

Constructing a Longevity Market that works for all Stakeholders

Exploring market inefficiencies in managing longevity risk on a global basis,
and suggestions for regulatory and market-based ways to correct them.

Avery Michaelson, Founder



LONGITUDE
SOLUTIONS

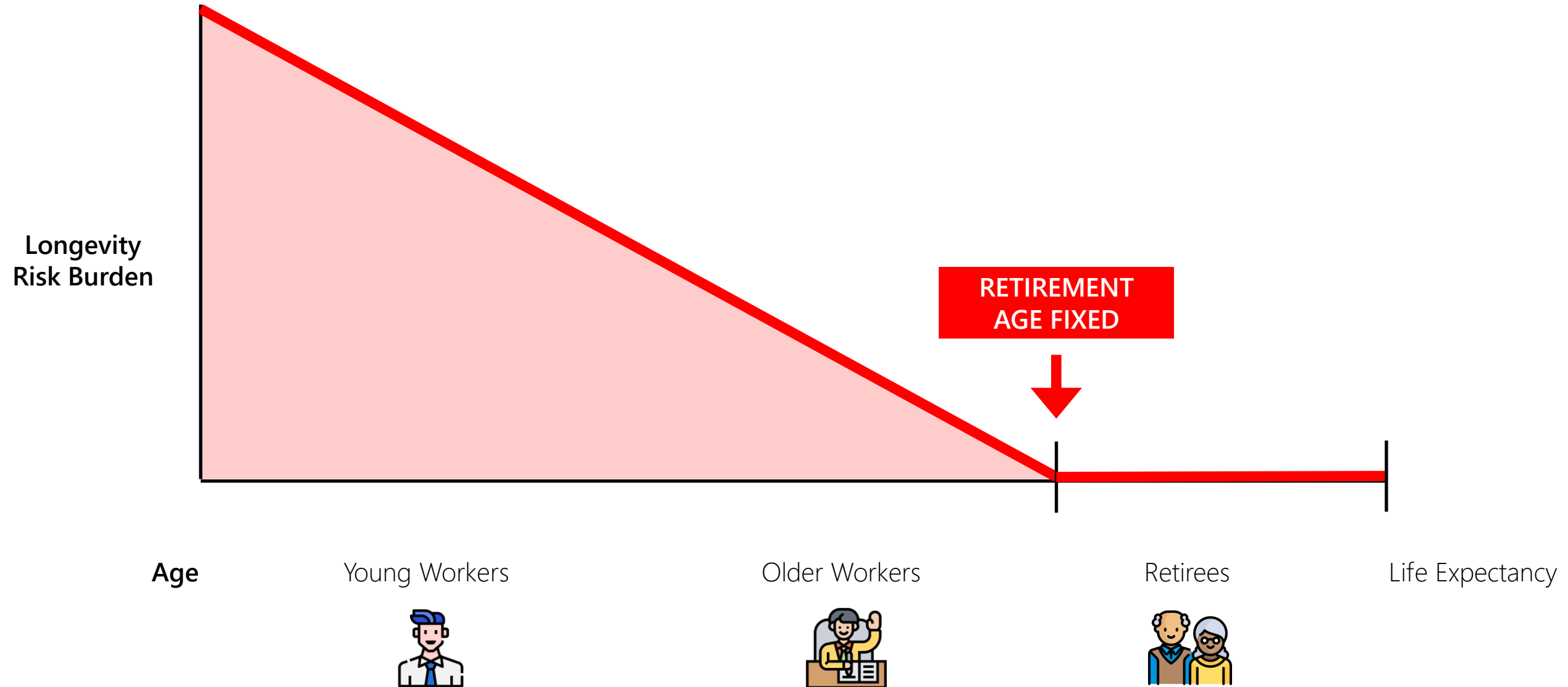


LONGITUDE
EXCHANGE

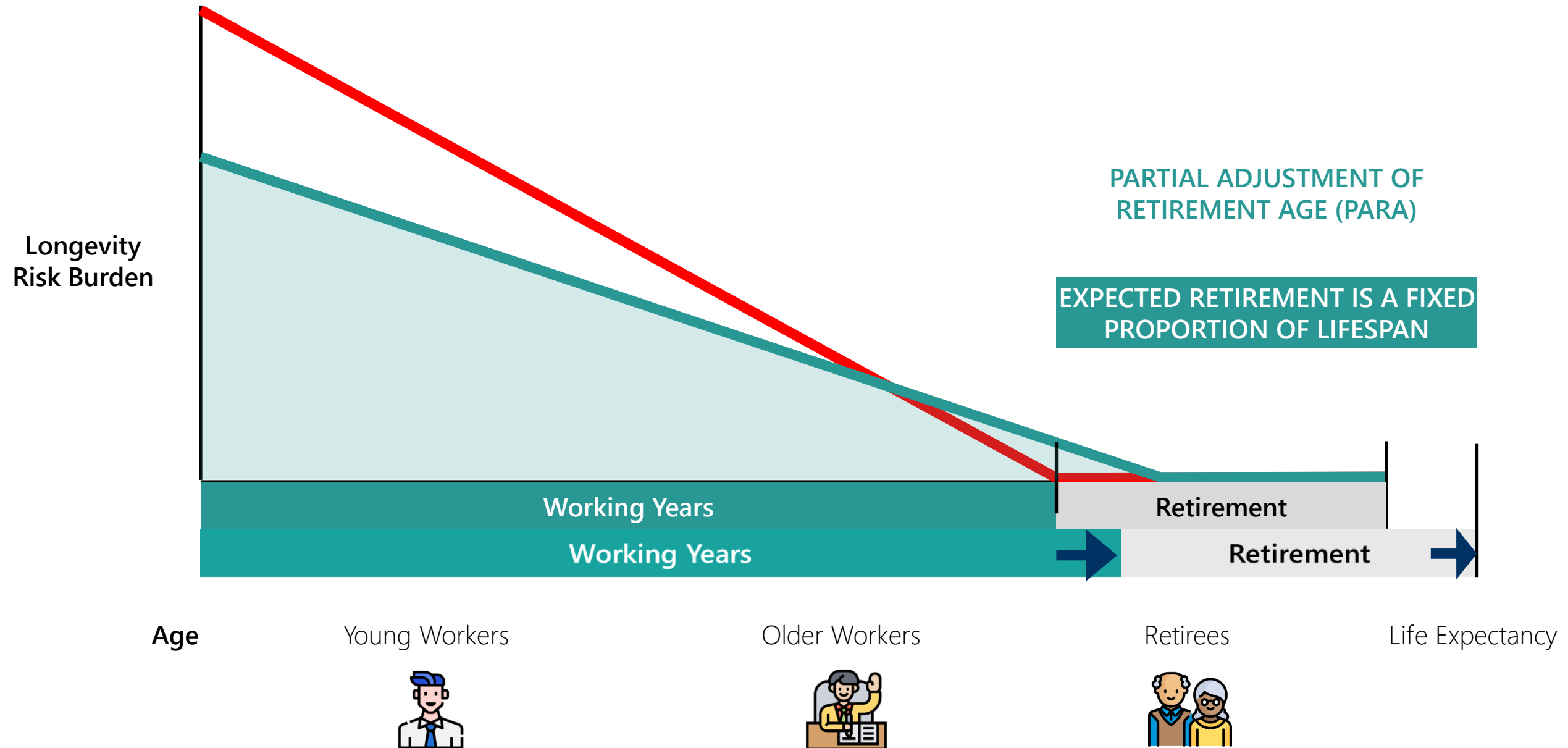
Defining & Quantifying Longevity Risk

	Longevity	Risk
Idiosyncratic (Individual)	<p>Person lives longer than they expected</p> <p>10% live 10 years longer than expected</p>	<p>Individual outlives their savings, is destitute</p> <p>Idiosyncratic = 10 years x \$25,000 = \$250,000 Systemic = 2 years x \$25,000 = \$50,000 Total Longevity Risk = \$300,000</p> <p>Against average savings in US of \$150,000</p>
Systemic (Population)	<p>Everyone lives longer than expected</p> <p>2.5 Std. Devs. → 2-year extension</p>	<p>Retirement system fails to meet obligations</p> <p>Idiosyncratic = 0 (law of large numbers) Systemic = 2 years x \$25,000 x 250M people Total Longevity Risk = \$12.5T</p> <p>May have caused \$50T shortfall over last 50 yrs.</p>

