

Proposal
To Provide An
Actuarial Audit of the Ohio School Employees Retirement System



for
The Ohio Retirement Study Council



June 7, 2024

Submitted by



June 7, 2024

Ms. Bethany Rhodes
Director/General Counsel
Ohio Retirement Study Council
30 East Broad Street, 2nd Floor
Columbus, OH 43215

Dear Bethany:

Pension Trustee Advisors (PTA), partnering with KMS Actuaries (KMS) and Bolton Partners (Bolton), is pleased to present this competitive offer in response to the Ohio Retirement Study Council's (ORSC) request for proposals (RFP) for actuarial audit services of the School Employees Retirement System (SERS).

This type of assignment is our primary business. Unlike most actuarial firms, most of PTA's work involves a second actuary. We would be privileged to continue to serve as your auditing actuary and look forward to the opportunity to present our qualifications to you on the following pages.

We understand the work to be done and will make a commitment to perform the work as scheduled. PTA, KMS and Bolton have the ability, willingness, knowledge, experience and resources to not only meet your needs, but exceed them, subject to the terms of the RFP. William (Flick) Fornia, Linda Bournival and Tom Vicente will be the primary consultants for ORSC and SERS.

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Public Pension Focus

The challenges facing public pensions are not unique to Ohio. Flick Fornia, Linda Bournival, and Tom Vicente have been involved considerably in this arena both currently as well as through our prior employers. Our participation has ranged from actuarial valuations and audits of numerous pension systems to working outside the pension systems to help our clients effect change. These engagements have been on all sides of the pension reform and often include state organizations such as ORSC. For example, PTA/KMS completed thorough actuarial reviews for the Colorado Office of the State Auditor and the Government of Guam, and, of course, we are extremely proud of the role we played with ORSC in the review of Ohio's funding plans leading to one of the most comprehensive and balanced pension reforms in the country in addition to our audits of all five Ohio retirement systems.

We continue to have substantial involvement in the forefront of the public pension scene. Linda has a sound foundation of public pension and health actuarial valuations both large and small, through KMS and prior firms. Flick is a nationally recognized public plan actuary and advisor. He recently authored an often-cited paper for the National Institute on Retirement Security on the economic efficiencies of defined benefit pensions. He is well known throughout the public pension community for his ability to explain complex matters to a lay audience. Tom Vicente, likewise, is a leader in the public pension community, often speaking on public pension matters to actuarial and pension organizations.

Our Philosophy

Our objective is to provide ORSC and SERS with accurate, well-understood information so that they can make the right decisions. Pensions are controversial these days and difficult to understand. We analyze the facts and present them in a manner that will enable the best decisions to be made. We do this through (1) timely and responsive client service; (2) accurate, peer-reviewed, thorough actuarial analysis; and (3) effective oral and written communication of our findings. We encourage you to contact our clients (including ORSC Council members and member system representatives) to confirm how we have accomplished our mission in the past.

We are happy to answer any questions on this proposal and look forward to discussing this with you further.

Sincerely,



William B. Fornia, FSA
President
Pension Trustee Advisors



Linda L. Bournival, FSA
Consulting Actuary
KMS Actuaries, LLC



Thomas Vicente, FSA
Senior Consulting Actuary
Bolton Partners

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1. Proposal Summary

In response to your Request for Proposal (RFP) for an Actuarial Audit, we are pleased to provide this proposal presenting our services for actuarial audit, advisory and related consulting to the Ohio Retirement Study Council (ORSC) and the School Employees Retirement System (SERS).

The services requested will be for the performance of an actuarial audit for the primary purpose of independent verification and analysis of the assumptions, procedures, and methods used by SERS' consulting actuary Cavanaugh Macdonald Consulting, LLC (CavMac) for:

- SERS annual pension actuarial valuation as of June 30, 2023 prepared by CavMac;
- The five-year experience review for the period July 1, 2016 to June 30, 2020 prepared by CavMac; and
- SERS annual retiree health care actuarial valuation as of June 30, 2023 prepared by CavMac, including GASB Statement 74 disclosures.

Because of our twelve year history of working with ORSC and prior audit of SERS, we have a sound understanding of the services that are sought by the ORSC and SERS.

Specific Audit Requirements

The ORSC has issued an RFP requesting proposals from qualified actuarial consulting firms interested in performing an actuarial audit of SERS. The RFP specifically is requesting the following services:

- Perform an actuarial audit for the primary purpose of independent verification and analysis of the assumptions, procedures and methods used by the consulting actuary (CavMac) of SERS for:
 - SERS annual pension actuarial valuation as of June 30, 2023 prepared by CavMac
 - the five-year experience review for the period July 1, 2015 to June 30, 2020 prepared by CavMac
 - SERS annual retiree health care actuarial valuation as of June 30, 2023 prepared by CavMac, including GASB 74 disclosures

As part of the independent verification analysis the actuarial audit shall include the following elements and activities:

- **Data Validity:**
 - Assess the validity, completeness, and appropriateness for SERS' structure and funding objectives of the demographic and financial information used by the consulting actuary in the valuation of SERS.

- **Actuarial Valuation Method and Procedures:**
 - Assess whether the consulting actuary's valuation method and procedures are reasonable and consistent with generally accepted actuarial standards and practices appropriate for SERS' structure and funding objectives and are applied as stated by the actuary.
 - Report the impact, if any, of deviations from accepted standards found during the audit, including the rationale for the deviations and determination of effects, including monetary impact.

- **Actuarial Valuation Assumptions:**
 - Determine whether the assumptions utilized in the actuarial valuations:
 - are technically sound,
 - conform to the appropriate Actuarial Standards of Practice,
 - are reasonable based on SERS' experience, and
 - are appropriate for SERS' structure and funding objectives
 - Include in the analysis demographic and economic assumptions such as mortality, retirement, separation rates, pay adjustments, rates of investment return and disability factors
 - Determine whether actual experience is appropriately evaluated in the experience study and whether recent changes in assumptions are appropriate, reasonable and supported by the experience study
 - Review the gain/loss analyses from the last four actuarial valuation reports

- **Parallel Valuation:**
 - Perform parallel valuations of pension benefits as of June 30, 2023, and of retiree health care benefits as of June 30, 2023, using the validated member census data and the same actuarial assumptions.

- **Recommendations:**
 - If adjustments to assumptions are recommended to more accurately reflect present and future assets, liabilities, and costs of SERS:
 - Provide detailed rationale for such recommendations, and
 - Describe the general effect on SERS' condition resulting from the proposed changes in assumptions.

- **Review of Health Care:**
 - Assess whether the system appropriately and consistently determines retiree contributions to health care and whether the implementation of the SERS's health care policies differ from those determinations.

This proposal will demonstrate our team's ability to perform the audit and related consulting services that the ORSC requires. Flick Forna, Linda Bournival and Tom Vicente can provide proactive, actuarial consulting advice based on years of experience with public sector plan sponsors. Not only should you review our qualifications and experience that we have detailed in Section 2, but we encourage you to contact the references we provide in Section 3 so you can gain confidence in our ability to provide these services. The fact that we have provided actuarial services during the last 30+ years to a large number of public sector clients speaks to our ability to provide satisfactory services.

Of course, our most important reference is the ORSC itself. From November 2011 through July 2012, we worked with ORSC and SERS nearly every day reviewing plan details and actuarial calculations as a component of our pension reform study. We know ORSC and SERS quite well and have a thorough understanding of its features and actuarial nuances.

We have conducted audits of all five Ohio Retirement Systems:

- In 2013, School Employees Retirement System of Ohio (SERS)
- In 2014, Ohio Public Employees Retirement System (OPERS)
- In 2016, Ohio Police and Fire Pension Fund (OP&F)
- In 2021, Highway Patrol Retirement System, and
- In 2022, State Teachers Retirement System (STRS) .

- **The firm's primary contact for ORSC staff use and, if different, for SERS staff use during the audit, including the contact's address, telephone and e-mail address.**

William (Flick) Forna, Linda Bournival and Tom Vicente will be the primary consultants for ORSC and SERS.

William B. Forna, FSA, EA, MAAA
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- **General ownership structure of the organization, including subsidiary and affiliated companies, and joint venture relationships.**

Pension Trustee Advisors was incorporated in Colorado in 2010 by its sole owner, William Forna. KMS Actuaries, formed in 2011 by its sole owner, Linda Bournival, is a limited liability company. Bolton Partners was founded in 1981 by Mr. Robert G. Bolton as an independent actuarial and employee benefits consulting firm.

- **Information regarding any material change in the firm's structure or ownership within the last eighteen months, or any material change in ownership, staff, or structure currently under review or being contemplated by the firm.**

No material changes in PTA's, KMS' or Bolton's structure or ownership are currently being contemplated.

- **If available, a third-party assessment or report concerning client satisfaction and measures of the firm's strengths and weaknesses.**

No third-party assessment of PTA, KMS or Bolton has been conducted to our knowledge. We encourage a discussion of our past performance with our references

as well as knowledgeable ORSC councilmembers and staff.

- **Any material litigation which has been threatened against the firm or to which the firm is currently a party.**

No litigation has been threatened against PTA, KMS or Bolton.

- **A list and brief description of litigation brought against the firm by existing or former clients over the last five years.**

No litigation has been brought against PTA, KMS or Bolton by existing or former clients at any time.

- **A list of any professional relationships involving the ORSC, the five Ohio public retirement systems, the State of Ohio, or its political subdivisions for the past five years, together with a statement explaining why such relationships do not constitute a conflict of interest relative to performing the proposed review. In the event that the firm has had any professional relationships involving the ORSC, the five Ohio public retirement systems, the State of Ohio, or its political subdivisions for the past five years, the firm shall provide a statement explaining why such relationships do not constitute a conflict of interest relative to performing the proposed review, or, if necessary, an explanation of the actions that will be taken to ensure an independent review.**

Other than previous work performed for ORSC, we have no professional relationships involving the ORSC, the five Ohio public retirement systems, the State of Ohio, or its political subdivisions.

2. Capabilities and Experience

PTA and KMS have together provided actuarial consulting services to the following:

PTA/KMS Clients

- Ohio Retirement Study Council
- Government of Guam
- Ingham County, Michigan
- Materials Innovation and Recycling Authority of Connecticut
- Municipal Employees Retirement System of Michigan
- Confidential Multi- $\$$ Billion Public Retirement System
- Colorado Office of the State Auditor
- Kentucky Teachers' Retirement Funding Work Group
- Providence RI Retirees
- Cranston RI Retirees
- Edgewater CO Firemen's Pension Fund
- City of Brockton, Massachusetts
- City of Springfield, Massachusetts

Flick, the proposed lead actuary and consultant for ORSC, has conducted sixteen audits for large defined benefit public retirement systems. We believe that he has more recent experience with actuarial audits for statewide systems than anyone. Flick is well known for his ability to explain complex concepts to lay audiences. He is an author and frequent speaker at organizations such as the Pension Research Council, the National Association of State Retirement Administrators (NASRA), the National Council on Teacher Retirement (NCTR), the National Association of Public Pension Attorneys (NAPPA), the National Conference on Public Employee Retirement Systems (NCPERS), the Conference of Consulting Actuaries, the Western Pension and Benefits Conference, the International Foundation of Employee Benefit Plans, The Conference Board, the Government Finance Officers Association (GFOA), and the Brazilian Association of Pension Plans (ABRAPP).

PTA, founded in 2010, is the leading provider of specialized non-routine actuarial services relating to state and local government retirement systems.

PTA, KMS and Bolton have provided actuarial consulting services to hundreds of clients including the following:

- Ohio Retirement Study Council
- Municipal Employees Retirement System of Michigan
- Puerto Rico General Employees Retirement System
- State of Colorado
- State of Nevada
- State of Kentucky
- Colorado Fire and Police Pension Association
- International Association of Firefighters' (IAFF) Locals in twenty jurisdictions

- Alaska Public Pension Coalition

- Government of Guam
- Worcester Regional Retirement System
- Manchester, New Hampshire
- Massachusetts Water Resources Authority
- Plymouth, Massachusetts
- Dukes County, Massachusetts (Cape Cod Islands)
- Massachusetts Public Employee Retirement Administration Commission

- State of Maryland
- State of Maine
- District of Columbia
- City of Providence, RI
- Pension Benefit Guaranty Corporation
- State of Texas
- State of California

Flick Fornia specializes in the type of actuarial consulting services that ORSC is requesting. He has conducted seventeen audits for large defined benefit public retirement systems. Flick is well known for his ability to explain complex concepts to lay audiences. He is an author and frequent speaker at organizations such as the National Association of State Retirement Administrators (NASRA), the National Council on Teacher Retirement (NCTR), the National Association of Public Pension Attorneys (NAPPA), the National Conference on Public Employee Retirement Systems (NCPERS), the Conference of Consulting Actuaries, the International Foundation of Employee Benefit Plans, The Conference Board, the Government Finance Officers Association (GFOA), National Association of State Auditors, and the Brazilian Association of Pension Plans (ABRAPP).

