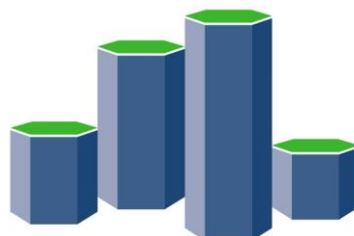# Rectal cancer

1993-2022

(ICD10 codes: C19-C20)

Northern Ireland
Cancer Registry

Northern Ireland Cancer Registry, 2024

An official statistics publication

ABOUT THIS REPORT

Contents

This report includes information on incidence of rectal cancer as recorded by the Northern Ireland Cancer Registry (NICR). Incidence data is available annually from 1993 to 2022, however in order to provide stable and robust figures the majority of information presented in this report is based upon the average number of cases diagnosed in the last five years.

Methodology

The methodology used in producing the statistics presented in this report, including details of data sources, classifications and coding are available in the accompanying methodology report available at: www.qub.ac.uk/research-centres/nicr/CancerInformation/official-statistics.

Official statistics

The incidence, prevalence and survival statistics in this publication are designated as official statistics signifying that they comply with the Code of Practice for Official Statistics. Further information on this code is available at code.statisticsauthority.gov.uk.

Cancer mortality data

The NI Statistics and Research Agency (NISRA) is the official statistics provider of cancer mortality data in Northern Ireland. However, for completeness, data on cancer mortality is also provided in this report. While analysis is conducted by NICR staff, the original data is provided courtesy of the General Register Office (NI) via the Department of Health.

Reuse of information

The information in this report (and any supplementary material) is available for reuse free of charge and without the need to contact NICR. However, we request that NICR is acknowledged as the source of any reused information. The following reference is recommended:

Northern Ireland Cancer Registry 2024. Rectal cancer: 1993-2022. Available at: www.qub.ac.uk/research-centres/nicr

Further information

Further information is available at: www.qub.ac.uk/research-centres/nicr
Phone: +44 (0)28 9097 6028   **e-mail:** nicr@qub.ac.uk

Acknowledgements

The Northern Ireland Cancer Registry (NICR) uses data provided by patients and collected by the health service as part of their care and support.
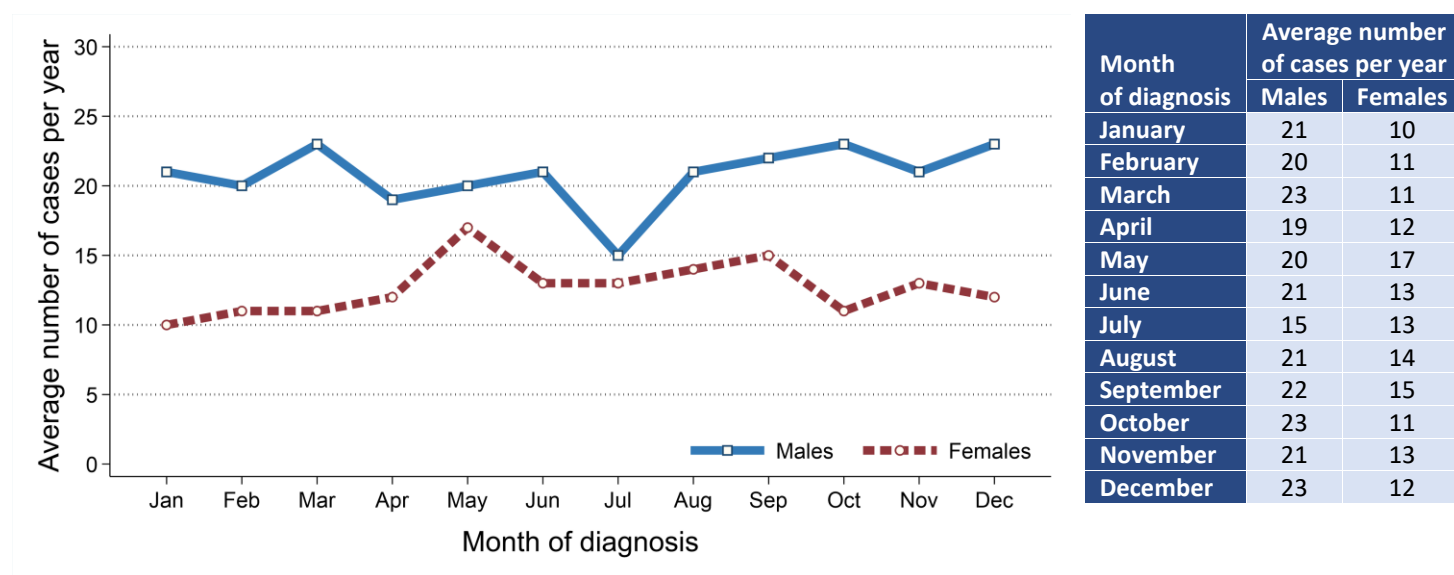
NICR is funded by the Public Health Agency and is based in Queen's University, Belfast.
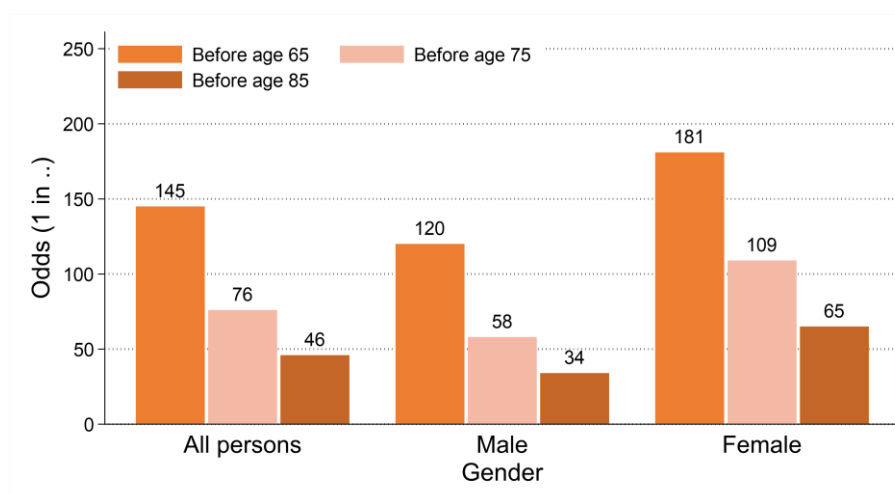
INCIDENCE

- There were 2,009 cases of rectal cancer diagnosed during 2018-2022 in Northern Ireland. On average this was 402 cases per year.
- During this period 38.0% of rectal cancer cases were among women (Male cases: 1,245, Female cases: 764). On average there were 249 male and 153 female cases of rectal cancer per year.
- The most common diagnosis month during 2018-2022 was October, March and December among males with 23 cases per year and May among females with 17 cases per year.

Figure 1: Average number of cases of rectal cancer per year in 2018-2022 by month of diagnosis

Month of diagnosis	Average number of cases per year	
	Males	Females
January	21	10
February	20	11
March	23	11
April	19	12
May	20	17
June	21	13
July	15	13
August	21	14
September	22	15
October	23	11
November	21	13
December	23	12

- The rectal cancer incidence rates for each gender were 26.6 cases per 100,000 males and 15.8 cases per 100,000 females.
- The odds of developing rectal cancer before age 85 was 1 in 34 for men and 1 in 65 for women.

Figure 2: Odds of developing rectal cancer in 2018-2022

- The median age of patients diagnosed with rectal cancer during 2018-2022 was 68 years (Males: 68, Females: 67).
- The risk of developing rectal cancer varied by age, with 29.3% of men and 34.2% of women diagnosed with rectal cancer aged 75 and over at diagnosis.
- In contrast, 14.9% of patients diagnosed with rectal cancer were aged 0 to 54 at diagnosis.

