Continuous Mortality Investigation

Institute and Faculty of Actuaries

SIAS Staple Inn Actuarial Society

Outlook for mortality improvements

Discussion hosted by SIAS and the CMI Mortality Projections Committee

5 April 2022
Staple Inn Hall, London

The views expressed in this presentation are those of the presenters and not necessarily those of their employers, the CMI or the Staple Inn Actuarial Society.

Agenda

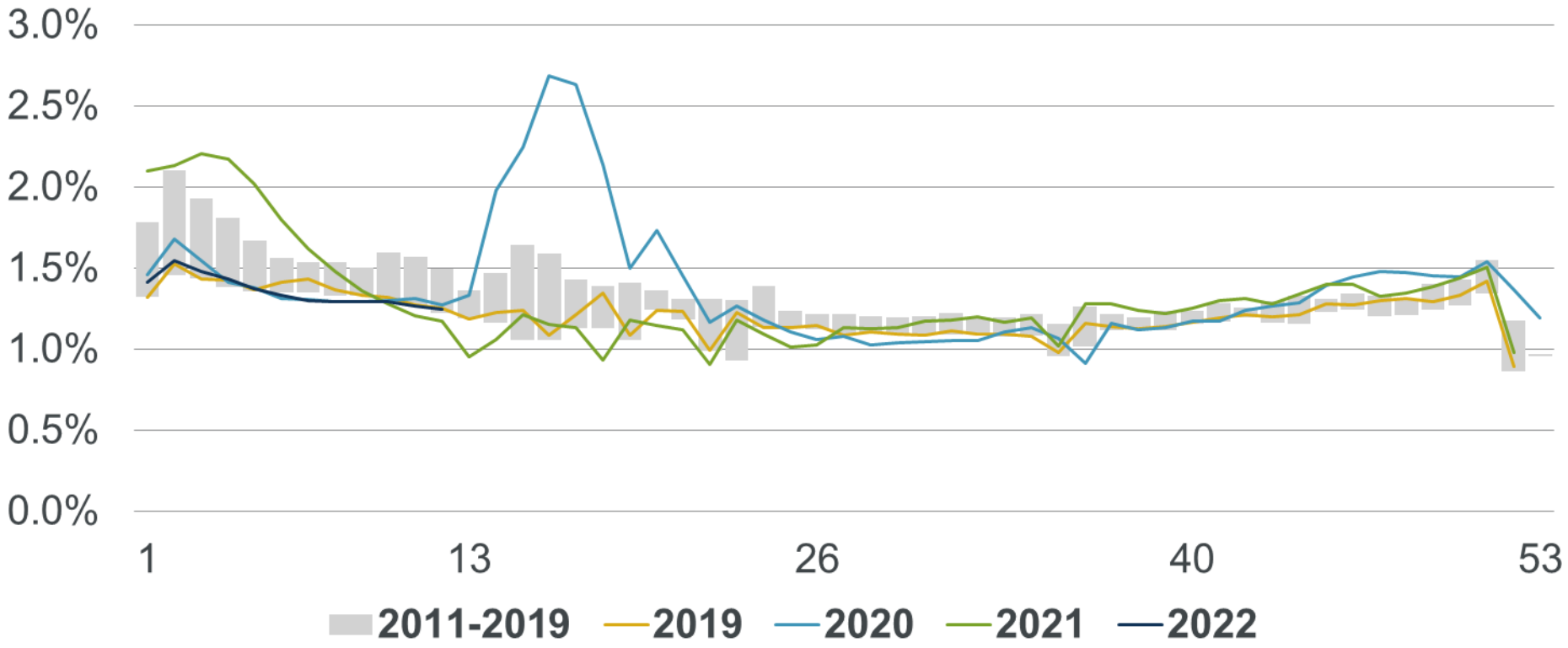
- **Welcome and introduction**
  - Cobus Daneel, CMI
- **Recent mortality and CMI_2021**
  - Susan Hanlon, CMI
- **Outlook for mortality improvements**
  - COVID-19: Stuart McDonald, Lloyds Banking Group
  - Social care: Adele Groyer, Gen Re
  - Climate change: Joseph Lu, Legal & General
- **Discussion**

Recent mortality and CMI_2021

Susan Hanlon
CMI Mortality Projections Committee

Recent mortality

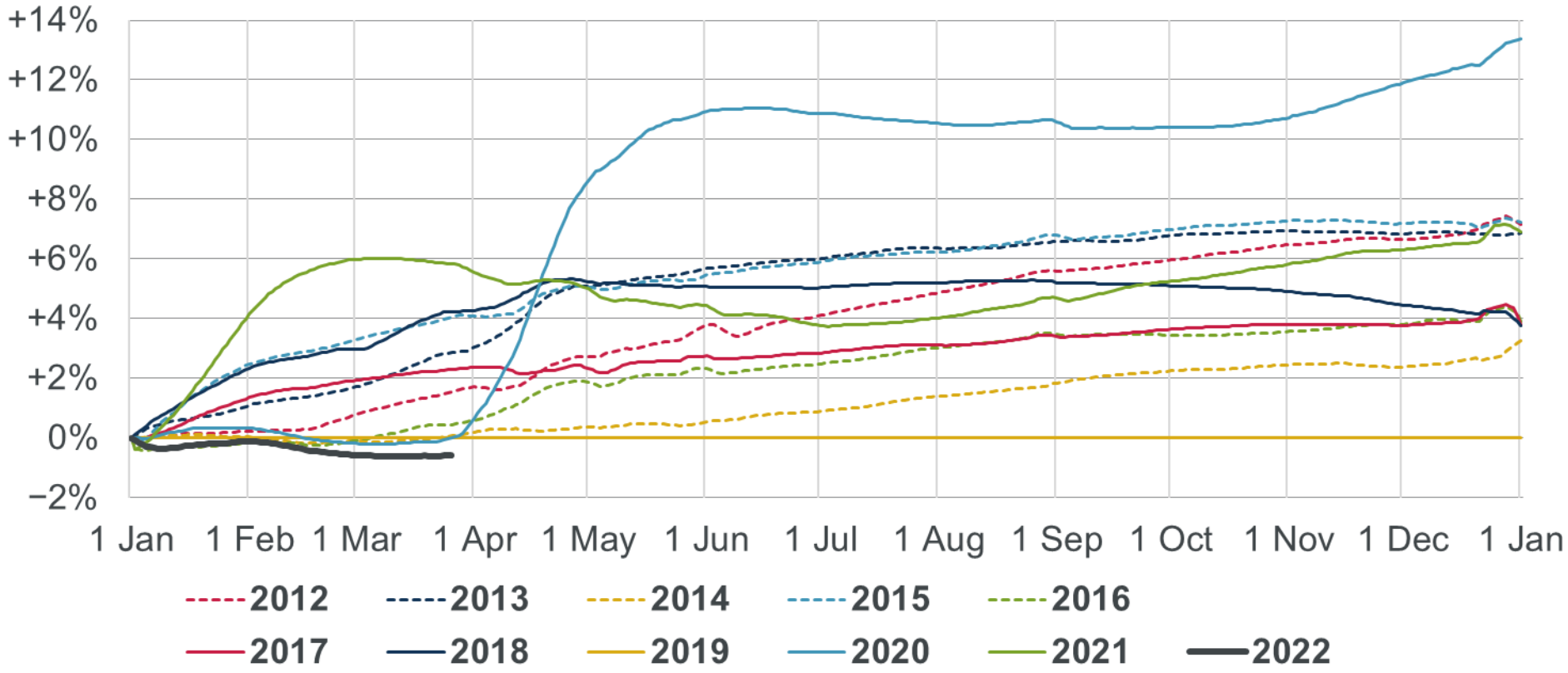
Standardised mortality rates by week number



Source: CMI calculations, to 25 March 2022, based on ONS provisional weekly deaths data for England & Wales

Recent mortality

Cumulative mortality relative to 2019



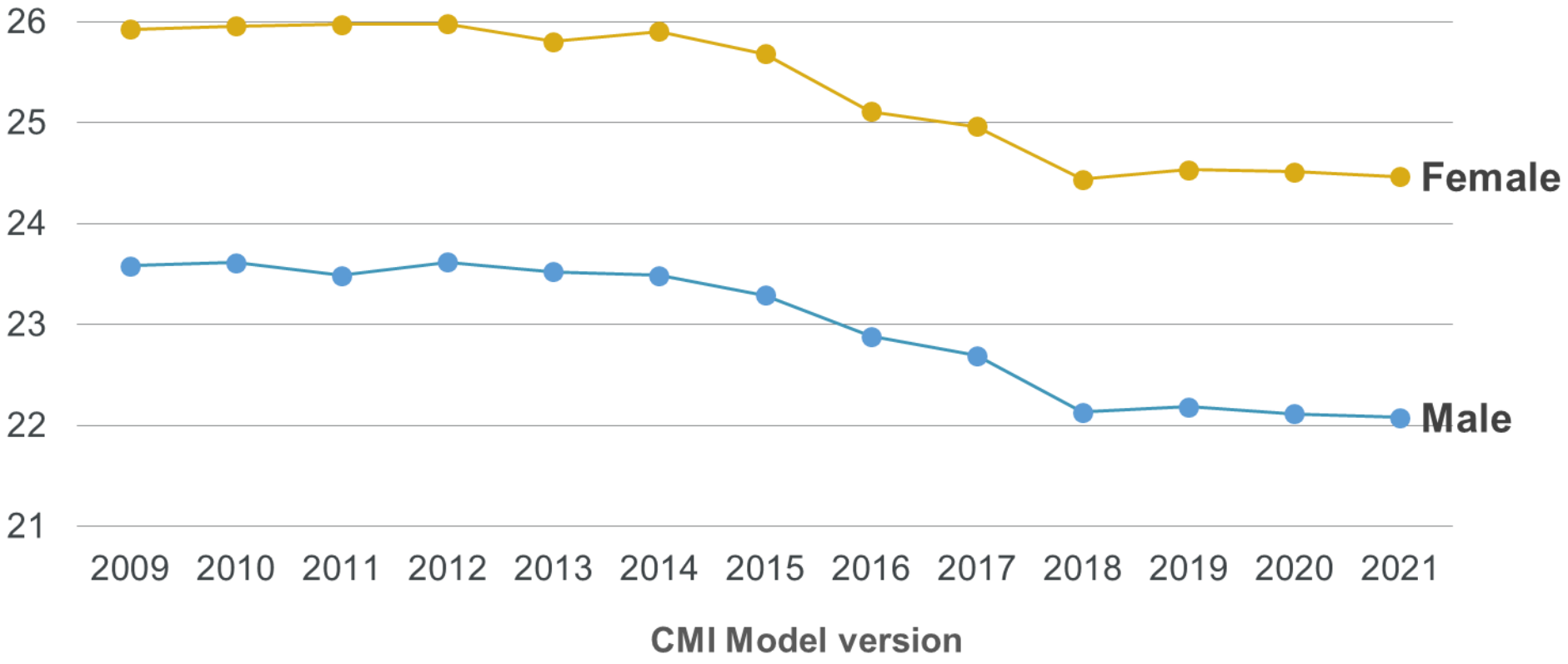
Source: CMI calculations, to 25 March 2022, based on ONS provisional weekly deaths data for England & Wales

CMI_2021

- CMI_2021 incorporates mortality data to 31 December 2021
- But 2020 and 2021 data is given 0% weight in the Core version
  - Consistent with approach for CMI_2020 supported by consultation
  - Data for 2020 and 2021 is unlikely to be indicative of future trends
  - Using 100% weight for 2020 and 2021 data would lead to excessive falls in life expectancy
- Overall impact is a modest reduction in life expectancies in CMI_2021 relative to CMI_2020 – by around two weeks for both males and females
- We encourage users to consider which parameters to use, particularly:
  - 2020 and 2021 weights – to reflect the impact of the pandemic
  - Initial improvements – to reflect the composition of their population
  - Long-term rate – to reflect the impact of the pandemic and other factors

Progression of cohort life expectancy

Age 65, CMI Model, S3PxA, illustrative long-term rate of 1.5% p.a.



Source: CMI calculations

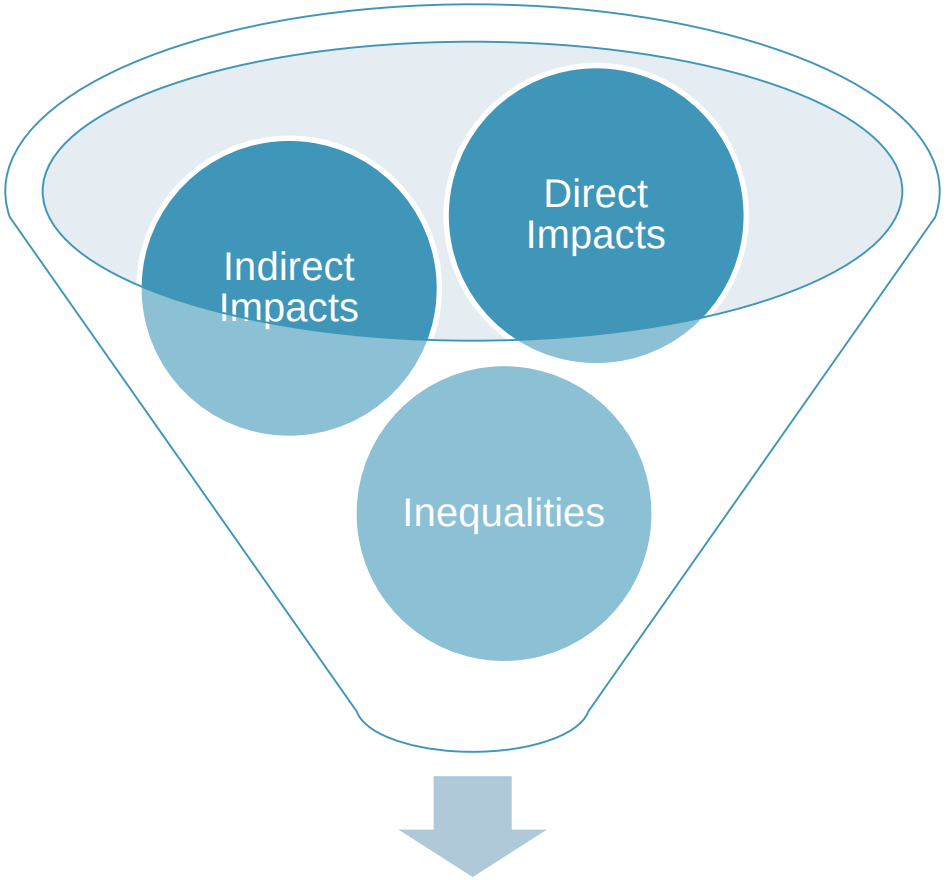
Future plans

- Continue frequent mortality monitoring for the time being
- Second survey benchmarking use of the Model by insurers
  - Aim to issue later in April, with results in June
- The ONS may revise population estimates as a result of the 2021 census
  - We will review the impact on the CMI Model
  - We may modify the release date of CMI_2022 depending on when the ONS releases revised population estimates
- Annual “interim update” working paper, likely to include consideration of census results and a calibration of the CMI Model to US data
- MPC will consider the weight to be applied to 2022 data in CMI_2022
  - We will communicate our preliminary view on this in the autumn

