

Bowel Cancer Quality Improvement Report

2019

This report publishes quality performance indicator data from patients diagnosed with colorectal cancer in New Zealand between 1 January 2013 and 31 December 2016.

Acknowledgements

This report is the result of a partnership between the Cancer Services team within the Ministry of Health and the National Bowel Cancer Working Group to identify and report on bowel cancer quality performance indicators.

This report is based on data from the New Zealand Cancer Registry and the Ministry of Health's National Collections. Support from staff at the New Zealand Cancer Registry within the Ministry was invaluable to the authors' understanding of the cancer registration data and how it could be used.

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The staff in Cancer Services – particularly those involved with the *New Zealand Cancer Health Information Strategy* – have supported all stages of the development of the indicators this report presents.

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Disclaimer

The results in this report are not official statistics; they have been created for service quality improvement purposes from the Ministry of Health's National Collections. The opinions, findings, recommendations and conclusions expressed in this report are those of the authors, not the Ministry of Health.

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1 Executive summary

This report presents the first release of results of our investigation into the use of the Ministry's National Collections to calculate quality performance indicators for bowel cancer.

The primary audience for this report includes those who deliver care to people with bowel cancer and manage the delivery of health services.

The aim of the report is to measure the quality of care and outcomes for people with bowel cancer in New Zealand and provide a baseline for ongoing quality improvement.

The report presents six quality performance indicators (QPIs) which have been identified and generally accepted as measures of good care.

The report compares the variation in these measures between district health boards (DHBs).

Geographic variation in services received and outcomes can be seen with all indicators. For some indicators there are also variations in access and outcomes for people belonging to different ethnic groups and ages.

Detailed evaluation of the indicators at DHB level is needed to understand the variation between DHBs.

The results of these investigations will likely present opportunities for improving service or care pathways and reducing inequalities. In some instances a national quality improvement programme will be needed to reduce treatment variation.

2 Key findings and recommendations

This section summarises the key findings and recommendations for the indicators based on our analyses of national administrative data for people diagnosed with bowel cancer in New Zealand. We have grouped the indicator results and recommendations under the following three headings: care pathway, surgical care and rectal cancer.

2.1 Care pathway

Between 2013 and 2016, the majority of people (71%) were diagnosed with bowel cancer following referral to a clinic. The proportion of people diagnosed following a referral from publicly funded screening services was 3 percent, and 26 percent were diagnosed following presentation at an emergency department (ED).

Māori and Pacific people were more likely to be diagnosed following an emergency presentation. Women and people younger than 50 years old, or 75 years old and over, were also more often diagnosed following an emergency presentation.

This report covers the period of the bowel screening pilot in Waitemata DHB. The indicator on route to diagnosis will provide a measure of the benefits and consequences of the Bowel Screening Programme as the programme is extended to all DHBs across New Zealand.

Recommendations

This indicator reflects inequalities in diagnostic pathways; evidence shows that patients who are diagnosed following an acute presentation have poorer outcomes.

Acute presentation is an indicator that varies across regions. We need to undertake detailed evaluation at DHB level to understand why a high proportion of patients are presenting acutely.

This will likely present us with an opportunity for improving service or care pathways.

2.2 Surgical care

The overall 90-day mortality following colorectal cancer resection was 4.0 percent.

In people with colon cancer, the 90-day mortality following resection was 4.8 percent. In people with rectal cancer, the 90-day mortality following resection was 1.9 percent.

The highest 90-day mortality rates following colon surgery were for people aged over 75 years old.

Of people with colorectal cancer, the proportion who undergo major surgical resection performed as an emergency in New Zealand was 19.6 percent. In people with colon cancer, the rate of emergency surgery was 24.7 percent, and in people with rectal cancer the rate was 4.4 percent.

The highest rates of emergency surgery were for Māori (23.8%), females (21.1%) and people younger than 50 years (27.1%) old and over 75 years old (21.2%).

Of people with colon cancer who had surgery and lymph node yield reported, 82 percent had 12 or more lymph nodes examined; there was wide variation between DHBs.

Recommendations

The overall post-operative mortality in patients undergoing surgery for colorectal cancer in New Zealand is acceptable, but there is currently wide variation between DHBs that needs investigating.

National initiatives to improve outcomes for patients undergoing emergency surgery, and to improve pathways that reduce the rate of emergency surgery, are likely to reduce overall post-operative mortality and improve equity of outcomes.

2.3 Rectal cancer

Of rectal cancer patients, 60 percent had publicly funded major surgery. Of these patients, 54 percent received preoperative radiotherapy treatment, either long-course (38%) or short-course (15%).

People with rectal cancer generally experience a higher quality of life after treatment if their surgery to remove the primary tumour does not result in a permanent stoma. The 18-month stoma-free survival for people who had rectal cancer surgery nationally was

54.7 percent. There is wide variation in this rate across individual DHBs, from 14 percent to 80 percent.

Recommendations

The Ministry of Health together with the NBCWG should consider measures to understand the variation between DHBs and consider a national quality improvement programme for the treatment of low rectal cancer (cancer within 6 cm of the anal verge), to reduce treatment variation.

Further work is needed to identify the reasons for the variability of pre-operative adjuvant therapy. This should involve the Radiation Oncology Working Group and other cancer service advisory groups involved in the multidisciplinary meeting process.

3 Introduction

3.1 Background

Bowel cancer is a leading cause of illness, disability and death in New Zealand.

During 2017 and 2018 the Ministry of Health and the National Bowel Cancer Working Group (NBCWG) have worked together to develop a set of proposed quality performance indicators (QPIs) for bowel cancer.

We selected the proposed QPIs to measure performance and drive quality improvement in bowel cancer diagnosis and treatment services in New Zealand. These indicators will support standards of service provision for bowel cancer. In some instances, the indicators cannot be measured using currently available data in national data collections. We have identified areas where national data quality improvement is required (eg, on stage and grade of cancer).

The Ministry of Health has prepared this report in collaboration with the NBCWG. The report presents the first release of results of an investigation into the use of National Collections to calculate QPIs for bowel cancer. It aims to measure the quality of care and outcomes for people with bowel cancer in New Zealand, and provide a baseline for quality improvement. The report presents QPIs that are generally accepted as measures of good care, and primarily describes the variation in these measures between district health boards (DHBs).

Some measures of equity (age, sex, ethnic group and deprivation) have been added for context.

The report includes data on 11,428 people diagnosed with bowel cancer between 1 January 2013 and 31 December 2016.

The primary audience for the report is those who deliver care to people with bowel cancer and manage the delivery of services.

3.2 Context

Timely access to high-quality cancer services and standardised treatment pathways can improve cancer treatment and overall survival.

The Ministry of Health's *New Zealand Cancer Plan: Better faster cancer care 2015–2018* tasks Cancer Services with improving the quality and consistency of care by

implementing tumour standards that assist in the standardisation of treatment pathways.

The Ministry of Health also published the *New Zealand Cancer Health Information Strategy* in 2015. Its vision is to enable the Cancer Plan, and to deliver comprehensive, accessible and accurate information to support the delivery of quality care across the cancer patient pathway.

The Ministry of Health is committed to measuring health impact and outcome data to improve the delivery of high-quality health care for Māori, and provide critical analysis of organisational practices that maintain disparities in health care.

This report will assist health practitioners to review their own clinical practice and those of their peers through a health equity and quality lens.

3.3 News for 2018

This report is the first report on QPIs for a cancer group in New Zealand.

The Ministry of Health together with the NBCWG undertook a process in late 2017 to identify measures that will drive improvement in quality of care for people diagnosed with bowel cancer in New Zealand. Following consultation and feedback from the wider cancer care sector, 20 QPIs for bowel cancer were agreed (see *Bowel cancer quality performance indicators: Descriptions*, 2019).

After assessment of the data available in the Ministry of Health's National Collections, we identified 10 indicators with potential for development. For one of these indicators (QI02: Time from histological diagnosis to first definitive treatment) the data required was not available in National Collections as expected. For another indicator (QI20: Unplanned return to theatre) a local audit of Auckland DHB patient records showed that the National Collections data did not provide enough accuracy to use our results for quality improvement. For other indicators (QI10: Lymph node yield and QI16: Radiotherapy), we made some changes from the original descriptions to fit with the available data.

No measures are risk adjusted in this report. The methods for developing the measures are still under development, and some key information needed for adjustment (eg, tumour, node, metastasis group stage) is missing from the National Collections.

The numbers of people in each DHB is small so the equity measures have been calculated for all people diagnosed and treated in publicly funded services across New Zealand. These national trends may not apply to individual DHBs.

Private hospital surgery data was available for only two of the four years analysed for this report. Therefore, this report includes only data on publicly funded care. More complete private data would allow us to include this data in future reports.

3.4 Structure of this report

The sources of data for the indicators and the methods of analysis are explained in Section 4.

The indicator results are presented in Sections 5--7. We present the pathway to care indicator (BCQI01 Route to diagnosis) in Section 5, surgical care indicators (BCQI07 Treatment survival, BCQI10 Lymph node yield, BCQI19 Emergency surgery) in Section 6 and indicators specific to rectal cancer (BCQI 16 Radiotherapy, BCQI 21 Stoma free survival) in Section 7.

Our results include commentary on geographical variation between DHBs, comparisons with similar indicators reported previously in New Zealand and recently in the United Kingdom and recommendations for improving quality of care and outcomes for patients accessing cancer services in New Zealand.

4 Methods

4.1 Methods summary

We extracted all data for people diagnosed with colorectal cancer from 1 January 2013 to 31 December 2016 from the New Zealand Cancer Registry. For the purposes of this report, our dataset only includes people with a new primary diagnosis of bowel cancer.

We linked data from the Ministry of Health's National Collections to the cancer registrations at patient level using National Health Index (NHI) numbers to obtain information on patient care and follow-up.

We used funnel plots to make comparisons between district health boards (DHBs). We did not adjust outcomes for patient case-mix.

We contacted all DHBs prior to publication to inform them of their results and provide them with an opportunity to review results and consider areas where they could improve services and outcomes for patients.

4.2 Data sources

Data used in this report is on people diagnosed with bowel cancer in New Zealand between 1 January 2013 and 31 December 2016 who received publicly funded treatment following diagnosis.

