The nature and development of international longevity swap markets
13 September 2022
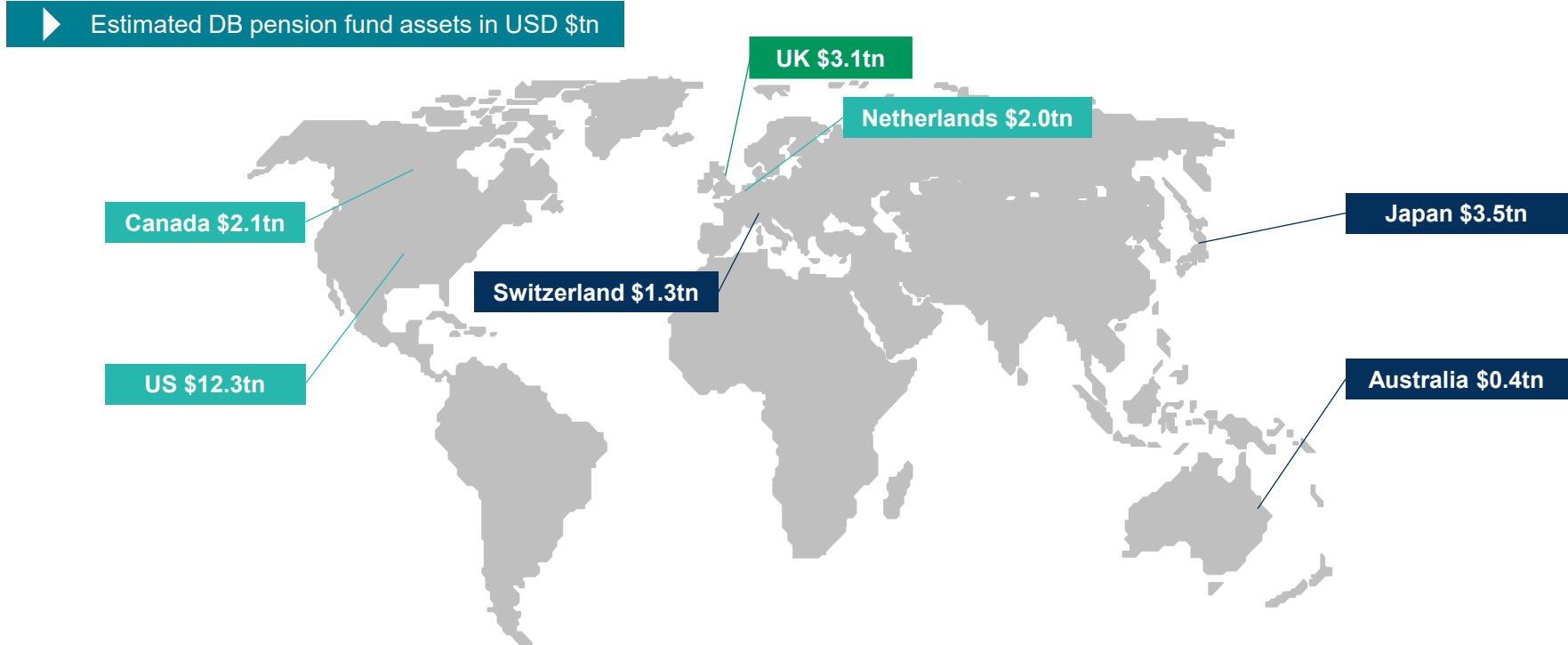
Chris Pigott, Senior Longevity Actuary
Jessica Elkin, Commercial Longevity Actuary

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Image: 3alexd

Agenda

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Global defined benefit pension plan exposure

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Estimated DB pension fund assets in USD $tn

UK $3.1tn

Netherlands $2.0tn

Canada $2.1tn

Japan $3.5tn

Switzerland $1.3tn

US $12.3tn

Australia $0.4tn

Global longevity developments

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- Global longevity risk transfer (bulk annuities and longevity swaps) is dominated by UK transactions

- …although in recent years there have been a number of notable deals in the US, Canada and the Netherlands

US$38bn of PRT deals in US written in 2021

Pension risk transfer deals with Lockheed Martin in US of US$4.9bn in August 2021 and $4.3bn in June 2022

AEGON longevity reinsurance transactions in the Netherlands covering €38bn of liabilities from 2012-2021

CAD$1.8bn PRT deal by GM Canada in 2020. CAD$7.7bn PRT transactions in 2021

Manulife reinsured group and individual totalling US$12bn in the US and covering 100,000 Canadian annuitants in 2018 and 2019

NN Life in the Netherlands completed €17.5bn longevity reinsurance transactions in 2020 and 2021

