PUERTO RICO TEACHERS RETIREMENT SYSTEM

June 30, 2019 Actuarial Valuation Report

1550 Liberty Ridge Drive
Suite 200
Wayne, PA 19087-5572

Tel +1 610 687.5644
Fax +1 610.687.4236

www.milliman.com

August 5, 2022

Mr. Luis M. Collazo Rodríguez, Esq.
Administrator
Puerto Rico Teachers Retirement System
Capital Center Building, North Tower
235 Arterial Hostos Avenue
8th Floor
San Juan, PR 00918

Dear Mr. Collazo:

This report presents the results of the actuarial valuation of the Puerto Rico Teachers Retirement System (PRTRS) as of June 30, 2019. Section I contains highlights of the valuation including a general discussion. The subsequent Sections contain schedules summarizing the underlying calculations, participant data, plan benefits and actuarial assumptions and methods. The final section contains information about risks to the Plan, including considerations for pay-as-you-go financing.

Purpose

The main purposes of this report are:

- to present information pertaining to the operation of the plan for inclusion in financial statements based on relevant Statements of the Government Accounting Standards Board (GASB); and
- to review the experience under the plan since the previous valuation.

In particular, this valuation provides the change in total pension liability under GASB 73 and the change in total other postemployment benefits ("OPEB") liability under GASB 75. This valuation does not include the GASB 73 pension expense nor the GASB 75 OPEB expense.

The use of this report for purposes other than those stated above may not be appropriate and should be reviewed with Milliman.

The report was prepared solely to provide assistance to the Commonwealth of Puerto Rico Teachers Retirement System for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning PRTRS's operations, and uses PRTRS's data, which Milliman has not audited. Milliman and PRTRS do not intend to benefit and assume no duty or liability to other parties who receive this report. Milliman and PRTRS recommend that any third party recipient of this report be aided by its own actuary or other qualified professional when reviewing the Milliman report. Any distribution of this report should be made in its entirety.

<u>Data Reliance</u>

In performing this analysis, we relied on the census data, benefit payment information, and other information (both written and oral) provided by the System. We have not audited or verified the census data, benefit payment information, or other information. To the extent that any of these are inaccurate or incomplete, the results of this valuation may likewise be inaccurate or incomplete.

We did not audit the data used in our analysis, but did review it for reasonableness and consistency and have not found material defects in the data. It is possible that material defects in the data would be uncovered by a detailed, systematic review and comparison of the data to search for data values that are questionable or for relationships that are materially inconsistent. Such a review was beyond the scope of our assignment.

<u>Future Measurements</u>

This valuation report is only an estimate of the System's financial condition as of a single date. It can neither predict the System's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of System benefits. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct. Determining results using alternative assumptions is outside the scope of our engagement.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as the following:

- Plan experience differing from the actuarial assumptions;
- Future changes in the actuarial assumptions;
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements; and,
- Changes in the plan provisions or accounting standards.

Due to the limited scope of our assignment, we did not perform an analysis of the potential range of such measurements.

Certification

We hereby certify that, to the best of our knowledge, this report is complete and accurate and all costs and liabilities were determined in conformance with generally accepted actuarial principles and practices which are consistent with the Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the applicable Guides to Professional Conduct, amplifying Opinions, and supporting recommendations of the American Academy of Actuaries and are based on actuarial assumptions and methods adopted by the System. All of the actuarial assumptions were developed by Milliman in consultation with PRTRS. We believe that the actuarial assumptions and methods used in this actuarial valuation are reasonable for the main purposes of this report as stated herein.

Actuarial computations presented in this report are for purposes of fulfilling financial accounting requirements under the GASB Statements 73 and 75. The calculations in the enclosed report have been made on a basis consistent with our understanding of the plan provisions described in Section V of this report, and of the applicable GASB Statements. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes.

The results shown in this report were developed using models intended for valuations that use standard actuarial techniques.

This valuation reflects the law in effect as of June 30, 2019, as required by GASB accounting. The impact of any prospective legislative changes impacting the System are not yet fully known.

This report was prepared solely to provide assistance to PRTRS. Milliman and PRTRS do not intend to benefit and assume no duty or liability to other parties who receive this report. Milliman and PRTRS recommend that any third party recipient of this report be aided by its own actuary or other qualified professional when reviewing the Milliman report. Any distribution of this report should be made in its entirety.

Qualifications

The consultants who worked on this assignment are retirement actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

We are members of the Society of Actuaries and meet the qualification standards of the American Academy of Actuaries to render this actuarial opinion.

Respectfully submitted,

By: Glenn D. Bowen, F.S.A.
Member American Academy of Actuaries

Richard L. Gordon, F.S.A.
Member American Academy of Actuaries

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PUERTO RICO TEACHERS RETIREMENT SYSTEM

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PUERTO RICO TEACHERS RETIREMENT SYSTEM

SECTION I – SUMMARY

A. Summary of Principal Results of June 30, 2019 Actuarial Valuation

GASB 73 Accounting ($ amounts in thousands)

	June 30, 2018 Valuation	June 30, 2019 Valuation
Total Pension Liability [1]	$15,939,245	$16,801,530

GASB 75 Accounting ($ amounts in thousands)

	June 30, 2018 Valuation	June 30, 2019 Valuation
Total OPEB Liability [1]	$440,834	$434,171

Both the pension benefits accounted for under GASB 73 and the OPEB benefits accounted for under GASB 75 are administered on a pay-as-you-go basis.

[1] A discussion of the benefits included in the Total Pension Liability and the Total OPEB Liability begins on page 3 of this section.

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SECTION I – SUMMARY

	July 1, 2017 Census Data Collection	July 1, 2018 Census Data Collection
Participant Data		
Active Members		
Number	32,024	26,283
Average Salary [1]	$29,854	$29,345
Total Annual Salary [1]	$933,330,917	$771,279,995
Retirees		
Number	37,927	40,610
Average Monthly Basic System Benefit	$1,541	$1,582
Average Monthly System Administered Benefit	$42	$37
Disabled Members		
Number	2,380	2,425
Average Monthly Basic System Benefit	$582	$601
Average Monthly System Administered Benefit	$44	$41
Beneficiaries		
Number	3,463	3,431
Average Monthly Basic System Benefit	$470	$481
Average Monthly System Administered Benefit	$9	$8
Terminated Vested Members		
Number	1,094	1,730
Average Monthly Basic System Benefit	$739	$784

Basic System Benefit and System Administered Benefit amounts shown above are for pension benefits, including minimum benefits and COLAs. Special Law "bonus" benefits are not reflected.

[1] Active members on leave of absence are excluded.

B. General Discussion

Basic System Benefits

As summarized in Section V, the Puerto Rico Teachers Retirement System (PRTRS) provides benefits to members who were hired before August 1, 2014, or their beneficiaries, upon:

- Retirement
- Disability
- Vested withdrawal
- Death
- Nonvested withdrawal (return of contributions)

Annuity benefits are subject to a $300 monthly minimum. Active members are required to contribute 9% of payroll.

These benefits will be referred to as the "Basic System Benefits" throughout this report. Prior to Act 106-2017, these benefits were paid from System assets.

