



Changes in Cancer Diagnoses and Staging Due to COVID-19 in PEI

Summary

- In March of 2020, PEI declared a state of public health emergency due to COVID-19. Cancer screening was suspended at that time. There were concerns that delays in cancer diagnoses would occur, resulting in more advanced cases and increased health care usage and needs.
- The monthly numbers of cancer diagnoses were lower from March through May 2020 than for the same months in previous years. However, the overall number of yearly cancer cases was 3.9% higher in 2020 compared to previous years. That magnitude of increase is expected each year, due to population aging and increasing size.
- The number of diagnoses for screening cancers (breast, colorectal and cervical cancers) were lower than expected for all of 2020 and 2021. At the start of the pandemic, screening cancers had decreased in the number of diagnoses to almost half of what was expected in April and May 2020.
- Non-screening cancers overall did not have a decrease in the number of expected cancers during the years of 2020 to 2022; however, differences by site were observed. Prostate cancer diagnoses increased during the height of COVID-19 pandemic restrictions, from March to June 2020. In contrast, melanoma had dramatic reductions during this same time period and for the whole of 2020.
- PEI had changes similar to Canada except for prostate cancer. However, changes in cancer diagnoses during the pandemic in PEI were less severe.
- Average cancer stage at diagnosis trended upward in 2020. This was seen for both screening and non-screening cancers overall, and individually for the most common cancers in PEI except for prostate cancer.
- The ease back of screening programs and regular health care appointments from the fall of 2020 to March 2021 moderated pandemic effects on stage of cancer diagnoses in PEI.
- Long-term effects of the COVID-19 pandemic on cancer patient diagnoses should be monitored over time by measuring survival times.

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Introduction

In January of 2020, Canada had its first diagnosed case of COVID-19. In March of 2020, PEI declared a state of public health emergency due to COVID-19. Public gatherings were cancelled, and Islanders were asked to stay home as much as possible. The province's healthcare system was disrupted with many services and appointments delayed or cancelled, starting midway through March. Cancer screening was suspended from March until May 2020 for breast cancer and non-urgent colonoscopy screening. For cervical and colorectal FIT testing, screening was suspended from March until October 2020, when an ease back approach was initiated to full operational capacity by March 2021. There were concerns that the lack of regular and timely healthcare may cause delays in cancer diagnoses, resulting in serious impacts on many cancer patients on the Island. The effects of COVID-19 on PEI cancer diagnoses and staging were evaluated for this report.

Measurements

Data in the PEI Cancer Registry were used for this report. All invasive cancer cases diagnosed in PEI from 2020 through 2022 were evaluated for delayed diagnoses. Prostate cancer diagnoses are presented separately at times within this report because prostate cancer did not show the same incident behavior as other types of cancer during the period of investigation. Baselines for assessing delayed diagnoses were average frequencies of incident cases from 2015 to 2019, the years prior to the COVID-19 pandemic. Measurements that were compared to baseline included the number of cases diagnosed monthly in 2020 and yearly in 2020 through 2022 plus the percent change in number of cases diagnosed during this period. The number of cases diagnosed after the start of the pandemic were reported for all cancers together, by cancer type (screening vs. non-screening cancers), and for specific cancers. Screening cancers were breast, cervical and colorectal cancer and non-screening cancers were all other cancers.

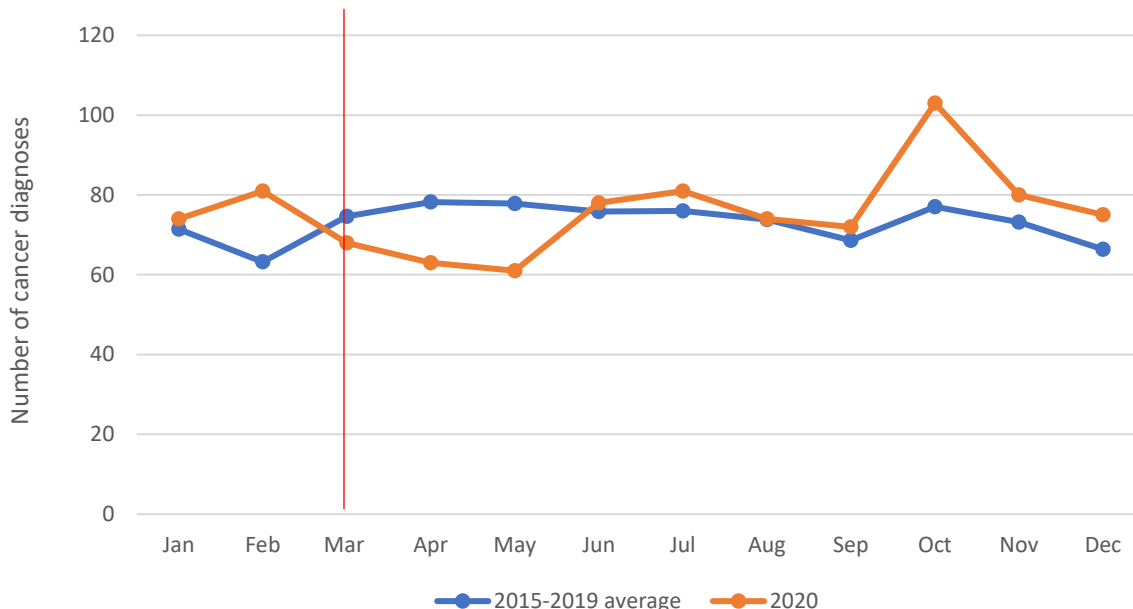
To evaluate changes in patient prognosis due to pandemic delays in health care, average stage at cancer diagnosis was investigated for cancers in stages I through IV. Data from 2018 through 2021 only were used for this part of the analysis, as earlier staging data was based on a different system of cancer stage classification and was not comparable and later staging data was not complete. The impacts of COVID-19 disruptions on cancer staging were investigated by calculating average stage of cancer cases for all cancers together, by cancer type (screening vs. non-screening cancers), and for specific cancers.