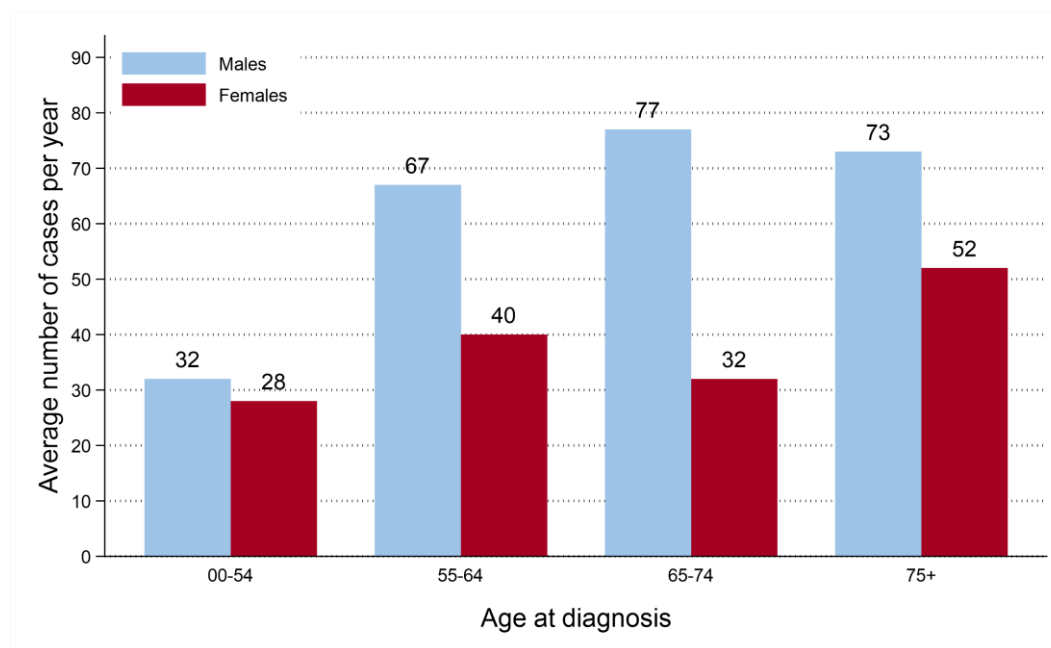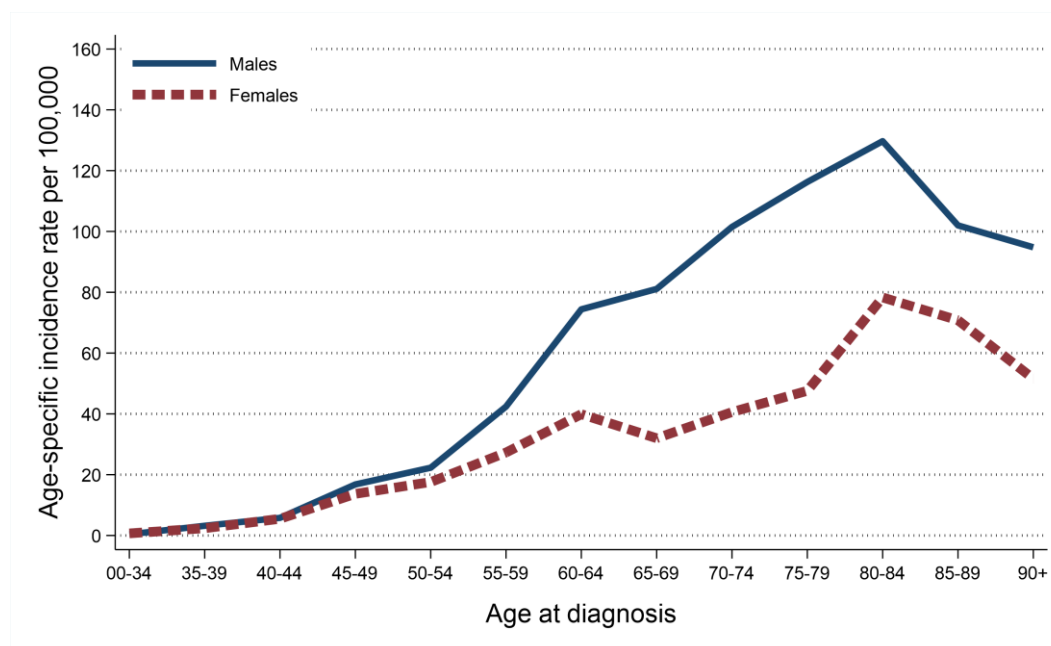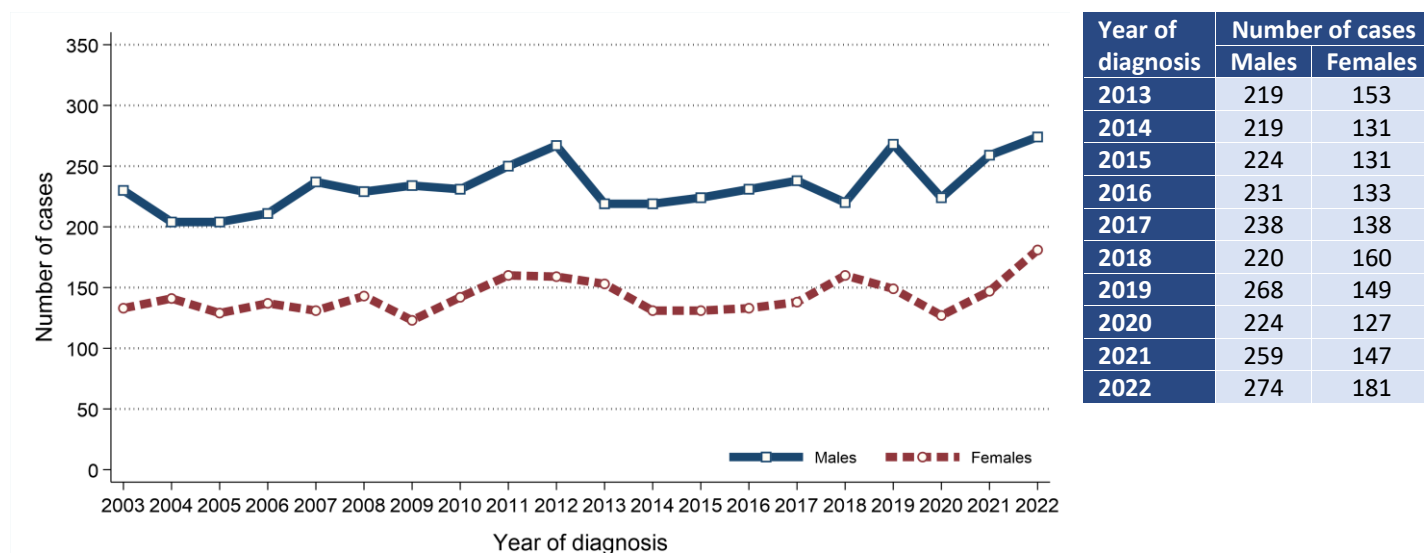*Figure 3: Average number of cases of rectal cancer diagnosed per year in 2018-2022 by age at diagnosis*

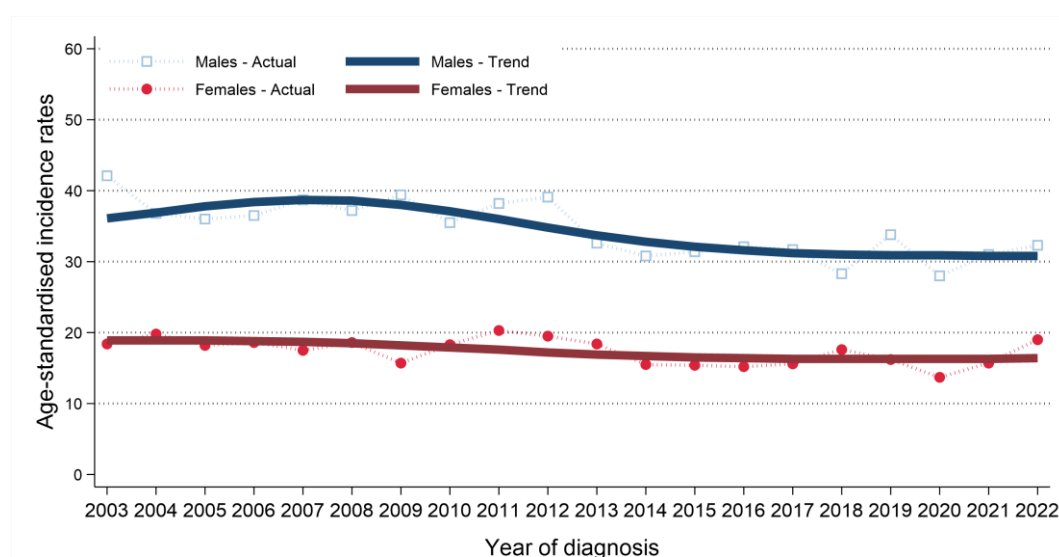*Figure 4: Age-specific incidence rates of rectal cancer in 2018-2022*

INCIDENCE TRENDS

- The number of cases of rectal cancer among males increased between 2013-2017 and 2018-2022 by 10.1% from 1,131 cases (226 cases per year) to 1,245 cases (249 cases per year).
- The number of cases of rectal cancer among females increased between 2013-2017 and 2018-2022 by 11.4% from 686 cases (137 cases per year) to 764 cases (153 cases per year).

Figure 5: Trends in number of cases of rectal cancer diagnosed from 2003 to 2022

Year of diagnosis	Number of cases	
	Males	Females
2013	219	153
2014	219	131
2015	224	131
2016	231	133
2017	238	138
2018	220	160
2019	268	149
2020	224	127
2021	259	147
2022	274	181

- Male age-standardised rectal cancer incidence rates decreased between 2013-2017 and 2018-2022 by 3.2% from 31.7 to 30.7 cases per 100,000 males. This change was not statistically significant.
- Female age-standardised rectal cancer incidence rates increased between 2013-2017 and 2018-2022 by 2.5% from 16.0 to 16.4 cases per 100,000 females. This change was not statistically significant.

Figure 6: Trends in incidence rates of rectal cancer from 2003 to 2022

Age-standardised incidence rates illustrate the change in the number of cases within a population of a fixed size and age structure (2013 European Standard).

They thus represent changes other than those caused by population growth and/or ageing.

Trends can also be influenced by changes in how cancer is classified and coded. (e.g. the move from ICD-0-2 to ICD-0-3 in 2019).

INCIDENCE TRENDS BY AGE

- Between 2013-2017 and 2018-2022 the number of cases of rectal cancer among
  - Persons aged 0 to 54 increased by 12.1% among males and increased by 34.3% among females.
  - Persons aged 55 to 64 increased by 27.9% among males and increased by 43.9% among females.
  - Persons aged 65 to 74 increased by 7.5% among males and decreased by 12.9% among females.
  - Persons aged 75 and over decreased by 0.8% among males and increased by 2.0% among females.

Table 1: Average number of cases per year of rectal cancer by period of diagnosis in 2013-2022

Age at diagnosis	All persons		Male		Female	
	2013-2017	2018-2022	2013-2017	2018-2022	2013-2017	2018-2022
All ages	363	402	226	249	137	153
	.	.	.	.	.	.
0 to 54	49	60	28	32	21	28
55 to 64	80	107	52	67	28	40
65 to 74	109	110	72	77	37	32
75 and over	125	125	74	73	51	52

- Between 2013-2017 and 2018-2022 age-standardised incidence rates of rectal cancer among
  - Persons aged 0 to 54 did not change significantly among males or females.
  - Persons aged 55 to 64 did not change significantly among males or females.
  - Persons aged 65 to 74 did not change significantly among males or females.
  - Persons aged 75 and over did not change significantly among males or females.

