ACTEX Learning

# RET 101

# Retirement Plan Design Comprehensive Summary

1st Edition

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An SOA Exam

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# NOTES

Welcome to your preparation journey for the SOA RET101 – Retirement Plan Design / RET201 – Retirement Plan Valuation / RET301 – Actuarial Topics for Canadian Retirement Plans.

This manual follows the official syllabus and presents each topic in a clear, focused manner to help you master the material with confidence and clarity. To complement your study, a set of accompanying flashcards is available for quick reviews, reinforcing key concepts, and keeping your knowledge fresh on the go.

While every effort has been made to ensure accuracy, I warmly welcome your thoughts, suggestions, or corrections at *actuarial613@gmail.com*. Remember—steady progress, disciplined practice, and a willingness to challenge yourself are the keys to success. As a final suggestion, practice is essential. Among the most common reasons for failure, not taking past exams seriously ranks as the number one issue. Candidates are strongly encouraged to attempt the relevant past-year questions published officially by the SOA to maximize their chances of passing.

Best of luck with your studies!

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# ***<u>FUNDAMENTALS OF PRIVATE PENSION (9TH EDITION) BY MCGILL ET AL.</u>***

**Chapter 9: Dealing with risks out outliving resources in retirement (page 270 - 289)**

## I. <u>ANNUITIES AND RETIREMENT PLANS</u>

1. Trending away from annuitization (coincide with shift to DC / Hybrid)
2. Amount people willing to pay for annuities depends on risk aversion and decreased with the ROR they can make
   a) Known vs. uncertain inflation environment not a significant factor
3. Why the low annuitization rate
   a) Social Security (already an annuity but alone not enough to sustain living standards)
   b) Tapping home equity
      i) Tend to sell when health declines (moving into nursing home) or widowed
      ii) Use proceeds to pay for institutional services (e.g. nursing homes) vs. buy annuity
   c) Pricing of individual annuities – Expensive (various loads), timing risks
      i) Variable immediate annuity – also state prem. tax, annual investment a/c charges
      ii) Inflation indexed annuity
      iii) Life annuity with long term care insurance – PPA (2006) gives small tax advantage, though unavailable for qualified plans
   d) Legal and institutional considerations for annuity pricing under pension plans
      i) Plan must offer QJSA for annuity options
      ii) PPA (2006) mandated use of corporate bonds to calculate lump sum option
   e) Desire for felicity – most like combo of lump sum and annuity (security and spending flexibly)
   f) Bequest motives
   g) Self insurance and couples – higher ROR from alternative investments than annuitization

# *MANAGING POST-RETIREMENT RISKS*

**Strategies for a Secure Retirement 2020**

## I. MANAGING INFLATION RISKS

1. Optimize inflation-protected sources of income:
    a. Delay Social Security benefits after full retirement age and before age 70 increases their benefit
    b. help build up valuable inflation-indexed benefits
    c. Coordinating the start dates of other retirement incomes can optimize this strategy.
2. Plan for increased consumption over time - set aside assets for the more expensive future
    a. Invest in assets with inflation protection/hedging in the long run (though more volatile in short run)
    b. I.e. trading inflation risk for financial market risk
    c. E.g. stocks, commodities, Treasury Inflation Protected Securities (TIPS)
3. Home values: risky strategy to rely on increases in house value and selling it to generate retirement income

## II. MANAGING INTEREST RATE RISKS

1. Lock in interest rates
2. Consider longer-term investments: long-term bonds, mortgages or dividend-paying stocks
    a. although the risk is rising rates will reduce asset value available to meet needs
    b. For bonds, consider methods (e.g., duration matching, bond ladders) to manage rate risk
3. Long-term rates often move in tandem with inflation.
    a. Low rates is more harmful to those rely on interest income for retirement
    b. When rates earned on investments decline, rates charged on some forms of debt, e.g. credit card debt, may not decline.

## III. MANAGING INVESTMENT RISKS

1. Diversification E.g. diversify across asset classes, avoid heavy concentration in a few stocks
2. Think long term: e.g. develop income-generating plans (fixed income) and gradually reduce equity exposure throughout retirement
3. Invest in different types of pooled approaches e.g. mutual / target-date / index funds, ETFs.
4. Don't forget fees: Investors cannot control return but can control the fees paid for investing
5. Additional considerations
    a. Investment products that guarantee against loss of principal may have higher fees
    b. Generally, older people allocate decreasing proportion of their assets to equities over time (less time than younger people to recover loss)
        i. But those who can cover regular spending needs without selling stocks might decide to hold a greater proportion of stocks
    c. Retirees who don't use target date funds can still achieve the same goal by slowly moving a percentage of their investments from stocks to bonds as they age.
    d. Investing large amounts in any single stock increases risk, especially in the employer stock (additional job loss potential)
        i. If receiving employer stock, particularly important to focus on opportunities outside the employer

## IV. MANAGING EMPLOYER SOLVENCY RISK

1. Employer solvency risk (certainty of income and future accruals)
    a. Risks from single employer DB
        i. Plan freeze / termination (ability to earn benefits)
        ii. Lay off
        iii. Employer bankruptcy
        iv. Plan underfunded and earned benefits > what is guaranteed by Pension Benefit Guaranty Corp.

b. Multiemployer DB plan
   i. Plan freeze
   ii. Layoff
   iii. Employer leaves MEP, Employer bankruptcy
   iv. Plan underfunded and earned benefits > what is guaranteed by Pension Benefit Guaranty Corp.
   v. Trustees declare benefit reduction to shore up plan financial position
c. DC Plan: higher risk when invested in employer who becomes distressed / employee is laid off
d. Annuity contract issues: Insurer insolvent and benefits earned > State guaranty

2. Managing the risks - Be familiar with plan issues
   a. DB plan issues: PBGC limit
   b. DC: No state guarantee, diversify investment especially if DC assets are heavy in employer stock
   c. Understand annuity contracts: State guaranty limits vary by state (limit the amount purchased from one insurance carrier to the guaranteed amount)
   d. Additional considerations
      i. Consider ongoing viability of employer/plan when choosing distribution options e.g. lump-sum, single-life annuity, and joint-and-survivor annuity
      ii. Plans may offer retirees to exchange fixed lifetime income for lump sum - Consider if can manage the money for the remainder of lifetime and produce sufficient income (higher longevity risk)
      iii. Insurance company annuity - understand the features and their costs, financial soundness of the insurer, and state guarantee rules

## V. <u>MANAGING LONGEVITY RISKS</u>

1. Focus on products with a fixed amount for a guaranteed period e.g. Social Security, traditional pensions and immediate annuities.
2. Explore deferred annuity products
3. Delaying Social Security: (may not be optimal
   a. for those with shorter life expectancy or who rely on the benefits to make ends meet
   b. if spouse not dependent on the retiree’s benefits,
4. Maintain a process to provide regular withdrawals with a gradual drawdown of assets -improves the chance of having income longer
5. Manage the required minimum distributions (RMDs) - RMDs can be a good rule of thumb
6. Consider home value
   a. For large outstanding mortgages - reverse mortgages can improve cash flow (need to evaluate related fees and terms)
   b. If not, consider paying off and not take on a new mortgage.
7. Additional considerations
   a. Periodic review expected income needs and resources and adjust strategies if necessary
   b. Approach to annuitization:
      i. General rule of thumb - avoid annuitizing all of one’s assets
      ii. Social Security provides a significant lifetime income to most retirees) - but some retirees may want to buy more from the private market
      iii. Pros: income guarantees without the need to manage the money for withdrawals
      iv. Cons: losing control of assets, costs of annuity products, and inability to leave money to heirs
   c. Annuities without inflation protection - only partial protection against cost of living increases
   d. Annuities can include survivor benefits
   e. Consider multiple annuity purchases over time - average out the purchase price and spread risk among different insurers
   f. Investments that incorporate annuities: Selecting those that include various guaranteed withdrawals.
   g. Use reverse mortgages to create retirement income (can add and reduce risks at the same time, need to be very careful when using)
   h. Annuities compared with reverse mortgages
      i. When rates are high, more annuity income but lower amount from reserved mortgage
      ii. Consider combining reverse mortgages with investments to provide retirement income.

