CLUB VITA

Thank you for joining us – the webinar will start shortly

Public vs private
Is there a sector effect in post-retirement mortality?

June 3rd, 2020

11am ET / 4pm BST

@ClubVita

linkedin.com/company/club-vita

Your panel

Erik Pickett
Webinar chair

Head of Product,
Club Vita

Julie Belair
Panelist

Vice President,
Actuarial Services
and Plan Policy,
OPTrust

Richard Brown
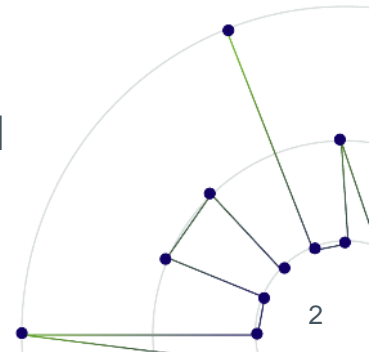**Panelist**

Chief Operating
Officer,
Club Vita Canada

Steven Baxter
Panelist

Head of
Innovation and
Development,
Club Vita

Research paper details

RESEARCH NOTE 20-04

Public vs Private: Is there a sector effect in post-retirement mortality?

🇺🇸

https://www.clubvita.us/collaborative-research/public-vs-private-is-there-a-sector-effect-in-post-retirement-mortality-us

🇬🇧

https://www.clubvita.co.uk/collaborative-research/public-vs-private-is-there-a-sector-effect-in-post-retirement-mortality-1

🇨🇦

https://clubvita.ca/Collaboration/Research

Summary of findings

Public vs Private

1. There is a large diversity of pension plans within both the private and public sectors.

2. Studies showing different longevity patterns between the sectors are heavily affected by the specific plans analyzed.

3. Socioeconomic factors other than sector are better for capturing this diversity. And once you control for these factors, sector has little effect on longevity.

RESEARCH NOTE 20-04
Public vs Private: Is there a sector effect in post-retirement mortality?

Agenda

1. History of public sector / private sector mortality

2. Case study: OPSEU Pension Plan
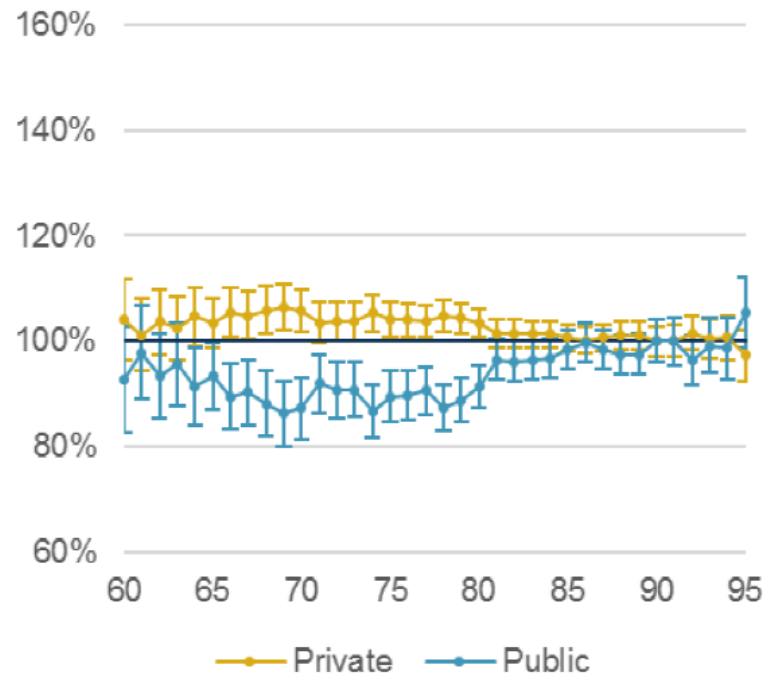
3. Capturing diversity

4. Analyzing sector effects
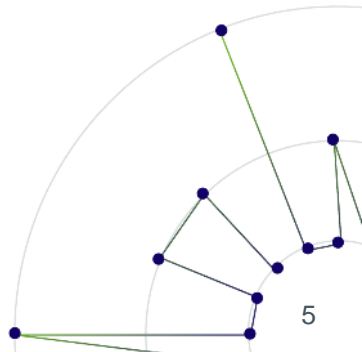
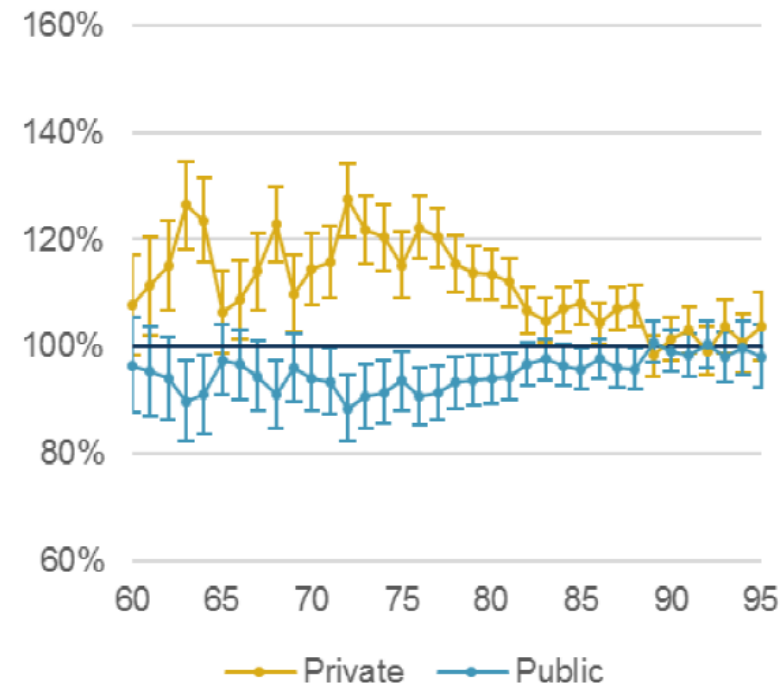# History of public sector / private sector mortality

UK evidence: Continuous Mortality Investigation

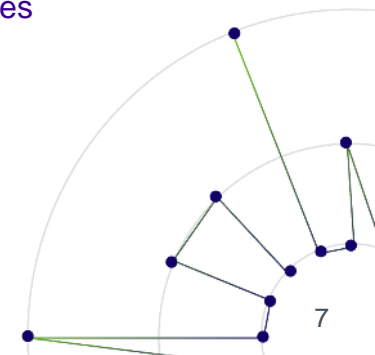CMI working paper 107

Men (S3PMA)

Women (S3PMA)

Shorter lives

Longer lives

Private — Public

Private — Public

Source: Charts 7C and &D from CMI working paper 107,   © Continuous Mortality Investigation Limited

On average people live longer in the public sector

UK evidence: Continuous Mortality Investigation

CMI working paper 113

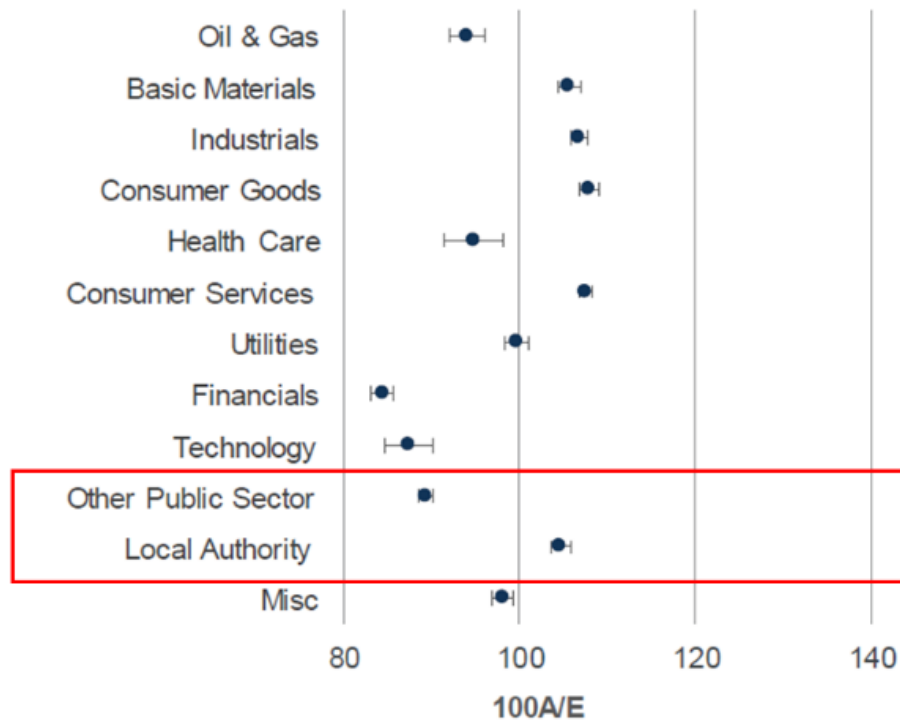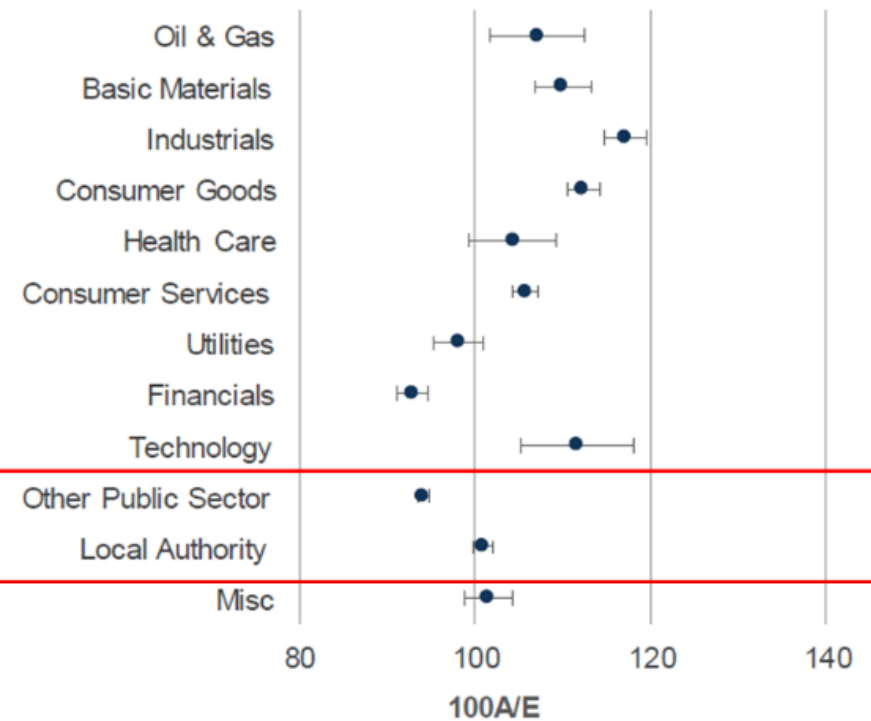**Chart 5H: Male Pensioners**

Longer lives ← → Shorter lives

Oil & Gas	
Basic Materials	
Industrials	
Consumer Goods	
Health Care	
Consumer Services	
Utilities	
Financials	
Technology	
Other Public Sector	
Local Authority	
Misc	

80 100 120 140

100A/E

Chart 5I: Female Pensioners

Longer lives ← → Shorter lives

Oil & Gas	
Basic Materials	
Industrials	
Consumer Goods	
Health Care	
Consumer Services	
Utilities	
Financials	
Technology	
Other Public Sector	
Local Authority	
Misc	

80 100 120 140

100A/E

Source: CMI working paper 113 © Continuous Mortality Investigation Limited. The chart shows the relative weight of mortality rates for different industries in the CMI data set compared with rates expected from their S3 SAPS tables.

