



Office of the Superintendent of
Financial Institutions Canada
Office of the Chief Actuary

Bureau du surintendant des
institutions financières Canada
Bureau de l'actuaire en chef

Actuarial Report

14th

on the Public Service Death Benefit Account

as at 31 March 2020

Canada 

Office of the Chief Actuary

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29 Septembre 2021

The Honourable Jean-Yves Duclos, P.C., M.P.
President of Treasury Board
Ottawa, Canada
K1A 0R5

Dear Minister:

Pursuant to Section 59 of the *Public Service Superannuation Act*, I am pleased to submit the report on the actuarial review as at 31 March 2020 of the Public Service Death Benefit Account established under Part II of this Act.

Yours sincerely,



Assia Billig, FCIA, FSA, PhD
Chief Actuary
Office of the Chief Actuary

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1 Executive Summary

This actuarial report on the Public Service Death Benefit Account (Account) was made pursuant to Section 59 of the *Public Service Superannuation Act* (PSSA).

This actuarial valuation is as at 31 March 2020 and is in respect of death benefits and contributions defined by Part II of the PSSA.

The previous actuarial report was prepared as at 31 March 2017. The date of the next periodic review is scheduled to occur no later than 31 March 2023.

1.1 Purpose of Actuarial Report

The purpose of this actuarial valuation is to determine the state of the Account as well as to assist the President of the Treasury Board in making informed decisions regarding the financing of the government's death benefit obligation. This report may not be suitable for another purpose.

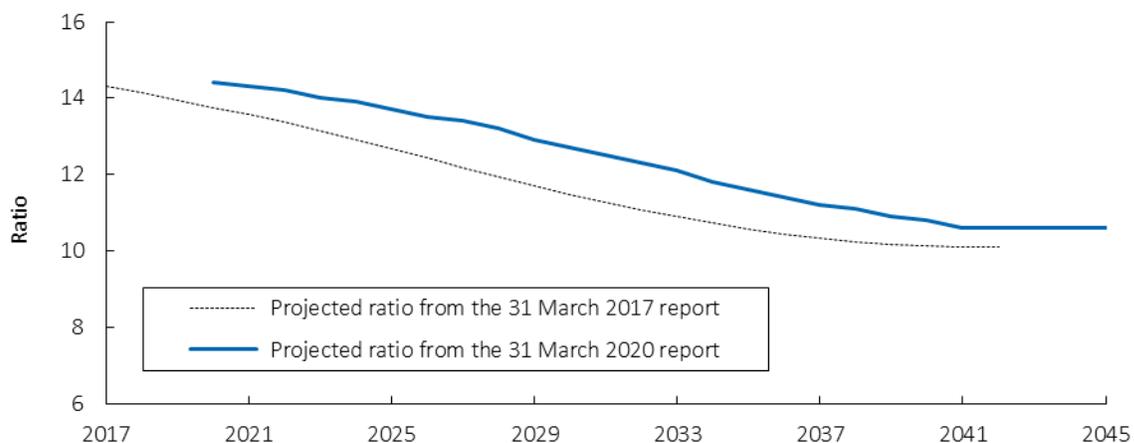
1.2 Main Findings

As at 31 March 2020, the supplementary death benefit (SDB) plan has an actuarial excess of \$2,884 million resulting from the difference between the Account balance of \$3,880 million and the liabilities of \$996 million.

The actuarial excess is projected to reach \$4,413 million at the end of plan year¹ 2045. Chart 1 shows the ratio of projected actuarial excess at the end of the plan year to annual benefit payments projected for the following plan year. This ratio is expected to decrease from the current level of 14.4 to 10.6 by the end of plan year 2045 as the cost continues to exceed the contributions throughout the period.

Chart 1 Projected Ratio of Actuarial Excess to Annual Benefit Payments

(Actuarial excess is measured at the end of plan year and annual payments are those of the following plan year.)



¹ Any reference to a given plan year in this report should be taken as the 12-month period ending 31 March of the given year.

1.3 Valuation Basis

This valuation report is based on the SDB plan provisions enacted by the Legislation, summarized in Appendix A.

There have been no changes to the plan provisions since the last actuarial valuation report.

The financial data on which this valuation is based relate to the Account established to track contributions and benefits under the SDB plan provisions. The Account data is summarized in Appendix B.

The membership data is summarized in Appendix C.

The valuation was prepared using accepted actuarial practice in Canada, methods and assumptions which are summarized in Appendices D to F.

All actuarial assumptions used in this report are best-estimate assumptions. They are independently reasonable and appropriate in aggregate for the purposes of the valuation at the date of this report. The actuarial assumptions used in the previous report were revised based on economic trends and demographic experience. A complete description of the assumptions is shown in Appendices E and F.

The following tables present summaries of the ultimate economic and of the demographic assumptions used in this report and a comparison with those used in the previous report.

Table 1 Ultimate Best-Estimate Economic Assumptions		
	31 March 2020	31 March 2017
Real increase in average earnings	0.7%	0.8%
Real projected yield on the Public Service Death Benefit Account	2.1%	2.7%

Table 2 Demographic Assumptions		
	31 March 2020	31 March 2017
Promotional and seniority rate of increase		
Male	0.6 - 5.9%	0.6 - 5.6%
Female	0.7 - 6.1%	0.7 - 5.7%
Life expectancy at age 65		
Male	22.9 years	21.9 years
Female	24.6 years	23.7 years
Average retirement age		
Group 1	60.1 years	59.3 years
Group 2	62.1 years	61.6 years

We have reflected the impacts of the COVID-19 pandemic on the economic assumptions used in this report where relevant. Those impacts are explained in Appendix E. It is important to note that the pandemic is a very fluid situation that will likely continue to evolve for some time. We have estimated the impacts based on the information known at the time the report was prepared. The final impacts of this health and economic crisis will likely generate some differences in the future.

2 Financial Position of the SDB

The state of the Account as at 31 March 2020 was prepared using the Account balance described in Appendix B, the data described in Appendix C, the methodology described in Appendix D, and the assumptions described in Appendices E and F.

In this report *Paid-up benefit* refers to the \$10,000 portion of the benefit for which monthly contributions are no longer required from either the participant or the government.

