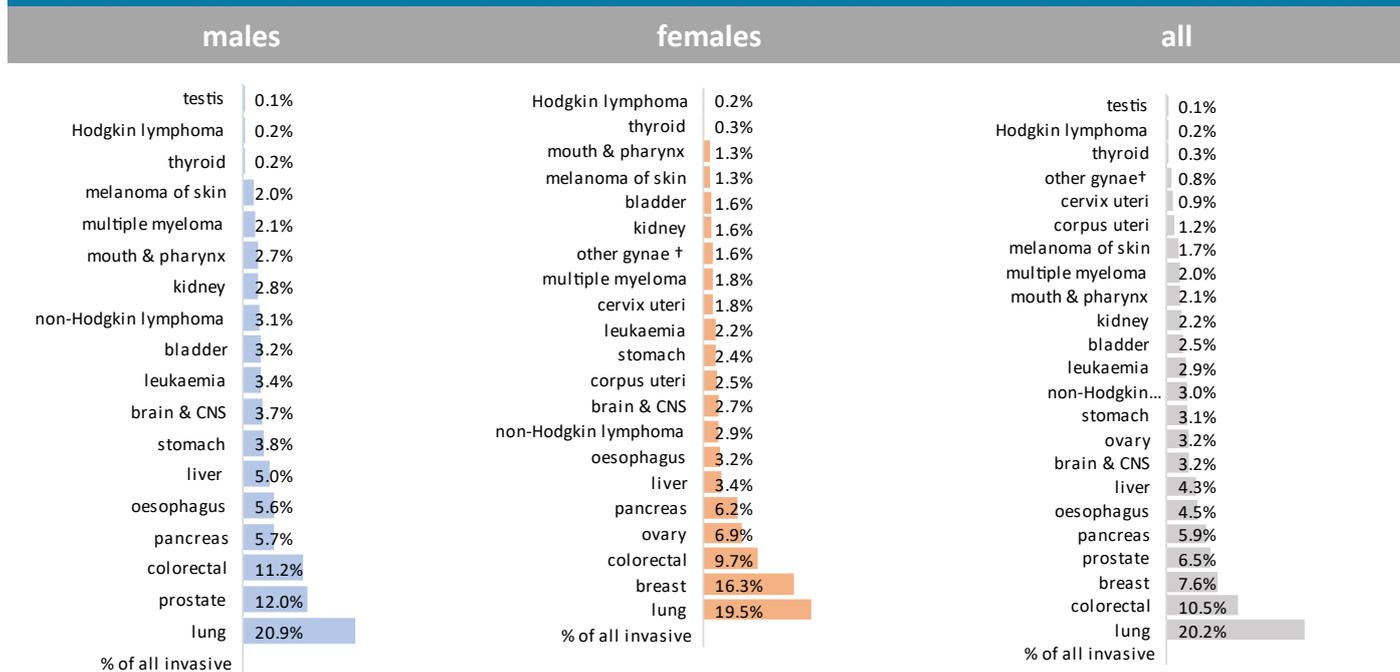
See Appendix III for mortality statistics of other cancers.

- The estimated cumulative risk of dying from invasive cancer before 75th birthday was approximately 1 in 12 for women and 1 in 10 for men.
- Lung cancer was the leading cause of cancer death in both sexes, with an average of 1,946 deaths per year or 19.5% of cancer deaths in women and 20.9% of cancer deaths in men during the period 2019-2021 (Table 3-1, Figure 3-1).
- Colorectal cancer was the next most common cause of cancer death overall (3rd most common in females and in males), with an average of 1,012 deaths per year or 9.7% of cancer deaths in females and 11.2% of cancer deaths in males.
- Deaths from lung, colorectal, breast and prostate cancers combined made up almost half (45%) of all deaths from cancer during 2019-2021 similar to 46% for the period 2016-2018 [4]. Since 2016-2018 prostate cancer has moved ahead of colorectal cancer in the relative ranking of cancer

deaths in males (colorectal cancer accounted for 12.2%, prostate cancer for 11.5% of male cancer deaths during 2016-2018 [4]).

- Deaths from cancers of the pancreas, oesophagus and liver in males ranked 4th, 5th and 6th respectively, and comprised 16% of all cancer deaths in males. Mortality rankings for these high-fatality cancers were much higher than their incidence rankings (Figure 3-1).
- Deaths from cancers of the ovary and pancreas ranked 4th and 5th respectively in females and comprised 13% of cancer deaths in women, again much higher than the incidences ranking for these high fatality cancers (Figure 3-1). A more detailed breakdown of mortality statistics is given in Appendix III.

FIGURE 3-1
PERCENTAGES AND RANK OF THE MOST COMMON CANCER DEATHS: ANNUAL AVERAGE 2019-2021



Cancers accounting for smaller percentages of cancer deaths (c.10% in total) are not shown, therefore percentages do not sum to 100%. †Other gynaecological malignancies: vulva, vagina, uterus (NOS) and placenta.

Mortality data were provided by the Central Statistics Office (CSO).

PREVALENCE

Complete cancer prevalence is defined as the number of persons surviving with, or following a diagnosis of, cancer in a given population at a particular point in time, i.e., the index date. For a cancer registry, fixed-duration prevalence is the number of cancer survivors calculated directly from observed data collected by the cancer registry since it was established. The NCRI began national collation of cancer registration in 1994 and it currently holds 28 years of complete or near-complete incidence and follow-up information on cancer cases, up to the end of 2021. However, there remains a subset of cancer patients alive at the end of 2021 who are not included in NCRI data because they were diagnosed before 1994. The size of this hidden subset was estimated [12]. The sum of the fixed-duration cancer survivor population (1994-2021) and estimated numbers of survivors from the hidden cancer subset (pre-1994) gives an estimate of complete prevalence, presented below (Table 4-1).

TABLE 4-1. FIXED DURATION AND ESTIMATED COMPLETE PREVALENCE BY SEX: NUMBER OF CANCER SURVIVORS* AT END OF 2021.

sex	Fixed duration (1994-2021)	%	Complete prevalence	%
all	201,608	100%	214,905	100%
males	99,430	49%	104,066	48%
females	102,178	51%	110,840	52%

*Survivors of any invasive cancer other than non-melanoma skin cancer (ICD-10 C00-96 excluding C44); Only the first invasive cancer was counted per patient ignoring any subsequent cancers in other body sites. Figures are subject to rounding.

The figure reported for complete cancer prevalence (up to 31/12/2020) in last year's annual report was 207,364 [4]. For this report (up to 31/12/2021) the same figure was estimated at 214,905 (Table 4-1) which comprised c.4.3% of the Irish population in 2021. These figures include patients still undergoing active treatment or palliative treatment at the end of 2021, in addition to longer-term survivors (either cured or potentially at risk of recurrence or relapse).

**TABLE 4-2
FIXED DURATION AND ESTIMATED COMPLETE PREVALENCE, BY CANCER TYPE: NUMBER OF CANCER SURVIVORS AT THE END OF 2021**

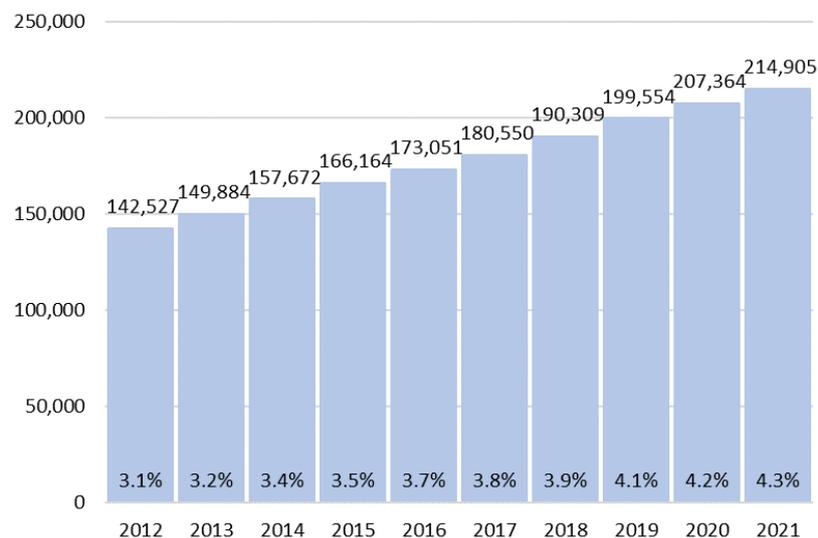
	Fixed duration (1994-2021)	Complete to end of 2021	%*
C50 breast	45,741	49,164	22.9%
C61 prostate	45,945	46,417	21.6%
C18-20 colorectal	23,094	24,426	11.4%
C43 melanoma of skin	14,592	15,699	7.3%
C82-85 non-Hodgkin lymphoma	8,465	9,047	4.2%
C33-34 lung and trachea	7,522	7,607	3.5%
C54 corpus uteri	6,276	6,746	3.1%
C91-95 leukaemia	5,817	6,423	3.0%
C64 kidney	6,073	6,287	2.9%
C62 testis	3,837	5,334	2.5%
C53 cervix uteri	4,236	5,190	2.4%
C67 bladder	3,576	4,291	2.0%
C73 thyroid	3,839	4,019	1.9%
C01-14 mouth & pharynx	3,776	3,894	1.8%
C56 ovary	2,884	3,323	1.5%
C81 Hodgkin lymphoma	2,525	3,208	1.5%
C16 stomach	2,494	2,571	1.2%
C71-72 brain and spinal cord	2,018	2,473	1.2%
C90 multiple myeloma	2,302	2,315	1.1%
C15 oesophagus	1,622	1,651	0.8%
C51-52, C55, C57-58 other gynaecological†	1,291	1,364	0.6%
C25 pancreas	1,064	1,078	0.5%
C22 liver	821	831	0.4%

†Other gynaecological malignancies: vulva, vagina, uterus (NOS) and placenta. *Percentage of all cancer survivors (complete prevalent cancers, C00-43, C45-96)

The number of survivors of a given cancer type is related to its incidence rate, median age at diagnosis and survival prospects. Rare cancers with poorer survival diagnosed in elderly patients comprise only a small proportion of cancer survivors. Conversely, common cancers with good survival prospects diagnosed in younger persons will tend to predominate in the prevalent cancer population.

Overall, the topmost common cancers in the prevalent cancer population were breast cancer (23% of all cancer survivors), prostate cancer (22%), colorectal cancer (11%) and skin melanoma (7%) (Table 4-2). These percentages are not mutually exclusive (i.e., they do not add up to 100% of the 'all cancer' set displayed in Table 4-1), as some cancer survivors had been diagnosed with more than one type of cancer. In some cases, the patient's first cancer may have been of a rarer type not listed in Table 4-2. Lung cancer, a common cancer with relatively poor survival accounted for only <4% of survivors, and less common cancers with poor survival such as liver, pancreatic, oesophageal cancers and multiple myeloma comprised <3% of cancer survivors combined.

FIGURE 4-1
ESTIMATED COMPLETE CANCER PREVALENCE IN IRELAND UP TO END OF 2021



The numbers above the bars show the numbers living with a cancer diagnosis at the end of the year on the x-axis. Percentages represent the proportion of the Irish population living with a cancer diagnosis. Figures for 2021 are based on the latest available complete data at the time of writing.

CANCER SURVIVAL 2014-2018

Five-year survival for patients diagnosed during 1994-2018

Five-year net survival rate is a commonly quoted metric by population-based cancer registries [13]. Calculation of net survival does not require cause-of-death information which is not always certain in deaths certificates. *Net survival* is the expected survival in the hypothetical situation in which cancer is the only cause of death, i.e., adjusted for other causes of death using a life table for that population [14]. It is based on observed survival of cancer patients scaled against survival in the general population of the same age and sex (expressed as a percentage). *Observed survival* is the actual percentage of people diagnosed with cancer who are still alive after a specified time regardless of cause of death (i.e., persons with cancer can die of other causes).

Net survival is in close agreement with observed survival for cancers with very poor survival (e.g., pancreatic cancer), and for cancers seen in younger persons (e.g., testicular, cervical cancers and Hodgkin lymphoma) because, if death occurs within 5 years, the cause of death is usually due to the cancer. Whereas, with non-lethal cancers (e.g., NMSC) or cancers with relatively long survival (e.g., prostate and melanoma), 5-year net survival approaches 100%, and observed survival is lower, mirroring background age/sex mortality rates in the general population for the same period. To illustrate this distinction between 'net' and 'observed' survival, observed survival is presented alongside net survival for the main cancers during 2014-2018, (Figure 5-1).

Calculation of cancer survival estimates requires adequate follow-up time, for example, it is not possible to calculate 5-year survival for cases diagnosed this year (2023) until end of 2028. Since last year's NCRI annual statistical report, more precise 5-year survival estimates are now possible for the period 2014-2018 after one additional year of follow-up [3]. Therefore, revised five-year survival statistics are presented below for common cancers diagnosed during 2014-2018 (Figures 5-1 & 5-2). This practice of updating survival estimates for more recent diagnosis periods will continue in our annual reports to follow where more recent estimates supersede estimates shown in previous reports.

Survival estimates presented in Figure 5-1 are age-standardised i.e. survival for all ages 15-99 years (15-64 for testicular cancer, 20-99 for bone cancer) was standardised to recommended population age weights [15]. The age-groups used differ for prostate cancer, and greater weighting is given to younger patients for some cancers (melanoma, bone, cervix, testis, brain, and thyroid), reflecting difference in typical age at diagnosis for these cancers. Survival estimates for paediatric cases are not presented but were published separately by the NCRI in 2023 [16]. We also present 5-year net survival by age and stage at diagnosis for the most common cancers diagnosed during 2014-2018.

Table 5-1 Cancers for which survival estimates are presented: for individual cancers/groups of cancers as defined for EUROCare-5: https://ecis.jrc.ec.europa.eu/pdf/EUROCARE_5_cancer_sites.pdf

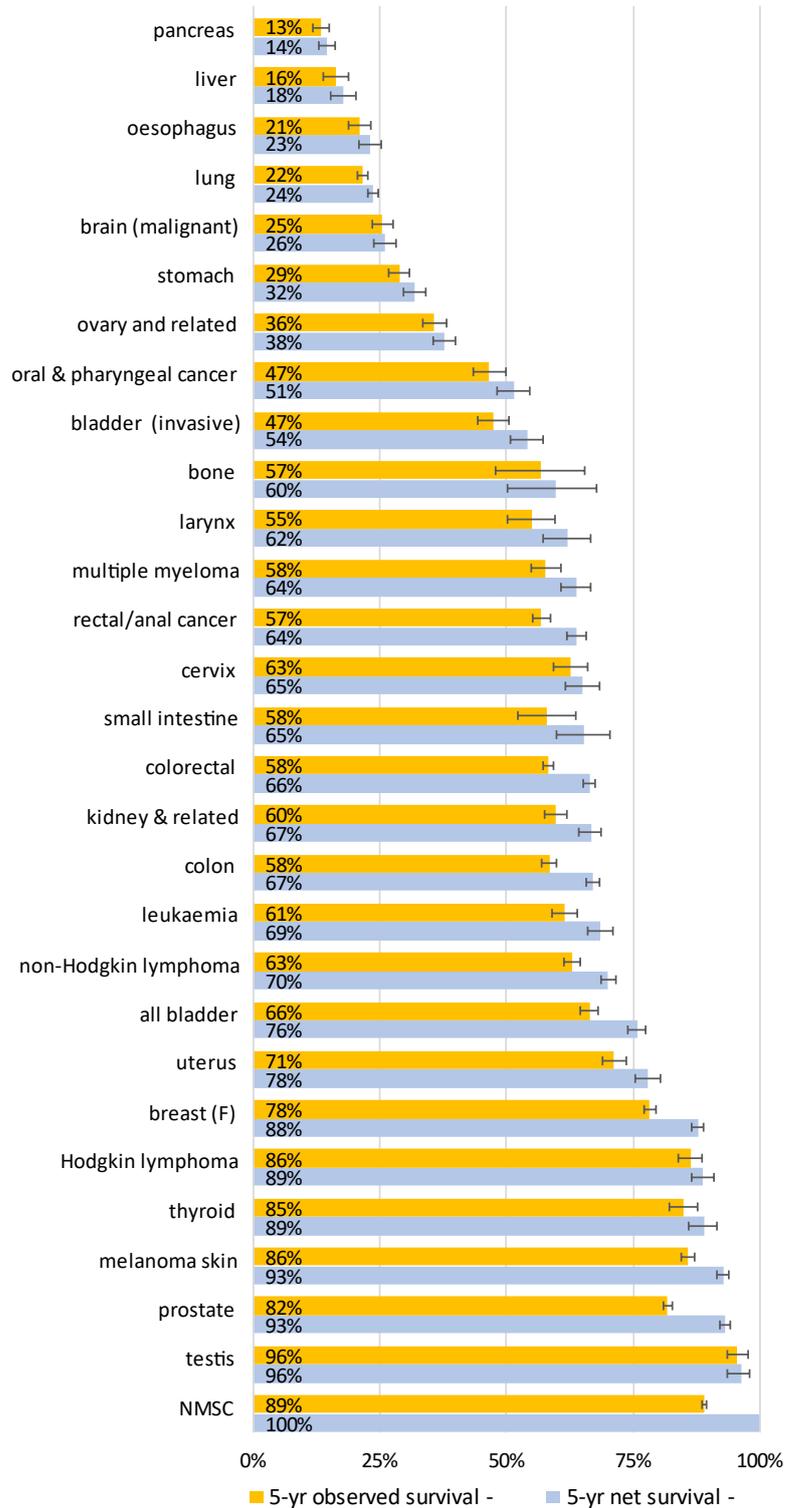
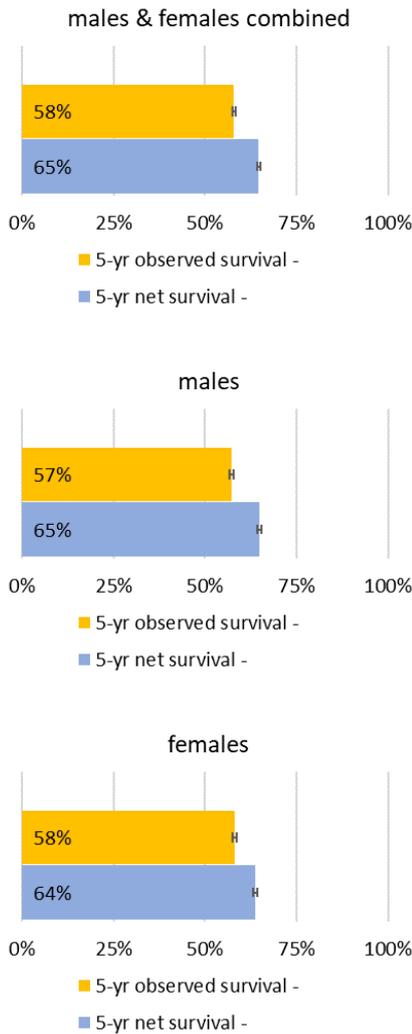
Oral & pharyngeal cancer excl. salivary glands (C01-C06 & C09-C13)	Cervical cancer (C53)
Oesophageal cancer (C15)	Uterine cancer (C54)
Stomach cancer (C16)	Ovary & uterine adnexal cancer (C56, C57.0-57.7)
Small intestine cancer (C17)	Prostate cancer (C61)
Colorectal cancer (C18-C21) excl. carcinoid tumours of the appendix	Testicular cancer (C62)
Colon cancer (C18) excl. carcinoid tumours of the appendix	Kidney & related cancer (C64-C66 & C68)
Rectal/anal cancer (C19-C21)	All bladder tumours invasive/in situ/uncertain (C67/D09.0/D41.4)
Liver cancer (C22)	Bladder cancer [invasive] (C67)
Pancreatic cancer (C25)	Brain cancer [malignant] (C71)
Laryngeal cancer (C32)	Thyroid cancer (C73)
Lung & tracheal cancer (C33-C34)	Hodgkin lymphoma (C81)
Bone & cartilage cancer (C40-C41)	Non-Hodgkin lymphoma (C82-C85 & C96)
Melanoma of skin (C43)	Multiple myeloma (C90.0)
Breast cancer (C50)	Leukaemia (C91-C95)

FIGURE 5-1

AGE-STANDARDISED 5-YEAR OBSERVED AND NET SURVIVAL OF CANCER PATIENTS IN IRELAND, 2014-2018, BY CANCER TYPE

all invasive cancers, excluding NMSC

Individual cancers, 5-yr survival & 95%CI: ranked by net survival



Error bars represent 95% confidence intervals. Intervals are narrower for more common cancers reflecting greater precision in the 5-year survival metric.