*…some public sector plans have longer lives, some have shorter lives*

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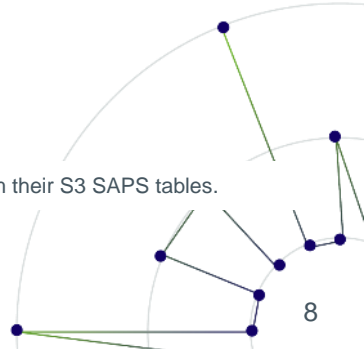
Canadian evidence: Canadian Institute of Actuaries

Canadian Institute of Actuaries split public and private sector data for their 2014 Canadian Pensioners' Mortality (CPM) study due to:

- the significant difference in mortality experience between the sectors; and

- the lack of availability of other factors beyond pension amount.

The development of the CPM tables involved reweighting data to try to counteract disproportionate representation of certain sectors/industries in the underlying data.

Canadian public sector mortality as a percentage of private sector mortality (CPM2014)

Shorter lives

Longer lives

Men — Women
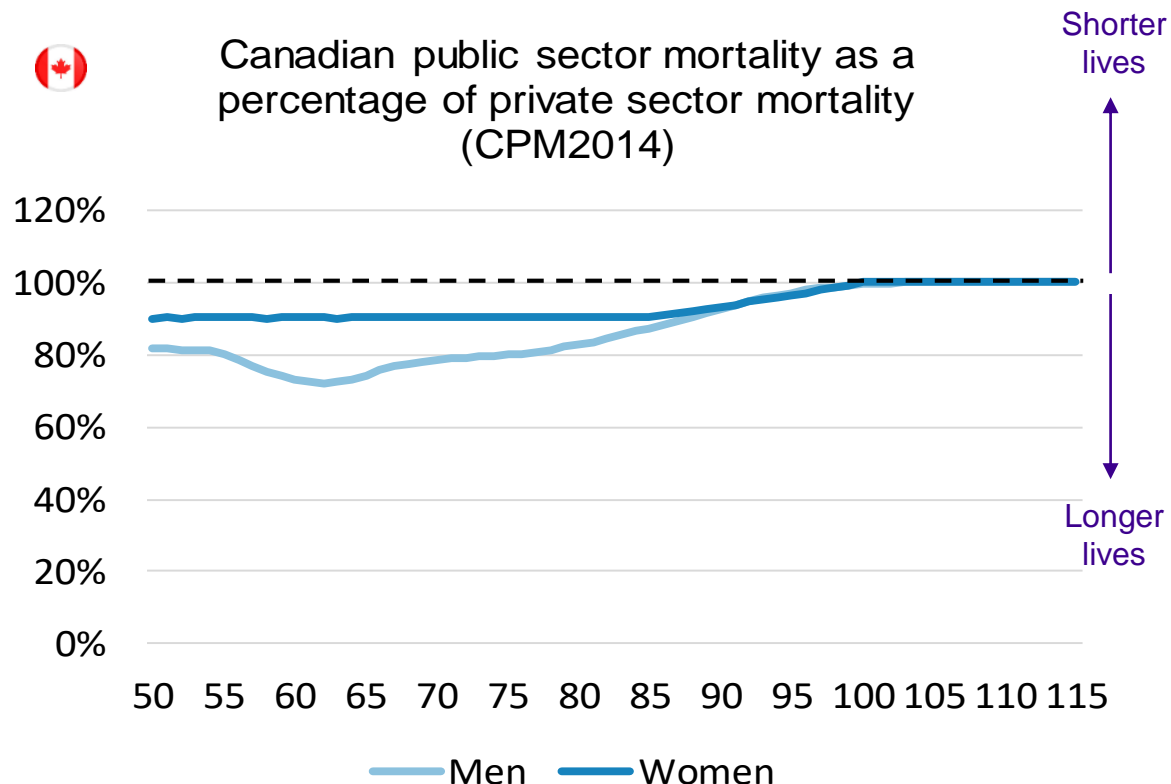
Source: Mortality ratios relate to the CIA's public sector (CPM2014Publ) and private sector (CPM2014Priv) amounts based tables.

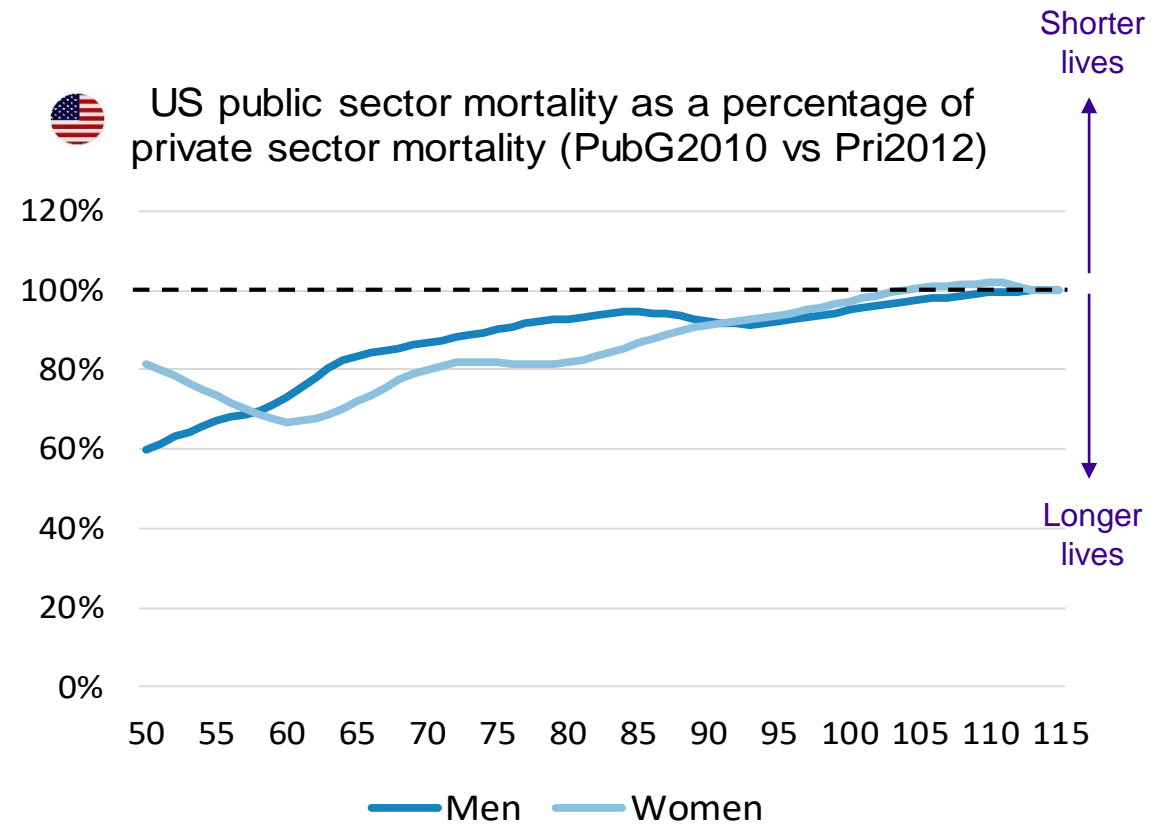"On average people live longer in the public sector"
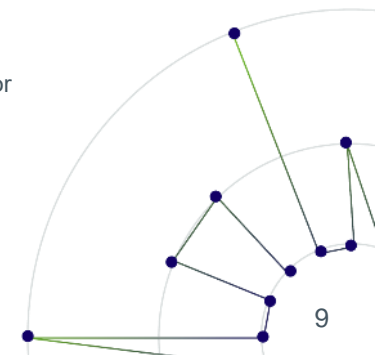
US evidence: Society of Actuaries

The Retirement Plans Experience Committee decided to split out public sector data from the RP2014 analysis of pension plan mortality for the following reasons:

- **Gender differences:** Age-specific male-to-female mortality ratio too different

- **Amounts differences:** Differences in benefit profiles

- **Age-based differences:** Different experience under age 65

- No collar information was submitted for the public plans

Separate data sets used for Pri2012 and Pub2010

US public sector mortality as a percentage of private sector mortality (PubG2010 vs Pri2012)

Source: Mortality ratios relate to "General" public sector (PubG-2010) rolled up from 1 July 2010 effective date to 1 January 2012 to be consistent with Pri-2012. In both cases amounts based tables for healthy retirees used.

"On average people live longer in the public sector"

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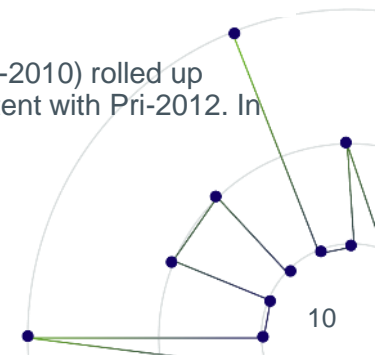
US evidence: academia

CENTER for RETIREMENT RESEARCH at BOSTON COLLEGE

STATE AND LOCAL PENSION PLANS — NUMBER 44, JUNE 2015

DOES MORTALITY DIFFER BETWEEN PUBLIC AND PRIVATE SECTOR WORKERS?

By Alicia H. Munnell, Jean-Pierre Aubry, and Geoffrey T. Sanzenbacher

CONCLUSION

The public sector takes care to align its mortality assumptions to the mortality experience of its members. In practice, this alignment results in assumptions that public sector workers live slightly longer than private sector workers. The data in the NLMS PUMS seem to support this idea – especially for women. The explanation for this lower mortality turns out to be relatively simple: the public sector tends to employ more educated workers on average than the private sector, and these workers are less likely to die over a given period. After controlling for education, the rates of mortality between public and private sector workers are comparable.