Changes in the number of new cancer diagnoses

All Cancers – Monthly

Figure 1 and Table A.1 in the Appendix present the number of cancer diagnoses (excluding prostate cancer) in 2020 compared to baseline, the monthly average number of diagnoses in 2015-2019.

Figure 1: Monthly* number of cancer diagnoses[†] in 2020 compared to the average in 2015-2019 in PEI



*The vertical red line indicates the start of the epidemic in PEI.

[†]Prostate cancer diagnoses excluded.

In January and February 2020, prior to the COVID-19 lockdown, the total number of cancer cases diagnosed (excluding prostate cancer) were higher than baseline, at 3.6% and 28.2% higher, respectively. It is possible the increase in diagnoses in February 2020 was a result of prioritization of diagnostic testing for possible cancer cases because of looming COVID-19 health care shutdowns. Data in March started reflecting disruptions from COVID-19 to the healthcare system, with the number of cases decreasing to below baseline, at an 8.8% reduction compared to the average number of cases in March from 2015-2019. In April and May 2020, PEI experienced the most extreme reductions in cancer diagnoses during the pandemic, reaching 19.4% and 21.6% reductions, respectively. As screening services gradually reopened, the number of diagnoses returned to baseline from June through September 2020. During that time, patients may have also become more comfortable seeking primary care and more primary care appointments became available, which would have contributed to the number of cancer diagnoses returning to baseline. Towards the end of the year, there was a surge in cancer diagnoses in October with a high of 103 cases, a 33.8% increase from baseline. That rise was associated with screening programs increasing capacity and catching up cancer screens missed during the height of pandemic healthcare restrictions. With a small population like PEI, cancer diagnosis data are susceptible to monthly fluctuations due to normal variation. However, when large differences in monthly case frequencies consistently align with COVID-19 pandemic restrictions, it is reasonable to interpret that the pandemic impacted cancer detection in PEI. The pattern of changes seen in total cancer cases in PEI was similar to what was seen across Canada¹. However, PEI had less pronounced changes.

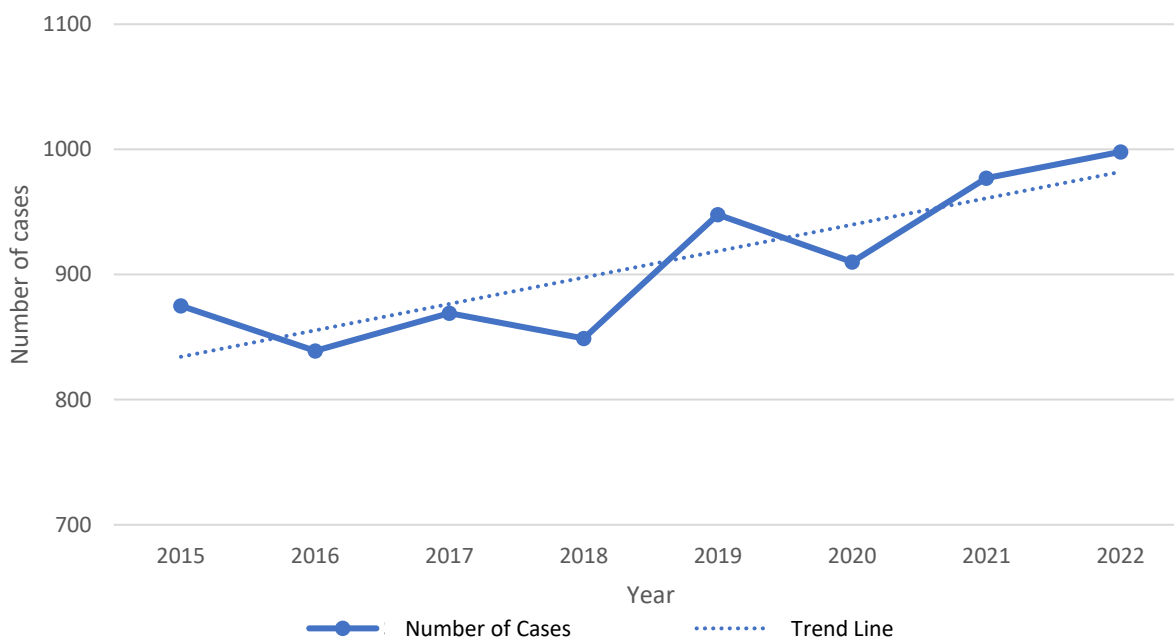
¹<https://www.partnershipagainstcancer.ca/topics/cancer-in-covid-19-era/current-state/impacts-diagnoses/>

