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Pension Plan for the Royal Canadian Mounted Police Mortality Study

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I- Executive Summary

This is the fifteenth actuarial study to be published by the Office of the Chief Actuary (OCA). Increasing longevity of the Canadian population puts pressure on the cost of defined benefit pension plans. As a result, mortality rates assumptions used to prepare actuarial valuations of pension plans are of paramount importance.

The Royal Canadian Mounted Police Pension Plan (the “RCMP Plan”) established under the *Royal Canadian Mounted Police Superannuation Act* provides retirement, disability and survivor pension benefits to RCMP members. Statutory actuarial reports on the RCMP Plan are prepared at least every three years pursuant to the *Public Pensions Reporting Act*. The Office of the Chief Actuary conducts mortality studies of federal public sector pension plans, including the RCMP Plan, at least every three years in order to develop mortality assumptions used in the preparation of statutory actuarial reports. This study provides detailed analyses of the mortality assumptions used by OCA to determine the financial status of the RCMP Plan as at 31 March 2012.

A. Purpose

The main purpose of this actuarial study is to verify that the mortality assumptions used in the most recent actuarial valuation on the RCMP Plan, as at 31 March 2012, are appropriate for the financing of the RCMP Plan. The second purpose of this study is to provide sufficient analysis to support the premise that RCMP members experience lower mortality than the Canada Pension Plan and the Public Service Pension Plan of Canada (PS Plan) populations. The last objective of this study is to provide sufficient analysis to support the choice of the mortality improvement rates used in actuarial valuations of the RCMP Plan.

B. Scope

This mortality study was conducted over a 15-year period and covers the mortality experience of male Regular Members only. A study of the mortality experience for female Regular Members was disregarded as the number of female RCMP Plan participants is too small¹ to produce meaningful results. The mortality experience of Civilian Members and disabled members was not included in this study. The mortality rates for these groups are deemed to be the same as those used for the respective groups in the most recent actuarial report on the PS Plan for valuation purposes as at 31 March 2011.

In February 2014, the Pension Experience Subcommittee of the Research Committee of the Canadian Institute of Actuaries (the “CIA”) has published a report titled “Canadian Pensioners’ Mortality” (CPM). This report presented mortality tables developed using Canadian pensioners’ mortality experience and mortality projection scale (the “CPM-B”). The CPM mortality tables were used for comparison purposes in this study.

¹ As at 31 March 2012, there were only 378 female Regular Member retirement pensioners, compared to 11,313 male Regular Member retirement pensioners. The proportion of female contributors was 20% as at 31 March 2012 (3,900 female contributors), it was only 5% 40 years ago.

C. Main findings

- The current study demonstrates that the mortality assumptions used for the 2012 RCMP Plan Actuarial Report are appropriate for the purpose of financing the RCMP Plan.
- The male Regular Member mortality rates developed under this study are comparable to those used in the 2012 RCMP Plan Actuarial Report. The period life expectancy at age 65 of 20.4 under the mortality basis of the 2012 RCMP Plan Actuarial Report would increase to 20.6 based on the mortality rates developed under this study.
- Except at older ages, the male Regular Member mortality rates developed under this study are lower than those of the Canada Pension Plan and the PS Plan. A male Regular Member aged 65 in plan year¹ 2013 is expected to live 1.3 years longer than a Canadian male and 1.1 years longer than a male member of the PS Plan. However, this gap narrows and even reverses at older ages. A male Regular Member aged 85 in plan year 2013 is expected to live approximately as long as a Canadian male and a male member of the PS Plan.
- At age 55, the life expectancy based on the mortality rates developed in this study for males in plan year 2013 is equal to the life expectancy based on the mortality rates of the CPM Table for the Public Sector. At older ages, the life expectancies based on the mortality rates developed in this study for males in plan year 2013 are closer to the life expectancies based on the mortality rates of the CPM Table for combined experience for private and public sectors.
- Based on the Regular Members mortality rates used in the 2012 RCMP Plan Actuarial Report, women aged 65 in plan year 2013 are expected to live to 89.1, almost two years more than Canadian females. In the absence of significant mortality experience, it appears reasonable to revise the mortality rates for female Regular Members in future actuarial valuations to reduce life expectancies so that they are in line with the life expectancies based on comparable mortality tables (e.g. the CPM2014 Combined table).
- The liabilities and current service costs presented in the 2012 RCMP Plan Actuarial Report are based on mortality assumptions that take into account future mortality improvements. If future mortality improvements were not taken into account, the total actuarial liability as at 31 March 2012 of \$18.4 billion would be reduced by \$0.7 billion or 3.6%. The current service cost for plan year 2013 of \$440 million, or 22.65% of the pension payroll, would decrease by \$17 million to \$423 million, or 21.77% of pensionable payroll, if future mortality improvements were not taken into account.
- The projected life expectancies in plan year 2050 of Regular Members age 65 based on the mortality assumptions of the 2012 RCMP Plan Actuarial Report are about three years higher than the current mortality experience of the RCMP Plan.
- CIA improvement scale CPM-B is comparable with the mortality improvement scale used for the purpose of the 2012 RCMP Plan Actuarial Report.

¹ Any reference to a given *plan year* in this report refers to the 12-month period ending 31 March of the given year.

II- Development of Mortality Rates

This chapter presents the RCMP male mortality rates developed using the methodology of mortality studies of the Canada Pension Plan (CPP) and the Old Age Security (OAS) Program beneficiaries.

As the RCMP population is significantly smaller than the CPP population or even the PS Plan population, the selected observation period of 15 years, from 1 April 1997 to 31 March 2012, is longer than what was used in OCA previous mortality studies. The mortality rates shown in this section were derived for male Regular Members of the RCMP Plan. Derived mortality rates and corresponding life expectancies are shown and compared those based on other mortality tables.

A. Evolution of the Number of Male Regular Members

The following table shows the evolution of the number of male RCMP Regular Members. The selected years correspond to published valuation reports (as at 31 March).

Table 1 Evolution of the Number of Male RCMP Regular Members

	1998	2005	2012
Retired	6,621	9,190	11,315
Active	13,389	13,394	15,315
Total	20,010	22,584	26,630

B. Data

Individual data on Regular Members were extracted from past databases used for valuation purposes. The data extracted covers the period from 1 April 1997 to 31 March 2012. Some records have been excluded for the following reasons:

- Female Regular Members, as the volume of data is not sufficient to produce statistically significant results.
- Civilian Members, survivors and disabled members, as their mortality rates for valuation purposes are deemed to be the same as the rates for PS Plan contributors and pension beneficiaries, survivors and disabled members from the most recent actuarial report on the PS Plan as at 31 March 2011.
- Date of termination is before the start of the study period.
- Inconsistent date of entry in relation to the date of termination over the study period.
- Cash outs over the study period.

C. Methodology Overview

Over the observation period of 15 plan years, from 1 April 1997 to 31 March 2012, the data was grouped by age and exposures and actual deaths were calculated. The determined mortality rates were deemed to correspond to plan year 2005.

To identify trends, experience analysis was also conducted for the three sub periods of 5 years included in the period of observation of 15 years. Rates developed for each sub period were deemed to be mortality rates for plan years 2000¹, 2005 and 2010.

¹ For example, the rates developed for plan years 1998 to 2002 (1 April 1997 to 31 March 2002) are deemed to be the applicable mortality rates for plan year 2000.

The crude mortality rate for a given age for any given plan year is the probability that a person at that age on 1 April of the previous year dies by 31 March of that year. To develop crude mortality rates, deaths and exposures were grouped by quinquennial ages. Crude mortality rates for each age group were calculated by dividing the relevant number of deaths by the number of life-years that were exposed to the risk of death over the observed period.

The crude mortality rates were graduated to reflect a compromise between smoothness and fit. Mortality rates were extended up to age 104; from 105 onward they are assumed to be 50%.

D. Mortality Experience

The following deaths, exposures and developed mortality rates are based on the data and methodology explained above.

1. Deaths and exposures

The deaths and exposures are shown in the following table for the three sub periods of observation. They are shown on an age last birthday basis.

Table 2 Deaths and Exposures

Age Last Birthday	Plan Years 1998-2002		Plan Years 2003-2007		Plan Years 2008-2012		Total Plan Years 1998-2012	
	Deaths	Exposures	Deaths	Exposures	Deaths	Exposures	Deaths	Exposures
Less than 40	9	26,184	17	27,326	7	36,315	33	89,825
40-44	18	15,223	7	12,553	7	12,071	32	39,846
45-49	35	17,887	25	14,971	12	12,504	72	45,363
50-54	47	15,876	34	17,133	28	14,245	109	47,254
55-59	35	9,763	64	15,144	54	16,235	153	41,141
60-64	54	7,295	63	9,421	73	14,523	190	31,239
65-69	60	5,368	85	6,959	91	9,019	236	21,346
70-74	35	1,646	93	4,970	123	6,444	251	13,060
75-79	20	454	50	1,435	158	4,358	228	6,246
80-84	27	239	27	332	63	1,102	117	1,674
85-89	18	94	22	116	29	205	69	415
90-94	3	21	8	34	10	41	21	97
95-99	3	7	2	4	1	5	6	16
100+	0	0	1	1	0	0	1	1
Total	364	100,055	498	110,399	656	127,068	1,518	337,522

There was only one centenarian observed. However, the RCMP Plan is young as the *Royal Canadian Mounted Police Superannuation Act* came into force on 1 April 1960. Based on the 31 December 1982 actuarial report, which is the oldest report that provides information on the age of retirees, only about 100 members were old enough as at 31 December 1982 for becoming centenarians in the observation period.