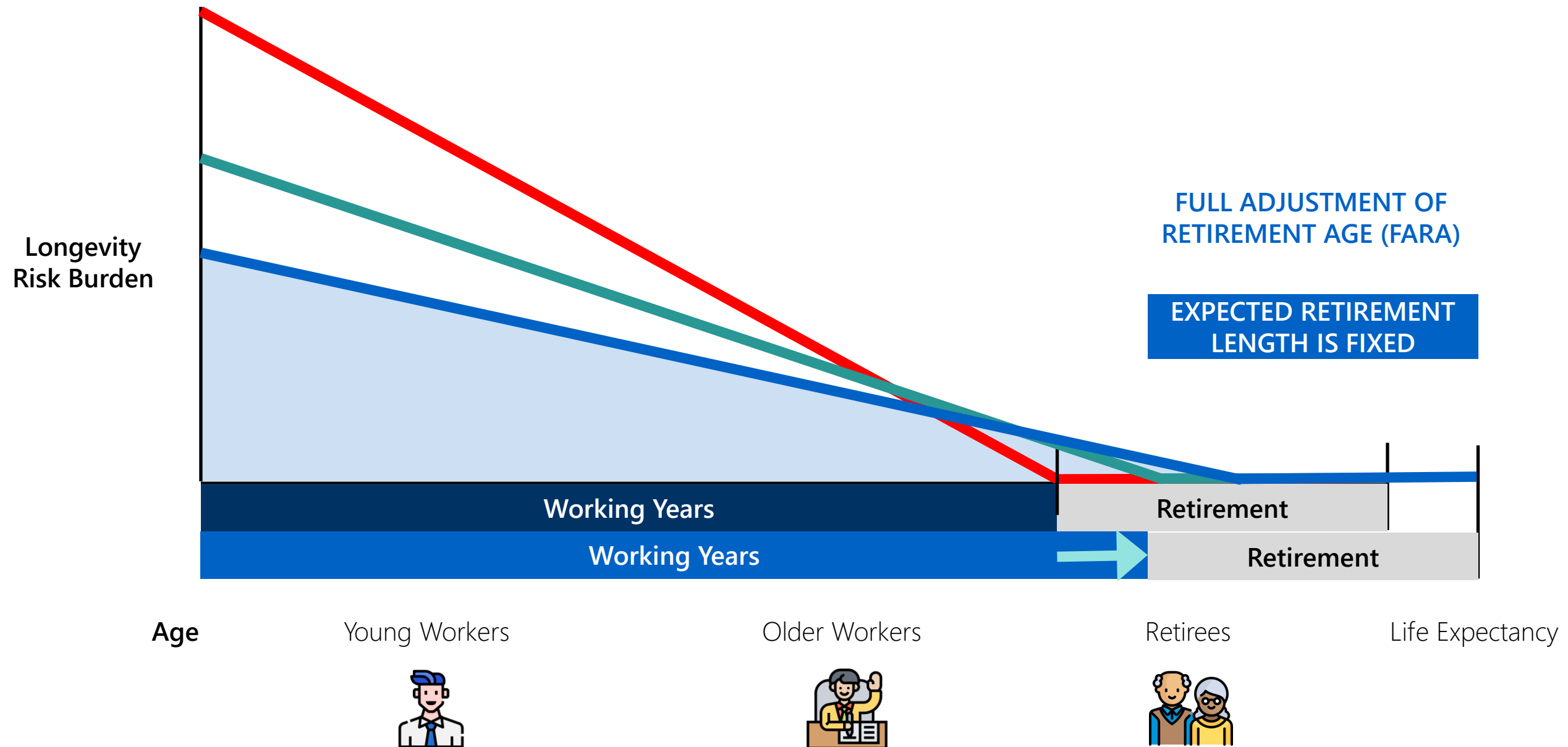
Sharing Longevity Risk Across Cohorts



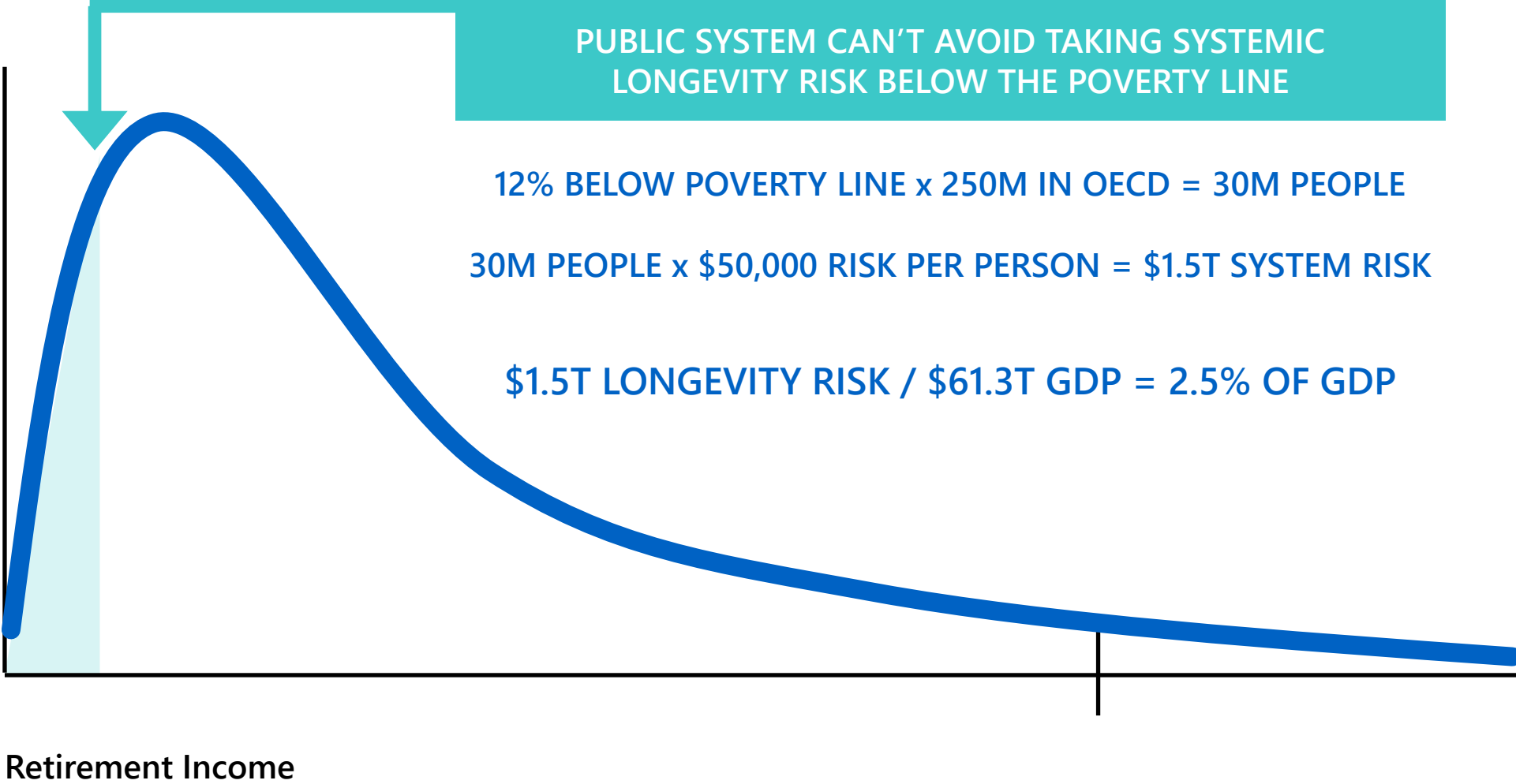
Sharing Longevity Risk Across Cohorts



Sharing Longevity Risk Across Cohorts

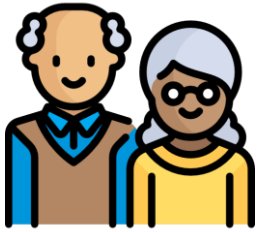


How much should the public system take?