Monthly cancer diagnoses by sex showed similar patterns for both females and males (excluding prostate cancer) as overall. There were notable reductions of cases from March to May and then increases towards the end of the year (data not shown).

All Cancers - Annually

Annual changes in cancer diagnoses due to COVID-19 were investigated by assessing trends in total number of cases per year (excluding prostate cancer) from 2015 to 2022 and comparing case numbers diagnosed from 2020 through 2022 to baseline, the average of yearly total cases in 2015-2019. Data from 2021 and 2022, beyond the year of pandemic healthcare restrictions, were included in this analysis to assess for longer delayed diagnoses from COVID-19 following year 2020. Figure 2 shows the number and trend of cancer cases diagnosed annually during the period of investigation. Table A.2 in the Appendix lists annual case numbers and percent changes in 2020 to 2022 compared to baseline.

Figure 2: Annual number of cancer cases[†] diagnosed from 2015 to 2022 in PEI



[†]Prostate cancer diagnoses excluded.

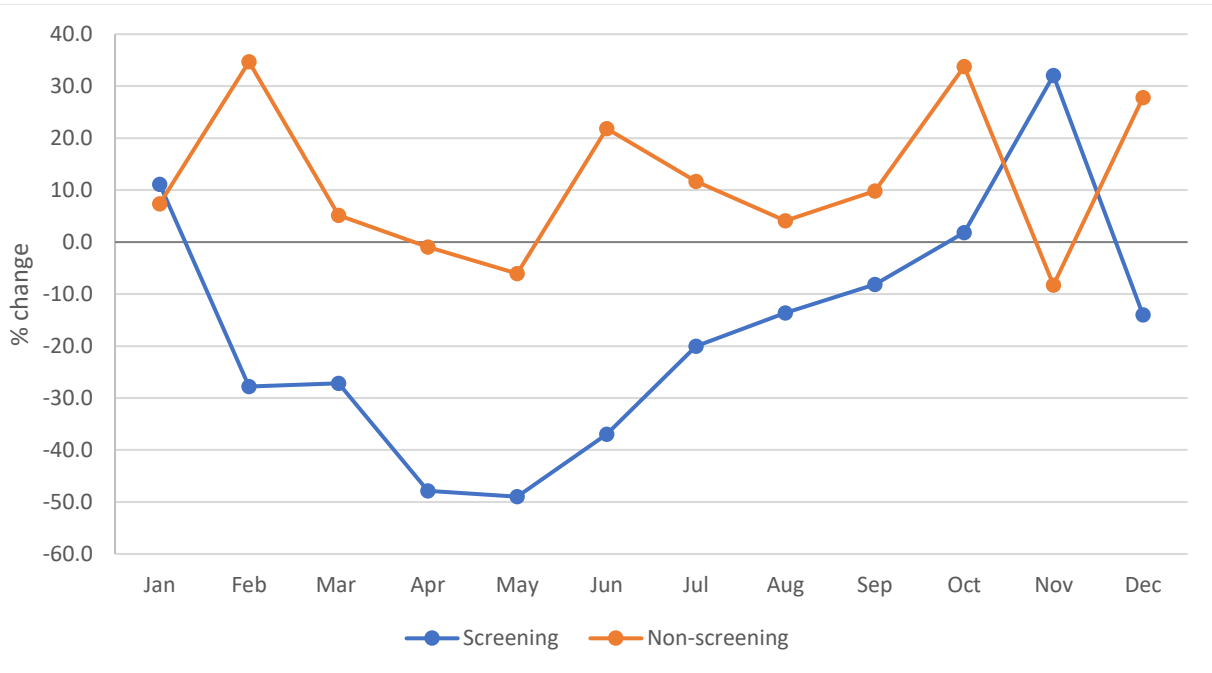
Overall, variations in the number of cancer cases diagnosed per year (excluding prostate cancer) were similar from 2015 to 2022, trending slightly upward over time. In 2020, there was a 3.9% increase in total number of cases diagnosed compared to baseline, despite the drop in cases for the months of March to May 2020 described previously. That increase was close to the annual increases expected for cancer cases due to population growth and aging. The Canadian Partnership Against Cancer (CPAC) predicts about 3% annual increase when not under unusual circumstances². In 2021, a larger rise of 11.5% from baseline was observed. That increase could suggest that missed or delayed diagnostic appointments due to COVID-19 impacted cancer detection in PEI after the year 2020.

