BC CANCER COLON SCREENING
Provincial Health Services Authority

BC Cancer Colon Screening
2018 Program Results

Date Published: June 2020

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PROGRAM OVERVIEW

Colon cancer screening in B.C. is organized under a partnership framework with regional health authorities, laboratory service providers, primary care providers and specialists. BC Cancer provides oversight for organized cancer screening in B.C., and supports:

- development of provincial policies, guidelines and standards,
- strategies to increase public and health care provider awareness, including both benefits and limitations of screening,
- correspondence to eligible British Columbians about results, follow-up and rescreening,
- quality assurance and quality improvement, and
- reporting and monitoring of system performance and screening outcomes.

In B.C., regional health authorities are responsible for the planning and delivery of healthcare services within their geographic areas. Health Authorities and community health service providers work with BC Cancer Screening to provide high quality screening and diagnostic services.

Primary care providers play the important role of identifying eligible individuals for screening. BC Cancer provides material to help primary care providers discuss the benefits and limitations of screening with their patients. Once the decision to screen is made, the primary care provider directs the patient to the appropriate screening test, and supports them throughout their screening journey.

In addition, as part of the Indigenous Cancer Strategy, BC Cancer Screening works collaboratively with the First Nations Health Authority, Métis Nation British Columbia and the B.C. Association of Aboriginal Friendship Centres to improve cancer screening access and participation of Indigenous people.

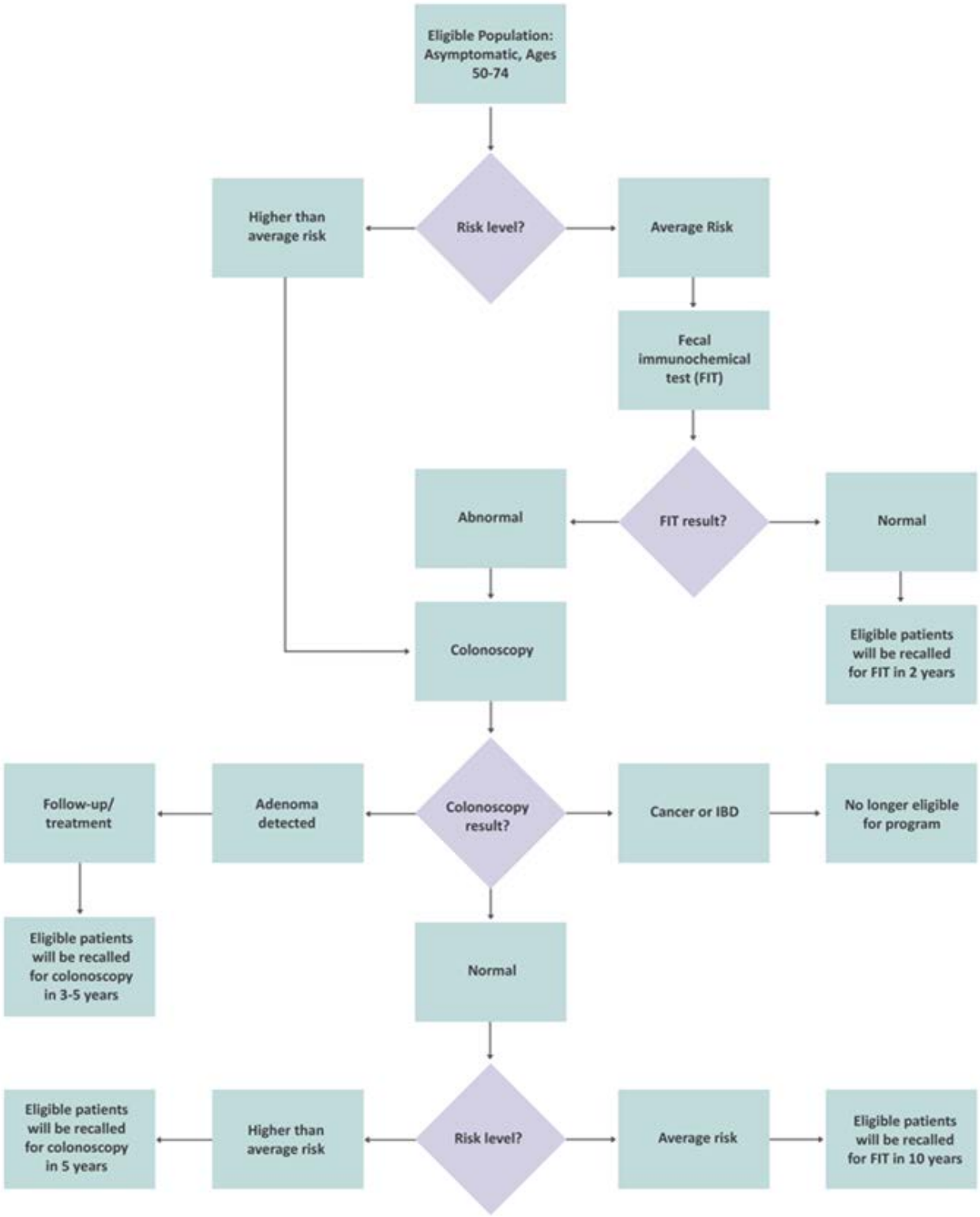
At this time, Northern Health Authority follows their own colon screening processes for referral and recall and does not provide data to the Provincial program. Therefore, no monitoring of the efficacy and quality of colon screening can be done for the people living in the area comprising the Northern Health Authority.

The Colon Screening Program started in B.C. in November 2013. The data provided in this report is based on screening results for British Columbians registered in the Colon Screening Program.

The Screening Process

The screening pathway is initiated by primary care providers referring asymptomatic individuals 50 to 74 years of age for a screening test – either the fecal immunochemical test (FIT) or colonoscopy, depending on the patient's risk of developing colorectal cancer. Figure 1 provides an overview of the colon screening process.

FIGURE 1: COLON SCREENING PROCESS OVERVIEW



PROGRAM RESULTS

In order to prevent inappropriate disclosure of health-related information, all integers presented in this report have been randomly rounded up or down to the nearest five using Statistics Canada methodology.

1. Program Uptake

Asymptomatic British Columbians, ages 50 to 74, can enter into the Colon Screening Program by visiting their primary care provider. The primary care provider assesses the individual's risk of developing colorectal cancer and orders the appropriate screening test – FIT for an average risk individual and colonoscopy for higher than average risk.

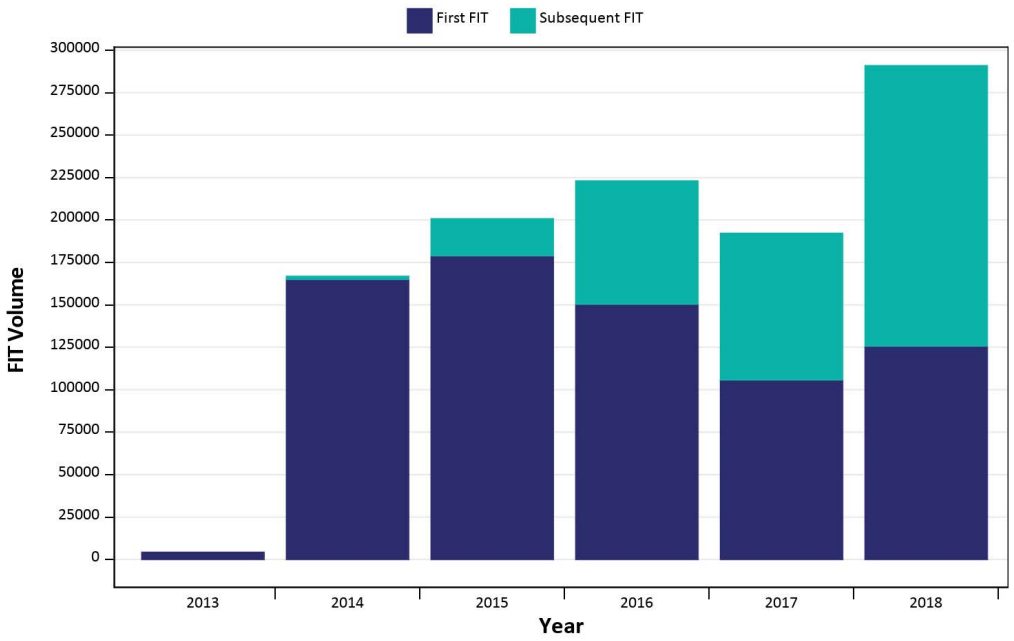
Primary care providers enroll asymptomatic average risk individuals by selecting the appropriate option on the laboratory requisition form. Colonoscopy referral for higher than average risk individuals is sent directly to the Colon Screening Program.

