Impact of Chronic Disease on Labor Force Participation
Acknowledgment

- Based on previous work from Schofield et al., “Chronic disease and labour force participation among older Australians”. MJA 2008; 189 (8): 447-450

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- Thang Tran, Pfizer
Methods

- **Objective**: To examine the association between chronic disease and the probability of labour force participation among Canadians aged 45-64 yrs and the private and fiscal costs associated to the reduction of labour force participation because of chronic disease.

- **Data Source**: Statistics Canada’s National Canadian Community Health Survey 2005 (CCHS)

- **Chronic Disease**: Self-reported.
  - Question: ‘Now I’d like to ask about certain chronic health conditions which you may have. We are interested in “long-term conditions” which are expected to last or have already lasted 6 months or more and that have been diagnosed by a health professional’
Data: An annual cross-sectional survey that collects information related to health status, health care utilization and health determinants for the Canadian population.

Target Population: All Canadians aged 12 and over.

Sample Size: 130,000 observations

Year of Survey: 2005

There are 4 other surveys, however the 2005 survey is the most precise for the identification of the type of disease, (40 types)
The dependent variable of our regression analysis is binary.

**In Labor Force**
- Had a job - at work last week
- Had a job – absent from work last week
- Looked for work in past 4 weeks

**Not in Labor Force (Inactive)**
- Did not have a job last week
- Did not look for work in past 4 weeks
- Permanently unable to work
Table 1: Population estimation by gender, aged 45-65

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>n</td>
<td>n</td>
<td></td>
</tr>
<tr>
<td>45-49</td>
<td>1,152,182</td>
<td>1,156,117</td>
<td>2,308,299</td>
</tr>
<tr>
<td>50-54</td>
<td>1,001,613</td>
<td>1,032,140</td>
<td>2,033,753</td>
</tr>
<tr>
<td>55-59</td>
<td>875,602</td>
<td>885,600</td>
<td>1,761,202</td>
</tr>
<tr>
<td>60-64</td>
<td>701,038</td>
<td>698,603</td>
<td>1,399,641</td>
</tr>
<tr>
<td>Total</td>
<td>3,730,435</td>
<td>3,772,460</td>
<td>7,502,895</td>
</tr>
</tbody>
</table>

Table 2: Inactivity by age and gender

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>n</td>
<td>total</td>
<td>%</td>
</tr>
<tr>
<td>45-49</td>
<td>133,032</td>
<td>1,152,182</td>
<td>11.5</td>
</tr>
<tr>
<td>50-54</td>
<td>144,900</td>
<td>1,001,613</td>
<td>14.5</td>
</tr>
<tr>
<td>55-59</td>
<td>254,430</td>
<td>875,602</td>
<td>29.1</td>
</tr>
<tr>
<td>60-64</td>
<td>341,356</td>
<td>701,038</td>
<td>48.7</td>
</tr>
<tr>
<td>Total</td>
<td>873,718</td>
<td>3,730,435</td>
<td>23.4</td>
</tr>
</tbody>
</table>

In 2005, among the 7.5 millions Canadians aged 45 – 64, 2.3 millions (31%) were estimated not in labor force
## Prevalence of long term health conditions among Canadians aged 45-64 and percent inactive by disease

