CRDCN Webinar Series

Cancer incidence and survival among Indigenous persons in Canada

With Loraine Marrett, Dalla Lana School of Public Health, University of Toronto and Diana Withrow, National Cancer Institute, U.S.A.

February 13, 2018
Canadian Research Data Centre Network

- **Improve access** to Statistics Canada detailed microdata
- **Expand the pool of skilled quantitative researchers**
- **Make research count**

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Loraine Marrett (Ph.D.) is Scientist Emeritus, Aboriginal Cancer Control Unit, Prevention & Cancer Control, at Cancer Care Ontario, and Professor, Dalla Lana School of Public Health, University of Toronto. Most of her current work concerns surveillance of cancer and cancer risk factors in Ontario’s First Nations, Inuit and Métis populations, as well as research on the relationship between exposure to ultraviolet radiation (solar and non-solar), and skin cancer, particularly focusing on enhancing prevention. She has led the production of a number of reports and monographs, has authored or co-authored well over 100 papers in peer-reviewed journals and held numerous research grants.

Diana Withrow (Ph.D.) is a postdoctoral fellow in the Radiation Epidemiology Branch of the Division of Cancer Epidemiology and Genetics at the National Cancer Institute in the United States. Working with Dr. Marrett, her doctoral research comprised the first national-level analysis of cancer survival among First Nations and Métis adults in Canada. Her research interests include socio-demographic and economic disparities in survival and survivorship, the role of therapy on second cancer risk, and the optimal application of survival analysis techniques to these research areas.
Acknowledgements

The services and activities provided by the CRDCN are made possible by the financial or in-kind support of the SSHRC, the CIHR, the CFI, Statistics Canada and participating universities which we gratefully acknowledge.
Cancer Incidence and Survival: First Nations and Métis compared to non-Aboriginal Adults in Canada

Canadian Research Data Centre Network Webinar
February 13th, 2018

Lorraine Marrett, PhD and Diana Withrow, PhD
Partners

- CIHR Institute of Aboriginal Peoples’ Health funder (2012)
- Cancer Care Ontario’s Aboriginal Cancer Control Unit led the work
  - Loraine Marrett, Scientist
  - Diana Withrow, PhD student (now post-doctoral fellow)
  - Alethea Kewayosh, ACCU Director
- Statistics Canada was data custodian, performed linkages and controlled how and where data used
  - Michael Tjepkema, Scientist, Health Analysis Division
- Health portfolios at Assembly of First Nations (AFN) and Métis National Council (MNC) are key knowledge users
Background
Aboriginal peoples of Canada

There are three groups of people recognized by Canada’s Constitution Act of 1982:

First Nations
- 637,660 Status (or ‘Registered’) First Nations
- 213,900 non-Status self-identified First Nations
- Together, 2.6% of total Canadian population

Métis
- 451,795 self-identified Métis
- 1.4% of total Canadian population

Inuit
- 59,445 self-identified Inuit
- 0.2% of total Canadian population

Aboriginal peoples of Canada

There are three groups of people recognized by Canada’s Constitution Act of 1982:

First Nations

- **Status Indians**: Status Indians are those who are registered as Indians under the Indian Act
- **Non-Status Indians**: Non-Status Indians are those who lost their status, or whose ancestors were never registered or lost their status, under previous or current provisions of the Indian Act

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LD Marrett and DR Withrow: Cancer Incidence and Survival: First Nations and Métis compared to non-Aboriginal Adults in Canada, 13 February 2018
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First Nations

- **Métis** are of mixed First Nations (e.g. Ojibway, Cree) and European (particularly fur traders and early settlers) ancestry.
  - Subsequent intermarriages between mixed ancestry children resulted in a new people with a distinct identity, culture, language, way of life and consciousness – the Métis Nation.

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Problem

- Ethnicity/race, including First Nation, Inuit and Métis, is not generally recorded in health data systems in Canada
  - This is also true in the majority of our cancer registries (NWT and Nunavut excepted)
- Therefore, cancer incidence, mortality and survival patterns cannot be *routinely* tracked in First Nations, Inuit or Métis nationally or provincially
- As a result, advocacy, priority setting, action planning and outcome evaluation to improve cancer control are challenging

LD Marrett and DR Withrow: Cancer Incidence and Survival: First Nations and Métis compared to non-Aboriginal Adults in Canada. 13 February 2018
Study Aims

To assess cancer burden in Canada’s Aboriginal people to support cancer control

• To estimate cancer incidence rates and survival in Canadian adults reporting First Nation or Métis ancestry* in the 1991 census (long form)

• To compare these with estimates for Canadians reporting no First Nation, Inuit or Métis ancestry in 1991 census