## VI. MANAGING POST-RETIREMENT EMPLOYMENT

1. To maintain employment: continue to improve expertise and technical skills, enhance healthy mental and physical presence
2. Postpone retirement: a very powerful way to improve retirement security. Allow resources to grow while fewer years in retirement
3. Retire gradually
4. Additional considerations
   a. Retirement planning generally does not rely heavily on income from post-retirement employment.
   b. Terminating employment before age 65 may make it difficult to find a source of affordable health insurance before a retiree is eligible for Medicare.

## VII. MANAGING CHANGES IN HOUSING AND SUPPORT NEEDS (SUITABILITY AND AFFORDABILITY)

1. Make affordable choices:
   a. Retirement planning typically cover expenses for different types of housing or upgrades to allow aging in the home
   b. Housing is the largest expense plus housing values are unpredictable and it can take a long time to sell
2. Consider different financial strategies depending on retiree's situation
   a. Paying off mortgage and remain debt-free
   b. Take a reverse mortgage
   c. Secure a home equity loan - provide a large lump sum to cover an expensive repair that can be paid off throughout retirement.
3. Choose location well - family nearby, in-home care is available, climate preference; good close-by health care facilities; availability of favored activities, reliable transportation and social opportunities.
4. Understand the options before setting on a strategy
   a. Explore the range of options, what they offer, and associated costs and risks
   b. Update strategy as needs and family situations change.
5. Make timely decisions: Understanding when a decision is needed when choosing a particular option.
6. Finance support when major help is needed (e.g. savings, current income, selling house, long-term care insurance, Medicaid and Medicare etc.)
7. Understand the terms when buying long-term care insurance
8. Understand public programs: Medicare, Medicaid in your state
   a. Consider public programs and support when choosing where to live
9. Additional considerations
   a. Choices depend on personal preference, limitations in functional status, financial and family resources
   b. Continuing care retirement communities include elements of advance funding for long-term care and medical care
      i. Vary greatly and considerable risk - Need to evaluate the community's options, charges and financial stability very carefully.
   c. Defining functional status can be problematic - may not trigger benefit eligibility under long-term care insurance, may trigger the need for help
   d. Consider spousal protection rules when deciding whether Medicaid would help.
   e. Combination and linked benefit products (combine long term care benefits with annuities or life insurance) - alternatives to stand-alone long-term care insurance.

## VIII. MANAGING DEATH OF SPOUSE / PARTNER

1. Financial approaches: Can combine the many financial vehicles available e.g. Life insurance, survivor income in Social Security, traditional pension plans and annuities, Long-term care insurance, Savings and investments

2. Legal matters, trust funds and beneficiary designations: Source of stability for the surviving spouse or partner. Trust approaches are very valuable in some situations.
3. Family and community support:
4. Plan wisely for Social Security survivor benefits: One way is for the lower earner to apply for benefits as early as age 62 and the higher earner waits until age 70.
5. Purchase of annuities: Useful when one managed the finances and the other has limited capability (annuity for the latter). Also important to retain some assets for emergencies
6. Additional considerations
    a. Blended families - not clear if members in blended families help in the same way as first-marriage families.
    b. Survivors to review beneficiary designations, account registrations, trusts, wills and power of attorney documents after the death of a spouse.
    c. Single- and dual-earner families:
        i. A single-earner family survivor gets two-thirds of the combined family benefit payable while both were alive.
        ii. For dual-earner families with equal earnings, survivors get about half of the combined benefit.
        iii. Social Security benefits for widows/widowers stop if they remarry before age 60.

## IX. MANAGING MARRIAGE BREAKDOWN / SEPARATION

1. Engage professionals to learn the rights and assess the value of assets/income from divorce proceedings.
2. Additional considerations
    a. Often residence is retained by one spouse in exchange for pension rights or other invested assets. - Not be an option if the retiree cannot pay the ongoing expenses and lifestyle of the house
    b. Divorcees must review beneficiary designations, account registrations, trusts, wills and power of attorney documents. Upon remarriage, new partners should do the same review
    c. Consider how remarriage will affect Social Security, Medicare, Medicaid and retirement or survivor programs - Rights to current survivor's benefits may change

## X. MANAGING THE RISK OF POLICY CHANGES

1. Maintain an emergency fund
2. Use tax-favored investments - protect against future higher income tax rates
3. Convert traditional IRA to Roth IRA programs:
    a. Tax free growth and tax free withdrawals in retirement; Do not require any required minimum distributions (RMDS)
    b. But must consider immediate and long-term tax implications for the conversion
4. Use RMDs to make charitable contributions: Taxpayers can use RMDs to make Qualified Charitable Donation (QCD) to a qualified charitable organization. QCD counts towards RMD and can be excluded from taxable income
5. Additional considerations - Increased level of uncertainty in current planning -
    a. Congress continues to debate how to change the 2010 healthcare reform law
    b. Future reductions in Medicaid and in support for long-term care seem likely - less quality providers and facilities in total; affecting the broader population

## XI. MANAGING THE RISK OF SIGNIFICANT HEALTH CARE NEEDS

1. Make Medicare choices wisely: Medicare is the primary source of coverage for post-65 retirees.
2. Explore availability of other public support by low-income retirees
3. Utilize Health Savings Accounts (HSAs) while working
4. Consider health care in retirement timing - consider keep working part time to remain in coverage
5. Make good lifestyle choices
6. Consider options for early retirees: Individual health coverage available through ACA marketplaces but choices may be limited and premiums volatile

7. Take advantage of employer offerings: Explore what the former employer offers e.g. COBRA
8. Look into discount programs - for typical non-covered services, e.g. dental or vision care
   a. Regulators need to monitor misleading marketing practices
9. Buy coverage for travel
10. Obtain care out of the country: Medical travel or even migration to other countries
    a. Consider quality of medical procedures, travel costs, accommodations and necessary services
    b. Medicare does not cover out of the country care. Some U.S. insurers may not cover as well
11. Additional considerations - Medicare premiums differ by different parts, have different provisions, deductibles, copays etc.

## XII. MANAGING UNFORESEEN NEEDS OF FAMILY MEMBERS

1. Plan for support of other family members: consider the potential of such family needs and consider if they can actually provide support before committing assets to the family.
2. Give gifts to family, charity or other causes: must ensure such transfers do not result in unwanted reduced standard of living or to poverty later in life.
3. Consider public benefits to children and surviving spouses after the death of a parent or a spouse.
4. Communicate well with family members about financial resources and expectations - Minimize future conflicts, and potential better management when help is needed.
5. Additional considerations
   a. More grandparents are primary caregivers for their grandchildren.
   b. Blended families from remarriages can expand the potential number of family members
   c. Family members, status and relationships can change during retirement - can affect the assistance available to a retiree

## XIII. MANAGING THE RISK OF BAD ADVICE, FRAUD OR THEFT

1. Use prudent practices. e.g.
   a. Brush up on the basics of investing and handling money.
   b. Get advice from qualified and trustworthy sources, including federal and state agencies and employer-sponsored programs.
   c. Simplify finances to allow for clearer decision-making and fewer mistakes. Will also be better for the person handling the retiree's finances once the retiree is no longer capable of doing so
   d. Get several opinions on important issues. Don't fall for pressure tactics.
   e. Be very cautious in giving control of assets (e.g., bank accounts, home equity and personal data) to any professional or in dealing with strangers personally or online.
   f. In later years, expect to rely more on trusted family members or professionals. Investigate who the person(s) should be before help is needed.
   g. Use paid caregivers who are bonded and insured.
   h. Limit investment purchases to those that can be easily bought and sold.
   i. Check out unfamiliar investments with state securities departments. Use only well known and regulated money managers
   j. Keep legal documents up-to-date and ensure that financial institutions and medical care providers are aware of trusted parties.
   k. Be careful about whom to designate as power of attorney.
   l. Inform local senior centers or local police of potential scams (prevent them from continuing and to alert the local community)
2. Examine emerging technology: in monitoring financial accounts and activity, help with identity theft.
3. Review powers of attorney. Consider the individuals' credentials before delegating power.
4. Select a trusted contact: Designate a trusted contact for each financial account. Financial institutions can contact the person if they become concerned for the retiree's health or welfare (e.g., exploitation, endangerment or neglect). The trusted contact cannot execute transactions on the retiree's account,