Characteristics of an attractive market – reinsurer perspective

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Large pension market

Whole of life income market

Existence of large pension funds

>US $1 bn PV liabilities

Market ready to de-risk at an acceptable price

Drivers to de-risk

Regulatory requirements

Evidence of longevity risk and trend

Positive mortality improvements

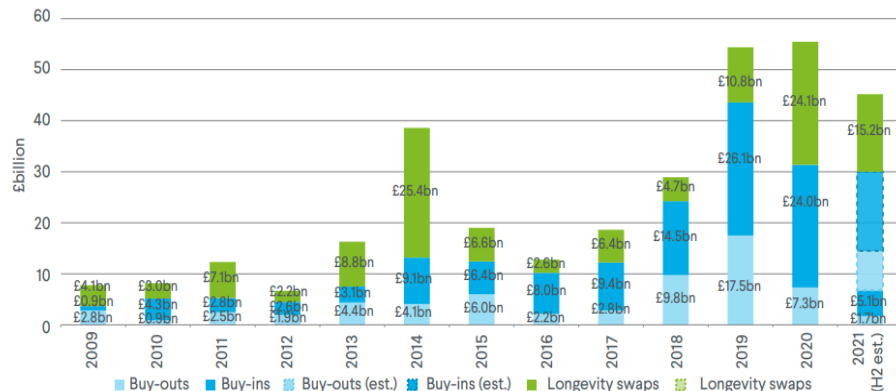Adequate data available to produce suitable basis
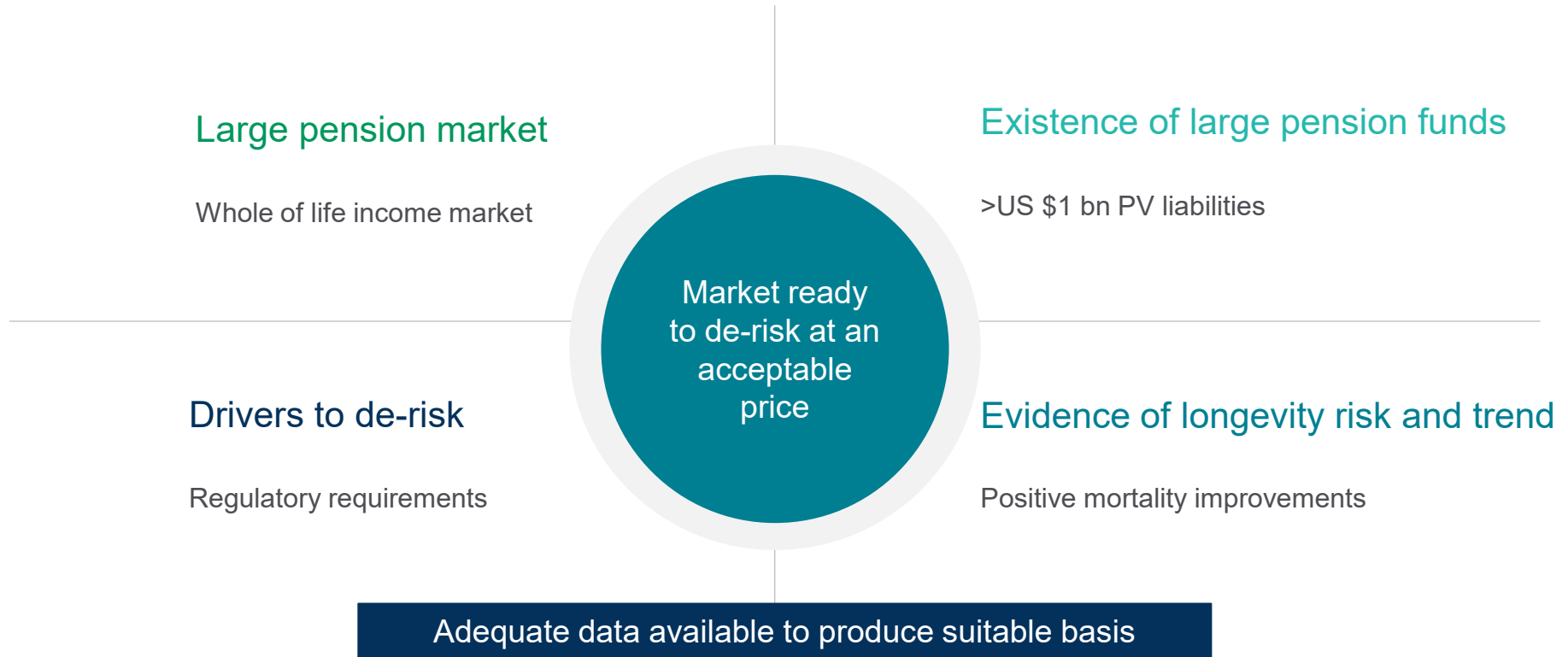
The UK – a well-established market

