

Assessing Mortality without Health Data

Erik Pickett, Actuary & Chief Content Officer at Club Vita

54th Annual Conference – Tuesday, January 27, 2026



Metropolitan
Underwriting
Discussion Group

54th Annual MUD Conference

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Erik Pickett

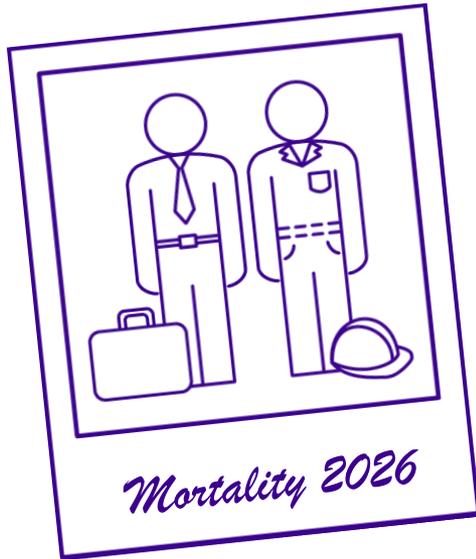
Actuary & Chief Content Officer at Club Vita





Longevity modeling in Pension Risk Transfer

Two steps to calculate life expectancy



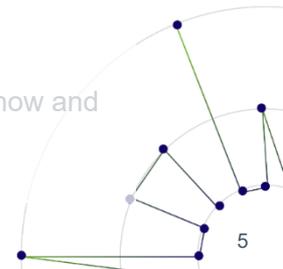
Baseline

- 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?



The Pension Risk Transfer Longevity Challenge

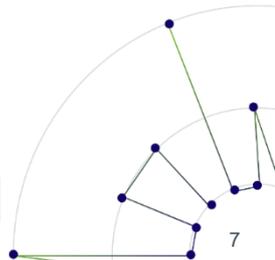
***“Top Down”
Traditional standard
tables***

**Collect large amounts of data
from similar pension plans**

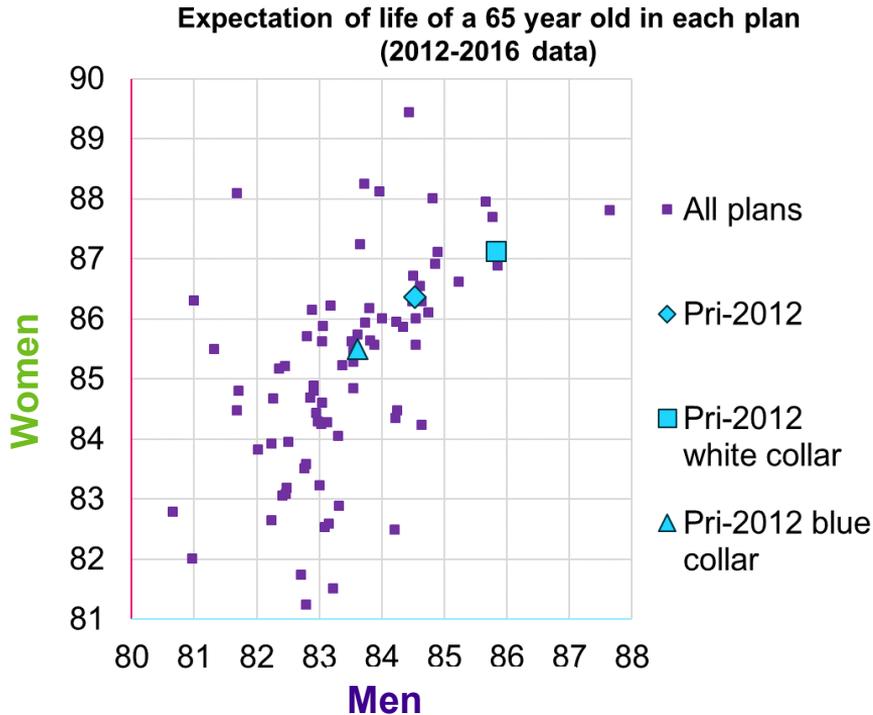
Average out
experience and
apply to plan

