International comparisons in mortality improvement modelling

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What we will cover today

1 Introduction

2 Extrapolating mortality rates

3 Model adjustments

4 Summary

Introduction

Introduction

Background

- The interest of Dutch insurers in longevity reinsurance continues to grow, with further impetus from the 2023 pension reforms.
- Global reinsurers are increasingly active, bringing with them techniques for modelling longevity from other territories.
- Today we will talk about the challenges of applying pre-existing models to a new territory.

Introduction

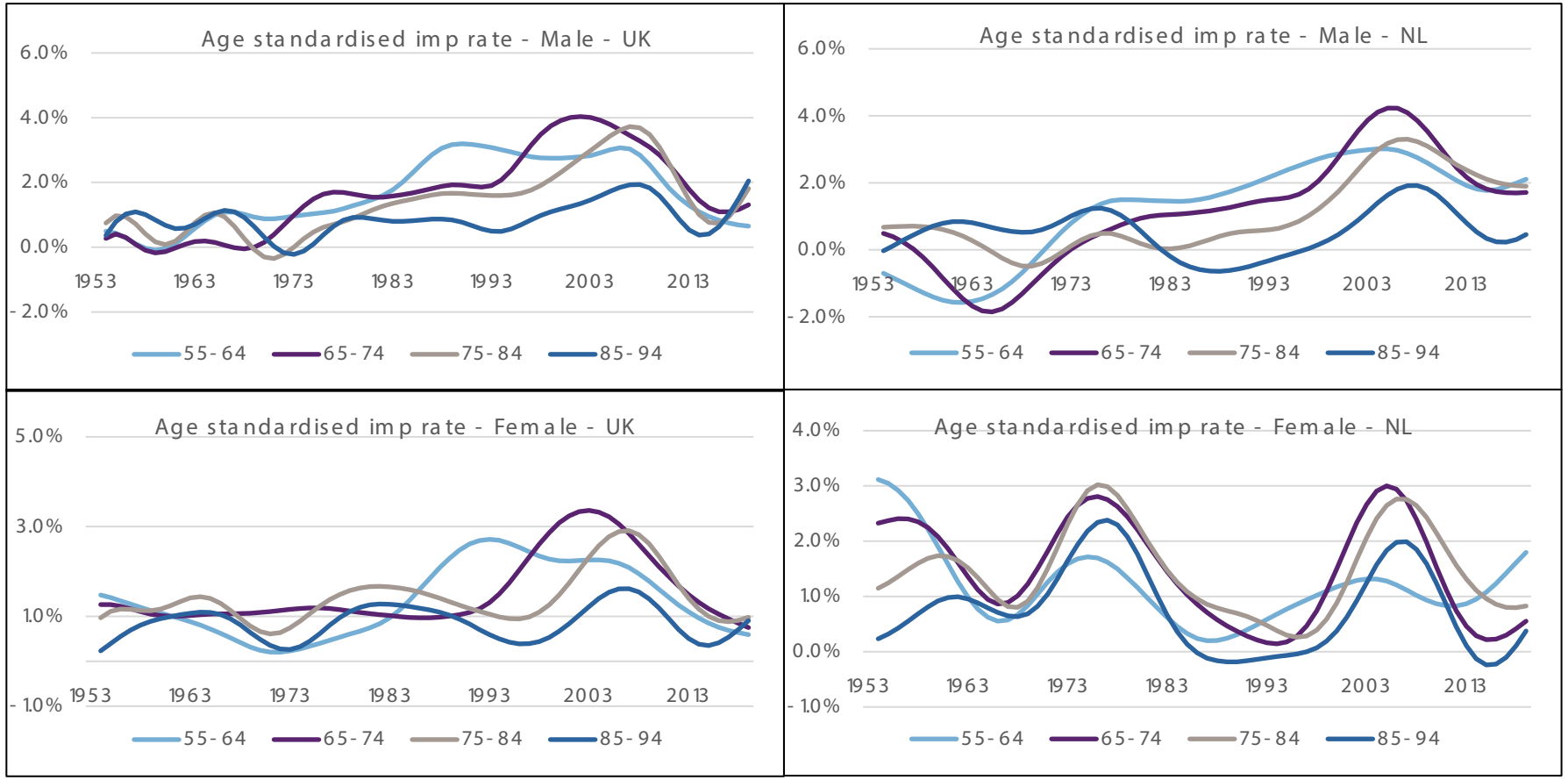
Profession led mortality projection models

- In this presentation we will focus on two widely used models:
  - The UK CMI model, which is widely referenced internationally as a benchmark
  - The SOA mortality improvement model (MIM) from the US, which is also a commonly cited alternative
- There are four key features of these models that we will refer to in this presentation:
  1. Initial rates of improvement
  2. Long-term rates of improvement
  3. Convergence between the initial and long-term rates
  4. Adjustments to address the impact of COVID-19
- The Koninklijk Actuarieel Genootschap (Royal Dutch Actuarial Association) publish the AG tables every two years.

