

# Cancer in Nunavut: Burden and Trends 2008-2017

**Health Information Unit  
Department of Health  
Government of Nunavut**

Dated: October 2022

Contents

Executive Summary:..... 3

Background: Nunavut and Risk factors for Cancer ..... 4

Cancer overview..... 6

Lung Cancer..... 7

    Risk factors for lung cancer ..... 7

    Comparison to Canada..... 7

    Regional Differences ..... 7

    Age-Related Trends..... 8

    Gender-Related Trends..... 8

    Mortality Data..... 9

    Discussion..... 9

Colorectal Cancer ..... 10

    Risk factors for colorectal cancer ..... 10

    Comparison to Canada..... 10

    Regional Differences ..... 10

    Age-Related Trends..... 11

    Gender-Related Trends..... 11

    Mortality Data..... 12

    Discussion..... 12

Breast Cancer ..... 13

    Risk factors for breast cancer ..... 13

    Comparison to Canada..... 13

    Regional Differences ..... 13

    Age-Related Trends..... 14

    Mortality Data..... 15

    Discussion..... 15

Oral Cancer ..... 16

    Risk factors for oral cancer ..... 16

    Comparison to Canada..... 16

    Regional Differences ..... 16

    Age-Related Trends..... 17

    Gender-Related Trends..... 17

Mortality Data.....	18
Discussion.....	18
Prostate Cancer.....	19
Risk factors for prostate cancer.....	19
Comparison to Canada.....	19
Regional Differences.....	19
Age-Related Trends.....	20
Mortality Data.....	20
Discussion.....	21
Summary.....	22
Recommendations.....	24
References.....	25
Appendices:.....	27
Methodology (including data sources and validation).....	27
Data flow.....	27
<i>Overall Cancer Data Submission Process</i> .....	29
Key Terms.....	30

# Executive Summary:

This report provides an overview of the burden and trends for the five most common cancers in Nunavut with the thought of conversion of information to action for a targeted cancer control plan and to underscore further need of exploration of reasons behind the high incidence of cases. In 2017, the all-cancer age-standardized incidence rate (ASIR) for Nunavummiut was 505.5 per 100,000 population less than the national ASIR of 547.7 per 100,000 population. However, Nunavummiut are disproportionately affected by some types of cancer and other chronic diseases. The impact of cancer, and cancer treatment, on Nunavummiut generates higher personal and health system costs due to necessary travel to out-of-territory cancer care centres.

Between 2008 and 2017, 664 Nunavummiut (322 male, 342 female) were diagnosed with cancer. During this period, the most common cancers in Nunavut were (1) lung, (2) colorectal, (3) breast, (4) oral, and (5) prostate, which accounted for 66.9% of all cancers diagnosed. The Nunavut ASIR for lung, colorectal and oral cancer is higher than that of the national rate whereas the rate for breast and prostate cancer is lower. Differences in cancer risk among populations may be related to the prevalence of risk factors and their interactions; awareness of cancer symptoms and help-seeking behaviour; and access to and acceptance of screening and diagnostic services.

Currently, the Government of Nunavut's Department of Health is working in many areas of cancer care, from prevention through to palliative care. Notable cancer control interventions in Nunavut include: the Tobacco Reduction Program, Human Papillomavirus (HPV) immunization program, and opportunistic screening for colorectal and cervical cancer. Currently, the department is in the process of developing a Nunavut-wide screening program for colorectal cancer. The goal of this program is to decrease morbidity and mortality and increase the number of Nunavummiut being appropriately screened.

# Background: Nunavut and Risk factors for Cancer

Nunavut is the largest jurisdiction in Canada, covering approximately one-fifth of the country's total land mass with an 85% Inuit population (Kikkert, 2021). The territory's total population is 39,353 people, who are spread over 25 communities accessible only by air (Statistics Canada, 2021).

The demographic distribution of Nunavut differs from Canada, with most of the population under the age of 30 (Figure 1). Nunavut has recorded the highest population growth in Canada, with a 12.7% increase between 2011 and 2016 (Statistics Canada, 2017). However, the life expectancy of Nunavummiut at birth (71.1 years) is 11 years lower than Canada (82.1 years) (Statistics Canada, 2020; Statistics Canada, 2020). The crude birth rate in Nunavut was 2.3 times the national average and the total fertility rate was 1.9 times the national average in 2020 (Statistics Canada, 2021). Age is a key determinant for the risk of developing cancer and the incidence of most cancers increase with age (Doll, 1954) (Mary C. White, 2014).

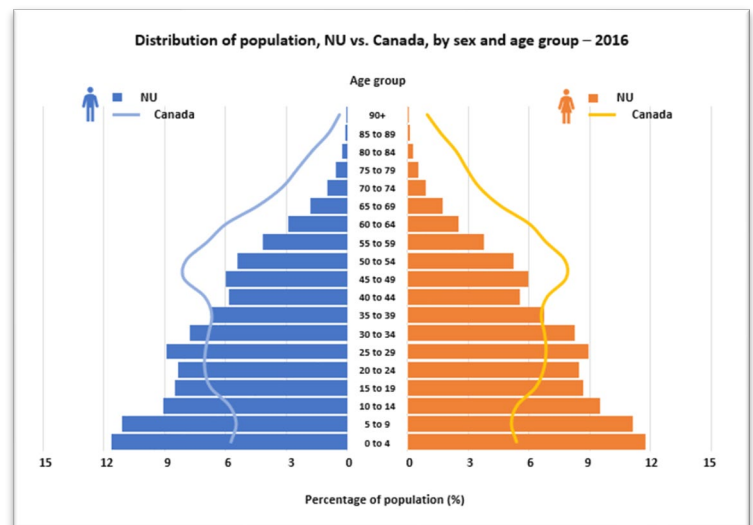


Figure 1. Distribution of population, Nunavut and Canada, by sex and age group, 2016

Other risk factors that are related to the development of cancer include substance use, dietary patterns, and physical activity.

Trends in substance use in Nunavut are different from that of Canada, specifically related to tobacco and alcohol use. The proportion of people living in Nunavut who report being a daily or occasional smoker is 3.9 times higher than Canada (Statistics Canada, 2019). Approximately 62% of Nunavummiut report smoking daily or occasionally, and as high as 84% in some communities. Furthermore, 51% of Nunavut youth aged 12-19 reported smoking, which is more than six times the national rate of 7.7% (Statistics Canada, 2019). The rate of smoking has continued to rise in Nunavut for both sexes (Figure 2). Between 2007 and 2018, the rate of smoking increased by 6% for males and 3% for females (Statistics Canada, 2019). The higher rate of tobacco use in Nunavut is reflected in the higher rate of some cancers.

Alcohol consumption is also reported at a greater frequency among the population in Nunavut than in Canada as a whole. While alcohol is controlled in Nunavut, with some communities prohibiting alcohol altogether, about one in four people 12 years of age and older are considered heavy drinkers (more than 5 drinks per occasion at least monthly in the past year) in Nunavut (23.1%) (Statistics Canada, 2019). This proportion of the population of heavy drinkers is 4% more than Canada as a whole (19.3%). Males in both the Nunavut population and the national population tend to have a higher rate of heavy

drinking (Statistics Canada, 2019). Drinking alcohol increases the risk of certain types of cancers, including breast and colorectal cancer (Canadian Cancer Society, 2021).

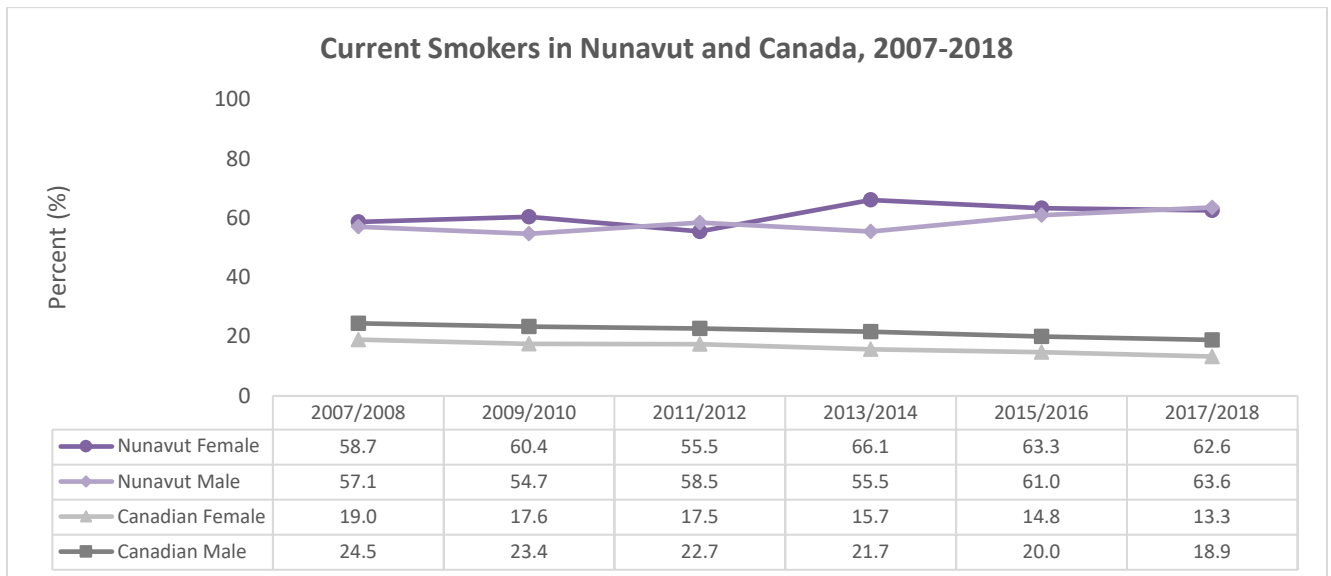
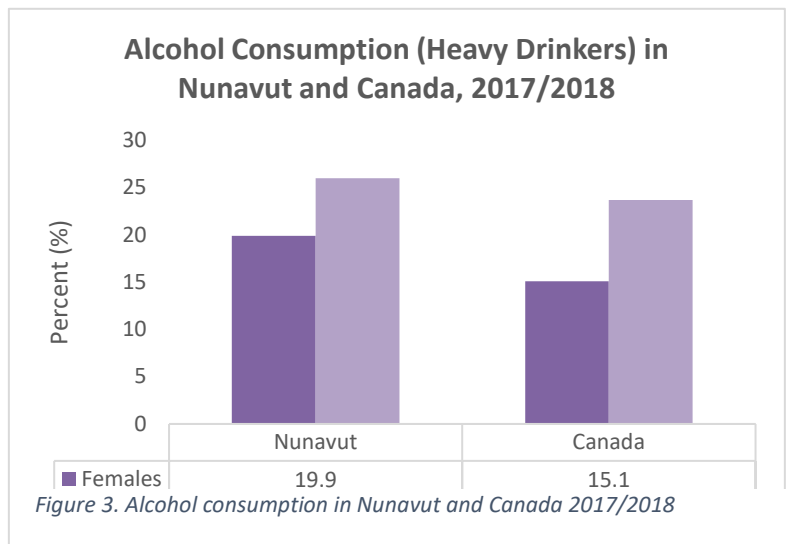


Figure 2. Current smokers in Nunavut and Canada, 2007 – 2018

Dietary patterns in Nunavut are quite different from the rest of Canada. Traditional foods are high in macronutrients, vitamins, antioxidants, and minerals (Blanchet C, 2000). With the increase in store bought foods, there is a greater consumption of processed foods and nutrients found in traditional foods are not being adequately replaced. Fruits and vegetables are an important source of these nutrients, but the rate of consumption in Nunavut is significantly lower than that of Canada. In 2017/2018, only 18.2% of Nunavummiut reported consuming fruits and vegetables five times or more per day (Statistics Canada, 2019). Diet is an important protective factor in cancer prevention; poor diet quality and nutrient deficits may contribute to higher cancer rates.



