Longer life expectancy, longevity risk, implications on retirement income and cost
A brief actuarial view
(with emphasis on “brief”)

December 10, 2015

Charles J. Clark, ASA, EA, MAAA
Principal
Milliman, an EBRI Sustaining Member
Agenda
December 10, 2015

- Life expectancy
  - Definition
  - Ages at death 1900 to 2010 (Social Security Administration data)

- Longevity risk
  - Definition

- US Population: look back and forecast

- Cost implications (in brief)
  - Annuitants/Individuals
  - Plan Sponsors
Life Expectancy

- Life expectancy
  - Is the expected number of years of life remaining at a given age
  - Varies by age, year of birth, gender, income and place of residence

- US life expectancy graphs (from Social Security Administration studies)
Life Expectancy – Age at Death in 1900

Reading the graph:
- If birth year = 1900, age at death = ~47 (in 1947)
- If attained age in 1900 = 40, age at death =~67
- If attained age in 1900 = 65, age at death = ~77

Life Expectancy
- Age 65
- Age 40
- At Birth

Number of Deaths per 100,000 Deaths

Age

*13,283
Life Expectancy – Age at Death in 1910

At Birth

Age 40

Age 65

*10,916
Life Expectancy – Age at Death in 1930

Number of Deaths per 100,000 Deaths

Age

Life Expectancy

Age 65
Age 40
At Birth
Life Expectancy – Age at Death in 1940

*4,725
Life Expectancy – Age at Death in 1950
Life Expectancy – Age at Death in 1960

![Life Expectancy Graph]

- At Birth
- Age 40
- Age 65

*2,600
Life Expectancy – Age at Death in 1970
Life Expectancy – Age at Death in 1980

At Birth
Age 40
Age 65
Life Expectancy

*1,262
Life Expectancy – Age at Death in 1990

Life Expectancy

Age 65

Age 40

At Birth

*922
Life Expectancy – Age at Death in 2000
Life Expectancy – Age at Death in 2010

- Life Expectancy
- Age 65
- Age 40
- At Birth
Longevity Risk

- Longevity risk is the risk that life expectancies will exceed our assumptions, resulting in greater-than-anticipated retirement cash flow needs
- For individuals, longevity risk is the risk of outliving ones’ assets, resulting in a lower standard of living, reduced care, or a return to employment
- For pension plan sponsors or financial institutions, longevity risk is the risk of underestimating survival rates, resulting in increased liabilities to sufficiently cover promised payments
US Population by Age & Gender: 1900

Demography 101
1. Fertility
2. Mortality
3. Immigration

1900 US Population
Classic pyramid shape due to high fertility and mortality
**US Population by Age & Gender: 1970**

**Great Depression**
1. Births decreased
2. Those born in 1930s were 30 to 39 in 1970

**Baby Boom**
1. Births increased
2. Those born in 1946 to 1965 were 5 to 24 in 1970
Today
1. Few retirees from 1930s births: 70 to 79 in 2010
2. Baby boom approaches retirement
US Population by Age & Gender: 2030

Tomorrow
1. Baby boom provides lots of retirees

Social impact?
1. Medical needs
2. Long-term care
3. Caregivers
The Impact of Longevity Risk

- Aging population with increasing life expectancy
- Experienced a shift in who bears the responsibility of sufficient retirement income
- Feelings of uncertainty with regard to government benefits and economic volatility
# Increased Life Expectancy

## Healthy Female Retirees – Age at Death

<table>
<thead>
<tr>
<th>Current age</th>
<th>Current Table*</th>
<th>“New” table**</th>
<th>Extra years</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>83.3</td>
<td>85.2</td>
<td>1.9</td>
</tr>
<tr>
<td>60</td>
<td>84.3</td>
<td>86.3</td>
<td>2.0</td>
</tr>
<tr>
<td>65</td>
<td>85.1</td>
<td>87.0</td>
<td>1.9</td>
</tr>
</tbody>
</table>

*Current IRC Mortality

## Healthy Male Retirees – Age at Death

<table>
<thead>
<tr>
<th>Current age</th>
<th>Current Table*</th>
<th>“New” table**</th>
<th>Extra years</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>80.1</td>
<td>82.5</td>
<td>2.4</td>
</tr>
<tr>
<td>60</td>
<td>81.6</td>
<td>84.1</td>
<td>2.4</td>
</tr>
<tr>
<td>65</td>
<td>82.6</td>
<td>85.1</td>
<td>2.4</td>
</tr>
</tbody>
</table>

*Current IRC Mortality

**RP-2014 Mortality table proposed by Society of Actuaries

---

Milliman
## Cost of two more years to an annuitant

<table>
<thead>
<tr>
<th>Line</th>
<th>Current Mortality</th>
<th>Increased Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Account Balance</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>2.</td>
<td>Current Age (female)</td>
<td>60</td>
</tr>
<tr>
<td>3.</td>
<td>Age at Death</td>
<td>84</td>
</tr>
<tr>
<td>4.</td>
<td>Actuarial Factor at 4%</td>
<td>14.8977</td>
</tr>
<tr>
<td>5.</td>
<td>Monthly Annuity</td>
<td>$5,600</td>
</tr>
<tr>
<td>6.</td>
<td>Taxes at 25%</td>
<td>$1,400</td>
</tr>
<tr>
<td>7.</td>
<td>Cash</td>
<td>$4,200</td>
</tr>
<tr>
<td>8.</td>
<td>Decrease in monthly cash</td>
<td>$230</td>
</tr>
<tr>
<td></td>
<td>- as a percentage</td>
<td></td>
</tr>
</tbody>
</table>

**Calculations:**

- 5. = \( \frac{1}{4 \times 12} \)
- 6. = 5. * 25%
- 7. = 5. - 6.
- 8. = compare values in line 7.
## Cost of Longevity to an employer in the DC Plan

<table>
<thead>
<tr>
<th></th>
<th>Employee who delays retirement</th>
<th>New Hire</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual Salary</strong></td>
<td>$75,000</td>
<td>$25,000</td>
</tr>
<tr>
<td><strong>4% Employer Match</strong></td>
<td>$3,000</td>
<td>$1,000</td>
</tr>
<tr>
<td><strong>Incremental Savings</strong></td>
<td>$2,000</td>
<td></td>
</tr>
</tbody>
</table>

**Same Employee who delays retirement one more year**

<table>
<thead>
<tr>
<th></th>
<th>New Hire</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual Salary</strong></td>
<td>$77,300</td>
</tr>
<tr>
<td><strong>4% Employer Match</strong></td>
<td>$3,100</td>
</tr>
<tr>
<td><strong>Incremental Savings plan cost</strong></td>
<td>$2,100</td>
</tr>
<tr>
<td><strong>Total 2-year incremental cost</strong></td>
<td>$4,100</td>
</tr>
</tbody>
</table>

Acknowledgement: Other employer benefit plans have a separate incremental cost impact.
References:
Slides 3 to 14: Life Tables for the United States Social Security Area 1900-2100
https://www.ssa.gov/oact/NOTES/as120/LOT.html

Slides 16 to 19: U.S. Census Bureau, P23-212, 65+ in the United States: 2010,
June 2014
Questions?

Happy holidays
Good health and success to all in 2016

Charles.Clark@Milliman.com
202.680.2734