Response to CMI_2024 consultation (Working Paper 197)

Continuous Mortality Investigation (“CMI”) Working Paper 197 (“WP197”) consults upon a set of proposed methodological changes to the CMI_2024 mortality projections model. We are responding to the consultation in our capacity as a provider of mortality and longevity analytics services to both pension schemes and insurers.

In the main body of the paper we set out Club Vita’s key observations on the proposed approach. We have summarised these into three key themes which we introduce on the next page. Throughout the main paper we highlight in boxes the key suggestions / areas of concern which we believe the CMI model update would benefit from addressing. Our responses to the specific consultation questions are set out in the Annex with cross references to relevant content in the main body where appropriate.

Please note that in forming our response we have focussed on the areas which we anticipate being most material – specifically the Fitted Overlay and Multiple Period Terms. CMI 2024 proposes an extensive overhaul of the model, and the sheer volume of material has limited our capacity to provide responses to all the consultation questions posed. We would anticipate having additional comments on some of these areas in due course.

We thank the Projections Committee and CMI Secretariat for their work in producing the working paper and accompanying illustrative software.

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Key themes of our response

1 Does the new "Fitted Overlay" approach meet the desirable characteristics of a projection model?

We believe the desirable characteristics for a mortality projection model in the aftermath of the COVID pandemic are:

- A sensible fit to observed mortality rates *pre* COVID
- A sensible fit to observed mortality rates *post* COVID
- A plausible launching off point for best estimate improvements
- Robustness over time as new data emerges

We have used this framework in forming our response. Our focus here has been the new proposed Fitted Overlay since that methodological change relates most directly to the ongoing implications of the COVID pandemic.

We conclude that the proposed Option ("D") broadly meets these desirable characteristics but have a concern regarding how the model will respond if 2025 is "as expected".

2 What are the practical challenges when using the proposed model to generate mortality rates?

The two key uses of a mortality projections model are to generate prospective mortality rates (for use in cashflow projections and valuations) and historical mortality rates (for use in experience studies). Both require the combination of a selected projection with an appropriate base table.

CMI_2024 as proposed implies "spiky" year on year mortality rates over the course of the pandemic, in contrast to previous versions which excluded 2020 and 2021 data from the fitted trend. Particular care is needed when combining the projection with a base table calibrated against data including 2020 and beyond. Further, the shape of the Fitted Overlay is based on an estimate of excess mortality in the overall England & Wales population. Other populations (both in the UK and beyond) may have exhibited different levels or year-on-year pattern of excess mortality to the England & Wales data. The overlay fitted to England & Wales data is unlikely to match the excess mortality rates seen in a particular book or required for a particular use case.

We conclude that many users will need to adapt the proposed core projection to meet these challenges and that the model would benefit from some simple changes to make these adaptations easy for users – specifically easier access to the projection excluding the overlay and more flexibility in defining the overlay to be used for populations other than the England & Wales population built into the model.

3 Wider changes to CMI Model: Is the introduction of three period terms necessary?

The most material of these wider changes to the model is the extension of the existing age-period-cohort improvement ("APCI") model to have three period terms. **This materially increases the complexity of the model for users and stakeholders – which may be to the detriment of understanding and of stability.**

In our response we look specifically at:

- The rationale for introducing multiple period terms in the context of the emerging data.
- Whether the resulting updated projections at younger ages are plausible, explicable, and useful.
- Whether alternative interpretations of the emerging data could lead to a different, simpler, model

As part of this discussion, we suggest two alternative approaches which could address the challenge of capturing the current age pattern of improvements, but which are materially less invasive.

1 Desirable characteristics of a projection model

In our response to the CMI_2023 consultation[1], we set out a set of desirable characteristics of a mortality projection model in the aftermath of the COVID pandemic. These were:

1. A sensible fit to observed mortality rates *pre* COVID
2. A sensible fit to observed mortality rates *post* COVID
3. A plausible launching off point for best estimate improvements
4. Robustness over time as new data emerges

We have reviewed the new Fitted Overlay mechanism within the model against these characteristics. We summarise our conclusions below, with more detail in the remainder of this section.

A better fit and more plausible launching off point

Our view is that the proposed approach of explicitly modelling a Fitted Overlay achieves a better adherence to characteristics 2 and 3 than the approach taken in CMI_2023. This is also the case in comparison to the alternative candidate approach, Option B. See section **1.1**.

Unexpected behaviour of adding 2025 data to the model

We note that the approach proposed appears to generate a somewhat weaker projection for CMI_2025 than we'd expect based on our interpretation of how a "broadly unbiased" model should perform. See section **1.2.1**.

More flexibility in the Fitted Overlay shape?

A useful extra piece of flexibility that would be helpful to users would be the ability to define the Fitted Overlay shape to reflect their own views on the run-off of COVID-related excess mortality beyond the pre-defined exponential and linear run-off options built into the model. This would be particularly useful to non-UK users to allow them to make use of the Fitted Overlay mechanism where COVID excess mortality peaked later than 2020. See section **1.2.2**.

Should the core projection include the Fitted Overlay?

We also see an argument for making the projection with the Fitted Overlay stripped out the core projection, or alternatively to make the inclusion or exclusion of the Fitted Overlay a core parameter. Under the core model as proposed, this would require users to first strip out the England & Wales fitted overlay using the intermediate calculations in the output file.

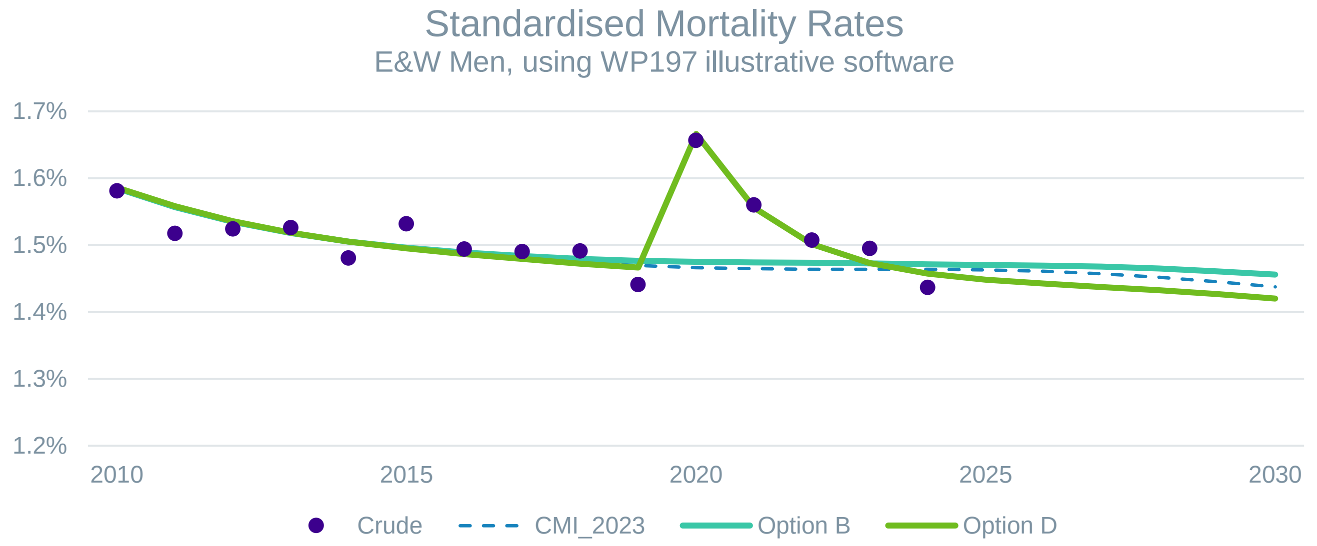
We would encourage the committee to make the alternative "Underlying Trend" projection easy for users to access and describe within the model's naming convention.

We discuss this further in **Section 2** when we consider how CMI_2024 projections should be combined with a base table under different scenarios.

[1] See https://www.clubvita.net/uk/news-and-insights/what-makes-a-good-projection-model-and-how-do-the-latest-cmi-proposals-match-up

1.1 Goodness of fit and launching off point

The chart below shows the progression of observed standardised mortality rates for men, and how the proposed core CMI model smooths through those rates (using the illustrative software provided alongside WP197, with a long-term rate of 1.5% p.a.). For comparison we also show the projection using core CMI_2023 and using CMI_2024 with no fitted overlay but instead with W_{2020} and W_{2021} set to zero (i.e. Option B as described in Section 13 of WP197).



Notes: CMI_2024 ran using beta software with a 1.5% long term rate and core parameters. For Option B fitted overlay set to No and weights for 2020 and 2021 set to 0%

In terms of a sensible fit to pre-COVID rates (our characteristic 1), in our view all three models perform equally well.

We can see that (by design) Option D provides a good fit to the acute pandemic period during 2020 and 2021 and into 2022. It also provides a more plausible interpretation of the 2022-24 data, with closer adherence to the 2024 data point and a level of ongoing improvements from 2025 onwards broadly in line with the pre-pandemic trend.

CMI_2023 and Option B give what look like, in the context of 2024 mortality rates, too high a set of projected mortality rates during the remainder of the 2020s. Most notably, Option B predicts mortality rates will be higher than those seen in 2019 and 2024 throughout the remainder of this decade and into the 2030s. This seems implausible in the absence of a convincing argument as to why 2024 was such a light year. **However, we note that understanding 2024 mortality, and its potential influence on modelling decisions is a structurally key question – a point we explore in section 3.**

We agree with the committee's conclusion that the Fitted Overlay approach provides a better way of stripping out the impact of COVID on England & Wales mortality rates than an approach which relies on setting zero and/or partial weights to different calendar years.

However, we would draw the CMI's attention to the fact that **the fitted overlay structures limit the application of the model extension the data for other countries** as our understanding is that it implicitly assumes a peak year of 2020. For example excess mortality in countries like the US peaked in 2021 rather than 2020. Further, at younger ages the peak within England & Wales may have been in 2021 rather than 2020 (see section 3.5). We discuss this limited flexibility further in section 1.2.2.

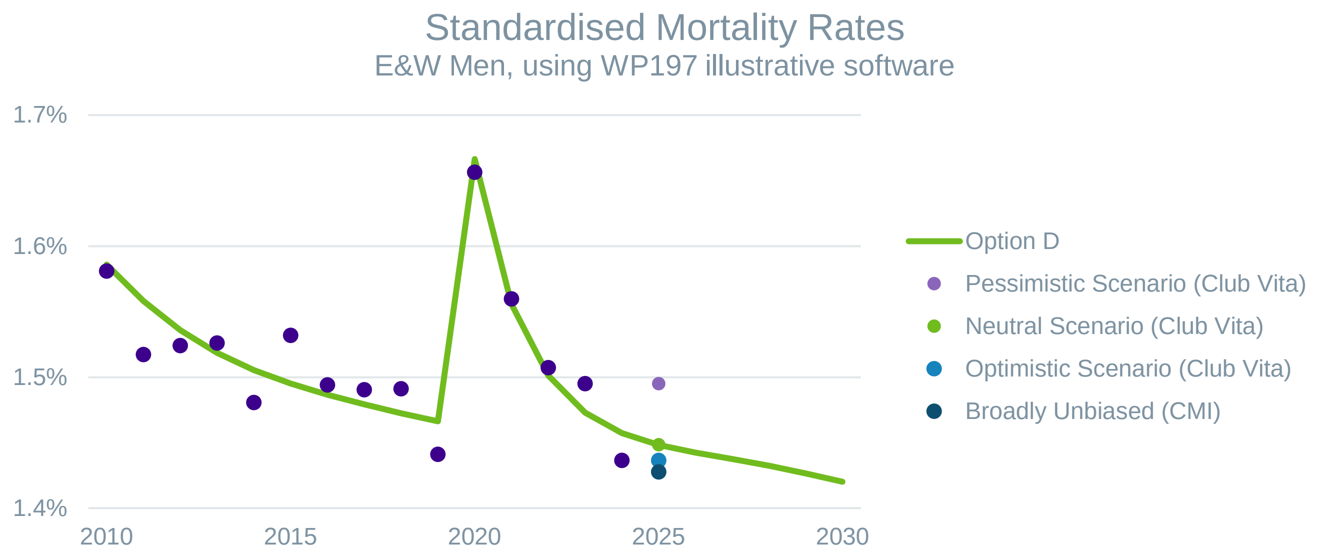
1.2 Robustness over time as new data emerges

1.2.1 Impact of adding an additional year of data

The short consultation window has prevented us from performing our own detailed analysis on the robustness of the proposed model to new data. We relied on the assessment set out in Table A3.1 and Table A3.2 of Appendix 3 of WP197.