PTA, founded in 2010, is the leading provider of specialized non-routine actuarial services relating to state and local government retirement systems.

Linda Bournival has provided actuarial consulting and retirement system valuation services for several municipalities and governmental entities over the past 35 years. In addition, she provides Governmental Accounting Standards Board Statement (GASB) Number 74 (GASB 74) and Number 75 (GASB 75) valuation services and retiree health care consulting services to many large, medium and small public sector clients. Over the years, she has provided a variety of services with respect to retirement plans, including the design and preparation of comprehensive employee benefit statements, the design and development of a complex automated benefit calculation system, the administration and establishment of qualification procedures for domestic relations orders and pension valuations of retirement benefits in divorce situations.

KMS, founded in 2011, has a significant presence in the public sector, providing services to over one hundred entities, including state and local retirement systems, cities, towns, counties and regional school districts.

Tom Vicente is a Senior Consulting Actuary with Bolton and the leader of Bolton's public sector pension practice. Tom has over 30 years of experience in actuarial, retiree medical, and pension consulting services, as well as the administration and communication of retirement programs. He also has significant experience with design, benchmarking, and retirement adequacy studies for retirement programs, determining cost factors for union-negotiated programs, as well as with hybrid pension plans such as Cash Balance and Retirement Equity programs. He has been a speaker for different groups, including the American Academy of Actuaries, and the Society of Actuaries, as well as local groups, such as the Georgia GFOA where he spoke about the types and benefits of actuarial audits for pension and OPEB plans. He also spoke at an SOA-sponsored webcast on the impact of COVID-19 on public sector pension plans. Tom has published a whitepaper on service purchase rules for governmental pension plans as well as a paper on the impact of accounting rules affecting governmental employers offering post-employment benefit programs and ways in which those employers could manage those costs.

Bolton was founded in 1981 by Mr. Robert G. Bolton as an independent actuarial and employee benefits consulting firm, and since our founding, actuarial services and benefit plan consulting have been our primary focus. The firm has over 40 years of experience providing consulting services to clients in the public and corporate sectors, nonprofit organizations, as well as for the Federal Government.

Flick, Linda and Tom's expertise combined with our experience with ORSC over the last decade bring unparalleled actuarial capabilities to ORSC.

The team we have assembled here has expertise in all retirement-related areas, including financing, plan design, bond analysis, asset-liability studies, retiree healthcare and legislative testimony. The following are the actuarial audits performed by members of the team:

Retirement System Audits (audited actuarial firm noted)

- Alaska Public Employees' Retirement System and Teachers' Retirement System (Buck)
- California State Teachers' Retirement System (Milliman)
- Colorado Public Employees' Retirement Association (Watson Wyatt)
- Public School Retirement System of Kansas City (Hays)
- Teachers' Retirement System of Louisiana (Hall)
- North Dakota Public Employees' Retirement System (Segal)
- North Dakota Teachers' Fund For Retirement (GRS)
- Ohio Highway Patrol Retirement System (Foster & Foster)*
- Ohio Police and Fire Pension Fund (Buck)*
- Ohio Public Employees Retirement System (GRS)*
- Ohio School Employees Retirement System (Cavanaugh Macdonald)*
- Ohio State Teachers Retirement System (Cheiron)*
- Oklahoma Police Pension and Retirement System (Mercer)
- Oklahoma Public Employees' Retirement System (Mercer)
- Omaha School Employees' Retirement System (Milliman)
- Seattle City Employees Retirement System (Milliman)

- Tacoma City Employees Retirement System (Milliman)
- Vermont Retirement Systems (Buck)
- Confidential Multi- $\$$ Billion Public Retirement System (Internal)

* PTA Joint work with KMS

3. References

Below, we provide references that you can contact and learn more about our strength in providing actuarial services.

City of Austin, Texas

Contact: Belinda Weaver, Treasurer
Address: 919 Congress Ave Suite 1250, Austin, TX 78701
Phone: (512) 974-7885
Email: Belinda.Weaver@austintexas.gov

Flick has served the City as their actuary since 2021. He reviews the actuarial valuations for their three retirement systems and advises the City on pertinent actuarial matters.

Worcester Regional Retirement System

Contact: Kevin Blanchette, Chairperson
Address: 23 Midstate Drive, Auburn, MA 01501
Phone: (508) 832-6314
Email: kpblanchette@worcesterregionalretirement.com

KMS serves as actuaries for the Worcester Regional Retirement System. We have provided cost-of-living studies and presented the valuation results to the 95 member units. Linda has provided services to Worcester Regional since 2010, and previously while with Buck Consultants, from 1992 – 2000.

Maryland Department of Legislative Services

Contact: Michael Rubenstein, Policy Analyst
Address: 90 State Circle, Annapolis MD 21401
Phone: (410) 946-5520
Email: Michael.Rubenstein@mlis.state.md.us

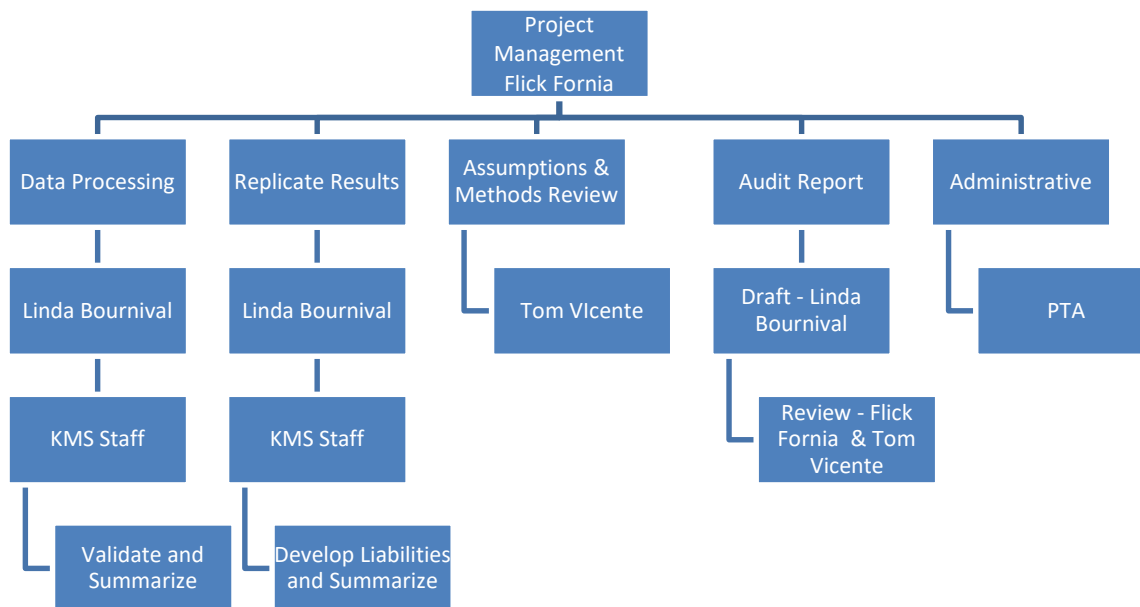
As the actuaries for the Maryland Department of Legislative Services, Bolton provides fiscal analysis for all proposed legislation related to the state's retirement systems. Each year, we begin by matching the most recent actuarial valuation results and reviewing the multi-year cost projections from the actuary for the State Retirement and Pension System, including each component (Teachers, Employees, State Police, Judges, and LEOPS). From these baseline results, we can model the effect of changes in such program aspects as employee contribution rates, benefit levels, employer contributions, salary increases, eligibility, past service credits for military service, and changes in the retirement eligibility age.

4. Staff Qualifications

Pension Trustee Advisors (Flick Forna) is partnering with KMS Actuaries (Linda Bournival) and Bolton Partners (Tom Vicente) to provide actuarial consulting services to ORSC and SERS. Flick, Linda and Tom are pension and retirement system actuaries with significant experience in providing actuarial consulting services to public sector clients. Flick, Linda and Tom are fully credentialed Fellows of the Society of Actuaries (FSA), the highest level of professional accreditation that an actuary can achieve. They are also members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries necessary to perform the services requested in this RFP and render actuarial opinions with respect to the calculations required.

Flick will serve as the lead actuary and consultant to the ORSC and SERS. He will be responsible for management of the overall relationship and project. Linda and other KMS team members will perform all the data processing, calculations and modeling using an actuarial valuation system called ProVal, widely used by many national firms, including CavMac, SERS’ actuaries. Tom and other Bolton team members will conduct the assumptions and methods review including review of the 5-year experience study. We estimate the portion of the audit’s time that will be spent by each for completion of the audit to be as follows:

- Flick Forna – 13%
- Linda Bournival – 30%
- Tom Vicente – 23%
- Other Actuarial Staff – 34%



We provide a summary of Flick, Linda, Tom and other members of the team's professional qualifications and experience on the following pages.

William B. (Flick) Forna

Flick, the proposed lead actuary and consultant for the ORSC, has conducted sixteen audits for large defined benefit public retirement systems. We believe that he has more experience with actuarial audits for statewide systems than anyone.

He is founder and President of Pension Trustee Advisors (PTA). PTA provides consulting services on public pensions with focus on pension advice.

Previous Work History

He was senior vice president at Aon Consulting, leading their public sector pension actuarial consulting practice from 2006 to 2010. Flick has more than 30 years of consulting and actuarial experience, primarily in the areas of retiree pension and healthcare benefits. Prior to Aon, he managed the Denver Retirement Practice of Buck Consultants and has served nationally as a Senior Consultant for Gabriel, Roeder, Smith & Co., both specializing in public pensions.

Work Experience

Flick Forna has expertise in all retirement-related areas, including financing, plan design, bond analysis, asset-liability studies, retiree healthcare and legislative testimony. His career includes serving as corporate actuary for The Boeing Company and as consultant for numerous multinational corporations in Brazil and Argentina during his ten years at Towers Perrin. Previously, he was corporate actuary for Boeing.

He has performed consulting services for 22 statewide retirement systems in Alaska, California, Colorado, Louisiana, Missouri, New Mexico, North Dakota, Oklahoma, Puerto Rico, Utah, Vermont, Wyoming and others. He conducted the first actuarial audits of Oklahoma Police Pension and Retirement System and Oklahoma Public Employees' Retirement System. Other clients have included the US Department of State, Cities of Baltimore, Oakland and Philadelphia, IBM, US WEST and Ford Motor Company.

Articles and Speech Presentations

Flick is well known for his ability to teach complex concepts to lay audiences. He is an author and frequent speaker at organizations such as the Pension Research Council, the National Conference of State Legislators (NCSL), National Association of State Retirement Administrators (NASRA), the National Council on Teacher Retirement (NCTR), the National Association of Public Pension Attorneys (NAPPA), the National Conference on Public Employee Retirement Systems (NCPERS), the Conference of Consulting Actuaries, the Western Pension and Benefits Conference, the International Foundation of Employee Benefit Plans, The Conference Board, the Government Finance Officers Association (GFOA), and the Brazilian Association of Pension Plans (ABRAPP).

Articles and speeches have addressed all aspects of retirement programs including retiree healthcare plans, and the challenges of public sector defined contribution plans. He co-authored "*Still a Better Bang for the Buck – The Economic Efficiencies of Defined Benefit Plans*" with the National Institute of Retirement Security in 2014.

Professional Organizations and Education

He is a Fellow of the Society of Actuaries, Enrolled Actuary, Member of the American Academy of Actuaries, and Fellow of the Conference of Consulting Actuaries. He was elected to serve on the Board of Directors of the 30,000-member Society of Actuaries from 2016 to 2022, where he was elected by the Board to serve as its Secretary/Treasurer. He serves on the steering committee of the Conference of Consulting Actuaries Public Pensions Subcommittee and is on the faculty of the Society of Actuaries Fellowship Admissions Course. Flick earned a Bachelor of Arts in Mathematics at Whitman College.

Linda L. Bournival

Linda Bournival formed KMS Actuaries, LLC, after nearly 25 years of actuarial consulting experience with a wide-range of retirement plan and postemployment benefit assignments and issues. A significant portion of her experience includes consulting and actuarial services for pension plans and postemployment benefit programs for governmental entities, including states, cities, towns, school districts and authorities.

Previous Work History

Prior to forming KMS Actuaries, Linda was a Director and Consulting Actuary at Buck Consultants and most recently Executive Vice President at Ricci Consultants. Linda has over 25 years of consulting and actuarial experience and includes services for pension plans and postemployment benefit programs for private and public sector entities. She has worked with clients regarding qualified and non-qualified defined benefit and defined contribution plans.

