BC CANCER COLON SCREENING
Provincial Health Services Authority

BC Cancer Colon Screening
2021 Program Results

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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 age eligible individuals for a screening test – either the fecal immunochemical test (FIT) or colonoscopy, depending on the patient's risk of developing colorectal cancer.

PROGRAM RESULTS

1. Program Uptake

Asymptomatic, age eligible British Columbians can enter into the Colon Screening Program by speaking with 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 ages 50-74 and colonoscopy for higher than average risk. Family history colonoscopy screening begins at age 40 or 10 years prior to the age of diagnosis of the youngest affected relative, whichever comes first. Those with a personal history of precancerous lesions can enter the program at any age.

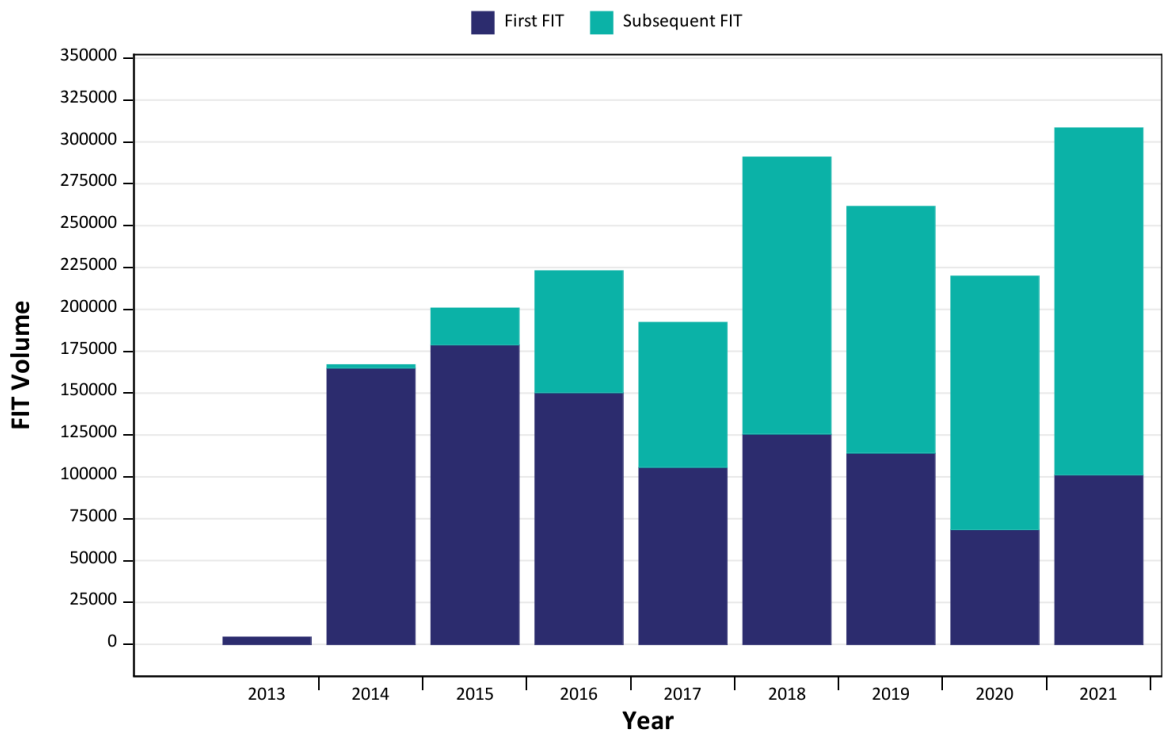
Primary care providers enroll asymptomatic average risk individuals by selecting the appropriate option on the laboratory requisition form. Colonoscopy referral for higher than average risk individuals is sent directly to the Colon Screening Program.

Figure 1 shows the volume of FIT results received by the Colon Screening Program since the inception of the provincial program. There continues to be a high proportion of first time screeners registering in the program. The number of people returning for subsequent rounds of screening is growing as expected. Volumes are lower in 2017 due to the FIT suspension that occurred that year, lower in 2019 due to the suspension 2 years prior and lower in 2020 due to the start of the COVID-19 pandemic. The proportion of FITs with results copied to the Colon Screening Program increased in 2021 to 89.1% (Figure 2).

In 2021, 12.33% of patients had a repeat FIT within 21 months following a negative FIT in the program. Early return to screening utilizes screening resources but does not increase the uptake of colon screening in B.C..

In 2021, the program received 308,682 FIT results on 303,470 British Columbians ages 50 to 74. 13,656 individuals had a total of 13,909 colonoscopies for higher than average risk reasons. 10,518 colonoscopies were completed for a personal history of precancerous lesion(s) plus an additional 1,510 colonoscopies performed within one year of a previous colonoscopy in patients requiring a short interval follow-up. 1,881 colonoscopies were completed for a family history. 34% of the age eligible population has had a FIT within the Colon Screening Program in the past 30 months (Figure 5). Of these, 53% were female and the mean age of individuals was 63 years.

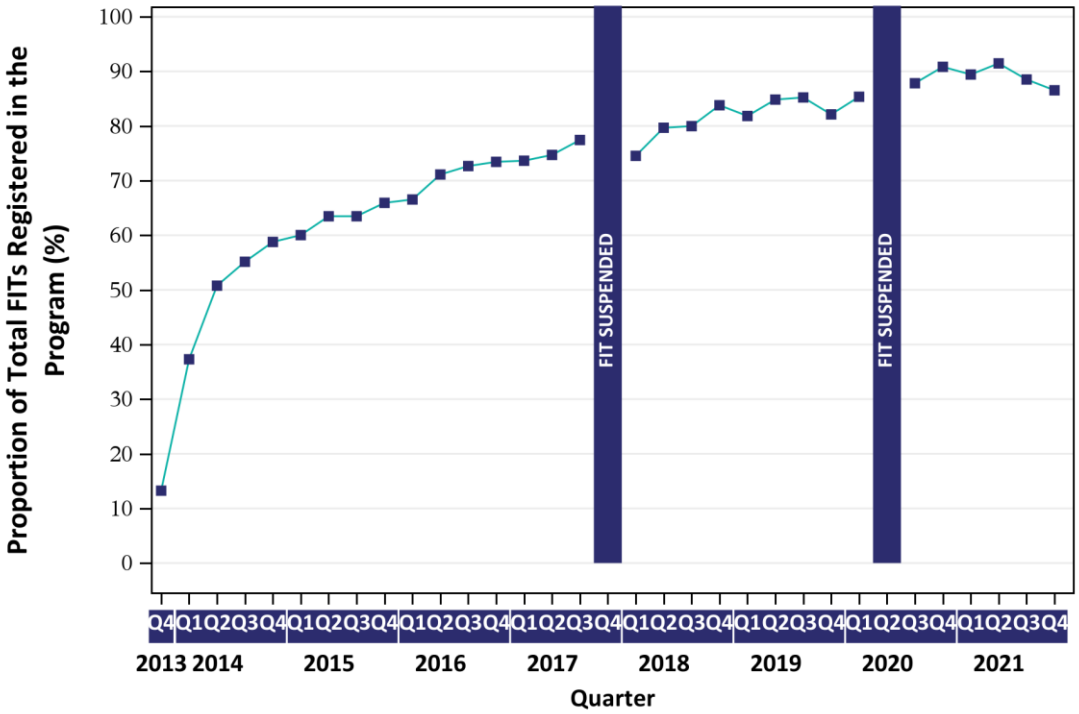
FIGURE 1: NUMBER OF FIT RESULTS RECEIVED BY THE COLON SCREENING PROGRAM OVER TIME



NOTES:

1. Colon Screening Program data extraction date: 22/02/2024.
2. FIT was unavailable in B.C. for most of Q4 2017 and Q2 2020.