5. Identify potential concerns: Try to identify issues before they happen by carefully choosing advisors and learning how to spot scams and fraud.
6. Additional considerations
7. Prudent to access different sources of advice for different needs.
8. Sources of retirement income that do not require ongoing financial and investment decisions (e.g. pension, annuities) reduces fraud risks
9. No clear line between legitimate help and abusive control - important when family and friends are helping.
10. People dealing with seniors can learn to look for signals that something is wrong. e.g. cannot balance checkbook, behavioral changes

## XIV. RELATED PLANNING ISSUES

1. Failure to pay attention to planning - Do systematic longer-term planning
2. Time horizon: People need to plan for the rest of life. The Actuaries Longevity Illustrator can help individuals understand potential planning horizons.
3. Loss of functional ability (e.g. hearing, vision, mobility and cognitive decline): Recommend people prepare appropriate legal documents (e.g., powers of attorney, advance directives, etc.) before entering their frail elderly years.
4. Loss of social connectivity: Consider social connectivity when choosing housing and lifestyle options.
5. Abandoned and forgotten assets - Retirement plans often get fragmented (e.g. DB, DC, IRA etc.) and more numerous. - can lose track of retirement assets or promised benefits. - important to interact with all accounts and keep contact information up to date.
6. Debt: Many experts believe it is best to enter retirement without significant debt—and stay that way
7. Home values: often the most important part of non-financial assets.
   a. Important for retirees who need to draw on home values to fund retirement (e.g. sell, rent out, reverse mortgage)
   b. Housing needs also change as health and capabilities change (again important if related expenses need to be pay by home values)

# ***HOW ACCURATELY DOES 70% FINAL EMPLOYMENT EARNINGS REPLACEMENT MEASURE RETIREMENT INCOME (IN)ADEQUACY? INTRODUCING THE LIVING STANDARDS REPLACEMENT RATE***

**RET101-114-25**

## I. WHY THE CONCERN OVER ABILITY OF RETIREMENT INCOME TO SUSTAIN LIVING STANDARDS OF FUTURE SENIORS

1. low interest rates
2. high investment fees
3. longer life expectancies
4. rising divorce rates among seniors (with likely negative financial implications),
5. aging population,
6. increasing reliance on paid services for the potentially costly expenses associated with chronic health conditions and
7. less secure sources of retirement income

## II. REPLACEMENT RATES AND REPLACEMENT RATE TARGETS

1. Replacement rate - the fraction of a worker's annual final employment earnings replaced by annual retirement income.
2. Why major inconsistencies in analysis of earnings replacement rates
   a) differences in conceptual framing of retirement income adequacy and analytical purpose
   b) Data constraints (Bigger reason of the 2)
3. Conventional final employment earnings replacement rate
   a) = Gross (Pre-tax) income in 1st year of retirement / gross pre-retirement final year employment earnings
   b) "retirement income" includes income reported for income tax purposes (i.e. exclude savings whose withdrawals are not taxed).
   c) "rule-of-thumb" - 70% final employment earnings replacement gives 100% replacement of pre-retirement living standards.
      i) Retirees pay lower taxes, not be saving for retirement
      ii) typically no mortgage and no longer need to support children and/or pay work-related expenses.
   d) Missing components of living standards
      i) household-level differences in individual consumption due to family size, particularly dependent children
      ii) Changes over time in household size and composition
      iii) the return on house ownership, or "imputed rent";
      iv) taxes (differentials in taxation year-by-year, pre- and postretirement);
      v) government transfers
      vi) accumulation and drawdown of non-traditional forms of savings
      vii) earnings volatility
      viii) retirement income volatility;
      ix) pre- and post-retirement risks (e.g., poor market returns, spouse death/divorce, longevity, medical conditions, extended care needs and inflation uncertainty);
      x) phased retirement and continuing employment income after retirement;
      xi) individual preferences (risk aversion, value of leisure and bequest)
      xii) changes in expenses over the life course
4. Substantial variation in optimal target replacement rates presents a challenge for developing sensible replacement rate rules of thumb.

## III. CONCEPTUAL AND METHODOLOGICAL FRAMEWORK FOR RETIREMENT INCOME ADEQUACY

1. Why Microsimulation?
   a) analysts often tweak earnings replacement rate measure by incorporating some improvements to the formula
      i) availability of data often shapes these improvements
   b) I.e. large-scale, complex, dynamic micro-simulation models are increasingly used - because they can
      i) integrate and extend existing data sources to give the most comprehensive picture of pre and post retirement consumption sources
      ii) model individuals' *interactions with* and *accruals under* retirement income programs throughout lifetime, enabling full flexibility in analysis
      iii) generate results reflecting realistic complexity and diversity within life courses, and across individuals;
      iv) model the likely impact of current socio-economic trends on future outcomes; facilitate explicit evaluations of the uncertainty of the future (including the post-retirement risks that people face)
2. Microsimulation allows people to act differently, rather than assume that everyone behaves like the "average".