Work Experience

She has provided a variety of services with respect to retirement plans, including implementation of GASB 67 and GASB 68 for several public retirement systems. She has recently performed two actuarial audits of large pension systems.

Since the implementation of Statement Numbers 43 and 45 issued by the Governmental Accounting Standards Board, and their successor statements 74 and 75, Linda has been retained by local entities in New England, including the City of Manchester NH, the Manchester NH School District, Dukes County OPEB Trust, the University of Maine System, the Towns of Littleton and Weston, Massachusetts, Wachusett Regional School Districts and others.

She has presented on “Pension Reform and Plan Design: Around the Country” and “Planning, Preparation and Collaboration for GASB 67/68 Implementation” at PERAC’s Emerging Issues Forums. Most recently, she has presented on retiree medical actuarial issues as a panelist in a municipal round table series “Healthcare Cost Management at the Crossroads: What’s Left in My Bag of Tricks?” and at the 2020 Conference of Consulting Actuaries Annual Meeting on “OPEB – Anything But GASB”.

Professional Organizations and Education

She is a Fellow of the Society of Actuaries, an Enrolled Actuary, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. Linda graduated magna cum laude from Providence College, earning a Bachelor of Arts in Mathematics.

Linda currently serves as Council Member on the Society of Actuaries Social Insurance and Public Finance Section.

Tom Vicente

Tom is a Senior Consulting Actuary at Bolton Partners and leads the firm's public sector practice. Tom's focus is on providing high value to clients through innovative solutions, strong communication, and high-quality, timely results.

Previous Work History

Prior to joining Bolton, Tom was a Partner at Aon, serving as a lead pension and retiree medical program consultant.

Work Experience

Tom Vicente has over 30 years of experience in actuarial, retiree medical, and pension consulting services, as well as the administration and communication of retirement programs. He also has significant experience with design, benchmarking, and retirement adequacy studies for retirement programs, determining cost factors for union-negotiated programs, as well as with hybrid pension plans such as Cash Balance and Retirement Equity programs.

Areas of Specialization

- Presenting results and making recommendations to Boards, leadership, and trustees on valuation results (funding and accounting), and special studies for pension and OPEB plans
- Performing and supervising pension plan and OPEB plan valuations
- Auditing pension and OPEB valuations performed by other actuaries
- Developing benchmark reports and peer-group evaluations
- Completing plan design evaluations and determinations of the costs and appropriateness of different changes
- Supervising and preparing benefit statements
- Resolving pension plan administrative issues (such as missing data or participants, overdue payments, complex QDROs, etc.)
- Working with outside auditors to effectively complete year-end accounting and disclosure requirements

Professional Organizations and Education

Tom is a Fellow of the Society of Actuaries, an Enrolled Actuary, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. Tom has been an active member in the Social Insurance and Public Finance section of the Society of Actuaries, including serving as Chair of the section, and has been a member of the American Academy of Actuaries Public Plans Committee. Tom graduated from Drexel University earning a Bachelor of Science in Mathematics.

He has been a speaker for different groups including the National Conference of Public Employer Retirement Systems (NCPERS), Maryland GFOA, MIIA, the Massachusetts Municipal Association, the Actuary's Club of Philadelphia, and the Georgia GFOA. Tom has published white papers on the purchase of service provisions in pension plans as well as the impact of accounting rules affecting governmental employers offering post-employment benefit programs and ways in which those employers could manage those costs.

Amanda J. Makarevich

Amanda Makarevich joined KMS in 2017. She has seven years of experience working with governmental entities and private-sector clients providing a wide range of actuarial services, including preparation of valuations for funding purposes, GASB and FASB accounting disclosures and financial reporting, and projections for funding and plan termination purposes. Her background also includes the preparation and review of benefit calculations and employee benefit statements.

Work Experience

Amanda has been involved with the transition work for multiple new clients. Her responsibilities have included programming assumptions and plan provisions for valuations, reconciling results with those provided by the prior actuary, and developing templates for reports, benefit calculations, and statements.

Professional Organizations and Education

Amanda graduated with distinction from the University of North Carolina at Chapel Hill in 2012, earning a Bachelor of Arts in Mathematics with a second major in Music. She is a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries.

Michael P. Collins

Michael Collins joined KMS full time in May of 2018 and previously worked as an intern during the summers since 2014.

Work Experience

He provides actuarial support to Linda and Amanda, including data analysis and editing, coding valuations in Proval for funding and GASB, setup of actuarial reports and preparation of benefit calculations and employee benefit statements.

Education

In May 2018, Michael graduated from the College of William & Mary with a Bachelor of Science in Computational & Applied Mathematics and Statistics and a minor in Music. Michael has successfully passed seven actuarial exams and is working towards his Associateship in the Society of Actuaries.

Michael A. Bubulo

Michael Bubulo joined KMS in February of 2020.

Work Experience

He provides actuarial support to Linda and Amanda, including data analysis and editing, excel modeling, actuarial report setup and preparation of benefit calculations and employee benefit statements.

Education

Michael graduated from Sacred Heart University in May, 2019, with a Bachelor of Science in Mathematics and Finance and a minor in Actuarial Science. Michael has successfully passed seven actuarial exams and is working towards his Associateship in the Society of Actuaries.

Kelly M. Collins

Kelly Collins joined KMS in June of 2021.

Work Experience

She provides actuarial and administrative support to Linda and Amanda and heads KMS' Human Resources, Marketing and Finance departments.

Education

Kelly graduated from Hamilton College in May of 2021.

5. Methodology, Work Product and Timeline

Based on our understanding of the requested services in the ORSC's RFP, the services requested will be for the performance of an actuarial audit for the primary purpose of independent verification and analysis of the assumptions, procedures, and methods used by the consulting actuary CavMac of SERS for:

- SERS annual pension actuarial valuation as of June 30, 2023 prepared by CavMac;
- The five-year experience review for the period July 1, 2015 to June 30, 2020 prepared by CavMac; and
- SERS annual retiree health care actuarial valuation as of June 30, 2023 prepared by CavMac, including GASB Statement 74 disclosures.

In our review, we will make a determination as to whether the actuarial methods, considerations and analyses used by CavMac in preparing the June 30, 2023 valuations are technically sound and conform to the appropriate Actuarial Standards of Practice as promulgated by the Actuarial Standards Board. Finally, we will prepare a written report summarizing our conclusions and recommendations, including appropriate documentation, and attend two meetings to present to the SERS Board of Trustees and the ORSC Board.

Our proposed methodology for completion of the scope of review and other consulting services, along with the desired work products and estimated timeline¹ for completion of the reviews, follows:

1. **Hold initial meeting** with ORSC and SERS to discuss project specifics, deliverables, timeline, etc. (Week 1)

This meeting will be a critical kickoff and will define the work to be completed, the staff support and consulting actuary requirements, deliverables and timeline.

2. **Collect data**, actuarial reports, actuarial calculations etc. used in the June 30, 2023 actuarial valuations of SERS pension and retiree health care benefits as well as five-year experience review ending June 30, 2020 (Weeks 2-3)

The following information would be required in order to complete the audit:

To be provided by SERS Staff:

- June 30, 2023 Retirement System actuarial valuation report
- June 30, 2023 Health actuarial valuation report
- Member data submitted to CavMac by SERS
- Financial data submitted to CavMac by SERS
- Current plan provisions as contained in Ohio Revised Code Chapter 3309
- All communications and reports pertaining to actuarial calculations

¹ Week 1 of the timeline is the week following the execution of the contract.

To be provided by CavMac:

- Member data used by CavMac
- Complete tables of pre-retirement decrements and salary scales
- Present value annuity factors for sample ages
- Individual, detailed actuarial valuation results from a sampling of member lives (pensioners, active members and inactive members)
- Health claims cost calculations for retirees, disabled retirees, spouses and children

We anticipate approximately five hours of SERS' staff time to provide the materials above and approximately ten hours of CavMac's time to provide the member data and sample life calculations. Additional hours may be required from CavMac if we are unable to match CavMac's sample life calculations immediately and need to confer further with them. We will work hard to minimize the time commitment by CavMac and SERS.

3. Review System information. We will thoroughly review all available information gathered (Weeks 3-5)

4. Review the valuation calculation results (Weeks 3-5)

The valuation results are only as good as the methods and assumptions upon which they are developed. Our review would test the appropriateness of these building blocks.

Methodology

- We will review the methodology and process used by CavMac to check for adherence to actuarial standards and comment on the appropriateness of the method and procedures.
- We will quantify any issues in terms of actuarial impact.

5. Hold meeting with SERS staff to review data layouts, plan provisions, etc. (Week 5)

After we thoroughly review the materials provided, we will meet by phone with SERS staff to review the valuation data, plan provisions and other valuation methodology nuances. This is critical and will help us gain a better understanding of the valuation data elements, determination of plan benefits, etc.

6. Verify the accuracy of the benefits valued and the data used by CavMac (Weeks 5-8)

We will verify that all appropriate benefits provided under SERS have been valued accurately. We will also verify that the data provided by SERS is consistent with the data used by CavMac. Linda and the KMS team will perform all the data processing, calculations and modeling using an actuarial valuation system used by many national firms. KMS has a lease arrangement with Winklevoss Technologies (WinTech) for their software called ProVal, used for pension and OPEB valuations. ProVal can perform the following tasks:

- Funding valuations. The system can produce valuation results under any assumption set
- GASB 67, 68, 74 and 75 accounting valuations
- Client-ready valuation report

- Deterministic and stochastic modeling of assets and liabilities for assessing future costs
- Detailed gain/loss analysis: This module produces a detailed gain/loss analysis by source
- Experience analysis: This produces experience results by decrement
- Multi-cycle valuations
- Data Base development and maintenance
- Data modeling

The WinTech software, which is supported nationally and widely used by actuarial firms, provides us with extensive valuation flexibility including the support to value plan and assumption changes and the ease in conducting plan design studies. We both also use the Microsoft Office suite of software applications including Word, Access, PowerPoint, and Excel. The consultants' involvement in every aspect of the SERS audit allows for a more streamlined consulting approach and in the end, better service to our clients.

Methodology

- Analyze member data submitted by SERS to CavMac
- Analyze member data used by CavMac and compare aggregated data with that submitted by SERS
- Program the benefits in ProVal and develop actuarial results
- Compare actuarial results to actuarial valuations
- Review for conformity with Actuarial Standard of Practice No. 23, Data Quality

7. Evaluate the actuarial cost method and actuarial asset valuation method used by the System (Weeks 3-8)

SERS currently utilizes the entry age normal cost funding method. SERS uses an actuarial asset valuation method which we have thoroughly modeled in our prior ORSC work.

Methodology

- We will first understand SERS' funding objectives and review any statutory requirements relative to the selection of the funding and/or asset method.
- We will review the funding and asset methods and determine if the methods are technically sound and conform to the Actuarial Standard of Practice.
- If we find that the funding and/or asset methods are inappropriate, we will recast the costs and such using better methods. We will present in our report a detailed rationale for the recommendations.
- Review for conformity with Actuarial Standard of Practice No. 4, Measuring Pension Obligations and Actuarial Standard of Practice No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations.

8. Verify the reasonableness of the unfunded actuarial accrued liability calculation and the amortization period utilized (Weeks 3-8)

Methodology

- Review the methodology to calculate the unfunded actuarial accrued liability and the amortization period used under the cost method for reasonableness.
- We will show actual projections of contribution patterns under various amortization approaches.

- Make recommendations, if necessary, for changes to the methodology.
- Review for conformity with Actuarial Standard of Practice No. 4, Measuring Pension Obligations.

9. Perform review of Demographic and Economic Assumptions (Weeks 3-8)

We will review the demographic and economic assumptions used by SERS in the June 30, 2023 actuarial valuations. Demographic assumptions to be analyzed include the rates of mortality, retirement and separation rates. Economic assumptions to be analyzed include the investment return rate, inflation rate, individual salary increases and payroll growth, health care cost trend rates and morbidity factors.

Methodology

- Review past experience based on information contained in the most recent experience study, comparing that experience with peers and standard benchmarks.
- Review demographic assumptions for consistency with plan provisions. Just as with the economic assumptions, demographic assumptions have a significant impact on funding.
- Compare current assumptions with prevailing actuarial practice utilizing the Public Fund Survey.
- Prepare forward looking assumptions using empirical methods. These methods look at the asset allocation used of the particular client and anticipated real and nominal returns of each asset class. The methodology is consistent from client to client, but the outcomes may be quite different.
- If we find that the economic or demographic assumptions are inappropriate, we will recast the costs and such using better assumptions.
- Review for conformity with Actuarial Standard of Practice No. 27, Selection of Economic Assumptions for Measuring Pension Obligations and Actuarial Standard of Practice No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations.