Canadian adults tend to be more physically active than Nunavut adults. However, Nunavut youth are more physically active than Canadian youth. Overall, males tend to be more physically active than females in both the national and Nunavut populations. There is evidence that higher levels of physical activity are associated with lower risks of some cancers, including breast and colorectal cancers (National Cancer Institute, 2020).

# Cancer overview

Cancer is the second leading cause of death worldwide, with approximately 9.6 million deaths in 2018 (World Health Organization, 2021), and is the leading cause of death in Canada. In 2016, 29.6% of all deaths in Canada were caused by cancer (Canadian Cancer Society, 2022).

A total of 664 Nunavummiut (322 male, 342 female) were diagnosed with cancer between 2008 and 2017. During this period, the most common cancers in Nunavut were lung, colorectal, breast, oral, and prostate, which accounted for 66.9% of all cancers diagnosed.

In 2017, the all-cancer age-standardized incidence rate (ASIR) for Nunavummiut was lower at 505.5 per 100,000 population compared to 547.7 per 100,000 population in Canada. However, Nunavummiut are disproportionately affected by some types of cancer and other chronic diseases (Tungasuvvingat Inuit and Cancer Care Ontario, 2017).

The gender specific ASIR patterns differed with Nunavummiut females exceeding Canadian females by 8.7% (572.5/100,000 compared to 526.8/100,000) and with Nunavummiut males having a 24.5% lower rate than Canadian males (429.5/100,000 compared to 568.9/100,000) (Statistics Canada, 2021).

Most cancer cases are diagnosed in the older age groups. Cancer occurring in children (aged 0 to 14) accounted for only 2.4% of the total cancer diagnosed, whereas cases diagnosed for those aged 45 and older accounted for 82.2% of the total diagnosis.

There are few differences in cancer incidence rates by sex across age groups. Incidence rates were higher for females between the ages of 45 and 54, where females had almost one and a half times (1.4) the risk of cancer. Much of this difference is due to the high incidence of breast cancer among females in this age group between 2008 and 2017. Breast cancer accounted for 27% of cancers among females aged 45-54.

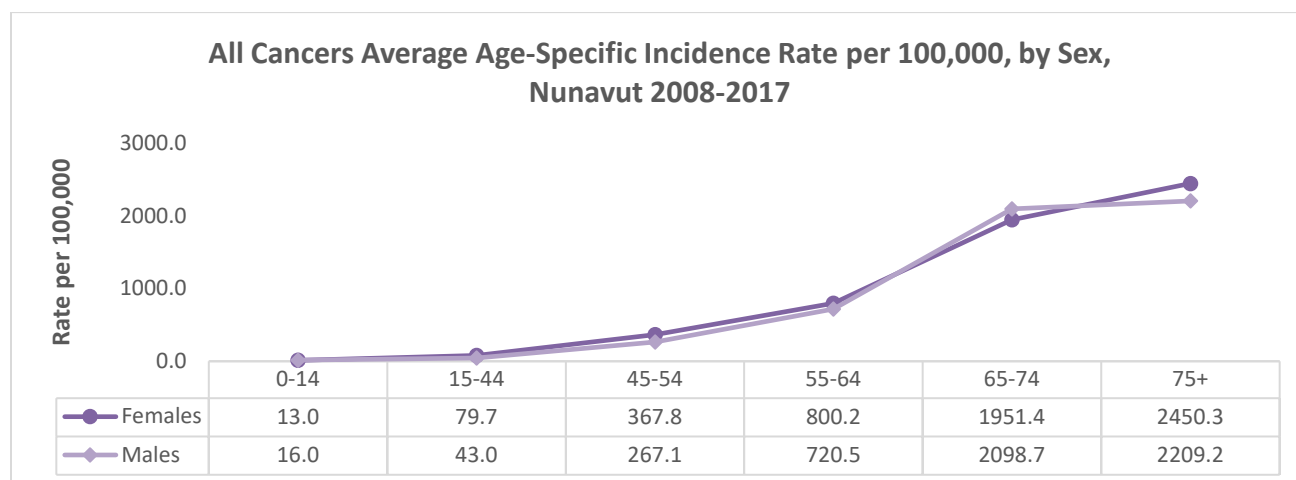


Figure 4. All cancers Age-Specific Incidence Rate per 100,000 by sex, Nunavut 2008 - 2017

The crude incidence rate of cancer in Nunavut is 189.7 per 100,000 population over the 10-year time period. The crude incidence rate of all cancers was highest in the Qikiqtaaluk region (244.2 per 100,000), followed by the Kitikmeot region (148.5 per 100,000) and the Kivalliq region (115.2 per 100,000).

# Lung Cancer

Lung cancer is the leading cancer among Nunavummiut with 192 cases (95 male, 97 female) accounting for 28.9% of reported cancer cases between 2008 and 2017.

## Risk factors for lung cancer

The primary causal agent for lung cancer is smoking tobacco. Smokers are at a 20 times greater risk of developing lung cancer compared to those who do not smoke. In Nunavut, 56.7% of people 12 years of age and older reported smoking, which is 5 times higher than the Canadian average (Statistics Canada, 2019). Smoking is likely one of the major contributing factors to the high cancer rate among Nunavummiut.

## Comparison to Canada

The Nunavut ASIR for lung cancer has been trending down over time but remains significantly higher than that of the national rate. The ASIR for lung cancer in Nunavut was 1.6 times greater than the Canadian lung cancer rate in 2017. The higher lung cancer rates in Nunavut are reflective of the higher rate of smoking. The downward trend may be associated with efforts to reduce smoking in the territory.

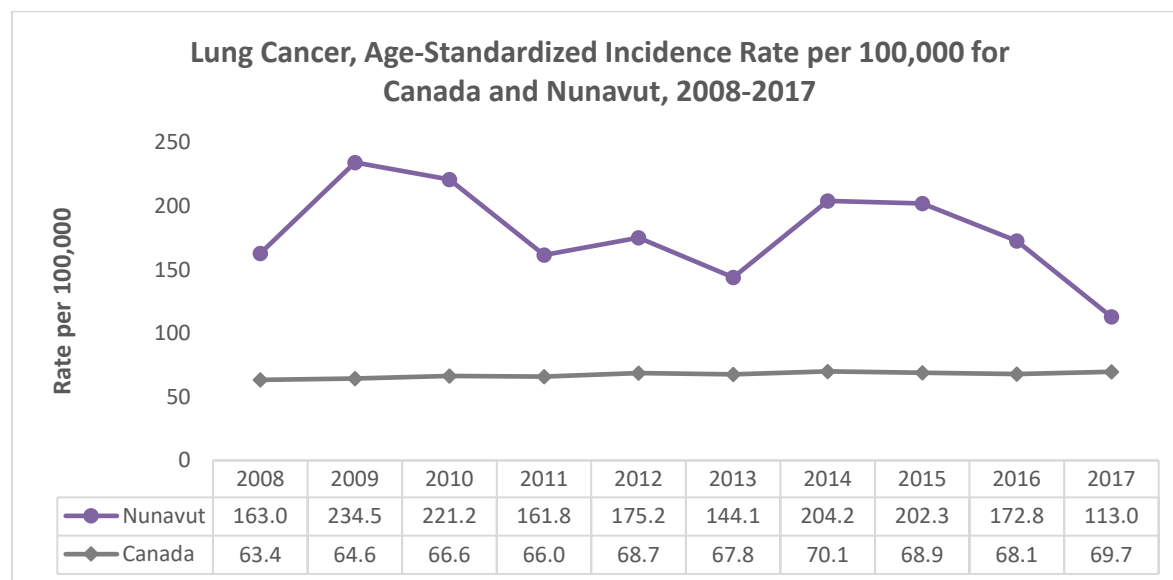


Figure 5. Lung Cancer, Age-Standardized Incidence Rate per 100,000 for Canada and Nunavut, 2008 - 2017

## Regional Differences

The Qikiqtaaluk region has the highest rate of lung cancer (78.7 cases per 100,000) followed by the Kivalliq region (29.0 cases per 100,000) and then the Kitikmeot region (26.3 cases per 100,000) between 2008 and 2017.



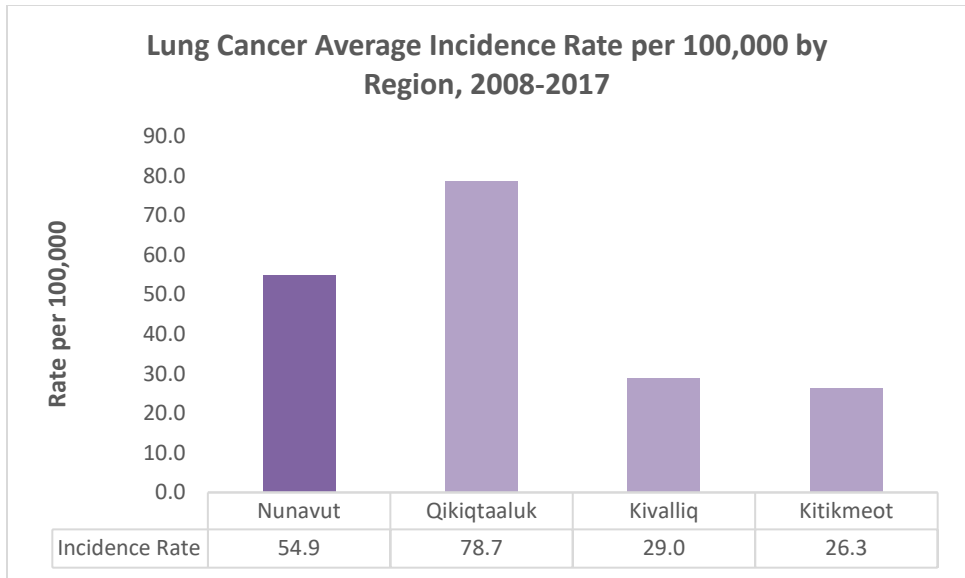


Figure 6. Lung Cancer Average Incidence Rate per 100,000 by Region, 2008-2017

### Age-Related Trends

In Nunavut, the average age at diagnosis was 66 years (range 35-92 years, standard deviation 9.4 years).