² <https://www.partnershipagaincancer.ca/topics/cancer-in-covid-19-era/current-state/impacts-diagnoses/>

Cancer Type (Screening vs Non-Screening Cancer) - Monthly

Screening is intended to diagnose pre-cancer or early cancer before it has had time to advance to symptomatic disease. Cancers considered to be screening cancers are breast, cervical and colorectal cancer and all other cancers, including prostate cancer, are non-screening cancers. In March 2020, breast cancer screening, colorectal screening, and routine pap testing for cervical cancer programs were suspended. While breast cancer screening and non-urgent colonoscopy screening restarted in May 2020, colorectal FIT test screening and pap testing clinics were eased back starting in October that year. Based on those screening service suspensions, the changes in cancer diagnoses by cancer type (screening vs non-screening cancers) were calculated to determine if there was a differential impact of COVID-19. Figure 3 illustrates monthly percent changes in number of cancer cases in 2020 compared to baseline, by cancer type. Full details on monthly numbers and percent changes for 2020 and baseline by cancer type are provided in Appendix Table A.3.

Figure 3: Monthly percent change in number of cancer cases in 2020 compared to the average number of cases for 2015-2019 by cancer type in PEI



Screening cancers were severely affected during the pandemic, with many large reductions in diagnoses per month from February to September 2020 compared to baseline. Percent change in case numbers slowly improved as screening services were reinstated. However, it is likely persistent reductions in cancer diagnoses were related to pandemic health system response that included reduced capacity in facilities, staff deployment and screening services closed or reduced, as well as patients' hesitation to return to health system utilization when they were asymptomatic. Although non-screening cancer diagnoses were also lower than expected in April and May 2020, percent change decreases were minor compared to those seen for screening cancers and fell within normal variation ranges typical of small populations such as PEI. In contrast to screening cancers, the number of non-screening cancer cases diagnosed from June through December 2020 tended to exceed expectations.

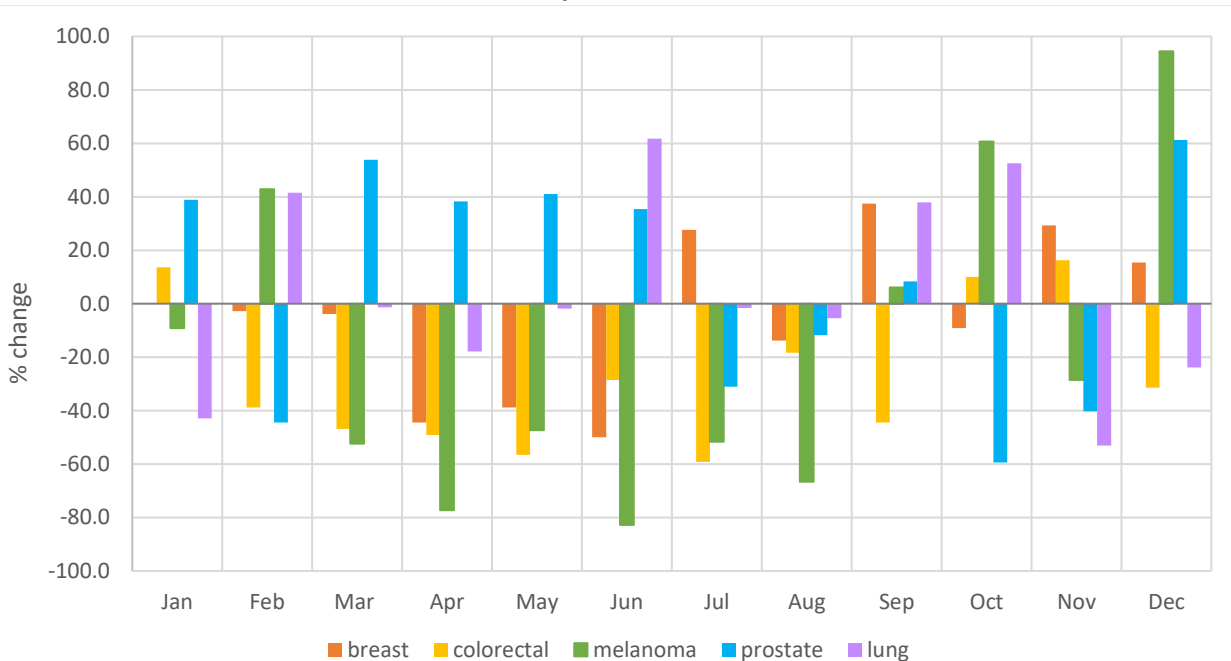
Cancer Type (Screening vs Non-Screening Cancer) - Annually