Munnell et al, 2015

Controlling for socioeconomic factors removes apparent public/private difference.
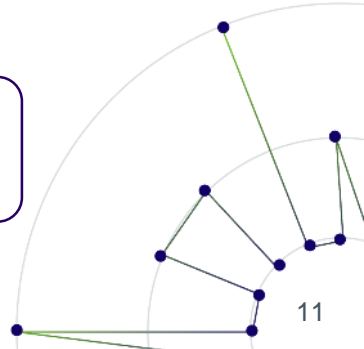
UK and Canadian evidence: Club Vita

VITALSTATISTICS

Founded
2008

3.0m+
retirees

1 in 4
DB pensioners

230+
Pension plans

1.5m+
death records

Plan by plan life expectancy in the UK

Plan by plan life expectancy in Canada

VITALSTATISTICS

Founded
2015

750k+
retirees

1 in 4
DB pensioners

65+
Pension plans

250k+
death records

Large diversity between different plans
Conclusion: difference in average life expectancy depends on the plans in your data set

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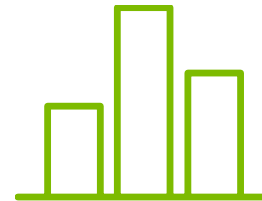# Case study: OPSEU Pension Plan

About OPSEU Pension Plan and OPTrust
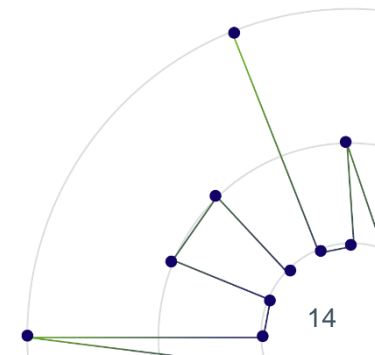
A defined benefit and jointly sponsored pension plan

One of the **Top 10** public sector pension funds in Canada

Over 96,000 members

Almost $22 billion in net assets
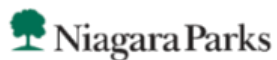
All public sector workforces are not the same

Distribution of CPM Public exposure amounts by industry

CPM Public

	Services including Medical & Social	Educational Institutions	Public Admin or Gov't	Police, Fire or Military
Females	33%	26%	41%	
Males	19%	17%	55%	9%
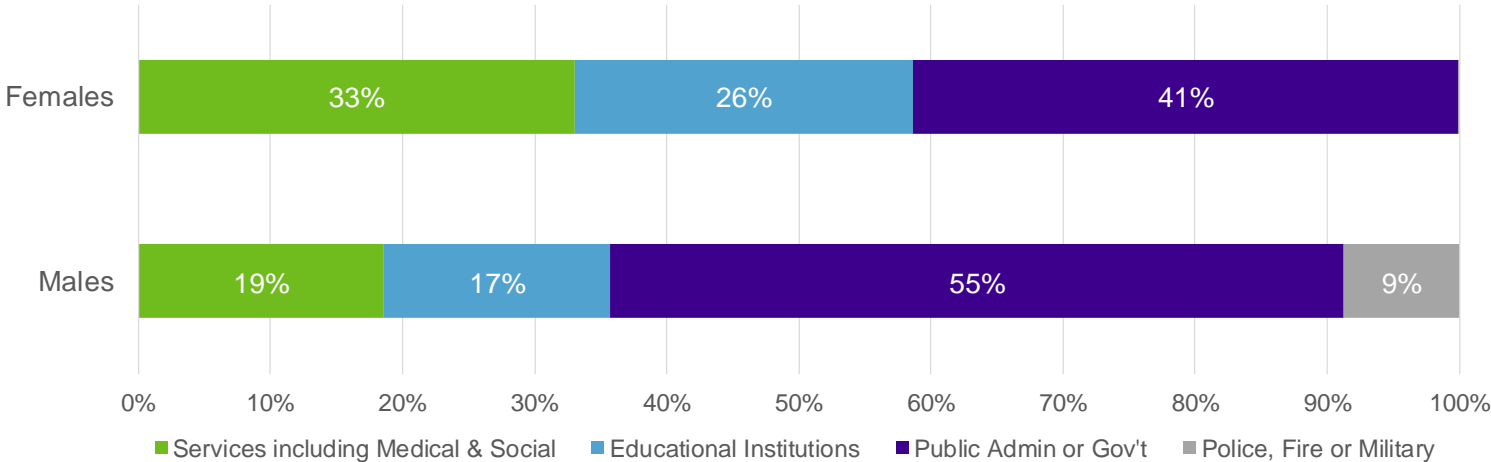
Distribution of OPTrust pensioners by industry

OPTrust

	Health & Long Term Care	Public Admin or Gov't	Correctional Services
Females	18%	74%	7%
Males	9%	79%	12%

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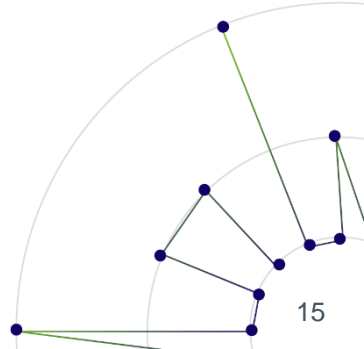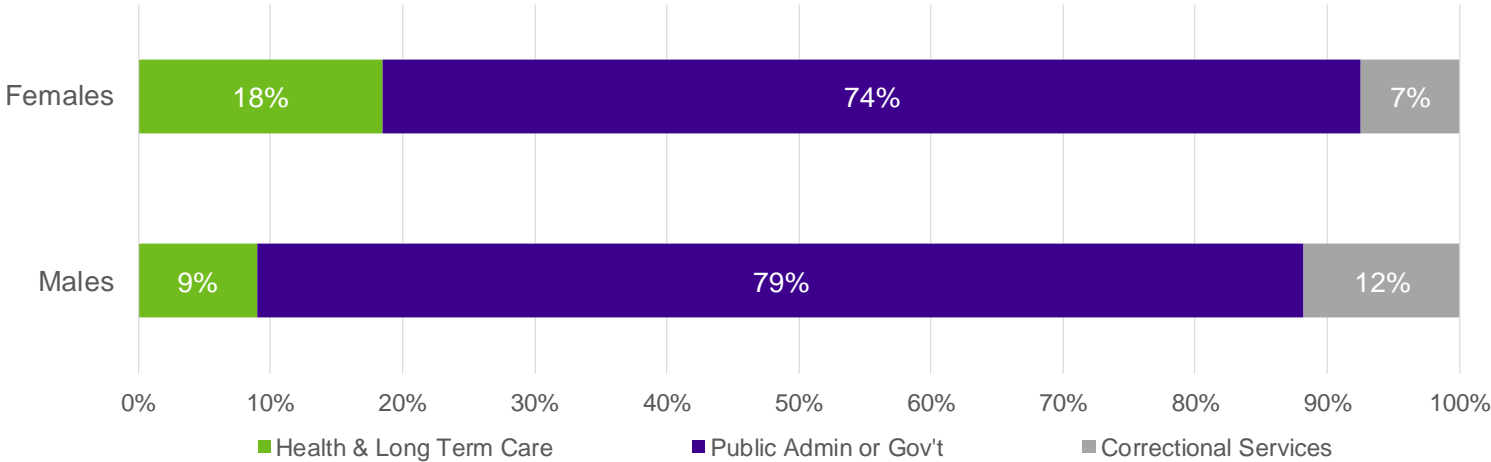
Occupation and affluence profile

Occupation profile - male members

Actives	57%	43%
Deferreds	57%	43%
Pensioners	60%	40%

0% 20% 40% 60% 80% 100%

■ Manual ■ Non-manual
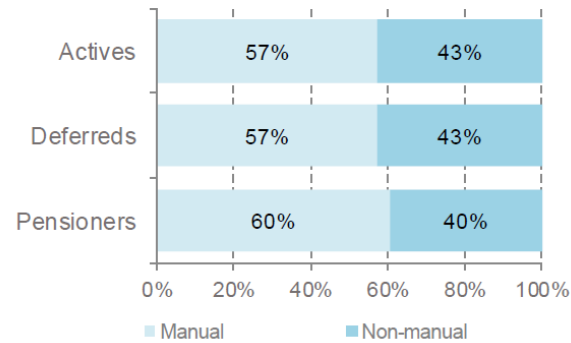
Occupation profile - female members

Actives	34%	66%
Deferreds	43%	57%
Pensioners	32%	68%

0% 20% 40% 60% 80% 100%

■ Manual ■ Non-manual
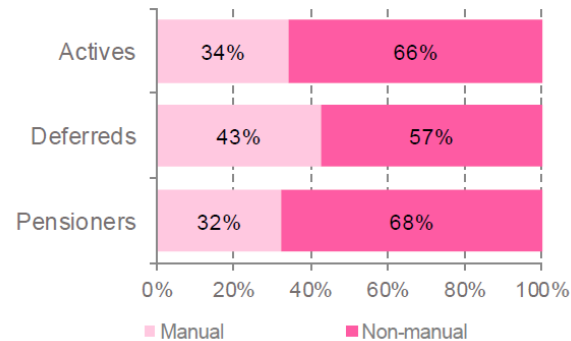
Distribution of annual pension in payment
(All pensioners excluding survivors, revalued to 2017)

Men - all
Men - manual
Men - non-manual
Women - all
Women - manual
Women - non-manual