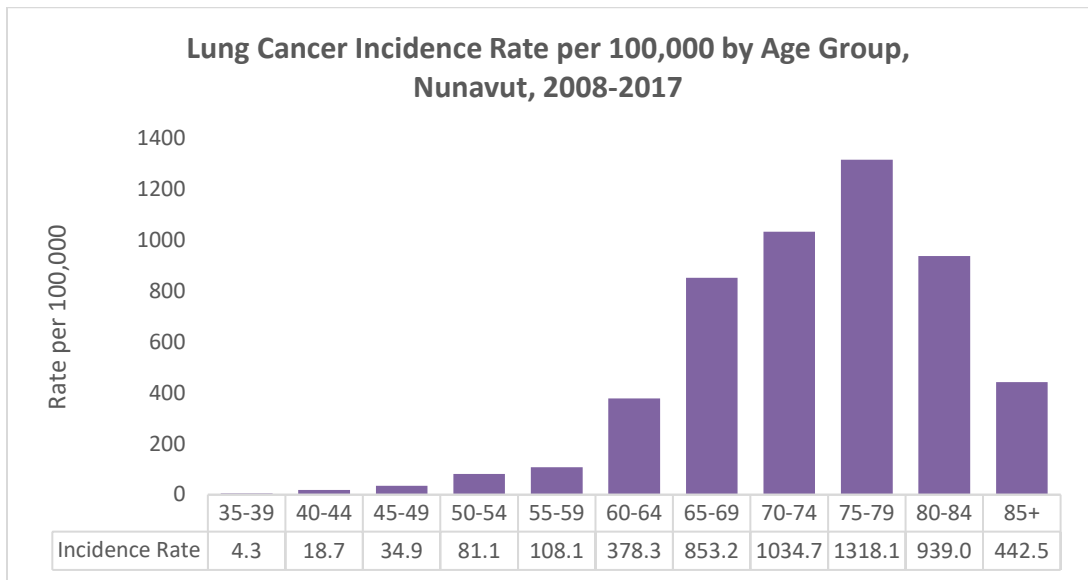


Figure 7. Lung Cancer Incidence Rate per 100,000 by Age Group, Nunavut, 2008-2017

### Gender-Related Trends

Trends in lung cancer incidence among males and females in the Canadian population have been similar between 2008 and 2017. However, among Nunavummiut there are no consistent patterns in lung cancer incidence between males and females. Overall, both Nunavummiut males and females have a higher age-standardized incidence rate of lung cancer than male and female Canadians. Nunavut males were 1.7 times more likely to develop lung cancer than Canadian males in 2017 and Nunavut females were 1.6 times more likely to develop lung cancer than Canadian females during the same year.

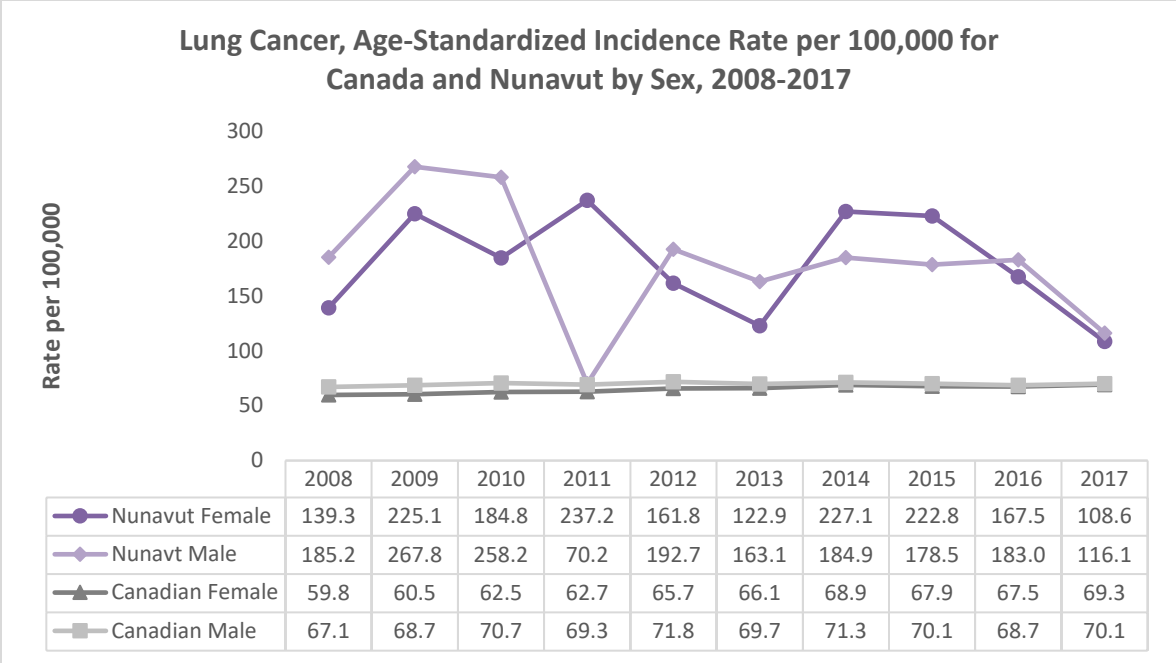


Figure 8. Lung Cancer, Age-Standardized Incidence Rate per 100,000 for Canada and Nunavut by Sex, 2008 - 2017

**Mortality Data**

Of all the cases of lung cancer between 2008 and 2017, 45.8% died within one year of receiving a diagnosis and 65.1% died within two years of diagnosis.

**Discussion**

Nunavummiut experience higher rates of lung cancer compared to Canada after adjusting for differences in age. Higher rates of tobacco use are likely a major contributing factor to Nunavut’s lung cancer rate. The Tobacco Reduction Program in Nunavut aims to improve overall health of Nunavummiut by reducing the negative health outcomes caused by tobacco use. Continued implementation of tobacco reduction strategies is essential to reducing the risk of developing lung cancer.

# Colorectal Cancer

Colorectal cancer is the second leading cancer among Nunavummiut with 130 cases (65 male, 65 female) accounting for 19.6% of reported cancer cases between 2008 and 2017.

## Risk factors for colorectal cancer

Obesity is associated with a higher risk of colorectal cancer and diet is directly correlated with colorectal cancer risk (Bardou M, 2013). Consumption of fruits, vegetables, and fish reduce the risk of colorectal cancer while consumption of red meats and alcohol increase the risk of colorectal cancer (Lee J, 2017). Other lifestyle factors, such as physical activity, have been found to have a protective effect against colorectal cancer (Slattery, 2004).

## Comparison to Canada

The Nunavut ASIR for colorectal cancer has been trending up slightly over time and is significantly higher than that of the national rate in 2017. The ASIR for colorectal cancer in Nunavut was almost 3 times greater than the Canadian colorectal cancer rate in 2017.

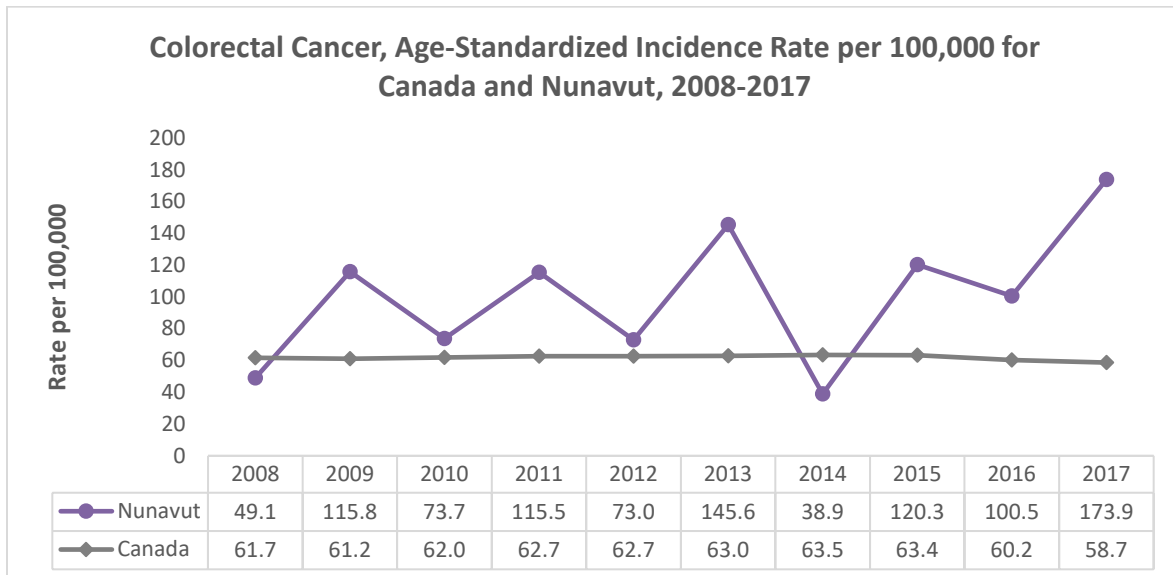


Figure 9. Colorectal Cancer, Age-Standardized Incidence Rate per 100,000 for Canada and Nunavut, 2008-2017

## Regional Differences

The Qikiqtaaluk region has the highest rate of colorectal cancer (46.4 cases per 100,000) followed by the Kitikmeot region (30.9 cases per 100,000) and then the Kivalliq region (24.0 cases per 100,000) between 2008 and 2017.

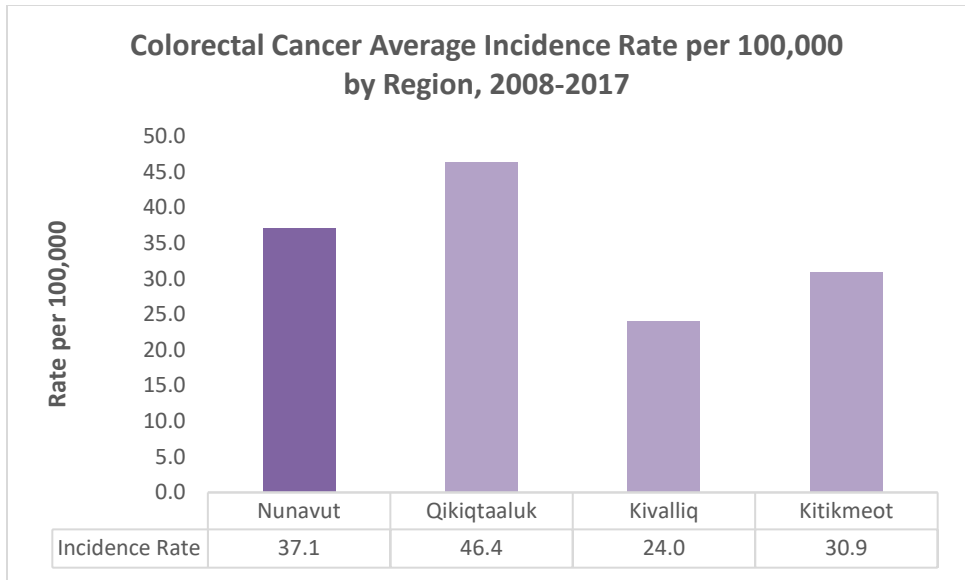


Figure 10. Colorectal Cancer Average Incidence Rate per 100,000 by Region, 2008-2017

### Age-Related Trends

In Nunavut, the average age at diagnosis was 60 years (range 20-89 years, standard deviation 12.6 years).