Observed and net survival was very similar for cancers with very poor survival (e.g. pancreatic and liver cancer), and for cancers in younger persons (e.g. testis, cervix and Hodgkin lymphoma).

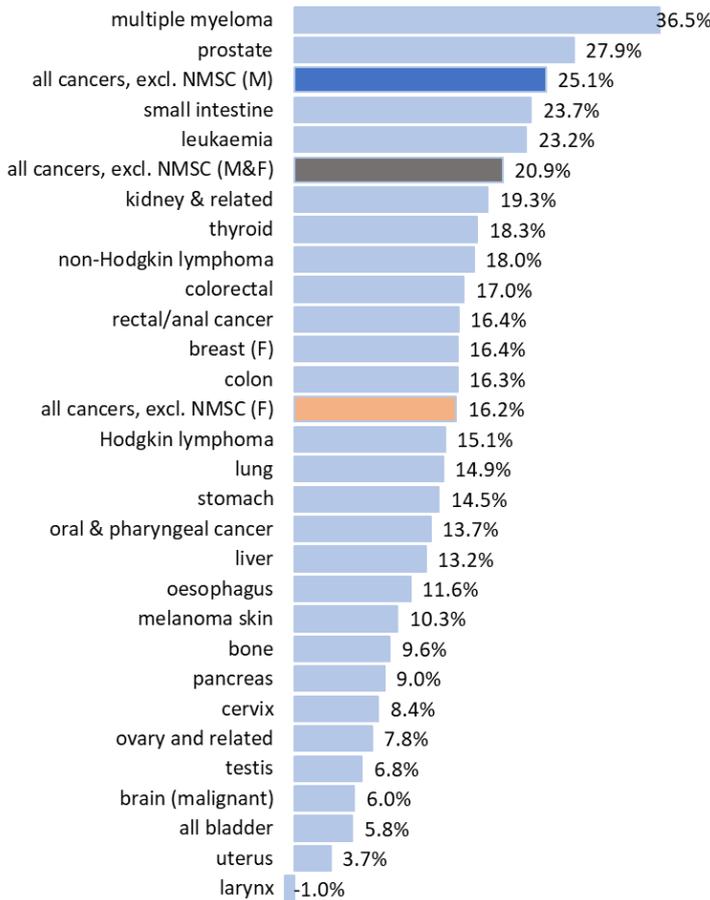
For NMSC, 5-yr net survival was practically 100%, while 5-yr observed survival was lower (89%) mirroring age-standardised background population mortality during 2014-2018

- For all invasive cancers (excl. NMSC) diagnosed during 2014-2018, 5-year net survival was 65% (males 65%; females 64%, Figure 5-1).

- Cancers with lowest 5-year net survival during 2014-2018 were: cancers of the pancreas (14%), liver (18%), oesophagus (23%), lung (24%), brain (26%), stomach (32%) and ovary (38%). 5-year observed, and 5-year net survival were very similar for these cancers with poor survival.
- Cancers with the highest 5-year net survival were NMSC (c.100%), testicular cancer (96%), prostate cancer (93%), melanoma skin cancer (93%), thyroid cancer (89%), Hodgkin lymphoma (89%), and female breast cancer (88%), Figure 5-1.

FIGURE 5-2
CHANGE IN 5-YEAR NET SURVIVAL BETWEEN 1994-1998 AND 2014-2018

percentage point change in 5-yr net survival
(1994-1998 vs. 2014-2018)



Improvements in average five-year net survival, expressed as absolute (percentage-point) gains comparing diagnosis period 1994-1998 with 2014-2018, were highest for:

- multiple myeloma (+37% points),
- prostate cancer (+28% points),
- small intestinal cancer (+24% points)
- leukaemia (+23% points);
- kidney and related cancer (19% points)

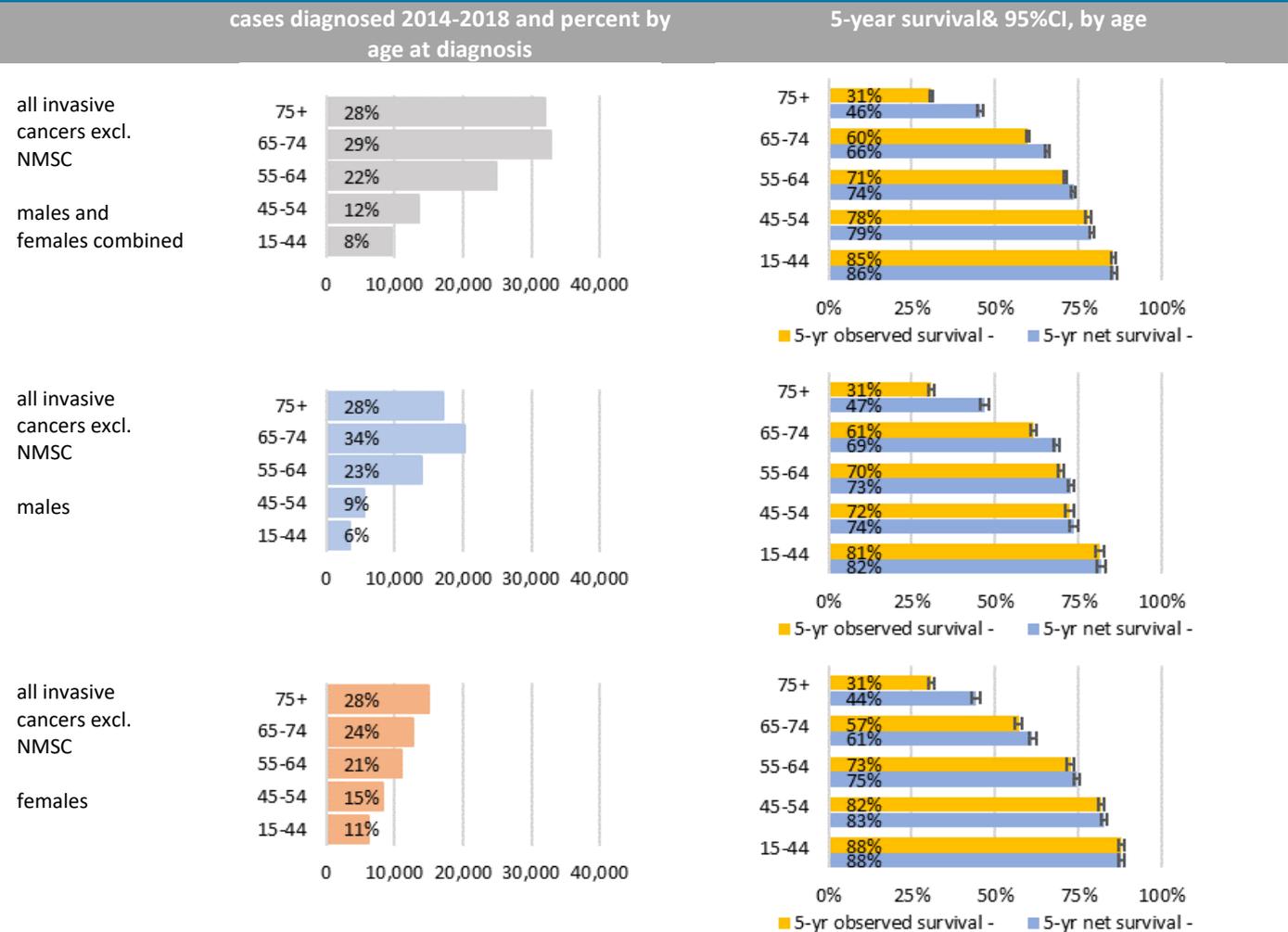
and lowest for:

- laryngeal tumours (-1% point),
- uterine tumours (+4% points),
- bladder tumours (+6% points)
- brain tumours (+6% points),
- testicular cancers (+7% points)
- ovarian and related cancers (+8% points)

Age standardised 5-year net survival figures were presented for all cancer types for five diagnosis periods 1994-1998, 1999-2003, 2004-2008, 2009-2013, 2014-2018 in last year's annual report [3].

In this year's annual statistical report, we present 5-year net survival (2014-2018) by cancer type, age, and stage at diagnosis (Figures 5-3, 5-4, 5-5).

FIGURE 5-3
5-YEAR SURVIVAL OF CANCER PATIENTS BY AGE: 2014-2018



- Cancer incidence is more common in the older population. During 2014-2018, 57% of invasive cancers (excl. NMSC) were diagnosed in persons >65y (62% in males; 52% in females, Figure 5-3).
- For cases diagnosed at age 55-64y, 5-year net survival was 74% (M 73%; F 75%). For younger cases 5-year year net survival was higher: 45-54Y, 79% (M 74%; F 83%) and 15-44Y, 86% (M 82%; F 88%).
- Net survival and observed survival were similar for younger cases (<65Y) because if these younger cases died within five years it was usually due to cancer as opposed to other causes.
- For cases diagnosed after the age 65, 5-year net survival was 66% (65-74y) and 46% (>75Y) and observed survival was 60% and 31% respectively because some of the older cases died of causes other than cancer (Figure 5-3).
- For cancers subject to screening (i.e., breast, cervical and colorectal), 5-year net survival by target ages ranges were previously presented for successive diagnosis periods, 1994-1998, 1999-2003, 2004-2008, 2009-2013 and 2014-2018 [1].
- Age distribution at diagnosis and 5-year net survival by age for cases diagnosed during 2014-2018 are presented for individual cancers in Figure 5-4 below.

FIGURE 5-4

5-YEAR NET SURVIVAL OF CANCER PATIENTS BY AGE AND CANCER TYPE: 2014-2018

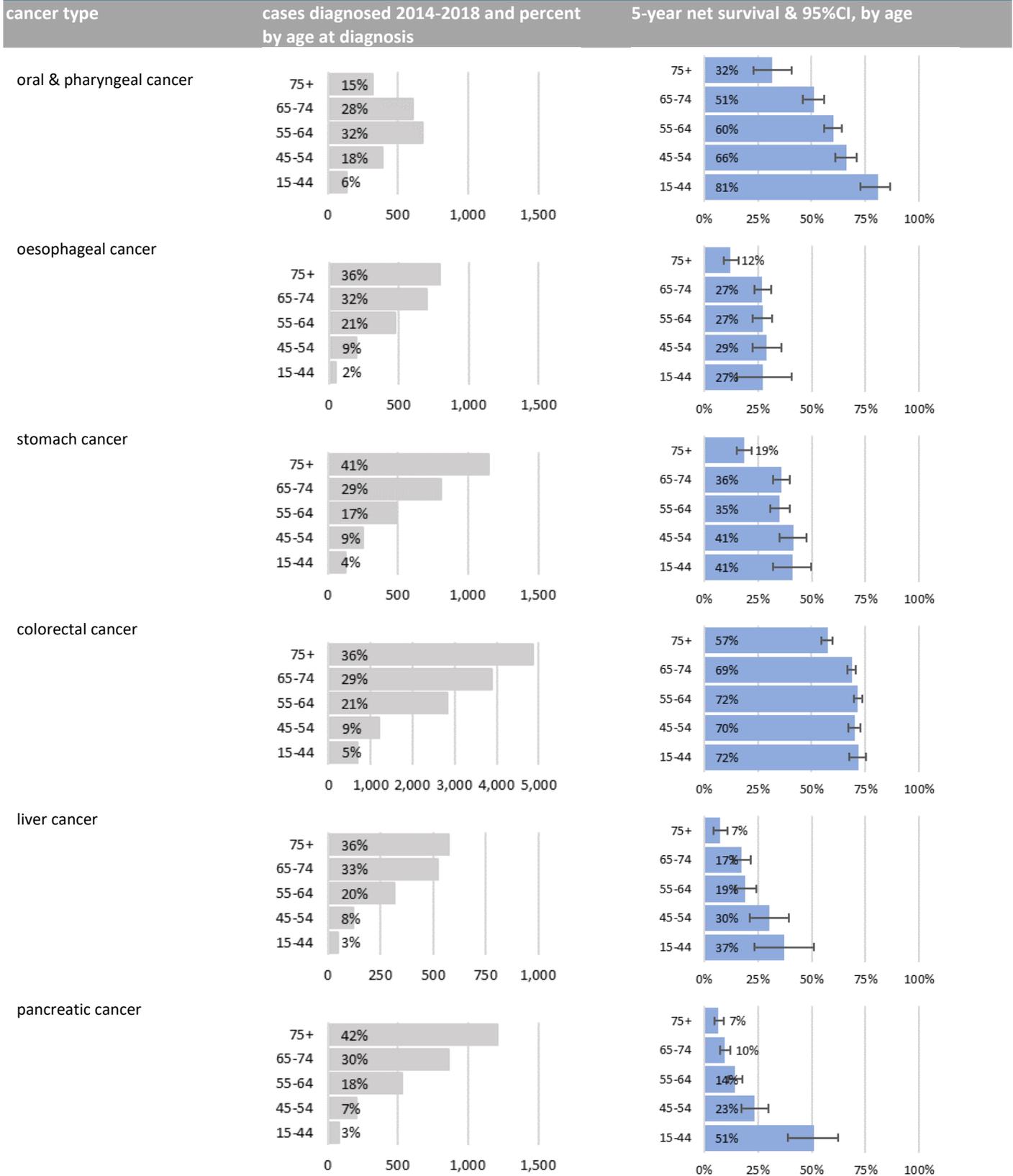
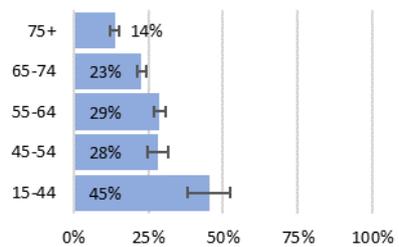
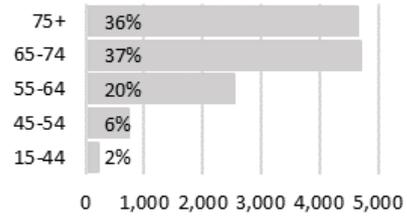


FIGURE 5-4

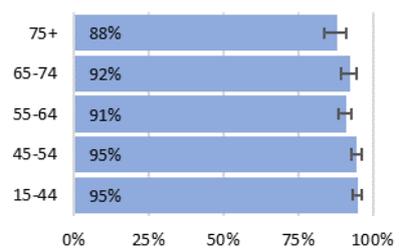
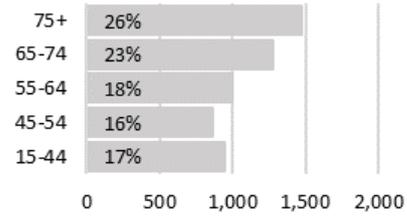
5-YEAR NET SURVIVAL OF CANCER PATIENTS BY AGE AND CANCER TYPE: 2014-2018

cancer type cases diagnosed 2014-2018 and percent by age at diagnosis 5-year net survival & 95%CI, by age

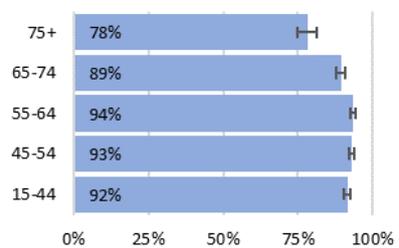
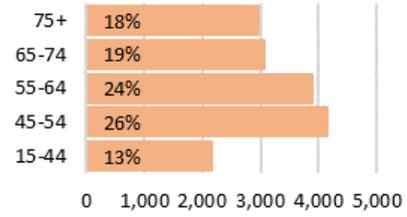
lung cancer



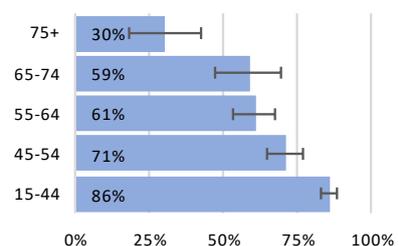
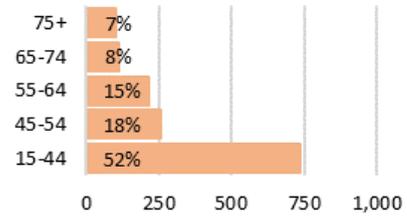
melanoma of skin



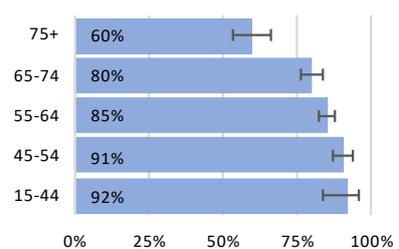
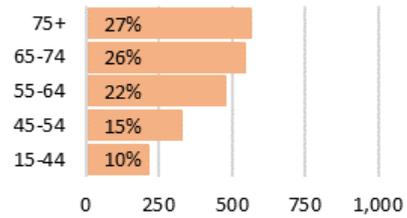
breast cancer (female)



cervical cancer



uterine cancer



ovary and related cancer

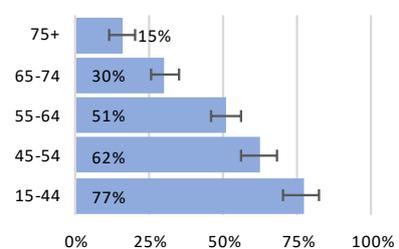
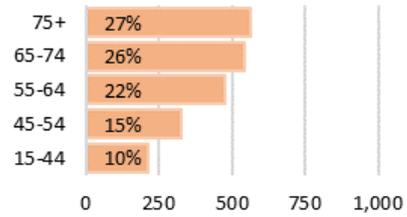
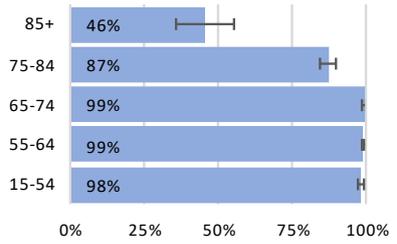
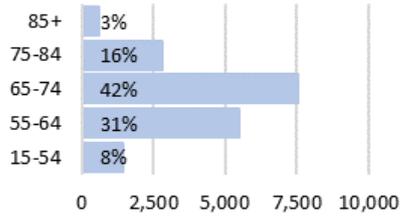