We have created three broad narrative scenarios for what could happen in 2025 and estimated what the impact of those scenarios would be on CMI_2025 relative to CMI_2024 (as proposed). Our impacts are based on the indicative life expectancies shown in Table A3.1 interpolated for the level of expected improvement in our scenarios. We have focused here on Option D with three period terms, i.e. the proposed core model.

We illustrate these scenarios in SMR terms for men below, alongside our reading of the Broadly Unbiased scenario used in WP197 (i.e. 2024 crude mortality with fitted 2024 to 2025 improvements applied).



Results for Men

Scenario	Mortality Improvements in 2025 (applied to crude 2024 m_x rates)	Change in LE65
Optimistic: 2025 looks like 2024	0%	-0.1%
Neutral: 2025 broadly on trend[2]	-0.8%	-0.5%
Pessimistic: 2025 looks like 2023	-4.1%	-2.0%

[2] Improvement rate based on comparing 2024 observed with 2025 projected under CMI_2024 core using Option D as illustrated on the previous page.

Results for Women

Scenario	Mortality Improvements in 2025 (applied to crude 2024 m_x rates)	Change in LE65 Option D, 3 terms
Optimistic: 2025 looks like 2024	0%	0.0%
Neutral: 2025 broadly on trend	-0.8%	-0.3%
Pessimistic: 2025 looks like 2023	-4.3%	-1.8%

Given that observed mortality during 2024 fell materially below the implied underlying trend resulting from Option D, we might expect that another year of mortality in line with 2024 would cause the projection to strengthen. Instead it appears CMI_2025 as proposed would come out neutral under such circumstances.

This runs counter to the commentary in WP197 below Table A.3.3 and repeated in the main body of the consultation below Table 6.2. WP197 suggests that Option D performs better against the broadly unbiased criteria than Option B. In our view, the committee's broadly unbiased scenario is in fact an optimistic scenario.

We would expect the broadly unbiased criteria to focus on the behaviour of the model if mortality during 2025 was in line with the projection (i.e. approximately 0.8% heavier than in 2024 for both men and women as per our Neutral scenario). Under this formulation **Option D reduces life expectancy rather than being neutral.**

The broadly unbiased test is a good test to apply, but based on our interpretation, the proposed model is biased towards producing a weaker projection for CMI_2025 if 2025 emerges as predicted by the model.

We have not investigated why the mechanics of the proposed model might lead to this apparent tendency to underplay the impact of a light year during 2025.

1.2.2 The ability to refine views on the impact of COVID over time

We note that the Fitted Overlay approach ***potentially*** provides flexibility to straightforwardly adjust for the user's (or indeed the Committee's) view on how COVID has distorted emerging mortality trends. This flexibility could be used either as part of the CMI Model's next edition or could represent an ad hoc adjustment by a particular user to reflect their specific views on COVID within CMI_2024.

However, the flexibility within the model is currently somewhat limited. It assumes that the excess mortality peaked in the first year of the pandemic and then forces the user to assume either an exponential or linear run-off.

We suggest that a third option "User Defined", alongside "Exponential" and "Linear" could be built into the model.

Users could then define the overlay that they wish to apply for each year from 2020 onwards to reflect their specific views on the likely run-off of the excess mortality rates associated with COVID. This flexibility would be particularly useful to non-UK users who are applying the model to a set of excess mortality rates which did not peak in 2020 and/or don't demonstrate the apparent exponential decay pattern seen in the England & Wales data. This flexibility could extend to allowing the user to also define an age variant shape for each year.

2 Practical challenges when using the proposed model

We begin this section with a quote from the Working Paper.

> *"Our proposed approach for CMI_2024 is intended to remain consistent with the CMI's existing approach of constructing mortality base tables using pre-pandemic data and using the CMI Model to reflect the impact of the pandemic. We note that users with a base table date in 2020 or later should consider whether using the fitted overlay results in a reasonable set of projections for their base table."*
>
> Source: Section 9.4 of WP197

We would observe that this consideration extends to base table with effective dates prior to 2020, if they have been fitted including post-2019 data without adjustment for excess mortality.

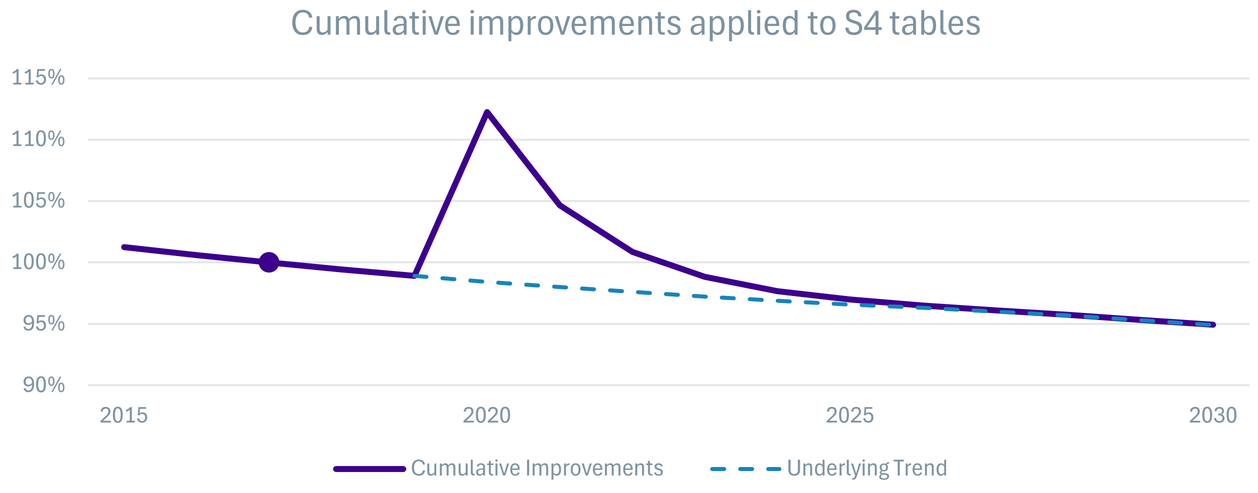
As part of our deliberations on the proposed model, we first worked through the practicalities using the proposed model in combination with a conventional "pre-COVID" base table (using one of the S4 suite of tables as an example). We set out our thoughts and conclusions in **2.1**.

We then found it useful to explore how the proposed Fitted Overlay approach could be integrated with a base table which has been fitted including post-2019 data. Many users (Club Vita included) have already engaged with this issue and started to build post-pandemic data into their choice of base tables. This will also become an issue for the CMI Self-Administered Pension Schemes ("SAPS") committee as they work towards compiling and publishing their S5 tables. We set out our thoughts and conclusions in **2.2**.

In our assessment we consider both the experience analysis and the cashflow projection use cases, focussing on the needs of pension plans and annuity writers.

2.1 Example 1: S4 table projection

In the chart below we show the cumulative reduction factor (in SMR terms[3]) that would be applied to a base table with a base table date of 1 January 2017 for each year from 2015 to 2030. We show the projection including the Fitted Overlay and also the "Underlying Trend", i.e. the projection with the Fitted Overlay stripped out.



[3] SMRs calculated using Standard Population (as included in Illustrative Software) covering ages 65 to 100. Projection is proposed core CMI_2024 model with 1.5% Long Term Rate for men.

2.1.1 Cashflow Projection Use Case

The purple line shown above gives a plausible projection as the Fitted Overlay runs off. With the exception of very mature populations and where the calculation date falls before 2025, the difference between the purple and dotted blue lines is likely to make minimal difference in any liability calculation.

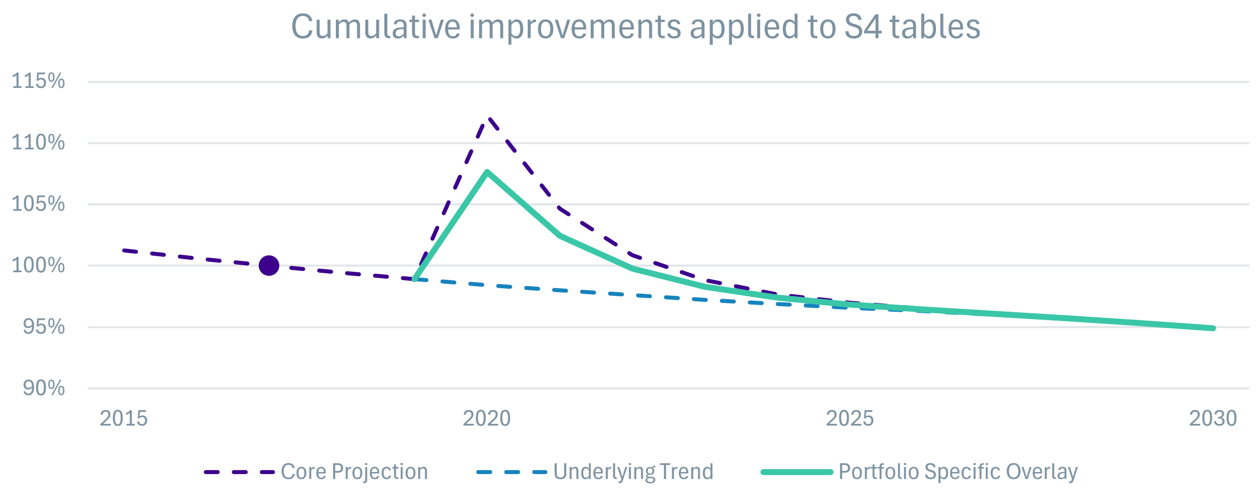
(NB: This also may not be the case where the user actively deviates from the core model.)

2.1.2 Experience Analysis Use Case

On the face of it, the purple line, in combination with a pre-COVID base table, provides an off-the-shelf mechanism for generating expected mortality rates in each year during the pandemic and post-pandemic period. However, we know that different populations exhibited different rates of excess mortality during 2020, 2021 and beyond. For example:

- In 2020, male population excess mortality varied between 106% in the South West of England and 121% in London[4].
- Female mortality in the SAPS dataset was **only** 0.6% lower in 2021 than in 2019 compared to 6.4% higher in 2021 than in 2019 in England & Wales overall population[5].