10. Perform review of June 30, 2023 valuation reports (Pension and Health) (Weeks 8-10)

- Review the June 30, 2023 valuation reports prepared by CavMac for conformity with Actuarial Standard of Practice No. 41, Actuarial Communications.
- Present any recommendations for improvement to the report.

11. Deliver preliminary draft report to ORSC and SERS (Weeks 11-16)

We will prepare a written report that is in language clearly understood by lay readers. Our audit report will be in a format similar to that included in Appendix A. Appendix B includes a sample actuarial audit presentation.

- During the course of the reviews, we will provide progress reports to ORSC and SERS on a monthly basis.
- We will develop a written report containing a description of the work performed, and executive summary, findings, and detailed recommendations and conclusions where appropriate. The key findings and recommendations will be organized in a manner that clearly identifies to whom they are primarily directed (e.g., the Legislature, SERS Board, and ORSC).
- Our report will be in language clearly understood by lay readers.

- Our report will contain a glossary of terms essential to an understanding of retirement system funding and actuarial valuations.

12. Present preliminary report to SERS Executive Director (after delivery of preliminary draft report)

- We will present the preliminary draft report to the SERS Executive Director prior to the release of the final report.
- We will hold an exit conference with the SERS staff and consulting actuary to discuss our findings and recommendations contained in our preliminary draft report.

13. Present final report (after meetings to present preliminary draft report)

- Make any required modifications to report and issue final report.
- We will present the final report to the SERS Board of Trustees and the ORSC Board.
- We will provide a digital and 25 bound copies of the final report to SERS and a digital and 25 bound copies of the final report to the ORSC not later than one week after completion of the final report.

6. Glossary

Below, we provide a glossary of all abbreviations, acronyms and technical terms used to describe the services contained in our proposal.

Actuarial Accrued Liability – The portion of the Actuarial Present Value of future benefits which is allocated to all periods prior to a valuation year and therefore is not provided by future Normal Costs.

Actuarial Assumptions – Assumptions as to the occurrence of future events affecting pension and OPEB costs, such as mortality, withdrawal, disablement and retirement; changes in compensation and Government provided pension benefits; rates of investment earnings and asset appreciation or depreciation; procedures used to determine the Actuarial Value of Assets; characteristics of future entrants for Open Group Actuarial Cost Methods; and other relevant items.

Actuarial Cost Method – A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an actuarially equivalent allocation of such value to time periods, usually in the form of a Normal Cost and an Actuarial Accrued Liability.

Actuarial Present Value of Future Benefits – The present value of the cost to finance all benefits payable in the future, discounted to reflect the probability of payment and the time value of money.

Actuarial Valuation – the determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets and related Actuarial Present Values for a retirement plan or an OPEB plan.

Actuarial Value of Assets – The value of plan assets used in an actuarial valuation. The Actuarial Value of Assets may reflect smoothing techniques intended to dampen year-to-year fluctuations in the market value of assets.

Bolton – Bolton Partners

Chapter 3307 of the Ohio Revised Code – The Ohio statutes governing SERS.

CavMac – SERS' actuaries, Cavanaugh Macdonald Consulting, LLC

Funded Ratio – The Actuarial Value of Assets expressed as a percentage of the Actuarial Accrued Liability.

FSA – Fellow of the Society of Actuaries, the highest educational standard for actuaries.

GASB – Governmental Accounting Standards Board.

GASB 74 – Financial Reporting for Postemployment Benefit Plans Other Than Pension Plans

GASB 75 – Accounting and Financial Reporting for Postemployment Benefits Other Than Pensions

GASB 67 – Financial Reporting for Pension Plans

GASB 68 – Accounting and Financial Reporting for Pensions.

HPRS – The Ohio State Highway Patrol Retirement System.

KMS – KMS Actuaries, LLC.

OPEB – Other Postemployment Benefits including medical, dental, vision, hearing and life insurance benefits.

OPERS – Ohio Public Employee Retirement System.

OP&F – Ohio Police and Fire Pension Fund.

ORSC – Ohio Retirement Study Council.

ProVal – Winkelvoss Technologies actuarial software used for funding and accounting valuations of retirement benefits and OPEB.

PTA – Pension Trustee Advisors, Inc.

SERS – School Employees’ Retirement System of Ohio.

STRS – The Ohio State Teachers Retirement System.

Unfunded Actuarial Accrued Liability – The excess of Actuarial Accrued Liability over the Actuarial Value of Assets

7. Cost Information

Fees are determined based on our estimate of the time required to perform the audit. We propose that invoices, which will include the hourly rate and number of hours worked on the audit by specific personnel, will be submitted on a monthly or quarterly basis.

Our cost proposal is presented below and includes hourly rates for the professional staff assigned to the actuarial audit and an estimate of the number of hours anticipated. In support of our commitment to the ORSC and SERS and to demonstrate our sincere desire to continue working with you, we provide a discount on our fees and a “not to exceed fee” as shown below:

ORSC / SERS Audit Fee Development

Task	Team Member Name	Hours	Average Hourly Billing Rate	Estimated Cost
<ul style="list-style-type: none"> Initial Kick-off meeting Data collection Review Information 	William Fornia	5	\$555	\$2,775
	Linda Bournival	10	400	4,000
	Tom Vicente	5	550	2,750
	Other Actuarial Staff	5	300	1,500
	Total	25		\$11,025
<ul style="list-style-type: none"> Data Validity 	Linda Bournival	2	\$400	\$800
	Other Actuarial Staff	8	300	2,400
	Total	10		\$3,200
<ul style="list-style-type: none"> Review of Methods and Procedures 	William Fornia	1	\$555	\$555
	Linda Bournival	2	400	800
	Tom Vicente	8	550	4,400
	Total	11		\$5,755
<ul style="list-style-type: none"> Review of Assumptions 	William Fornia	4	\$555	\$2,220
	Linda Bournival	6	400	2,400
	Tom Vicente	16	550	8,800
	Total	26		\$13,420
<ul style="list-style-type: none"> Perform Parallel Valuations 	Linda Bournival	25	\$400	\$10,000
	Tom Vicente	5	550	2,750
	Other Actuarial Staff	75	300	22,500
	Total	105		\$35,250

ORSC / SERS Audit Fee Development (continued)

Task	Team Member Name	Hours	Average Hourly Billing Rate	Estimated Cost
• Review Health Care Premiums	Linda Bournival	6	\$400	\$2,400
	Tom Vicente	3	550	1,650
	Total	9		\$4,050
• Prepare Written Report	William Fornia	5	\$555	\$2,775
	Linda Bournival	16	400	6,400
	Tom Vicente	10	550	5,500
	Other Actuarial Staff	12	300	3,600
	Total	43		\$18,275
• Briefings, Meetings and Exit Conference	William Fornia	24	\$555	\$13,320
	Linda Bournival	24	400	9,600
	Tom Vicente	24	550	13,200
	Other Actuarial Staff	5	300	1,500
	Total	77		\$37,620
Total Estimated Cost		306	\$420	\$128,595
Travel Costs				\$12,000
Printing and Other Miscellaneous Costs				\$1,500
Discount for ORSC				(\$13,000)
Total Estimated Fee (not to exceed)				\$129,095

Appendix A – Sample Actuarial Audit Report

**REPORT
TO ORSC**



**ACTUARIAL AUDIT
FOR THE
STATE TEACHERS RETIREMENT SYSTEM OF OHIO**

**William B. Fornia, FSA
Amanda Makarevich, FSA**

May 2022



May 10, 2022

Ohio Retirement Study Council
Columbus, OH 43215

Re: State Teachers Retirement System of Ohio (STRS) Actuarial Audit of the Pension and Health Benefits as of June 30, 2021

Dear ORSC Members:

We have completed our actuarial audit of the State Teachers' Retirement System of Ohio (STRS) pursuant to R.C. §171.04(E). As shown in the attached findings, we have matched actuarial calculations quite closely and have several related comments. None of the comments reflects a critical concern. Our audit finds that actuarial calculations were reasonable, consistent and accurate.

The undersigned are members of the American Academy of Actuaries and meet the Qualification Standards to provide this statement of actuarial opinion.

We are available to answer any questions you may have regarding our findings and recommendations of the actuarial audit.

Sincerely,



William B. Forna, FSA
President
Pension Trustee Advisors



Amanda Makarevich, FSA
Consulting Actuary
KMS Actuaries, LLC

cc: State Teachers Retirement System of Ohio

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Section 1 – General Findings

The Ohio Revised Code §171.04(E) require that the Ohio Retirement Study Council (ORSC) contract for an independent audit of the state retirement systems’ actuaries not less than once every ten years. ORSC elaborated that the firm conducting the audit is to express an opinion regarding:

- An overall opinion as to the validity, completeness, and appropriateness of the demographic and financial information used by the consulting actuary to meet Ohio State Teachers Retirement System (STRS’) financial objectives;
- An overall opinion as to the reasonableness of the consulting actuary’s conclusions and the conformance of the consulting actuary’s work with generally accepted actuarial standards and practices;
- A detailed description of each audit exception and the estimated effects of each exception on STRS; and
- Detailed recommendations for improvement.

Our opinion is that these standards were met, as will be discussed in the following pages.

STRS provides retirement benefits and health care benefits. Actuarial values were reported through two actuarial reports:

- STRS Actuarial Valuation Report as of June 30, 2021, dated October 2021
- STRS Retiree Health Care Benefits Plan Actuarial Valuation and GASB 74 and 75 Report as of June 30, 2021, dated October 2021

We have duplicated these June 30, 2021 actuarial valuations conducted by Cheiron, STRS’ actuary, and the results match quite closely. This match confirms that Cheiron is able to capture the complexity of STRS accurately and that STRS should have confidence in the actuarial calculations provided to them. In addition, we reviewed Segal’s March 3, 2017 Quinquennial Actuarial Experience Review for July 1, 2011 to June 30, 2016 and its recommendations. Segal was the STRS actuary prior to the July 1, 2018 actuarial valuation. We found that the assumptions proposed by Segal, adopted by the Board, and utilized by Cheiron were reasonable. Cheiron has performed their July 1, 2016 to June 30, 2021 Quinquennial Actuarial Experience Review on demographic assumptions and recently released their findings. This analysis does not consider that recent development, but a cursory review of the Cheiron analysis indicates that their findings are fairly consistent with our recommendations. We look forward to Cheiron considering our comments when they conduct their review of economic assumptions later this year.

The primary purpose of an actuarial audit is to confirm that there are no significant errors in the actuarial calculations. Based on our replication, we report that **we have found no significant discrepancies and conclude that there are no significant errors**. This is confirmed on the tables and discussion below.

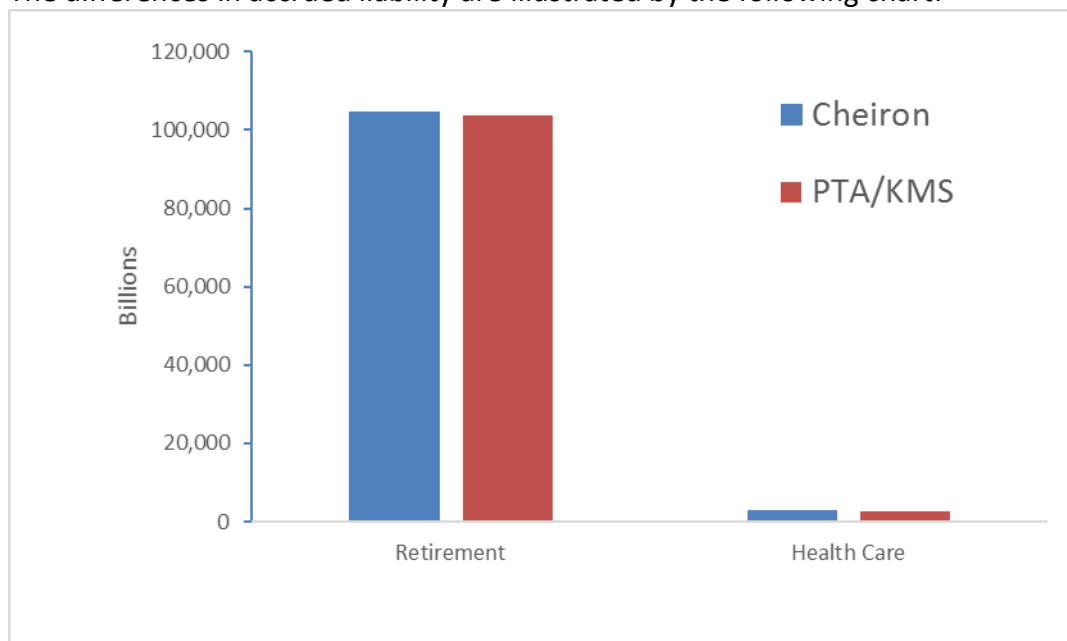
The following tables summarize the actuarial liabilities and normal costs produced by Cheiron and PTA/KMS actuarial valuations.