Figure 2 shows the volume of FIT results received by the Colon Screening Program since the inception of the provincial program. There continues to be a higher proportion of first time screeners registering in the program. The number of people returning for subsequent rounds of screening is growing as expected. Volumes in 2017 are lower due to the FIT suspension that occurred in 2017. The proportion of FITs with results copied to the Colon Screening Program increased in 2018 up to 83.8% (Figure 3).

In 2018, 16% of patients had a repeat FIT within 21 months following a negative FIT in the program. Early return to screening does not increase the uptake of colon screening in B.C. but utilizes screening resources.

In 2018, the program received 291,305 FIT results on 285,750 British Columbians ages 50 to 74. 9,385 individuals had a total of 9,555 colonoscopies for higher than average risk reasons. 7,270 colonoscopies were completed for a personal history of adenoma(s), 1,305 were completed for a family history and 980 colonoscopies were done due to short deviation (less than one year) reasons. 33.4% of the age eligible population has had a FIT within the Colon Screening Program in the past 30 months (Figure 6). Of these, 52% were female and the mean age of individuals was 62 years.

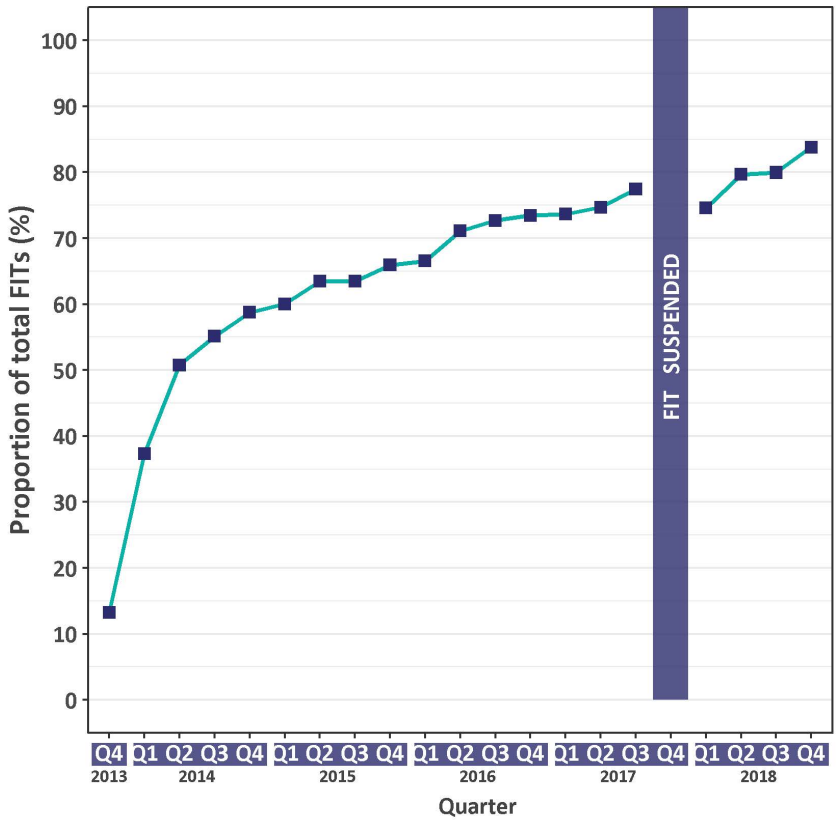
FIGURE 2: NUMBER OF FIT RESULTS RECEIVED BY THE COLON SCREENING PROGRAM OVER TIME



NOTES:

1. Colon Screening Program data extraction date: 02/21/2020.
2. Integers have been rounded as per Statistics Canada methodology.
3. FIT was unavailable in B.C. for most of Q4 2017.

FIGURE 3: PROPORTION OF FITs REGISTERED WITH THE COLON SCREENING PROGRAM FOR BRITISH COLUMBIANS AGES 50-74

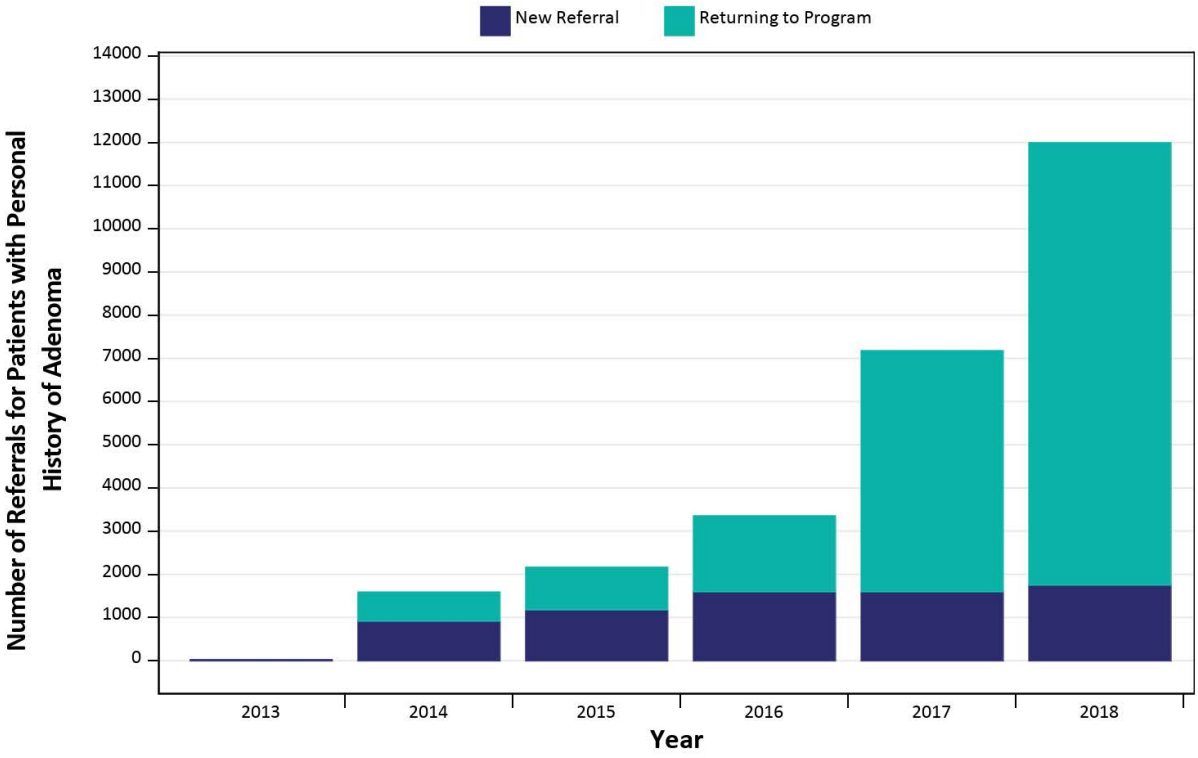


NOTES:

1. Colon Screening Program data extraction date: 02/21/2020.
2. An Individual may have multiple FITs performed in any time period.
3. FIT was unavailable in B.C. for most of Q4 2017.

Figure 4 and Figure 5 demonstrate that the number of referrals for colonoscopy for individuals at higher than average risk reasons have continued to increase. This includes participants with a high risk family history defined as one first degree relative (i.e. parent, full-sibling or child) with colorectal cancer diagnosed under the age of 60 or two or more first degree relatives with colorectal cancer diagnosed at any age. A high risk family history is the colonoscopy referral indication in 16% of higher than average risk referrals while a personal history of adenoma(s) accounts for 84% of higher than average risk patients referred to Health Authorities for colonoscopy in 2018.