<table>
<thead>
<tr>
<th>Long-term health conditions</th>
<th>total n</th>
<th>%</th>
<th>Inactive n</th>
<th>%</th>
<th>Long-term health conditions</th>
<th>total n</th>
<th>%</th>
<th>Inactive n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back problems (excl. Fibro. and arthritis)</td>
<td>1,787,069</td>
<td>23.8</td>
<td>682,024</td>
<td>29.0</td>
<td>Chronic fatigue syndrome</td>
<td>135,331</td>
<td>1.8</td>
<td>92,577</td>
<td>3.9</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>1,616,846</td>
<td>21.5</td>
<td>654,652</td>
<td>27.9</td>
<td>Rheumatism</td>
<td>134,669</td>
<td>1.8</td>
<td>60,810</td>
<td>2.6</td>
</tr>
<tr>
<td>Other kind of health problem</td>
<td>1,231,305</td>
<td>16.4</td>
<td>487,501</td>
<td>20.8</td>
<td>Glaucoma</td>
<td>106,947</td>
<td>1.4</td>
<td>46,835</td>
<td>2.0</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>920,339</td>
<td>12.3</td>
<td>447,353</td>
<td>19.0</td>
<td>Learning disability</td>
<td>99,171</td>
<td>1.3</td>
<td>52,013</td>
<td>2.2</td>
</tr>
<tr>
<td>Migraine headaches</td>
<td>815,319</td>
<td>10.9</td>
<td>302,589</td>
<td>12.9</td>
<td>Breast cancer</td>
<td>95,190</td>
<td>1.3</td>
<td>56,043</td>
<td>2.4</td>
</tr>
<tr>
<td>Thyroid condition</td>
<td>572,091</td>
<td>7.6</td>
<td>258,464</td>
<td>11.0</td>
<td>Stroke</td>
<td>78,409</td>
<td>1.0</td>
<td>52,800</td>
<td>2.2</td>
</tr>
<tr>
<td>Asthma</td>
<td>528,135</td>
<td>7.0</td>
<td>200,907</td>
<td>8.6</td>
<td>COPD</td>
<td>70,036</td>
<td>0.9</td>
<td>43,537</td>
<td>1.9</td>
</tr>
<tr>
<td>Diabetes</td>
<td>512,440</td>
<td>6.8</td>
<td>224,434</td>
<td>9.6</td>
<td>Emphysema</td>
<td>61,791</td>
<td>0.8</td>
<td>38,717</td>
<td>1.6</td>
</tr>
<tr>
<td>Mood disorder</td>
<td>503,029</td>
<td>6.7</td>
<td>256,181</td>
<td>10.9</td>
<td>Other kind of bowel disease</td>
<td>57,235</td>
<td>0.8</td>
<td>29,072</td>
<td>1.2</td>
</tr>
<tr>
<td>Heart disease</td>
<td>383,623</td>
<td>5.1</td>
<td>190,195</td>
<td>8.1</td>
<td>Skin cancer</td>
<td>56,985</td>
<td>0.8</td>
<td>22,911</td>