FIGURE 2: PROPORTION OF FITs REGISTERED WITH THE COLON SCREENING PROGRAM FOR BRITISH COLUMBIANS AGES 50-74

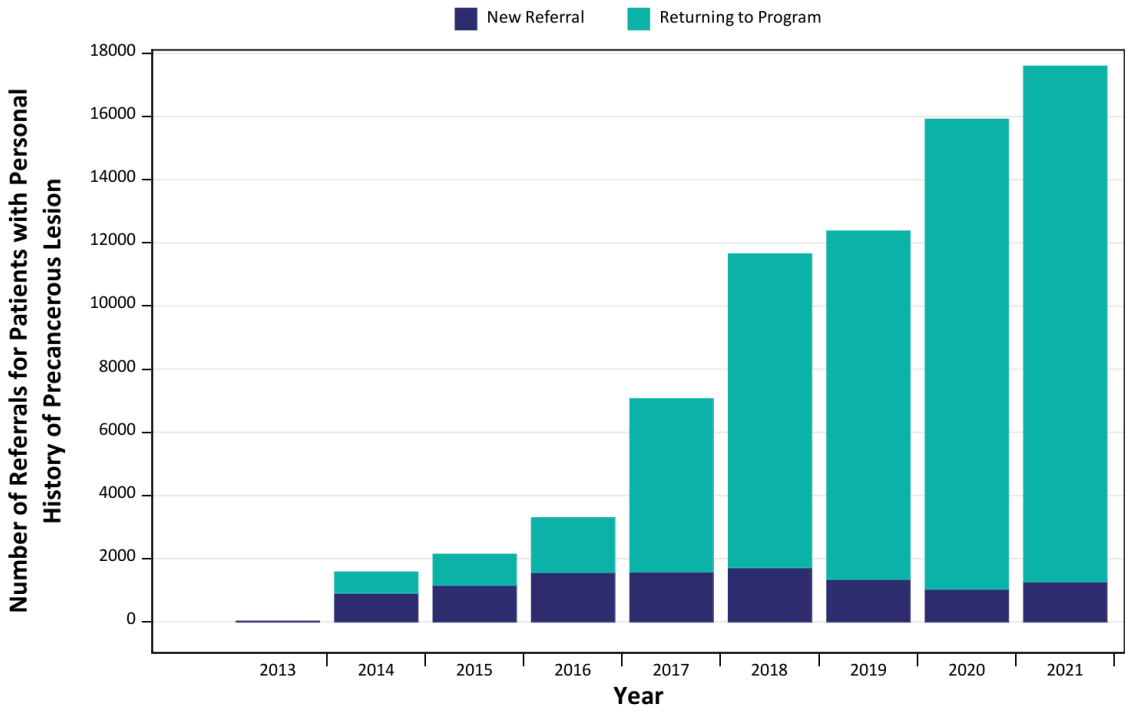


NOTES:

1. Colon Screening Program data extraction date: 22/02/2024.
2. An Individual may have multiple FITs performed in any time period.
3. FIT was unavailable in B.C. for most of Q4 2017 and Q2 2020.

Figure 3 and Figure 4 demonstrate that the total 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 13% of higher than average risk referrals while a personal history of precancerous lesion(s) accounts for 87% of higher than average risk patients referred to Health Authorities for colonoscopy in 2021.

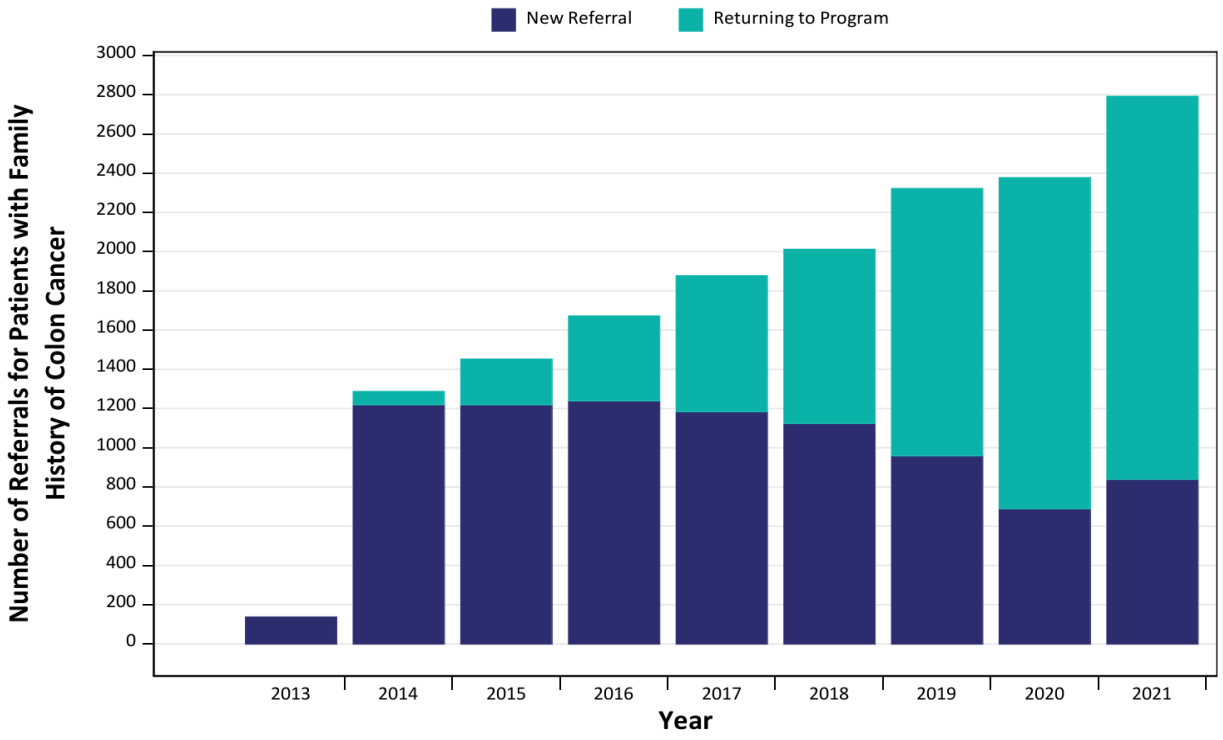
FIGURE 3: NUMBER OF REFERRALS FOR PATIENTS WITH PERSONAL HISTORY OF PRECANCEROUS LESION(S)



NOTES:

1. Colon Screening Program data extraction date: 22/02/2024.
2. An individual may have multiple referrals.

FIGURE 4: NUMBER OF REFERRALS FOR PATIENTS WITH FAMILY HISTORY OF COLORECTAL CANCER

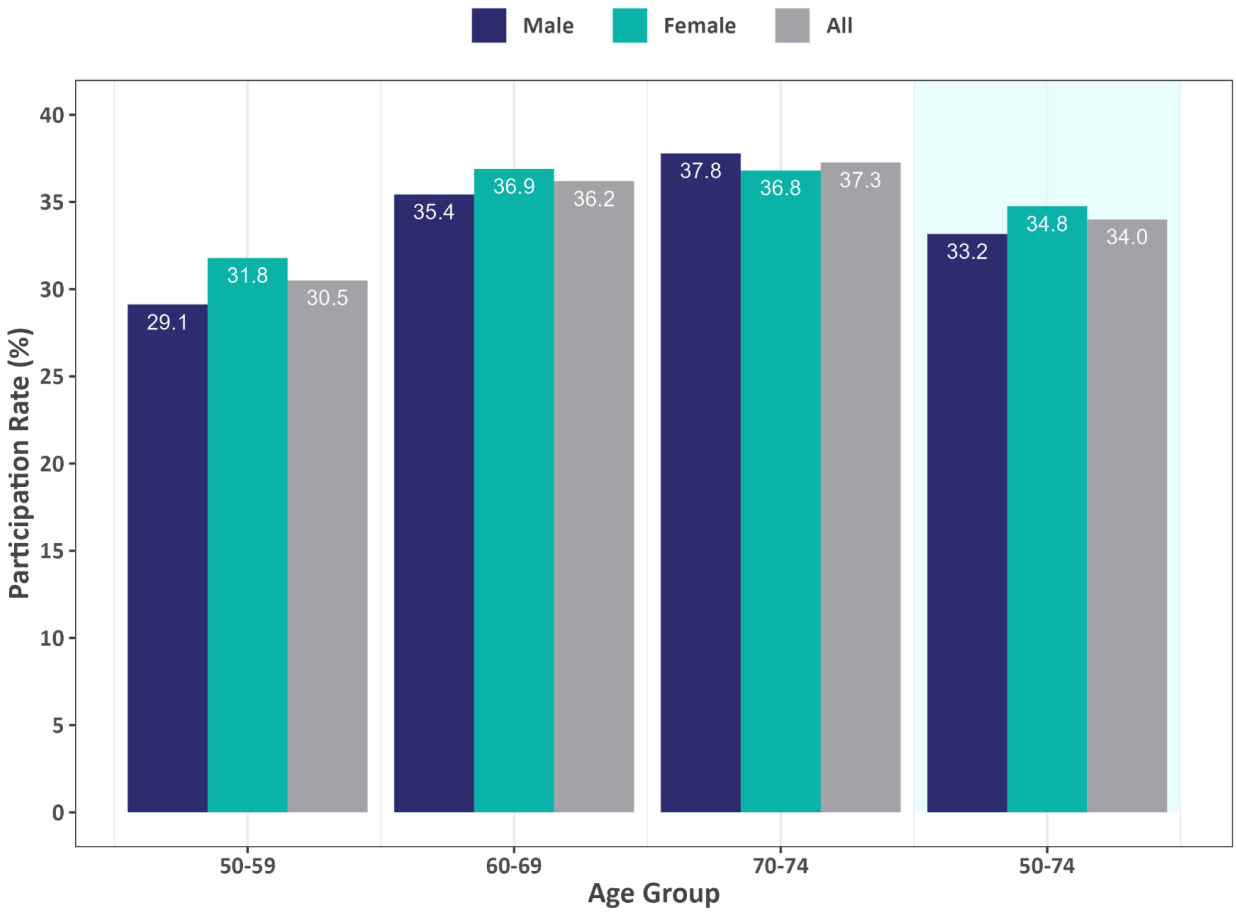


NOTES:

1. Colon Screening Program data extraction date: 22/02/2024.
2. An individual may have multiple referrals.

Figure 5 shows FIT participation by age and sex. Regional variation is shown in Figure 6. 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.

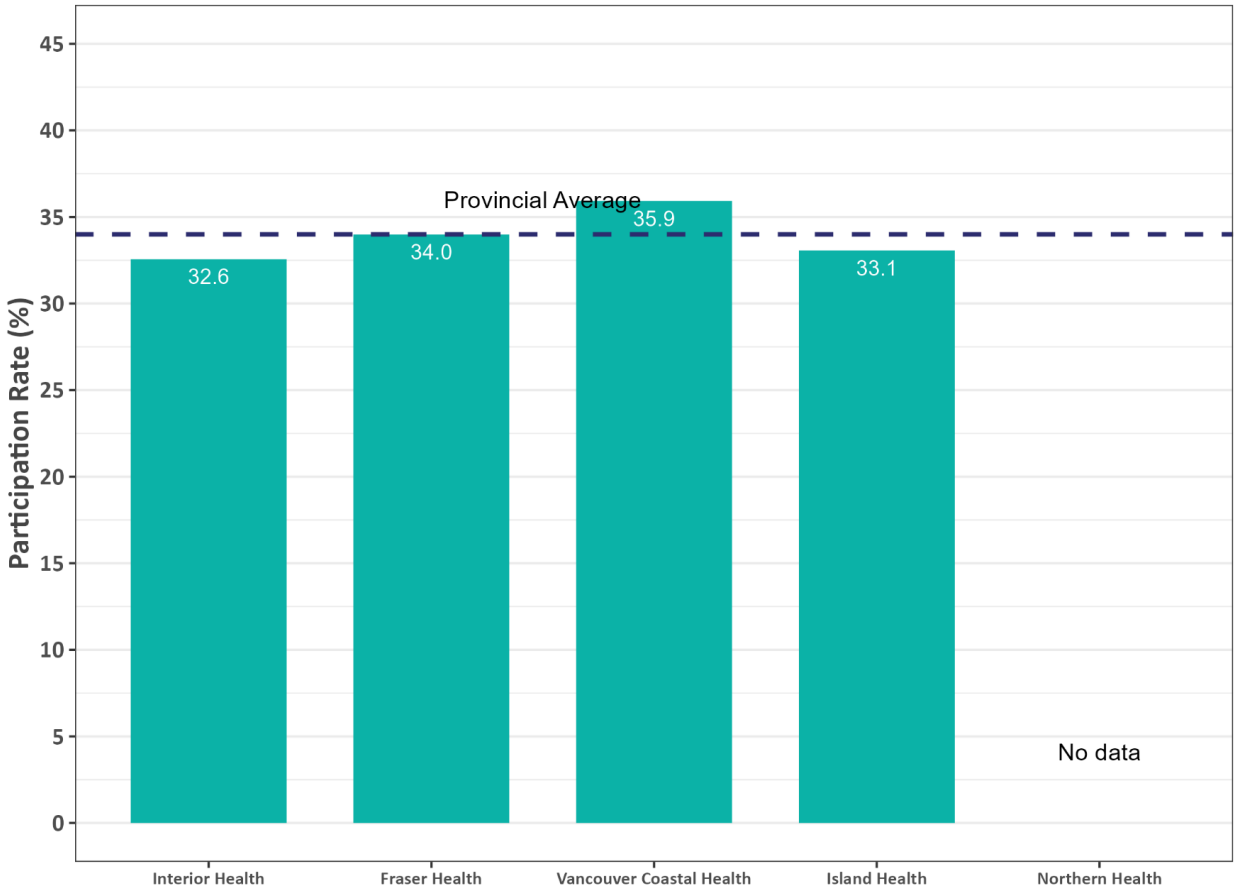
FIGURE 5: PROGRAM FIT PARTICIPATION RATE IN B.C. BY AGE AND SEX



NOTES:

1. Colon Screening Program data extraction date: 22/02/2024.
2. Population data source: P.E.O.P.L.E 2020 (Sept 2020), BC STATS, Service BC, BC Ministry of Citizen's Services

FIGURE 6: PROGRAM PARTICIPATION RATE BY HEALTH AUTHORITY

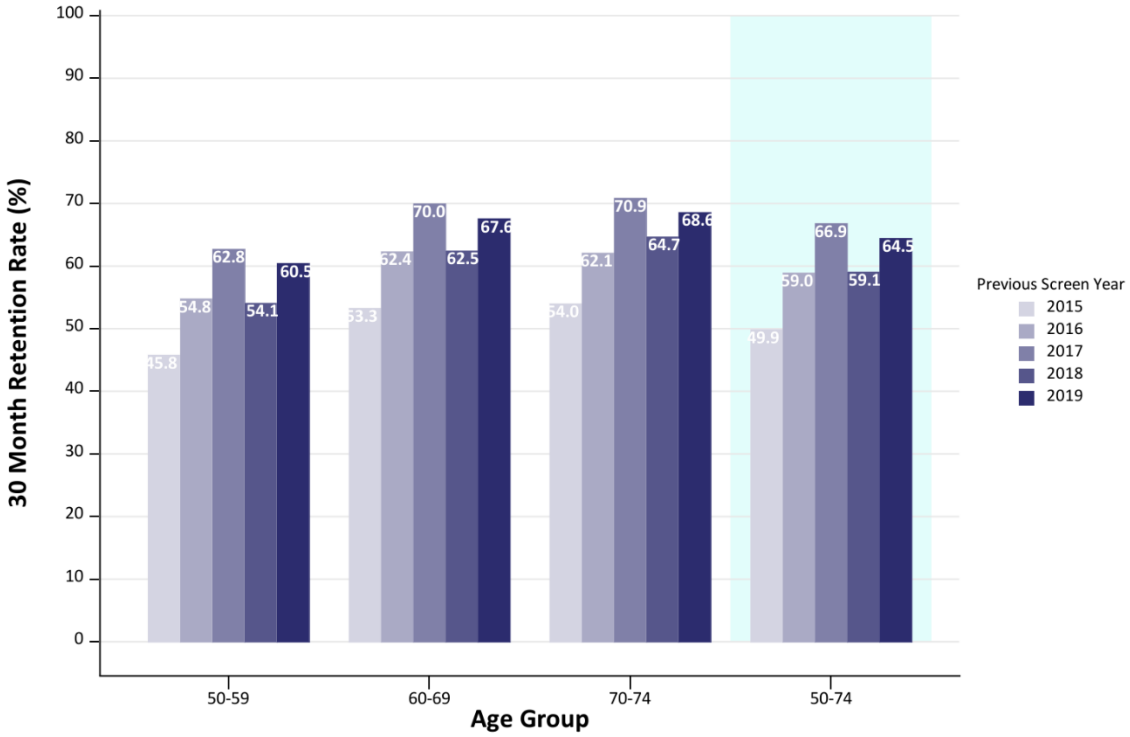


NOTES:

1. Colon Screening Program data extraction date: 22/02/2024.
2. Population data source: P.E.O.P.L.E 2020 (Sept 2020), 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 7 and Figure 8 show retention rates by age and sex respectively for participants who had a normal FIT result in 2015, 2016, 2017, 2018 and 2019 and then completed another FIT within 30 months. The retention rate improved in 2019 (previous screen year 2017) with the implementation in 2018 of mailed FIT requistions with recall notices, rather than participants needing to obtain a FIT requisition from their provider. The 2020 retention rate (previous screen year 2018) decreased due to the suspension of FIT March to June 2020 due to the COVID-19 pandemic and overall health service reductions that occurred at that time. Retention rate increases with age and there are no differences between male and females.

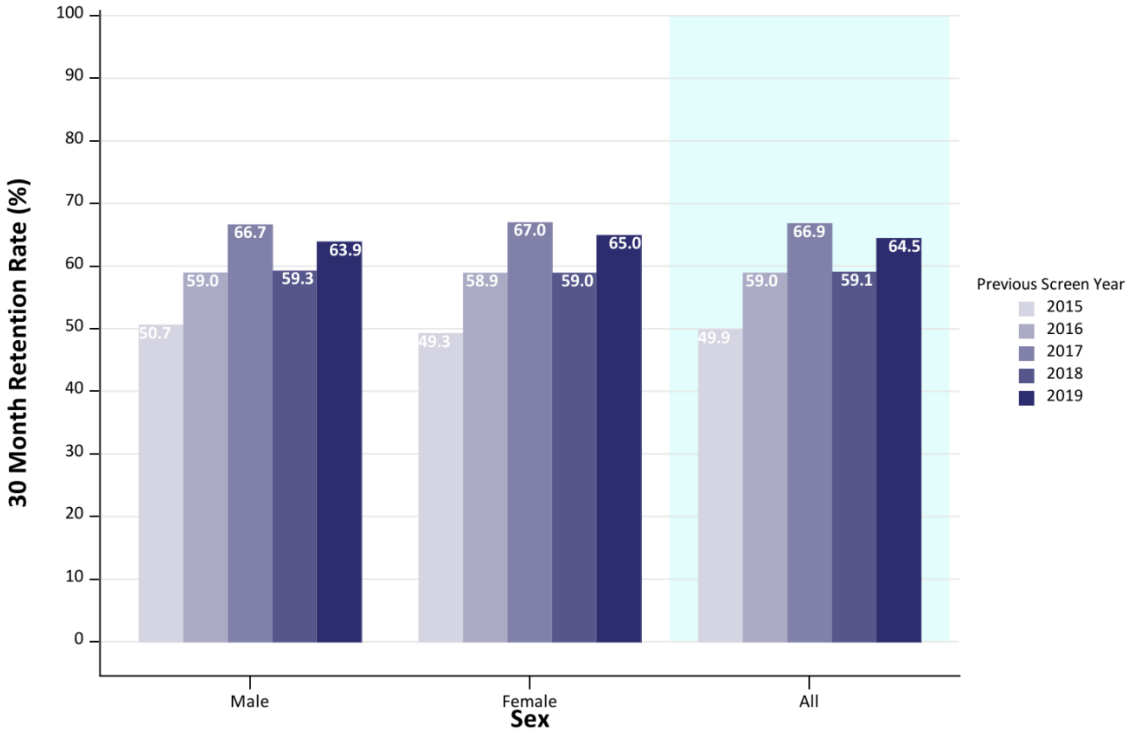
FIGURE 7: PROGRAM RETENTION RATE IN B.C. BY AGE



NOTES:

1. Colon Screening Program data extraction date: 22/02/2024.

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



NOTES:

1. Colon Screening Program data extraction date: 22/02/2024.

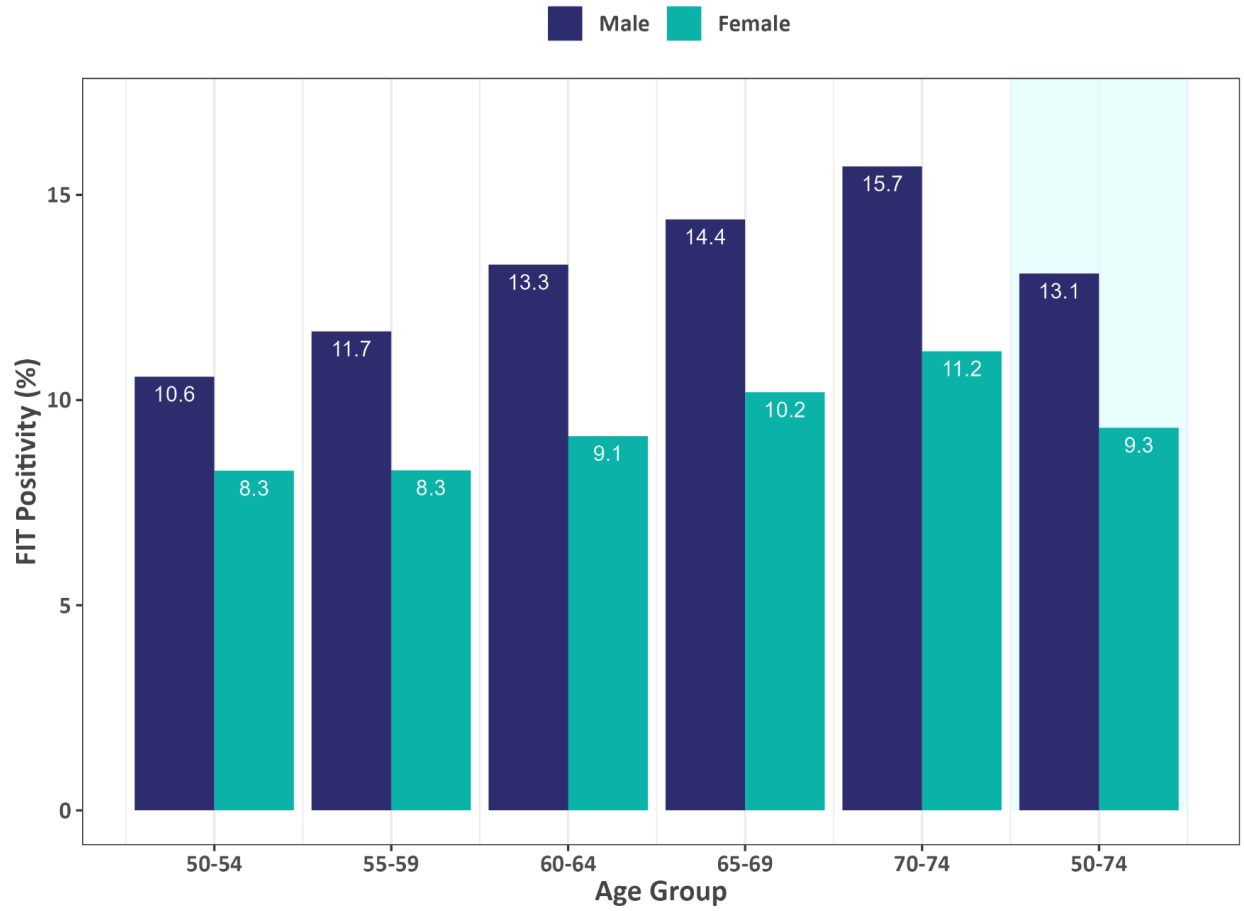
The following sections describe the Colon Screening Program results from January 1, 2021 to December 31, 2021.

2. FIT Results

The percent of FIT results that were abnormal in 2021 was 11.2%.

Figure 9 demonstrates that abnormal FIT results were more common in males and increase with age, which reflects the prevalence of colorectal cancer.

FIGURE 9: FIT POSITIVITY BY AGE GROUP AND SEX



NOTES:
1. Colon Screening Program data extraction date: 22/02/2024.

3. Colonoscopy Results

Participants with Abnormal FIT Results

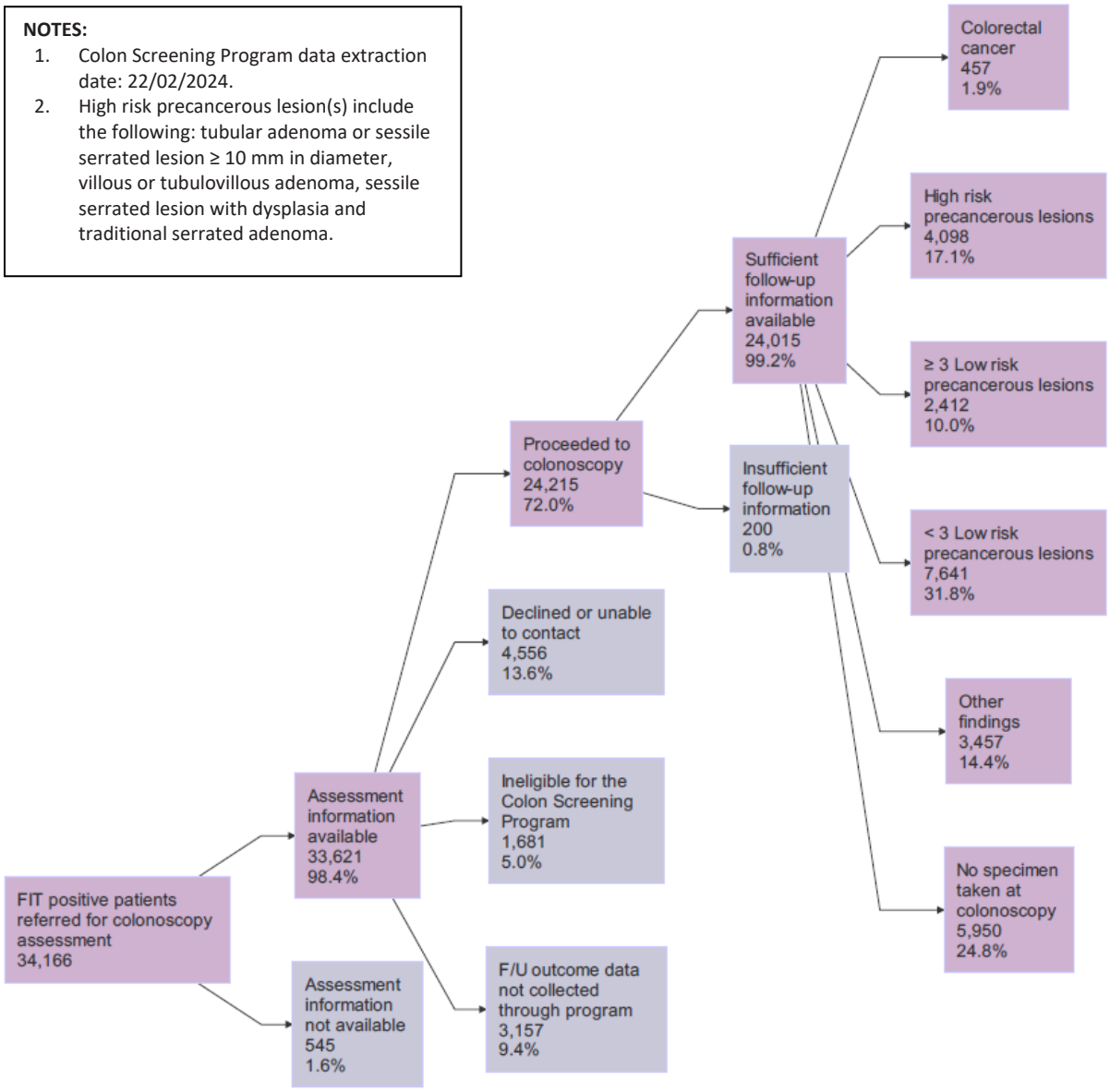
In 2021, a total of 34,166 program participants with abnormal FIT results were referred to regional health authorities for colonoscopy assessment. After initial assessment by health authority staff, 72.0% proceeded to have a colonoscopy with outcome data captured by the Colon Screening Program, 13.6% declined colonoscopy or were unable to be contacted, 5.0% were deemed ineligible for the program and 9.4% did not proceed to colonoscopy through the program but likely obtained follow-up through a provider directly.