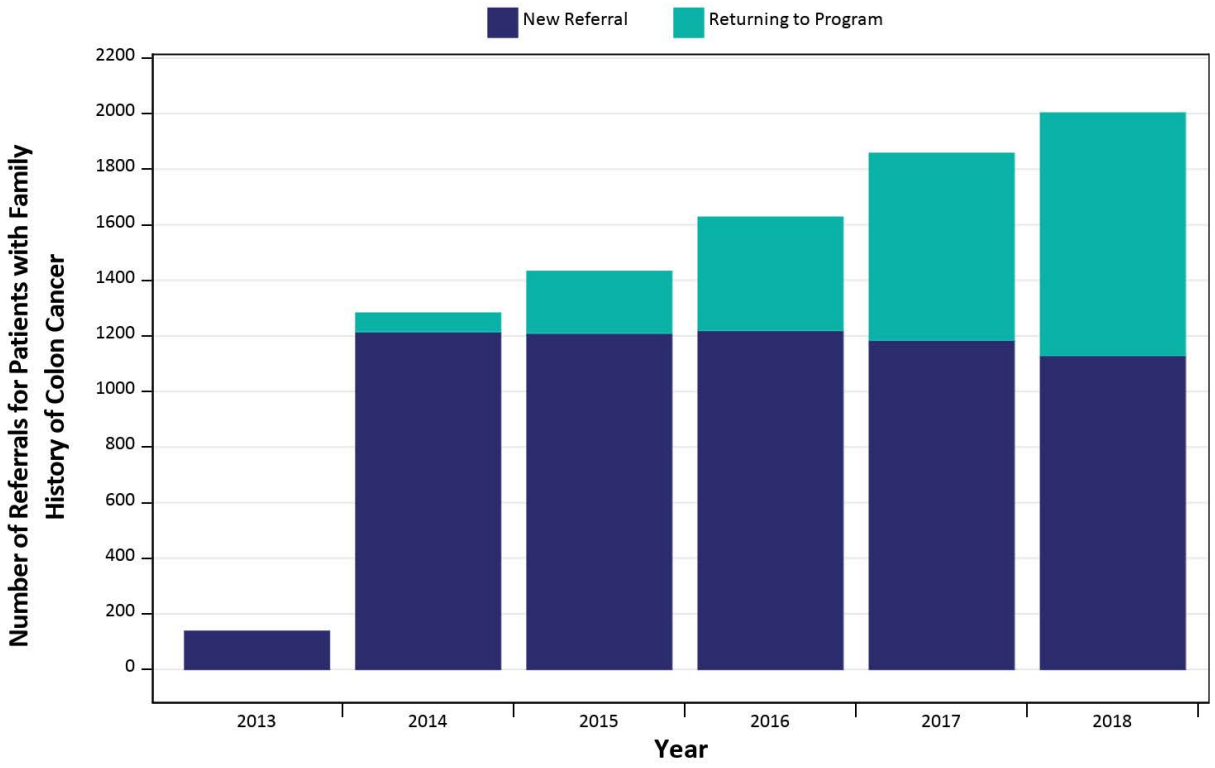
FIGURE 4: NUMBER OF REFERRALS FOR PATIENTS WITH PERSONAL HISTORY OF ADENOMA



NOTES:

1. Colon Screening Program data extraction date: 02/21/2020.
2. An individual may have multiple referrals.
3. Integers have been rounded as per Statistics Canada methodology.

FIGURE 5: NUMBER OF REFERRALS FOR PATIENTS WITH FAMILY HISTORY OF COLON CANCER

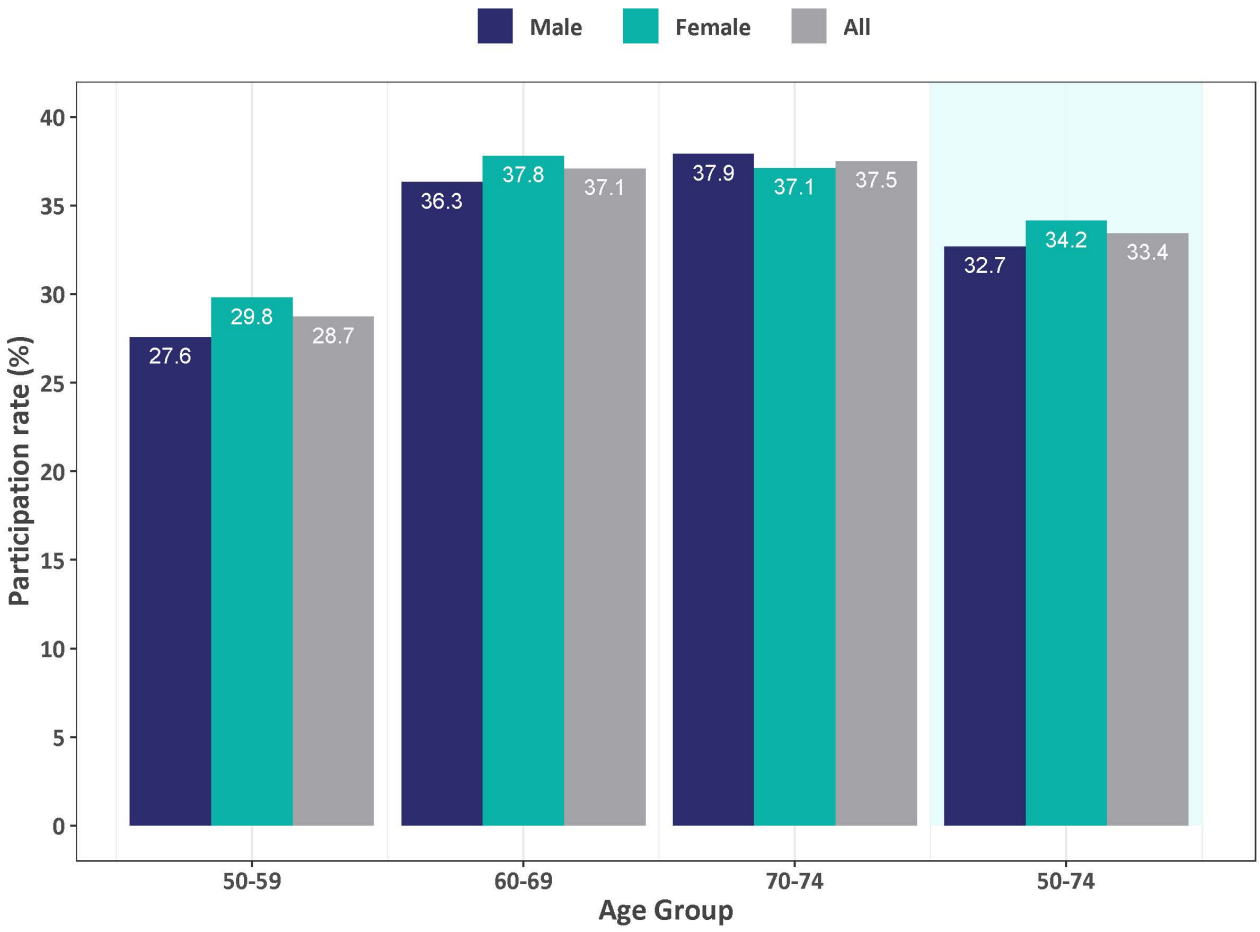


NOTES:

1. Colon Screening Program data extraction date: 02/21/2020.
2. An individual may have multiple referrals.
3. Integers have been rounded as per Statistics Canada methodology.

Figure 6 shows FIT participation by age and sex. Regional variation is shown in Figure 7. This does not account for those screened outside of the program, those at higher than average risk who underwent colonoscopy within the program or those participants with a previous abnormal FIT with a normal colonoscopy to be rescreened with FIT in 10 years following colonoscopy.