Detailed annual cancer cases and percent changes for 2020 to 2022 and baseline by cancer type are provided in Appendix Table A.4. The impact of COVID-19 on screening cancers is also detectable when looking at diagnoses per year. Screening cancer diagnoses decreased from baseline by 16.7% in 2020. In 2021, screening cancer diagnoses were slowly catching up and finally surpassed baseline level by 2022. People without symptoms of cancer may not have prioritized cancer screening during the pandemic but returned to screening when COVID threats subsided. Non-screening cancer case numbers remained relatively stable over the 3 years from 2020 to 2022 and well above baseline.

Most Common Cancers by Site – Monthly

The most frequently diagnosed cancers in PEI are lung, colorectal, breast, prostate, and melanoma cancers. Cancer case diagnoses for each of these cancers were evaluated to determine if COVID-19 impacts differed by site. Figure 4 depicts monthly percent changes in number of cancer cases in 2020 compared to baseline for each of the five most common cancer sites. Appendix Table A.5 displays the values for monthly percent change for the five sites for the months with the tightest COVID-19 pandemic healthcare restrictions, March to June 2020.

Figure 4: Monthly percent change of cancer cases in 2020 compared to the average number of cases in 2015-2019 for the five most common cancers by site in PEI



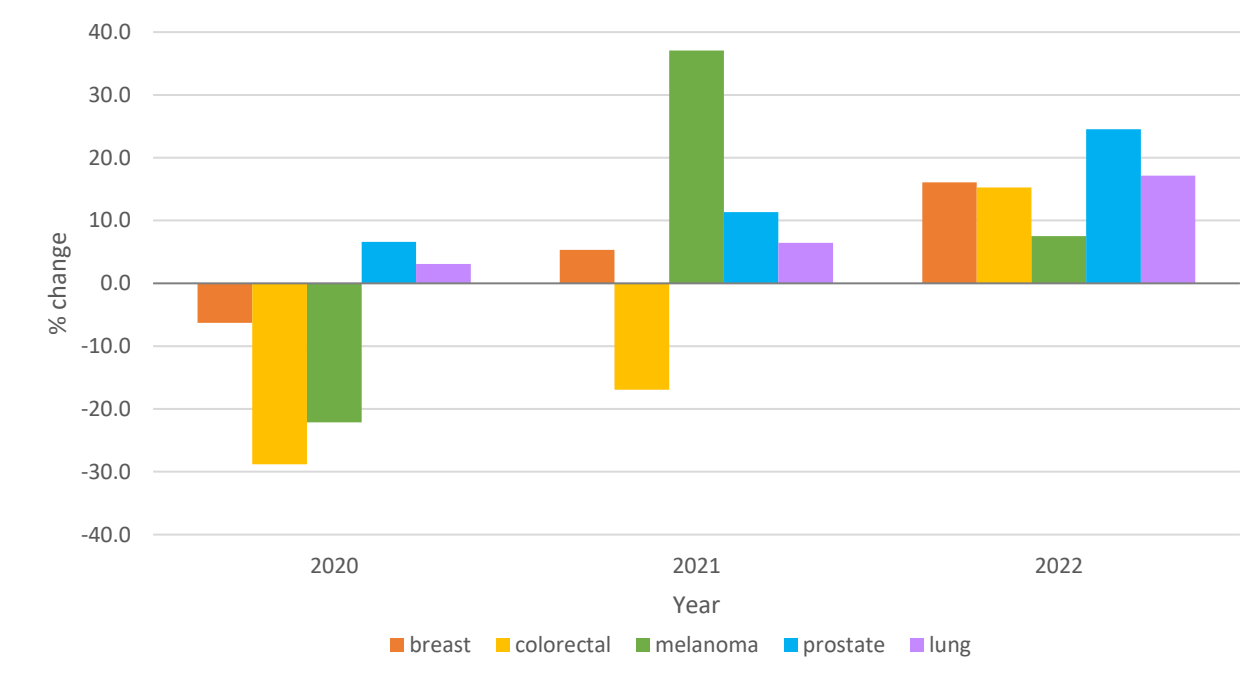
Breast cancer, colorectal cancer and melanoma diagnoses showed strong negative effects from COVID-19. Largest impacts were observed from March to June 2020, with maximum reductions of 82.8% for melanoma diagnoses, 56.5% for colorectal cancer diagnoses, and 50% for breast. Although melanoma is not a screening cancer, its early symptoms are usually visible and therefore its incident pattern may be similar to screening cancer diagnoses. Lung cancer, a non-screening cancer, showed reductions in cases from March through May 2020, however this was followed by an increase of 61.8% above baseline in