COVID-19

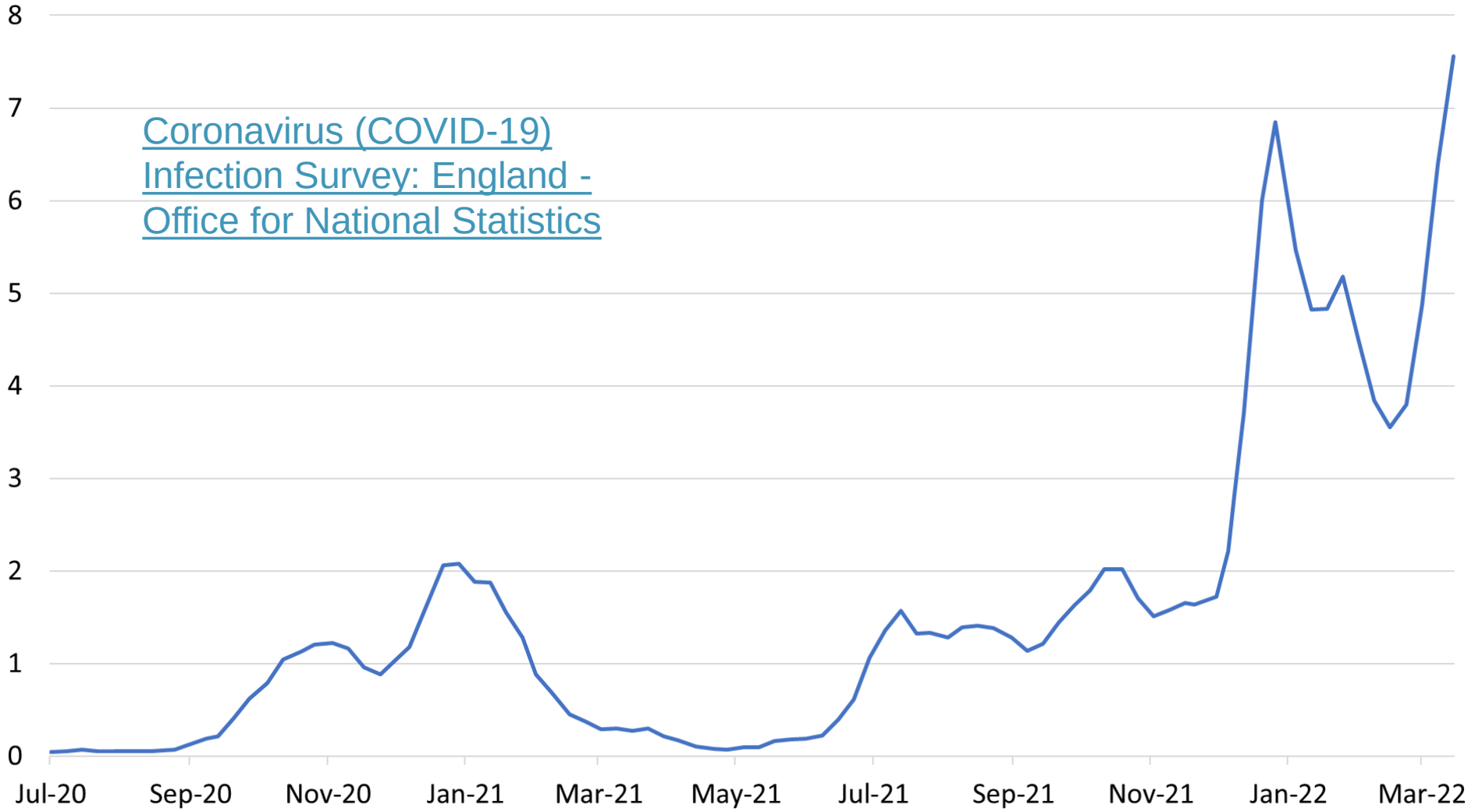
Stuart McDonald
Lloyds Banking Group

Overview



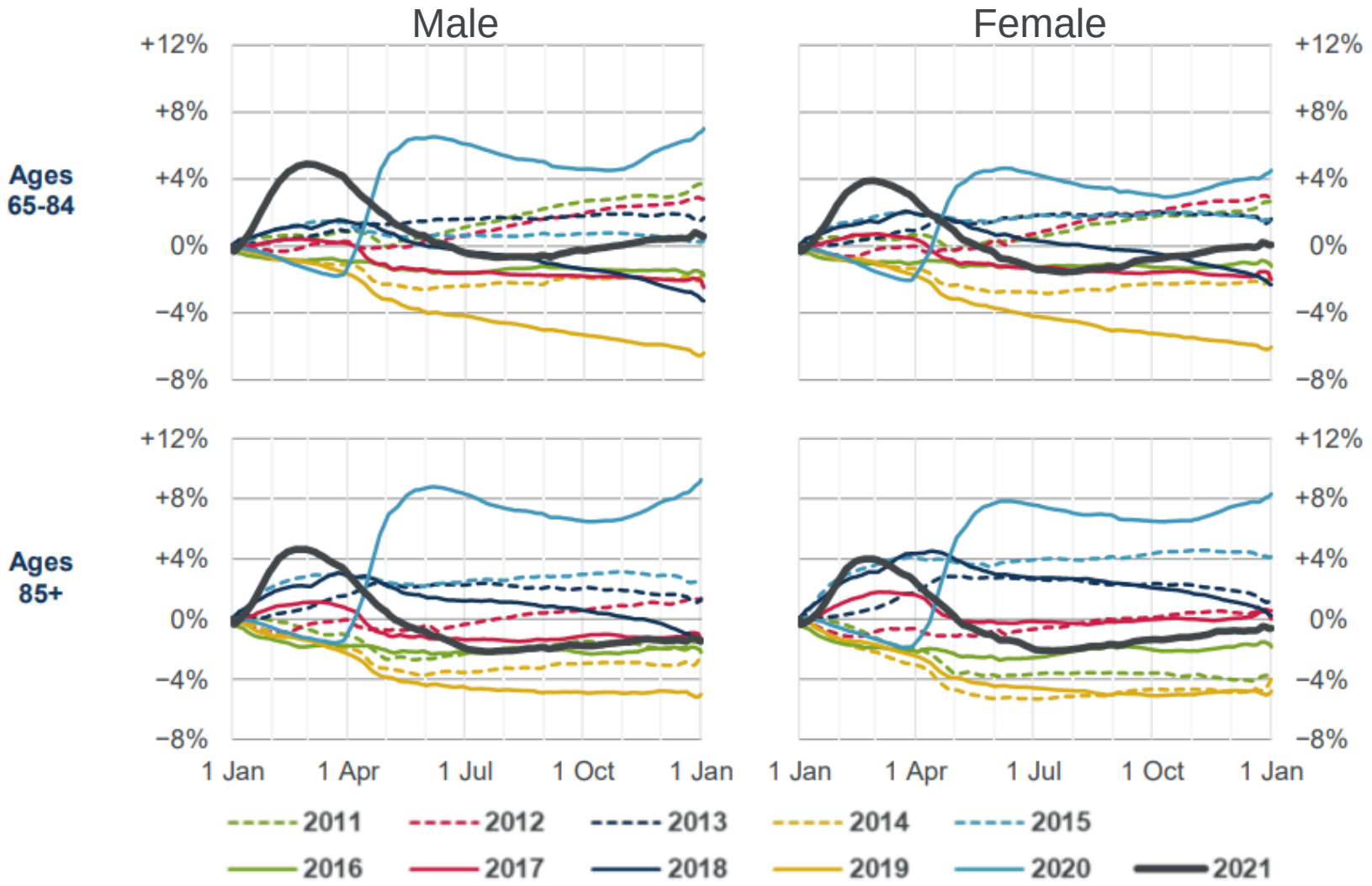
Future Mortality

% of Population Testing Positive – England

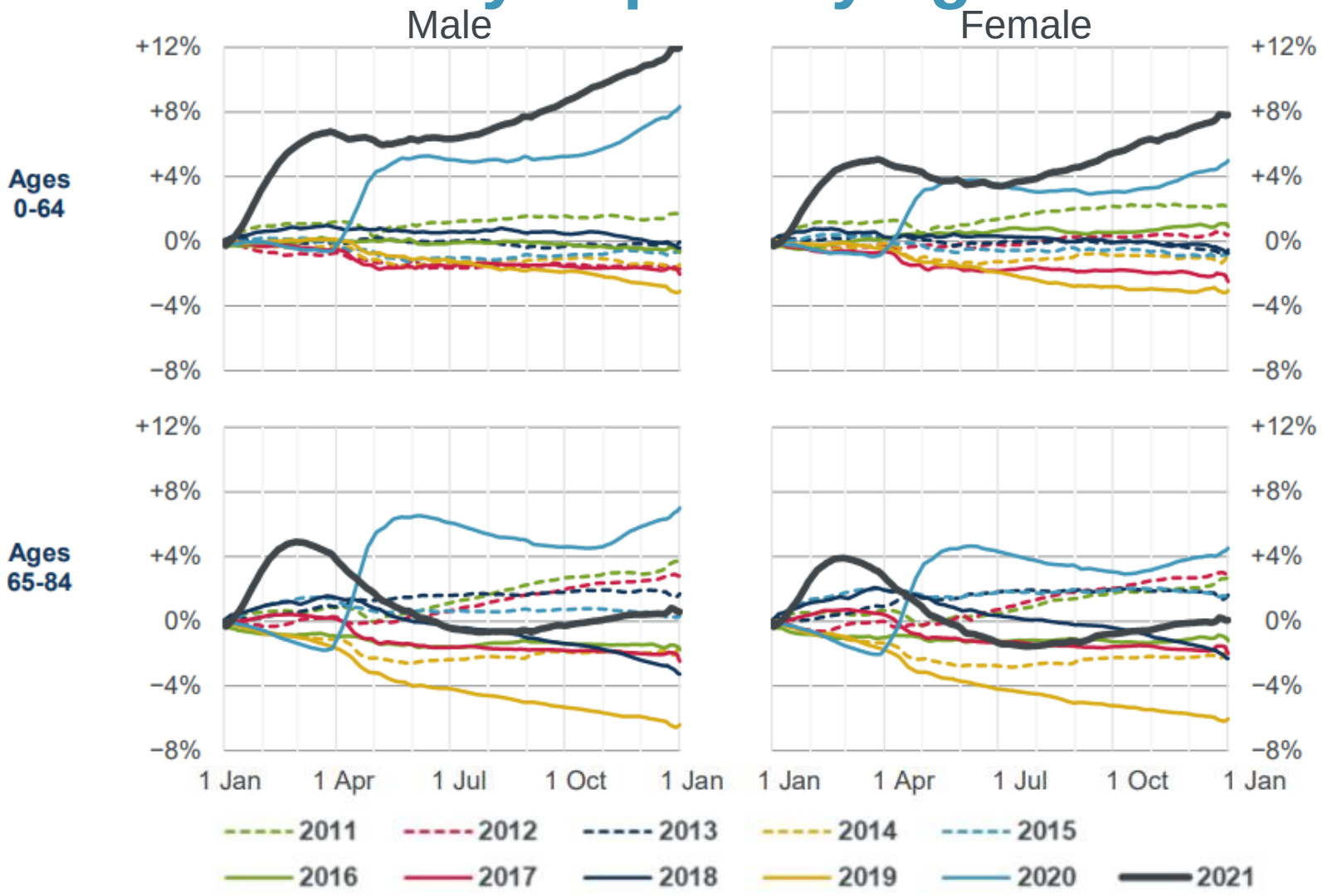


[Coronavirus (COVID-19) Infection Survey: England - Office for National Statistics]

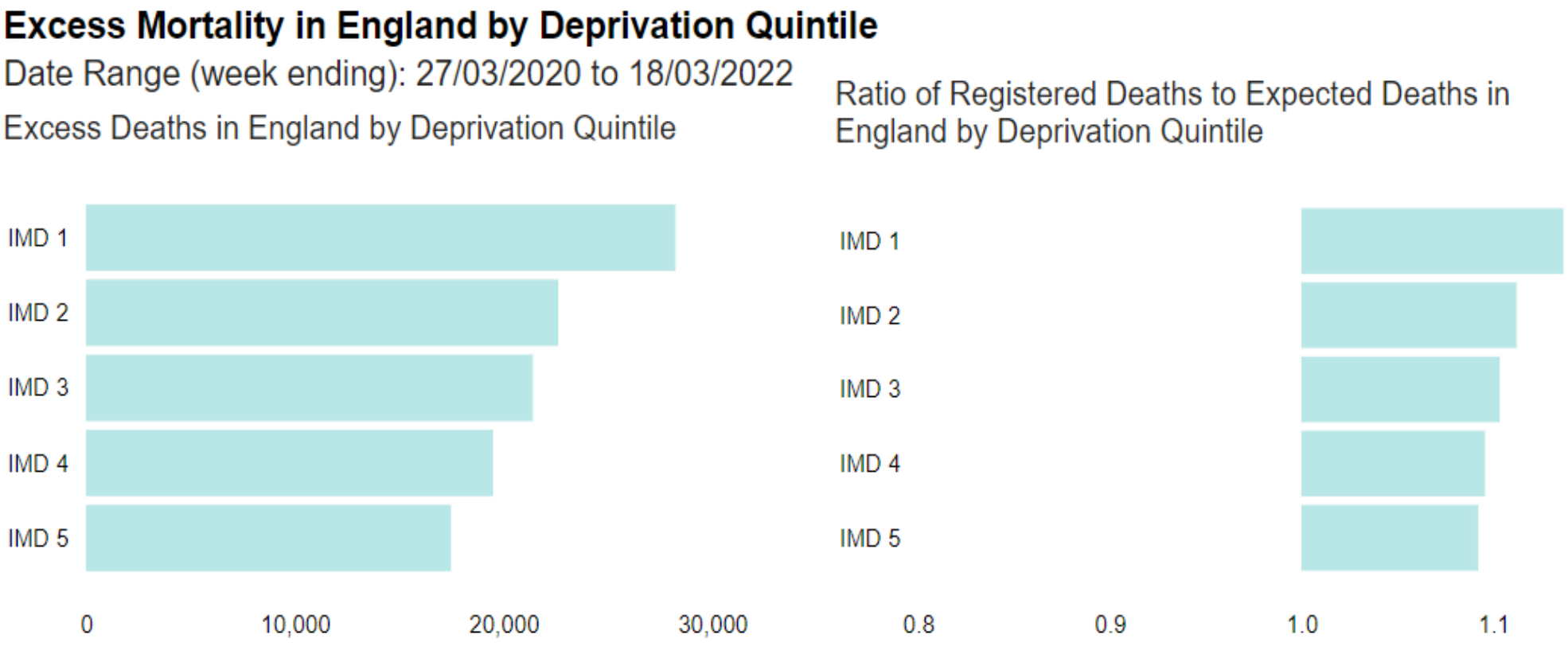
Different mortality impact by age in 2021