All patient data for this report has come from administrative datasets held within the Ministry of Health's National Collections.

4.3 Data linkage

a) New Zealand Cancer Registry

The New Zealand Cancer Registry (NZCR) is a population-based registry. It is the most comprehensive source of information on people who have been diagnosed with malignant cancer in New Zealand. It is primarily based on pathology reporting, but also includes information from other sources, including death certificates and review of the diagnosis coding for people admitted to public hospitals.

b) National Bowel Screening Data Warehouse

The National Bowel Screening Data Warehouse holds records for people who were diagnosed following bowel screening from a publicly funded bowel screening programme.

c) National Minimum Dataset

The National Minimum Dataset (NMDS) is a national collection of public and private hospital discharge information, including coded clinical data for inpatients and day patients.

Linking NZCR data to NDMS data allowed a view of the procedures particular patients underwent in public hospitals leading up to their diagnosis and following their diagnosis and treatment.

d) Radiotherapy dataset

The Radiation Oncology Collection is a national collection of delivered private and public courses of radiation therapy.

Treatment centres have submitted data electronically in an agreed format since 2018, although most providers have supplied historic data back to 2012.

Data collected for each course of radiation therapy delivered includes treatment centre, diagnosis code (according to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM), 8th edition), treatment site, intent of the treatment and number of treatment sessions.

e) National Non-Admitted Patients Collection

The National Non-Admitted Patients Collection (NNPAC) information includes event-based purchase units that relate to medical and surgical outpatient events and ED events. This includes information on the type of service provided and the health specialty involved.

The NNPAC allows the Ministry of Health and DHBs to monitor outpatient activity and ensure that DHBs are appropriately remunerated for the services they provide.

The NNPAC provides national consistent data on non-admitted patient (outpatient and ED) activity.

4.4 Data processing

We calculated all indicators from existing data within the Ministry of Health's National Collections ie, no data was provided by DHBs specifically for these indicators.

For all people diagnosed with bowel cancer between 2013 and 2016, we used existing routinely available national administrative data sources to work backwards through individual patients' cancer journeys to examine the sequence of events that took them to that diagnosis, treatment and outcome. These routes to diagnosis included emergency presentation, screening and referral to a clinic (as inpatients (NMDS) or outpatients (NNPAC)).

We processed data by linking data sources within the National Collections using the encrypted NHI.

We considered a patient to be diagnosed with primary bowel cancer when that patient was registered on the NZCR for the first time with a diagnosis of bowel cancer. We defined bowel cancer as C18, C19 or C20 according to the ICD-10-AM, 8th edition. We defined rectal cancer as C20 and colon cancer as C18 or C19. We assumed a patient's diagnosis to be the first diagnosis if we could identify no previous diagnosis for that patient in the NZCR since 1 January 1995.

We excluded from all analyses people who were registered from death certificates only and those diagnosed with appendiceal cancer (C18.1), neuroendocrine tumours, gastrointestinal stromal tumours, lymphomas, squamous cell carcinomas and melanomas.

4.5 Data completeness

We defined data completeness as the proportion of people with complete data on all four of the variables age; sex; pathological tumour, node, metastasis (TNM) stage; and site of cancer, as we will use these variables for risk adjustment in future. In the future, the risk adjustment model will also need data on mode of admission and number of co-morbidities. We only assessed data completeness in patients who underwent major surgery, because only in these patients could we expect all six data items to be complete.

National Collections have high rates of completion of data fields. Mode of admission was available for all patients. For patients undergoing major surgery, data on all patients included sex, age and site of cancer.

The NZCR included data on T and N stage for most people (80% or more), but data on M stage only rarely (11%) (Table 1).

Table 1: People who had bowel cancer surgery with pathological tumour, node, metastasis stage available on the New Zealand Cancer Registry, 2013–16

Year	Total	Tumour (T)		Node (N)		Metastases (M) ¹		Any (T, N or M)		All (T, N and M)	
		N	%	N	%	N	%	N	%	N	%
Total	7,170	5,791	80.8	5,671	79.1	821	11.5	5,797	80.9	820	11.4
2013	1,786	1,448	81.1	1,424	79.7	137	7.7	1,450	81.2	137	7.7
2014	1,851	1,482	80.1	1,455	78.6	243	13.1	1,482	80.1	243	13.1
2015	1,734	1,418	81.8	1,393	80.3	210	12.1	1,419	81.8	210	12.1
2016	1,799	1,443	80.2	1,399	77.8	231	12.8	1,446	80.4	230	12.8

4.6 Privately funded service provider data

The National Collections include all publicly funded hospital events. Private hospitals in New Zealand have recently begun voluntary submission of treatment data, but reporting was incomplete for the time period 2013–16. This report therefore does not include private care events. We hope that future quality reports will include this data.

4.7 Definition of outcomes derived from the National Minimum Dataset

We calculated length of hospital stay for patients undergoing major surgery, defined as the number of days between the date of surgical procedure as recorded in the NMDS and either discharge or death.

We derived data on unplanned return to theatre within 30 days of surgery for patients undergoing major surgery, defined as return to theatre for surgery involving abdominal or wound complications within 30 days of surgery.

¹ Pathological M-stage is reported as not available where the M value is submitted as 'not assessed' (Mx) or 'not recorded' (M9).

We estimated 18-month stoma-free rates for rectal cancer patients undergoing major surgery. We assumed that patients undergoing an abdomino-perineal excision of the rectum (APER) (operation to remove the entire rectum and anal canal), Hartmann's procedure (operation to remove an area of bowel on the left-hand side with part of the rectum, leaving a colostomy) or other identified stoma-forming procedures had a stoma at the time of their primary procedure. We classified this as permanent in patients having an APER.

We used NMDS data to capture whether patients received a stoma, and the type of stomas that were created. In patients having an anterior resection (AR) or Hartmann's procedure, we also obtained information on subsequent stoma reversal from NMDS. We assumed a procedure code for reversal of ileostomy² or colostomy³ within 18 months of surgery to mean that the patient had their stoma reversed.

We made no adjustments for case mix using risk factors. We pooled data over three years. (Note this is fewer years than for other indicators, to allow 18 months follow-up after surgery and to ensure a sufficient number of operations per DHB, to make comparisons.)

4.8 Definition of surgical urgency

Admission types

We defined acute admission according to the Ministry of Health's Common Counting Standards 2013–14,⁴ as follows:

Acute Admission – An unplanned admission on the day of presentation at the admitting healthcare facility. Admission may have been from the emergency or outpatient departments of the healthcare facility or a transfer from another facility.

We defined all other admissions as 'elective'.

We defined emergency surgery as any definite surgery procedure performed during an acute admission.

² An ileostomy is a surgical procedure that creates an opening for a stoma by bringing the end or loop of small intestine out onto the surface of the skin.

³ A colostomy is the surgical procedure that creates an opening in the large intestine.

⁴ Common Counting Technical Advisory Group and Ministry of Health. 2017. *Common Counting Standards 2013/14*. Wellington: Ministry of Health. URL: https://nsfl.health.govt.nz/system/files/documents/publications/commoncountingstandards2013-14final_0_0.docx (accessed 18 December 2018).

4.9 Statistical analysis

Most results reported in this report are descriptive. We report the results of categorical data as percentages (%). We typically group results by DHB of service (ie, where the service was located).

We also present results by year of diagnosis, ethnic group (prioritised), sex, age group (years) and NZDep2013⁵ quintile (based on domicile at the time of diagnosis) in the data tables in Appendix A.

We have not presented results in the tables when there are fewer than 10 people in the denominator.

Funnel plots

This report uses funnel plots to make comparisons between DHBs. We plot the rate for each DHB against the total number of patients used to estimate the rate. The average across all DHBs appears as an orange line.

The funnel limits depend on the average rate and the number of patients included in the estimate; rate estimates have greater uncertainty when estimated from fewer patients. Results fall outside the inner limits if they are statistically different from the average at a 0.05 level, and outside the outer limits if they are statistically significantly different from the average at a 0.002 level.

We contacted all DHBs prior to publication of this report to inform them of their results and provide them with an opportunity to review results and consider areas where they could improve services and outcomes for patients.

Adjusted outcomes

We have made no risk adjustment to the data due to missing stage data and other risks, such as comorbidity.

We encourage service providers to interpret their results in context of the case mix of their unit. We have stratified data and present it in data tables in the appendix. Stratifying variables include age group, sex, ethnic group (prioritised) and NZDep2013 quintile with data from the New Zealand Cancer Registry. Other variables (such as TNM group stage and comorbidity) are not available in National Collections, but should be available for patients in local DHB records.

⁵ Atkinson J., Salmond C. and Crampton P. 2014. NZDep2013 Index of Deprivation. Dunedin: University of Otago.

4.10 Comparisons

We have compared our results to two reports that have calculated and published similar bowel cancer indicators: the Piper Project and the 2017 National Bowel Cancer Audit (NBOCA) report. Note that differences in data collection or analysis methods may limit comparisons with these reports.

The PIPER Project

The New Zealand PIPER Project ('PIPER' stands for presentations, investigations, pathways, evaluation and Rx) looked at colorectal cancer survival according to rurality, ethnicity and socioeconomic deprivation⁶. It was a national retrospective cohort study of all New Zealand residents diagnosed with colorectal adenocarcinoma in New Zealand from 1 January 2007 to 31 December 2008, with an extended cohort of Māori and Pacific people.

The study identified potential cases from the NZCR (ICD-10-AM codes C18–C20). Researchers obtained data from patient clinical records and national databases of hospitalisations and mortality.

The National Bowel Cancer Audit report

The NBOCA describes and compares the care and outcomes of patients diagnosed with bowel cancer in England and Wales. The Healthcare Quality Improvement Partnership commissions this Audit.

Our comparison looked at the 2017 Annual Report on the NBOCA, which is the eighth such report; it includes data on over 30,000 patients diagnosed with bowel cancer between 1 April 2015 and 31 March 2016⁷. The overall case ascertainment for England and Wales was 95 percent.