Actuarial Liabilities and Normal Cost as of June 30, 2021 (\$ in thousands) - Pension Benefits			
	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Present Value of Future Benefits	117,307,166	116,367,022	-0.80%
Accrued Liability	104,591,408	103,874,190	-0.69%
Normal Cost	1,344,767	1,308,056	-2.73%

Actuarial Liabilities and Normal Cost as of June 30, 2021 (\$ in thousands) - Health Care Benefits			
	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Accrued Liability	2,821,322	2,782,265	-1.38%
Normal Cost	38,323	36,653	-4.36%

The grand total actuarial liability calculated by PTA/KMS was within 0.7% of the same calculated by Cheiron. Our grand total normal cost was within 2.8% of that calculated by Cheiron. Both are well within actuarial norms and strong evidence that the Cheiron actuarial valuations are reliable.

The differences in accrued liability are illustrated by the following chart:



Although the match was reasonably close, there is still room for improvement. We make the following recommendations for enhancement in the accuracy of calculations and completeness in the reports:

- Correct minor calculations as discussed in the following pages
- Expand disclosure of methodology and assumptions more rigorously in the next actuarial experience study and valuation reports
- Reconsider certain actuarial assumptions in the next experience study, including:
 - Percentage of employees electing deferred annuities and contribution refunds upon termination
 - Marriage rates
 - Age difference between husbands and wives
 - Number of dependents
 - Annuity option selection
 - Administrative expenses
 - Short-term return on employer assets
 - Gross claim rate derivation
 - Morbidity
 - Health plan participation rates and elections

Section 2 – Audit of Actuarial Methods, Factors and Assumptions

The first step in the actuarial audit process is to review the actuarial methods, actuarial factors, and actuarial assumptions used in the actuarial valuations.

ACTUARIAL METHODS

Cheiron uses several actuarial methods in determining costs and liabilities for STRS.

- The actuarial funding method is the Individual Entry Age actuarial cost method.
- The actuarial asset valuation method for pension is a four-year smoothed market value.
- The amortization of the unfunded actuarial accrued liability is based on a level payroll, closed period method of 30 years as of July 1, 2015.
- The method of developing the health care claims cost assumptions is not clearly described in the reports.

Actuarial Funding Method

The Individual Entry Age Normal actuarial cost method is used for both actuarial valuations. This method is designed to maintain constant plan costs throughout each employee's career as a portion of pay. We believe this is a reasonable and appropriate method. It is the most common method used by large public pension systems such as STRS. Cheiron is applying the method reasonably, consistently, and accurately.

Actuarial Asset Valuation Method

Cheiron employs a four-year smoothed market value actuarial asset valuation method for the retirement plan actuarial valuation. Unlike actuarial funding methods, actuarial asset valuation methods are not precisely defined. Most actuaries use what could be categorized as a four-year or five-year smoothed market value actuarial asset valuation method as does Cheiron, but might use different methods. We have reviewed the precise provisions of the method that Cheiron employs and find them to be reasonable, consistently applied, and accurate.

The method is a conventional and appropriate application of a four-year smoothed method. They spread any investment gains or losses (relative to the actuarial assumption) over four years and apply a 9% maximum disparity from true market value. This is a reasonable and appropriate method. More common is for funds to use a 20% maximum disparity from true market value. This 9% corridor and four-year smoothing has been in place since 1997. STRS has worked with four actuarial firms (Buck, PriceWaterhouseCoopers, Segal, and now Cheiron) who have each utilized this method.

This narrow corridor means that the STRS funding position and amortization cost is more volatile than it would be if using a more conventional wider corridor. This means that in bad investment years, the costs could increase more rapidly, while in good investment years, the costs could decrease more rapidly. This means that STRS is responding more quickly to market returns. This

corridor was triggered only once in the past ten years, in 2021, when it added \$1.9 billion to actuarial value of assets (would have been zero if 20%). This is somewhat unusual to have a corridor this narrow. PERS has a 12% corridor, and the other three Ohio statewide retirement systems have the common 20% corridor. As discussed above, the fact that STRS has a narrower corridor than most means that they may be more responsive to market fluctuations and reflecting the current market conditions. The advantage to this is that it is a truer reflection of the true value of assets. The disadvantage is that the unfunded liabilities and funding periods might be more volatile than they would have been with the typical 20% corridor. As mentioned above, however, this has not been the case. From this point forward, if we were to have a prolonged downturn in investment returns, the STRS actuarial results would respond more quickly than other systems.

We are not concerned with this narrower corridor; only wish to point out the variance from most common practice. We encourage Cheiron to analyze this method concurrent with the next study of economic assumptions and analyze the implications of changing to a wider corridor.

Amortization Method for Determining Funding Amounts

In addition to the Entry Age Normal actuarial cost method, Cheiron and STRS use a conventional method for amortizing components of unfunded liability. The method is a closed period, which decreased from 30 years as of June 30, 2017, to 24 years as of June 30, 2021.

The funding period is calculated by subtracting the employer normal cost from the total employer contributions, and then measuring how many years it would require to fully amortize the unfunded retirement liability from these contributions. While this would tend to decrease every year (by one year if all actuarial assumptions are met), there may be years when the period rises.

Many statewide pension systems continue to use an open period to amortize the unfunded liability. The closed period approach tends to be more conservative than the open period approach. As discussed in our 2011 Pension Reform Solutions report, we believe that the closed period is more appropriate.

The other amortization feature being used is to amortize the costs as a constant percentage of payroll. With payroll growing at an assumed rate of 3.00% per year, this maintains steady costs. An alternative would be to amortize costs in constant dollars, which would result in higher costs in early years when expressed as a percentage of pay. We believe this is a reasonable approach for funding, despite the changes in the GASB rules which will not permit this method for GASB determinations. The 3.00% payroll growth rate is reasonable in the aggregate based on a stable population. We note that the number of covered Defined Benefit Plan members has dropped somewhat since 2016, for example, from 169,212 as of June 30, 2016 to 166,427 as of June 30, 2021. While this is only a 1.6% reduction over five years, if the trend continues, it could undermine the benefit of assuming that payroll increases by 3.00%. We recommend that Cheiron explicitly considers this in their next experience study. While 3.00% might be an appropriate price inflation assumption, if population is

forecasted to decline, STRS may wish to adjust its total payroll growth assumption in order to minimize the likelihood of increasing costs.

In conclusion, we find the amortization method reasonable, consistent, and accurate.

ACTUARIAL ASSUMPTIONS

We have reviewed the actuarial assumptions used by the actuary and find them to be reasonable, consistent, and accurate. Cheiron is conducting the Quinquennial Actuarial Experience Review for 2017 through 2021. We encourage Cheiron and the STRS Board to consider our comments in the process of adopting proposed assumption changes.

The actuary uses a large number of actuarial assumptions, including:

- Demographic Assumptions
 - Post-Retirement Mortality
 - Disabled Post-Retirement Mortality
 - Pre-Retirement Mortality
 - Withdrawal from Service Before Retirement
 - Retirement
 - Disability Retirement
 - Other Demographic Assumptions
- Economic Assumptions
 - Investment Return Rate
 - Inflation
 - Wage Inflation
 - Individual Salary Increases
- Post-Employment Healthcare Assumptions
 - Gross Claim Rate Derivation
 - Health Care Cost Trend Rate
 - Morbidity
 - Retiree – Paid Premiums
 - Health Plan Participation Rates and Elections

Detailed comments on each assumption are included below.

DEMOGRAPHIC ASSUMPTIONS

Demographic Experience Since the 2017 Investigation

Experience in the past five years, since the prior experience investigation, indicates that the demographic actuarial assumptions have generated cumulative actuarial gains of 0.2% over five years. This is an indication that the demographic assumptions in aggregate have been a very reasonable measure of anticipated experience.

Demographic Actuarial (Gains)/Losses By Component (\$millions)

Source	FY 17	FY 18	FY 19	FY 20	FY 21	Total
Salary/Service Increase	(279)	(181)	(208)	(178)	(237)	(1,083)
Retirement	36	121	207	84	203	651
Retiree Mortality	(27)	9	(153)	(111)	(208)	(490)
All Other	275	165	119	29	85	673
Total (Gain)/Loss	5	114	(35)	(176)	(157)	(249)
Actuarial Liability (\$billions)	95	95	96	97	102	102
Gain/Loss as % of FYE Liability	<.1% Loss	0.1% Loss	<.1% Gain	0.2% Gain	0.2% Gain	0.2% Gain

Rates of Post-Retirement Mortality

Actuaries are getting more sophisticated in their techniques for anticipating future mortality improvements. Cheiron is using the more sophisticated method of a “generational” mortality table which assigns different mortality probabilities based not only on age but on generation. For example, an 80-year old retiree in 2022 (born in 1942) would have higher mortality rates than a future 80-year old retiree born in 1987.

Segal in 2017 proposed changing the mortality projection basis from a static projection Scale AA to 2022 to a generational MP-2016 projection scale. This was a substantial enhancement to the actuarial methodology because it recognized future mortality improvement beyond 2022. Mortality improvement projection is a critical issue in the measurement of pension liabilities and costs.

Many trends have contributed to lengthening life expectancies, including:

- Continued eradication of diseases
- Advances in medicine
- Advances in nutrition
- Improved access to medical care

But other trends may suggest that life expectancies may not continue to improve, including:

- Emergence of new diseases including COVID-19 and potential future variants
- Obesity
- Many factors which improved mortality are one-time, and cannot be repeated, for example, smoking cessation trends (one can only quit smoking once)
- More sedentary lifestyles
- Substance abuse
- Climate change

As a result of the uncertainty of these contrary trends, we encourage Cheiron to rigorously study 2020 and 2021 experience and the appropriate application of projection scales. They may choose to incorporate different short-term and long-term mortality improvement scales. The Society of Actuaries has also developed more recent projection scales such as MP-2021.

The table above illustrates that over the five-year period, the retiree mortality assumptions have generated actuarial gains of \$490 million, while the current retiree actuarial liability is \$69 billion. This is less than 1%. Pending Cheiron's consideration of COVID, we would anticipate that a modest decrease in the retiree mortality rate or additional mortality improvement would be recommended.

Rates of Disabled Post-Retirement Mortality

Segal had proposed a standard table for disabled retirees. We expect that Cheiron will include this in their experience study and possibly make minor modifications in this table. This is not a particularly critical assumption, as many more retirees are non-disabled than disabled.

Rates of Pre-Retirement Mortality

The pre-retirement mortality assumption also appears reasonable. Very few active members die, so the use of a standard mortality table is generally appropriate.

Withdrawal from Service before Retirement

We concur that the withdrawal tables developed by Segal and used by Cheiron are reasonable, consistent, and accurate. Cheiron uses a table based on service for individuals with less than five years of service and one based on age thereafter. We find that this is a sound methodology

because individuals do have higher likelihood of termination during their first few years of employment than later in their careers.

The 2017 Segal experience study appropriately balanced prior assumptions with more recent experience and considered the credibility of the data effectively. It appears that Cheiron has taken a similar approach.

Retirement

We concur that the retirement tables used by Cheiron are reasonable, consistent, and accurate. Varying retirement rates are used for (1) retirements prior to July 1, 2015, (2) retirements for grandfathered employees retiring after June 30, 2015, and (3) retirements for non-grandfathered employees retiring after June 30, 2015. The first table is for the most part irrelevant as of now, and when Segal conducted the 2011-2016 experience study, they had only two years of experience to measure when developing these assumptions. Cheiron's 2022 experience study would likely result in some changes to these assumptions. Note from the table at the beginning of this section that the five-year experience is a loss of \$651 million. This probably indicates that members are retiring a bit earlier than anticipated. As Cheiron conducted the 2016-2021 experience study, they did review this and their suggestions seem very reasonable.

Other Demographic Assumptions

We reviewed the other demographic assumptions which could be analyzed by Cheiron. We find their study reasonable, consistent, and accurate. These assumptions include:

Disability Rates – Segal recommended and Cheiron uses an assumption for disability retirement which is 0.01% at ages under 30, increasing to a still-small 0.25% at age 60 and above. This is based on five-year experience where less than 1,000 teachers retired from disability. This is consistent with national experience for teacher retirement systems. Cheiron did analyze this in its 2022 investigation and made adjustments as we would have recommended.

Marriage Rates – Cheiron assumes 60% of future female retirees and 80% of future male retirees would be married. Current retirees use actual marriage data at the time of valuation. We support this approach.

Age Difference between Husbands and Wives – Segal recommended and Cheiron assumes female retirees are one year younger than their husbands and that male retirees are 3 years older than their wives. We find this reasonable. Many retirement systems use three years as a widely established norm. Given the large volume of STRS data available, we recommend that Cheiron continue to make detailed analyses in future experience studies as did Segal.