Different mortality impact by age in 2021

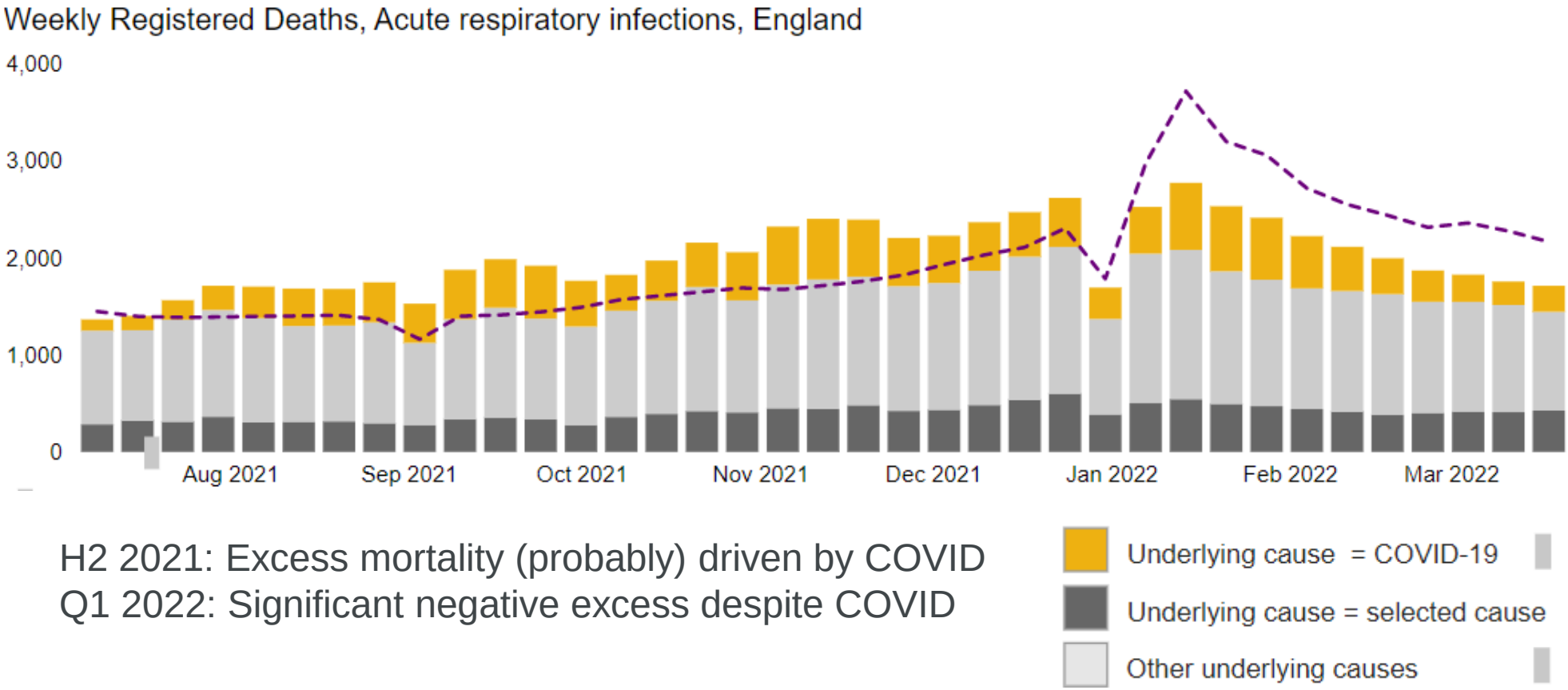


Larger mortality impact on deprived groups



[Excess mortality in England: weekly reports - GOV.UK (www.gov.uk)]

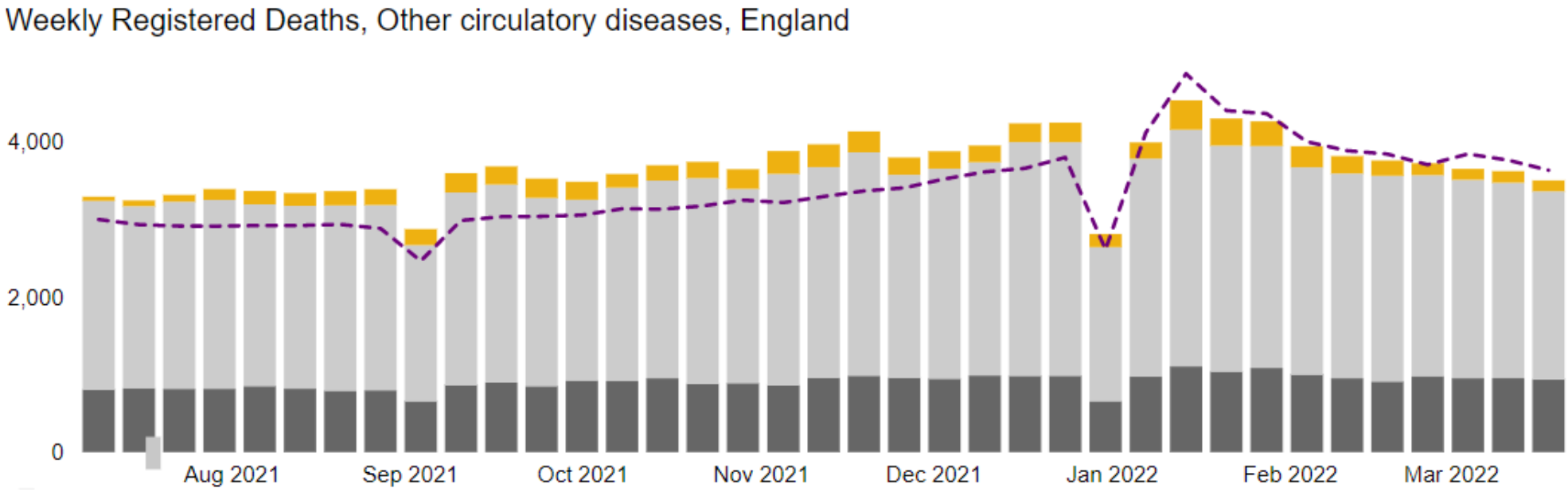
Impact of pandemic varies by cause of death



H2 2021: Excess mortality (probably) driven by COVID
Q1 2022: Significant negative excess despite COVID

[Excess mortality in England: weekly reports - GOV.UK (www.gov.uk)]

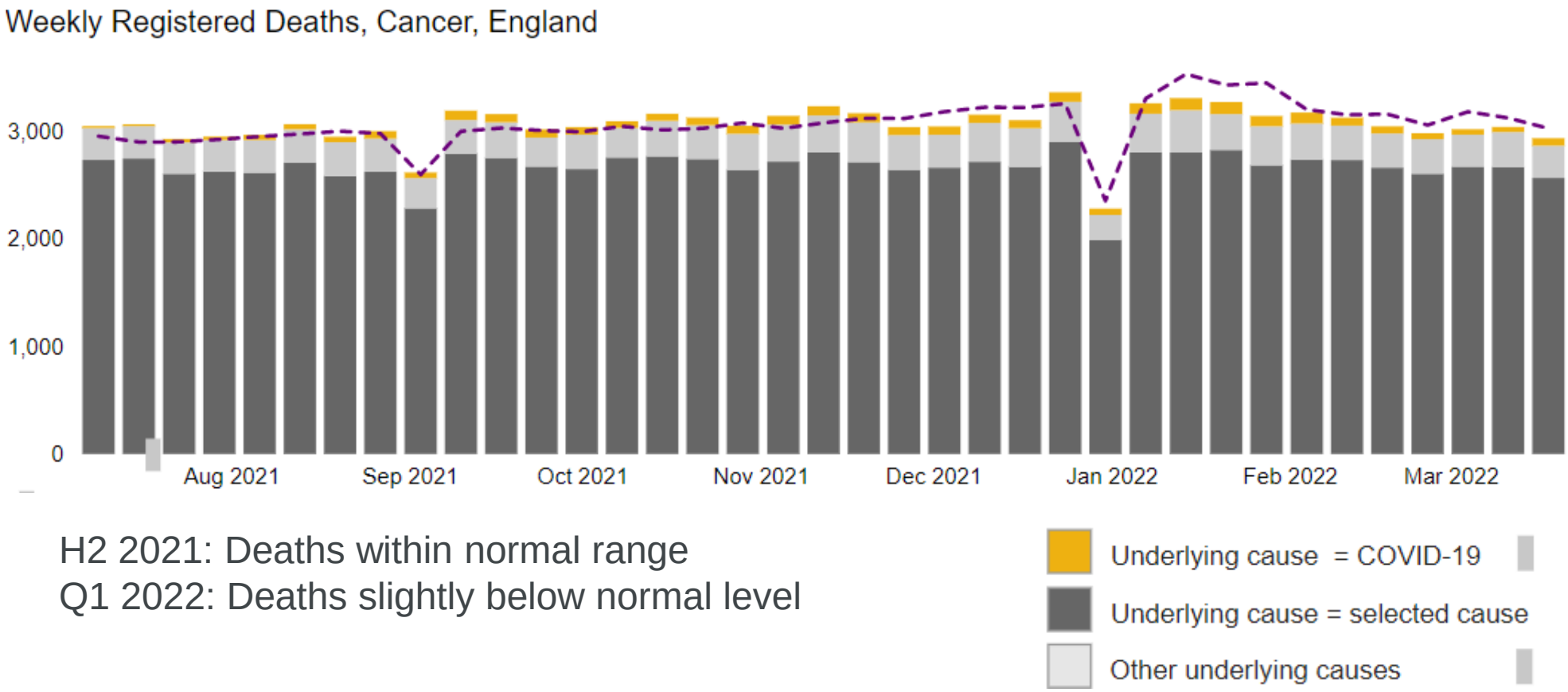
Impact of pandemic varies by cause of death



H2 2021: Excess mortality partially explained by COVID
Q1 2022: Deaths within normal range despite COVID

[Excess mortality in England: weekly reports - GOV.UK (www.gov.uk)]

Impact of pandemic varies by cause of death



H2 2021: Deaths within normal range
Q1 2022: Deaths slightly below normal level

[Excess mortality in England: weekly reports - GOV.UK (www.gov.uk)]

Pandemic impact on future mortality

- Healthy Survivor effect
- More Health and Social Care funding?
- Healthier behaviours, e.g. fewer smokers
- Less air pollution?
- Public Health lessons learned
- New technology e.g. mRNA vaccines
- Virtual health and telemedicine

- Deterioration of health for those already old/unwell
- Impact on health and care systems and providers
- Impaired long term health
- New waves of infection (and/or new variants)
- Global recession

Conclusions

- Mortality will be impacted by both direct and indirect impact of the pandemic
- Overall, the pandemic looks like a net negative for life expectancy
- Impact will vary significantly between cohorts and socioeconomic groups
- The situation remains inherently uncertain with lots of unknowns
- Difficult to quantify the impact at this stage
- Different ways to allow for estimated impact of COVID:
  - Adjust base tables
  - Adjust CMI model parameters
  - Adopt “directionally correct” CMI_2020 and CMI_2021

Social care

Adele Groyer
Gen Re

Overview

- Data on deaths preceded by care need
- Impact of unmet care needs
- Correlations between funding and mortality
- Funding outlook

Distribution of deaths by age

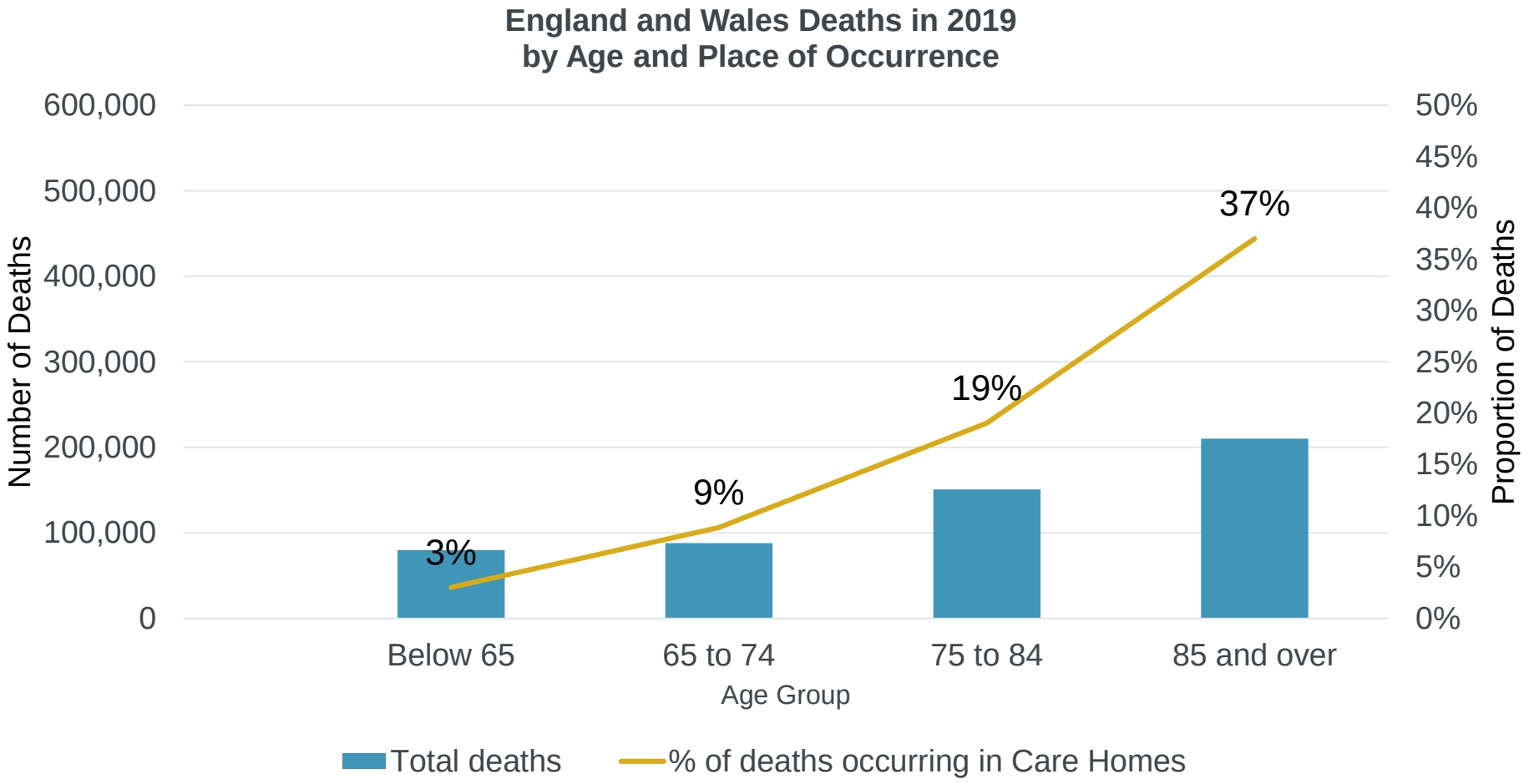
- Deaths in England and Wales in 2019
  - 68% aged 75+
  - 40% aged 85+

- 30% of deaths are among formal care recipients

  - 26% among care home residents
    - of which 85% occur in care homes
  - 4% among regulated home care users

Sources: ONS Deaths Registered in England and Wales, 2019 and
ONS Analysis of deaths involving COVID-19 within the care sector (May 2020)