2. Mortality Rates

a) Crude Central Mortality Rates

Based on the observed deaths and exposures shown in the table above, crude average central mortality rates are shown in the following table by age groups and sub periods. They were obtained by dividing the number of actual deaths by the corresponding exposure of the age group.

Table 3 Crude Central Mortality Rates
(Deaths per thousand)

Age Last Birthday	Plan Years 1998-2002	Plan Years 2003-2007	Plan Years 2008-2012	All Years
40-44	1	1	1	1
45-49	2	2	1	2
50-54	3	2	2	2
55-59	4	4	3	4
60-64	7	7	5	6
65-69	11	12	10	11
70-74	21	19	19	19
75-79	44	35	36	37
80-84	113	81	57	70
85-89	192	189	141	166
90-94	143	235	241	217
95-99	455	548	190	387

The results for the 3 sub periods show some reductions of the mortality between 1998 and 2012. The volume of data is too small to draw any conclusion, but the results observed for most age groups show some improvement or are equal to the level of mortality observed in previous years. Section III discusses in details the assumptions used for valuation purposes on future improvements in mortality.

b) Graduated Mortality Rates

The graduated mortality rates by age are presented in Table 4. They were developed based on the crude central mortality rates shown for all years in Table 3 (experience observed for plan years 1998 to 2012). The graduated rates were deemed to be those of plan year 2005 (mid-point of the period of observation). They were projected to the valuation year (plan year 2013) using assumed mortality improvement factors of previous actuarial valuations on the RCMP Plan¹. The plan year 2005 and the plan year 2013 rates are shown in the Appendix (Table 17). The following table shows a sample of the graduated male mortality rates projected to plan year 2013 and corresponding life expectancies without future mortality improvements (also called period life expectancies).

¹ Applicable assumed longevity improvement factors from the 2002, 2005, 2008 and the 2011 actuarial valuations were used.

Table 4 Graduated Male Mortality Rates and Period Life Expectancy
For Plan Year 2013

Age Last Birthday	Mortality Rate (Per 1,000 individuals)			Exact Age	Period Life Expectancy (in years)		
	Current Study	2012 Actuarial Report	Ratio		Current Study	2012 Actuarial Report	Difference
40	0.6	0.9	0.67	40	44.0	43.6	0.4
45	1.0	1.1	0.91	45	39.2	38.8	0.4
50	1.6	1.9	0.84	50	34.4	34.1	0.3
55	2.5	2.7	0.93	55	29.7	29.4	0.3
60	4.2	4.6	0.91	60	25.1	24.8	0.3
65	7.3	7.9	0.92	65	20.6	20.4	0.2
70	13.2	14.0	0.94	70	16.4	16.3	0.1
75	24.3	25.7	0.95	75	12.6	12.5	0.1
80	45.7	49.8	0.92	80	9.2	9.3	(0.1)
85	86.6	90.4	0.96	85	6.4	6.7	(0.3)
90	156.3	143.5	1.09	90	4.3	4.9	(0.6)
95	259.1	206.3	1.26	95	2.9	3.6	(0.7)

The graduated mortality rates were extended up to age 104; from age 105 the mortality rate is assumed to be 50%.

E. Comparisons

Comparisons of life expectancies with various other segments of the Canadian population are presented in this section. Life expectancies at age 55, which is the average age at retirement of the Regular Members, and at ages 65, 75 and 85 were calculated for the Canada Pension Plan, the PS Plan and using the mortality assumptions presented in the report titled “Canadian Pensioners’ Mortality” published by the Pension Experience Subcommittee of the Research Committee of the Canadian Institute of Actuaries. Comparisons were done on the basis of the following mortality rates:

- Mortality rates developed in this study (Current Study)
- 2012 RCMP Plan Actuarial Report (RCMP 2012)
- 26th CPP Actuarial Report (CPP26)
- 2011 PS Plan Actuarial Report (PS 2011)
- 2014 Private Sector Mortality Table (CPM2014 Private)
- 2014 Public Sector Mortality Table (CPM2014 Public)
- 2014 Mortality Table (CPM2014 Combined) – combined experience for private and public sectors

All life expectancies shown in the following tables were calculated¹ for plan year 2013.

¹ Mortality assumptions for the CPP and the CPM are provided on a calendar year basis; life expectancies for plan year 2013 were estimated by blending the calendar year results for years 2012 (75% weight) and 2013 (25% weight). The following actuarial formula $q[x+1] = (q(x) + q(x+1)*p(x))/(2-q(x))$ was used to convert mortality rates from an age last birthday basis (in round bracket) to an exact age basis (in square bracket) for the RCMP Plan and the PS Plan.

Table 5 Period Life Expectancy Comparisons - Males
For Plan Year 2013

Age	Current Study	RCMP 2012	CPP26	PS 2011	CPM2014 Combined	CPM2014 Public	CPM2014 Private
55	29.7	29.4	27.6	28.3	29.0	29.7	28.1
65	20.6	20.4	19.3	19.5	20.6	21.0	19.8
75	12.6	12.5	12.0	11.9	12.7	13.1	12.2
85	6.4	6.7	6.5	6.3	6.5	6.7	6.3

Except at older ages, this study has produced somewhat lower mortality rates than those used in the RCMP 2012. The life expectancy at age 65 based on the current study is 0.2 year higher (20.6 vs. 20.4) than the life expectancy based on the mortality assumptions of the RCMP 2012. The life expectancy at age 55 based on the current study is 0.3 year higher. At older ages, the mortality rates produced by this study are equal or even higher than the mortality rates used in the RCMP 2012.

This difference in mortality rates (Current Study vs. RCMP 2012) is explained by the methodologies used to produce the mortality rates. For the triennial valuation, based on the judgement of the actuary, mortality rates are developed giving 50% credibility to the experience of the past three years and 50% credibility to the mortality rates as projected in the previous actuarial valuation as long as the trend can be observed over two valuation periods.

The life expectancy at age 55 based on the mortality rates of the current study is equal to the life expectancy calculated under the CPM2014 Public table but is greater than the life expectancies calculated for the CPP26 and the PS Plan. It is also greater than the life expectancy calculated under the CPM2014 Private and the CPM2014 Combined tables. At age 65, the only table that produces life expectancy at age 65 higher than the one based on the mortality rates of the current study is the CPM2014 Public. At age 75, the gaps are closing and starting to reverse with life expectancies calculated under the CPM2014 Public and the CPM2014 Combined tables being greater than the life expectancy based on the current study. At age 85, the life expectancy calculated based on mortality rates of the current study is shorter than the life expectancy calculated under the CPP26 table, as well as the life expectancies calculated under the CPM2014 Public and the CPM2014 Combined tables.

As mentioned in the first section of this document, an analysis of the mortality experience for female Regular Members was not included in this study as the number of female RCMP Plan participants is too small¹ to produce meaningful results. The mortality rates used for female Regular Members for valuation purposes are based on the PS Plan mortality rates for females and reflecting the lower mortality experienced by male Regular Members. Life expectancies comparisons with various other segments of the Canadian population are shown in the following table.

¹ As at 31 March 2012, there were only 378 female Regular Member retirement pensioners, compared to 11,313 male Regular Member retirement pensioners. The proportion of female contributors was 20% as at 31 March 2012 (3,900 female contributors), it was only 5% 40 years ago.

Table 6 Period Life Expectancy Comparisons - Females
For Plan Year 2013

Age	RCMP 2012	CPP26	PS 2011	CPM2014 Combined	CPM2014 Public	CPM2014 Private
55	33.3	30.8	31.2	32.3	32.3	31.6
65	24.1	22.2	22.1	23.2	23.3	22.6
75	15.9	14.2	14.1	14.9	14.9	14.4
85	9.0	7.7	7.6	7.9	8.0	7.7

It can be seen from Table 6 that mortality rates used in the 2012 RCMP Actuarial report produce the highest life expectancies. In the absence of significant mortality experience, it appears reasonable to increase female Regular Member mortality rates in the future in order to reduce life expectancies so that they are in line with the life expectancies based on comparable mortality tables (e.g. the CPM2014 Combined table).

F. Discussion

Except at older ages, the analysis of male mortality over a 15 year observation period has produced somewhat lower mortality rates (higher life expectancies) than those used in the 2012 RCMP Plan Actuarial Report. Under the current study, the period life expectancy of a male aged 65 is 20.6, which is 0.2 year higher than the life expectancy based on the 2012 RCMP Plan Actuarial Report.

The mortality rates for female Regular Members would need to be revised upward in the next actuarial valuation in order to bring these rates in line with comparable mortality tables.

For valuation purposes, if the male mortality assumptions developed under the current study and the female CPM2014 for the Public Sector were used to determine the financial status of the RCMP Plan, the financial impact on the RCMP Plan would be minor.