Number of Dependents – Cheiron assumes that the spouse is the only dependent for the survivor benefit in the retirement plan. For the health valuation, Cheiron assumes that of those future

retirees who elect to continue health coverage, 20% have an eligible spouse who also opts for health coverage at that time. We recommend that this assumption be analyzed in the future experience studies.

Lump Sum Selection – Cheiron assumes that half of terminating members of the Defined Benefit Plan are assumed to elect a deferred termination benefit and half are assumed to take an immediate lump-sum. This was not explicitly studied by Segal in 2017. We recommend that Cheiron include this in a more robust manner in future experience studies. This assumption has a very modest impact on actuarial valuation results and other approaches are likely reasonable. Other approaches may also consider the eligibility for additional benefits, such as retiree health coverage.

Retirement Age for Inactive Vested Participants – For the pension valuation, Cheiron assumes that 5% of these members elect to retire at each early retirement age through age 64, then 100% retire at age 65 or the first age at which unreduced retirement benefits are available. This was consistent with the Segal experience investigation and seems reasonable. For the health valuation, 100% are assumed to retire at age 62 or the first age at which unreduced benefits are available. We would recommend reviewing this assumption and considering making it consistent between the valuations.

Retiree Health Participation – Based on Segal’s recommendations from their 2017 investigation, Cheiron assumes 75% of future eligible service retirees, 65% of future eligible disabled retirees, and 30% of inactive vested participants who do not cash out are assumed to elect health coverage at retirement. This is reasonable at this time, and an important assumption. We see that Cheiron did analyze this thoroughly in the 2022 experience investigation and make changes based on recent experience.

ECONOMIC ASSUMPTIONS

Investment Return Rate

Segal in 2017 recommended a decrease from 7.75% to 7.00% for the investment return rate. This assumption change was a bit “ahead of the curve” with respect to rates used by most systems in 2017, when 7.50% was the rate most commonly used. Today, however, 7.00% is the median return according to the Public Funds Survey.

STRS did not lower the rate from 7.75% to 7.00% at that time. Rates assumed were as follows:

- Lowered from 7.75% to 7.45% for the actuarial valuation as of June 30, 2017.
- Remained at 7.45% for the actuarial valuations as of June 30, 2018, 2019, and 2020.
- Lowered from 7.45% to 7.00% for the actuarial valuation as of June 30, 2021.

Actuaries are required under their standards of practice to opine if they believe that the rate is not reasonable. Even though experience investigations are typically conducted only every five years, this standard applies each year.

A 7.00% rate would be among the lowest rates used by the statewide systems in Ohio. The other systems' expected rates are:

- Ohio Police and Fire Pension Fund – 7.50% (reduced from 8.00% effective 2022)
- School Employees Retirement System of Ohio – 7.00%
- Ohio Public Employees Retirement System – 6.90% (reduced from 7.20% effective 2022)
- Ohio Highway Patrol Retirement System – 7.25%

Of course, a simple comparison of what other systems are using is helpful, but it is not a sufficient criterion for establishing an assumed rate of investment return.

Segal used a robust forward-looking “building block” method, where they developed an inflation assumption, a real return assumption and an assumption for expenses. Each of these components was calculated independently, then summed (net of expenses) to develop the net investment return assumption.

Their 7.00% net investment return assumption recommendation was comprised of 2.50% inflation plus 4.50% real return net of administrative expenses. Inflation is discussed in the section below, so we will focus on the real return component and the administrative expense component.

Based on our experience, investment consultants continue to pare back their expectations for future returns. This is partially a consequence of continued low inflation expectations and short-term fixed income rates, but can also be on a real return basis. Consequently, we would expect that it is likely that in the next experience study, Cheiron would possibly suggest another drop in net return assumption or maintain the 7.00% rate until conditions change.

In particular, recent inflation hints that the continuing decline in expected rates of return may be tapering. We trust that Cheiron rigorously analyzes both the expected real return as well as the inflation assumption.

According to state data from the Public Funds Survey as of March, 2022, the average real rate of return assumption for 119 state systems, 47 of which disclosed this, is 4.53%. Although not specifically asked, this is presumably after reduction for administrative expenses in most responses.

The 4.50% real rate currently used by STRS is the lowest rate used by the statewide systems in Ohio. The other systems' expected real rates of return are:

- Ohio Police and Fire Pension Fund – 5.25% (possibly to be reduced effective 2022)
- School Employees Retirement System of Ohio – 4.60%
- Ohio Public Employees Retirement System – 4.70% (possibly to be reduced effective 2022)
- Ohio Highway Patrol Retirement System – 4.75%

Administrative Expenses – STRS’ anticipated administrative expenses are incorporated into its valuation by reducing the assumed rate of return by 0.20%. The investment return rate is thus assumed to be net of administrative expenses. Segal incorporated a thorough analysis of this assumption, including a look at asset classes such as real estate and alternatives where returns are sometimes calculated net of their investment expenses. We recommend that Cheiron also incorporates a robust expense assumption in the 2022 experience investigation.

Health Care Plan Rate of Investment Return – Cheiron uses the same 7.00% investment return assumption for the healthcare valuation as is the assumed return from plan assets. This is appropriate because the plan is fully funded and expected to remain so.

Inflation

We reviewed the development of the 2.50% inflation rate developed by Segal and used by Cheiron. We find that the assumption is very reasonable. The Segal investigation considered forward looking data such as the yields on inflation-indexed treasury bonds and economist forecasts to the extent that they are not purely short term. We expect that Cheiron will continue to use a robust analysis as did Segal. This is particularly valuable in the current environment, where headline inflation is high, but the bond markets continue to anticipate modest long-term inflation.

According to the Public Funds Survey data cited above as of March, 2022, the median inflation assumption for those who reported their inflation rate is 2.55%.

A 2.50% rate is consistent with the other statewide systems in Ohio. The other systems’ expected inflation rates are:

- Ohio Police and Fire Pension Fund – 2.75% (possibly to be reduced effective 2022)
- School Employees Retirement System of Ohio – 2.40%
- Ohio Public Employees Retirement System – 2.50%
- Ohio Highway Patrol Retirement System – 2.50%

Wage Inflation

Cheiron proposes a real wage inflation, or payroll growth rate, of 0.50%. When added to 2.50% inflation, this results in a total payroll growth assumption of 3.00%. We find this to be reasonable, consistent, and accurate. Segal provided a robust analysis in support of this assumption in its experience study. We expect Cheiron to conduct a similar analysis and note

that 0.50% is typical and reasonable. As mentioned above, however, this wage inflation assumption is also used for the amortization policy. The active member population has declined from 175,065 in 2006 to 169,212 in 2016 to 166,427 in 2021. If the population continues to decline, this 3.00% assumption may no longer be appropriate.

Individual Salary Increases

Segal analyzed individual salary increase rates, and made recommendations for minor reduction. We found this to be appropriate and expect that Cheiron will make a similarly robust analysis. In particular, it is critical to analyze *real* (inflation-adjusted) salary growth as did Segal. Inflation averaged only 1.80% during the five-year period, compared with a previously assumed rate of 2.75%. With such a large disparity between 2.75% and 1.80%, it was particularly appropriate that Segal reflected this gap between actual and expected inflation. As we would have recommended, we see that Cheiron did use this methodology in its experience study and not merely study nominal salary growth.

POST-EMPLOYMENT HEALTHCARE ASSUMPTIONS

Gross Claim Rate Derivation

It is common practice for actuaries to project future claim costs by measuring past experience and adjusting it to reflect the effects of inflation and plan design. Cheiron did this based on Calendar Year (CY) 2020 and CY 2021 projected premiums provided by STRS developed by its vendors (Wakely, Aetna, AultCare, and Paramount). Cheiron thoroughly documented this process in the actuarial valuation report. Based on our review of certain calculations, we find that the health care claim cost assumption is reasonable.

In order to develop the core health care claims cost assumption, Cheiron took the following steps:

- Average the 2020 and 2021 premium rates STRS pays its vendors,
- Average Wakely's projected 2019 and 2020 Employer Group Waiver Program Recoveries that STRS is expected to receive for CY 2020 and CY 2021 prescription filled dates,
- Reflect an estimate of the Rx rebates PPM for the Non-Medicare population-based on actual 2018 Non-Medicare Rx rebates,
- Add a children load of 3.1% for Medical and 1.9% for Rx to Non-Medicare claims and expenses.

We have reviewed the resulting gross rates and find them reasonable, appropriately calculated, and accurate. We recommend that Cheiron study the children load in the 2022 experience investigation.

Health Care Cost Trend Rate

To properly measure future liabilities, actuaries apply trend rates (health inflation) to the base claim costs described above. Standard practice is to use prevailing national trend rates and grade down to an ultimate trend rate that is slightly higher than prevailing CPI rates. In this case, the ultimate

trend rate is 4.00%. Cheiron used the Society of Actuaries (SOA) Long-Run Medical Cost Trend Model version 2020_b.

We find this approach reasonable and the trend rates which it produces reasonable. COVID has had a profound effect on healthcare costs. We encourage Cheiron to consider this carefully in the next experience investigation. This might lead to basing projections on long run trends, extrapolating from 2026 forward, leaving the intervening turbulence (years 2022 -2025) mostly unspecified.

Morbidity

In a health insurance valuation, morbidity is sometimes defined as the difference in claims costs at different ages. Morbidity rates are also known as aging factors. They are used to transform average health cost assumptions to health care cost assumptions which vary by age and gender. Cheiron did not disclose in the valuation report what data was used for development of aging factors.

We encourage Cheiron to review these factors in the next experience study to the extent data is available. At the very least, we would recommend that the experience study report discloses the process used for choice of these aging factors. We reviewed the aging factors developed by Cheiron and found them appropriate.

Retiree Contributions

The true measure of a plan's liability is the difference between total claims costs and the amount that retirees contribute to offset those total costs. In developing the Plan's liability, Cheiron used the specific STRS subsidy provisions. We reviewed the methodology used by Cheiron and found it appropriate. However, additional detail could be provided directly in the report as we found it necessary to reference the retiree benefit booklets provided on the STRS website for clarification of the retiree contribution provisions. For clarity and transparency, we recommend that this information be included in the actuarial valuation report.

Health Plan Participation Rates and Elections

Based on the Segal experience investigation, Segal recommended that the assumption be that 75% of future eligible service retirees, 65% of future eligible disabled retirees, and 30% of inactive vested participants who do not cash out are assumed to elect health coverage at retirement. Cheiron adopted Segal's recommended assumption. We recommend that Cheiron demonstrate a rigorous analysis of these assumptions in the next experience investigation.

DISCLOSURE OF ACTUARIAL ASSUMPTIONS AND METHODOLOGY

Cheiron's disclosure of actuarial assumptions (and methods) was robust, particularly given the complexity of STRS.

If STRS were ever to change actuaries from Cheiron, based on our experience with the audit, the new actuary would be able to confirm the reasonableness of Cheiron's calculations.

Section 3 – Audit of Compilation of Actuarial Valuations

The cornerstone of an actuarial audit is a replication of the actuarial valuation. As mentioned above, we matched quite closely the costs and liabilities developed by Cheiron for the retirement system. Consequently, we conclude that the valuation results are reasonable, consistent, and accurate.

The following table summarizes the present value of future benefits, actuarial liability and normal cost for the Pension Benefits produced by Cheiron and PTA/KMS actuarial valuations.

Table 3.1
Pension Benefits Liabilities as of June 30, 2021

Actuarial Liabilities and Normal Cost as of June 30, 2021 (\$ in thousands)					
STRS	<u>Defined Benefit</u>	<u>Cheiron Combined</u>	<u>Total</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Present Value of Future Benefits					
Active Members	45,245,074	604,064	45,849,138	45,238,799	-1.33%
Reemployed Retiree Benefits	281,192	0	281,192	281,192	0.00%
Inactive Benefits					
(i) Deferred Annuity	1,563,705	17,903	1,581,608	1,560,574	-1.33%
(ii) Contribution Refund	395,303	1,336	396,639	396,639	0.00%
Retiree & Beneficiary Benefits					
(i) Annuity & Pension Reserve Fund	67,988,885	44,808	68,033,693	67,721,730	-0.46%
(ii) Survivor's Benefit Fund	1,164,896	0	1,164,896	1,168,088	0.27%
Total	116,639,055	668,111 [✓]	117,307,166	116,367,022	-0.80%
Accrued Liability					
Active Members	30,373,530	333,380	30,706,910	30,311,596	-1.29%
Reemployed Retiree Benefits	281,192	0	281,192	281,192	0.00%
Inactive Benefits	1,959,007	19,240	1,978,247	1,965,246	-0.66%
Retiree & Beneficiary Benefits	69,153,781	44,808	69,198,589	68,889,818	-0.45%
Defined Benefit Plan Actuarial Liability	101,767,510	397,428 [✓]	102,164,938	101,447,852	-0.70%
Defined Contribution Account Balances	2,426,470	0	2,426,470	2,426,338	-0.01%
Total	104,193,980	397,428	104,591,408	103,874,190	-0.69%
Normal Cost	1,324,603	20,164	1,344,767	1,308,056	-2.73%

The defined contribution account balances disclosed by PTA/KMS are based on the file entitled "NRS FYE 2021 BALANCES.txt" provided directly by STRS.

