

# City of Atlanta Finance Executive Committee

## WHAT DID MY ACTUARY SAY?

### The Basics of Pension Actuarial Science

March 23, 2011

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*Consulting Actuary*

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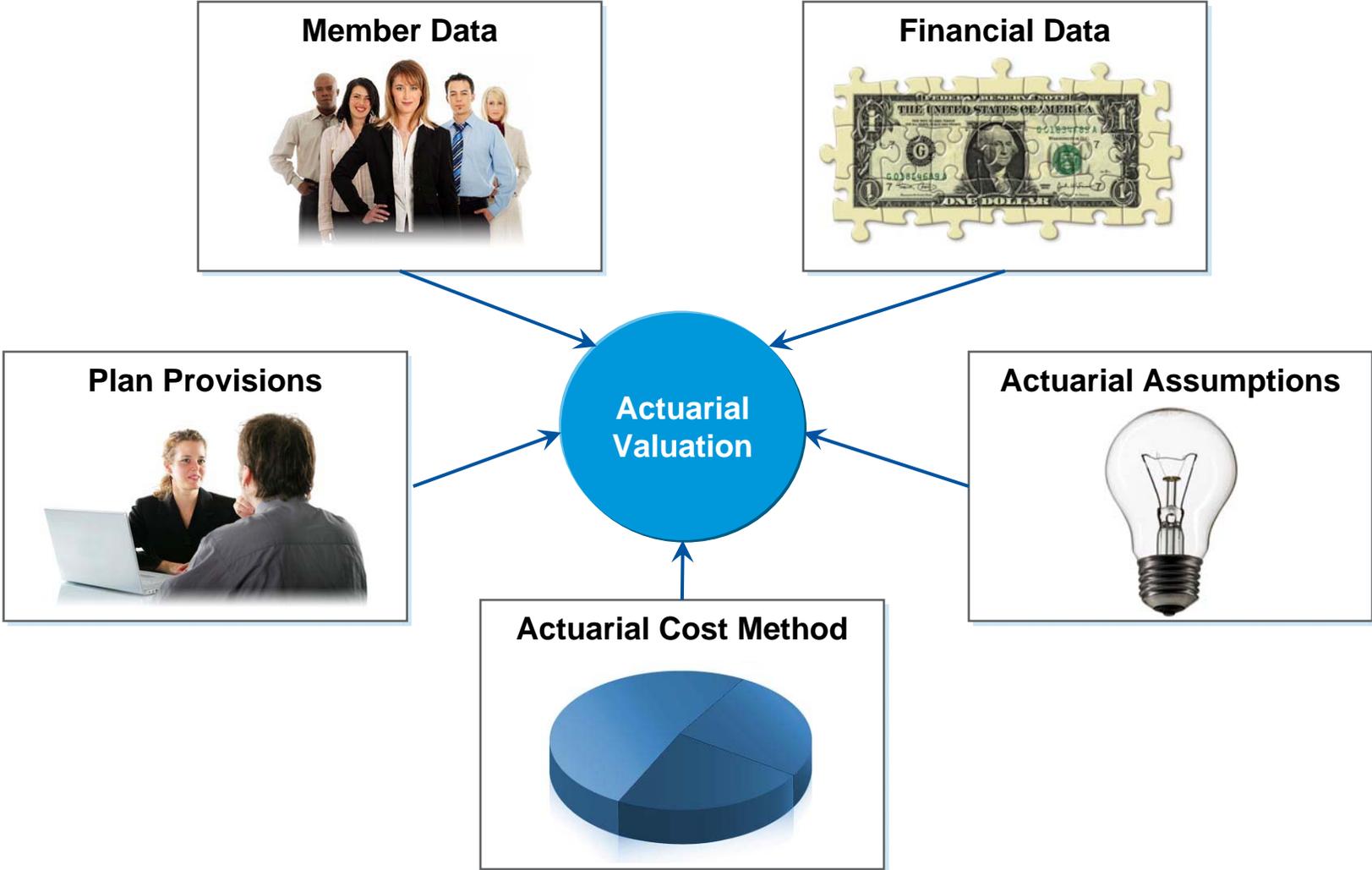




- ① Actuarial Concepts and Terminology
- ② Replacement Ratios
- ③ Retirement Plans Overview
- ④ Plan Design Considerations
- ⑤ Sample Decision Matrix
- ⑥ Appendices

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# Actuarial Valuation Inputs



# Actuarial Valuation

## Purpose of Actuarial Valuation

- Primary reasons include:
  - Contribution requirements
  - Funded status
  - Compliance with the law
  
- Secondary reasons include:
  - Analysis of demographic experience
  - Analysis of financial experience
  - Disclosure
  - Basis for plan changes
  - Allocation of cost to appropriate time periods



# Actuarial Assumptions

Two types:

## Demographic Assumptions

- When benefits will be payable
- Amount of benefits

## Economic Assumptions

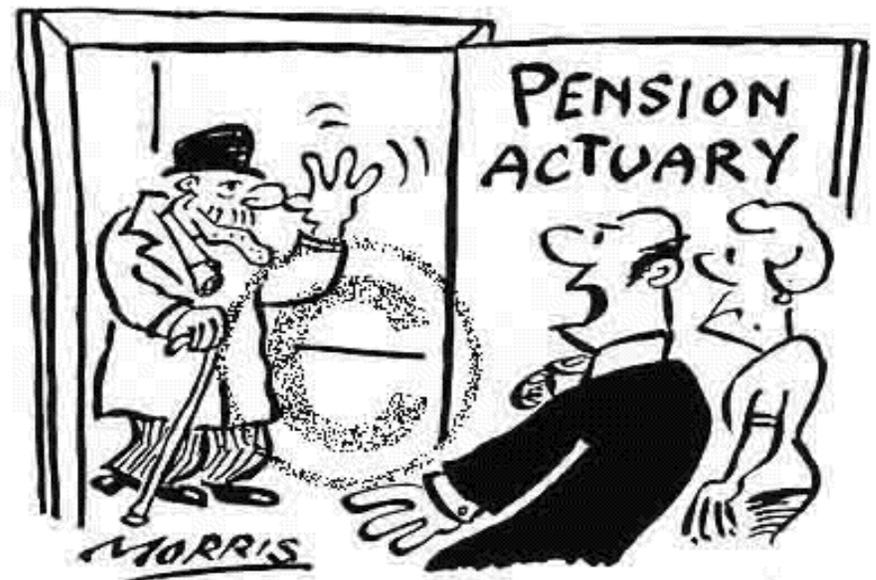
- How assets grow
- How salaries increase



# Demographic Assumptions

ACTUARIAL CONCEPTS AND TERMINOL

- Rates of “Decrement:”
  - Retirement, Termination, Mortality, Disability
- Retirement:
  - Rate at which participants leave service
  - Service retiree, early retiree
- Termination:
  - Rate at which employees are expected to withdraw
  - Participants may withdraw and not collect pension immediately (Deferred Vested)
- Mortality:
  - Before and after retirement
  - Service connected or not
  - Service, disability, beneficiary
- Disability:
  - Service connected or not
- Other demographic assumptions:
  - Percent married
  - Member/Spouse age difference



"He's 104. He always comes back on his birthday - I worked out he'd be gone at 69."

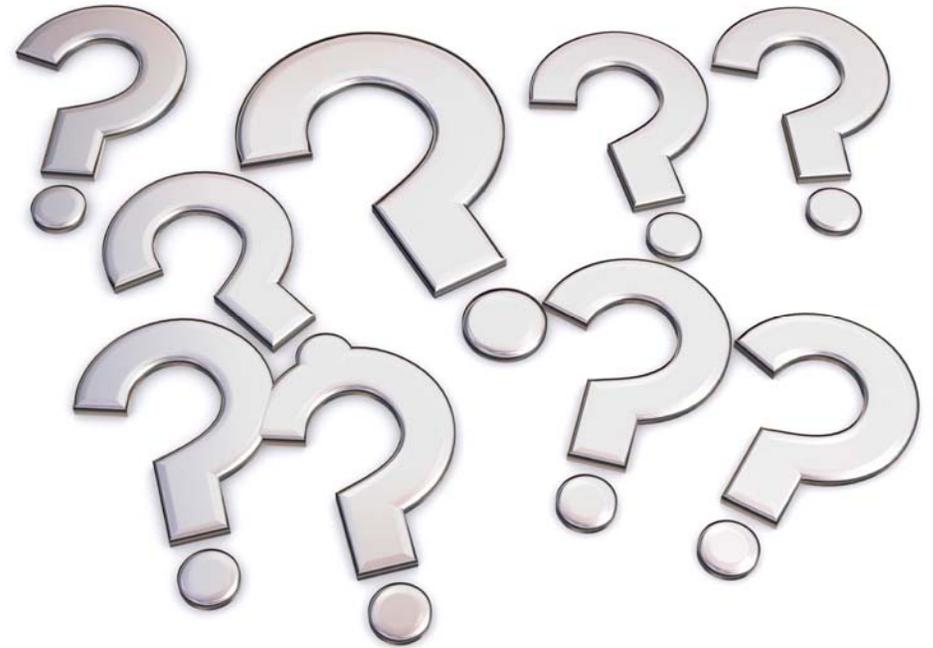
# Economic Assumptions

- Includes Inflation, Investment Return and Salary Increases
- **Develop using “building block” approach under Actuarial Standards of Practice (ASOP)**
  - **Investment Return = Inflation + Expected Real Rate of Return**
    - » Inflation
      - › Basis for inflation: Past five years inflation = 2.65%; Bond market inflation forecast: 2.58%; NASRA Survey: 3.0%-4.5%
      - › Reasonable range: 2.5%-4.5
    - » Real Rate of Return
      - › Consider historical returns, the Capital Market Outlook and the asset allocation for the Plan
      - › Reasonable Range: 4.1% to 5.4% (for a 60% equity portfolio)
- **Recommendation: 7.25%**
  - **3.25% Inflation + 4.00% Real Rate of Return**