Collective Defined Contribution (CDC)

RETIREEES



LONGEVITY RISK



CDC PLAN



IDIOSYNCRATIC
LONGEVITY RISK



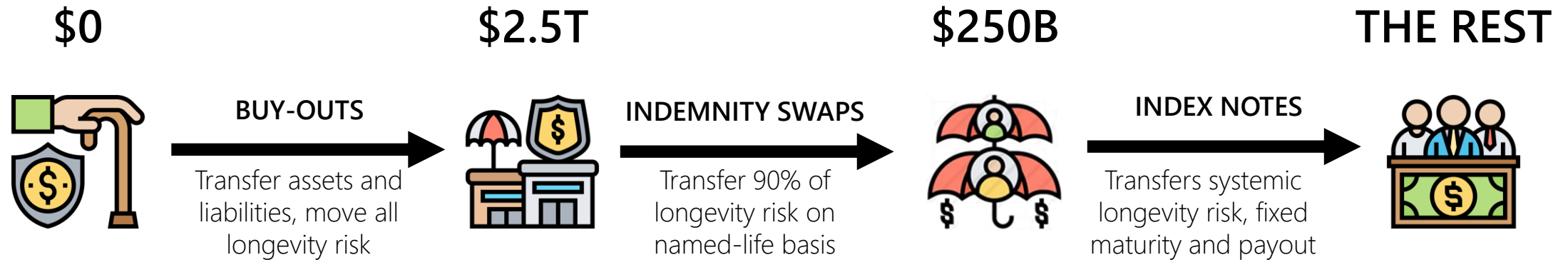
DIVERSIFICATION



SYSTEMIC LONGEVITY RISK
(PAYMENTS CAN DECREASE)

	Retiree	CDC Plan	Total Per Person
No CDC	\$300,000	\$0	\$300,000
With CDC	\$50,000	\$0	\$50,000

Where to place \$11 Trillion of Longevity Risk?



PENSIONS

- Longevity is not diversified by size and demographics
- Longevity is uncompensated risk / distracts from business
- Not a good home for longevity risk – DB to DC, but should do buy-outs instead

PROBLEM – don't have provisions for longevity risk, face artificially high cost in transferring liabilities

INSURERS

- Can diversify idiosyncratic risk by consolidating pensions
- Some diversification against mortality and P&C risks
- Retain Policy Administration, but must de-risk to maintain capacity for more buy-outs

PROBLEM – reinsurers lack long-term capacity alone, but risk margin and capital benefit from index hedges is uncertain

REINSURERS

- Better diversification by size, geography and insurance risk
- Retain idiosyncratic risk given expertise in underwriting
- Transfer systemic risk, net of basis risk, which becomes a diversified risk over time

PROBLEM – given small number of players, can't grow capacity too much or else systemic credit risk emerges