<td>1.0</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>366,474</td>
<td>4.9</td>
<td>187,591</td>
<td>8.0</td>
<td>Other learning disability</td>
<td>43,903</td>
<td>0.6</td>
<td>28,335</td>
<td>1.2</td>
</tr>
<tr>
<td>Ulcer</td>
<td>289,851</td>
<td>3.9</td>
<td>128,672</td>
<td>5.5</td>
<td>Epilepsy</td>
<td>43,293</td>
<td>0.6</td>
<td>21,399</td>
<td>0.9</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>288,002</td>
<td>3.8</td>
<td>125,277</td>
<td>5.3</td>
<td>Colitis</td>
<td>42,988</td>
<td>0.6</td>
<td>16,930</td>
<td>0.7</td>
</tr>
<tr>
<td>Other cancer</td>
<td>253,927</td>
<td>3.4</td>
<td>119,961</td>
<td>5.1</td>
<td>Prostate cancer</td>
<td>33,050</td>
<td>0.4</td>
<td>16,795</td>
<td>0.7</td>
</tr>
<tr>
<td>Chemical sensitivities</td>
<td>245,468</td>
<td>3.3</td>
<td>121,273</td>
<td>5.2</td>
<td>Crohn’s disease</td>
<td>32,726</td>
<td>0.4</td>
<td>11,647</td>
<td>0.5</td>
</tr>
<tr>
<td>Urinary incontinence</td>
<td>228,415</td>
<td>3.0</td>
<td>117,588</td>
<td>5.0</td>
<td>Colorectal cancer</td>
<td>30,996</td>
<td>0.4</td>
<td>20,879</td>
<td>0.9</td>
</tr>
<tr>
<td>Cataracts</td>
<td>210,090</td>
<td>2.8</td>
<td>116,545</td>
<td>5.0</td>
<td>Eating disorder</td>
<td>22,801</td>
<td>0.3</td>
<td>14,107</td>
<td>0.6</td>
</tr>
<tr>
<td>Chronic bronchitis</td>
<td>208,237</td>
<td>2.8</td>
<td>102,557</td>
<td>4.4</td>
<td>Schizophrenia</td>
<td>22,424</td>
<td>0.3</td>
<td>16,864</td>
<td>0.7</td>
</tr>
<tr>
<td>Irritable bowel syndrome</td>
<td>204,637</td>
<td>2.7</td>
<td>92,191</td>
<td>3.9</td>
<td>Bowel incontinence</td>
<td>11,069</td>
<td>0.1</td>
<td>8,642</td>
<td>0.4</td>
</tr>
<tr>
<td>Fibromyalgia</td>
<td>193,198</td>
<td>2.6</td>
<td>116,726</td>
<td>5.0</td>
<td>Alzheimer</td>
<td>7,130</td>
<td>0.1</td>
<td>6,421</td>
<td>0.3</td>
</tr>
<tr>
<td>Other kind of arthritis</td>
<td>149,910</td>
<td>2.0</td>
<td>66,683</td>
<td>2.8</td>
<td>ADHD</td>
<td>6,568</td>
<td>0.1</td>
<td>3,272</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Income and taxes estimations