Plan assumption

Traditional approach introduces a number of challenges



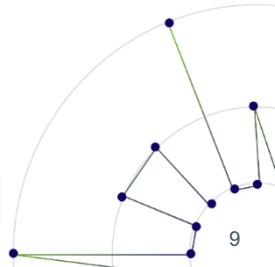
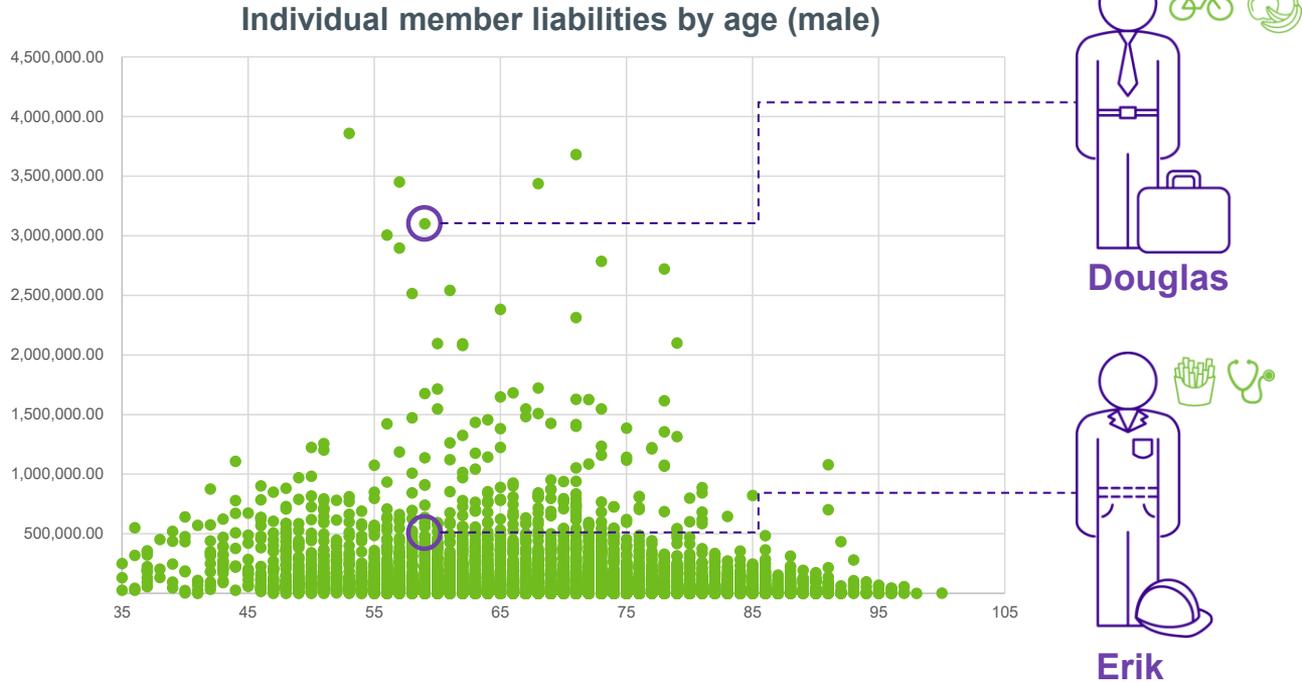
US pension plans: diversity of mortality experience



Source: Club Vita analysis on c100 single employer plans

- Each purple dot shows the average life expectancy of participants in one pension plan in our data set
- Even at the plan level, longevity experience of defined benefit pension plans varies widely

A group is made of individuals



***“Top Down”
Traditional standard
tables***

Collect large amounts of data
from similar pension plans

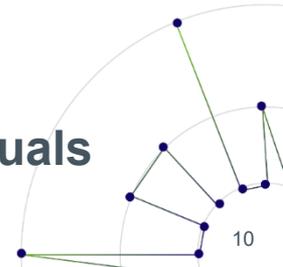
Average out
experience and
apply to plan

Plan assumption

***“Bottom Up”
Multi-factor models***

Combine
assumptions for
the individuals
within plan

Calculate longevity for different individuals
based on their characteristics



Pension Risk Transfer Longevity Modeling



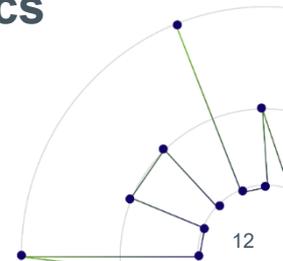
VitaCurves “multi-factor” baseline model

- ‘Bottom up’ modeling approach
- Uses mortality data + multiple pension administration fields (factors) which influence mortality
- Generalized Linear Modeling to capture impact of each factor on mortality
- Creates suite of mortality tables, which vary according to values of these factors
- Allocate individuals to a specific table based on their factor values
- Overall assumption based on aggregating across individuals

Your assumption

Combine assumptions for the individuals within your plan

Calculate longevity for different individuals based on their characteristics



What affects how long people live?



