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Thank you for joining us – the webinar will start shortly

Longevity 103:
longevity risk management

November 18th, 2021

11am ET / 4pm GMT

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Longevity 103: *longevity risk management*

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Agenda

1. Introduction
2. Measuring longevity risk
3. The four “T”s of managing longevity risk
   - Treat, Tolerate, Transfer, Terminate
4. Monitoring emerging information

Focus on longevity risk from an organizational perspective

1. Introduction

Definition of longevity risk

Longevity risk

The risk that people live longer than expected…

… resulting in adverse financial consequences

Risk should be considered in the context of objectives of an organization / individual

The balancing act of risk management

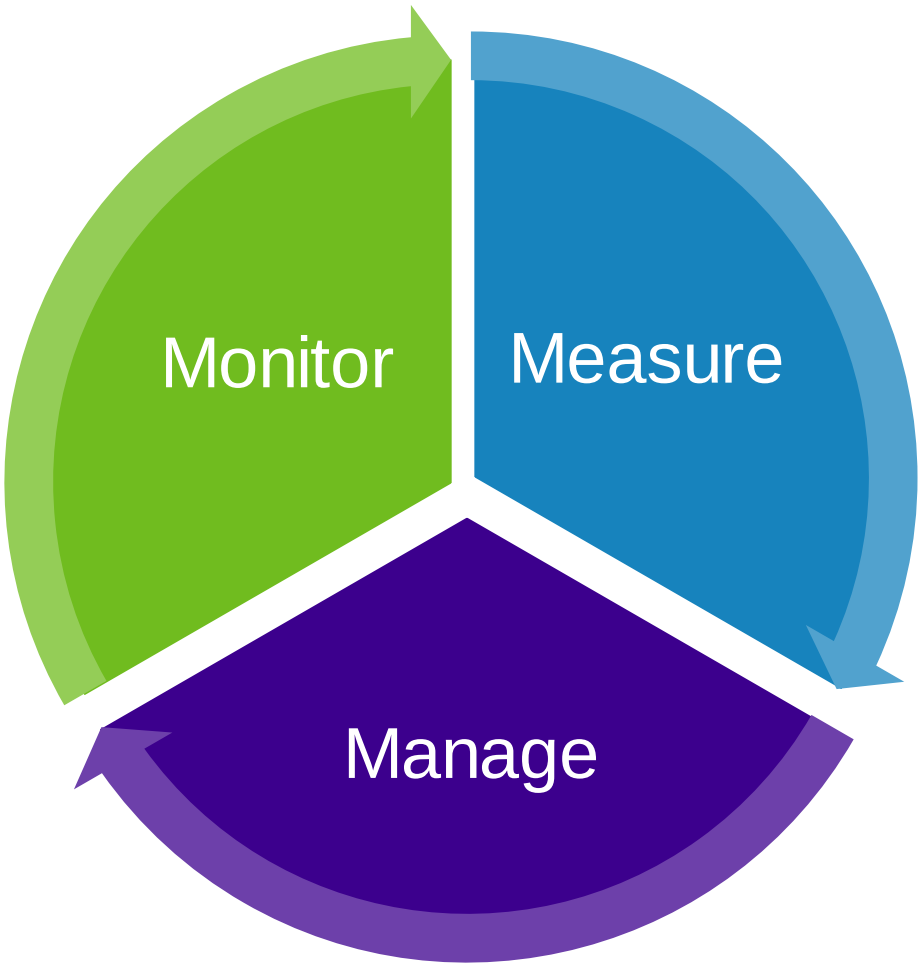
Risk appetite
The amount of risk an organization is willing to seek in pursuit of its long-term objectives

Risk tolerance
The boundaries of risk an organization ***is willing*** to accept

Risk capacity
The amount of risk an organization ***is able*** to support

Risk profile
The total risk to which the organization is exposed

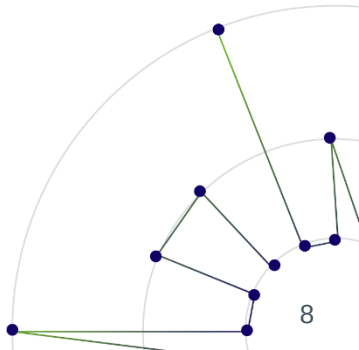
Risk management control cycle



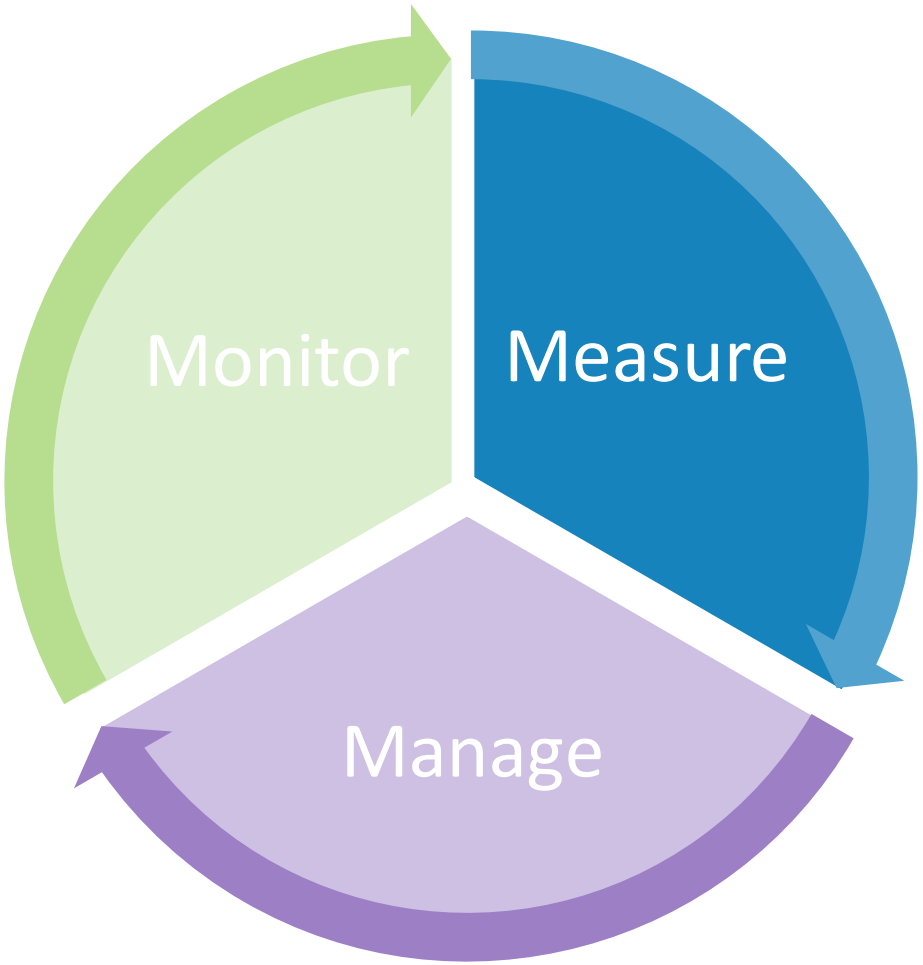
1. Measure the risk (define the problem)
2. Manage the risk (develop a solution)
3. Monitor the outcome

Holistic risk management

- Different risks will interact
- Important to consider longevity risk within context of other risks



2. Measuring longevity risk



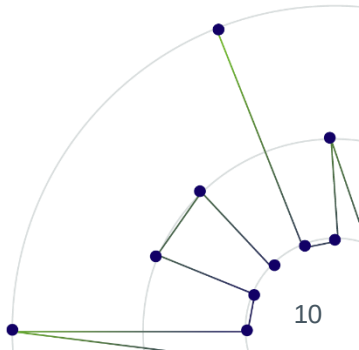
Measure the risk

Step 1

Calculate a “best estimate” assumption

Step 2

Assess the potential range and likelihood of outcomes around the best estimate



Step 1: “best estimate” assumption

Baseline

- Snapshot of current state of longevity
- Objective measure
- Based on past experience

Future trends

- How longevity will change in the future
- More subjective measure
- Recent experience a good starting point, but how and when will it change?

Best estimate assumptions: baseline

- Understand the longevity characteristics of your population
- Analyze large, relevant sets of experience data
- Use credibility adjustments if using multiple data sets

More information is available in Club Vita's Longevity 101 webinar

Longevity 101: baseline

https://www.clubvita.us/events/longevity-101-baseline

Best estimate assumptions: trends

- Understand the longevity characteristics of your population
- Recent history (usually) good indicator of the near future
- Long term assumptions more subjective and more uncertain

More information is available in Club Vita's Longevity 102 webinar

Longevity 102: improvements / trends

https://www.clubvita.us/events/longevity-102-improvements-trends

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Step 2: Variation around the best estimate

Baseline risk

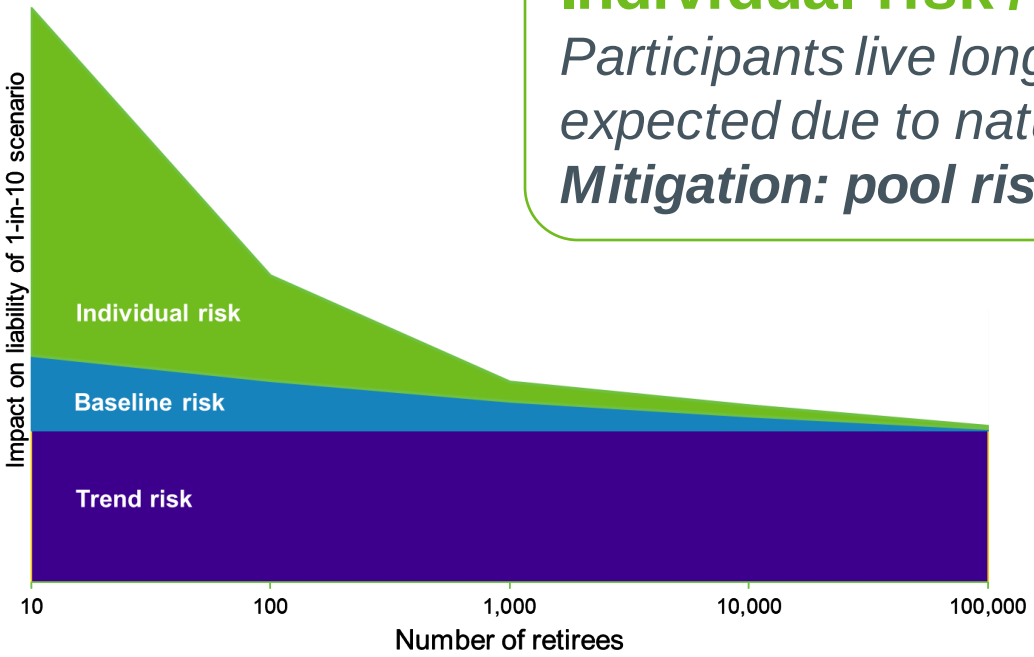
The longevity characteristics of your plan differ from the population underlying your baseline assumption

Mitigation: sophisticated approaches to baseline longevity modeling

Individual risk / idiosyncratic risk

Participants live longer/shorter lives than expected due to natural variation / noise

Mitigation: pool risk in large groups



Trend risk

Mortality rates decrease/increase at different rates to those in your improvement scale

Mitigation: longevity hedging through insurance or investment products

Even the largest plans are exposed to trend risk

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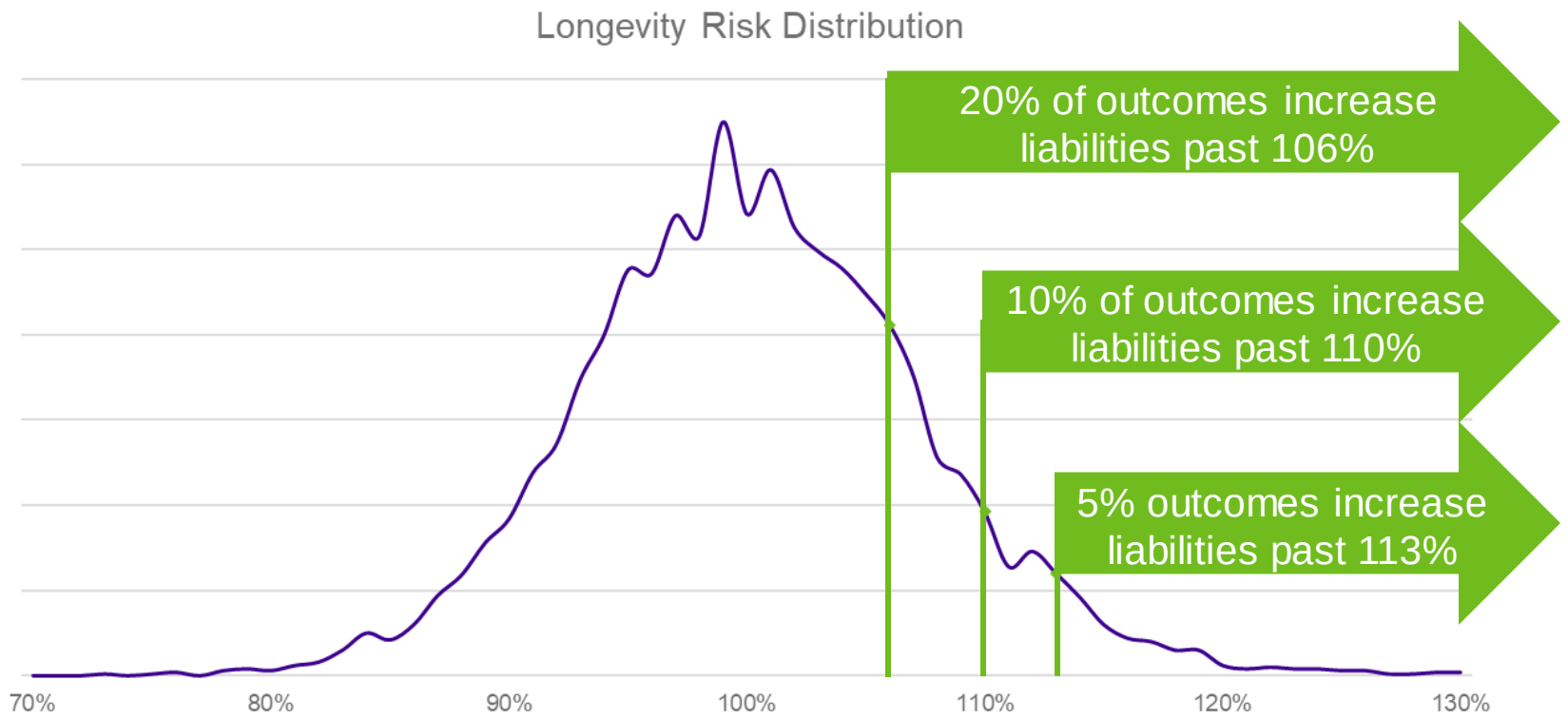
Range of outcomes

What is the range of outcomes?

- Use historical volatility to calibrate a stochastic model of potential future outcomes
- Use scenario modeling to analyze extreme events and sense check stochastic model
- The time horizon selected will be based on the organization's objectives – 1 year? Run off?

Value at risk (VaR)

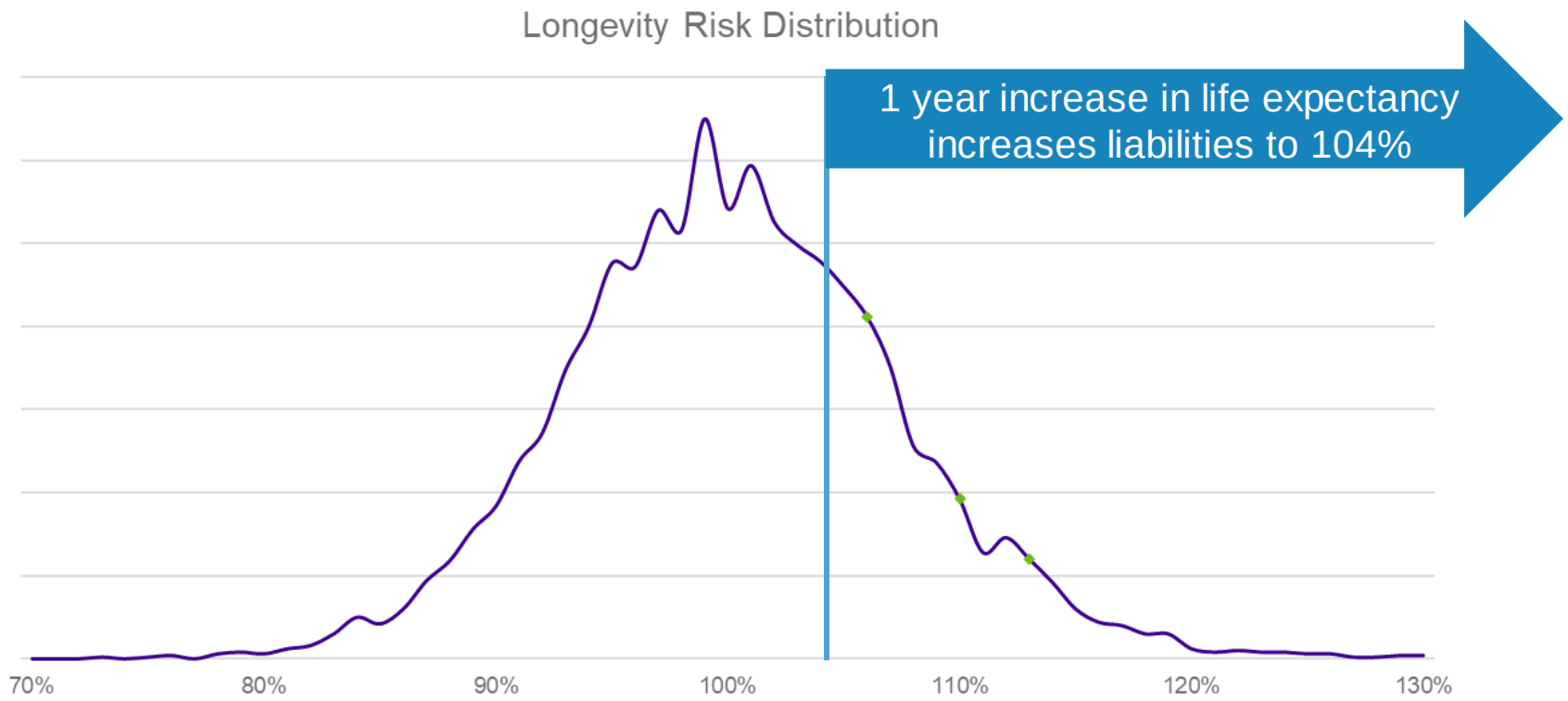
How will your liabilities change in the worst X% of outcomes?



Time horizon and percentage will depend on objectives and risk appetite

Stress testing: assumption sensitivity

What will happen to my liabilities if X happens?