The mortality rates used for conducting statutory actuarial valuations are appropriate for the purposes of the valuation. As expected, male mortality rates for male Regular members are lower than those used for the CPP and the PS Plan but only up to a certain age. At older ages (80+), the gap narrows and even reverses with male mortality rates for male Regular members being close to the mortality rates used for the PS Plan and even slightly higher than those used for the CPP.

More detailed analysis similar to the current study should be conducted on a regular basis. With more data becoming available in the future for female Regular Members, subsequent studies should include analysis of the female mortality.

III- Projected Mortality

This section discusses the assumption on future mortality rates for RCMP Plan Regular Members developed for the 2012 RCMP Plan Actuarial Report (RCMP 2012). All information presented in this section is based on the methodology of the RCMP 2012.

A. Future Mortality Improvement Rates

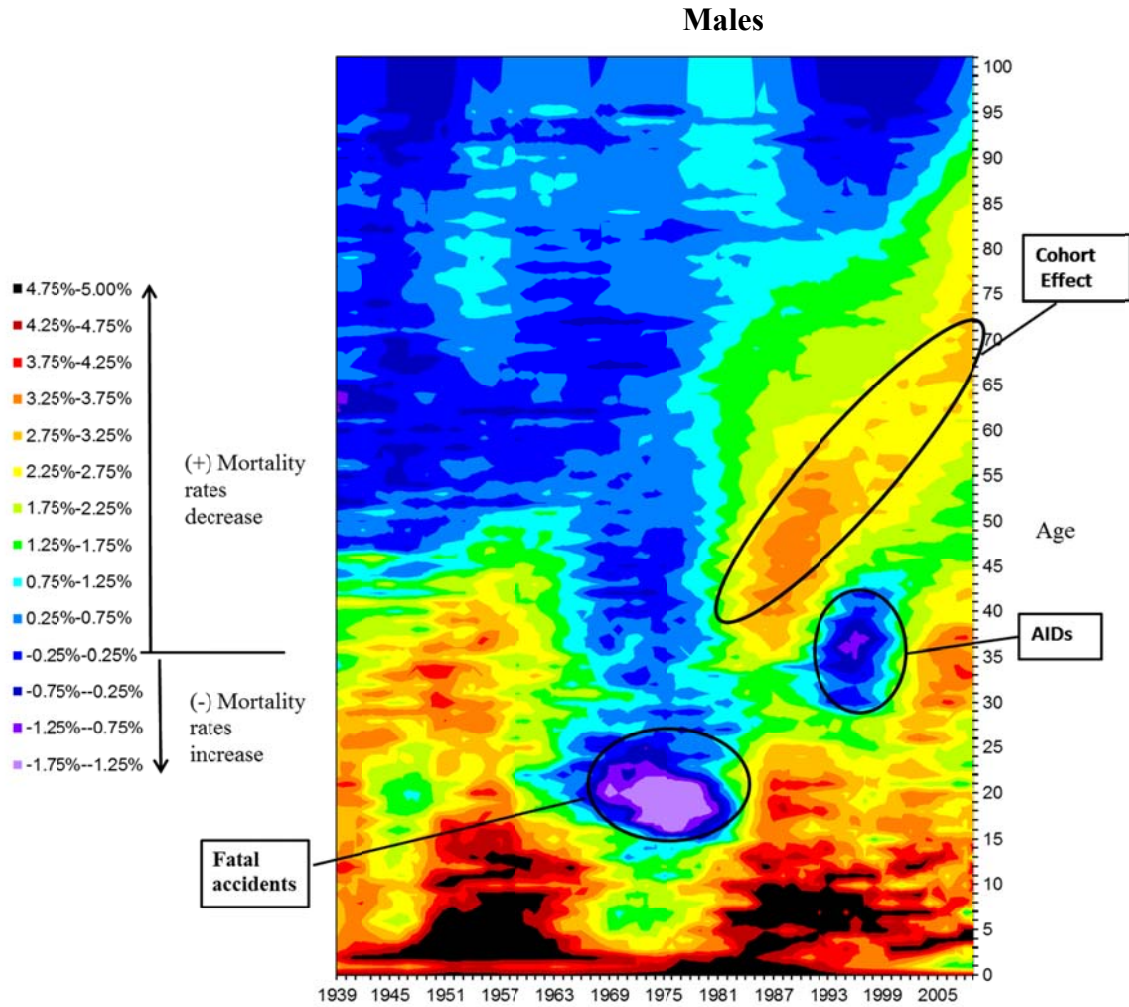
The calculations of the RCMP Plan actuarial liability and the current service cost are based on mortality assumptions that include future improvements in mortality. That is, the methodology used to project future mortality rates involves making assumptions about future annual rates of mortality improvements by age, sex, and calendar year. These future annual rates of mortality improvements are then applied to the plan year 2013 rates developed for the purpose of the RCMP 2012.

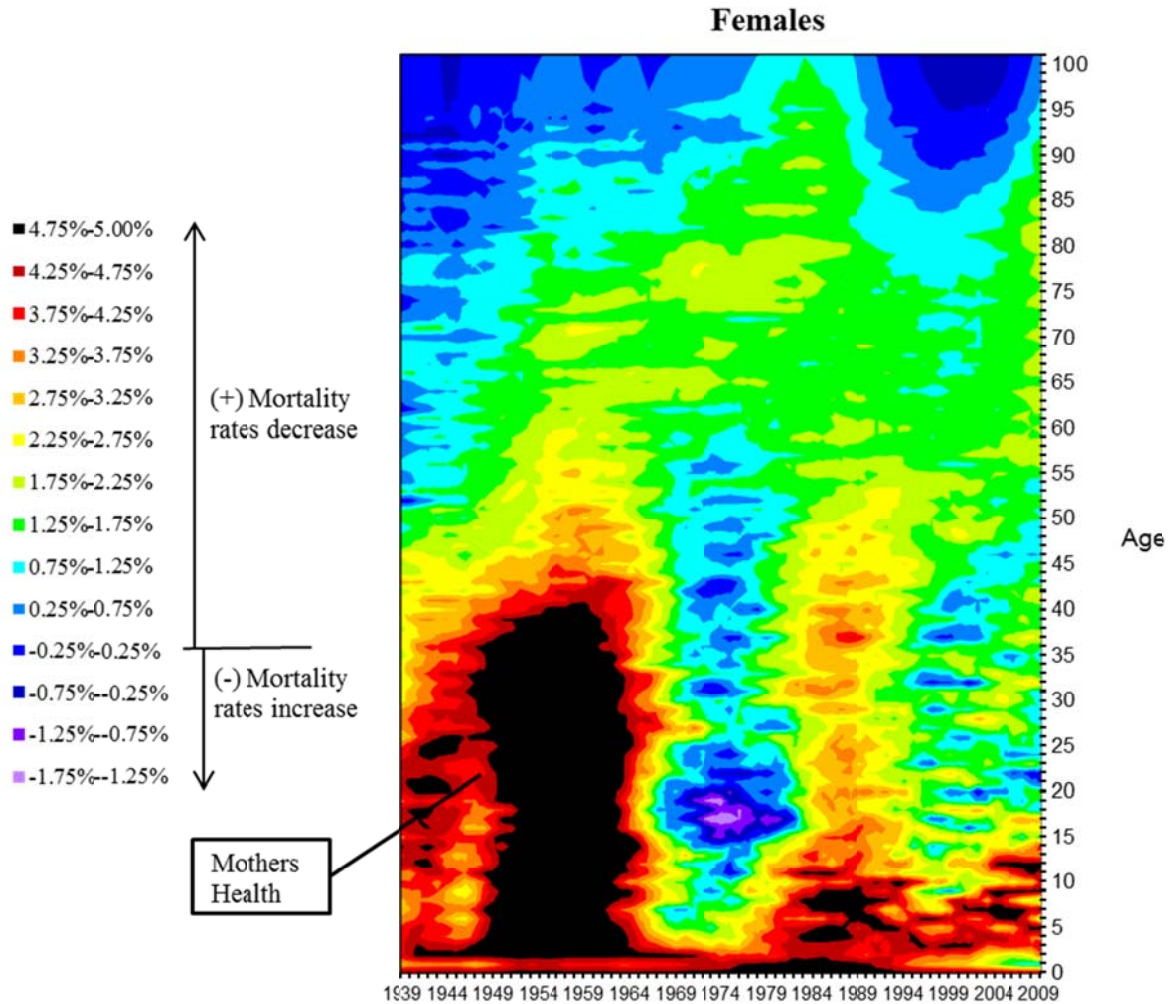
Mortality rates across all ages fell dramatically during the 20th century, leading to an unprecedented increase in life expectancy at all ages for both men and women in Canada. There have been a number of reasons for the drop in mortality rates, including access to medical care, immunizations, antibiotics, medical innovations, improvement in sanitary conditions, clean water supply, and improvements in the standard of living and education. This trend is also observed in the RCMP Plan population, as supported by analysis of past mortality experience.