Figure 7: Trends in incidence rates of rectal cancer from 2003 to 2022 by age group
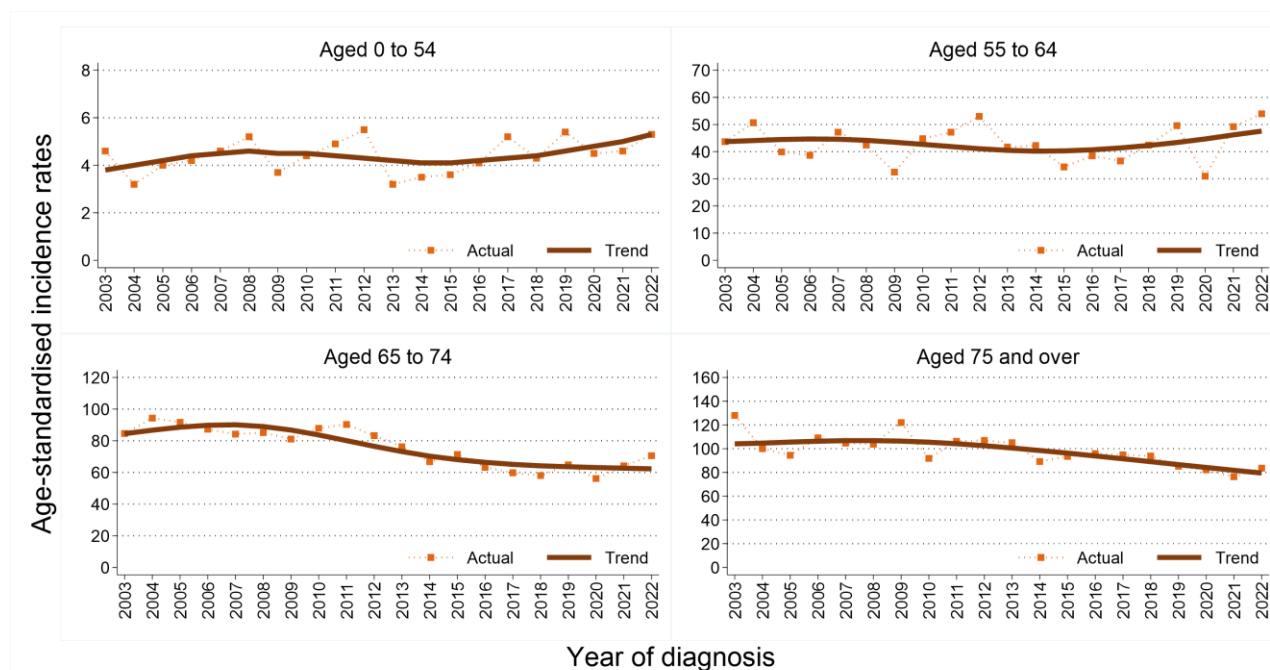
INCIDENCE BY HISTOLOGICAL TYPE

- During 2018-2022 95.0% of rectal cancer cases had a histological type specified.

- Of the 101 cases with an unspecified type 92.1% were not microscopically verified.

- The most common rectal cancer types among males were adenocarcinoma (91.6%) and another specified type (4.1%). Among females they were adenocarcinoma (90.2%) and another specified type (3.5%).

Table 2: Number of cases of rectal cancer diagnosed in 2018-2022 by histological type

Histological type	All persons		Male		Female	
	Total cases in period	Average cases per year	Total cases in period	Average cases per year	Total cases in period	Average cases per year
All types	**2,009**	**402**	**1,245**	**249**	**764**	**153**
	.	.	.	.	.	.
Adenocarcinoma	1,830	366	1,141	228	689	138
Other specified type	78	16	51	10	27	5
Unspecified	101	20	53	11	48	10

Figure 8: Proportion of cases of rectal cancer in 2018-2022 by histological type

MALE
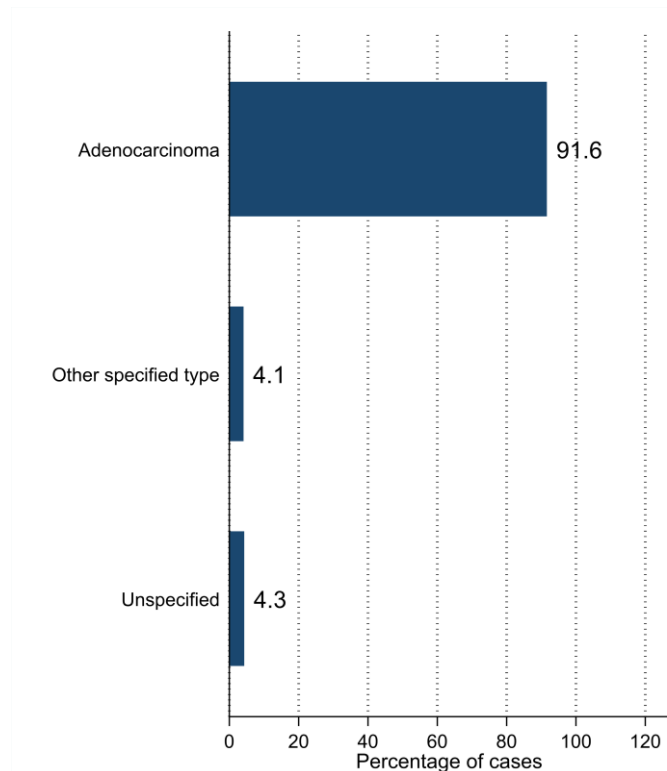
FEMALE
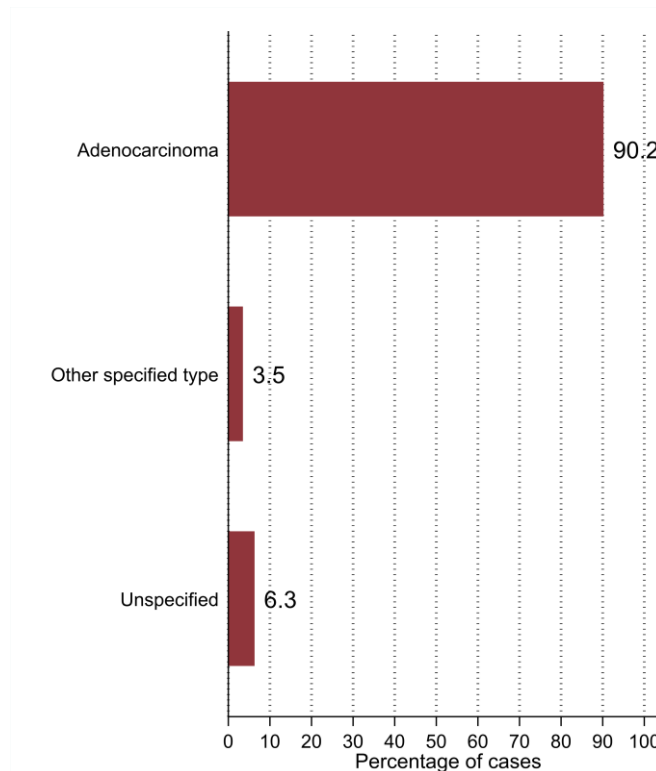
INCIDENCE BY STAGE AT DIAGNOSIS

- During 2018-2022 91.2% of rectal cancer cases had a stage assigned.

- 21.7% of rectal cancer cases were diagnosed at Stage I. (23.7% of staged cases)

- 19.0% of rectal cancer cases were diagnosed at Stage IV. (20.8% of staged cases)

Table 3: Number of cases of rectal cancer diagnosed in 2018-2022 by stage at diagnosis

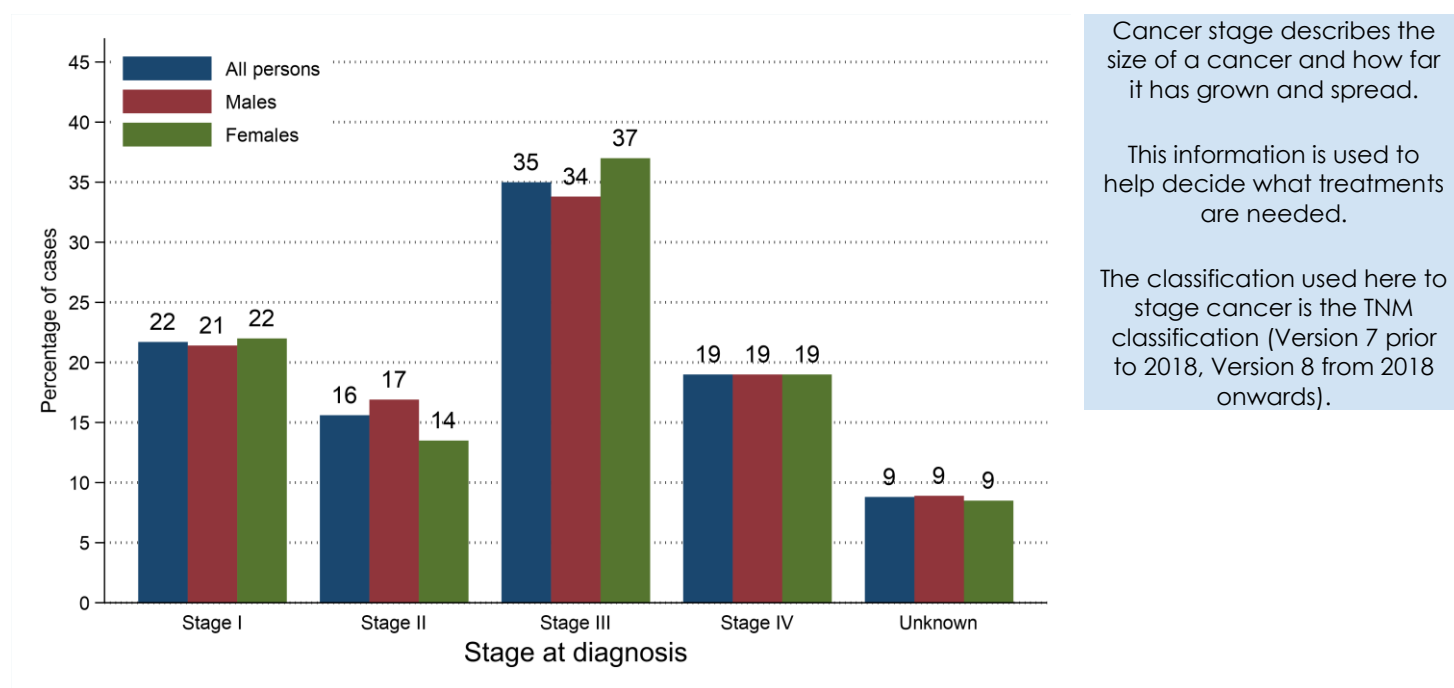| Stage at diagnosis	All persons		Male		Female	
	Total cases in period	Average cases per year	Total cases in period	Average cases per year	Total cases in period	Average cases per year
All stages	**2,009**	**402**	**1,245**	**249**	**764**	**153**
	.	.	.	.	.	.
Stage I	435	87	267	53	168	34
Stage II	313	63	210	42	103	21
Stage III	704	141	421	84	283	57
Stage IV	381	76	236	47	145	29
Unknown	176	35	111	22	65	13

Figure 9: Proportion of cases of rectal cancer diagnosed in 2018-2022 by stage at diagnosis

Cancer stage describes the size of a cancer and how far it has grown and spread.

This information is used to help decide what treatments are needed.