% of deaths in care homes increase with age



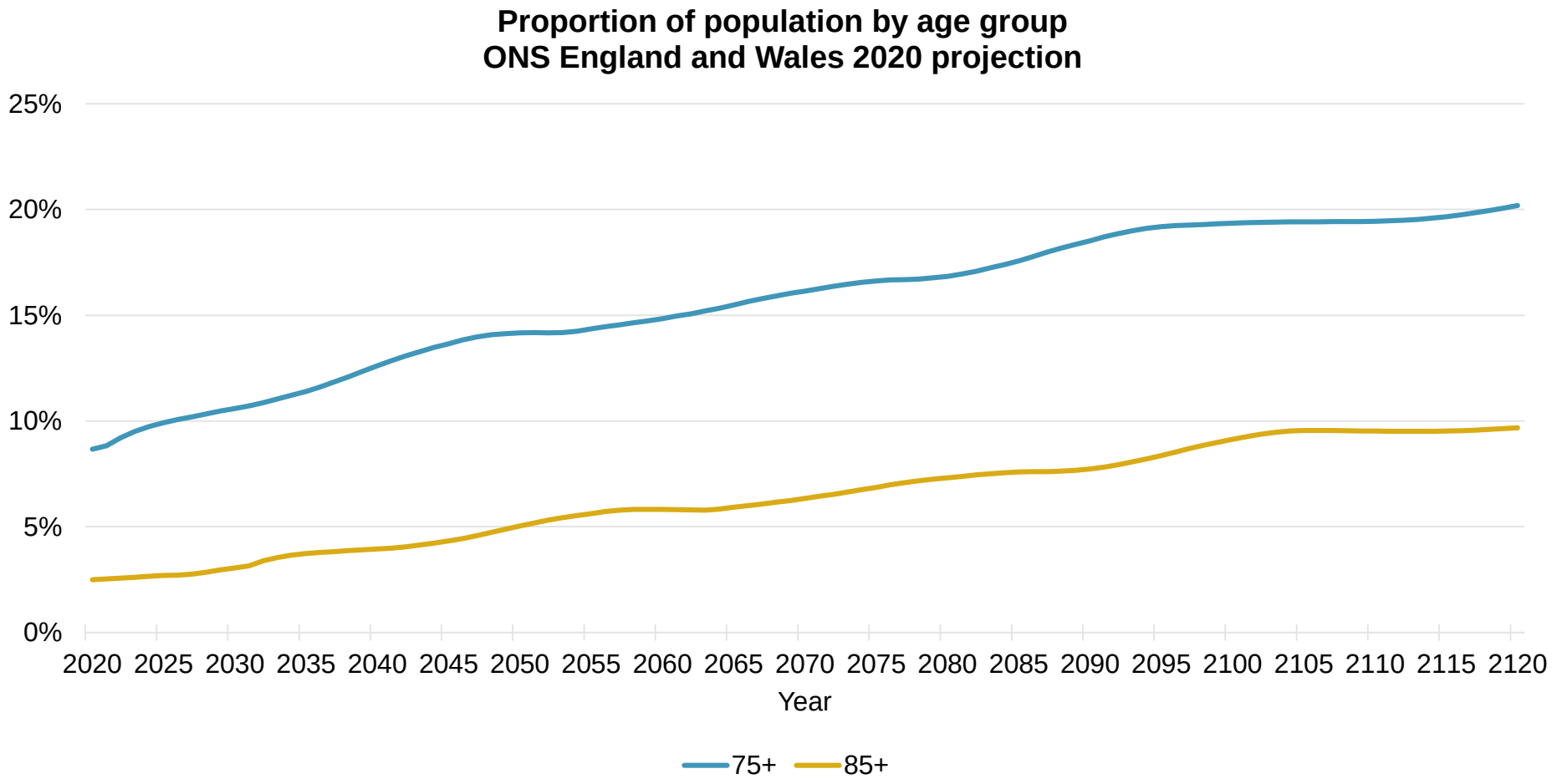
Source: ONS Deaths Registered in England and Wales, 2019

Most people receive care at home

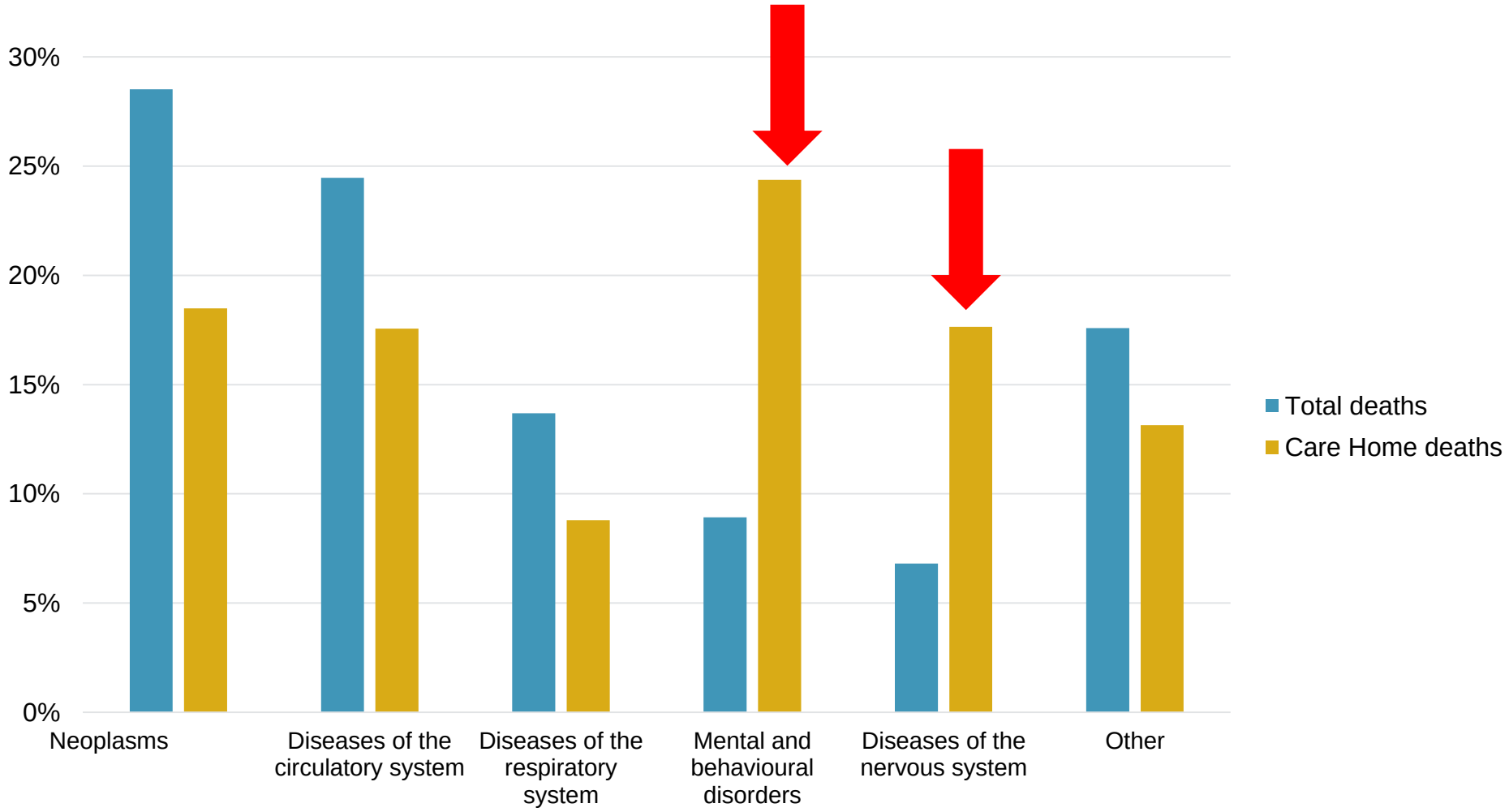
Social care setting	Number of people receiving care in the UK	Data source
Care home	411,000	London School of Economics
Domiciliary care	500,000	UK Home Care Association (UKHCA)
Community-based care and support at home	417,910	NHS Confederation 2012/2013

Source: “Cripps et al (2020) COVID-19 report: Impact on Social Care”

The population is ageing



Deaths by cause and place of occurrence

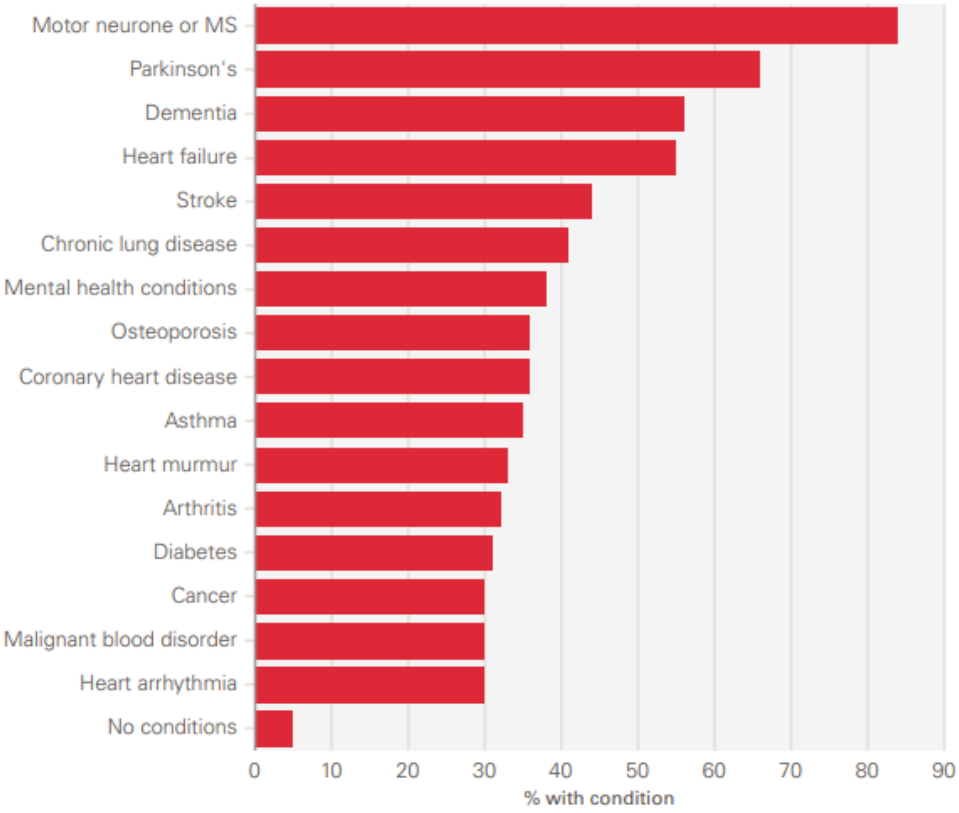


Source: ONS Deaths Registered in England and Wales, 2019

Care needs by long term condition

The majority of people living in the community with a diagnosis of **MND, MS, Parkinson's, Dementia** need ADL support.

Figure 11: Percentage of the older population needing ADL support by long-term condition, 2018



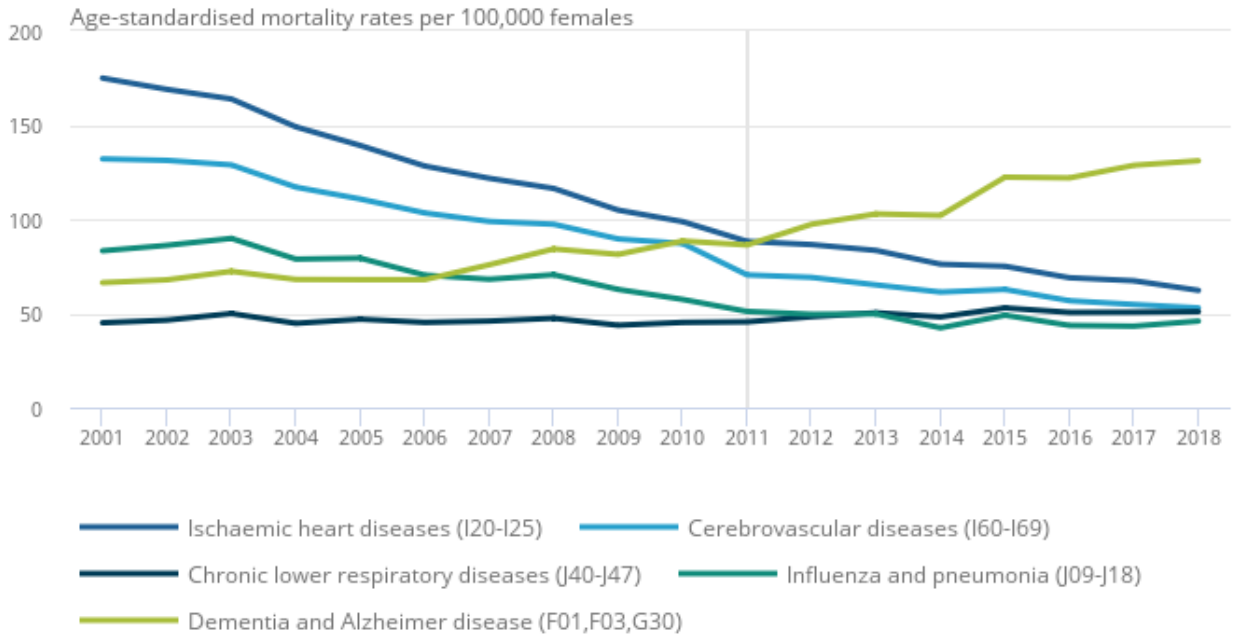
Source: ELSA, 2018.

Source: The Health Foundation "Our ageing population"

Mortality rates for dementia are increasing

Figure 2: Since 2012, the leading cause of death for females in England was dementia and Alzheimer disease

Age-standardised mortality rates for females by leading causes of death, all ages, England, 2001 to 2018



In 2018, mental and behavioural disorders and diseases of the nervous system accounted for 18% of deaths among those aged 65+

Source: ONS Changing trends in mortality by leading causes of death, England and Wales: 2001 to 2018 and 21st Century Mortality Files

Overview

- Data on deaths preceded by care need
- **Impact of unmet care needs**
- Correlations between funding and mortality
- Funding outlook

Unmet care needs in the community in England

People aged 65+ with unmet ADL care needs	2016 report	2019 report
% of population	12.5%	15%
Number of people aged 65+ with unmet needs	1.2 million	1.5 million

Sources: Age UK November 2016 and November 2019, based on ELSA data

Unmet care needs in the community in England

People aged 65+ with unmet ADL care needs	2016 report	2019 report
% of population	12.5%	15%
Number of people aged 65+ with unmet needs	1.2 million	1.5 million

2019 report age break down

Table 3. Older people with unmet care and support needs, by age group.

	Age 50-64	Age 65-74	Age 75-84	Age 85+
Percentage with care and support needs	9%	12%	15%	31%
Number with care and support needs	0.9 million	0.7 million	0.5 million	0.4 million

Sources: Age UK November 2016 and November 2019, based on ELSA data

Unmet care needs in the community in England

People aged 65+ with unmet ADL care needs	2016 report	2019 report
% of population	12.5%	15%
Number of people aged 65+ with unmet needs	1.2 million	1.5 million

2019 report age break down

Table 3. Older people with unmet care and support needs, by age group.

	Age 50-64	Age 65-74	Age 75-84	Age 85+
Percentage with care and support needs	9%	12%	15%	31%
Number with care and support needs	0.9 million	0.7 million	0.5 million	0.4 million

The % of unmet needs will be higher if we consider wider needs such as IADLs.