When performing pandemic-era experience analyses users will therefore often wish to apply different levels of overlay to the illustrated Underlying Trend relevant to the specific population of interest. Under the current proposal, this would require them to first strip out the Fitted Overlay (noting this is a trivial calculation) and then replace it with their own estimate of excess mortality in each calendar year post-2019 for the mix of lives they are working with. We illustrate this potential use case in the schematic below.



2.1.3 Conclusion

We agree that the **Fitted Overlay approach represents an attractive and intuitive mechanism** to control for the impact of the COVID pandemic on mortality rates seen in the overall England & Wales population.

However the inclusion of the Fitted Overlay component in the resulting projection is **likely to make little difference (under the proposed core parameters) to most users generating cashflow projections. Further, it will often be stripped out and replaced by users conducting experience studies.**

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[4] Club Vita calculations based on ONS data.

[5] See Table 2.3 of WP197.

We strongly encourage that the ability to generate the Underlying Trend (or, using the terminology in the Illustrative Software, "NoOverlay") projection is made as straightforward as possible for users. In addition, the Underlying Trend projection should have a defined name under the model's Naming Convention.

Access to the Underlying Trend projection could be facilitated in several different ways:

- Make the Underlying Trend rather than the projection including the Fitted Overlay the core output of the model.
- Add a second core parameter to the model allowing the user to choose between "with" and "without" Fitted Overlay projections.
- Make the option to exclude (or indeed include) the Fitted Overlay an Extended Parameter.
- Add an Extended Parameter enabling the user to choose what percentage of the Fitted Overlay to include in the projection (whether 0%, 100% or an intermediate value).

We think the approach described in the fourth bullet would provide maximum flexibility to users.

2.2 Integration with Post-2019 Base Tables

Where a base table is generated which includes post-2019 data, two broad approaches are possible:

- Use a "conventional" fitted table i.e. q_x rates include the excess mortality associated with the pandemic observed in the modelled population; or
- Use an "adjusted" table, which strips out an estimate of the excess mortality seen in that population.

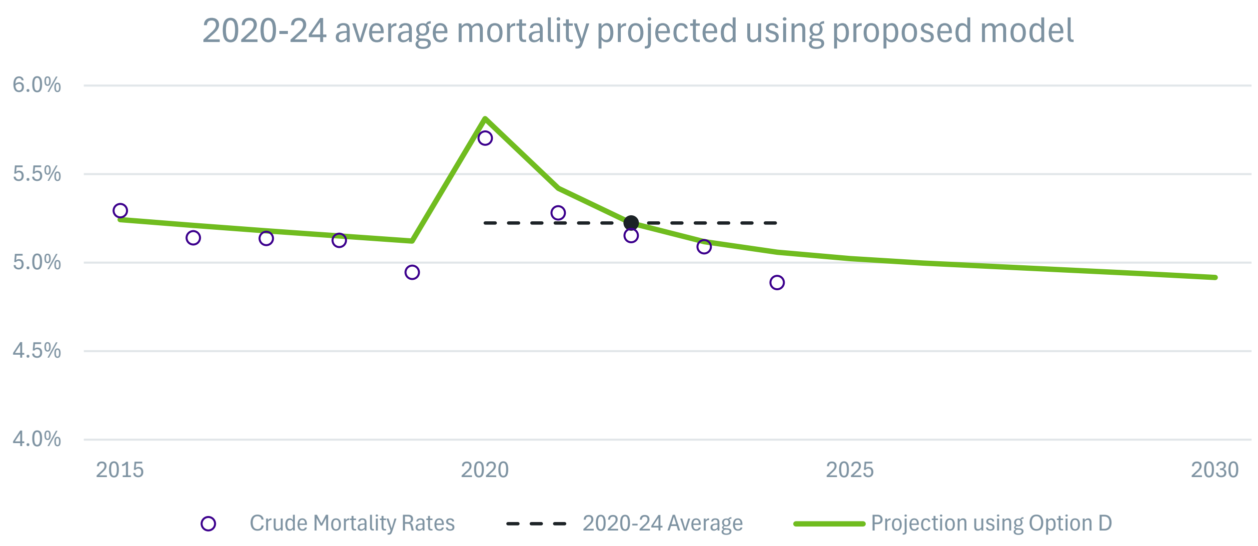
To motivate this discussion, consider the example of a base table covering the calendar years 2020 to 2024 and centred on 2022 has been constructed using one or other of these approaches. As hinted at in the quote from WP197 included at the start of this section, neither of these approaches interlocks naturally with the proposed projection which includes the Fitted Overlay.

2.2.1 Conventional approach

In terms of a (male) base table which captures observed mortality covering 2020-24 and centred on 2022:

- Let us first assume that the average level of excess mortality in the base table over the five-year calibration period is 105.3%[6], i.e. identical to that seen in the England & Wales data (based on CMI calculations).
- The non-linear decay pattern of the Fitted Overlay means that this average will be higher than the 2022 Fitted Overlay component (103.3%) which will be used to bind together the base table with the projection. This means that mortality in all subsequent (and previous) years will be overstated by around 2%, all other things being equal.

We illustrate the consequences of such a mismatch in excess rates below[7].



This makes the integration of a conventional base table which include post 2019 data with the proposed model conceptually difficult, requiring the user to apply an additional overlay to "rebase" excess mortality in the central year of the base table.

[6] The average of 114.1%, 106.8%, 103.3%, 101.7% and 100.8% which are the Fitted Overlays for men in 2020-2024 respectively in the Illustrative Software.

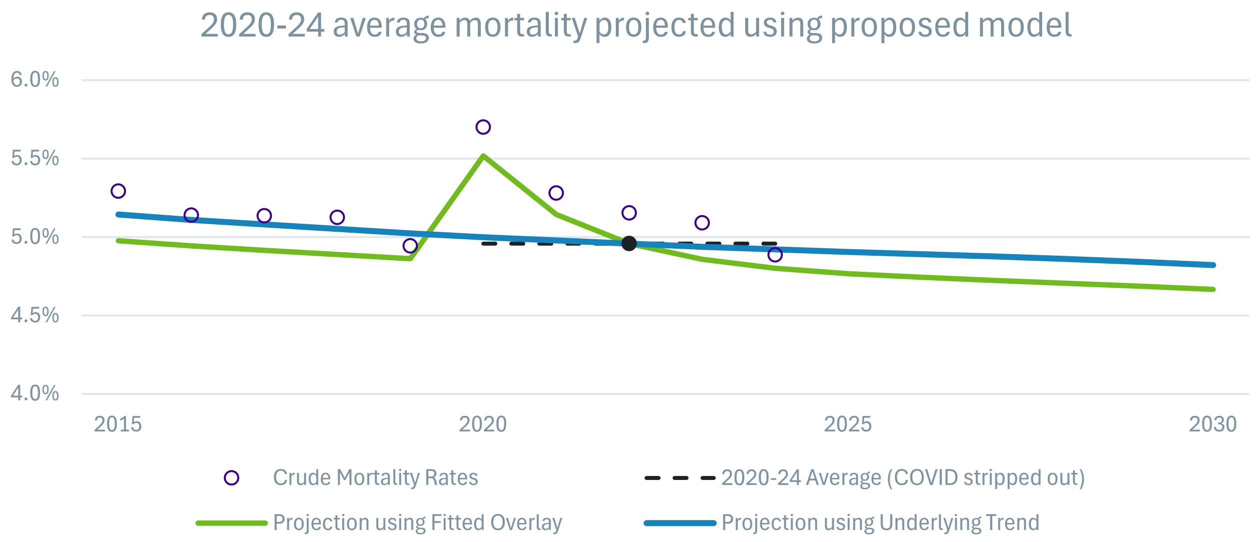
[7] The schematics in this section illustrate a pair of base tables constructed using England & Wales data, but the same arguments apply to base tables constructed using other datasets.

This additional overlay would be difficult to communicate and justify to stakeholders where both the base table and improvements are in isolation intended to represent a best estimate assumption.

We note that once the industry starts to build the body of data to construct base tables with a start year of 2022 or beyond, these considerations become less material due to the lower levels of excess mortality involved post-2021. **In the meantime we would encourage the CMI to continue to highlight this mismatching issue to users** to support them in their use of the projection and their subsequent communication with stakeholders.

2.2.2 Adjusted approach

If the base table instead strips out excess mortality from the 2020-24 base table, this also does not integrate naturally with the projection including the Fitted Overlay. The projection will run off the 2022 Fitted Overlay, leading to too low a level of mortality rates in all future years (as captured in green below). **However, a projection representing the Underlying Trend integrates naturally** with a base table which excludes pandemic-related excess mortality.



Further, where using such a base table for experience analysis purposes, a consistent approach can be adopted to where a pre-COVID base table is (or was previously) used, as discussed in **2.1.2** (i.e. the user adds on an estimate of year-on-year excess mortality for each year based on the specific population being modelled).

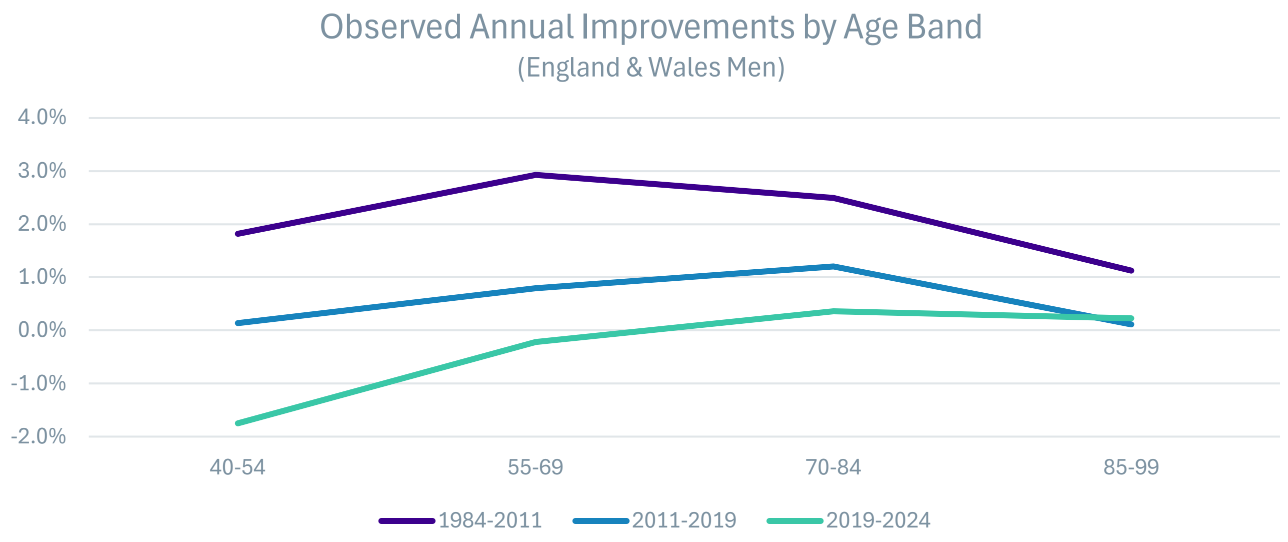
2.2.3 Conclusion

In our view, the ability to integrate the projection with a post-COVID base table with excess mortality stripped out represents **another argument for making the "Underlying Trend" projection automatically output** as a core, or at least an extended output of CMI_2024.