Extrapolating mortality rates

Extrapolating mortality rates

Historic improvement rates



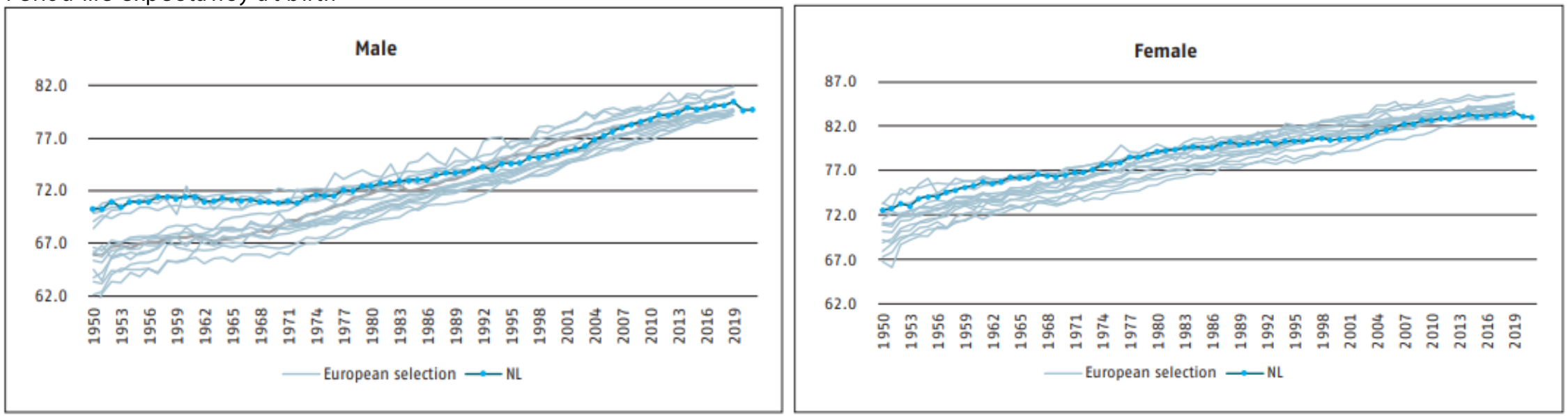
Source: HMD and CBS

An extrapolation model that is calibrated to UK data may not be suitable for Dutch data (especially females).

Extrapolating mortality rates

AG 2022 approach

Period life expectancy at birth

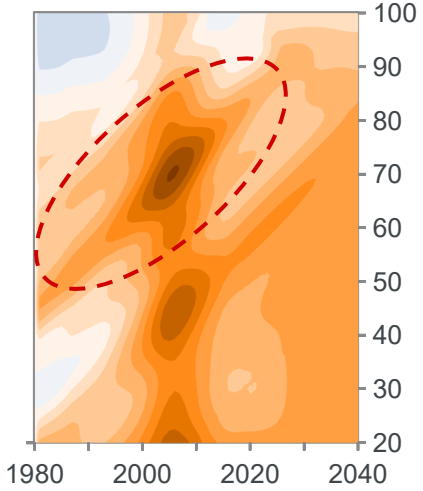


Source: Projections Life Table AG 2022

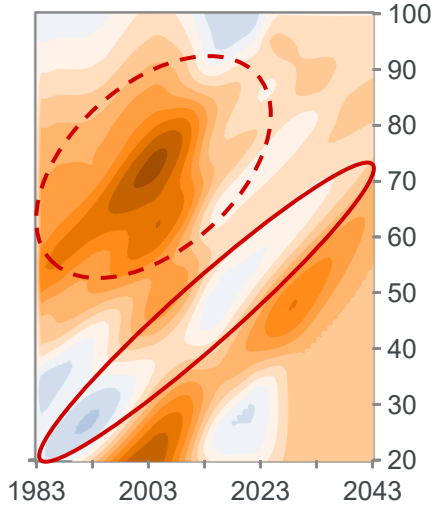
The Projections life table of the Koninklijk Actuarieel Genootschap (AG tables) fit mortality experience to a selection of western European countries and not just Dutch data.