Heat maps of the historical Canadian mortality improvement rates (the “MIRs”) are shown in Chart 1. A heat map is a useful tool to analyse the trends in mortality improvement rates. This analysis is usually performed on smoothed mortality improvement rates, 15-year smoothing in the case of Chart 1. Different colours correspond to the different levels of improvement rates. Looking at these heat maps, it can be seen, that although there has been a substantial reduction in mortality rates over time, there have been periods with low or even negative mortality improvements (i.e. little change or increase in mortality). Furthermore, these periods have been more pronounced for males than females. The most recent deterioration in mortality rates was observed in the 1990s for males aged late 20s to early 40s, which was due to increasing mortality from AIDS. Nevertheless, over the last decades, males have experienced on average higher mortality improvements than females.

In future, several factors may affect mortality improvements including new medical techniques and discoveries, the level of pollutants, air quality, improvements in nutrition, amounts of physical activity, prevalence of obesity and diabetes, emergence of new forms of diseases, prevalence of smoking, health education, etc. As such, the projections of future mortality rates are developed by first examining past mortality trends and then applying judgment as to the magnitude of the impact these trends will have on future mortality improvement rates. More analyses on the past Canadian mortality trends could be found in Actuarial Study No. 12 “Mortality Projections for Social Security Programs in Canada” published by the OCA in April 2014.

Chart 1 Historical Annual Mortality Improvement Rates (Canada)
 (15-year Moving Average based on CHMD Mortality Rates)





As stated in the Revised CIA Educational Note: Selection of Mortality Assumptions for Pension Plan Actuarial Valuations published in March 2014 (the “CIA Educational Note on Mortality”): “The analysis of mortality improvement rates requires large quantities of consistent data over long periods. As a result, most mortality improvement studies are based on data gathered through social security programs and assumptions for future mortality improvements are normally based on these published mortality studies.” Accordingly, the assumption on the future annual rates of mortality improvements of the RCMP 2012 is based on the corresponding assumption developed for the purpose of the 25th CPP Actuarial Report. The CPP MIRs are developed on calendar year basis, so these rates have been interpolated to obtain plan year mortality improvement rates.

MIRs for plan year 2012 are assumed to be those experienced in Canada on average over the 15-year period from 1991 to 2006. After plan year 2012, the improvement rates are assumed to reduce gradually to their ultimate level by plan year 2031. A sample of assumed mortality improvement rates is shown in Table 7.

Table 7 Mortality Improvement Factors
(applicable at the end of the plan)

Age Last Birthday	Initial and Ultimate Plan Year Mortality Reductions ¹ (%)			
	Male		Female	
	2013	2031+	2013	2031+
30	2.66	0.80	1.51	0.80
40	2.04	0.80	1.29	0.80
50	1.78	0.80	1.23	0.80
60	2.22	0.80	1.34	0.80
70	2.40	0.80	1.42	0.80
80	1.94	0.70	1.41	0.70
90	1.11	0.44	0.67	0.44
100	0.34	0.30	0.12	0.30
110+	0.03	0.30	0.03	0.30

The resulting mortality rates for RCMP Plan Regular Members developed for the purpose of the RCMP 2012 are shown in Table 8.

Table 8 Mortality Rates by Plan Year
Contributors and Retirement Beneficiaries (per 1,000 individuals)

Age Last Birthday	Male Regular Members			Female Regular Members		
	2013	2025	2050	2013	2025	2050
20	0.5	0.4	0.3	0.2	0.2	0.1
30	0.5	0.4	0.3	0.3	0.3	0.2
40	0.9	0.7	0.6	0.6	0.5	0.4
50	1.9	1.6	1.3	1.0	0.9	0.7
60	4.6	3.7	3.0	3.1	2.7	2.2
65	7.9	6.2	5.0	5.9	5.1	4.1
70	14.0	11.1	8.9	9.5	8.2	6.7
75	25.7	20.9	17.0	15.8	13.7	11.3
80	49.8	41.2	34.1	28.2	24.4	20.3
85	90.4	77.6	66.3	51.0	45.4	39.0
90	143.5	128.7	114.4	92.6	86.2	77.0
95	206.3	192.8	176.5	152.4	146.2	134.2

B. Life Expectancies

Life expectancies are the result of the assumption on future mortality rates. Table 9 shows projected life expectancies (without future improvements, also called period life expectancies) for RCMP 2012 Regular Members at various ages for the specified plan years, based on each given plan year's mortality rates. On a national level, life expectancies calculated in similar ways are usually presented by statistical agencies. Table 10 is similar to Table 9, the only difference being that it takes into account the assumed mortality improvements after the specified plan years (with future improvements, also called cohort life expectancies). Given the continuing trend in increased longevity, it may be argued that Table 10 is more realistic than Table 9, especially for the older ages. At the same time, the extended length of the projection period increases the uncertainty of the results presented in Table 10 for younger ages.

¹ The mortality rate reduction applicable during any plan year within the 19-year select period is found by linear interpolation between the figures for plan years 2013 and 2031.

From plan years 2013 to 2050, life expectancy of RCMP 2012 Regular Members at age 65 (with assumed future mortality improvements) is projected to grow from 21.8 to 23.8 years for males and from 25.1 to 26.9 years for females, as shown in Table 10.

Table 9 Life Expectancies without Improvements after the Given Year

Age	Male Regular Member			Female Regular Member		
	2013	2025	2050	2013	2025	2050
20	63.0	64.7	66.3	67.4	68.5	69.9
30	53.3	55.0	56.5	57.6	58.6	60.0
40	43.6	45.2	46.7	47.8	48.8	50.1
50	34.1	35.6	37.0	38.1	39.1	40.4
60	24.8	26.2	27.6	28.6	29.5	30.7
65	20.4	21.8	23.0	24.1	25.0	26.1
70	16.3	17.5	18.6	19.9	20.6	21.7
75	12.5	13.5	14.6	15.9	16.5	17.5
80	9.3	10.1	10.9	12.2	12.7	13.5
85	6.7	7.3	7.9	9.0	9.4	10.0
90	4.9	5.3	5.7	6.4	6.6	7.1
95	3.6	3.8	4.1	4.5	4.6	4.9

Table 10 Life Expectancies with Improvements after the Given Year

Age	Male Regular Member			Female Regular Member		
	2013	2025	2050	2013	2025	2050
20	67.2	67.9	69.3	70.8	71.4	72.6
30	56.9	57.6	59.0	60.4	61.1	62.3
40	46.6	47.3	48.6	50.1	50.7	52.0
50	36.4	37.1	38.5	39.9	40.5	41.8
60	26.5	27.3	28.5	29.9	30.5	31.7
65	21.8	22.6	23.8	25.1	25.7	26.9
70	17.3	18.1	19.2	20.6	21.2	22.2
75	13.2	13.9	14.9	16.4	16.9	17.8
80	9.6	10.3	11.1	12.5	13.0	13.8
85	6.9	7.4	8.0	9.1	9.5	10.1
90	5.0	5.3	5.8	6.5	6.7	7.1
95	3.7	3.8	4.1	4.5	4.6	4.9

Chart 2 compares, for plan year 2013, the impact of including future mortality improvement rates in the calculation of life expectancies for the RCMP 2012, the 25th Actuarial Report on the Canada Pension Plan as at 31 December 2009 (CPP25), the 26th Actuarial Report on the Canada Pension Plan as at 31 December 2012 (CPP26), and CPM tables with the scale CPM-B. The 25th and 26th CPP Actuarial Report as well as CPM life expectancies based on plan year are obtained by using 75% of calendar year 2012 and 25% of calendar year 2013 values.

The solid part of the bars in Chart 2 represents the period life expectancy, and the shaded part corresponds to the projected increase in life expectancy due to future mortality improvements. As was discussed in Section II of this study, period life expectancies for the general population as determined for the purpose of the Canada Pension Plan actuarial reports are lower than those under the RCMP Plan. At the same time, for males, the CPM Public and Combined tables produce higher life expectancies than those of the RCMP Plan Regular Members at age 65. For females, the period life expectancy of the RCMP Plan Regular Members at age 65 are higher than the life expectancies based on the CPM tables.