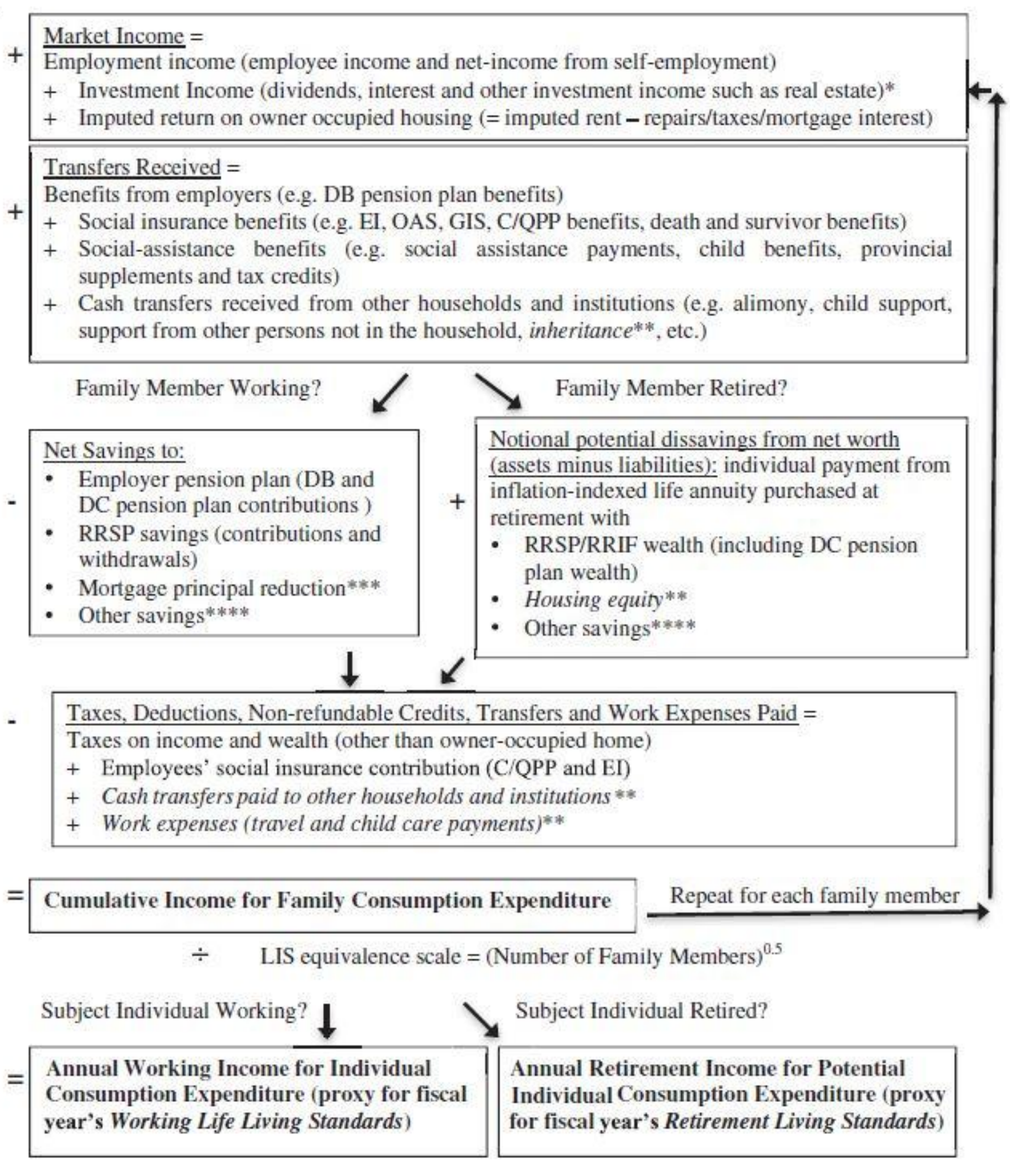
## IV. TOOL OF ANALYSIS: LIFEPATHS

1. LifePaths is a dynamic micro-simulation model of the Canadian population that simulates individual life-courses of synthetic individuals that are representative of the Canadian population.
2. Can compute estimates for individual living standards across the life-course to evaluate how well living standards are maintained by people who approximately hit a 70% earnings replacement rate target.
   a) Use comprehensive definition of income (includes nontraditional working and retirement income sources)
   b) look over the individual's entire lifetime (i.e. go beyond the one year before and after retirement)
   c) stochastically model financial market returns and mortality (including the death of family members).
   d) Individuals exit the workforce in a realistic manner (matches labor force data)

## V. LIVING STANDARDS REPLACEMENT RATE (LSSR)

1. Goal - capture a worker's living standards continuity after retirement, by calculating how much money a worker has available to support his/her personal consumption of goods and services before and after retirement.
   a) Assumes in working years - income available for individual consumption equals his/her family's disposable income (gross income after taxes and transfers) less net savings, adjusted for family size
   b) Assumes in retirement - income available for individual consumption equal disposable income plus the drawdown from accumulated savings (calculated at the family level and adjusted for family size). Figure 1 presents the LSRR framework for estimating an individual's living
   c) Once an individual's living standards are estimated for each year of life, then the LSRR is simply the average estimated retirement living standards divided by the average estimated working-life living standards.
      i) = (average annual retirement living standards) / (average annual working-life living standards)
      ii) = (average real annual retirement income for potential individual consumption expenditure) / (trimmed average real annual working income for individual consumption expenditure)




2. 80% < LSRR < 120% as the range of outcomes compatible with living standards continuity (i.e., working life "living standards" plus or minus 20%).
3. Differences between the conventional earnings replacement rate and LSSR: LSSR
   a) uses a much broader measurement period for pre- and post-retirement
   b) measures income at the family level (not individual level)
   c) includes a much more comprehensive income definition

Conventional replacement rate from Equation (1)

$$= \frac{gross\ income\ at\ age\ 62}{gross\ employment\ earnings\ at\ age\ 60}$$

$\downarrow$ *Measure the numerator and denominator over broader measurement period (while accounting for inflation)*

$$= \frac{\sum_{x=62}^{death-1} real\ gross\ income\ at\ age\ x/(age\ of\ death-62)}{\sum_{x=31}^{60\ (middle\ 20\ years)} real\ gross\ employment\ earnings\ at\ age\ x/20}$$

$\downarrow$ *Measure at the family level and then adjust for family size*

$$= \frac{\sum_{x=62}^{death-1}\left[(real\ gross\ income\ of\ family\ )/\sqrt{Family\ size}\ \right]\ at\ age\ x\ /(age\ of\ death-62)}{\sum_{x=30}^{60\ (middle\ 20\ years)}\left[(real\ gross\ employment\ earnings\ of\ family)/\sqrt{Family\ size}\ \right]\ at\ age\ x\ /20}$$

$\downarrow$ *Use a fuller measure of income available for consumption expenditure (as outlined in Figure 1)*

$$= \frac{\sum_{x=62}^{death-1}\left[(real\ income\ for\ family\ consumption\ expenditure)/\sqrt{Family\ size}\ \right]\ at\ age\ x/(age\ of\ death-62)}{\sum_{x=30}^{60\ (middle\ 20\ years)}\left[(real\ income\ for\ family\ consumption\ expenditure)/\sqrt{Family\ size}\ \right]\ at\ age\ x\ /20}$$

= LSRR from Equation (2)

**VI. <u>SAMPLE</u>**

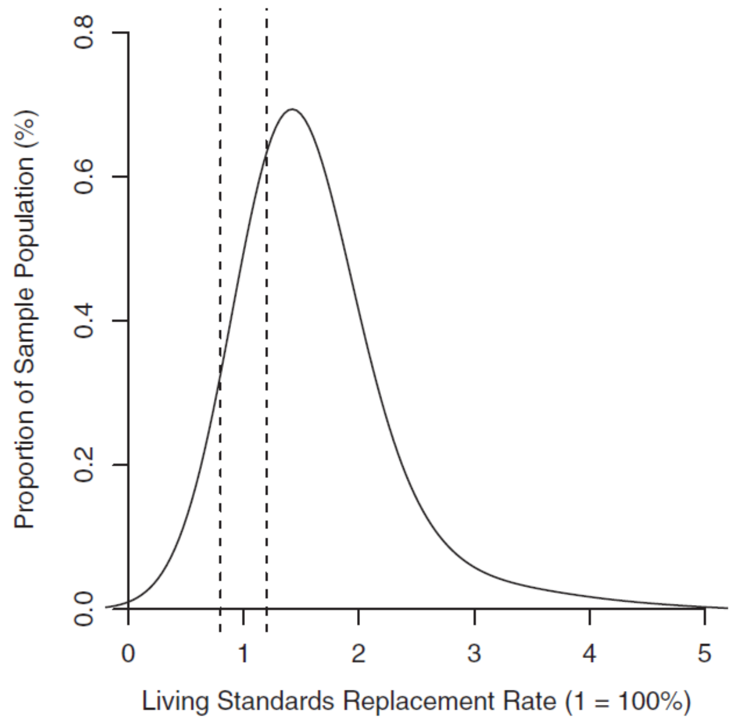
1. Retirement defined as transition from working at least 75% to less than 25% of the year
2. Examine the continuity of living standards using the LSRR for individuals with a 65%–75% earnings replacement rate (given equation 1), where
   a) employment earnings = wages and self-employment gross income
   b) gross retirement income includes federal pension, guaranteed income supplement, old age security, any occupational DB/DC plan, notional annuity income from registered savings — single-life inflation indexed annuity, purchased at retirement with any registered personal savings (RRSP)