- Once we have determined the lost jobs because of chronic disease we estimate the annual earnings lost because of inactivity with the Survey of Labour and Income Dynamics, 2005 (SLID).

- Hypothesis: observation with long-term chronic conditions predicted to be inactive at the time of the survey are inactive for some period during the year.

With the SLID we predict earnings lost using Linear regression of income, federal taxes, provincial taxes and transfers on variables that are available in both data sets:
- Gender, Province, Age and Education

- Earnings estimation with no long-term conditions:
  - Employed all year or unemployed all year or both

- Earnings estimation with long-term conditions:
  - 3 estimations (sensitivity analysis)
    - Not in the labour force all year (52 weeks)
    - Not in the labour force at least 26 weeks
    - Not in the labour force at least 1 week

All information contained herein is considered strictly confidential and proprietary.
### Logit regression of inactivity on Socio-demographic variables and chronic disease

#### Table 4: Socio-demographic variables on inactivity

<table>
<thead>
<tr>
<th>Socio-demographic variables</th>
<th>OP</th>
<th>P value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newfoundland</td>
<td>1.94</td>
<td>0.00</td>
<td>[1.48; 2.53]</td>
</tr>
<tr>
<td>Prince-Edward Island</td>
<td>1.19</td>
<td>0.24</td>
<td>[0.89; 1.61]</td>
</tr>
<tr>
<td>Nova-Scotia</td>
<td>1.18</td>
<td>0.07</td>
<td>[0.99; 1.41]</td>
</tr>
<tr>
<td>New-Brunswick</td>
<td>1.39</td>
<td>0.00</td>
<td>[1.16; 1.68]</td>
</tr>
<tr>
<td>Québec</td>
<td>1.60</td>
<td>0.00</td>
<td>[1.42; 1.80]</td>
</tr>
<tr>
<td>Manitoba</td>
<td>0.80</td>
<td>0.02</td>
<td>[0.66; 0.96]</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>0.75</td>
<td>0.00</td>
<td>[0.62; 0.91]</td>
</tr>
<tr>
<td>Alberta</td>
<td>0.87</td>
<td>0.12</td>
<td>[0.73; 1.04]</td>
</tr>
<tr>
<td>British-Columbia</td>
<td>1.03</td>
<td>0.63</td>
<td>[0.91; 1.16]</td>
</tr>
<tr>
<td>Woman</td>
<td>1.15</td>
<td>0.06</td>
<td>[1.00; 1.33]</td>
</tr>
<tr>
<td>Age</td>
<td>0.53</td>
<td>0.00</td>
<td>[0.45; 0.62]</td>
</tr>
<tr>
<td>Age2</td>
<td>1.01</td>
<td>0.00</td>
<td>[1.01; 1.01]</td>
</tr>
<tr>
<td>Urban</td>
<td>0.92</td>
<td>0.06</td>
<td>[0.85; 1.00]</td>
</tr>
<tr>
<td>Spouse</td>
<td>0.59</td>
<td>0.00</td>
<td>[0.52; 0.67]</td>
</tr>
<tr>
<td>Spouse*woman</td>
<td>2.24</td>
<td>0.00</td>
<td>[1.89; 2.66]</td>
</tr>
<tr>
<td>No secondary diploma</td>
<td>1.59</td>
<td>0.00</td>
<td>[1.43; 1.76]</td>
</tr>
<tr>
<td>Secondary diploma</td>
<td>1.24</td>
<td>0.00</td>
<td>[1.11; 1.39]</td>
</tr>
<tr>
<td>college</td>
<td>1.19</td>
<td>0.02</td>
<td>[1.02; 1.39]</td>
</tr>
<tr>
<td>Languages</td>
<td>1.85</td>
<td>0.01</td>
<td>[1.16; 2.94]</td>
</tr>
<tr>
<td>Immigrant</td>
<td>0.88</td>
<td>0.03</td>
<td>[0.78; 0.99]</td>
</tr>
<tr>
<td>Unemployment</td>
<td>1.02</td>
<td>0.07</td>
<td>[1.00; 1.04]</td>
</tr>
<tr>
<td>Physical exercise - moderate</td>
<td>0.70</td>
<td>0.00</td>
<td>[0.63; 0.78]</td>
</tr>
<tr>
<td>Physical exercise - none</td>
<td>0.56</td>
<td>0.00</td>
<td>[0.51; 0.62]</td>
</tr>
<tr>
<td>Obesity</td>
<td>0.93</td>
<td>0.23</td>
<td>[0.84; 1.04]</td>
</tr>
<tr>
<td>Overweight</td>
<td>0.84</td>
<td>0.00</td>
<td>[0.77; 0.92]</td>
</tr>
<tr>
<td>Alcohol</td>
<td>1.00</td>
<td>0.00</td>
<td>[1.00; 1.00]</td>
</tr>
</tbody>
</table>
Table 5a: Long-term health conditions on inactivity