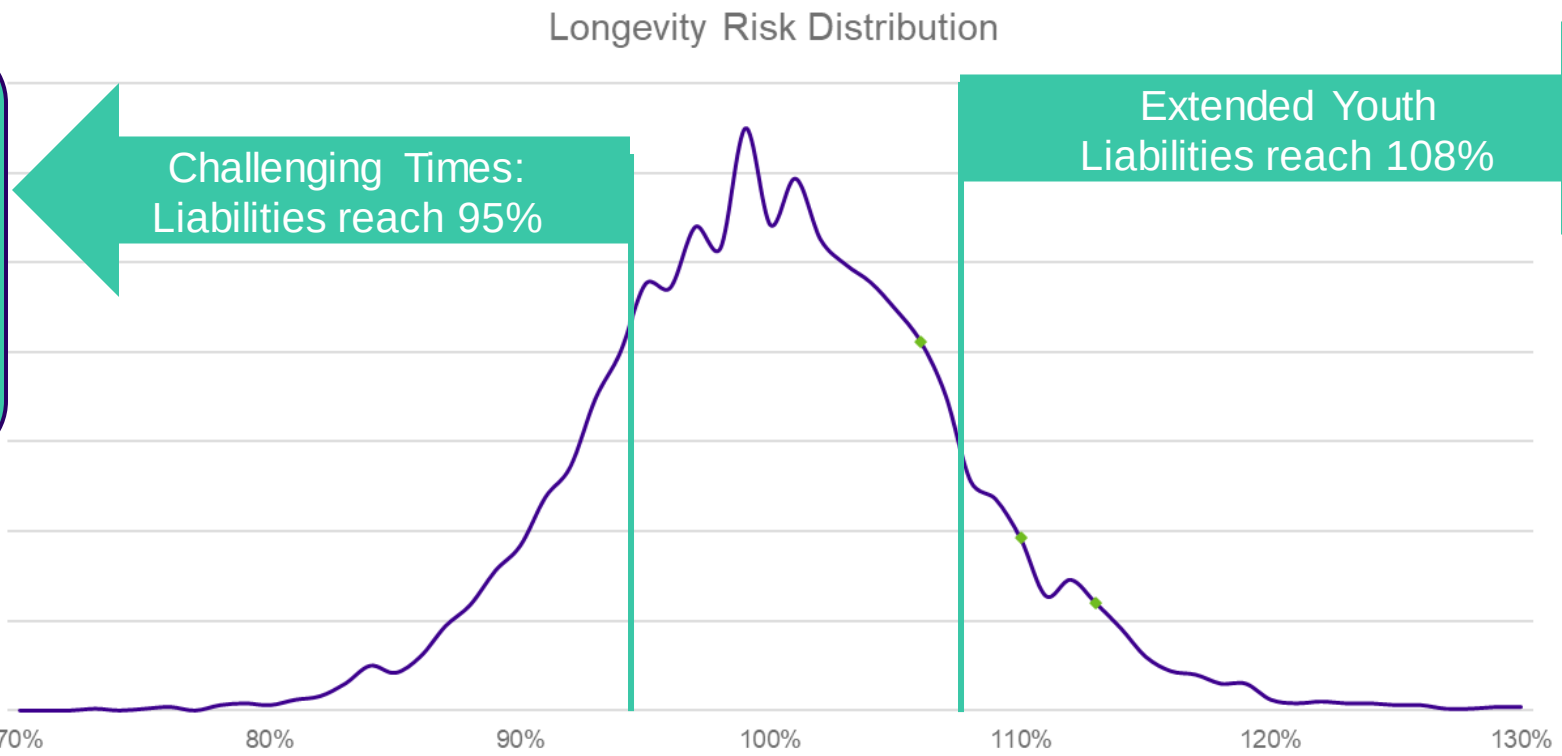
Relevant sensitivity will depend on objectives and risk appetite

Stress testing: scenario testing

What will happen to my liabilities if X happens?

Climate change scenario.

Fallout from resource constraints and extreme weather



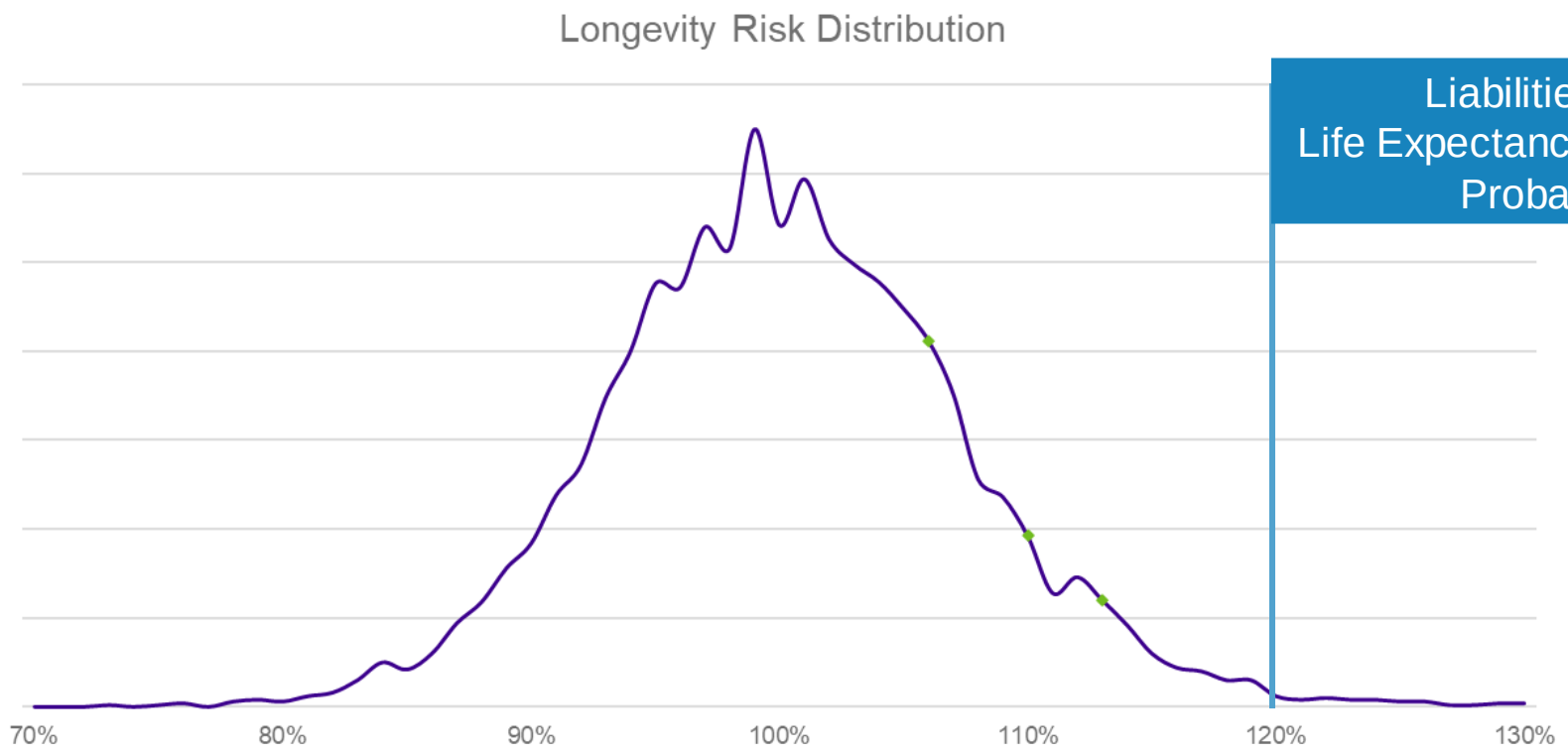
Recent slowdown in improvements turns out to be temporary.

Improvements return to levels seen in 00's

Relevant scenarios will depend on objectives and risk appetite
Often used as part of holistic scenario testing

Reverse stress testing: probability of ruin

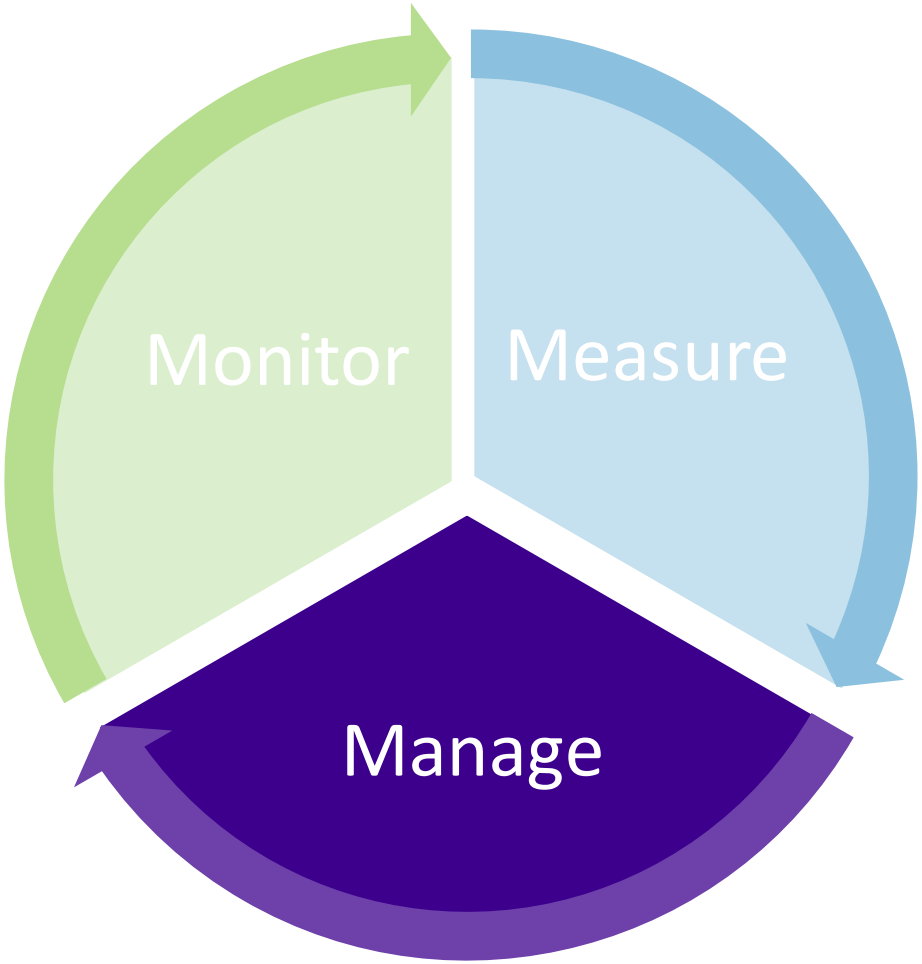
What would need to happen to cause my liabilities to increase to X?



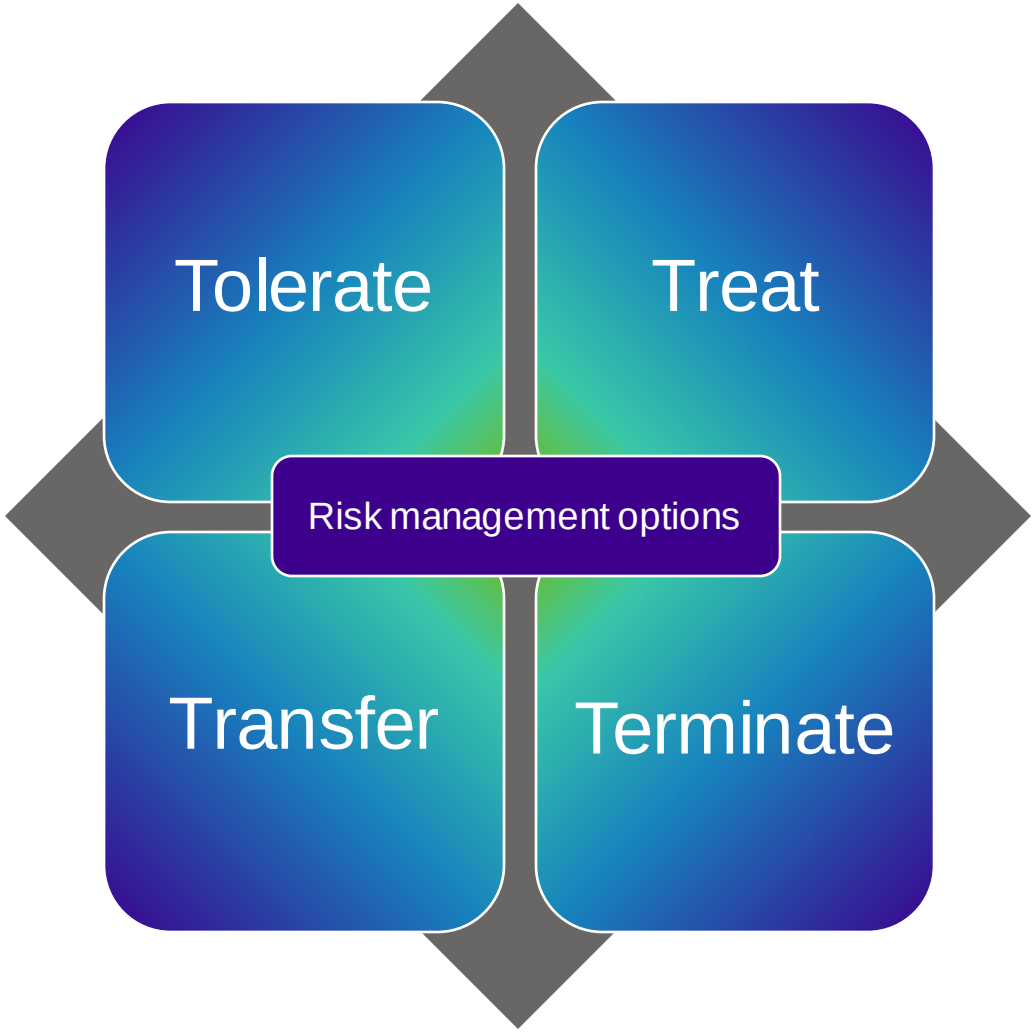
Liabilities reach 120% if
Life Expectancy increases by 5 years
Probability of c0.8%

Relevant timescale and level will depend on objectives and risk appetite

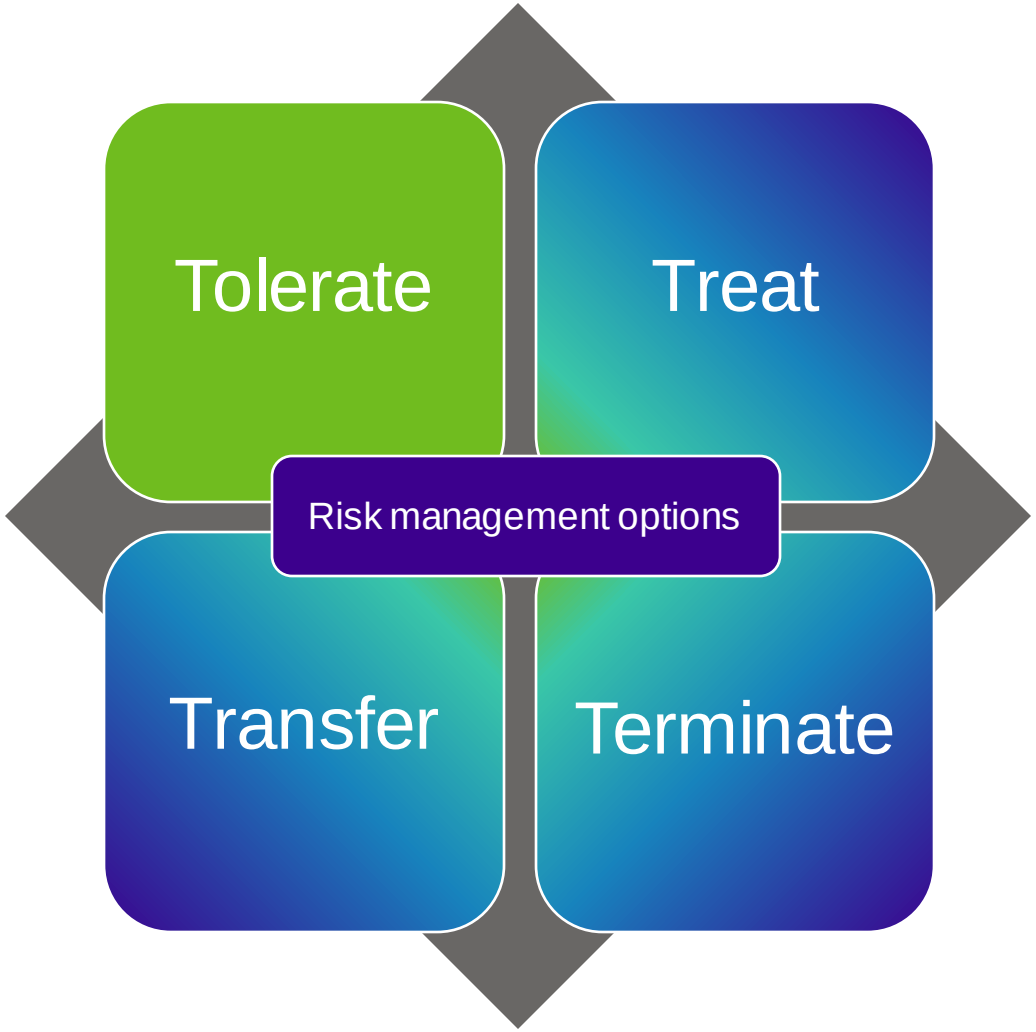
3. The four “T”s of managing longevity risk



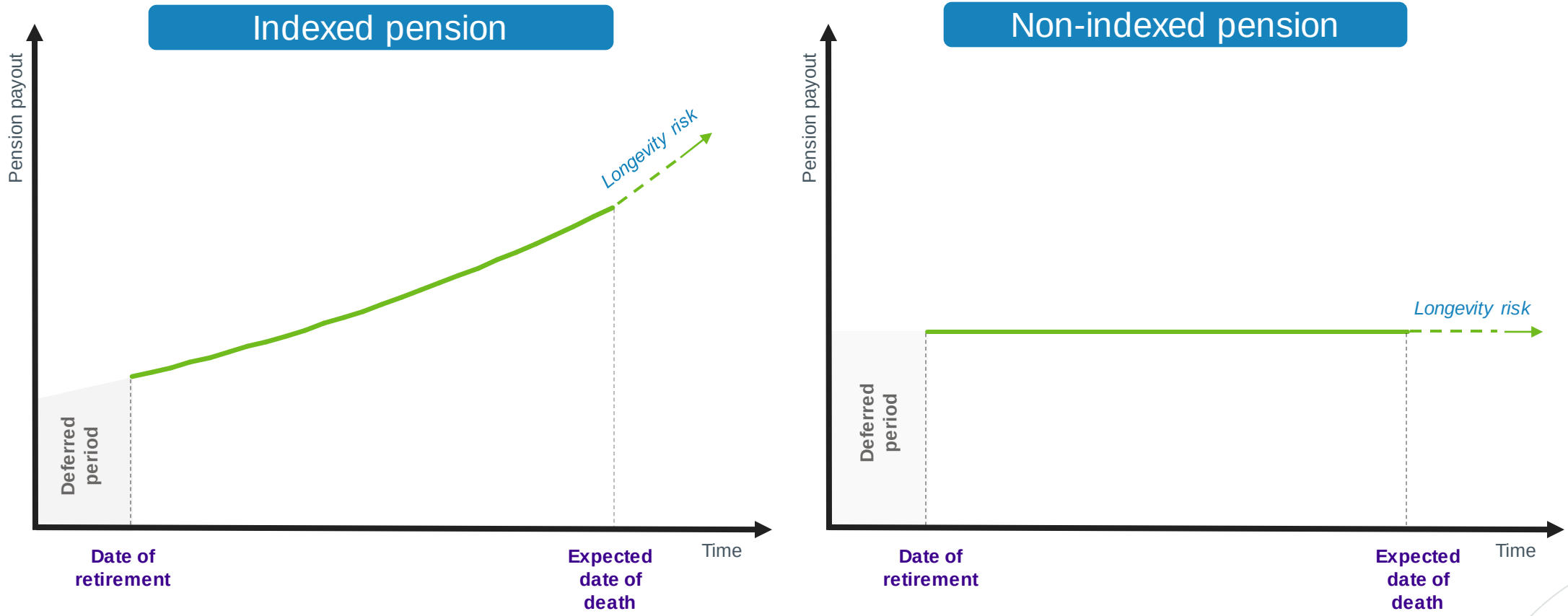
The four “T”s of risk management



Tolerate


Tolerate
Treat
Risk management options
Transfer
Terminate

Why is it important to manage the risk?