# Selecting Actuarial Assumptions

- Objective - Long Term
- Experience Analysis
- Recent Experience or Future Expectations:
  - Demographic: recent experience usually
  - Economic: not necessarily!
- City Specific or Not
- Consistency Among Assumptions
- Desired Pattern of Cost Incidence

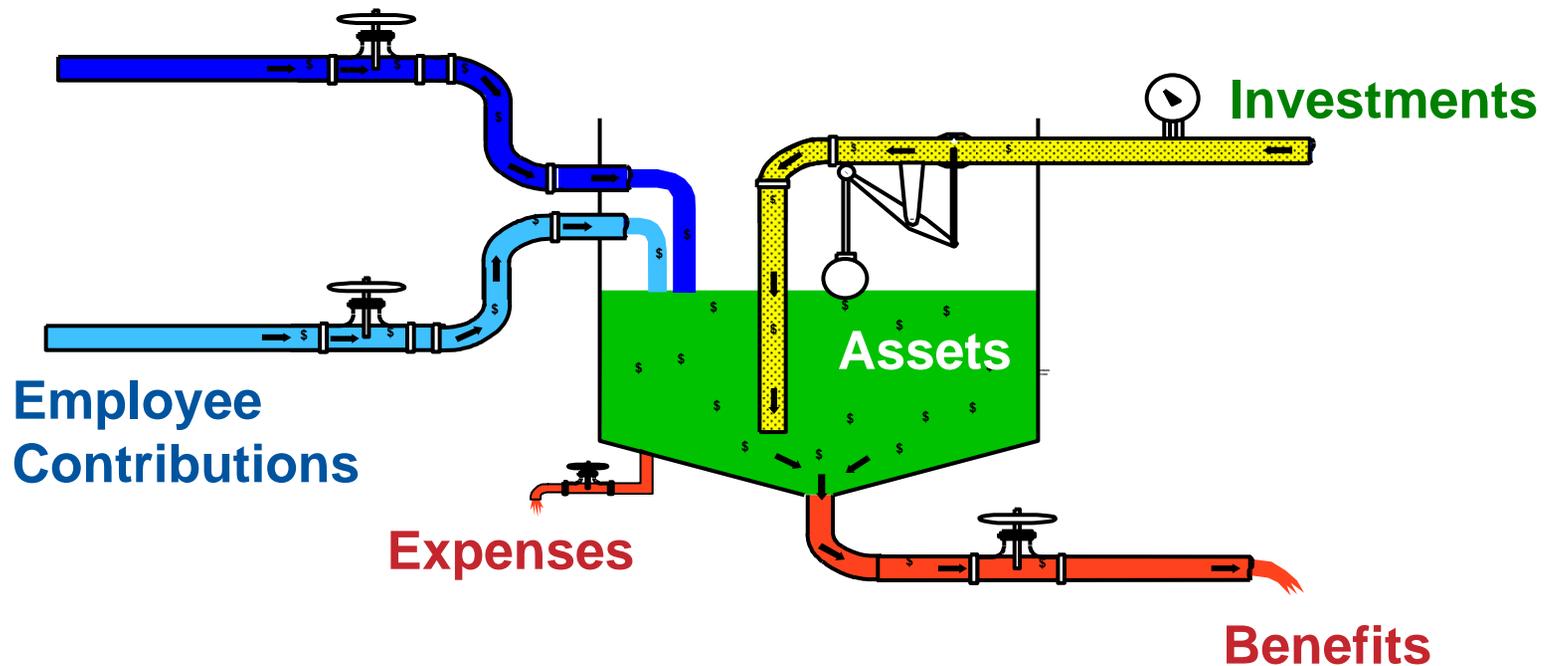


# Funding Mechanics

ACTUARIAL CONCEPTS AND TERMINOL

Ultimately, Contributions + Investment Return = Benefits + Expenses

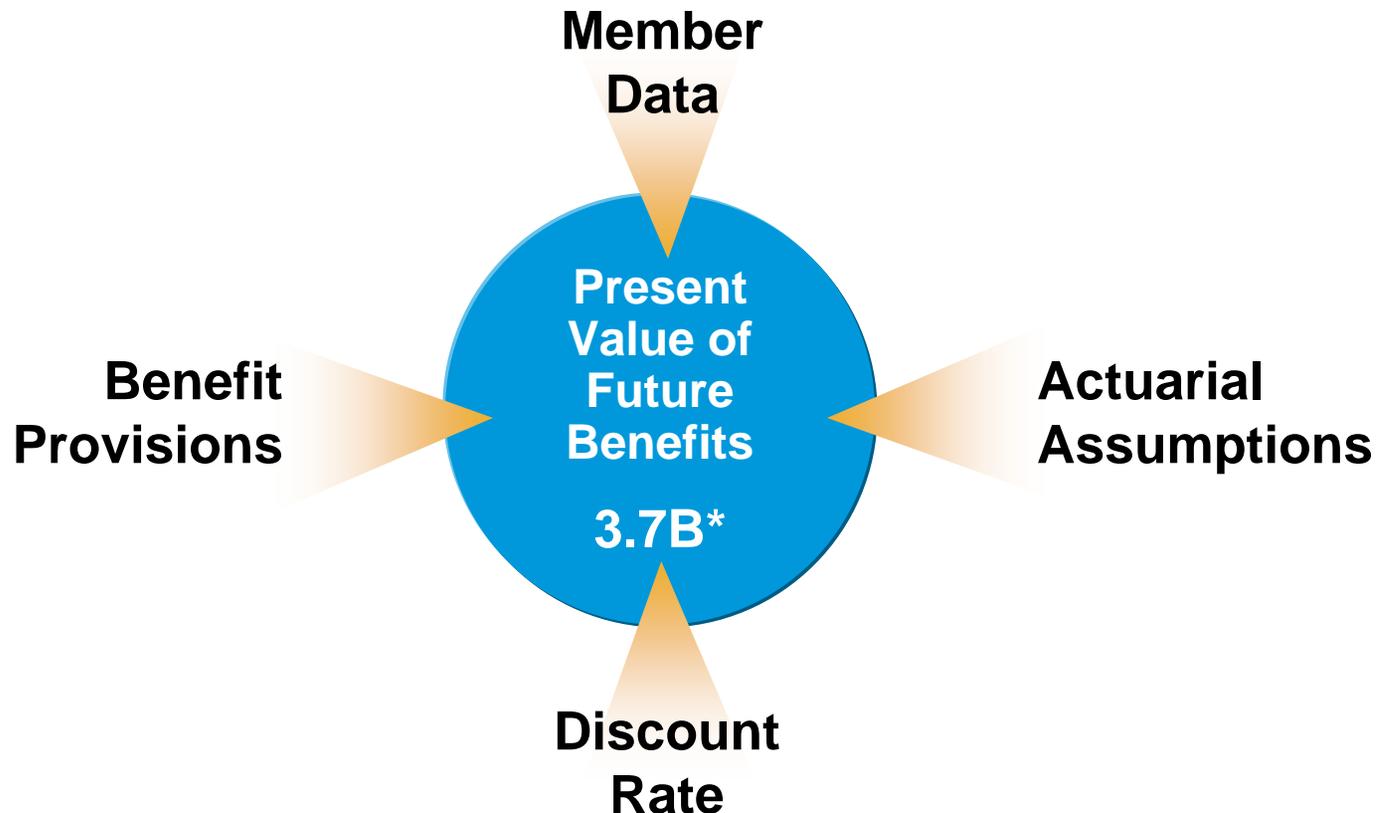
## City Contributions



Assumptions and funding methods affect only the timing of costs.  
“Nobody ever made a benefit payment from assumed interest!”

# Present Value of Benefits

The **Present Value of Future Benefits (PVB)** is the present value of total benefits promised to current participants, based on projected pay and service at retirement



\* Estimated as of July 1, 2010 based on assumptions from most recent actuarial reports

# Present Value of Benefits

## Example

- Promise to pay \$100 in ten years to each of ten participants
- Investments will double in ten years (interest rate is 7.2%)
- Three out of ten subscribers will survive to collect



# Present Value of Benefits

## *Example*

### Consider Interest Only

- Collect \$50, invest it, pay \$100
- We say \$50 is the “present value” of the \$100 “discounted at 7.2% interest” for ten years

### Consider Survival Only

- Collect \$30 from each, use \$300 to pay each of the three survivors
- We say \$30 is the “present value” of the \$300 “discounted at survivorship” for ten years



# Present Value of Benefits

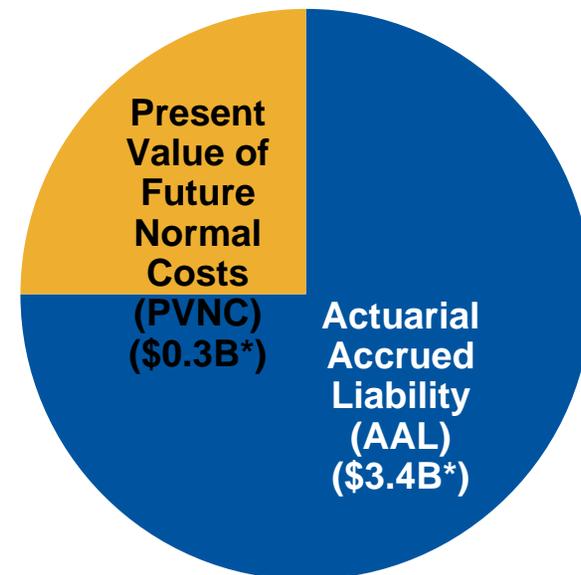
## *Example*

- Consider Both Interest and Survival
  - Collect \$15 from each participant
  - Invest the \$150, have \$300 in ten years
  - Pay \$100 to each of the three survivors
  