FIGURE 5-4

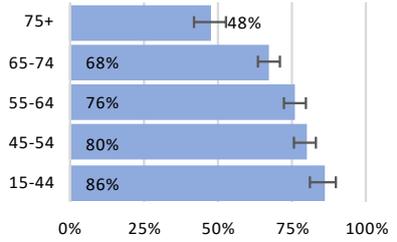
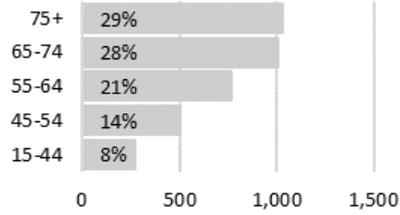
5-YEAR NET SURVIVAL OF CANCER PATIENTS BY AGE AND CANCER TYPE: 2014-2018

cancer type cases diagnosed 2014-2018 and percent by age at diagnosis 5-year net survival & 95%CI, by age

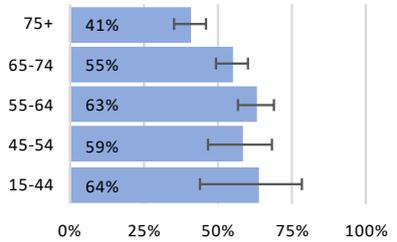
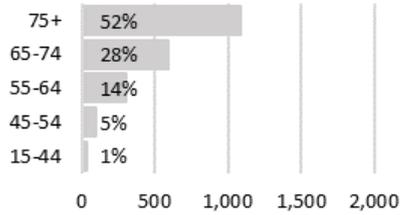
prostate cancer



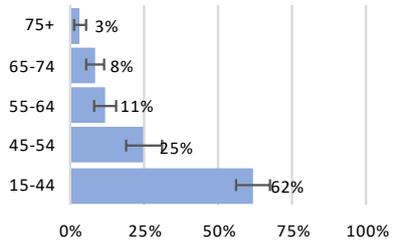
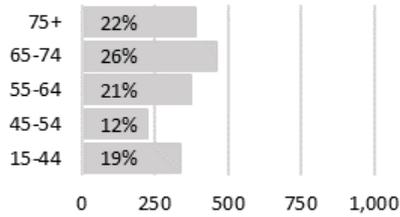
kidney and related cancer



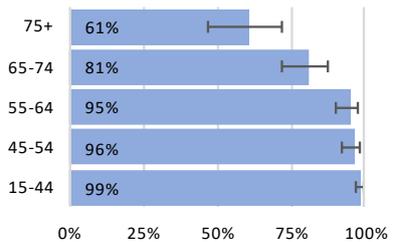
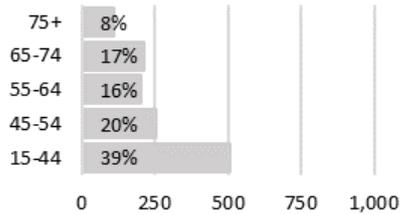
invasive bladder cancer



brain cancer (invasive)



thyroid cancer



Hodgkin lymphoma

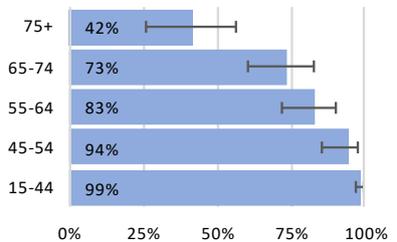
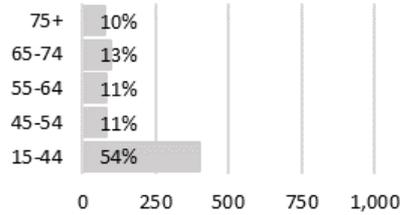
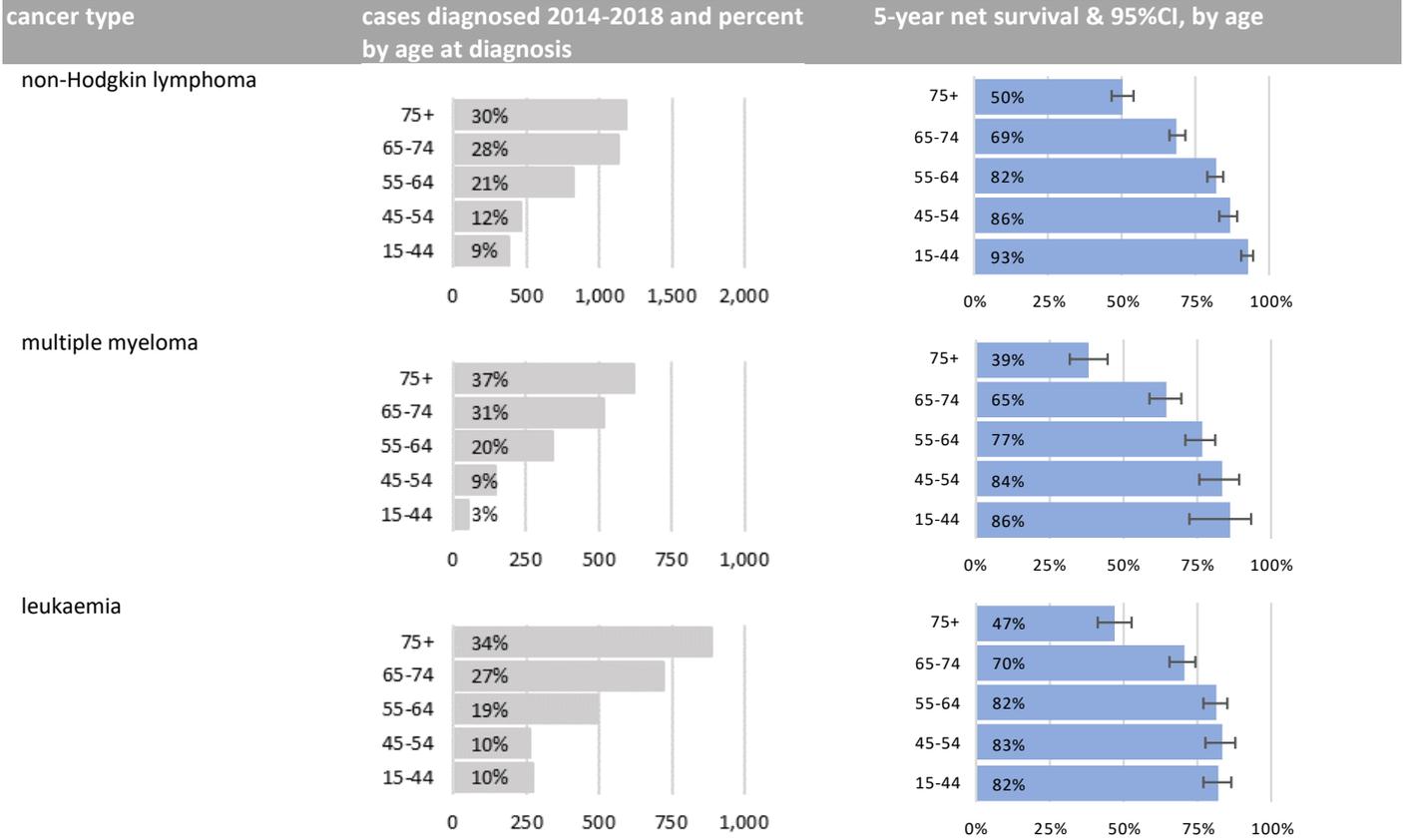


FIGURE 5-4

5-YEAR NET SURVIVAL OF CANCER PATIENTS BY AGE AND CANCER TYPE: 2014-2018



Survival for patients diagnosed during 2014-2018, by cancer type and stage at diagnosis.

Figure 5-5 shows 5-year net survival by stage for the most common invasive cancers diagnosed during 2014-2018. For each cancer, a certain proportion are labelled as unstaged because some data elements that comprise the TMN7 staging system [17] remain incomplete or unknown at the time of writing such that the TNM staging algorithm could not generate condensed stage (i.e., stage I,II, III, IV).

For most cancers there was a step-wise gradient of decreasing survival with each increment in stage which illustrates the importance of diagnosis at earlier stage, i.e. at stage I/II, (KPI No. 4 for colorectal, breast and lung cancers), National Cancer Strategy, 2017-2026, [18]).

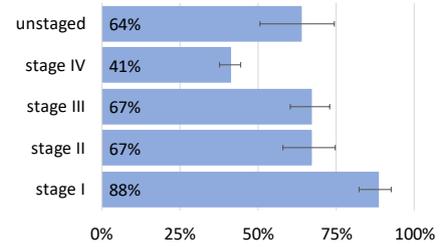
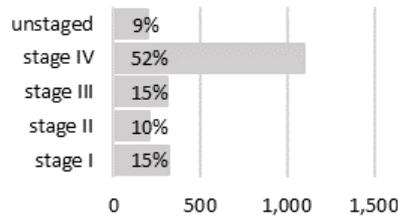
- Pancreatic cancer showed the lowest overall 5-year net survival (14%, Figure 5-1). Almost half of pancreatic cancers (47%) were diagnosed at stage IV for which 5-year net survival was only 3%; stage III, 5%; stage II, 17%; stage I, 33%, Figure 5-5.
- Liver cancer showed the 2nd lowest overall 5-year net survival (18%, Figure 5-1). A quarter of liver cancers (26%) were diagnosed at stage IV for which 5-year net survival was only 6%; stage III, 7%; stage II, 25%; stage I, 38%, Figure 5-5.
- Oesophageal cancer showed the 3rd lowest overall 5-year net survival (23%, Figure 5-1). More than one quarter of oesophageal cancers (28%) were diagnosed at stage IV for which 5-year net survival was only 3%; stage III, 21%; stage II, 40%; stage I, 64%, Figure 5-5.
- Lung cancer showed the 4th lowest overall 5-year net survival for cases diagnosed during 2014-2018 (24%, Figure 5-1). More than one third (39%) were diagnosed at stage IV for which 5-year net survival was only 4%; stage III, 17%; stage II, 35%; stage I, 57%, Figure 5-5.
- Overall 5-year net survival for female breast cancer diagnosed during 2014-2018 was relatively high (88%, Figure 5-1). 76% of cases were diagnosed at stage I or II. 5-year survival was 99% and 94% for stage I and II respectively, and 78% and 34% of stage III and IV respectively, Figure 5-5.
- Overall 5-year net survival for cervical cancer diagnosed during 2014-2018 was 65%, (Figure 5-1). 47% of cases were diagnosed at stage I, 14% at stage II, 22% at stage III and 13% at stage IV. 5-year net survival was 95% for stage I, 80% for stage II, 58% for stage III and 19% for stage IV, Figure 5-5.
- Overall 5-year net survival for colorectal cancer diagnosed during 2014-2018 was 66% (Figure 5-1). 17% of cases were diagnosed at stage I, 24% at stage II, 30% at stage III and 21% at stage IV. 5-year net survival was 97% for stage I, 90% for stage II, 73% for stage III and 14% for stage IV, Figure 5-5.

FIGURE 5-5

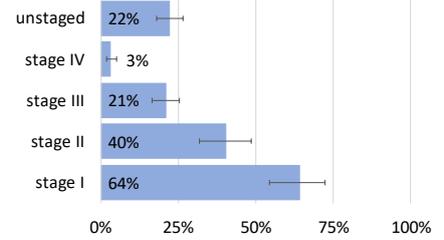
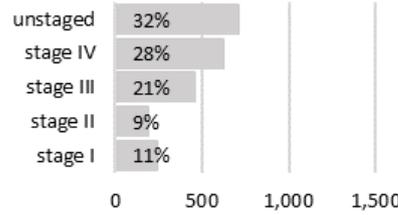
5-YEAR NET SURVIVAL OF CANCER PATIENTS BY STAGE AND CANCER TYPE: 2014-2018

cancer type cases diagnosed 2014-2018 and percent by stage at diagnosis 5-year net survival & 95%CI, by stage

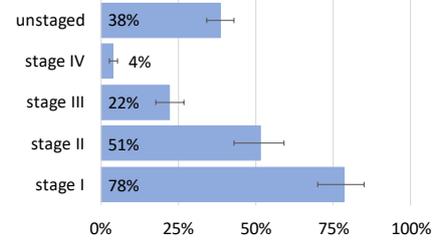
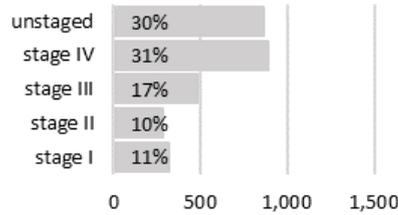
oral & pharyngeal cancer



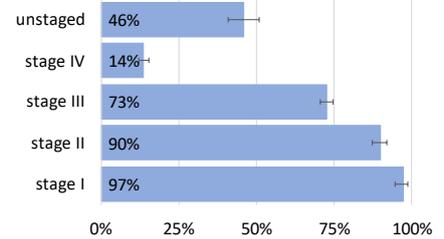
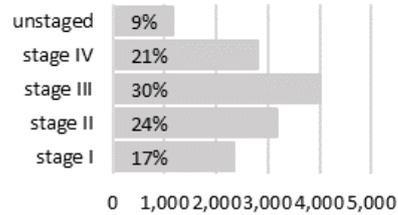
oesophageal cancer



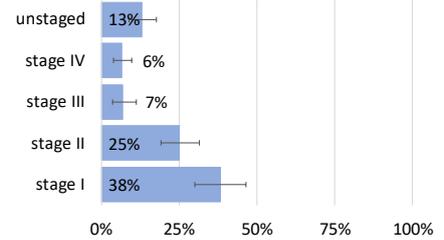
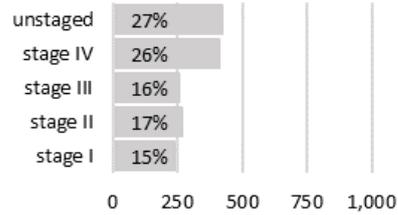
stomach cancer



colorectal cancer



liver cancer



pancreatic cancer

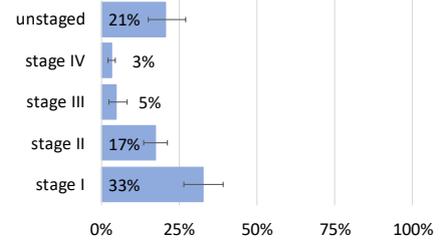
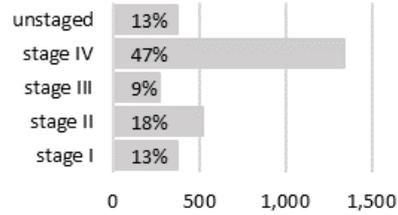


FIGURE 5-5

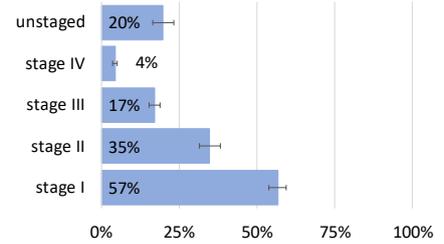
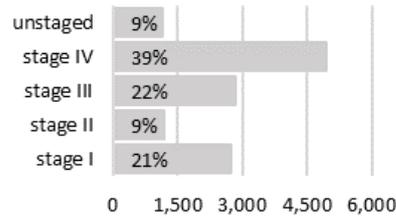
5-YEAR NET SURVIVAL OF CANCER PATIENTS BY STAGE AND CANCER TYPE: 2014-2018

cancer type

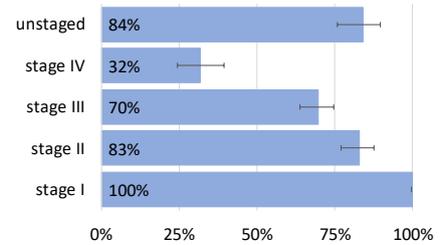
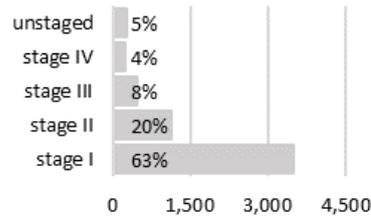
cases diagnosed 2014-2018 and percent by stage at diagnosis

5-year net survival & 95%CI, by stage

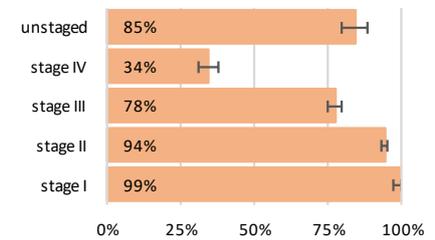
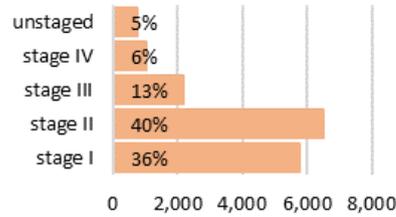
Lung cancer



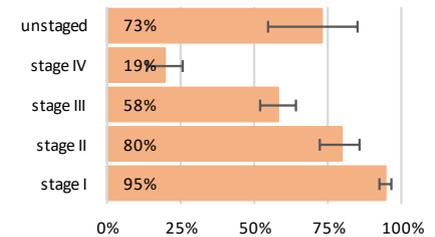
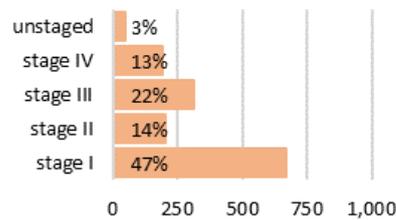
melanoma of skin



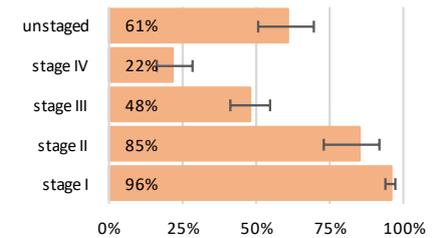
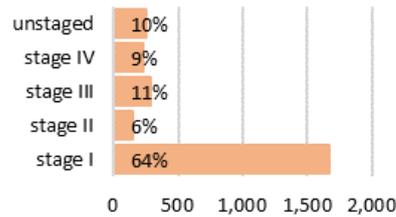
breast cancer (female)



cervical cancer



corpus uteri (uterine cancer)



cancer of the ovary and related

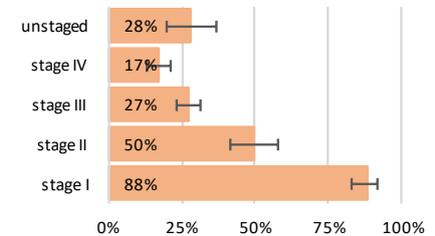
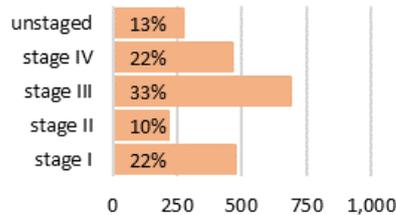
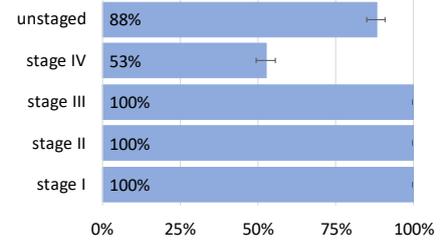
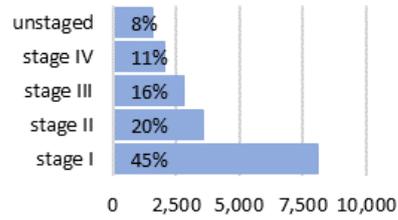