Pensioners may live longer than expected, increasing the total obligations of the plan sponsor

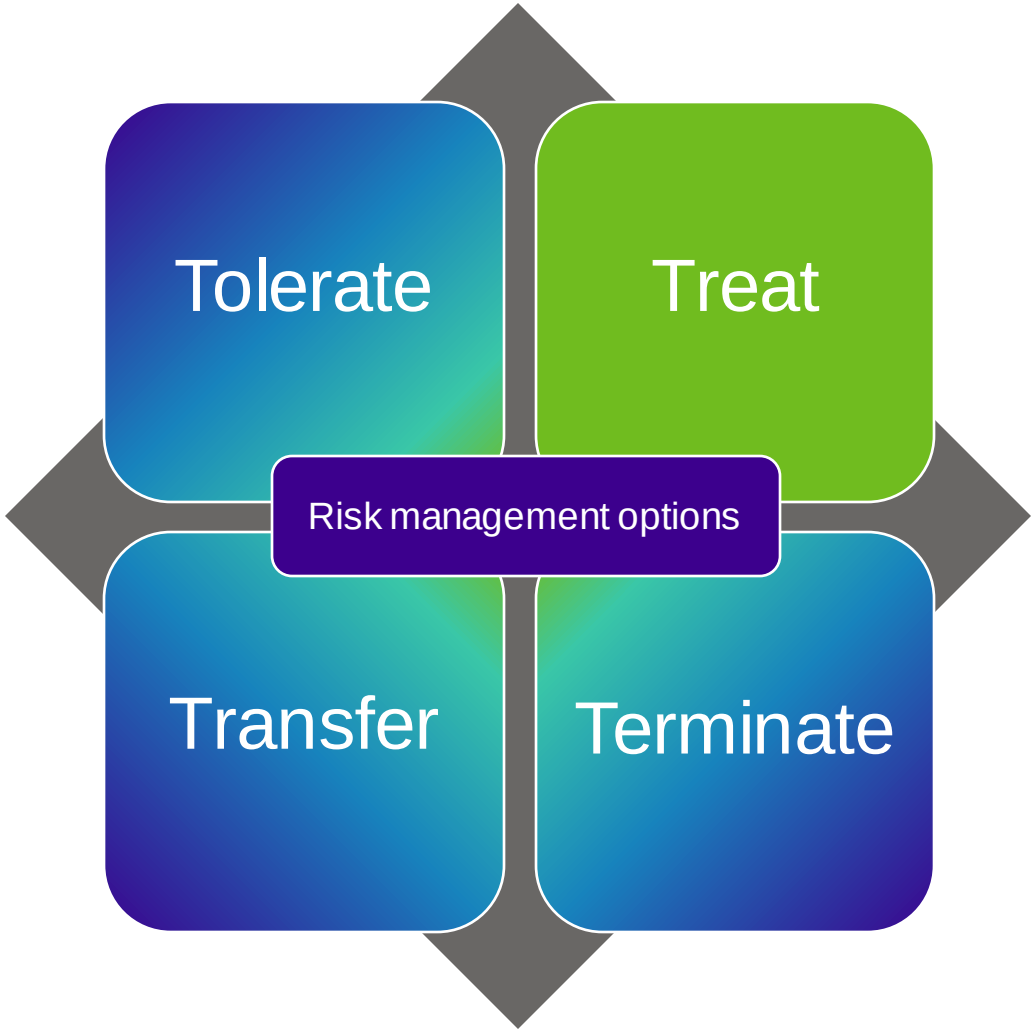
Key considerations in tolerating the risk

Assess the risk of maintaining the plan in the broader context of the business – ***opportunity costs*** ?

Analyse the **strength of sponsor** to and **willingness to contribute** when funding levels drops

Contingency planning for **extreme risk events**

Treat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Risk management options
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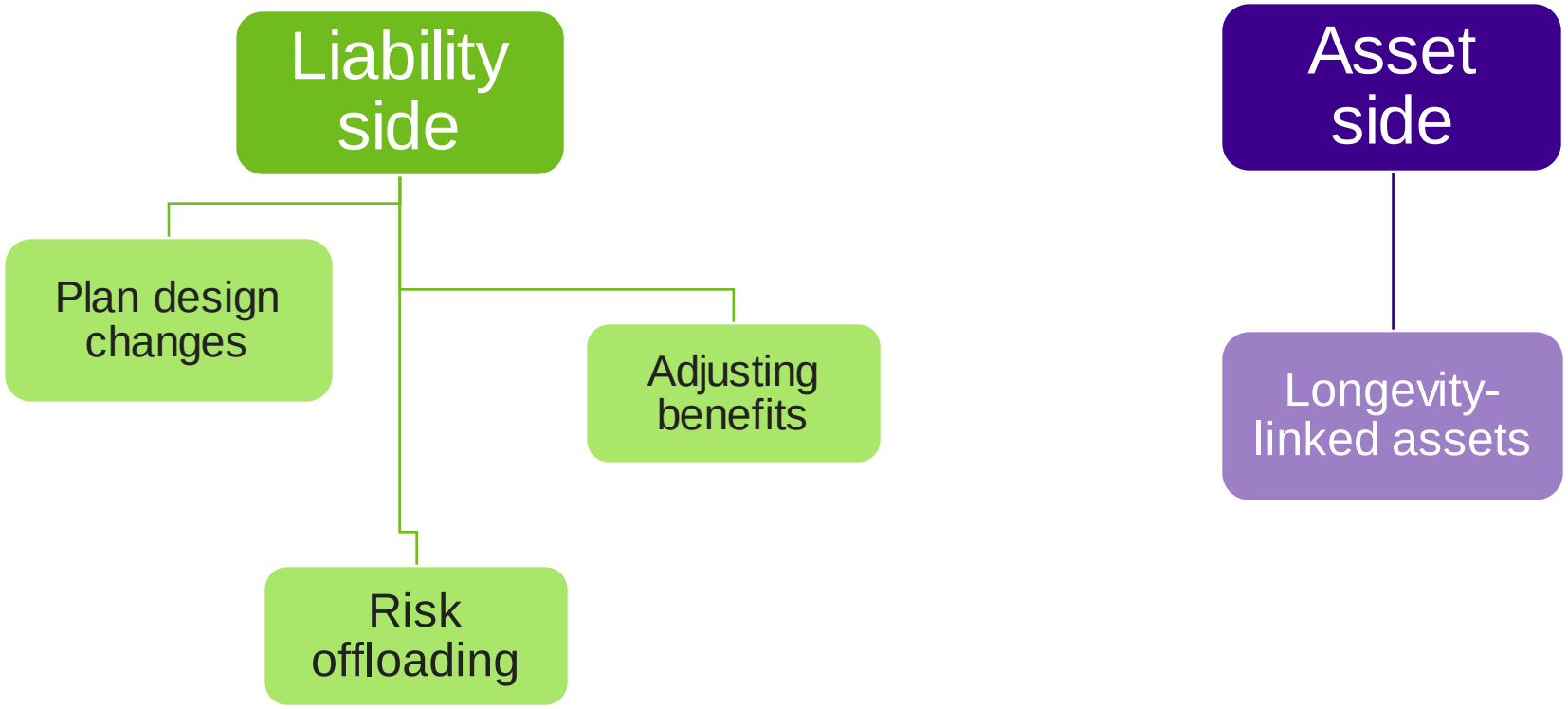
Terminate

Options for treating longevity risk…

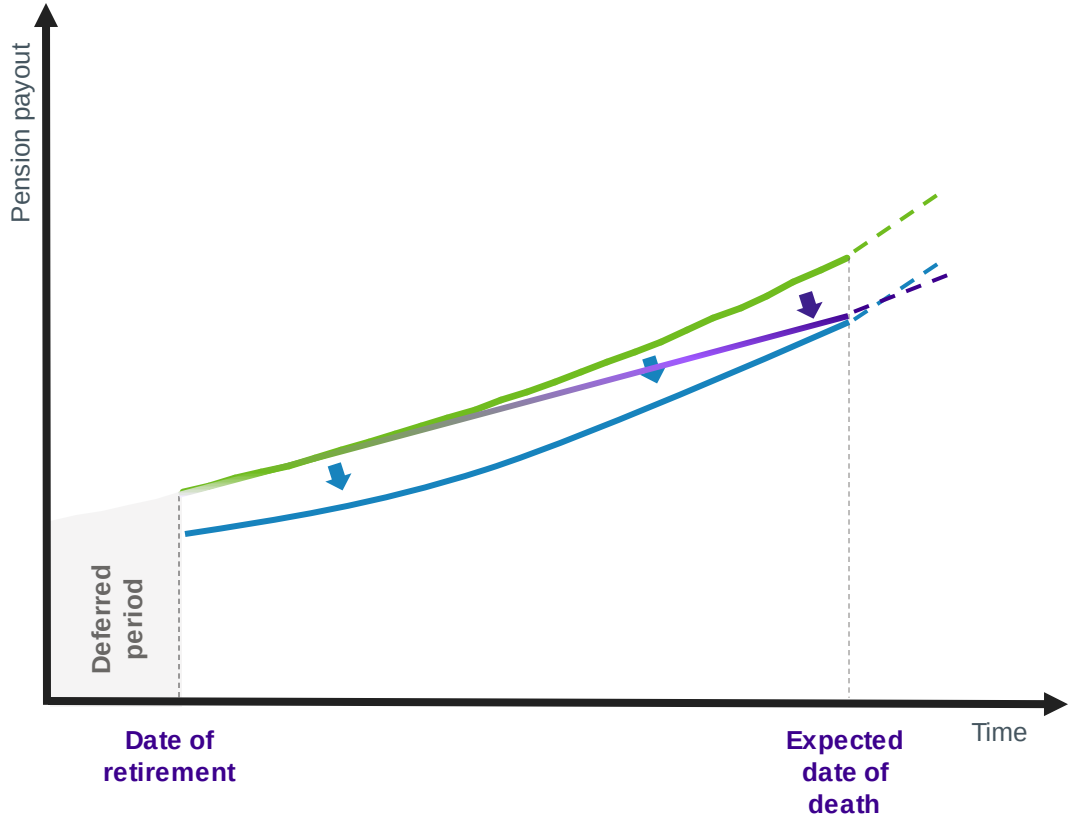


Plan design changes

Closing plan to new entrants

Ceasing accrual to future service

Modifying pension indexation



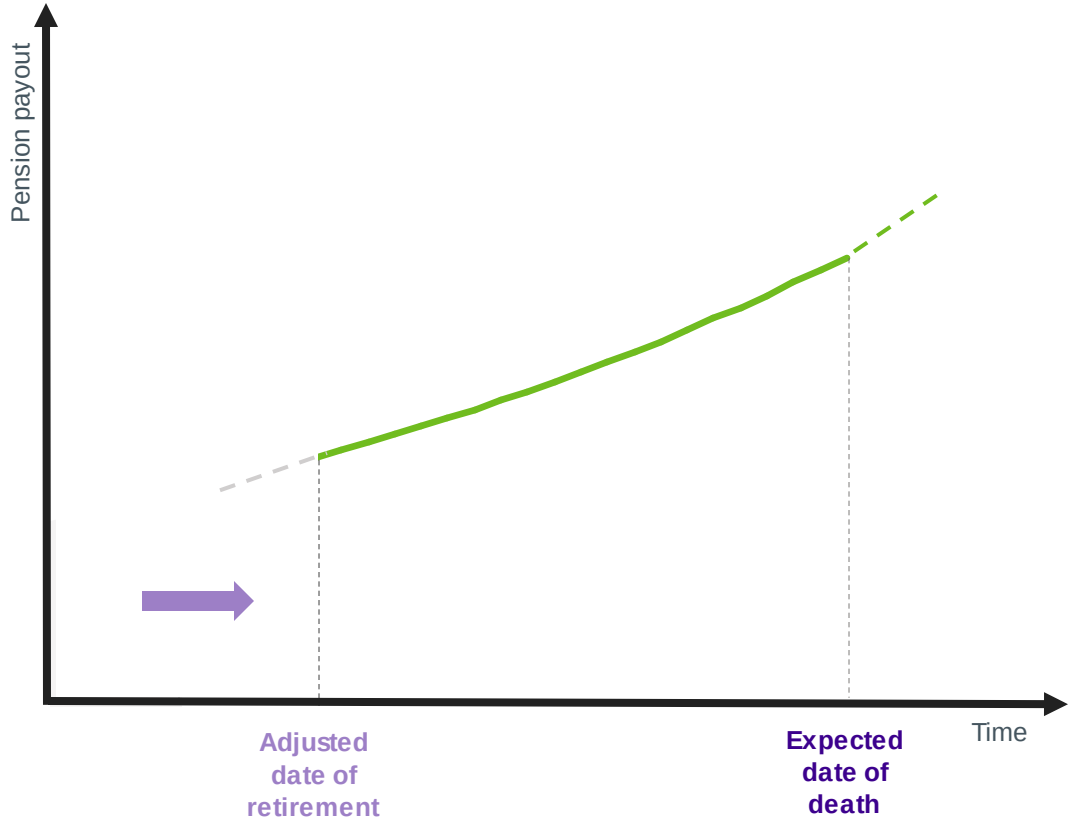
Plan design alterations

Closing plan to new entrants

Ceasing accrual to future service

Modifying pension indexation

Increasing retirement age



Options available to plan will be dependent on regulations and rules of the pension plan

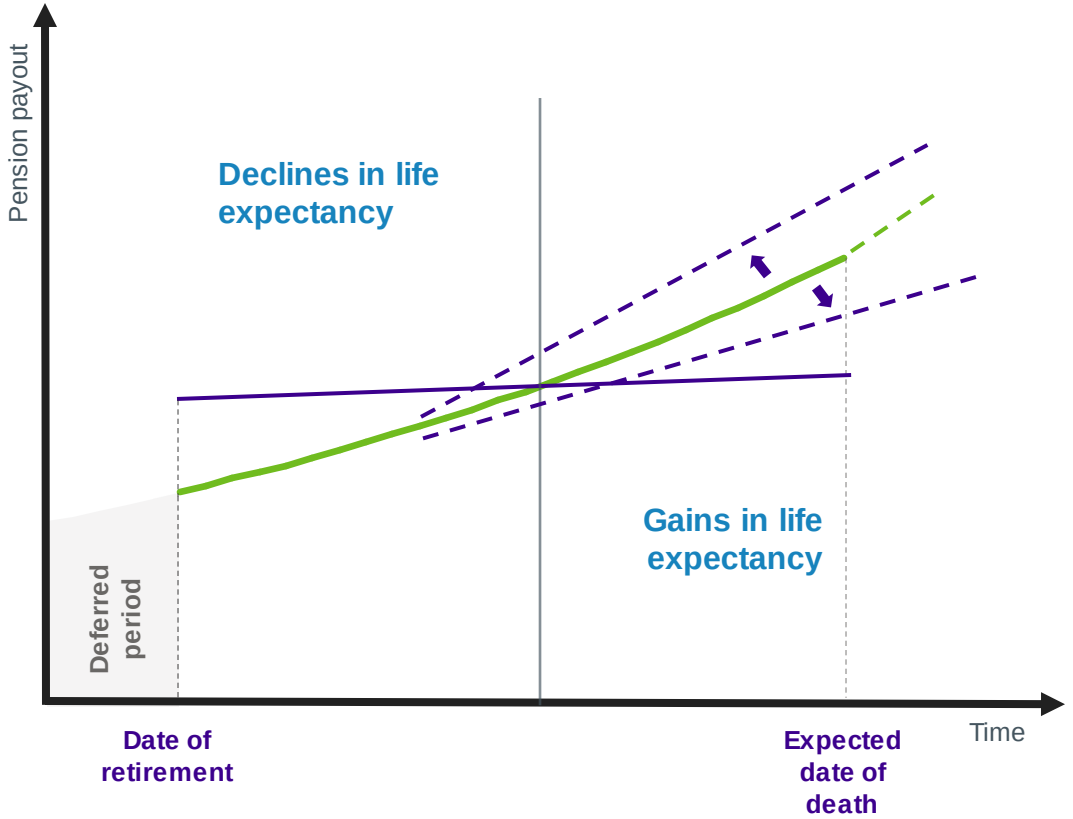
Adjusting size of future pension payments

Pension increase exchange (PIE)

- Reduces exposure to future longevity risk by offering pensioners the opportunity to exchange non-statutory future pension increases for one time uplift in their current pension
- Reduces **longevity** risk and **inflation** risk

Automatic indexation linked to life expectancy

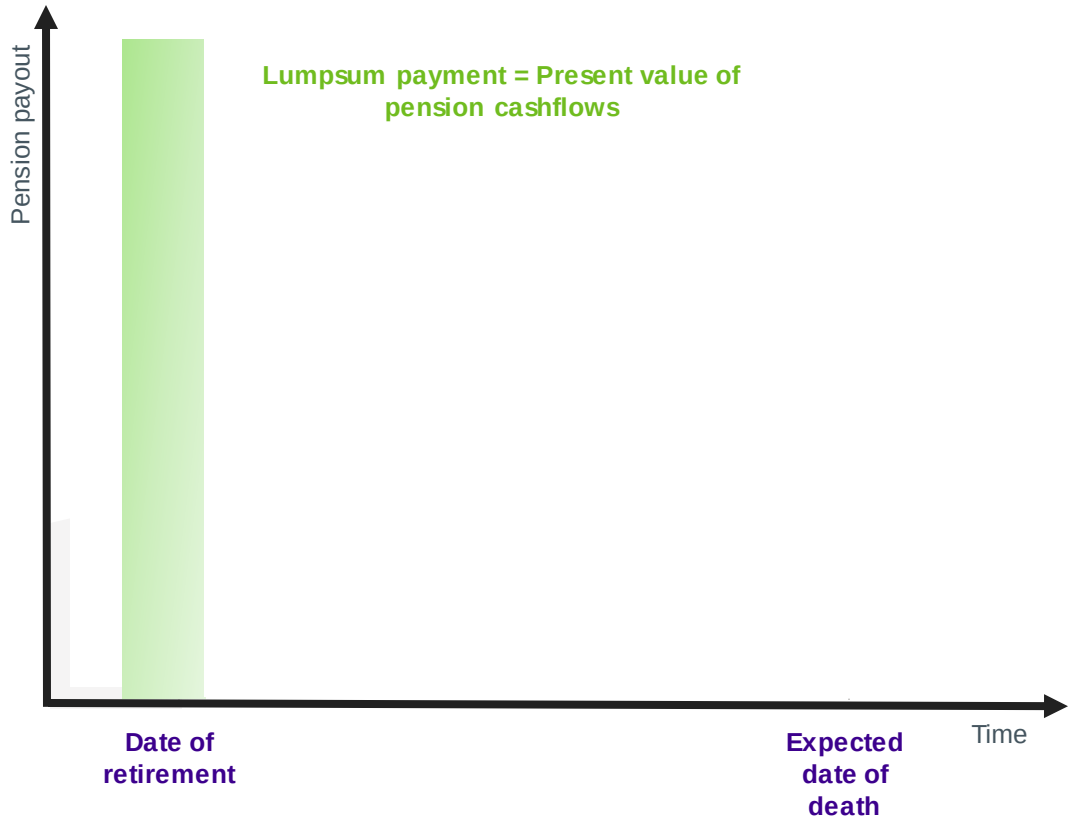
- Adjusting pension payments by factor which reflects changes in life expectancy
- Shares **longevity** risk with pensioner