Table 3 presents the state of the account as at 31 March 2020. The results of the previous valuation are also shown for comparison purposes.

	31 March 2020	31 March 2017
Account Balance	3,880	3,627
Liabilities		
Paid-up Death Benefit	965	771
IBNR ¹	31	29
Total Liabilities	996	800
Actuarial Excess	2,884	2,827

The table below presents the financial position as at the valuation date.

	31 March 2020	31 March 2017
Actuarial excess (A)	2,884	2,827
Estimated benefits for next plan year (B)	200	198
Ratio of the actuarial excess over estimated benefits for next plan year (A/B)	14.4	14.3

¹ Incurred But Not Reported claims. See Appendix D.3.2.

3 Legislated Contribution Rates

The aggregate amount of death benefit payments projected for plan year 2021 is \$200.3 million, which is made up of \$156.3 million in respect of the term insurance and \$44.0 million in respect of the paid-up insurance. In this report, *term insurance* means the basic coverage (two times salary) less 10% reduction per year from age 66 and less \$10,000 paid-up insurance from age 65.

3.1 Paid-up Insurance

The estimated single premiums¹ and the legislated contribution rates² at age 65 for each \$10,000 of paid-up insured benefit are shown in the table below.

Table 5 Paid-Up Insurance per \$10,000 of Coverage for Plan Year 2021

	Single Premiums at Age 65 (\$)	Legislated Contribution Rate (\$)
Male	5,491	310
Female	5,229	291

The assumed mortality improvements and the projected increase in yield from 3.5% in plan year 2021 to 4.1% ultimately are expected to cause the projected single premium for the paid-up death benefit to decrease over time. The projected single premium for male and female in plan year 2045 are \$4,195 and \$3,949, respectively.

3.2 Term Insurance

The total amounts of insurance coverage and benefits payable for plan year 2021 are projected to be \$68,431 million and \$156 million, respectively.

Non-elective participants and elective participants in receipt of an immediate annuity or an annual allowance are required to contribute 15 cents per \$1,000 of term insurance monthly. As a minimum, the government contribution credited monthly to the Account is equal to one-twelfth of the total amount of term insurance proceeds payable during the month. Table 6 presents the monthly contribution and the cost rates for plan year 2021. It shows that contributions are 2.2 cents less than the monthly cost.

Table 6 Monthly Cost and Contributions per \$1,000 of Coverage for Plan Year 2021 (cents)

Participant	Contribution		Total Cost
	Government	Total	
15	1.8	16.8	19.0

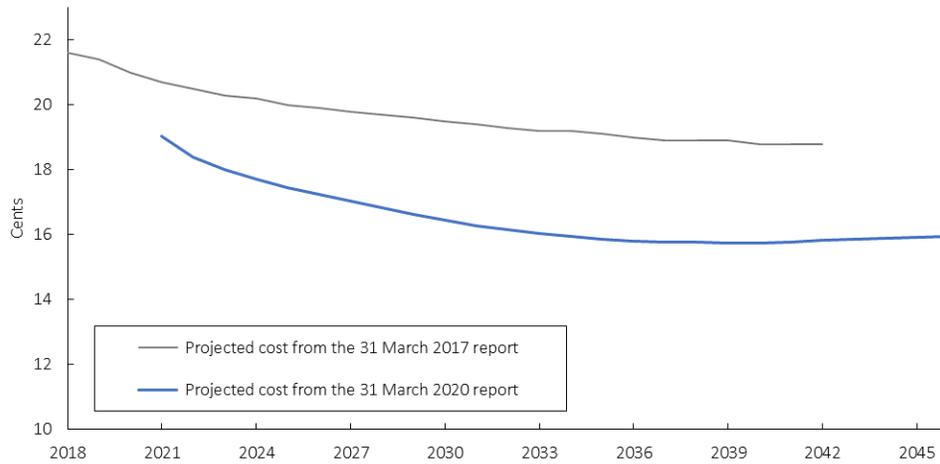
¹ The single premium is the present value of the paid-up death benefit for a member aged 65.

² The contribution rates are equal to the legislated single premium indicated in the Schedule II of the PSSA.

As shown in Chart 2, the projected monthly cost in the 31 March 2020 report is significantly lower than in the previous valuation. This is mainly due to

- a change in the mortality improvement rates,
- changes in demography.

Chart 2 Projected Monthly Cost
(cents per \$1,000 of term insurance)



The following table shows the projected monthly costs per \$1,000 of term insurance by participant type for selected plan years.

Participants	2021	2025	2030	2035	2040	2045
Non-elective	9.3	8.6	8.5	8.4	8.3	8.3
Elective	57.2	55.7	54.7	51.7	49.3	49.9
All	19.0	17.5	16.4	15.9	15.8	15.9

The monthly cost per \$1,000 of term insurance is projected to gradually decrease to 15.9 cents by plan year 2045 while the total contribution rate is projected to be 16.6 cents (15 cents from the participants and 1.6 cents from the government) in the same plan year. This results mainly from the following two factors:

- Lower mortality rates assumed for plan year 2045 in accordance with the mortality improvement rates shown in Table 32 applied to the current mortality rates shown in Table 31. This has the effect of decreasing the costs.
- Heavier weights at older ages on the distribution of non-elective participants in plan year 2045 than the current weight. This has the effect of increasing the costs.

Altogether, the increased costs due to heavier weights at older ages is more than offset by the decreased costs due to assumed mortality improvements.

4 Reconciliation as at 31 March 2020

Table 8 illustrates the impact of the updated assumptions, intervaluation economic experience, demographic changes and changes in mortality assumption methodology since the last valuation report as at 31 March 2017.

In the intervaluation period, the non-elective population grew significantly more than expected. The higher proportion of non-elective members compared to the elective group resulted in a lower monthly cost than anticipated.

The main revision to the demographic assumptions is a change to the mortality improvement rates. The main revision to economic assumptions is a reduction of the real interest rates.