The classification used here to stage cancer is the TNM classification (Version 7 prior to 2018, Version 8 from 2018 onwards).
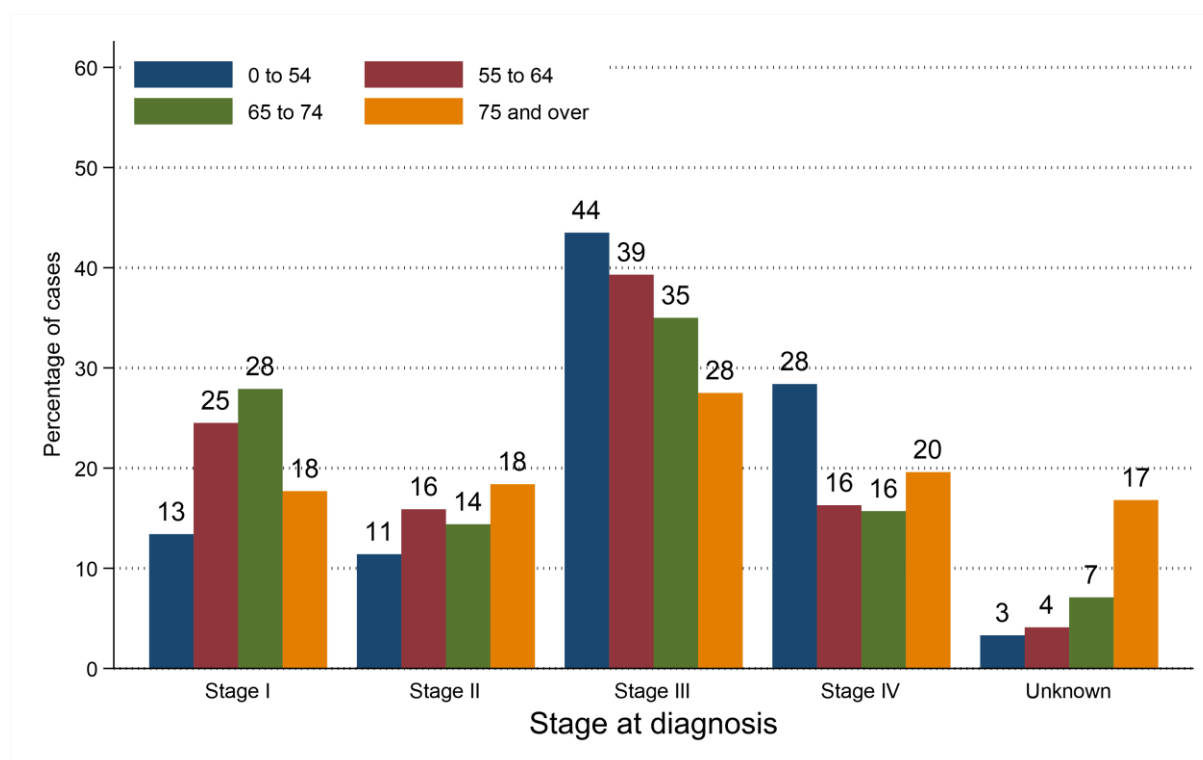
INCIDENCE BY STAGE AND AGE AT DIAGNOSIS

- During 2018-2022 83.2% of rectal cancer cases among those aged 75 and over had a stage assigned compared to 96.7% of those aged 0 to 54.
- 17.7% of rectal cancer cases among those aged 75 and over were diagnosed at Stage I (21.3% of staged cases) compared to 13.4% of those aged 0 to 54 (13.8% of staged cases).
- 19.6% of rectal cancer cases among those aged 75 and over were diagnosed at Stage IV (23.6% of staged cases) compared to 28.4% of those aged 0 to 54 (29.4% of staged cases).

Table 4: Average number of cases of rectal cancer diagnosed per year in 2018-2022 by stage and age at diagnosis

Stage at diagnosis	Age at diagnosis				
	All ages	0 to 54	55 to 64	65 to 74	75 and over
All stages	402	60	107	110	125
	.	.	.	.	.
Stage I	87	8	26	31	22
Stage II	63	7	17	16	23
Stage III	141	26	42	38	34
Stage IV	76	17	17	17	25
Unknown	35	2	4	8	21

Figure 10: Proportion of cases of rectal cancer diagnosed in 2018-2022 by stage and age at diagnosis
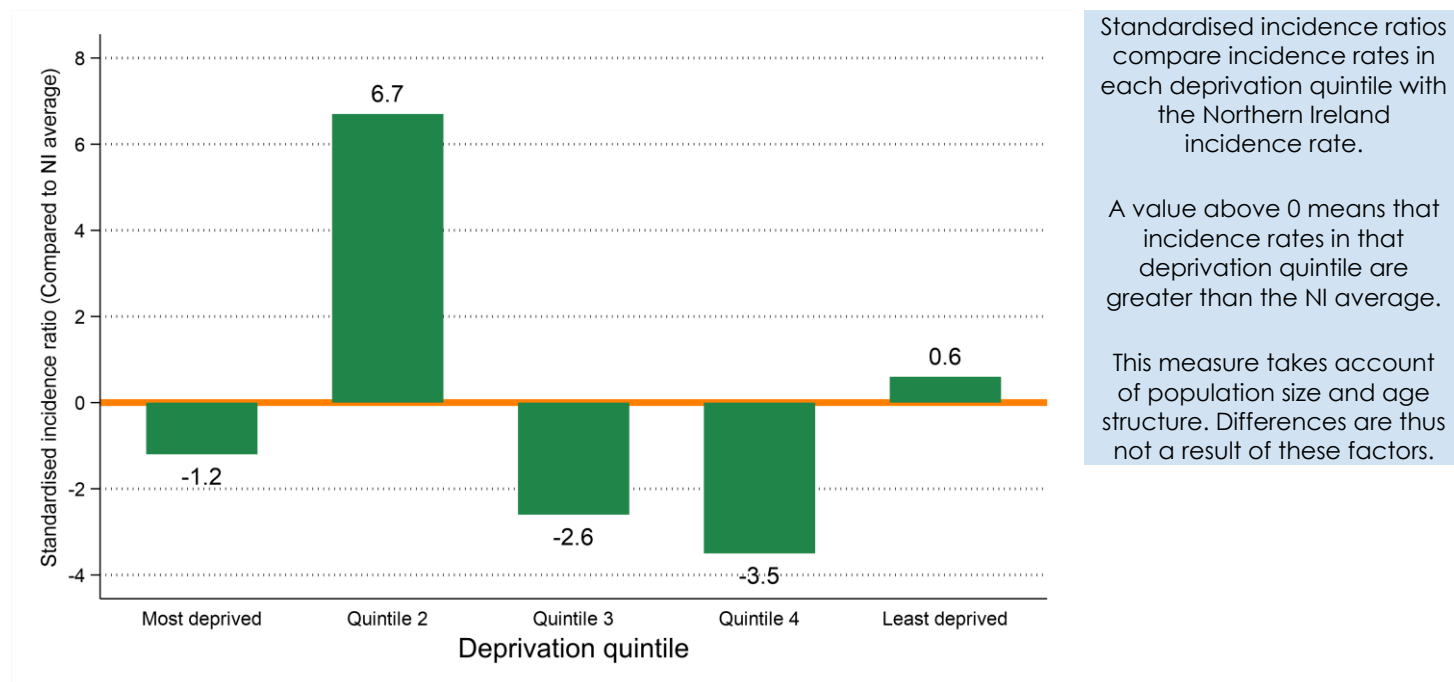
INCIDENCE BY DEPRIVATION

- The number of cases of rectal cancer diagnosed during 2018-2022 varied in each deprivation quintile due to variations in population size and age.
- After accounting for these factors, incidence rates:
  - in the most socio-economically deprived areas did not vary significantly from the NI average.
  - in the least socio-economically deprived areas did not vary significantly from the NI average.

Table 5: Number of cases of rectal cancer diagnosed in 2018-2022 by deprivation quintile

Deprivation quintile	All persons		Male		Female	
	Total cases in period	Average cases per year	Total cases in period	Average cases per year	Total cases in period	Average cases per year
Northern Ireland	**2,009**	**402**	**1,245**	**249**	**764**	**153**
	.	.	.	.	.	.
Most deprived	326	65	220	44	106	21
Quintile 2	428	86	269	54	159	32
Quintile 3	412	82	245	49	167	33
Quintile 4	414	83	250	50	164	33
Least deprived	429	86	261	52	168	34
Unknown	0	0	0	0	0	0

Figure 11: Standardised incidence ratio comparing deprivation quintile to Northern Ireland for rectal cancer diagnosed in 2018-2022

Standardised incidence ratios compare incidence rates in each deprivation quintile with the Northern Ireland incidence rate.

A value above 0 means that incidence rates in that deprivation quintile are greater than the NI average.

This measure takes account of population size and age structure. Differences are thus not a result of these factors.

INCIDENCE BY HEALTH AND SOCIAL CARE TRUST

- The number of cases of rectal cancer diagnosed during 2018-2022 varied in each Health and Social Care Trust due to variations in population size and age.

- After accounting for these factors, incidence rates:

  - in Belfast HSCT did not vary significantly from the NI average.

  - in Northern HSCT did not vary significantly from the NI average.

  - in South Eastern HSCT did not vary significantly from the NI average.

  - in Southern HSCT did not vary significantly from the NI average.

  - in Western HSCT did not vary significantly from the NI average.