- We say \$15 is the “present value” of the \$100, “discounted at interest and survivorship” for ten years

# Actuarial Cost Method

- The **actuarial cost method** is a mechanism to allocate the present value of future benefits (PVB) to time periods (i.e., benefits related to past service vs. future service):
  - The **Present Value of Future Normal Cost (PVNC)** is the portion of the PVB attributable to future service
  - The **Actuarial Accrued Liability (AAL)** is the portion of PVB attributable to past service

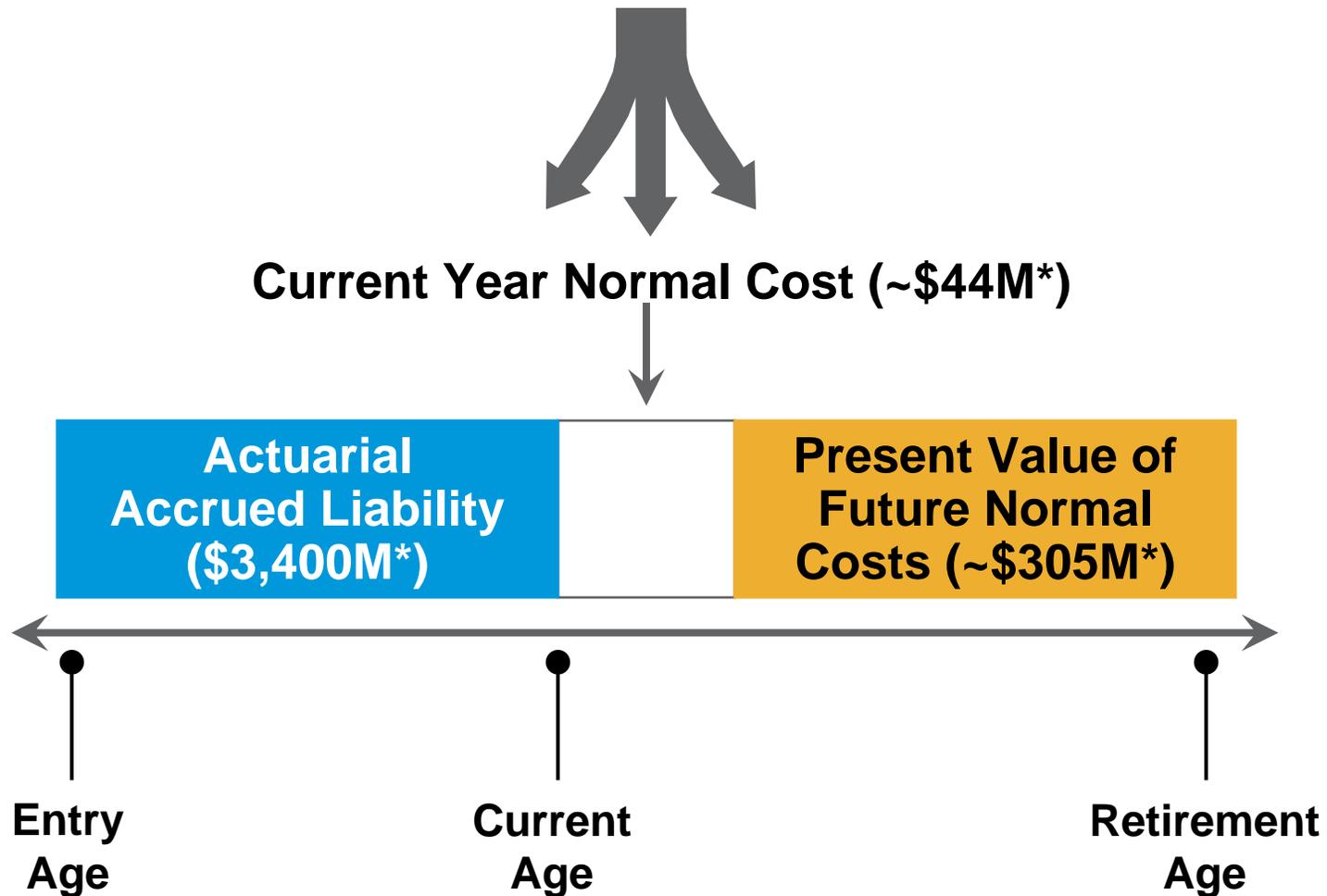
$$\text{PRESENT VALUE OF FUTURE BENEFITS} = \text{AAL} + \text{PVNC}$$



\* Estimated as of July 1, 2010 based on assumptions from most recent actuarial reports

# Actuarial Cost Method *continued*

## Present Value of Future Benefits

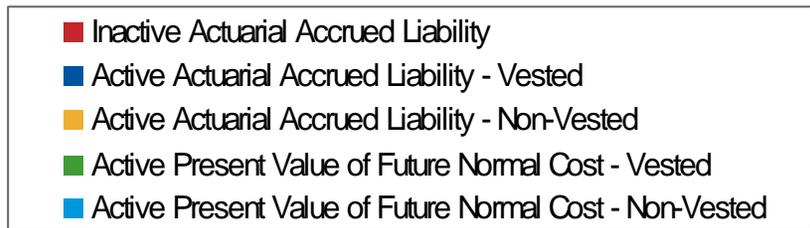
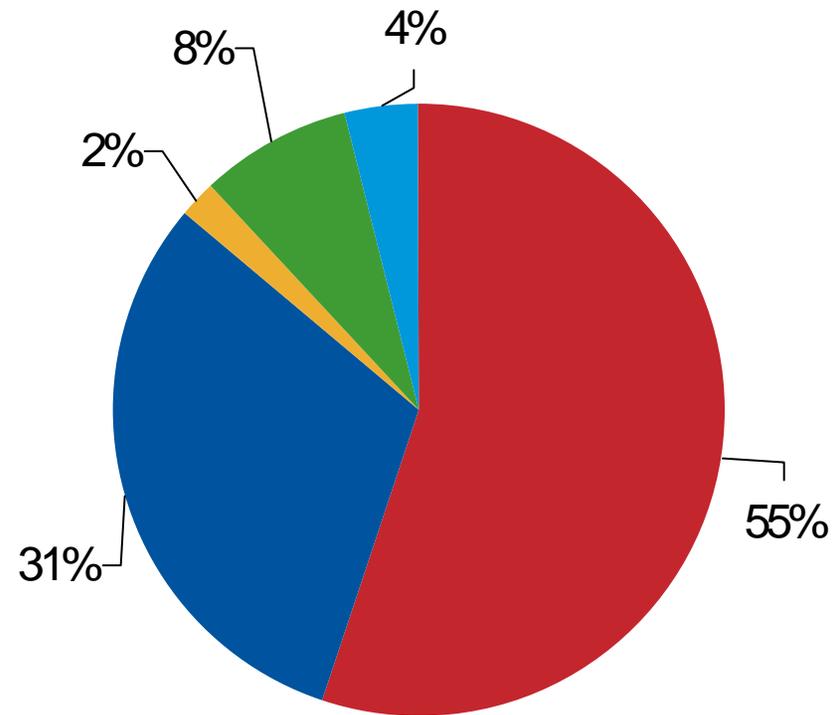


\* Estimated as of July 1, 2010 based on assumptions from most recent actuarial reports

# Actuarial Cost Method *continued*

➤ The Present Value of Future Benefits is composed of multiple parts. The following is a breakdown:

- The inactive participants (i.e., retirees, beneficiaries, disableds and terminated vested) account for about 55% of the PVB
- Vested active participants account for about 39% of the PVB
- Non-vested active participants account for about 6% of the PVB

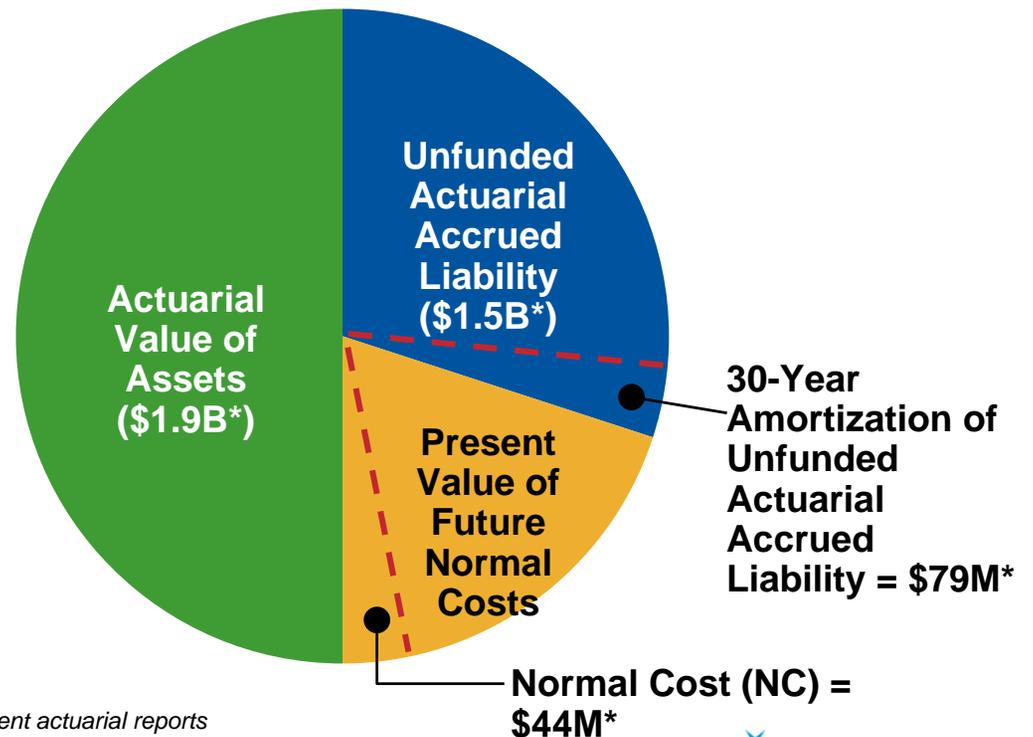


# Annual Cost

**Annual Required Contribution (ARC) = Normal Cost (NC) + 30-Year Amortization of Unfunded Actuarial Accrued Liability (UAAL)**