* Inuit could not be included because of concerns re quality of linkage.
Methods: Data sources

- 1991 Census Long Form
- 1990-1991 Tax files (Demographics)
- Canadian Mortality Database (1991-2009)
- Canadian Cancer Registry (1992 – 2010)
- 1991 Census Mortality Cohort
- Quebec
- "The Survival Sub Cohort"

Probabilistic linkage of four nationally-representative administrative data sources

N_{total} \approx 2.7 \text{ million}
Methods: cohorts

First Nations
- North American Indian ancestry and/or
- Membership in a band or First Nation and/or
- Registration under the Indian Act
- N=62,360

Métis
- Reported Métis ancestry and up to one other ancestry
- Not First Nations (as defined)
- N=11,050

Non-Aboriginal
- Not First Nations
- Not Métis
- Not Inuit
- N=2.7M
Cohort Demographics

**Income quintile (1991)**

- **Non-Aboriginals**
- **Metis**
- **First Nations**

**Rurality (1991)**

- **Non-rural**
- **Rural**

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Methods: Incidence rates and relative risks

Rates

• Follow up 1 Jan 1992 to earliest of date of death or 31 Dec 2009
• Ages 25-99 at diagnosis
• Age standardized to World Standard Population

Relative risks (First Nations or Métis vs non-Aboriginal)

• Poisson models controlling for age and sex, rurality and income quintile
Most common cancers by ethnicity

Same four cancer types account for over 50% of all diagnoses in Métis, First Nations and non-Aboriginal Canadians, though in different order.

Métis
n=1,090

First Nations
n=5,080

Non-Aboriginal
N=335,860

Cancer Care Ontario

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Incidence
Incidence of all cancers combined, Canada

Age Standardized Incidence Rate (per 100,000 person-years)

- **Comparing to non-Aboriginal**
  - First Nations similar
  - Métis significantly higher *

- **Comparing to non-Aboriginal**
  - First Nations lower *
  - Métis similar

Cancer Care Ontario
First Nations Incidence: Most Common Cancers, Canada

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>First Nation men</th>
<th>non-Aboriginal men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td></td>
<td></td>
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<tr>
<td>Lung and Bronchus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorectal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kidney</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Hodgkin Lymphoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stomach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral &amp; Pharynx</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pancreas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bladder</td>
<td></td>
<td></td>
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<tr>
<td>Liver</td>
<td></td>
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</tr>
</tbody>
</table>

Age Standardized Incidence Rate (per 100,000 person-years)

First Nations vs. non-Aboriginal

Higher:
- Colorectal
- Kidney
- Liver

Lower:
- Prostate
- Non Hodgkin Lymphoma
- Bladder

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First Nations Incidence: Most Common Cancers, Canada

First Nations vs. non-Aboriginal

- **Higher**
  - Colorectal
  - Lung
  - Cervical
  - Kidney
  - Stomach

- **Lower**
  - Breast
  - Uterine
  - Non-Hodgkin lymphoma
  - Thyroid

**Cancer Care Ontario**
Age Standardized Incidence Rate (per 100,000 person-years)

**References**
LD Marrett and DR Withrow: Cancer Incidence and Survival: First Nations and Métis compared to non-Aboriginal Adults in Canada. 13 February 2018
### First Nations cancer rates HIGHER than non-Aboriginal Canadians

<table>
<thead>
<tr>
<th>Cancer type</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorectal</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Kidney</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Lung</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Liver</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Stomach</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Cervix</td>
<td></td>
<td>✔</td>
</tr>
</tbody>
</table>

### First Nations cancer rates LOWER than non-Aboriginal Canadians

<table>
<thead>
<tr>
<th>Cancer type</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Breast</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>NHL</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Uterus</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Bladder</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Thyroid</td>
<td></td>
<td>✔</td>
</tr>
</tbody>
</table>

**Summary: First Nations**

LD Marrett and DR Withrow: Cancer Incidence and Survival: First Nations and Métis compared to non-Aboriginal Adults in Canada. 13 February 2018
Métis Incidence: Most Common Cancers, Canada

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Métis Men</th>
<th>non-Aboriginal Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>120</td>
<td>80</td>
</tr>
<tr>
<td>Lung and Bronchus</td>
<td>160</td>
<td>120</td>
</tr>
<tr>
<td>Colorectal</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>Non Hodgkin Lymphoma</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>Bladder</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Kidney</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Oral &amp; Pharynx</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Stomach</td>
<td>2.5</td>
<td>1</td>
</tr>
<tr>
<td>Larynx</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Pancreas</td>
<td>0.5</td>
<td>0.25</td>
</tr>
</tbody>
</table>