⁶ Jackson C, Sharples K, Firth M, et al. 2015. *The PIPER Project - An Internal Examination of Colorectal Cancer Management in New Zealand*. URL: [https://www.fmhs.auckland.ac.nz/assets/fmhs/sms/ctnz/docs/THE%20PIPER%20PROJECT%20Final%20deliverable%20report%207%20August%202015%20\(HRC%2011_764%20FINDLAY\).pdf](https://www.fmhs.auckland.ac.nz/assets/fmhs/sms/ctnz/docs/THE%20PIPER%20PROJECT%20Final%20deliverable%20report%207%20August%202015%20(HRC%2011_764%20FINDLAY).pdf) (accessed 18 February 2019).

⁷ HQIP. 2016. *National Bowel Cancer Audit Annual Report* URL: <https://www.acpgbi.org.uk/content/uploads/2016/07/nati-clin-audi-bowe-canc-2016-rep-v2.pdf> (accessed 18 February 2019)

5 Care pathway

5.1 Where are people diagnosed with bowel cancer presenting?

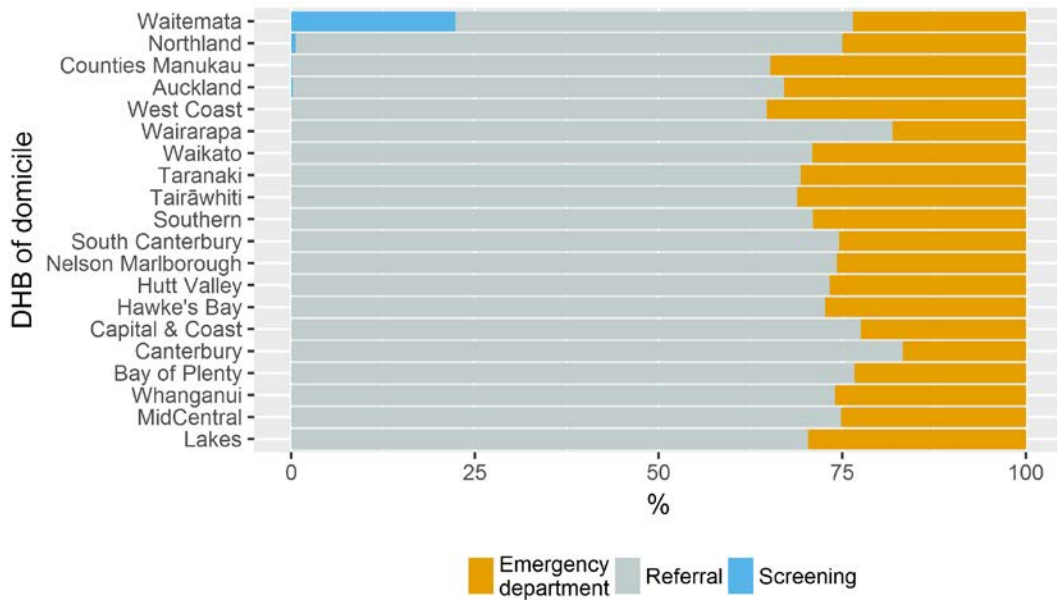
The majority of people (71%) were diagnosed with bowel cancer following referral to a clinic (Table 2). The proportion of patients diagnosed following a referral from screening services was 3 percent, and 26 percent were diagnosed following presentation at an ED (Table 2).

Table 2: People diagnosed with colorectal cancer following screening, presentation to an emergency department or referral to a clinic, by year, 2013–16

	People diagnosed	ED presentation		Referral to clinic		Screening	
		Number	%	Number	%	Number	%
Total	11,428	3,002	26.3	8,123	71.1	303	2.7
Year of diagnosis							
2013	2,809	749	26.7	1,948	69.3	112	4.0
2014	2,933	729	24.9	2,137	72.9	67	2.3
2015	2,802	769	27.4	1,977	70.6	56	2.0
2016	2,884	755	26.2	2,061	71.5	68	2.4

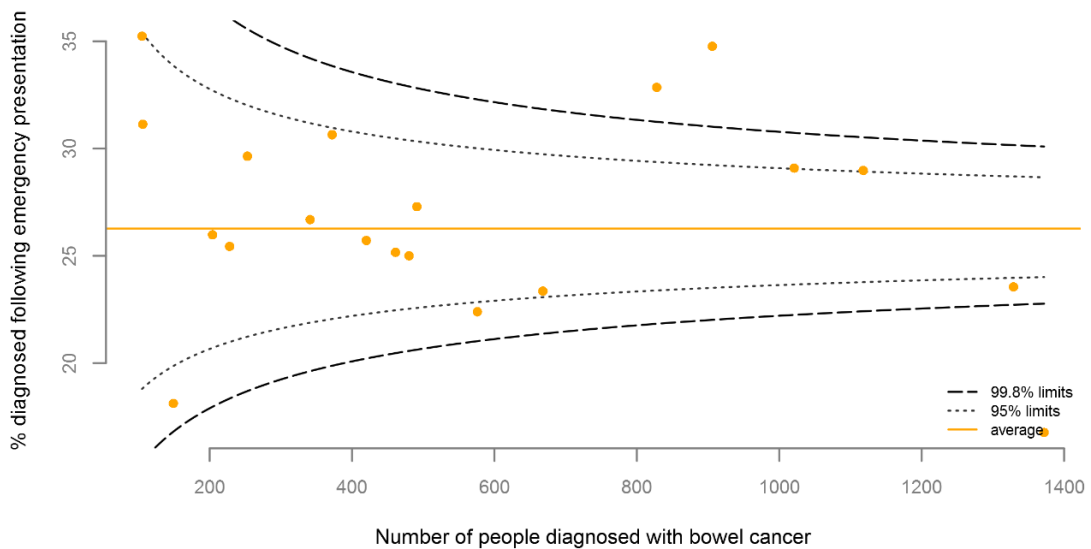
Waitemata was the only DHB providing publicly funded screening services during the reporting period (Figure 1). Of people in Waitemata DHB who were diagnosed with colorectal cancer in this period, 22 percent were diagnosed following screening.

Figure 1: Referral sources for people diagnosed with bowel cancer, by district health board of domicile, 2013–16



There was wide variation between DHBs for diagnosis following presentation at an ED (Figure 2). Two DHBs were outside the outer limits of the funnel plot.

Figure 2: Proportion of people diagnosed with bowel cancer following presentation at an emergency department, by district health board of domicile, 2013–16



People aged younger than 50 years or 75 years and older, women, Pacific people, Māori and those living in areas of high social deprivation were more likely to be diagnosed after presenting at an ED (Table 3).

Table 3: People diagnosed with colorectal cancer following screening, presentation to an emergency department or referral to a clinic, by age group, sex, ethnic group and social deprivation, 2013–16

	People diagnosed	ED presentation		Referral to clinic		Screening	
	N	N	%	N	%	N	%
Age group							
18–49	733	239	32.6	494	67.4	0	0.0
50–59	1,371	333	24.3	967	70.5	71	5.2
60–74	4,434	951	21.4	3,253	73.4	230	5.2
75+	4,890	1,479	30.2	3,409	69.7	2	0.0
Sex							
Female	5,416	1,546	28.5	3,734	68.9	136	2.5
Male	6,012	1,456	24.2	4,389	73.0	167	2.8
Ethnic group							
Māori	649	229	35.3	409	63.0	11	1.7
Pacific peoples	264	115	43.6	141	53.4	8	3.0
Asian	442	127	28.7	280	63.3	35	7.9
European/Other	9,912	2,506	25.3	7,163	72.3	243	2.5
Unknown	161	25	15.5	130	80.7	6	3.7
NZDep2013 quintile							
1	2,049	442	21.6	1,521	74.2	86	4.2
2	2,117	539	25.5	1,496	70.7	82	3.9
3	2,494	622	24.9	1,797	72.1	75	3.0
4	2,643	709	26.8	1,902	72.0	32	1.2
5	2,125	690	32.5	1,407	66.2	28	1.3

The Bowel Screening Programme

The Bowel Screening Pilot began in Waitemata DHB in January 2012. The DHB offered screening to eligible people aged 50–74 living in its area.

Following completion of the pilot, the Ministry of Health is rolling out the National Bowel Screening Programme progressively across all DHBs. The eligible age range for the national programme is 60–74.

Two DHBs began free bowel screening from July 2017, and Waitemata transitioned from the pilot to the national programme in January 2018. As of August 2018, six DHBs offer free bowel screening. Other DHBs will follow in stages; the Ministry expects that all DHBs will offer free bowel screening by the end of 2021.

In the PIPER Project, 31 percent of people presented directly to an ED. Māori people were the most likely to present to ED (45%), followed by Pacific peoples (35%) and non-Māori/non-Pacific peoples (30%). After controlling for demographic characteristics and disease variables such as stage and grade at diagnosis, Māori patients (particularly rural Māori) and those in the highest quintile of deprivation were still significantly more likely to present directly to ED. This indicator is therefore likely to reflect inequalities in access to care.

A national bowel screening programme has been in place in England since 2006. In England in 2016, of patients diagnosed with bowel cancer, 55 percent of patients were diagnosed following general practitioner (GP) referral. Just under 10 percent of patients were diagnosed following referral from a screening service, and 23 percent were diagnosed following an emergency admission.

Recommendation

A detailed evaluation at DHB level of patients who present acutely is likely to uncover gaps in access to primary care or diagnostic services, and presents an opportunity to improve service or care pathways. The solutions required to reduce the proportion of people diagnosed following emergency presentation and increase the proportion of those diagnosed following screening or referral from GPs are likely to vary by region.

This indicator reflects inequalities in diagnostic pathways, and is likely to affect outcomes for patients.

This indicator provides an opportunity to monitor the consequences of the Bowel Screening Programme. As an increasing proportion of patients are diagnosed following screening, the proportion of people presenting with late-stage bowel cancer should decrease. People referred from screening services tend to have earlier cancers, and are more likely to be able to be treated with curative intent than people diagnosed via other referral means.

