Medical Practice Variations in Ontario, Canada

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ICES Atlases

• ICES has complete, linkable, population-based health care utilization data for residents of Ontario
• Atlases are regularly updated, beginning in 1994
• ICES Atlases have typically been created for specific conditions, including:
  ➤ Primary care including supply
  ➤ Cancer
  ➤ Cardiovascular diseases including stroke
  ➤ Arthritis/ Musculoskeletal conditions
  ➤ Asthma
  ➤ Diabetes care
• ICES work is summarized through maps and tables in a form that is easily accessible to policy-makers, researchers and clinicians
• All slides are downloadable from the ICES website: http://www.ices.on.ca/webpage.cfm?site_id=1&org_id=31
Primary Care

• Prenatal care
• Screening
• Preventive care
Percentage of adults without a family doctor

Wave 1 January-March 2006; Wave 18 April-June 2010

Enhancing the effectiveness of health care for Ontarians through research
### Proportion of women receiving prenatal care, by physician specialty, overall and by region, 2003/04

<table>
<thead>
<tr>
<th>Local Health Integration Network</th>
<th>No billings*</th>
<th>Visits shared between GP/FP &amp; OB**</th>
<th>≥75% of visits to OB</th>
<th>≥75% of visits to GP/FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Ontario</td>
<td>9</td>
<td>53</td>
<td>29</td>
<td>10</td>
</tr>
<tr>
<td>North West</td>
<td>23</td>
<td>24</td>
<td>41</td>
<td>12</td>
</tr>
<tr>
<td>South East</td>
<td>14</td>
<td>42</td>
<td>27</td>
<td>17</td>
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<tr>
<td>North Simcoe Muskoka</td>
<td>16</td>
<td>38</td>
<td>33</td>
<td>13</td>
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<tr>
<td>North East</td>
<td>19</td>
<td>33</td>
<td>39</td>
<td>9</td>
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<td>2</td>
<td>41</td>
<td>35</td>
<td>10</td>
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<tr>
<td>Central West</td>
<td>14</td>
<td>54</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>Champlain</td>
<td>10</td>
<td>53</td>
<td>27</td>
<td>9</td>
</tr>
<tr>
<td>Central East</td>
<td>17</td>
<td>46</td>
<td>27</td>
<td>9</td>
</tr>
<tr>
<td>Hamilton Niagara</td>
<td>33</td>
<td>22</td>
<td>16</td>
<td>30</td>
</tr>
<tr>
<td>Haldimand Brant</td>
<td>18</td>
<td>50</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>Mississauga Halton</td>
<td>32</td>
<td>24</td>
<td>33</td>
<td>11</td>
</tr>
<tr>
<td>Toronto Central</td>
<td>29</td>
<td>30</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>Wellington Waterloo</td>
<td>13</td>
<td>19</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td>Central</td>
<td>46</td>
<td>13</td>
<td>22</td>
<td>19</td>
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<tr>
<td>Erie St. Clair</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

* This includes women whose physician did not bill the Ontario Health Insurance Plan (OHIP), those who were seen predominantly by midwives or nurse practitioners and those who received little or no prenatal care (<4 visits).

** Some women receive the majority of their prenatal care (≥75% of their OHIP visits) from GP/FPs while others receive the majority of their care (≥75% of their OHIP visits) from OBs. In other women, prenatal care is “shared” more evenly between OBs and GP/FPs.

** GP/FP = General practitioner/family physician
** OB = Obstetrician
Age-adjusted rates of cervical cancer screening per 100 women aged 20 to 69, by Census Division (CD), 2006/07

*For a list of census divisions see Northern Ontario screening rate map.
Age- and sex-adjusted rates of eye examination per 100 population aged 30 and older with diabetes mellitus (DM), by Census Division (CD), 2006/07

Southern Ontario

Age- and sex-adjusted rates of eye examination per 100 population aged 30 and older with DM, by CD, 2006/07