June. The biggest surprise was the number of prostate cancer diagnoses during COVID-19 lockdown. Instead of decreasing like the other most common cancers, prostate cancer diagnoses increased considerably throughout this period, ranging from 35-54% above baseline. Clinical explanation for this finding was that patients who were high risk for prostate cancer were prioritized at the start of the pandemic, leading to early increases in diagnoses. The increase in the expected number of prostate cancers in PEI was opposite from the reduction in prostate cancer diagnoses in Canada.³

Corresponding to when their screening services reopened, cancer diagnoses increased after June 2020 for breast cancer and after September 2020 for colorectal cancers. The number of prostate cases dropped in these same months, presumably because many cases were already detected earlier in the year.

Most Common Cancers by Site – Annually

Figure 5: Annual percent change of cancer cases in 2020 to 2022 compared to the average number of cases in 2015-2019 for the five most common cancers by site in PEI



As can be seen in Figure 5, impacts of COVID-19 on the most common cancers differed by site when number at diagnoses per year was investigated. The strong negative impact of COVID-19 on breast cancer, colorectal cancer and melanoma diagnoses remained detectable for 2020 overall. In 2021, most cancers were above baseline levels except for colorectal, which showed an increase from 2020 but still had a 16.9% reduction from baseline. By 2022, all five most common cancers showed increases in annual cases diagnosed compared to both 2020 and the averaged 2015-2019 data.

³<https://www.partnershipagainstcancer.ca/topics/cancer-in-covid-19-era/current-state/impacts-diagnoses/>

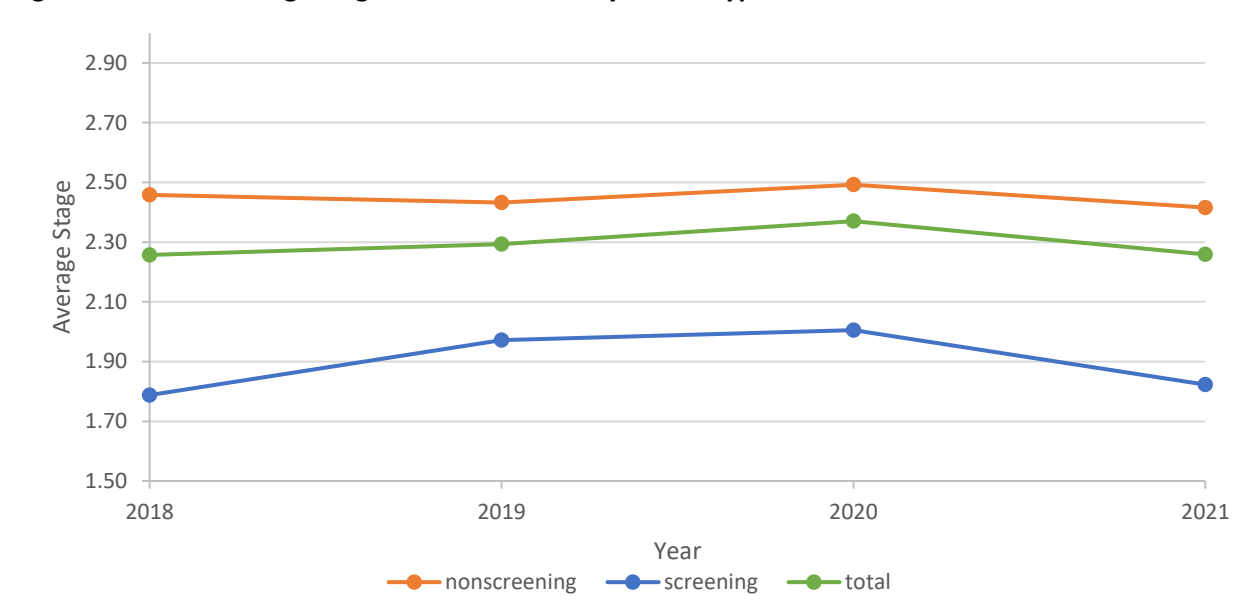
Changes in Cancer Staging

Delays in cancer screening and detection can lead to serious effects, such as overloading cancer care systems, more advanced cancer stage at diagnosis, more complicated treatments, lower survival rates, and higher risk of complications.