Table 8 Reconciliation of Results

	Monthly Cost by \$1,000 of term insurance (Cents)	Actuarial Excess to Benefit Payments in Plan Year (Ratio)
Previous valuation as at 31 March 2017	20.7	14.3
Change in methodology	0.1	0.5
Retroactive data correction	(0.1)	(0.1)
Demographic changes	(1.4)	(0.2)
Changes in assumptions		
Revision of economic assumptions	0.3	(0.4)
Revision of demographic assumptions	(0.6)	0.3
Valuation as at 31 March 2020	19.0	14.4

5 Sensitivity of Valuation Results

The following supplementary estimates indicate the degree to which the valuation results depend on some of the key assumptions. The table below presents the the effects on valuation results when key assumptions are varied.

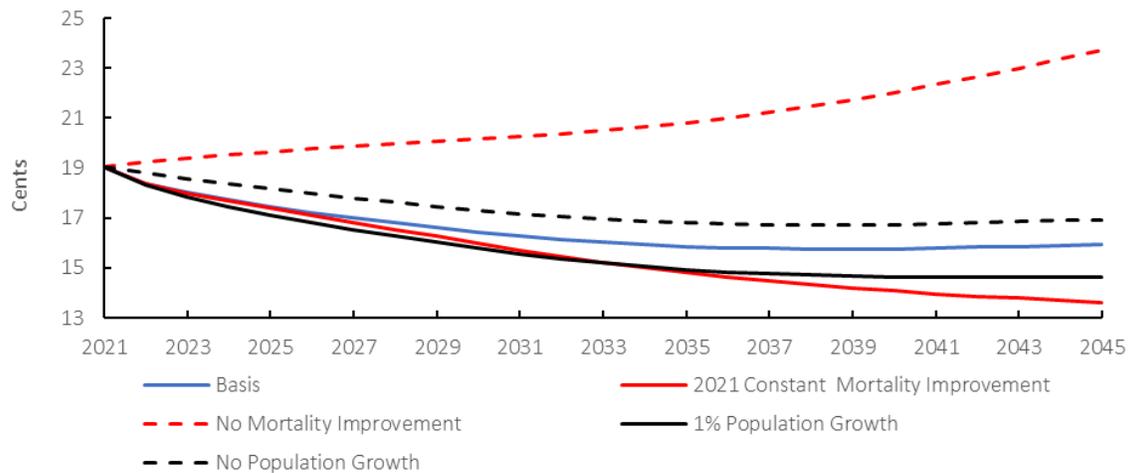
Table 9 Sensitivity of Valuation Results to Variations in Key Assumptions

	Actuarial liability (\$ million)	Effect	Actuarial Excess to Benefit Payments in Plan Year (Ratio)	Effect
	996		14.40	
<u>Projected interest yields</u>				
+1%	882	(114)	14.96	0.56
-1%	1,134	138	13.70	(0.70)
<u>Mortality improvement</u>				
- 0%	1,016	20	14.29	(0.11)
- Constant at plan year 2021 rates	986	(10)	14.45	0.05

Differences between these results and those shown in the valuation can also serve as a basis for approximating the effect of other numerical variations in a key assumption to the extent that such effects are indeed linear.

Chart 3 below shows that lower (no mortality improvement – top dotted line) or higher (2021 constant mortality improvement – bottom continuous line) mortality improvement factors would have a significant impact on the monthly cost by \$1,000 of term insurance. The chart also illustrates the smaller impact of population growth on that same ratio.

Chart 3 Sensitivity of Projected Monthly Cost to Variation in select Demographic Assumptions



6 Actuarial Opinion

In our opinion, considering that this report was prepared pursuant to the *Public Pensions Reporting Act*,

- the valuation input data on which the valuation is based are sufficient and reliable for the purposes of the valuation;
- the assumptions used are individually reasonable and appropriate in aggregate for the purposes of the valuation; and
- the methods employed are appropriate for the purposes of the valuation; and

This report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada. In particular, this report was prepared in accordance with the Standards of Practice (General Standards) published by the Canadian Institute of Actuaries.

We have reflected the impacts of the COVID-19 pandemic on the economic assumptions used in this report. It is important to note that the pandemic is a very fluid situation that will likely continue to evolve for some time. We have estimated the impacts based on the information known at the time the report was prepared. The final impacts of this health and economic crisis will likely generate some differences in the future.

To the best of our knowledge, after discussion with Public Services and Procurement Canada and the Treasury Board of Canada Secretariat, there were no subsequent events between the valuation date and the date of this report that would have a material impact on the results of this valuation.



Assia Billig, FCIA, FSA
Chief Actuary



Véronique Ménard, FCIA, FSA



Yann Bernard, FCIA, FSA

Ottawa, Canada
29 September 2021

Appendix A — Summary of Plan Provisions

The following is a summary description of the main provisions of the SDB plan established for public servants under Part II of the PSSA. This plan supplements benefits payable under the pension plan for the Public Service of Canada (PSPP) by providing a lump sum benefit upon the death of a plan participant.

A.1 Plan Participants

A.1.1 Non-elective Participants

The term *non-elective participant* means all contributors to the PSPP who are employed in the Public Service except employees of Crown corporations covered under other group life insurance plans.

A.1.2 Elective Participants

The term *elective participant* means all participants who have ceased to be employed in the Public Service following disability or retirement and have opted to continue their coverage under the SDB plan. Such right is limited to participants who, at the time they cease to be employed in the Public Service, have completed at least two years of continuous service in the Public Service or two years of participation in the SDB plan.

A non-elective participant who ceases employment and becomes entitled to an immediate annuity or annual allowance under the PSPP automatically becomes an elective participant. During the first 30 days as an elective participant, an individual has the right to opt out of the plan, effective on the 31st day.

A.2 Contributions

A.2.1 Non-elective Participants and Elective Participants in Receipt of an Immediate Annuity or an Annual Allowance

For non-elective participants as well as elective participants in receipt of an immediate annuity (disability or retirement) or an annual allowance under the PSPP, the rate of contribution is 15 cents per month for each \$1,000 of death benefit. When these participants attain age 65 (or complete two years of service, if later), their contribution is reduced by \$1.5 per month in recognition of the fact that \$10,000 of basic benefit becomes paid-up (by the government) for the remaining lifetime of the participant.