- Normal Cost (NC) = Cost attributable to benefits accruing during upcoming year
- Unfunded Actuarial Accrued Liability (UAAL) = Actuarial Accrued Liability (AAL) – Assets

**PRESENT VALUE OF FUTURE BENEFITS = AAL + PVNC**



\* Estimated as of July 1, 2010 based on assumptions from most recent actuarial reports



- ① Actuarial Concepts and Terminology
- ② Replacement Ratios
- ③ Plan Design
- ④ Trends
- ⑤ Resources
- ⑥ Appendices

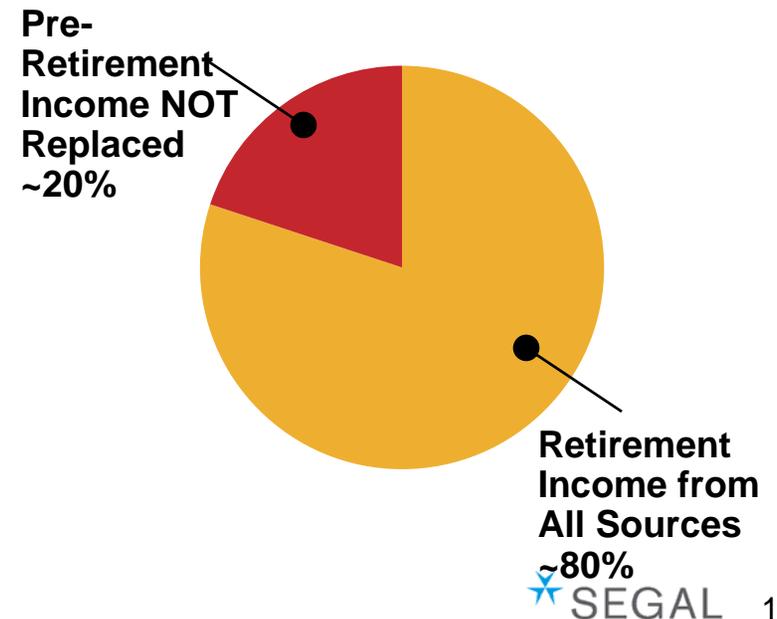
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# Retirement Income Replacement Ratio Definition

REPLACEMENT RATIO

A common approach used to analyze and compare retirement programs is to measure the relative income provided by the retirement plan as a percentage of the employee's final salary prior to retirement:

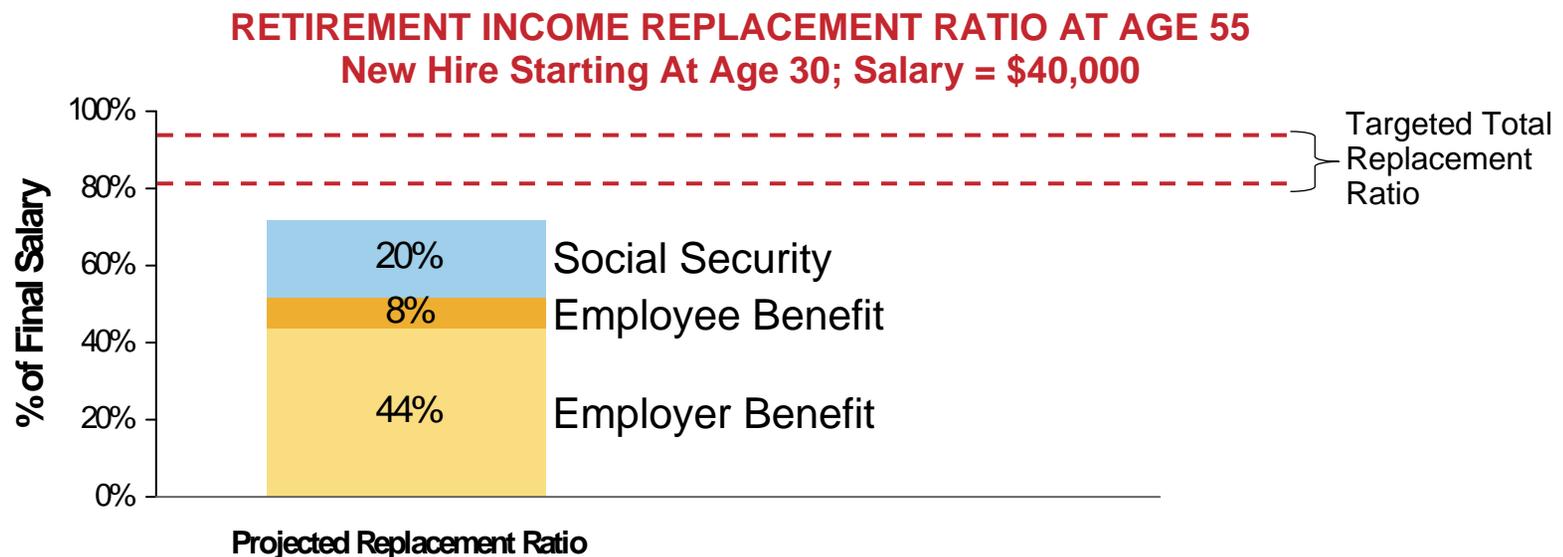
- **Retirement Income Replacement Ratio (“Replacement Ratio”):** measure of annual income provided at retirement to the employee's final salary prior to retirement:
  - Includes income from all sources including employer-provided retirement benefit, Social Security and employee savings
- Employees need between 78% to 94% of pre-retirement income (“replacement ratio”) to maintain their standard of living during retirement according to Dr. Bruce Palmer, Professor and Chair Emeritus of Georgia State's Department of Risk Management



# Benchmarking against Targeted Replacement Ratio

REPLACEMENT RATIO

- The graph below illustrates how a typical retirement plan's projected benefits for a new employee compare against targeted retirement income replacement ratios at Age 55



- The replacement ratios include Social Security benefits even though employees are not eligible to begin receiving benefits until Age 62
- Employee contributions to the Defined Benefit Plan are the only employee savings assumed



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- Retirement Plans fall into two broad categories:
  1. **Defined Benefit Plans:** focus on benefit security
  2. **Defined Contribution Plans:** focus on wealth accumulation
  
- **Defined Benefit Plans** include final average salary plans, career average salary plans and flat dollar plans:
  - Risk borne by Employer
  - Risk includes: Wage inflation, Inflation risk, Interest rate, Investment risk, Longevity risk, Incentive risk, Regulatory risk
  
- **Defined Contribution Plans** include 401(a), 401(k), 403(b), 457 and matching plans:
  - Risk borne by Employee
  - Risk includes: Wage inflation, Inflation risk, Interest rate, Investment risk, Longevity risk, Incentive risk, Regulatory risk, Non-participation risk, Leakage risk, Cognitive and Will-power risk

# Comparison of Features

Objective	Defined Benefit	Defined Contribution
<b>Funding Certainty</b>	Plan liabilities change based on actuarial assumptions, e.g., future salary increases, investment earnings, employee turnover.	Employer liability is fulfilled annually as contributions are made to employee accounts based on a percentage of payroll.
<b>Predictable Contribution Costs</b>	Annual contribution may vary from year-to-year based upon actuarial assumptions (see above). Rates may be set by statute to increase predictability.	Annual cash expenditures are more predictable as they are based on a set percentage of employee salaries.
<b>Recruitment Tool</b>	Some portability through service credit purchase or return of employee contributions.	Assets are portable.
<b>Reward Career Employees</b>	Benefits are typically based on final year(s) salary, rewarding career employees.	Benefits are based upon accumulated contributions and earnings.
<b>Investment Risk</b>	Investment risk is assumed by the employer. Contributions may be lowered by earnings that exceed assumed rates of return.	The employee assumes investment risk and bears a direct relationship to the retirement benefit. In some cases, the plan design includes a minimum guaranteed return.

# Comparison of Features *continued*

Objective	Defined Benefit	Defined Contribution
<b>Benefit Potential</b>	Benefits paid at retirement are for life and are guaranteed by the plan's benefit formula. Cost of living increases are common.	Benefits paid at retirement are based on contributions and earnings. The final retirement benefit can be eroded by pre-retirement distributions.
<b>Understandable Benefits</b>	Benefits require explanation because they are based on a set of variables, e.g., future earnings and year of service at retirement. There are no separate accounts.	Benefits are based on accumulated contributions plus earnings at the time of retirement. Market fluctuations make it difficult to predict retirement benefit.
<b>Expenses</b>	Expenses include actuarial valuation and investment fees, including recordkeeping and investment management. Employer pays administrative and investment fees.	Expenses may be lower than a defined benefit plan because no actuarial valuation is necessary, and investment fees are shifted to the employee. Employee education costs may be higher. Actual expenses are more difficult to determine and may be included as an offset to investment return.
<b>Access to Benefits While Employed</b>	Benefits may not be withdrawn while actively employed. Loans can be made provided IRS guidelines are followed, but are rare.	Benefits may be withdrawn or loaned under certain circumstances provided IRS guidelines are followed.