Market

- Significant **volume of transactions**, predicted to continue over the next decade at around £50bn pa
- Growth of **deferreds and full asset trades** in derisking solutions

Basis

- **Credible mortality experience data** widely available
- Alignment of view between **pension schemes** and **providers** on base tables/improvements (e.g. SAPS, CMI model). Multiple industry base tables

Market Developments

- Standardisation of structure (indemnity-only); consistent collateral structures and legal terms
- Smaller transaction sizes, <£500m
- Fewer participants with greater experience and efficiency
- Pension freedoms (fewer individual annuities, more BPAs)
- Solvency II leading to sale of annuity backbooks and reinsurance of longevity risk
- Covid-19 demonstrated the advantages of a well-hedged mortality/longevity balance

Volume of risk transfer deals since 2009

Developing longevity market

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	Netherlands	US	Canada
Market	▪ Dutch DB pension assets over 2x GDP ▪ Collective culture with large umbrella schemes currently held under insurers	▪ Huge market for risk settlement ($3tn of private DB pension liabilities) ▪ Buy-ins are an increasingly popular way to lock in insurer pricing, without waiting for the long period to get to buy-out	▪ PRT activity doubled 2013-18 to reach sales of CAD $4.6bn ▪ Record breaking 2021 with $7.7bn of business written
Basis	▪ Good data available for mortality base and trend ▪ Regularly published industry tables with published methodology	▪ Good data available for mortality base and trend ▪ Industry tables are not granular or regularly updated	▪ CPM tables released 2014, replacing tables from 1994. However, more (re)insurers expected to enter market and develop bases ▪ Pension schemes only tend to reassess mortality after periodic release of new studies
Opportunity	▪ Limited potential for pension schemes to undertake a longevity swap in current regime ▪ But regulatory change is coming, which could open up the BPA market	▪ Pension schemes transact bulk annuities, but not longevity swaps as too onerous for the amount of risk hedged ▪ Regulatory regime means limited drivers to de-risk – this may change.	▪ Market developing and expectations are for (some) further growth. ▪ Change in pension scheme approach/cultural view to analysing longevity risk and mortality improvements

Select global markets

Characteristic	UK	Netherlands	US	Canada
Large pension market	✓✓✓	✓✓	✓✓✓	✓✓
Existence of large DB pension funds	✓✓✓	✓✓	✓✓✓	✓✓
Evident longevity risk and mortality improvements	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Drivers to de-risk longevity	✓✓✓	✓✓✓	✓	✓✓
Market ready to de-risk at an acceptable price	✓✓✓	✓✓	✓✓	✓✓
Adequate data available to produce suitable basis	✓✓✓	✓✓	✓✓	✓✓

Other markets

Country		Commentary	Result
Germany	🇩🇪	• Small market • Lack of socioeconomic data • Occupational schemes written onto company balance sheet – no minimum funding requirement so no driver to de-risk	✕
Ireland	🇮🇪	• Small market, but recent improvement in pricing which has increased interest from pension schemes and sponsors • Basis-setting may be considered easier from the UK as could be seen as similar population	？
Switzerland	🇨🇭	• Evidence of improvements – but majority of scheme managers/trustees in Aon's 2019 pension risk survey were comfortable with retaining longevity risk • Small market, but one that may open up in the future	？
France	🇫🇷	• Small market	✕
Australia	🇦🇺	• Lifetime annuities are not popular; often people buy term annuities (20 years) at retirement then rely on the state • Superannuation is a mandatory DC system established in 1992 • DC occupational pensions more common, so low pension risk borne by companies	✕
Chile (& South America)	🇨🇱	• Small market • Unreliable or lack of historic longevity data	✕
Japan	🇯🇵	• Current pension system relatively new, with The Defined Benefit Occupational Pensions Act introducing DB and DC in 2001 • Significant longevity risk due to high and growing life expectancy • Material DB assets of c$3.5trn, with $1trn reported to be represented by annuities in 2016 and Government Investment Pension Fund worth $1.4trn • Corporate pensions often paid as a lump sum at retirement, and increasingly DC-oriented or risk-sharing arrangements	？

Market conclusions

UK

- Plenty of life left in the UK market, but currently constrained by human capacity – in future constrained by financial capacity?