3 Wider changes to CMI Model

3.1 Introduction

As well as adding the Fitted Overlay mechanism, WP197 also proposes another significant change to the mechanics of the Age-Period-Cohort decomposition used to generate starting rates within the model. This is in response to an apparent emerging divergent trend in mortality improvements at different ages, as illustrated below:



Underlying the APCI methodology is an assumption that age effects (i.e. bonuses or penalties applying at different ages relative to the headline level of annual improvements as captured by the period effect) remain constant over time. This is illustrated neatly in the chart above: whilst headline annual improvements during 2011-19 were lower than during 1984-2011[8], the level of improvement at different ages all shifted down in concert. Under such circumstances, the APCI approach should work well. However, when we look at improvements over 2019-24, this pattern appears to break down.

The committee have elected to allow for this phenomenon by introducing a new concept: underlying period effects that vary by age. This mechanism in effect enables the adjusted APCI outputs to capture the evolution of the age structure over time.

In the pair of charts on the next page we show the combined age and period effects applying at different ages at different points within the calibration period. We show this for the proposed CMI_2024 model and for an alternative calibration where the multiple period effect feature is turned off.

[8] The first two periods were chosen based on a change in trend towards lower mortality improvements in or around 2011.

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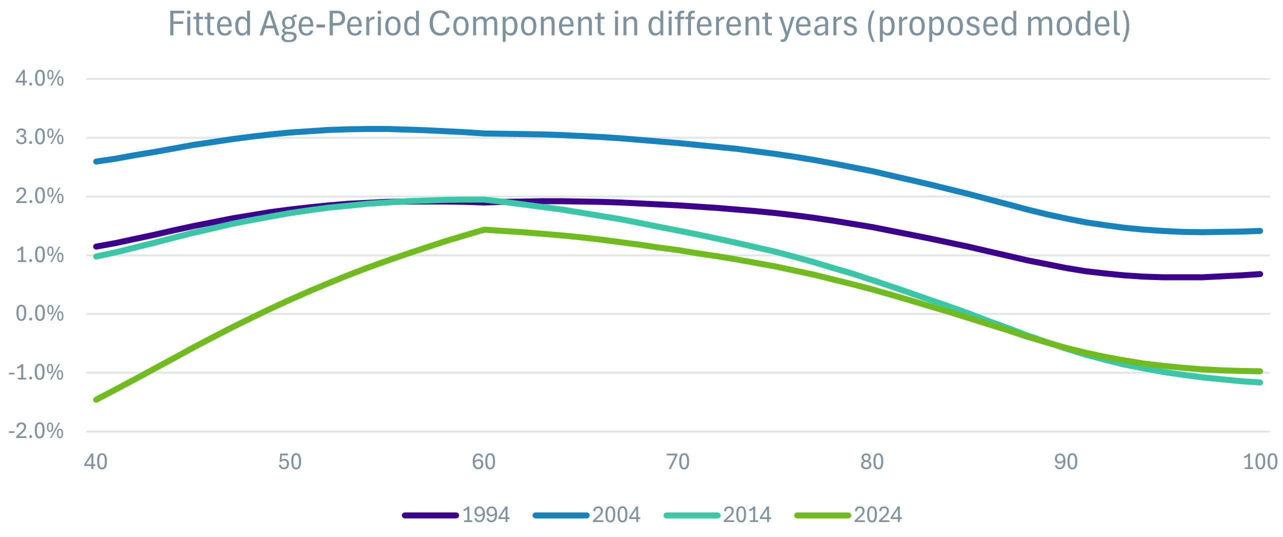
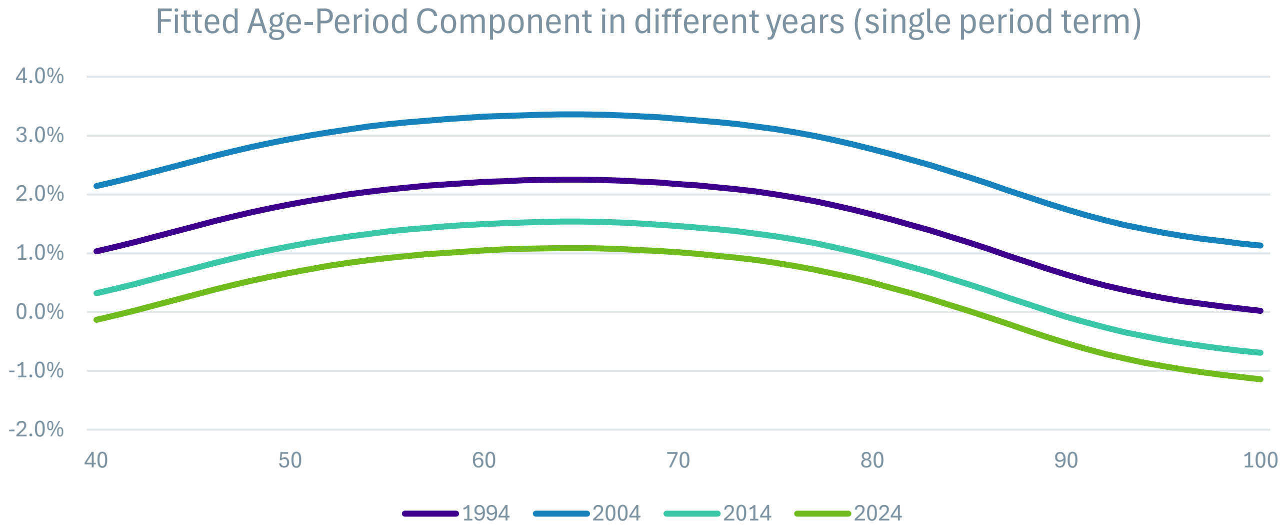
Here we can see that (unlike the conventional APCI approach) the new proposed approach allows different levels of improvement by age to be fitted at different points in time. As a result it captures the observed negative improvements at younger ages in the 2024 rates.





This feels on the face of it, an attractive additional feature: there is no real-life reason the relative pattern of mortality improvements by age should remain static over a 40-year period. However, it also presents significant challenges to users of the model.

1 Ease of understanding

The period effect is often understood to represent the headline average level of improvements seen in the modelled population at a particular point in time (after year-on-year smoothing). Adding this feature means that this intuitive interpretation falls away as a different period effect effectively applies at each age. In our view, this makes an APCI-type approach to setting initial rates in the model less accessible to generalist actuaries using the model in their work and to other more technically minded stakeholders.

Does this added flexibility comes at the cost of making the workings of the model (even) less accessible to practitioners and end users than is currently the case?

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2 Increased volatility at the leading edge of the projection

Whilst the new approach allows the model to capture the negative improvements seen in the younger England & Wales population, it would seem to place a high level of reliance on recent observed mortality rates at younger ages to determine the associated trend. This seems a particular concern currently, as we move out of the pandemic era and have limited volumes of reliable recent data to work with.

Is there a sufficient body of evidence for a genuine change in trend in lower age mortality improvements to support such a major change to the model? We look at this question further in section 3.2.

3 Implausible looking value for age 20 period effect in 2024

In our initial exploration of the output of the illustrative software, we were surprised to see implausible values for MI_m_Period_1 at 2024 (i.e. at age 20) of -5.047% for men and -4.014% for women. We note that these values lead to plausible starting rates due to their interaction with an offsetting strongly positive cohort effect.

However, the make us wonder: **How stable is this new approach given the low numbers of deaths and hence volatile mortality rates seen at younger ages?** We would encourage the CMI to publish additional sensitivity analysis to understand the potential instabilities this new complexity may introduce.

3.2 Exploring younger age mortality

The charts below (copied from WP197) show Standardised Mortality Rates amongst 20-44 year olds in England & Wales.

Chart 2E: Annual ASMRs for England & Wales Males, ages 20-44

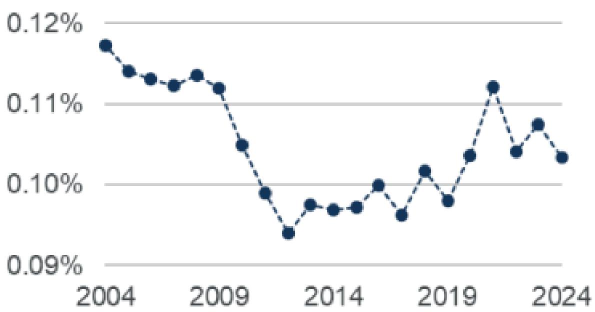
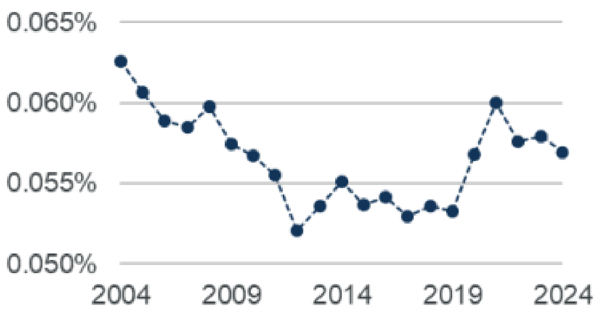


Chart 2F: Annual ASMRs for England & Wales Females, ages 20-44



Superficially there appears to be a clear upwards trend in the data which might encourage readers to agree with the CMI's view that there is a need to introduce multiple period effects. However, we would suggest that caution is required in interpreting the evidence (in the same way the CMI recommend caution in interpreting the overall trend in Section 3.3 of WP197). Specifically:

- How genuine is this trend? Can we rationalise the different changes by age group, or might underlying data issues be distorting our view? (See section 3.3)
- If this is a genuine trend, then should it be interpreted as a cohort effect not a period effect? And why is it not being picked up by the cohort term in the model? (Section 3.4); and
- Could changing our frame of reference to focus on the 2011-2019 era change our impression? (Section 3.5)

> Our conclusion from these considerations is that alternative plausible interpretations of the evidence exist which could be allowed for in the CMI model via less invasive changes.