Sources: Age UK November 2016 and November 2019, based on ELSA data

Impact of unmet care on mortality among older adults (aged 65+)

Unmet Care Needs	Lack of doctor visits
10% increased risk over 3 years China (Zhen et al, 2013)	Among those with ADL dependency: **Relative risk 2.55** (95% CI 1.22; 5.32) over 5 years Spain (Alonso et al, 1997)
Hazard ratio over 1 year 1 ADL: **1.96** (95% CI 1.29;2.87) 2 ADL: **1.37** (95% CI 1.07;1.75) 3+ ADL: mortality not increased USA (He et al, 2015)	**Hazard ratio 1.53** (95% CI 1.24 – 1.88) over 5 years (Lindstrom et al, 2019)

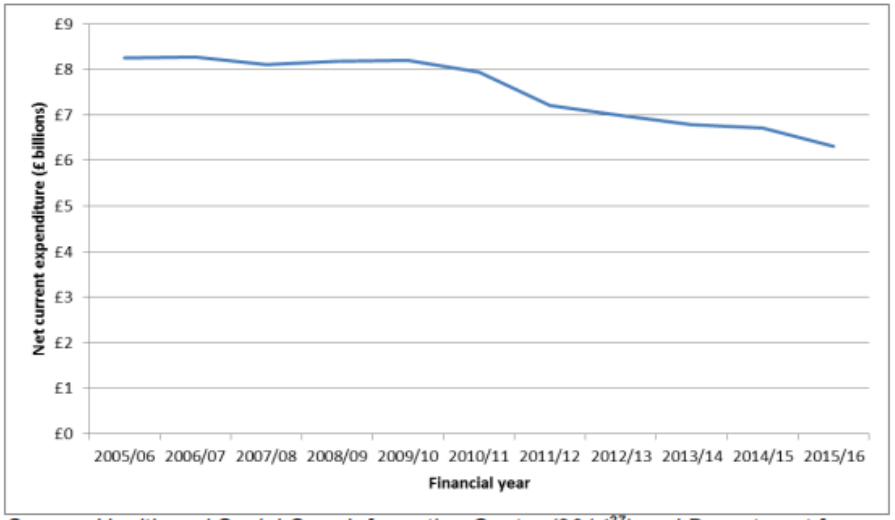
Overview

- Data on deaths preceded by care need
- Impact of unmet care needs
- **Correlations between funding and mortality**
- Funding outlook

Funding and care support fell from 2010/11

Social care funding fell by ~20%

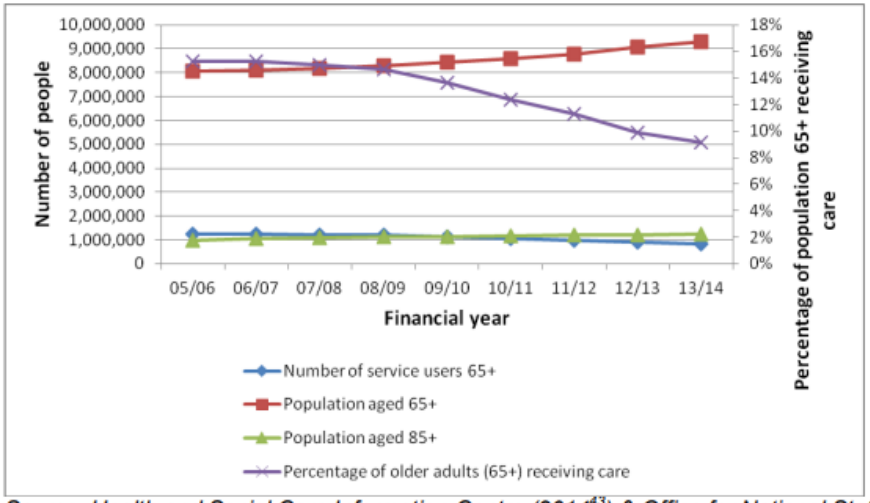
Figure 18: Net current expenditure on older people's social care, England, 2005/06 – 2015/16[7] (in 2014/15 prices)



Source: Health and Social Care Information Centre (2014[37]) and Department for Communities and Local Government (2014[38], 2015[39])

% of older people receiving social care support fell from 15% to 9%

Figure 19: Number and percentage of people receiving support with social care in England, 2005/06 – 2013/14

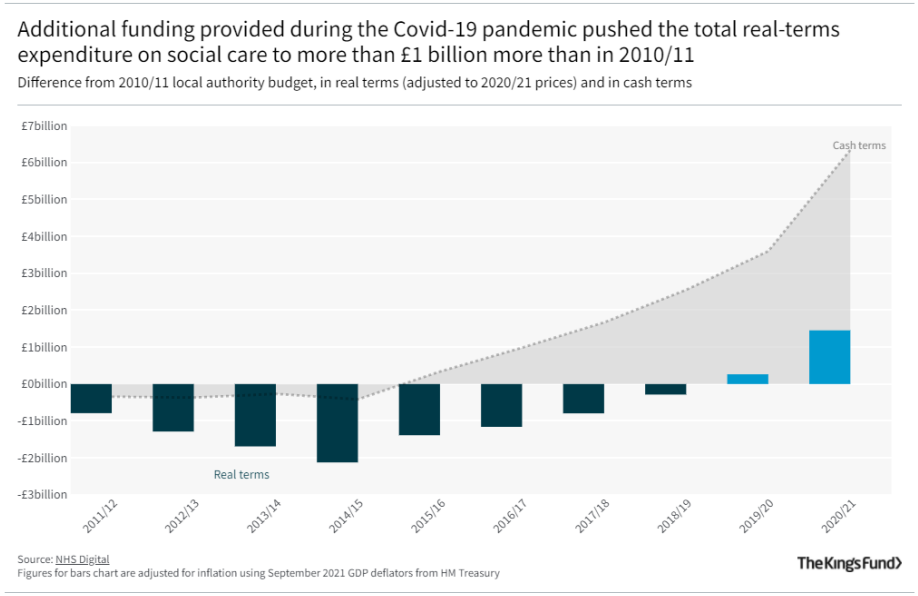


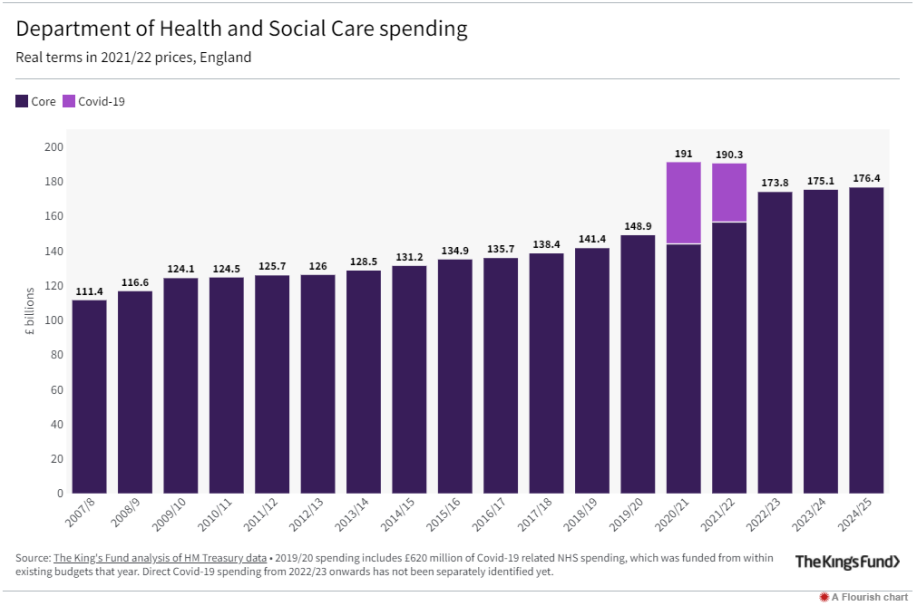
Source: Health and Social Care Information Centre (2014[43]) & Office for National Statistics (2014[44])

Source: Age UK Briefing "The Health and Care of Older People in England 2015"

Health and social care funding squeeze

- In real terms
  - Social Care funding has fallen
  - Total Health and Social Care funding has grown slower vs pre-2010



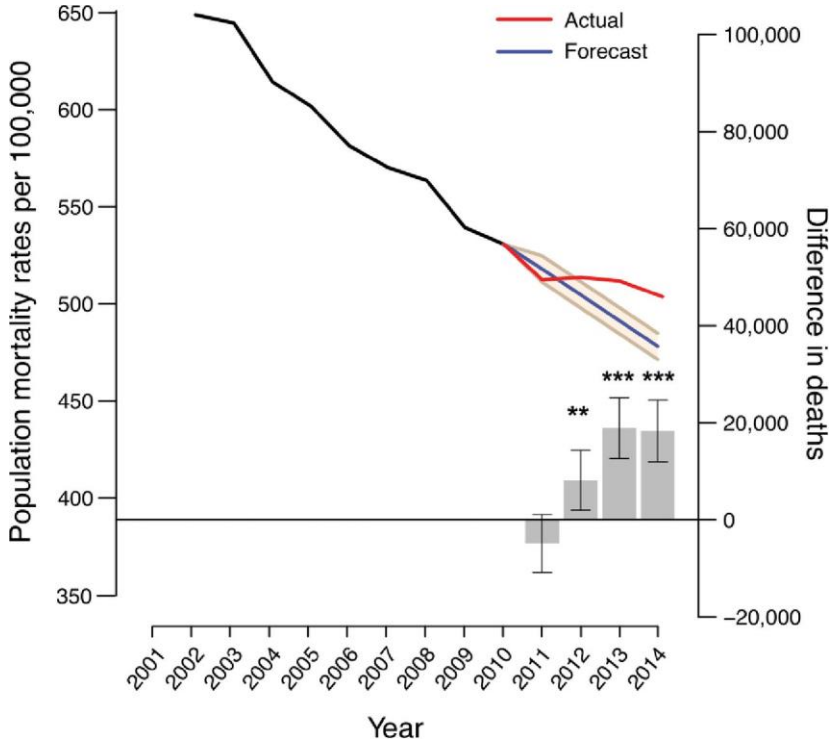


Source: The King's Fund

Effects of health and social care spending constraints on mortality in England

Watkins et al

- Compared the actual mortality rates in 2011–2014 with expected trends.
- Estimated that each £10 per capita decline in real social care spending associated with an increase of 5.10 (3.65–6.54) care home deaths per 100,000.



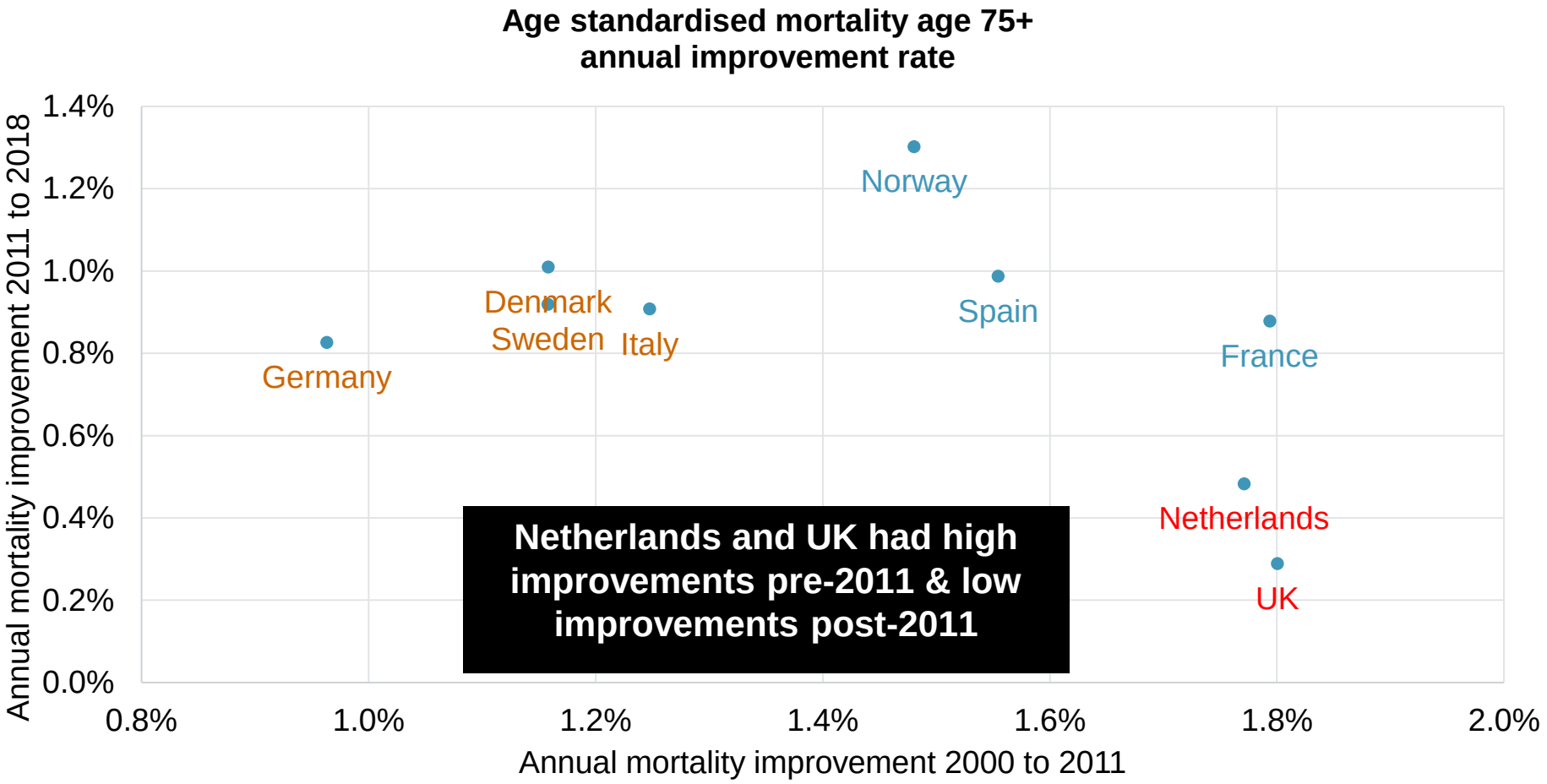
Criticism

- Other European countries with less austerity tightening also saw slower mortality improvements
- Missing and insufficiently granular explanatory variables
- No allowance for different severity of flu seasons over short time horizons
- Linear application of trend to number of deaths would eventually reach zero deaths

"Although we should not draw too many firm conclusions from the evidence in this paper, it shows signs of trouble that deserve further research, using better data."

Friedel and Watts, The Health Foundation, 8 January 2018

Mortality improvements pre and post 2011

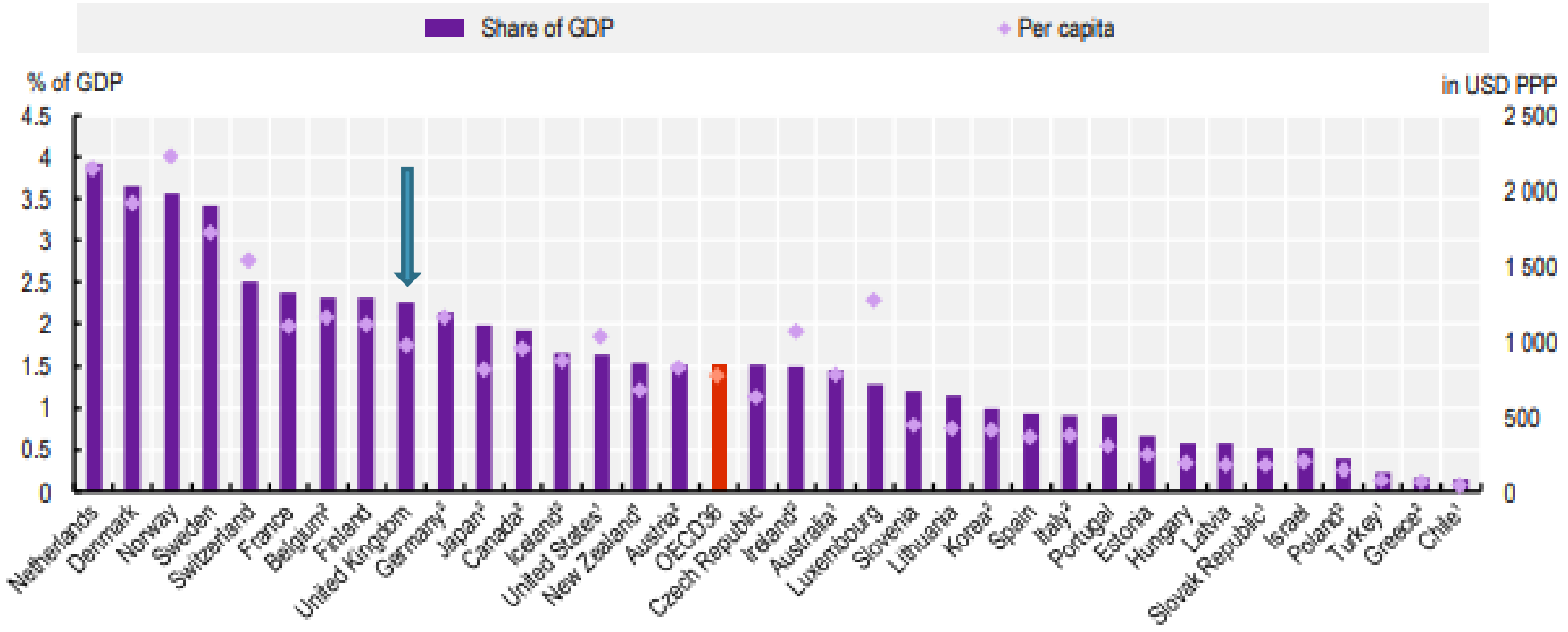


Source: own calculations based on Human Mortality Database and 2013 European Standard Population