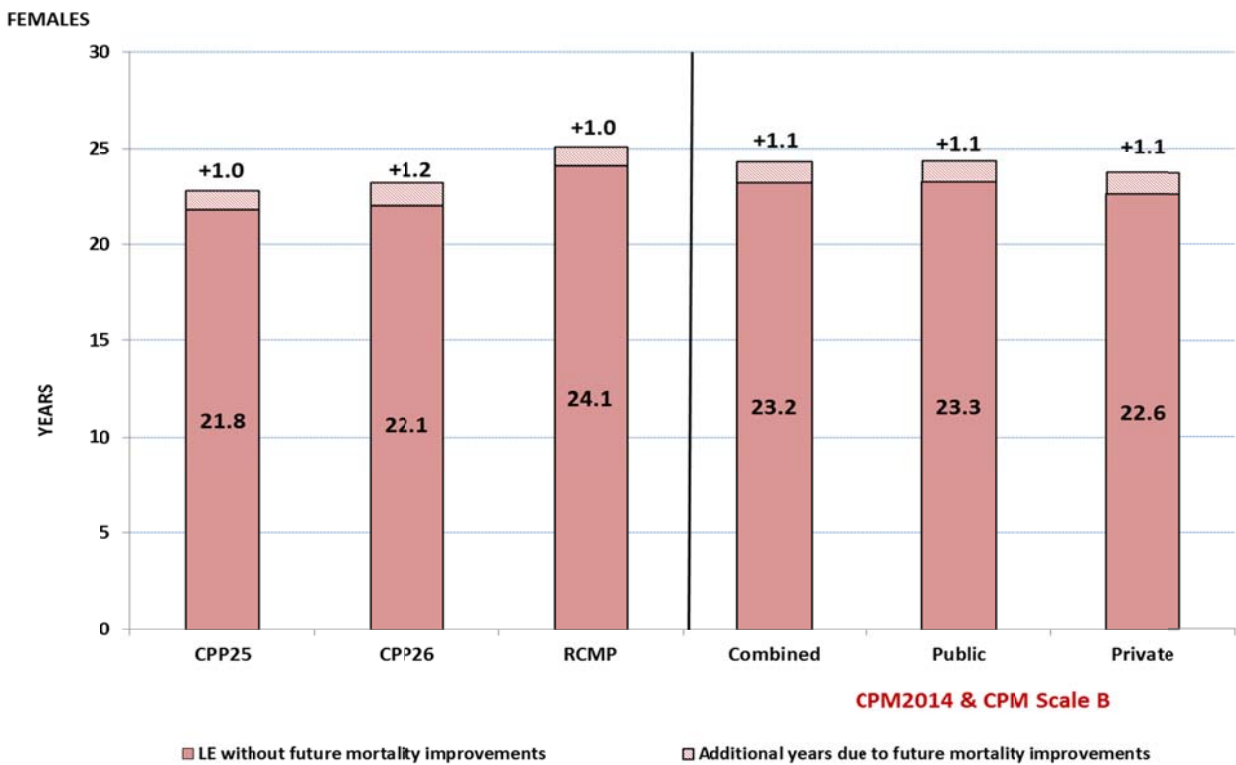
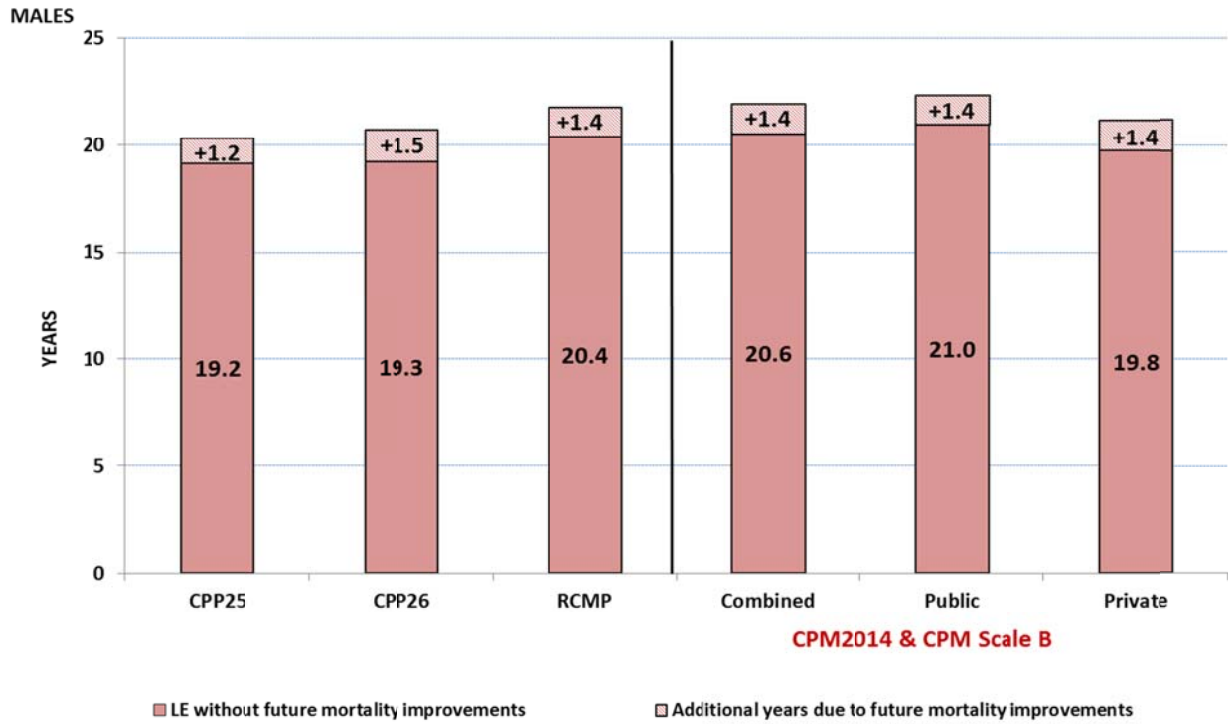
For the RCMP 2012, the assumed future improvements in mortality increase the life expectancy in 2013 by 1.4 years for males and 1.0 year for females. These increases are similar to those expected under the 25th CPP Actuarial Report.

The changes made between the 25th and 26th CPP Actuarial Reports provide indications on how the RCMP 2012 mortality assumptions could evolve in the future. Firstly, the period life expectancies (without future mortality improvements) for the plan year 2013 have increased for both males and females between the CPP25 and CPP26. This increase is mainly related to stronger actual mortality improvements between the two reports compared to the CPP25 assumption. Secondly, the strengthening of the assumption on the future mortality improvement rates for the purpose of the 26th CPP Actuarial Report results in a higher expected differential between period and cohort life expectancies for the CPP26 compared to CPP25 (1.5 years versus 1.2 years for males, and 1.2 years versus 1.0 year for females). It could be expected that similar trends will be considered for the next RCMP Plan triennial actuarial report.

The scale CPM-B was published by the CIA at the same time as the CPM tables. This scale adopts the assumption used for the purpose of the 26th CPP Actuarial Report with respect to the ultimate improvement rates and the period of transition from higher short-term improvement rates to the ultimate rates of improvement. The CIA Educational Note on Mortality states that: “The use of the CPM-B for future mortality improvement rates would typically be an appropriate assumption in the absence of credible information to the contrary...”

As it could be seen from Chart 2, improvement scale CPM-B produces increases in life expectancy (1.4 years for males and about 1.1 years for females) that are comparable to those obtained under the assumptions of the RCMP 2012 and the 26th CPP Actuarial Report. It further confirms that mortality improvement rates assumptions developed for the purpose of the RCMP 2012 are reasonable.

**Chart 2 Impact of Future Mortality Improvements on Life Expectancy
At Age 65 for Plan Year 2013**

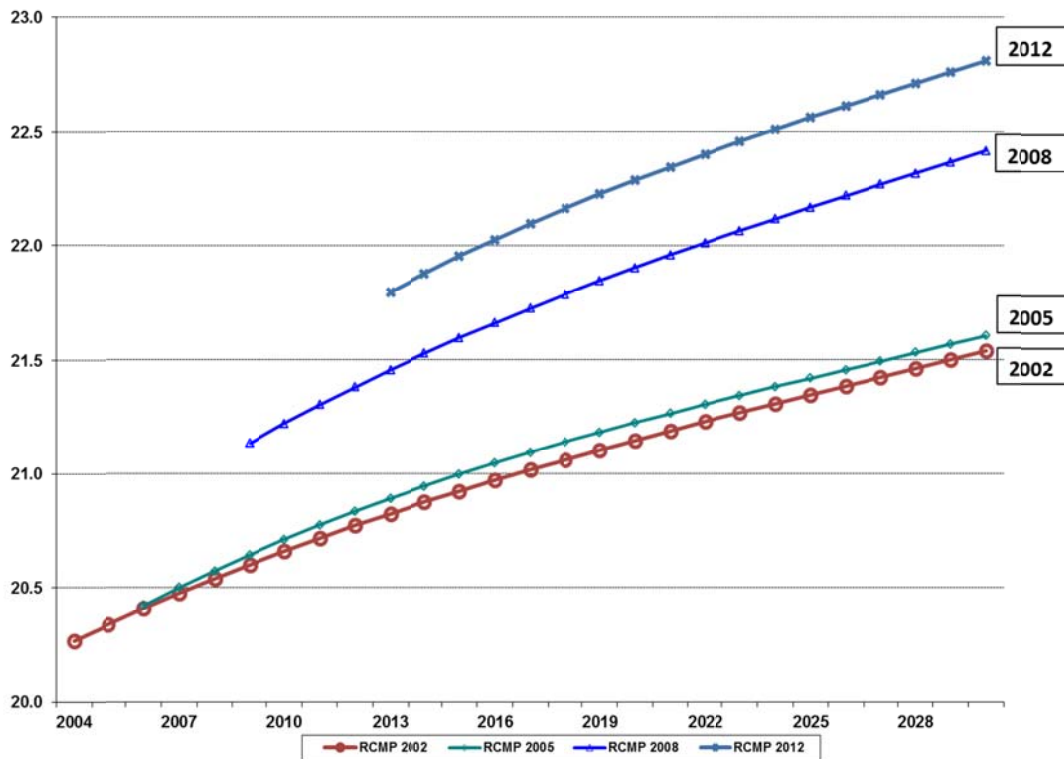


C. Impact of Mortality Assumptions on Liabilities and Current Service Cost

Mortality assumptions for the RCMP Plan Actuarial Reports are monitored and updated every time a statutory actuarial report is prepared. Both the starting mortality rates and future mortality improvement rates are examined. Charts 3 and 4 present the evolution of projected cohort life expectancies (with future improvements) of RCMP Plan male and female Regular Members at age 65 over four actuarial reports (2002 to 2012).