Table 6: Number of cases of rectal cancer diagnosed in 2018-2022 by Health and Social Care Trust

Health and Social Care Trust	All persons		Male		Female	
	Total cases in period	Average cases per year	Total cases in period	Average cases per year	Total cases in period	Average cases per year
Northern Ireland	**2,009**	**402**	**1,245**	**249**	**764**	**153**
	.	.	.	.	.	.
Belfast HSCT	371	74	238	48	133	27
Northern HSCT	513	103	312	62	201	40
South Eastern HSCT	407	81	227	45	180	36
Southern HSCT	395	79	260	52	135	27
Western HSCT	323	65	208	42	115	23
Unknown	0	0	0	0	0	0

Figure 12: Standardised incidence ratio comparing Health and Social Care Trust to Northern Ireland for rectal cancer diagnosed in 2018-2022
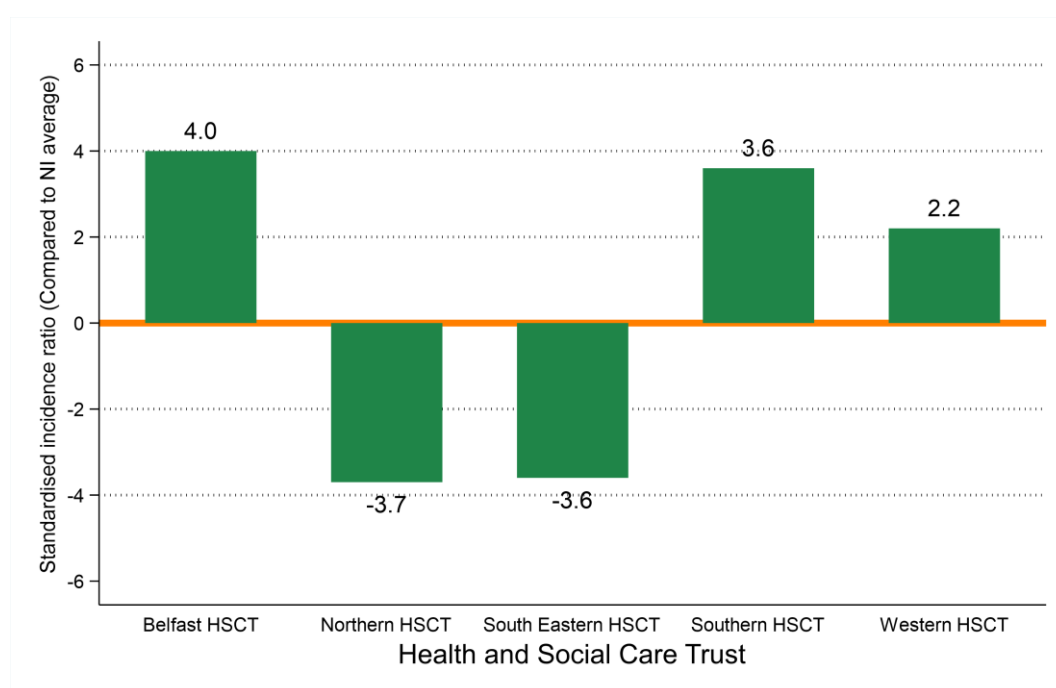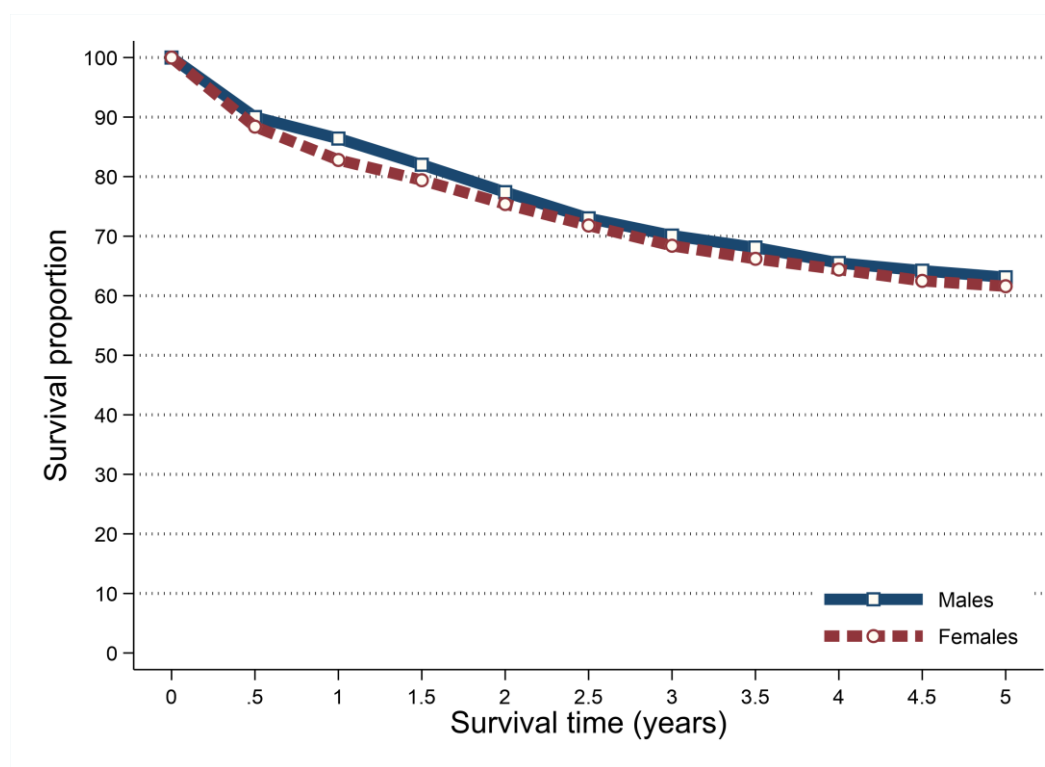
SURVIVAL

- 81.8% of patients were alive one year and 53.7% were alive five years from a rectal cancer diagnosis in 2013-2017. (observed survival)

- Age-standardised net survival (ASNS), which removes the effect of deaths from causes unrelated to cancer, was 85.1% one year and 62.5% five years from a rectal cancer diagnosis in 2013-2017.

- Five-year survival (ASNS) for rectal cancer patients diagnosed in 2013-2017 was 63.1% among men and 61.6% among women.

Table 7: Survival from rectal cancer for patients diagnosed in 2013-2017

Time since diagnosis	All persons		Male		Female	
	Observed survival	Age-standardised net survival	Observed survival	Age-standardised net survival	Observed survival	Age-standardised net survival
6 months	87.4%	89.4%	88.3%	90.0%	85.9%	88.4%
One year	81.8%	85.1%	83.5%	86.4%	78.9%	82.8%
Two years	71.6%	76.7%	72.5%	77.4%	70.2%	75.4%
Five years	53.7%	62.5%	54.2%	63.1%	53.0%	61.6%

Figure 13: Age-standardised net survival from rectal cancer for patients diagnosed in 2013-2017

Observed survival examines the time between diagnosis and death from any cause, however, due to the inclusion of non-cancer deaths it may not fully reflect how changes in cancer care impact survival from cancer.

Age-standardised net survival provides an estimate of patient survival which has been adjusted to take account of deaths unrelated to cancer. It is more widely used to assess the impact of changes in cancer care on patient survival.
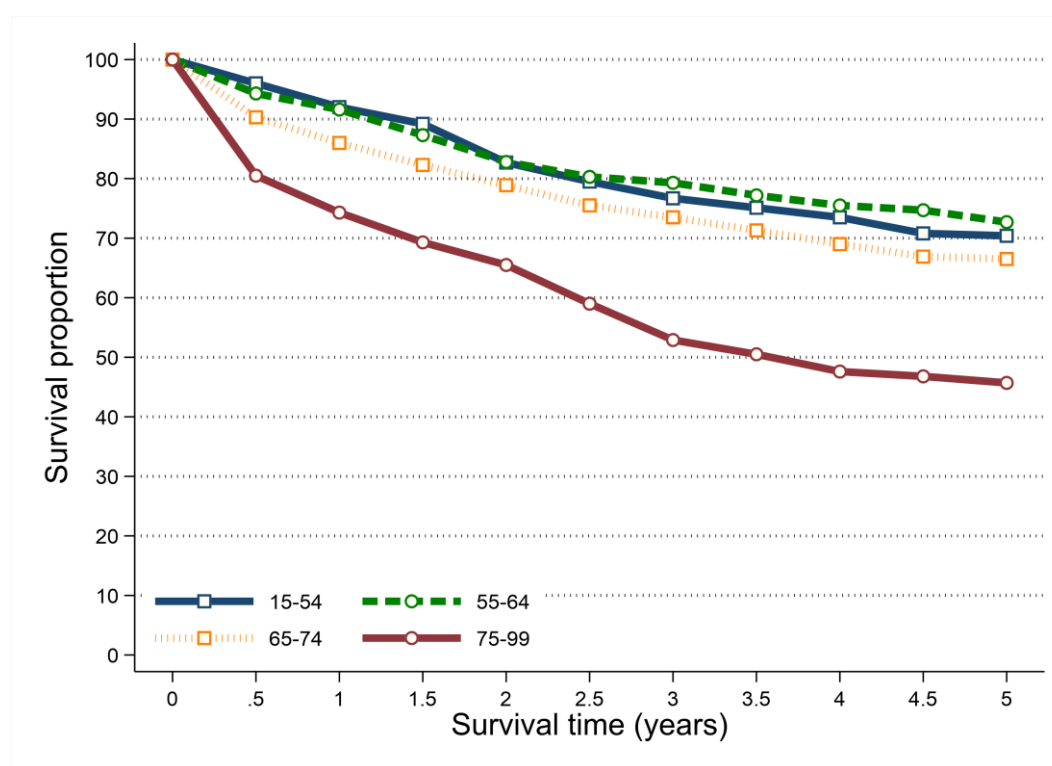
SURVIVAL BY AGE

- Survival from rectal cancer among patients diagnosed during 2013-2017 was related to age with better five-year survival among younger age groups.
- Five-year net survival ranged from 72.7% among patients aged 55 to 64 at diagnosis to 45.7% among those aged 75 to 99.
- Five-year net survival for rectal cancer patients aged 75 to 99 at diagnosis in 2013-2017 was 48.1% among men compared to 42.2% among women.