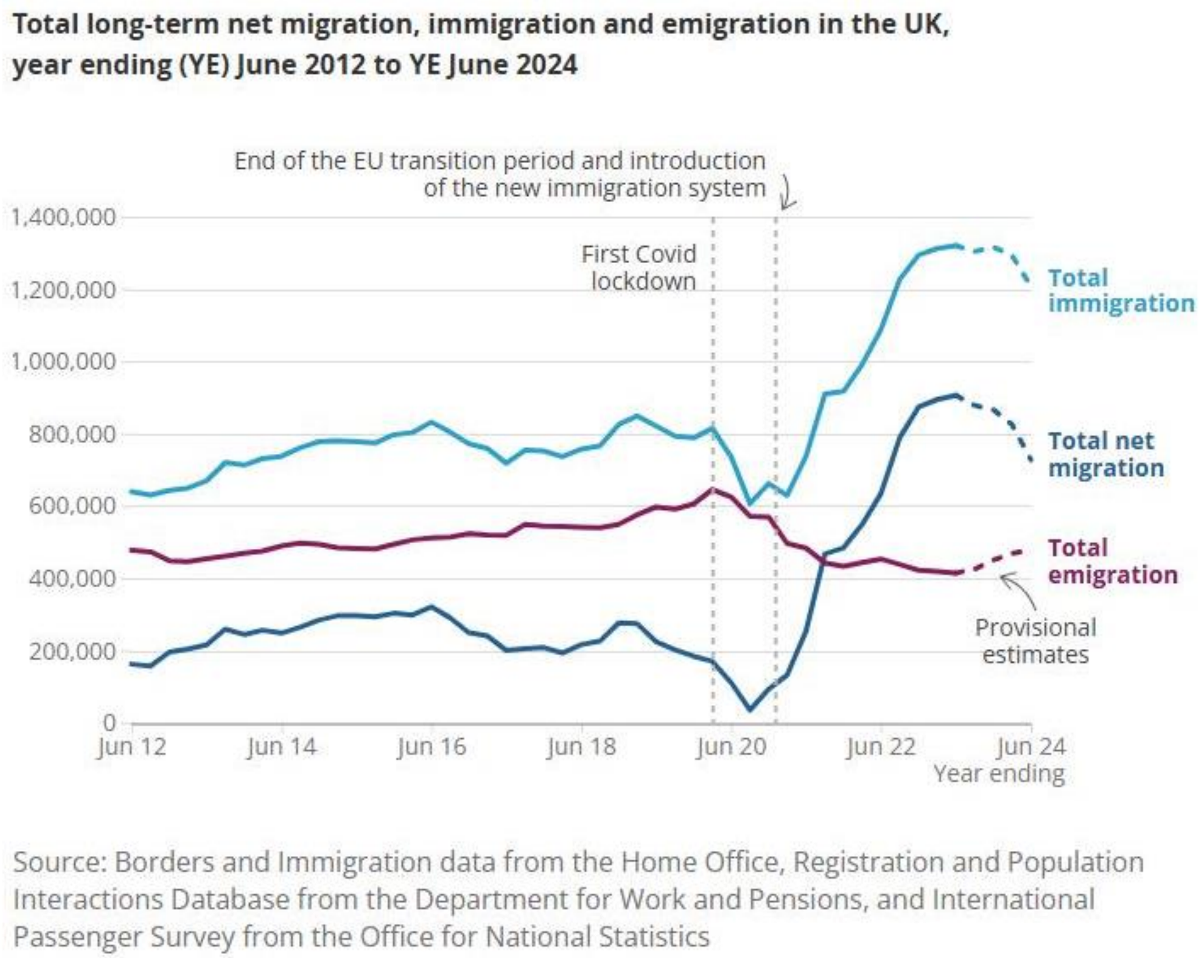
3.3 How genuine is the trend?

In our view there are good reasons to be cautious about interpreting this trend.

Firstly, the eye is drawn by the 2020 through 2023 data points, but we should place limited weight on these as they will be at least somewhat impacted by the pandemic. Therefore, significant weight is being placed on the 2024 mortality data to establish the trend. We think there are two arguments to be sceptical about the 2024 data point, one more quantitative (the impact of net immigration on estimated mortality), one more qualitative (how the pandemic continues to impact different age groups).

3.3.1 Quantitative argument: Impact of high levels of immigration on population estimates

The exposures for 2024 used in the illustrative software are estimates, based on a roll-forward. This relies on an allowance for net migration which is calculated as the six-year average of the difference between actual and estimated ONS exposure data. Net migration has grown rapidly in the aftermath of COVID and Brexit, as captured in the ONS chart below[9] and so the migration estimate represents an average covering this period of growing immigration. This means that the method is likely to underestimate net migration during 2024, and in turn the population numbers relied upon in estimating mortality rates.



Most immigration occurs amongst under 40s, so it seems likely that the 2024 mortality rates at younger ages in the illustrative software are overstated. By way of example, estimated male exposures amongst 20–39-year-olds

[9] Source: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/bulletins/longterminternationalmigrationprovisional/yearendingjune2024

in 2023 included in the CMI_2023 were 7.76m. The updated value in the illustrative software is 7.88m, 1.5% higher.

The ONS analysis we have highlighted here also comments upon the uncertainty associated with these net migration estimates. This uncertainty will also be exacerbated by the high rates of immigration seen since 2021.

Considering this uncertainty we would strongly encourage the CMI to perform (and publish) sensitivity studies of the new multiple-period effects approach to the immigration assumption used to estimate mortality rates at younger ages.

We suspect this will highlight that this approach provides for a source of instability in both the assessed level of the three period terms and potentially the perceived need for this approach to be adopted.

3.3.2 Qualitative argument: Longer lasting indirect impact of pandemic on younger adults?

The proposed model assumes that the effects of COVID on mortality will run off at the same pace for all age groups (owing to the age invariant delta and half-life parameters for the fitted overlay). This seems reasonable in relation to ***direct*** COVID mortality and *potentially* for issues like availability of primary, urgent, and emergency healthcare.

However, if we consider restrictions on social activity and reduced education or employment opportunities, an argument could be made that these more indirect drivers will have had a more long-lasting impact on younger adults. Similarly, for users of the view that much of the direct COVID mortality at older ages was “forward displacement” then it would be reasonable to assume a level of age variation in the pattern of run-off.

We explore this line of reasoning, and an alternative method of modelling COVID in Sections 3.4and 3.5below.

3.4 If it is genuine, why isn’t it being picked up in cohort dimension?

It is natural to ask why the negative improvements seen at younger ages aren’t being picked up as a cohort effect under the existing APCI framework. Referring to our chart at the start of 3.1, we might expect the negative improvements amongst 40–54-year-olds to be picked up in the cohort dimension under the constraint that the general shape of mortality improvements by age is fixed.

Heat maps of improvements split by year and age are often instructive in identifying cohort effects in the diagonals of the chart. Below we show a heat map of annualised mortality improvements for England & Wales men, split into non-overlapping 5-year periods and age bands.

Age Band / Period	1984-1989	1989-1994	1994-1999	1999-2004	2004-2009	2009-2014	2014-2019	2019-2024
20-24	-0.643%	0.478%	0.563%	2.285%	3.629%	4.195%	-1.316%	0.767%
25-29	-0.192%	-1.043%	-1.842%	2.995%	2.632%	2.877%	-0.781%	1.716%
30-34	-0.715%	-2.456%	0.324%	1.454%	1.977%	2.707%	-1.073%	0.131%
35-39	-1.600%	0.631%	0.458%	-0.042%	-0.077%	3.298%	-0.478%	-1.630%
40-44	1.483%	-0.154%	1.063%	0.763%	-0.363%	2.216%	0.796%	-2.643%
45-49	2.174%	3.553%	-0.450%	1.371%	1.770%	1.029%	-0.475%	-1.445%
50-54	2.955%	2.382%	1.719%	1.129%	2.759%	2.042%	-0.816%	-1.559%
55-59	3.320%	3.104%	1.718%	3.740%	0.895%	2.448%	0.512%	-1.450%
60-64	2.294%	3.516%	2.991%	2.901%	3.234%	1.296%	1.083%	0.113%
65-69	1.916%	2.441%	3.088%	4.005%	3.265%	2.584%	0.211%	0.155%
70-74	1.415%	2.395%	2.161%	4.560%	3.731%	1.962%	1.496%	-0.620%
75-79	1.176%	2.173%	1.859%	3.440%	4.067%	2.361%	0.807%	0.915%
80-84	0.881%	1.871%	1.436%	2.770%	2.954%	2.319%	0.947%	0.520%
85-89	0.111%	1.887%	0.634%	2.571%	1.424%	1.693%	0.631%	0.419%
90-94	0.090%	1.197%	-0.096%	1.732%	1.429%	0.304%	0.235%	-0.112%
95-99	-0.174%	0.463%	-0.887%	1.680%	0.684%	0.013%	-0.937%	0.651%

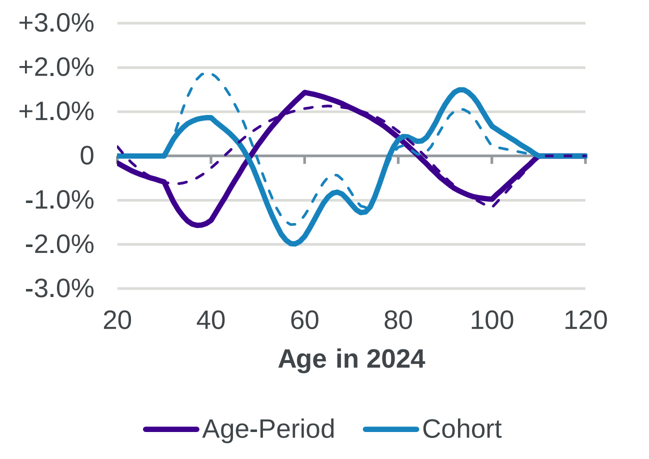
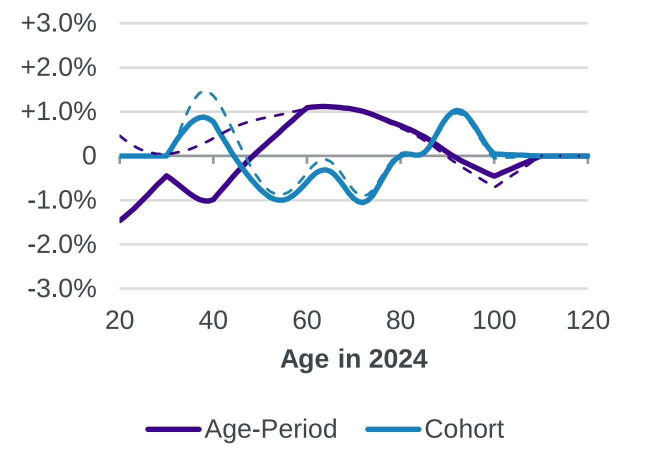
This graphic hints at a tentative widely spanning negative cohort effect amongst current 40- to 64-year-olds over the last decade.

This negative cohort effect seems to have persisted throughout the calibration period for those aged 50 to 59 in 2019-24 (the cohort picked out with a thicker border).

In contrast, improvements were notably high prior to 2014 amongst those aged 35-49 in 2019-24 (picked out with a thinner border).

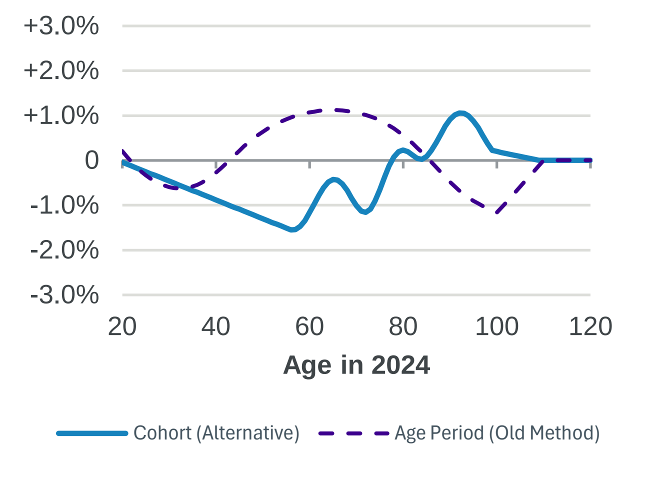
Speculatively, we wonder if the strongly positive improvements prior to 2014 amongst (current) under 50s might be offsetting the apparent negative cohort effect visible in more recent data, leading in aggregate to an impression of a positive cohort effect in that group centred on age 40.

If we look at cohort improvement rates as picked up by the proposed core model, we see that there is a pronounced trough at age 58 for men (broadly centred on our thicker bordered cohort) and 54 for women. There is also a peak at age 40 for men and women. In the below charts, we show both the proposed core starting rates in bold and the “old method” starting rates (with one period term and cohort constraints within the APCOI fitting) as dotted lines for comparison.