# Introduction to Hybrid Plans

**Hybrid Plans** seek to combine features of both Defined Benefit and Defined Contribution Plans and include Dual Plans, DB Plans with Lump-sum options (including DROP features), Crossover Plans, Cash Balance, Target benefit plans and Floor offset:

- **Dual Plans:** an arrangement which consists of both a defined contribution and defined benefit plan. The defined benefit is the primary plan while the defined contribution plan establishes a minimum benefit and provides portability
- **Cash Balance Plans:** a defined benefit plan which accumulates, under a pre-defined interest crediting rate, a hypothetical account balance. The interest accumulated is based on an index (e.g., one-year Treasury rate plus 1.5%) as defined in the plan. A simple example of a cash balance plan is one that allocates 5% of annual salary to each participant's cash balance account and guarantees a fixed rate of interest on those contributions. The benefit is typically calculated using a career average salary
- **Crossover Plans:** permits participants to move between an employer-sponsored defined benefit and defined contribution plan. When hired the employee is given a choice of plans DB, DC or a combined plan. Typically the option to "cross-over" to the DB plan is permitted after 3 to 5 years of employment

# Introduction to Hybrid Plans

- Why Consider a Hybrid Plan?
  - Lower employer costs
  - Reduce employer contribution volatility
  - Provide members benefit flexibility
  - Create greater flexibility, especially for short service employees
  - Make the Plan more understandable
  - Modify the risk characteristics of the pension offerings
  - Attract/Motivate/Retain talent base
- DB and DC plans have decidedly different approaches to benefit design
- Shifting of risk may have unintended consequences
- There is no magic equivalent plan (DB = DC)
  - Difference rests in risk and performance



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- What key elements does the City need to consider when evaluating Defined Benefit versus Defined Contribution Plans?
  - **How risk will be allocated:** City only, Employee only or shared
  - **Demographics:** aging population, educational level, health
  - **Competing concerns:** employee, employer and taxpayer
  - **Healthcare issues:** impact on retirement planning
  
- Design should balance competing concerns—employee concerns, employer concerns and taxpayer concerns:
  - Employee concerns include adequacy of retirement benefits (replace standard of living), competitive compensation and benefits, outliving the money, purchasing power retention (inflation impact), portable benefits, affordable health care in retirement, investment risk/capturing superior returns, healthcare costs (including end of life costs) and leaving an estate
  - Employer concerns include no increase or reduction in cost, recruiting and retaining workforce, meeting service mission and no decrease in services
  - Taxpayer concerns include no increase in taxes and no decrease in services

# Appropriateness of a Plan Design

PLAN DESIGN CONSIDERATIO

- Assess risk components
  - Is risk in its proper place?
  - Can the risk be managed by the City?
    - Investment risk
    - Longevity risk
    - Short-term vs. Long-term benefit risk  
(Is a short-term problem being solved at the expense of a long-term problem?)
  - Can the motivation for change be handled another way?
  
- Assess the Value of Alternative Plan Design or Approach
  - Measure against retirement policy
    - Adequacy at retirement (replacement ratios)
    - Purchasing power into retirement
  - Measure against funding policy
    - Stability
    - Amount
  - Analyze investment options
    - Sufficient number and variety
    - Sufficient safeguards



# Selecting the “Right” Plan



How do we mitigate financial risk?  
Are employees capable of handling risk?

Who am I competing with for talent?  
Will that change?  
What are they doing?

How do I balance perceived and real value?

What are my future talent requirements? What type of retirement programs supports those needs?

Are benefits—and in particular retirement benefits—important in attracting and retaining employees?

Is adequacy of retirement income an issue?

# Putting Retirement Plans in Context

PLAN DESIGN CONSIDERATION

## The Employee Value Proposition

What do employees want?



### Plan Design Implications:

1. Several of the most important components are the least managed
2. Some employers are starting to turn focus from tangible (*compensation and benefits*) to intangible (*affiliation, work content, and career*)
3. The holistic vantage point: Employee Engagement



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# Sample Decision “Matrix”

Decision Criteria	Options for Consideration		
	Option 1	Option 2	Option 3
<b>Financial Criteria</b>			
<p><b>Predictable Cost:</b> Is the contribution predictable based on known information such as participants’ annual compensation, expected annual employee contributions to DC plans, or percentage of general budget?  <i>Sample Goal: Predictable annual contribution</i></p>			
<p><b>Funding Flexibility:</b> Do funding requirements provide for varying contributions; (i.e., prefunding in good years and using the prefunding to help meet contribution requirement in other years?)  <i>Sample Goal: Flexibility to meet funding requirements</i></p>			
<p><b>Reduce Unfunded Actuarial Accrued Liability (UAAL):</b> Does the plan increase, decrease or have no effect on past service liability amounts?  <i>Sample Goal: Decrease unfunded actuarial accrued liability by \$200 million</i></p>			
<p><b>Benefit Security:</b> Who/What/How are the retirement benefits promised to employees guaranteed to be paid?  <i>Sample Goal: To have a retirement program the City can afford over the long term and accumulate sufficient assets to pay all retirement benefits</i></p>			
<b>HR Criteria</b>			
<p><b>Target Income Replacement Ratio:</b> Will the new plan provide a benefit at normal retirement that meets the City’s Target Income Replacement Ratio?  <i>Sample Goal: Plan provides at least a 70% income replacement, from all sources.</i></p>			
<p><b>Meaningful Benefit for Early Career Hires:</b> Is the program designed to provide future early career hires adequate benefits at retirement?  <i>Sample Goal: To provide target income replacement ratio within City’s targeted range.</i></p>			
<p><b>Meaningful Benefit for a Career Employee:</b> Does the plan provide a future career employee a benefit at normal retirement that meets the City’s Target Income Replacement Ratio?  <i>Sample Goal: To provide target income replacement ratio within City’s targeted range.</i></p>			

# Sample Decision “Matrix” *continued*

Decision Criteria	Options for Consideration		
	Option 1	Option 2	Option 3
<b>HR Criteria (continued)</b>			
<p><b>Encourage Employee Savings:</b> Will the retirement program provide a means and encourage individual employee savings for retirement?  <i>Sample Goal: To encourage employees to save for retirement</i></p>			
<p><b>Employee Understanding/Appreciation:</b> Will employees know what benefits to expect from the retirement program at retirement. How complicated are the plan benefits to explain and illustrate to participants? Are the plan provisions and eligibility requirements easy to follow?  <i>Sample Goal: For employees to know what benefits are promised and their value; To have a benefit plan that is easy to use and understand for the employee</i></p>			
<p><b>Supports New Employee Recruiting:</b> Are the benefits provided by the new retirement program the type (defined benefit, defined contribution or a combination) wanted by new employees?  <i>Sample Goal: To have the retirement program be a positive attraction for new employee recruitment</i></p>			
<p><b>Positive Influence on Employee Retention:</b> Are the benefits from all sources provided by the retirement program adequate for normal retirement (defined benefit, defined contribution, social security or a combination) wanted by employees?  <i>Sample Goal: To have a retirement program that provides adequate benefits at retirement and helps retain employees</i></p>			
<b>Other</b>			
<p><b>Administrative Complexity:</b> How complicated would the plan benefits be to calculate? Are the complications such that there is an increase on administrative cost?  <i>Sample Goal – to have a plan that the City can administer easily and maintains or lowers administrative cost</i></p>			
<p><b>Predictability of Retirement Benefits:</b> Will the benefits provided be determinable or is the benefit a function of the funds accumulated for the employee?  <i>Sample Goal: To have the retirement benefit definitely determinable</i></p>			
<p><b>Risk of Litigation:</b> Will the new plan limit exposure to litigation risk?  <i>Sample Goal: To develop a plan that meets current legal requirements and exposes the City to minimal litigation risk</i></p>			

# Questions



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## Websites and Papers for Future Exploration

### ➤ **The National Association of State Retirement Administrators**

- [NASRA.org](http://NASRA.org)

### ➤ **The National Institute on Retirement Security (NIRS)** is a not-for-profit organization established to contribute to informed policymaking by fostering a deep understanding of the value of retirement security to employees, employers, and the economy through national research and education programs. NIRS seeks to encourage the development of public policies that enhance retirement security in America

- [NIRSONline.org](http://NIRSONline.org)

### ➤ **Bureau of Labor Statistics**

- [Bls.gov/ebs](http://Bls.gov/ebs)