LD Marrett and DR Withrow: Cancer Incidence and Survival: First Nations and Métis compared to non-Aboriginal Adults in Canada. 13 February 2018
Métis Incidence: Most Common Cancers, Canada

Age Standardized Incidence Rate (per 100,000 person-years)

- Breast
- Lung and Bronchus
- Colorectal
- Uterus
- Cervix
- Ovary
- Non Hodgkin Lymphoma
- Kidney
- Stomach
- Pancreas

Métis vs. non-Aboriginal

Higher incidence for:
- Lung and bronchus
- Cervical
- Stomach

LD Marrett and DR Withrow: Cancer Incidence and Survival: First Nations and Métis compared to non-Aboriginal Adults in Canada. 13 February 2018
Summary: Métis

Métis cancer rates **HIGHER** than non-Aboriginal Canadians

<table>
<thead>
<tr>
<th>Cancer type</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Cervix</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Stomach</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Larynx</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Colorectal cancer incidence is **LOWER** in Métis women, but not significantly so.

LD Marrett and DR Withrow: Cancer Incidence and Survival: First Nations and Métis compared to non-Aboriginal Adults in Canada. 13 February 2018
Survival
Methods: Survival

- Included first and higher order malignancies
- Cohort members aged 45 to 90
- Excluded death certificate only, autopsy only, or negative survival time cases

- Relative survival using ethnicity-, age-, sex- and calendar-time specific life tables
- Excess mortality rate ratios generated using flexible parametric survival models
- Adjusted for age, sex, decade of diagnosis, income quintile and rurality
Methods: Survival

Total number of cancer cases at index sites

- 187475 Non-Aboriginal
- 3295 First Nations
- 545 Métis
First Nations: Survival from common cancers, Canada

Cases aged 45 to 90 at diagnosis, diagnosed between January 1st 1992 and December 31st, 2009, excluding Quebec.

Model B: Adjusted for age, sex (if applicable), time period, area-level income quintile, rurality.
First Nations: Survival from common cancers, Canada

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Cases aged 45 to 90 at diagnosis, diagnosed between January 1st 1992 and December 31st, 2009, excluding Quebec.

Model B: Adjusted for age, sex (if applicable), time period, area-level income quintile, rurality

Cancer Care Ontario
Summary: Cancer Survival

• FN vs. non-Aboriginal
  • Significantly poorer for lung, breast, oral cavity & pharyngeal, cervical and ovarian cancers and leukemia

• Métis vs. non-Aboriginal:
  • Significantly poorer for prostate cancer

• Adjusting for income and rurality had little impact on the results.
Multiple factors contribute to the disparities in risk and survival among First Nation and Métis Canadians.

<table>
<thead>
<tr>
<th>Cancer Incidence</th>
<th>Cancer Survival</th>
</tr>
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<tbody>
<tr>
<td>• Lifestyle factors (e.g. smoking)</td>
<td>• Screening</td>
</tr>
<tr>
<td>• Obesity</td>
<td>• Access to timely diagnosis and treatment</td>
</tr>
<tr>
<td>• Screening</td>
<td></td>
</tr>
<tr>
<td>• Genetic susceptibility (e.g. gallbladder cancer)</td>
<td>• Patient provider trust</td>
</tr>
<tr>
<td></td>
<td>• Co-morbidities</td>
</tr>
</tbody>
</table>

**Social determinants and inequalities**
Strengths and Limitations

- Census-based linkages represent a very powerful tool
  - Relatively large numbers
  - All Indigenous groups, as self-reported
  - Sociodemographic information in 1991, including income, rurality, residence on reserve
  - ‘Proof of concept’ for future work
- Indigenous peoples as defined here are sub-optimal by today’s standards
  - Preferred concept now is ‘identity’ vs ancestry (1996 and later censuses)
  - More individuals now identify as Aboriginal (‘Ethnic mobility’)
- Closed cohort limits ability to analyze and interpret trends over time
- Insufficient cancer stage information to explore its effect on survival

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Some comments and conclusions
First Nations have established OCAP (Ownership, Control, Access and Possession) principles

- a set of standards for how to conduct research with First Nations
- establishes how data about First Nations should be collected, protected, used, and shared.
- asserts that First Nations have control over data collection processes in their communities, and that they control how this information can be used.

Métis have similar requirements but not so ‘codified’

Statistics Canada

- Owns, controls, possesses the data which are collected or held under the Statistics Act
- Analysis allowed ONLY at Statistics Canada offices (including Research Data Centres)
- Stipulates rigorous conditions for data to be released from these offices, including no small numbers; staff check all data for adherence

Implications

- Limits exploratory analyses, small geographic areas, rarer cancers
- Makes full implementation of OCAP or related principles challenging
Dissemination

How Common is Cancer in Métis in Canada?