Table 8: Net survival from rectal cancer for patients diagnosed in 2013-2017 by age at diagnosis

Age group	All persons		Male		Female	
	One-year	Five-years	One-year	Five-years	One-year	Five-years
15 to 54	92.0%	70.4%	89.6%	66.0%	95.3%	76.4%
55 to 64	91.6%	72.7%	92.3%	74.1%	90.2%	69.9%
65 to 74	86.0%	66.5%	86.7%	67.4%	84.5%	64.7%
75 to 99	74.3%	45.7%	79.4%	48.1%	66.9%	42.2%

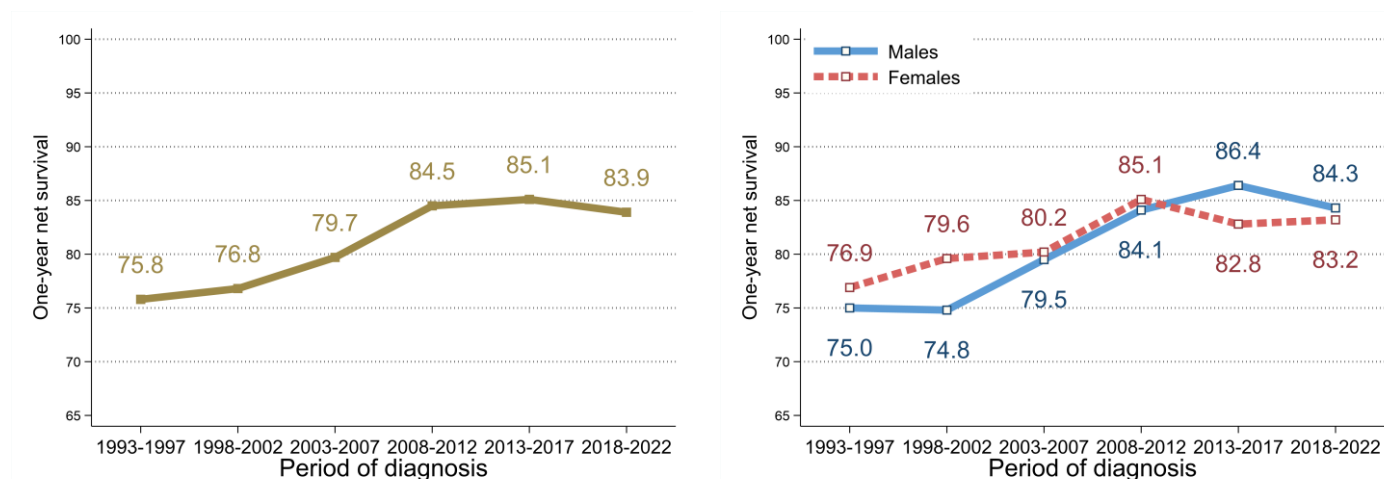*Figure 14: Net survival from rectal cancer for patients diagnosed in 2013-2017 by age at diagnosis*

SURVIVAL TRENDS

ONE-YEAR NET SURVIVAL

- Between 2013-2017 and 2018-2022 there was no significant change in one-year survival (ASNS) from rectal cancer.

- Compared to 1993-1997 one-year survival (ASNS) from rectal cancer in 2018-2022 increased significantly from 75.8% to 83.9%. This increase was significant for males (75.0% to 84.3%) but not females.

Figure 15: Trends in one-year age-standardised net survival from rectal cancer in 1993-2022

FIVE-YEAR NET SURVIVAL

- Between 2008-2012 and 2013-2017 there was no significant change in five-year survival (ASNS) from rectal cancer.

- Compared to 1993-1997 five-year survival (ASNS) from rectal cancer in 2013-2017 increased significantly from 45.4% to 62.5%. This increase was significant for males (45.2% to 63.1%) and females (45.8% to 61.6%).

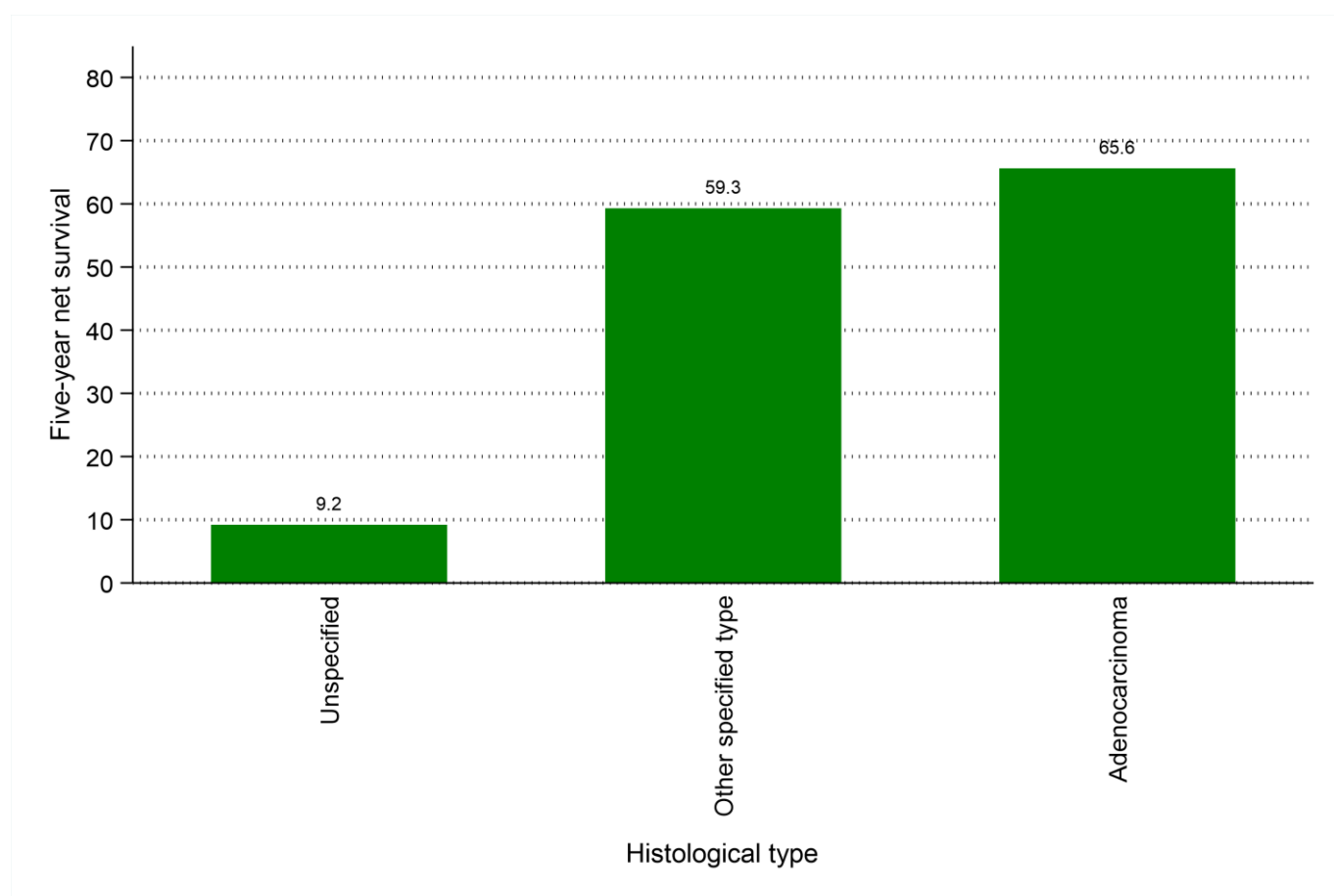*Figure 16: Trends in five-year age-standardised net survival from rectal cancer in 1993-2017*
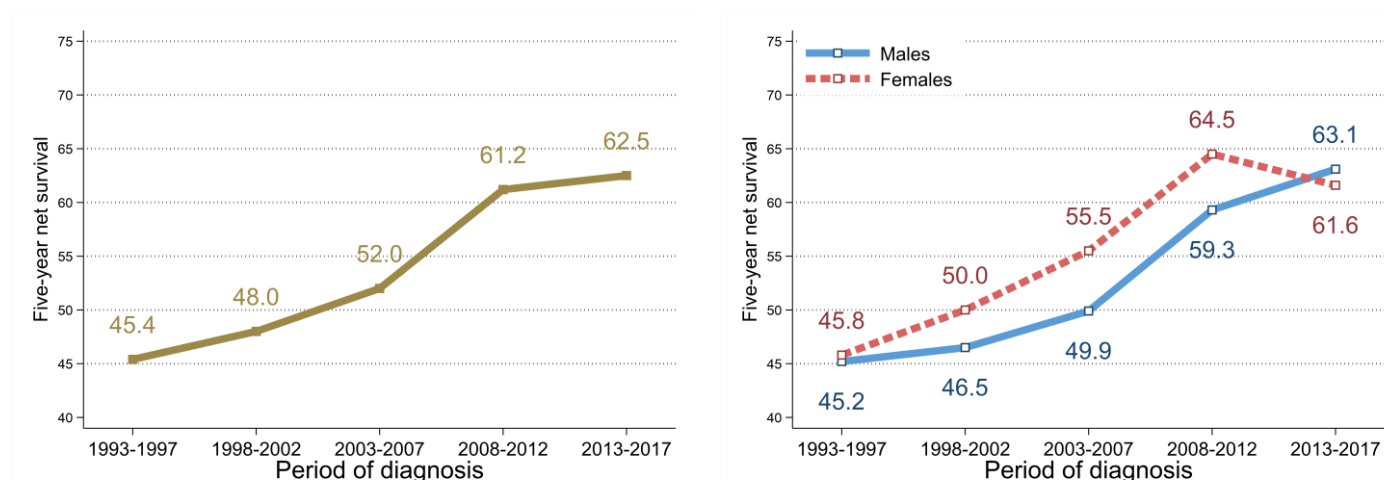
SURVIVAL BY HISTOLOGICAL TYPE

- Five-year survival (ASNS) for patients diagnosed in 2013-2017 ranged from 65.6% for adenocarcinoma to 9.2% for those with an unspecified histological type.

Table 9: Age-standardised net survival from rectal cancer for patients diagnosed in 2013-2017 by histological type

Histological type	All persons		Male		Female	
	One-year	Five-years	One-year	Five-years	One-year	Five-years
Adenocarcinoma	89.0%	65.6%	89.7%	65.9%	87.9%	65.2%
Other specified type	69.5%	59.3%	69.0%	60.8%	73.8%	71.2%
Unspecified	29.8%	9.2%	28.1%	15.3%	31.7%	2.3%

Figure 17: Five-year age-standardised net survival from rectal cancer for patients diagnosed in 2013-2017 by histological type

SURVIVAL BY STAGE

- Survival from rectal cancer among patients diagnosed during 2013-2017 was strongly related to stage with better five-year survival among those diagnosed at earlier stages.
- Five-year survival (ASNS) ranged from 91.3% among patients diagnosed at Stage I to 5.8% among those diagnosed at Stage IV.
- Five-year survival (ASNS) for rectal cancer patients diagnosed at Stage IV in 2013-2017 was 6.2% among men compared to 5.2% among women.