For males, the projected cohort life expectancy in 2013 at age 65 increased from 20.8 as based on the mortality assumptions of the 2002 RCMP Plan Actuarial Report (RCMP 2002) to 21.8 as based on the mortality assumptions of the RCMP 2012. A little less than a third of this increase of 1.0 year could be explained by the lower 2012 mortality rates used in the RCMP 2012 than those projected under the RCMP 2002 (the 2012 period life expectancies shown in Chart 5 are 20.1 and 20.4 years as per RCMP 2002 and RCMP 2012). The majority of the increase is the result of higher assumed future MIRs under the RCMP 2012. Chart 5 shows that the impact of MIRs on the life expectancy at age 65 is 0.7 year under the 2002 Report and 1.4 years under the RCMP 2012. It should be noted that the difference in projected cohort life expectancies under these two reports widens over time and reaches 1.3 years by 2030.

Chart 3 Life Expectancy of Male with Future Mortality Improvements
At age 65 by Plan Year



Over the same period (2002 Report to 2012 Report), the projected female cohort life expectancy in 2013 at age 65 increased by 0.3 year from 24.8 to 25.1. The higher increase for males is related in large extent to remarkable gains made by Canadian males over the last decades.

Chart 4 Life Expectancy of Female with Future Mortality Improvements At Age 65 by Plan Year

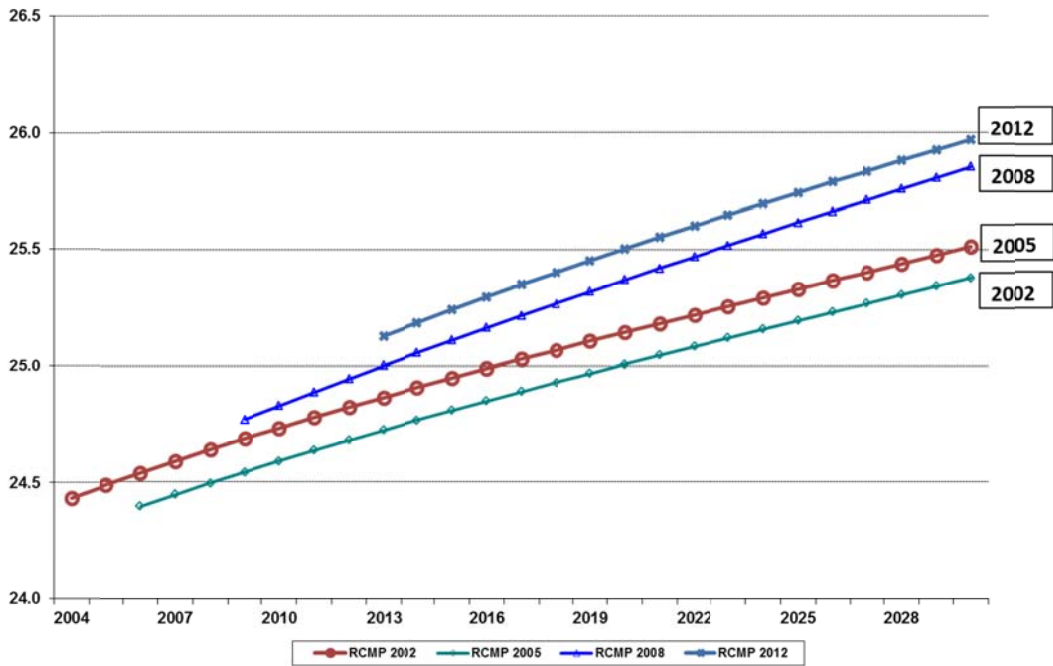
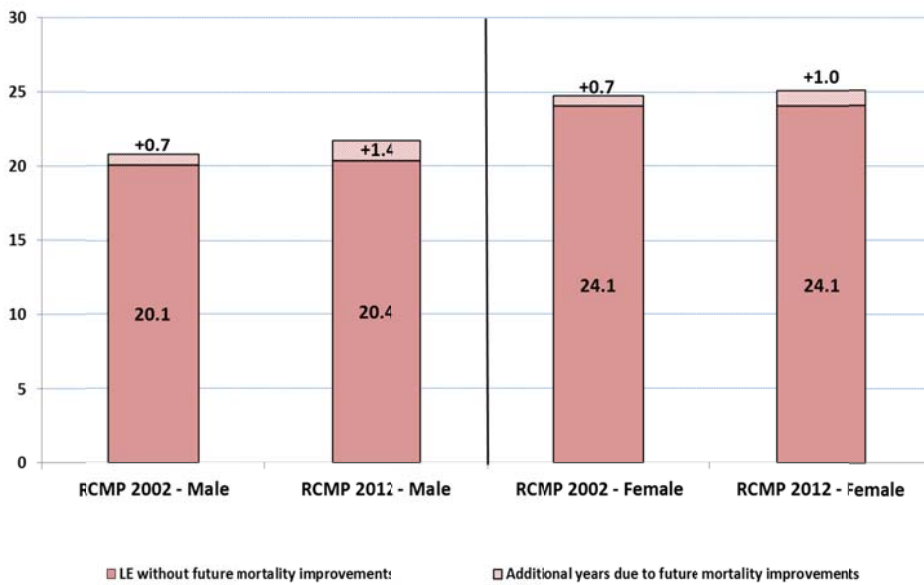


Chart 5 Life expectancy – 2002 vs. 2012 RCMP Plan Actuarial Reports At Age 65 without and with Future Mortality Improvements for Plan Year 2013



The revision of mortality assumptions could have a sizable impact on RCMP Plan’s actuarial liability and current service cost. The following Table shows the impact of changes in mortality

assumptions between 2002 and 2012 RCMP Plan Actuarial Reports on the liabilities as at 31 March 2012.

Table 11 2012 RCMP Plan Actuarial Liabilities - 2002 vs. 2012 Mortality Assumptions
As at 31 March 2012

Description	RCMP Plan Actuarial Liabilities (\$ millions)		
	Superannuation Account	Pension Fund	Total
Mortality assumptions of the 2012 Report	13,141	5,307	18,448
Mortality assumptions of the 2002 Report	12,875	5,257	18,132
Difference	(266)	(50)	(316)
Difference %	(2.0%)	(0.9%)	(1.7%)

The total actuarial liability of \$18.4 billion would decrease by \$0.3 billion or 1.7% as at 31 March 2012 if the mortality assumptions of the 2002 RCMP Plan Report were used. The 2013 current service cost determined using 2002 mortality assumption would be \$436 million or 22.44% of pensionable payroll compared to \$440 million or 22.65% of pensionable payroll as determined under the 2012 RCMP Plan Actuarial Report.

As discussed, the results of the RCMP Plan actuarial reports take into account future potential improvements in mortality. The financial impact of excluding future mortality improvements as at 31 March 2012 is shown in the following Table.

Table 12 2012 RCMP Plan Actuarial Liabilities with and without Mortality Improvements
As at 31 March 2012

Description	RCMP Plan Actuarial Liabilities (\$ millions)		
	Superannuation Account	Pension Fund	Total
Mortality improvements of the 2012 Report	13,141	5,307	18,448
Without mortality improvements	12,665	5,127	17,792
Difference	(476)	(180)	(656)
Difference %	(3.6%)	(3.4%)	(3.6%)

The total actuarial liability of \$18.4 billion would decrease by \$0.7 billion or 3.6% as at 31 March 2012 if future mortality improvements were not taken into account. The cost of future mortality improvements is divided between the Pension Fund and the Superannuation Account with 73% of this cost allocated to the Account. The current service cost for plan year 2013 of \$440 million, or 22.65% of pensionable payroll, as determined in the RCMP 2012 Actuarial report would decrease by \$17 million to \$423 million, or 21.77% of pensionable payroll, if future mortality improvements were not taken into account.

Chapter 1 of the Spring 2014 Report of the Auditor General of Canada states that the actuarial liabilities of the three major public sector pension plans (the Public Service, Canadian Forces and Royal Canadian Mounted Police) include the cost of future mortality improvements. The Auditor General report further specifies that if future mortality improvements were excluded from the calculations, the total liability for the three plans as at 31 March 2013 would be \$7.7 billion lower than the total liability presented in the statutory actuarial reports. The figure as at 31 March 2013 for the RCMP is \$0.7 billion.

IV- Conclusion

The results of the current mortality study demonstrate that mortality assumptions developed for the 2012 RCMP plan Actuarial Report are appropriate for the purposes of the valuation.

The liabilities presented in the most recent Actuarial Report on the Pension Plan for the Royal Canadian Mounted Police as at 31 March 2012 tabled in Parliament on 16 October 2013 include expected future mortality improvements. The cost of these future mortality improvements is \$0.7 billion or 3.6% of the total RCMP plan actuarial liabilities.