<table>
<thead>
<tr>
<th>Long-term health conditions</th>
<th>OP</th>
<th>P value</th>
<th>95% CI</th>
<th>Workforce</th>
<th>Income</th>
<th>T &amp; T</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back problems (excl. Fibro. and arthritis)</td>
<td>1.26</td>
<td>0.00</td>
<td>[1.15; 1.38]</td>
<td>71,792</td>
<td>3,011</td>
<td>948</td>
<td>3,249</td>
</tr>
<tr>
<td>Other kind of health problem</td>
<td>1.37</td>
<td>0.00</td>
<td>[1.24; 1.52]</td>
<td>69,866</td>
<td>3,032</td>
<td>952</td>
<td>3,257</td>
</tr>
<tr>
<td>Mood disorder</td>
<td>1.78</td>
<td>0.00</td>
<td>[1.53; 2.07]</td>
<td>55,098</td>
<td>2,310</td>
<td>728</td>
<td>2,486</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>1.34</td>
<td>0.00</td>
<td>[1.20; 1.50]</td>
<td>52,009</td>
<td>2,003</td>
<td>605</td>
<td>2,496</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>1.14</td>
<td>0.01</td>
<td>[1.04; 1.26]</td>
<td>39,295</td>
<td>1,576</td>
<td>488</td>
<td>1,700</td>
</tr>
<tr>
<td>Cancer</td>
<td>3.15</td>
<td>0.00</td>
<td>[2.30; 4.30]</td>
<td>27,951</td>
<td>1,182</td>
<td>360</td>
<td>1,270</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>1.37</td>
<td>0.00</td>
<td>[1.15; 1.62]</td>
<td>21,872</td>
<td>873</td>
<td>281</td>
<td>943</td>
</tr>
<tr>
<td>Heart disease</td>
<td>1.34</td>
<td>0.00</td>
<td>[1.13; 1.58]</td>
<td>20,330</td>
<td>860</td>
<td>268</td>
<td>930</td>
</tr>
<tr>
<td>Chronic fatigue syndrome</td>
<td>2.15</td>
<td>0.00</td>
<td>[1.62; 2.85]</td>
<td>18,669</td>
<td>769</td>
<td>245</td>
<td>828</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.22</td>
<td>0.01</td>
<td>[1.06; 1.40]</td>
<td>18,474</td>
<td>762</td>
<td>238</td>
<td>824</td>
</tr>
<tr>
<td>Fibromyalgia</td>
<td>1.63</td>
<td>0.00</td>
<td>[1.27; 2.08]</td>
<td>17,766</td>
<td>694</td>
<td>210</td>
<td>741</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>1.37</td>
<td>0.00</td>
<td>[1.16; 1.63]</td>
<td>17,064</td>
<td>684</td>
<td>207</td>
<td>738</td>
</tr>
<tr>
<td>Stroke</td>
<td>2.79</td>
<td>0.00</td>
<td>[1.93; 4.03]</td>
<td>14,627</td>
<td>593</td>
<td>189</td>
<td>646</td>
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<tr>
<td>Cataracts</td>
<td>1.42</td>
<td>0.00</td>
<td>[1.14; 1.77]</td>
<td>14,071</td>
<td>563</td>
<td>166</td>
<td>606</td>
</tr>
<tr>
<td>Ulcer</td>
<td>1.22</td>
<td>0.04</td>
<td>[1.01; 1.48]</td>
<td>10,160</td>
<td>421</td>
<td>134</td>
<td>454</td>
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<tr>
<td>Other kind of arthritis</td>
<td>1.41</td>
<td>0.01</td>
<td>[1.11; 1.80]</td>
<td>9,267</td>
<td>376</td>
<td>117</td>
<td>406</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>1.85</td>
<td>0.00</td>
<td>[1.34; 2.56]</td>
<td>7,759</td>
<td>319</td>
<td>105</td>
<td>348</td>
</tr>
<tr>
<td>Learning disability</td>
<td>1.49</td>
<td>0.01</td>
<td>[1.09; 2.02]</td>
<td>7,384</td>
<td>313</td>
<td>105</td>
<td>342</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>5.47</td>
<td>0.00</td>
<td>[2.36; 12.70]</td>
<td>4,666</td>
<td>198</td>
<td>65</td>
<td>214</td>
</tr>
<tr>
<td>Epilepsy</td>
<td>1.88</td>
<td>0.01</td>
<td>[1.21; 2.92]</td>
<td>2,542</td>
<td>97</td>
<td>30</td>
<td>105</td>
</tr>
<tr>
<td>Bowel incontinence</td>
<td>3.62</td>
<td>0.00</td>
<td>[1.65; 7.93]</td>
<td>547,495</td>
<td>21,860</td>
<td>6,774</td>
<td>23,571</td>
</tr>
<tr>
<td>No chronic Disease</td>
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<td></td>
<td></td>
<td>547,495</td>
<td>21,860</td>
<td>6,774</td>
<td>23,571</td>
</tr>
</tbody>
</table>

All information contained herein is considered strictly confidential and proprietary.
Chronic diseases with no impact on labour force participation