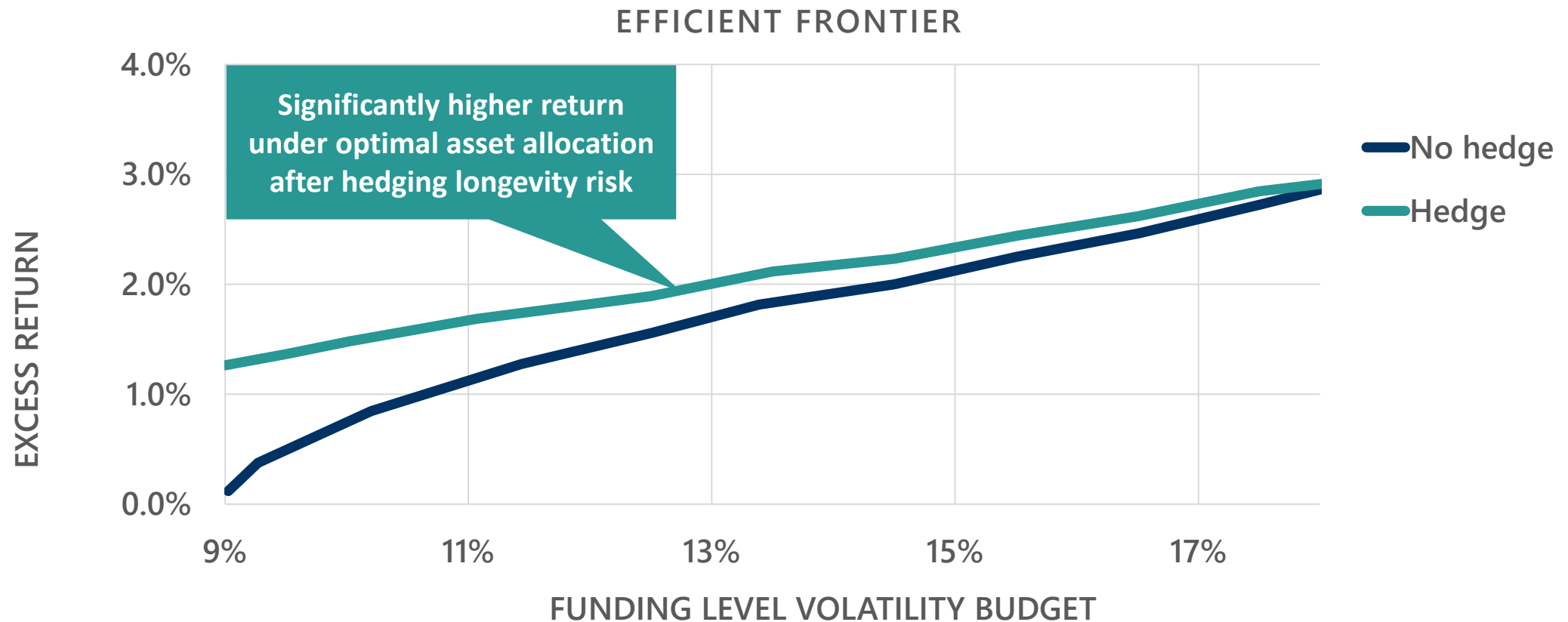
CAPITAL MARKETS

- Longevity risk is uncorrelated with other asset classes
- Index longevity risk can be modeled by financial quants
- Taking trend risk with fixed downside and maturity is like alternative fixed income

PROBLEM – lack steady enough deal flow to dedicate resources, need options for secondary liquidity to develop

Hedging Longevity Raises Efficient Frontier for DB

Hedging of Longevity Risk creates risk budget for a more optimal asset allocation ([Schrager](#))



This figure is based on hedging 100% of the risk with Longevity Swap.

Further optimization is possible using structures that optimize reinsurance premium vs. risk cover

Solvency II Diversification Matrices

Solvency Capital Requirement (SCR)
Standard Formula calculation of the
Life Underwriting Risk Module:

$$Basic\ SCR = \sqrt{\sum_{i,j} Corr_{i,j} \times SCR_i \times SCR_j}$$

i,j	Mortality	Longevity	Disability	Lapse	Expense	Revision	CAT
Mortality	1						
Longevity	-0.25	1					
Disability	0.5	0	1				
Lapse	0	0.25	0	1			
Expense	0.25	0.25	0.5	0.5	1		
Revision	0	0.25	0	0	0.25	1	
CAT	0	0	0	0	0	0	1

Solvency Capital Requirement (SCR)
Standard Formula combining risk modules:

$$Basic\ SCR = \sqrt{\sum_i \sum_j Corr_{i,j} \times SCR_i \times SCR_j}$$

i,j	Market	Default	Life	Health	Non-Life
Market	1				
Default	0.25	1			
Life	0.25	0.25	1		
Health	0.25	0.25	0.25	1	
Non-Life	0.25	0.5	0	0	1

Solvency II Diversification Matrices

	Mono-Line	Life Insurer	Life & P&C
Longevity SCR	100	100	100
Mortality SCR	0	100	100
Non-Life SCR	0	0	75
Undiversified Total	100	200	275
Diversified Total	100	122	144
Capital Reduction	0%	39%	48%



Life Underwriting capital optimized at 1:1 ratio of Longevity to Mortality



Life & Non-Life optimized with Non-Life at 75% of Longevity

Direct Insurers	Shareholders Equity	Longevity Capacity
Life	\$1050B	\$857B
Composite	\$537B	\$375B

\$1.25T

Solvency II Diversification Matrices

	Mono-Line	Life Insurer	Life & P&C
Longevity SCR	100	100	100
Mortality SCR	0	100	100
Non-Life SCR	0	0	75
Undiversified Total	100	200	275
Diversified Total	100	122	144
Capital Reduction	0%	39%	48%



Life Underwriting capital optimized at 1:1 ratio of Longevity to Mortality



Life & Non-Life optimized with Non-Life at 75% of Longevity

Direct Insurers	Shareholders Equity	Longevity Capacity
Life	\$1050B	\$857B
Composite	\$537B	\$375B

\$1.25T

Reinsurers	Shareholders Equity	Longevity Capacity
Life	\$122B	\$100B
Composite	\$22B	\$15B

\$115B

Current Total	\$1.25T
Double over 20yrs.	\$2.5T

Governments & Regulators Could Buy Protection

Governments have been long-time buyers of catastrophe insurance from ILS investors.