6 Surgical care

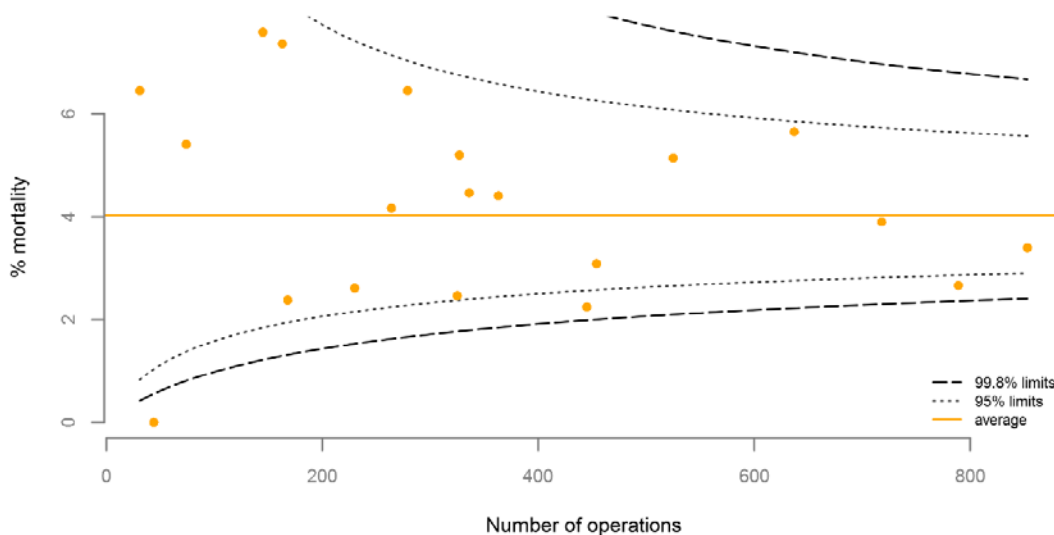
6.1 How many patients die within 90-days of major surgery?

In people with colorectal cancer, the overall 90-day mortality following colorectal cancer resection was 4.0 percent, and the overall 30-day mortality following colorectal cancer resection was 2.7 percent.

In people with colon cancer, the 90-day mortality following resection was 4.8 percent, and the 30-day mortality following resection was 3.2 percent. In people with rectal cancer, the 90-day mortality following resection was 1.9 percent, and the 30-day mortality following resection was 1.3 percent.

We observed a wide variation in the rate of post-operative mortality: 90-day post-operative mortality ranged from 0 to 7.6 percent across different DHBs (Figure 3). No DHBs were above the 95 percent confidence limits, and three units were below the 95 percent confidence limits.

Figure 3: Observed 90-day post-operative mortality (elective and emergency admissions) for patients diagnosed with bowel cancer, by district health board of service, 2013–16

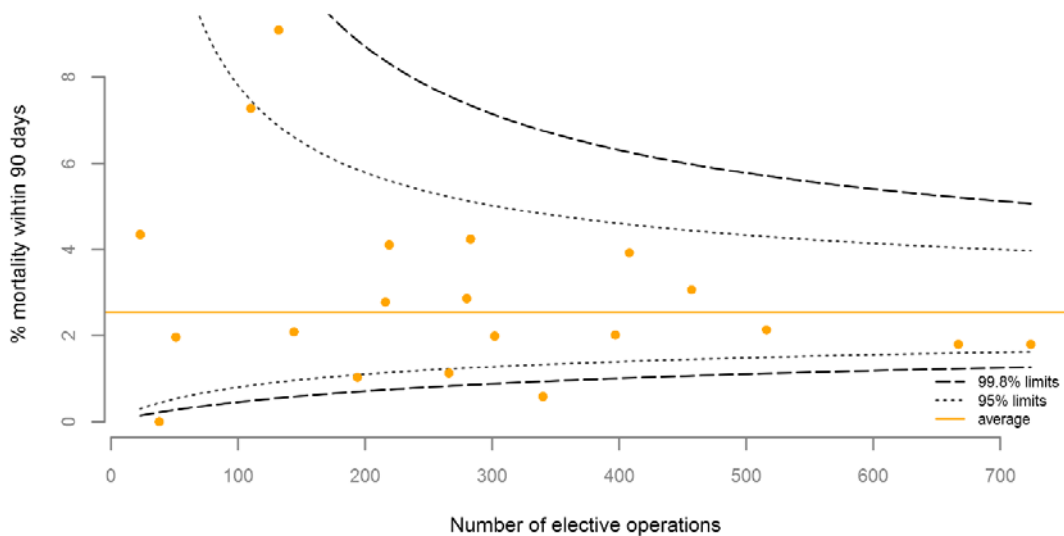


There was a significant increase in mortality associated with emergency surgery (see section 6.2).

The wide variation in mortality observed increased if we only considered elective procedures (Figure 4). One unit was above the 95 percent confidence limits, and four units were below the 95 percent confidence limits.

Overall, the 90-day post-operative mortality rate was highest for people aged 75 years and over (7.6 percent).

Figure 4: Observed 90-day post-operative mortality (elective admissions only) for patients diagnosed with bowel cancer, by district health board of service, 2013–16



The 90-day post-operative mortality in patients undergoing major resection reported in the NBOCA audits for the four year period 2013–16 was 3.8 percent. In the 2017 report the 90-day mortality in patients undergoing emergency surgery was significantly higher than for those having elective surgery (10.3% compared to 1.9%). There was wide variation in 90-day mortality between trusts.

Recommendation

The overall post-operative mortality in patients undergoing surgery for colorectal cancer in New Zealand is acceptable, but there is currently wide variation between DHBs that needs investigating.

District health boards that have performed excellently against this indicator may be a helpful resource to support quality improvement programmes in DHBs with higher rates of mortality.

National initiatives to improve outcomes in patients undergoing emergency surgery and to improve pathways that reduce the rate of emergency surgery are likely to reduce overall post-operative mortality.

6.2 How many patients have emergency surgery?

The proportion of people with colorectal cancer who undergo major surgical resection performed as an emergency in New Zealand was 19.6 percent. In people with colon cancer, the rate of emergency surgery was 24.7 percent, and in people with rectal cancer the rate was 4.4 percent.

For both colon and rectal cancer, 90-day mortality was significantly higher in patients undergoing emergency surgery.

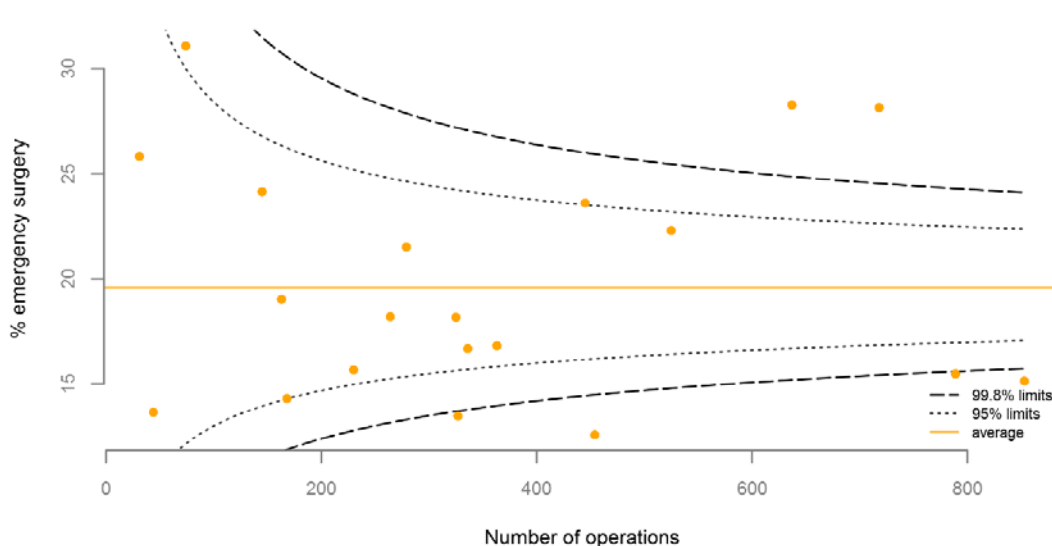
Table 4: 90-day mortality following surgery for people diagnosed with bowel cancer, by surgical urgency, 2013–16

	Total people	90-day mortality					
		All		Colon		Rectal	
		Number	%	Number	%	Number	%
Emergency surgery	1,409	143	10.1	135	10.2	8	9.8
Elective surgery	5,769	148	2.6	121	3.0	27	1.6

We observed a wide variation in the rate of emergency surgery, varying from 12.6 percent to 31.1 percent across individual DHBs (Figure 5). Four DHBs were above the 95 percent confidence limits, and five DHBs were below the 95 percent confidence limits.

Among people with colorectal cancer, the emergency colorectal cancer surgery rate was highest for Māori (23.8%) and people under 50 years old (27.1%). The emergency surgery rate for women (21.1%) was higher than it was for men (18.2%).

Figure 5: Observed emergency surgery rate for patients diagnosed with bowel cancer, by district health board of service, 2013–16



The proportion of people with colorectal cancer who underwent major colorectal surgical resection performed as an emergency (urgent cases also included) as reported in the 2017 NBOCA report was 16 percent (this was lower than audit years prior to 2017 when the emergency surgery rate was more than 22 percent). The audit also demonstrated a wide variation between units.

The 90-day mortality rate in patients undergoing major colorectal cancer resection as an emergency as reported in the 2017 NBOCA report was 10.3 percent, compared to 1.9 percent in elective patients.

Recommendation

The rate of emergency resections performed for colorectal cancer is high in New Zealand, and may contribute to worse cancer outcomes. The rate of emergency colorectal resection is highest in Māori, which contributes to inequality in outcomes.

The Ministry of Health together with the NBCWG should consider measures to understand variation in the rates of emergency colorectal cancer surgery between units in New Zealand.

To reduce overall mortality in colorectal cancer, we need to improve elective pathways and promote screening, especially for Māori and Pacific people.

6.3 How long do patients stay in hospital after major bowel cancer resection?

The median length of stay in hospital for people with bowel cancer following major resection was seven days. The median length of stay varied according to patient age (it was eight days for patients aged 75 years and over) and operative urgency (it was nine days for emergency surgery and seven days for elective surgery). The median length of stay for men was one day longer than it was for women.

The median length of stay after surgery was seven days for people with colon cancer and eight days for people with rectal cancer.

The median length of stay after surgery for bowel cancer ranged from six to eight days between DHBs.