Table 5a: Long-term health conditions on inactivity

<table>
<thead>
<tr>
<th>Long-term health conditions</th>
<th>OP</th>
<th>P value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migraine headaches</td>
<td>0.99</td>
<td>0.94</td>
<td>[ 0.87 ; 1.14 ]</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>0.98</td>
<td>0.94</td>
<td>[ 0.67 ; 1.45 ]</td>
</tr>
<tr>
<td>Colitis</td>
<td>0.96</td>
<td>0.86</td>
<td>[ 0.61 ; 1.51 ]</td>
</tr>
<tr>
<td>Crohn's disease</td>
<td>1.09</td>
<td>0.71</td>
<td>[ 0.70 ; 1.69 ]</td>
</tr>
<tr>
<td>Irritable bowel syndrome</td>
<td>1.04</td>
<td>0.68</td>
<td>[ 0.85 ; 1.28 ]</td>
</tr>
<tr>
<td>Asthma</td>
<td>0.95</td>
<td>0.49</td>
<td>[ 0.81 ; 1.11 ]</td>
</tr>
<tr>
<td>Urinary incontinence</td>
<td>1.08</td>
<td>0.44</td>
<td>[ 0.89 ; 1.31 ]</td>
</tr>
<tr>
<td>Chronic bronchitis</td>
<td>1.10</td>
<td>0.39</td>
<td>[ 0.89 ; 1.35 ]</td>
</tr>
<tr>
<td>Emphysema</td>
<td>1.29</td>
<td>0.20</td>
<td>[ 0.88 ; 1.91 ]</td>
</tr>
<tr>
<td>Thyroid condition</td>
<td>1.13</td>
<td>0.09</td>
<td>[ 0.98 ; 1.31 ]</td>
</tr>
<tr>
<td>Other kind of bowel disease</td>
<td>1.33</td>
<td>0.08</td>
<td>[ 0.97 ; 1.83 ]</td>
</tr>
<tr>
<td>Rheumatism</td>
<td>1.31</td>
<td>0.07</td>
<td>[ 0.98 ; 1.75 ]</td>
</tr>
<tr>
<td>Chemical sensitivities</td>
<td>1.21</td>
<td>0.07</td>
<td>[ 0.99 ; 1.48 ]</td>
</tr>
</tbody>
</table>
## Aggregate losses

Table 6: Sensitivity analysis depending on sample used to estimate earnings

<table>
<thead>
<tr>
<th>Lost (millions)</th>
<th>52 weeks</th>
<th>At least 26 weeks</th>
<th>At least 1 week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>22,310</td>
<td>21,860</td>
<td>20,550</td>
</tr>
<tr>
<td>T &amp; T</td>
<td>6,935</td>
<td>6,774</td>
<td>6,331</td>
</tr>
<tr>
<td>Total</td>
<td>24,068</td>
<td>23,571</td>
<td>22,120</td>
</tr>
</tbody>
</table>

All information contained herein is considered strictly confidential and proprietary.
Estimated losses and confidence intervals

Table 6: Losses

<table>
<thead>
<tr>
<th>Lost</th>
<th>mean</th>
<th>95 % Conf. Interval</th>
</tr>
</thead>
</table>
| Workforce                     | 547,495 | [ 459,852 ; 635,139 ]
| Income (millions)             | 21,860 | [ 18,025 ; 25,567 ]
| Federal taxes (millions)      | 3,627  | [ 2,975 ; 4,268 ]   |
| Provincial taxes (millions)   | 1,436  | [ 1,180 ; 1,692 ]   |
| Transfer (millions)           | 1,711  | [ 1,435 ; 1,987 ]   |
| Total (millions)              | 23,571 | [ 19,769 ; 27,373 ] |
| % du PIB*                     | 1.72   | [ 1.44 ; 1.99 ]     |

* GDP Canada 2005, 1,373,845 millions can$