System Administered Benefits

Also summarized in Section V are benefits granted under a series of special laws that are administered by PRTRS, including:

- Additional minimum pension benefits, including the increase in the monthly minimum benefit from $300 to $400
- Additional minimum death benefit (if retired prior to August 1, 2014)
- Ad-hoc cost-of-living adjustments (COLAs)
- Medical insurance plan contribution (if retired prior to August 1, 2014)
- Medication bonus (if retired prior to August 1, 2014)
- Christmas bonus (if retired prior to August 1, 2014)

These benefits will be referred to as "System Administered Benefits" throughout this report. Prior to Act 106-2017, these benefits were generally paid from the Commonwealth's General Fund on a pay-as-you-go basis.

SECTION I – SUMMARY

Benefits included in Total Pension Liability and Total OPEB Liability

The Total OPEB Liability is for the medical insurance plan contribution benefit. The Total Pension Liability is for the Basic System Benefits and all other System Administered Benefits. Note that the Medication Bonus has been included in the Total Pension Liability because members can receive the bonus without submitting documentation to substantiate medication expenses.

System Experience since Prior Valuation

Our analysis of System experience between the June 30, 2018 to June 30, 2019 valuations resulted in a liability loss of $0.19 billion (e.g. – the original June 30, 2018 Total Pension Liability of $15.94 billion was expected to decrease to $15.92 billion as of June 30, 2019, and instead increased to $16.11 billion prior to the changes in assumptions and plan change).

Major sources of gains and losses from the June 30, 2018 valuation to the June 30, 2019 valuation are as follows:

1. $9 million loss on rehired active members who were not included in the June 30, 2018 valuation.
2. $270 million loss on roughly 3,600 active members who retired since the prior valuation.
3. $22 million loss on roughly 170 “pop-up” retirees and terminated vested members who were not included in the prior year census data.
4. $65 million gain from active members terminating employment.

Further discussion is warranted on Item 2.

For Item 2, the act of retiring from active status generates a liability loss for an individual member. Possible explanations for additional liability losses attributable to individual members include any data clean-up that may have occurred during the benefit calculation process when the member retired.

Changes in Assumptions since Prior Valuation

In accordance with GASB 73 and GASB 75, the discount rate is based on a bond market index. PRTRS has selected the Bond Buyer General Obligation 20-Bond Municipal Bond

Index for this purpose. The index rate and resulting discount rate decreased from 3.87% as of June 30, 2018 to 3.50% as of June 30, 2019.

The projected mortality improvement scale was updated from Scale MP-2018 to Scale MP-2019.

In April 2018, Administrative Order OA-2018-4 enacted the Program of Voluntary Transition for Employees for Employees of the Department of Education "2018 Voluntary Transition Program". Members who elected to voluntarily resign received salary continuation (primarily for a 12 month period) to be paid during Fiscal Year 2018-2019. Members who were eligible to retire at the time of resignation could commence their PRTRS pension benefit after the salary continuation period expires. Members who were not eligible to retire have the option of requesting a refund of contributions to be paid after the salary continuation period expires, or commence their PRTRS pension benefit at a later date when they have met retirement eligibility conditions.

For purposes of this valuation, the 716 active members as of July 1, 2018 who were indicated as participating in the 2018 Voluntary Transition Program were assumed to retire (if eligible to do so) or terminate (if not eligible to retire) on July 1, 2018.

In addition, active members as of July 1, 2017 who were not reported in the July 1, 2018 data but were reported in the July 1, 2019 data as retirees were reflected as retirees in the July 1, 2018 data. Therefore, the retirement rates for active members as of July 1, 2018 who did not participate in the 2018 Voluntary Transition Program were set to 0% for 2018-2019.

Changes in Plan Provisions since Prior Valuation

There have been no changes plan provisions since the prior valuation.

Changes in Methods since the Prior Valuation

There have been no changes in methods since the prior valuation.

SECTION I – SUMMARY

Overview of Recent Significant Changes in Plan Provisions

Act 3-2017

Act 66-2014 originally implemented a salary freeze for FY 2014-15 through FY 2016-17. The recent extension in Act 3-2017 freezes salaries for four additional years, through FY 2020-21.

Act 106-2017

Act 106-2017 was enacted on August 23, 2017 and impacts the benefits provided to PRTRS members as follows:

- New employees hired July 1, 2017 or later will be participants in a separate defined contribution plan outside of PRTRS and will not become PRTRS members.
- Effective July 1, 2017, current PRTRS members who were hired August 1, 2014 or later had their Defined Contribution Account assets transferred to a separate defined contribution plan outside of PRTRS and are no longer PRTRS members. The amount transferred was $11.5 million.

In addition to the benefit changes, Act 106-2017 provided that PRTRS will be funded on a pay-as-you-go basis effective July 1, 2017. The following contributions were eliminated by Act 106-2017:

- Act 114-2011 employer contributions – was 14.75% of payroll in 2016-2017 and was scheduled to increase by 1.25% of payroll per year to an ultimate rate of 20.525% of payroll in 2021-2022 and later
- Act 160-2013 Annual Additional Contribution – was scheduled to become effective for the 2018-2019 fiscal year, payable until 2041-2042 with annual recalculations
- Act 160-2013 Teacher's Justice Uniform Contribution - $30 million for the 2016-2017 and 2017-2018 fiscal years and $60 million for each fiscal year from 2018-2019 to 2041-2042
- Act 160-2013 Supplemental Contributions – $1,675 each fiscal year for each pensioner (including beneficiaries receiving survivor benefits)

SECTION I – SUMMARY

Fiscal Plan

The *2021 Fiscal Plan for Puerto Rico* was certified on April 23, 2021 by the Financial Oversight and Management Board ("FOMB"), a body created by the enactment of the Puerto Rico Oversight, Management, and Economic Stability Act ("PROMESA"). The liabilities presented in this valuation are based on existing law only.

GASB Pension Accounting Information

Pension accounting results in Section II of this report have been prepared under GASB 73 parameters to determine a Total Pension Liability at the end of the fiscal year. The Total Pension Liability reflects the full amount of the liability, and thus can be significantly volatile from year to year.

GASB OPEB Accounting Information

OPEB accounting results in Section III of this report have been prepared under GASB 75 parameters to determine a Total OPEB Liability at the end of the fiscal year. The Total OPEB Liability reflects the full amount of the liability, and thus can be significantly volatile from year to year.

SECTION II - GASB 73 ACCOUNTING INFORMATION

A. Total Pension Liability

	June 30, 2018	June 30, 2019
Total Pension Liability		
Total pension liability	$15,939,245,054	$16,801,529,902
Covered payroll	$933,330,917	$771,279,995
Total pension liability as a % of covered payroll	1707.78%	2178.40%

The total pension liability was determined by an actuarial valuation as of July 1, 2018, calculated based on the discount rate and actuarial assumptions as shown in Section VI and was then projected forward to June 30, 2019. There have not been significant changes between the valuation date of July 1, 2018 and the fiscal year end. Any significant changes during this period must be reflected as prescribed by GASB 73. Covered Payroll is as of July 1, 2018.

Discount Rate

Discount rate	3.87%	3.50%
Municipal bond rate	3.87%	3.50%

The discount rate was based on the Bond Buyer General Obligation 20-Bond Municipal Index.