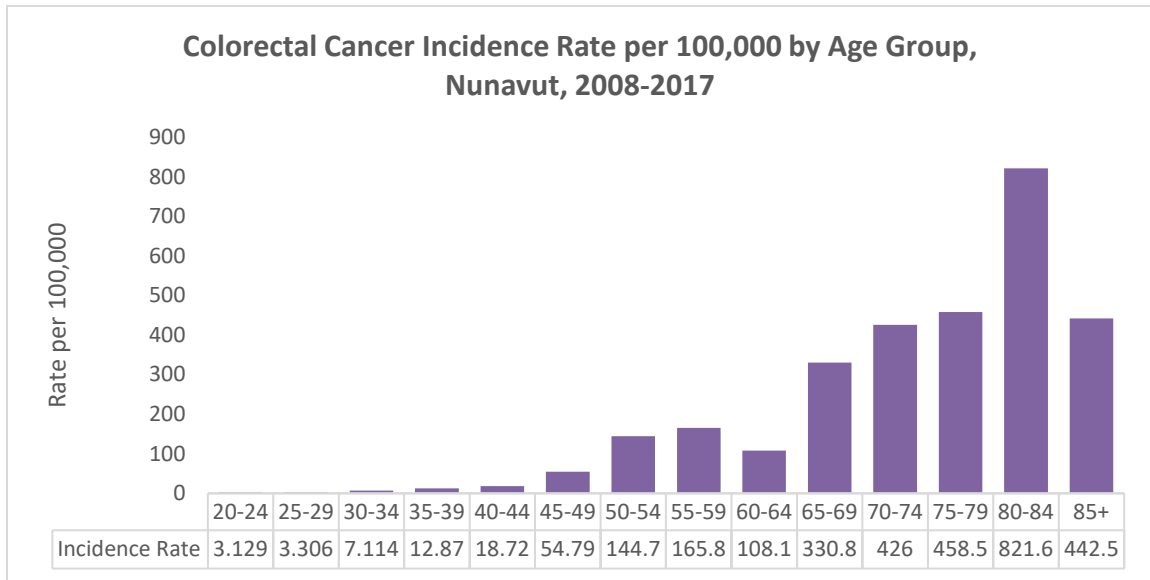


Figure 11. Colorectal Cancer Incidence Rate per 100,000 by Age Group, Nunavut, 2008-2017

### Gender-Related Trends

Nationally, between 2008 and 2017, Canadian males have consistently had higher colorectal cancer rates than female population. However, females in Nunavut tend to have a higher risk of colorectal cancer than Nunavut males with a 2.5 times greater risk (compared to a 20% reduction in risk in the national population). Overall, both Nunavummiut males and females have a higher age-standardized incidence rate of colorectal cancer than male and female Canadians. In 2017, Nunavut males were 1.5

times more likely to develop colorectal cancer than Canadian males and Nunavut females were 4.7 times more likely to develop colorectal cancer than Canadian females.

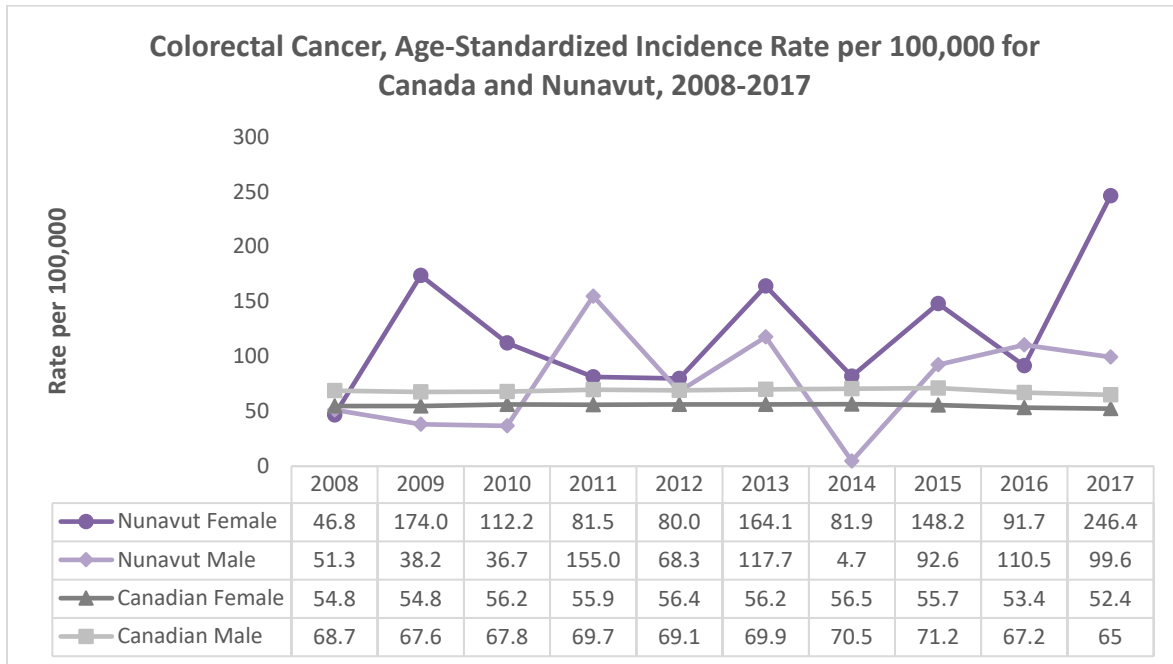


Figure 12. Colorectal Cancer, Age-Standardized Incidence Rate per 100,000 for Canada and Nunavut, 2008-2017

### Mortality Data

Of all the cases of colorectal cancer between 2008 and 2017, 19.2% died within one year of diagnosis and 30.4% died within two years of diagnosis.

### Discussion

Promotion of healthy lifestyle choices such as eating fruits, vegetables, and fish, increasing physical activity, and reducing alcohol consumption are important to reducing the risk of colorectal cancer. Screening provides an opportunity for early case identification and improved prognosis. Targeted screening based on identified risk factors and population-based screening is an efficient way to make a difference in colorectal cancer prognosis and to potentially improve survival.

# Breast Cancer

Breast cancer is the third leading cancer among Nunavummiut with 54 cases accounting for 8.1% of reported cancer cases between 2008 and 2017.

## Risk factors for breast cancer

Maternal age at first birth and patterns of breast feeding (e.g., decreased duration) are risk factors associated with breast cancer (J Wohlfahrt, 2001). Alcohol has also been shown to increase the risk of breast cancer (Jasmine A. McDonald, 2013).

## Comparison to Canada

The Nunavut ASIR for breast cancer had been trending down between 2008 and 2014 but has seen a reversal in trends from 2014 to 2017. The ASIR for breast cancer in Nunavut has been, on average, below that of the national rate. In 2017, the ASIR for breast cancer in Nunavut was 62.3% lower than the Canadian breast cancer rate in 2017.

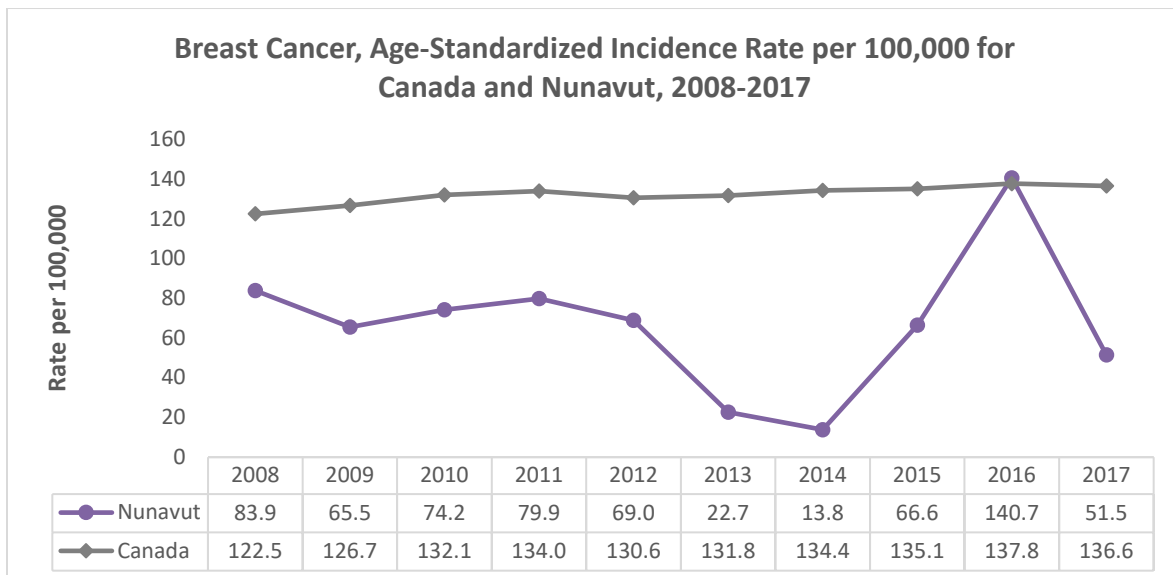


Figure 13. Breast Cancer, Age-Standardized Incidence Rate per 100,000 for Canada and Nunavut, 2008-2017

## Regional Differences

The Kitikmeot region has the highest rate of breast cancer (54.6 cases per 100,000) followed by the Qikiqtaaluk region (33.6 cases per 100,000) and then the Kivalliq region (14.5 cases per 100,000) between 2008 and 2017.

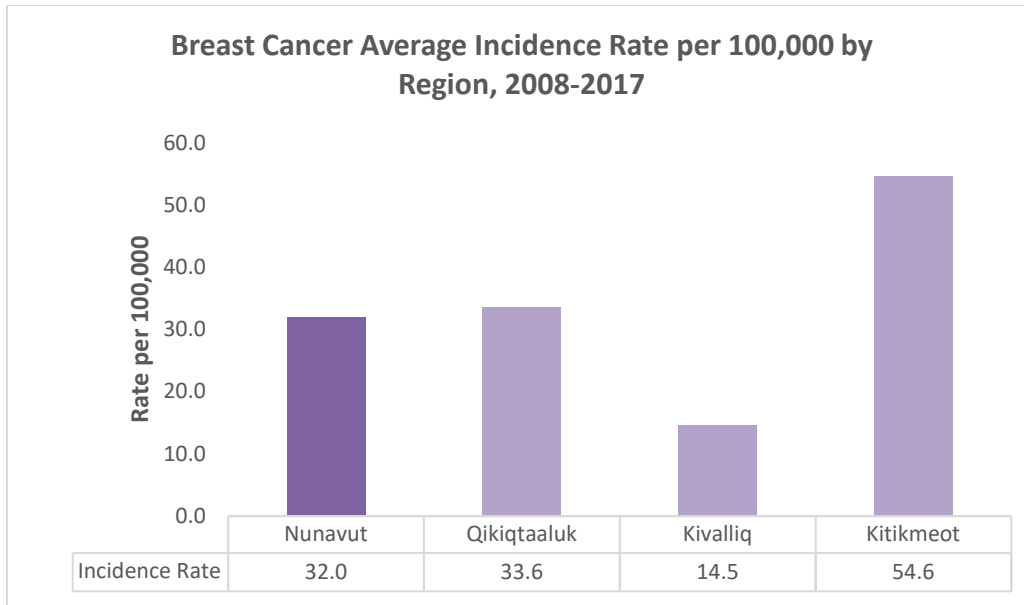


Figure 14. Breast Cancer Average Incidence Rate per 100,000 by Region, 2008-2017

#### Age-Related Trends

In Nunavut, the average age at diagnosis was 53 years (range 26-82 years, standard deviation 12.6 years).

