Mortality of Canada Pension Plan and Old Age Security Beneficiaries: Implications for Public Pensions

14th International Conference of Social Security Actuaries and Statisticians

23 September 2003
Presentation

• Canadian Mortality Trends
• Mortality Projections – Living to 100 years
• CPP Retirement Beneficiary Mortality
• CPP Survivor Beneficiary Mortality
• Future Challenges – World Comparison
Life Expectancy at Birth (LTC)

- **Male**
- **Female**

Bar graph showing the difference in life expectancy at birth (LTC) between males and females from 1921 to 1996.
Life Expectancy at Age 65 (LTC)
Probability of surviving

« 70% of males would die between 74 and 94 »
Globe and Mail, March 2002
Probability of surviving

« 70% of females would die between 77 and 96 »
Globe and Mail, March 2002

70% of females would die between 77 and 96.
Globe and Mail, March 2002

\[ e_0 = 58 \]
\[ e_0 = 81 \]
\[ e_0 = 88 \]
Average Annual Population-Weighted Mortality Improvement Rates

- 0.0%
- 0.5%
- 1.0%
- 1.5%
- 2.0%
- 2.5%


Males
Females
Comparison of Survival Curves for Males

- 1995-1997 LTC
- Improvement in qx of 90%
- Increased Life Span to 146
Comparison of Survival Curves for Females

- 1995-1997 LTC
- Improvement in qx of 85%
- Increased Life Span to 135
Life Expectancy at Age 65 - Male

Difference

AR18

SSA
Life Expectancy at Age 65 - Female

- Difference
- AR18
- SSA

Office of the Chief Actuary
Bureau de l’Actuaire en chef
Probability of Surviving from Birth to Age 18

- Male
- Female

% Survival Over Time

- 1966
- 1982
- 1998
- 2014
- 2030
- 2046
- 2062
Probability of Surviving from Age 18 to Age 65

% 100 96 92 88 84 80 76 72


Female

Male
Probability of Surviving from Age 18 to Age 65

<table>
<thead>
<tr>
<th>Year</th>
<th>Male (Without)</th>
<th>Male (With)</th>
<th>Female (Without)</th>
<th>Female (With)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>72%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>78%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>80%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>84%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>88%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>92%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2038</td>
<td>96%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2050</td>
<td>99%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2062</td>
<td>100%</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2074</td>
<td>100%</td>
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</tbody>
</table>
Probability of Surviving from Age 65 To

(Males)

Calendar Year

Percentage (%)


Age 70
Age 75
Age 80
Age 85
Age 90
Age 95
Age 100
Probability of Surviving from Age 65 To

(Females)

% 100 90 80 70 60 50 40 30 20 10 0

Calendar Year


Age 70
Age 75
Age 80
Age 85
Age 90
Age 95
Age 100
Probability of Surviving from Age 65 to Age 80

With future mortality improvements

Without future mortality improvements

Male

Female

%
CPP Retirement Beneficiary Mortality Ratios
(By Level of Pension – Males)

(CPP vs LTC-Q)

Age

0-25%
25-50%
50-75%
75-100%
CPP Retirement Beneficiary Mortality Ratios (By Level of Pension – Females)
### CPP Retirement Beneficiary Life Expectancies

**By Level of Pension - Males**

<table>
<thead>
<tr>
<th>Age</th>
<th>0-25%</th>
<th>25-50%</th>
<th>50-75%</th>
<th>75-100%</th>
<th>All</th>
<th>1995-97 C-QLT</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>17.7</td>
<td>18.9</td>
<td>19.5</td>
<td>20.6</td>
<td>20.1</td>
<td>20.0</td>
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<tr>
<td>65</td>
<td>14.2</td>
<td>15.1</td>
<td>15.6</td>
<td>16.4</td>
<td>16.0</td>
<td>16.2</td>
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<tr>
<td>70</td>
<td>11.4</td>
<td>12.0</td>
<td>12.4</td>
<td>12.9</td>
<td>12.6</td>
<td>12.8</td>
</tr>
<tr>
<td>75</td>
<td>8.8</td>
<td>9.2</td>
<td>9.5</td>
<td>9.9</td>
<td>9.7</td>
<td>9.9</td>
</tr>
<tr>
<td>80</td>
<td>6.6</td>
<td>6.9</td>
<td>7.1</td>
<td>7.4</td>
<td>7.2</td>
<td>7.3</td>
</tr>
<tr>
<td>85</td>
<td>4.8</td>
<td>5.0</td>
<td>5.2</td>
<td>5.3</td>
<td>5.2</td>
<td>5.3</td>
</tr>
<tr>
<td>90</td>
<td>3.4</td>
<td>3.6</td>
<td>3.7</td>
<td>3.8</td>
<td>3.7</td>
<td>3.8</td>
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</tbody>
</table>
## CPP Retirement Beneficiary Life Expectancies

(By Level of Pension - Females)