Cancer Type (Screening vs Non-Screening Cancer) – Annually

Screening cancer cases (breast, cervical and colorectal cancer) are typically diagnosed at an earlier stage than non-screening cases, often when the disease is still asymptomatic. To investigate whether the COVID-19 pandemic impacted cancer staging of screening cancers differently than non-screening cancers, trends in cancer staging over time were assessed. Figure 6 depicts average stage for all cancer cases by cancer type (screening vs non-screening cancers) in 2018 to 2021.

Figure 6: Annual average stage for cancer cases by cancer type from 2018 to 2021 in PEI

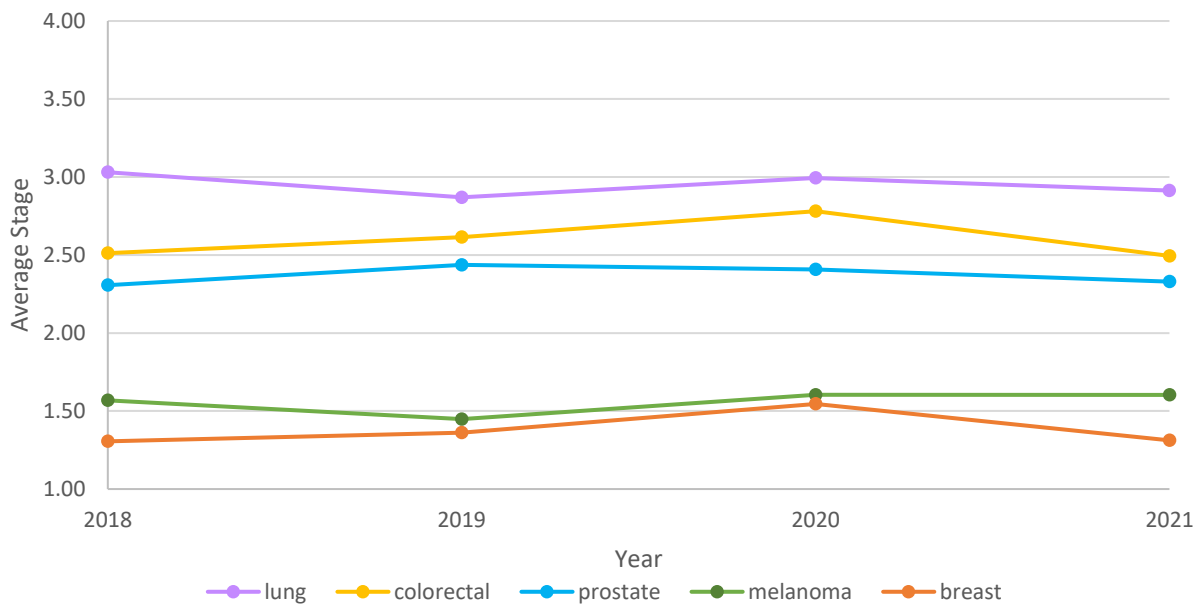


For both screening and non-screening cancers, there was a slight increase in average stages in 2020 compared to 2019, before decreasing again in 2021. Although these changes were not statistically significant, there was potential clinical importance. On average, there are 240 screening cancers diagnosed each year. The return of cancer screening testing and regular health care in 2021 would theoretically have led to 22 more cases diagnosed in stage I (rather than at stages II-IV) and 10 less cases diagnosed at stage IV (rather than at stages I-III) in 2021 compared to 2020. Fortunately, if healthcare disruptions caused by COVID-19 led to more cases diagnosed at an advanced stage for either screening or non-screening cancers, it seems the effect was short-term.

Most Common Cancers by Site – Annually

To investigate whether COVID-19 impacted cancer staging of specific cancers differently, trends in cancer staging over time were assessed. Figure 7 shows the annual average stages for the five common cancers in PEI, breast, colorectal, lung, melanoma, and prostate cancer.

Figure 7: Annual average stage of cancer cases for the five most common cancers by site from 2018 to 2021 in PEI



Of the most common cancers in PEI, prostate cancer showed a unique trend in average stage with respect to COVID-19 pandemic restrictions on healthcare, having a lower average stage in 2020 than 2019. This may be due to the diagnostic prioritization of high-risk patients early in the pandemic, as described previously. In contrast, both breast and colorectal cancers, which had screening programs suspended by COVID-19 lockdown restrictions, had non-significantly higher average stages in 2020 than 2019. Average stages tended to decrease from 2020 to 2021, except for melanoma cases where staging remained higher. Although cancer trends for individual cancer staging generally aligned with the COVID-19 pandemic situation in PEI over time, it is possible that some of the trends are due to normal data variation and other health care changes.