3. Population Sample:

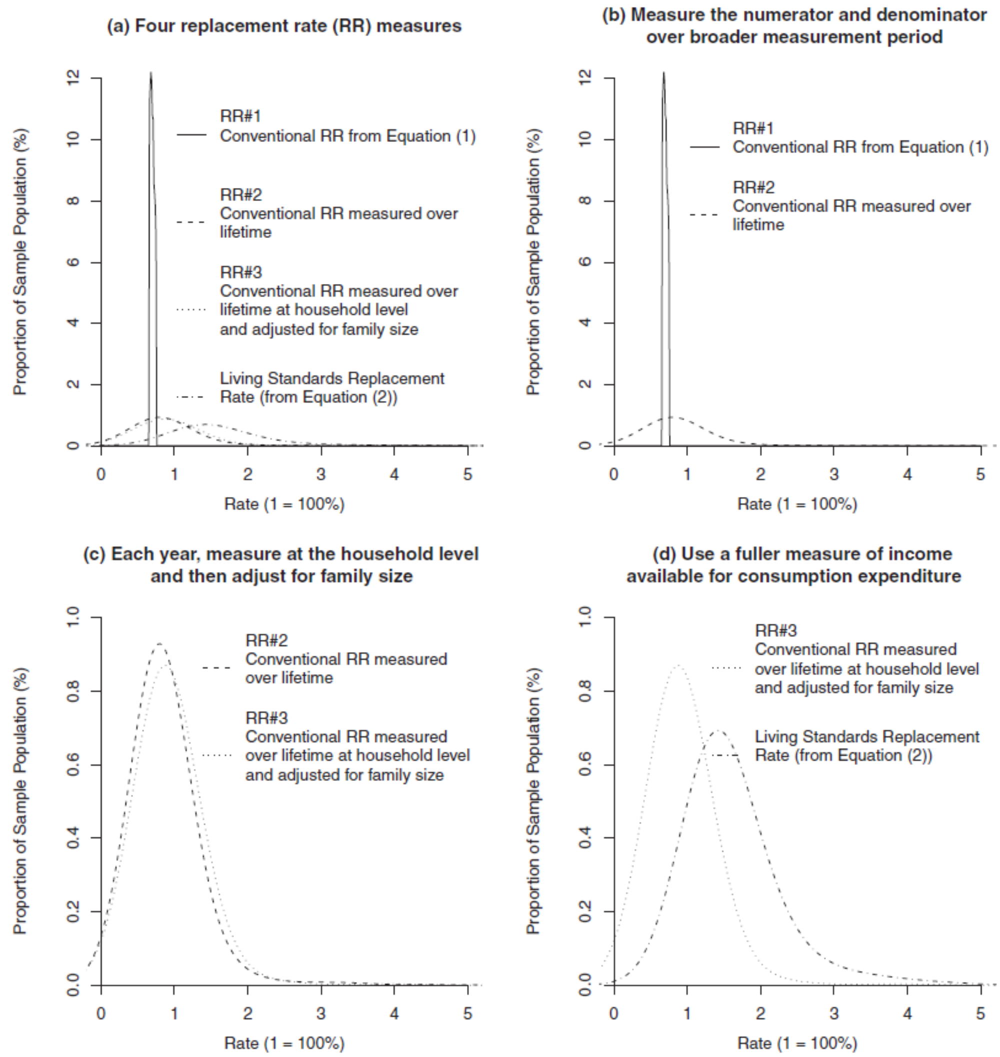
| | 1951–1958 Birth Cohort | | |
|---|---|---|---|
| | Those Who Retire at Age 61 with 65%–75% Conventional Replacement Rate | Those Who Retire at Age 61 | Entire Birth Cohort |
| Household | | | |
| Single Male | 11% | 12% | 11% |
| Single Female | 19% | 15% | 14% |
| Member of Couple | 69% | 73% | 74% |
| *Sector* | | | |
| Public | 24% | 18% | 17% |
| Private | 76% | 82% | 82% |
| *Education* | | | |
| Less than High School | 9% | 17% | 23% |
| High School Graduate | 33% | 29% | 25% |
| Certificate (Non-University) | 31% | 33% | 29% |
| University Degree or Certificate | 27% | 21% | 23% |

*Note*: 1% of the entire birth cohort never worked (therefore, do not receive the private- nor public-sector classification).

4. Result 1:
   a) most of those people satisfying the narrow 65%–75% earnings replacement rate criterion can actually expect to improve their living standards after retirement (but to various degrees). Specifically, some 80% of the sample will improve their living standards by over 20% after retirement (that is, LSRR > 120%).
   b) retirees satisfying the narrow 65%–75% earnings replacement rate criterion can actually expect a wide range of changes in living standards after retirement.


Proportion of Sample Population (%)
0.0
0.2
0.4
0.6
0.8
0
1
2
3
4
5
Living Standards Replacement Rate (1 = 100%)

5. Result 2:




RR#1: Conventional earnings replacement rate from Equation (1)

↓ Measure the numerator and denominator over broader measurement period (as in the LSRR).

RR#2: Conventional earnings replacement rate measured over lifetime

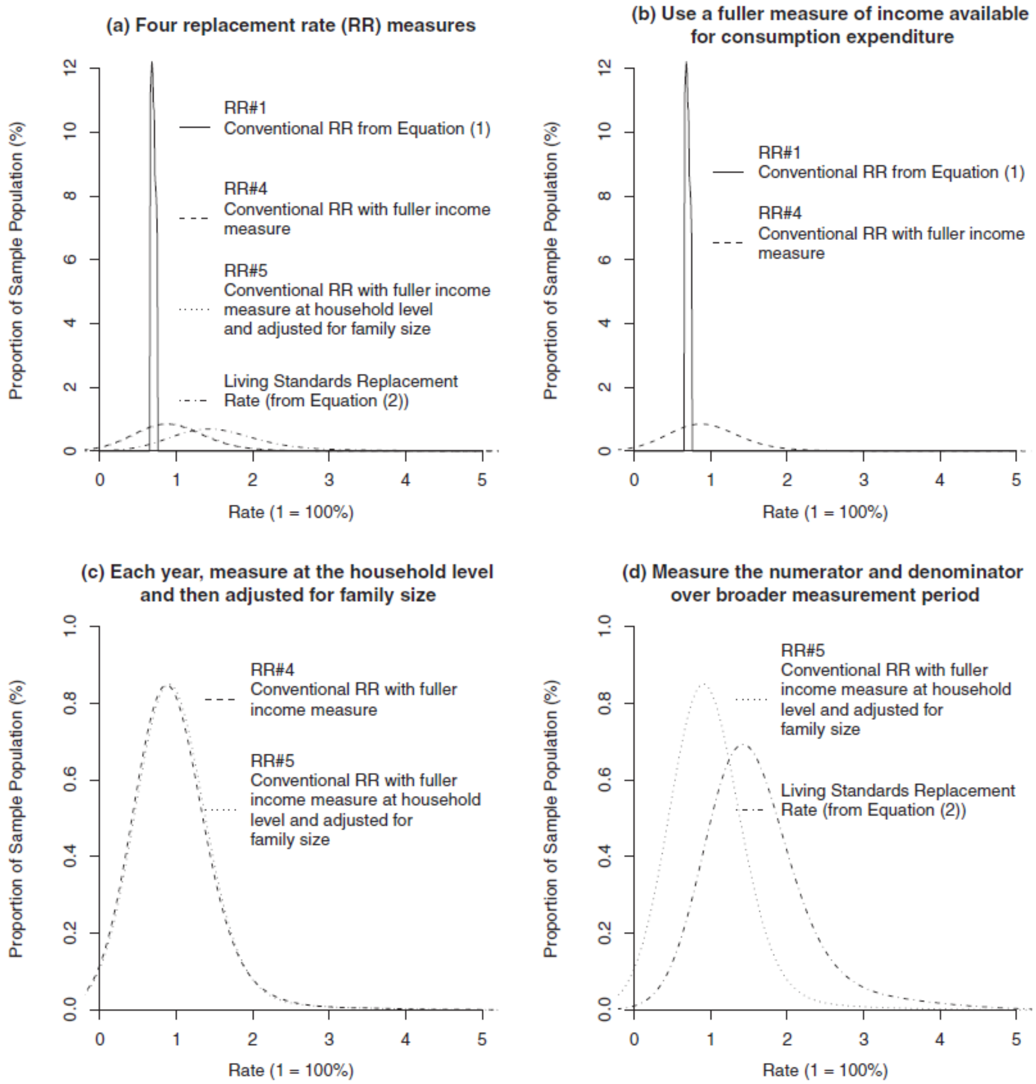
↓ Each year, measure at the family level and then adjust for family size (as in the LSRR)

RR#3: Conventional earnings replacement rate measured over lifetime at household level

↓ Use a fuller measure of income available for consumption expenditure (as in the LSRR).

LSRR from Equation (2)

6. Result 3




RR#1: Conventional RR from Equation (1)

↓ Use a fuller measure of income available for consumption expenditure (as in the LSRR).