Lifestyle



Affluence



Occupation



Health



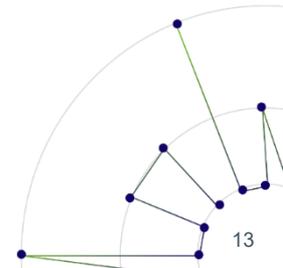
Sex



Marital status



Survivor?



Data available in pension plan records



ZIP+4



Pension



Collar



Disability?



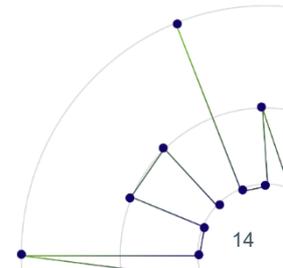
Sex



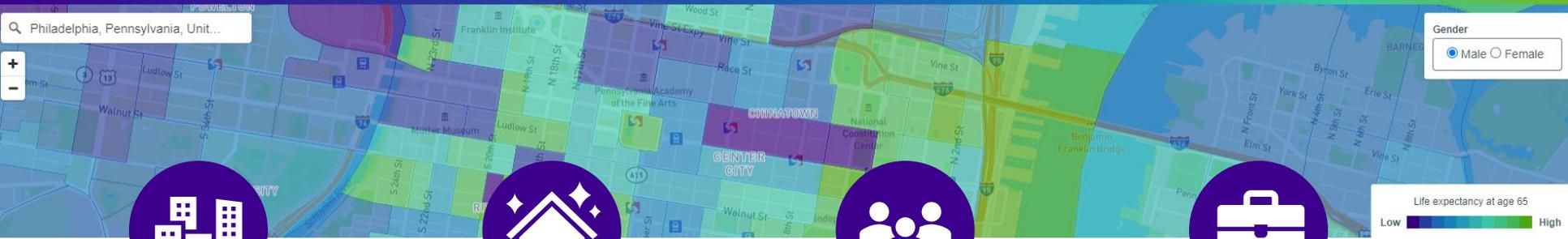
Pension form



1st/2nd life



Neighborhood characteristics captured with ZIP+4



Geographical factors

Urban vs rural
Access to healthcare



Property factors

- Type of property inc. number of rooms
- Tenure
- Value
- Vacant property rate



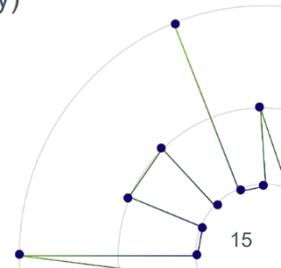
Demographic factors

- Household income
- Level of other sources of income
- Social security reliance
- Education levels (highest attainability)
- Family structure



Employment

- Employment levels
- Employment types (akin to industry)



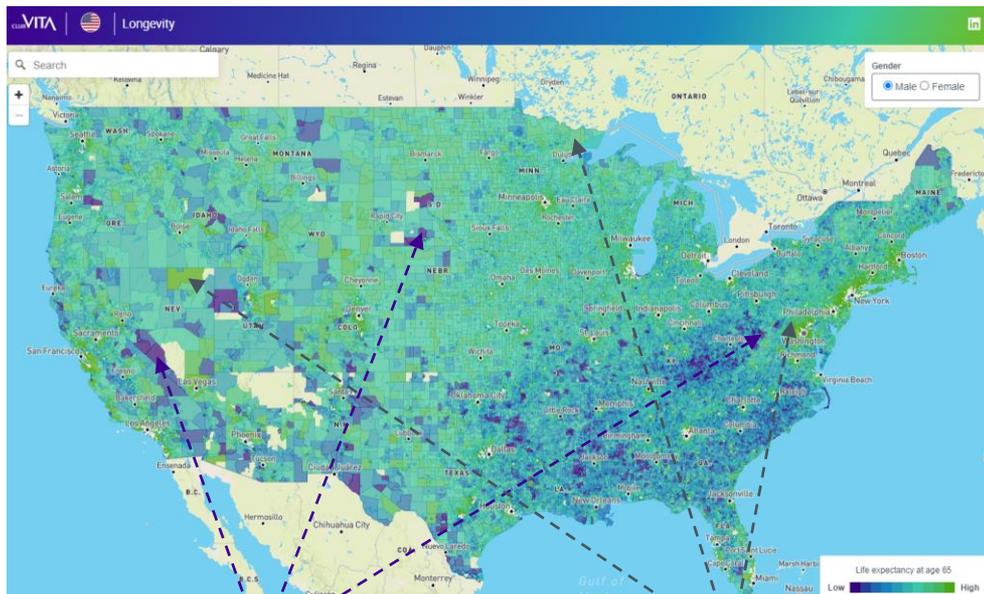
Grouping ZIP codes

- ZIP code is a proxy for lifestyle and more
- Residents living in the same neighborhood have similar characteristics
- Neighborhoods can be characterized by typical residents
- Neighborhoods with the same characteristics appear all over the country
- People with similar characteristics have similar longevity