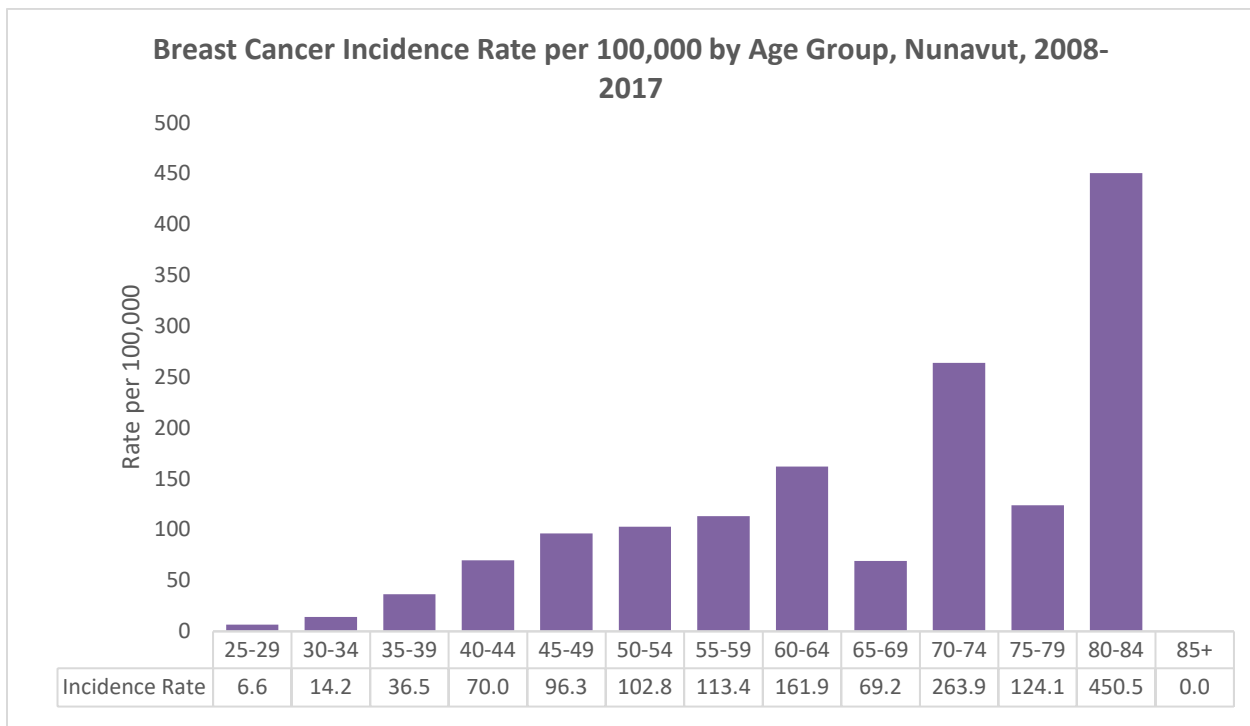


Figure 15. Breast Cancer Incidence Rate per 100,000 by Age Group, Nunavut, 2008-2017

### Mortality Data

Of all the cases of breast cancer between 2008 and 2017, 3.7% died within one year of diagnosis and 5.6% died within two years of diagnosis.

### Discussion

Overall, breast cancer rates in Nunavut are lower than the national average. Nunavut offers a Well-Women clinic that includes a clinical breast exam and recommends mammography every 1-2 years for low-risk people between the ages of 50 and 69. For patients with family history of breast cancer, the recommended age of screening is 5 years prior to the age at diagnosis of the family member. Early detection of breast cancer significantly increases the prognosis (Koriech, 1996).



# Oral Cancer

Oral cancer is the fourth leading cancer among Nunavummiut with 39 cases (22 male, 17 female) accounting for 5.9% of reported cancer cases between 2008 and 2017.

## Risk factors for oral cancer

Approximately 62% of Nunavummiut 12 years or older report smoking tobacco. Smoking and chewing tobacco increase the risk for oral cancer (Xiaoge Jiang, 2019). Some studies have also suggested that consuming preserved foods during childhood, such as traditional Inuit dried fish, increase the risk of oral cancer later in life (Jing Xu, 2014). HPV is also a risk factor, and one that is increasing in prominence.

## Comparison to Canada

The Nunavut ASIR for oral cancer is significantly higher than that of the national rate. The ASIR for oral cancer in Nunavut was more than 4 times greater than the Canadian oral cancer rate in 2011.

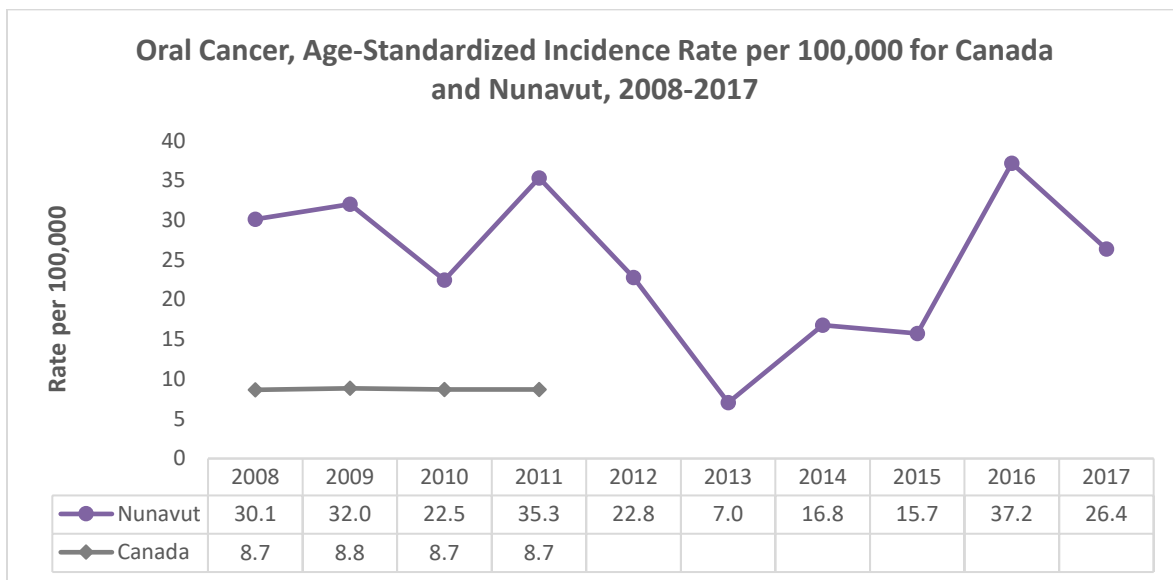


Figure 16. Oral Cancer, Age-Standardized Incidence Rate per 100,000 for Canada and Nunavut, 2008-2017

## Regional Differences

The Kivalliq region has the highest rate of oral cancer (14.0 cases per 100,000) followed by the Qikiqtaaluk region (11.3 cases per 100,000) and then the Kitikmeot region (6.2 cases per 100,000) between 2008 and 2017.

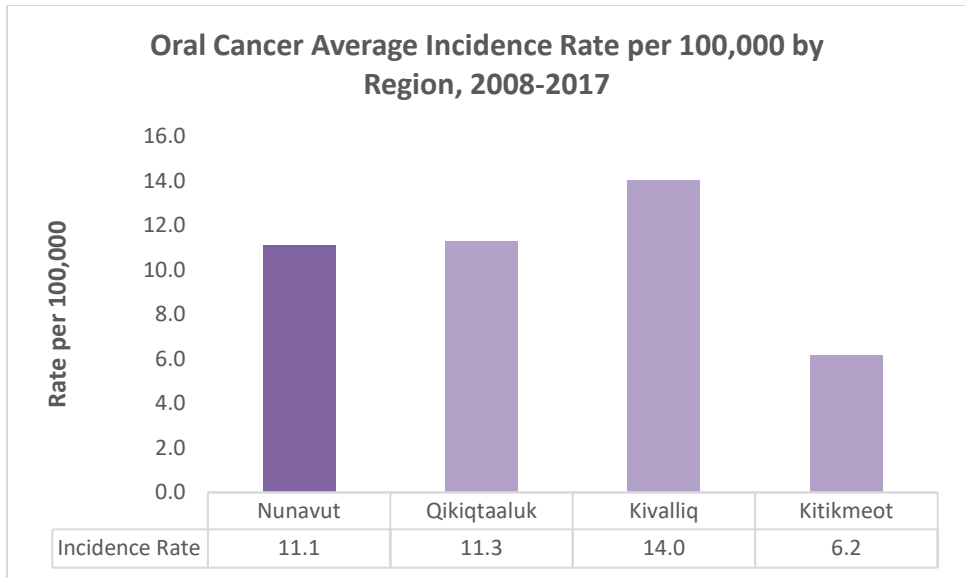


Figure 17. Oral Cancer Average Incidence Rate per 100,000 by Region, 2008-2017

### Age-Related Trends

In Nunavut, the average age at diagnosis was 56 years (range 12-76 years, standard deviation 14.6 years).