Ontario rate (OR) = 48.9 per 100 population

<table>
<thead>
<tr>
<th>CD rate per 100 population</th>
<th>CD rate compared to OR</th>
<th>Number of CDs in each category</th>
</tr>
</thead>
<tbody>
<tr>
<td>62.1</td>
<td>More than 20% above OR</td>
<td>1</td>
</tr>
<tr>
<td>56.1–58.0</td>
<td>10% to 20% above OR</td>
<td>4</td>
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<tr>
<td>44.7–52.5</td>
<td>Within 10% of OR</td>
<td>42</td>
</tr>
<tr>
<td>42.3–43.6</td>
<td>10% to 20% below OR</td>
<td>2</td>
</tr>
<tr>
<td>N/A</td>
<td>More than 20% below OR</td>
<td>0</td>
</tr>
</tbody>
</table>

*For a list of census divisions see Northern Ontario eye examination rate map.*
Age- and sex-adjusted rates of lipid-lowering prescriptions per 100 population aged 65 and older diagnosed with diabetes mellitus (DM), by Census Division (CD), 2006/07.

*For a list of census divisions see Northern Ontario prescription rate map.
Cardiovascular care

- CVD risk factors and drug costs
- Ischemic Heart Disease (IHD)
- Congestive Heart Failure (CHF)
- Acute Myocardial Infarction (AMI)
5.19. Number of Cardiovascular Disease (CVD) Risk Factors, per Health Region, with a Prevalence rate greater than the National Average, 2000/2001

Source: Canadian Cardiovascular Outcomes Research Team, Statistics Canada Canadian Community Health Survey 2000/01.
6.1. Age-standardized Cardiovascular Disease (CVD) Mortality Rates per 100,000 Adults, by Health Region, 1995–1997

![Map showing the age-standardized CVD mortality rates across different health regions in Canada, with rates ranging from 167 to 431 per 100,000 population and distribution across various health regions.]
6.3. Age-standardized Ischemic Heart Disease (IHD) Mortality Rates per 100,000 Adults in Canada, 1995-1997

Data source: Statistics Canada, 2000/01

Source: Canadian Institute for Health Information

Coronary Artery Bypass Graft Rates after AMI

<table>
<thead>
<tr>
<th>Rate per 100 AMI Survivors</th>
<th># of HR in each category</th>
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<tbody>
<tr>
<td>6.4 to 12.2</td>
<td>(20)</td>
</tr>
<tr>
<td>5.4 to &lt;6.4</td>
<td>(18)</td>
</tr>
<tr>
<td>4.5 to &lt;5.4</td>
<td>(22)</td>
</tr>
<tr>
<td>3.7 to &lt;4.5</td>
<td>(26)</td>
</tr>
<tr>
<td>0.2 to &lt;3.7</td>
<td>(39)</td>
</tr>
<tr>
<td>missing/suppressed</td>
<td>(14)</td>
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</table>

Canadian Rate = 4.9 per 100 AMI Survivors

Source: Canadian Institute for Health Information
13.3. Thirty-day Revascularization rates for AMI patients by province, Apr. 1, 1997 to Mar. 31, 2000

Impact of risk adjustment for age and sex compared to risk-adjusted neighbourhood factors (socioeconomics, ethnicity, rurality) and hospital factors (proportion admitted to on-site cath facility, on-site revascularization facility, and academically affiliated hospital).
Stroke/TIA Care
Percentage of adults seen in an emergency department (ED) or hospitalized with an ischemic stroke or TIA who underwent carotid imaging, by sex and region, in Ontario, 2005/06
Percentage of adults age ≥ 45 admitted to hospital for a stroke or TIA who were cared for in a dedicated stroke unit while in hospital, by sex and LHIN, in Ontario, 2004/05

Local Health Integration Network (LHIN)

Data source: RCSN-OSA
Percentage of adults age ≥ 45 who were seen in an emergency department or hospitalized for a stroke or TIA who received neurology or neurosurgical consultation, by sex and LHIN, in Ontario, 2004/05

Local Health Integration Network (LHIN)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Halton
7. Toronto Central
8. Central East
9. South East
10. Champlain
11. North Simcoe Muskoka
12. North East
13. North West

Data source: RCSN-OSA
Percentage of adults age ≥ 45 discharged from an emergency department with a diagnosis of stroke or TIA who received a referral to a stroke prevention clinic, by sex and LHIN, in Ontario, 2004/05