Figure 10 summarizes the outcomes for those with abnormal FIT results. Of the 24,015 cases with available pathology information 60.8% were diagnosed with colorectal cancer or a precancerous lesion. When categorized by the highest risk lesion discovered, 457 (1.9%) had colorectal cancer, 4,098 (17%) had high risk precancerous lesion(s), 2,412 (10%) had multiple (3 or more) low risk precancerous lesions, and 7,641 (31.8%) had 1 or 2 low risk precancerous lesion(s).

FIGURE 10: COLONOSCOPY FINDINGS FOR THOSE WITH AN ABNORMAL FIT RESULT

NOTES:

1. Colon Screening Program data extraction date: 22/02/2024.
2. High risk precancerous lesion(s) include the following: tubular adenoma or sessile serrated lesion ≥ 10 mm in diameter, villous or tubulovillous adenoma, sessile serrated lesion with dysplasia and traditional serrated adenoma.



Quality indicators help assess the effectiveness of the colonoscopy. The unadjusted cecal intubation rate was 98.2% and the adequate bowel preparation rate was 97.8% 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 precancerous lesions 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 Precancerous Lesions	≥ 3Low Risk Precancerous Lesions	1 or 2 Precancerous Lesions	Any Neoplasia
All	457 (1.9%)	4,098 (17.1%)	2,412 (10.0%)	7,641 (31.8%)	**14,608 (60.8%)**
By FIT					
First FIT	230 (2.5%)	1,830 (20.2%)	852 (9.4%)	2,681 (29.6%)	**5,593 (61.8%)**
Subsequent FIT	227 (1.5%)	2,268 (15.2%)	1,560 (10.4%)	4,960 (33.2%)	**9,015 (60.3%)**
By Sex					
Females	185 (1.7%)	1,598 (14.6%)	736 (6.7%)	3,224 (29.4%)	**5,743 (52.4%)**
Males	272 (2.1%)	2,500 (19.1%)	1,676 (12.8%)	4,417 (33.8%)	**8,865 (67.9%)**
By Age group					
50-54	65 (1.5%)	636 (15.1%)	237 (5.6%)	1,239 (29.4%)	**2,177 (51.6%)**
55-59	75 (1.6%)	742 (15.9%)	370 (7.9%)	1,471 (31.5%)	**2,658 (57.0%)**
60-64	101 (1.9%)	908 (16.9%)	569 (10.6%)	1,774 (33.0%)	**3,352 (62.3%)**
65-69	105 (2.0%)	1,011 (19.1%)	635 (12.0%)	1,710 (32.3%)	**3,461 (65.4%)**
70-74	111 (2.5%)	801 (18.0%)	601 (13.5%)	1,447 (32.4%)	**2,960 (66.3%)**

NOTES:
1. Colon Screening Program data extraction date: 22/02/2024.

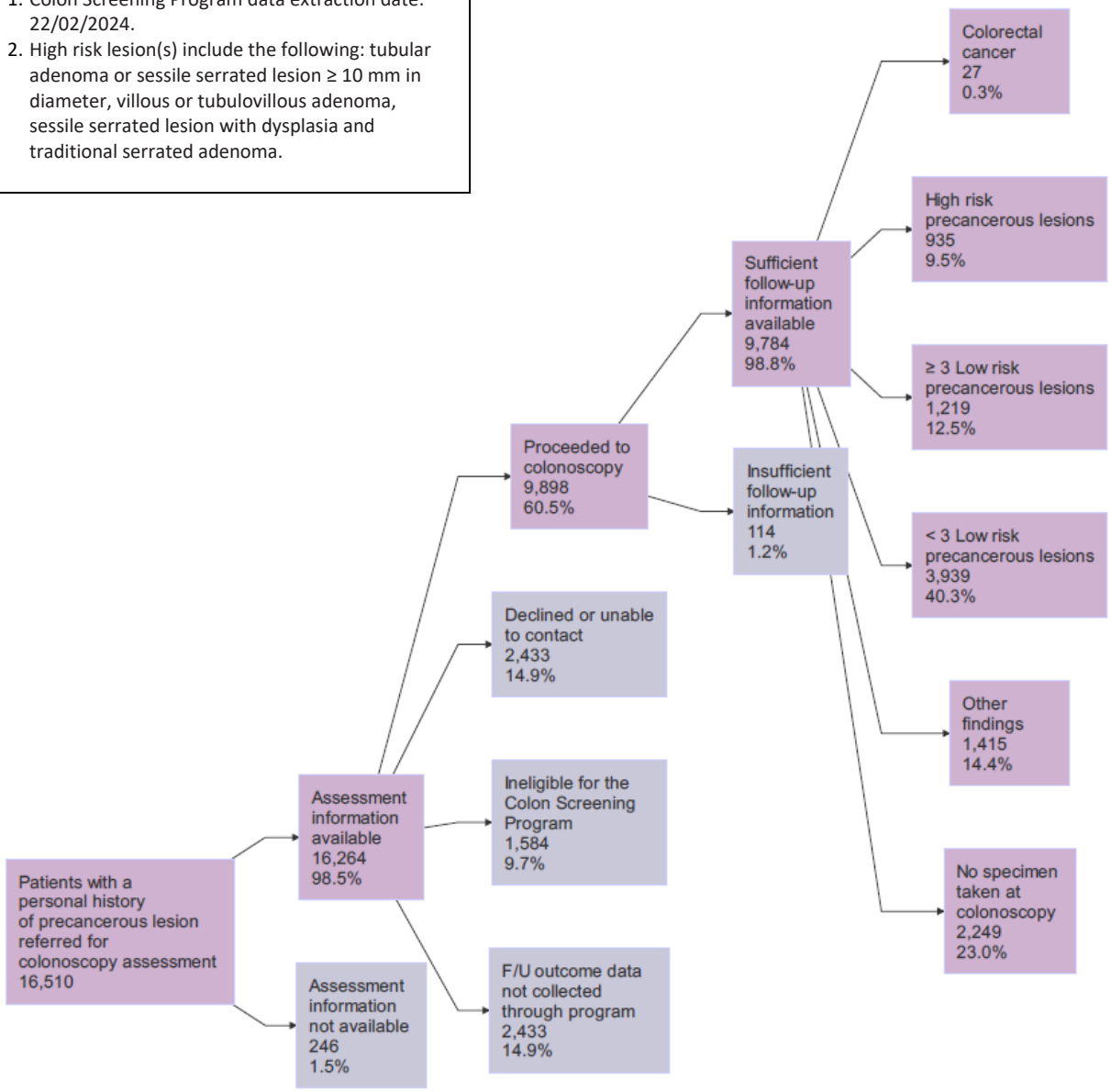
Higher than Average Risk Participants with Personal History of Precancerous Lesion(s)

During the report period, 16,510 referrals for colonoscopy assessment were sent to the Health Authorities for higher than average risk screening due to a personal history of precancerous lesion(s). After initial assessment by health authority staff, 60.9% proceeded to have a colonoscopy with outcome data captured by the Colon Screening Program, 15% declined colonoscopy or were unable to be contacted, 9.7% colonoscopy was not indicated (e.g. medically unfit for follow-up or colonoscopy in the last five years) and 14.4% did not proceed to colonoscopy through the program but likely obtained follow-up through a provider directly.