Other Key Actuarial Assumptions

Please refer to Section VI of this report for the other actuarial assumptions used.

Valuation date	July 1, 2017	July 1, 2018
Measurement date	June 30, 2018	June 30, 2019
Actuarial cost method	Entry Age Normal	Entry Age Normal

SECTION II - GASB 73 ACCOUNTING INFORMATION

B. GASB 73 Benefit Obligations as of June 30, 2019

	Basic System Benefits	System Administered Benefits	Total
1. Projected Benefits Payable to Retirees and Beneficiaries			
Retirees	$11,039,877,472	$278,037,962	$11,317,915,434
Disabled Members	255,897,357	19,685,211	275,582,568
Beneficiaries	197,000,499	5,322,316	202,322,815
Total	11,492,775,328	303,045,489	11,795,820,817
2. Projected Benefits Payable to Vested Terminated Members	210,908,588	760,165	211,668,753
3. Actuarial Accrued Liability for Active Members	4,759,979,337	0	4,759,979,337
4. Refund of Contributions due to former members	34,060,995	0	34,060,995
5. Total Pension Liability as of June 30, 2019: (1) + (2) + (3) + (4)	$16,497,724,248	$303,805,654	$16,801,529,902

The above liabilities are for Basic System Benefits and selected System Administered Benefits. See Section I for more information.

SECTION II - GASB 73 ACCOUNTING INFORMATION

C. Changes in Total Pension Liability

Changes in Total Pension Liability	Increase (Decrease) Total Pension Liability
Balances as of June 30, 2018	$15,939,245,054
Changes for the year:	
Service cost	176,718,146
Interest on total pension liability	608,211,500
Effect of plan changes	0
Effect of economic/demographic (gains) or losses	188,311,493
Effect of assumptions changes or inputs	696,515,949
Benefit payments	(807,472,240)
Balances as of June 30, 2019	$16,801,529,902

D. Sensitivity Analysis

The following presents the total pension liability of PRTRS, calculated using the discount rate of 3.50%, as well as what the System's total pension liability would be if it were calculated using a discount rate that is 1 percentage point lower (2.50%) or 1 percentage point higher (4.50%) than the current rate.

	1% Decrease 2.50%	Current Discount Rate 3.50%	1% Increase 4.50%
Total pension liability	$19,140,018,221	$16,801,529,902	$14,882,445,667

SECTION III - GASB 75 ACCOUNTING INFORMATION

A. Total OPEB Liability

	June 30, 2018	June 30, 2019
Total OPEB Liability		
Total OPEB liability	$440,834,249	$434,170,515
Covered payroll	N/A	N/A
Total OPEB liability as a % of covered payroll	N/A	N/A

The total OPEB liability was determined by an actuarial valuation as of July 1, 2018, calculated based on the discount rate and actuarial assumptions as shown in Section VI and was then projected forward to June 30, 2019. There have not been significant changes between the valuation date of July 1, 2018 and the fiscal year end. Any significant changes during this period must be reflected as prescribed by GASB 75.

Discount Rate

Discount rate	3.87%	3.50%
Municipal bond rate	3.87%	3.50%

The discount rate was based on the Bond Buyer General Obligation 20-Bond Municipal Index.

Other Key Actuarial Assumptions

Please refer to Section VI of this report for the other actuarial assumptions used.

Valuation date	July 1, 2017	July 1, 2018
Measurement date	June 30, 2018	June 30, 2019
Actuarial cost method	Entry Age Normal	Entry Age Normal
Medical trend rate	not applicable	not applicable

SECTION III - GASB 75 ACCOUNTING INFORMATION

B. GASB 75 Benefit Obligations as of June 30, 2019

1. Projected Benefits Payable to Retirees and Beneficiaries	
Retirees	$408,165,991
Disabled Members	26,004,524
Beneficiaries	0
Total	434,170,515
2. Projected Benefits Payable to Vested Terminated Members	0
3. Actuarial Accrued Liability for Active Members	0
4. Total OPEB Liability as of June 30, 2019: (1) + (2) + (3)	434,170,515

The above liabilities are for the Medical Insurance Plan Contribution portion of the System Administered Benefits. See Section I for more information.

SECTION III - GASB 75 ACCOUNTING INFORMATION

C. Changes in Total OPEB Liability

Changes in Total OPEB Liability	Increase (Decrease) Total OPEB Liability
Balances as of June 30, 2018	$440,834,249
Changes for the year:	
Service cost	0
Interest on total OPEB liability	16,408,925
Effect of plan changes	0
Effect of economic/demographic (gains) or losses	(1,882,414)
Effect of assumptions changes or inputs	12,794,392
Benefit payments	(33,984,637)
Balances as of June 30, 2019	$434,170,515

D. Sensitivity Analysis

The following presents the total OPEB liability of PRTRS, calculated using the discount rate of 3.50%, as well as what the System's total OPEB liability would be if it were calculated using a discount rate that is 1 percentage point lower (2.50%) or 1 percentage point higher (4.50%) than the current rate.

	1% Decrease 2.50%	Current Discount Rate 3.50%	1% Increase 4.50%
Total OPEB liability	$478,208,549	$434,170,515	$396,858,727

PUERTO RICO TEACHERS RETIREMENT SYSTEM

SECTION IV – CENSUS DATA

A. Reconciliation with Prior Valuation

	Active [1]	Terminated Vested	Retirees, Disabled Members, and Beneficiaries	Total
Members as of July 1, 2017	32,024 [2]	1,094	43,770	76,888
Changes				
Terminated Vested	(795)	795	0	0
Retired & Disabled	(3,551)	(20)	3,571	0
Death	(5)	(5)	(1,119)	(1,129)
Disappeared	(867)	0	0	(867)
Return/Transfer of Contributions	(718)	(229)	0	(947)
Return to Active	95	(15)	(2)	78
Newly Reported	100	110	246	456
Members as of July 1, 2018	26,283	1,730	46,466	74,479

[1] The July 1, 2017 census data reflects retirements during July 2017. The July 1, 2018 census data reflects retirements during July 2018 through June 2019.

[2] Includes 761 members on leave of absence without pay who are assumed not to earn additional benefits.

The liability for the Return of Contributions due to former Members was provided by the System and equals the accumulated contributions with interest as of June 30, 2019 for former participants who terminated employment by June 30, 2019 and have not received a return of contributions as of June 30, 2019.