RR#4: Conventional RR with fuller income measure

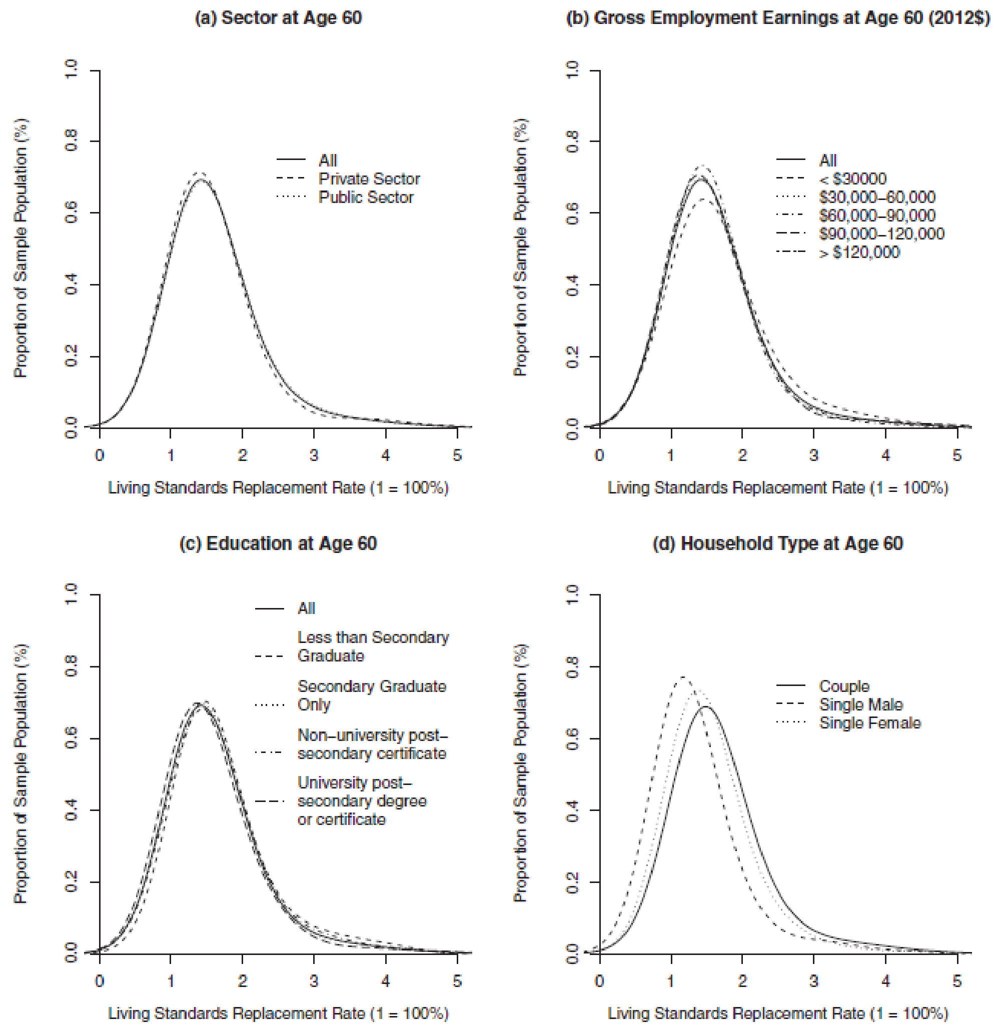
↓ Each year, measure at the family level and then adjusted for family size (as in the LSRR)

RR#5: Conventional RR with fuller income measure at household level

↓ Measure the numerator and denominator over broader measurement period (as in the LSRR).

LSRR from Equation (2)

   b) conventional earnings replacement rate is not a robust indicator of living standards continuity the choices made when building the replacement rate regarding
      i) unit of analysis (family versus the individual)
      ii) sources of consumption
      iii) measurement periods all have large impacts.
   c) Above choices interact, moreover, and the effect of improving one may not emerge without the other.
7. Result #3 —the 70% target does not appear to fit any subgroup




8. Result #4 —the conventional earnings replacement rate and living standards continuity are poorly correlated

## VII. ADOPTING THE LSRR

1. any single year's employment earnings not a good estimate of working-life living standards - i.e. Not a reliable benchmark for determining retirement income adequacy.
2. LSRR framework - allow more consistent measure of retirement income adequacy
   a) facilitate the interpretation, comparison and integration of findings across different analysis (between authors, over time and across nations)
3. Use of LSSR for Employer pension sponsors
   a) investigate the retirement income adequacy provided by their pension/ savings program for the "typical" type of employee

   b) test true effectiveness of adopting different plan features
   c) assess the level of retirement preparedness among its plan participants
   d) engage plan participants to help them better appreciate true impact of alternative financial planning decisions on post-retirement living standards
4. Use of LSSR for policy analysts
   a) evaluate the retirement income adequacy of their current system across the population,
   b) identify vulnerable groups
   c) understand the implication of policy changes.
5. Use of LSSR for financial advisors
   a) as retirement income target that clients can understand

# ***RISK MANAGEMENT AND PUBLIC PLAN RETIREMENT SYSTEMS***

**RET101-111-25**

## DIFFERENCES BETWEEN PUBLIC AND PRIVATE SECTOR PLANS

1. Less federal oversight – state and local govts have more discretion
2. Different budgeting process and accounting standards
3. Design issues: need to make up for lack of Social Security, tax deductible employee contributions, earlier retirement age for police and fire fighters
4. Higher public transparency

## 3 OBSERVATIONS BY TASK FORCE

1. Must better manage public pension risks
2. Need a risk evaluation, management and reporting framework to identify moral hazard, risk levels and potential structural consequence; potential breakdowns/ stresses and related contingency plans
3. Actuaries is integral to better plans

## FOCUS OF REPORT:

1. Essential elements for robust risk reporting framework (Not judging the appropriateness of risk taking in pension plans
2. Current stress on public systems
   a. Plans is hitting maturity
   b. Long term affordability by taxpayers
   c. Insufficient funding by legislative bodies
   d. Excessive benefits vis-à-vis risk capacity to fund them
   e. Inappropriate benefit design
3. 3 contributors to stress
   a. Slippery slope of skipping contribution – Sets precedents for bad plan governance
   b. Managing plan surplus vis-à-vis ongoing investment risks – Tend to focus on employer budget without taking note of factors leading to the surplus
   c. Understanding level of investment risks actually taken – w/o this understanding, short term decisions (e.g. benefit levels) can have long term impacts on future generations
4. Why risk management framework important:
   a. Major structural issue: Diffusion of responsibilities and controlling authorities among stakeholders
   b. Without external, independent authority, a risk management framework can set risk taking boundaries and policies and mechanisms to support:
      i. Continuous funding
      ii. Educate stakeholders to understand risk better
      iii. Identify plan provisions creating misalignment / mis-price risk incentive
      iv. Identify conflicting objectives between stakeholders and health of pension system
   c. 3 main financial levers: Current & future benefit levels; contributions (employer and employee) and investments

## 5 ELEMENTS OF ACTUARIAL CONTROL CYCLE:

1. Identify all stakeholders, their objectives and ability to influence outcome
2. Identify objective of risk system
3. Establish risk budget (of obligor); use to evaluate risk levels
4. Evaluate risk mitigation alternatives
5. Maintain effective feedback process (both employee and public disclosures)