Extrapolating mortality rates

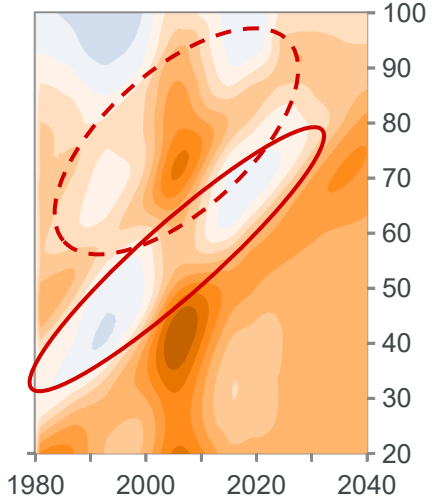
Cohort features



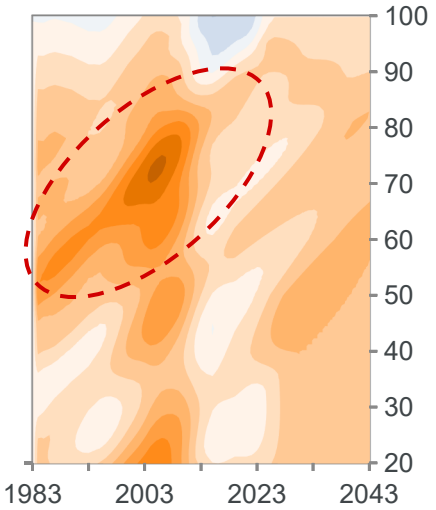
Dutch males



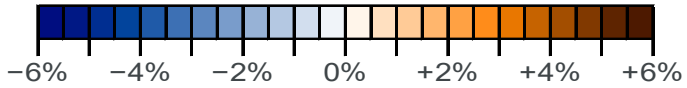
E&W Males



Dutch females



E&W Females



Source: CMI

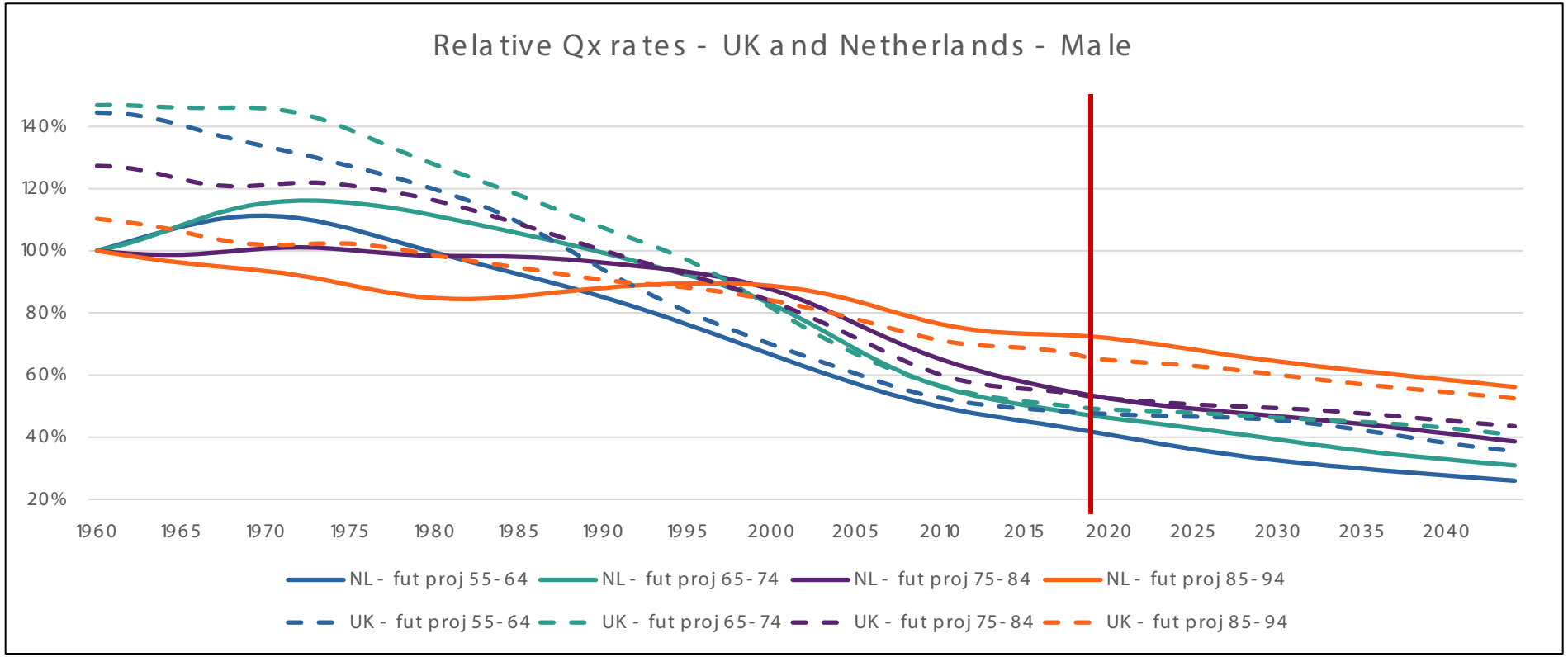
There are different features in historic improvements between the UK and NL