46 million+ US ZIP+4 codes =>
58 resident type groups

58 resident type groups =>
8 longevity groups men (6 for women)

See our 'Zooming in on ZIP codes' paper for more details
<https://www.clubvita.us/collaborative-research/zooming-in-on-zipcodes-whitepaper>



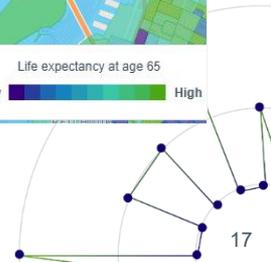
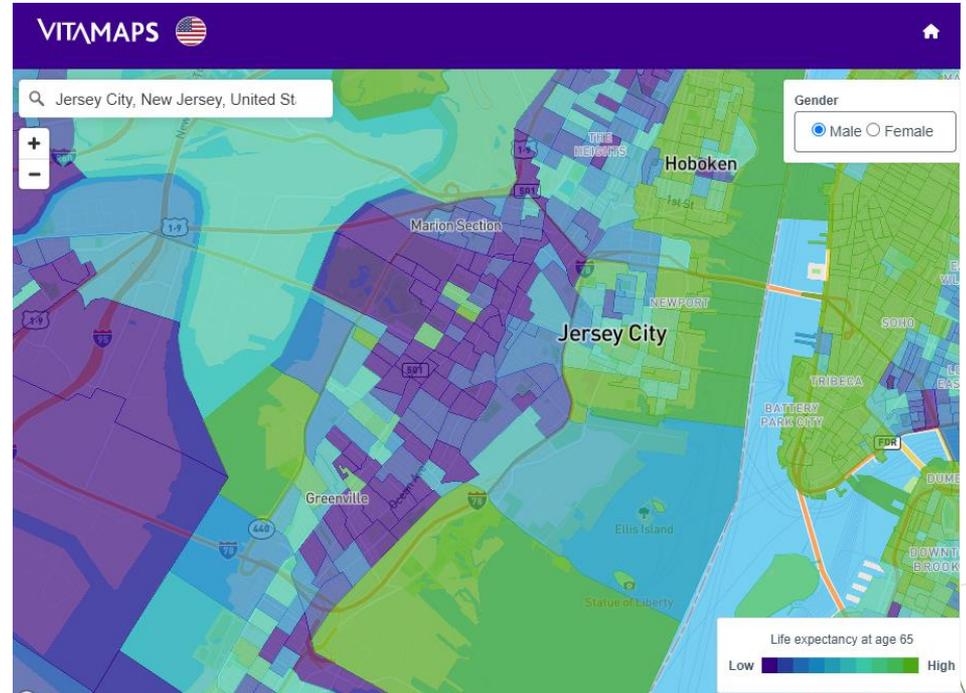
Low socio-
economics