SECTION IV – CENSUS DATA

B. Summary of Active Members as of July 1, 2018

Number of Defined Benefit Active Members

Age Group	Years of Service							
	0-4	5-9	10-14	15-19	20-24	25-29	30+	Total
<25	-	-	-	-	-	-	-	-
25-29	190	90	-	-	-	-	-	280
30-34	661	1,479	223	-	-	-	-	2,363
35-39	420	1,240	1,572	393	-	-	-	3,625
40-44	249	698	1,024	2,646	137	1	-	4,755
45-49	185	411	677	1,888	1,511	307	-	4,979
50-54	113	295	497	1,261	1,274	2,238	43	5,721
55-59	84	156	304	749	650	1,154	85	3,182
60-64	25	86	84	224	198	342	59	1,018
65-69	10	19	27	55	44	83	33	271
70+	3	7	7	16	13	26	17	89
Total	1,940	4,481	4,415	7,232	3,827	4,151	237	26,283

Average Annual Compensation of Defined Benefit Active Members
(excluding 0 leave of absence members)

Age Group	Years of Service							
	0-4	5-9	10-14	15-19	20-24	25-29	30+	Average
<25	-	-	-	-	-	-	-	-
25-29	21,078	21,347	-	-	-	-	-	21,165
30-34	21,257	21,860	23,413	-	-	-	-	21,838
35-39	21,088	22,007	25,542	30,711	-	-	-	24,377
40-44	21,457	22,235	26,296	32,276	34,715	27,000	-	29,017
45-49	22,553	22,320	26,159	32,351	34,484	35,353	-	31,149
50-54	23,248	22,678	26,026	31,903	34,028	35,149	36,995	32,527
55-59	23,866	22,685	25,643	31,499	33,892	34,558	38,145	32,082
60-64	23,385	23,184	26,084	31,004	33,540	34,845	37,056	31,885
65-69	23,619	24,851	25,422	30,981	34,889	34,374	38,647	32,333
70+	21,780	22,214	26,277	30,718	33,472	35,563	39,284	32,852
Average	21,622	22,112	25,776	32,012	34,192	34,960	37,817	29,345

SECTION IV – CENSUS DATA

C. Summary of Terminated Vested Members as of July 1, 2018

Terminated Vested

Age	Count	Average Annual Basic System Pension Benefit
<35	9	4,727
35-39	124	6,247
40-44	323	7,780
45-49	309	8,504
50-54	293	9,886
55-59	327	9,995
60-64	154	11,586
65+	191	12,388
All	1,730	9,407

The average annual pension amounts are as of July 1, 2018. The $400 minimum monthly benefit is not reflected.

SECTION IV – CENSUS DATA

D. Summary of Participants in Pay Status as of July 1, 2018

All average annual pension amounts are as of July 1, 2018.

Retirees

Age	Count	Average Annual Basic System Pension Benefit	Average Annual Total Pension Benefit
<45	4	11,102	11,102
45-49	60	18,710	18,710
50-54	1,441	23,304	23,305
55-59	5,126	24,791	24,792
60-64	8,436	23,357	23,362
65-69	8,626	20,295	20,473
70-74	6,346	17,316	17,883
75-79	4,240	14,241	15,205
80-84	2,984	11,597	12,897
85-89	2,022	10,000	11,529
90-94	972	9,023	10,441
95-99	296	8,554	9,855
100+	57	9,067	10,308
All	40,610	18,982	19,427

In addition, 532 retirees are currently paying annual additional contributions of $1,678,110 (via a reduced monthly benefit which is not reflected above). The 50 Act 70-2010 retirees as of July 1, 2017 have initial monthly employer contributions totaling $15,996 and the amounts above do not reflect the deferral of the benefits for these retirees.

PUERTO RICO TEACHERS RETIREMENT SYSTEM

SECTION IV – CENSUS DATA

D. Summary of Participants in Pay Status as of July 1, 2018

Disabled Members

Age	Count	Average Annual Basic System Pension Benefit	Average Annual Total Pension Benefit
<45	41	7,135	7,160
45-49	93	8,961	8,989
50-54	257	10,263	10,321
55-59	359	10,165	10,271
60-64	406	8,851	9,138
65-69	299	6,179	6,813
70-74	262	5,242	6,058
75-79	247	4,698	5,578
80-84	197	4,598	5,446
85-89	170	4,444	5,335
90-94	65	4,531	5,377
95-99	20	4,391	5,299
100+	9	5,160	5,945
All	2,425	7,207	7,699

Beneficiaries

Age	Count	Average Annual Basic System Pension Benefit	Average Annual Total Pension Benefit
<30	47	5,800	5,855
30-35	2	3,438	3,646
35-39	13	6,327	6,404
40-44	19	5,762	5,769
45-49	47	5,622	5,673
50-54	71	6,657	6,744
55-59	104	6,634	6,701
60-64	207	7,116	7,217
65-69	322	7,442	7,553
70-74	558	6,427	6,509
75-79	547	5,981	6,085
80-84	638	5,166	5,266
85-89	479	4,787	4,879
90+	377	4,271	4,368
All	3,431	5,778	5,872

SECTION V – SUMMARY OF PRINCIPAL PLAN PROVISIONS AS OF JUNE 30, 2019

PRTRS was established in 1951. Act 106-2017 (enacted August 23, 2017) superseded Act 160-2013 (enacted December 24, 2013), which superseded Act 91-2004 (enacted March 29, 2004), which superseded Act 218-1951 (enacted May 6, 1951).

Prior to Act 106-2017, two main sets of benefit provisions applied to various members of PRTRS depending on the member's date of hire. Act 106-2017 closed participation in PRTRS to members hired July 1, 2017 and later. Members hired August 1, 2014 through June 30, 2017 had their defined contribution account assets moved to a separate defined contribution plan outside of PRTRS and are no longer members of PRTRS.

The following plan provisions apply to members hired on or before July 31, 2014 and reflects the provisions of Act 160-2013, as modified by the April 11, 2014 decision of the Puerto Rico Supreme Court. Distinctions for members who retired August 1, 2014 or later are noted throughout as applicable. Per System policy, administrative staff who resigned July 31, 2014 and commenced retirement benefits August 1, 2014 and members who requested disability retirement by July 31, 2014 who subsequently commenced disability retirement benefits are entitled to the medical insurance plan contribution, the Christmas bonus, and the medication bonus as if they had actually retired prior to August 1, 2014.

This summary of plan provisions is intended only to describe the essential features of the plan for valuation purposes. All eligibility requirements and benefit amounts shall be determined in strict accordance with the plan document itself.

References to Act 160-2013 in this summary are all inclusive and refer to the applicable section, together with any modifications by the April 11, 2014 Supreme Court decision and the June 9, 2016 sentence from the Puerto Rico Court of Appeals.

Act 106-2017 eliminated the prior statutory employer contributions and changed the funding of Systems benefits to pay-as-you-go by the Commonwealth. Prior to July 1, 2017, most benefits were paid from system assets while some benefits were paid by the General Fund.

1. Type of Plan

   A contributory, defined benefit pension plan.

SECTION V – SUMMARY OF PRINCIPAL PLAN PROVISIONS AS OF JUNE 30, 2019

2. Eligibility for Membership

   Members of the Teacher's Retirement System of Puerto Rico include teachers hired by the Department of Education on or before July 31, 2014, retired teachers, licensed teachers working in private schools or other educational organizations who elect to become members on or before July 31, 2014, employees of the System hired before March 29, 2004 who elected to become members, and employees of the System hired on or after March 29, 2004 and on or before July 31, 2014 (Act 160-2013, Article 3.1).