Based on the Regular Members mortality rates used in the 2012 RCMP Plan Actuarial Report, men aged 65 in plan year 2013 are expected to live to 85.4, more than one year older than Canadian males. By 2050, it is expected that male RCMP Regular Members will live for approximately 3 more years, up to age 88.

Based on the Regular Members mortality rates used in the 2012 RCMP Plan Actuarial Report, women aged 65 in plan year 2013 are expected to live to 89.1, almost two years more than Canadian females. In the absence of significant mortality experience, it appears reasonable to revise the mortality rates for female Regular Members in future actuarial valuations to reduce life expectancies so that they are in line with the life expectancies based on comparable mortality tables (e.g. the CPM2014 Combined table).

RCMP Regular Members are living longer than the general Canadian population mainly because of lower mortality rates before age 80.

V- Appendices

A. Complete Period Life Tables - Current Study and RCMP Plan Report

Table 13 Period Life Table – Current Study
RCMP Plan Regular Members – Plan Year 2013

x	Males			Exact Age
	Age Last Birthday			
	l_x	q_x	d_x	e_x
50	100,000	0.0016	160	34.36
51	99,840	0.0017	170	33.41
52	99,670	0.0019	189	32.47
53	99,481	0.0021	209	31.53
54	99,272	0.0023	228	30.59
55	99,044	0.0025	248	29.65
56	98,796	0.0028	277	28.73
57	98,519	0.0031	305	27.80
58	98,214	0.0034	334	26.88
59	97,880	0.0038	372	25.97
60	97,508	0.0042	410	25.06
61	97,098	0.0047	456	24.16
62	96,642	0.0052	503	23.26
63	96,139	0.0058	558	22.38
64	95,581	0.0065	621	21.50
65	94,960	0.0073	693	20.63
66	94,267	0.0082	773	19.77
67	93,494	0.0092	860	18.92
68	92,634	0.0103	954	18.08
69	91,680	0.0117	1,073	17.25
70	90,607	0.0132	1,196	16.44
71	89,411	0.0149	1,332	15.64
72	88,079	0.0168	1,480	14.86
73	86,599	0.0190	1,645	14.09
74	84,954	0.0215	1,827	13.33
75	83,127	0.0243	2,020	12.60
76	81,107	0.0275	2,230	11.88
77	78,877	0.0311	2,453	11.18
78	76,424	0.0354	2,705	10.51
79	73,719	0.0402	2,964	9.85
80	70,755	0.0457	3,234	9.22
81	67,521	0.0519	3,504	8.61
82	64,017	0.0590	3,777	8.02
83	60,240	0.0671	4,042	7.46
84	56,198	0.0763	4,288	6.93
85	51,910	0.0866	4,495	6.43
86	47,415	0.0982	4,656	5.95
87	42,759	0.1111	4,751	5.50
88	38,008	0.1248	4,743	5.09
89	33,265	0.1399	4,654	4.70
90	28,611	0.1563	4,472	4.34
91	24,139	0.1742	4,205	4.00
92	19,934	0.1935	3,857	3.69
93	16,077	0.2142	3,444	3.40
94	12,633	0.2361	2,983	3.14
95	9,650	0.2591	2,500	2.90
96	7,150	0.2829	2,023	2.69
97	5,127	0.3074	1,576	2.49
98	3,551	0.3313	1,176	2.32
99	2,375	0.3551	843	2.17
100	1,532	0.3787	580	2.03
105	97	0.5000	49	1.54
110	3	0.5000	2	1.47
115	0	1.0000	0	0.50

Table 14 Period Life Table – 2012 Actuarial Report
RCMP plan Regular Members – Plan Year 2013

x	Males				Females			
	Age Last Birthday			Exact Age	Age Last Birthday			Exact Age
	l_x	q_x	d_x	e_x	l_x	q_x	d_x	e_x
50	100,000	0.0019	190	34.06	100,000	0.0010	100	38.12
51	99,810	0.0020	200	33.12	99,900	0.0011	110	37.16
52	99,610	0.0022	219	32.19	99,790	0.0011	110	36.20
53	99,391	0.0024	239	31.25	99,680	0.0012	120	35.23
54	99,152	0.0025	248	30.33	99,560	0.0013	129	34.27
55	98,904	0.0027	267	29.40	99,431	0.0015	149	33.32
56	98,637	0.0029	286	28.47	99,282	0.0018	179	32.36
57	98,351	0.0032	315	27.55	99,103	0.0021	208	31.42
58	98,036	0.0036	353	26.64	98,895	0.0024	237	30.48
59	97,683	0.0041	401	25.72	98,658	0.0028	276	29.54
60	97,282	0.0046	447	24.82	98,382	0.0031	305	28.62
61	96,835	0.0052	504	23.93	98,077	0.0035	343	27.70
62	96,331	0.0058	559	23.04	97,734	0.0038	371	26.79
63	95,772	0.0064	613	22.17	97,363	0.0045	438	25.89
64	95,159	0.0071	676	21.30	96,925	0.0051	494	24.99
65	94,483	0.0079	746	20.44	96,431	0.0059	569	24.11
66	93,737	0.0089	834	19.59	95,862	0.0065	623	23.24
67	92,903	0.0098	910	18.76	95,239	0.0072	686	22.39
68	91,993	0.0111	1,021	17.93	94,553	0.0078	738	21.54
69	90,972	0.0125	1,137	17.11	93,815	0.0088	826	20.70
70	89,835	0.0140	1,258	16.31	92,989	0.0095	883	19.86
71	88,577	0.0158	1,400	15.52	92,106	0.0105	967	19.04
72	87,177	0.0179	1,560	14.75	91,139	0.0117	1,066	18.23
73	85,617	0.0201	1,721	13.99	90,073	0.0130	1,171	17.43
74	83,896	0.0228	1,913	13.25	88,902	0.0144	1,280	16.64
75	81,983	0.0257	2,107	12.53	87,622	0.0158	1,384	15.87
76	79,876	0.0291	2,324	11.83	86,238	0.0176	1,518	15.10
77	77,552	0.0330	2,559	11.15	84,720	0.0198	1,677	14.35
78	74,993	0.0378	2,835	10.49	83,043	0.0224	1,860	13.61
79	72,158	0.0434	3,132	9.86	81,183	0.0251	2,038	12.89
80	69,026	0.0498	3,437	9.25	79,145	0.0282	2,232	12.20
81	65,589	0.0572	3,752	8.68	76,913	0.0316	2,430	11.52
82	61,837	0.0656	4,057	8.14	74,483	0.0355	2,644	10.86
83	57,780	0.0730	4,218	7.64	71,839	0.0402	2,888	10.21
84	53,562	0.0813	4,355	7.17	68,951	0.0453	3,123	9.60
85	49,207	0.0904	4,448	6.73	65,828	0.0510	3,357	9.00
86	44,759	0.1006	4,503	6.31	62,471	0.0577	3,605	8.43
87	40,256	0.1120	4,509	5.92	58,866	0.0652	3,838	7.89
88	35,747	0.1216	4,347	5.57	55,028	0.0737	4,056	7.37
89	31,400	0.1321	4,148	5.24	50,972	0.0827	4,215	6.88
90	27,252	0.1435	3,911	4.92	46,757	0.0926	4,330	6.42
91	23,341	0.1559	3,639	4.63	42,427	0.1020	4,328	5.99
92	19,702	0.1694	3,338	4.35	38,099	0.1125	4,286	5.58
93	16,364	0.1809	2,960	4.10	33,813	0.1254	4,240	5.19
94	13,404	0.1932	2,590	3.86	29,573	0.1381	4,084	4.82
95	10,814	0.2063	2,231	3.62	25,489	0.1524	3,885	4.47
96	8,583	0.2203	1,891	3.40	21,604	0.1653	3,571	4.14
97	6,692	0.2353	1,575	3.18	18,033	0.1797	3,241	3.83
98	5,117	0.2512	1,285	2.97	14,792	0.1961	2,901	3.52
99	3,832	0.2660	1,019	2.76	11,891	0.2125	2,527	3.21
100	2,813	0.2800	788	2.55	9,364	0.2300	2,154	2.90
105	291	0.5000	146	1.56	1,263	0.5000	632	1.58
110	9	0.5000	5	1.47	39	0.5000	20	1.47
115	0	1.0000	0	0.50	1	1.0000	1	0.50

B. Canadian Pensioner Mortality Rates (CPM)

Table 15 Mortality Rates of Canadian Pensioner Mortality (CPM) – Males
For Calendar Years 2012 and 2013