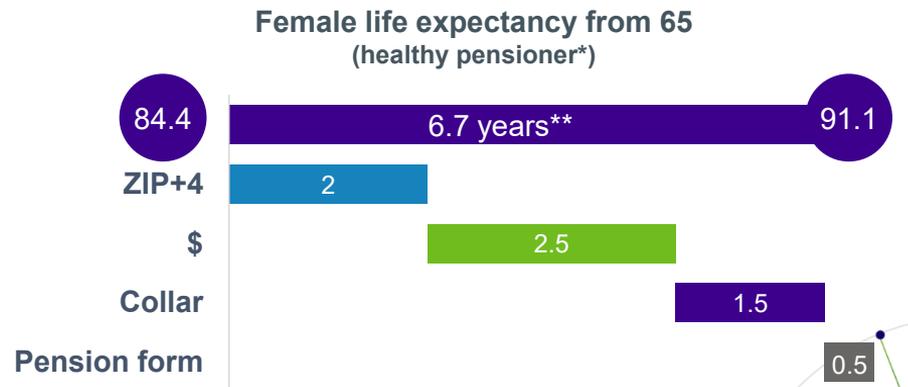
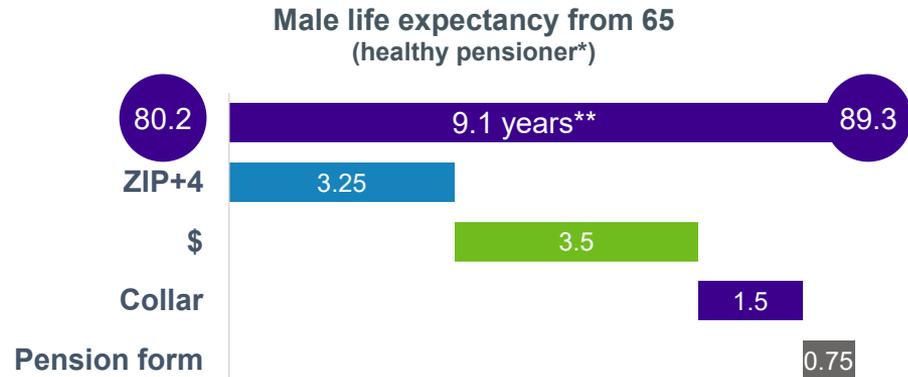
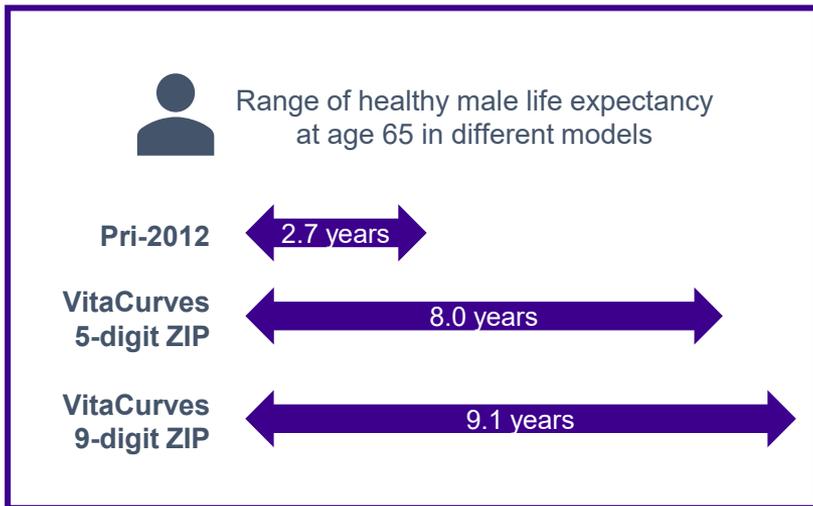
High socio-
economics

VitaCurves – multi-factor baseline mortality model

LONGEVITY PREDICTOR	INDICATOR
 Lifestyle	ZIP+4 Code
 Affluence	Pension amount
 Retirement health	Disabled vs. normal retirement
 Gender	Male/female
 Occupation	Blue/white collar
 Marital status	Pension form
 Survivor?	Pensioner/beneficiary



CV24 v2 (adjusted) model (2020-2022 data – midpoint 1 Jan 2021)



*For disabled pensioner curves add another ½ year to life expectancy range.

**Sum of individual impacts may not be equal to total impact due to rounding.

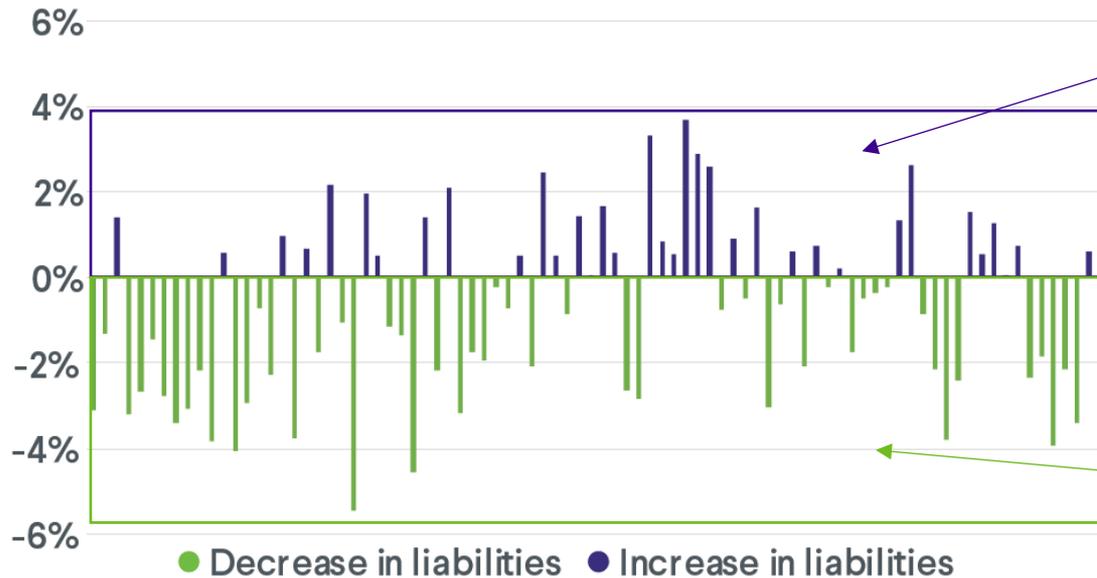
Note: Indicative impact of changing one variable in isolation. Exact impact varies depending on values taken by other variables.