Convergence periods:
CMI: c. 20 years (age-period), c.40 years (cohort)
SOA: c. 10 years (age-period), c.20 years (cohort)

What is the most appropriate assumption to apply to the Netherlands?

Extrapolating mortality rates

Future mortality projection



Source: HMD, CMI

Projection is using CMI 2023 with HMD data up to 2019

The graph to the above shows [NL Qx] / [UK Qx] at different ages.

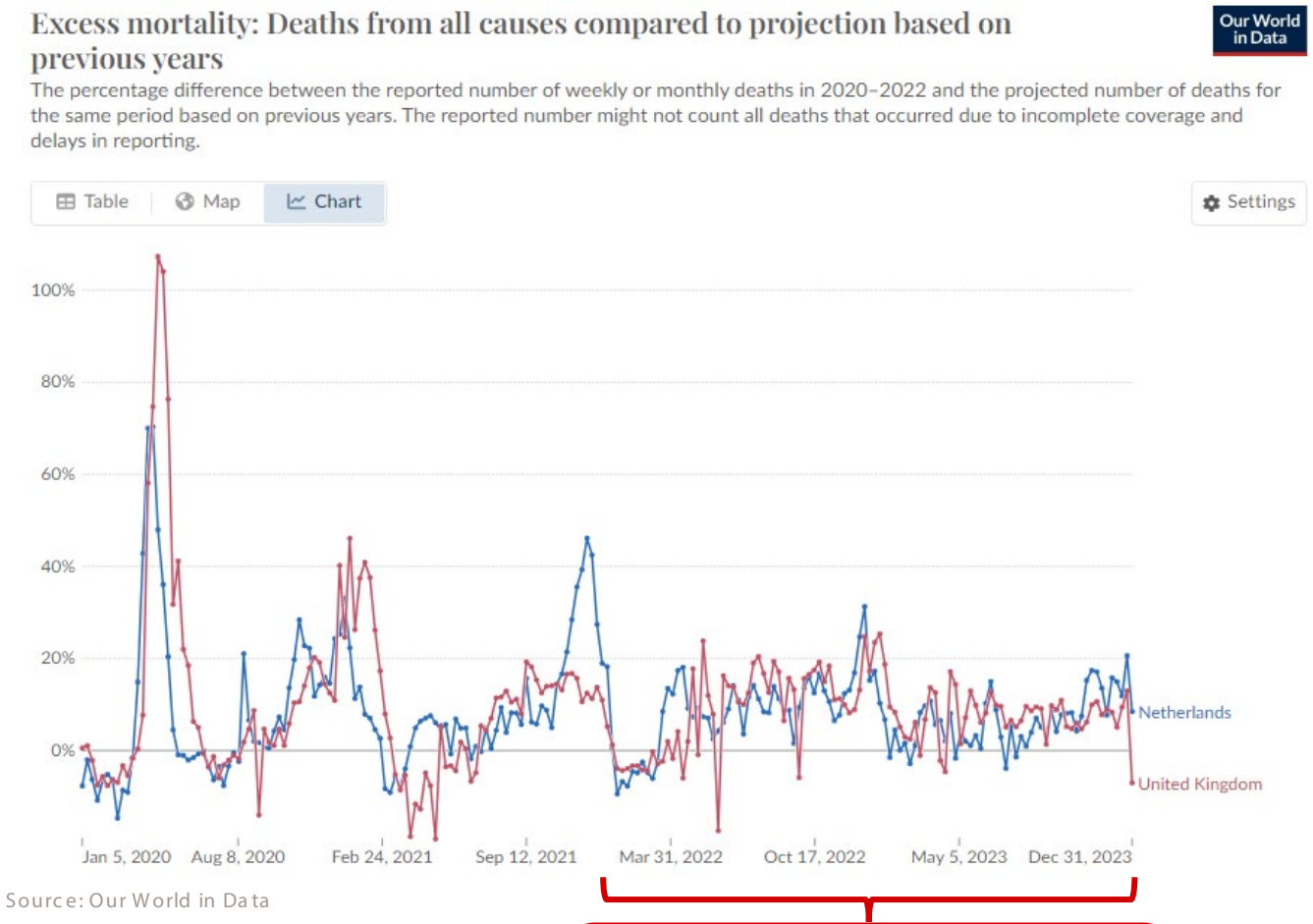
The narrowing in rates between 1960 and 2019 seems to have reversed by 2044.