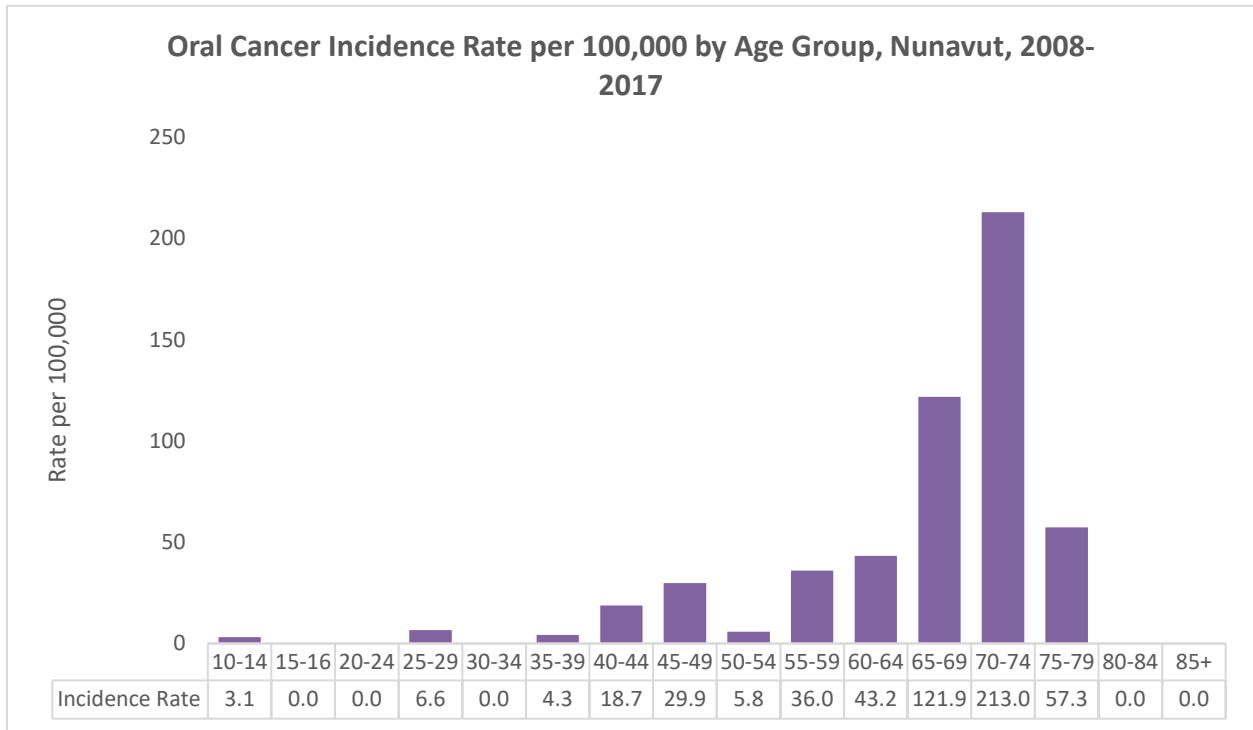


Figure 18. Oral Cancer Incidence Rate per 100,000 by Age Group, Nunavut, 2008-2017

### Gender-Related Trends

Canadian males have consistently had higher oral cancer rates than the national female population between 2008 and 2011. Similar patterns are seen in Nunavut with males having a higher risk of oral

cancer than Nunavut females. There is a trend for increasing risk of oral cancer among Nunavut males while Nunavut females are seeing a downward trend in risk.

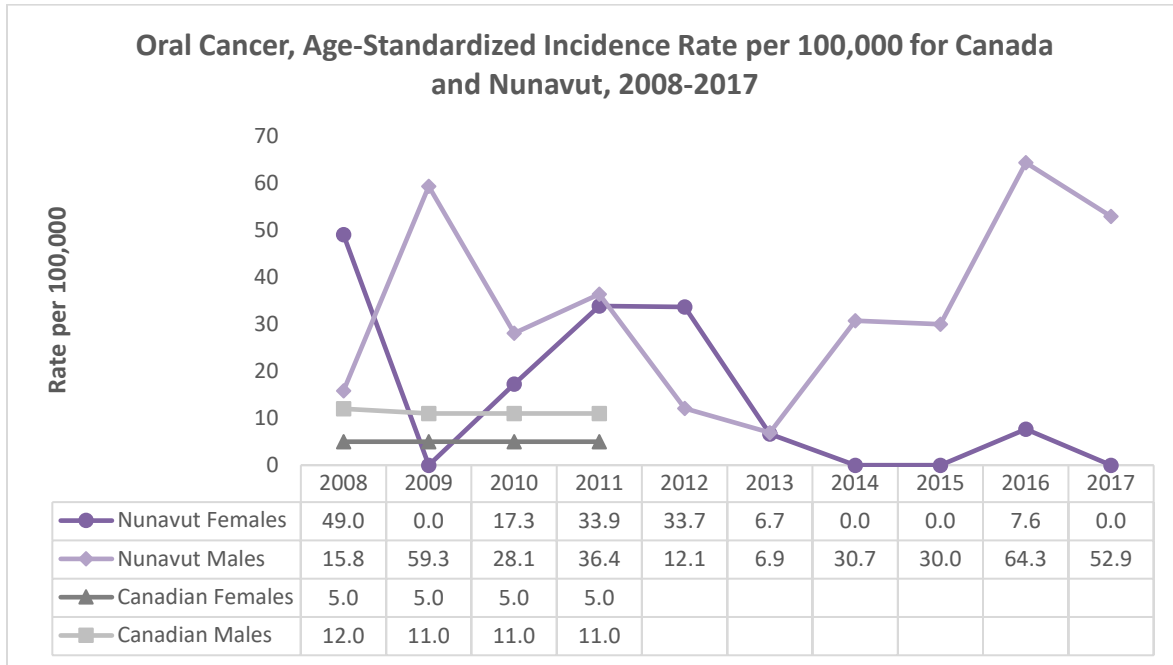


Figure 19. Oral Cancer, Age-Standardized Incidence Rate per 100,000 for Canada and Nunavut, 2008-2017

#### Mortality Data

Of all the cases of oral cancer between 2008 and 2017, 15.4% died within one year of diagnosis and 25.6% died within two years of diagnosis.

#### Discussion

Overall, oral cancer rates are significantly higher in Nunavut compared to the national average and are trending up for males. Factors influencing this cancer risk, such as alcohol and tobacco consumption, are modifiable and continued efforts from the Nunavut Tobacco Reduction program are essential to further reducing risk.

# Prostate Cancer

Prostate cancer is the fifth leading cancer among Nunavummiut with 29 cases accounting for 4.4% of reported cancer cases between 2008 and 2017.

### Risk factors for prostate cancer

Prostate cancer increases with age and is rare in patients under the age of 40 (American Cancer Society, 2022). There appears to be an inheritable genetic predisposition to prostate cancer with dietary patterns also playing a role in one’s risk of prostate cancer. For example, patients who consume a lot of dairy products appear to be a greater risk. Smoking has also been linked to an increased risk of prostate cancer as well as increasing the risk of dying from prostate cancer (American Cancer Society, 2022).

### Comparison to Canada

The Nunavut ASIR for prostate cancer is significantly lower than that of the national rate. The ASIR for prostate cancer in Nunavut was 63.6% less than the national prostate cancer rate in 2017.

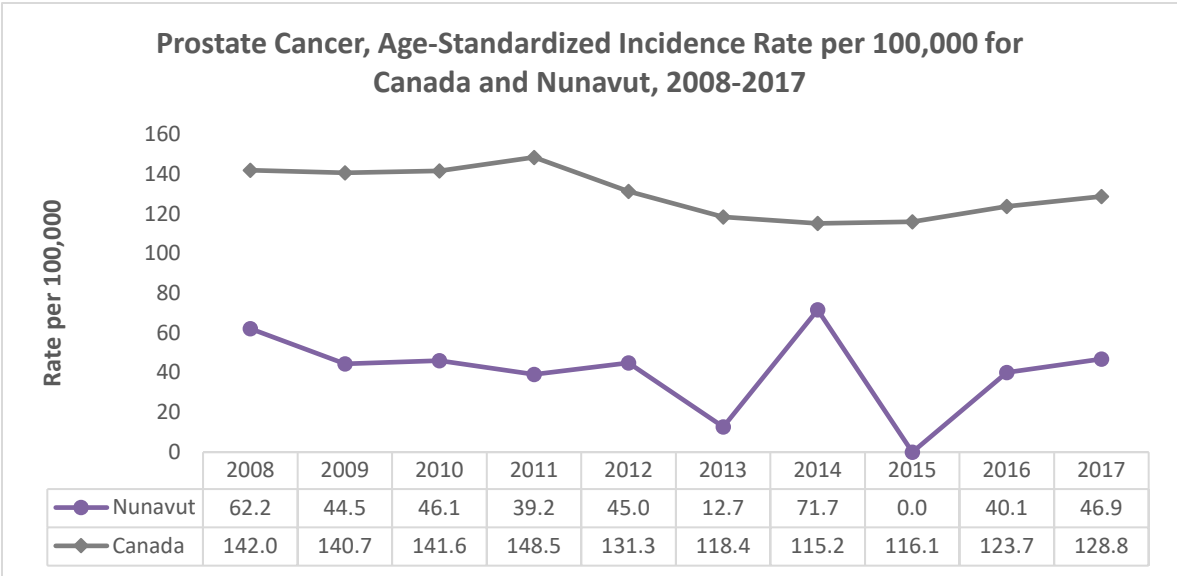


Figure 20. Prostate Cancer, Age-Standardized Incidence Rate per 100,000 for Canada and Nunavut, 2008-2017

### Regional Differences

The Qikiqtaaluk region has the highest rate of prostate cancer (23.9 cases per 100,000) followed by the Kitikmeot region (9.0 cases per 100,000) and then the Kivalliq region (5.8 cases per 100,000) between 2008 and 2017.

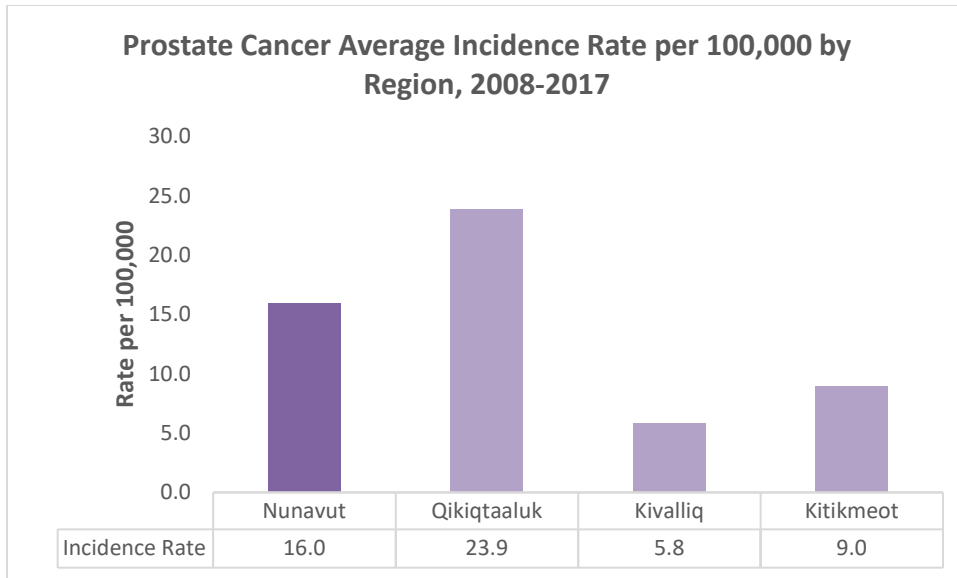


Figure 21. Prostate Cancer Average Incidence Rate per 100,000 by Region, 2008-2017

### Age-Related Trends

In Nunavut, the average age at diagnosis was 63 years (range 47-75 years, standard deviation 7.4 years).