Conclusions

The COVID-19 pandemic in PEI caused a rational fear of entering the public and a shutdown in health care services. Patients missed regular cancer screening and were reluctant to attend medical appointments if offered. Cancer diagnoses in PEI were reduced from March through May 2020 which was like Canada but with a smaller magnitude. These reductions were influenced mostly by cancers commonly diagnosed by screening (breast and colorectal cancers) or by visual inspection such as melanoma. Screening cancer diagnoses remained less than expected until September 2020, as screening programs gradually returned to capacity. Other cancer type diagnoses did not seem to be as affected by the pandemic. Cancer prognosis, as measured by increased average cancer stage at diagnosis, was most affected in breast, colorectal, lung, and melanoma cancers. By 2021, average staging for breast and colorectal cancers returned to levels seen in 2019. Unexpectedly, average melanoma cancer staging in 2021 remained higher than in 2019. While cancer incidence trends aligned with COVID-19 pandemic timelines in PEI, we acknowledge there were other non-COVID changes in the health care system that may have also influenced cancer trends. Long-term patient outcomes, including length of survival,

should be continuously assessed over time to further understand how a pandemic or reduced health care services can affect cancer control in Prince Edward Island.

Appendix

Table A.1: Monthly number and percent change of cancer diagnoses[†] in 2020 compared to the average number of cases for 2015-2019 in PEI

	2015-2019	2020	% change*
Jan	71.4	74	3.6
Feb	63.2	81	28.2
Mar	74.6	68	-8.8
Apr	78.2	63	-19.4
May	77.8	61	-21.6
Jun	75.8	78	2.9
Jul	76	81	6.6
Aug	73.8	74	0.3
Sep	68.6	72	5.0
Oct	77	103	33.8
Nov	73.2	80	9.3
Dec	66.4	75	13.0
Total cases	876	910	3.9

*Orange indicates a lower number of diagnoses than expected.

*Green indicates >20% increase in diagnoses than expected.

[†]Prostate cancer diagnoses excluded.

Table A.2: Annual number and percent change of cancer diagnosis[†] in 2020 to 2022 compared to the average number of cases for 2015-2019 in PEI

	2015-2019	2020	2021	2022
Total	876	910	977	998
% change from baseline		3.9	11.5	13.9

[†]Prostate cancer diagnoses excluded.

Table A.3: Monthly number and percent change of cancer cases in 2020 compared to the average number of cases for 2015-2019 by cancer type in PEI

	Screening			Non-screening		
	2015-2019	2020	% change*	2015-2019	2020	% change*
Jan	19.8	22	11.1	62.4	67	7.4
Feb	18.0	13	-27.8	54.2	73	34.7
Mar	20.6	15	-27.2	61.8	65	5.2
Apr	23.0	12	-47.8	64.6	64	-0.9
May	19.6	10	-49.0	66.0	62	-6.1
Jun	22.2	14	-36.9	63.2	77	21.8
Jul	20.0	16	-20.0	61.8	69	11.7
Aug	22.0	19	-13.6	58.6	61	4.1
Sep	19.6	18	-8.2	61.0	67	9.8
Oct	21.6	22	1.9	62.8	84	33.8
Nov	21.2	28	32.1	65.4	60	-8.3
Dec	18.6	16	-14.0	54.0	69	27.8

*Orange indicates a lower number of diagnoses than expected.

Table A.4: Annual number and percent change of cancer cases in 2020 to 2022 compared to the average number of cases in 2015-2019 by cancer type in PEI

	Screening				Non-screening			
	2015-2019	2020	2021	2022	2015-2019	2020	2021	2022
Total	246.2	205	232.0	283	735.8	818	863.0	847
% change* from baseline		-16.7	-5.77	14.9		11.2	17.3	15.1

*Orange indicates a lower number of diagnoses than expected.

Table A.5: Monthly percent change* of cancer cases in March to June 2020 compared to the average number of cases in 2015-2019 for the most common cancers by site in PEI

Month (in 2020)	Breast	Colorectal	Lung	Melanoma	Prostate
Mar	-3.8	-46.8	-1.4	-52.4	53.8
Apr	-44.4	-49.2	-17.9	-77.3	38.3
May	-38.8	-56.5	-1.8	-47.4	41.0
Jun	-50.0	-28.6	61.8	-82.8	35.4

*Orange indicates a lower number of diagnoses than expected.