*Element # 1: Identify stakeholders*

1. Society / Taxpayers / Recipients of Social Services
   a. Objective: Attract and retain good public staff but not over-compensate & at predictable costs
   b. Incentives: Typically do not understand tradeoffs between immediate funding and long term plan risks
   c. Options / Decisions: Rely on agents (elected officials, public sector employers)
2. Public employees (Plan members / Beneficiaries)
   a. Objectives: Bft security (esp. not covered by Social Security)
   b. Incentives: Want biggest bang for the buck (Largest benefit with smallest cont.)
   c. Options / Decisions: Collective bargaining; Can find a job
3. Unions (as an institution)
   a. Objectives: Particularly favor superior continuing benefits (i.e. not s.t. repeated bargaining)
   b. Incentives: member loyalty from successful bargaining outcome
   c. Options / Decisions: Ability to negotiate and campaign (against elected officials)
4. Non-elected Public Sector employer
   a. Objectives: See pension and other benefits as valuable tool to mitigate compensation differences from private sector
   b. Incentives: Want a stable, good workforce; min. conflict with officials; may also belong to the same pension plan
   c. Options / Decisions: Important role in framing final budget decisions (being at the negotiation table)
5. Retirement System Governing Body (within a standalone retirement system)
   a. Objectives: ensure enough assets to meet obligations cost effectively
   b. Incentives: Perceived as providing benefits at lowest cost and risk to plan members
   c. Options / Decisions: Depends on the type of authority granted to the governing body (e.g. from full authority to set cont. to zero authority)
6. Legislative Body (Elected officials)
   a. Objectives: Provide taxpayer expected service at lowest cost
   b. Incentives: Election success
   c. Options / Decisions: Ability to increase tax rates is limited; Aware of decisions made at bargaining table on voters

*Element # 2: Define Objectives*

1. 3 Major risks:
   a. Inherent risks (E.g. longevity risks)
   b. Management risk (e.g. the 3 main financial levers, see above)
   c. Governance risk (e.g. inherent in the diffuse authority structure)
2. Other considerations
   a. Sustainability
   b. Equitable (taxpayers & public employees; intergenerational)
   c. Appropriate funding (predictable and not excessive)
   d. Benefit design (attract and retain employee but allow no gaming the system)
   e. Governance (risk disclosures)

*Element # 3: Setting Risk Budgets*

1. Must define risk tolerance level and bearer of consequences of the risk exposure
2. Must have a hard limit which should rarely be crossed & soft limit to manage escalating exposures (e.g. higher level authorities)
3. Considerations:
   a. Systematic risk of pooled risks
   b. Anti-selection potential (e.g. double dipping)
   c. Un-hedgeable actuarial risks (e.g. longevity risks)
   d. Un-hedgeable non-actuarial risks (e.g. legislative unwillingness to fund properly)

   e. Extreme tail situations (e.g. events which cut tax base and increase required contribution at the same time)
   f. Benefit level stability – plans able to change benefit levels can take on more risk)
   g. Ability to pay contributions – both contribution level and costs of changing contributions
   h. Demands on revenue streams (e.g. new schools, infrastructure maintenance)
   i. Asset liability risk (e.g. combined effect of interest rate, credit and liquidity)
   j. Plan maturity - asset shortfalls may lead to large required contributions)
   k. Relative importance of investment earnings as a funding source – annual volatility and uncertainty re long term mean reversion

*Element #4: Evaluate Risk Mitigation Alternatives*

1. System discipline (e.g. tight control over surplus usage; use risk budget to identify warning situations and establish a corresponding response system)
2. Pricing discipline – have a framework to measure risk inherent in benefit promises
   a. Use market value or risk-adjusted or actuarial values
   b. Use stochastic measurement
   c. Use stress and specific scenario testing
   d. Use analytics and guidelines re tradeoffs between additional benefits and current market conditions
3. Budgetary discipline – aligning revenue to costs
   a. Traditional risk mitigation
   b. Potential change in risk exposure and related scenarios especially the downside
   c. Possible position to mitigate downside risk
   d. Correlation level of different risks
   e. Risk Mitigation – Regulatory Back Stop Structure
   f. Generally protected by the same state constitutional clauses that forbid government to abrogate contracts

*Element #5: Effective feedback process*

1. Distortions in pension feedback loop
2. Time horizon – may take decades to bring bad management to light – too late for cost effective mitigation
3. Dysfunctional control structure – No single authority to make significant change / compel contribution
4. Lack effective regulatory standard - No single authority to compel disclosures on comparable basis
5. Economic & demographic cycles – Can change tax base; Relying on long term average as a risk mitigation strategy may cause inadequate cont. during good times and unsustainable contribution during down times
6. Note: Although it is assumed government entities are "perpetual", 2 main concerns:
   a. Tax base are not stable
   b. Taxpayers are better able to recognize reduced funding by state for other long-term responsibilities

## RISK BUDGETING & FEEDBACK PROCESS

1. Risk budgets structures risk decision process – feedback loop disciplines decision making and allows managing effects of risk taking
2. Setting Risk Budget – Considerations
   a. Risk tolerance (quantify and disclose hedged and unhedged costs)
   b. Types of future events giving intolerable outcomes over different time horizons
   c. Allowable risks and related mitigation strategies – ensure within risk budget
   d. Execution of strategy and over what time frame

*Consideration #1: Set risk budget*

1. Risk budget often stated as upper limit to plan cost / annual variance in cost
2. Consider feature of plan itself and sponsoring system
3. Understand stakeholders

4. Future taxpayers as reason for more risk? – consider consequences of today's risk taking on tomorrow's cost structure
5. Risk Defeasance
    a. Cost of defeasance - financial risk is determined by comparing risk adjusted liability value with asset market value
    b. Cost of defeasance is the cost a rational party willing to pay to accept the liability (Does not mean the system intends to or can transfer the liability)
    c. A public entity with benefits it cannot afford to defease should know the additional risks endured by funding parties (taxpayers and employees)
    d. Use of range of all possible outcomes- analysis should focus on how to manage all outcomes outside the acceptable risk budgets

*Consideration #2: Exceeding Risk Budgets*

1. To decide what can breach the established risk budget, consider how close it currently is to the risk budget and how much risk it is taking on via new commitments

*Consideration #3: Employing Risk Mitigation Strategies*

1. Prioritize risk exposure based on severity, significance and time horizon
2. Strong governance structure – a key mitigation strategy

*Consideration #4: Risk Management Strategy – Establishing process and time horizon*

1. After setting risk budget; "exceed budget" scenarios and mitigation strategies, develop risk management process and time horizon (Before changing risk management process, re-evaluate the 3 items)

**CONCLUSION AND RECOMMENDATIONS**

1. Risk focused reporting and governance requirement addresses - 3 topics:
2. Constructive Structural Incentives (including moral hazard issue)
3. Distinguish Prudent Risks
4. Planning for future Stresses

*Topic #1 Constructive Structure Incentives*

1. DB funding dysfunctions include
    a. Unenforceable funding mechanism – employer not required making needed contribution
    b. Un-specified method for contribution determination
    c. Unclear method for benefit adjustment if underfunded
    d. Unclear method to restrict distributing perceived surplus for non-pension purpose
    e. No limit set to relate risk undertaken with sponsor's ability to tolerate adverse results
    f. Agency Cost - Plan provisions encourage unfavorable stakeholders and agents actions
    g. Manipulate final average earnings to increase pension amount
    h. Management support past service cost if they also benefit
    i. Overly broad dispersion of control

*Topic #2 Distinguishing Prudent Risks - Considerations*

1. Market value or risk-adjusted vs. actuarial value of assets and obligations (Going concern)
2. Appropriate use depends on specific context
3. Plan maturity – leverage investment risk relative to payroll
4. Plan design – consider anti-selection, agency cost and put option cost in risk hedging and taking strategy
5. Sponsors' ability to adjust design directly relate to ability to withstand future adverse events
    a. A contingent benefit structure with risk sharing enhance plan viability
6. Sponsor's ability to adjust contribution w/o endangering other public benefits
    a. An agreed-upon risk budget facilitates any trade-off decision between funding with other public needs

*Topic #3 Planning for future stresses - Effective risk management reporting:*

1. Clarifies the fixed and discretionary elements in the system
2. The elements are: benefits levels, contribution levels and investment
3. If one element is fixed, the other 2 must create an offsetting hedge
4. Information access for all decision makers
5. Factor in future demographic and economic conditions
6. Assess event's horizon (the point at which adequate funding can no longer be secured)
7. Identify governance issues that create bias (e.g. benefit structure)
8. Have a feedback loop based on actuarial considerations to suggest governance improvement