Netherlands, Canada, US

- The Netherlands in particular seems a promising market due to regulatory changes – though could be short-lived
- Market activity in Canada is ramping up
- Longevity swaps in the US unlikely under current regime, though this may change

Other Market

- Other markets could show promise, e.g. Japan
- Longevity improvements evident in many jurisdictions
- Smaller markets could be of interest if basis setting is not considered too onerous

Defining the price of longevity risk

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Large pension market

Whole of life income market

- Would the market buy longevity cover **at prices the market would be able to provide?**
- **How is this defined?**

Drivers to de-risk

Regulatory requirements

Market ready to de-risk at an acceptable price

Existence of large pension funds

>US $1 bn PV liabilities

- No value perceived by potential purchasers = low demand

Evidence of longevity risk and trend

Adequate data for basis

- **Adequate data** to produce a suitable basis?
- Ability to incorporate socio-economic factors
- Credible scheme-specific past mortality experience

Practical concerns
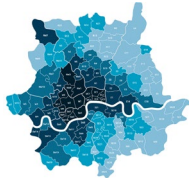
Data required

- Publicly available e.g. Human Mortality Database, or
- Invest in granular data, e.g. location or annuitant specific
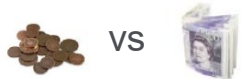- Should the data be adjusted?

1. Country data

2. Location adjustments

National population data

We use postcode in UK

3. Adjustment for socio economic mix

VS

From this we can infer lifestyle and occupation of the population

Models

Use industry standard
- Ready-made for market
- Using external expertise
- Potentially out of date or overly simplistic

OR

Extend existing internal models
- Well-understood by team
- Potentially not appropriate for local longevity

Other considerations

- Quote on books with large amounts of credible experience
- Market feedback on quotations
- Insurer surveys
- Industry knowledge
  - Market intelligence
  - Industry groups and working bodies
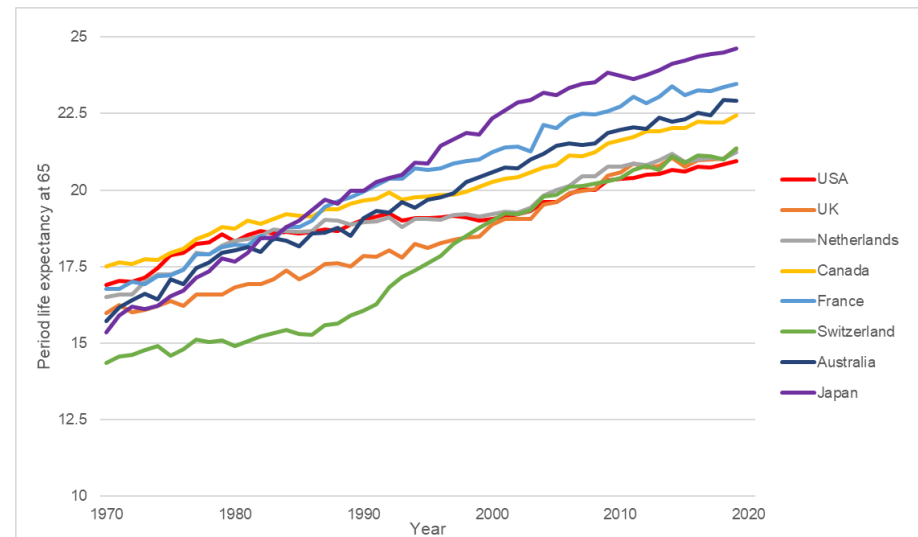- Team with industry experience and external perspectives

Align pricing approach with existing longevity bases?