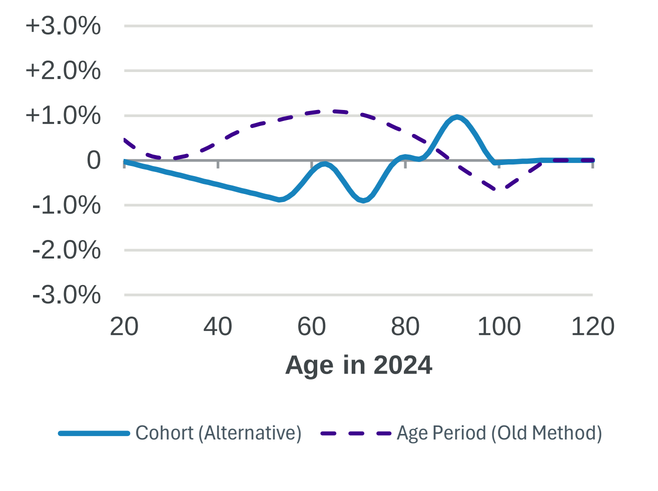
Core proposed CMI_2024 (Men)	Core proposed CMI_2024 (Women)
	

It strikes us that a less invasive approach to allow for more current trends amongst under 50s could be to simply override the positive cohort effects for younger cohorts. However, rather than set them to zero below a certain age (say age 50) as per the current model structure, they could be set in a way which broadly captures the low level of improvements at younger ages (and associated implied negative cohort effect) seen in the more recent data. As a simple example, the cohort effect could be assumed to taper linearly from the local minimum values at 58 for men and 54 for women to zero at age 20, as per the charts below. We also include here the age-period improvements from the old method in dotted purple.

Tapered Cohort CMI_2024 (Men)



Tapered Cohort CMI_2024 (Women)



This alternative approach is deliberately simplistic. However, with appropriate refinement, such an approach would have the benefit of both capturing the negative improvements seen at younger ages and persisting them in the cohort dimension. We believe many users would find this a more natural interpretation of the emerging trend (albeit other interpretations are possible). Further, such an approach negates the need for the three period terms by allowing for the recent negative improvements to be captured directly in the cohort dimension and hence the total initial improvements.

We encourage the CMI to consider the possibility that the negative improvements at younger ages feature of recent mortality trends would be better captured via cohort overlay at younger ages i.e. the user using the existing functionality in the previous APCI model to modify the cohort initial rates.

3.5 Changing our frame of reference

Section 3.3 highlighted concerns around the reliability of the 2024 observed mortality rate, and whether to interpret this as the end of the COVID strain on mortality a*cross the age range*.

The high COVID era mortality rates, coupled with the position of (estimated) observed mortality for 2024 draws the observer to a view that ***directionally*** improvements have been materially improving across the age range in recent times, but with a material deterioration at the younger ages. We illustrate this in the first figure on subsequent pages (Figure A). Those charts also illustrate how under this interpretation the magnitude of the COVID peak (the "delta" term in the fitted overlay) is broadly comparable across the age spectrum, consistent with the view taken in WP197 that this is age invariant.

However, if we remove the years which may have COVID distortions (both direct and indirect) by removing the points 2020 onwards, the impression of directionally different improvements is much more muted – as highlighted on the second page of figures (Figure B). In the final page of figures we show what happens if we take forward the pre 2020 directional trends to 2020 and beyond (Figure C). These two sets of figures suggest an alternative way of interpreting the data whereby:

- The improvements by age are more consistent than under the WP197 interpretation
- The magnitude of the COVID peak in terms of the overlay's delta term (and potentially the half-life) varies by age

This perspective could be captured in the CMI model by fitting a simple age structure to the COVID overlay e.g. magnitude / half-life and (possibly) peak year.

We have not yet explored this alternative approach in detail; however we believe that it would:

- Provide a similar quality of fit to the observed crude rates
- Reduce the sensitivity of the model to changes in 2024 mortality and to data in subsequent years as population numbers are adjusted for immigration
- Reflect the possibility that the run-off of indirect impacts of COVID may vary by age
- Reduce the overall complexity of the model by
  - enabling the existing APCI model to better identify a cohort effect amongst the under 40s; and / or
  - requiring a simpler cohort adjustment from the user (if combined with our suggestion in section 3.4)

  In doing so this could negate the need for multiple period effects and so **materially reduce the complexity of changes required to the model and its fitting** – as well as provide helpful flexibility to the model both for modelling different COVID scenarios and for international users**.**

We strongly encourage the CMI to:

1. **Acknowledge the potential for alternative interpretations of the recent evidence in relation to younger ages.**
2. **Explore the possibility of a simple age variable Fitted Overlay and either**
   a. **Integrate this directly into the model; or**
   b. **as a minimum enable a "user-defined" overlay so that users can adopt this alternative interpretation**

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Figure A: Impression of materially different time trends and (broadly) age-invariant delta when looking at age-banded ASMRs through to 2024

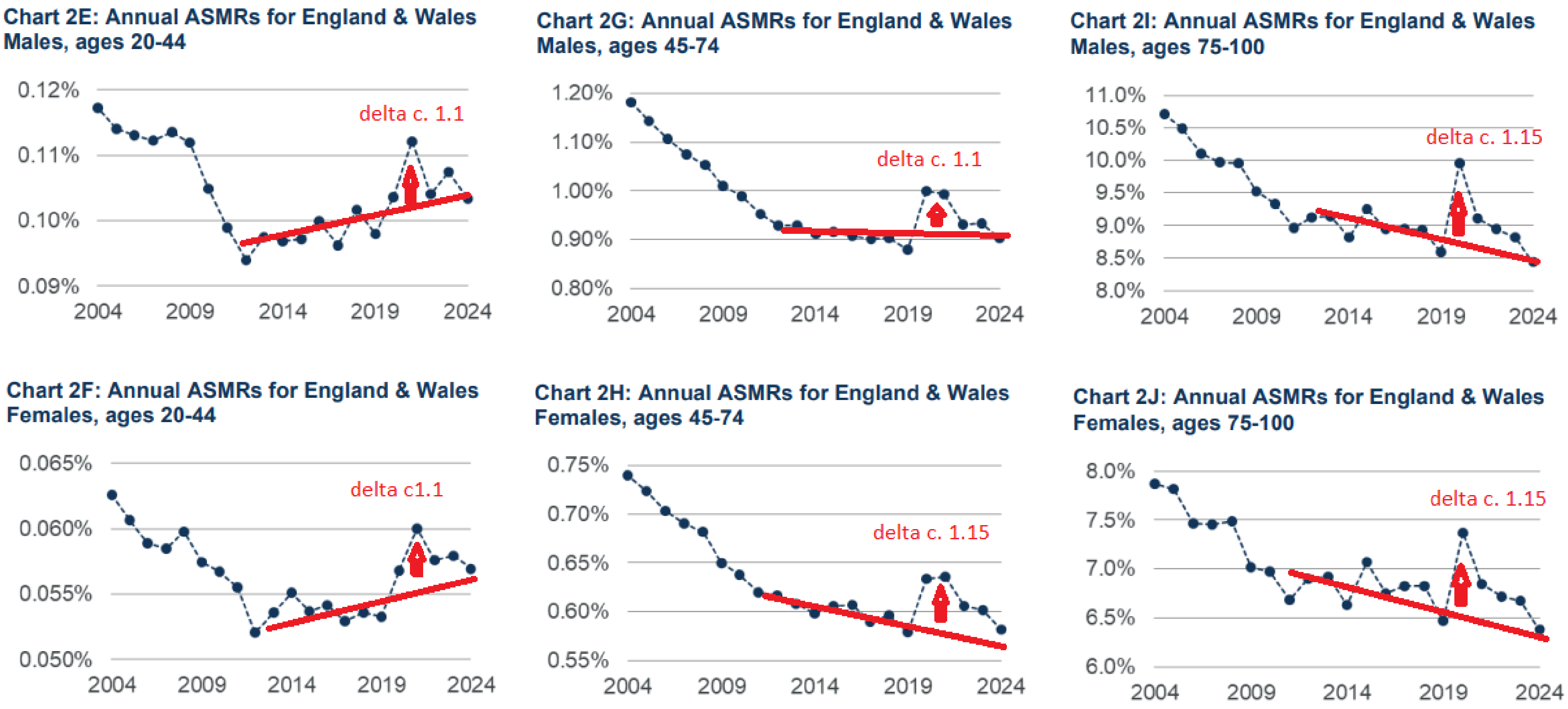

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Figure B: An alternative impression if we remove COVID era (2020 onwards) data – different trends by age but less dramatically different