Age	CPM Males 2012			CPM Males 2013		
	Public	Private	Combined	Public	Private	Combined
50	0.00253	0.00310	0.00274	0.00249	0.00305	0.00270
51	0.00272	0.00333	0.00294	0.00268	0.00328	0.00289
52	0.00293	0.00360	0.00317	0.00289	0.00355	0.00312
53	0.00319	0.00391	0.00345	0.00313	0.00384	0.00339
54	0.00346	0.00427	0.00379	0.00340	0.00419	0.00372
55	0.00377	0.00471	0.00419	0.00370	0.00462	0.00411
56	0.00409	0.00521	0.00466	0.00401	0.00510	0.00457
57	0.00443	0.00576	0.00516	0.00434	0.00564	0.00505
58	0.00479	0.00636	0.00567	0.00468	0.00621	0.00554
59	0.00517	0.00699	0.00615	0.00505	0.00682	0.00600
60	0.00557	0.00763	0.00659	0.00544	0.00744	0.00643
61	0.00599	0.00828	0.00700	0.00584	0.00807	0.00683
62	0.00645	0.00893	0.00740	0.00628	0.00869	0.00720
63	0.00695	0.00956	0.00785	0.00676	0.00929	0.00763
64	0.00748	0.01020	0.00836	0.00727	0.00991	0.00812
65	0.00808	0.01086	0.00895	0.00784	0.01054	0.00869
66	0.00874	0.01155	0.00962	0.00848	0.01121	0.00933
67	0.00947	0.01233	0.01040	0.00919	0.01197	0.01009
68	0.01032	0.01329	0.01130	0.01001	0.01289	0.01097
69	0.01128	0.01443	0.01236	0.01095	0.01401	0.01200
70	0.01239	0.01578	0.01359	0.01203	0.01531	0.01319
71	0.01367	0.01734	0.01502	0.01327	0.01683	0.01458
72	0.01516	0.01916	0.01665	0.01472	0.01860	0.01616
73	0.01687	0.02126	0.01852	0.01638	0.02064	0.01799
74	0.01886	0.02367	0.02067	0.01831	0.02299	0.02007
75	0.02116	0.02646	0.02310	0.02055	0.02570	0.02244
76	0.02382	0.02963	0.02591	0.02314	0.02879	0.02517
77	0.02691	0.03327	0.02913	0.02615	0.03233	0.02831
78	0.03049	0.03744	0.03283	0.02964	0.03639	0.03191
79	0.03465	0.04220	0.03711	0.03369	0.04102	0.03607
80	0.03946	0.04762	0.04206	0.03837	0.04630	0.04089
81	0.04486	0.05360	0.04760	0.04370	0.05222	0.04637
82	0.05102	0.06035	0.05396	0.04979	0.05889	0.05266
83	0.05803	0.06789	0.06118	0.05673	0.06638	0.05982
84	0.06595	0.07630	0.06935	0.06460	0.07474	0.06794
85	0.07488	0.08562	0.07855	0.07349	0.08403	0.07709
86	0.08490	0.09590	0.08886	0.08348	0.09429	0.08737
87	0.09611	0.10725	0.10037	0.09468	0.10564	0.09887
88	0.10861	0.11974	0.11316	0.10719	0.11817	0.11167
89	0.12252	0.13349	0.12735	0.12113	0.13198	0.12592
90	0.13796	0.14863	0.14306	0.13665	0.14722	0.14171
91	0.15510	0.16530	0.16042	0.15391	0.16404	0.15919
92	0.17408	0.18369	0.17955	0.17307	0.18263	0.17851
93	0.19513	0.20400	0.20068	0.19435	0.20319	0.19988
94	0.21845	0.22643	0.22398	0.21798	0.22594	0.22349
95	0.24295	0.24992	0.24830	0.24286	0.24983	0.24821
100	0.36668	0.36840	0.36872	0.36656	0.36828	0.36860
105	0.47942	0.47942	0.47942	0.47927	0.47927	0.47927
110	0.58035	0.58035	0.58035	0.58021	0.58021	0.58021
115	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Table 16 Mortality Rates of Canadian Pensioner Mortality (CPM) – Females
For Calendar Years 2012 and 2013

Age	CPM Females 2012			CPM Females 2013		
	Public	Private	Combined	Public	Private	Combined
50	0.00131	0.00145	0.00132	0.00129	0.00144	0.00130
51	0.00143	0.00159	0.00144	0.00142	0.00157	0.00143
52	0.00156	0.00173	0.00157	0.00154	0.00171	0.00155
53	0.00171	0.00190	0.00172	0.00169	0.00187	0.00170
54	0.00190	0.00209	0.00191	0.00187	0.00207	0.00188
55	0.00212	0.00234	0.00213	0.00209	0.00231	0.00210
56	0.00236	0.00261	0.00237	0.00233	0.00257	0.00234
57	0.00264	0.00292	0.00265	0.00261	0.00288	0.00262
58	0.00293	0.00325	0.00295	0.00289	0.00321	0.00291
59	0.00326	0.00360	0.00328	0.00321	0.00354	0.00323
60	0.00359	0.00397	0.00361	0.00353	0.00391	0.00355
61	0.00393	0.00436	0.00396	0.00387	0.00429	0.00390
62	0.00432	0.00478	0.00435	0.00425	0.00470	0.00428
63	0.00476	0.00527	0.00480	0.00468	0.00518	0.00472
64	0.00525	0.00580	0.00529	0.00516	0.00570	0.00520
65	0.00578	0.00640	0.00582	0.00568	0.00629	0.00572
66	0.00634	0.00702	0.00639	0.00623	0.00690	0.00628
67	0.00695	0.00768	0.00699	0.00683	0.00755	0.00687
68	0.00760	0.00841	0.00765	0.00747	0.00826	0.00752
69	0.00832	0.00921	0.00838	0.00817	0.00904	0.00823
70	0.00911	0.01009	0.00917	0.00895	0.00991	0.00901
71	0.01000	0.01107	0.01008	0.00983	0.01087	0.00990
72	0.01102	0.01220	0.01110	0.01082	0.01198	0.01091
73	0.01219	0.01349	0.01227	0.01197	0.01326	0.01206
74	0.01353	0.01498	0.01363	0.01330	0.01472	0.01339
75	0.01511	0.01672	0.01521	0.01484	0.01643	0.01494
76	0.01696	0.01876	0.01708	0.01666	0.01843	0.01678
77	0.01913	0.02117	0.01925	0.01879	0.02079	0.01891
78	0.02165	0.02397	0.02181	0.02127	0.02355	0.02142
79	0.02461	0.02724	0.02479	0.02418	0.02677	0.02435
80	0.02807	0.03106	0.02826	0.02758	0.03052	0.02776
81	0.03207	0.03550	0.03229	0.03151	0.03487	0.03172
82	0.03670	0.04061	0.03695	0.03605	0.03990	0.03630
83	0.04201	0.04649	0.04230	0.04127	0.04567	0.04155
84	0.04809	0.05322	0.04842	0.04725	0.05229	0.04757
85	0.05503	0.06090	0.05540	0.05407	0.05984	0.05444
86	0.06273	0.06898	0.06313	0.06173	0.06789	0.06213
87	0.07142	0.07802	0.07184	0.07040	0.07691	0.07081
88	0.08117	0.08809	0.08161	0.08014	0.08697	0.08058
89	0.09208	0.09928	0.09254	0.09107	0.09818	0.09152
90	0.10426	0.11167	0.10474	0.10328	0.11062	0.10375
91	0.11779	0.12531	0.11827	0.11689	0.12435	0.11737
92	0.13283	0.14037	0.13330	0.13206	0.13955	0.13253
93	0.14955	0.15697	0.15002	0.14895	0.15634	0.14942
94	0.16812	0.17527	0.16857	0.16776	0.17489	0.16821
95	0.18876	0.19545	0.18919	0.18869	0.19538	0.18912
100	0.31804	0.31804	0.31804	0.31794	0.31794	0.31794
105	0.41949	0.41949	0.41949	0.41936	0.41936	0.41936
110	0.53032	0.53032	0.53032	0.53019	0.53019	0.53019
115	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Table 17 Current Study – Plan Years 2005 and 2013 Male Mortality Rates

Age Last Birthday	Current Study Plan Year 2005 (Graduated observed mortality rates)	Current Study Plan Year 2013 (Plan year 2005 rates projected to 2013)
50	0.0018	0.0016
51	0.0020	0.0017
52	0.0022	0.0019
53	0.0025	0.0021
54	0.0027	0.0023
55	0.0030	0.0025
56	0.0034	0.0028
57	0.0037	0.0031
58	0.0041	0.0034
59	0.0046	0.0038
60	0.0051	0.0042
61	0.0057	0.0047
62	0.0064	0.0052
63	0.0071	0.0058
64	0.0079	0.0065
65	0.0089	0.0073
66	0.0099	0.0082
67	0.0111	0.0092
68	0.0125	0.0103
69	0.0140	0.0117
70	0.0157	0.0132
71	0.0176	0.0149
72	0.0198	0.0168
73	0.0223	0.0190
74	0.0251	0.0215
75	0.0283	0.0243
76	0.0319	0.0275
77	0.0359	0.0311
78	0.0405	0.0354
79	0.0457	0.0402
80	0.0515	0.0457
81	0.0580	0.0519
82	0.0653	0.0590
83	0.0736	0.0671
84	0.0827	0.0763
85	0.0930	0.0866
86	0.1043	0.0982
87	0.1169	0.1111
88	0.1307	0.1248
89	0.1459	0.1399
90	0.1624	0.1563
91	0.1802	0.1742
92	0.1992	0.1935
93	0.2196	0.2142
94	0.2410	0.2361
95	0.2633	0.2591
96	0.2865	0.2829
97	0.3101	0.3074
98	0.3340	0.3313
99	0.3578	0.3551
100	0.3814	0.3787
105	0.5000	0.5000
110	0.5000	0.5000
115	1.0000	1.0000

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