Orange markers denote where your Plan's median lies against the total pensioner

$0 $10,000 $20,000 $30,000 $40,000 $50,000 $60,000

Annual pension, revalued to 2017 with CPI
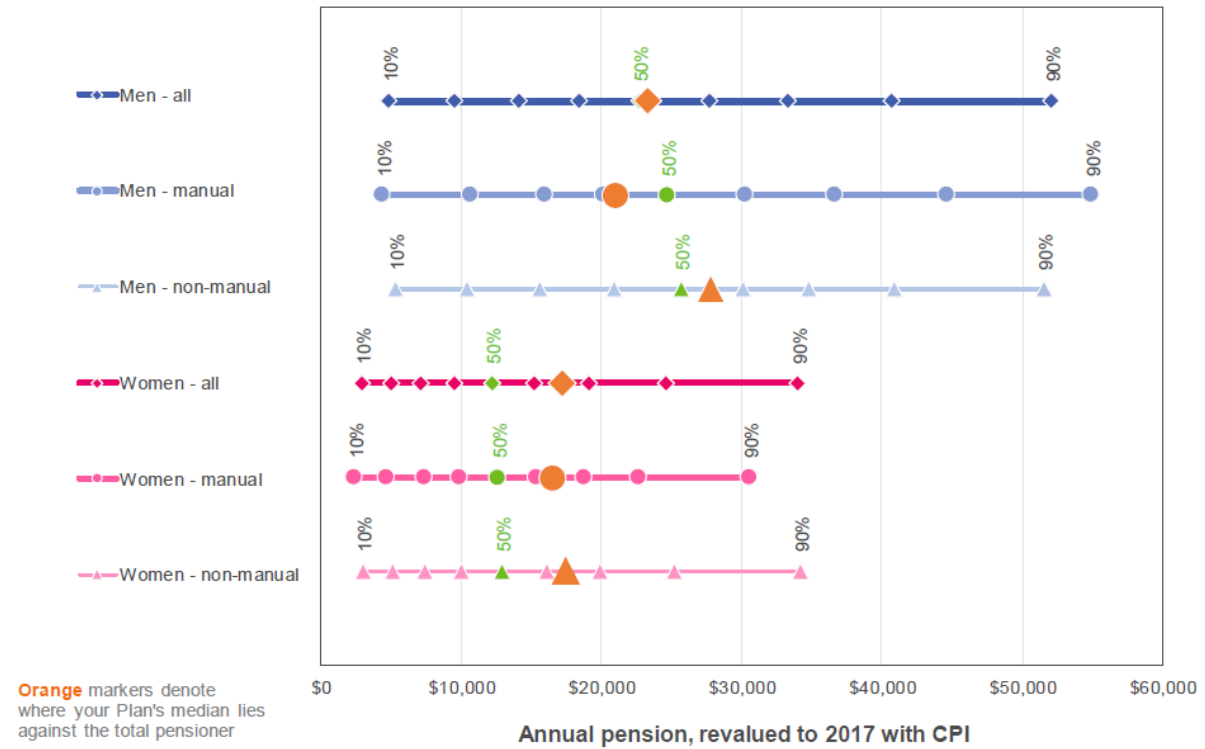
Fairly heavily weighted toward manual (i.e., blue collar) occupations with average pension income level for men and slightly above average for women

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CPM Public mortality expectations not representative

Plan experience over five years to December 31, 2017 split by age group

Notes: Expected death amounts projected to each exposure year based on MI-2017. Error bars represent 95% confidence intervals.
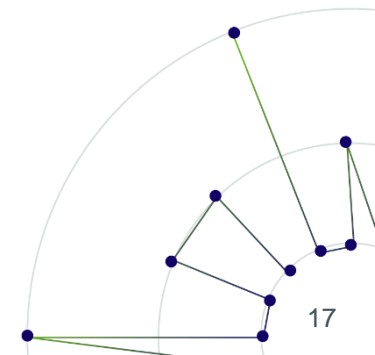
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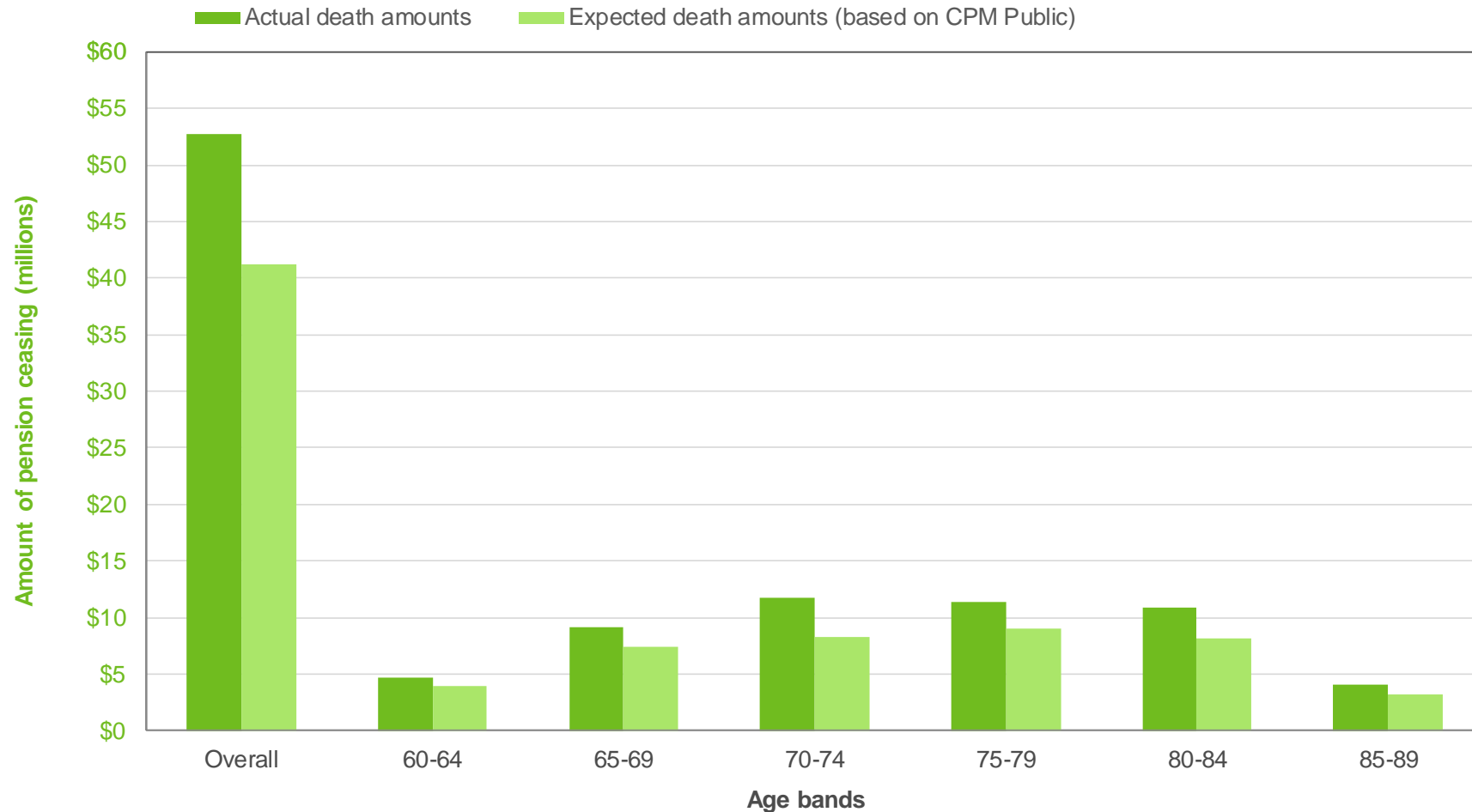
CPM Public mortality expectations not representative

Plan experience over five years to December 31, 2017 split by age group

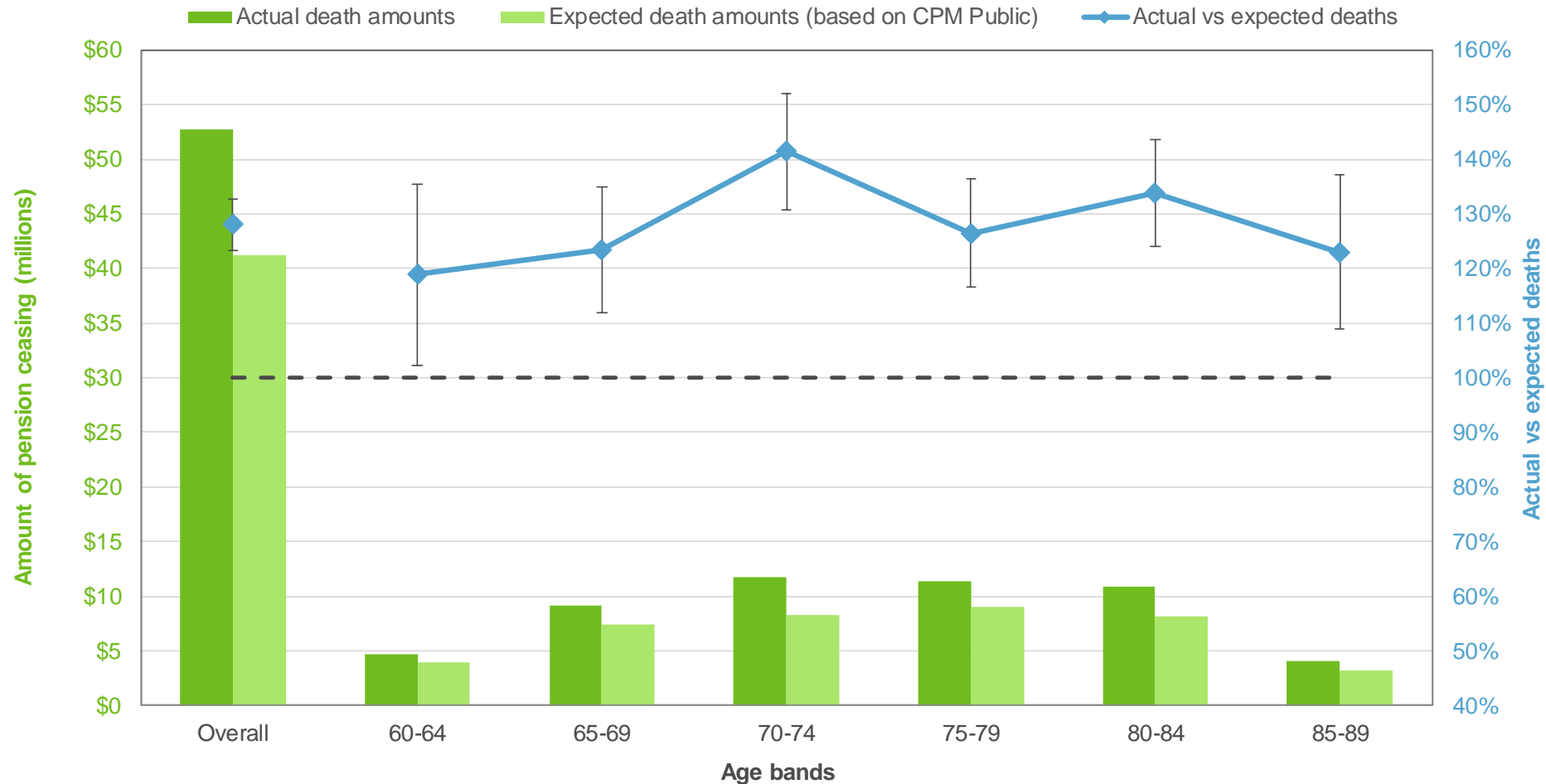
Notes: Expected death amounts projected to each exposure year based on MI-2017. Error bars represent 95% confidence intervals.