FIGURE 5-5

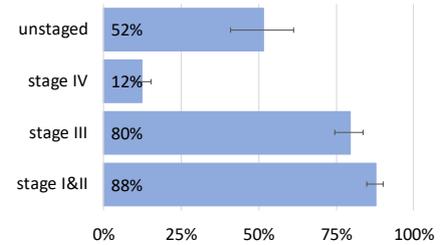
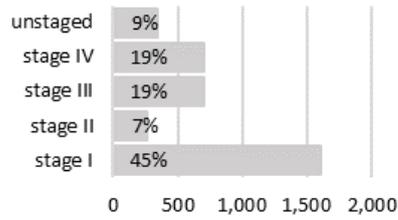
5-YEAR NET SURVIVAL OF CANCER PATIENTS BY STAGE AND CANCER TYPE: 2014-2018

cancer type cases diagnosed 2014-2018 and percent by stage at diagnosis 5-year net survival & 95%CI, by stage

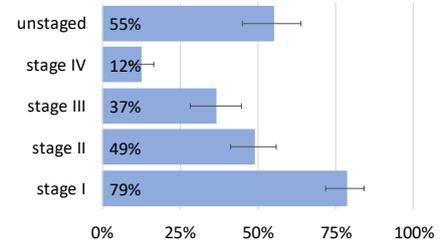
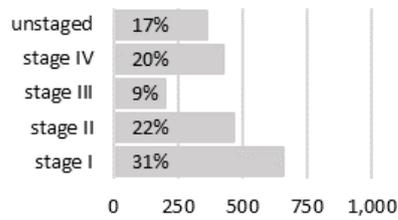
prostate cancer



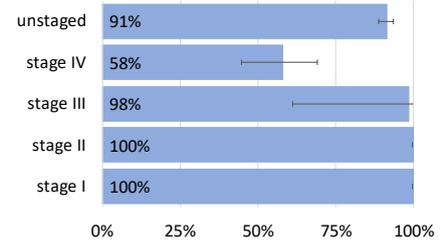
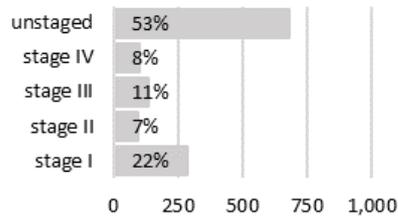
kidney cancer and related



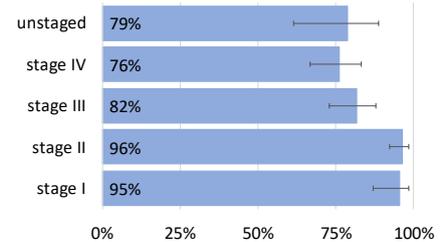
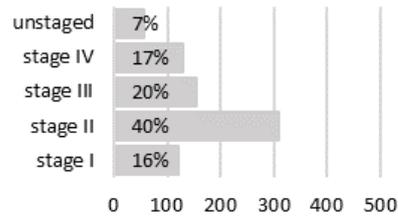
invasive bladder cancer



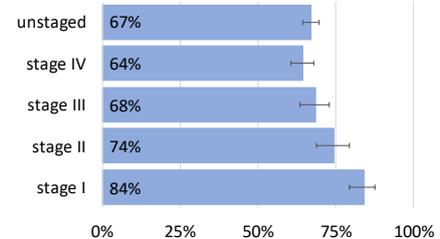
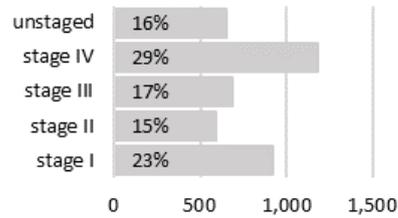
thyroid cancer



Hodgkin lymphoma



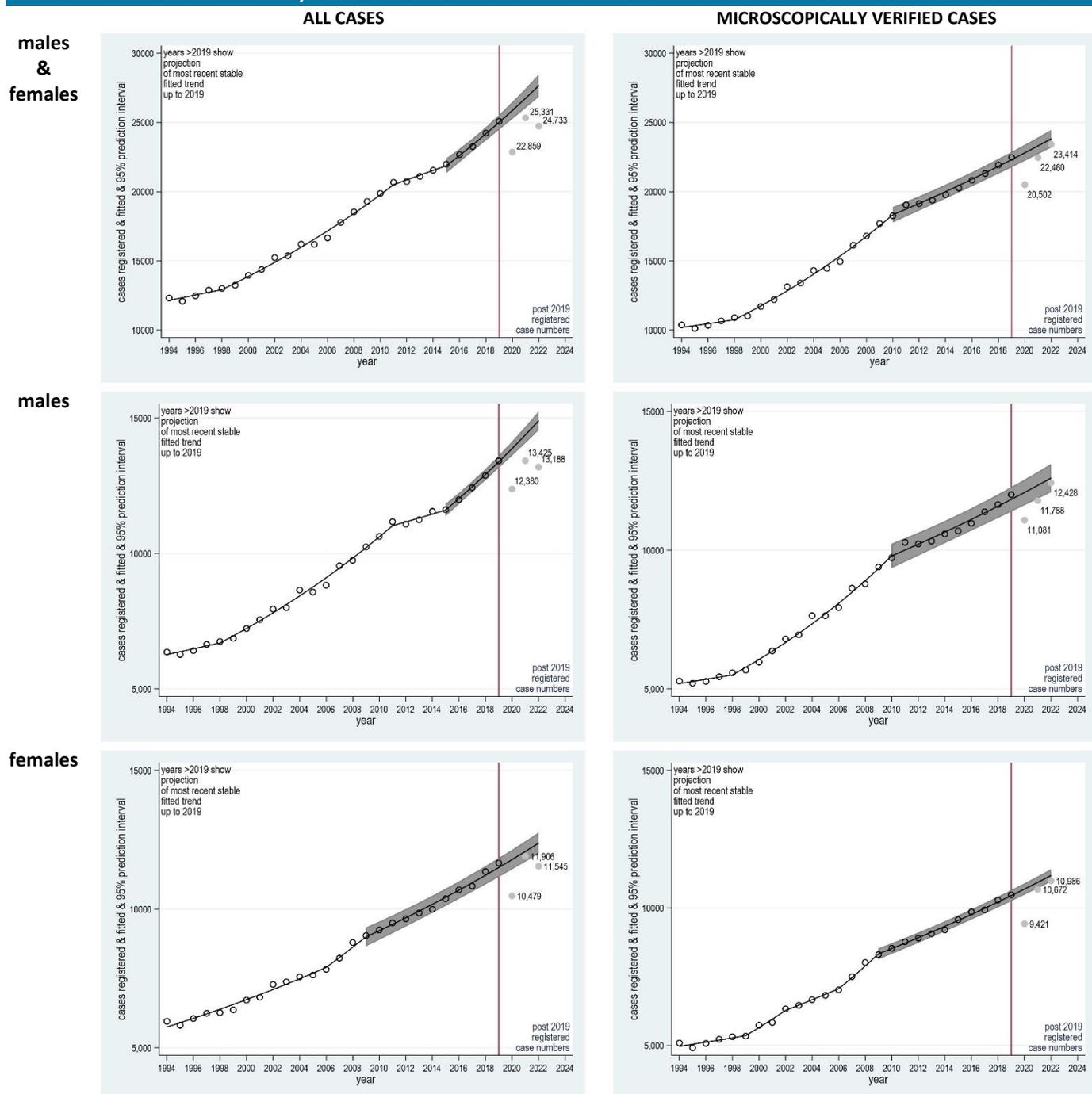
non-Hodgkin lymphoma



COVID-19 IMPACTS ON CANCER CASE NUMBERS DIAGNOSED IN 2021

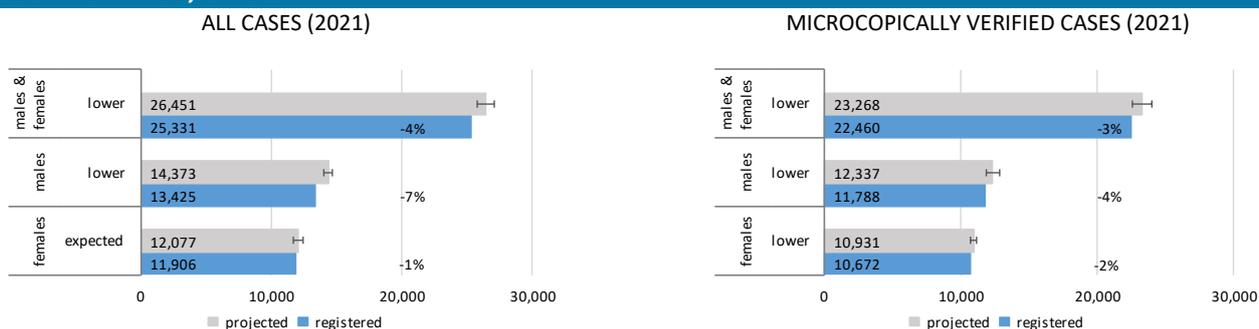
To assess the impact of COVID-19 on numbers of cancers diagnosed in Ireland up to 2022, the most recent stable trend for number of cases per year over the period 1994-2019 was projected to 2022 using Joinpoint regression [12]. The projected numbers therefore represent expected numbers of cancers diagnosed up to 2022 as if the COVID-19 pandemic had not occurred. 95% prediction intervals were calculated over the most recent stable trend and projected numbers were compared to observed numbers of cancers. A preliminary report for cases registered/projected for the year 2021 was published in March 2023 [21]. The figures below provide an update after a further 6 months of registration activity now that registration is essentially complete up to 2021. In 2021, registered cancer cases in females were within the expected range following a significant shortfall in 2020 (lower left-most panel, Figure 6-1). In 2021, registered cancer cases in males were 7% below the predicted range (Figure 6-2).

FIGURE 6-1. CASE COUNTS, ALL CANCERS EXCLUDING NMSC: REGISTERED VS. PROJECTED 1994-2022



In Figure 6-1, ‘all cases’ refer to cancer cases registered each year. It takes up to two years before complete details of a case are fully registered. Some late registrations may still emerge as it takes up to five years after the end of a given calendar year before each element of cancer data is received, checked, and validated. Registration for 2022 is not yet complete at the time of writing but preliminary figures (subject to change) are provided below to give an early indication of case numbers in 2022. Microscopically verified cases refer to those cases with pathologically confirmed diagnoses, accounting for just under 90% of all cancer cases and are typically registered more quickly by NCRI than cases based on clinical findings only. An earlier indication of changes over time may be obtained by looking at the microscopically verified subset.

FIGURE 6-2. REGISTERED CANCER CASE COUNT VS. PROJECTED CASE COUNT FOR 2021: ALL CANCERS EXCLUDING NMSC, BY SEX



Data labels show the percentage change from projected (expected) to registered cases for 2021, and whether the observed number was higher, lower or within the expected 95% range of the prediction interval.

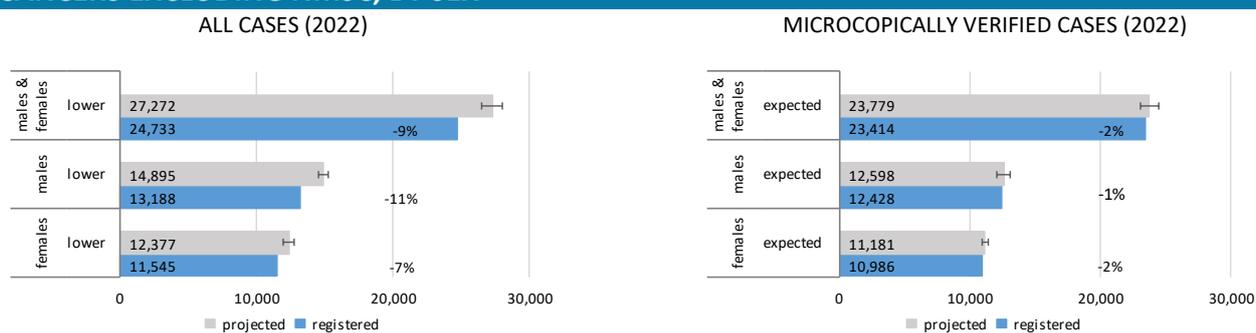
- For all cases in males and females combined, registered cancer cases were 4% below the projected range for 2021.
- Male case count was 7% below the projected range for 2021.
- Female case count was 1% lower but was within the projected range for 2021.
- For microscopically verified cases, males and females combined, registered cancer cases were 3% below the projected range for 2021.
- Male case count was 4% below the projected range for 2021.
- Female case count was 2% below projected range for 2021.

In 2021, for all cases in both sexes combined registered cases were (4%) below the projected case number based on the trend up to 2019 (25,331 vs. 26,451; 1,120 shortfall). For microscopically verified cases the projected case number fell (3%) below the projected case number (22,460 vs. 23,268; 808 shortfall), Figure 6-2.

In 2021, for all cases in males registered cases were (7%) below the projected case number (13,425 vs. 14,373; 948 shortfall). For microscopically verified cases the projected case number was (4%) below the projected case number (11,788 vs. 12,337; 549 shortfall).

In 2021, for all cases in females registered cases were within the expected range (11,906 vs. 12,077; 171 shortfall). For microscopically verified cases the projected case number was (2%) below the projected case number (10,672 vs. 10,931; 259 shortfall).

FIGURE 6-3. PRELIMINARY REGISTERED CANCER CASE COUNT VS. PROJECTED CASE COUNT FOR 2022: ALL CANCERS EXCLUDING NMSC, BY SEX



Data labels show the percentage change from projected (expected) to registered cases for 2022, and whether the observed number was higher, lower or within the expected 95% range of the prediction interval.

- For all cases in males and females combined, registered cancer cases were 9% below the projected range for 2022.
- Male case count was 11% below the projected range for 2022.
- Female case count was 7% below the projected range for 2022.
- For microscopically verified cases, for males and females combined, registered cancer case count was 2% lower, but within the projected range for 2022.
- Male case count was 1% lower, but within the projected range for 2022.
- Female case count was 2% lower, but within the projected range for 2022.

In 2022, for all cases in both sexes combined registered cases were (9%) below the projected case number based on the trend up to 2019 (24,733 vs. 27,272; 2,539 shortfall). For microscopically verified cases the projected case number was within the expected range (23,414 vs. 23,779; 365 shortfall), Figure 6-3.

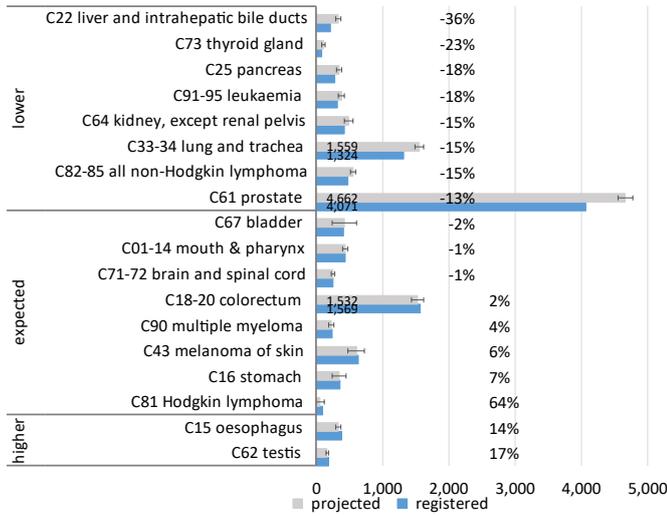
In 2022, for all cases in males registered cases were (11%) below the projected case number (13,188 vs. 14,895; 1,707 shortfall). For microscopically verified cases the projected case number was within the expected range (12,428 vs. 12,598; 170 shortfall).

In 2022, for all cases in females registered cases were (7%) below the projected case number (11,545 vs. 12,377; 832 shortfall). For microscopically verified cases the projected case number was within the expected range (10,986 vs. 11,181; 195 shortfall).

FIGURE 6-4

GRAPHICAL DISPLAY OF OBSERVED (REGISTERED) CASE COUNT VS. PROJECTED CASE COUNT FOR 2021, BY CANCER TYPE: IN MALES

Data labels show the percentage change from projected (expected) to registered (observed) cases for 2021, and whether the observed number was higher, lower or within the expected 95% range of the prediction interval.



In 2021, observed case counts of 8 out of the 18 cancer types examined were lower than projected based on pre-2020 trends.

The largest shortfalls from expected numbers of male cancer cases were in liver (-36%), thyroid (-23%) and pancreatic (-18%) cancers.

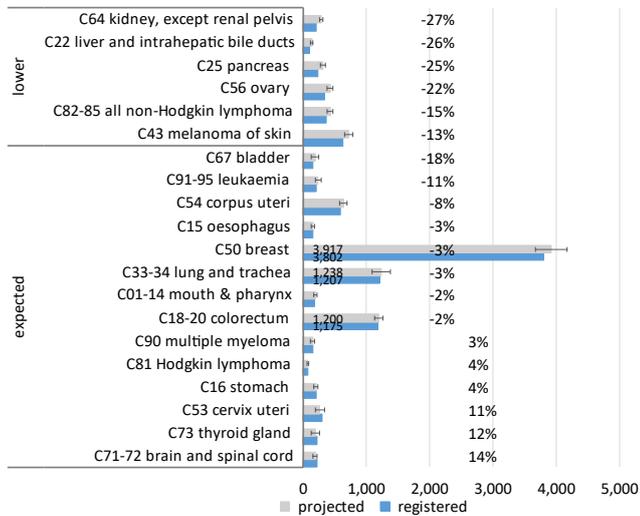
For the three most common cancers in males

- 4,662 prostate cancer cases were projected in 2021, compared with 4,071 registered (13% lower than projected).
- 1,559 cases of lung cancer were projected, compared with 1,324 registered (15% lower).
- 1,532 cases of colorectal (bowel) cancer were projected, compared with 1,569 registered (within the prediction interval limits).

FIGURE 6-5

GRAPHICAL DISPLAY OF OBSERVED (REGISTERED) CASE COUNT VS. PROJECTED CASE COUNT FOR 2021, BY CANCER TYPE IN FEMALES

Data labels show the percentage change from projected (expected) to registered (observed) cases for 2021, and whether the observed number was higher, lower or within the expected 95% range of the prediction interval.



In 2021, observed case counts of 6 out of the 20 cancer types examined were lower than projected based on pre-2020 trends.

The largest shortfalls from expected numbers of female cancer cases were in kidney (-27%), liver (-26%), pancreatic (-25%) and ovarian (-22%) cancers.

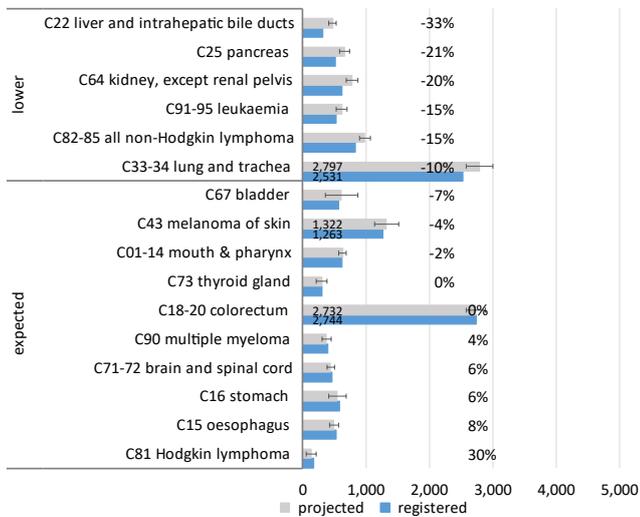
For the three most common cancers in females:

- 3,917 cases of breast cancer were projected, compared with 3,802 registered (within the prediction interval limits).
- 1,238 cases of lung cancer were projected, compared with 1,207 (within the prediction interval limits).
- 1,200 cases of colorectal (bowel) cancer were projected, compared with 1,175 registered (within the prediction interval limits).