6.4 How many patients have more than 12 lymph nodes examined?

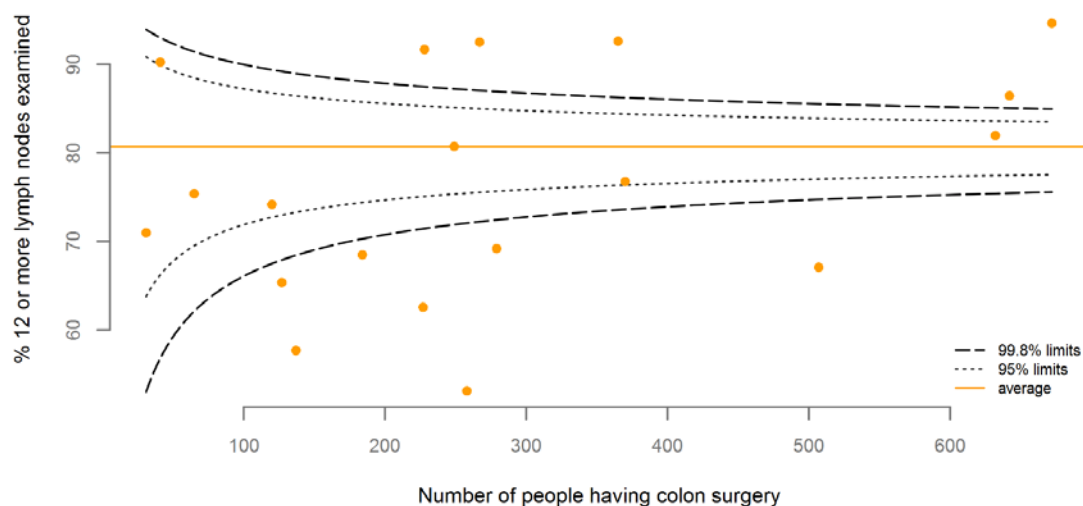
Maximising the lymph node yield (ie, the number of lymph nodes resected and examined) enables reliable staging which influences the decisions made for the patient's treatment. Current guidelines recommend a minimum of 12 nodes are harvested as the standard of care.

Pathology laboratories reported on the number of lymph nodes examined for 98 percent of people undergoing major colon surgery (including both metastatic and non-metastatic disease). Overall, 82 percent of people had 12 or more lymph nodes examined.

As Figure 6 shows, the proportion of people undergoing major colon surgery who had more than 12 lymph nodes examined varied considerably between DHBs, from 54.9 percent to 95.3 percent.

In contrast to other previous studies, our analysis found little difference between Māori and non-Māori (80.0 percent compared to 81.5 percent).

Figure 6: Proportion of people having colon cancer surgery who had 12 or more lymph nodes examined by district health board of service, 2013–16



The 2017 NBOCA report stated that 83 percent of patients undergoing colorectal surgery had more than 12 lymph nodes examined: a rate very similar to New Zealand's. As in New Zealand, there was wide geographical variation between trusts in England (from 37% to 98%) in the proportions of patients who had 12 or more lymph nodes reported.

The Piper Project found that 65 percent of patients with non-metastatic colon cancer had 12 or more lymph nodes examined. Māori patients had fewer lymph nodes examined (57%) compared with Pacific patients (85%) and non-Māori/non-Pacific patients (65%). Other New Zealand studies have also reported lower overall lymph node yield for Māori.

Recommendation

It is encouraging to see that the proportion of patients with 12 or more lymph nodes examined has increased since the Piper Project, and that the variation by ethnicity appears to have reduced since previous studies.

As lymph-node yield is related to patient outcomes and influences treatment options, this indicator may be valuable as a driver of quality improvement in DHBs with low lymph-node yield.

Overseas experience has shown that quality improvement programmes can result in higher reported lymph-node yields.

The reasons for variation in this indicator are likely to be complex. Review within DHBs will require a multi-disciplinary approach, and may benefit from external input. We recommend that DHBs with results below the 99.8 percent lower limits develop a quality improvement programme to improve harvesting, examination and reporting of lymph node yields.

7 Rectal cancer

7.1 How are patients with rectal cancer treated?

Surgical resection of the rectum is the most common intervention for the treatment of rectal cancer; 60 percent of rectal cancer patients have this publicly funded surgery. The rate of surgical resection varied from 57 percent to 80 percent across DHBs.

Of patients having publicly funded major surgery for rectal cancer, 54 percent received preoperative radiotherapy treatment: either short- or long-course (Table 5). 38 percent received long-course radiotherapy (LCRT) and 15 percent received short-course radiotherapy (SCRT).

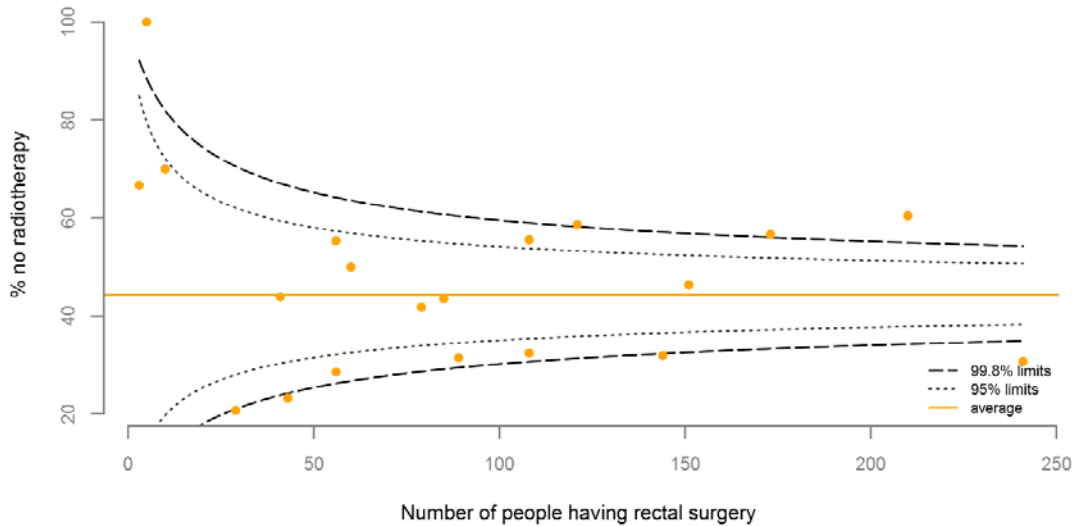
Table 5: People with rectal cancer having surgery alone and short-course and long-course preoperative radiotherapy, 2013–16

	Major surgery	Preoperative radiotherapy		LCRT		SCRT		No radiotherapy (surgery alone)	
	Number	Number	%	Number	%	Number	%	Number	%
Total	1,808	984	54.4	692	38.3	273	15.1	800	44.2

For 27.7 percent of people, their preoperative radiotherapy was short-course. Wide variation was seen in the use of short-course radiotherapy between providers (from 12 percent to 54 percent).

There was wide variation between DHBs in the proportion of people with rectal cancer who received no publicly funded radiotherapy (Figure 7). Five DHBs were above the 95 percent confidence limits for this indicator, and seven DHBs were below the 95 percent confidence limits.

Figure 7: Proportion of people with rectal cancer having no radiotherapy (surgery alone), by district health board of service for surgery, 2013–16



Wide variation in SCRT and LCRT use between cancer centres was the likely cause of variation at a DHB level (Figure 8 and Figure 9). In each case, three DHBs were above the 95 percent confidence limits, and five or more DHBs were below the 95 percent confidence limits.

Figure 8: Proportion of people with rectal cancer having pre-operative short-course radiotherapy, by district health board of service for surgery, 2013–16

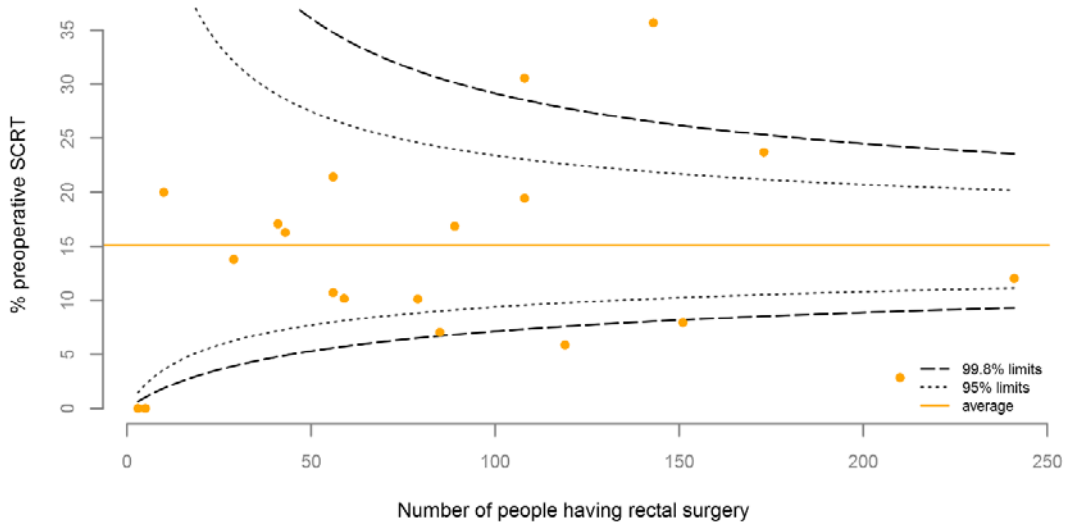
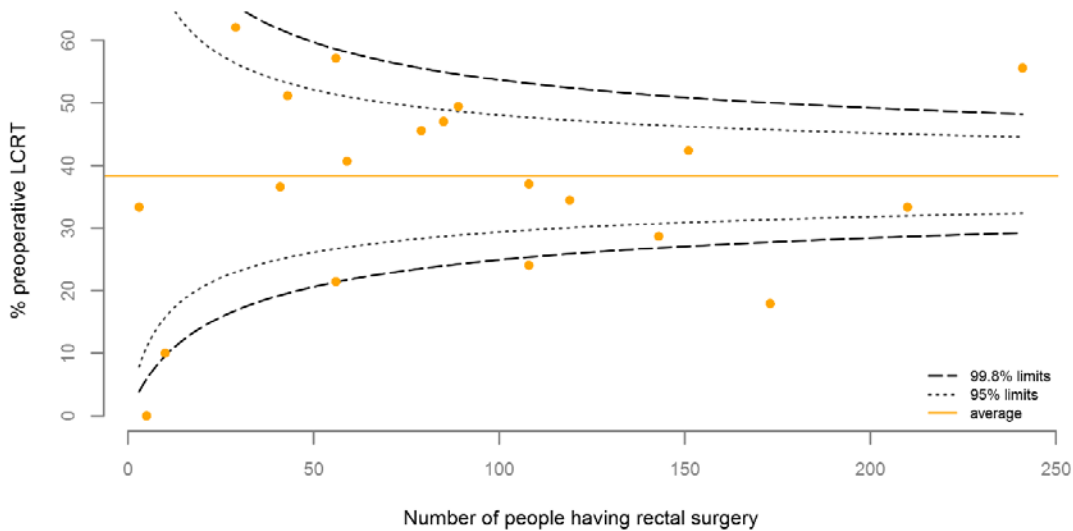


Figure 9: Proportion of people with rectal cancer having long-course pre-operative radiotherapy by district health board of service for surgery, 2013–16



Māori had significantly lower rates (35%) of having no radiotherapy (surgery alone) than all other ethnic groups (45–49%). Pacific had lower SCRT rates (6%) than other ethnic groups (11–16%).