Data source: RCSN-OSA
X suppressed due to small sample size
Cancer Care

• Hysterectomy
• Mastectomy
• Prostatectomy
Age-standardized hysterectomy rate for benign conditions per 100,000 women aged 15-84, by region, 2007
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Age- and sex-adjusted rate of mastectomy for cancer per 100,000 population aged 40 years and older, by Local Health Integration Network, in Ontario, 2003/04

Local Health Integration Networks (LHINs)
1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Oakville
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Age- and sex-adjusted rates for mastectomy for cancer per 100,000 population aged 40 years and older, by Local Health Integration Network, in Ontario, 2003/04

<table>
<thead>
<tr>
<th>Rate per 100,000 population</th>
<th>Comparative rate ratio</th>
<th>Number of LHINs in each category</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 64.9</td>
<td>≥ 1.3</td>
<td>(2)</td>
</tr>
<tr>
<td>54.9 to 64.9</td>
<td>1.1 to 1.3</td>
<td>(4)</td>
</tr>
<tr>
<td>44.9 to 54.9</td>
<td>0.9 to 1.1</td>
<td>(3)</td>
</tr>
<tr>
<td>37.4 to 44.9</td>
<td>0.75 to 0.9</td>
<td>(3)</td>
</tr>
<tr>
<td>&lt; 37.4</td>
<td>&lt; 0.75</td>
<td>(2)</td>
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</tbody>
</table>

Ontario rate = 49.9/100,000 persons
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2.3c Age-adjusted rate of radical prostatectomy for cancer per 100,000 men aged 40 years and older, by Local Health Integration Network, in Ontario, 2003/04

Local Health Integration Networks (LHINs)

1. Erie St. Clair
2. South West
3. Waterloo Wellington
4. Hamilton Niagara Haldimand Brant
5. Central West
6. Mississauga Oakville
7. Toronto Central
8. Central
9. Central East
10. South East
11. Champlain
12. North Simcoe Muskoka
13. North East
14. North West

Age-adjusted rates for radical prostatectomy for cancer per 100,000 men aged 40 years and older, by Local Health Integration Network, in Ontario, 2003/04

<table>
<thead>
<tr>
<th>Rate per 100,000 population</th>
<th>Comparative rate ratio</th>
<th>Number of LHINs in each category</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 133.5</td>
<td>≥ 1.3</td>
<td>(2)</td>
</tr>
<tr>
<td>113.0 to 133.5</td>
<td>1.1 to 1.3</td>
<td>(1)</td>
</tr>
<tr>
<td>92.5 to 113.0</td>
<td>0.9 to 1.1</td>
<td>(5)</td>
</tr>
<tr>
<td>77.0 to 92.5</td>
<td>0.75 to 0.9</td>
<td>(4)</td>
</tr>
<tr>
<td>&lt; 77.0</td>
<td>&lt; 0.75</td>
<td>(2)</td>
</tr>
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</table>

Ontario rate = 102.7/100,000 persons

ICES Institute for Clinical Evaluative Sciences
Hip, knee and joint replacement
Wait times for primary total knee replacement, per 100,000 population aged 15 years and older, by District Health Council, in Ontario, 2001/02

Data sources: Canadian Institute for Health Information; Ontario Health Insurance Plan

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Variations in Diagnostic Radiology (CT and MRI) – A Chart-Based Study

• Used the Diagnostic Imaging Referral Guidelines, set out by Canadian Association of Radiologists (CAR)

• Indicated:
  ▶ Test will likely contribute to diagnosis and management

• Not routinely indicated:
  ▶ Specialized test – resource intensive, perform only after discussion with radiologist, or
  ▶ Indicated in specific circumstances – non-routine examination

• Not indicated:
  ▶ Rationale for the investigation is untenable
Top 4 indications for MRI vs. Guidelines

**Brain**
- Suspected cancer: 18.2%
- Headache: 13.5%
- Suspected multiple sclerosis: 13.4%
- Cancer follow-up: 12.6%

**Extr**
- Suspected meniscal tear: 31.7%
- Knee pain / swelling / restricted mobility: 28.7%
- Suspected rotator cuff tear: 14.6%
- Shoulder pain / restricted mobility: 11.1%