Chart 2E: Annual ASMRs for England & Wales Males, ages 20-44

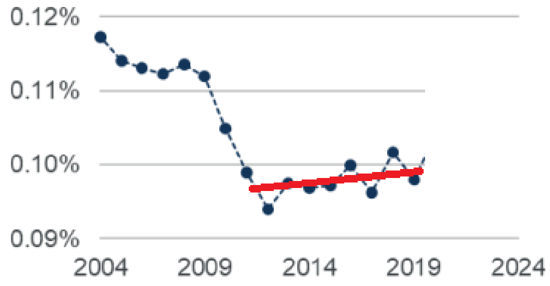

Chart 2G: Annual ASMRs for England & Wales Males, ages 45-74

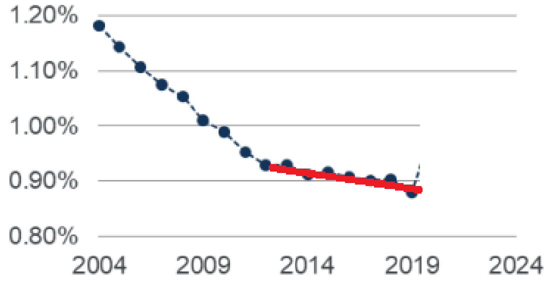

Chart 2I: Annual ASMRs for England & Wales Males, ages 75-100

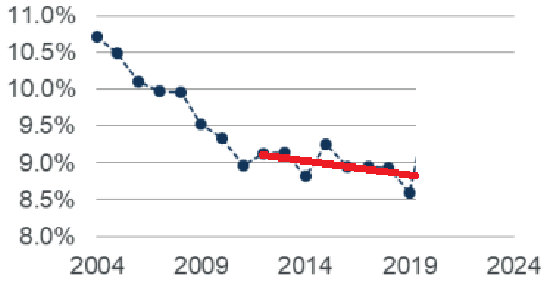

Chart 2F: Annual ASMRs for England & Wales Females, ages 20-44

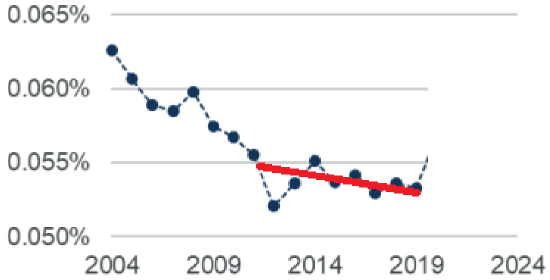

Chart 2H: Annual ASMRs for England & Wales Females, ages 45-74

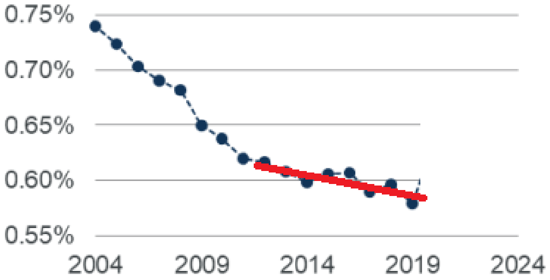

Chart 2J: Annual ASMRs for England & Wales Females, ages 75-100

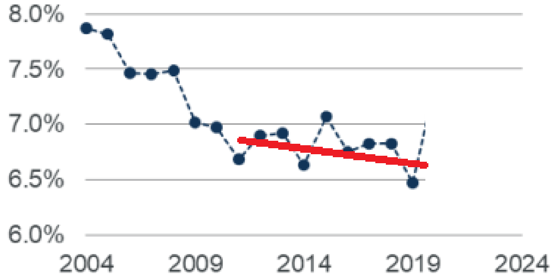

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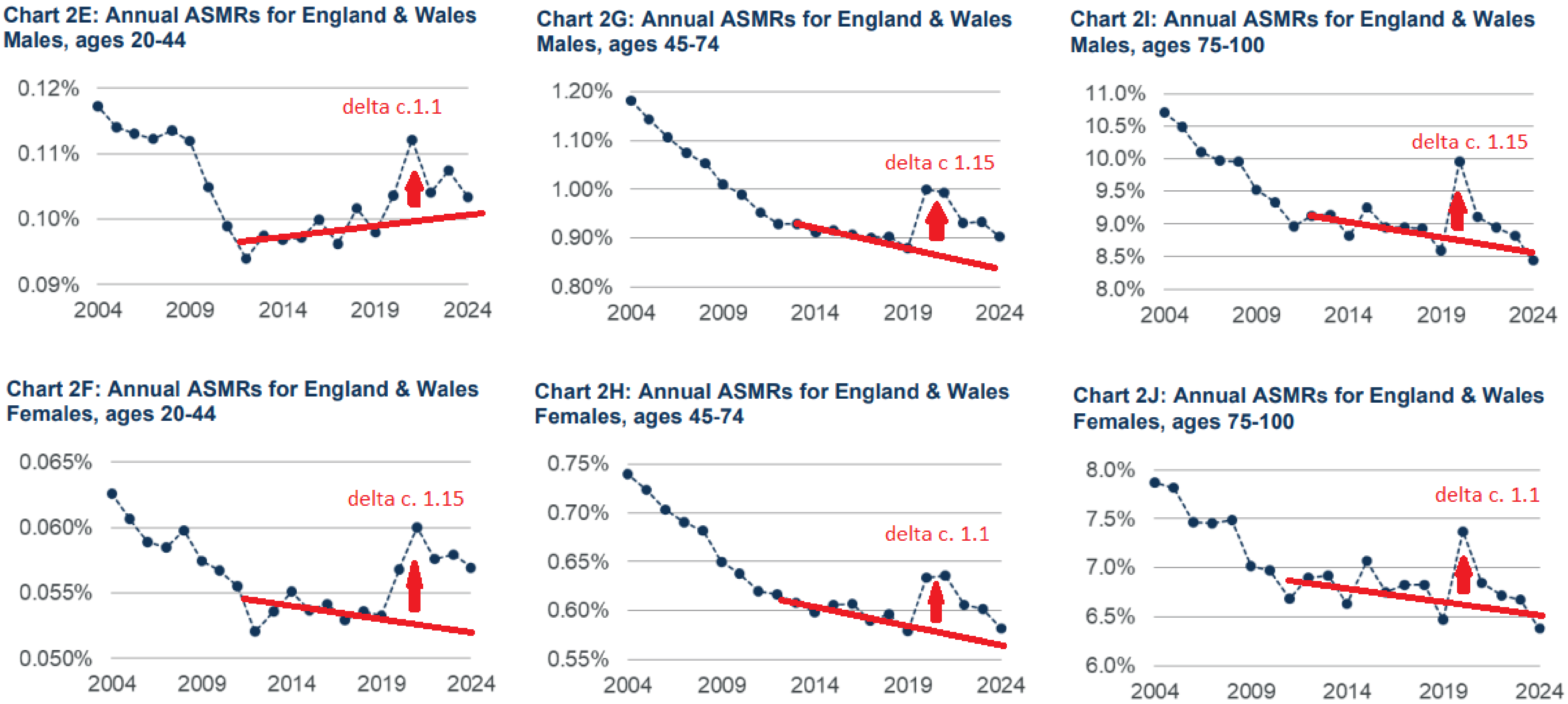
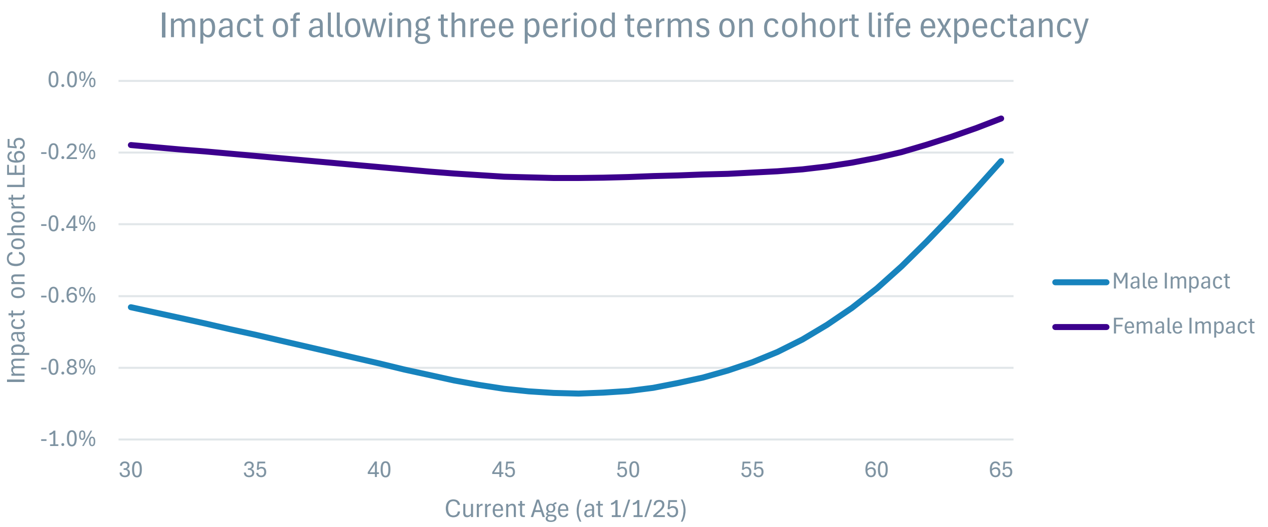
Figure C: Applying the pre COVID era impression of trends – should fitted overlay delta / half-life / peak year vary by age band?



3.6 Materiality

On first reading of WP197, our initial impression was that the use of three period terms added a lot of complexity to better capture current improvement rates at younger ages. This would be of most relevance to life insurance practitioners. However, because of the focus on trends at younger ages we anticipated only a minor impact on older deferred and pensioner lives who are of most interest to the annuity / pensions sector.

To explore this further, we looked at the cohort life expectancies from age 65 for current generations aged below 65. Specifically, we considered the impact of switching the model from using one period term and old-style cohort constraints to three period terms and new-style cohort constraints (i.e. the proposed core settings). All other parameters have been held the same and a long-term rate of 1.5% p.a. (a broadly typical rate) has been used. The impact of this change (as applied to the S4P_A tables) is illustrated in the chart below.



From this chart we can see:

- The impact of introducing three period effects is small for such a complex and invasive change to the model, particularly for women.

  This suggests that the exploration of simpler solutions would be beneficial.

- The introduction of three period terms reduces cohort life expectancies across the range of ages covered by deferred annuities and most materially so for men currently aged around 40 to 55.

  This seems unintuitive and hard to explain to the end users of these actuarial projections. Shouldn't allowing for lower improvements at younger ages have a bigger impact on younger cohorts?

3.7 Other considerations

We note that the introduction of multiple period terms may have implications for other parameters within the model which define the projection in the age-period dimension. These include the long-term rate, the "A" parameter and convergence parameters. Whilst a smooth – and plausible - set of initial rates is produced within the core model, we would need to carry out consider testing to understand if the model continues to respond intuitively and reasonably to the typical configurations of those parameters that we would usually use.

In the time available to us we have not been able to consider these implications and would ask the CMI to have an "open door" policy to further feedback as the industry is able to engage more fully with these complexities.

3.8 Conclusion

We can see that considerable effort has gone in to adapting the model to enable multiple period effects. However, we believe that other interpretations can be placed on the data which are plausible and appear to have been overlooked. If the committee considered these alternative interpretations, then we would value understanding why they were dismissed.

We encourage the committee to pause for thought before embedding multiple period effects in the core model. We believe that alternative options could yield a simpler and easier to understand / communicate model and should be explored.

Annex: Responses to Consultation Questions

1 Multiple period terms – general approach

1a) Do you broadly agree with our proposal to amend the Core version of the Model to have multiple period terms rather than one? (Yes/No)

No.

We believe the addition of multiple period terms:

- Adds material complexity to the model making it less tractable to a generalist audience with:
  - Little benefit for most use cases; it seems that users who write under 45 mortality business are unlikely to use the model "as is" given they will have a specific interpretation of developments at younger ages (for example whether there is a strong negative cohort effect).
  - counter-intuitive changes to cohort life expectancies for older cohorts; and
  - an additional ask of users to engage with and understand this very technical change alongside the Fitted Overlay

  We discuss these points in sections 3.1 and 3.6 of the main body of our response.

- Has led to a significant further change to the approach to constraining cohort effects for users to digest and get comfortable with.
- Relies on 2024 younger age mortality rates to identify the emerging trend. Is that data reliable? Are the negative effects likely to be long-lived or are they an indirect artefact of the pandemic?

  We discuss this in sections 3.2 and 3.3.

- Is based upon one interpretation of the evidence where alternative interpretations exist.

  We believe there are alternative approaches which could achieve the committee's aim of better reflecting emerging mortality trends at different ages whilst providing more understandable, accessible, and stable results. One option is to apply an overlay to the derived cohort initial rates in APCOI model at younger ages. We explore this option in section 3.4. In addition, the fitted overlay mechanism could be adapted to capture the emerging differential trend at different ages. We explore this option in section 3.5.

In summary, we do not agree with amending the core model to include multiple period terms based on the arguments presented in WP197 and the supplementary analysis we have carried out. We encourage the authors to pause to consider alternative approaches before imposing this in the core model.

We do see benefit in retaining the functionality within the Illustrative Software as an advanced option within the APCOI model for those interested in exploring the mechanism further and for those with a specific interest in younger age mortality projections.

1 Multiple period terms – details

1b) How many period terms should the Core version of the Model have? (Two, three, four, other)

1c) What basis functions should the Core version of the Model use? (Linear, linear with flat edges, quadratic, step function, other)

1d) Do you agree with the proposed method for determining three period smoothing parameters from an equivalent single smoothing parameter? (Yes/No)

1e) Do you agree with the Model having a single Extended equivalent period smoothing parameter that will be automatically adjusted by the Model, with other parameters relating to period terms being Advanced parameters? (Yes/No)

Given our fundamental remarks in relation to 1a) we have not responded to these questions.

2 Fitted overlay – general approach

2a) Do you broadly agree with our proposal for the Core version of the Model to set all weights to 100% and fit an overlay? (Yes/No)

Yes.