- Florida – hurricanes
- California – earthquakes, wildfires
- WHO – catastrophic mortality (this paid out due to COVID)

Some examples for Longevity...

- US state employee retirement system
 - Needs to remain open / buy-out is not appropriate
 - Longevity swap is overkill, already well diversified
 - Mortality data is reported at state level, so an index with little basis risk is achievable
 - Protects against benefit cuts / increase in taxes
- Chile
 - 80% of insurance companies reserves are from pensions
 - Creates a systemic risk for the country financial system
 - But \$6 billion is manageable by the global longevity market
 - Export this risk to investors around the globe

Longitude Exchange is the marketplace for longevity risk



Brings hedgers and investors together on a digital platform designed for transacting longevity risk.

By providing a marketplace, Longitude Exchange will drive down frictional costs and timelines, leading to more transaction volume and presenting an option for secondary liquidity.

Our tools streamline the process of hedging and investing in longevity risk.

More efficient. More liquid. More deals.

For Hedgers



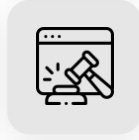
Hedge Construction

Construct trades optimized for risk and capital objectives.



Hedge Analysis

Measure hedges impact on risk and capital positions.



Hedge Placement

Conduct auctions, negotiate terms and execute deals.



Hedge Reporting

Receive reporting, payment and collateral instructions.



Hedge Management

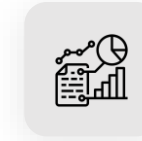
Increase or decrease hedges through secondary trading.

For Investors



Longevity Modeling

Models and datasets to generate longevity scenarios.



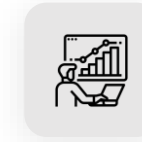
Investment Analysis

Price transactions using longevity scenarios.



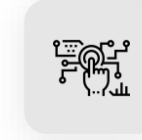
Investment Execution

Place bids and negotiate terms with counterparties.



On-going Valuations

Live quotes and historical trades to mark positions.



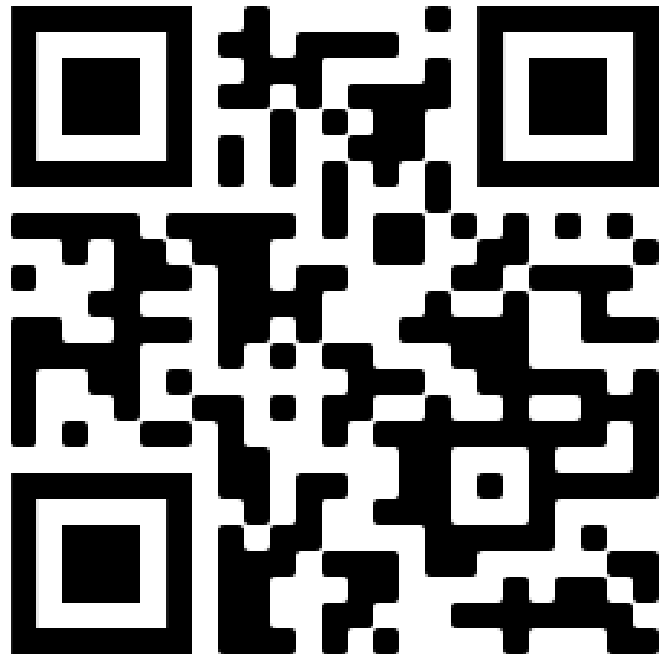
Secondary Trading

List positions, request bids, and buy listed transactions.

Request Access to Longitude Exchange



longitude.exchange



My Contact Information

Avery Michaelson

avery@longitudesolutions.com



LONGITUDE
SOLUTIONS



LONGITUDE
EXCHANGE

THANK YOU!