Options for offloading risk - Lumpsums

Lumpsum windows/at retirement

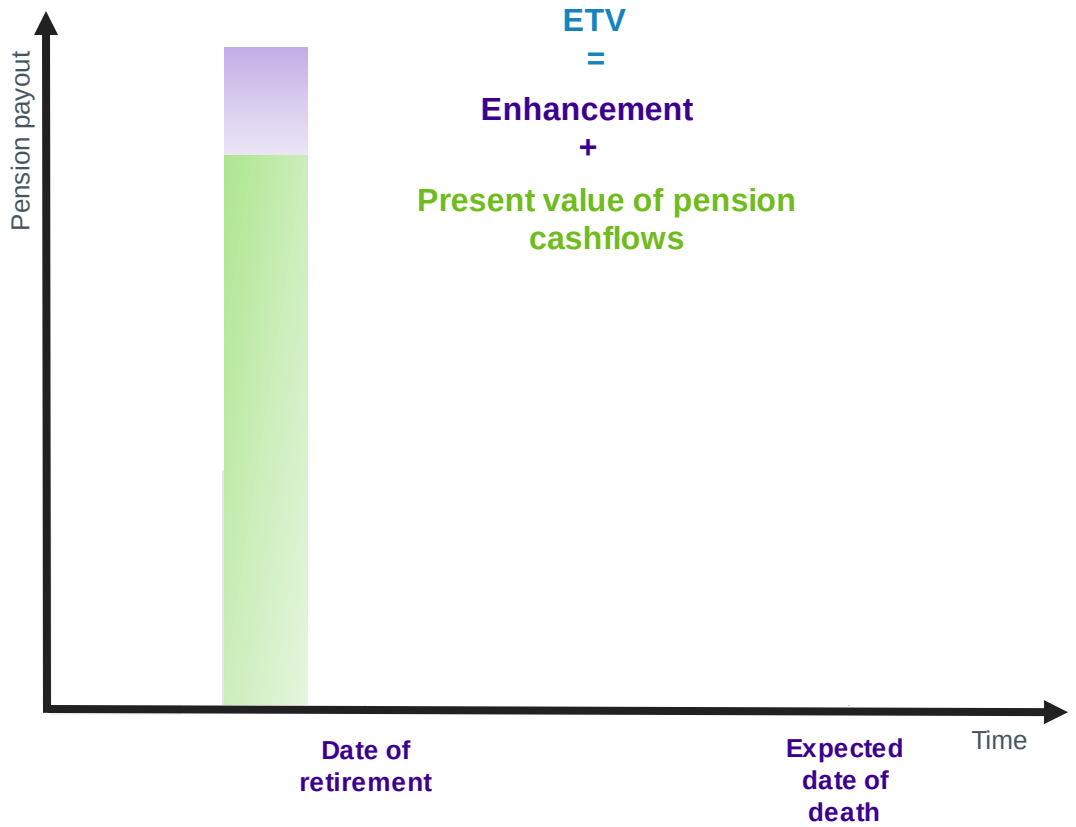
- Payment to pensioner equalling the discounted value of future cashflows
- May be offered at retirement or over a period prior to retirement
- Transfers **longevity** risk to the individual
- Plan members have the **option** to not take a lumpsum



Options for offloading risk - ETVs

Enhanced transfer value (ETV) exercise

- One-off opportunity to transfer the value of the pension to another financial institution
- Commonly offered to deferred pensioners
- Offers incentive ("**enhancement**") for transferring **longevity** risk
- Plan members have the **option** to not take ETV



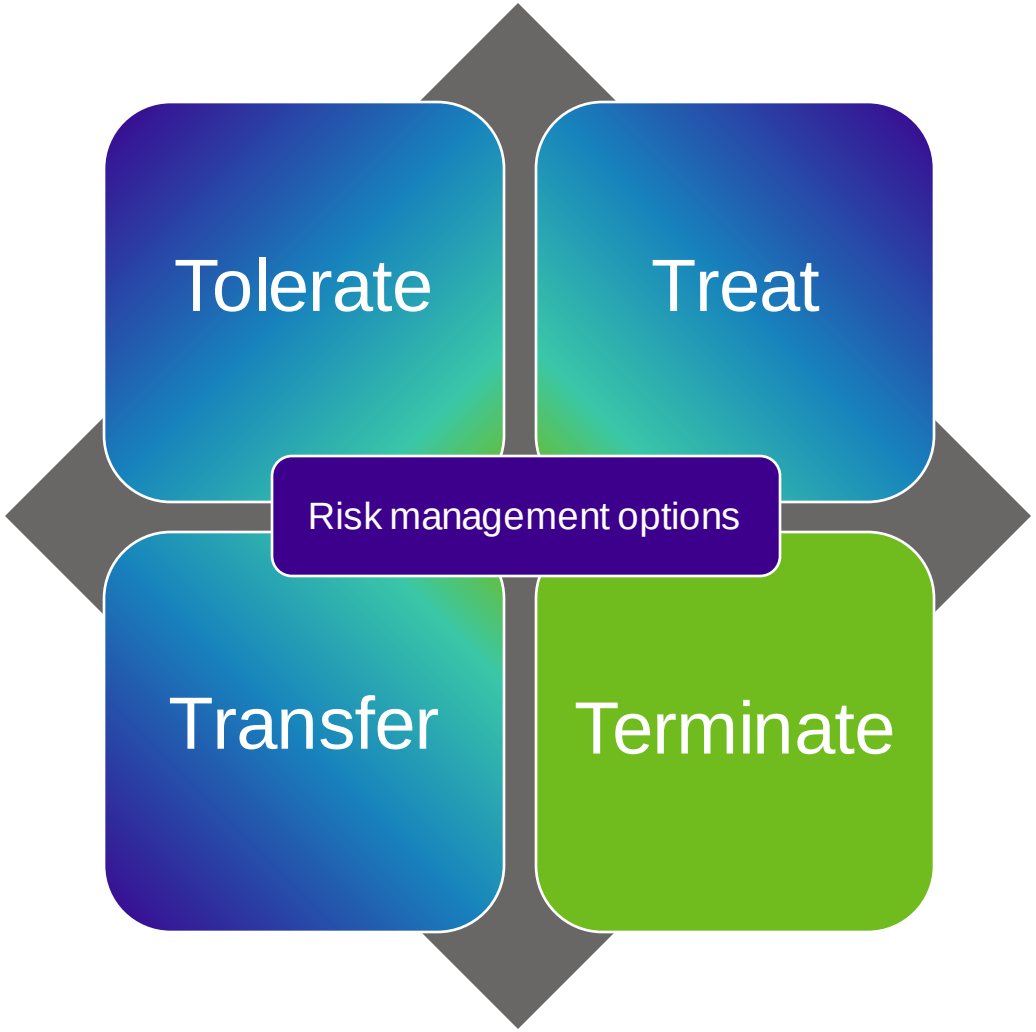
Longevity-linked assets

Mitigating exposure to longevity risk by investing in assets which offers upside returns from people living longer

Pharmaceutical or biotechnology companies

Social housing for elderly & care homes

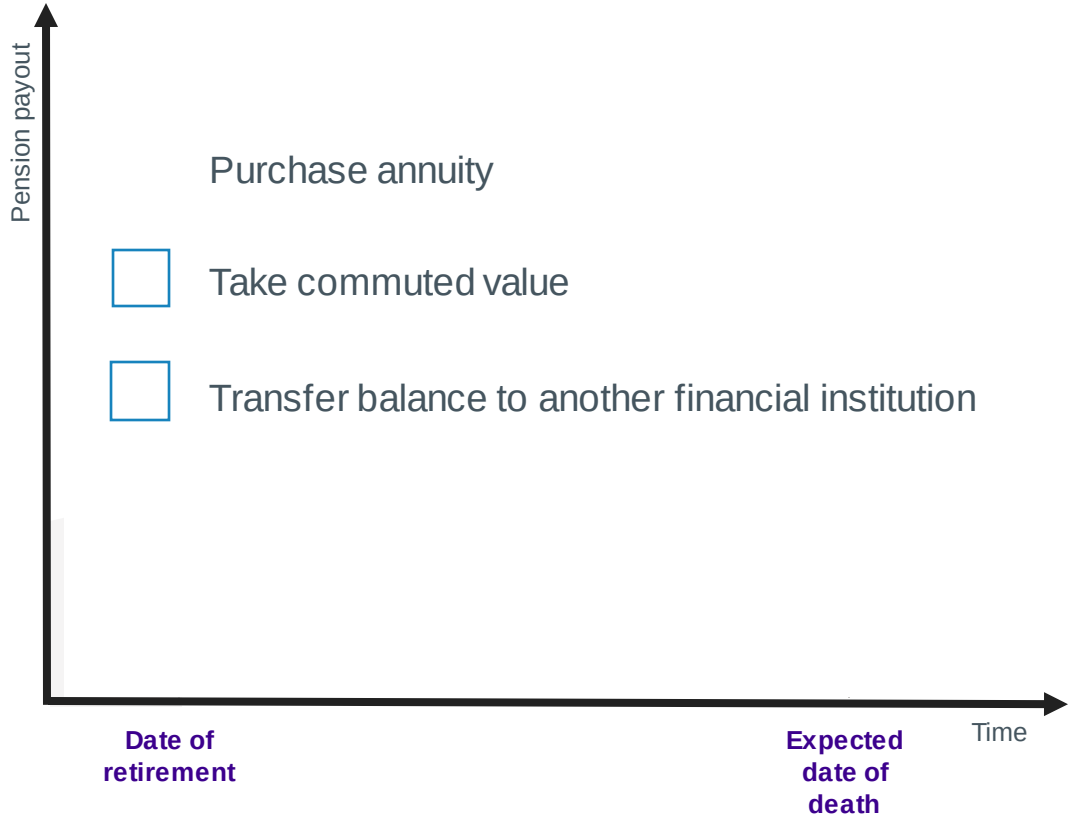
Terminate


Tolerate
Treat
Risk management options
Transfer
Terminate

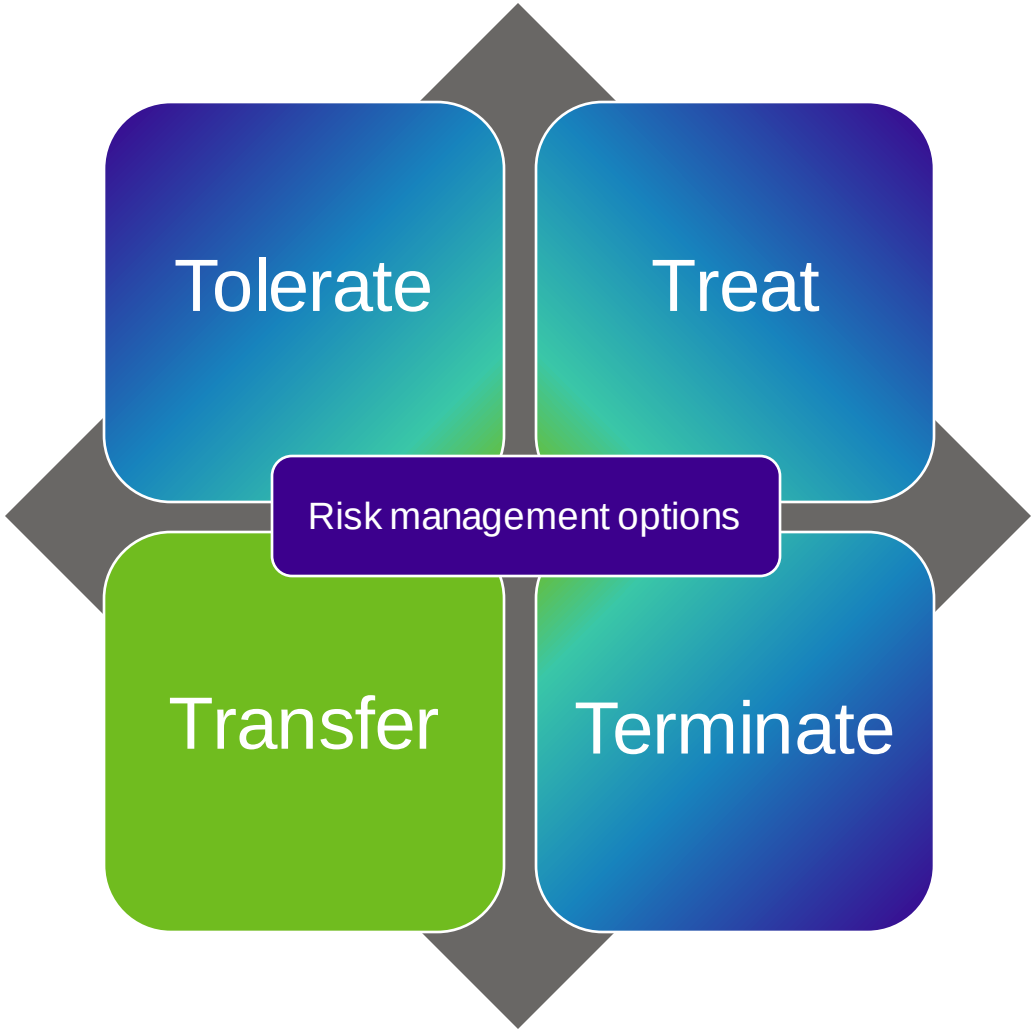
Terminating the pension plan

Plan termination or wind-up

- Involves settling the plan's obligations and distributing the plan's assets
- Plan members are provided with various *options* for receiving their benefits
- Requires the plan to be fully-funded
- Completely eliminates **longevity** risk



Transfer


Tolerate
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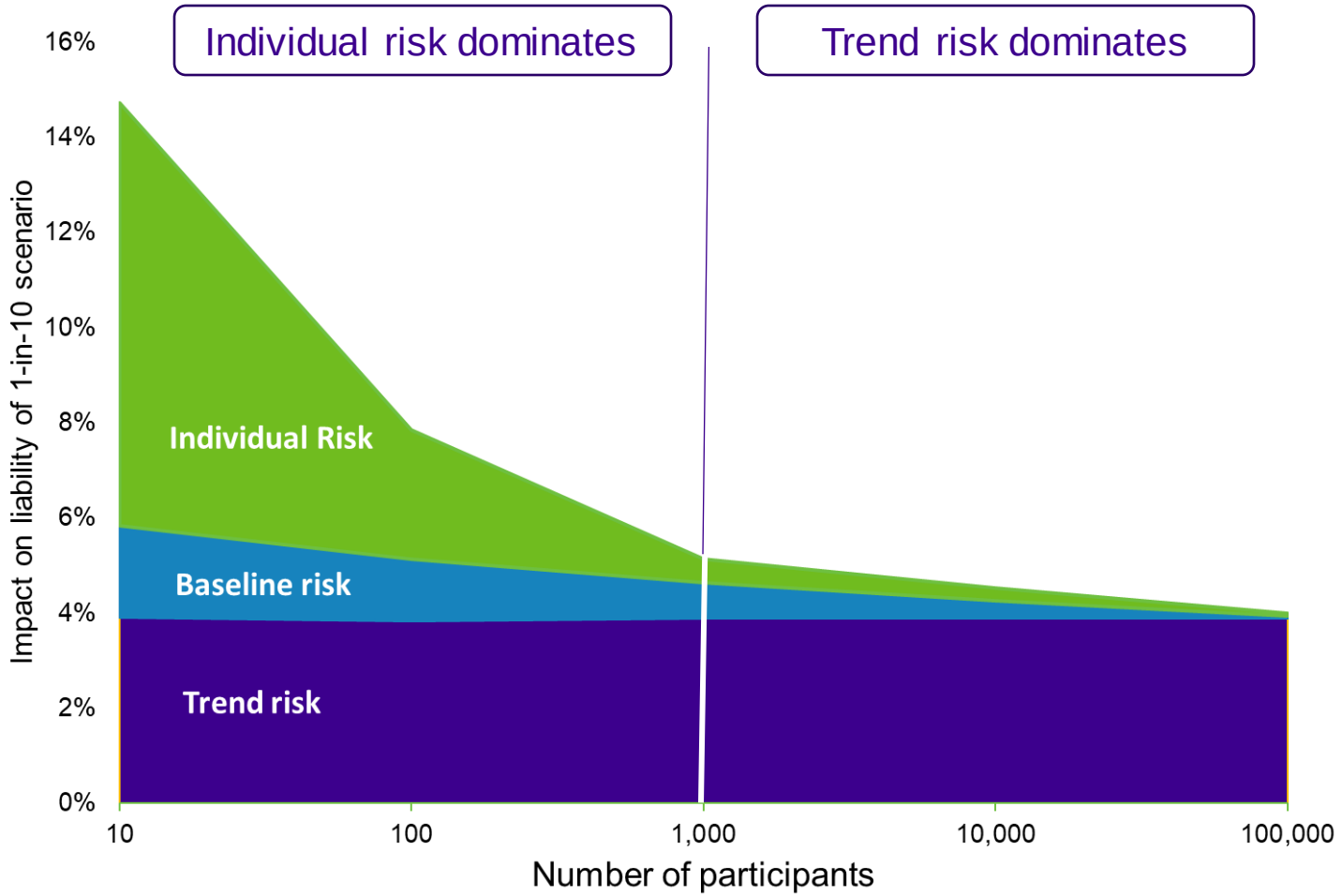
What longevity risk do you care about?...



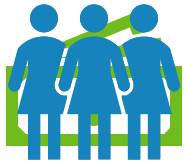
..and do you want to cover everyone?


- Concentration of risk concerns[1]
- Segmentation often focusses on highest liabilities
- **"Top" slicing**


- PBGC levies contain significant fixed levy component[2]
- Segmentation often focusses on lowest pensions
- **"Bottom" slicing**

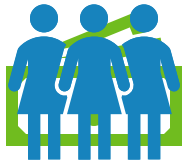

- Limits exist on protections on insurer solvency[3]
- Segmentation often focusses on quota sharing pensions
- **"Thin" slicing**

1. Typically 50% of a pension scheme's liabilities are concentrated in around 10-15% of the membership
2. The PBGC levy has a fixed and variable component. The fixed component is set at $88 for single-employer plans (2022 rate, see here)
3. Lifetime annuities are protected by Assuris (www.assuris.ca) upon insolvency of a life company. Protection is up to C$2,000 pm or 85% of the benefit amount, whichever is higher. (C$2,0000 monthly limit only applies to buy-outs)



Longevity and investment risk?