International funding

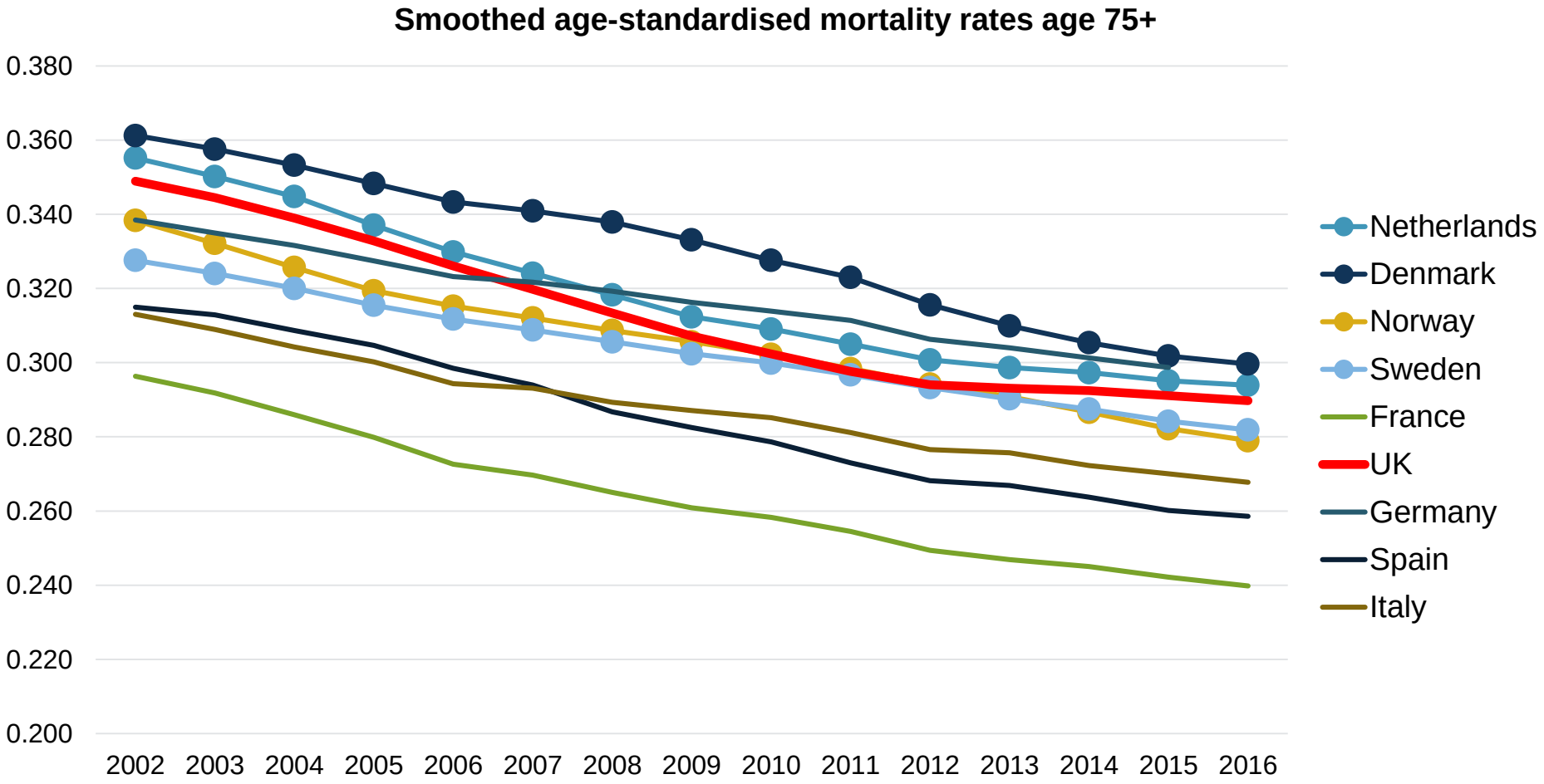
Netherlands, Denmark, Norway and Sweden spend the most on Care

Figure 1. Total LTC expenditure as share of GDP and per capita, 2018 (or nearest year)



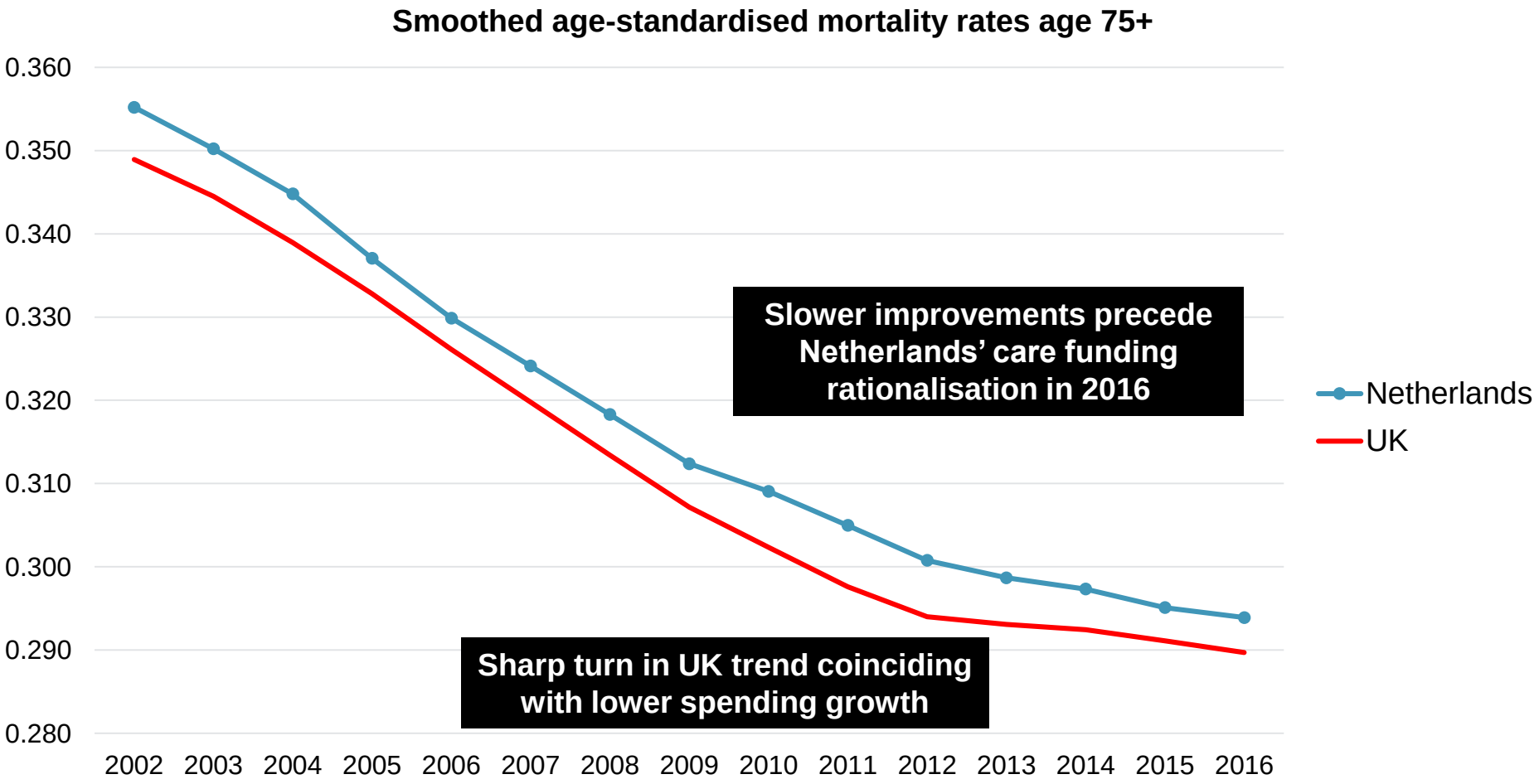
Source: OECD Focus on Spending on long-term care November 2020

Countries with highest LTC spending don't have lowest mortality rates



Source: own calculations based on Human Mortality Database

Netherlands vs UK



Source: own calculations based on Human Mortality Database

Overview

- Data on deaths preceded by care need
- Impact of unmet care needs
- Correlations between funding and mortality
- **Funding outlook**

Funding outlook

Health Foundation estimates	Cost in 2022/23 (2021/22 prices)
2019/20 budget	£20.1bn
2022/23 demand levels, no change in care measures	£21.7bn (+£1.6bn)
2022/23 demand levels, improve access to care by 10%	£23.9bn (+£3.8bn)
2022/23 demand levels, pay 18% more for care	£25.7bn (+£5.6bn)
2022/23 demand levels, improve access to care by 10%, pay 18% more for care	£28.2bn (+£8.1bn)

Funding outlook

Health Foundation estimates	Cost in 2022/23 (2021/22 prices)
2019/20 budget	£20.1bn
2022/23 demand levels, no change in care measures	£21.7bn (+£1.6bn)
2022/23 demand levels, improve access to care by 10%	£23.9bn (+£3.8bn)
2022/23 demand levels, pay 18% more for care	£25.7bn (+£5.6bn)
2022/23 demand levels, improve access to care by 10%, pay 18% more for care	£28.2bn (+£8.1bn)

- December 2021 White Paper
  - Health and Social Care Levy
    - £30.3bn over 3 years
    - of which £5.4bn for Care

Funding outlook

Health Foundation estimates	Cost in 2022/23 (2021/22 prices)
2019/20 budget	£20.1bn
2022/23 demand levels, no change in care measures	£21.7bn (+£1.6bn)
2022/23 demand levels, improve access to care by 10%	£23.9bn (+£3.8bn)
2022/23 demand levels, pay 18% more for care	£25.7bn (+£5.6bn)
2022/23 demand levels, improve access to care by 10%, pay 18% more for care	£28.2bn (+£8.1bn)

- December 2021 White Paper
  - Health and Social Care Levy
    - £30.3bn over 3 years
    - of which £5.4bn for Care
- £5.4bn breakdown
  - £3.6bn over 3 years for
    - cap on care costs
    - looser means tests
    - fair price for care
  - £1.8bn for other improvements
    - training
    - recruitment
    - technology etc.

Conclusions

- Social care considerations are important for mortality trends
  - Ageing population
  - Unmet needs associated with higher mortality rates
- Social care funding doesn’t predict older age mortality on its own
- Health and social care funding needs to be considered in total
- Improved UK funding for social care from Health and Social Care Levy
  - is it enough?

Resources

- The Health Foundation www.health.org.uk
- The King's Fund www.kingsfund.org.uk
- Age UK www.ageuk.org.uk
- Nuffield Trust www.nuffieldtrust.org.uk
- Office for National Statistics www.ons.gov.uk and

https://gss.civilservice.gov.uk/user-facing-pages/adult-social-care-statistics/

- English Longitudinal Study of Ageing www.elsa-project.ac.uk
- OECD www.oecd.org

Climate change

Joseph Lu
Legal & General

To discuss the latest 3 IPCC reports

IPCC reports

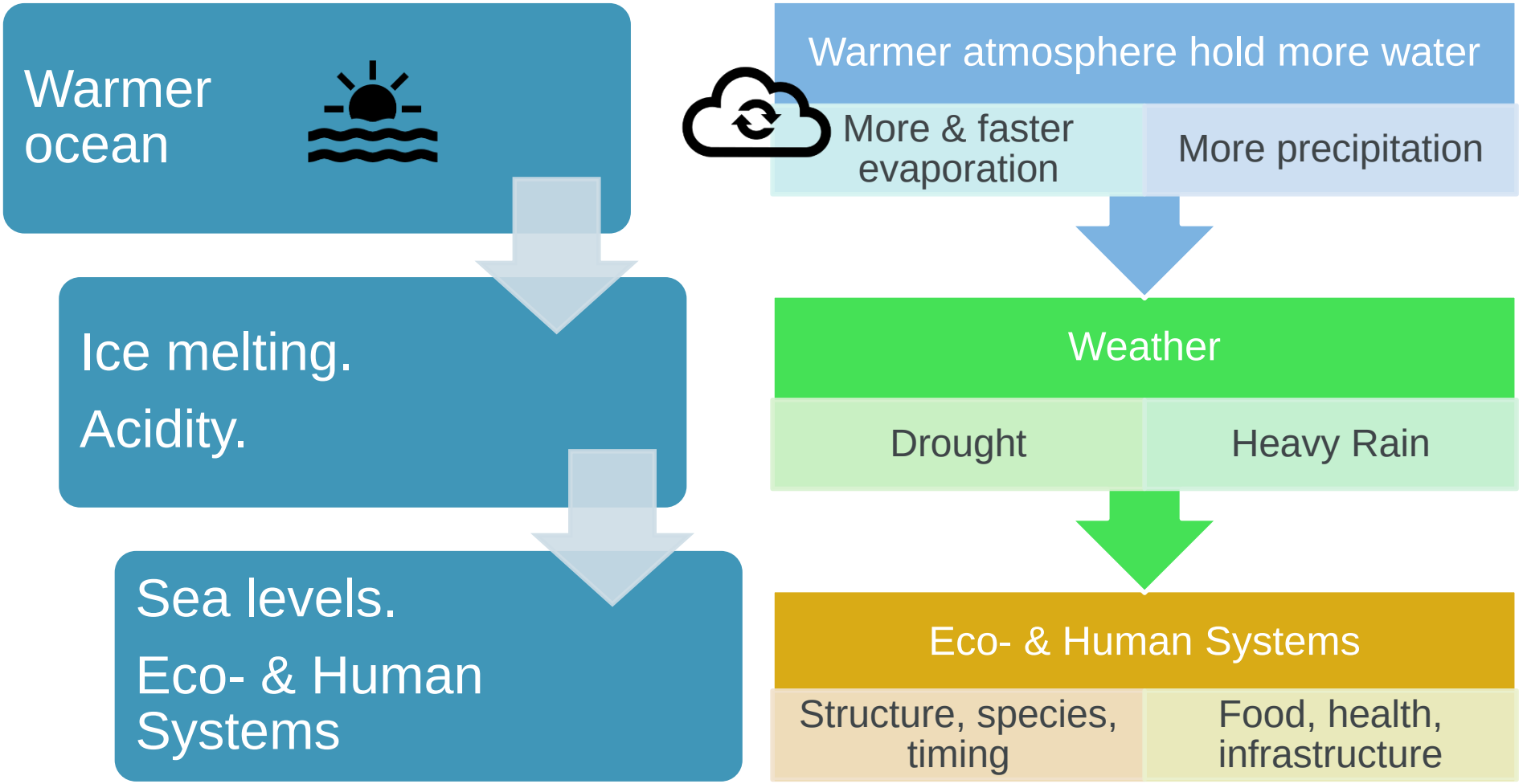
- The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.
  - Working Party I: The Physical Science Basis (August 2021)
  - Working Party II: Impacts, Adaptation & Vulnerability (February 2022)
  - Working Party III: Mitigation of Climate Change (April 2022)

Relevance to actuaries

- The IFoA Climate Change Working Party has covered the relevance of climate change on insurance industry, capital market and society. These will not be discuss in detail here.
- Instead, we will discuss some emerging evidence, ideas and conceptual framework.
- We will consider how the Actuarial Profession can add to this ongoing debate.