Pension Risk Transfer Applications



PRT: mis-pricing with standard tables

Impact of moving from traditional table to ZIP+4 US VitaCurves



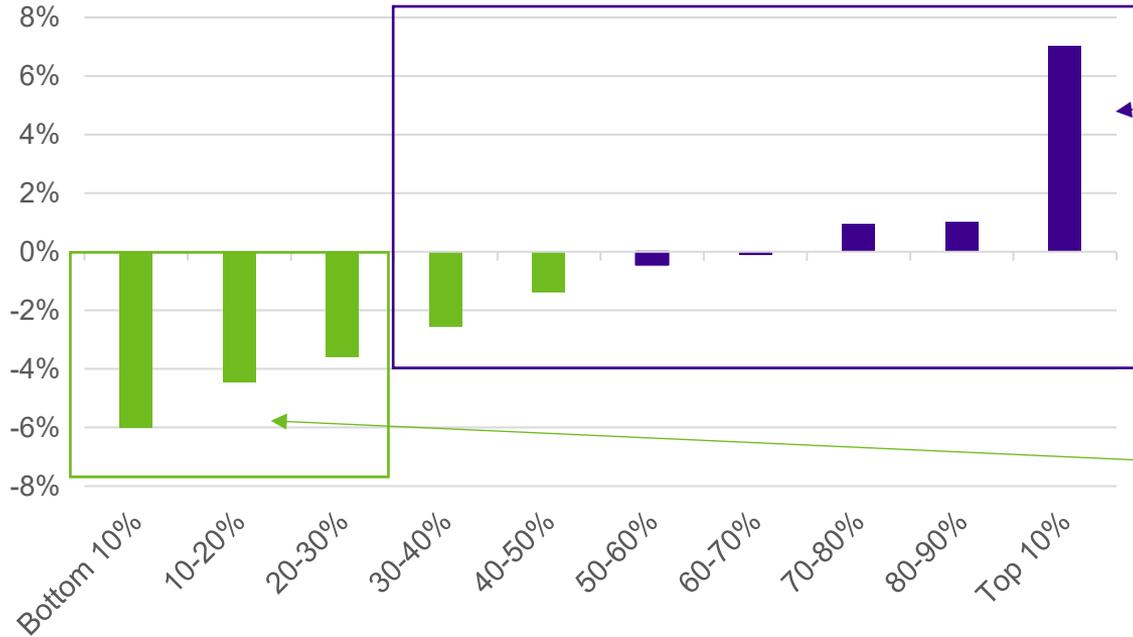
Increasing plan size (benefits in payment)

- Using traditional industry table (Pri-2012) underprices these plans
- More likely to win the deals, but less likely to be profitable

- Using traditional industry table (Pri-2012) overprices these plans
- More likely to lose deals to competitor using multi-factor model

PRT: mis-pricing with top-down assumptions

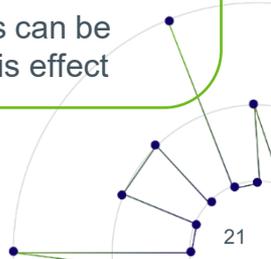
Impact of moving from traditional table to ZIP+4 US VitaCurves



← Smallest pensions over valued Largest pensions under valued →

- If plan has already previously executed “lift outs”, residual plan undervalued by traditional industry table (Pri-2012)
- More likely to win deal, but less likely to be profitable

- Small benefit “lift outs” over-valued by traditional industry table (Pri-2012)
- Likely to lose deal if shorter life expectancy not reflected
- Multi-factor models can be used to quantify this effect