### ➤ **Papers**

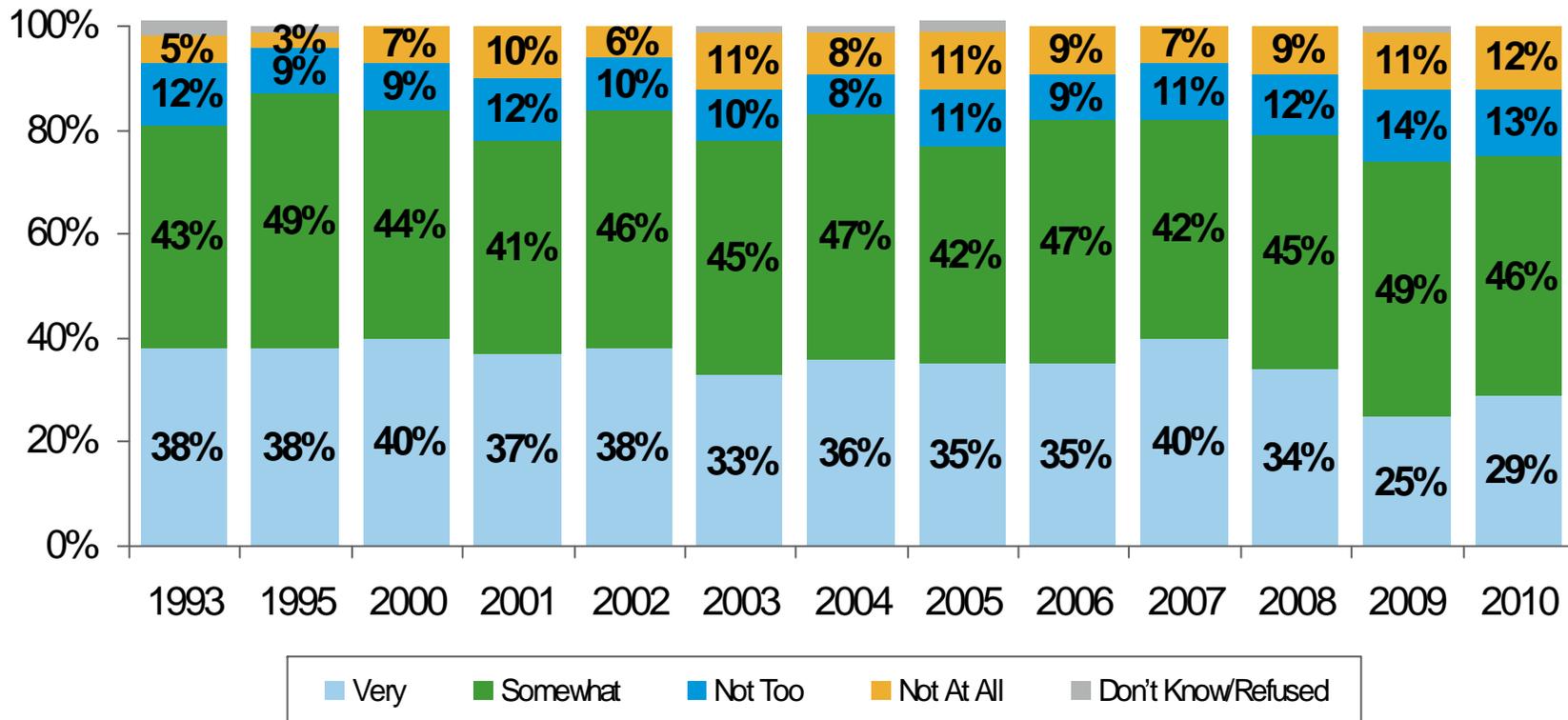
- [Patience is a Virtue: Asset Allocation Patterns of DB & DC Plans](#)
- [Retirement Readiness: What Difference Does A Pension Make?](#)
- [A Better Bang for the Buck: The Economic Efficiencies of DB Plans](#)

# Employee Attitudes:

## *Worker Confidence on Basic Needs in Retirement*

APPENDICES

### WORKER CONFIDENCE IN HAVING ENOUGH MONEY TO PAY FOR BASIC EXPENSES IN RETIREMENT



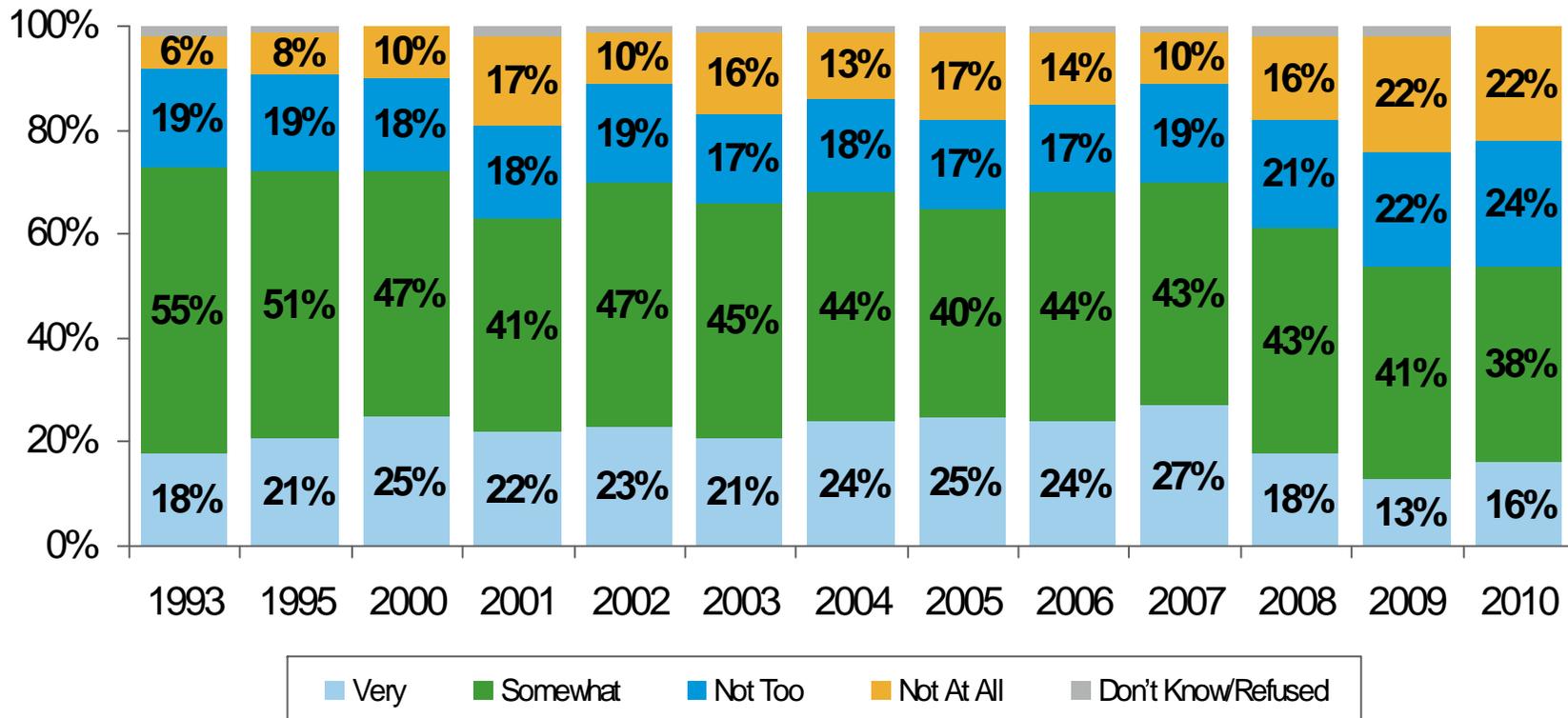
Source: Employee Benefit Research Institute and Mathew Greenwald & Associates, Inc., 19983 – 2010 Retirement Confidence Surveys.

# Employee Attitudes:

## Worker Confidence On Comfortable Retirement

APPENDICES

### WORKER CONFIDENCE IN HAVING ENOUGH MONEY TO LIVE COMFORTABLY THROUGHOUT THEIR RETIREMENT YEARS



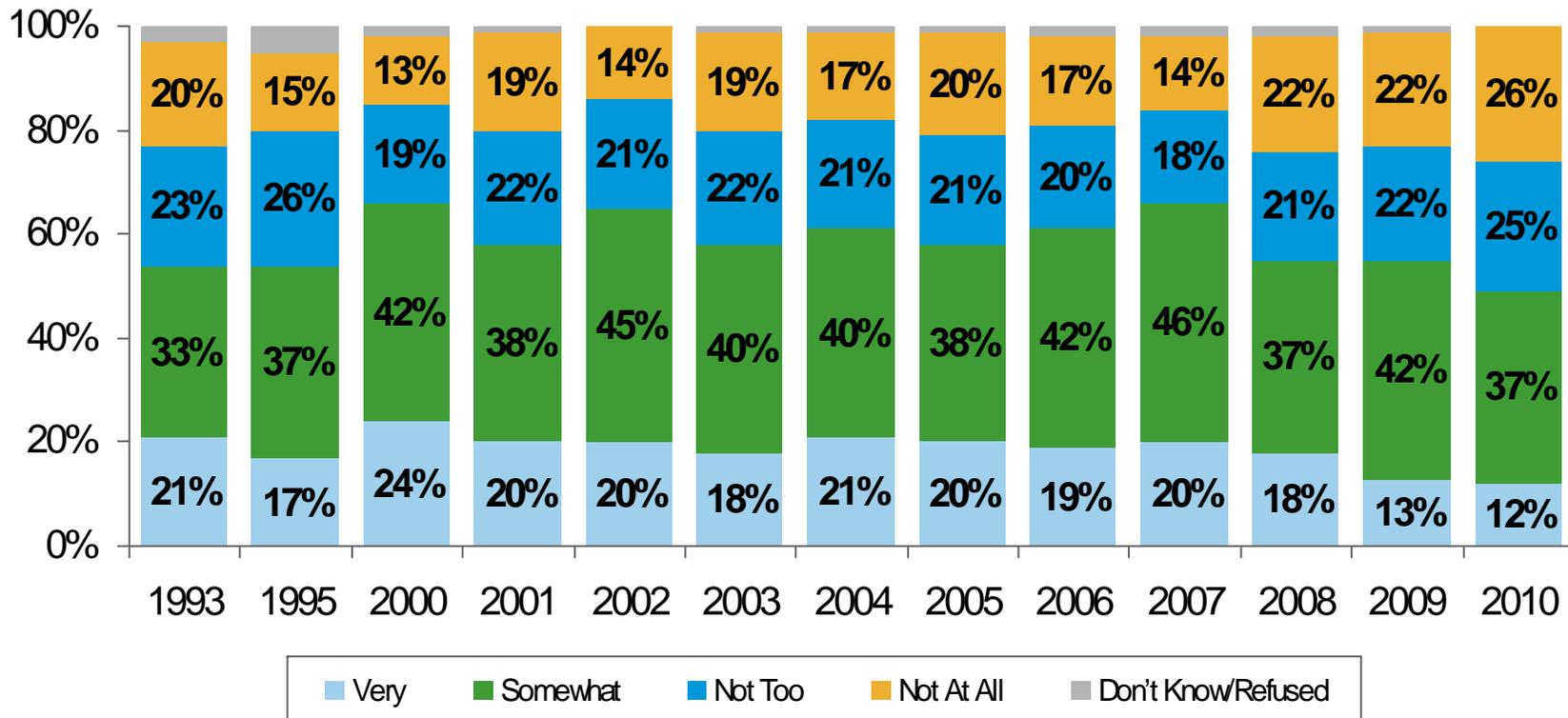
Source: Employee Benefit Research Institute and Mathew Greenwald & Associates, Inc., 19983 – 2010 Retirement Confidence Surveys.