Human activities produce greenhouse gas

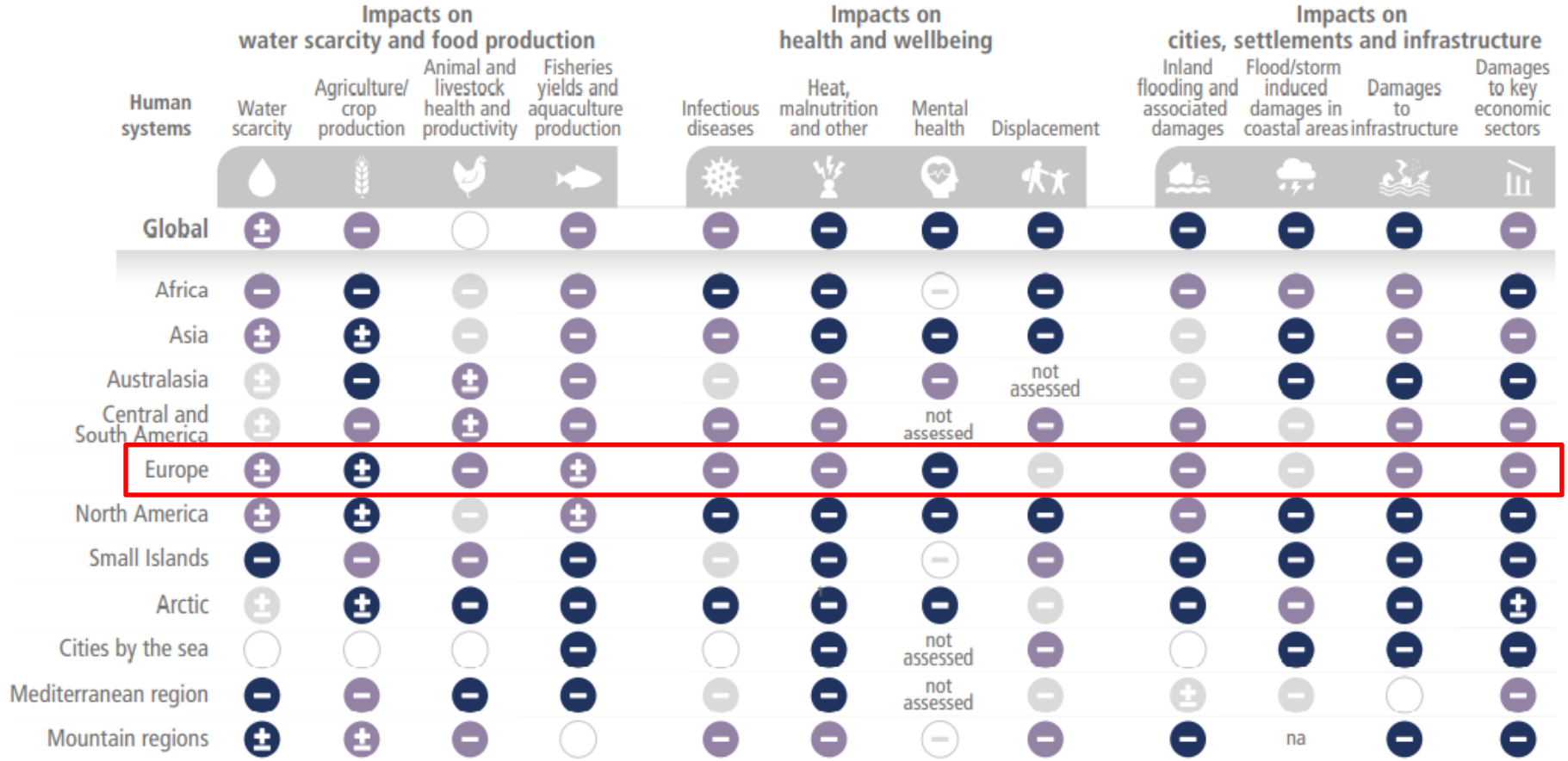
CO2 (75%), Methane (18%), Other



Global impacts

(about 1ºC rise in temperature since 1850-1900)

(b) Observed impacts of climate change on human systems

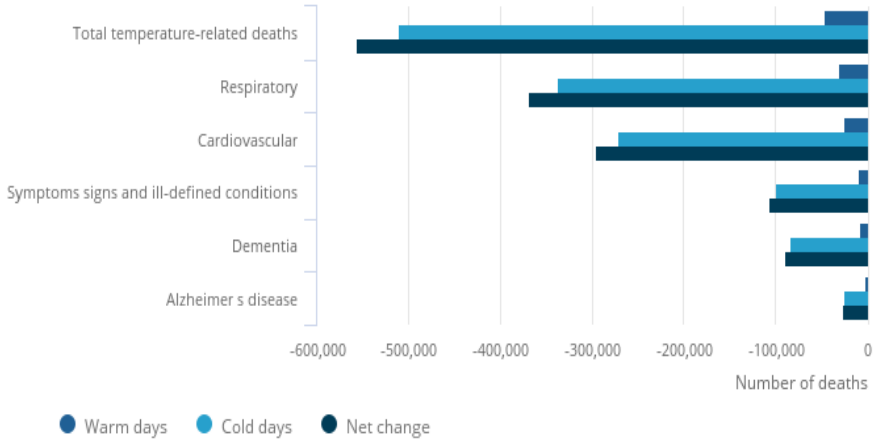


Warmer climate has reduced deaths in England & Wales (2001-2020)

More warm days (>13.8ºC)
and fewer cold days (<6.4ºC) reduce deaths

Figure 2: Total and top five causes contributing to a change in the number of deaths from causes affected by temperature

England and Wales, 2001 to 2020

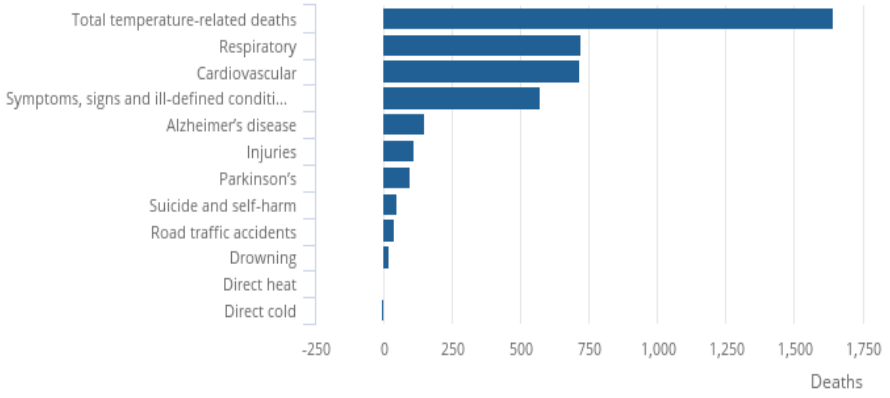


Source: Office for National Statistics – Death registration data for England and Wales

Average rise in deaths per year of 82
in 4 warmest months

Figure 3: Total change in selected causes of death from causes affected by temperature in the four warmest months, by cause of death, England and Wales, 2001-2020

England and Wales, 2001 to 2020



Source: Office for National Statistics – Death registration data for England and Wales

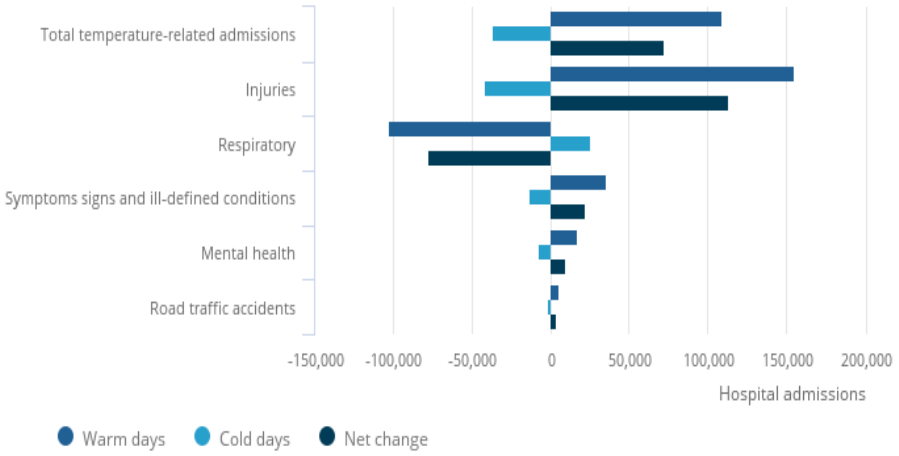
Climate-related mortality and hospital admissions, England and Wales - Office for National Statistics

Warmer climate has increased hospital admissions in England & Wales

Average extra admission 8.0k per year

Figure 4: Top five diagnoses contributing to change in the number of hospital admissions affected by temperature

England, 2010 to 2018

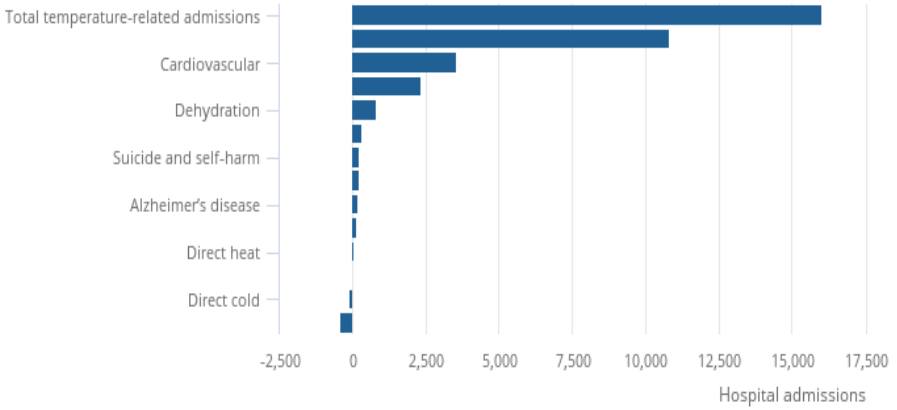


Source: Office for National Statistics – Daily admissions and first episodes in hospital episode data

Average extra admission 1.8k per year

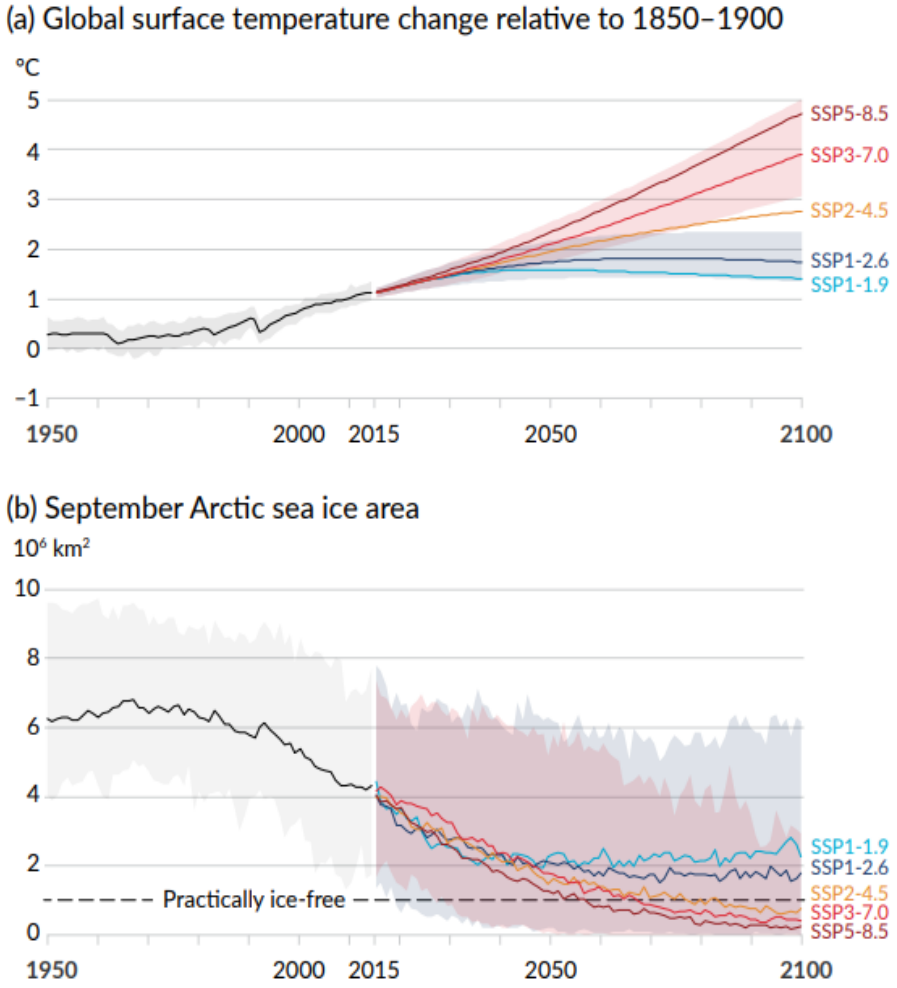
Figure 5: Total change in selected reasons for hospital admission affected by temperature in the four warmest months

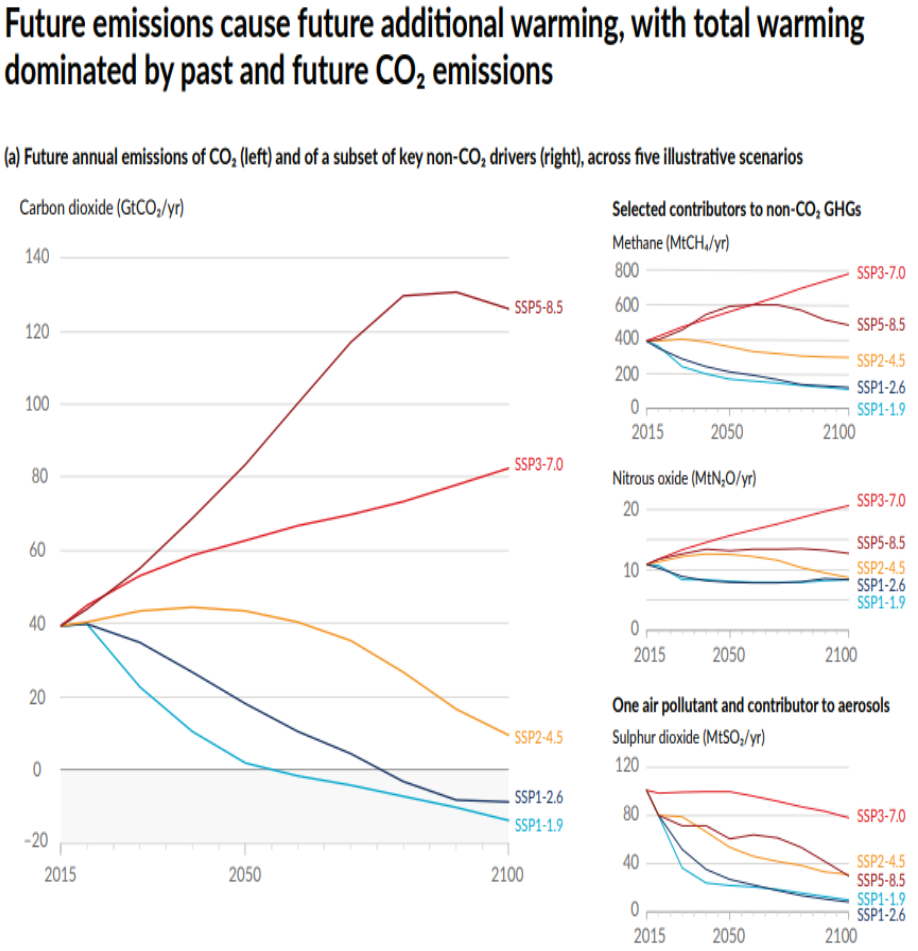
England, 2010 to 2018



Source: Office for National Statistics – Daily admissions and first episodes in hospital episode data