# Historic mortality trends

Male
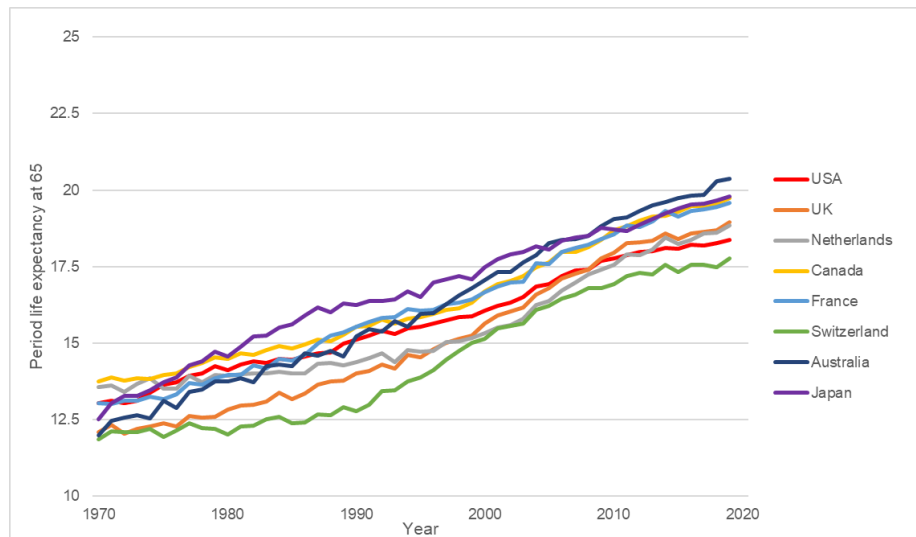
Female

Source: Calculations based on data from the Human Mortality Database.
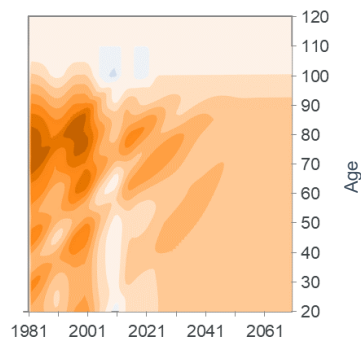
- Consistent pattern of improvements across nations
- Considerations:
  - Extent of extrapolation from existing trend?
  - Are past patterns explainable from one-off events or series of events that won't be repeated?

Projecting improvements from past data

United States
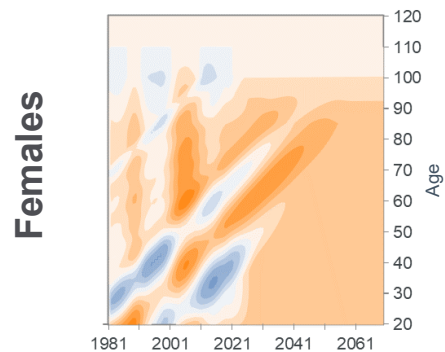
Japan

Switzerland

Females
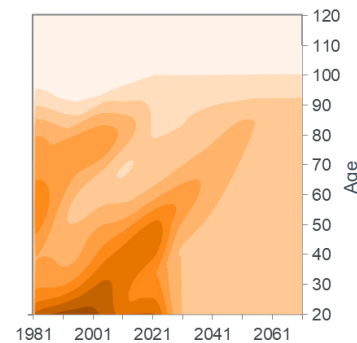
Males
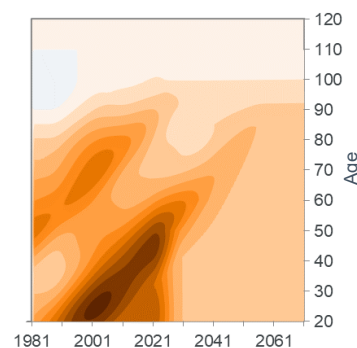
- Strong improvements in Switzerland

- Negative cohorts in the US

- High improvements at older ages in Japan in multiple cohorts

- Do we believe the projections?

−6% −4% −2% 0% +2% +4% +6%

Source: Calculations based on data from the Human Mortality Database and the Continuous Mortality Investigation (CMI) model 2021, core parameters and 1.5% pa long-term rate of improvement

Non-repeatable events

Should you strip out some factors when projecting forward?