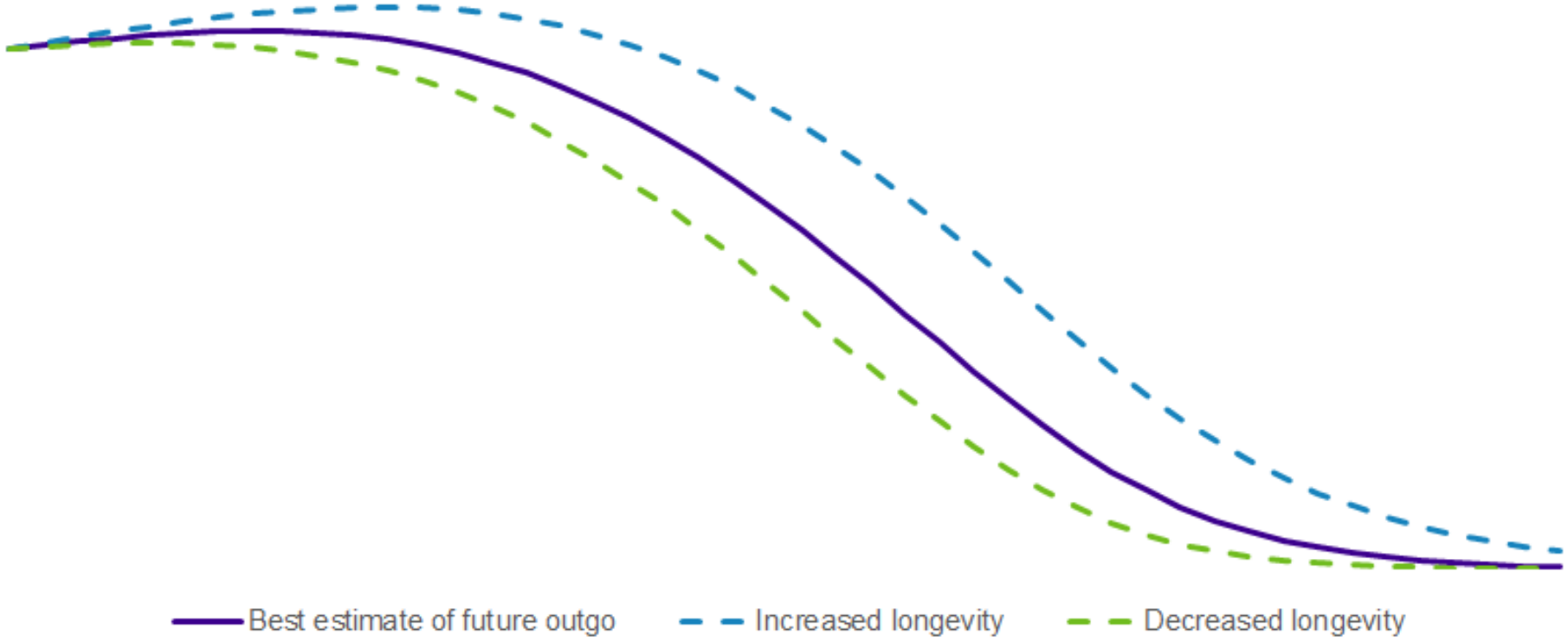
Just longevity risk?



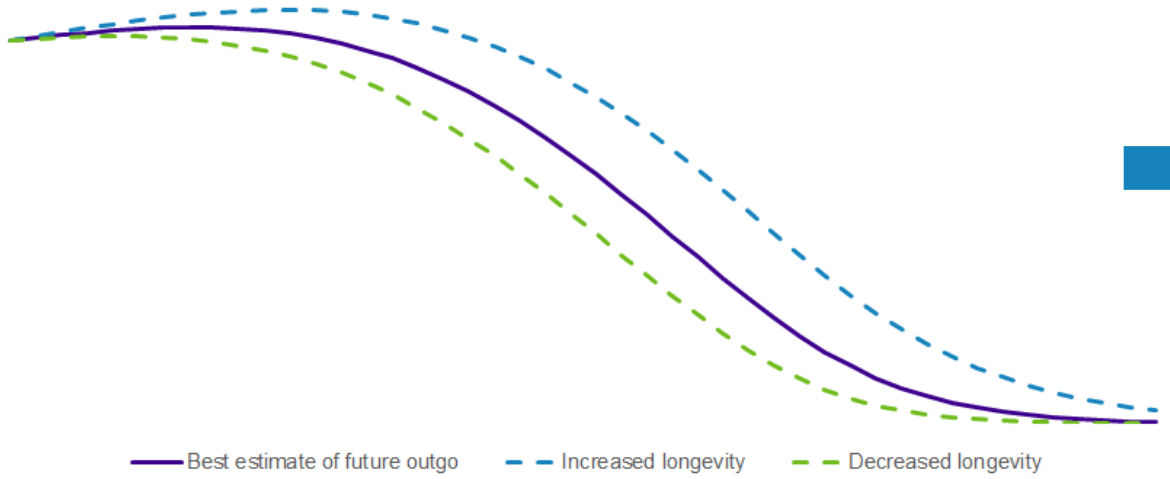
Annuities
Buy-in / Buy-out

Longevity swaps
Longevity bonds

Exchanging uncertain cashflows for certainty



Annuities



Risk cedant

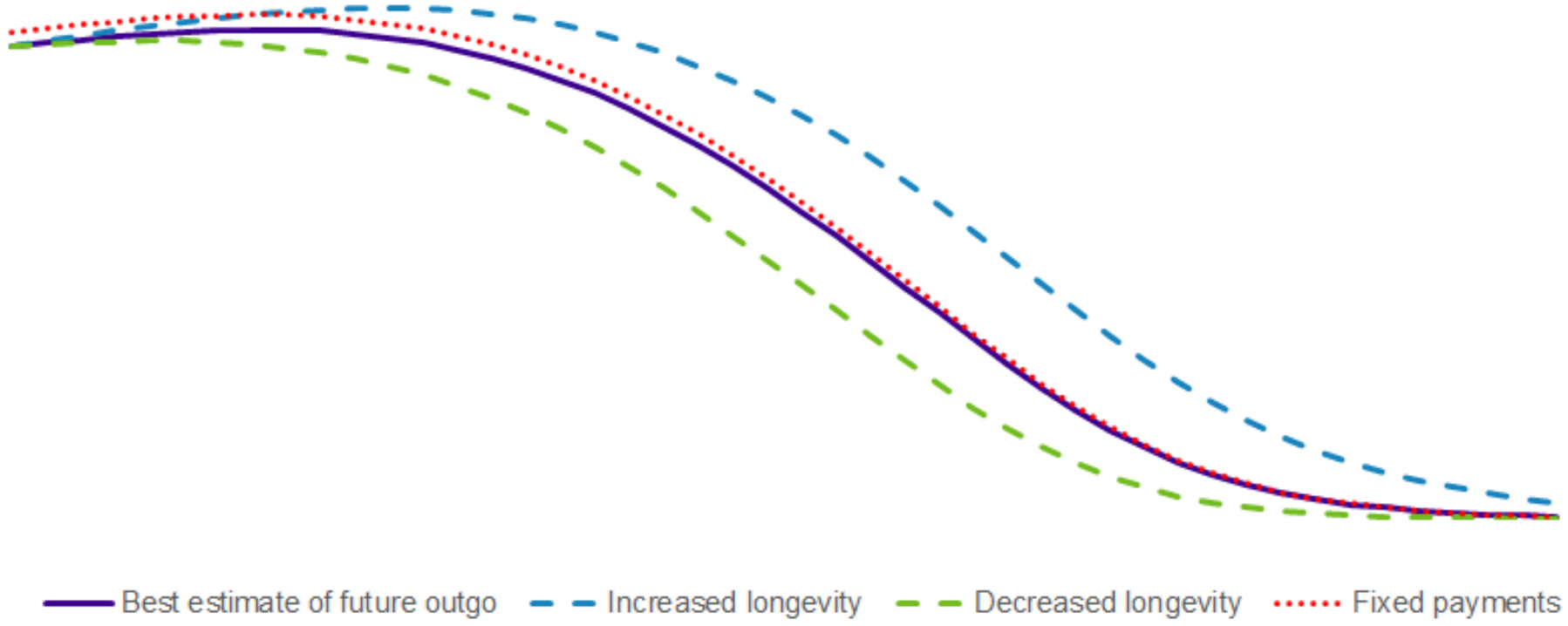
- Cash payment to insurer
- Broadly present value of expected outgo…
- …plus a profit loading

Provider

- Provides *exactly* the future outgo…
- ..*whatever* path it follows
- Either direct to pension plan participant (buy-out) or via the pension plan (buy-in)

Full transer of risk; large upfront payment; lose control of assets

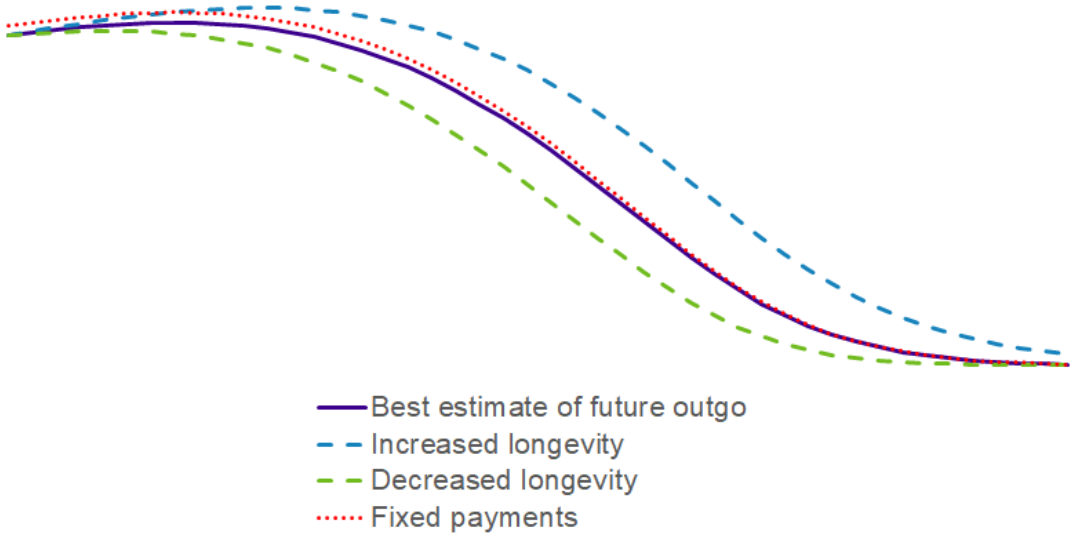
Exchange *pure* longevity risk



Longevity swaps exchange the uncertain outgo for fixed payments

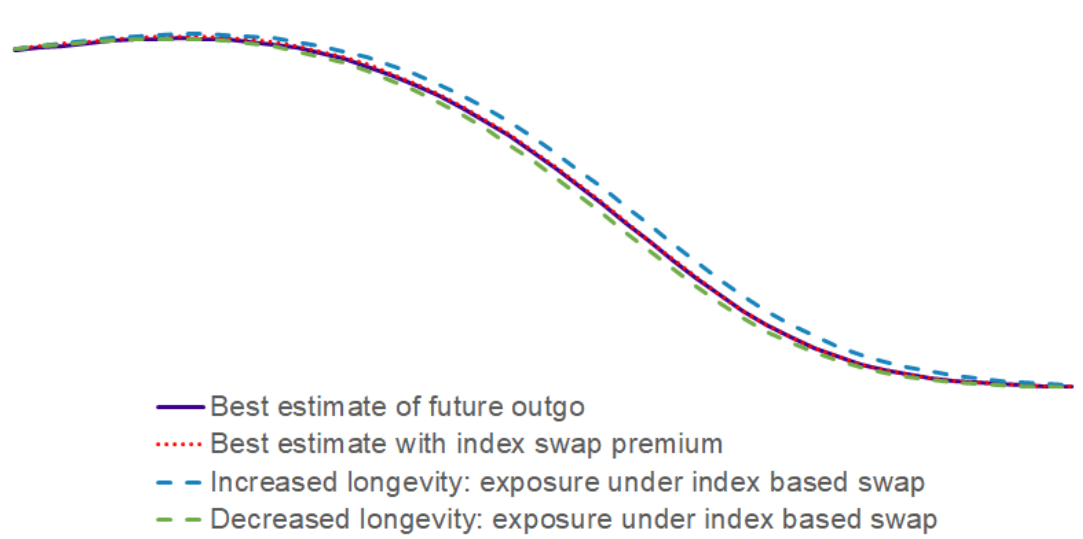
Indemnity or Index based swaps?

Indemnity



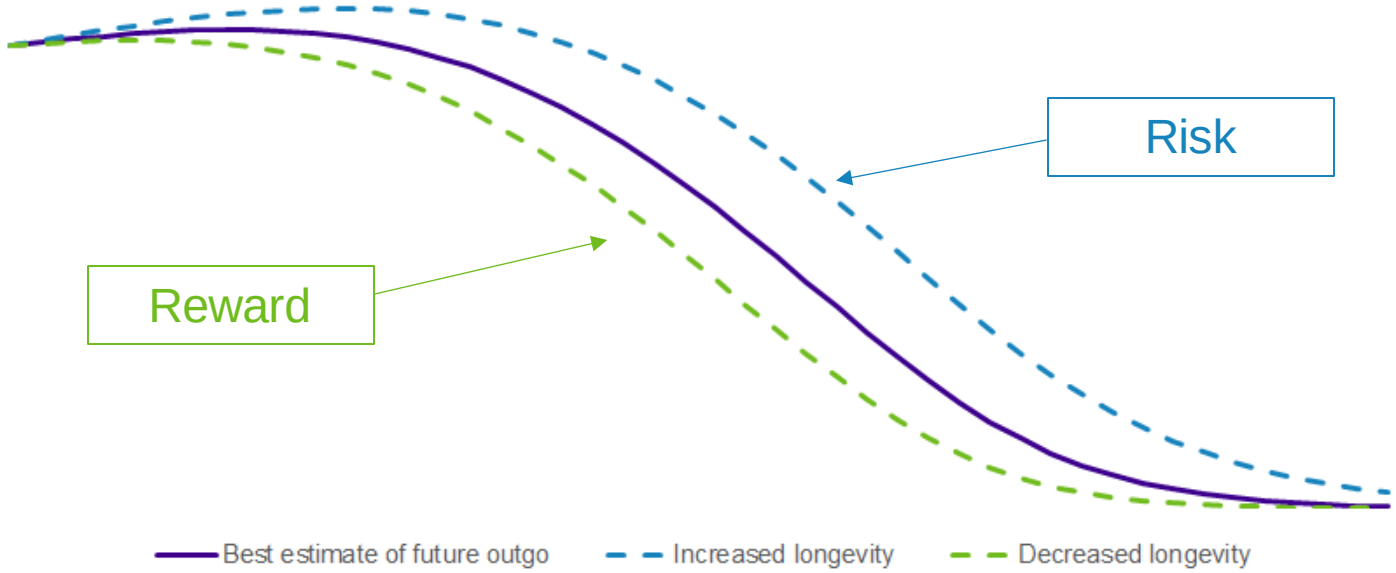
- Covers all sources of risk: **individual**, **baseline** and **trends**
- More specialist pricing
- Considerable execution and administration costs

Index



- Focusses on largest risk: **trends**
- Based on a published index as a ***proxy*** to trends
- Leaves residual risks: **individual**, **baseline** and ***basis***
- Cheaper and simpler to execute / administer

Retaining the financial “upside”



“Out of the money” swaps

- Pays out if longevity increases **above** a pre-determined level…
- …up to a maximum level
- Retain risk of modest increases, and the excess in an extreme event

Longevity bonds

- Bond issuance
- Pays interest rate
- Capital of investors at risk if longevity exceeds a pre-determined level…
- ..exhausted in extreme longevity events

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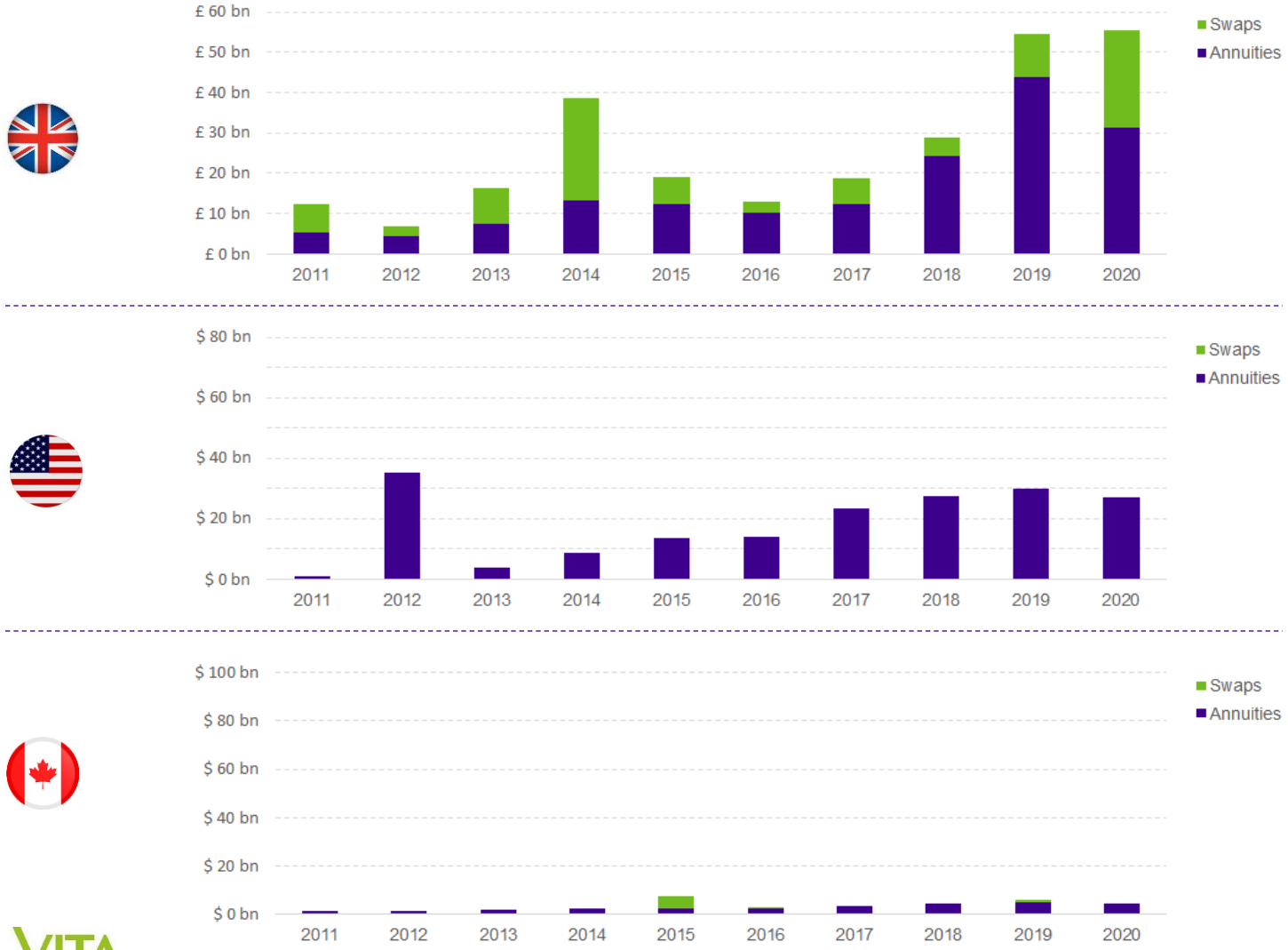
Growth of longevity risk transfer market