In Section 1.1 of this paper we assess the generated projection against a set of criteria that we previously developed as part of our response to CMI_2023. In our view, the Fitted Overlay approach represents a better method of allowing for the COVID pandemic and therefore produces a more plausible projection.

We did have an observation about the impact on the projection of adding 2025 data, building on the analysis provided in A.3.2 of WP197. Our interpretation is that the proposed model is biased towards producing a weaker projection for CMI_2025 if 2025 emerges as predicted by the model. This runs counter to the conclusions set out in that section of the Working Paper. We provide more detail in section 1.2.1.

2 Fitted overlay – details

2b) Do you agree with our proposal to apply the same uplift (as a proportion of underlying mortality) and the same decay pattern at all ages (fitted separately by gender)? (Yes/No)

Yes. We can see the attraction of keeping the uplift as simple as possible given it is intended to allow for a short-lived feature in the data.

It would be useful to see further sensitivities on the impact of this modelling decision: it strikes us that setting an age-invariant overlay may have (unintended) knock on effects on the fitted age / period / cohort starting rates.

Specifically, it would be useful to see the impact of adopting an alternative model where the level of the Fitted Overlay was allowed to vary by age as well as by year to provide reassurance that any such knock-on effects are immaterial.

The ability to vary by the uplift by age and by year within the model (as an advanced parameter) would provide useful additional flexibility to users. It may prove particularly useful to non-UK users where 2020 did not represent a clear peak for excess mortality and/or where the gradient of excess mortality by age was more pronounced.

We also note that a Fitted Overlay varying by age may provide an alternative method to capture negative improvement rates at younger ages, particularly if there is an unsettled argument as to whether this feature may be a short-lived or overstated phenomena. We discuss this alternative method in section 3.5.

2c) Do you agree with our preference for exponential rather than linear decay of the overlay component? (Yes/No)

Yes. In the England & Wales context, we agree with the conclusions of the committee.

2d) If we do use exponential decay, what is your preference for the half-life? (0.5 years, 0.75 years, 1 year, 1.25 years, other)

Based on Charts 9C and 9D in WP197, 1.25 years appears to provide a better fit to the 2021 and 2022 data points. However, 1 year appeals in terms of "explainability". On balance, we prefer **1 year**.

2e) Do you agree with the proposal to express the exponential decay using a half-life rather than an annual percentage reduction? (Yes/No)

Yes. We have no issues with the use of half-life terminology. Whilst not widely used in actuarial work, it seems an intuitive concept that most users will be able to understand.

In the Illustrative Software, the choice of Half Life is an Extended Parameter. We wonder whether this should be the case. Whilst the meaning of the parameter is intuitive, the knock-on impact of changing the parameter on the overall projection is less so.

In addition, as future editions of the CMI model are published, this parameter will become less material because the emergent post-COVID trend will become easier to assess without needing to strip out material levels of excess mortality via the Fitted Overlay. In our view, the ability to alter the half-life should therefore be relegated to an advanced parameter.

2f) Do you agree with the proposal to use the combined (underlying plus overlay) rates for the Core output, rather than the underlying rates? (Yes/No)

No, if it is the sole Core output.

In our view the "Underlying Trend" projection is equally if not more useful to users.

We think there is an argument that both options should be presented as alternative core parameterisations (i.e. by making "Include/Exclude Fitted Overlay" a second core parameter within the Projection assumptions alongside the Long-Term Rate). Failing that, the option to include or exclude the Fitted Overlay in the projected improvement rates should become a new Extended Parameter.

We think that the Underlying Trend projection will be widely used. It is therefore important that it has a standard name under the CMI model naming convention, whether captured via an additional core parameter or an extended parameter.

We discuss potential uses of the Underlying Trend projection in section 2 of the main body of our response.

2g) Do you agree with the "APCOI" name for the version of the APCI model with the overlay added? (Yes/No)

Yes.

Cohort constraints

3a) Do you agree that the Model should continue to constrain cohorts at the youngest ages? (Yes/No)

We appreciate that there is most uncertainty about emerging cohort effects at the younger ages and that constraints are necessary for identifiability in the model and to avoid spurious edge-effects.

However, we are conscious that mortality at the younger ages is a material driver to the addition of the multiple period effects and as such struggle to reconcile flexibility in the age-period dimension with constraints in the cohort dimension. As such we would like to see more discussion regarding the use of expert judgement overrides for the under 50 population given the APCI model performs less well there, and the potential interpretation that the underlying drivers may be best modelled as a broad-ranging negative cohort effect.

Beyond this we have not engaged with the technical aspects of the suggestions on the cohort constraints owing to the volume of material in the consultation so we simply provide some observations in response to 3b) and 3c).

3b) If we do constrain cohorts, do you agree with the proposal to do this after fitting the APCOI model, rather than while fitting it (as described in Section 10 and Appendix 4)? (Yes/No)

We have not explored this question in any detail. We are concerned that the challenges that the CMI have encountered may be artefacts of the multiple period change. Given the simultaneous introduction of the Fitted Overlay, we wonder if users will have sufficient bandwidth to get comfortable with the new approach.

3c) If we do constrain cohorts after fitting the APCOI model, do you agree with the details of the proposed method in Section 10.3? (Yes/No)

We have not explored the details however we would note that based on the Illustrative Software the net effect of multiple period terms and cohort constraints is that it can:

- lead to an implausibly high fitted period value at age 20 (and more generally at the lower end of the 20 to 44 age range);
- add significant volatility in the overall improvements (as well as the decomposition) at younger ages

Both are concerning given the invasive nature of the changes designed to address the younger ages.

Method for fitting the APCOI model

4a) **Do you agree with the proposed method for fitting the APCOI model (described in Section 11 and Appendix 5)? (Yes/No)**

Yes, but we believe it would be **highly beneficial to enable** users to override individual years (i.e. not fitted but defined by user) alongside the existing ability to adjust the decay shape.

Extended and Advanced parameters

5a) Do you agree with the proposal in Section 6.5 for which parameters should be Extended or Advanced? (Yes/No)

No.

As covered in our response to 2e), it is not obvious to us that the choice of **Half Life** should be an extended parameter. We do not think the parameter will be widely used in CMI_2024, and as time passes and post-COVID data builds up, the choice of the exact run-off pattern of the Fitted Overlay is likely to become less material.

In 2f) we highlighted that we believe that the ability to exclude the Fitted Overlay from the projection should be either be a Core Parameter or an Extended parameter.

One further option might be to allow the user to define what percentage of the Fitted Overlay to include in the projection (whether 0%, 100% or another value).

We could not see a way to alter **which ages are covered by the three period terms** within the updated APCOI model (or indeed which age bands will apply by default if two, four or five period terms are desired.) Should the ability to choose these age ranges be added as an Advanced Parameter?

Finally, in our view we believe that allowing users to define their own Fitted Overlay for each year and by age would provide valuable flexibility, particularly for overseas users. This could also be added as an Advanced Parameter.

Adoption of CMI_2024

6a) How likely would you be to use CMI_2024 with a similar approach to our proposal at some point, even if not adopting it immediately?

Please provide your response as an approximate probability (i.e. 100% = would definitely use it, with Core or very similar parameters; 0% = would not use CMI_2024 at all or would take a materially different approach).

We cannot give a probability as much of our work applies improvements as used by the client base of our subscribing pension plans and insurers. Our usage of the model will be driven by their adoption rates.

For the purposes of our own internal analysis we would certainly anticipate using the model to make use of the Fitted Overlay mechanism. However we are likely to take a materially different approach to other aspects of the proposed core model, as highlighted in our response.

6b) If you are unlikely to use CMI_2024, please say why and describe what alternative approach you are likely to take.

See 6a) and Section 3 of the main body of our response.

Projected life expectancy

7a) Setting aside any opinion on the methods used, how does the male life expectancy at age 65 shown in bold in Table 6.1 compare to your best-estimate view based on mortality improvements for the general population of England & Wales?

- *Table 6.1 figures are more than 1.5% higher than your view*
- *Table 6.1 figures are between 0.5% and 1.5% higher than your view*
- *Table 6.1 figures are within 0.5% of your view*
- *Table 6.1 figures are between 0.5% and 1.5% lower than your view*
- *Table 6.1 figures are more than 1.5% lower than your view*

We are comfortable that CMI_2024 as proposed (in combination with a suitable choice of Long-Term Rate) would represent a reasonable best estimate for a current 65-year-old, noting the committee's comments on the difficulty of interpreting the current trend highlighted in Section 3.3 of the Working Paper.

7b) Setting aside any opinion on the methods used, how does the female life expectancy at age 65 shown in bold in Table 6.1 compare to your best-estimate view based on mortality improvements for the general population of England & Wales?

- *Table 6.1 figures are more than 1.5% higher than your view*
- *Table 6.1 figures are between 0.5% and 1.5% higher than your view*
- *Table 6.1 figures are within 0.5% of your view*
- *Table 6.1 figures are between 0.5% and 1.5% lower than your view*
- *Table 6.1 figures are more than 1.5% lower than your view*

See 7a).

7c) Do you have any further comments on this? For example, how your response would vary by age, or how your response is affected by the change to three period terms?

Whilst not our usual area of focus, we found it surprising that the emergent trend of negative improvements at younger ages has not led to a pronounced negative cohort effect at those ages and thereby a more material reduction in cohort life expectancies. Based on qualitative arguments, we would expect the emergent trend to also impact the future life course of the impacted generations. We therefore wonder (on the assumption that the apparent trend of increasing mortality at younger ages is a genuine one) whether the cohort life expectancies generated for those ages (say those currently 45 or 50 and below) are not too strong.

Software

8a) We propose to remove the existing overlay feature (available for CMI_2022 and CMI_2023) from the software. Do you agree with this? (Yes/No)

Yes. Advanced users will have sufficient understanding of the model to apply overlays “outside of the box” if needed.

8b) The consultation software allows the user to consider the possible outcome of a future version of the Model for different mortality scenarios. Is this a useful feature that should be included in the published software for CMI_2024 and later versions? (Yes/No) Do you have any comments on its implementation?

Yes. We have not had time to explore this functionality, but if it was found useful to the authors, it will no doubt be useful more widely.

8c) Do you agree with our proposal to retain the direction of travel (modified to vary by single age as described in Section 8.5) in the Model? (Yes/No)

Yes. In our experience, the Direction of Travel parameter is not currently widely used. However, given the substantial number of changes already proposed to the model, we suggest that this aspect of the model should be left unchanged for now.

8d) Do you have any other comments on the software?

We would find it useful if more detail could be added to the Full Output to provide a clearer trail of how the APCOI outputs lead to the final projection. Specifically:

- How the suppressed cohort effect is transferred into the age-period dimension under the new approach (i.e. how AP_x is calculated from $AP_x^{(Unc)}$ and $C_x^{(Unc)}$ as per Section 10.3 of WP197.)
- The addition of an MI_m_Overlay tab as a third contributor to the overall projection.

Other

9a) Do you agree with our proposal to not make any changes to the CMI_2024 calibration dataset for the effects of recent changes to registrations of deaths, as noted in Section 2 and Appendix 1? (Yes/No)

Yes, the additional complexity required to allow for this change does not seem proportionate to the impact described in the Working Paper.

9b) Do you have any comments on the proposed Model Review Policy (set out in Section 7)?

No.

9c) Do you have any further comments on our proposals, or any other aspect of the Model?

No.