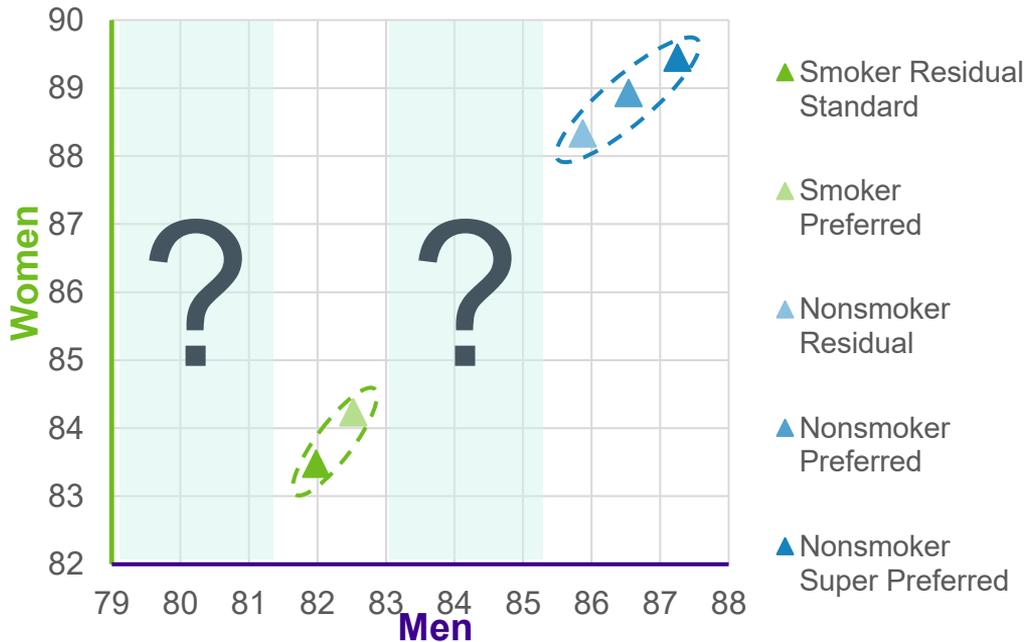




Pension Risk Transfer models ...applied to life insurance

Traditional US life tables

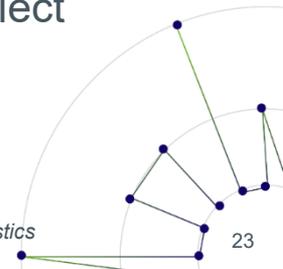
Life expectancy at age 65



- The chart shows life expectancy at 65 under different traditional US life insurance tables
- These tables capture limited diversity and difficult to know how to assign individuals when select period is over

Notes:

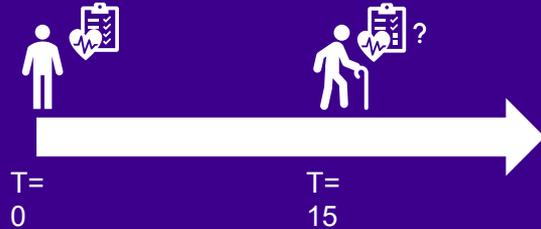
1. The triangles show the life expectancy based on the 2017 Unloaded CSO Preferred Structure ANB tables.
2. In 2021, life expectancy at age 65 was 18.4 years in the US (19.7 years for women and 17 for men). Source: The National Center for Health Statistics



VitaCurves^{LIFE}: a pilot for life insurance policies

Current approach

- No medical information collected after policy inception



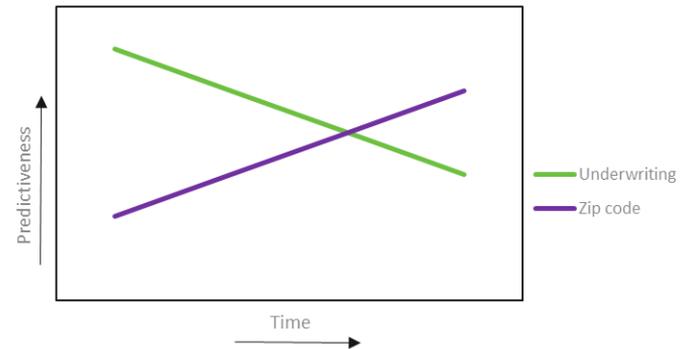
Limitations

- Valuation assumptions driven by claims experience rather than underlying risk
- Select effect drops off after c.15 years, making mortality risk segmentation a challenge
- Definition of underwriting groups changes over time, making experience studies complex

Proposed approach

- Including ZIP+4 code as an additional data point
- Allows for greater understanding of the mortality risks inherent in a block of in force business

Insight over time from underwriting vs ZIP code



VitaCurves^{LIFE}: Applicability

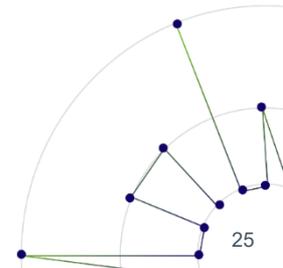


- ✓ Permanent business
- ✓ Mature blocks (past select period)
- ✓ Reserve assumption setting
- ✓ Presence of sizeable claims experience (min. 1k, ideally 5k, deaths since 2015*)
- ✓ Understanding sales performance