A.2.2 Elective Participants Entitled to a Deferred Annuity

For elective participants entitled to a deferred annuity under the PSPP, the contribution rate set in the legislation¹ varies in accordance with the attained age of the participant, and the corresponding contributions become chargeable on the 30th day immediately following cessation of employment.

¹ Contributions for elective participants entitled to a deferred annuity are disclosed in Schedule I of the *Supplementary Death Benefit Regulations*.

The contribution rates for selected ages are shown in the following table:

Table 10 Contribution per \$2,000 of Death Benefit

Age	Annual ¹	Monthly ²
25	9.70	0.82
30	11.42	0.97
35	13.58	1.15
40	16.29	1.39
45	19.72	1.67
50	24.11	2.05
55	29.80	2.53
60	37.65	3.20

A.2.3 Government

The government credits monthly to the Account an amount equal to one-twelfth of the total amount of death benefits paid in the month.

Crown corporations and public boards whose employees are participants in the plan contribute at the rate of four cents per month for each \$1,000 of death benefit.

When a participant, other than one entitled to a deferred annuity, reaches age 65 (or completes two years of service, if later), the government credits to the Account a single premium for the individual \$10,000 paid-up portion of basic benefit in respect of which contributions are no longer required from the participant.

The legislated amount of single premium³ for each such \$10,000 paid-up portion of basic benefit is shown in the following table and corresponds to one-twentieth of the single premium rate for \$10,000 dollars of death benefit, computed on the basis of the Life Tables, Canada, 1950-1952 and interest at 4% per annum.

Table 11 Legislated Single Premium per \$10,000 of Basic Benefit (\$)

Age Nearest Birthday	Male	Female
65	310	291
66	316	298
67	323	306
68	329	313
69	336	320
70	343	328
71	349	335
72	356	342
73	362	349
74	369	356
75	375	363

¹ For elective participants entitled to a deferred annuity during deferral period.

² For elective participants who were entitled to a deferred annuity once and are currently in payment.

³ The legislated single premiums per \$10,000 of Basic Benefit are disclosed in Schedule II of the PSSA.

Under the statutes, if for whatever reason the Account were to become exhausted, the government would then credit special contributions to the Account in an amount at least equal to the basic benefits then due but not paid by reason of such cash shortfall.

A.3 Amount of Basic Benefit

Subject to the applicable reductions described below, the lump sum benefit payable upon the death of a participant is equal to twice the participant's current salary, the result being rounded to the next higher multiple of \$1,000 if not already equal to such a multiple. For this purpose, the current salary of an elective participant is defined as the annual rate of pay at the time of cessation of employment in the Public Service.

The amount of basic benefit described above is reduced by 10% per year starting at age 66 until it would normally vanish at age 75. However, the amount of basic benefit cannot at any time be reduced below a basic floor value of \$10,000 subject to the following exceptions:

- For those elective participants who had, upon cessation of employment prior to 5 October 1992, made an election to reduce their basic benefit to \$500 and further had made a second election, within one year thereafter, to keep their basic benefit at \$500, the floor value is \$500 instead of \$10,000. Such election is irrevocable.
- For non-elective participants, the amount of basic benefit cannot be reduced below the multiple of \$1,000 equal to or next above one-third of the participant's annual salary, even if the resulting amount is higher than \$10,000.
- All participants aged between 61 and 70 prior to 1 October 1999 may elect to retain the 10% a year reduction schedule starting at age 61.
- For elective participants entitled to a deferred annuity, there is no coverage past age 75.

Upon ceasing to be employed in the Public Service, elective participants in receipt of an immediate annuity or in receipt of an annual allowance under the PSPP may opt to reduce their amount of basic benefit to \$10,000.

Appendix B — Account Balance

B.1 Reconciliation of the Public Service Death Benefit Account

The Account, which forms part of the Public Accounts of Canada, records the transactions for the plan. No formal debt instrument has been issued to the Account by the government in recognition of the amounts therein. The Account is:

- credited with all contributions made by participants, Crown corporations and the government;
- credited with interest earnings every three months on the basis of the actual average yield for the same period on the combined Superannuation Accounts of the Public Service, Canadian Forces and Royal Canadian Mounted Police pension plans. These accounts generate interest earnings as though net cash flows were invested quarterly in 20-year Government of Canada bonds issued at prescribed interest rates and held to maturity; and
- debited with basic benefit payments when they become due.

Table 12 shows the reconciliation of the balance of the Account from the last valuation date to the current valuation date. Since the last valuation, the Account balance has grown by \$253 million (a 7% increase) to \$3,880 million as at 31 March 2020. The net growth in the Account balance is to a large extent the result of interest credits made.

Table 12 Public Service Death Benefit Account				
(\$ millions)				
Plan Year	2018	2019	2020	2018-2020
Opening balance as at 1 April of the previous year	3,626.9	3,714.7	3,799.9	3,626.9
INCOME				
Employee Contributions				
Active members				
Public Service employees	70.8	76.2	80.9	227.9
Public Service corporations	5.8	6.0	6.1	17.9
Retired employees	<u>26.3</u>	<u>27.0</u>	<u>27.5</u>	<u>80.8</u>
Total Employee Contributions	102.9	109.2	114.5	326.6
Employer Contributions				
Public Service corporations	1.5	1.6	1.6	4.7
Death benefit - general	11.9	12.0	12.5	36.4
Death benefit - single premium \$10,000	3.1	3.1	3.2	9.4
Interest	<u>149.7</u>	<u>144.8</u>	<u>140.8</u>	<u>435.3</u>
Total Income	269.1	270.7	272.6	812.4
EXPENDITURES				
Benefits payments				
General	142.4	143.8	149.7	435.9
Life coverage for \$10,000	38.5	41.3	42.5	122.3
Other death benefit payments	<u>0.4</u>	<u>0.4</u>	<u>0.0</u>	<u>0.8</u>
Total Expenditures	181.3	185.5	192.2	559.0
Closing balance as at 31 March of the plan year	3,714.7	3,799.9	3,880.2	3,880.2

B.2 Rates of Interest

The following rates of interest on the Account by plan year were calculated using the foregoing entries.