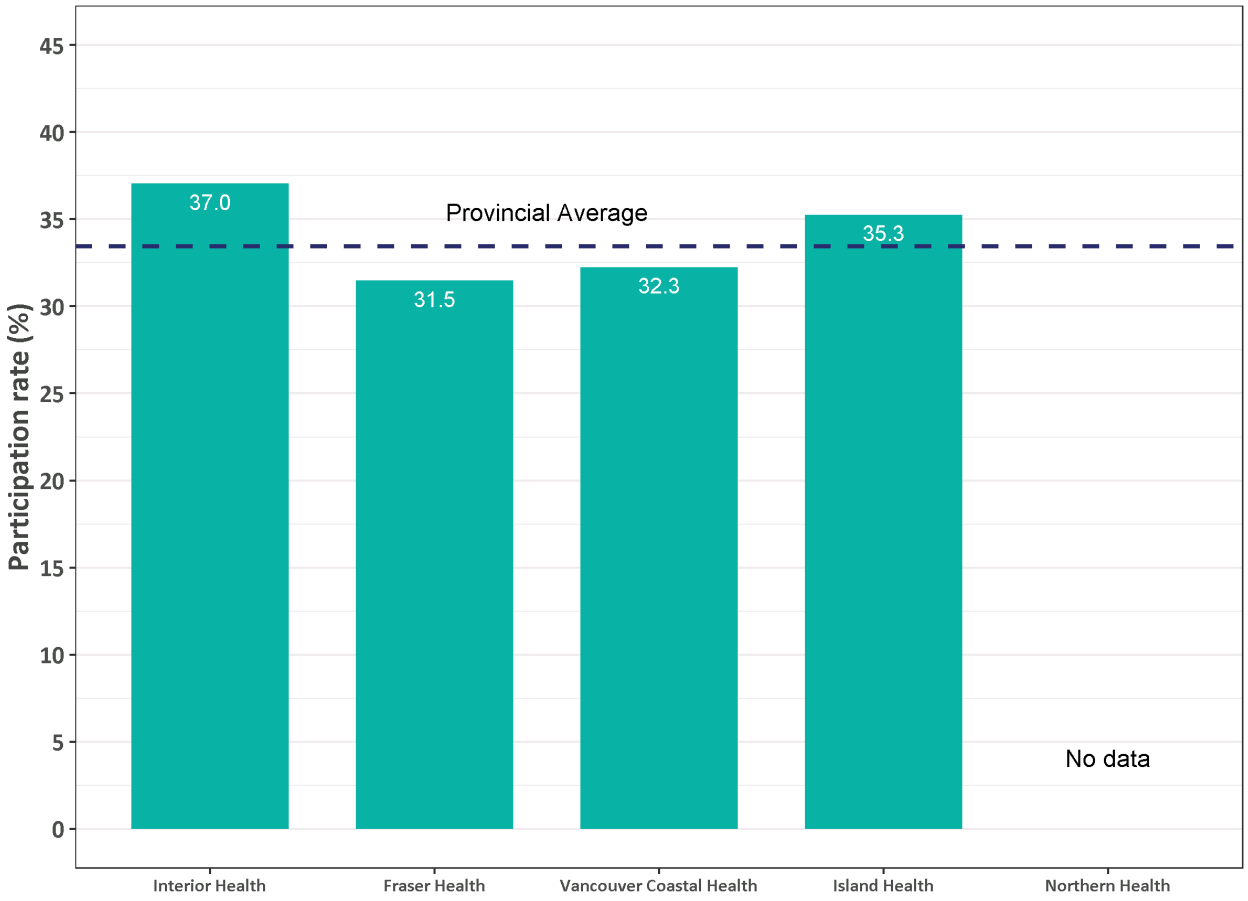
FIGURE 6: PROGRAM PARTICIPATION RATE IN B.C. BY AGE AND SEX



NOTES:

1. Colon Screening Program data extraction date: 02/21/2020.
2. Population data source: P.E.O.P.L.E 2019 (Sept 2019), BC STATS, Service BC, BC Ministry of Citizen's Services

FIGURE 7: PROGRAM PARTICIPATION RATE BY HEALTH AUTHORITY

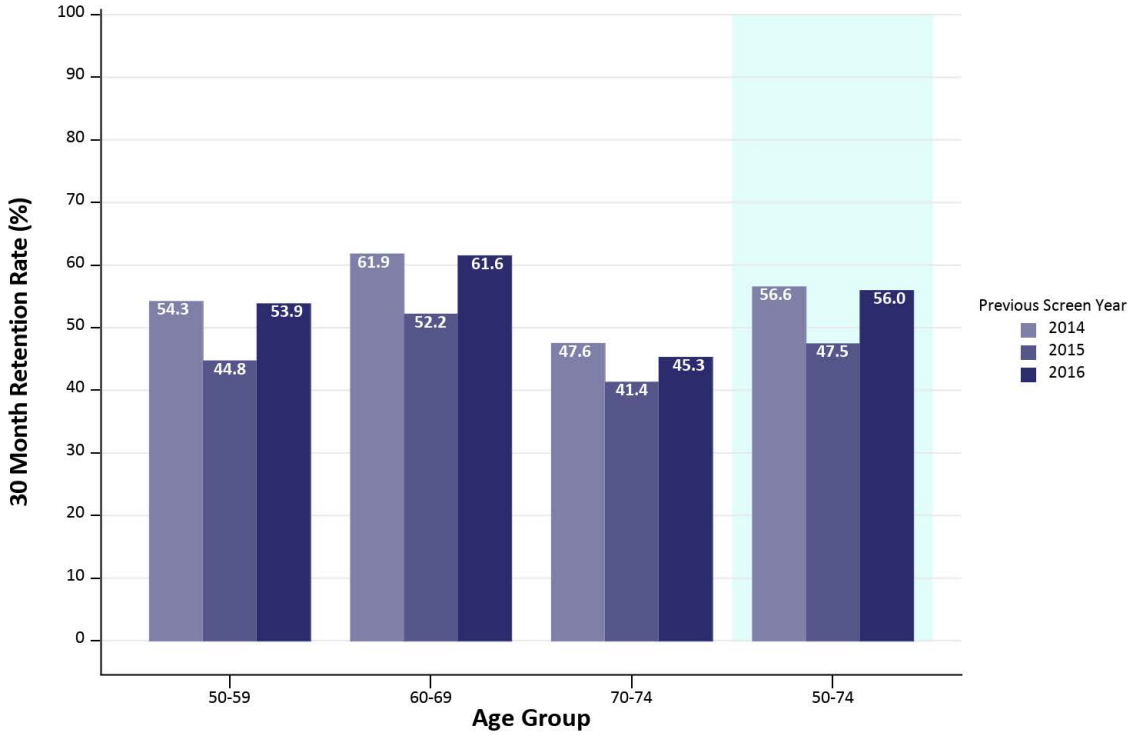


NOTES:

1. Colon Screening Program data extraction date: 02/21/2020.
2. Population data source: P.E.O.P.L.E 2019 (Sept 2019), BC STATS, Service BC, BC Ministry of Citizen's Services

Retention rate is defined as the proportion of average risk participants with a normal FIT result who returned for a FIT by 30 months. Figure 8 and Figure 9 show retention rates by age and gender respectively for participants who had a normal FIT result in 2014, 2015 and 2016 and then completed another FIT within 30 months.

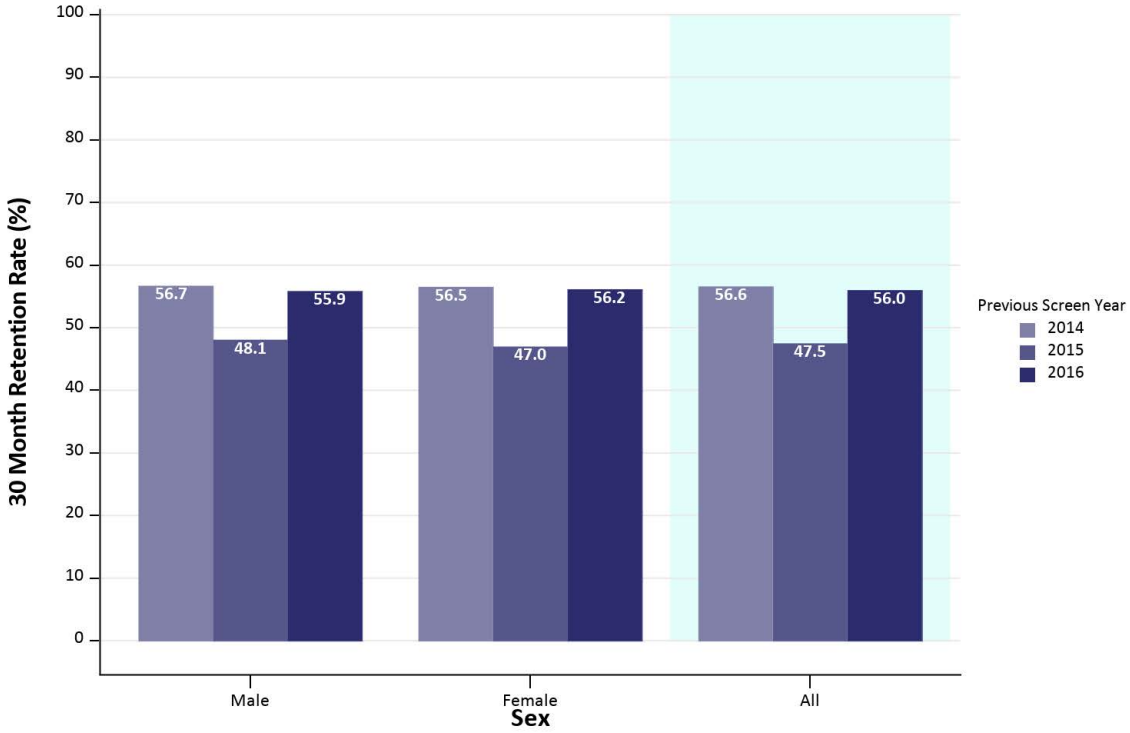
FIGURE 8: PROGRAM RETENTION RATE IN B.C. BY AGE