Mortality expectations after incorporating membership profile using VitaCurves

Plan experience over five years to December 31, 2017 split by age group

Notes: Expected death amounts projected to each exposure year based on MI-2017. Error bars represent 95% confidence intervals.
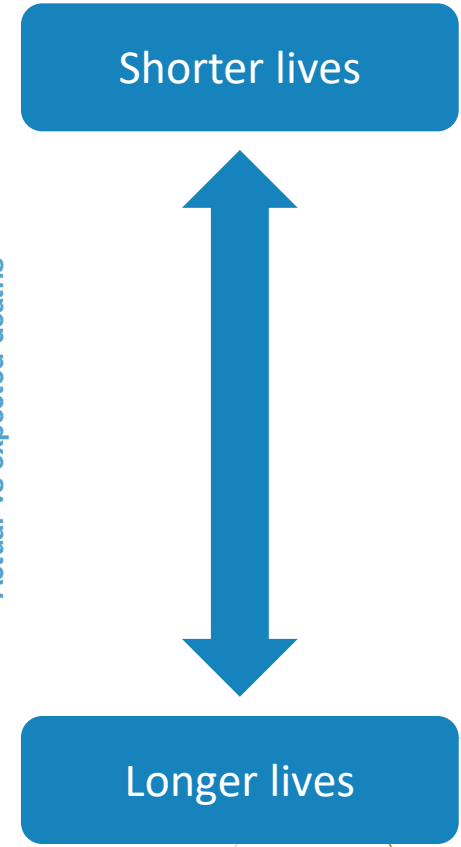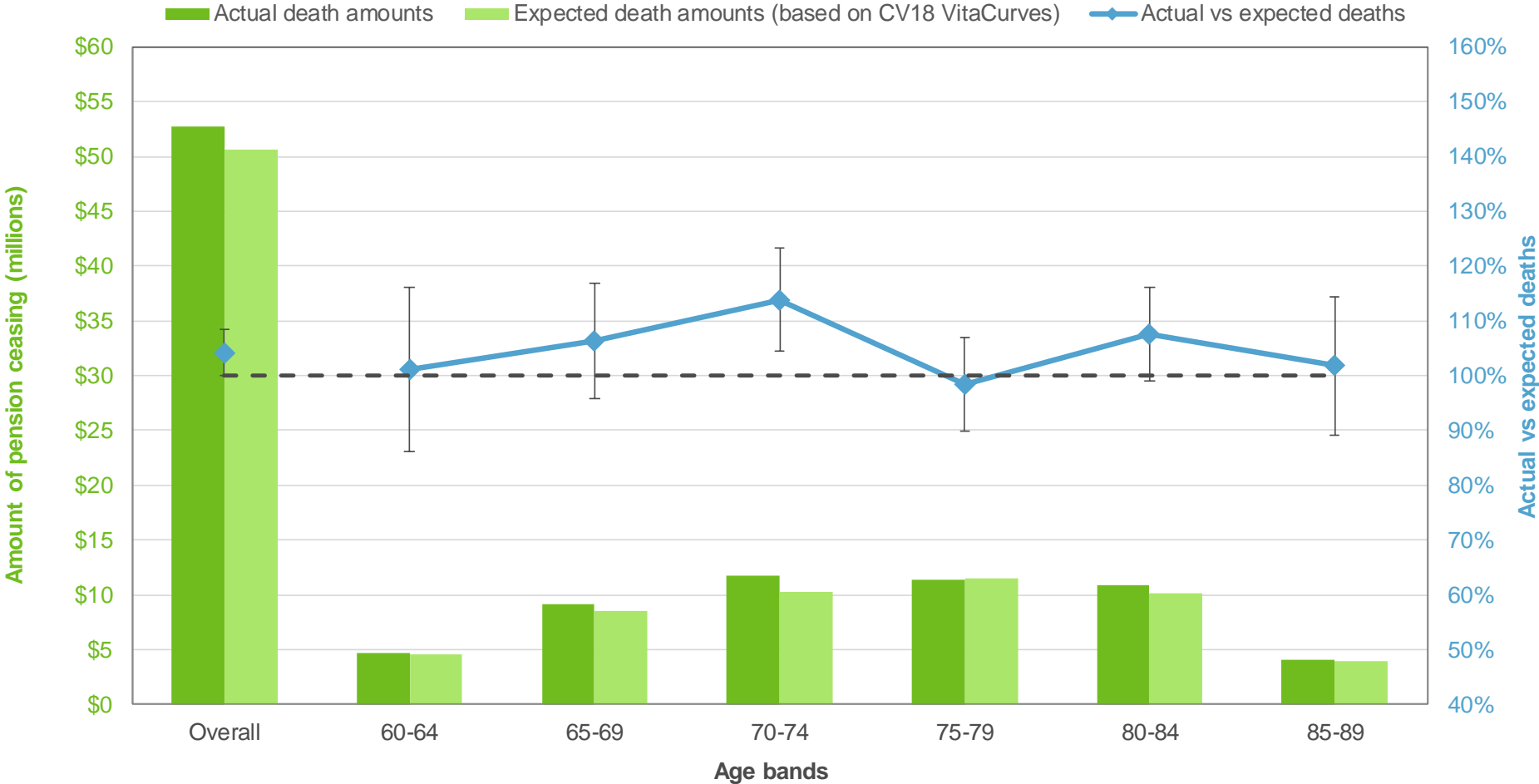
Capturing diversity

What affects how long people live?

Lifestyle

Affluence

Occupation

Health

Marital status
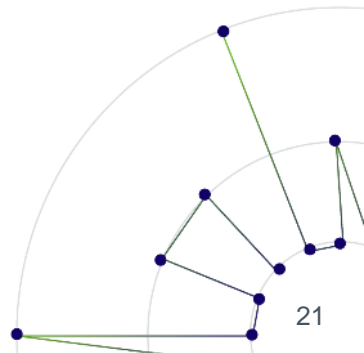
Sector

VitaCurves baseline model

Postcode / ZIP code

Pension / salary

Manual / non-manual

Disability / ill health?

Pension form

Public/private

Generalized Linear Modeling used to calculate the effect of each factor on longevity

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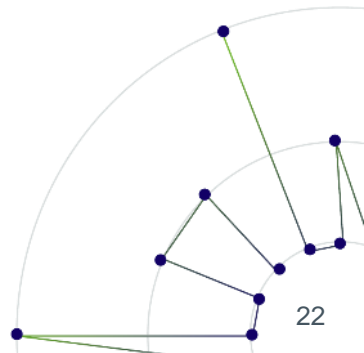
Generalized Linear Model (GLM)

Chance of dying over next year

Transformed onto a "log" or "logistic" scale so <u>broadly</u> linear with age

Age

Fit curves to across different combinations of affluence, postal code, occupation etc... <u>simultaneously</u>
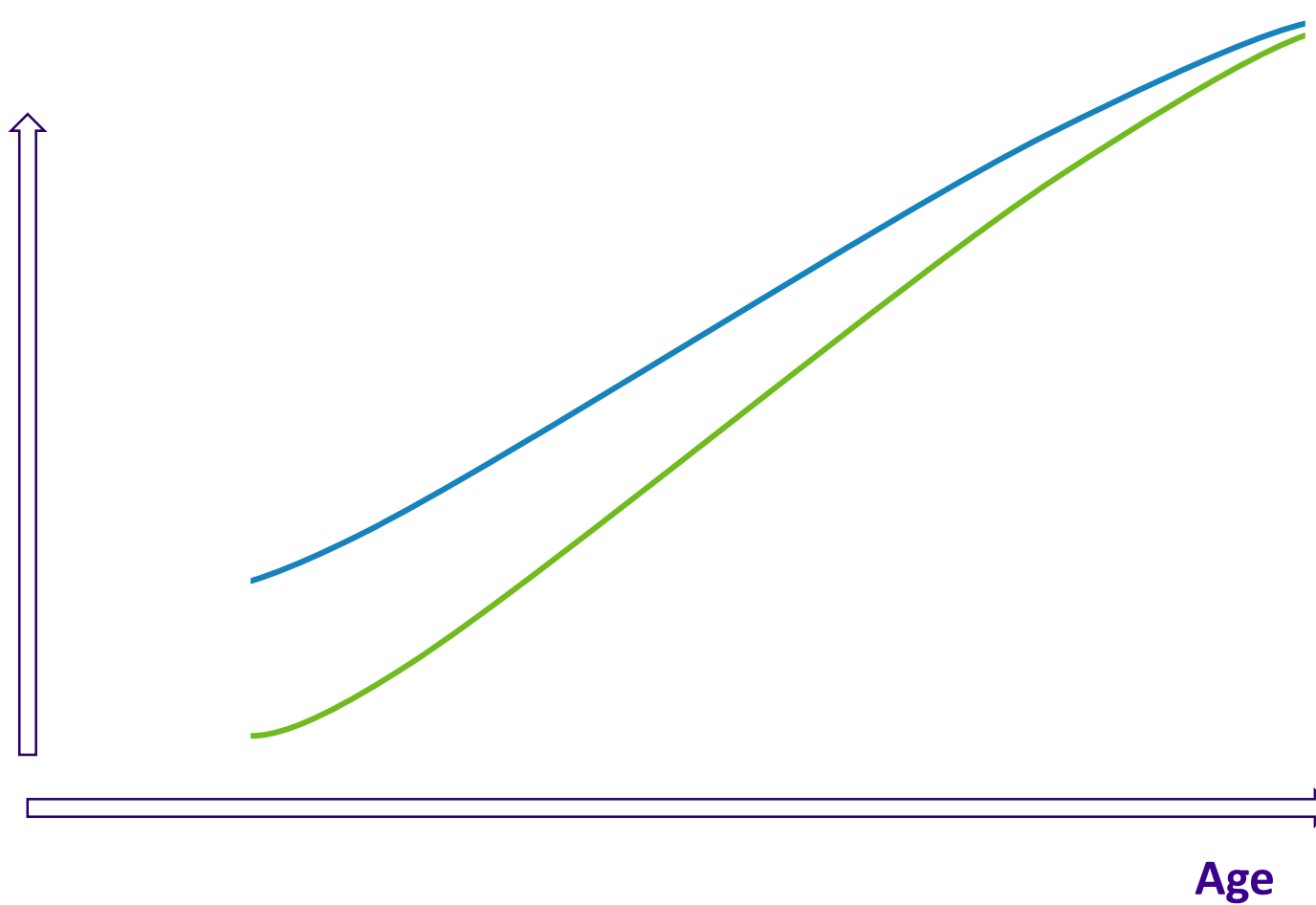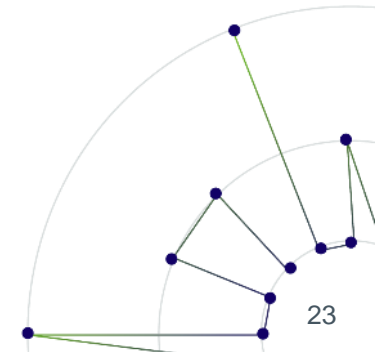
Maximises the predictive power of the data

Developing an international longevity currency

The importance of each of the factors is remarkably similar in each of our countries

VITACURVES™

	UK ◄ ►		Canada ◄ ►		USA ◄ ►	
Total spread	**12 years**		**10 years**		**9½ years**	
Gender specific spread	10½	8½	7	7½	8½	6½
Retirement health	2½	3	½	2	1	1
"Normal health" spread	8	5½	6½	6	7½	6
Lifestyle	4¼	4½	2¾	3½	3¼	3½
Affluence	3½	½	2	2½	3¼	1½
Occupation	¼	½	1¼	<¼	1¼	1

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Effects shown are the impact of changing one rating factor in isolation. Precise impacts depend on order of changing variables and so above reflects broad quantum and therefore relative importance of each variable. Sums may not add due to rounding.