Table 13 Rates of Interest	
Plan Year	Interest
2018	4.2%
2019	4.0%
2020	3.7%

B.3 Sources of the Financial Data

The Account entries shown previously were taken from the Public Accounts of Canada.

Appendix C — Participant Data

C.1 Source of Participant Data

The valuation input data required in respect of contributors (both active and non-active) and pensioners are extracted from master computer files maintained by the Department of Public Services and Procurement Canada (PSPC).

The main valuation data file supplied by PSPC contained the historical status information on all participants up to 31 March 2020.

C.2 Validation of Participant Data

The participant data were validated with respect to the Actuarial Report on the Pension Plan for the Public Service of Canada as at 31 March 2020. Details of the data validation can be found in Appendix D of that report.

C.3 Participant Data Summary

Tables 14 to 18 on the following pages show the detailed participant data upon which this valuation is based.

Table 14 Reconciliation of Non-Elective Participants

	Male	Female	Total
As at 31 March 2017	127,728	163,377	291,105
Data corrections	909	1,386	2,295
Eligibility Change	38	34	72
New non-elective from			
New non-elective	36,137	47,373	83,510
Rehired from cash-outs	1,112	1,884	2,996
Rehired from pensioners	<u>565</u>	<u>951</u>	<u>1,516</u>
Subtotal	37,814	50,208	88,022
Non-elective terminations			
Disability	(557)	(1,290)	(1,847)
Deferred Annuity (DA)	(2,795)	(3,808)	(6,603)
Annuity (IA/AA) ¹	(11,147)	(14,147)	(25,294)
Death (no survivors)	(225)	(206)	(431)
Death (with survivors)	(351)	(284)	(635)
Contributor ROC or TV	<u>(7,459)</u>	<u>(9,677)</u>	<u>(17,136)</u>
Subtotal	(22,534)	(29,412)	(51,946)
As at 31 March 2020	143,955	185,593	329,548

¹ IA refers to Immediate Annuity while AA means Annual Allowance.

Table 15 Reconciliation of Elective Participants

	Male	Female	Total
As at 31 March 2017	96,767	83,472	180,239
Data Corrections	(33)	(55)	(88)
New elective from			
New non-elective	11,551	15,254	26,805
Rehired non-elective	—	—	—
Subtotal	11,551	15,254	26,805
Transfer status to			
Non-elective	(44)	(50)	(94)
Terminations			
Death	(9,527)	(4,779)	(14,306)
As at 31 March 2020	98,714	93,842	192,556

Table 16 Non-Elective Participants¹
As at 31 March 2017

Age ²	Number			Basic Benefits (\$ thousands)		
	Male	Female	Total	Male	Female	Total
15-19	64	61	125	6	6	12
20-24	3,754	5,145	8,899	622	839	1,461
25-29	11,044	16,078	27,122	2,240	3,191	5,431
30-34	14,516	20,157	34,673	3,337	4,473	7,810
35-39	18,857	26,078	44,935	4,778	6,307	11,085
40-44	20,967	29,317	50,284	5,687	7,495	13,183
45-49	20,595	27,305	47,900	5,794	7,156	12,950
50-54	19,946	25,484	45,430	5,718	6,637	12,355
55-59	19,437	21,590	41,027	5,503	5,404	10,907
60-64	10,232	10,562	20,794	2,854	2,526	5,380
65-69	3,507	3,038	6,545	831	613	1,444
Above 69	1,036	778	1,814	5,503	69	185
Total	143,955	185,593	329,548	37,486	44,715	82,201

	Average	Male	Female	Total
As at 31 March 2017	Age	46.4	44.7	45.5
	Service ²	14.3	13.2	13.7
	Basic Benefit (\$)	164,040	150,011	156,166
As at 31 March 2020	Age	46.5	44.8	45.6
	Service	14.0	12.9	13.4
	Basic Benefit (\$)	173,733	160,719	166,386

¹ Includes Correctional Services Canada employees and members from participating Crown corporations and public boards.

² Expressed in rounded years calculated at the beginning of the plan year. Averages are calculated on a dollar-weighted basis.

Table 17 Elective Participants in Receipt of a Disability Pension
 As at 31 March 2020

Age	Number			Basic Benefits (\$ thousands)		
	Male	Female	Total	Male	Female	Total
To 34	5	15	20	1	1,733	1,733
35- 39	36	97	133	5	12,564	12,569
40- 44	78	280	358	10,789	37,935	48,723
45- 49	171	549	720	24,157	75,281	99,438
50- 54	339	896	1,235	48,743	118,985	167,728
55- 59	795	1,764	2,559	111,490	229,275	340,765
60- 64	879	2,022	2,901	109,046	231,418	340,464
65- 69	901	1,513	2,414	77,135	124,457	201,592
70- 74	809	1,029	1,838	23,457	28,462	51,919
75- 79	524	575	1,099	5,240	5,750	10,990
80- 84	411	437	848	4,110	4,370	8,480
85- 89	241	234	475	2,410	2,340	4,750
90- 94	66	75	141	660	750	1,410
100-104	3	3	6	30	30	60
105-109	0	0	0	0	0	0
Total	5,285	9,527	14,812	417,542	873,729	1,128,808

	<u>Average</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
As at 31 March 2017	Age ¹	59.6	57.2	58.0
	Basic Benefit (\$)	74,815	86,873	82,278
As at 31 March 2020	Age ¹	59.9	58.1	58.7
	Basic Benefit (\$)	80,020	91,711	87,539

¹ Expressed in rounded years calculated at the beginning of the plan year. Averages are calculated on a dollar-weighted basis.