NOTES:

1. Colon Screening Program data extraction date: 02/21/2020.

FIGURE 9: PROGRAM RETENTION RATE IN B.C. BY SEX



NOTES:

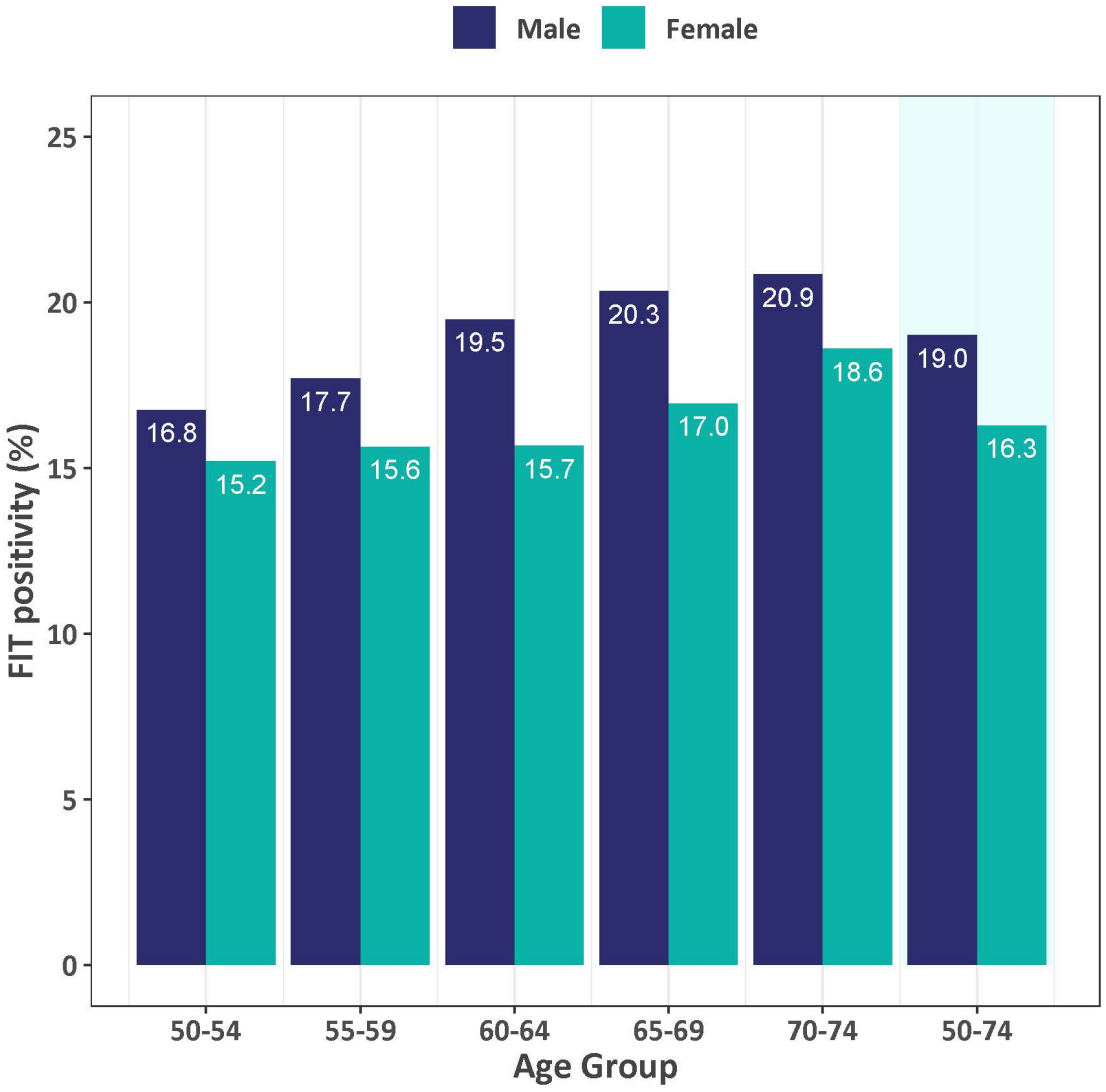
1. Colon Screening Program data extraction date: 02/21/2020.

The following sections describe the Colon Screening Program results from January 1, 2018 to December 31, 2019.

2. FIT Results

The percent of FIT results that were abnormal in 2018 was 17.6%, this has remained elevated in 2018 compared to previous years. This is most likely related to the FIT manufacturer reagent as opposed to population differences year over year. Figure 10 demonstrates that abnormal FIT results were more common in males and increase with age, which reflects the prevalence of colorectal cancer.

FIGURE 10: FIT POSITIVITY BY AGE GROUP AND SEX



NOTES:
1. Colon Screening Program data extraction date: 02/21/2020.

3. Colonoscopy Results

Participants with Abnormal FIT Results

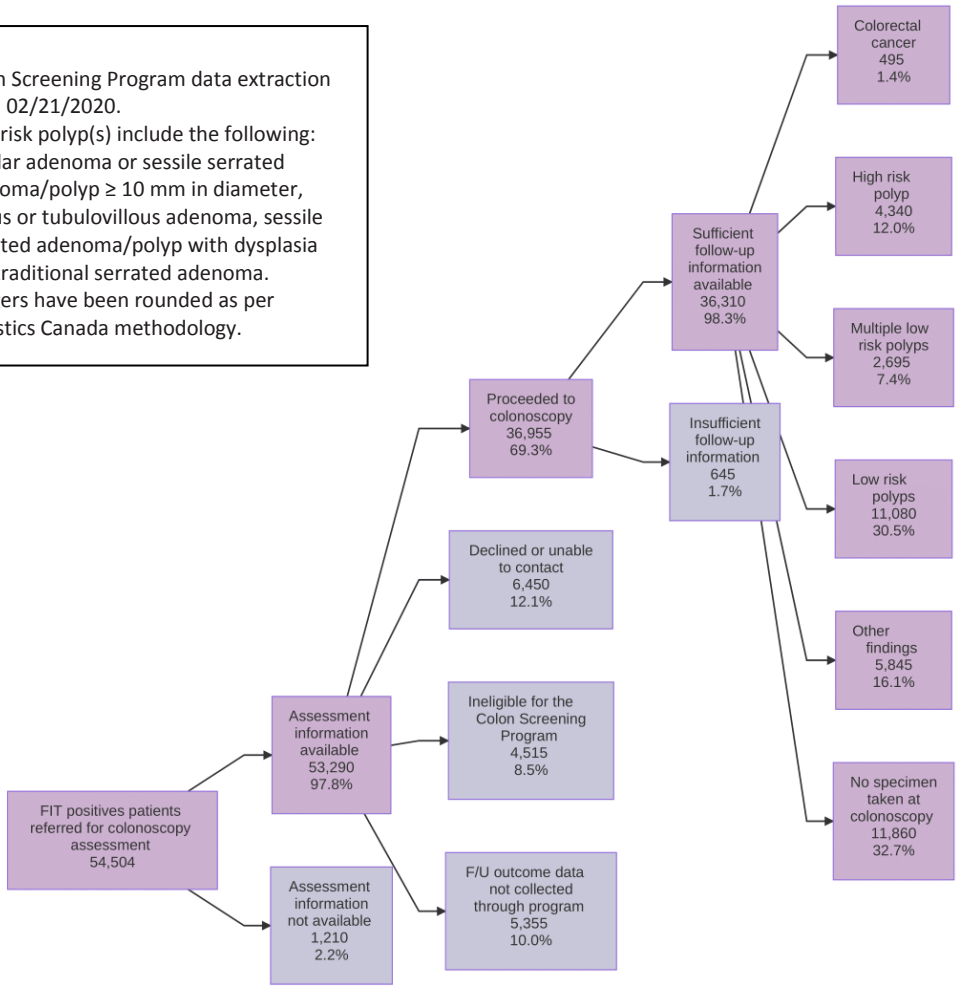
In 2018, a total of 54,504 program participants with abnormal FIT results were referred to regional health authorities for colonoscopy assessment. After initial assessment by health authority staff, 69.3% proceeded to have a colonoscopy with outcome data captured by the Colon Screening Program, 12.1% declined colonoscopy or were unable to be contacted, 8.5% were deemed ineligible for the program and 10.0% did not proceed to colonoscopy through the program but likely obtained follow-up through a provider directly. This underscores the importance of having primary care providers assess a potential participant's understanding that an abnormal FIT result requires a colonoscopy to complete the screening episode. This assessment should occur prior to proceeding with FIT.