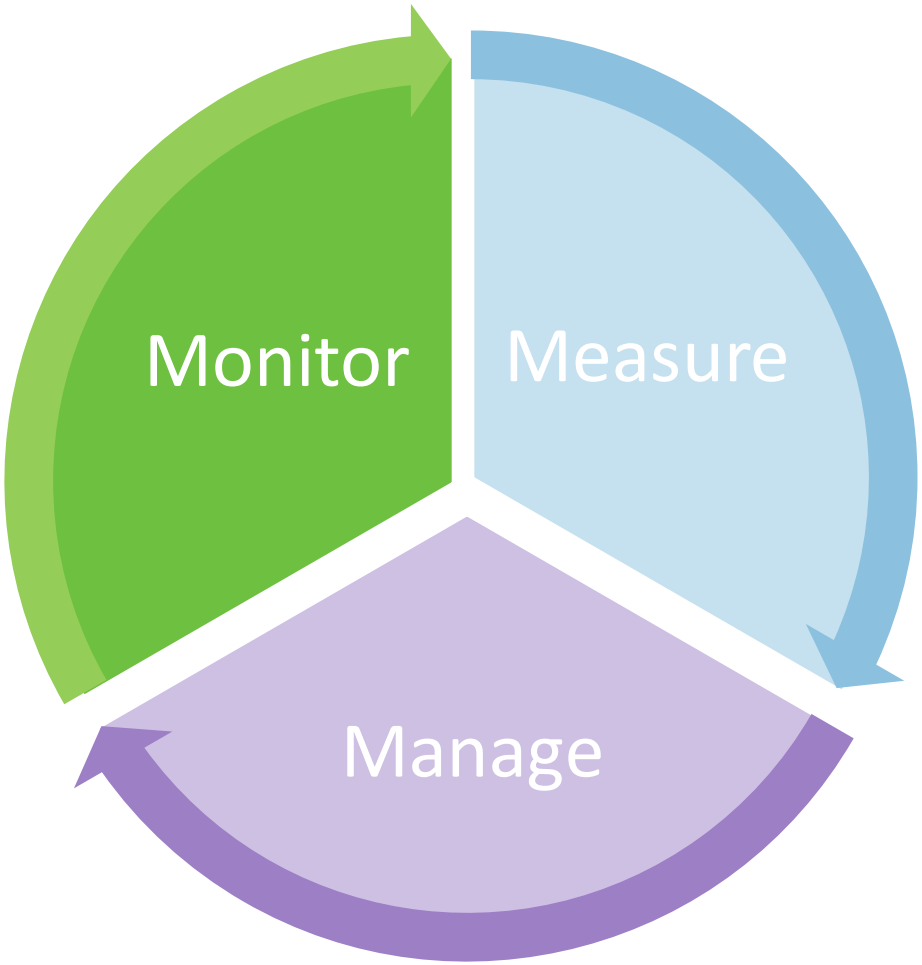
Emerging themes?

- Constraints of existing providers
  - Capital
  - Human resources
- Rise of new entrants
- Growing appetite to warehouse and transform risk
- New needs
  - Deferred "buy-out" protection
- Cost vs benefit

Notes to charts:

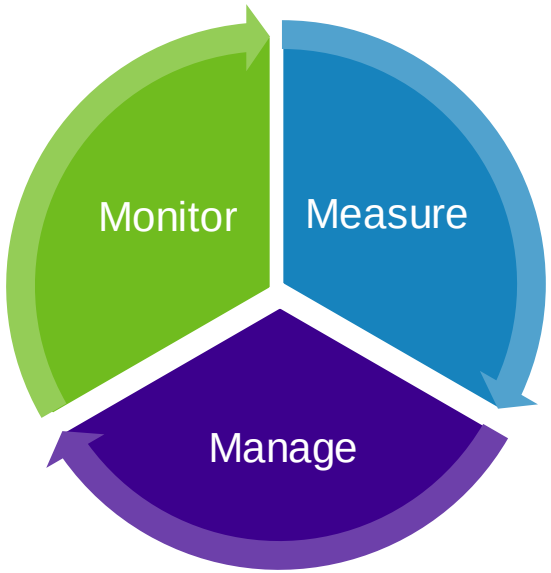
- Source of data on historical deal volumes: Hymans Robertson Risk Transfer Report (UK); Aon Pension Risk Transfer Annuity Settlement Market Update (US). Eckler Pension Risk Transfer Report (Canada);
- Charts scaled to be broadly comparable in $ terms.
- Only deals involving pension plans include – insurer back book deals excluded.

4. Monitoring emerging information

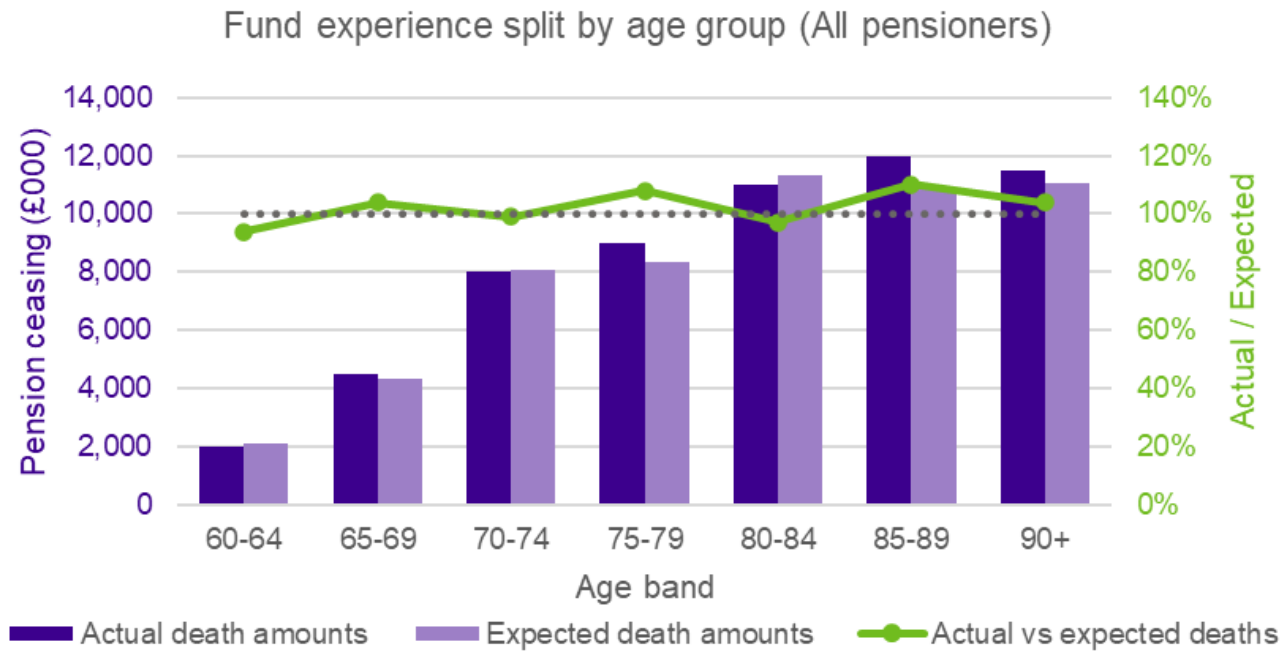


Monitoring longevity risk

- Regular monitoring feeds back into the control cycle
- Re-measurement of risk:
  - Revise best estimate assumption
  - Re-assess variation
- Review risk management decisions:
  - Changes to risk profile
  - Increased/decreased risk appetite
  - Changes to market place

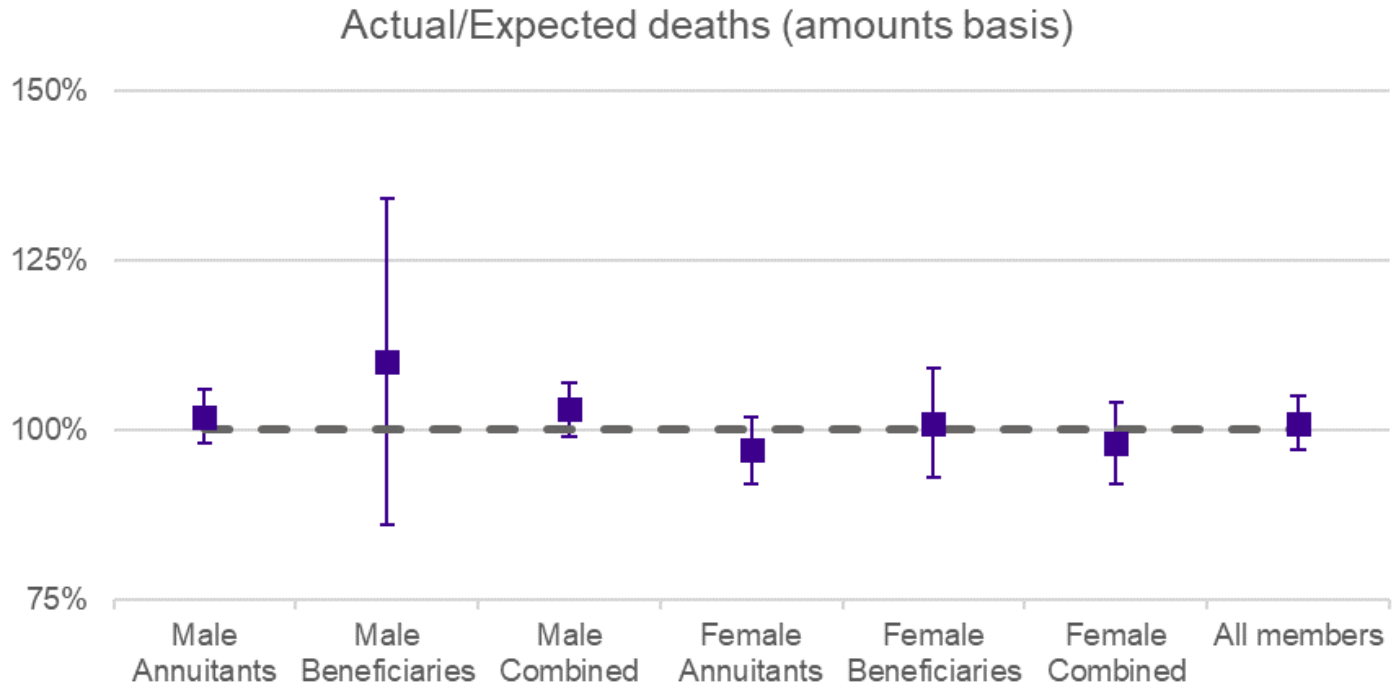


Monitoring experience



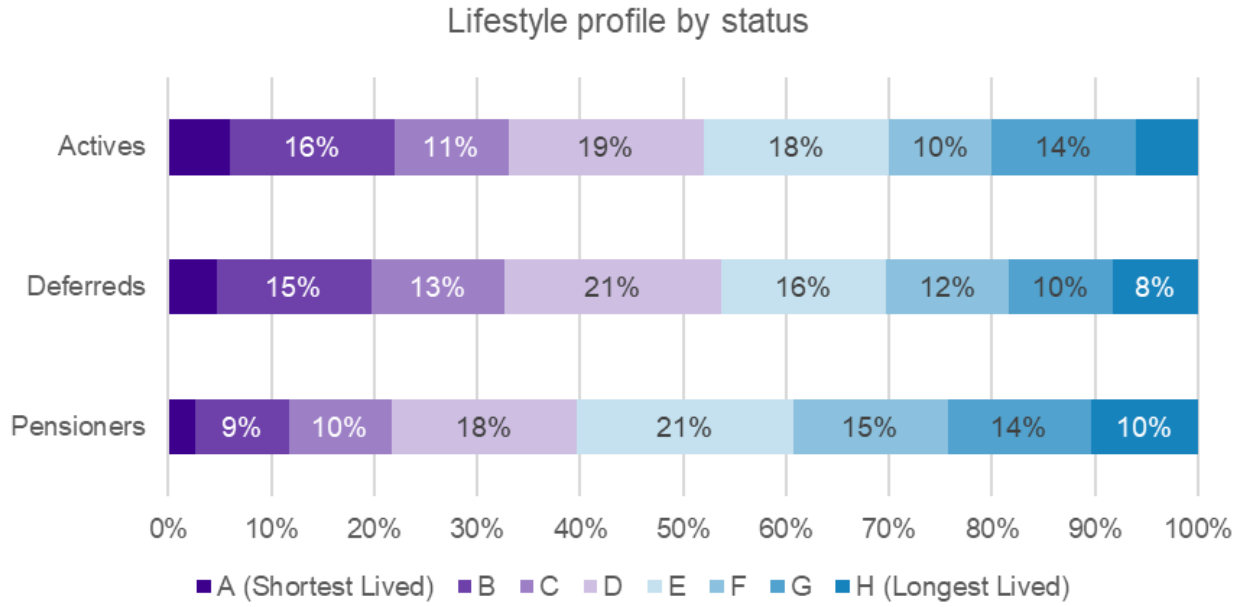
- Compare ratio of actual deaths (A) to expected deaths (E)
- If A/E is above (below) 100%, then more (fewer) deaths than expected and liabilities will reduce (increase)
- Impact depends on ages and affluence of deaths – bigger impact for higher pensions and lower ages

A/E analysis – exploring results



- Consider different splits of analysis (e.g. by year, affluence, lifestyle groups etc)
- Confidence intervals illustrate credibility of results
  - Less data results in wider intervals

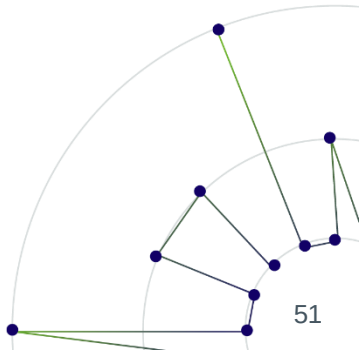
Longevity characteristics



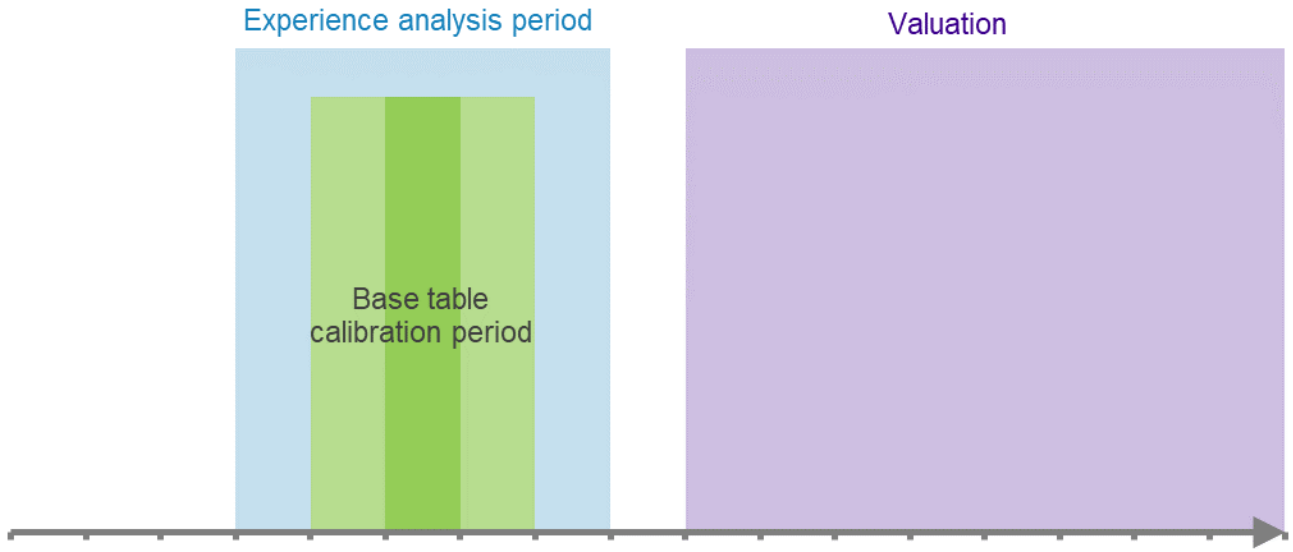
- Individual characteristics drive expected mortality and so scheme liabilities (see Longevity 101)
- Important to monitor changes in characteristics over time
- Reflect emerging changes in base tables and/or future improvements

Reflecting experience

- Use emerging experience to adjust mortality assumptions
- Update base table to reflect latest available data
- Applying adjustments to reflect plan experience
  - E.g. scaling factors
- More credible data available, greater weight given to experience

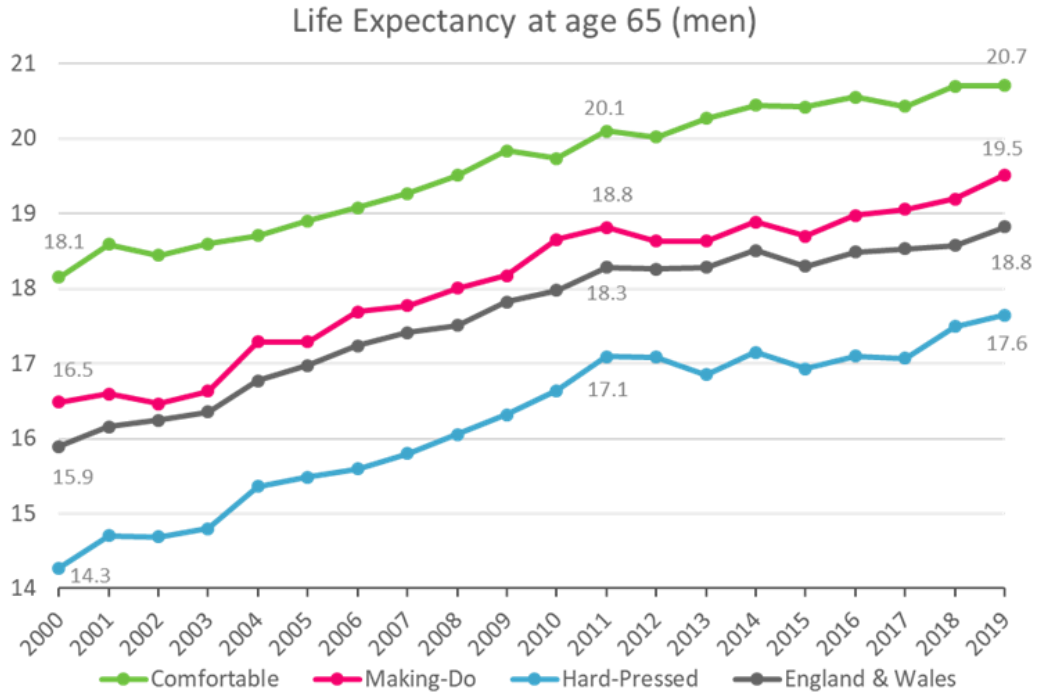


Baseline update



- Important that baseline mortality is relatively recent
- The further back the *base year*, the more reliance on *future* improvement assumption to adjust to *current* time period
- By regularly updating baseline, get early insight into emerging trends, rather than getting periodic shocks at valuations
- Ideally base year would be within the time period used in the experience analysis

Future improvements



- Emerging trends in life expectancy need to be separated from short term experience
- Analysis of trends requires significant volumes of data to give credible results
- Monitor new data to update improvement assumption
- See Longevity 102 for more details

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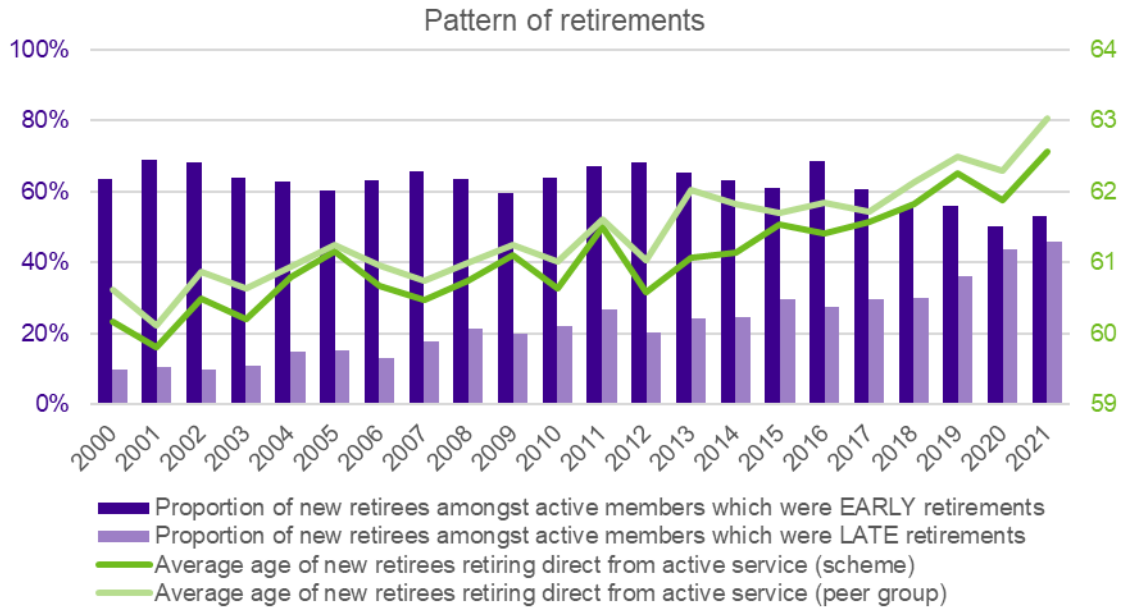
For more information see our longevity trends research.