**RECOMMENDATION**

1. Identify and assess stakeholders & agents' incentives – keep transparent balance of incentives
2. Disclose potential stress between obligations and funding requirements, potential breaking point, volatility that accompany the best estimate and errors around the mean.
3. Stress value of the risk management principles to stakeholders, agents and regulatory

**APPENDIX A**

1. Why the design difference between public and private plans?
   a. Lack of federal involvement (states have significant rights of self government)
   b. Different employee expectations (different career patterns)
2. Why the operational difference between public and private plans?
   a. The above 2 reasons plus requirement of a balanced cash budget and informational transparency
3. Nature of Plan Sponsor
   a. State and local govt must balance annual budget and borrowing channels similar to private sector
   b. Expect continuing existence of govts – tend to increase number of stakeholders
   c. State institutions may dictate certain aspects of state and local plans
   d. Large number of participations – aid risk pooling; economy of scale
4. Nature of Membership - Longer average service period; Most without Social Security coverage
5. Plan Design
   a. Aim to provide an adequate retirement benefit after a full career
   b. Permit employee contribution on a pre-tax basis (not allowed for private employee)
   c. Plans for public safety members all have industrial death and disability benefits
   d. Substantial variation in benefit formula, retirement age; early retirement benefit, COLA provisions; DROP features if offered
   e. Common provisions: cost-sharing or risk-adjusting provisions where contribution or benefit change for a variety of reasons
   f. Concern: Benefit levels offered by some public retirement systems are greater than what is needed for adequate retirement.
6. Plan Governance
   a. State constitutions set the rules on benefits,
   b. Public sector benefits are codified by law – less adjustment possibility
   c. Tend to be less concern re: ERISA, PBGC and Social Security
   d. Governed by board of elected, ex-officio and appointed members (may represent management, labor, non-represented members, retirees, outside trustees)
   e. Public plan retirement boards s.t. to freedom of information law – transparency lead to public scrutiny and need to communicate to a variety of stakeholders
   f. Subscribe to GASB (not FASB)
7. Funding
   a. Greater latitude in developing funding regime (flexible actuarial funding technique
   b. No min. funding compliance nor maximum funding limitations
   c. Tax deductibility not a concern (public employer not s.t. to tax)

   d. Common to use entry age normal (relatively level funding as % of pay); fixed employee and variable employer contribution

**APPENDIX B – DISCUSSION OF STAKEHOLDERS**

1. Society / Taxpayers
   a. Backstop for pension plans
   b. Direct payers to public employees
2. Public employees (Mbrs, Beneficiaries, and Future employees)
   a. Has many "employers": taxpayers, politicians, civil service bureaucracy
3. Unions - Mainly employee agent but may be treated as a distinct stakeholder
4. Public Sector employer (civil service bureaucracy)
   a. Agent of taxpayers and politicians
   b. Control key elements in pension equation: pay levels (direct pay and benefit), continued employment, making of employer contribution
   c. Managers, if also plan members, may face principal-agent conflict
5. Retirement System Governing Body
   a. Can be independent or semi or fully controlled by employer sponsor
   b. Oversee funding authorized by state legislature and benefit admin, safeguard cont. and investment earnings for future benefits
6. Legislature (Elected officials for making employer cont. and setting benefits)
   a. Responsibilities: Appropriating cash cont. into plan and benefits levels provided
   b. Can raise funds beyond debt ceilings using pension obligation bonds (another risk)
   c. May have no authority to stop elected officials from diverting funds unless codified by law
7. Other agents - Actuaries, plan administrators, investment managers
   a. Professional responsibility to communicate risk

**APPENDIX C**

1. General Benefit of Pooling
   a. Risk pooling – main risk: longevity risk (but must use the same mortality table)
   b. Low admin and investment cost
   c. Pooling benefit is only realized if investment risk is constrained within a good risk management budget
2. Risk exposure - Inherent risks in Bfts design:
3. Systematic longevity risk, benefit options (e.g. subsidized early retirement); ability to game the system (final average earnings manipulation)
4. Management risk of major stakeholder actions
   a. Contribution policy – legislation can refuse to make required contribution Or take funding holidays
   b. Increasing benefits – Elected officials can increase benefits in lieu of other compensation component increase seen as cost free but reality is increasing fixed plan cost
5. Investment risk – biggest unknown: determination of long term rate
6. Governance Risk (Unique to public plan)
   a. No single governing authority
   b. Principal agency problem – a good system will incentive participations to act such that overall cost is lowered
7. Operational Risk
   a. Elected officials managing risks without appropriate expertise
   b. Lacking appropriate risk analytic tools –e.g. meaningful way to measure ROI, ex ante and ex post
   c. Looking solely on ROA not conducive to asset-liability match
   d. ALM don't factor in the "fat tail" cost
   e. Also to consider the effect from cascading risks and relatedness of market downturns and reduced tax revenues
8. Inherent Time Horizon Risks
   a. Due to long time frame – generation of managers can pass risk forwards

   b. Little incentive to hedge – future taxpayers are more interested to hedge but have no say
9. Plan Maturity risks
   a. Asset shortfalls may drop to a point where significant additional contribution is required

**APPENDIX D – RETIREE HEALTH BFTS**

1. Offers Indemnity coverage (i.e. implicit COLA and is recognized by GASB)
2. Great variety of plan design - Spouse and dependent coverage often employer subsidized
3. Benefit not related to pay or service
4. Contribution during retirement – less so in public sector – instead share cost via deductible and co-insurance
5. Tendency to constitutionally guaranteed benefit but not advanced funded

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QUESTION 19 OF 704 | Question # Go! | Prev | Next

**Question** — Difficulty: Advanced

An airport purchases an insurance policy to offset costs associated with excessive amounts of snowfall. The insurer pays the airport $300$ for every full ten inches of snow in excess of $40$ inches, up to a policy maximum of $700$.

The following table shows the probability function for the random variable $X$ of annual (winter season) snowfall, in inches, at the airport.

| Inches | [0,20) | [20,30) | [30,40) | [40,50) | [50,60) | [60,70) | [70,80) | [80,90) | [90,inf) |
|---|---|---|---|---|---|---|---|---|---|
| Probability | 0.06 | 0.18 | 0.26 | 0.22 | 0.14 | 0.06 | 0.04 | 0.04 | 0.00 |

Calculate the standard deviation of the amount paid under the policy.

**Possible Answers**

A 134 | ✓ 235 | X 271 | D 313 | E 352

**Help Me Start**

Find the probabilities for the four possible payment amounts: $0$, $300$, $600$, and $700$.

**Solution**

With the amount of snowfall as $X$ and the amount paid under the policy as $Y$, we have

$$\begin{array}{c|c} y & f_Y(y) = P(Y=y) \\ \hline 0 & P(Y=0) = P(0 \le X < 50) = 0.72 \\ 300 & P(Y=300) = P(50 \le X < 60) = 0.14 \\ 600 & P(Y=600) = P(60 \le X < 70) = 0.06 \\ 700 & P(Y=700) = P(Y \ge 70) = 0.08 \end{array}$$

The standard deviation of $Y$ is $\sqrt{E(Y^2) - [E(Y)]^2}$.

$$E(Y) = 0.14 \times 300 + 0.06 \times 600 + 0.08 \times 700 = 134$$

$$E(Y^2) = 0.14 \times 300^2 + 0.06 \times 600^2 + 0.08 \times 700^2 = 73400$$

$$\sqrt{E(Y^2) - [E(Y)]^2} = \sqrt{73400 - 134^2} = 235.465$$

**Common Questions & Errors**

Students shouldn't overthink the problem with fractional payments of $300$. Also, account for probabilities in which payment cap of $700$ is reached.

In these problems, we must distinguish between the REALT RV (how much snow falls) and the PAYMENT RV (when does the insurer pay)?. The problem states "The insurer pays the airport $300$ for every full ten inches of snow in excess of 40 inches, up to a policy maximum of $700$." So the insurer will not start paying UNTIL AFTER 10 full inches in excess of 40 inches of snow is reached (say at $50+$ or 51). In other words, the insurer will pay nothing if X<50.

Rate this problem: Excellent | Needs Improvement | Inadequate

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