Figure 11 summarizes the outcomes for those with abnormal FIT results. Of the 36,310 cases with available pathology information, 51.3% were found to have colorectal cancer or a pre-cancerous polyp: 495 (1.4%) cases for whom a colorectal cancer was found, 4,340 (12.0%) cases with high risk polyp(s) identified, 2,695 (7.4%) cases with multiple (3 or more) low risk polyps and 11,080 (30.5%) cases with 1 or 2 low risk polyp(s). For the cancers, 185 (37.4%) were located on the left side of the colon, 155 (31.3%) were right-sided and 145 (29.3%) were in the rectum.

FIGURE 11: COLONOSCOPY FINDINGS FOR THOSE WITH AN ABNORMAL FIT RESULT

NOTES:

1. Colon Screening Program data extraction date: 02/21/2020.
2. High risk polyp(s) include the following: tubular adenoma or sessile serrated adenoma/polyp ≥ 10 mm in diameter, villous or tubulovillous adenoma, sessile serrated adenoma/polyp with dysplasia and traditional serrated adenoma.
3. Integers have been rounded as per Statistics Canada methodology.



Quality indicators help assess the effectiveness of the colonoscopy. The unadjusted cecal intubation rate was 98.5% and the adequate bowel preparation rate was 98.6% in colonoscopies done for patients with abnormal FIT results.

The positive predictive value (PPV) of a test is a measure of performance. It represents the proportion of individuals with an abnormal FIT who have cancer or pre-cancerous polyps at follow-up colonoscopy. Table 1 summarizes the PPV by screening round, sex and age. The PPV of FIT increases with age and is higher in males than females.

TABLE 1: POSITIVE PREDICTIVE VALUE OF THE FIT

	Cancer	High Risk Polyp(s)	Multiple Low Risk Polyps	Low risk polyp	Any Neoplasia
All	495 (1.4%)	4,340 (12.0%)	2,695 (7.4%)	11,080 (30.5%)	**18,610 (51.3%)**
By FIT					
First FIT	310 (1.8%)	2,485 (14.0%)	1,265 (7.1%)	5,220 (29.5%)	**9,280 (52.4%)**
Subsequent FIT	185 (1.0%)	1,850 (9.9%)	1,430 (7.7%)	5,855 (31.5%)	**9,325 (50.1%)**
By Sex					
Females	215 (1.2%)	1,645 (9.3%)	860 (4.9%)	4,980 (28.2%)	**7,705 (43.6%)**
Males	275 (1.5%)	2,695 (14.5%)	1,835 (9.9%)	6,095 (32.7%)	**10,895 (58.5%)**
By Age group					
50-54	55 (0.8%)	605 (9.1%)	290 (4.4%)	1,830 (27.5%)	**2,785 (41.9%)**
55-59	85 (1.1%)	855 (10.9%)	440 (5.6%)	2,340 (29.8%)	**3,725 (47.5%)**
60-64	110 (1.4%)	1,005 (12.3%)	640 (7.9%)	2,565 (31.5%)	**4,320 (53.0%)**
65-69	120 (1.5%)	1,030 (13.2%)	725 (9.3%)	2,475 (31.7%)	**4,350 (55.7%)**
70-74	120 (2.0%)	840 (14.3%)	605 (10.3%)	1,865 (31.7%)	**3,435 (58.5%)**

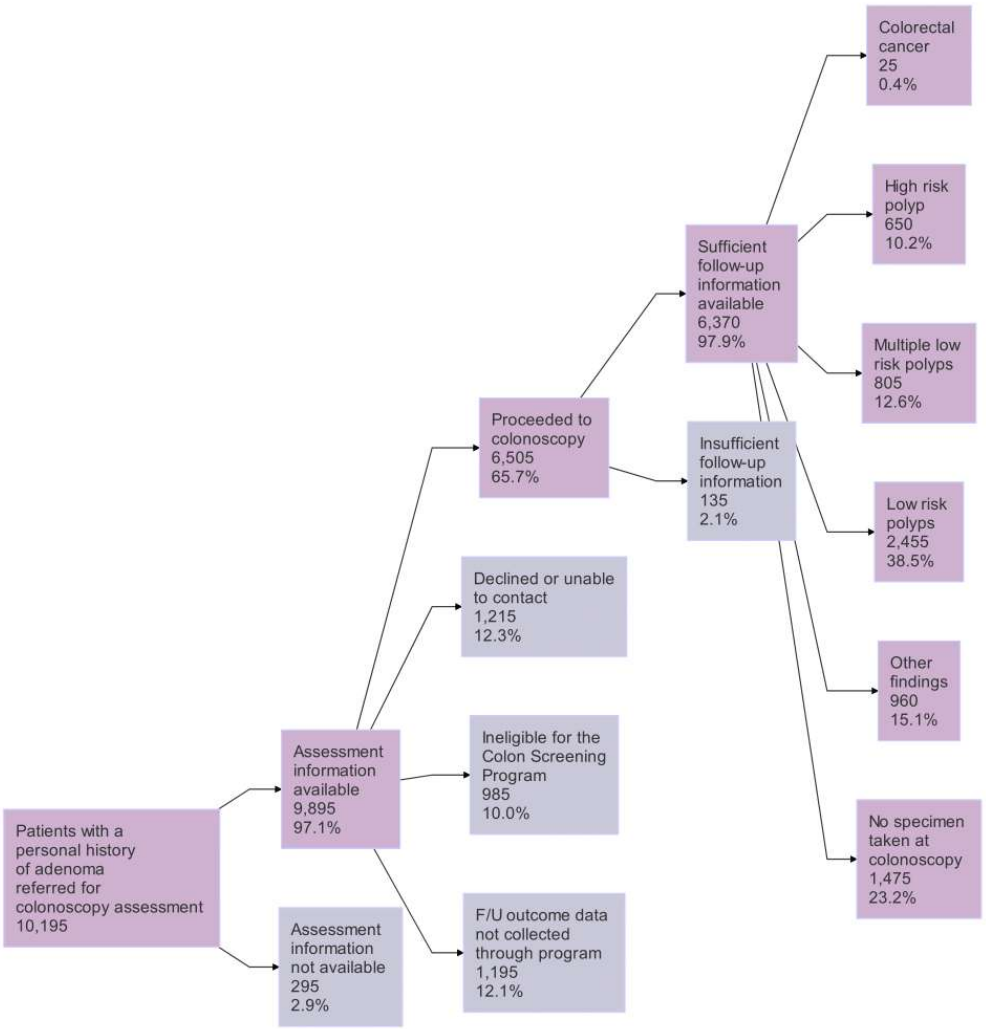
NOTES:
1. Colon Screening Program data extraction date: 02/21/2020.
2. Integers have been rounded as per Statistics Canada methodology.

Higher than Average Risk Participants with Personal History of Adenomas

During the report period, 10,195 referrals for colonoscopy assessment were sent to the Health Authorities for higher than average risk screening due to a personal history of adenomas. After initial assessment by health authority staff, 65.7% proceeded to have a colonoscopy with outcome data captured by the Colon Screening Program, 12.3% declined colonoscopy or were unable to be contacted, 10.0% were deemed ineligible for the program and 12.1% did not proceed to colonoscopy through the program but likely obtained follow-up through a provider directly. This emphasizes the need for ongoing primary care education regarding program eligibility.

Figure 12 summarizes colonoscopy findings for those with a personal history of adenomas. Of the 6,370 cases with available follow-up information, 61.7% were found to have colorectal cancer or a precancerous polyp.