Table 10: Age-standardised net survival from rectal cancer for patients diagnosed in 2013-2017 by stage at diagnosis

Stage at diagnosis	All persons		Male		Female	
	One-year	Five-years	One-year	Five-years	One-year	Five-years
Stage I	97.4%	91.3%	97.6%	91.5%	97.0%	91.0%
Stage II	96.6%	80.4%	96.6%	79.2%	96.7%	82.8%
Stage III	92.2%	63.4%	92.8%	63.0%	91.0%	64.1%
Stage IV	48.8%	5.8%	50.0%	6.2%	46.9%	5.2%
Unknown	62.8%	40.1%	68.2%	37.2%	57.5%	42.8%

Figure 18: Age-standardised net survival from rectal cancer for patients diagnosed in 2013-2017 by stage at diagnosis
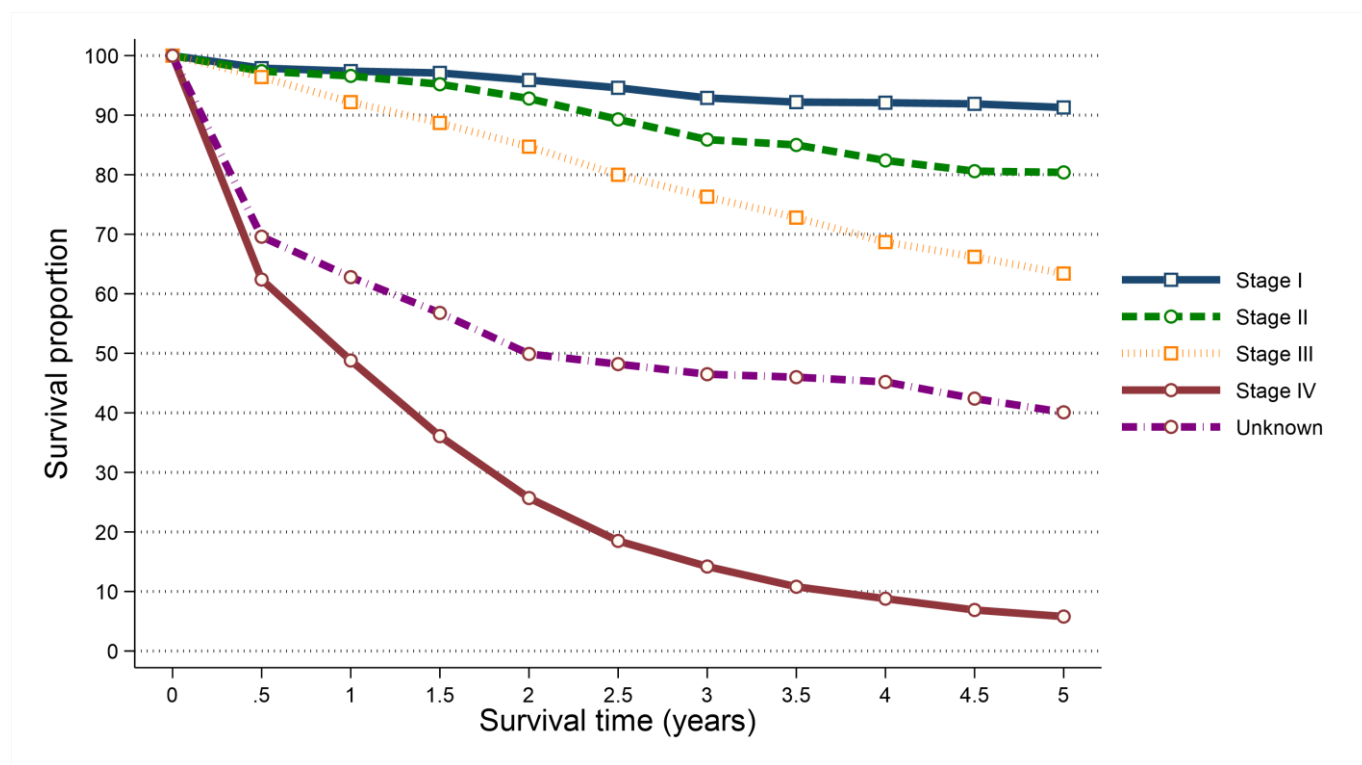
PREVALENCE

- At the end of 2022, there were 3,415 people (Males: 2,081; Females: 1,334) living with rectal cancer who had been diagnosed with the disease during 1998-2022.
- Of these 11.7% had been diagnosed in the previous year (one-year prevalence) and 66.1% in the previous 10 years (ten-year prevalence).
- 41.6% of rectal cancer survivors were aged 75 and over at the end of 2022.
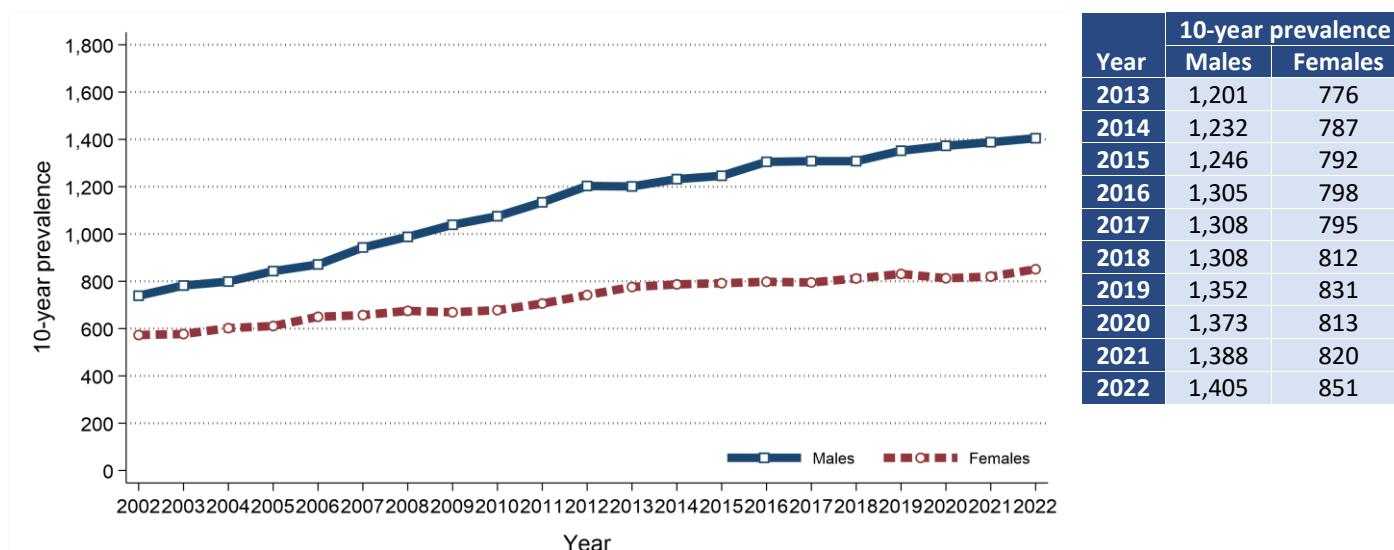
Table 11: 25-year prevalence of rectal cancer by age at end of 2022

| Gender | Age at end of 2022 | 25-year prevalence | Time since diagnosis | | | |
			0 to 1 year	1 to 5 years	5 to 10 years	10 to 25 years
All persons	All ages	3,415	400	1,034	822	1,159
	0 to 74	1,993	288	713	485	507
	75 and over	1,422	112	321	337	652
Male	All ages	2,081	244	646	515	676
	0 to 74	1,203	175	443	300	285
	75 and over	878	69	203	215	391
Female	All ages	1,334	156	388	307	483
	0 to 74	790	113	270	185	222
	75 and over	544	43	118	122	261

PREVALENCE TRENDS

- 10-year prevalence of rectal cancer among males increased between 2017 and 2022 by 7.4% from 1,308 survivors to 1,405 survivors.
- 10-year prevalence of rectal cancer among females increased between 2017 and 2022 by 7.0% from 795 survivors to 851 survivors.

Figure 19: Trends in 10-year prevalence of rectal cancer in 2002-2022

| Year | 10-year prevalence | |
	Males	Females
2013	1,201	776
2014	1,232	787
2015	1,246	792
2016	1,305	798
2017	1,308	795
2018	1,308	812
2019	1,352	831
2020	1,373	813
2021	1,388	820
2022	1,405	851

MORTALITY

- There were 1,106 deaths from rectal cancer during 2018-2022 in Northern Ireland. On average this was 221 deaths per year.

- During this period 42.2% of rectal cancer deaths were among women (Male deaths: 639, Female deaths: 467). On average there were 128 male and 93 female deaths from rectal cancer per year.

- Rectal cancer deaths made up 5.3% of all male cancer deaths and 4.3% of all female cancer deaths.

- The median age of patients who died from rectal cancer during 2018-2022 was 75 years (Males: 74, Females: 76).

- The risk of dying from rectal cancer varied by age, with 47.9% of men and 54.6% of women who died from rectal cancer aged 75 and over at death.

- In contrast, 10.4% of patients who died from rectal cancer were aged 0 to 54 at death.