Analyzing sector effect in a GLM

Capturing the sector effect

Two ways to introduce public/private sector into Club Vita approach:

- Split the data (**"stratify"**)

All data

Public sector

Private sector

| Postcode |
| Affluence |
| Employment type |

| Postcode |
| Affluence |
| Employment type |

Two models, half the data each
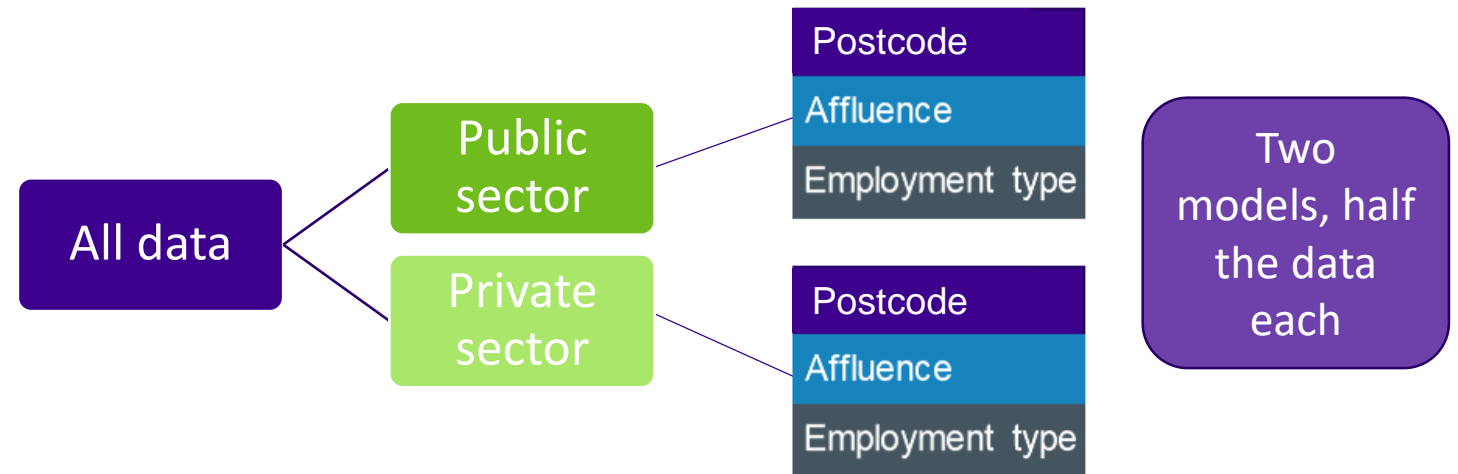
- Introduce public/private as an extra variable (**"covariate"**)

All data

| Postcode |
| Affluence |
| Employment type |
| Public/private |

One model with all the data
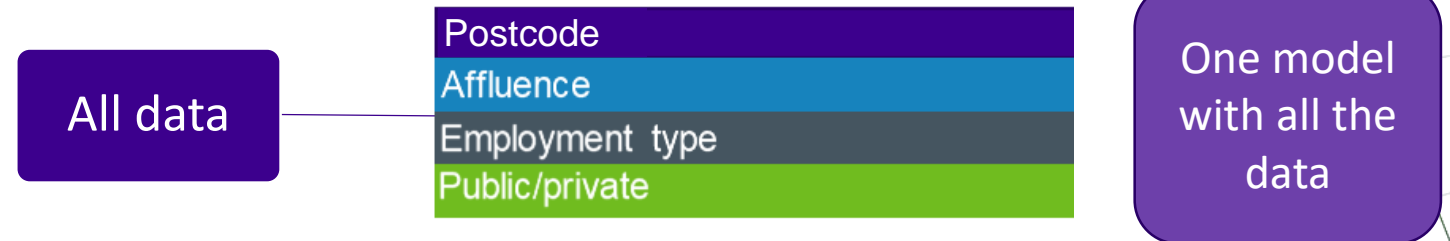
Should we split the data?

Reasons to split the data (stratify):

1. Fundamental **difference in meaning** of predictors

2. Fundamental **differences to shape** of mortality curves (e.g. disabled versus normal health)

Normal health vs ill health mortality (UK men 2015-2017 data)

y-axis: logit(qx)

• Normal health   • Ill health
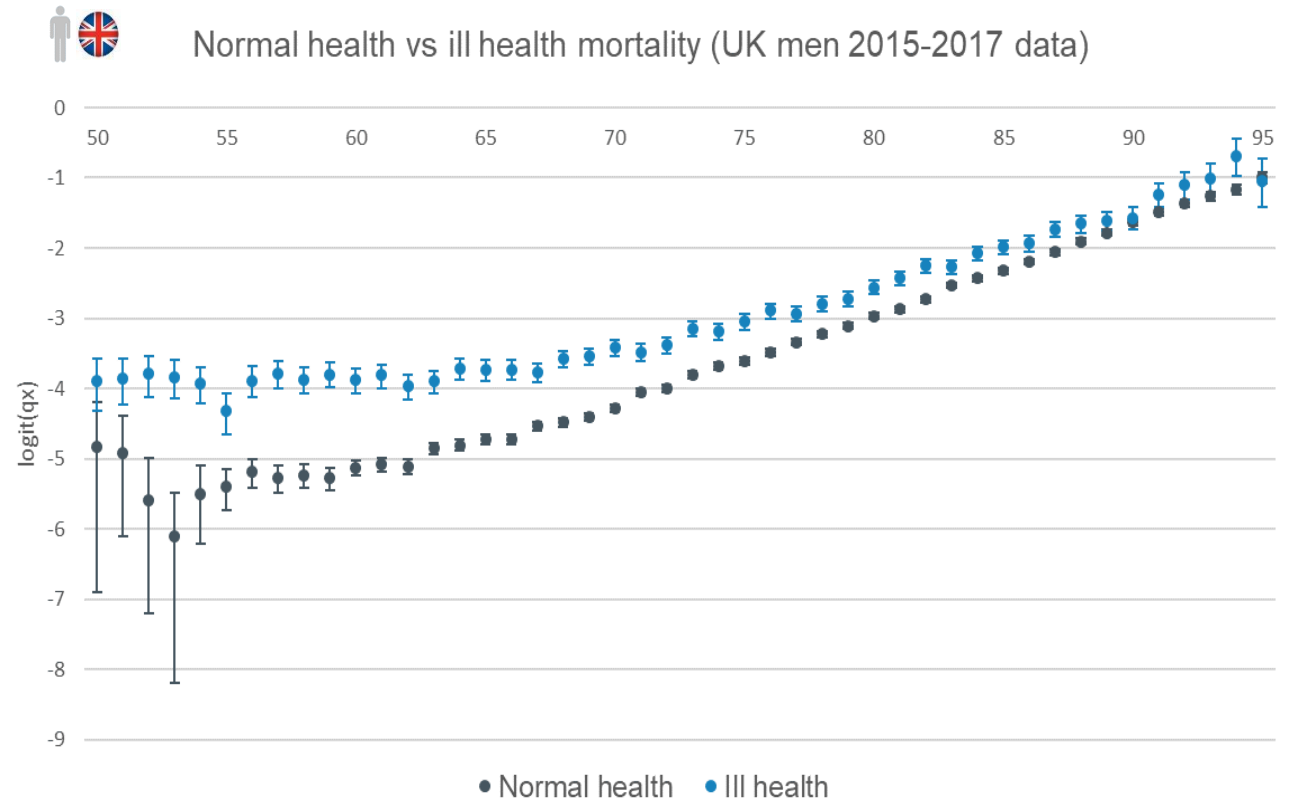
Source: Crude mortality rates with 95% confidence intervals, 2015-2017 Club Vita data

General shape of mortality with age
No fundamental difference between public & private

Public vs Private Sector mortality
(UK men 2015-2017 data)

- Public sector
- Private sector

Public vs Private Sector mortality
(UK women 2015-2017 data)

- Public sector
- Private sector
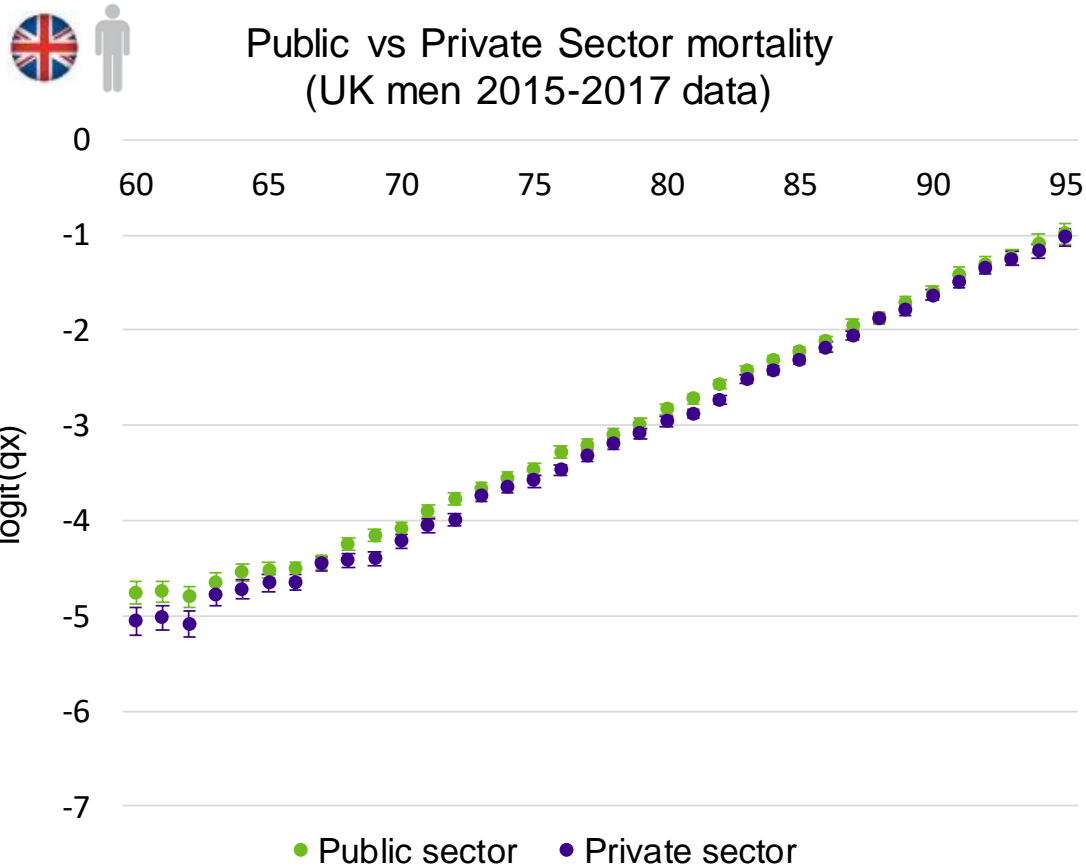
Source: Crude pensioner mortality rates with 95% confidence intervals, 2015-2017 normal health (UK)