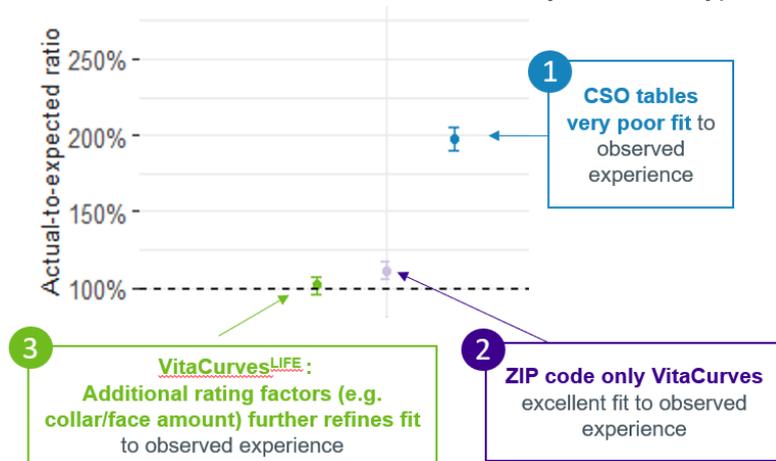
- ✗ Term business
- ✗ New business
- ✗ Pricing assumption setting
- ✗ Limited claims history

*Estimated numbers, may be subject to change.

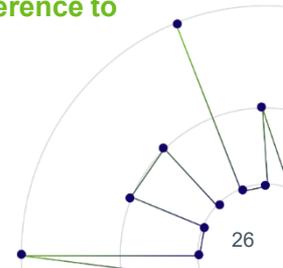


VitaCurves^{LIFE}: proof of concept study results

- We were engaged to complete a study on 2 in force blocks of life business. The blocks contained business written at least 16 years ago, with the majority written from the late 80s to early 2000s. The study years were 2011-2019 to exclude Covid.
- We calculated A/E ratios as the ratio of actual deaths over expected deaths to those expected during that period under each of the tables shown. (In each case with an allowance for mortality improvements).
- The ZIP tables are Club Vita's proprietary mortality tables using gender, age, and ZIP code as the only inputs into the selection of the appropriate qx curve
- The life insurance VitaCurves additionally use collar type and face amount to further refine the qx curve selection



- Club Vita's VitaCurves perform noticeably better than the CSO Smoker Distinct tables
- Club Vita ZIP(+4) tables provide a closer match to experience than SOA CSO tables
- Life insurance VitaCurves provide very close adherence to actual mortality with a tight confidence interval





Partnering for success



54th Annual MUD Conference

Collaboration: pension risk transfer

CLUB VITA

Access to Club Vita's VitaCurves multi-factor baseline model for PRT pricing



Nationwide®



Contribution to Club Vita's VitaBank (anonymized) mortality dataset

Collaboration: thought leadership

CLUB VITA and Nationwide

THE RISK OF LIVING LONGER

Thank you for joining us – the webinar will start shortly

Douglas and Uli ask the ultimate question of human longevity for financial institutions:
How long can we go?

Series program

Session 1 April 16 th , 2024	<i>An introduction to the question of human longevity: how long can we go?</i>	<ul style="list-style-type: none">Dan Ryan, Just GroupPhil Newman, Longevity.technology	Today!
Session 2 May 7 th , 2024	<i>The biology of aging</i>	<ul style="list-style-type: none">Richard Faragher, University of Brighton	Register here
Session 3 May 20 th , 2024	<i>Cancer research</i>	<ul style="list-style-type: none">Xiao Gao, SCORCatherine Pickworth, Cancer Research UK	Register here
Session 4 June 18 th , 2024	<i>Biological clocks</i>	<ul style="list-style-type: none">Peter Joshi, Humanity Inc	Register here
Session 5 July 9 th , 2024	<i>Using AI to improve and advance healthcare</i>	<ul style="list-style-type: none">tbc	Register here

For full details and registration for the series, visit: www.clubvita.net/us/events or follow <http://linkedin.com/company/club-vita>

About the speakers



Erik Pickett

**Actuary & Chief
Content Officer at
Club Vita**



Erin McClintock

**Sr Director of
Underwriting
Innovation at
Nationwide Financial**



Q&A Time

Thank You



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