**Spine**
- Back pain: 26.4%
- Leg pain / radiculopathy: 25.8%
- Arm pain / radiculopathy: 17.3%
- Neck pain: 12.0%

**CAR Recommendation:**
- Not addressed by guidelines
- Indicated (A)
- Not routinely Indicated (C)
- Not routinely Indicated (B)
- Not routinely Indicated (C)
- Not addressed by guidelines
- Back pain + “red flag” – Indicated (B)
- Acute back pain – not routinely indicated (B)
- Chronic back pain – not routinely indicated (C)
- Not addressed by guidelines
- Not routinely Indicated (B)
- Not routinely Indicated (B)
Variation in indications by hospital – MRI brain

North

South – community

South - academic

Percent of scans with indication

Hospital

Suspected cancer (EQ 5.6)

Headache (EQ 8.9)

Suspected MS (EQ 8.6)

* = regional cancer centre

EQ = extremal quotient (ratio of highest to lowest)
Is Higher Health Care Spending Related to Better Outcomes?

Hospitalized patients admitted for incident admission with:

• AMI
• CHF
• Hip Fracture
• Colon Cancer with Resection

Stukel et al. JAMA (2012)
Regional Variations in U.S. Spending Intensity

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<table>
<thead>
<tr>
<th>L6M</th>
<th>Medicare $ per Capita</th>
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<tbody>
<tr>
<td>9,074</td>
<td>3,922</td>
</tr>
<tr>
<td>10,636</td>
<td>4,439</td>
</tr>
<tr>
<td>11,559</td>
<td>4,940</td>
</tr>
<tr>
<td>12,598</td>
<td>5,444</td>
</tr>
<tr>
<td>14,644</td>
<td>6,304</td>
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(r = 0.81)
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U.S. health care system: Services in highest vs. lowest spending regions

**Effective Care: benefit clear for all**
- Reperfusion in 12 hours (Heart attack)
- Aspirin at admission (Heart attack)
- Mammogram, Women 65-69
- Pap Smear, Women 65+
- Pneumococcal Immunization

**Preference Sensitive: values matter**
- Total Hip Replacement
- Total Knee Replacement
- Back Surgery
- CABG following heart attack

**Supply sensitive: often avoidable care**
- Total Inpatient Days
- Inpatient Days in ICU or CCU
- Evaluation and Management (visits)
- Imaging
- Diagnostic Tests

Higher spending regions get more services (if right of bar)
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Rates of mortality in US were **no different or higher** in high spending regions.

Decreased risk

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
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<tbody>
<tr>
<td>Hip Fracture</td>
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<tr>
<td>Colorectal Cancer</td>
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<td></td>
</tr>
<tr>
<td>Acute Myocardial Infarction</td>
<td></td>
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</tbody>
</table>

Increased risk

Rates of mortality in US were no different or higher in high spending regions.


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Where is Canada on the Health Benefit – Spending Curve?

Healthcare Spending

Where is Canada?

U.S. is here
CHF: Mortality rate within 30 days – Ontario, Canada

End of Life Expenditure Index (EOL-EI)

Proportion

End of Life Expenditure Index (EOL-EI)
Hip fracture: Mortality rate within 30 days - Ontario, Canada

End of Life Expenditure Index (EOL-EI)

Proportion

20,000 25,000 30,000 35,000 40,000 45,000 50,000

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Adjusted Relative 30-day and 1-year Mortality Rates for Medium and High vs. Low Hospital Expenditure Groups

Ontario, Canada

Evidence Guiding Health Care

ICES Institute for Clinical Evaluative Sciences
Adjusted Relative 30-day and 1-year Cardiac (AMI, CHF) and All-Cause Readmission Rates for Medium and High vs. Low Hospital Expenditure Groups

Ontario, Canada
Conclusions

• Ontario ICES Atlases have documented large regional variations in:
  ▶ Overall hospital admissions
  ▶ Physician visits and wait times
  ▶ Screening
  ▶ Prescription drug use
  ▶ Diagnostic testing
  ▶ Surgical procedures, such as coronary artery bypass grafting (CABG), hysterectomy, prostatectomy, etc.

• Studies of Causes of Variations Require More Complex Methods than Simple Descriptive Rates