FIGURE 12: COLONOSCOPY FINDINGS FOR THOSE WITH A PERSONAL HISTORY OF ADENOMAS



NOTES:

1. Colon Screening Program data extraction date: 02/21/2020
2. High risk polyp(s) include the following: tubular adenoma or sessile serrated adenoma/polyp ≥ 10 mm in diameter, villous or tubulovillous adenoma, sessile serrated adenoma/polyp with dysplasia and traditional serrated adenoma.
3. Integers have been rounded as per Statistics Canada methodology.

Detection of neoplasia by sex and age in screening colonoscopy for those with a personal history of adenomas are presented in Table 2.

TABLE 2: DETECTION OF NEOPLASIA IN SCREENING COLONOSCOPY FOR THOSE WITH A PERSONAL HISTORY OF ADENOMAS

	Cancer	High Risk Polyp(s)	Multiple Low Risk Polyps	Low risk polyp	Any Neoplasia
All	25 (0.4%)	650 (10.2%)	805 (12.6%)	2,455 (38.5%)	**3,935 (61.8%)**
By Sex					
Females	5 (0.2%)	235 (9.6%)	235 (9.6%)	860 (35.0%)	**1,340 (54.6%)**
Males	15 (0.4%)	415 (10.6%)	565 (14.4%)	1,595 (40.7%)	**2,590 (66.2%)**
By Age group					
50-54	NA	30 (7.1%)	30 (7.1%)	155 (36.5%)	**205 (48.8%)**
55-59	NA	80 (7.3%)	100 (9.1%)	430 (39.1%)	**610 (55.5%)**
60-64	5 (0.3%)	150 (9.8%)	175 (11.5%)	600 (39.3%)	**935 (61.3%)**
65-69	5 (0.3%)	170 (9.6%)	265 (14.9%)	685 (38.6%)	**1,135 (63.8%)**
70-74	5 (0.3%)	215 (13.9%)	245 (15.9%)	590 (38.2%)	**1,050 (68.2%)**

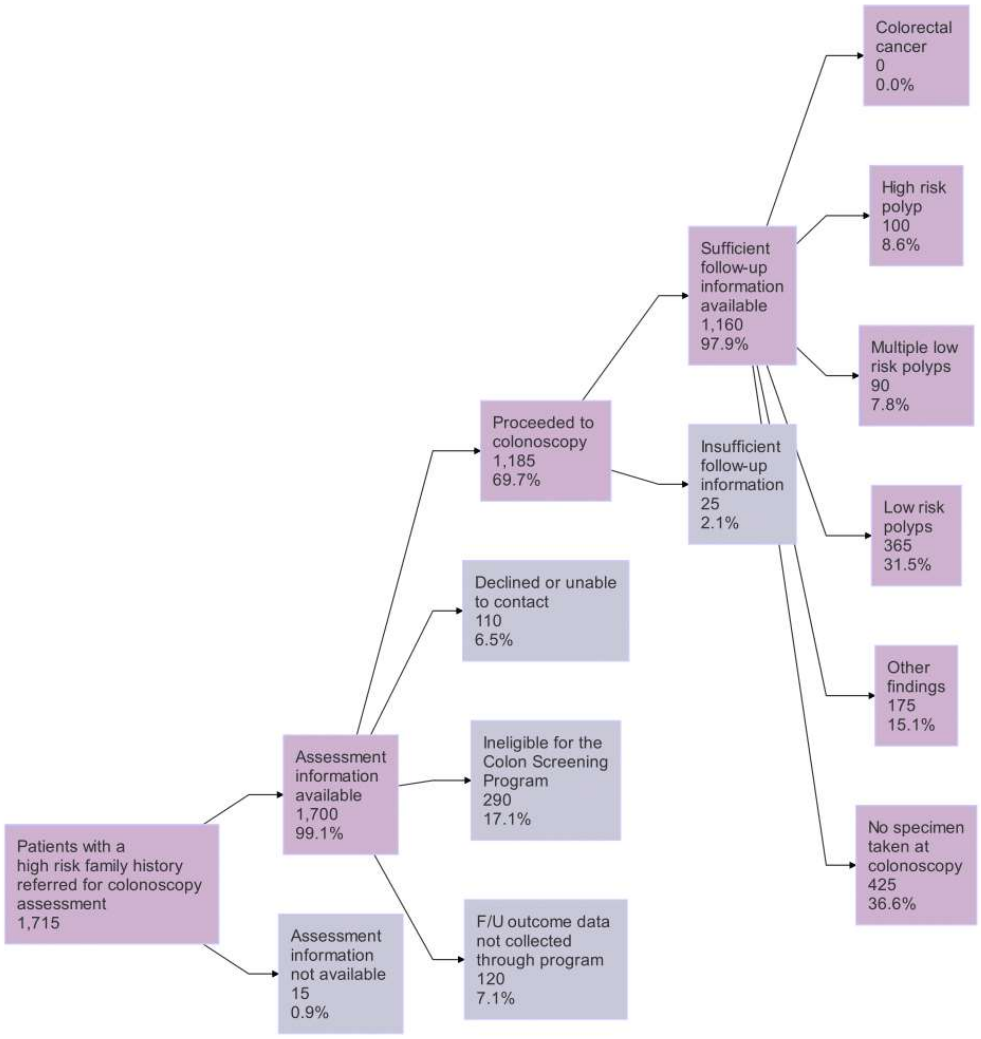
NOTES:
1. Colon Screening Program data extraction date: 02/21/2020.
2. Integers have been rounded as per Statistics Canada methodology.

Higher than Average Risk Participants with Family History of Colon Cancer

During the report period, 1,715 referrals for pre-colonoscopy assessment were sent to the Health Authorities for those with a family history of colon cancer. After initial assessment by health authority staff, 69.7% proceeded to have a colonoscopy with outcome data captured by the Colon Screening Program, 6.5% declined colonoscopy or were unable to be contacted, 17.1% were deemed ineligible for the program and 7.1% did not proceed to colonoscopy through the program but likely obtained follow-up through a provider directly. This emphasizes the need for ongoing primary care education on the eligibility for screening.

Figure 13 summarizes colonoscopy findings for higher risk participants with a family history of colon cancer. Of the 1,160 cases with available follow-up information, 47.9% were found to have colorectal cancer or a precancerous polyp.

FIGURE 13: COLONOSCOPY FINDINGS FOR THOSE WITH A FAMILY HISTORY



NOTES:

1. Colon Screening Program data extraction date: 02/21/2020.
2. High risk polyp(s) include the following: tubular adenoma or sessile serrated adenoma/polyp ≥ 10 mm in diameter, villous or tubulovillous adenoma, sessile serrated adenoma/polyp with dysplasia and traditional serrated adenoma.
3. Integers have been rounded as per Statistics Canada methodology.

In the higher than average risk patients undergoing colonoscopy, the unadjusted cecal intubation rate was 98.3%, and 98.2% had an adequate bowel preparation.

Detection of neoplasia by sex and age in screening colonoscopy for those with a family history of colon cancer are presented in Table 3.

TABLE 3: DETECTION OF NEOPLASIA IN SCREENING COLONOSCOPY FOR THOSE WITH A FAMILY HISTORY OF COLON CANCER

	Cancer	High Risk Polyp(s)	Multiple Low Risk Polyps	Low risk polyp	Any Neoplasia
All	NA	100 (8.6%)	90 (7.8%)	365 (31.5%)	**555 (47.8%)**
By Sex					
Females	NA	50 (7.7%)	45 (6.9%)	185 (28.2%)	**285 (43.5%)**
Males	NA	50 (9.9%)	45 (8.9%)	180 (35.6%)	**275 (54.5%)**
By Age group					
50-54	NA	10 (5.4%)	10 (5.4%)	50 (27.0%)	**70 (36.8%)**
55-59	NA	25 (8.6%)	15 (5.2%)	90 (31.0%)	**130 (44.8%)**
60-64	NA	25 (8.8%)	15 (5.4%)	90 (31.6%)	**135 (47.4%)**
65-69	NA	20 (8.5%)	25 (10.4%)	85 (36.2%)	**135 (57.4%)**
70-74	NA	20 (12.1%)	25 (15.2%)	55 (34.4%)	**95 (57.6%)**

NOTES:
1. Colon Screening Program data extraction date: 02/21/2020.
2. Integers have been rounded as per Statistics Canada methodology.

Table 4 compares detection rates for the three different populations participating in B.C.'s Colon Screening Program.