3. Definitions

   a. Fiscal Year: A Fiscal Year is a 12-month period beginning on July 1 and ending on June 30.

   b. Fund: System Contribution Fund (Act 160-2013, Article 4.1).

   c. General Fund: The General Expenses Budget of the Government of the Commonwealth of Puerto Rico.

   d. Creditable Service: The years and months of plan participation, during which contributions have been made, beginning on the date of the first original appointment for rendering services. For purposes of calculating Creditable Service, 15 calendar days of a school year month shall be equal to 1 calendar month worked during the school year for teachers; and 21 calendar days of a month shall be equal to 1 calendar month worked for other participants. (Act 160-2013, Article 3.8) Creditable Service also includes purchased service, if any (Act 160-2013, Articles 3.6 and 3.8).

   e. Compensation: The gross cash compensation, excluding bonuses and overtime, upon which contributions by a Member to the Fund are based (Act 160-2013, Article 1.1).

   f. Average Compensation: The average of the 36 highest months of compensation that the participant has received for Creditable Service (Act 160-2013, Article 1.1).

SECTION V – SUMMARY OF PRINCIPAL PLAN PROVISIONS AS OF JUNE 30, 2019

g. Average Non-occupational Disability Compensation: The average of the 60 highest consecutive months of compensation that the participant has received. (Act 160-2013, Article 4.6).

h. Average Occupational Disability Compensation: The average of the 60 highest consecutive months of compensation that the participant has received. If less than 60 months of creditable service, the average of the monthly compensation that the participant has received. (Act 160-2013, Article 4.6).

i. Contributions: The amount deducted from the compensation of a Member or directly paid to the System (Act 160-2013, Article 1.1).

j. Accumulated Contributions: The sum of all amounts deducted from the compensation of a Member or directly paid to the System, without interest.

4. Retirement Benefits

   a. Retirement because of age

      Eligibility: Age 60 with 10 years of Creditable Service (Act 160-2013, Article 3.9).

      Benefit: Members who retire because of age shall be entitled to a lifetime monthly income equal to 1.8% of Average Compensation multiplied by years of Creditable Service (Act 160-2013, Article 4.4). In no event will the benefit determined be less than the Minimum Benefit.

      Additional Contributions required: None.

   b. Retirement because of age and years of service

      Eligibility: Age 47 with 25 years of Creditable Service (Act 160-2013, Article 3.9).

      Benefit: Members who retire because of age and years of service shall be entitled to a lifetime monthly income based on age and years of Creditable Service as shown below (Act 160-2013, Article 4.4). In no event will the benefit determined below be less than the Minimum Benefit.

SECTION V – SUMMARY OF PRINCIPAL PLAN PROVISIONS AS OF JUNE 30, 2019

Attained Age	Years of Creditable Service	Lifetime Monthly Income
55	30	75% of Average Compensation
50	30	75% of Average Compensation
Under 50	30	65% of Average Compensation
50	25 but less than 30	1.8% of Average Compensation multiplied by years of Creditable Service
47 but less than 50	25 but less than 30	95% of 1.8% of Average Compensation multiplied by years of Creditable Service

Additional Contributions required: If a member retires at age 55 or older with at least 30 years of Creditable Service, no additional contributions are required. Members who retired before December 24, 2013 who have not attained age 55 and 30 years of Creditable Service at retirement must contribute to the Fund 9% of the Average Compensation on a monthly basis for a minimum period of 5 years after retiring because of age and years of service. Current administrative practice requires contributions until attainment of both age 55 and the date when 30 years of Creditable Service would have been completed if employment had continued for members who retired before December 24, 2013. Members who retired on or after December 24, 2013 who have not attained age 55 and 30 years of Creditable Service at retirement must contribute to the Fund 9% of the Average Compensation on a monthly basis until attainment of age 55. Prior to July 1, 2017, the employer of each of these members shall continue making the corresponding employer contributions while the member is paying the 9% additional contribution until the age 55 requirement is met; effective July 1, 2017, this employer contribution was eliminated due to Act 106-2017. (Act 160-2013, Article 4.4)

5. Termination Benefits

   a. Lump Sum Withdrawal

      Eligibility: A Member is eligible upon termination of service.

      Benefit: The benefit equals a refund of Accumulated Contributions, plus compound interest accumulated at 2.0% per annum for a period no longer than 6 months following separation of service. (Act 160-2013, Article 3.4)

b. Deferred Retirement

Eligibility: A Member is eligible upon termination of service prior to age 60 and after 10 years of Creditable Service, provided the member has not taken a lump sum withdrawal (Act 160-2013, Article 4.4).

Benefit: The benefit, commencing at age 60, is equal to 1.8% of Average Compensation multiplied by years of Creditable Service at date of termination (Act 160-2013, Article 4.4). In no event will the benefit determined be less than the Minimum Benefit.

6. Death Benefits

a. Pre-retirement Death Benefit

Eligibility: Any current non-retired member is eligible.

Benefit: The benefit is as follows:

(i) While in active service, the benefit equals a refund of Accumulated Contributions, plus interest accumulated at 2.0% per annum until the date of death; plus, if death occurred on or before July 31, 2014, an amount equal to one year of Compensation in effect at the time of death (Act 160-2013, Article 3.18).

(ii) While not in active service, the benefit equals a refund of Accumulated Contributions, plus interest accumulated at 2.0% per annum up to separation of service (Act 160-2013, Article 3.17).

b. Post-retirement Death Benefit for members who retired on or before July 31, 2014

Eligibility: Any retiree or disabled member receiving a monthly benefit who retired on or before July 31, 2014.

Benefit: The benefit is as follows:

(i) Full pension for the month in which the pensioner died plus an additional fifteen-day pay period payable to the member's eligible beneficiaries (Act 160-2013, Article 4.8). In no case shall the benefit be less than $1,000. Prior to July 1, 2017, the General Fund paid up to $500 and the System paid for the rest. (Act 160-2013, Article 4.8 and Act 272-2004)

(ii) For those married at the time of death, the lifetime annual income to a widow or widower is equal to 50% of the Retirement Benefit at time of death, payable for life (Act 160-2013, Article 4.8).

(iii) For those with children at the time of death, the total lifetime annual income to all children is equal to 50% of the Retirement Benefit at time of death. The benefit is payable while the children are under age 6 or are currently enrolled in a regular public or private school or college program until the age of 22, and it is payable for life while they are disabled (Act 160-2013, Article 4.8).

(iv) The benefit, when there is no relation as stated above, is equal to the remaining balance of Accumulated Contributions with interest (interest is determined as of the date of retirement if retired directly from active service or as of separation of service otherwise) after the deduction of lifetime annual income paid and is payable to a beneficiary or to the Member's estate (Act 160-2013, Article 4.8).

c. Post-retirement Death Benefit for Members who retire August 1, 2014 or later

Eligibility: Any retiree or disabled member receiving a monthly benefit whose retirement occurred August 1, 2014 or later (Act 160-2013, Articles 4.8 and 5.11).

Benefit: If the member elected at the time of retirement to transfer a portion of the annuity to a beneficiary by selecting an actuarially equivalent optional form of payment, the applicable survivor benefit (Act 160-2013, Article 5.11).

For all members, the excess, if any, of the Accumulated Contributions with interest (interest is determined as of the date of retirement if retired directly from active service or as of separation of service otherwise) after the deduction of lifetime annual income paid and is payable to a beneficiary or to the member's estate (Act 160-2013, Article 5.11). Beneficiaries may elect to receive the remaining accumulated contributions as a lump sum payment or a monthly payment of the pension amount until the depletion of the contributed amount.