The use of radiotherapy for rectal cancer patients in New Zealand appears higher than use as reported in the United Kingdom NBOCA report.

The 2017 NBOCA report stated that 38 percent of all rectal cancer patients undergoing a major resection received pre-operative treatment, 26 percent of patients received LCRT and 8 percent of patients received SCRT. These results are lower than the results calculated from New Zealand publicly funded service data.

The Piper Project found that 52 percent of patients with non-metastatic rectal cancer received radiotherapy. Of the pre-operative strategies, 18 percent received SCRT and 82 percent received LCRT. Of patients who received radiotherapy, 10 percent were treated post-operatively rather than pre-operatively.

We were unable to ascertain whether individual patients' rectal cancer was metastatic or non-metastatic, so our analyses do not exclude people with metastatic rectal cancer. Therefore our findings may not be directly comparable to the Piper Project, in which people with metastatic rectal cancer were excluded from the radiotherapy rates.

The proportion of people receiving SCRT appears to have increased since the Piper Project, with the caveat that the PIPER measure excluded metastatic rectal cancer.

Recommendation

Pre- or postoperative radiotherapy reduces the risk of pelvic recurrence of rectal cancer, but results in morbidity, so appropriate patient selection for this treatment is

important. Preoperative radiotherapy results in fewer long-term side effects than postoperative radiotherapy.

The current New Zealand guidelines for the management of early colorectal cancer⁸ recommend either preoperative short-course radiotherapy or preoperative long-course chemoradiation for people with rectal cancer who are at risk of local recurrence. Preoperative long-course chemoradiation is recommended for people who have a low rectal cancer or a threatened circumferential resection margin.^{9 10}

Short-course radiotherapy is more convenient for patients, has fewer short-term side effects and uses fewer health resources, so it should be considered for patients at increased risk of pelvic recurrence, who are not at risk of positive resection margins.

This indicator therefore needs to be interpreted in conjunction with the rate of margin positivity.

The reasons why Māori have lower rates of surgery alone are not immediately clear; this potential disparity may require focused audit. It may reflect the wide variation in practice between DHBs, and different ethnic population structures within DHBs.

Further work is needed to identify the reasons for the variability of pre-operative adjuvant therapy. This should involve the Radiation Oncology Working Group and other cancer service advisory groups involved in the multidisciplinary team process.

7.2 How often are patients stoma free at 18 months after surgery?

Stoma-free survival at 18 months after surgery for people with rectal cancer in New Zealand was 54.7 percent. The lowest 18-month stoma free survival rate was for people aged 75 years and over (42.5%).

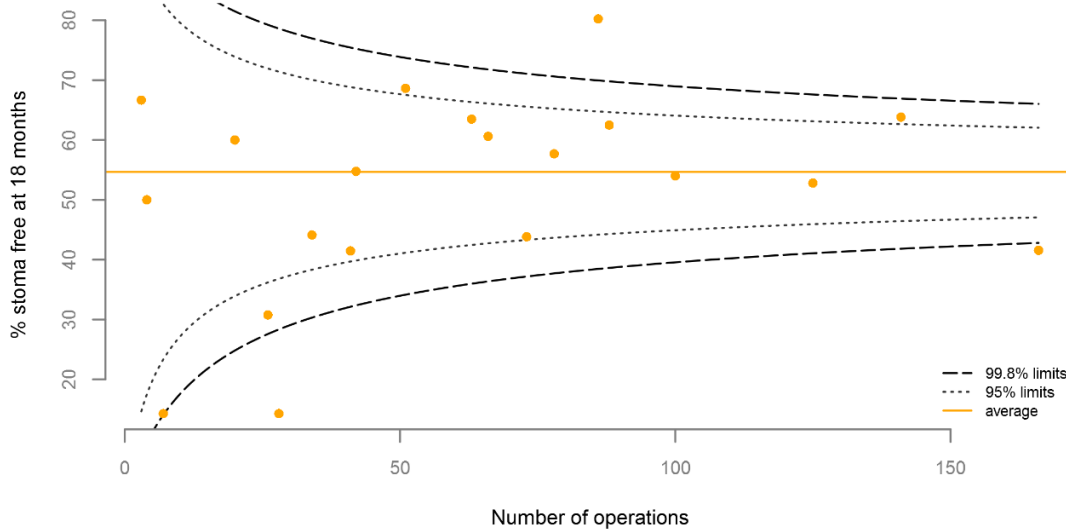
The 18-month stoma-free survival rate varied widely, from 14.3 percent to 80.2 percent across individual DHBs. Four DHBs were below the 95 percent confidence limits, and three DHBs were above the 95 percent confidence limits.

⁸ New Zealand Guidelines Group. 2011. Clinical practice guidelines for the management of early colorectal cancer. Wellington: New Zealand Guidelines Group. URL: <https://www.health.govt.nz/system/files/documents/publications/early-management-colorectal-cancer-guideline.pdf> (accessed 18 December 2018).

⁹ The edge or border of the tissue removed in cancer surgery. The margin is described as positive or involved when the pathologist finds cancer cells at the edge of the tissue, suggesting that all of the cancer has not been removed.

¹⁰ NICE. 2011. Colorectal cancer: diagnosis and management. National Institute for Health and Care Excellence; November.

Figure 10: Observed 18-month stoma-free rate by district health board of service for patients diagnosed with rectal cancer, 2013–15



The NBOCA reports stoma rate, rather than stoma-free survival rate. The stoma procedures used to define the NBOCA stoma rate are different in some respects to the New Zealand stoma-free survival indicator.

The 18-month stoma rate in the 2017 NBOCA report was 52 percent. There was wide variation in the stoma rate between units.

The NBOCA report stated that 83 percent of rectal cancer patients had surgery resulting in a stoma. In New Zealand, the estimated stoma rate for people having rectal surgery was 88 percent. Our definition for rectal surgery resulting in a stoma was broader than that used in the United Kingdom, as we assumed all anterior resections were covered with a stoma, and we excluded people who died within 18 months. This may overestimate the stoma rate in New Zealand, as only 77 percent of anterior resections in the United Kingdom were covered with a stoma.

Recommendation

Stoma-free survival is an important indicator of quality in rectal cancer surgery. This indicator assesses the appropriateness of the multidisciplinary decision-making process for rectal cancer patients, the availability of resources and the timeliness of reversal of defunctioning stoma.

The 18-month stoma-free survival indicator is a composite surrogate marker of the success of sphincter-preserving surgery in rectal cancer surgery.

The Ministry of Health with the NBCWG should seek to understand the variation in the 18-month stoma-free survival rate between DHBs in New Zealand and consider a national quality improvement programme in the treatment of low rectal cancer to reduce treatment variation.

Appendix A: Data tables

1 Diagnosis and surgery

Table 6: People diagnosed with colon and rectal cancer, number and percentage who had major surgery, by district health board of domicile, age group, sex and ethnic group, 2013–16

	Colon cancer			Rectal cancer		
	Number diagnosed	People having major surgery		Number diagnosed	People having major surgery	
	N	N	%	N	N	%
Total	8,430	5,360	63.6	2,998	1,810	60.4
Year of diagnosis						
2013	2,086	1,345	64.5	723	441	61.0
2014	2,122	1,346	63.4	811	505	62.3
2015	2,072	1,307	63.1	730	427	58.5
2016	2,150	1,362	63.3	734	437	59.5
DHB of domicile						
Auckland	603	321	53.2	225	114	50.7
Bay of Plenty	516	347	67.2	152	108	71.1
Canterbury	1,014	577	56.9	358	202	56.4
Capital and Coast	409	239	58.4	167	79	47.3
Counties Manukau	644	372	57.8	262	150	57.3
Hawke's Bay	370	257	69.5	121	85	70.2
Hutt Valley	252	169	67.1	89	56	62.9
Lakes	186	120	64.5	67	43	64.2
MidCentral	331	233	70.4	130	82	63.1
Nelson Marlborough	309	211	68.3	111	69	62.2
Northland	346	246	71.1	134	89	66.4
South Canterbury	163	130	79.8	65	44	67.7
Southern	848	550	64.9	270	175	64.8
Tairāwhiti	83	64	77.1	23	15	65.2
Taranaki	282	225	79.8	90	59	65.6
Waikato	769	489	63.6	252	142	56.3
Wairarapa	95	59	62.1	54	40	74.1
Waitemata	982	580	59.1	347	205	59.1
West Coast	74	51	68.9	31	23	74.2
Whanganui	154	120	77.9	50	30	60.0