FIGURE 6-6

GRAPHICAL DISPLAY OF OBSERVED (REGISTERED) CASE COUNT VS. PROJECTED CASE COUNT FOR 2021, BY CANCER TYPE IN BOTH SEXES

Data labels show the percentage change from projected (expected) to registered (observed) cases for 2021, and whether the observed number was higher, lower or within the expected 95% range of the prediction interval.



In 2021, observed case counts of 6 out of the 16 cancer types examined were lower than projected based on pre-2020 trends. These were liver, pancreatic and kidney cancers, leukaemia, NHL and lung cancer.

The largest shortfall from expected numbers of cancer cases were in liver (-33%), pancreatic (-21%) and kidney (-20%) cancers.

- 2,732 cases of colorectal (bowel) cancer were projected, compared with 2,744 registered (within the prediction interval limits).
- 2,797 cases of lung cancer were projected, compared with 2,531 registered (10% lower).
- 1,322 cases of melanoma skin cancer were projected, compared with 1,263 registered (within the prediction interval limits).

Conclusion: COVID-19 impact on cancer registration

For 2020, the first year of the COVID-19 pandemic, a preliminary analysis estimated that the shortfall of cancer diagnoses due to COVID-19 in 2020 was no greater than 14% [4]. After one further year of registration activity, the shortfall on projected cases for 2020 was estimated at 10% (10% for males; 10% for females) as reported in the 2022 NCRI annual statistical report [3].

For 2021, a preliminary analysis published in March 2023 showed that the estimated shortfall was 6% (9% in males; 3% in females) [21]. After a further 6 months of registration activity, with registration essentially complete, a re-calculation showed that the shortfall on projected cases in 2021 was 4% (7% for males; 1% for females) where registered cases in females fell within the expected range based on pre-2020 trends.

For 2022, with registration still ongoing, the shortfall on projected cases was estimated to be 9% (11% for males; 7% for females). For microscopically verified cases which tend to be registered quicker, the shortfall on projected cases was estimated to be 2% (1% for males; 2% for females) but within the expected range for 2022 microscopically verified cases based on pre-2020 trends.

These reductions in cancer diagnoses during 2020 and 2021 are likely a result of pandemic-related impacts on health-seeking behaviour among the public, disruptions to cancer control services and COVID-19 related deaths among people who would otherwise have gone on to be diagnosed with cancer [5].

For the estimated shortfalls for 2020, 2021 it was assumed that the cancer case trends, increasing up to 2019, would have continued along the same trajectory as if the COVID-19 pandemic had not occurred. This assumption on pre-COVID cancer trends will be re-examined as more years of registration have accrued.

DIAGNOSING CANCER IN AN EMERGENCY

Emergency presentation with cancer can result from several factors including tumour biology, health care systems and individual patient characteristics. It is generally associated with more advanced stage, limited treatment options and poorer survival outcomes. The analysis presented here expands on results presented in the 2017 NCRI annual report [22] and a separate more detailed report in conjunction with the Irish Cancer Society in 2018 [2].

There is no universally accepted definition about what constitutes an ‘emergency diagnosis’ [23]. Although it generally refers to diagnosis of a new cancer as part of attending an Accident and Emergency (A&E) or an Emergency Department (ED). The medical literature uses a variety of definitions including emergency or unplanned admission following attendance at A&E, those not seen by a general practitioner prior to admission, and patients who self-refer to an emergency service. Nationally collected data often use proxy measures such as an ‘emergency management event’ close to diagnosis [24]. Using the available data at its disposal the NCRI uses such a proxy measure. i.e., the NCRI dataset is limited to data on management events originating in secondary care.

Patients who are diagnosed emergently are more likely to have later stage cancers, to be older and resident in an area of greater deprivation [2]. The achievement of a reduction in the proportion of cancers diagnosed through emergency departments is one of the key performance indicators measured over the course of the National Cancer Strategy (KPI no. 7) [18].

The number and proportion of cancer patients presenting emergently (i.e., first diagnosed as an emergency presentation) in a hospital was calculated using National Cancer Registry data for the period 2014-2020 inclusive. The temporal sequence of events (diagnosis/management/treatment schedule) for each cancer case was abstracted within the date limits of 30 days before to 2 days after the formal diagnosis date. If any of these events was flagged as an emergency, the case was considered as an emergency presentation. At the level of the individual patient, this approach might appear arbitrary, but at the population level it provides a useful way for the registry to look at trends and rank different cancers for emergency presentation. The limitation of this proxy measure used by the registry is that it does not capture events in the background such as emergency GP referral cases entering secondary care via the scheduled elective system. It was estimated that about one third of emergency presentations in the UK originate from the GP referral pathway [23].

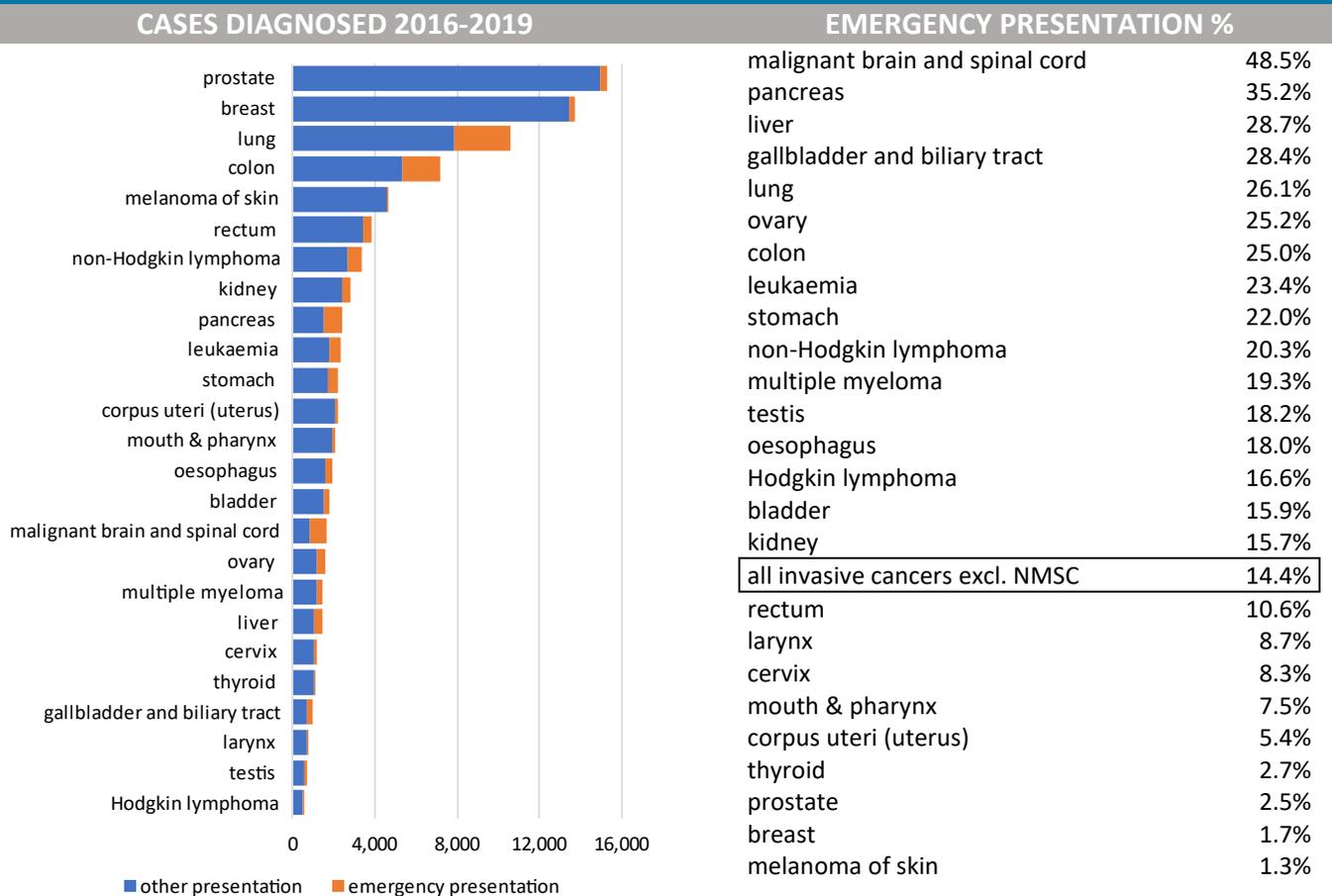
The NCRI criteria for ‘emergency presentation’ included all cancers first diagnosed during an admission through a hospital emergency department, as well as any further cases described in clinical notes as having been diagnosed emergently during (other) in-patient or out-patient hospital visits (but not including GP visits).

For the analysis in this report, all ‘reportable’ invasive cancers (i.e., cancers of sufficiently different site, morphology) were counted for each patient for the individual cancer types. This approach of considering some patients more than once, i.e., ‘case count vs. patient count’, better reflects the scale of the burden on hospitals.

Using definitions as described [25], the UK National Cancer Intelligence Network analysed the proportion of all invasive cancers (excl. NMSC) diagnosed as emergency presentations for the period 2006-2015 and reported a proportion of 22% [26], or 16.5% after factoring out GP emergency referrals. The same cancers that were most prone to emergency presentation in the UK were also problematic in Ireland, in the scale of proportions and the ranking of cancers [2]. Our estimate of 14%, which has not changed since 2009, was

almost on a par with the UK figure (after factoring out the GP emergency referrals) which gives some validation to our method and comparison.

FIGURE 7-1
MODE OF PRESENTATION BY CANCER TYPE: 2016-2019



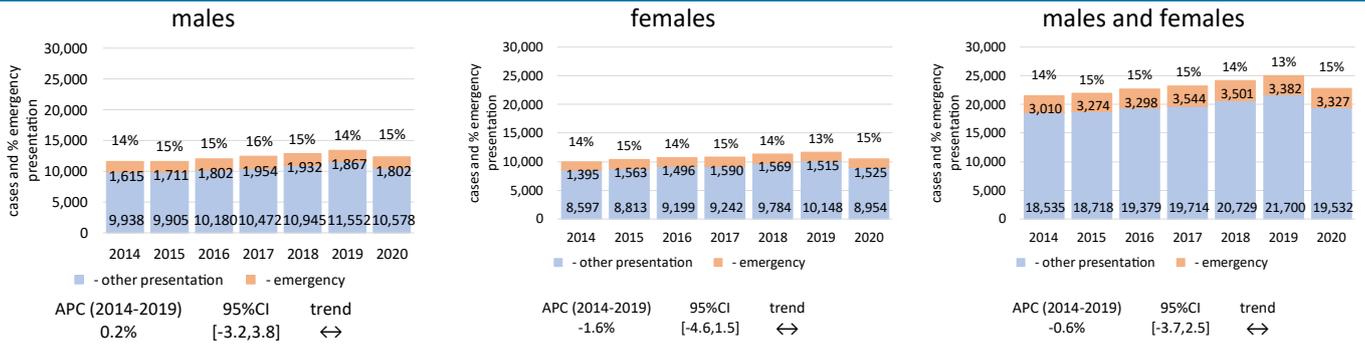
sorted in ascending order of cases diagnosed during 2016-2019

sorted in ascending order of % presenting emergently

- Overall, during 2016-2019, 14.4% of cancer cases (excluding non-melanoma skin cancers) presented as emergencies at the time of diagnosis (Figure 7-1).
- Of the 26 individual cancer types examined, those with the highest proportions (>20%) of emergency presentation during 2016-2019 were cancers of the brain and spinal cord (48.5%), pancreas (35.2%), liver (28.7%), gallbladder & biliary tract (28.4%), lung (26.1%), colon (25.0%) and ovary (25.2%), leukaemia (23.4%) and stomach (22.0%) and non-Hodgkin lymphoma (20.3%).
- Cancers with the lowest proportions (<10%) of emergency presentation were melanoma of skin (1.3%), and breast (1.7%), prostate (2.5%), thyroid (2.7%), uterine (5.4%), mouth and pharynx (7.5%), cervix (8.3%) and larynx (8.7%).
- Intermediate levels of emergency presentation were seen for multiple myeloma (19.3%), testis (18.2%), oesophagus (18.0%), Hodgkin lymphoma (16.6%), kidney (15.7%), bladder (15.9%) and rectum (10.6%).

FIGURE 7-2

TREND IN EMERGENCY PRESENTATION DURING 2014-2020: ALL INVASIVE CANCERS EXCL. NMSC



APC: average annual percentage change in proportion presenting as emergency over period 2014-2019 and 95% confidence interval (95%CI) based on annual data points fitted with Joinpoint regression. Trend: ↑=significant increase, ↓=significant decrease, ↔=no change (static), at the 95% level.

Data point for the atypical year 2020 was omitted in trend estimation due to the COVID-19 disruption of health service in that year.

A joint report by the NCRI and Irish Cancer Society [2] showed that the rate of emergency presentation for all invasive cancers (excl. NMSC) fell from 20% to 14% between 2002 and 2009 after which no further reduction was evident up to 2015. For the more recent period (2016-2019), there has been no change on 14% in the overall rate of emergency presentation (Figure 7-1).

While there was little difference in the actual number of emergency presentations between 2019 (3,382) and 2020 (3,327), the emergency presentation proportion in 2020 (15%) was marginally higher than in 2019 (13%). This was due to a smaller denominator in 2020, i.e., the denominator, the number of cancer patients diagnosed in 2020 was 10% lower than projected [3] due to COVID-19 disruption, including pauses in the screening programmes (Figure 7-2).

During 2016-2019, brain tumours showed the highest rate of emergency presentation (48.5%, Figure 7-1). Of all cancers diagnosed in the UK, brain cancer also showed the highest rate of emergency presentation during 2006-2015 [26].

For prostate and breast cancer, the two most common cancers in males and females respectively and for melanoma of skin, the 4th most common cancer in males and in females, the rate of emergency presentation was very low during 2016-2019 (prostate 2.5%; breast cancer 1.7%; melanoma 1.3%, Figure 7-1). Action to reduce emergency presentation in the next most common cancers (lung and colorectal cancer) could contribute towards an overall reduction in the emergency presentation rate.

Lung cancer, the third most common cancer in males and second most common in females had an emergency presentation rate of 26% during 2016-2019. GPs can refer possible lung cancer cases to rapid access clinics which were set up in designated cancer centres [18], but that depends on the person first attending their GP, and that the GP has access to an efficient referral pathway and diagnostic reports. Preventing emergency presentation of lung cancer involves streamlined diagnostic pathways, public health campaigns about symptoms, decision-support tools for general practitioners, improved communication and access for primary and secondary care [24]. A best-practice, National Optimal Lung Cancer Pathway (NOLCP) was developed to shorten overall time to diagnosis. It recommended protocol-led triaging of referrals, rapid turnaround times for all investigations, immediate reporting of all chest X-rays and subsequent CT scans, and daily rapid-access respiratory clinics. Maximum waiting times to diagnosis and treatment were set at 14 and 28 days, respectively [27].

Colorectal cancer is the 2nd most common cancer in males and 3rd most common cancer in females. This cancer showed an emergency presentation rate of 25.0% and 10.6% for colon and rectal cancer respectively during 2016-2019. System wide improvements, including innovation in diagnostic technologies and fuller participation in the bowel screening programme which currently stands at 41.9% of eligible persons [28] could reduce the overall rate of emergency presentation.

The National Cancer Strategy, 2017-2026 contains a target to reduce the proportion of cancers diagnosed in emergency departments (ED) by 50% over the course of the ten-year strategy. Yet for each individual cancer type there is no international benchmark to provide a target level of emergency presentation. Even in countries with highly performing healthcare systems, up to one in four patients are diagnosed as emergencies [19] [26].

Based on the emergency presentation rate for the period 2016-2019 using the NCRI methodology and looking at the most common cancers with higher emergency presentation rates, if the rate could be reduced from 25% to 12.5% for colon cancer and from 26% to 13% for lung cancer, the overall rate of emergency presentation could be reduced from 14% to about 12%.

To improve early detection and thereby avoid emergency presentation of cancer the National Cancer Strategy set the following objectives or key performance indicators (KPIs) [30]:

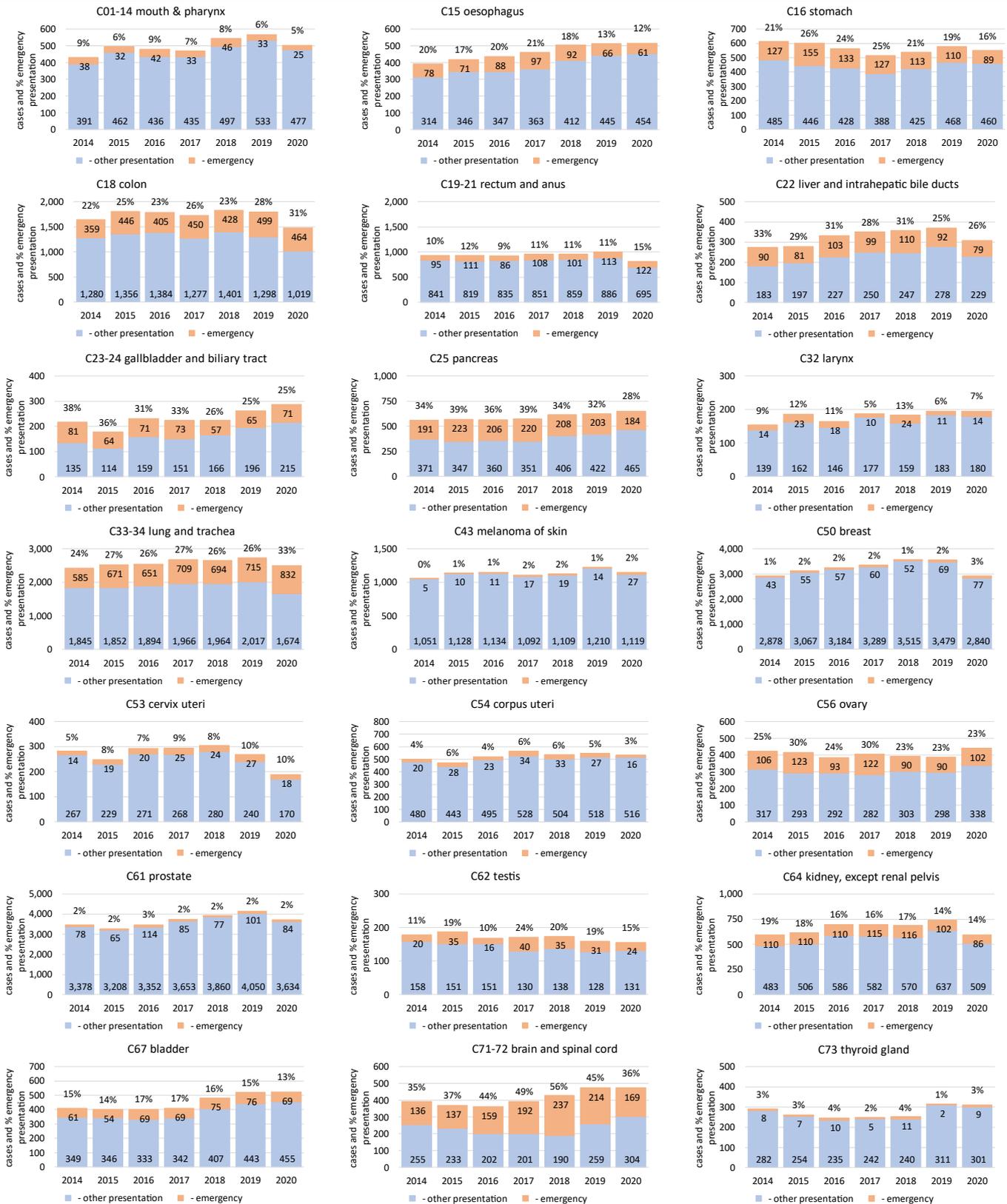
- 1) Introduce cancer awareness campaigns for specific diseases (e.g., lung cancer).
- 2) Expand electronic referrals for all General Practice cancer referrals.
- 3) Increase proportion of cancers diagnosed early.
- 4) Ensure that Rapid Access Clinic targets are met.
- 5) Ensure that GPs have direct access to diagnostics for patients meeting referral criteria.
- 6) Maintain target uptake rate for BreastCheck, CervicalCheck and BowelScreen.