Demographic trends



- Important to monitor emerging demographic trends, e.g.:
  - Proportions and ages of those retiring early/late
  - Proportions and ages of those retiring on ill health / disabled benefits
  - Proportions with surviving dependant on death
  - Age difference between annuitant and any dependant at death
- Impacts assumptions used, as well as expected cashflow requirements

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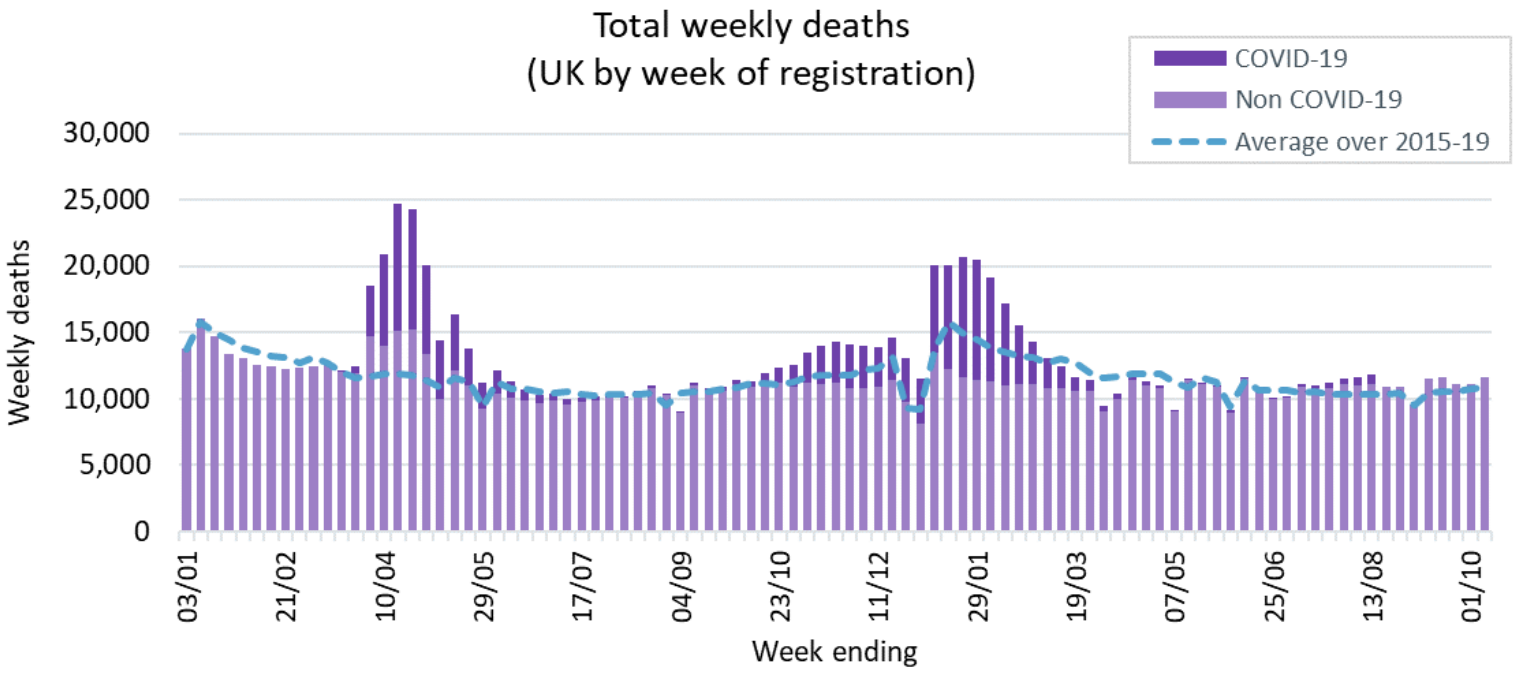
COVID-19 impact



- COVID-19 saw material shifts in mortality rates in 2020/21
- Significant variation across different groups
  - Geographic
  - Socio-economic
  - Age

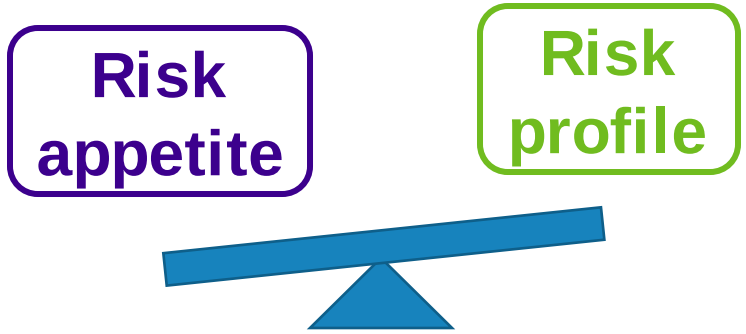
- Consider whether/how to reflect in experience analysis
  - Include experience?
  - Strip out 'heavy' mortality?
  - Interaction with future improvements (e.g. include in base but unwind in improvements)

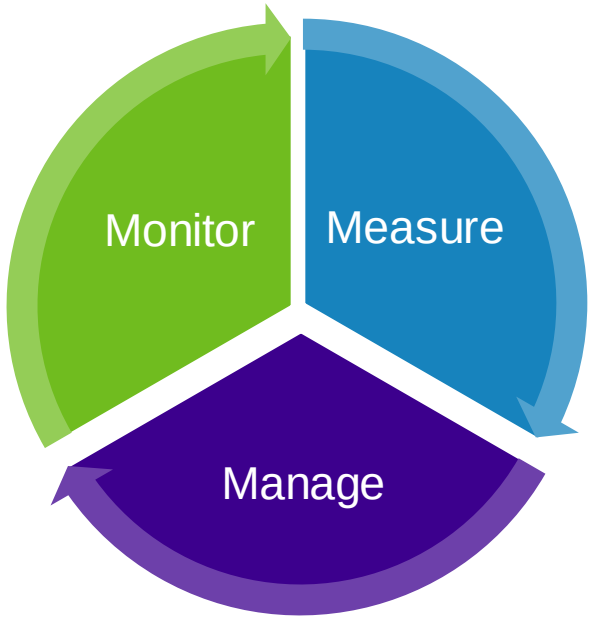
Summary

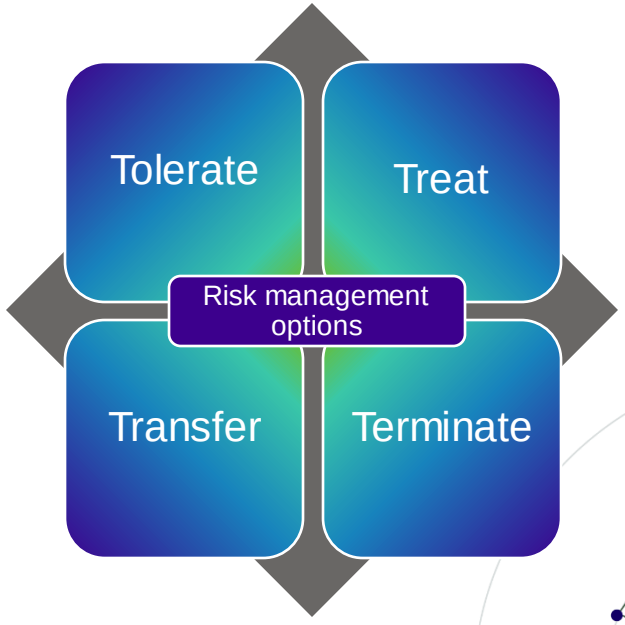
Longevity risk

The risk that people live longer than expected…

… resulting in adverse financial consequences





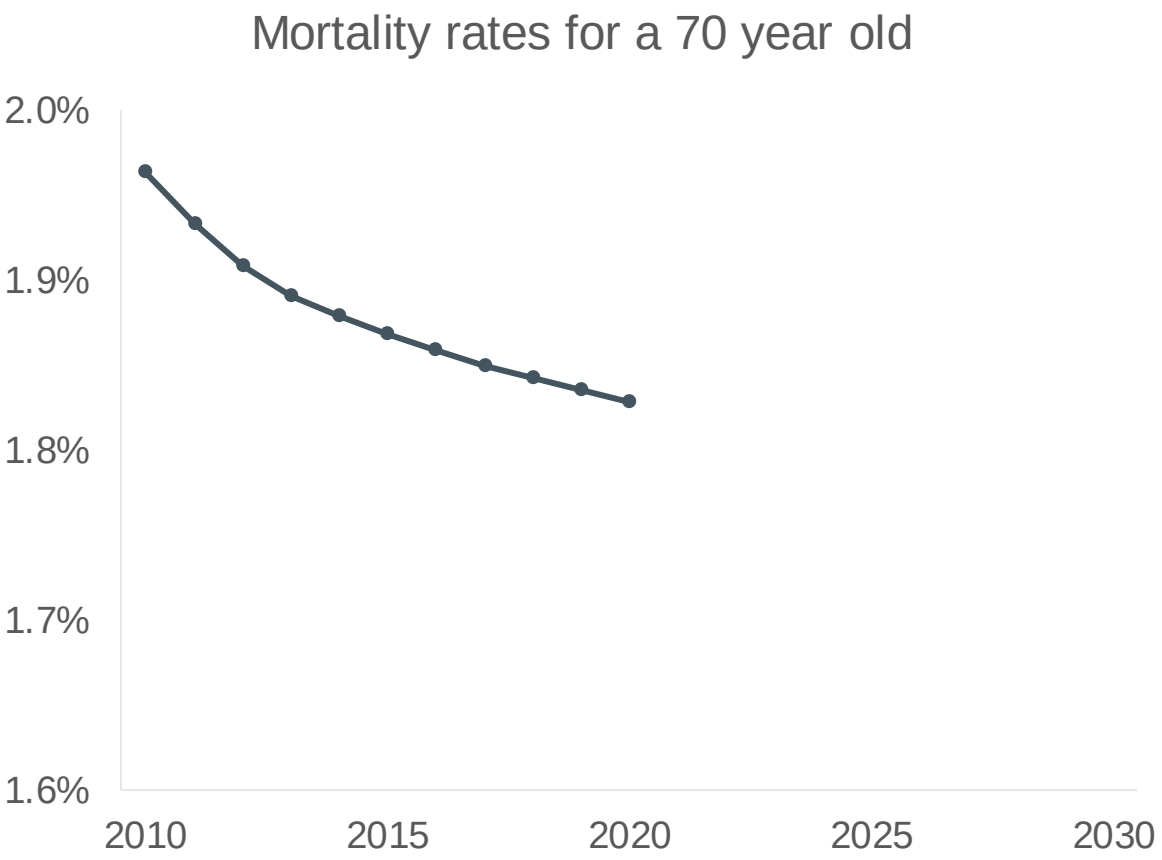


Thank you

End state solutions

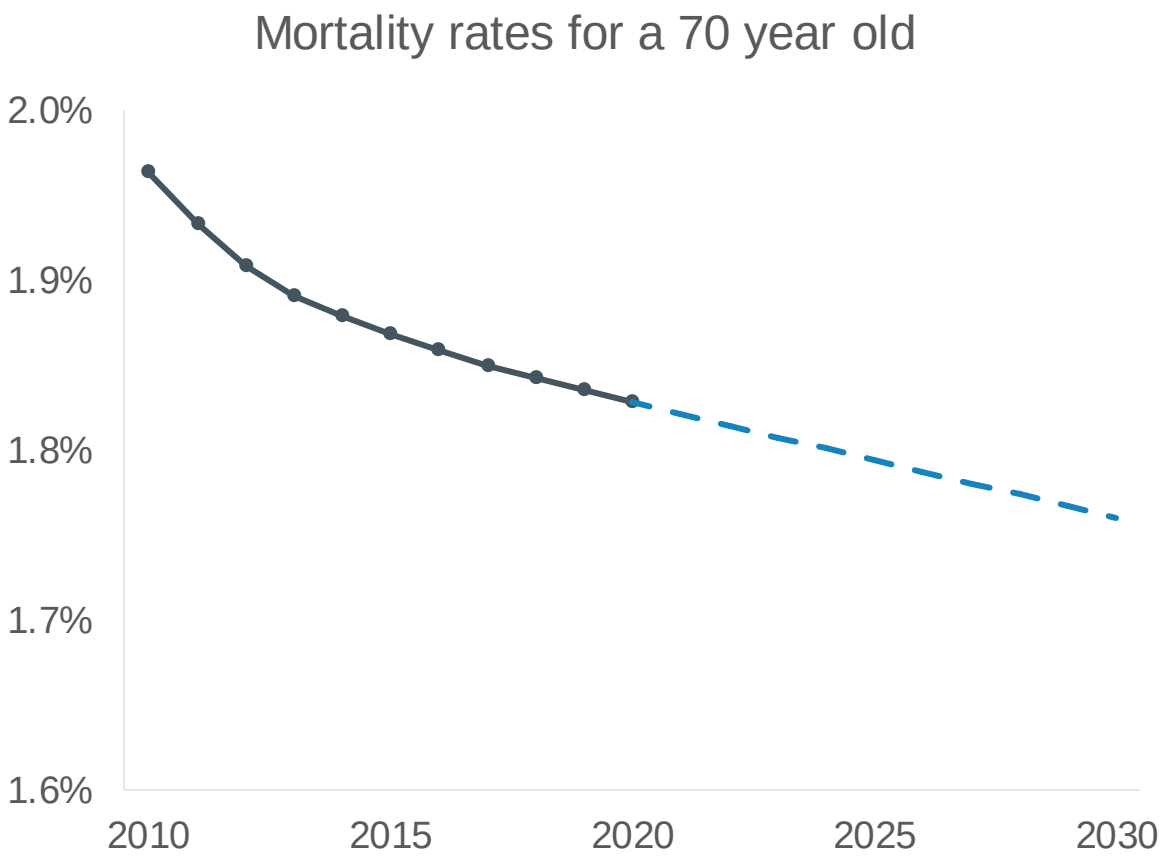
Pension plan end state targets			
	Run-off: *LDI solution*	**Synthetic buy-in:** *LDI + longevity swap*	**Buyout:** *Fully insured*
Interest rates and inflation	✓ **Hedged**	✓ **Hedged**	✓ **Hedged**
Longevity risk	× **Retained**	✓ **Hedged**	✓ **Hedged**
Return seeking asset exposure	✓ **Some**	✓ **Some**	× **None**

Projection models



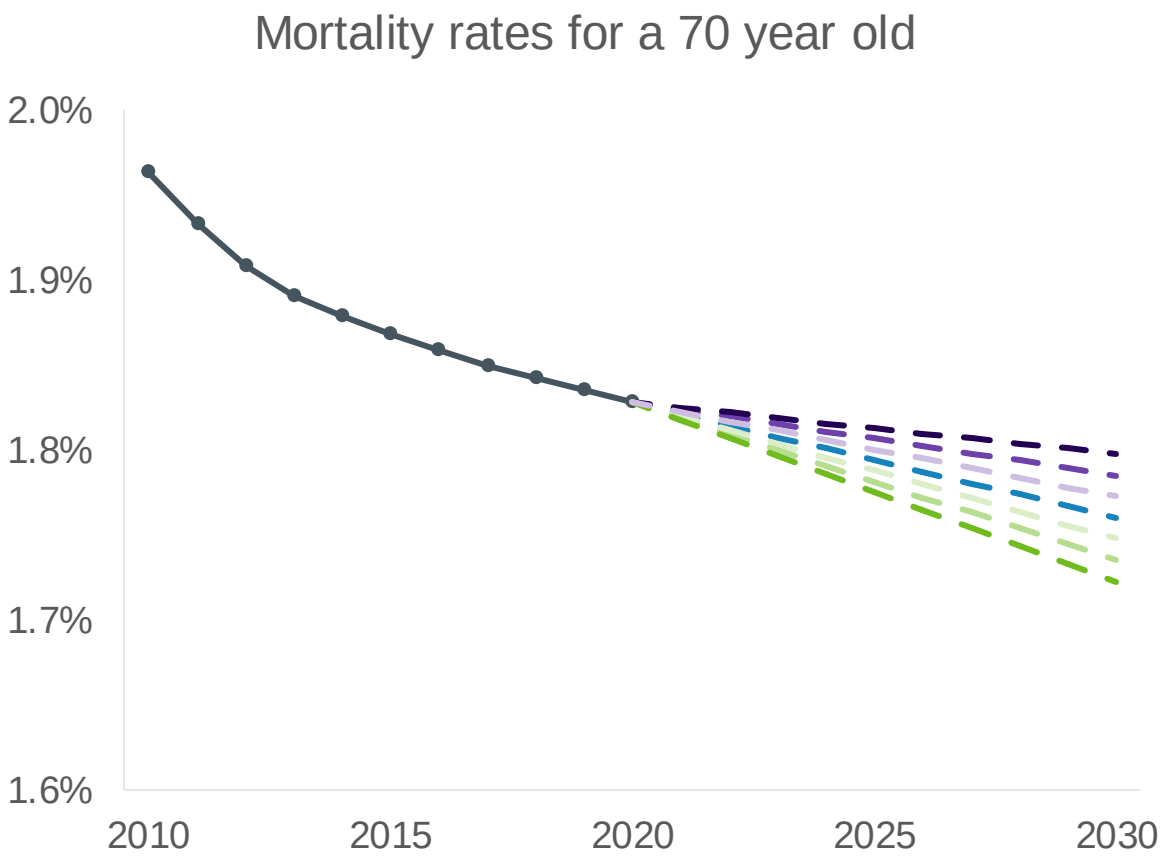
- Historical mortality rates and improvements are known
- Projection models estimate what mortality rates and improvements will be in the future