	Colon cancer			Rectal cancer		
	Number diagnosed N	People having major surgery N %		Number diagnosed N	People having major surgery N %	
Age group (years)						
18–49	463	272	58.7	270	152	56.3
50–59	885	517	58.4	486	304	62.6
60–74	3,155	2,067	65.5	1,279	828	64.7
75+	3,927	2,504	63.8	963	526	54.6
Sex						
Female	4,305	2,789	64.8	1,111	658	59.2
Male	4,125	2,571	62.3	1,887	1,152	61.0
Ethnic group						
Māori	447	288	64.4	202	123	60.9
Pacific peoples	160	92	57.5	104	55	52.9
Asian	292	181	62.0	150	89	59.3
European/Other	7,417	4,725	63.7	2,495	1,512	60.6
Unknown	114	74	64.9	47	31	66.0
NZDep2013 quintile						
1 (least deprived)	1,475	854	57.9	574	297	51.7
2	1,580	978	61.9	537	315	58.7
3	1,830	1,169	63.9	664	400	60.2
4	2,001	1,335	66.7	642	411	64.0
5 (most deprived)	1,544	1,024	66.3	581	387	66.6

2 Bowel cancer surgery

Table 7: People having major surgery for bowel cancer in public hospitals, 2013–16

	People having major surgery	Emergency surgery		Death within 90 days of surgery		Death within 90 days of elective surgery		Median length of stay
	N	N	%	N	%	N	%	days
Total	7,170	1,403	19.6	289	4.0	147	2.5	7
Year of diagnosis								
2013	1,786	363	20.3	78	4.4	38	2.7	8
2014	1,851	363	19.6	86	4.6	44	3.0	7
2015	1,734	356	20.5	55	3.2	33	2.4	7
2016	1,799	321	17.8	70	3.9	32	2.2	7
DHB of service								
Auckland	445	105	23.6	10	2.2	2	0.6	8
Bay of Plenty	454	57	12.6	14	3.1	8	2.0	8
Canterbury	853	129	15.1	29	3.4	13	1.8	7
Capital and Coast	363	61	16.8	16	4.4	6	2.0	7
Counties Manukau	525	117	22.3	27	5.1	16	3.9	8
Hawke's Bay	336	56	16.7	15	4.5	8	2.9	7
Hutt Valley	230	36	15.7	6	2.6	2	1.0	7
Lakes	163	31	19.0	12	7.4	12	9.1	8
MidCentral	327	44	13.5	17	5.2	12	4.2	8
Nelson Marlborough	264	48	18.2	11	4.2	6	2.8	7
Northland	325	59	18.2	8	2.5	3	1.1	7
South Canterbury	168	24	14.3	4	2.4	3	2.1	7
Southern	718	202	28.1	28	3.9	11	2.1	7
Tairāwhiti	74	23	31.1	4	5.4	1	2.0	7
Taranaki	279	60	21.5	18	6.5	9	4.1	6
Waikato	637	180	28.3	36	5.7	14	3.1	7
Wairarapa	44	6	13.6	0	0	0	0	6
Waitemata	789	122	15.5	21	2.7	12	1.8	7
West Coast	31	8	25.8	2	6.5	1	4.3	8
Whanganui	145	35	24.1	11	7.6	8	7.3	7

	People having major surgery	Emergency surgery		Death within 90 days of surgery		Death within 90 days of elective surgery		Median length of stay days
	N	N	%	N	%	N	%	
Age group (years)								
18–49	424	115	27.1	5	1.2	1	0.3	7
50–59	821	166	20.2	11	1.3	3	0.5	7
60–74	2,895	480	16.6	72	2.5	38	1.6	7
75+	3,030	642	21.2	201	6.6	105	4.4	8
Sex								
Female	3,447	727	21.1	136	3.9	61	2.2	7
Male	3,723	676	18.2	153	4.1	86	2.8	8
Ethnic group								
Māori	411	98	23.8	22	5.4	13	4.2	8
Pacific peoples	147	30	20.4	6	4.1	2	1.7	7
Asian	270	43	15.9	3	1.1	2	0.9	7
European/Other	6,237	1,212	19.4	258	4.1	130	2.6	7
Unknown	105	20	19.0	0	0	0	0	7
NZDep2013 quintile								
1 (least deprived)	1,151	229	19.9	45	3.9	25	2.7	7
2	1,293	258	20.0	56	4.3	27	2.6	7
3	1,569	308	19.6	54	3.4	25	2.0	7
4	1,746	331	19.0	73	4.2	37	2.6	7
5 (most deprived)	1,411	277	19.6	61	4.3	33	2.9	7

3 Colon cancer surgery

Table 8: People having major surgery for colon cancer in public hospitals, 2013–16

	People having major surgery	Emergency surgery		Death within 90 days of surgery		Death within 90 days of elective surgery		Median length of stay	12 or more lymph nodes reported	
	N	N	%	N	%	N	%	days	N	%
Total	5,360	1,324	24.7	255	4.8	121	3.0	7	4,178	81.5
Year of diagnosis										
2013	1,345	338	25.1	70	5.2	32	3.2	7	1,043	80.7
2014	1,346	341	25.3	73	5.4	34	3.4	7	1,044	81.2
2015	1,307	339	25.9	48	3.7	27	2.8	7	1,017	81.0
2016	1,362	306	22.5	64	4.7	28	2.7	7	1,074	83.3
DHB of service										
Auckland	326	98	30.1	10	3.1	2	0.9	7.5	285	93.1
Bay of Plenty	346	55	15.9	13	3.8	7	2.4	7	259	77.5
Canterbury	612	125	20.4	25	4.1	10	2.1	7	477	82.2
Capital and Coast	254	59	23.2	16	6.3	6	3.1	7	168	70.9
Counties Manukau	374	104	27.8	23	6.1	13	4.8	8	351	98.0
Hawke's Bay	255	52	20.4	12	4.7	6	3.0	6	222	93.3
Hutt Valley	175	36	20.6	6	3.4	2	1.4	7	118	70.2
Lakes	120	31	25.8	11	9.2	11	12.4	8	77	67.5
MidCentral	238	41	17.2	13	5.5	9	4.6	8	186	82.3
Nelson Marlborough	205	44	21.5	10	4.9	5	3.1	6	129	63.9
Northland	240	57	23.8	8	3.3	3	1.6	7	123	54.9
South Canterbury	127	24	18.9	3	2.4	2	1.9	7	74	61.2
Southern	545	188	34.5	27	5.0	11	3.1	7	470	88.2
Tairāwhiti	63	22	34.9	4	6.3	1	2.4	7	44	73.3
Taranaki	223	58	26.0	17	7.6	8	4.8	6	200	92.6
Waikato	494	169	34.2	29	5.9	9	2.8	6	320	67.8
Wairarapa	41	6	14.6	0	0.0	0	0.0	6	37	92.5
Waitemata	580	113	19.5	16	2.8	8	1.7	7	534	95.7
West Coast	26	7	26.9	2	7.7	1	5.3	8	19	73.1
Whanganui	116	35	30.2	10	8.6	7	8.6	7	85	76.6

	People having major surgery	Emergency surgery		Death within 90 days of surgery		Death within 90 days of elective surgery		Median length of stay	12 or more lymph nodes reported	
	N	N	%	N	%	N	%	days	N	%
Age group (years)										
18–49	272	100	36.8	4	1.5	0	0.0	7	229	90.9
50–59	517	155	30.0	9	1.7	2	0.6	6	404	84.0
60–74	2,067	460	22.3	60	2.9	28	1.7	7	1,621	82.5
75+	2,504	609	24.3	182	7.3	91	4.8	7	1,924	79.3
Sex										
Female	2,789	691	24.8	125	4.5	51	2.4	7	2,221	83.0
Male	2,571	633	24.6	130	5.1	70	3.6	7	1,957	79.9
Ethnic group										
Māori	288	96	33.3	20	6.9	11	5.7	7	216	80.0
Pacific peoples	92	22	23.9	4	4.3	1	1.4	6	78	89.7
Asian	181	38	21.0	3	1.7	2	1.4	6	156	92.3
European/Other	4,725	1,151	24.4	228	4.8	107	3.0	7	3,663	81.0
Unknown	74	17	23.0	0	0.0	0	0.0	6	65	87.8
NZDep2013 quintile										
1 (least deprived)	854	219	25.6	43	5.0	23	3.6	7	705	85.8
2	978	248	25.4	53	5.4	24	3.3	7	792	84.7
3	1,169	290	24.8	44	3.8	18	2.0	7	903	81.1
4	1,335	310	23.2	65	4.9	30	2.9	7	1,004	78.3
5 (most deprived)	1,024	257	25.1	50	4.9	26	3.4	7	774	79.7

4 Rectal cancer surgery

Table 9: People having major surgery for rectal cancer in public hospitals, 2013–16

	People having major surgery	Emergency surgery		Death within 90 days of surgery		Median length of stay
	N	N	%	N	%	days
Total	1,810	79	4.4	34	1.9	8
Year of diagnosis						
2013	441	25	5.7	8	1.8	9
2014	505	22	4.4	13	2.6	8
2015	427	17	4.0	7	1.6	8
2016	437	15	3.4	6	1.4	8
DHB of service						
Auckland	119	7	5.9	0	0	9
Bay of Plenty	108	2	1.9	1	0.9	9
Canterbury	241	4	1.7	4	1.7	9
Capital and Coast	109	2	1.8	0	0	9
Counties Manukau	151	13	8.6	4	2.6	9
Hawke's Bay	81	4	4.9	3	3.7	9
Hutt Valley	55	0	0	0	0	9
Lakes	43	0	0	1	2.3	7
MidCentral	89	3	3.4	4	4.5	9
Nelson Marlborough	59	4	6.8	1	1.7	8
Northland	85	2	2.4	0	0	8
South Canterbury	41	0	0	1	2.4	9
Southern	173	14	8.1	1	0.6	8
Tairāwhiti	11	1	9.1	0	0	8
Taranaki	56	2	3.6	1	1.8	7.5
Waikato	143	11	7.7	7	4.9	7
Wairarapa	-	-	-	-	-	-
Waitemata	209	9	4.3	5	2.4	9
West Coast	-	-	-	-	-	-
Whanganui	29	0	0	1	3.4	8
Age group (years)						
18–49	152	15	9.9	1	0.7	8
50–59	304	11	3.6	2	0.7	8
60–74	828	20	2.4	12	1.4	8
75+	526	33	6.3	19	3.6	10

	People having major surgery	Emergency surgery		Death within 90 days of surgery		Median length of stay
	N	N	%	N	%	days
Sex						
Female	658	36	5.5	11	1.7	8
Male	1,152	43	3.7	23	2.0	9
Ethnic group						
Māori	123	2	1.6	2	1.6	8
Pacific peoples	55	8	14.5	2	3.6	9
Asian	89	5	5.6	0	0	8
European/Other	1,512	61	4.0	30	2.0	8
Unknown	31	3	9.7	0	0	9
NZDep2013 quintile						
1 (least deprived)	297	10	3.4	2	0.7	8
2	315	10	3.2	3	1.0	8
3	400	18	4.5	10	2.5	8
4	411	21	5.1	8	1.9	9
5 (most deprived)	387	20	5.2	11	2.8	8

– Too few cases to report (<10).