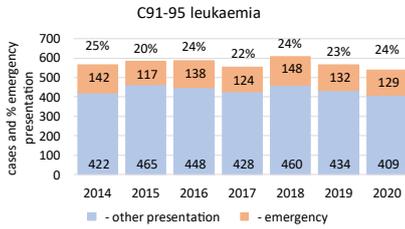
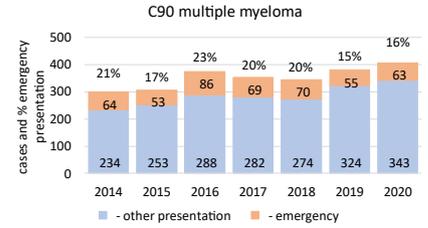
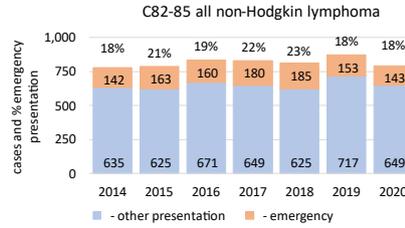
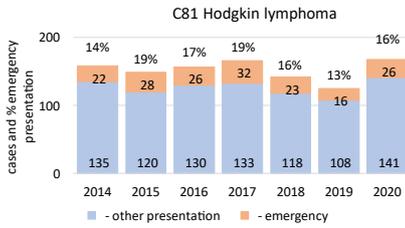
Looking at the rate and trend of emergency presentation for 25 individual cancers over the period 2014-2019 (Figure 7-3), there was no change in the trend of emergency presentation for most cancers, and the level of emergency presentation remained broadly in line with what was reported previously for each cancer during 2002-2015 [2].

Two cancers showed a decreasing trend in the rate of emergency presentation during 2014-2019: gallbladder/ biliary tract and kidney cancer. Cancer of the brain and spinal cord, the cancer with the highest rate of emergency presentation showed a marginal increasing trend in emergency presentations during 2014-2019 (Figure 7-3).

FIGURE 7-3

TREND IN EMERGENCY PRESENTATION DURING 2014-2020: BY CANCER TYPE





Cancers with significant downward trend (2016-2019) in proportion presenting emergently:

gallbladder & biliary tract

APC (2014-2019) 95%CI trend
-8.3 [-12.0, -4.3] ↓

kidney

APC (2014-2019) 95%CI trend
-4.5 [-8.6, -0.1] ↓

Cancer with significant upward trend (2016-2019) in proportion presenting emergently:

brain & spinal cord

APC (2014-2019) 95%CI trend
7.9 [0.0, 16.2] ↑

Static trend or 'no change' for all the other cancers. Data point for the atypical year 2020 (first year of COVID-19 pandemic) was omitted in trend estimation. Breast cancer graphic refers to females only

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APPENDIX I: INCIDENT CANCER CASES

3-year annual average 2019-2021: cases, risk of developing cancer before 75 th birthday and lifetime risk							
cancer	case count			risk # to age 75 1 in ...		lifetime risk # 1 in ...	
	males	females	all †	males	females	males	females
C00-96 all invasive cancers *	18,614	15,721	34,335				
C00-43 C45-96 all invasive cancers excl. NMSC	13,075	11,349	24,424	3	4	2	2
C00-96, D00-D48 all registered cancers	20,750	21,017	41,767				
D00-48 all non-invasive cancers **	2,137	5,296	7,433				
C00 lip	23	6	28	1,895	7,413	953	3,559
C01 base of tongue	32	11	43	1,070	2,937	840	2,300
C02 other and unspecified parts of tongue	64	33	96	537	1,256	396	722
C03 gum	12	9	21	3,288	4,536	2,024	2,271
C04 floor of mouth	27	11	37	1,221	3,554	1,021	2,053
C05 palate	18	14	32	2,124	2,854	1,357	1,871
C06 other and unspecified parts of mouth	26	19	46	1,253	2,555	967	1,023
C07 parotid gland	34	18	52	1,466	2,521	583	1,340
C08 other and unspecified major salivary glands	7	6	13	6,022	8,563	3,037	3,444
C09 tonsil	74	19	93	439	1,911	379	1,440
C10 oropharynx***	31	6	38	1,007	5,731	830	3,809
C11 nasopharynx	17	4	21	2,484	8,163	1,565	8,163
C12 pyriform sinus	14	4	18	2,695	13,237	1,628	5,461
C13 hypopharynx	21	5	26	1,795	7,780	1,100	4,693
C14 other and ill-defined sites of lip, oral cavity and pharynx	18	8	26	2,024	5,611	1,257	2,995
C01-14 mouth & pharynx	397	165	562	92	253	65	144
C00-14 lip oral cavity and pharynx	419	171	590	88	244	61	138
C01-C06 & C09-C13 oral & pharyngeal cancer	337	134	471	105	303	80	178
C15 oesophagus	358	161	519	111	339	63	118
C16 stomach	362	206	568	133	257	58	98
C17 small intestine	66	47	113	530	837	368	473
C18 colon	907	772	1,679	51	64	23	27
C19 rectosigmoid junction	99	64	163	427	717	225	308
C20 rectum	460	257	717	87	155	50	89
C21 anus	32	47	79	1,161	862	786	499
C19-20 rectosigmoid junction and rectum	559	322	881	72	127	41	69
C19-21 rectum and anus	591	369	960	68	111	39	61
C18-20 colorectum	1,466	1,093	2,560	30	43	15	19
C18-21 colorectum and anus	1,498	1,141	2,639	30	41	15	19
C17-21 intestine	1,564	1,188	2,752	28	39	14	18
C22 liver and intrahepatic bile ducts	228	103	331	185	462	95	200
C23 gallbladder	14	40	55	2,683	1,367	1,461	468
C24 other and unspecified parts of biliary tract	119	108	227	378	456	175	182
C23-24 gallbladder and biliary tract	133	148	281	331	342	157	131
C22-24 liver gall bladder and biliary	361	251	612	119	197	59	79
C25 pancreas	309	288	597	143	175	68	67
C26 other and ill-defined digestive organs	46	33	79	1,041	1,484	445	602
C30 nasal cavity and middle ear	14	8	22	3,214	6,143	1,633	2,488
C31 accessory sinuses	8	5	12	4,586	10,256	3,515	5,036
C32 larynx	163	33	196	226	1,097	146	731
C00-14 C30-32 all head and neck	604	217	821	63	192	42	109
C00-15 C32 lip oral pharynx larynx oesophagus	940	365	1,305	41	128	26	59
C33 trachea	2	2	4				
C34 bronchus and lung	1,386	1,199	2,586	31	35	15	18
C34 non-small cell lung cancer (NSCLC)	1,242	1,036	2,277	36	42	17	20
C34 small cell lung cancer (SCLC)	145	164	308	261	211	158	142
C33-34 lung and trachea	1,389	1,201	2,590	31	35	15	18
C37 thymus	8	7	15	4,637	5,312	3,117	3,743
C38 heart, mediastinum, and pleura	11	7	18	4,168	6,890	1,813	3,025
C39 other and ill-defined respiratory and intrathoracic	0	1	1				
C40 bone and articular cartilage of limbs	11	9	20	3,352	4,032	2,690	2,781
C41 bone and articular cartilage of other and unspecified	25	18	43	1,636	2,188	1,007	1,464
C40-41 bone and articular and unspecified	36	27	63	1,099	1,419	733	959
C43 melanoma of skin	608	603	1,211	73	68	37	40
C44 other skin	5,539	4,372	9,911	8	10	4	5
C45 mesothelioma	35	13	47	2,246	3,406	540	1,571
C46 Kaposi sarcoma	8	0	8	4,240		4,240	
C47 peripheral nerves and autonomic nervous system	3	2	5	18,219	19,606	9,270	12,991
C48 retroperitoneum and peritoneum	14	20	35	3,341	2,153	1,557	1,077
C49 other connective and soft tissue	123	79	202	386	508	182	326
C50 breast	30	3,422	3,452	1,408	11	728	7
C51 vulva		72	72		694		294
C51-52, C578-579 vaginal vulvar & related cancer		162	162		283		130
C52 vagina		16	16		2,787		1,337

3-year annual average 2019-2021: cases, risk of developing cancer before 75th birthday and lifetime risk

cancer	case count			risk # to age 75 1 in ...		lifetime risk # 1 in ...	
	males	females	all †	males	females	males	females
C53 cervix uteri		250	250		141		124
C53 cervical adenocarcinoma		53	53		670		593
C53 cervical squamous cell carcinoma		184	184		190		169
C54 corpus uteri		556	556		64		44
C55 uterus, part unspecified		39	39		967		624
C56 ovary		387	387		101		61
C56-C57 ovary and adnexa		415	415		94		57
C57 other and unspecified female genital organs		102	102		394		216
C58 placenta		2	2				
C51-52 C55 C57 C58 other malignant gynae neoplasms		230	230		185		96
C60 penis		50	50	773		469	
C61 prostate	3,980		3,980	9		6	
C62 testis	169		169	206		201	
C63 other and unspecified male genital organs	8		8	5,340		3,092	
C64 kidney, except renal pelvis	423	231	654	91	168	57	101
C64-C66, C68 kidney, renal pelvis, ureter and other	473	260	732	84	151	50	88
C65 renal pelvis	17	12	29	2,479	3,433	1,183	1,785
C66 ureter	21	12	33	2,885	3,650	928	1,668
C64-66 kidney incl. renal pelvis and ureter	461	254	715	85	154	52	90
C67 bladder	390	147	537	135	370	50	132
C67 (T0, T1, Ta, Tis), D090, D414 non-muscle invasive bladder (NMIBC)	470	151	621	99	281	45	143
C67 bladder & NMIBC	726	258	984	68	185	28	79
D090 carcinoma in-situ of bladder	224	66	290	200	581	98	358
D414 neoplasm of uncertain behaviour of bladder	111	43	155	421	994	182	472
C68 other and unspecified urinary organs	12	5	17	4,654	9,726	1,634	3,725
C69 eye and adnexa	43	26	68	900	1,353	584	1,038
C70 meninges	5	7	13	7,253	5,257	4,333	3,173
C71 brain	249	198	447	152	195	102	125
C72 spinal cord, cranial nerves and other parts of CNS	14	10	24	2,509	3,609	2,010	2,847
C71-72 brain and spinal cord	263	208	471	144	186	97	120
C70-72 malignant meninges brain and spinal cord	268	215	484	141	179	95	116
C70-72 D32-33 D42-43 all meninges brain and CNS	393	442	835	98	91	65	56
C73 thyroid gland	85	223	308	412	160	335	135
C74 adrenal gland	14	15	29	2,673	2,097	2,053	1,933
C75 other endocrine glands and related structures	18	13	31	2,460	2,860	1,456	1,855
C751-753 pituitary craniopharyngeal pineal brain	10	7	17	4,075	4,966	2,677	3,576
D352-354 benign pituitary craniopharyngeal pineal brain	61	55	116	587	698	424	507
C76 other and ill-defined sites	23	21	44	2,032	3,238	903	866
C80 neoplasm without specification of site	311	266	577	159	198	64	73
C81 Hodgkin lymphoma	83	73	156	439	491	348	391
C82 follicular nodular non-Hodgkin lymphoma	104	97	201	360	388	244	250
C83 diffuse non-Hodgkin lymphoma	237	157	394	182	277	94	137
C84 peripheral and cutaneous T-cell lymphomas	51	30	80	887	1,447	440	775
C85 other and unspecified types of non-Hodgkin lymphoma	88	69	157	504	642	248	302
C82-85 all non-Hodgkin lymphoma	479	353	833	88	119	48	63
C81-85 lymphoma (total)	562	426	989	73	95	42	54
C88 immunoproliferative diseases	13	7	19	3,195	8,808	1,652	3,141
C90 multiple myeloma	229	163	392	190	269	96	129
C88-90 multiple myeloma and immunoproliferative	241	170	411	179	261	90	124
C91 lymphoid leukaemia	182	107	290	231	345	127	222
C910 acute lymphoblastic leukaemia (ALL)	31	20	51	1,127	1,660	984	1,508
C911 chronic lymphocytic leukaemia (CLL)	126	72	198	361	529	170	305
C92 myeloid leukaemia	130	90	221	340	504	172	251
C920 acute myeloblastic leukaemia (AML)	75	54	129	619	822	288	421
C921 chronic myeloid leukaemia (CML)	43	25	67	987	1,847	544	931
C93 monocytic leukaemia	2	1	2	20,569	98,982	14,030	27,719
C94 other leukaemia of specified cell type	2	2	4	23,932	25,928	12,378	8,968
C95 leukaemia of unspecified cell type	13	12	26	4,568	4,450	1,275	1,508
C91-95 leukaemia	330	213	542	132	194	68	107
C96 other and unspecified lymphoid haematopoietic	241	207	448	196	234	88	100
D00 carcinoma in situ of oral cavity, oesophagus, and stomach	21	24	45				
D01 carcinoma in situ of other and unspecified digestive organs	14	17	31				
D02 carcinoma in situ of middle ear and respiratory system	24	11	35				
D03 melanoma in situ	383	397	780				
D04 carcinoma in situ of skin	660	822	1,482				
D05 carcinoma in situ of breast	2	391	393				
D06 carcinoma in situ of cervix uteri		2,653	2,653				
D07 carcinoma in situ of other and unspecified genital organs	74	69	142				
D09 carcinoma in situ of other and unspecified sites	238	73	311				
D13 benign other and ill-defined parts of digestive system	0	0	0				
D16 benign bone and articular cartilage	0		0				

3-year annual average 2019-2021: cases, risk of developing cancer before 75th birthday and lifetime risk

cancer	case count			risk # to age 75 1 in ...		lifetime risk # 1 in ...	
	males	females	all †	males	females	males	females
D17 benign lipomatous neoplasm	0	1	1				
D18 Haemangioma and lymphangioma, any site	3	2	5				
D21 other benign connective and other soft tissue	0	0	0				
D32 benign meninges	53	150	203				
D33 benign brain and other parts of CNS	26	33	59				
D32-33 benign meninges, brain & CNS	79	182	261				
D35 benign other and unspecified endocrine glands	61	55	116				
D36 benign other and unspecified sites	0	0	0				
D37 uncertain or unknown of oral cavity and digestive organs	70	97	167				
D38 uncertain or unknown of middle ear and respiratory intrathoracic	22	16	38				
D39 uncertain or unknown of female genital organs		99	99				
D40 uncertain or unknown of male genital organs	10		10				
D41 uncertain or unknown of urinary organs	124	50	174				
D42 uncertain or unknown of meninges	13	18	31				
D43 uncertain or unknown of brain and CNS	33	26	59				
D42-43 uncertain meninges, brain & CNS	45	44	90				
D44 uncertain or unknown of endocrine glands	23	48	71				
D47 other uncertain or unknown of lymphoid and haematopoietic	79	66	144				
D48 uncertain or unknown of other and unspecified sites	206	179	385				
HAEMACARE HAEMATOPOIETIC CANCER CATEGORIES							
H01 lymphoma NOS	28	29	57	1,774	1,518	753	728
H02 non-Hodgkin lymphoma NOS	57	39	97	748	1,162	385	525
H03 composite Hodgkin and Non-Hodgkin	1	0	1				
H04 Hodgkin lymphoma nodular lymphocyte predominance	10	2	12	3,381	19,512	3,151	19,512
H05 classical Hodgkin lymphoma	73	71	144	504	503	391	399
H06 chronic lymphocytic leukaemia/small lymphocytic lymphoma	129	74	203	351	520	165	297
H07 immunoproliferative diseases	20	13	34	2,096	3,735	991	1,549
H08 mantle cell/ centrocytic lymphoma	34	9	44	1,256	5,081	636	2,262
H09 follicular B-cell lymphoma	79	75	154	462	486	328	329
H10 diffuse B-cell lymphoma	177	130	307	246	335	125	165
H11 Burkitt lymphoma	12	7	19	2,977	5,114	2,359	3,660
H12 marginal zone lymphoma	27	25	52	1,420	1,698	844	950
H13 T-cell lymphoma cutaneous	20	11	31	2,325	3,498	1,057	2,203
H14 other T cell lymphomas	36	24	60	1,207	1,873	642	937
H15 lymphoblastic lymphoma/acute precursor cell lymphatic lymphoma	35	26	61	1,004	1,258	888	1,146
H16 plasma cell neoplasms	231	164	395	188	268	95	128
H18 mature B-cell leukaemia, hairy cell	15	3	19	2,398	10,194	1,800	8,298
H19 lymphatic leukaemia NOS	2	2	3				
H20 leukaemia NOS	13	12	26	4,568	4,450	1,275	1,508
H21 myeloid leukaemia NOS	4	4	8	15,369	15,686	4,481	4,642
H22 acute myeloid leukaemia	87	66	153	508	683	254	345
H23 myeloproliferative neoplasms	152	145	297	257	284	159	162
H24 myelodysplastic syndrome	109	73	183	576	1,001	168	236
H25 myelodysplastic, myeloproliferative neoplasm	17	9	26	2,832	6,286	1,203	2,112

† 3-year annual averages: male and female totals are subject to rounding.

*Incidence figures for C00-C96 where C96 presented in this report include polycythaemia vera, myelodysplastic syndromes and chronic myeloproliferative disease, considered malignant in ICDO3 but previously classed as uncertain behaviour (and previously coded under ICD10 codes D45-D47).

** D00-D48 tumours in this report exclude polycythaemia vera, myelodysplastic syndromes and chronic myeloproliferative disease (see note above).

*** The ICD-10 definition C10 "Malignant neoplasm of oropharynx" is not equivalent to (and is narrower than) the definition of "oropharyngeal" used to categorise subsites for purposes of identifying cancers where HPV may be involved. The broader, HPV-relevant definition includes the whole of C01 (base of tongue), C09 (tonsil) and C10 (oropharynx) and selected subsites within C02 (other/unspecified parts of tongue), C05 (palate) and C14 (other/ill-defined sites of lip, oral cavity & pharynx), further characterized by cell-type (squamous cell carcinoma).