7. Disability Benefits

   a. Non-occupational Disability

      Eligibility: All members are eligible for Non-occupational Disability upon 5 years of Creditable Service and the occurrence of disability (Act 160-2013, Article 4.5).

      Benefit: 1.8% of Average Non-occupational Disability Compensation multiplied by years of Creditable Service (Act 160-2013, Article 4.6). In no event will the benefit determined be less than the Minimum Benefit.

   b. Occupational Disability

      Eligibility: All members disabled while in the course and as a consequence of their work (Act 160-2013, Article 4.5).

      Benefit: 1.8% of Average Occupational Disability Compensation multiplied by years of Creditable Service (Act 160-2013, Article 4.6). In no event will the benefit determined be less than the Minimum Benefit.

8. Minimum Benefits

   a. Past Ad hoc Increases: The legislature, from time to time, increases pensions for certain retirees as described in Act 124-1973 and Act 47-1984. Prior to July 1, 2017, the benefits were paid 50% by the General Fund and 50% by the System.

   b. Current Minimum Benefit: The minimum monthly lifetime income for members who retire or become disabled is $400 per month effective July 1, 2007 ($300 per month up to June 30, 2007). Prior to July 1, 2017, the General Fund paid for the $100 per month increase in the minimum benefit (Act 38-2007, Section 3).

9. Cost-of-Living Adjustments (COLA) to Pension Benefits: The legislature, from time to time, increases pensions by 3% for retired and disabled members. Beneficiaries are not entitled to COLAs granted after the retiree's death. The first increase was granted by Act 62-1992. Subsequent 3% increases have been granted every third year since

1992, with the latest 3% increase established on April 24, 2007 and effective July 1, 2007 (retroactive to January 1, 2007) for retired and disabled members that were receiving a monthly benefit on or before January 1, 2004 (Act 38-2007). In addition, effective July 1, 2008, any retired or disabled member that was receiving a monthly annuity on or before January 1, 2004 less than $1,250 per month received an increase of up to 3% without exceeding the limit of $1,250 per month (Act 38-2007). Prior to July 1, 2017, all COLAs were paid by the General Fund, with the exception of Act 226-1998 (various Acts).

10. Medical Insurance Plan Contribution: A payment of up to $100 per month to the eligible medical insurance plan selected by the retiree or disabled member provided the member retired prior to August 1, 2014. (Act 160-2013, Article 4.9).

11. Special "Bonus" Benefits:

    a. Christmas Bonus: An annual bonus of $200 for each retiree and disabled member paid in December provided the member retired prior to August 1, 2014. (Act 160-2013, Article 4.9).

    b. Medication Bonus: An annual bonus of $100 to cover health costs paid in July for each retiree and disabled member provided the member retired prior to August 1, 2014 and for each beneficiary provided the associated member had died prior to August 1, 2014. Evidence of coverage is not required. The amount is prorated if there are multiple beneficiaries. (Act 160-2013, Article 4.9).

12. Member Contributions: Contributions by Members are 9% of Compensation (Act 160-2013, Article 4.3). Before January 27, 2000, member contributions were 7% of Compensation. In addition, members who retired due to age and service who are not age 55 and 30 years of Creditable Service at the time of retirement are required to continue to pay the member contributions as described in Item 4b.

13. Service Purchase: Active members with eligible service from prior employment may elect to purchase service in PRTRS. The cost of the purchase is calculated by applying the PRTRS statutory member and employer contribution rates to the member's salary during the years of service at the former employer. The amount due to member contributions is accumulated at 9.5% compound per year until the time of service purchase. If the service purchase is a time purchase and not an intergovernmental service transfer, the amount due to employer contributions is

accumulated at 9.5% compound per year until the time of service purchase. The accumulation rate was 2% compound per year for purchases prior to September 15, 2015. Any amount not covered by asset transfers from the member's prior pension fund is payable by the member. (Act 160-2013, Article 3.6)

14. Act 70-2010 Retirement Incentive: During the 2010-2011 fiscal year, Act 70-2010 provided for an early retirement incentive. Additional window periods occurred through December 31, 2012. Active members who had at least 15 years of service, but less than 30 years of service, were able to retire immediately with an enhanced benefit ranging from 37.5% to 50% of salary. This enhanced benefit is paid by the General Fund until the member reaches the later of age 55 or the date the member would have completed 30 years of service had the member continued working. The System will have the liability to pay the benefit after this time period. While the General Fund is paying the pension benefit to the member or any surviving beneficiary, the General Fund will also pay a contribution to the System equal to the employer contribution rate (11.50% for the 2013-2014 fiscal year) applied to final salary. The employer contribution rate applied to final salary increases as under Act 160-2013 to an ultimate rate of 20.525% of payroll in 2021-2022 and thereafter. Members who retired under this incentive are not eligible to receive the Medical Insurance Plan Contribution.

Changes in Plan Provisions since Prior Valuation

None.

SECTION VI – SUMMARY OF ACTUARIAL ASSUMPTIONS AS OF JUNE 30, 2019

Municipal Bond Rate: 3.50% per annum (Bond Buyer General Obligation 20-Bond Municipal Index)

GASB 73 and GASB 75 discount rate: 3.50% per annum

Compensation Increases: Compensation increases vary by years of creditable service as shown below. The rates below include the assumption for general wage inflation of 2.5%. However, no compensation increases are assumed from July 1, 2013 until July 1, 2021 as a result of the Act 3-2017 four year extension of the Act 66-2014 salary freeze. Merit scale is based on a 2004-2007 experience study. Compensation increases are modified for the impact of Act 66-2014 as extended by Act 3-2017.

Years of Creditable Service	Increase in Annual Rate over Prior Year	Years of Creditable Service	Increase in Annual Rate over Prior Year
1-5	4.70%	15	3.20%
6	4.50	16	3.10
7	4.30	17-19	3.00
8	4.10	20	2.90
9	3.90	21	2.80
10	3.80	22	2.75
11	3.70	23	2.70
12	3.60	24-27	2.65
13	3.50	28	2.60
14	3.30	29 & Over	2.50

Termination: Withdrawal rates vary by gender and years of creditable service. The withdrawal rates are shown below. Based on a 2004-2007 experience study as well as the actuary's judgment and continual review of experience.

Years of Creditable Service	Male	Female
0	12.00%	15.00%
1	9.00	8.00
2	6.00	5.00
3	3.00	3.00
4	3.00	2.75
5	2.50	2.50

Years of Creditable Service	Male	Female
6	2.50	2.25
7	2.00	2.00
8	1.50	1.50
9	1.00	0.50
10+	0.10	0.05

However, for active members who participated in the 2018 Voluntary Transition Program, members who were not eligible to retire July 1, 2018 were assumed to terminate effective July 1, 2018.

Retirement: Rates of retirement vary by age and years of creditable service. The rates shown below apply when an active member is eligible for retirement (e.g. age 47 with at least 25 years of creditable service or age 60 with at least 10 years of creditable service). Based on a 2004-2007 experience study as well as the actuary's judgment and continual review of experience.