Figure 11 summarizes colonoscopy findings for those with a personal history of precancerous lesions. Of the 9,784 cases with available follow-up information, 62.6% were found to have colorectal cancer or a precancerous lesion.

FIGURE 11: COLONOSCOPY FINDINGS FOR THOSE WITH A PERSONAL HISTORY OF PRECANCEROUS LESION(S)

NOTES:
1. Colon Screening Program data extraction date: 22/02/2024.
2. High risk lesion(s) include the following: tubular adenoma or sessile serrated lesion ≥ 10 mm in diameter, villous or tubulovillous adenoma, sessile serrated lesion with dysplasia and traditional serrated adenoma.



Detection of neoplasia by sex and age in screening colonoscopy for those with a personal history of precancerous lesion(s) are presented in Table 2.

TABLE 2: DETECTION OF NEOPLASIA IN SCREENING COLONOSCOPY FOR THOSE WITH A PERSONAL HISTORY OF PRECANCEROUS LESION(S)

	Cancer	High Risk Precancerous Lesions	≥ 3Low Risk Precancerous Lesions	1 or 2 Precancerous Lesions	Any Neoplasia
All	27 (0.3%)	935 (9.6%)	1,219 (12.5%)	3,939 (40.3%)	**6,120 (62.6%)**
By Sex					
Females	10 (0.3%)	328 (8.4%)	366 (9.4%)	1,480 (37.9%)	**2,184 (55.9%)**
Males	17 (0.3%)	607 (10.3%)	853 (14.5%)	2,459 (41.8%)	**3,936 (67.0%)**
By Age group					
50-54	1 (0.3%)	22 (6.4%)	33 (9.6%)	131 (38.3%)	**187 (54.7%)**
55-59	6 (0.4%)	114 (6.9%)	161 (9.7%)	654 (39.3%)	**935 (56.2%)**
60-64	2 (0.1%)	257 (10.8%)	281 (11.8%)	916 (38.4%)	**1,456 (61.1%)**
65-69	12 (0.4%)	280 (10.0%)	366 (13.1%)	1,159 (41.5%)	**1,817 (65.1%)**
70-74	6 (0.2%)	262 (10.1%)	378 (14.5%)	1,079 (41.5%)	**1,725 (66.3%)**

NOTES:

1. Colon Screening Program data extraction date: 22/02/2024.
2. Any neoplasia includes any precancerous lesion and colorectal cancer.
3. No neoplasia includes colonoscopies without specimens or specimens that were not colorectal cancer or precancerous lesion.

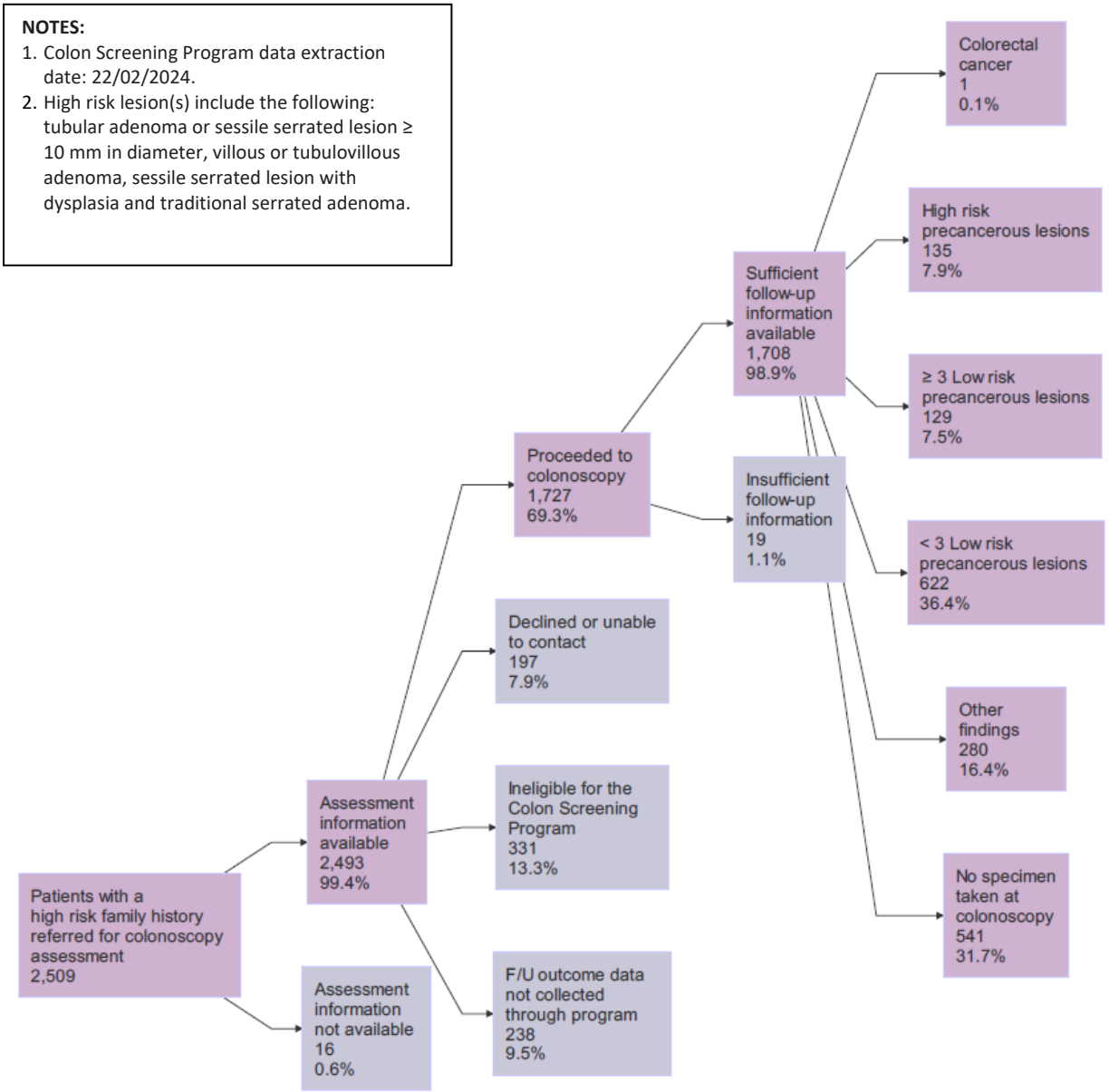
Higher than Average Risk Participants with Family History of Colorectal Cancer

During the report period, 2,509 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, 69.5% proceeded to have a colonoscopy with outcome data captured by the Colon Screening Program, 7.9% declined colonoscopy or were unable to be contacted, 13.3% were deemed ineligible for the program and 9.5% did not proceed to colonoscopy through the program but likely obtained follow-up through a provider directly.

Figure 12 summarizes colonoscopy findings for higher risk participants with a family history of colon cancer. Of the 1,708 cases with available follow-up information, 51.8% were found to have colorectal cancer or a precancerous lesion.