- US example:
  - rapidly falling deaths from stroke in the early 2000s may be from improved ambulance times
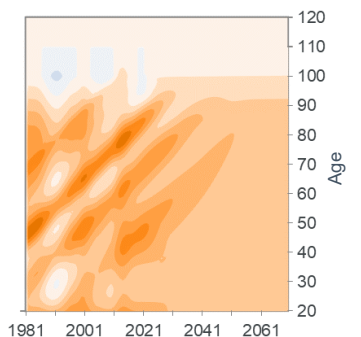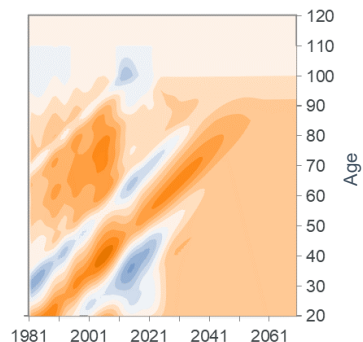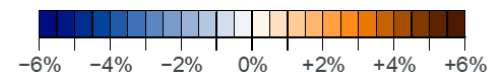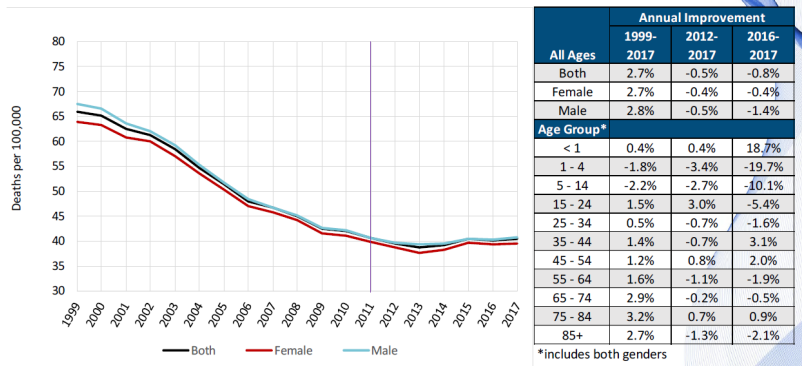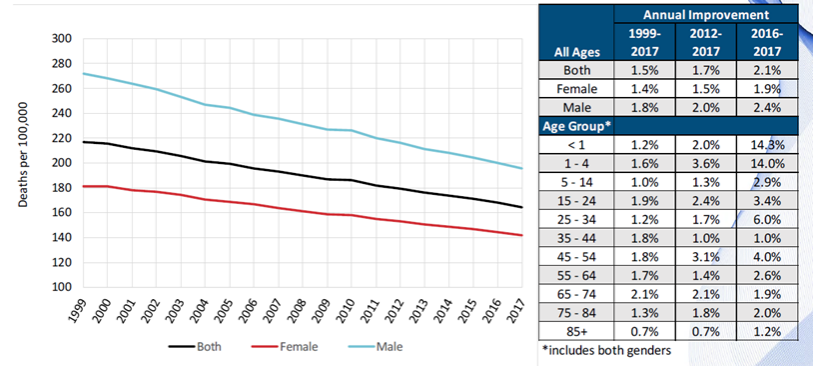 - High improvements (especially male, age 55+) have since fallen away

What other drivers to consider?

Stroke Population Trend from SOA Study

All Ages	Annual Improvement		
	1999-2017	2012-2017	2016-2017
Both	2.7%	-0.5%	-0.8%
Female	2.7%	-0.4%	-0.4%
Male	2.8%	-0.5%	-1.4%
Age Group*			
< 1	0.4%	0.4%	18.7%
1 - 4	-1.8%	-3.4%	-19.7%
5 - 14	-2.2%	-2.7%	-10.1%
15 - 24	1.5%	3.0%	-5.4%
25 - 34	0.5%	-0.7%	-1.6%
35 - 44	1.4%	-0.7%	3.1%
45 - 54	1.2%	0.8%	2.0%
55 - 64	1.6%	-1.1%	-1.9%
65 - 74	2.9%	-0.2%	-0.5%
75 - 84	3.2%	0.7%	0.9%
85+	2.7%	-1.3%	-2.1%

*includes both genders

Cancer Population Trend from SOA Study

All Ages	Annual Improvement		
	1999-2017	2012-2017	2016-2017
Both	1.5%	1.7%	2.1%
Female	1.4%	1.5%	1.9%
Male	1.8%	2.0%	2.4%
Age Group*			
< 1	1.2%	2.0%	14.3%
1 - 4	1.6%	3.6%	14.0%
5 - 14	1.0%	1.3%	2.9%
15 - 24	1.9%	2.4%	3.4%
25 - 34	1.2%	1.7%	6.0%
35 - 44	1.8%	1.0%	1.0%
45 - 54	1.8%	3.1%	4.0%
55 - 64	1.7%	1.4%	2.6%
65 - 74	2.1%	2.1%	1.9%
75 - 84	1.3%	1.8%	2.0%
85+	0.7%	0.7%	1.2%