Age	Less than 30 years of Creditable Service	30 or more years of Creditable Service
47-49	0.5%	20.0%
50-54	2.0	25.0
55-59	5.0	30.0
60-61	10.0	25.0
62-64	12.0	25.0
65-79	15.0	25.0
80	100.0	100.0

However, for active members who participated in the 2018 Voluntary Transition Program, members who were eligible to retire July 1, 2018 were assumed to do so effective July 1, 2018.

Retirement rates for active members as of July 1, 2018 who did not participate in the 2018 Voluntary Transition Program were set to 0% for 2018-2019 to reflect that members who retired from July 1, 2018 to June 30, 2019 were reflected as retirees in the July 1, 2018 data.

Current terminated vested members as of the census data collection date were assumed to retire (i) at age 55, or attained age if later, if the member had at least 30 years of service or (ii) at age 60, or attained age if later, otherwise. Future terminated vested participants are assumed to retire at age 60.

Disability: Unisex rates which vary by age and years of creditable service are assumed. Illustrative rates are shown below. Rates of disability cease to apply upon attainment of retirement eligibility. Based on a 2004-2007 experience study as well as the actuary's judgment and continual review of experience.

Age	Less than 5 years of Creditable Service	5 or more years of Creditable Service
25	0.008%	0.013%
30	0.008	0.013
35	0.008	0.013
40	0.009	0.014
45	0.020	0.031
50	0.068	0.105
55	0.133	0.204
60	0.163	0.251
65	0.157	0.242
70	0.144	0.222

Pre-retirement Mortality: RP-2014 Employee Mortality Rates for males and females adjusted to reflect Mortality Improvement Scale MP-2019 from the 2006 base year, and projected forward using MP-2019 on a generational basis. As a generational table, it reflects mortality improvements both before and after the measurement date. Based on actuary's judgment.

Post-retirement Healthy Mortality: Rates which vary by gender are assumed for healthy retirees and beneficiaries based on a study of plan's experience from 2007 to 2012 and updated expectations regarding future mortality improvements. The 2010 base rates are equal to 92% of the rates from the UP-1994 Mortality Table for Males and 87% of the rates from the UP-1994 Mortality Table for Females. These base rates are projected using Mortality Improvement Scale MP-2019 on a generational basis from the 2010 base year. As a generational table, it reflects mortality improvements both before and after the measurement date.

Post-retirement Disabled Mortality: Rates which vary by gender are assumed for disabled retirees based on a study of plan's experience from 2007 to 2012 and updated expectations regarding future mortality improvements. The 2010 base rates are equal to the rates in the UP-1994 Mortality Table for males and females. These base rates are projected using Mortality Improvement Scale MP-2019 on a generational basis from the 2010 base year. As a generational table, it reflects mortality improvements both before and after the measurement date.

Marriage: 65% of current active and terminated members are assumed to be married at retirement with males 3 years older than females.

Form of Payment: For members retiring after July 31, 2014, a modified cash refund (approximated by a single life annuity with 3 years certain).

Spousal information was not provided for current retired and disabled members who retired prior to August 1, 2014. A 65% marriage assumption was applied to all current retirees and disabled members who retired prior to August 1, 2014 retroactively to the date of retirement or disability. The spouse's date of birth was imputed based on an assumed age difference of 3 years with males older than females. A 3-year certain period, retroactive to date of retirement or disability, is applied to approximate the cost of a modified cash refund for retirees without a surviving spouse.

No future dependent children were assumed to become beneficiaries.

Members who terminate employment with at least 10 years of service are assumed to elect to receive a deferred pension benefit in lieu of a refund of contributions.

Medical Insurance Plan Contribution: 85% of eligible retired and disabled members were assumed to receive a monthly medical insurance continuation benefit of $100 per month.

Census Data Collection Date: July 1, 2018. When information is provided by participant category in this report, the category is determined as of the census data collection date.

Special Data Adjustments: The following adjustments were made to the census data received from the System.

The entry age for active members was assumed to be the age as of June 30, 2018 less the provided years of creditable service.

If not provided by the System, benefits for new and continuing terminated vested participants were estimated based on the years of credited service and earnings history available from prior valuations.

Benefits for new retiree and disabled members that were less than the Minimum Benefit were reconciled and updated based on the census data provided for July 1, 2020.

Refer to the Form of Payment assumption above for a description of spousal data imputation for current retired and disabled members who retired before August 1, 2014.

For current retired and disabled members who retired on or after August 1, 2014 who did not elect an optional form of payment, the modified cash refund form of payment was approximated by a single life annuity with 3 years certain. According to PRTRS, no such retiree had elected an optional form of payment as of July 1, 2018.

If not provided by the System, the portion of the annual benefit payable to current beneficiaries attributable to past COLA adjustments was assumed to be 5%.

Benefits for current beneficiaries who are under age 22 as of the valuation date were assumed to cease at age 22. Benefits for current beneficiaries who are age 22 or older as of the valuation data were assumed to be payable for life. In addition, the current level of benefit was assumed to remain constant.

Benefits not valued: The minimum post-retirement death benefit of $1,000 for retirees without surviving beneficiaries is not explicitly valued. The additional liability associated with this benefit is expected to be de minimis.

Changes in actuarial assumptions since the prior valuation:

The GASB 73 and GASB 75 discount rate has decreased from 3.87% as of June 30, 2018 to 3.50% as of June 30, 2019.

The projected mortality improvement scale was updated from Scale MP-2018 to Scale MP-2019 to reflect the projected mortality improvement scale issued in the valuation year.

SECTION VI – SUMMARY OF ACTUARIAL ASSUMPTIONS AS OF JUNE 30, 2019

Active members who were indicated as participating in the 2018 Voluntary Transition Program were assumed to retire (if eligible to do so) or terminate (if not eligible to retire) on July 1, 2018.

Retirement rates for active members as of July 1, 2018 who did not participate in the 2018 Voluntary Transition Program were set to 0% for 2018-2019 to reflect that retirements from July 1, 2018 to June 30, 2019 were reflected as retirees in the July 1, 2018 data.

SECTION VII – SUMMARY OF ACTUARIAL METHODS AS OF JUNE 30, 2019

The ultimate cost of a pension plan is the excess of actual benefits and administrative expenses paid over actual net investment return on plan assets during the plan's existence until the last payment has been made to the last participant. The plan's "actuarial cost method" determines the expected incidence of actuarial costs by allocating portions of the ultimate cost to each plan year. The cost method is thus a budgeting tool to help to ensure that the plan will be adequately and systematically funded and accounted for. There are several commonly-used cost methods which differ in how much of the ultimate cost is assigned to each prior and future year. Therefore, the pattern of annual contributions and accounting expense varies with the choice of cost method. Annual contributions and accounting expense are also affected by the "asset valuation method" (as well as the plan provisions, actuarial assumptions, and actual plan demographic and investment experience each year).

Actuarial Cost Method

The plan's actuarial cost method is the entry age normal method (level percentage of payroll). Under this method, a projected benefit is determined at each active participant's assumed retirement age assuming future compensation increases. The plan's normal cost is the sum of each active participant's annual cost for the current year of service determined such that, if it were calculated as a level percentage of his compensation each year, it would accumulate at the valuation interest rate over his total prior and future years of service to his assumed retirement date into an amount sufficient to fund his projected benefit. The plan's accrued liability is the sum of (a) the accumulation of each active participant's normal costs attributable to all prior years of service plus (b) the present value of each inactive participant's future benefits.