# Employee Attitudes:

## *Worker Confidence on Medical Expense Needs*

APPENDICES

### WORKER CONFIDENCE IN HAVING ENOUGH MONEY TO PAY FOR MEDICAL EXPENSES IN RETIREMENT



Source: Employee Benefit Research Institute and Mathew Greenwald & Associates, Inc., 19983 – 2010 Retirement Confidence Surveys.

# Employee Attitudes

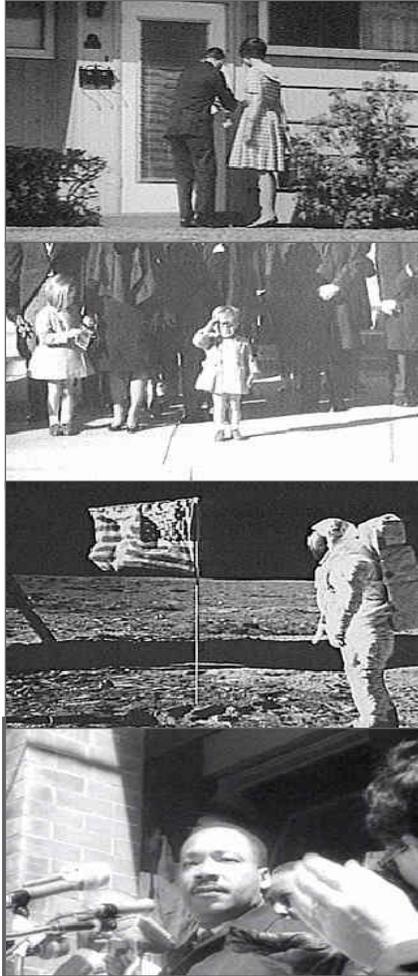
APPENDICES

## SAVINGS REQUIRED TO ACHIEVE DESIRED RETIREMENT GOALS As a Replacement Percent of Salary

Income Replacement Level	Years to Retirement					
	10	15	20	25	30	35
30%	36%	21%	13%	9%	6%	4%
40%	48%	27%	18%	12%	8%	6%
50%	60%	34%	22%	15%	10%	7%
60%	72%	41%	26%	18%	12%	9%
70%	84%	48%	31%	21%	14%	10%

Source: Committee for Economic Development, 1996 "Financing Retirement Security...",  
The Concord Coalition

# Workforce Demographics



As the largest generation in U.S. history, the baby boomers' birth, education, and development dominated American politics, business, and culture during the last half of the 20<sup>th</sup> century...

...their aging and retirement will shape American life, especially the workplace, during the first decades of the 21<sup>st</sup> century

# Workforce Demographics

APPENDICES

## The Workforce of the Future

- Every eight seconds for the next ten years a baby boomer turns 50
- This is 11,000 people per day



# Workforce Demographics

APPENDICES

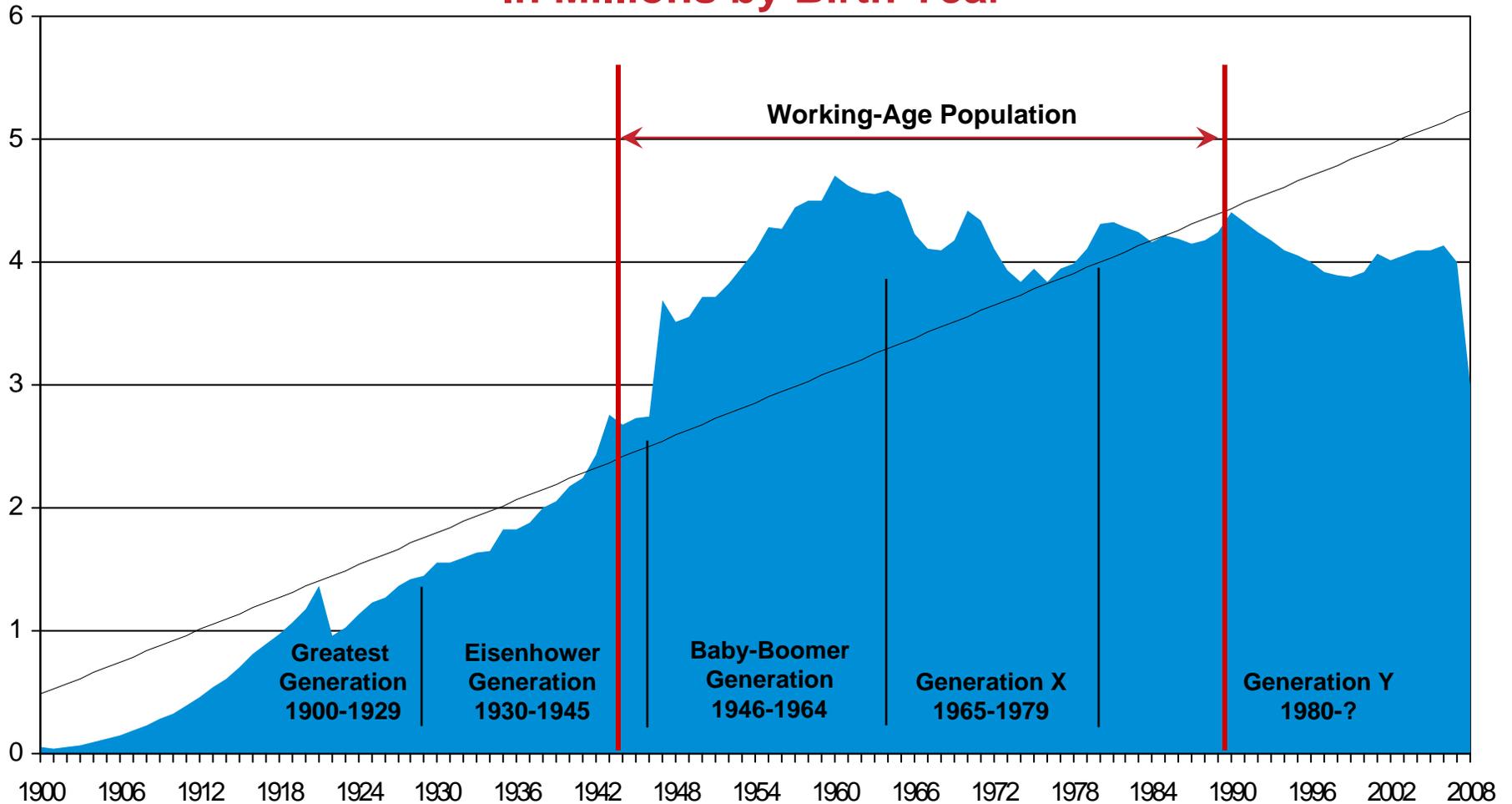
## Workforce Dynamics

- Increase in median age:
  - In 1979, 34.7
  - In 2000, 35.3
  - In 2005, 36.7
  - In 2020, 38.1
- Shortfall of younger workers
- Increased competition for workers
- Contingency workforce