Table 18 Elective Retired Participants¹
(In Receipt of an Immediate Annuity or an Annual Allowance)
As at 31 March 2020

Age ²	Number			Basic Benefits (\$ thousands)		
	Male	Female	Total	Male	Female	Total
45- 49	1	6	7	156	1,059	1,215
50- 54	134	217	351	23,449	37,281	60,731
55- 59	4,231	7,096	11,327	815,716	1,191,882	2,007,598
60- 64	13,637	18,652	32,289	2,472,929	2,901,597	5,374,527
65- 69	20,238	22,308	42,546	2,742,045	2,569,637	5,311,682
70- 74	21,619	17,176	38,795	1,034,894	696,036	1,730,930
75- 79	14,985	8,910	23,895	149,850	89,100	238,950
80- 84	8,684	4,673	13,357	86,840	46,730	133,570
85- 89	5,949	2,900	8,849	59,490	29,000	88,490
90- 94	2,881	1,565	4,446	28,810	15,650	44,460
95- 99	937	707	1,644	9,370	7,070	16,440
100-104	131	97	228	1,310	970	2,280
105-109	2	8	10	20	80	100
Total	93,429	84,315	177,744	7,424,879	7,586,093	15,009,757

	Average	Male	Female	Total
As at 31 March 2017	Age	64.7	63.2	64.0
	Basic Benefit (\$)	84,686	92,985	88,417
As at 31 March 2020	Age	65.5	64.2	64.9
	Basic Benefit (\$)	79,471	89,973	84,453

¹ Participants entitled to a deferred annuity were not taken into account for valuation purposes. Their impact is considered negligible.

² Expressed in rounded years calculated at the beginning of the plan year. Averages are calculated on a dollar-weighted basis.

Appendix D — Methodology

D.1 Account Balance

The balance of the Account forms part of the Public Accounts of Canada. The Account records the transactions for the plan, meaning that no debt instrument has been issued to the Account by the government in recognition of the amounts therein. The recorded balance is shown at the book value of the underlying notional bond portfolio described in Appendix B.

The Account balance corresponds to the cumulative historical excess of contributions and interest credits over basic benefit payments. The Account balance is accordingly projected to the end of a given plan year by adding to the Account at the beginning of that plan year the net income (i.e. the excess of contributions and interest credits over benefits) projected as described below for that plan year.

In the projection of the Account, no assumption was made regarding the expenses incurred for the administration of the plan. These expenses, which are not debited to the Account, are commingled with all other government charges.

D.2 Contributions

D.2.1 Participants

Participants' annual contributions are projected for a given plan year by multiplying:

- the legislated annual contribution rate of \$1.8 per \$1,000 of coverage (equivalent to the monthly rate of 15 cents per \$1,000 of coverage),
by
- the aggregate of two times the salaries of participants projected for that plan year on an open-group basis,
less
- 10% per year reduction from age 65, and
- 10,000 paid-up coverage after age 65.

Non-elective participants' salaries are projected for a given plan year using the assumed rates of increase described in Appendix E and the assumed seniority and promotional salary increases described in Table 20. Elective participants' salaries are frozen at the time of retirement or disability and are not subject to further increases.

D.2.2 Government

The government's annual contribution is projected for a given plan year as the sum of:

- one-twelfth of the amount of term insurance death benefits projected to be paid during that plan year,
and

- the legislated single premiums in respect of relevant participants 65 years of age (or participants completing two years of service, if older).

D.2.3 Crown Corporations and Public Boards

Crown corporations' and public boards' annual contributions are projected for a given plan year by multiplying:

- the legislated annual contribution rate of \$0.48 per \$1,000 of coverage (equivalent to the monthly rate of 4 cents per \$1,000 of coverage),
by
- the aggregate of two times the salaries of each participant who is employed by the Crown corporation or public board projected for that plan year on an open-group basis, less
- 10% per year reduction from age 65, and
- 10,000 paid-up coverage after age 65.

D.2.4 Interest Credits

Annual interest credits are projected for a given plan year as the product of the yield projected for that plan year (shown in Appendix E) and the projected average Account balance in that plan year.

D.2.5 Basic Benefit Payments

The total amount of basic benefits (term and paid-up insurance) for a given plan year is projected as the total amount of insurance in force during that plan year multiplied by the mortality rates assumed to apply during that plan year. The amount of basic benefit in force depends on the salary projected to time of death. Salaries are projected for this purpose using the assumed rates of increase in salaries and the number of participants is projected on an open-group basis as described in Appendix F.

D.3 Liabilities

D.3.1 Paid-up Reserve

At the end of a given plan year, the liabilities associated with the individual \$10,000 paid-up death benefit in force correspond to the amount which, together with interest at the projected yields, is sufficient to pay for each individual \$10,000 paid-up death benefit projected payable on the basis of the assumed mortality rates.

D.3.2 IBNR and Pending Claims Reserves

On the basis of the plan's experience, the reserve at the end of a given plan year for claims incurred but not reported (IBNR) and for pending claims is set equal to one-sixth of the projected annual death benefits paid on average during the six previous plan years.

Appendix E — Economic Assumptions

The following economic assumptions are required for valuation purposes:

E.1 Level of Inflation

Price increases, as measured by changes in the Consumer Price Index (CPI), tend to fluctuate from year to year. In 2016, the Bank of Canada and the government renewed their commitment to keep inflation between 1% and 3% until the end of 2021. As a result of the COVID-19 pandemic, a slowdown in inflation is expected during plan year 2021. Based on economic forecasts, the CPI is expected to increase at a rate above 2% for the following two years and to revert to the Bank of Canada's long-term target thereafter. It is assumed that the Bank of Canada will remain committed to meeting the mid-range 2% target. In this report, it is assumed that the level of inflation will increase from 0.7% in plan year 2021 to 2.3% in plan year 2022 and 2.2% in plan year 2023. The ultimate rate of 2.0% is reached in 2024. It is unchanged from the assumed rate in the previous valuation.

E.2 Employment Earnings Increases

The actual increase in employment earnings¹ for each plan year is based on recently approved contracts which apply to the majority of non-elective participants. Increases up to plan year 2022 are based on current collective agreements. Subsequent increases are based on average increases over recent rounds of collective bargaining and are assumed to gradually converge to the ultimate level in 2029. Over the long term, the annual increase in pensionable earnings is assumed to be 0.3% lower than the corresponding increase in the YMPE (unchanged from the previous valuation). This correspond to an ultimate value of 2.7% in 2029 and thereafter (2.8% in the previous valuation for plan year 2024 and thereafter).

E.3 Investment-Related Assumptions

E.3.1 New Money Rate

The new money rate is the nominal yield on 10-year-plus Government of Canada bonds and is set for each year in the projection period. The real yield on 10-year-plus federal bonds is equal to the new money rate less the assumed rate of inflation.