Liability Determination

The results as of June 30, 2019 are based on projecting the System obligations determined as of the census data collection date of July 1, 2018 for one year using roll-forward methods, assuming no liability gains or losses.

Changes in actuarial methods since the prior valuation

None.

SECTION VIII – RISK DISCLOSURE

The purpose of this section is to identify, assess, and provide illustrations of risks that are significant to the Plan, and in some cases to the Plan's participants.

The results of the actuarial valuation are based on one set of reasonable assumptions. However, it is almost certain that future experience will not exactly match the assumptions. It is therefore important to consider the potential impacts of these likely differences when making decisions that may affect the future financial health of the Plan, or of the Plan's participants.

In addition, as plans mature they typically grow in size and become more material compared to the plan sponsor's overall operations. This increases the potential risk inherent in the long-term financing of the plan. Since pension plans make long-term promises and rely on long-term financing, it is important to consider how mature the Plan is today, and how mature it may become in the future.

Actuarial Standard of Practice No. 51 (ASOP 51) addresses these issues by providing actuaries with guidance for assessing and disclosing the risk associated with measuring pension liabilities and the determination of pension plan contributions. Specifically, it directs the actuary to:

- Identify risks that may be significant to the Plan.
- Assess the risks identified as significant to the Plan. The assessment does not need to include numerical calculations.
- Disclose plan maturity measures and historical information that are significant to understanding the Plan's risks.

ASOP 51 states that if in the actuary's professional judgment, a more detailed assessment would be significantly beneficial in helping the individuals responsible for the Plan to understand the risks identified by the actuary, then the actuary should recommend that such an assessment be performed.

This section uses the framework of ASOP 51 to communicate important information about: significant risks to the Plan and the Plan's maturity.

Potential Pay-as-you-go ("paygo") financing risks

Operating a retirement system on a paygo basis may be conceptually simple, but can be very difficult in practice when reserves are limited or non-existent. While the valuation of liabilities for financial reporting purposes is conducted on an annual basis in arrears, benefit payments vary continuously and respond instantaneously to emerging events. There are also administrative expenses incurred continuously.

Disbursements will experience natural variation due to emerging demographic experience and can also be greatly impacted by specific management decisions, such as an early retirement incentive program or other workforce reduction.

A major issue that needs to be addressed is determining what the process of budgeting for paygo funding will be. While an expected paygo amount can be set at the time of budgeting for an upcoming fiscal year, disbursements can vary from expectations during the fiscal year.

- If the budget is set based on expected disbursements, in the event of adverse experience during the fiscal year, will additional funds be available?
- Alternately, would the budget request include a margin to provide a buffer against adverse experience?
    - If so, consideration will need to be given to what level of margin should be included. Scenarios such as higher retirement activity and/or lower mortality rates could be modeled to provide a range of potential adverse outcomes.
    - Increased security comes at increased cost, and no specific margin guarantees protection against all circumstances.
- How would the impacts of specific management decisions be handled?
    - For instance, assume that the fiscal year paygo amount appears to be sufficient as of mid-year.
    - Then a reduction in workforce is announced, with an effective date of March 31.
    - In the final three months of the fiscal year, disbursements will be higher than expected as some members will take a refund of contributions upon termination, and other members who are retirement eligible will commence their annuity earlier than they had been expected to do so.

There are certainly many more operational details to be considered. We provide this limited commentary in order to point out that paygo operation is a complex issue that requires careful thought and planning, constant monitoring, and the ability to respond to emerging events quickly.

SECTION VIII – RISK DISCLOSURE

Benefit Payment Risk

Definition: This is the potential that members will not receive the full benefit payments promised under current law.

Identification: The system is operated on a pay-as-you-go basis with benefits funded by the Commonwealth. The Commonwealth's finances are under the control of the FOMB, a body created by PROMESA.

Assessment: Uncertain. Future revenue sources will be needed in order to finance the benefit payments. Reductions in benefits have been proposed in prior fiscal plans.

Inflation Risk

Definition: This is the potential of a pension to lose purchasing power over time due to inflation.

Identification: The participants of pension plans without fully inflation-indexed benefits are subject to the risk that their purchasing power will be reduced over time due to inflation.

Assessment: Members in this Plan bear all of the inflation risk occurring after retirement.

Maturity Risk

Definition: This is the potential for total plan liabilities to become more heavily weighted toward inactive liabilities over time.

Identification: As a plan matures, benefits accumulate, and the plan membership ages, the plan's liabilities become large relative to its source of contributions. A decline in the sponsor's finances can exacerbate economic shocks to an older, bigger plan. The more mature a plan, the shorter the plan's time horizon, which leads to less time to recover from liability losses.

Assessment: The following table displays certain maturity risk metrics. Over the past 10 years, the percent of the liability attributable to retirees has increased as shown in the table below, due primarily to the ratio of active to retired members decreasing. Further, since the plan is closed to new entrants, it is expected that the maturity level will continue to increase over time.

SECTION VIII – RISK DISCLOSURE

Valuation Year	Percent of Liability Attributable to Retirees	Ratio of Actives to Retirees
2019	68.5%	0.57
2018	65.2%	0.73
2017	65.0%	0.76
2016	61.1%	0.90
2015	62.2%	0.90
2014	61.6%	0.97
2013	59.5%	1.08
2012	55.9%	1.17
2011	55.4%	1.23
2010	54.8%	1.33

Retirement Risk

Definition: This is the potential for participants to retire and receive subsidized benefits more valuable than expected.

Identification: This plan provides a significant increase in benefits for members who attain 30 years of service.

Assessment: If more participants attain 30 years of service than anticipated by the actuarial assumptions, it is expected that additional financing will be required.

Interest Rate Risk

Definition: The potential that interest rates will be different than expected.

Identification: The pension liabilities reported herein have been calculated by computing the present value of expected future benefit payments using the interest rate(s) described in Section VI. If interest rates in future valuations differ from this valuation, future pension liabilities may differ significantly from those presented in this valuation. As a general rule, using a higher interest rate to compute the present value of future benefit payments will result in a lower pension liability, and vice versa.

SECTION VIII – RISK DISCLOSURE

Assessment: Section II Exhibit D “Sensitivity Analysis” presents the results of re-measuring the Total Pension Liability at discount rates 100 basis points lower and higher than that used in the development of the Total Pension Liability

Demographic Risks

Definition: The potential that mortality or other demographic experience will be different than expected.

Identification: The pension liabilities reported herein have been calculated by assuming that participants will follow patterns of demographic experience (e.g., mortality, withdrawal, disability, retirement, form of payment election, etc.) as described in Section VI. If actual demographic experience or future demographic assumptions are different from what is assumed to occur in this valuation, future pension liabilities may differ significantly from those presented in this valuation.

Assessment: Demographic gain/loss is measured each year as part of the annual valuation process and reported in the GASB 73 reconciliation. Demographic assumptions are updated as needed each year to reflect significant known deviations occurring in the fiscal year in order to minimize short term gains/losses. Demographic assumptions are also updated when periodic experience studies are conducted, with a goal of minimizing gains/losses over the long term.