	1960	2019	2044
55-64	69%	87%	73%
65-74	68%	95%	76%
75-84	79%	101%	89%
85-94	91%	111%	107%

Model adjustments

Model adjustments

COVID



Source: Our World in Data

For 2022 and 2023 the level of excess appears to be comparable.

Method for adjusting for COVID:

CMI – weightings
SOA – provision for qx loadings.

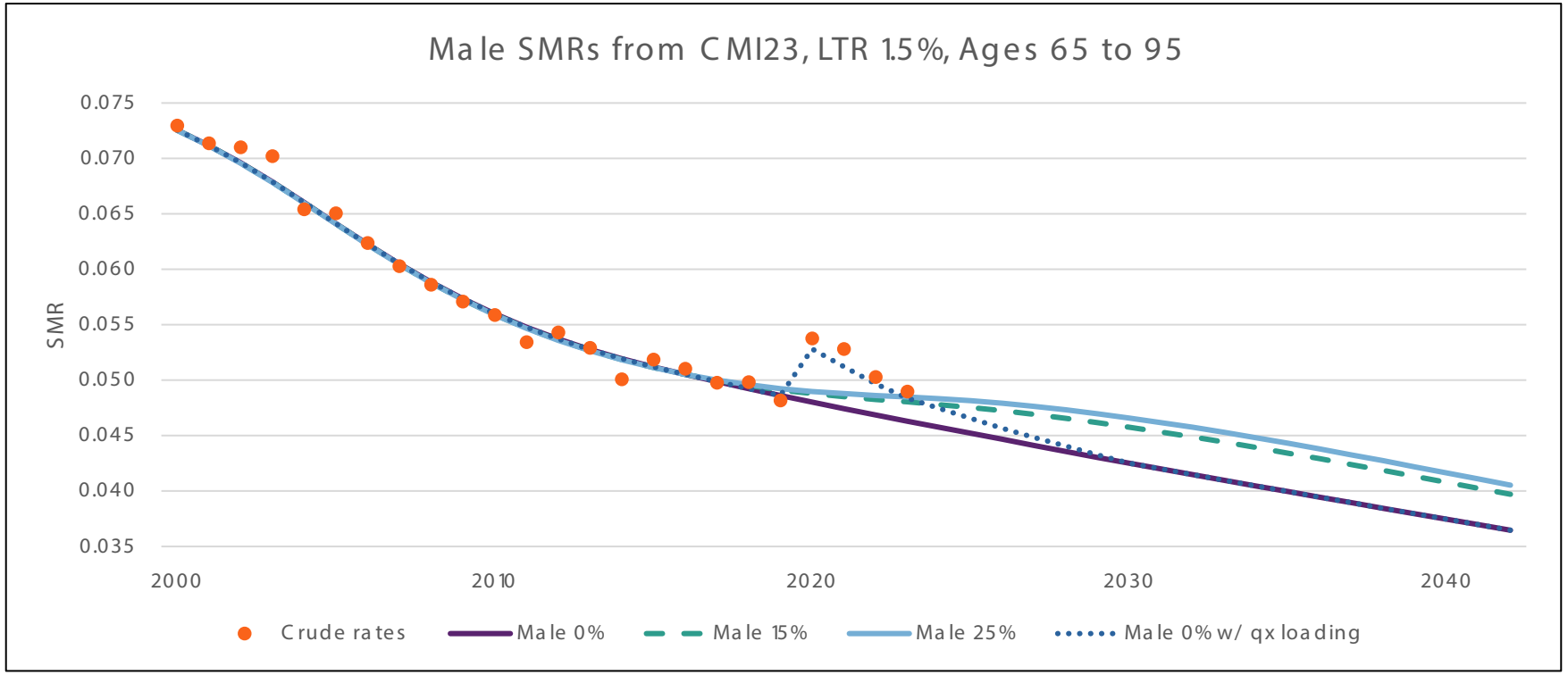
Which is the most appropriate method for the Netherlands?