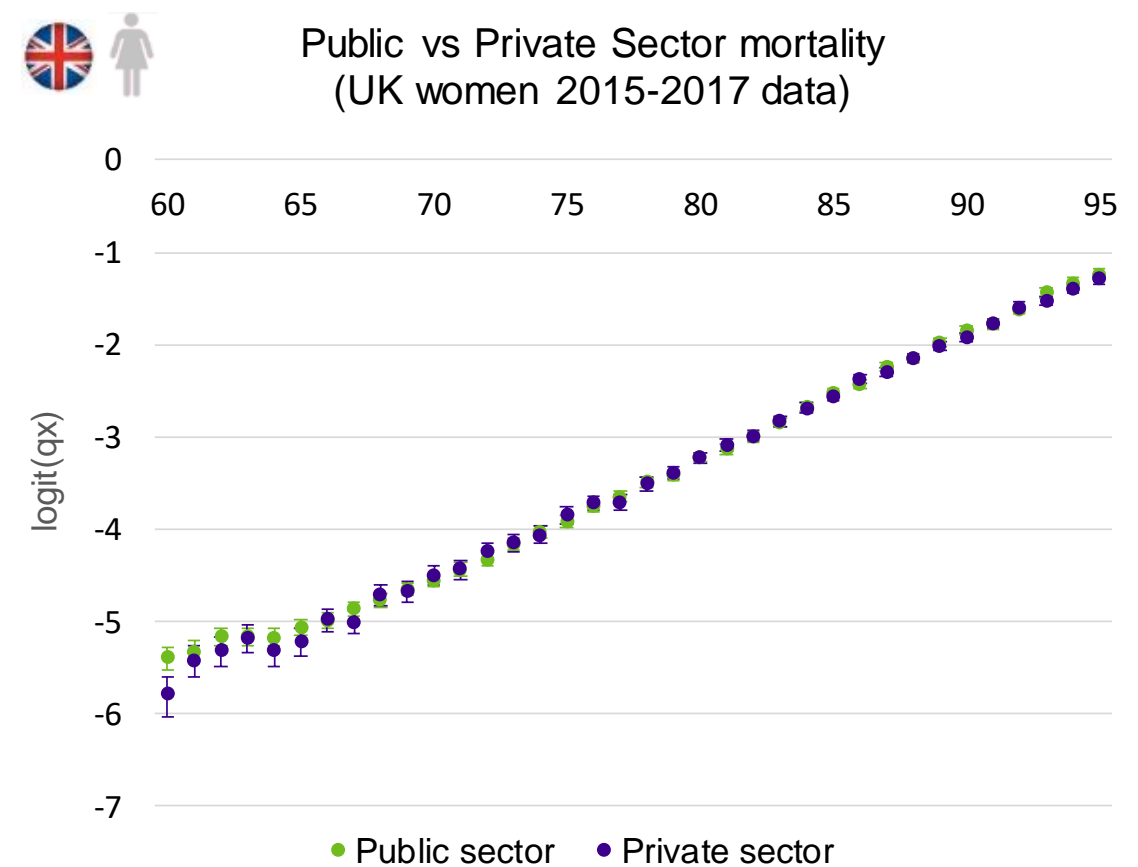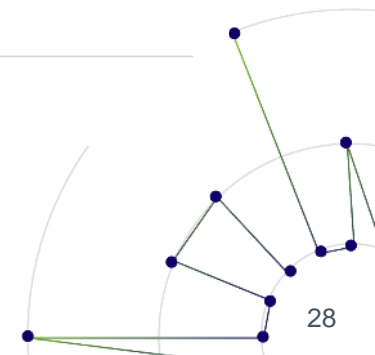# General shape of mortality with age
No fundamental difference between public & private

Public vs Private Sector mortality (Canada men 2014-2016 data)

logit(qx)

● Public sector ● Private sector
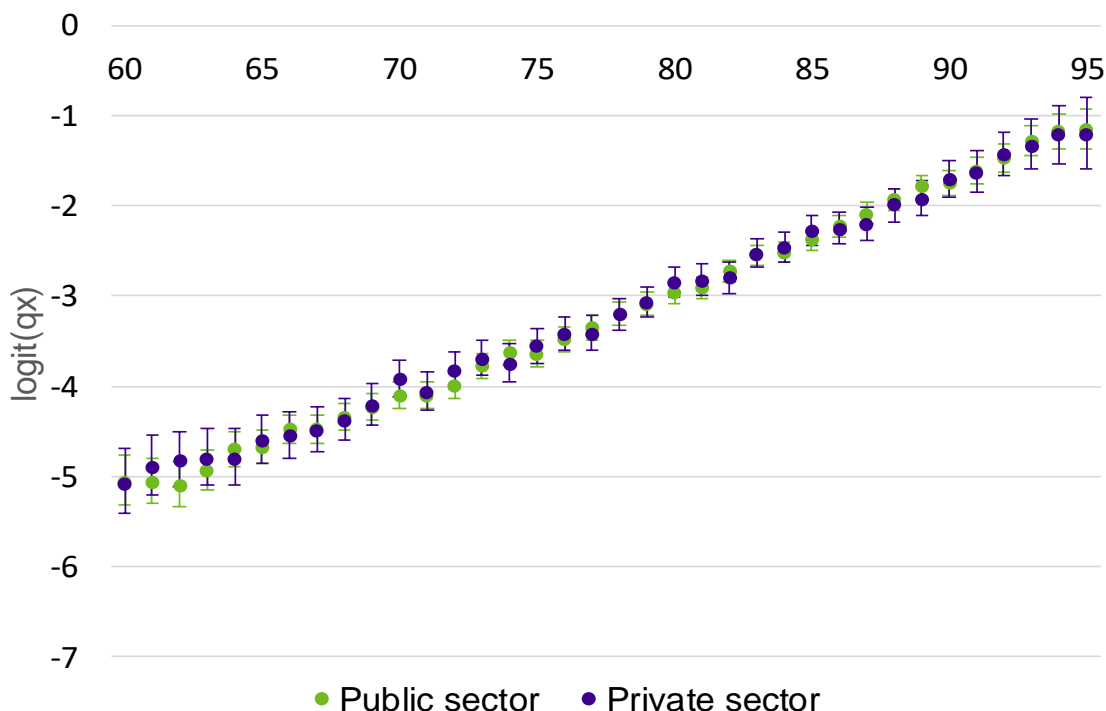
Public vs Private Sector mortality (Canada women 2014-2016 data)

logit(qx)

● Public sector ● Private sector
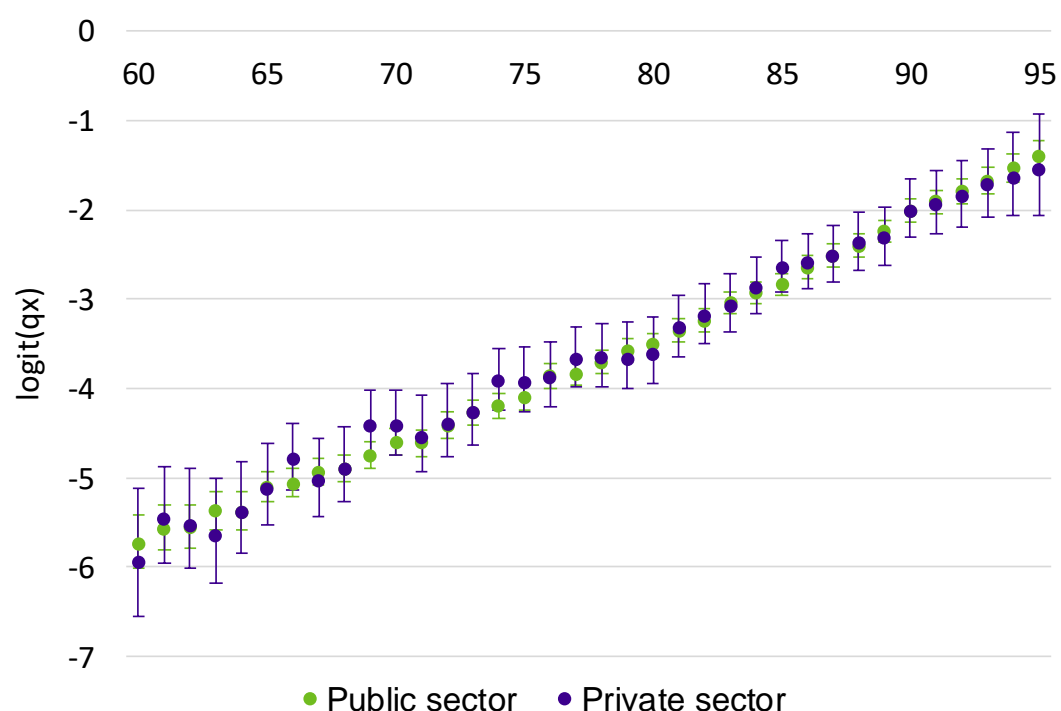
Source: Crude pensioner mortality rates with 95% confidence intervals, 2014-2016 all health (Canada)

Should we add sector as a "covariate"?