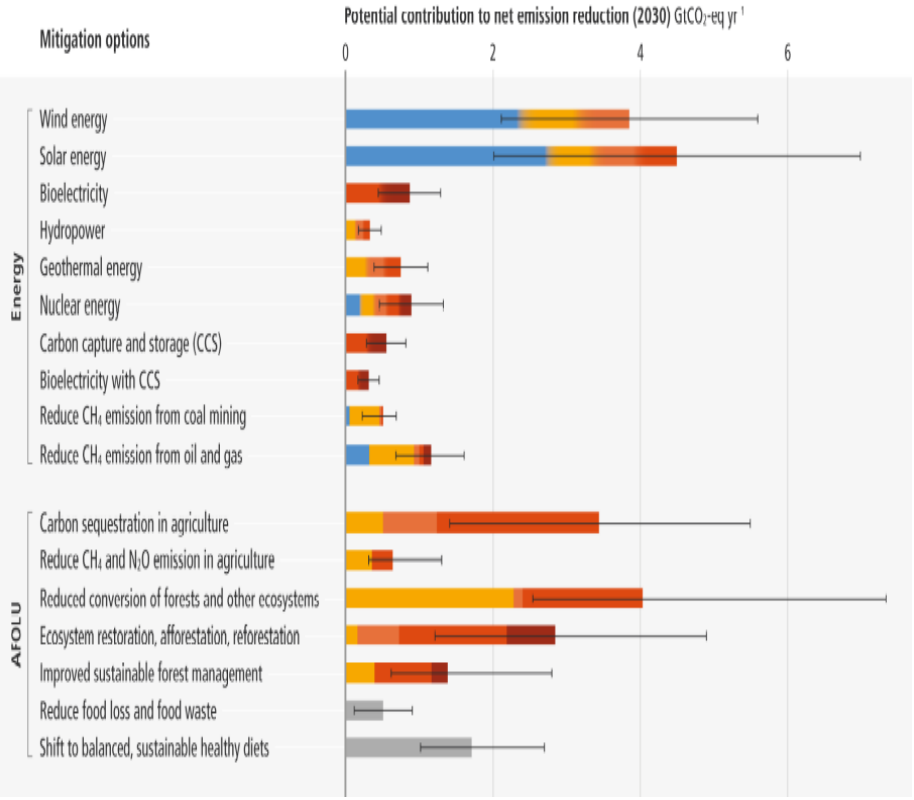
Temperature & Greenhouse Gas Projections for the world





Examples of adaptation

Many options available now in all sectors are estimated to offer substantial potential to reduce net emissions by 2030. Relative potentials and costs will vary across countries and in the longer term compared to 2030.



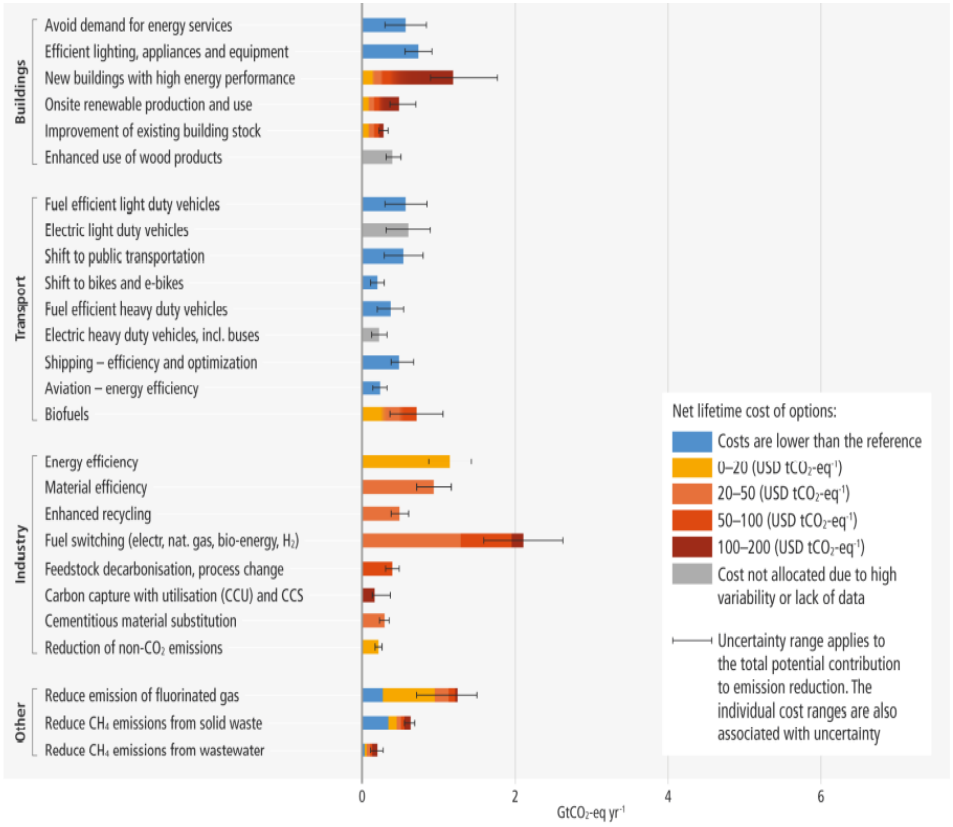
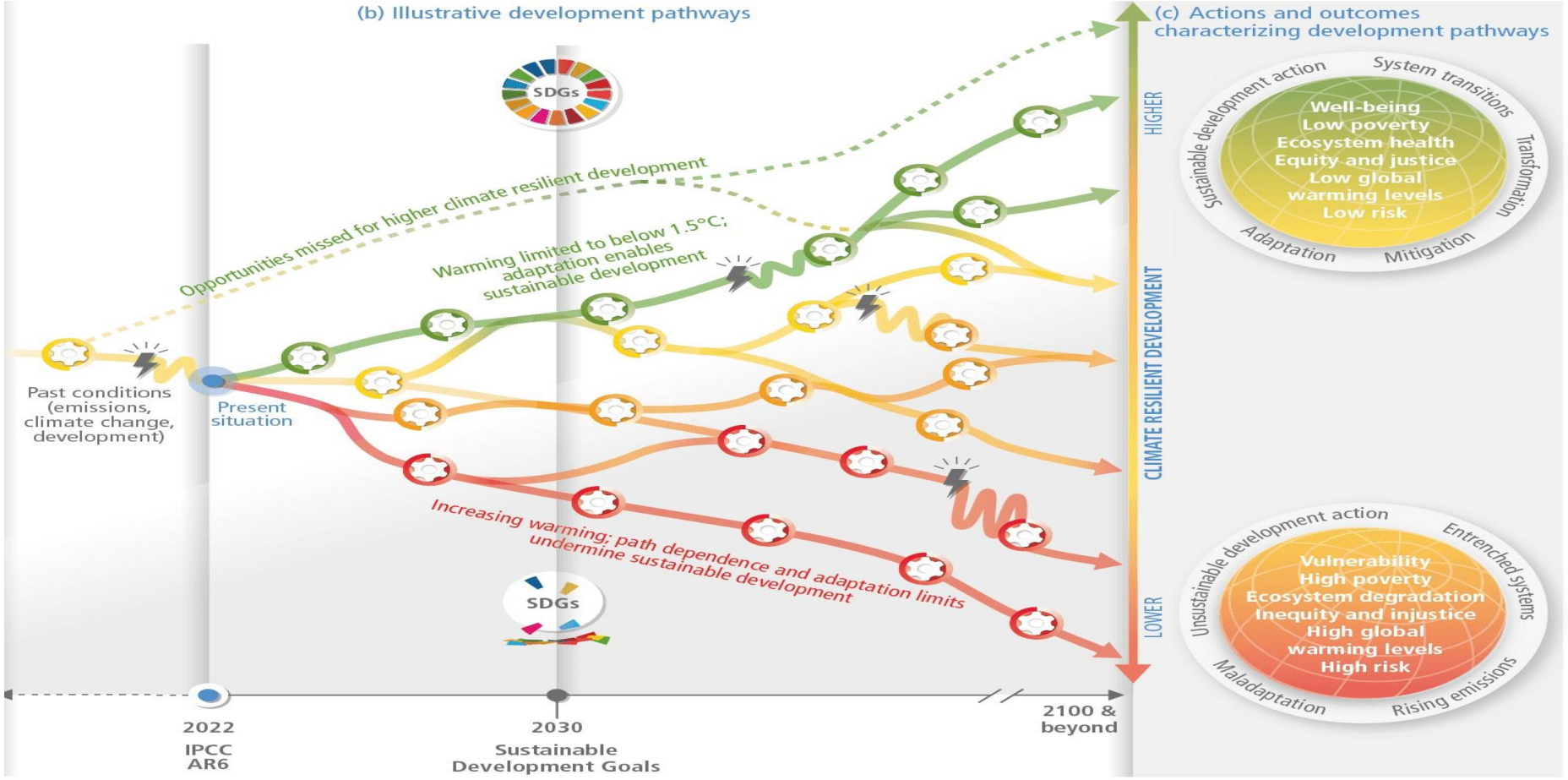


Figure SPM.7: Overview of mitigation options and their estimated ranges of costs and potentials in 2030.

Examples of adaptation

System transitions	Representative key risks	Climate responses[1] and adaptation options
Land and ocean ecosystems	Coastal socio-ecological systems	Coastal defence and hardening Integrated coastal zone management
	Terrestrial and ocean ecosystem services	Forest-based adaptation[2] Sustainable aquaculture and fisheries Agroforestry Biodiversity management and ecosystem connectivity
	Water security	Water use efficiency and water resource management
	Food security	Improved cropland management Efficient livestock systems
Urban and infrastructure systems	Critical infrastructure, networks and services	Green infrastructure and ecosystem services Sustainable land use and urban planning Sustainable urban water management
Energy systems	Water security	Improve water use efficiency
	Critical infrastructure, networks and services	Resilient power systems Energy reliability
Cross-sectoral	Human health	Health and health systems adaptation
	Living standards and equity	Livelihood diversification
	Peace and human mobility	Planned relocation and resettlement Human migration[3]
	Other cross-cutting risks	Disaster risk management Climate services, including Early Warning Systems Social safety nets Risk spreading and sharing

Can actuaries help generate scenarios and estimate impacts?



Important for actuaries to understand potential impact of climate on various risks

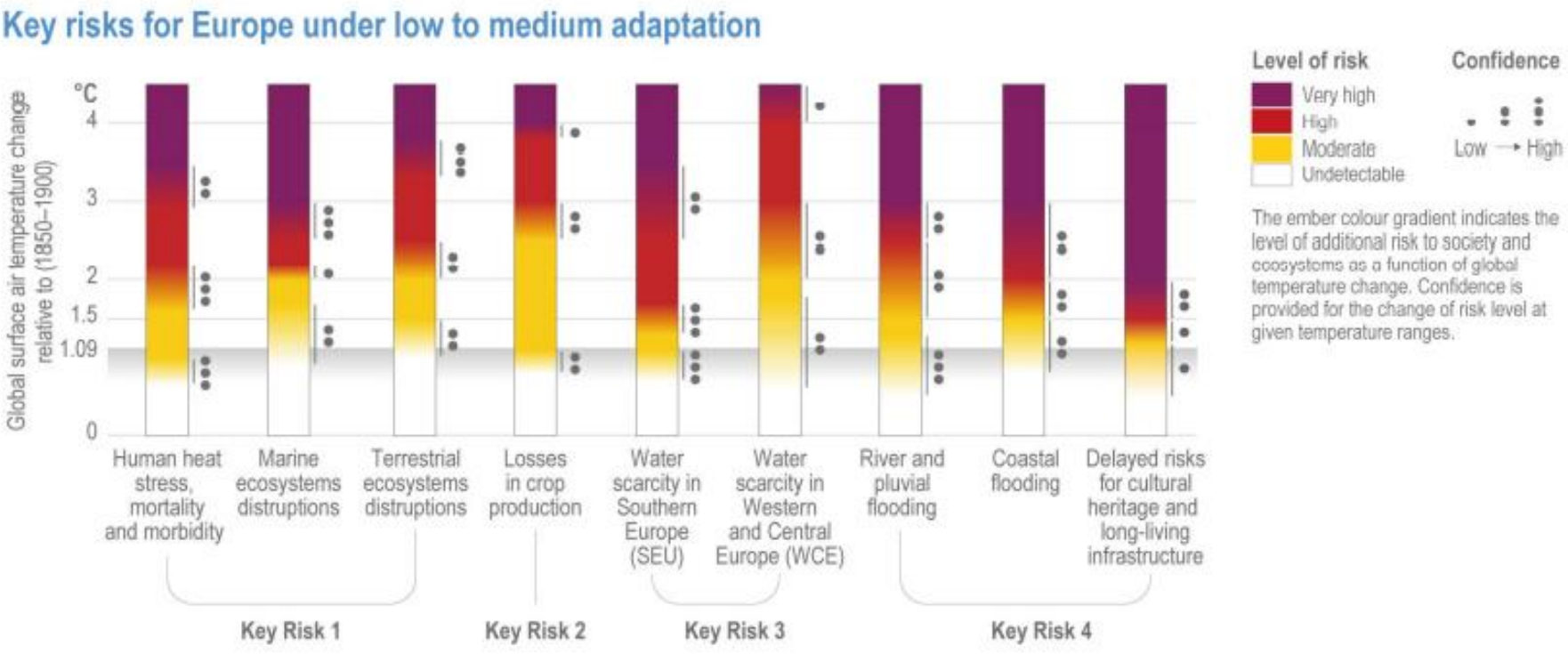


Figure 2: Burning ember diagrams for key risks for Europe with low to medium adaptation. {Figure 13.28}

Outlook for mortality improvement

- ***Climate change will affect our health and longevity*** directly and indirectly, but its ***future trends and impacts are uncertain.***
- Looking at impacts of temperature alone, England & Wales have experienced ***reduced*** number of deaths, ***contributing to mortality improvement*** in recent decades.
- This effect may continue with in the shorter term, but ***indirect impacts of climate change*** through the economy, society and infrastructure in the more distant future ***is unknown.***
- Actuaries can contribute to ***developing methods to track*** emerging trends of drivers of climate change and ***estimate potential impacts*** on outcomes relevant to our stakeholders.

Questions

Comments

The views expressed in this presentation are those of the presenter.

Continuous
Mortality Investigation

Institute and Faculty of Actuaries

Continuous Mortality Investigation Limited
Registered in England & Wales (Company number: 8373631)
Registered Office: 7th floor, Holborn Gate, 326-330 High Holborn, London, WC1V 7PP

Correspondence address: Cheapside House, 138 Cheapside, London, EC2V 6BW, United Kingdom
Email: info@cmilimited.co.uk
Tel: +44 20 7776 3820

Website: www.cmilimited.co.uk (redirects to www.actuaries.org.uk)

Continuous Mortality Investigation Limited ('the CMI') is wholly owned by the Institute and Faculty of Actuaries.

5 April 2022