Over time the key cause of excess deaths may shift from direct COVID deaths to secondary factors, such as stress on healthcare systems.

Similar levels of excess now may not lead to similar levels of excess in the future.

Model adjustments

COVID



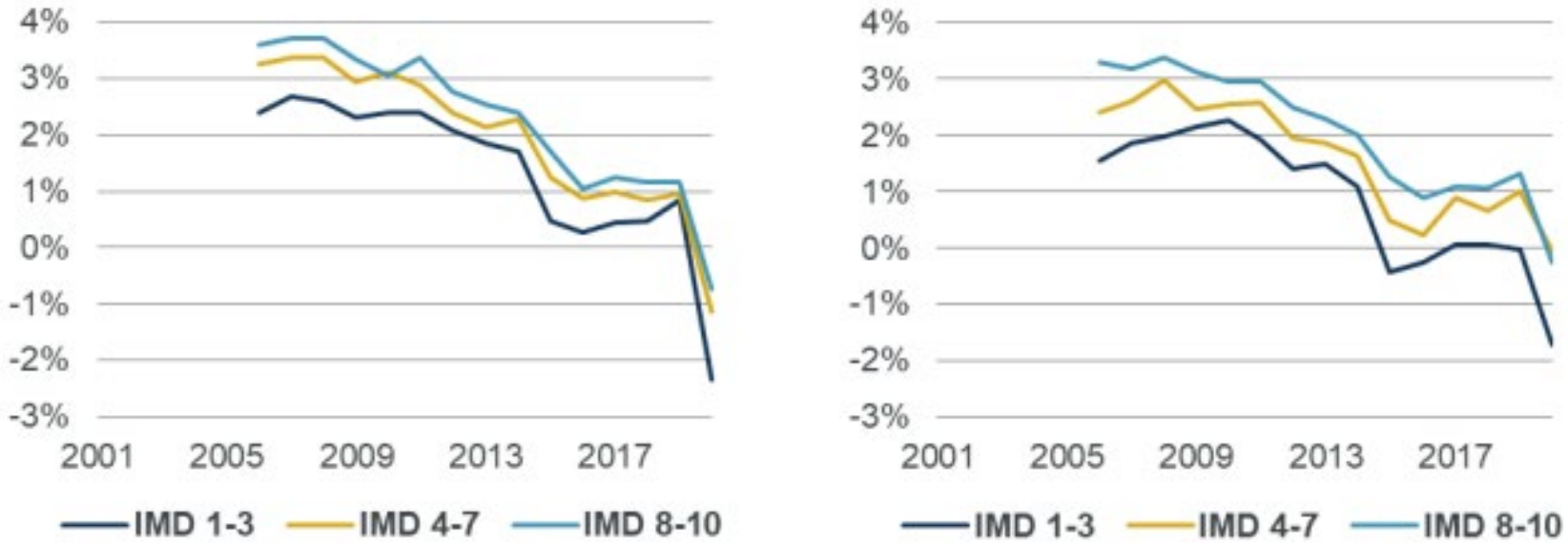
Source: CBS and CMI

How will a future projections allow for COVID experience into the future?

Model adjustments

Socio-economic differences

Five-year average mortality for ages 65-89, UK



Source: CMI working paper 187

Socio-economic differences within the UK population may not be representative of other population.

Is the data input into the model appropriate for the models use?

The CMI model does not contain an explicit adjustment to reflect differences in population and pensioner improvement rates.
The SOA model includes an optional input dataset for pensioners. This may not be available in other countries.

Summary

- Mortality experience in the Netherlands includes some unique features that make default versions of extrapolative models unsuitable for use in projecting improvements for this population
- Methods for dealing with COVID-19 and socioeconomic differences will have material impacts on assumptions and need to be implemented with due regard to local circumstances
- Cohort effects also merit careful treatment: the key test is whether projected mortality rates are plausible

Questions?

References

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