During the last quarter of plan year 2020, the emerging COVID-19 pandemic marked the beginning of a severe humanitarian and economic shock. Many governments enacted unprecedented measures to support families and workers, and central banks reacted swiftly to support the economy and stabilize financial markets. In Canada, the net effect was a decrease in both short-term and long-term interest rates during the early months of the pandemic. This economic shock occurred in a context where interest rates were already considered low by historical standards and where many were already contemplating the prospects of a "low-for-long" interest rates environment. Consequently, the new money rate is assumed to be lower than in the previous valuation.

The annual nominal yield on 10-year-plus federal bonds is assumed to be 1.2% in plan year 2021.

¹ Exclusive of seniority and promotional increases.

Then it is projected to increase gradually to its ultimate level of 4.1% in plan year 2034. The assumed rates over the short-term (2021-2025) are consistent with the average of private sector forecasts and take into account the recent market conditions. The ultimate level of 4.1% is equivalent to an ultimate real rate of 2.1%. The ultimate real yield was assumed to be 2.7% in 2027 in the previous valuation. The real new money rates over the plan years 2021 to 2033 are on average 1.3% lower than those assumed in the previous valuation over the same period.

E.3.2 Projected Yields on Account

The projected yields assumed for computing the present value of accrued benefits for service prior to 1 April 2000 and to be credited to the Superannuation Account are the projected annual yields on the combined book value of the Superannuation Accounts of the Public Service, Canadian Forces and RCMP pension plans.

The projected Account yields were determined by an iterative process involving the following:

- the combined notional bond portfolio of the three Superannuation Accounts as at the valuation date;
- the assumed future new money interest rates;
- the expected future benefits payable in respect of all pension entitlements accrued up to 31 March 2000;
- the expected future contributions for prior service elections made up to 31 March 2000; and
- the expected future administrative expenses,

taking into account that each quarterly interest credit to a Superannuation Account is calculated as if the principal at the beginning of a quarter remains unchanged during the quarter. The projected yield on the Account is 3.5% in plan year 2021. It is projected to reach a low of 2.4% in 2032 and to reach its ultimate value of 4.1% in 2052.

E.4 Summary of Economic Assumptions

The economic assumptions used in this report are summarized in the Table 19.

Table 19 Summary of Economic Assumptions
(percentage)

Plan Year	CPI Increase	Average Earnings Increase of Non-Elective Participants	Projected Yield on Account
2021	0.7	1.5	3.5
2022	2.3	1.5	3.3
2023	2.2	2.0	3.1
2024	2.0	2.0	3.0
2025	2.0	2.0	2.9
2026	2.0	2.2	2.8
2027	2.0	2.4	2.8
2028	2.0	2.6	2.7
2029	2.0	2.7	2.6
2030	2.0	2.7	2.5
2035	2.0	2.7	2.4
2040	2.0	2.7	2.9
2045	2.0	2.7	3.8
2052+	2.0	2.7	4.1

Appendix F — Demographic and Other Assumptions

All contributors to the pension plan for the Public Service of Canada (PS) are covered by a supplementary death benefit as defined under Part II of the PSSA. Hence, given the size of the population subject to the PSSA, except where otherwise noted, the demographic assumptions are the same as those used in the Actuarial Report on the Pension Plan for the Public Service of Canada as at 31 March 2020. Details on these assumptions can be found in Appendix G of that report.

F.1 Demographic Assumptions

F.1.1 Seniority and Promotional Salary Increases

Seniority means length of service within a classification and *promotion* means moving to a higher paid classification.

The following table shows a sample of the assumed seniority and promotional salary increases.

Table 20 Sample of Assumed Seniority and Promotional Salary Increases
(Percentage of annual earnings)

Years of Pensionable Service	Male	Female
0	5.9	6.1
1	5.5	5.7
2	5.0	5.2
3	4.4	4.6
4	3.8	4.0
5	3.3	3.5
6	3.0	3.1
7	2.7	2.9
8	2.5	2.7
9	2.3	2.5
10	2.1	2.4
15	1.5	1.7
20	1.2	1.4
25	1.0	1.2
30	0.9	1.0

F.1.2 New Participants

As the active population of the plan is expected to grow, new participants are projected to replace members that cease to be active as well as increase the number of participants over time.

The assumed percentage increases in the number of participants for each plan year are shown in the following table:

Table 21 Assumed Annual Increases in Number of Contributors

Plan Year	Percentage
2021	4.5
2022	2.0
2023	1.0
2024	0.7
2025+	0.6

New contributors are assumed to share the same characteristics as participants with less than one year of service at the valuation date. In particular they are assumed to have:

- The same average age,
- The same gender distribution, and
- The same average initial salary which is adjusted by the economic salary increase for plan year 2021 and beyond.

F.1.3 Pensionable Retirement

The following tables show a sample of the assumed rates of pensionable retirement.

Table 22 Sample of Assumed Rates of Retirement – Main Group 1 – Male
(Per 1,000 individuals)

Age ¹	Years of Pensionable Service						
	2	5	10	20	29	30	35
50	55	35	30	20	15	20	0
55	60	50	25	20	130	250	315
60	120	65	110	155	270	295	300
65	205	165	185	220	255	305	325
70	215	285	250	290	355	425	410

Table 23 Sample of Assumed Rates of Retirement – Main Group 1 – Female
(Per 1,000 individuals)

Age ¹	Years of Pensionable Service						
	2	5	10	20	29	30	35
50	90	45	15	10	15	10	0
55	90	50	25	35	195	345	490
60	130	75	125	225	360	390	335
65	230	215	245	270	245	285	455
70	195	195	290	380	365	310	490

¹ Expressed in rounded years calculated at the beginning of the plan year.