TABLE 4: DETECTION RATE BY POPULATION TYPE

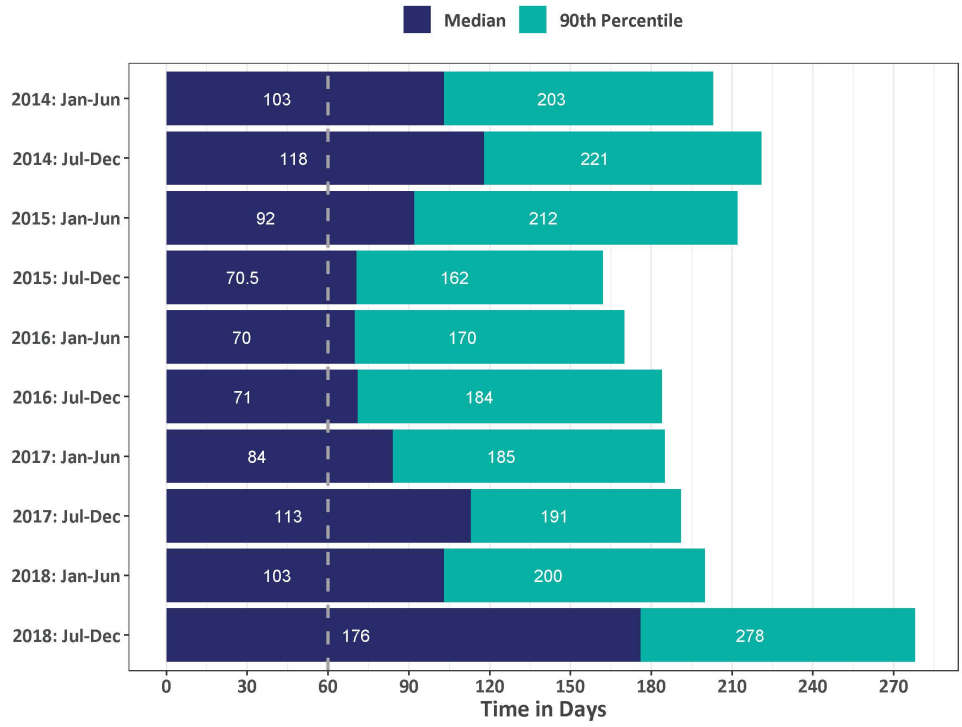
Pathology	FIT Positive	Personal History of Adenoma	Family History
Total	36,310	6,370	1,160
Cancer	495 (1.4%)	25 (0.4%)	NA
High Risk Polyp	4,340 (12.0%)	650 (10.2%)	100 (8.6%)
Any Neoplasia	18,610 (51.3%)	3,935 (61.8%)	555 (47.8%)
No Neoplasia	17,695 (48.7%)	2,435 (38.2%)	600 (51.7%)

NOTES:
1. Colon Screening Program data extraction date: 02/21/2020.
2. Any neoplasia includes high risk polyps, multiple low risk polyps and low risk polyps.
3. No neoplasia includes patients where no specimens were taken at colonoscopy and other polyps/specimens being removed.
4. Integers have been rounded as per Statistics Canada methodology.

4. Wait Times

Wait times for colonoscopy after an abnormal FIT result are shown in 6-month intervals in Figure 14. The target time from an abnormal FIT result to colonoscopy is 60 days. The increase in the proportion of abnormal FIT results increased demand for colonoscopy in 2017. It is recognized that there are many indications for endoscopy services.

FIGURE 14: WAIT TIME FROM ABNORMAL FIT TO COLONOSCOPY



NOTES:

1. Colon Screening Program data extraction date: 02/21/2020.

5. Quality Assurance

All colonoscopists providing procedures for Colon Screening Program participants in B.C. are encouraged to participate in direct observation of procedural skills (DOPS). DOPS is a formative assessment of a physician's performance of colonoscopy in terms of technical skill as well as patient and staff interaction. The DOPS process involves two trained assessors simultaneously and independently observing a physician perform two consecutive colonoscopies and completing a validated form. The assessors provide constructive feedback to the physician in written and verbal formats.

All endoscopy units providing procedures for Colon Screening Program participants in B.C. are expected to participate in the Global Rating Scale-Canada (GRS-C). GRS-C is a biannual survey to assess all aspects of endoscopic quality assurance at the level of the endoscopy unit. The survey is a patient-centered tool which enables units to identify areas not yet meeting quality standards and design action plans for quality improvement. The survey exists on a web-based platform supported by the Canadian Association of Gastroenterology.

Annual quality reports are sent to health authorities, primary care providers, colonoscopists and pathologists participating in the program with individual and aggregate performance statistics.

6. Summary

The following are some key findings based on the 2018 data:

- FIT participation is 33.4%. This does not account for those screened outside of the program, those at higher than average risk who underwent colonoscopy within the program or those participants with a previous abnormal FIT with a normal colonoscopy to be rescreened with FIT in 10 years following colonoscopy.
- The number needed to screen to detect one cancer is 594.
- The number needed to screen to detect one cancer or high risk polyp is 53.
- The number of participants with an abnormal FIT needed to undergo colonoscopy to detect one cancer is 74.
- The number of participants with an abnormal FIT needed to undergo colonoscopy to detect one cancer or high risk polyp is 8.
- 76% of colonoscopists are up to date with DOPS.
- There are further opportunities to support primary care providers in using the Colon Screening Program:
    - 15.6% of patients are having FIT ordered less than 21 months from the last negative FIT.
    - 9% of patients being referred for colonoscopy are assessed by the Health Authority staff to be ineligible for the program (colonoscopy in the last 5 years, personal history of CRC, incorrect family history or medically unfit).
    - 12% of patients being referred for colonoscopy decline or do not respond when contacted.

APPENDIX – PERFORMANCE INDICATOR GLOSSARY

Program Participation Rate

Percentage of British Columbia screen-eligible population, ages 50-74, who completed a fecal immunochemical test (FIT) registered with the Colon Screening Program within a 30-month period. Prevalence adjusted participation is used, as individuals who have had a previous colorectal cancer diagnosis at any point in time are no longer eligible to participate in the Colon Screening Program, and are therefore excluded from the population estimate.

$$\text{Program Participation rate} = \frac{\text{Number of patients with a successful FIT referral}}{\text{Prevalence adjusted BC population as of December 2017}} \times 100$$

FIT Positivity Rate

FIT positivity rate is defined as the number of satisfactory FITs with an abnormal result.

$$\text{FIT Positivity Rate} = \frac{\text{Number of FITs with an abnormal result}}{\text{Number of satisfactory FITs}} \times 100$$

FIT Positive Predicted Value (PPV)

FIT positive predicted value is defined as the proportion of satisfactory FITs resulting in pathological confirmation, where pathology result is some specified category of neoplasia.

$$\text{FIT PPV} = \frac{\text{Number of satisfactory FITs with pathologically confirmed neoplasia}}{\text{Number of satisfactory FITs with diagnostic data confirmation}} \times 100$$

Detection of Neoplasia (Higher Than Average Risk Patients)

Neoplasia detection rate is defined as the proportion of colonoscopy procedures resulting in pathological confirmation, where the pathology result is some specified category of neoplasia.

$$\text{Neoplasia Detection Rate} = \frac{\text{Number of colonoscopies with pathologically confirmed neoplasia}}{\text{Number of colonoscopies}}$$

Cecal Intubation Rate (Unadjusted)

Unadjusted cecal intubation rate is defined as proportion of colonoscopy procedures in which the cecum was intubated.

$$\text{Unadjusted Cecal Intubation Rate} = \frac{\text{Number of procedures w/ cecal intubation}}{\text{Total number of colonoscopies}} \times 100$$

Adequate Bowel Preparation Rate

Adequate bowel preparation rate is defined as the proportion of colonoscopy procedures where the bowel preparation was defined as either 'excellent', 'good', or 'fair' (i.e. not 'poor').

$$\text{Adequate Bowel Preparation Rate} = \frac{\text{Number of colonoscopy procedures w/ adequate bowel prep}}{\text{Total number of colonoscopies}} \times 100$$

Wait Time to Follow-Up Colonoscopy

Wait time to follow-up colonoscopy is defined as the number of days elapsed between an abnormal FIT result and date of follow-up colonoscopy, for patients who had an abnormal FIT result and have received a colonoscopy.