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<thead>
<tr>
<th>Age</th>
<th>0-25%</th>
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<th>50-75%</th>
<th>75-100%</th>
<th>All</th>
<th>1995-97 C-QLT</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>23.7</td>
<td>24.7</td>
<td>24.8</td>
<td>25.2</td>
<td>24.5</td>
<td>24.1</td>
</tr>
<tr>
<td>65</td>
<td>19.5</td>
<td>20.3</td>
<td>20.5</td>
<td>20.7</td>
<td>20.2</td>
<td>20.0</td>
</tr>
<tr>
<td>70</td>
<td>15.7</td>
<td>16.3</td>
<td>16.5</td>
<td>16.7</td>
<td>16.2</td>
<td>16.1</td>
</tr>
<tr>
<td>75</td>
<td>12.1</td>
<td>12.7</td>
<td>12.8</td>
<td>13.0</td>
<td>12.6</td>
<td>12.5</td>
</tr>
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<td>9.0</td>
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<td>6.7</td>
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<tr>
<td>90</td>
<td>4.5</td>
<td>4.8</td>
<td>4.8</td>
<td>4.9</td>
<td>4.7</td>
<td>4.7</td>
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</tbody>
</table>
CPP Survivor Beneficiary Mortality Ratios

(CPP vs LTC-Q)

Age

Males
Females
## CPP Survivor Life Expectancies

<table>
<thead>
<tr>
<th>Age</th>
<th>Males General Population</th>
<th>CPP</th>
<th>Females General Population</th>
<th>CPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>28.5</td>
<td>26.9</td>
<td>33.0</td>
<td>32.2</td>
</tr>
<tr>
<td>55</td>
<td>24.2</td>
<td>22.7</td>
<td>28.5</td>
<td>27.8</td>
</tr>
<tr>
<td>60</td>
<td>20.0</td>
<td>18.7</td>
<td>24.1</td>
<td>23.6</td>
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<tr>
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<td>20.0</td>
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<td>6.7</td>
<td>6.7</td>
</tr>
<tr>
<td>90</td>
<td>3.8</td>
<td>3.7</td>
<td>4.7</td>
<td>4.7</td>
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</tbody>
</table>
Evolution of OAS Beneficiaries (in thousands)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>2000</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>65-69</td>
<td>1,098</td>
<td>29 %</td>
</tr>
<tr>
<td>70-79</td>
<td>1,783</td>
<td>47 %</td>
</tr>
<tr>
<td>80+</td>
<td>896</td>
<td>24 %</td>
</tr>
<tr>
<td>All</td>
<td>3,777</td>
<td>100 %</td>
</tr>
</tbody>
</table>

Expected total population in 2050: 41 million
Future challenges

• Life expectancy at birth of 100 is practically impossible in the next half century unless there are dramatic medical and scientific breakthroughs.

• Future mortality improvements are expected to come more slowly and at older ages, as mortality rates at younger ages are already very low.

• In the context of CPP, more and more contributors are expected to reach the retirement age of 65.

• CPP retirement beneficiaries are expected to receive their benefit for a longer period.
Probability of Surviving
(World comparison)

United Nations Population Division, Period 2000-2005

Office of the Chief Actuary

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Probability of Surviving
(World comparison)

United Nations Population Division, Period 2000-2005

Office of the Chief Actuary  Bureau de l’Actuaire en chef
Probability of Surviving (World comparison)

United Nations Population Division, Period 2000-2005

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\(e_0 = 73\)
\(e_0 = 66\)
\(e_0 = 57\)
\(e_0 = 50\)
## Life Expectancy at Birth

### Countries (In 1980) (In 2000) (In 2050)

<table>
<thead>
<tr>
<th>Countries</th>
<th>(In 1980)</th>
<th>(In 2000)</th>
<th>(In 2050)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>-5</td>
<td>82</td>
<td>(9&lt;sup&gt;th&lt;/sup&gt;)</td>
</tr>
<tr>
<td>United States</td>
<td>-4</td>
<td>77</td>
<td>(3&lt;sup&gt;rd&lt;/sup&gt;)</td>
</tr>
<tr>
<td>Mexico</td>
<td>-5</td>
<td>73</td>
<td>(11&lt;sup&gt;th&lt;/sup&gt;)</td>
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<tr>
<td>China</td>
<td>-4</td>
<td>71</td>
<td>(1&lt;sup&gt;st&lt;/sup&gt;)</td>
</tr>
<tr>
<td>Brazil</td>
<td>-5</td>
<td>68</td>
<td>(5&lt;sup&gt;th&lt;/sup&gt;)</td>
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<tr>
<td>Russia</td>
<td>+1</td>
<td>67</td>
<td>(6&lt;sup&gt;th&lt;/sup&gt;)</td>
</tr>
<tr>
<td>India</td>
<td>-9</td>
<td>64</td>
<td>(2&lt;sup&gt;nd&lt;/sup&gt;)</td>
</tr>
<tr>
<td>Nigeria</td>
<td>-4</td>
<td>51</td>
<td>(10&lt;sup&gt;th&lt;/sup&gt;)</td>
</tr>
<tr>
<td>Zambia</td>
<td>+20</td>
<td>32</td>
<td>(74&lt;sup&gt;th&lt;/sup&gt;)</td>
</tr>
</tbody>
</table>

Since 1980, the difference in $e_0$ between the best and the worst country has actually increased from around 40 to 50 years!