Deterministic projection



- Deterministic models project one set of mortality rates into the future
- Projected rates often represent a “best estimate” or “prudent estimate” for changes in future mortality
- Often used when a fixed value is needed for a set of cashflows which depend on future mortality. Eg,
  - Regulatory funding valuation
  - Valuation for accounting disclosures

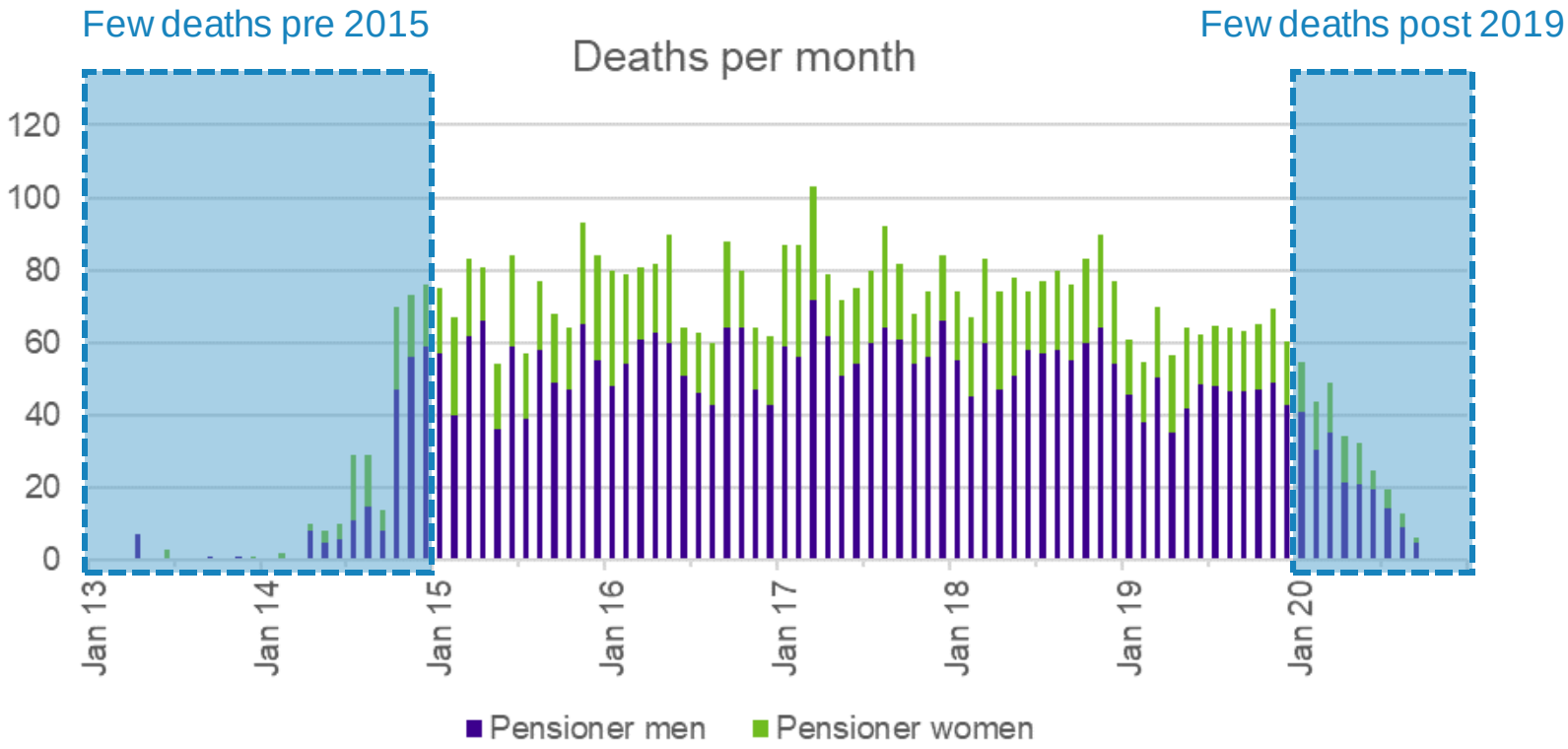
Stochastic projection



- Stochastic models project many sets of mortality rates into the future, assigning probabilities to the resulting distribution
- Often used to understand the risk associated with a set of uncertain cashflows which depend on future mortality. Eg,
  - Understanding the range of outcomes in a given confidence interval
  - Assessing risk mitigation strategies

Stochastic and deterministic models often complimentary

A/E analysis – choosing a time period



- Trade off between longer (so more data) or shorter (so focus on base mortality) time period
- Allow for limitations on historical data records, and more recent deaths not fully reported
- Consider seasonality too

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Reflecting experience

Ignore experience
Unadjusted base table

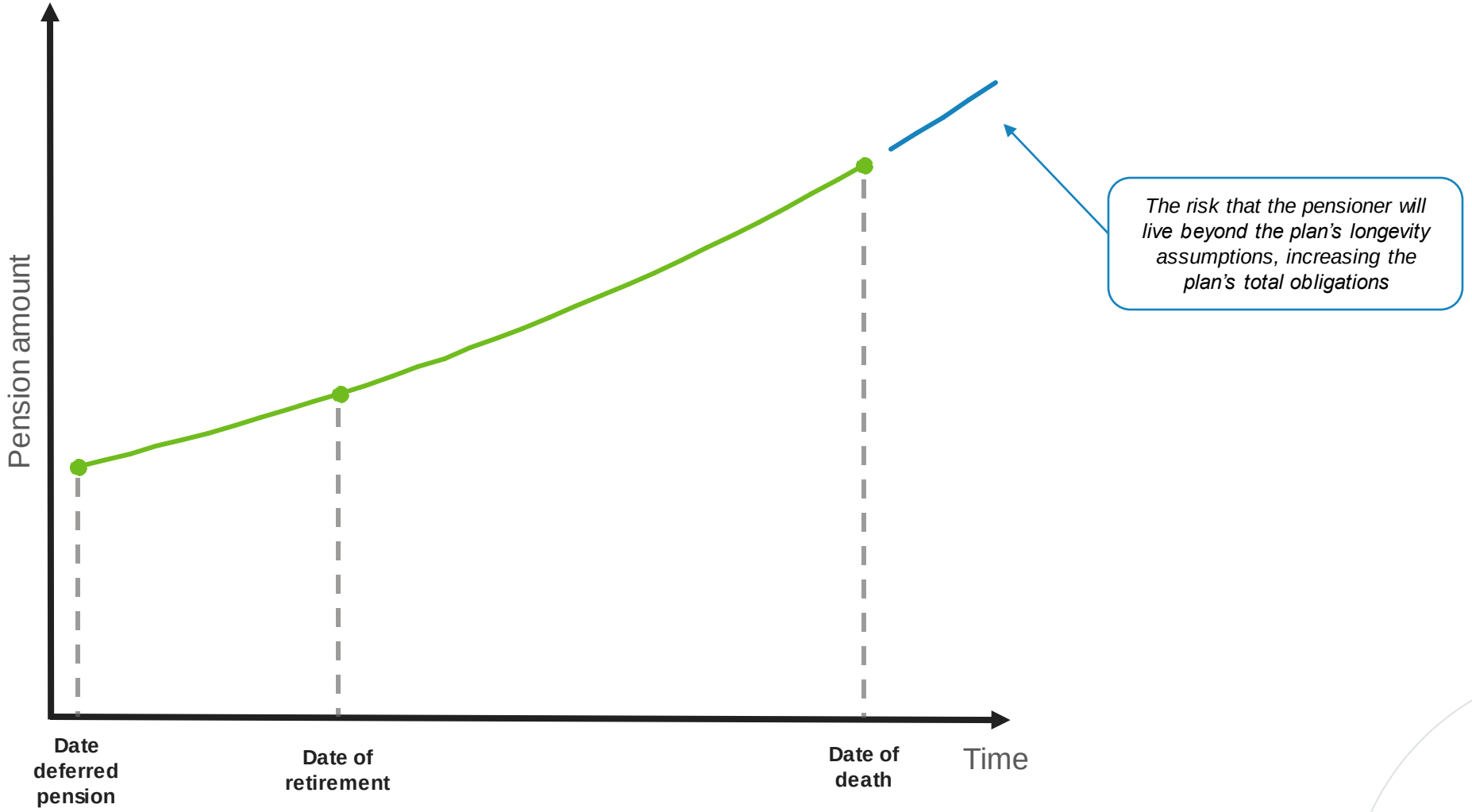
Fully reflect experience
Adjusted base table

A/E value * Weighting to experience + 100% * (1- Weighting to experience) = Scaling Factor

e.g. 104% * 90% + 100% * (1 – 90%) = 103.6%

- Adjust base mortality to reflect observed experience
  - Derive 'scaling factors' to adjust mortality rates (e.g. scaling of 105%)
- Weight given to experience will reflect available data volumes
  - More data enables greater weight to be given to experience
- Consider different ways to 'bucket' analysis (and so scaling factors)
  - e.g. by status / gender / affluence
  - Trade off between granularity and data volumes (and so credibility)

Why is it important to manage the risk?



Pensions get more expensive as pensioners out live expectations

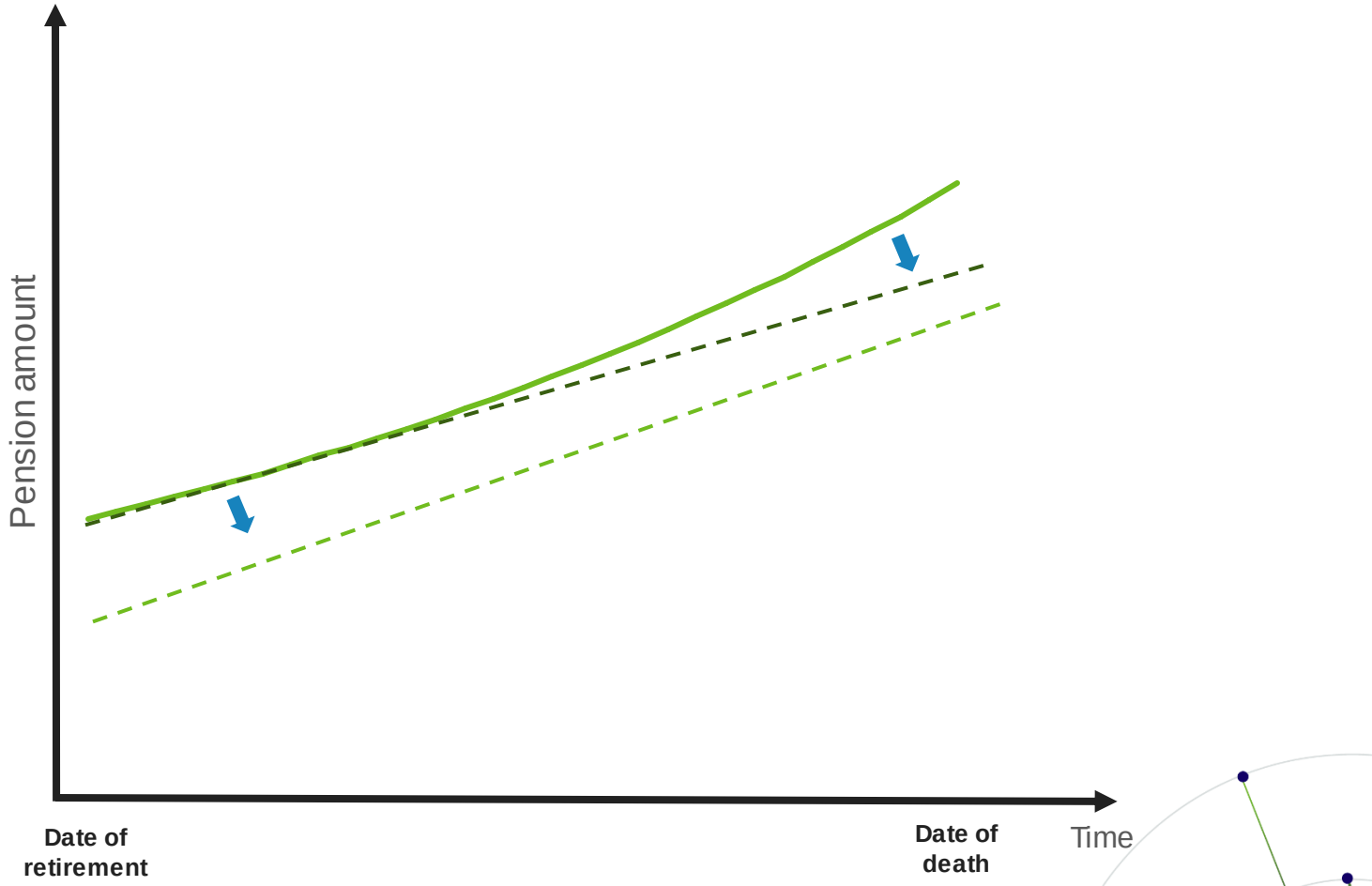
Plan design alterations

Closing plan to new entrants

Ceasing accrual to future service

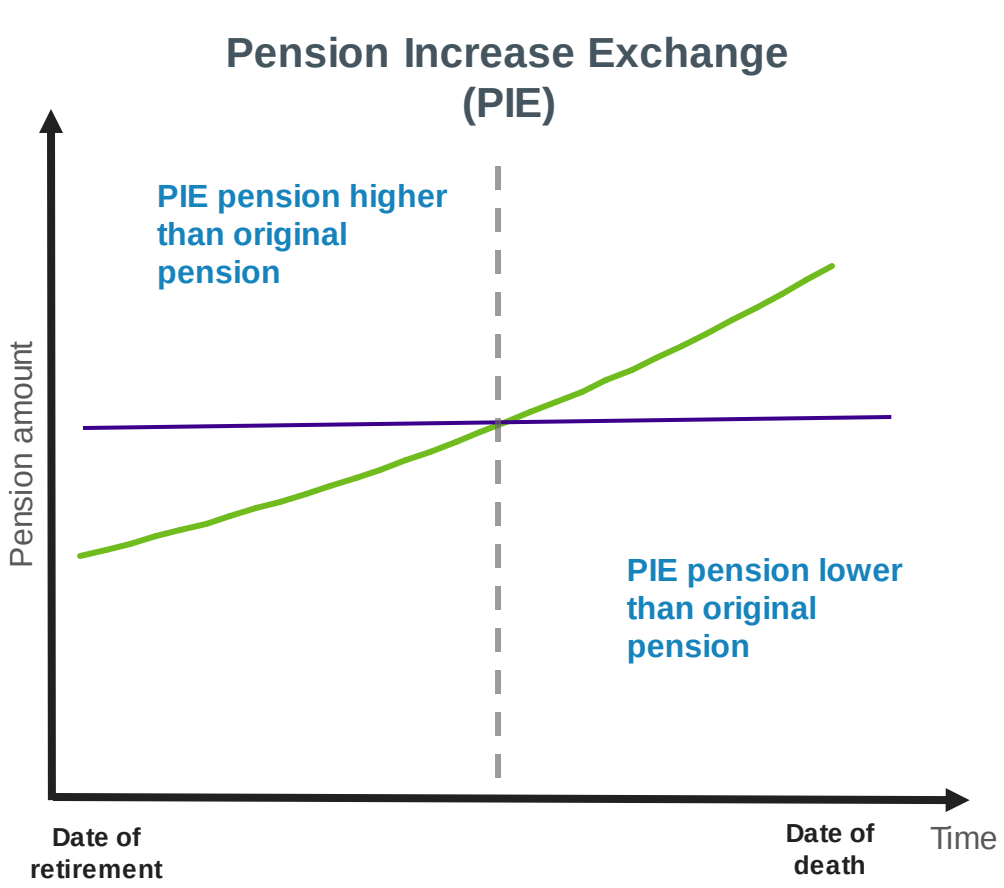
Adjusting DB pension formula

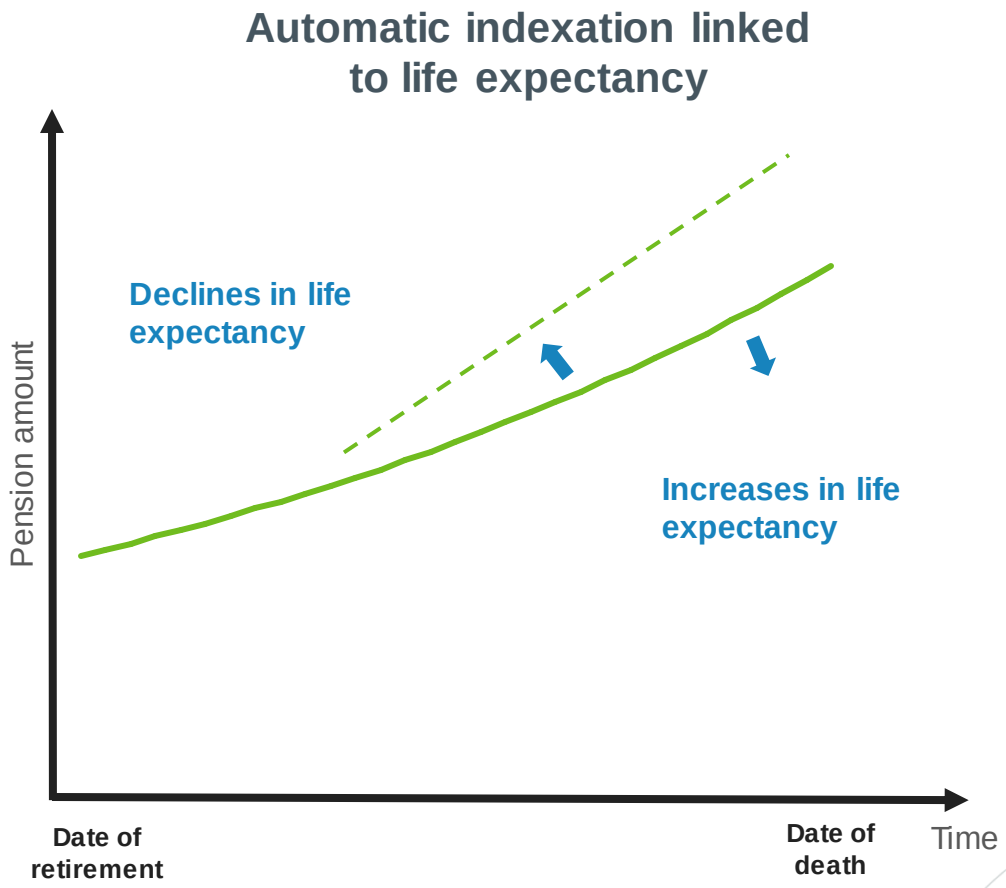
Modifying pension indexation



Options available to plan will be dependent on regulations and rules of the pension scheme

Adjusting size of future pension payments





Treat

Options for offloading risk

Lump sum windows

Enhanced transfer value exercises

At retirement lump sums

The four “T”s of risk management