Cumulative risk of developing cancer was calculated using the current probability method [7] [8]. Calculating the lifetime risk requires an estimate of incidence and mortality for the whole lifetime of individuals in a birth cohort using age-period-cohort modelling [31]. The lifetime risk (and risk to age 75) probabilities in this report were obtained by applying the cancer incidence and the all-cause mortality rates at different ages in a particular year as if they were to apply to a cohort as they aged. The risk figures (e.g., 1 in 10) presented here should be viewed as approximations; they assume that age-specific cancer rates and all-cause mortality rates are stable from year to year.

APPENDIX II: INCIDENT CANCER RATES

Age-standardised rate (ASR, per 100,000): annual average for 2019-2021. Incidence rate was calculated using two different age weights: 1976 and 2013 European standard populations (ESP).

Age-standardisation is one of the key methods to control for different age distributions among populations or over time. When comparing cancer incidence or mortality patterns between countries, regions or periods, variation in age and sex distribution can be misleading when looking at crude rates or case counts, and age-standardisation is recommended. The European population is ageing and Eurostat projections from 2008 to 2060 suggest that the age distribution will show a progressive shift to the older ages; the share of the population aged 65 and over is expected to increase in all countries and in particular the population aged 80 and over [6]. A task force for the revision of European Standard Population (ESP) (first published in 1976) recommended a more appropriate ESP for dissemination of public health statistics in the EU27, i.e. the '2013 ESP' [6]. Prior to the 2022 annual statistical report the NCRl routinely quoted cancer incidence and mortality rates using the 1976 ESP age weights in the main body of text, while quoting equivalent figures weighted by the 2013 ESP in appendices. Starting in 2022 we now quote rates adjusted using the 2013 ESP age weights in the main text while still retaining equivalent figures using the 1976 ESP in the appendices for continuity.

	ESP 1976			ESP 2013		
	male	female	all	male	female	all
C00-96 all invasive cancers	653.1	518.3	581.6	999.7	743.7	862.9
C00-43 C45-96 all invasive cancers excl. NMSC	461.5	379.1	417.7	696.9	533.8	609.7
C00-D48 all registered cancers	727.8	719.6	720.0	1113.6	970.9	1033.6
D00-48 all non-invasive cancers	74.7	201.3	138.5	113.9	227.1	170.7
C00 lip	0.8	0.2	0.5	1.2	0.3	0.7
C01 base of tongue	1.2	0.4	0.8	1.6	0.5	1.0
C02 other and unspecified parts of tongue	2.3	1.1	1.7	3.2	1.5	2.4
C03 gum	0.4	0.3	0.4	0.6	0.5	0.5
C04 floor of mouth	1.0	0.4	0.7	1.3	0.5	0.9
C05 palate	0.7	0.5	0.6	0.9	0.6	0.8
C06 other and unspecified parts of mouth	1.0	0.6	0.8	1.3	0.9	1.1
C07 parotid gland	1.2	0.6	0.9	1.9	0.8	1.3
C08 other and unspecified major salivary glands	0.2	0.2	0.2	0.4	0.3	0.3
C09 tonsil	2.8	0.7	1.7	3.5	0.8	2.2
C10 oropharynx	1.2	0.2	0.7	1.6	0.3	0.9
C11 nasopharynx	0.6	0.1	0.4	0.8	0.2	0.5
C12 pyriform sinus	0.5	0.1	0.3	0.8	0.2	0.5
C13 hypopharynx	0.8	0.2	0.5	1.1	0.2	0.7
C14 other and ill-defined sites in the lip, oral cavity, pharynx	0.6	0.3	0.4	1.0	0.4	0.7
C01-14 mouth & pharynx	14.6	5.6	10.0	20.0	7.8	13.7
C00-14 lip oral cavity and pharynx	15.4	5.8	10.5	21.3	8.0	14.4
C01-C06 & C09-C13 oral & pharyngeal cancer	12.5	4.6	8.5	16.7	6.3	11.4
C15 oesophagus	12.6	4.7	8.5	19.4	8.1	13.5
C16 stomach	12.4	6.3	9.1	20.4	10.1	14.9
C17 small intestine	2.4	1.5	1.9	3.4	2.3	2.8
C18 colon	31.1	23.8	27.3	50.2	37.5	43.4
C19 rectosigmoid junction	3.5	1.9	2.7	5.3	3.1	4.2
C20 rectum	16.3	8.6	12.3	24.4	12.2	17.9
C21 anus	1.2	1.6	1.4	1.6	2.2	1.9
C19-20 rectosigmoid junction and rectum	19.8	10.5	15.0	29.7	15.3	22.1
C19-21 rectum and anus	21.0	12.1	16.4	31.3	17.5	24.1
C18-20 colorectum	51.0	34.3	42.2	79.9	52.9	65.6
C18-21 colorectum and anus	52.1	35.9	43.6	81.6	55.1	67.5
C17-21 intestine	54.5	37.4	45.6	84.9	57.3	70.3
C22 liver and intrahepatic bile ducts	7.9	3.2	5.4	12.5	5.0	8.5
C23 gallbladder	0.5	1.2	0.9	0.8	2.0	1.5
C24 other and unspecified parts of biliary tract	4.1	3.2	3.6	6.7	5.4	6.0
C23-24 gallbladder and biliary tract	4.5	4.4	4.5	7.5	7.4	7.4
C22-24 liver gall bladder and biliary	12.4	7.5	9.9	19.9	12.4	16.0
C25 pancreas	10.5	8.6	9.5	17.2	14.3	15.8
C26 other and ill-defined digestive organs	1.6	1.0	1.3	2.6	1.6	2.1
C30 nasal cavity and middle ear	0.5	0.3	0.4	0.7	0.4	0.6
C31 accessory sinuses	0.3	0.2	0.2	0.4	0.2	0.3

AGE-STANDARDISED INCIDENCE RATE (ASR, PER 100,000): ANNUAL AVERAGE FOR 2019-2021

	ESP 1976			ESP 2013		
	male	female	all	male	female	all
C32 larynx	5.7	1.1	3.4	8.5	1.6	4.9
C00-14 C30-32 all head and neck	21.9	7.4	14.4	30.9	10.2	20.2
C00-15 C32 lip oral pharynx larynx oesophagus	33.7	11.7	22.3	49.2	17.7	32.8
C33 trachea	0.1	0.0	0.1	0.1	0.1	0.1
C34 bronchus and lung	47.3	37.6	42.1	77.4	59.6	67.7
C34 non-small cell lung cancer (NSCLC)	42.2	32.1	36.8	69.7	51.6	59.9
C34 small cell lung cancer (SCLC)	5.1	5.5	5.2	7.7	8.0	7.8
C33-34 lung and trachea	47.4	37.7	42.1	77.5	59.7	67.8
C37 thymus	0.3	0.3	0.3	0.4	0.3	0.4
C38 heart, mediastinum, and pleura	0.4	0.2	0.3	0.6	0.4	0.5
C39 other and ill-defined respiratory and intrathoracic	0.0	0.0	0.0	0.0	0.0	0.0
C40 bone and articular cartilage of limbs	0.4	0.3	0.4	0.5	0.4	0.4
C41 bone and articular cartilage of other and unspecified	0.9	0.6	0.8	1.2	0.8	1.0
C40-41 bone and articular and unspecified	1.4	1.0	1.2	1.7	1.2	1.4
C43 melanoma of skin	21.4	20.5	20.8	32.7	27.6	29.8
C44 other skin	191.6	139.2	163.9	302.9	210.0	253.2
C45 mesothelioma	1.1	0.4	0.7	2.1	0.6	1.3
C46 Kaposi sarcoma	0.3	0.0	0.1	0.3	0.0	0.2
C47 peripheral nerves and autonomic nervous system	0.1	0.1	0.1	0.1	0.1	0.1
C48 retroperitoneum and peritoneum	0.5	0.7	0.6	0.8	1.0	0.9
C49 other connective and soft tissue	4.3	2.8	3.5	6.5	3.5	4.8
C50 breast	1.0	120.1	62.0	1.6	156.0	81.5
C51 vulva		2.2	1.2		3.4	1.8
C51-52, C578-579 vaginal vulvar & related cancer		5.0	2.6		7.8	4.2
C52 vagina		0.5	0.3		0.8	0.4
C53 cervix uteri		9.5	4.8		10.4	5.3
C53 cervical adenocarcinoma		2.0	1.0		2.2	1.1
C53 cervical squamous cell carcinoma		7.0	3.6		7.7	3.9
C54 corpus uteri		19.2	9.8		26.4	13.6
C55 uterus, part unspecified		1.4	0.7		1.8	0.9
C56 ovary		13.2	6.8		18.2	9.5
C56-C57 ovary and adnexa		14.2	7.3		19.5	10.1
C57 other and unspecified female genital organs		3.3	1.7		5.0	2.6
C58 placenta		0.1	0.0		0.1	0.0
C51-52 C55 C57 C58 other malignant gynae neoplasms		7.4	3.9		11.0	5.8
C60 penis	1.8		0.9	2.6		1.3
C61 prostate	142.3		69.2	207.5		100.0
C62 testis	7.0		3.4	6.7		3.3
C63 other and unspecified male genital organs	0.3		0.1	0.4		0.2
C64 kidney, except renal pelvis	15.3	7.8	11.4	21.8	10.9	16.1
C64-C66, C68 kidney, renal pelvis, ureter and other	16.9	8.7	12.7	24.7	12.4	18.2
C65 renal pelvis	0.6	0.4	0.5	1.0	0.6	0.8
C66 ureter	0.7	0.4	0.5	1.2	0.6	0.9
C64-66 kidney incl. renal pelvis and ureter	16.5	8.5	12.4	24.0	12.1	17.8
C67 bladder	12.9	4.3	8.3	22.9	7.3	14.4
C67 (T0, T1, Ta, Tis), D090, D414 non-muscle invasive bladder (NMIBC)	15.9	4.8	10.1	26.3	7.4	16.2
C67 all bladder & NMIBC	24.4	7.9	15.6	41.4	12.7	26.0
D090 carcinoma in-situ of bladder	7.6	2.2	4.7	12.2	3.2	7.4
D414 neoplasm of uncertain behaviour of bladder	3.9	1.4	2.6	6.3	2.2	4.1
C68 other and unspecified urinary organs	0.4	0.2	0.3	0.7	0.3	0.5
C69 eye and adnexa	1.6	0.9	1.2	2.1	1.2	1.6
C70 meninges	0.2	0.2	0.2	0.3	0.4	0.3
C71 brain	9.3	7.0	8.1	12.2	9.0	10.5
C72 spinal cord, cranial nerves and other parts of CNS	0.5	0.4	0.5	0.6	0.4	0.5
C71-72 brain and spinal cord	9.9	7.4	8.6	12.9	9.4	11.1
C70-72 malignant meninges brain and spinal cord	10.1	7.7	8.8	13.1	9.8	11.4
C70-72 D32-33 D42-43 all meninges brain and CNS	14.7	15.5	15.1	19.2	20.1	19.6
C73 thyroid gland	3.2	8.5	5.9	3.9	9.4	6.7
C74 adrenal gland	0.5	0.6	0.6	0.6	0.6	0.6
C75 other endocrine glands and related structures	0.7	0.5	0.6	0.8	0.6	0.7
C751-753 pituitary craniopharyngeal pineal brain	0.4	0.3	0.3	0.4	0.3	0.4
D352-354 benign pituitary craniopharyngeal pineal brain	2.3	2.0	2.1	3.0	2.3	2.6
C76 other and ill-defined sites	0.8	0.6	0.7	1.3	1.0	1.1
C80 neoplasm without specification of site	10.5	7.9	9.1	17.9	13.1	15.2
C81 Hodgkin lymphoma	3.3	2.9	3.1	3.6	3.0	3.3
C82 follicular nodular non-Hodgkin lymphoma	3.8	3.3	3.5	5.2	4.6	4.9
C83 diffuse non-Hodgkin lymphoma	8.3	5.1	6.6	12.7	7.6	10.0
C84 peripheral and cutaneous T-cell lymphomas	1.8	1.0	1.3	2.7	1.4	2.0
C85 other and unspecified types of non-Hodgkin lymphoma	3.1	2.1	2.6	4.8	3.4	4.0
C82-85 all non-Hodgkin lymphoma	16.9	11.5	14.1	25.3	17.0	20.9
C81-85 lymphoma (total)	20.2	14.3	17.1	28.9	20.0	24.2

AGE-STANDARDISED INCIDENCE RATE (ASR, PER 100,000): ANNUAL AVERAGE FOR 2019-2021

	ESP 1976			ESP 2013		
	male	female	all	male	female	all
C88 immunoproliferative diseases	0.4	0.2	0.3	0.7	0.3	0.5
C90 multiple myeloma	7.9	5.2	6.5	12.5	7.9	10.1
C88-90 multiple myeloma and immunoproliferative	8.4	5.4	6.8	13.2	8.3	10.6
C91 lymphoid leukaemia	6.6	3.8	5.1	9.3	4.9	7.0
C910 acute lymphoblastic leukaemia (ALL)	1.3	0.9	1.1	1.2	0.8	1.0
C911 chronic lymphocytic leukaemia (CLL)	4.4	2.3	3.3	7.0	3.5	5.1
C92 myeloid leukaemia	4.6	3.0	3.8	6.9	4.2	5.4
C920 acute myeloblastic leukaemia (AML)	2.6	1.8	2.2	4.1	2.5	3.2
C921 chronic myeloid leukaemia (CML)	1.5	0.8	1.2	2.2	1.1	1.6
C93 monocytic leukaemia	0.1	0.0	0.0	0.1	0.0	0.1
C94 other leukaemia of specified cell type	0.1	0.1	0.1	0.1	0.1	0.1
C95 leukaemia of unspecified cell type	0.4	0.4	0.4	0.8	0.6	0.7
C91-95 leukaemia	11.9	7.2	9.4	17.2	9.8	13.2
C96 other and unspecified lymphoid haematopoietic	8.4	6.5	7.3	13.2	10.0	11.5
D00 carcinoma in situ of oral cavity, oesophagus, and stomach	0.8	0.8	0.8	1.1	1.1	1.1
D01 carcinoma in situ of other and unspecified digestive organs	0.5	0.6	0.5	0.7	0.8	0.8
D02 carcinoma in situ of middle ear and respiratory system	0.8	0.4	0.6	1.3	0.5	0.9
D03 melanoma in situ	13.5	13.8	13.6	20.1	18.3	19.1
D04 carcinoma in situ of skin	22.4	24.6	23.6	36.5	41.1	39.0
D05 carcinoma in situ of breast	0.1	14.9	7.6	0.1	17.2	8.8
D06 carcinoma in situ of cervix uteri		112.0	56.6		103.9	52.6
D07 carcinoma in situ of other and unspecified genital organs	2.8	2.6	2.7	3.6	2.9	3.3
D09 carcinoma in situ of other and unspecified sites	8.0	2.4	5.1	13.0	3.5	8.0
D13 benign other and ill-defined parts of digestive system		0.0	0.0		0.0	0.0
D16 benign bone and articular cartilage	0.0		0.0	0.0		0.0
D17 benign lipomatous neoplasm	0.0	0.0	0.0	0.0	0.0	0.0
D18 Haemangioma and lymphangioma, any site	0.1	0.1	0.1	0.1	0.1	0.1
D21 other benign connective and other soft tissue	0.0		0.0	0.0		0.0
D32 benign meninges	1.8	4.9	3.4	2.9	7.1	5.1
D33 benign brain and other parts of CNS	1.0	1.2	1.1	1.2	1.4	1.3
D32-33 benign meninges, brain & CNS	2.9	6.1	4.5	4.1	8.5	6.4
D35 benign other and unspecified endocrine glands	2.3	2.0	2.1	3.0	2.3	2.6
D36 benign other and unspecified sites	0.0	0.0	0.0	0.0	0.0	0.0
D37 uncertain or unknown of oral cavity and digestive organs	2.5	3.3	2.9	3.5	4.5	4.0
D38 uncertain or unknown of middle ear and respiratory intrathoracic	0.7	0.5	0.6	1.1	0.7	0.9
D39 uncertain or unknown of female genital organs		3.8	1.9		4.2	2.1
D40 uncertain or unknown of male genital organs	0.4		0.2	0.5		0.2
D41 uncertain or unknown of urinary organs	4.3	1.6	2.9	7.0	2.5	4.6
D42 uncertain or unknown of meninges	0.5	0.6	0.5	0.6	0.8	0.7
D43 uncertain or unknown of brain and CNS	1.3	1.0	1.1	1.4	1.0	1.2
D42-43 uncertain meninges, brain & CNS	1.7	1.6	1.7	1.9	1.9	1.9
D44 uncertain or unknown of endocrine glands	0.9	1.8	1.3	1.0	2.1	1.6
D47 other uncertain or unknown lymphoid haematopoietic	2.7	2.1	2.4	4.3	3.2	3.7
D48 uncertain or unknown of other and unspecified sites	7.2	6.3	6.7	11.0	7.8	9.2
HAEMACARE HAEMATOPOIETIC CANCER CATEGORIES						
H01 lymphoma NOS	1.0	0.9	0.9	1.6	1.4	1.5
H02 non-Hodgkin lymphoma NOS	2.0	1.2	1.6	3.1	2.0	2.5
H03 composite Hodgkin and Non-Hodgkin	0.0	0.0	0.0	0.0	0.0	0.0
H04 Hodgkin lymphoma nodular lymphocyte predominance	0.4	0.1	0.2	0.4	0.1	0.2
H05 classical Hodgkin lymphoma	2.9	2.8	2.8	3.2	3.0	3.1
H06 chronic lymphocytic leukaemia/small lymphocytic lymphoma	4.5	2.4	3.4	7.2	3.6	5.2
H07 immunoproliferative diseases	0.7	0.4	0.5	1.1	0.7	0.9
H08 mantle cell/ centrocytic lymphoma	1.2	0.3	0.7	1.9	0.5	1.1
H09 follicular B-cell lymphoma	2.9	2.5	2.7	3.9	3.5	3.7
H10 diffuse B-cell lymphoma	6.2	4.1	5.1	9.5	6.3	7.8
H11 Burkitt lymphoma	0.5	0.3	0.4	0.5	0.3	0.4
H12 marginal zone lymphoma	1.0	0.8	0.9	1.4	1.2	1.3
H13 T-cell lymphoma cutaneous	0.7	0.4	0.5	1.1	0.5	0.8
H14 other T cell lymphomas	1.3	0.8	1.0	1.9	1.1	1.5
H15 lymphoblastic lymphoma/acute precursor cell lymphoma	1.5	1.2	1.3	1.3	1.0	1.1
H16 plasma cell neoplasms	8.0	5.2	6.5	12.6	8.0	10.2
H18 mature B-cell leukaemia, hairy cell	0.6	0.1	0.3	0.7	0.1	0.4
H19 lymphatic leukaemia NOS	0.1	0.1	0.1	0.1	0.1	0.1
H20 leukaemia NOS	0.4	0.4	0.4	0.8	0.6	0.7
H21 myeloid leukaemia NOS	0.2	0.1	0.1	0.3	0.2	0.2
H22 acute myeloid leukaemia	3.1	2.2	2.6	4.6	3.0	3.8
H23 myeloproliferative neoplasms	5.5	4.9	5.2	7.7	6.8	7.2
H24 myelodysplastic syndrome	3.6	2.0	2.7	6.5	3.7	5.0
H25 myelodysplastic, myeloproliferative neoplasm	0.6	0.3	0.4	1.0	0.4	0.7