FIGURE 12: COLONOSCOPY FINDINGS FOR THOSE WITH A FAMILY HISTORY

NOTES:
1. Colon Screening Program data extraction date: 22/02/2024.
2. High risk lesion(s) include the following: tubular adenoma or sessile serrated lesion ≥ 10 mm in diameter, villous or tubulovillous adenoma, sessile serrated lesion with dysplasia and traditional serrated adenoma.



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 COLORECTAL CANCER

	Cancer	High Risk Precancerous Lesions	≥ 3Low Risk Precancerous Lesions	1 or 2 Precancerous Lesions	Any Neoplasia
All	1 (0.1%)	135 (7.9%)	129 (7.6%)	622 (36.4%)	**887 (51.9%)**
By Sex					
Females	0 (0.0%)	66 (7.1%)	46 (5.0%)	324 (35.0%)	**436 (47.0%)**
Males	1 (0.1%)	69 (8.8%)	83 (10.6%)	298 (38.2%)	**451 (57.7%)**
By Age group					
50-54	0 (0.0%)	13 (7.5%)	8 (4.6%)	65 (37.6%)	**86 (49.7%)**
55-59	0 (0.0%)	21 (5.6%)	15 (4.0%)	128 (33.9%)	**164 (43.4%)**
60-64	1 (0.2%)	36 (8.1%)	27 (6.0%)	167 (37.4%)	**231 (51.7%)**
65-69	0 (0.0%)	33 (8.0%)	38 (9.2%)	152 (36.8%)	**223 (54.0%)**
70-74	0 (0.0%)	32 (10.8%)	41 (13.8%)	110 (37.0%)	**183 (61.6%)**

NOTES:
1. Colon Screening Program data extraction date: 22/02/2024.
2. Any neoplasia includes any precancerous lesion and colorectal cancer.
3. No neoplasia includes colonoscopies without specimens or specimens that were not colorectal cancer or precancerous lesion.

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

TABLE 4: DETECTION OF NEOPLASIA BY POPULATION TYPE

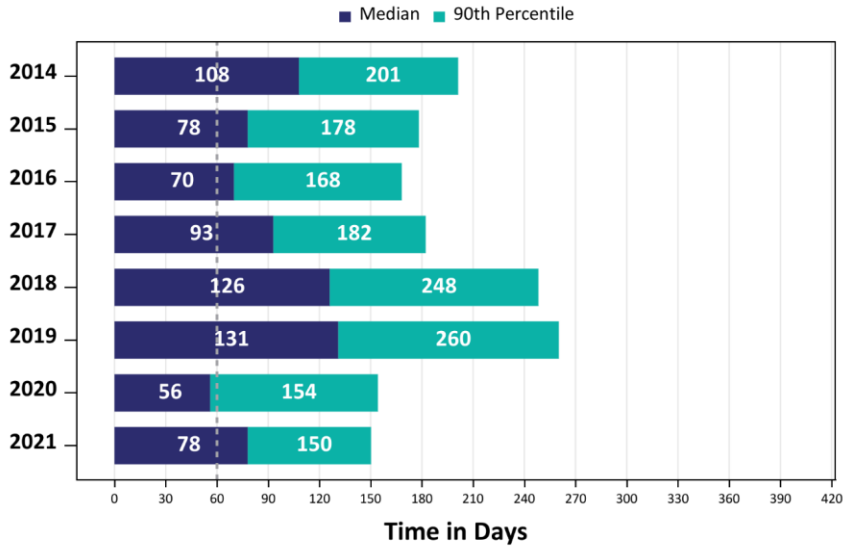
Pathology	FIT Positive	Personal History of Precancerous Lesion	Family History	Short Interval Surveillance
All	24,015	9,784	1,708	1,357
Cancer	457 (1.9%)	27 (0.3%)	1 (0.1%)	4 (0.3%)
High Risk Polyp	4,098 (17.1%)	935 (9.6%)	135 (7.9%)	256 (18.9%)
Any Neoplasia	14,608 (60.8%)	6,120 (62.6%)	887 (51.9%)	976 (71.9%)
No Neoplasia	9,407 (39.2%)	3,664 (37.4%)	821 (48.1%)	381 (28.1%)

NOTES:
1. Colon Screening Program data extraction date: 22/02/2024.
2. Any neoplasia includes any precancerous lesion and colorectal cancer.
3. No neoplasia includes colonoscopies without specimens or specimens that were not colorectal cancer or precancerous lesion.
4. Short interval surveillance is follow-up colonoscopy within one year.

4. Wait Times

Wait times for colonoscopy after an abnormal FIT result are shown in Figure 13. The target time from an abnormal FIT result to colonoscopy is 60 days. It is recognized that there are many indications for endoscopy services. The wait time benchmark from referral to colonoscopy for higher than average risk individuals is 180 days (Figure 14).

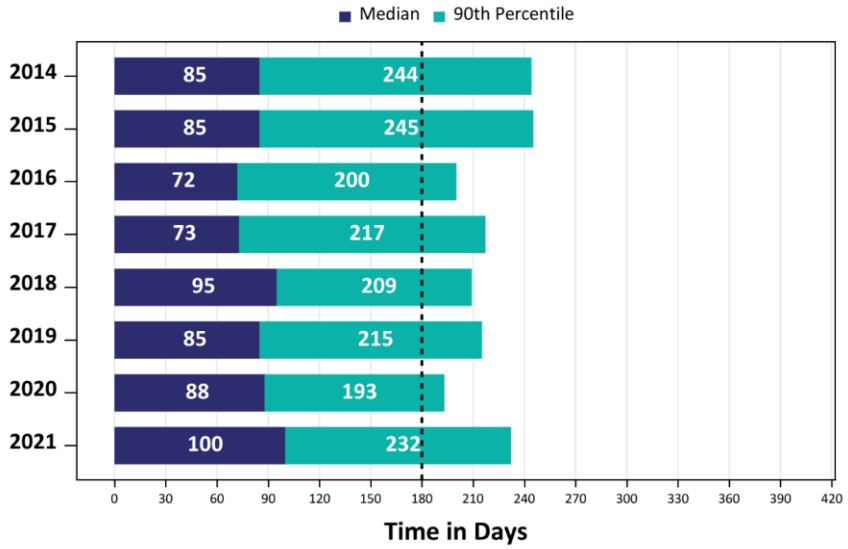
FIGURE 13: WAIT TIME FROM ABNORMAL FIT TO COLONOSCOPY



NOTES:

1. Colon Screening Program data extraction date: 22/02/2024.

FIGURE 14: WAIT TIME FROM REFERRAL TO COLONSCOPY FOR HIGHER THAN AVERAGE RISK



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 2021 data:

- FIT participation is 34%. 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 677.
- The number needed to screen to detect one cancer or high risk lesion is 56.
- The number of participants with an abnormal FIT needed to undergo colonoscopy to detect one cancer is 53.
- The number of participants with an abnormal FIT needed to undergo colonoscopy to detect one cancer or high risk precancerous lesion is 5.

APPENDIX – PERFORMANCE INDICATOR GLOSSARY

FIT 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’).

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

Wait Time to 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.

For higher than average risk patients entering the program, wait time to colonoscopy is defined as the number of days elapsed between date of referral and date of colonoscopy. For patients returning for surveillance colonoscopy, wait time to colonoscopy is defined as the number of days elapsed between due date and and colonoscopy.