*includes both genders

Patterns in rates of smoking and obesity

Source: https://ourworldindata.org/smoking

Proportion of daily smokers

Source: https://ourworldindata.org/obesity

Prevalence of obesity
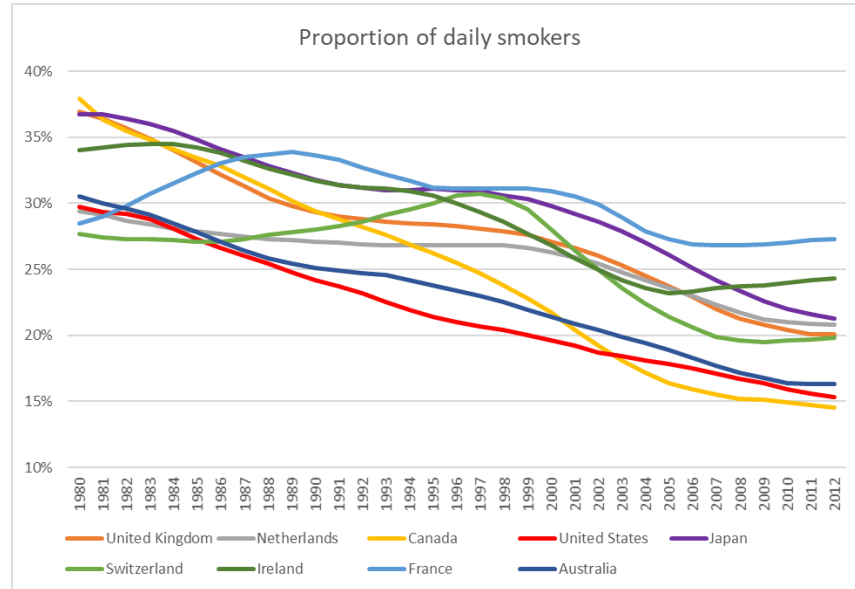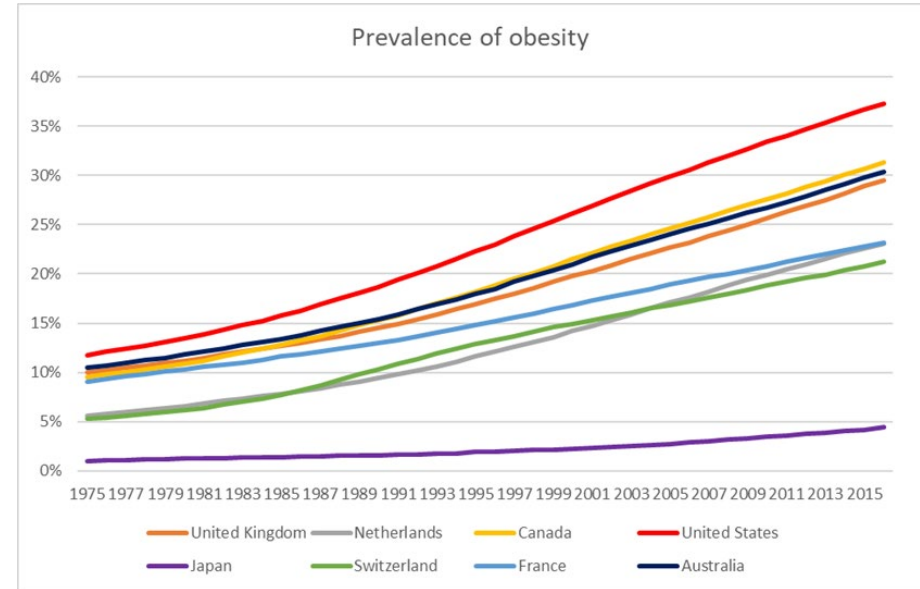
- **France** has 2x the lowest proportions; **Canada** is levelling off; **Ireland** is trending upwards
- **Swiss** increased until late nineties before dropping sharply (corresponding with high improvements) – will this continue now that it is trending upwards again?

- **8%** of global deaths were attributed to obesity in 2017, although not straightforward to separate
- **Smooth continuing upward trend** – is there an upper limit?

Progression of healthcare spend vs life expectancy
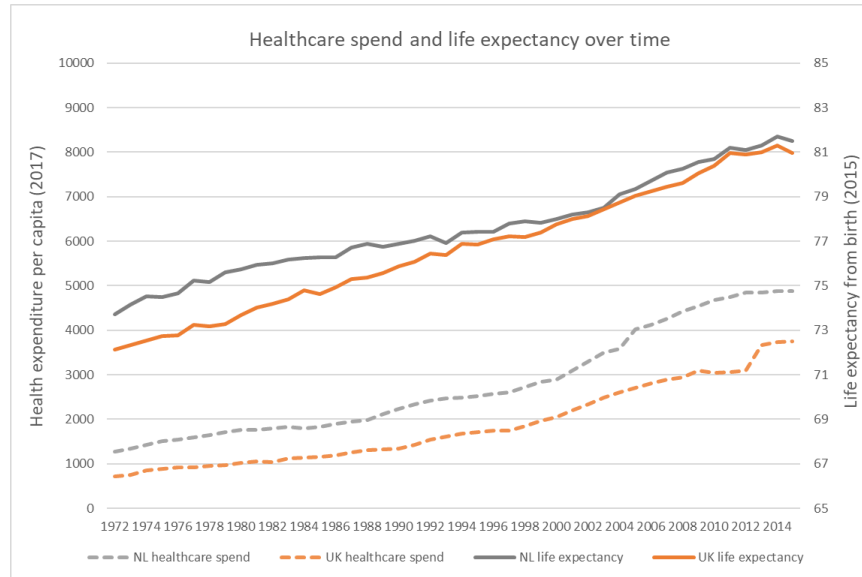
Healthcare spend and life expectancy over time

