Trends in colorectal cancer incidence in younger Canadians, 1969-2010

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• **Colorectal cancer (CRC) in Canada**
  - 3rd most commonly diagnosed cancer (2nd in males, 3rd in females)
    - 25,100 new cases estimated in 2015
  - a *leading cause of cancer death* (2nd in males, 3rd in females)
    - 9300 deaths estimated in 2015
  - 94% of annual new cases occur in adults age 50+
  - 5-yr relative survival: 64%
  - 10-yr prevalence (as of Jan 1, 2009): 105,195 Canadians

• **Declining incidence trend in Canada since mid-1980s**
  - average annual percent change (AAPC) in ASIR: **-0.7%/yr between 2001 and 2010**
  - introduction of provincial organized CRC screening programs (with fecal test as entry) began in 2008 onward for average-risk adults aged 50+
Background – young-onset CRC

- **CRC in under 50**
  - only high-risk individuals are referred for testing (e.g. with a family history, genetic predisposition)
  - ~70-80% of young-onset CRC cases have an unknown etiology
  - Patients tend to be identified after symptoms develop, usually at an advanced stage of disease
  - Histological types with poorer prognosis than older patients
  - Tend to receive more aggressive therapy
  - Higher recurrence
  - Difference in survival compared to older adults
Background – young-onset CRC

- Unlike declining trend in older adults, incidence trend in young cases is rising

- Possible role of changing lifestyle or environmental exposure
  - Overweight/obesity:
    - 14-20% of CRC cases in adults attributed to obesity
    - 2x increased risk of developing CRC in later life if overweight or obese during adolescence
  - Physical inactivity:
    - 12-14% of CRC cases in adults attributed to being physically inactive
  - Smoking:
    - Major risk with latency period of ~20-30 years
Increasing worldwide focus on young-onset CRC
Study objectives

1. To examine the CRC trends in Canadians ages 15-49 years

2. To examine the historical trends in modifiable risk factors in 15-49 year age group in relation to CRC trends
   - Overweight and obesity
   - Low dietary fibre (vegetable & fruit consumption)
   - Physical inactivity
   - Alcohol consumption
   - Smoking
METHODS
Methods

Data sources

1. Cancer incidence data:
   2) Canadian Cancer Registry (CCR) (1992-2010)
   3) Quebec Cancer Registry (2008-2010)

   • Cancer sites:
     • Colorectal (ICD-0-3 C18-C20, C26.0)
     • Colon (ICD-0-3 C18, C26.0)
     • Rectum and rectosigmoid (ICD-0-3 C19-C20)
2. **Risk factor prevalence data:** 11 national (population-based) surveys

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Survey</th>
<th>Definition used</th>
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<tbody>
<tr>
<td>Overweight and obesity</td>
<td>Canada Fitness Survey (1981)</td>
<td>Body Mass Index =&gt; 25.00</td>
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<td></td>
<td>Health Promotion Survey (1985; 1990)</td>
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<td></td>
<td>National Alcohol and Drugs Survey (1989)</td>
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<td></td>
<td>General Social Survey – Health (cycle 6) (1991)</td>
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<tr>
<td>Vegetable &amp; fruit consumption (fibre)</td>
<td>Canadian Community Health Survey – Annual Component (2000-2001; 2003; 2005; 2007-2008; 2009; 2010; 2011; 2012)</td>
<td>Consumption of more than five fruits and vegetables per serving per day</td>
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<td>Physical inactivity</td>
<td>Canada Fitness Survey (1981)</td>
<td>Total energy expenditure of less than 1.5 kcal/kg/day</td>
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<tr>
<td>Alcohol consumption</td>
<td>Canada Health Survey (1978-1979)</td>
<td>Drinking of 50g alcohol per day (in beer, wine, spirits)</td>
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<tr>
<td></td>
<td>Canada Fitness Survey (1981)</td>
<td>(volume varied slightly across surveys)</td>
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<td>Health Promotion Survey (1985; 1990)</td>
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<td></td>
<td>Canada’s Alcohol and other Drugs Survey (1994)</td>
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<tr>
<td>Smoking</td>
<td>Survey of Smoking Habits of Canadians (1971; 1972; 1973; 1974; 1975; 1986)</td>
<td>Smoking cigarettes daily or occasionally at time of survey</td>
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<td>Canada Fitness Survey (1981)</td>
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<td></td>
<td>Canadian Tobacco Use Monitoring Survey - Annual (1999-2012)</td>
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</tbody>
</table>
Methods (cont’d)

Analysis

• Age groups:
  • 15-29 years
  • 30-39 years
  • 40-49 years

• Sex:
  • Males
  • Females
  • Both sexes combined

• Age-standardized cancer incidence rates (ASIR) for 1969-2010
  (adjusted to 1991 Canadian Population)

• Prevalence proportions for risk factors

• Changes in trend:
  • analyzed using Joinpoint Regression 4.2.0.2 (up to 5 joinpoints)
  • reported as annual percent change (APC) or average annual percent change (AAPC)
  • Monte Carlo permutation test to identify significance of trend (two-sided p<0.05)
RESULTS
Results – CRC trends (cont’d)

- Similar timeframe and magnitude of increase in colon and rectal/rectosigmoid cancers

![Graph showing age-standardized incidence rate (per 100,000) over years for various diagnoses including colorectal, colon, and rectum/rectosigmoid.]