5 Radiotherapy

Table 10: Radiotherapy for people having major surgery for rectal cancer, 2013–16

	People having major surgery for rectal cancer	Pre-operative radiotherapy		Long-course RT		Short-course RT		No radiotherapy (surgery alone)	
	N	N	%	N	%	N	%	N	%
Total	1,808	984	54.4	692	38.3	273	15.1	800	44.2
Year of diagnosis									
2013	434	226	52.1	171	39.4	51	11.8	199	45.9
2014	507	309	60.9	206	40.6	98	19.3	193	38.1
2015	428	220	51.4	149	34.8	66	15.4	202	47.2
2016	439	229	52.2	166	37.8	58	13.2	206	46.9
DHB of service									
Auckland	119	50	42.0	41	34.5	7	5.9	69	58.0
Bay of Plenty	108	73	67.6	40	37.0	33	30.6	35	32.4
Canterbury	241	167	69.3	134	55.6	29	12.0	74	30.7
Capital and Coast	108	48	44.4	26	24.1	21	19.4	60	55.6
Counties Manukau	151	78	51.7	64	42.4	12	7.9	70	46.4
Hawke's Bay	79	44	55.7	36	45.6	8	10.1	33	41.8
Hutt Valley	56	25	44.6	12	21.4	12	21.4	31	55.4
Lakes	43	30	69.8	22	51.2	7	16.3	10	23.3
MidCentral	89	60	67.4	44	49.4	15	16.9	28	31.5
Nelson Marlborough	59	30	50.8	24	40.7	6	10.2	29	49.2
Northland	85	46	54.1	40	47.1	6	7.1	37	43.5
South Canterbury	41	23	56.1	15	36.6	7	17.1	18	43.9
Southern	173	72	41.6	31	17.9	41	23.7	98	56.6
Tairāwhiti	10	3	30.0	1	10.0	2	20.0	7	70.0
Taranaki	56	39	69.6	32	57.1	6	10.7	16	28.6
Waikato	143	93	65.0	41	28.7	51	35.7	45	31.5
Wairarapa	–	–	–	–	–	–	–	–	–
Waitemata	210	80	38.1	70	33.3	6	2.9	127	60.5
West Coast	–	–	–	–	–	–	–	–	–
Whanganui	29	22	75.9	18	62.1	4	13.8	6	20.7

	People having major surgery for rectal cancer	Pre-operative radiotherapy		Long-course RT		Short-course RT		No radiotherapy (surgery alone)	
	N	N	%	N	%	N	%	N	%
Age group (years)									
18–49	152	90	59.2	80	52.6	7	4.6	59	38.8
50–59	302	187	61.9	158	52.3	27	8.9	111	36.8
60–74	827	459	55.5	329	39.8	119	14.4	357	43.2
75+	527	248	47.1	125	23.7	120	22.8	273	51.8
Sex									
Female	657	372	56.6	257	39.1	108	16.4	281	42.8
Male	1,151	612	53.2	435	37.8	165	14.3	519	45.1
Ethnic group									
Māori	120	77	64.2	61	50.8	16	13.3	42	35
Pacific peoples	55	26	47.3	23	41.8	3	5.5	27	49.1
Asian	89	47	52.8	36	40.4	10	11.2	41	46.1
European/Other	1,513	819	54.1	561	37.1	240	15.9	675	44.6
Unknown	31	15	48.4	11	35.5	4	12.9	15	48.4
NZDep2013 quintile									
1 (least deprived)	295	148	50.2	99	33.6	46	15.6	144	48.8
2	316	173	54.7	128	40.5	38	12.0	140	44.3
3	402	190	47.3	129	32.1	56	13.9	209	52
4	410	249	60.7	169	41.2	79	19.3	155	37.8
5 (most deprived)	385	224	58.2	167	43.4	54	14.0	152	39.5

– Too few cases to report (<10).

6 Stoma-free survival

Table 11: People having major surgery for rectal cancer with a stoma at 18 months, 2013–15

	Major surgery for rectal cancer		Stoma forming surgery		APER		People with stoma reversal		Stoma free survival for people with rectal surgery	
	N		N	%	N	%	N	%	N	%
Total	1,242		1,108	89.2	282	22.7	545	49.2	679	54.7
Year of diagnosis										
2013	391		356	91.0	101	25.8	174	48.9	209	53.5
2014	460		412	89.6	102	22.2	203	49.3	251	54.6
2015	391		340	87.0	79	20.2	168	49.4	219	56.0
DHB of service										
Auckland	86		81	94.2	14	16.3	64	79.0	69	80.2
Bay of Plenty	73		68	93.2	19	26.0	27	39.7	32	43.8
Canterbury	166		157	94.6	47	28.3	60	38.2	69	41.6
Capital and Coast	78		74	94.9	19	24.4	41	55.4	45	57.7
Counties Manukau	100		87	87.0	24	24.0	41	47.1	54	54.0
Hawke's Bay	51		49	96.1	8	15.7	33	67.3	35	68.6
Hutt Valley	41		39	95.1	13	31.7	15	38.5	17	41.5
Lakes	26		24	92.3	10	38.5	6	25.0	8	30.8
MidCentral	66		54	81.8	20	30.3	28	51.9	40	60.6
Nelson Marlborough	42		32	76.2	13	31.0	13	40.6	23	54.8
Northland	63		45	71.4	8	12.7	22	48.9	40	63.5
South Canterbury	28		27	96.4	16	57.1	3	11.1	4	14.3
Southern	125		109	87.2	17	13.6	50	45.9	66	52.8
Tairāwhiti	7		7	100	1	14.3	1	14.3	1	14.3
Taranaki	34		31	91.2	8	23.5	12	38.7	15	44.1
Waikato	88		79	89.8	17	19.3	46	58.2	55	62.5
Wairarapa	–		–	–	–	–	–	–	–	–
Waitemata	141		119	84.4	27	19.1	68	57.1	90	63.8
West Coast	–		–	–	–	–	–	–	–	–
Whanganui	20		20	100	1	5	12	60.0	12	60.0

	Major surgery for rectal cancer	Stoma forming surgery		APER		People with stoma reversal		Stoma free survival for people with rectal surgery	
	N	N	%	N	%	N	%	N	%
Age group (years)									
18–49	111	103	92.8	15	13.5	62	60.2	70	63.1
50–59	203	184	90.6	35	17.2	115	62.5	134	66.0
60–74	587	521	88.8	133	22.7	264	50.7	330	56.2
75+	341	300	88.0	99	29.0	104	34.7	145	42.5
Sex									
Female	458	406	88.6	107	23.4	197	48.5	249	54.4
Male	784	702	89.5	175	22.3	348	49.6	430	54.8
Ethnic group									
Māori	77	70	90.9	22	28.6	33	47.1	40	51.9
Pacific peoples	31	25	80.6	4	12.9	14	56.0	20	64.5
Asian	63	60	95.2	9	14.3	38	63.3	41	65.1
European/Other	1,049	933	88.9	241	23.0	448	48.0	564	53.8
Unknown	22	20	90.9	6	27.3	12	60.0	14	63.6
NZDep2013 quintile									
1 (least deprived)	213	188	88.3	48	22.5	91	48.4	116	54.5
2	213	186	87.3	48	22.5	95	51.1	122	57.3
3	267	237	88.8	55	20.6	118	49.8	148	55.4
4	300	275	91.7	73	24.3	139	50.5	164	54.7
5 (most deprived)	249	222	89.2	58	23.3	102	45.9	129	51.8

– Too few cases to report (<10).

Appendix B: Working group members

The National Bowel Cancer Working Group members in 2018 were:

- Professor Ian Bissett (chair), colorectal surgeon, Auckland District Health Board/ University of Auckland
- Dr Christopher Jackson (deputy chair), medical oncologist, Southern District Health Board
- Mr Adrian Secker, general surgeon, Nelson Marlborough District Health Board
- Anne Cleland, gastroenterology nurse, MidCentral District Health Board
- Mr David Vernon, general surgeon, Lakes District Health Board
- Denise Robbins, consumer representative
- Dr Helen Moore, radiologist, Auckland District Health Board
- Dr Iain Ward, radiation oncologist, Canterbury District Health Board
- Dr Janet Hayward, general practitioner, Nelson
- Dr Joe Feltham, radiologist, Capital and Coast District Health Board
- Dr John McMenamin, general practitioner, Whanganui
- Judith Warren, cancer nurse, Waikato District Health Board
- Dr Marianne Lill, general surgeon, Whanganui District Health Board
- Dr Nicole Kramer, pathologist, Auckland District Health Board
- Dr Nina Scott (Ngāti Whatua), public health physician, Waikato
- Mr Ralph Van Dalen, colorectal surgeon, Waikato District Health Board
- Mr Siraj Rajaratnam, general and colorectal surgeon and endoscopist, Waitemata District Health Board
- Associate Professor Susan Parry, gastroenterologist, Auckland District Health Board
- Dr Teresa Chalmers-Watson, gastroenterologist and hepatologist, Canterbury District Health Board.

The bowel cancer indicator development group members were:

- Dr Christopher Jackson (chair), medical oncologist, Southern District Health Board
- Professor Ian Bissett (deputy chair), colorectal surgeon, Auckland District Health Board/University of Auckland
- Mr Christopher Harmston, general and colorectal surgeon, Northland District Health Board
- Dr Sarah Derrett, Bowel Cancer New Zealand
- Dr Joe Feltham, radiologist, Capital and Coast District Health Board
- Dr Nicole Kramer, pathologist, Auckland District Health Board
- Dr Iain Ward, radiation oncologist, Canterbury District Health Board
- Dr Janet Hayward, general practitioner, Nelson.