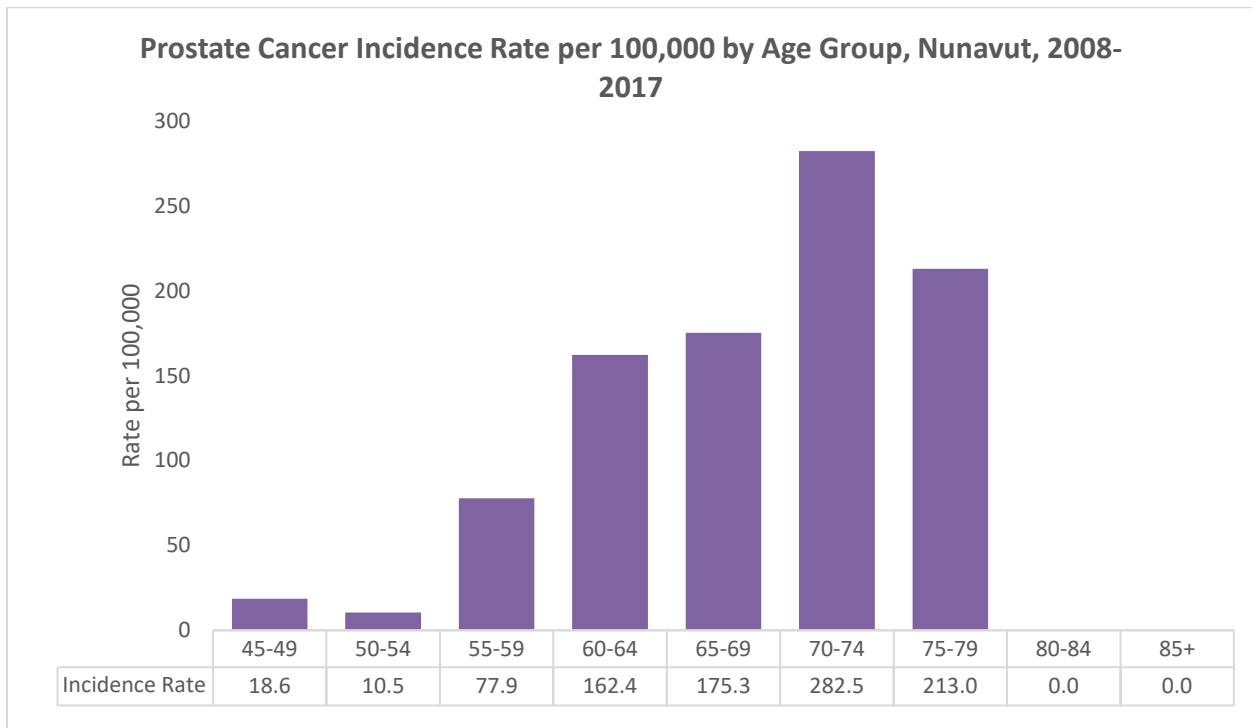


Figure 22. Prostate Cancer Incidence Rate per 100,000 by Age Group, Nunavut, 2008-2017

### Mortality Data

Of all the cases of prostate cancer between 2008 and 2017, 3.4% died within one year of diagnosis. All other cases survived beyond two years of diagnosis.

## Discussion

Overall, prostate cancer rates are significantly lower than the national rate. Dietary patterns and smoking contribute to the risk of prostate cancer. Therefore, healthy lifestyle and screening are essential to an improved prognosis.

# Summary

This report narrates the risk of the top five cancers in Nunavut with the thought of conversion of information to action for a targeted cancer control plan and to underscore further need of exploration of reasons behind the high incidence of cases. The Nunavut Cancer Registry is advancing and implementing methods to collect and collate epidemiological, morbidity, staging and mortality data at the individual level. The need for high quality, comprehensive national data on the burden of cancer is important for cancer control programs.

Differences in cancer risk among populations may be related to the prevalence of risk factors and their interactions; awareness of cancer symptoms and help-seeking behaviour; and access to and acceptance of screening and diagnostic services. We hope that this report will serve as a stimulus and information material for further exploration of finding the causes.

Key social determinants of Inuit health have been identified by Inuit Tapiriit Kanatami (Inuit Tapiriit Kanatami, 2014) and include factors such as quality of early childhood development, culture and language, livelihoods, income distribution, housing, personal safety and security, education, food security, availability of health services, mental wellness, and the environment. To have a fulsome picture of cancer in Nunavut, and to allow policy makers to enact effective preventative and cancer control interventions, demographics, including risk and protective factors, need to be taken into account. Inuit social determinants of health differ from other populations and the impact of these must be considered when evaluating the burden of cancer in Nunavut.

Specific health indicators for Nunavut should also be viewed with an understanding of how social and economic factors, coupled with the history of colonization have impacted the health of Inuit communities. Contextual knowledge is necessary to cultivate an appropriate lens through which any analysis of the health of Nunavummiut must take place. Many Nunavummiut face challenges with substance use, mental health status, nutrition, infant mortality, and overall well-being. Without knowledge of the reasons for the prevalence in challenges, the risk of a harmful or biased assessment is increased (Inuit Tapiriit Kanatami, 2014).

Colonization, rapid modernization, and ongoing social inequities mean that some Nunavummiut struggle with personal, familial and community wellness which contribute to the burden of disease in the territory (Inuit Tapiriit Kanatami, 2014). Valuing of traditional Inuit knowledge, increasing Inuit self-determination, and cultural revival are significant positive developments that highlight the resilience and strength of Nunavummiut (Inuit Tapiriit Kanatami, 2014). These protective factors, amongst others, provide additional context and help to frame the experience of many Nunavummiut in dealing with cancer and other chronic diseases.

Currently, the Government of Nunavut's Department of Health is working in many areas of cancer care from prevention through to palliative care:

- The Tobacco Reduction program aims to improve overall health of Nunavummiut by reducing negative health outcomes caused by tobacco use. This is being done through comprehensive tobacco prevention, protection, denormalization and cessation outreach and policy development.

- The Tobacco Reduction Program is also actively working on implementing the Ottawa Model for Smoking Cessation at Qikiqtani General Hospital in Iqaluit. This program not only provides best-practice tobacco cessation programming to clients locally, but would provide cessation supports to Nunavummiut as they travel to other jurisdictions to receive cancer care services.
- The Human Papillomavirus (HPV) immunization program is a school-based, publicly-funded immunization program for both boys and girls aged 11 years old and up. The goal of the HPV program is to protect Nunavummiut from the 9 most common strains of HPV known to cause cervical and other cancers.
- Opportunistic screening is also occurring for colorectal and cervical cancer. Currently, the department is in the process of developing an organized screening program for colorectal cancer. The goal of this program is to decrease morbidity and mortality and increase the number of Nunavummiut being appropriately screened.



# Recommendations

## Reducing the risk of cancer

- Boosting up vaccination programs against cervical and liver cancer by providing HPV and hepatitis B vaccines to the eligible group.
- Broaden and extend the integrated tobacco cessation system.
- Ensure operational controls on alcohol availability and increase access to counseling interventions for risk groups.
- Improve nutrition and promote healthy living.

## Early Diagnosis and Reporting

- Capacity building through a comprehensive approach including all relevant departments and establishing a communication system with corresponding physicians and laboratories.
- Colon cancer: Developing and implementing a population based colorectal cancer screening program.

## Treating and managing cancer

- Reducing waiting time for diagnosis and getting treatment.
- Ensure culturally appropriate support services.
- Ensure communities have the resources (e.g., telemedicine) required to better provide services.

## Research

- The largely unexplained increased prevalence of lung and colorectal cancers should be studied in detail.
- Information about prevalence of common modifiable risk factors, such as smoking, diet, exercise, alcohol consumption and uncertain risk factors is needed to be measured to correlate those with burden of cancer.
- Use of healthcare services and its effect on cancer prognosis should also be measured.
- Measures should be taken to raise awareness of healthy lifestyle behaviors to reduce the prevalence of important modifiable risk factors, such as tobacco, alcohol, and weight.
- Efforts should be made to improve the compatibility of health utilization data, risk factors, census, and health services between the cancer registry and other departments.
- Linkage of cancer registry data with occupational and census data can ensure better understanding of cancer causes

# References

- American Cancer Society, 2022. *Prostate cancer risk factors*. [Online]  
Available at: <https://www.cancer.org/cancer/prostate-cancer/causes-risks-prevention/risk-factors.html>  
[Accessed 07 February 2022].
- Bardou M, B. A. M. M., 2013. Obesity and colorectal cancer. *Gut*, Volume 62, pp. 933-947.
- Blanchet C, D. E. A. P. B. S. R. O. a. H. B., 2000. Contribution of Selected Traditional and Market Foods to the Diet of Nunavik Inuit Women. *Can J Diet Pract Res*, 61(2), pp. 50-59.
- Canadian Cancer Society, 2021. *Some sobering facts about alcohol and cancer risk*. [Online]  
Available at: <https://cancer.ca/en/cancer-information/reduce-your-risk/limit-alcohol/some-sobering-facts-about-alcohol-and-cancer-risk>  
[Accessed 12 November 2021].
- Canadian Cancer Society, 2022. *Cancer statistics at a glance*. [Online]  
Available at: <https://cancer.ca/en/research/cancer-statistics/cancer-statistics-at-a-glance>  
[Accessed 07 February 2022].
- Doll, P. A. a. R., 1954. The Age Distribution of Cancer and a Multi-stage Theory of Carcinogenesis.. *Br J Cancer*, 8(1), pp. 1-12.
- Government of Nunavut, 2016. *Health Profile Nunavut: Information to 2014*, Iqaluit: s.n.
- Inuit Tapiriit Kanatami, 2014. *Social Determinants of Inuit Health in Canada*, s.l.: s.n.
- J Wohlfahrt, M. M., 2001. Age at any birth is associated with breast cancer risk. *Epidemiology*, 12(1), pp. 68-73.
- Jasmine A. McDonald, A. G. a. M. B. T., 2013. Alcohol Intake and Breast Cancer Risk: Weighing the Overall Evidence. *Curr Breast Cancer Rep*, 5(3).
- Jing Xu, X.-x. Y. Y.-g. W. X.-y. L. a. B. B., 2014. Meat Consumption and Risk of Oral Cavity and Oropharynx Cancer: A Meta-Analysis of Observational Studies. *PLoS One*, 9(4).
- Kikkert, P., 2021. *The Canadian Encyclopedia*. [Online]  
Available at: <https://www.thecanadianencyclopedia.ca/en/article/nunavut>  
[Accessed 03 11 2021].
- Koriech, O. M., 1996. Breast Cancer and Early Detection. *J Family Community Med*, 3(1), pp. 7-9.
- Lee J, S. A. O. J. K. J., 2017. Colors of vegetables and fruits and the risks of colorectal cancer. *World Journal of Gastroenterology*, 23(14), pp. 2527-2538.
- Mary C. White, D. M. H. J. E. B. L. A. P. M. G. S. J. H., 2014. Age and Cancer Risk: A Potentially Modifiable Relationship. *Am J Prev Med*, 43(3.0.1), pp. 7-15.
- National Cancer Institute, 2020. *Physical activity and cancer*. [Online]  
Available at: <https://www.cancer.gov/about-cancer/causes-prevention/risk/obesity/physical-activity->

fact-sheet

[Accessed 12 November 2021].

Slattery, M., 2004. Physical activity and colorectal cancer. *Sports Med*, 34(4), pp. 239-52.

Statistics Canada, 2017. *Nunavut [Territory] and Canada [Country](table). Census Profile. 2016 Census. Statistics Canada Catalogue no 98-316-X2016001*. [Online]

Available at: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E>  
[Accessed 17 September 2021].

Statistics Canada, 2019. *Table 13-10-0805-01 Health characteristics, two-year period estimates, census metropolitan areas and population centres*. [Online]

Available at: <https://doi.org/10.25318/1310080501-eng>  
[Accessed 07 February 2022].