Table 24 Sample of Assumed Rates of Retirement – Main Group 2 – Male
(Per 1,000 individuals)

Age ¹	Years of Pensionable Service						
	2	5	10	20	29	30	35
55	30	40	25	20	20	20	15
60	95	60	45	55	160	210	345
65	170	170	220	295	400	455	425
70	215	285	250	290	355	425	410

Table 25 Sample of Assumed Rates of Retirement – Main Group 2 – Female
(Per 1,000 individuals)

Age ¹	Years of Pensionable Service						
	2	5	10	20	29	30	35
55	45	35	25	20	20	20	15
60	95	75	65	80	210	300	445
65	195	165	290	380	440	525	425
70	195	195	290	380	365	310	325

Table 26 Sample of Assumed Rates of Retirement – Operational Service
(Per 1,000 individuals)

Age ¹	Years of Pensionable Service						
	2	5	10	19	20	30	35
40	-	-	-	-	10	-	-
45	-	-	-	-	5	20	-
50	75	40	25	10	10	130	160
55	75	50	25	25	25	210	180
60	125	70	120	155	195	345	320
65	215	190	210	260	245	295	390

¹ Expressed in rounded years calculated at the beginning of the plan year.

F.1.4 Disability Retirement

The following table shows a sample of the assumed rates of disabled retirement.

Table 27 Sample of Assumed Rates of Pensionable Disability¹
(Per 1,000 individuals)

Age	Male	Female
25	0.00	0.00
35	0.38	0.89
45	1.44	2.76
55	4.06	7.07
59	4.95	7.44
60	8.02	10.76
61	9.72	12.01
62	11.70	13.20
63	13.69	14.20
64	14.69	15.20

F.1.5 Withdrawal

Withdrawal with less than two years of service includes termination of employment for any reason. Withdrawal with two or more years of service means termination of employment for reasons other than death, disability or retirement with an immediate annuity or an annual allowance. Tables 28 to 30 provide samples of the assumed rates of withdrawal.

Table 28 Sample of Assumed Rates of Withdrawal – Main Group – Male
(Per 1,000 individuals)

Age ²	Years of Pensionable Service						
	0	1	5	10	15	20	21+
20	375	375	-	-	-	-	-
25	150	135	35	-	-	-	-
30	115	105	35	20	-	-	-
35	105	90	25	20	10	-	-
40	105	100	45	10	10	5	-
45	115	100	35	25	15	5	-
50	140	125	30	15	10	5	-
54	160	145	31	15	10	5	-
60	226	215	-	-	-	-	-

¹ Rates for 60 to 64 apply to Group 2 only.

² Expressed in rounded years calculated at the beginning of the plan year.

Table 29 Sample of Assumed Rates of Withdrawal – Main Group – Female
(Per 1,000 individuals)

Age ¹	Years of Pensionable Service						
	0	1	5	10	15	20	21+
20	365	365	-	-	-	-	-
25	145	130	20	-	-	-	-
30	115	105	20	10	-	-	-
35	110	95	25	10	5	-	-
40	110	100	30	15	10	5	-
45	125	110	25	20	10	5	-
50	160	140	35	15	10	5	-
54	190	165	40	20	15	10	-
60	250	230	-	-	-	-	-

The assumed rates of withdrawal are the same for actual operational contributors as well as for deemed operational contributors.

Table 30 Sample of Assumed Rates of Withdrawal – Operational Group
(Per 1,000 individuals)

Years of Pensionable Service	Unisex
0	41
1	36
2	30
3	21
4	19
5	16
10	10
15	11
19	8
20+	-

F.1.6 Elective Participants Entitled to a Deferred Annuity

Due to their negligible impact on costs and liabilities, actual and future deferred annuitants are not taken into consideration for the purpose of this valuation.

F.1.7 Mortality

The following table provides samples of the assumed mortality rates.

Table 31 Sample of Assumed Rates of Mortality

For Plan Year 2021
(Per 1,000 individuals)

Age ¹	Non-Elective Participants and Elective Retired Participants		Elective Disabled Participants	
	Male	Female	Male	Female
	30	0.3	0.2	5.6
40	0.4	0.4	10.2	4.4
50	1.1	0.9	10.3	8.5
60	3.9	2.8	20.0	11.8
70	11.8	9.4	36.1	23.7
80	39.9	28.5	79.3	56.3
90	141.9	113.9	186.5	150.9
100	358.1	323.0	412.4	423.3
110	500.0	500.0	500.0	500.0

Mortality rates are expected to reduce over time. A sample of assumed mortality improvement rates is shown in the following table.

Table 32 Sample of Assumed Mortality Improvement Rates

(applicable at the beginning of the plan year)

Initial and Ultimate Plan Year Mortality Improvement Rates (%)

Age ¹	Male		Female	
	2021	2037+	2021	2037+
	30	1.10	0.80	0.59
40	1.57	0.80	1.42	0.80
50	1.49	0.80	0.98	0.80
60	2.18	0.80	1.65	0.80
70	2.07	0.80	1.49	0.80
80	2.08	0.80	1.50	0.80
90	1.83	0.65	1.66	0.65
100	0.62	0.29	0.67	0.29
110+	0.03	0.01	0.03	0.01

F.2 Election Proportions

The following table provides a sample of the assumed rates of non-elective participants who opt to continue coverage under the plan at retirement. A non-elective participant who becomes disabled is assumed to always opt to continue the coverage.

¹ Expressed in rounded years calculated at the beginning of the plan year.

Table 33 Election Proportions (Non-Elective participants choosing to become elective participants at retirement)

Age ¹	Pensionable Retirement ²	
	Male	Female
45	0.08	0.00
50	0.29	0.28
55	0.79	0.82
60	0.91	0.93
65	0.93	0.94
70	0.95	1.00
71+	1.00	1.00

F.3 Other Assumptions

F.3.1 Option to Reduce Coverage to \$10,000

The valuation data indicates that the proportion of elective participants opting to reduce their basic benefit to \$10,000 is negligible. Accordingly, no elective participants were assumed to make such an option.

F.3.2 Option to Continue the Annual 10% Reduction from Age 61

Bill C-78 introduced this option to participants effective 1 October 1999. Election of this option by participants would have a positive effect on the plan's actuarial excess. The valuation data indicates that approximately 2.3% of participants have opted to continue their 10% annual reduction from age 61 instead of age 66. Accordingly, no participants were assumed to make such an election.

¹ Expressed in rounded years calculated at the beginning of the plan year.

² A pensionable retirement is a retirement resulting in either an immediate annuity for reasons other than disability or an annual allowance.

Appendix G — Acknowledgements

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