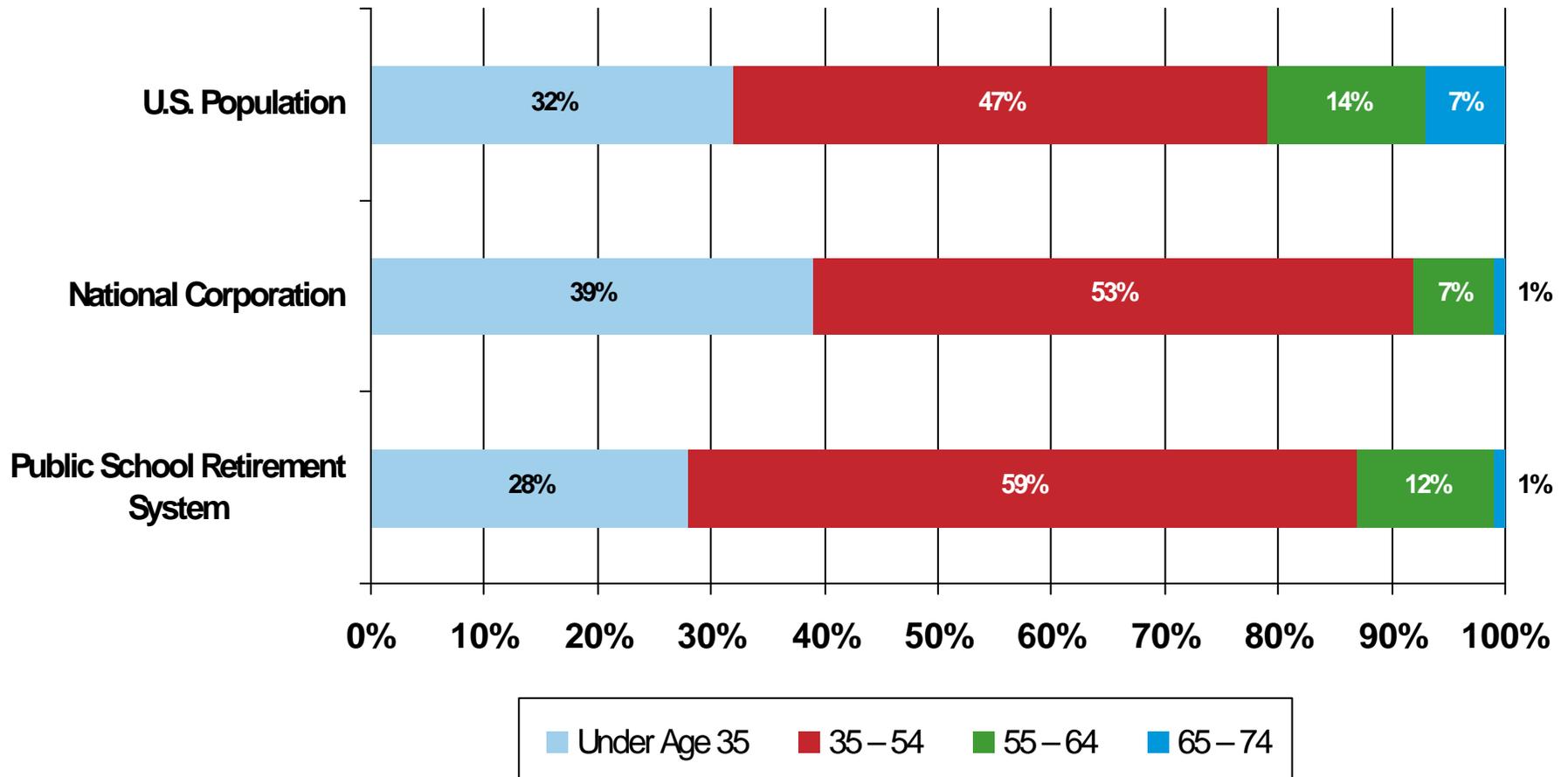


# Retirement Security: Demographics

## GENERATIONS ALIVE TODAY In Millions by Birth Year

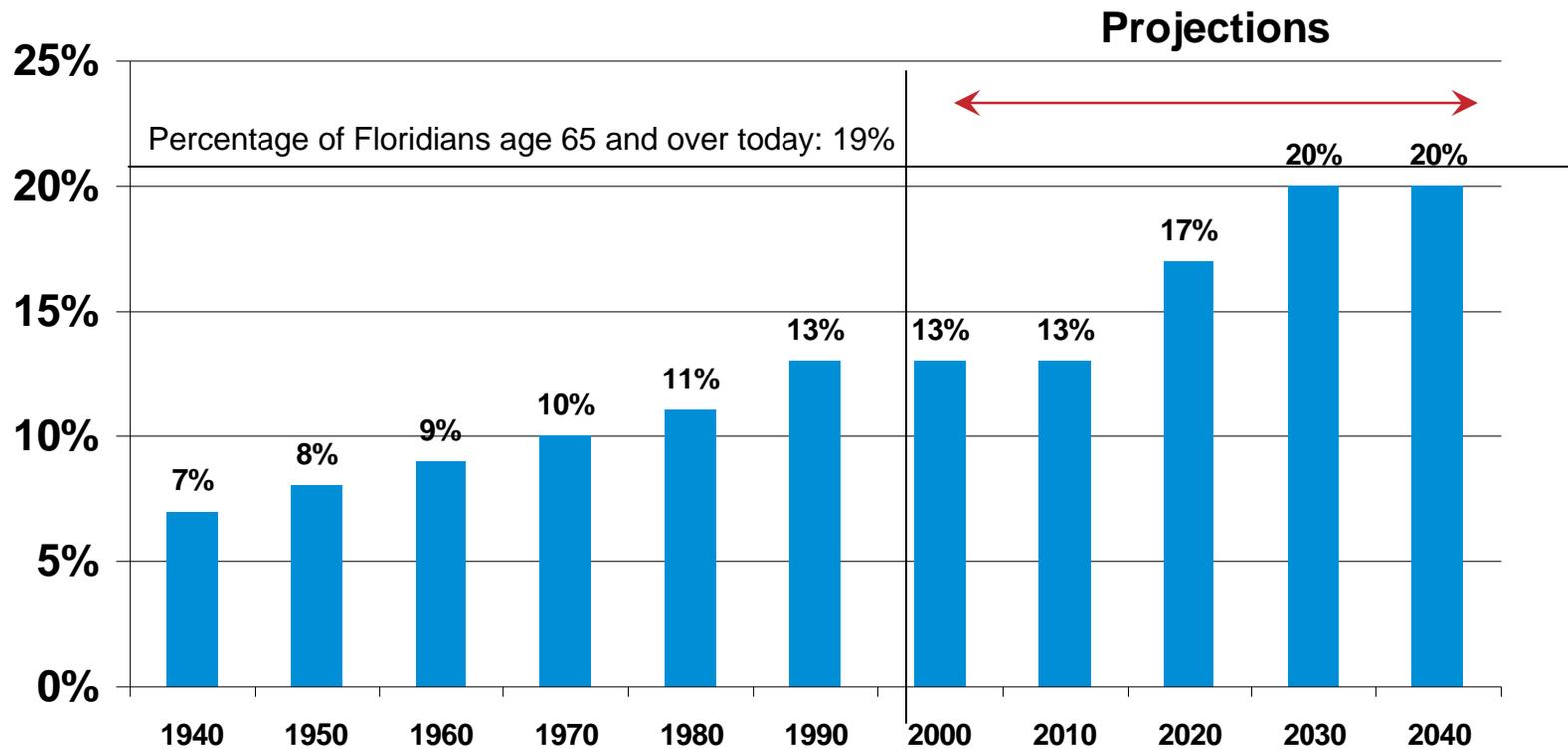


# How much of the working-age population is part of the baby boomer generation?



# Workforce Demographics

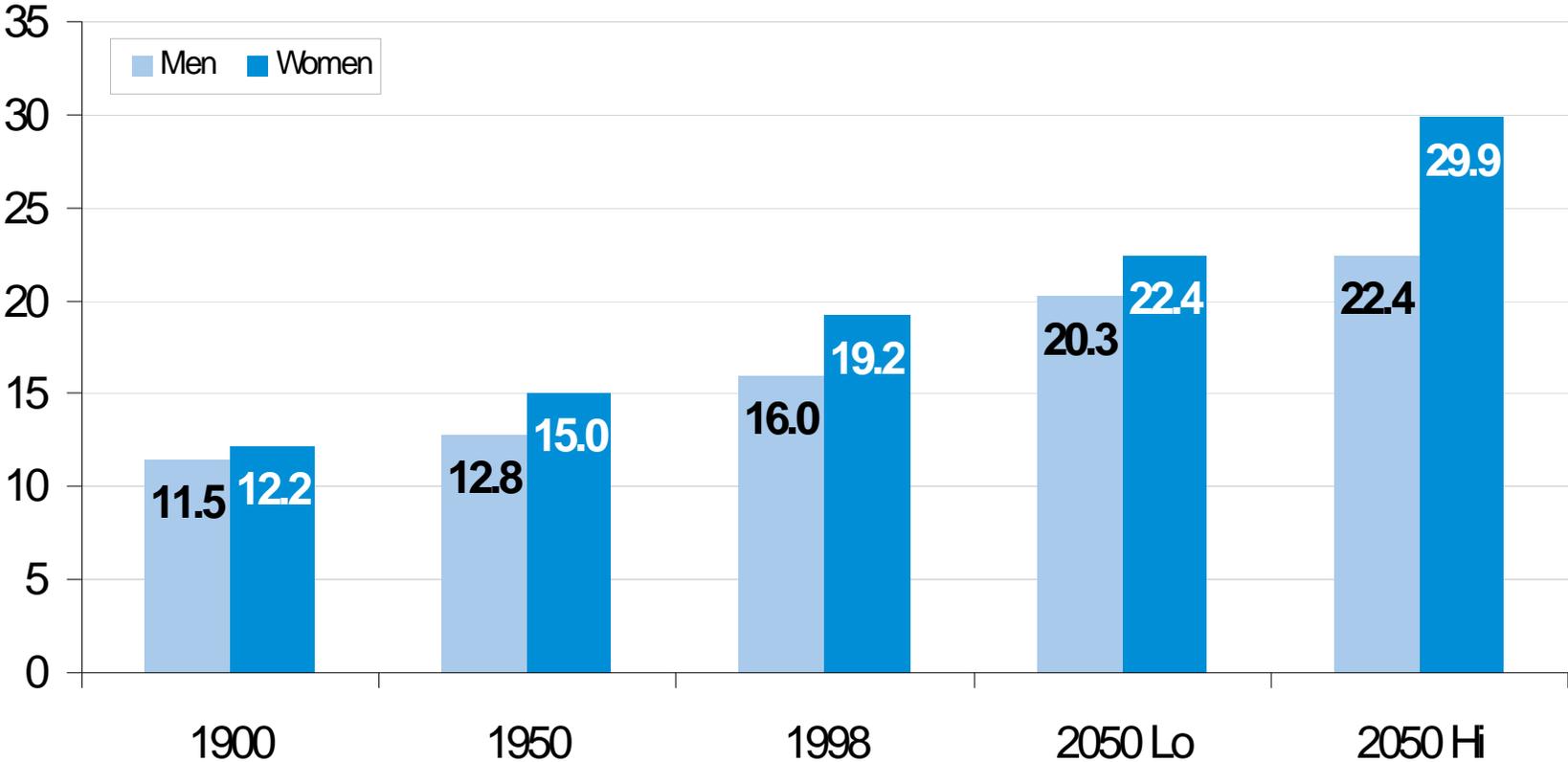
## PERCENTAGE OF AMERICANS OVER THE AGE OF 65



Source: Bureau of the Census, 1996

# Increasing Life Expectancy...

## REMAINING LIFE EXPECTANCY AT AGE 65



Source: Statistical Abstract of the U.S. 1900, 1950, 1998. For 2050, Administration on Aging based on U.S. Census Bureau projections.

# ...and where will it be felt?

## Increases in States' Populations Aged 65 and Older Between 1995 and 2025