Over the next 10 years, 55 out of every 1,000 Métis adults will likely get cancer.

Of these 55 cancers, we would expect:

11 Lung cancers
8 Breast cancers
8 Prostate cancers
6 Colorectal cancers
22 Other types of cancers

Cancer Can Be Prevented

1. Don’t smoke or chew commercial tobacco. The most important thing you can do to lower your risk of cancer is to live smoke-free.
2. Eat a balanced diet and have a healthy body weight. To lower your risk of cancer, eat lots of fruit, vegetables and fibre. Also, try not to eat too much fat, sugar and processed meat (e.g., hot dogs and diet meals).
4. Practice safe sex. HPV is a virus that you can catch through sexual contact and can raise your risk of several cancers. Using protection (e.g., condoms) and encouraging your friends and family to get an HPV vaccine (when recommended) will help stop the spread of this virus in the community.
5. Drink less alcohol. The recommended limit for women is no more than 1 drink a day and for men, no more than 2 a day.
6. When possible, avoid chemicals and pollutants at work, at home and outside.

Cancer by the Numbers

People do survive cancer!

More people are surviving cancer now than ever before.

People with prostate or breast cancer tend to live almost as long as people without cancer.

Finding cancer early can mean living longer.

Talking to your doctor if you notice strange symptoms, and getting screened for breast, cervical, and colorectal cancers according to guidelines, are the first steps to finding cancer early.

People with cancer live longer when they have healthy habits.

A healthy lifestyle can not only help prevent you from getting sick, but it can also help you get well faster if you do get sick.

What are the chances of a First Nation person in Canada surviving 5 years after getting cancer?

Prostate: 59%
Bladder: 57%
Kidney: 45%
Cervix: 42%
Colorectal: 37%
Lung: 28%

What happens when you get diagnosed with cancer?

Depending on your health, the type of your cancer, and where the cancer is in your body and its size, your cancer care team will likely ask you to get one or more of the following treatments:

Surgery: taking out the cancer, and sometimes the tissue around it and lymph nodes (e.g., small organs that help with the immune system).
Radiation: high-energy rays that kill cancer cells and stop them from growing.
Chemotherapy: drugs that you might take as pills or through a needle in your vein - surgery and radiation treat only one spot in the body, but chemotherapy can kill cancer cells in different parts of the body at the same time.
Immunotherapy, hormone therapy, and bone marrow or stem cell transplant might also be used to treat some cancers.

In addition, treatment can include traditional healing methods.
Cancer incidence and survival among Métis adults in Canada: results from the Canadian census follow-up cohort (1992–2009)
Forthcoming – CMAJ 2018

Cancer Care Ontario
Conclusions

Evidence of distinct cancer risk profiles among First Nations and Métis populations, and overall poorer survival in patients belonging to either of these groups.

Supports the need to work with Indigenous organizations and communities to:

1. define & conduct research: why the disparities? What are effective strategies for reducing?
2. develop strategies and databases for ongoing monitoring of cancer burden; and
3. secure additional investments across the cancer continuum, from prevention through palliative care, to reduce current and future burden in a holistic and culturally appropriate manner.
Some good news!

1. Cancer strategies developed or in progress for First Nations, Métis and Inuit peoples in several jurisdictions.
   - Ontario is in its 3rd strategy, which includes focuses on building relationships, screening, prevention, and research and surveillance.

2. Our national cancer control body (Canadian Partnership Against Cancer) has committed to establish a multi-stakeholder advisory committee to develop a strategy for increasing data to support better cancer control in Indigenous peoples.

3. Statistics Canada is linking 1996, 2001 and 2006 censuses to social and health data: time trends, larger sample sizes, all 3 Indigenous groups.
Thank you!

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Maegan Mazereeuw, Cancer Care Ontario
Diane Nishri, Cancer Care Ontario
Michael Tjepkema, Statistics Canada

Funder:
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Canadian Institutes of Health Research

Loraine.Marrett@cancercare.on.ca
Supplementary slides
First Nations: Regional differences in cancer incidence

Figure 1: Relative risk of cancer in First Nations compared to non-Aboriginal adults (age 25 years and older) adjusting for income and rurality, 1992-2009, by site and region, Canada
Figure 1: Relative risk of cancer in First Nations compared to non-Aboriginal adults (age 25 years and older) adjusting for income and rurality, 1992-2009, by site and region, Canada
Métis: Regional differences, lung cancer

- aged 25-99
- 1992-2009