The following table summarizes the actuarial liability and normal cost for the retiree health benefits produced by Cheiron and PTA/KMS actuarial valuations.

**Table 3.2
Retiree Health Benefits Liabilities as of June 30, 2021**

Actuarial Liabilities and Normal Cost as of June 30, 2021 (\$ in thousands)			
	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Accrued Liability			
Active Members	1,137,505	1,098,426	-3.44%
Inactive Members	2,990	2,910	-2.67%
Retirees, Spouses and Beneficiaries	1,680,827	1,680,929	0.01%
Total	2,821,322	2,782,265	-1.38%
Normal Cost	38,323	36,653	-4.36%

Summary of Deviation of Results

	Pension Benefits Valuation Results	Retiree Health Valuation Results
Accrued Liability	-0.69%	-1.38%
Normal Cost	-2.73%	-4.36%

Actuaries generally use a 5% deviation as an acceptable range of error. As the total actuarial liabilities and normal costs deviations calculated by PTA/KMS were well within this “margin of error,” we are completely satisfied that the numbers are appropriate.

Although we did match quite closely, there are several areas which we would encourage Cheiron to explore further:

- In valuing the pension and retiree health benefits, the following are a few items we uncovered that could be corrected, but overall would be immaterial to the valuation results:
 1. In the pension valuation, ensure that all members who would have been eligible to retire as of July 1, 2015 (the definition of grandfathered per the report) have been properly identified so that the appropriate retirement rates and benefit formulas may be applied. Cheiron indicated that only those members with a grandfathered flag in the data were considered grandfathered, but there were a

number of other members that would have been eligible to retire at July 1, 2015 that did not have this grandfathered indicator in the data.

2. Verify that the non-Medicare subsidy for 2022 and beyond is being applied correctly. According to the report, a subsidy of 2.055% per year of service to a maximum of 30 years applies in 2021, and in 2022 and beyond, a subsidy of 2.1% per year of service to a maximum of 30 years applies. However, our calculations indicate that the 2.055% subsidy may have been applied for 2022 and beyond.
3. Ensure that the correct retirement rates for members who have more than 30 years of service but are not eligible for unreduced retirement prior to age 65 are applied in the healthcare valuation. The report indicates that “two times 25-29 years of service rates” should be used under these circumstances, but we were only able to come close to matching the healthcare test lives within a reasonable margin when using the rates provided in the table for 29-34 and 35+ years of service for both reduced and unreduced retirement eligibility.
4. In the healthcare valuation, the report states that the trend rate for Limited Medicare is 6% for 2036 and beyond. However, the assumption tables we received have 4% for this trend rate, and we prepared our results using 4% as we were able to match more closely with this rate and it is consistent with the ultimate trend rate for all other benefits. It appears 6% may just be a typo in the report.
5. Disclose that the assumption that 50% of terminating individuals elect deferred annuities, and that 50% elect a refund of contributions also applies to members in the Combined Plan. This is consistent with our results, but the report only refers to the assumption applying to the Defined Benefit Plan.
6. For the Combined Plan, explicitly state which active benefits are included in the valuation and which are assumed to be funded fully by member contributions and therefore not generate any liability. Our results valued only retirement and termination benefits. Inclusion of death and disability benefits resulted in large discrepancies between our results and Cheiron’s, so we conclude that these benefits are not considered. The report indicates that member contributions and investment earnings are used in the funding of death and disability benefits, but it is unclear to what extent this is assumed.
7. We were unable to closely match the disability benefits in the pension valuation sample lives. Given that our level of discrepancy was consistent between all of the benefit formulas, we believe that there may have been a minor error with the post-retirement mortality assumption. However, we were not able to verify this

with the information provided in the sample lives. The difference was still immaterial overall as disability is a small percentage of total benefits.

8. We were also unable to replicate the death benefit in the healthcare valuation. Given that the gross benefit and participant net to zero or close to it in the test lives, this had no effect on our results.

STRS provided us with the system data for all active members and pensioners. Detailed data layouts that identified all the data elements used by Cheiron were provided for the pension valuation. Cheiron also provided us with the data files they utilized in performing the valuations. In performing our replication, we utilized the data files provided by Cheiron.

The following tables summarize the demographic statistics for the pension benefits and retiree health benefits valuations produced by Cheiron and PTA/KMS actuarial valuations:

Table 3.3
Active Members as of June 30, 2021 (\$ in thousands)

STRS	Male			Female			Total		
	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Number of Members	45,769	45,769	0.00%	120,658	120,658	0.00%	166,427	166,427	0.00%
Annual Salaries	3,265,627	3,265,627	0.00%	7,805,368	7,805,367	0.00%	11,070,995	11,070,994	0.00%
Average Annual Salary	71	71	0.00%	65	65	0.00%	67	67	0.00%
Average Age	45.23	45.23	0.00%	43.82	43.82	0.00%	44.20	44.20	0.00%
Average Service	13.74	13.74	0.00%	13.52	13.52	0.00%	13.60	13.60	0.00%

Table 3.4
Inactive Members as of June 30, 2021

STRS	Male			Female			Total		
	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Eligible for Allowances	4,944	4,944	0.00%	15,569	15,569	0.00%	20,513	20,513	0.00%
Eligible for Refunds Only	51,452	51,452	0.00%	92,256	92,256	0.00%	143,708	143,708	0.00%
Total	56,396	56,396	0.00%	107,825	107,825	0.00%	164,221	164,221	0.00%

Table 3.5
Retirees and Beneficiaries as of June 30, 2021 (\$ in thousands)

SERVICE RETIREES	STRS		
	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Number of Members	133,532	133,532	0.00%
Annual Allowance	6,267,659	6,258,153	-0.15%
Average Allowance	46.94	46.87	-0.15%

SURVIVORS & BENES	STRS		
	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Number of Members	18,600	18,600	0.00%
Annual Allowance	556,845	555,520	-0.24%
Average Allowance	29.94	29.87	-0.24%

DISABILITY RETIREES	STRS		
	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Number of Members	4,789	4,789	0.00%
Annual Allowance	184,917	184,576	-0.18%
Average Allowance	38.61	38.54	-0.18%

<u>TOTAL</u>	<u>STRS</u>		
	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Number of Members	156,921	156,921	0.00%
Annual Allowance	7,009,421	6,998,249	-0.16%
Average Allowance	44.67	44.60	-0.16%

Members in Retiree Health Care Benefits Valuation as of June 30, 2021			
<u>Status</u>	<u>Number</u>		
	<u>Cheiron</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Active Members	166,424	166,424	0.00%
Retired	93,045	93,045	0.00%
Surviving Spouse	4,237	4,237	0.00%
Disabled	3,277	3,277	0.00%
Spouse of Retiree	12,605	12,605	0.00%
Term Vested	20,430	20,430	0.00%
Grand Total	300,018	300,018	0.00%

Section 4 – Other Considerations

ACTUARIAL REPORT

We found the Cheiron actuarial valuation reports and Segal’s experience study report to be very well written, and focusing on important issues. Actuarial Standard of Practice (ASOP) No. 41 provides extensive guidance to actuaries regarding actuarial communications. We find that the Cheiron reports fully comply with the guidance of ASOP 41.

We would recommend a few modifications to enhance the completeness of the actuarial valuation reports. These include items discussed in Section 3 as well as the following:

- Table IV-1 identifies the account balances for Defined Contribution Accounts. But the entire \$2,426,469,723 is listed as an actuarial liability in the Defined Benefit Plan column. No value is listed for the Combined column. This amount is also listed as an asset in Table III-1, but in that table it is listed in a column labeled “Defined Contribution.” This amount flows through as both an asset and liability, which is appropriate, as it is a defined contribution account balance, but the labelling of it as part of the Defined Benefit Plan in Table IV-1 is not strictly correct. We recommend either a footnote explaining that the amount is included in that column (along with an NA in the Combined column) or including a third column labelled “Defined Contribution” with that \$2,426,469,723 value.
- We recommend that Cheiron includes the following in the pension benefits and retiree health benefits valuation reports:
 - Rationale for economic and demographic assumptions under the guidance of ASOP 27 and ASOP 35, respectively.
 - Breakout of liabilities by pre-65 and post-65 health care benefits.

Additionally, the reports generally are consistent with Government Finance Officers’ guidelines for reporting. The Cheiron signers of the reports are qualified actuaries and compliant for their continuing professional development education as of 2021.

The Segal actuarial experience study and report were similarly comprehensive, complete, and clear.

ACTUARIAL AUDIT PROCESS

Cheiron has been very cooperative in sharing of individual calculations supporting the calculations reported in the actuarial valuation report. However, rather than Cheiron providing complete detailed numbers for specified individuals, only a limited amount of information was provided, particularly in the case of the pension valuation. The inactive test lives for the pension valuation only provided results for the present value of future benefits, accrued liability, and first year

expected benefit payments without any further detail. The active pension test lives had slightly more detail as the present value of future benefits, accrued liability, and normal cost were broken out by benefits attributed to individual decrements, but still lacked details for individual benefits. As a consequence of this lack of information, (1) we cannot confirm that Cheiron is properly making the calculations, only that our calculations match within a reasonable margin, and (2) the audit process is much more tedious, time-consuming and drawn out than necessary. The test lives provided for the healthcare valuation, however, were more detailed. As a result, it was easier to replicate individual benefits and identify small errors as mentioned above.

We understand that there may be sound business, competitive, or legal reasons for Cheiron to have a non-disclosure policy. We also understand that at some other major actuarial firms (some of which do not consult to public pensions) have a similar policy. However, it is important to point out that this policy can make actuarial audits more problematic, lengthy and dubious than normal, as indicated in the previous paragraph. It would probably be helpful if future auditors were aware of the limits on shared information in advance. This issue is not unique to STRS and Cheiron. Actuarial firms are more often taking this approach of limiting detailed information that is shared. While most of the more than 20 audits that we have conducted in the last 20 years have not had this issue, many of the ones we have conducted in the last five years do have this issue.

CONCLUSIONS

We found Cheiron's work to be strong. It was reasonable, consistent, and accurate. We do not believe that any methods, assumptions, or calculations are erroneous to the level of necessary recalculations.

Cheiron, the ORSC, and the STRS staff were fully cooperative and responsive, which assisted in the process. Finally, we wish to reaffirm that the work done by Cheiron was reasonable, consistent, and accurate.

Appendix B – Sample Actuarial Audit Presentation

Presentation on the Actuarial Audit of the
State Teachers Retirement System of Ohio
for Ohio Retirement Study Council

William B. Fornia, FSA

To ORSC June 9, 2022

Agenda

- Major Findings of Actuarial Review
- Actuarial Assumptions
 - Demographic
 - Economic
 - Healthcare
- Actuarial Methods
- Actuarial Liability
- Healthcare Review
- Audit Conclusions

Major Findings

- We believe the numbers are correct
 - Our calculations match Cheiron calculations
 - Although the STRS benefit structure is very complex, the Cheiron calculations captured key provisions accurately
- Improved transparency in the Cheiron reporting is desirable
 - Development of assumptions
 - Disclosure of calculations
- Actuarial Assumptions are reasonable, but anticipate that they will be revised based on results of recent experience study

Findings of Actuarial Review - Summary

Actuarial Assumptions

- ↳ Reasonable and consistent
- ↳ Some minor concerns

Actuarial Methods

- ↳ Reasonable and consistent
- ↳ Some minor concerns with disclosure

Actuarial Valuation Replication

- ↳ Close match (0.7% on total liability)
- ↳ Reasonable, consistent and accurate