Possible predictor 1

Possible predictor 2

Possible predictor 3
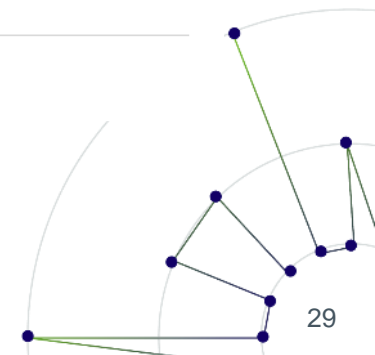
} Single most predictive variable
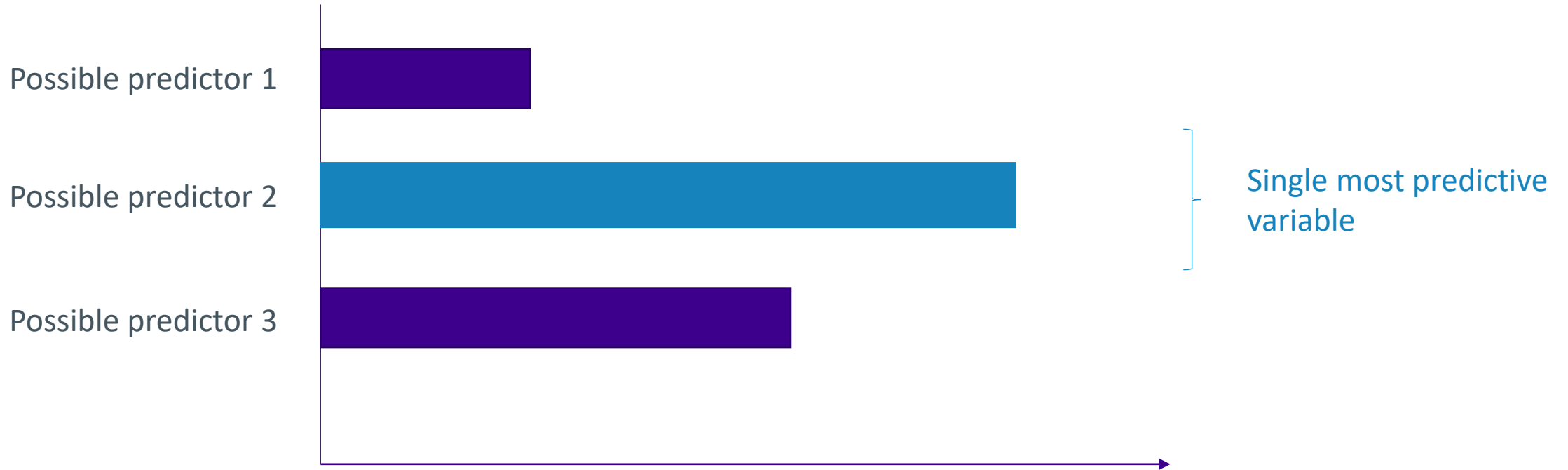
Improvement in **AIC** versus having no predictors

↑

A statistical measure of how well model fits the data (observed deaths) with a *penalty* which prevents spurious complexity

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Should we add sector as a covariate?

AIC after adding one covariate - UK men

Public/private	
Longevity group (postcode)	
Pension amount	
Occupation	

0 -500 -1000 -1500 -2000 -2500 -3000 -3500

AIC after adding one covariate - Canadian men

Public/private	
Longevity group (postal code)	
Pension amount	
Occupation	
Pension form	

0 -50 -100 -150 -200 -250 -300 -350

AIC after adding one covariate - UK women

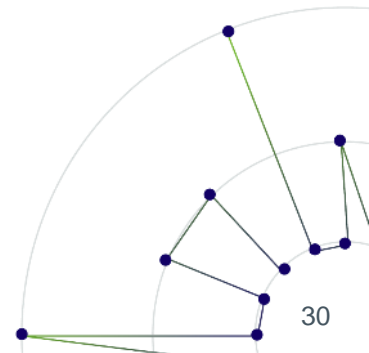|	
Public/private	
Longevity group (postcode)	
Pension amount	
Occupation	

0 -200 -400 -600 -800 -1000 -1200

AIC after adding one covariate - Canadian women

Public/private	
Longevity group (postal code)	
Pension amount	
Occupation	
Pension form	

0 -50 -100 -150 -200 -250 -300 -350
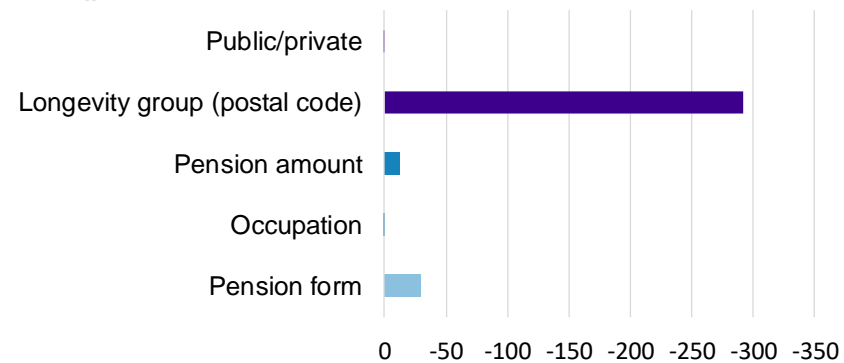
Longevity group (postcode) by far most predictive
Public/private sector has very little benefit on its own
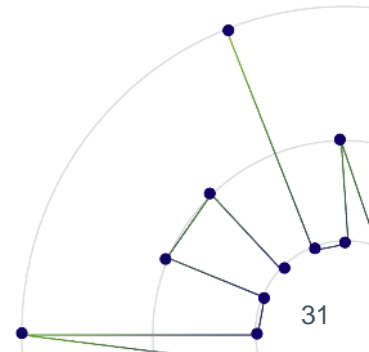
Should we add sector as a covariate?

AIC after adding fourth covariate - UK men

① Longevity group (postcode)
② + Pension amount
③ + Occupation
④ + Public/private

0   -1000   -2000   -3000   -4000

■ Longevity group   ■ Pension amount   ■ Occupation   ■ Public/private

Should we add sector as a covariate?

AIC after adding fourth covariate - UK men

Longevity group (postcode)
+ Pension amount
+ Occupation
+ Public/private

0   -1000   -2000   -3000   -4000

■ Longevity group   ■ Pension amount   ■ Occupation   ■ Public/private

AIC after adding fifth covariate - Canadian men

Longevity group (postal code)
+ Occupation
+ Pension amount
+ Pension form
+ Public/private

0   -100   -200   -300   -400   -500

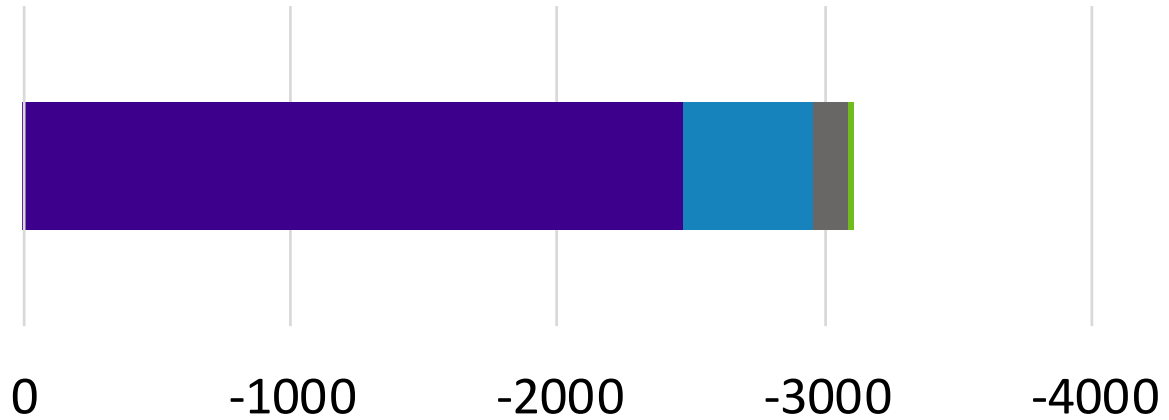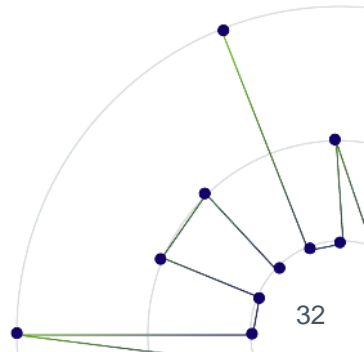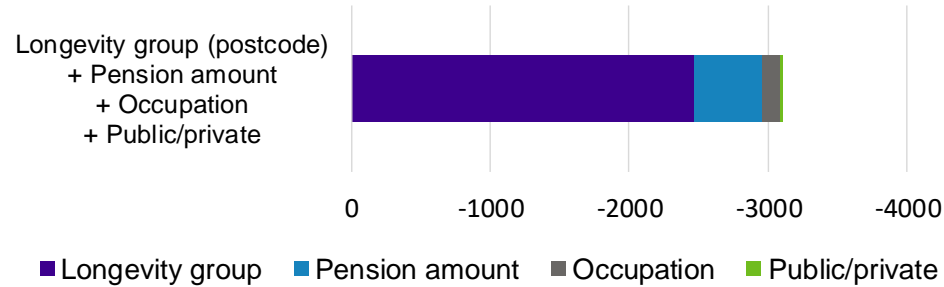■ Longevity group   ■ Occupation   ■ Pension amount   ■ Pension form

AIC after adding fourth covariate - UK women

Longevity group (postcode)
+ Pension amount
+ Occupation
+ Public/private

0   -500   -1000   -1500

■ Longevity group   ■ Occupation   ■ Public/private   ■ Pension amount

AIC after adding fifth covariate - Canadian women

Longevity group (postal code)
+ Occupation
+ Pension amount
+ Pension form
+ Public/private

0   -50   -100   -150   -200   -250   -300   -350

■ Longevity group   ■ Pension form   ■ Pension amount   ■ Occupation

UK men, Canadian men and Canadian women: Sector adds little to no benefit
UK women: Sector adds some marginal benefit

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Summary of findings

Public vs Private

1. There is a large diversity of pension plans within both the private and public sectors.

2. Studies showing different longevity patterns between the sectors are heavily affected by the specific plans analyzed.

3. Socioeconomic factors other than sector are better for capturing this diversity. And once you control for these factors, sector has little effect on longevity.

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RESEARCH NOTE 20-04

Public vs Private: Is there a sector effect in post-retirement mortality?

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Questions

Questions?

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Public vs Private: Is there a sector effect in post-retirement mortality?

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https://www.clubvita.us/collaborative-research/public-vs-private-is-there-a-sector-effect-in-post-retirement-mortality-us

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https://www.clubvita.co.uk/collaborative-research/public-vs-private-is-there-a-sector-effect-in-post-retirement-mortality-1

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