APPENDIX III: MORTALITY

3-YEAR ANNUAL AVERAGE DEATHS (2019-2021) AND RISK OF DYING OF CANCER BEFORE 75 TH BIRTHDAY					
cancer	deaths			# risk of cancer death before 75 th birthday	
	male	female	all●	male	female
C00-97, D00-48 all neoplasms	5,320	4,554	9,874	10	12
C00-97 all invasive cancers	5,184	4,436	9,621	10	12
C00-43, C45-97 all invasive cancers excl. NMSC	5,112	4,409	9,521	10	12
C00-14 lip oral cavity and pharynx	142	58	200	250	899
C00-14, C30-32 all head and neck	201	74	275	177	648
C01-C06, C09-C13 oral & pharyngeal cancer	111	45	156	304	1,113
C15 oesophagus	293	141	434	133	405
C16 stomach	196	107	303	254	544
C17 small intestine	19	11	30	2,161	3,991
C18-21 colorectum and anus	591	438	1,029	79	134
C17-21 intestine	610	449	1,059	77	130
C22 liver and intrahepatic bile ducts	258	153	411	156	329
C23-24 gallbladder and biliary tract	21	44	65	2,208	1,416
C22-24 liver gall bladder and biliary	279	197	476	146	267
C25 pancreas	296	273	569	136	190
C32 larynx	54	13	66	651	2,759
C33-34 lung and trachea	1,081	865	1,946	37	50
C40-41 bone and articular	14	12	27	3,149	3,650
C43 melanoma of skin	103	59	162	437	857
C45 mesothelioma	35	9	44	1,915	5,097
C50 breast	7	723	730	6,074	67
C51-52, C578-579 vaginal, vulvar & related cancer		27	27		2,595
C53 cervix uteri		82	82		446
C54 corpus uteri		112	112		445
C56-C57 ovary and adnexa		307	307		138
C61 prostate	623		623	138	
C62 testis	5		5	8,313	
C64 kidney, except renal pelvis	145	71	216	310	852
C64-C66, C68 kidney, renal pelvis, ureter and other	190	91	281	243	636
C67 bladder	166	71	236	426	1,170
C71-72 brain and spinal cord	191	121	312	185	305
D32-33 benign meninges, brain & CNS	8	12	19	5,231	6,193
D42-43 uncertain meninges, brain & CNS	17	17	33	4,150	4,009
C70-72, D32-33, D42-43 all meninges brain and CNS	216	150	366	171	270
C73 thyroid gland	12	13	25	3,930	4,045
C81 Hodgkin lymphoma	11	11	22	4,687	5,552
C82-85 non-Hodgkin lymphoma	158	127	285	346	551
C90 multiple myeloma	110	80	190	469	765
C91-95 leukaemia	176	99	276	285	583

Source of data: Central Statistics Office, Ireland

● 3-year annual averages: (i.e., male + female) deaths are subject to rounding
 # risk of dying of cancer before 75th birthday calculated using the cumulative risk method [11]: 1 in [...], e.g. 1 in 10 risk for males of dying of an invasive cancer (C00-97) before 75th birthday during the period 2019-2021.

APPENDIX IV: MORTALITY RATES

Age-standardised mortality rate (ASMR, per 100,000): annual average for 2019-2021. Mortality rate was calculated using two different age weights: 1976 and 2013 European Standard Populations (ESP) [6].

AGE-STANDARDISED MORTALITY RATE (ASMR PER 100,000): ANNUAL AVERAGE 2019-2021				
cancer	ESP 1976		ESP 2013	
	males	females	males	females
C00-97, D00-48 all registered cancers	177.7	132.2	344.3	225.3
C00-97 all invasive cancers	173.3	129.1	334.9	219.3
C00-43 C45-97 all invasive cancers excl. NMSC	170.9	128.4	329.2	217.9
C00-14 lip, oral cavity and pharynx	4.9	1.7	7.5	2.9
C00-14, C30-32 all head and neck	6.9	2.2	10.7	3.6
C01-C06, C09-C13 oral & pharyngeal cancer	3.9	1.3	5.7	2.2
C15 oesophagus	10.1	3.9	17.4	7.1
C16 stomach	6.5	3.0	12.6	5.3
C17 small intestine	0.7	0.3	1.1	0.5
C18-21 colorectum and anus	19.8	12.3	38.7	21.9
C17-21 intestine	20.5	12.6	39.8	22.4
C22 liver and intrahepatic bile ducts	8.6	4.4	15.6	7.6
C23-24 gallbladder and biliary tract	0.7	1.2	1.2	2.2
C22-24 liver gall bladder and biliary tract	9.3	5.6	16.9	9.8
C25 pancreas	9.9	7.7	18.2	13.7
C32 larynx	1.8	0.4	2.9	0.6
C33-34 lung and trachea	36.1	25.6	65.8	43.1
C40-41 bone and articular	0.5	0.4	0.7	0.6
C43 melanoma of skin	3.5	1.7	6.6	2.8
C45 mesothelioma	1.1	0.3	2.1	0.4
C50 breast	0.2	21.9	0.4	35.0
C51-52, C578-579 vaginal, vulvar & related cancer		0.7		1.4
C53 cervix uteri		2.9		3.7
C54 corpus uteri		3.2		5.6
C56-C57 ovary and adnexa		9.3		15.0
C61 prostate	20.1		50.3	
C62 testis	0.2		0.3	
C64 kidney, except renal pelvis	4.9	2.0	9.0	3.5
C64-C66, C68 kidney, renal pelvis, ureter and other	6.4	2.6	11.5	4.6
C67 bladder	5.4	1.8	12.7	3.6
C71-72 brain and spinal cord	6.9	4.0	9.6	5.7
D32-33 benign meninges, brain & CNS	0.3	0.3	0.4	0.6
D42-43 uncertain meninges, brain & CNS	0.6	0.5	1.0	0.8
C70-72, D32-33, D42-43 all meninges brain and CNS	7.7	4.8	11.1	7.1
C73 thyroid	0.4	0.4	0.6	0.6
C81 Hodgkin lymphoma	0.4	0.3	0.7	0.6
C82-85 all non-Hodgkin lymphoma	5.2	3.4	10.2	6.4
C90 multiple myeloma	3.6	2.2	7.4	4.1
C91-95 leukaemia	5.9	2.7	11.8	5.0

Source of data: Central Statistics Office, Ireland (by year of death)

APPENDIX V: PREVALENCE

ESTIMATED COMPLETE PREVALENCE BY CANCER SITE, SEX AND AGE: NUMBER OF CANCER SURVIVORS ON 31/12/2021

cancer	females			males			males and females		
	<50	50+	all*	<50	50+	all*	<50	50+	all*
C00-43, C45-96 all invasive cancers excl. NMSC	16,926	93,913	110,840	10,877	93,189	104,065	27,803	187,102	214,905
C01-14 mouth & pharynx	202	1,191	1,392	274	2,227	2,501	476	3,417	3,893
C15 oesophagus	19	528	547	52	1,052	1,104	71	1,580	1,651
C16 stomach	95	930	1,025	90	1,456	1,546	185	2,386	2,571
C18-20 colorectum	1,004	10,048	11,052	790	12,584	13,375	1,794	22,633	24,426
C22 liver	52	186	238	75	518	593	127	704	831
C25 pancreas	68	474	542	39	497	536	107	971	1,078
C33-34 lung and trachea	188	3,818	4,006	148	3,453	3,601	337	7,270	7,607
C43 melanoma of skin	1,880	7,427	9,307	927	5,465	6,392	2,807	12,892	15,699
C50 breast	5,128	43,755	48,883	14	267	281	5,143	44,022	49,164
C53 cervix uteri	1,754	3,436	5,190				1,754	3,436	5,190
C54 corpus uteri	269	6,476	6,746				269	6,476	6,746
C56 ovary	500	2,823	3,323				500	2,823	3,323
C51-52, C55, C57, C58 other malignant gynaecological neoplasms	194	1,171	1,364				194	1,171	1,364
C61 prostate				365	46,052	46,417	365	46,052	46,417
C62 testis				2,554	2,780	5,334	2,554	2,780	5,334
C64 kidney	351	2,065	2,416	448	3,423	3,871	799	5,488	6,287
C67 bladder	31	1,255	1,286	69	2,936	3,005	100	4,191	4,291
C71-72 brain and spinal cord	595	604	1,200	642	631	1,273	1,238	1,235	2,473
C73 thyroid	1,291	1,793	3,084	308	627	935	1,599	2,420	4,019
C81 Hodgkin lymphoma	820	676	1,496	846	865	1,712	1,666	1,541	3,208
C82-85 non-Hodgkin lymphoma	524	3,680	4,204	780	4,062	4,842	1,304	7,742	9,047
C90 multiple myeloma	55	892	947	77	1,291	1,368	132	2,183	2,315
C91-95 leukaemia	897	1,766	2,664	991	2,769	3,760	1,888	4,535	6,423

* Figures subject to rounding

APPENDIX VI: OBSERVED VS. PROJECTED CANCER INCIDENCE, 2021 (all cases)

sex	cancer	registered 2021	projected 2021	95% projection Interval (PI)	% change	registered relative to PI
M	C00-43 C45-96 all invasive cancers excl. NMSC	13,425	14,373	14,072-14,674	-7%	lower
M	C01-14 mouth & pharynx	433	438	402-474	-1%	expected
M	C15 oesophagus	379	332	288-377	14%	higher
M	C16 stomach	364	341	234-449	7%	expected
M	C18-20 colorectum	1,569	1,532	1,442-1,621	2%	expected
M	C22 liver and intrahepatic bile ducts	212	332	292-372	-36%	lower
M	C25 pancreas	283	345	304-387	-18%	lower
M	C33-34 lung and trachea	1,324	1,559	1,492-1,626	-15%	lower
M	C43 melanoma of skin	636	603	481-724	6%	expected
M	C61 prostate	4,071	4,662	4,551-4,773	-13%	lower
M	C62 testis	193	165	143-188	17%	higher
M	C64 kidney, except renal pelvis	418	493	430-556	-15%	lower
M	C67 bladder	414	424	235-614	-2%	expected
M	C71-72 brain and spinal cord	252	254	223-285	-1%	expected
M	C73 thyroid gland	81	106	83-128	-23%	lower
M	C81 Hodgkin lymphoma	97	59	1-118	64%	expected
M	C82-85 all non-Hodgkin lymphoma	471	553	512-594	-15%	lower
M	C90 multiple myeloma	236	226	191-261	4%	expected
M	C91-95 leukaemia	313	381	337-425	-18%	lower
sex	cancer	registered 2021	projected 2021	95% projection Interval (PI)	% change	registered relative to PI
F	C00-43 C45-96 all invasive cancers excl. NMSC	11,906	12,077	11,711-12,444	-1%	expected
F	C01-14 mouth & pharynx	185	190	162-217	-2%	expected
F	C15 oesophagus	153	158	131-185	-3%	expected
F	C16 stomach	213	204	171-237	4%	expected
F	C18-20 colorectum	1,175	1,200	1,134-1,266	-2%	expected
F	C22 liver and intrahepatic bile ducts	102	137	119-156	-26%	lower
F	C25 pancreas	233	312	277-346	-25%	lower
F	C33-34 lung and trachea	1,207	1,238	1,095-1,381	-3%	expected
F	C43 melanoma of skin	627	719	653-786	-13%	lower
F	C50 breast	3,802	3,917	3,665-4,168	-3%	expected
F	C53 cervix uteri	294	265	197-334	11%	expected
F	C54 corpus uteri	590	640	580-701	-8%	expected
F	C56 ovary	333	425	381-469	-22%	lower
F	C64 kidney, except renal pelvis	209	287	259-314	-27%	lower
F	C67 bladder	155	189	128-251	-18%	expected
F	C71-72 brain and spinal cord	215	188	156-220	14%	expected
F	C73 thyroid gland	219	195	130-261	12%	expected
F	C81 Hodgkin lymphoma	80	77	61-94	4%	expected
F	C82-85 all non-Hodgkin lymphoma	365	428	380-476	-15%	lower
F	C90 multiple myeloma	155	151	118-185	3%	expected
F	C91-95 leukaemia	210	237	195-279	-11%	expected
sex	cancer	registered 2021	projected 2021	95% projection Interval (PI)	% change	registered relative to PI
ALL	C00-43 C45-96 all invasive cancers excl. NMSC	25,331	26,451	25,783-27,118	-4%	lower
M&F	C01-14 mouth & pharynx	618	628	564-691	-2%	expected
M&F	C15 oesophagus	532	491	419-562	8%	expected
M&F	C16 stomach	577	545	405-685	6%	expected
M&F	C18-20 colorectum	2,744	2,732	2,576-2,887	0%	expected
M&F	C22 liver and intrahepatic bile ducts	314	470	411-528	-33%	lower
M&F	C25 pancreas	516	657	581-733	-21%	lower
M&F	C33-34 lung and trachea	2,531	2,797	2,588-3,007	-10%	lower
M&F	C43 melanoma of skin	1,263	1,322	1,134-1,510	-4%	expected
M&F	C64 kidney, except renal pelvis	627	780	689-871	-20%	lower
M&F	C67 bladder	569	614	362-865	-7%	expected
M&F	C71-72 brain and spinal cord	467	442	379-506	6%	expected
M&F	C73 thyroid gland	300	301	213-390	0%	expected
M&F	C81 Hodgkin lymphoma	177	136	62-212	30%	expected
M&F	C82-85 all non-Hodgkin lymphoma	836	981	892-1070	-15%	lower
M&F	C90 multiple myeloma	391	377	309-446	4%	expected
M&F	C91-95 leukaemia	523	618	532-704	-15%	lower

Interpretation: Based on the last stable trend in incident cases (up to 2019), for each cancer type the projected number of cases was calculated for 2021 (ignoring the effect of the COVID-19 pandemic). The column ('% change') represents the complement of the number of registered cases in 2021 expressed as a percentage of projected number of cases for 2021, i.e. $[(\text{registered cases } 2021 / \text{projected cases } 2021) - 1] * 100$. For *all invasive cancers excluding NMSC*, for both sexes combined, the estimated % change (or *shortfall*) in expected cases for 2021 was 4% (7% for males; 1% for females).

APPENDIX VII: OBSERVED VS. PROJECTED INCIDENCE, 2021 (microscopically verified)

sex	cancer	registered 2021	projected 2021	95% projection Interval (PI)	% change	registered relative to PI
M	C00-43 C45-96 all invasive cancers excl. NMSC	11,788	12,337	11,854-12,820	-4%	lower
M	C01-14 mouth & pharynx	396	429	393-464	-8%	expected
M	C15 oesophagus	354	331	291-371	7%	expected
M	C16 stomach	344	317	210-424	9%	expected
M	C18-20 colorectum	1,484	1,518	1,419-1,617	-2%	expected
M	C22 liver and intrahepatic bile ducts	114	146	117-175	-22%	lower
M	C25 pancreas	200	256	202-310	-22%	lower
M	C33-34 lung and trachea	1,061	1,272	1,193-1,351	-17%	lower
M	C43 melanoma of skin	628	600	479-720	5%	expected
M	C61 prostate	3,836	4,398	4,241-4,555	-13%	lower
M	C62 testis	184	161	136-185	14%	expected
M	C64 kidney, except renal pelvis	346	455	415-496	-24%	lower
M	C67 bladder	366	372	228-516	-2%	expected
M	C71-72 brain and spinal cord	168	213	188-238	-21%	lower
M	C73 thyroid gland	77	106	84-128	-28%	lower
M	C81 Hodgkin lymphoma	95	52	1-130	82%	expected
M	C82-85 all non-Hodgkin lymphoma	416	543	505-581	-23%	lower
M	C90 multiple myeloma	187	212	182-241	-12%	expected
M	C91-95 leukaemia	244	362	317-407	-33%	lower
sex	cancer	registered 2021	projected 2021	95% projection Interval (PI)	% change	registered relative to PI
F	C00-43 C45-96 all invasive cancers excl. NMSC	10,672	10,931	10,714-11,148	-2%	lower
F	C01-14 mouth & pharynx	160	174	145-204	-8%	expected
F	C15 oesophagus	138	152	126-178	-9%	expected
F	C16 stomach	194	198	167-230	-2%	expected
F	C18-20 colorectum	1,099	1,095	1,024-1,165	0%	expected
F	C22 liver and intrahepatic bile ducts	57	78	67-89	-27%	lower
F	C25 pancreas	170	215	179-252	-21%	lower
F	C33-34 lung and trachea	944	1,043	930-1156	-10%	expected
F	C43 melanoma of skin	615	718	652-784	-14%	lower
F	C50 breast	3,719	3,687	3,418-3,957	1%	expected
F	C53 cervix uteri	291	263	195-332	10%	expected
F	C54 corpus uteri	570	626	568-684	-9%	expected
F	C56 ovary	292	385	338-432	-24%	lower
F	C64 kidney, except renal pelvis	169	244	218-269	-31%	lower
F	C67 bladder	134	105	75-134	28%	higher
F	C71-72 brain and spinal cord	155	138	112-164	12%	expected
F	C73 thyroid gland	210	183	126-241	14%	expected
F	C81 Hodgkin lymphoma	79	76	59-93	4%	expected
F	C82-85 all non-Hodgkin lymphoma	309	351	267-434	-12%	expected
F	C90 multiple myeloma	119	138	109-167	-14%	expected
F	C91-95 leukaemia	155	163	110-215	-5%	expected
sex	cancer	registered 2021	projected 2021	95% projection Interval (PI)	% change	registered relative to PI
ALL	C00-43 C45-96 all invasive cancers excl. NMSC	22,460	23,268	22,568-23,968	-3%	lower
M&F	C01-14 mouth & pharynx	556	603	538-668	-8%	expected
M&F	C15 oesophagus	492	483	416-549	2%	expected
M&F	C16 stomach	538	515	377-654	4%	expected
M&F	C18-20 colorectum	2,583	2,613	2,443-2,782	-1%	expected
M&F	C22 liver and intrahepatic bile ducts	171	224	184-264	-24%	lower
M&F	C25 pancreas	370	471	381-561	-21%	lower
M&F	C33-34 lung and trachea	2,005	2,315	2,124-2,507	-13%	lower
M&F	C43 melanoma of skin	1,243	1,318	1,131-1,504	-6%	expected
M&F	C64 kidney, except renal pelvis	515	699	633-765	-26%	lower
M&F	C67 bladder	500	476	303-650	5%	expected
M&F	C71-72 brain and spinal cord	323	351	300-402	-8%	expected
M&F	C73 thyroid gland	287	290	210-369	-1%	expected
M&F	C81 Hodgkin lymphoma	174	128	60-224	35%	expected
M&F	C82-85 all non-Hodgkin lymphoma	725	894	772-1015	-19%	lower
M&F	C90 multiple myeloma	306	350	291-408	-12%	expected
M&F	C91-95 leukaemia	399	524	428-621	-24%	lower

Interpretation: Based on the last stable trend in incident cases (up to 2019), for each cancer type the projected number of cases was calculated for 2021 (ignoring the effect of the COVID-19 pandemic). The column ('% change') represents the complement of the number of registered microscopically verified cases in 2021 expressed as a percentage of projected number of microscopically verified cases for 2021, i.e. [(registered cases 2021 / projected cases 2021) - 1] * 100. For *all invasive cancers excluding NMSC*, for both sexes combined, the estimated % change (or *shortfall*) in expected cases for 2021 was 3% (4% for males; 2% for females).