Colorectal: 6.7% rise per year (1997-2010)

Colon only: 6.3% rise per year (1996-2010)

Rectum and rectosigmoid: 7.0% rise per year (1998-2010)

1969 (n=50); 2010 (n=80)
• Rectal cancer was fastest increasing subsite
Results – CRC trends (cont’d)

- Trends are similar to older adults

40-49 years

- **Colorectal**
  - 0.2% rise per year (1969-1985)
  - 1.8% drop per year (1985-1997)
  - 0.8% rise per year (1997-2010)

- **Colon only**
  - 0.5% rise per year (1969-1983)
  - 1.7% drop per year (1983-2003)
  - 1.6% rise per year (2003-2010)

- **Rectum and rectosigmoid**
  - 0.5% drop per year (1969-1996)
  - 1.6% rise per year (1996-2010)

1969 (n=550); 2010 (n=1120)
Summary of findings

1. Drop in CRC incidence rate prior to 1990s mainly due to colon cancer
2. Increase in CRC rate from mid-1990s, reflective of rising rates of both colon and rectal cancers
4. Rectal rates increasing faster than colon rates
5. Trends similar between males and females (only combined sex shown here)
### Summary of findings

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Data range (years)</th>
<th>Trend*</th>
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<tbody>
<tr>
<td>Rising prevalence of <strong>overweight and obesity</strong></td>
<td>1981-2012</td>
<td>AAPC= 1.9%/yr since 1981</td>
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<td>Decrease in prevalence of <strong>physical inactivity</strong></td>
<td>1981-2012</td>
<td>AAPC= -0.3%/yr since 1981</td>
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<td>Minimal change in <strong>vegetable &amp; fruit intake</strong> (proxy for fibre)</td>
<td>2001-2012</td>
<td>AAPC= 2%/yr only for 30-39 yrs</td>
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<td>No change in <strong>alcohol intake</strong></td>
<td>1978-2012</td>
<td><strong>No sig trend</strong></td>
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<td>Declining <strong>smoking</strong></td>
<td>1971-2012</td>
<td>AAPC= -1.5%/yr since 1971</td>
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</table>

*all ages and sexes combined unless otherwise noted
AAPC=avg annual percent change
Results – risk factor trends (cont’d)

- Prevalence rates have increased by approx. 10 percentage points in 15-29 year olds

15-29 years

Overweight + obesity trend

CRC trend

AAPC = 1.9%/yr (both sexes)
Results – risk factor trends (cont’d)

- Prevalence rates have increased by approx. 20 percentage points in 30-39 year olds

30-39 years

**Overweight + obesity trend**

**CRC trend**

AAPC=1.9%/yr (both sexes)
Results – risk factor trends (cont’d)

- Prevalence rates have increased by approx. 20 percentage points in 40-49 year olds

**40-49 years**

- Overweight + obesity trend
- CRC trend
DISCUSSION
Limitations

1. Risk factor exposure:
   • A latency of <20 years for CRC was assumed to apply to young people
     • whether shorter latency compared to adults is adequate for carcinogenesis is not known
   • Young people may have different CRC risk factors than adults
     • Not enough research to distinguish age-specific differences in risk and protective factors
   • Risk factor data based on self-report, cross-sectional and from different surveys

2. Availability of data:
   • Data on consumption of red/processed meat, fibre intake, and sedentary behaviour was not available
   • Lack of historical data and scarce recent data for vegetable & fruit intake
   • Cancer data provides no stratification of level of risk (e.g. cases with family history, genetic predisposition, etc)
• Pattern and **trends in CRC incidence rates generally similar across jurisdictions**
  • Although variation exists in magnitude of change

• **At least one other study showing increasing weight associated with CRC** risk in young adults ages <50 years *(Win AK, 2012)*
  • a matched case-control study of 6000 individuals in Australia, Canada, US
  • increasing BMI associated with CRC risk
  • no evidence of association with physical activity, alcohol, smoking, diabetes, aspirin use, meat consumption, vegetable & fruit consumption

• **Several studies on rectal cancer in younger adults** *(You YN, 2012; Wang R, 2015; Kim TJ, 2016; Nagai Y, 2016)*
  • no discussion of risk factors
  • 39-51% of CRC cases arise in rectum (predominantly in splenic flexure and rectum)

• Preliminary analysis of **kidney cancer incidence rates shows rise in young Canadians** *(De P, 2014)*
  • some risk factors in common with CRC (eg. overweight and obesity)
Conclusions and future direction

• **Too premature to recommend screening** for average-risk young people until more is known about CRC in under age 50 population

• **Greater awareness of CRC and related risks** needed among young people and their healthcare providers

• **Stronger public health emphasis on healthy living**

• **Etiology of CRC in young people requires further investigation**
  • Future studies would benefit from examining cohort data of average-risk individuals
  • Important to examine prevalence of other known risk factors at population-level (such as IBD, diabetes)
Questions?

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