Source: https://ourworldindata.org/grapher/life-expectancy-vs-health-expenditure
Adjusted for inflation and price level differences between countries (measured in 2010 international dollars)

- **UK** life expectancy has converged with Dutch life expectancy over time, despite lower health expenditure – due to other effects e.g. smoking?
- **NL** healthcare spend has increased in recent years – potential for future high improvements, if efficiently used

Healthcare spend: input vs outcome
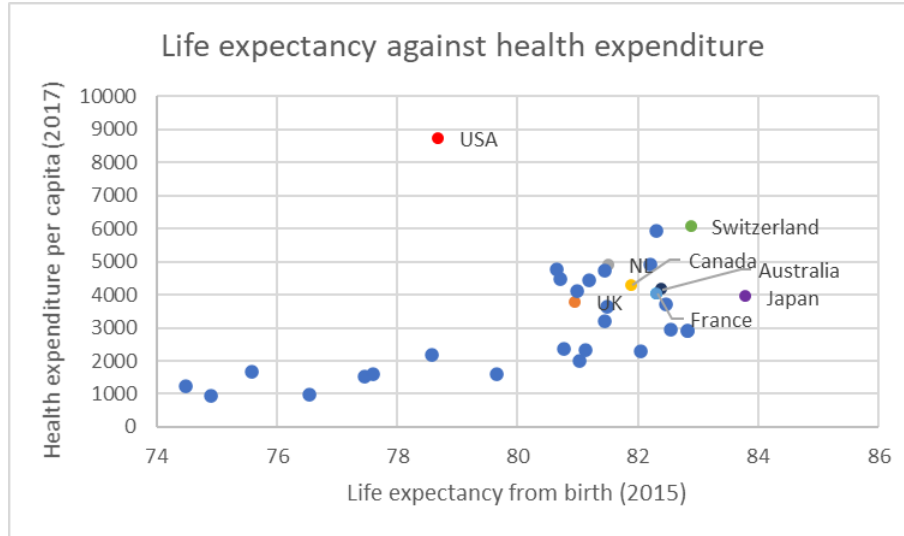
Life expectancy against health expenditure

Source: https://ourworldindata.org/grapher/life-expectancy-vs-health-expenditure
Adjusted for inflation and price level differences between countries (measured in 2010 international dollars)

ADMINISTRATIVE COSTS PER CAPITA (DOLLARS)

Country	Cost
United Kingdom	$70
Japan	$75
Sweden	$89
Canada	$144
Australia	$154
Belgium	$166
Average	$175
Austria	$201
Netherlands	$202
Switzerland	$273
Germany	$273
France	$279
United States	$843

LONG-TERM CARE PER CAPITA (DOLLARS)

Country	Cost
Australia	$100
United States	$511
United Kingdom	$738
France	$750
Canada	$762
Austria	$776
Japan	$839
Average	$940
Germany	$1,071
Belgium	$1,111
Switzerland	$1,381
Sweden	$1,392
Netherlands	$1,424

SOURCE: Organisation for Economic Cooperation and Development, OECD Health Statistics 2019, July 2019.
NOTES: Data are for 2018 or latest available. Chart uses purchasing power parities to convert data into U.S. dollars. Average is for other wealthy OECD countries with above median GDP and above median GDP per capita.
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PGPF.ORG

Source: Peter G. Peterson Foundation

Healthcare spend is material to life expectancy and mortality improvements, but doesn't tell the whole story

- **Imperfect** correlation (expenditure vs life expectancy)
- **Future** of aging populations uncertain, as spend on long-term care may become more material to outcomes

Other factors

1 Covid

Too early to say

2 Inequality and lifestyle factors

Hard to measure inequality (Gini coefficient?) and to split out from lifestyle factors

3 Government policy

e.g. sugar/salt taxes, smoking bans

Difficult to predict

4 Climate change response

Switching to green energy and reducing pollution would be beneficial to longevity – but refusal to act would have a negative impact

5 Progression of disease and medicine

Future medical advancements uncertain
Major breakthroughs or pandemics could cause shocks

Conclusions

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Evidence of improvements exist across all nations considered

- However, the trend is not consistent between markets

Drivers of longevity improvements are varied and complex

- Cause of death analysis can be useful

- Consider making data adjustments

Modelling trend

- Constrained by data available in a given geography

- Need to analyse if own internal models or industry models are more appropriate

Consider how to validate

Questions and Answers