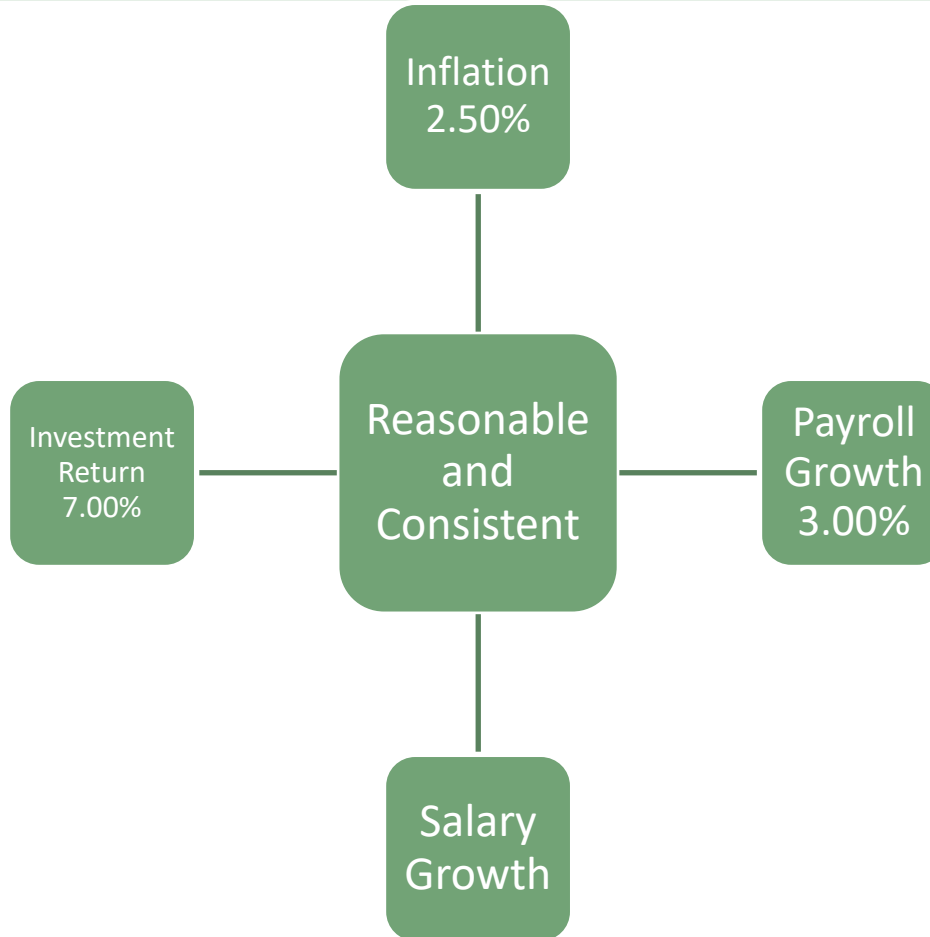
Actuarial Process

- ↳ Unable to precisely verify detailed calculations
- ↳ But overall close replication match suggests confidence in numbers

Demographic Assumptions



Economic Assumptions



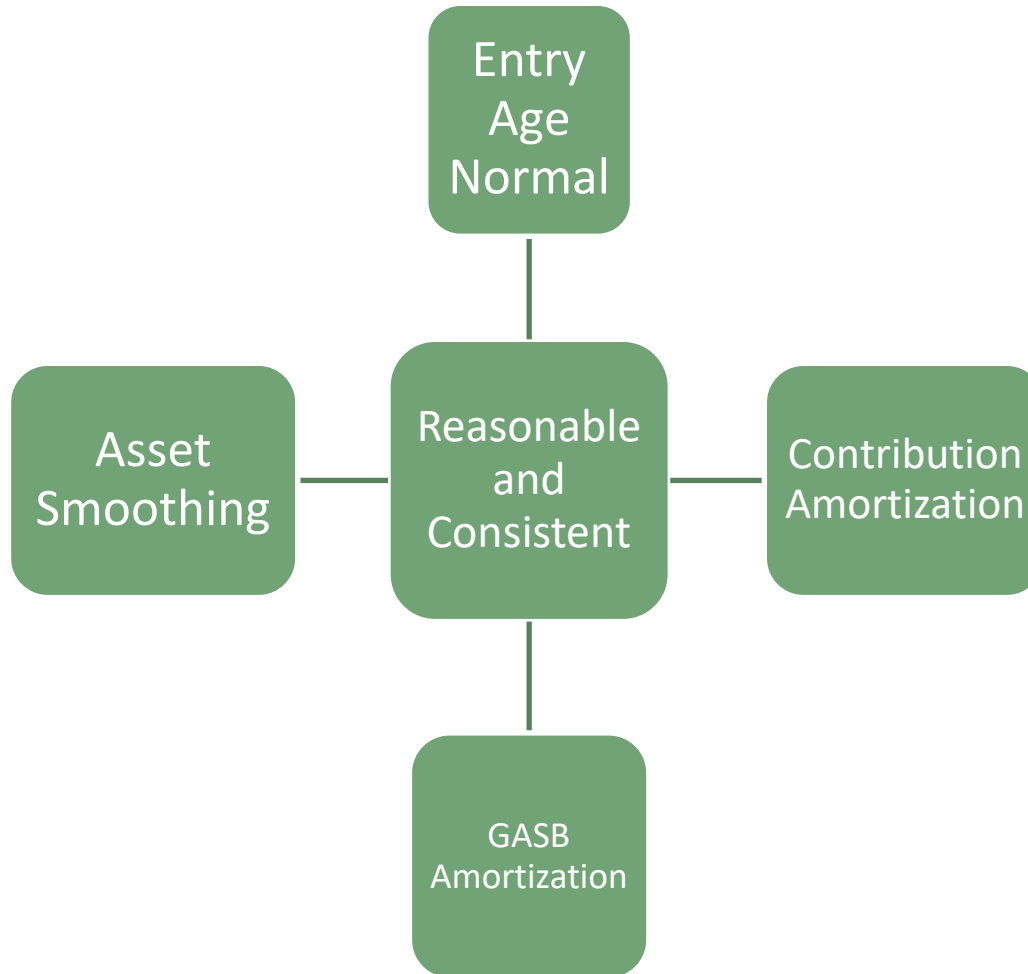
Economic Assumptions

- Investment Return Rate of 7.00%
 - Among the lowest of other systems (range is 6.90%-7.50%)
- Inflation Rate of 2.50%
 - Consistent with peers (median is 2.50%)
- Payroll Growth of 3.00%
 - Real wage inflation of 0.50% plus 2.50% inflation
- Salary Growth Rate
 - Reasonable, experience study analyzed inflation-adjusted salary growth appropriately

Healthcare Assumptions



Actuarial Methods



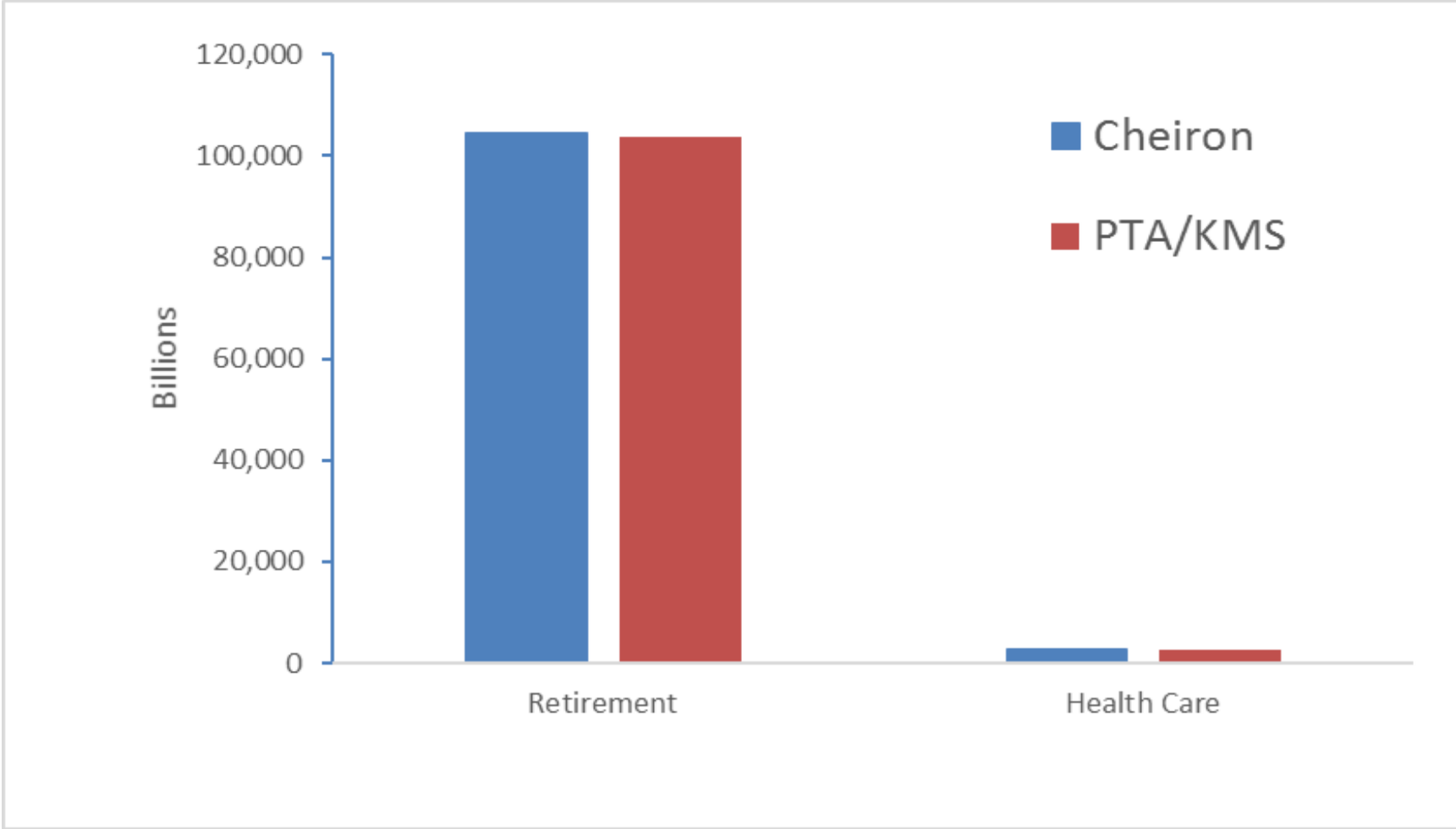
Amortization Methods

- For determination of contribution requirements
 - Based on increasing payroll (3.00% of total payroll)
 - 3.00% payroll growth reasonable in aggregate for a stable population
 - Consider reviewing payroll growth assumption given declining active population over the last 5 years
 - Amortization period is 24 years as of June 30, 2021
 - Down from 30 years as of June 30, 2017
 - Closed period approach – more conservative than open period approach

Actuarial Valuation Replication

- Data used by Cheiron matches data provided by STRS
- Reasonable match
- Actuarial liabilities match within 0.7% in total
- Thorough, complete work by Cheiron

Actuarial Liability



Health Care Review

- Assumed 2021 monthly rates are reasonable
- Age-adjusted rates reflect reasonable morbidity by age, are consistent with monthly rates and are reasonable

Audit Conclusions

- Reasonable match in valuation replication
- Assumptions, Methods and Factors
 - Reasonable
 - Consistent
 - Accurate
- Health care rates are reasonable
- Cheiron reports are complete
- Recommendations
 - Provide next auditor with transparent calculations
 - Correct minor issues mentioned in audit report

Minor Concerns and Areas for Improvement

- Clarify grandfathered retirement rates
- Address minor concerns with application of assumptions in health care report, including retirement rates, subsidies, and trend rates
- Provide more robust disclosures regarding the Combined Plan benefits in the pension report
- ORSC and System may wish to consider timing of changes in actuarial assumptions with timing of actuarial audit

Actuarial Audit Replication – In a Perfect World

- Auditing actuary receives:
 - From pension system:
 - Plan provisions,
 - Member data, and
 - Asset information
 - From system actuary:
 - Actuarial valuation reports, and
 - Experience study reports
- Auditing actuary is able to:
 - Match calculations of system actuary, and
 - Opine that system actuary's assumptions and methods are reasonable and appropriate

Actuarial Audit Replication – In the Real World

- Actuarial valuation report is not 100% complete in its description of plan benefits, actuarial assumptions, and actuarial methods
- Actuaries and retirement system have ongoing conversations clarifying ambiguities
- System actuary provides test cases illustrating precise calculations

Actuarial Audit Replication – In STRS World

- Cheiron was helpful and responsive in clarifying plan provisions and assumptions
- Cheiron would not provide detailed calculations
 - PTA/KMS could only try to replicate individual calculations through trial and error
 - After detailed questions and clarifications, we were able to match to totals reasonably
- We recommend that Cheiron provide fully transparent sample calculations
 - And enhance minor reporting issues in the next experience study report and/or actuarial valuation report

Findings of Actuarial Review - Recap

Actuarial Assumptions

- ↳ Reasonable and consistent
- ↳ Some minor concerns

Actuarial Methods

- ↳ Reasonable and consistent
- ↳ Some minor concerns with disclosure

Actuarial Valuation Replication

- ↳ Very close match (0.7% on total liability)
- ↳ Reasonable, consistent and accurate

Actuarial Process

- ↳ Unable to precisely verify detailed calculations
- ↳ But overall close replication match suggests confidence in numbers