Statistics Canada, 2020. *Table 13-10-0114-01 Life expectancy and other elements of the life tables, Canada, all provinces except Prince Edward Island*. [Online]

Available at: <https://doi.org/10.25318/1310011401-eng>  
[Accessed 11 November 2021].

Statistics Canada, 2020. *Table 13-10-0140-01 Life expectancy and other elements of the life table, Prince Edward Island and the territories*. [Online]

Available at: <https://doi.org/10.25318/1310014001-eng>  
[Accessed 11 November 2021].

Statistics Canada, 2021. *Table 13-10-0111-01 Number and rates of new cases of primary cancer, by cancer type, age group and sex*. [Online]

Available at: <https://doi.org/10.25318/1310011101-eng>  
[Accessed 11 November 2021].

Statistics Canada, 2021. *Table 1310-0418-01 Crude birth rate, age-specific fertility rates and total fertility rate (live births)*. [Online]

Available at: <https://doi.org/10.25318/1310041801-eng>  
[Accessed 11 November 2021].

Statistics Canada, 2021. *Table 17-10-0005-01 Population estimates on July 1st, by age and sex*. [Online]

Available at: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000501>  
[Accessed 03 11 2021].

Tungasuvvingat Inuit and Cancer Care Ontario, 2017. *Cancer Risk Factors and Screening Among Inuit in Ontario and Other Canadian Regions*, Toronto: s.n.

World Health Organization, 2021. *Cancer*. [Online]

Available at: <https://www.who.int/news-room/fact-sheets/detail/cancer>  
[Accessed 03 November 2021].

Xiaoge Jiang, J. W. J. W. a. R. H., 2019. Tobacco and oral squamous cell carcinoma: A review of carcinogenic pathways. *Tob Induc Dis*, 17(29).

# Appendices:

## Methodology (including data sources and validation)

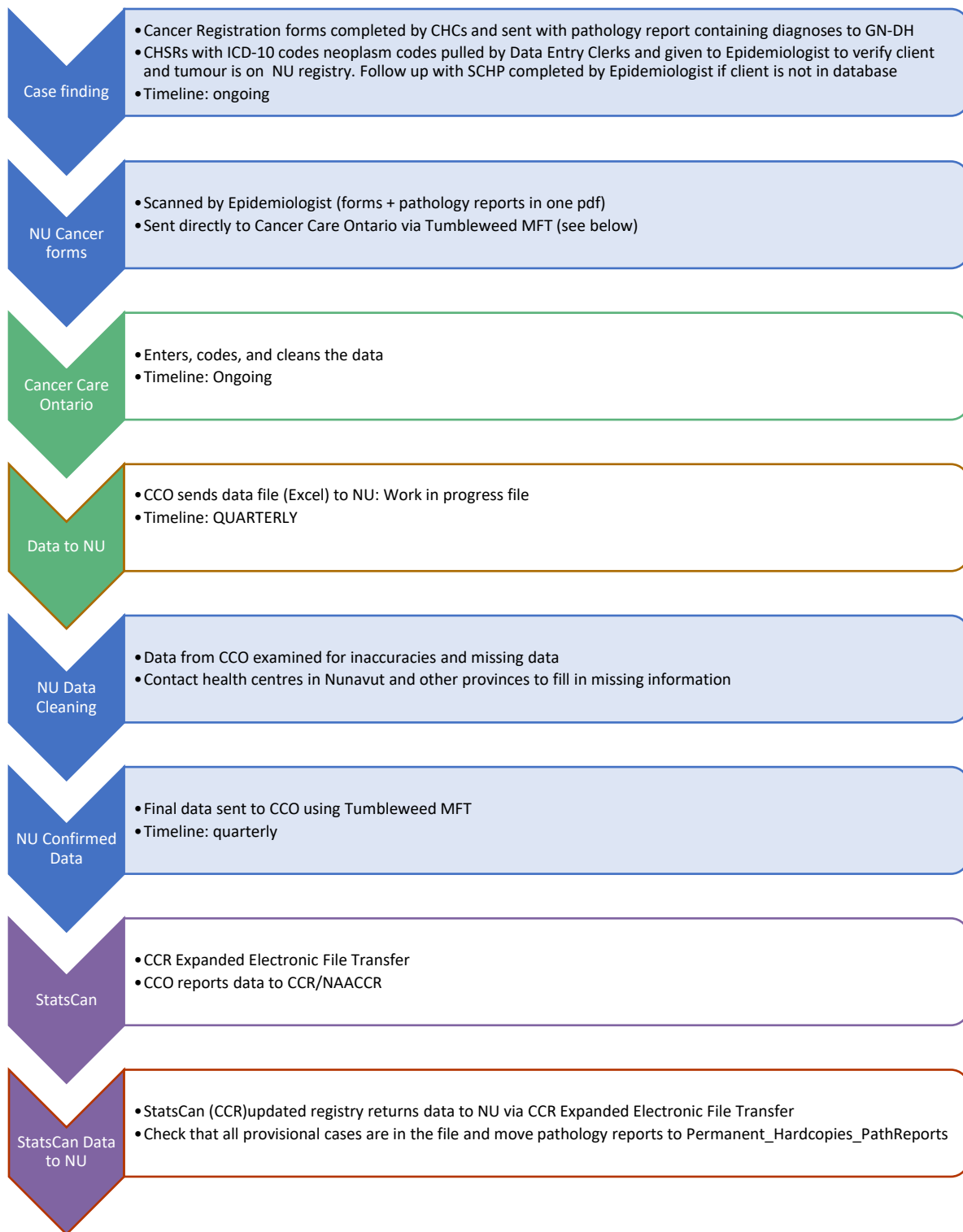
Information for this report comes from several sources. Nunavut cancer registry and population data from Nunavut Bureau of Statistics provide the details of "numerator(cases)" and "denominator(population)". Age standardized rates for comparison are derived from Statistics Canada website.

Pathology reports for confirmation of cancer diagnosis are mostly obtained from out of territory (Specifically, from Ontario, Manitoba, Alberta, Yukon, and Northwest Territories) laboratories. For completeness of provincial cancer records, cases identified and treated outside the territory are also tracked and included in the registry.

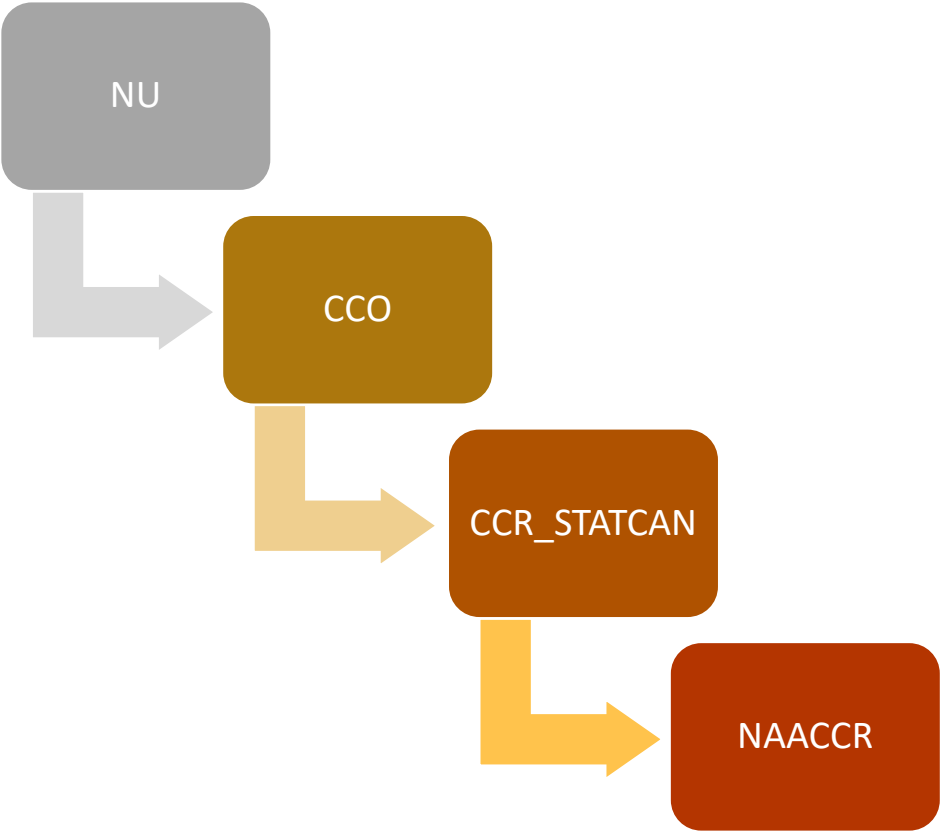
- Nunavut cancer diagnoses for 2008 to 2017 are obtained from the Nunavut Cancer Registry (NCR).
- Disease site groupings and other indicators are based upon Cancer Care Ontario (CCO) methodologies. All cases, and all information, are validated by Canadian Cancer Registry (CCR).
- For population, 'Nunavut Population Estimates by Region and Community, 1999 to 2017, as of July 1' by *Nunavut Bureau of and Statistics* is used.

### Data flow

- The registry collects and reviews probable cancer cases from case reports of community health service centers (CHSC) based on the reason for visit and the associated ICD 10 codes assigned during documentation review. Cases are also reported from CHSC by Cancer registration forms. Cases are then validated by pathological reports in support of their diagnosis. A secondary validation is done by Cancer Care Ontario (CCO) by screening the pathological report in detail. Duplicate resolution, inclusion of staging parameters and vital statistics are also checked through a collaborative process between NCR (Nunavut Cancer Registry) and the Canadian Cancer Registry (CCR). The duplication resolution process is done three times per year with a set of pre-set standards to rule out inclusion of duplicate cases in more than one provincial registry. Accuracy, completeness, and data quality are always ensured by double checking every variable by CCR and NCR



Overall Cancer Data Submission Process



## Key Terms

- Incident Case: An individual in the insured population who has met the case criteria for the first time in the selected year. These results are presented as the number of people we would expect to have a new disease for every 1,000 population within one year:

Incidence Rate per 1,000 person/years = ((Number of new Cases [Region]) / (Population at risk for duration [same Region])) × 1,000

- Rate Ratios (RRs): calculated by taking the ratio of the incidence rate of Nunavut compared to Canada's incidence rate:

Rate Ratio = ((Cases per 1,000 person/years [Nunavut]) / (Cases per 1,000 person/years [Canada]))

Rate Ratio at two different times = ((Cases per 1,000 person/years [Nunavut]) / (Cases per 1,000 person/years [Nunavut]))

- 95% confidence intervals (95%CI): are the range around the RR in which we are 95% confident contains the true RR of the region or community.
- Direct Age-Standardization: A technique called age-standardization enables fairer comparisons between populations and over time by removing differences in the observed rates that resulted from the underlying differences in age distribution from each province or territory. A directly age-standardized rate represents what the observed rate would have been if the population had the same population as the 2011 Canadian standard population.
- International Classifications of Disease (ICD): The ICD is the international standard diagnostic classification for diseases and health conditions. It is used to classify diseases and other health problems recorded on many types of health and vital records including death certificates and health records.