Figure 20: Average number of deaths from rectal cancer per year in 2018-2022 by age at death
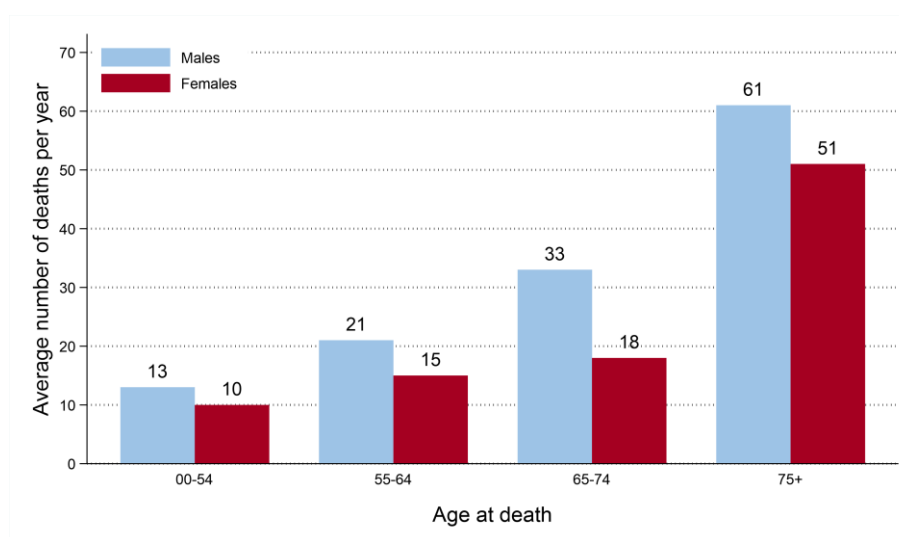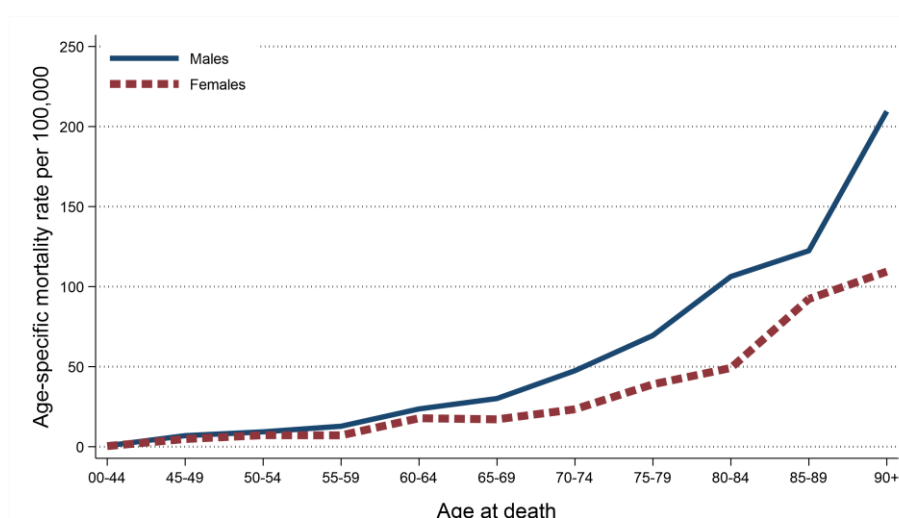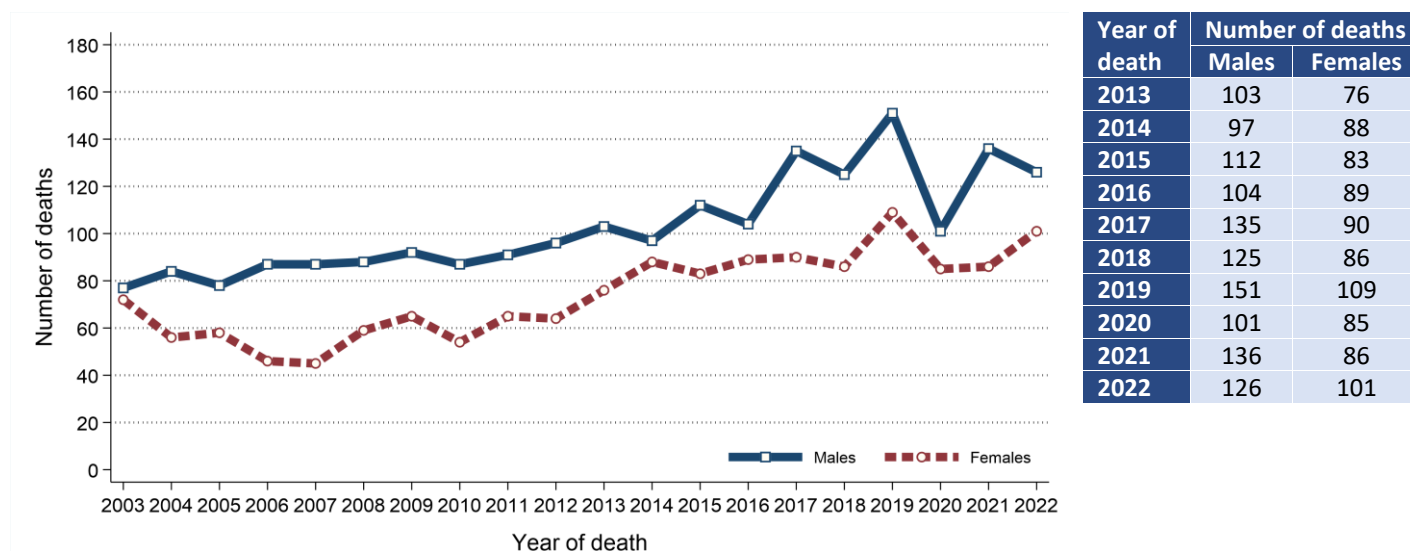

*Figure 21: Age-specific mortality rates of rectal cancer in 2018-2022*

- The number of deaths from rectal cancer among males increased between 2013-2017 and 2018-2022 by 16.0% from 551 deaths (110 deaths per year) to 639 deaths (128 deaths per year).
- The number of deaths from rectal cancer among females increased between 2013-2017 and 2018-2022 by 9.6% from 426 deaths (85 deaths per year) to 467 deaths (93 deaths per year).

Figure 22: Trends in the number of deaths from rectal cancer from 2003 to 2022

Year of death	Number of deaths	
	Males	Females
2013	103	76
2014	97	88
2015	112	83
2016	104	89
2017	135	90
2018	125	86
2019	151	109
2020	101	85
2021	136	86
2022	126	101

- Male age-standardised rectal cancer mortality rates increased between 2013-2017 and 2018-2022 by 3.6% from 16.5 to 17.1 deaths per 100,000 males. This change was not statistically significant.
- Female age-standardised rectal cancer mortality rates increased between 2013-2017 and 2018-2022 by 1.0% from 9.9 to 10.0 deaths per 100,000 females. This change was not statistically significant.

Figure 23: Trends in mortality rates of rectal cancer from 2003 to 2022
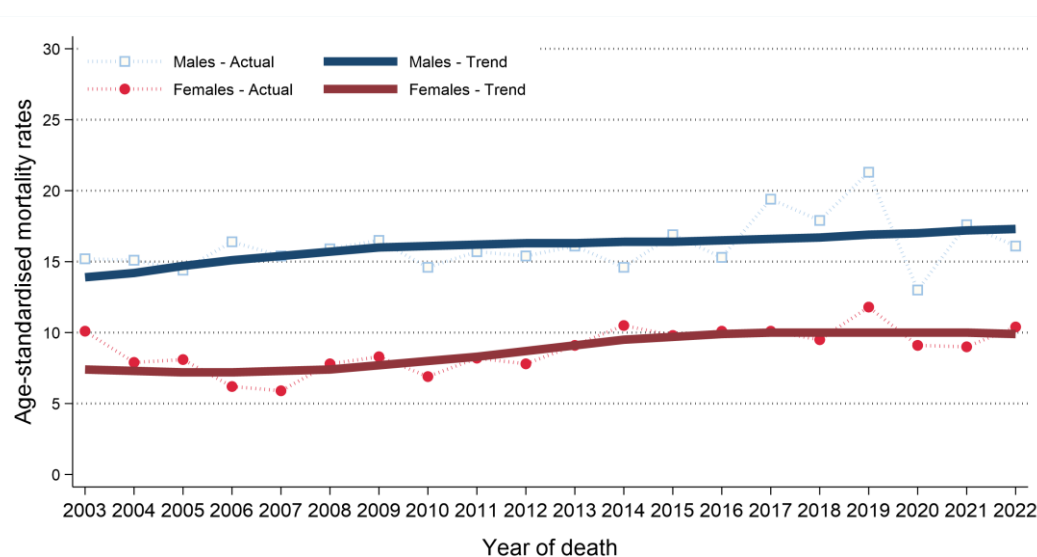
Age-standardised mortality rates illustrate the change in the number of deaths within a population of a fixed size and age structure (2013 European Standard).

They thus represent changes other than those caused by population growth and/or ageing.

Trends can also be influenced by changes in how cancer is classified and coded.

Cancer classification: Classification of tumour sites is carried out using ICD10 codes. For a listing and explanation of ICD10 codes see: World Health Organisation at http://apps.who.int/classifications/icd10/browse/2010/en#/II

Population data: Population data for Northern Ireland, and smaller geographic areas, are extracted from the NI mid-year population estimates available from the NI Statistics and Research Agency (available at www.nisra.gov.uk).

Geographic areas: Geographic areas are assigned based on a patient's postcode of usual residence at diagnosis using the Jul 2024 Central Postcode Directory (CPD) produced by the NI Statistics and Research Agency (available at www.nisra.gov.uk).

Deprivation quintiles: Super output areas (SOA) are assigned to each patient based on their postcode of usual residence at diagnosis. Using the SOA each patient is assigned a socio-economic deprivation quintile based on the 2017 Multiple Deprivation Measure. The 2017 Multiple Deprivation Measure is available from the NI Statistics and Research Agency (available at www.nisra.gov.uk).

Crude incidence/mortality rate: The number of cases/deaths per 100,000 person years in the population. Person years are the sum of the population over the number of years included.

Age-standardised incidence/mortality rates per 100,000 person years are estimates of the incidence/mortality rate if that population had a standard age structure. Throughout this report the 2013 European Standard Population has been used. Standardising to a common Standard Population allows comparisons of incidence/mortality rates to be made between different time periods and geographic areas while removing the effects of population change and ageing.

Standardised Incidence/Mortality Ratio (SIR/SMR) is the ratio of the number of cases/deaths observed in a population to the expected number of cases/deaths, based upon the age-specific rates in a reference population. This statistic is often used to compare incidence/mortality rates for geographic areas (e.g. Trusts) to the national incidence/mortality rates (i.e. Northern Ireland). An SIR/SMR of 100 indicates there is no difference between the geographic area and the national average.

Confidence intervals measure the precision of a statistic (e.g. rectal cancer incidence rate). Typically, when numbers are low, precision is poorer and confidence intervals will be wider. As a general rule, when comparing statistics (e.g. rectal cancer incidence rate in year 2012 vs year 2013), if the confidence interval around one statistic overlaps with the interval around another, it is unlikely that there is any real difference between the two. If there is no overlap, the difference is considered to be statistically significant.

Lifetime risk is estimated as the cumulative risk of getting cancer up to age 75/85, calculated directly from the age-specific incidence rates. The odds of developing the disease before age 75/85 is the inverse of the cumulative risk.

Prevalence is the number of cancer patients who are alive in the population on a specific date (31st December 2022 in this report). Since data from the NI Cancer Registry are only available since 1993, prevalence only refers to a fixed term (10 and 25 years in this report). There may be members of the population living with a diagnosis of cancer for more than 25 years.

Patient survival is evaluated using two measures. Observed survival examines the time between diagnosis and death from any cause. It thus represents what cancer patients experience, however, due to the inclusion of non-cancer deaths (e.g. heart disease), it may not reflect how changes in cancer care impact survival from cancer. Thus age-standardised net survival is also examined. This measure provides an estimate of patient survival which has been adjusted to take account of deaths unrelated to cancer. It also assumes a standard age distribution thereby removing the impact of changes in the age distribution of cancer patients on changes in survival over time. While this measure is hypothetical, as it assumes patients can only die from cancer related factors, it is a better indicator of the impact of changes in cancer care on patient survival.