England & Wales mortality monitor – Q2 2023

Summary

For the first time, this version of the mortality monitor makes allowance for the impact of results of the 2021 census. See Appendix 2 for further information.

Mortality in the second quarter of 2023 compared to the second quarter in recent years was similar to 2022, higher than in 2018, 2019 and 2021, and significantly lower than in 2020.

At the end of Q2 2023, the cumulative standardised mortality rate for 2023 was 0.6% above the 2013-2022 average and 4.7% above 2019, the last full year before the pandemic.

Background

This is the latest in a series of quarterly updates monitoring mortality in England & Wales. It is based on provisional weekly deaths data published by the Office for National Statistics (ONS) up to 30 June 2023 (i.e. week 26 of 2023) on 11 July 2023. We intend to publish the next quarterly update, for data to Q3 of 2023, in October 2023.

We are also publishing weekly updates which focus on "excess mortality". Summary versions are published weekly, with a more detailed version every quarter. The monitor for week 26 of 2023 uses the same data as this quarterly monitor and shows more detail of excess mortality during the past quarter.

All updates are publicly available from the CMI pages of the Institute and Faculty of Actuaries website: https://www.actuaries.org.uk/learn-and-develop/continuous-mortality-investigation/other-cmi-outputs/mortality-monitor. The same page has "beta" mortality monitor software, which is available to Authorised Users. This enables users to produce their own ad hoc updates to the results of this report.

Notes

We have used our standard approach in producing this report, basing it on data published by the Office for National Statistics.

Our calculations rely on data for registered deaths, and we are conscious that during the coronavirus pandemic the timing of registration of deaths may have differed from previous years. Consequently, comparisons of mortality between years may not be entirely on a like-for-like basis. Also, results for individual weeks may not be consistent between years due to the timing of public holidays.

We have included analysis of the difference between when deaths were registered and when they occurred in Appendix 1 of the mortality monitor for week 26 of 2023.

Our previous mortality monitor calculations have not taken account of the impact of the 2021 census in England & Wales on views of mortality rates and improvements. For the first time, this version of the mortality monitor does make allowance for the 2021 census. We have updated the results to use the same dataset as the latest version of the CMI Mortality Projections Model, CMI_2022. The impact of the change is to generally increase relative SMRs, with the impact on mortality improvements varying by year depending on the relative change in SMRs between years. Appendix 2 of this monitor describes the new dataset and compares key results between the new dataset and the previous dataset.

We intend to gather feedback on the mortality monitors from Subscribers to inform our future decisions on publication frequency, content, method, and frequency of data revisions.

We note that the ONS expects to published its revised mid-year population for mid-2012 to mid-2020 in September 2023. This will use a more detailed method and more detailed data to assess the 2012 to 2020 population than the CMI_2022 dataset that we use for this monitor. We intend to analyse the impact of the ONS dataset on the mortality monitor once it is available.

All of our analysis in this update is based on Standardised Mortality Rates (SMRs). These adjust the provisional weekly deaths data published by the Office for National Statistics to control for changes in the size and age and gender distribution of the population over time.

Contents

Charts A, B and C show centred averages of weekly SMRs. The annual averages smooth out seasonal variations. The quarterly averages smooth short-term variations but still show seasonal patterns, allowing the identification of, for example, winters with particularly heavy or light mortality.

Chart D shows cumulative standardised mortality (cSMR) for each year, relative to the average for 2013-2022, and Chart E shows cumulative standardised mortality improvements (cSMRI) for each year (i.e. the progression of annual mortality improvements over the course of each year). Charts D2 and E2 show the same information as charts D and E respectively in a different format and may be easier to interpret for those with colour vision deficiency.

Chart F shows the mortality improvement between 2019 and 2023.

Charts A to F show results for males and females combined, for ages 20-100. Charts G and H show variations in the cSMR and cSMRI by gender and age band.

Full details of the methods used are included in Working Paper 111.

The numerical results underlying the charts are provided in an accompanying spreadsheet, together with further results, including SMRs by gender and age band.

Use of this document

Please note that:

- The CMI disclaims any liability from use of or reliance on these calculations, including in relation to financial transactions such as longevity swaps; and
- The CMI does not guarantee that it will continue to publish quarterly updates.

Please also see the reliances and limitations, disclaimer, and copyright notice on the final page of this document.

This document is categorised as a “Research Report” as defined in the Terms and Conditions.

TAS compliance

This paper is intended to translate publicly available demographic information published by the Office for National Statistics and similar bodies into indicative mortality measures to illustrate recent mortality experience primarily in England & Wales. The paper is intended for use by actuaries and other parties interested in detailed mortality statistics and is for information only.

The paper complies with the principles in the Financial Reporting Council’s Technical Actuarial Standard “TAS 100: General Actuarial Standards”. Any person using this paper should exercise judgement over its suitability and relevance for their purpose.

Smoothed mortality at a point in time

Chart A shows quarterly (13-week) and annual (53-week) centred averages of SMR, since weekly deaths data became available. Note that although we have used data from 31 July 1999 to 30 June 2023, the quarterly and annual averages start 6 and 26 weeks later and stop 6 and 26 weeks earlier.

The annual average SMR shows a fairly steady fall from 1.75% in early 2000 to 1.30% by mid-2011. From mid-2011 to mid-2018 the annual average SMR was fairly flat, remaining within the range from 1.24% to 1.34%, but it reached a new low of 1.21% in early 2019. It rose rapidly because of the coronavirus pandemic, reaching 1.48% in September 2020, but has since fallen. The latest value is 1.34%.

The quarterly average SMR shows that mortality typically peaks near the start of each year. However during the pandemic the quarterly average SMR peaked at 1.78% in week 15 of 2020 and 1.77% in weeks 1 and 2 of 2021. In contrast, the low of 1.08% in week 31 of 2020 was the lowest ever seen. It reached 1.55% in the first quarter of 2023 and the latest value is 1.25%.

Chart A: Quarterly and annual centred average SMRs – whole period

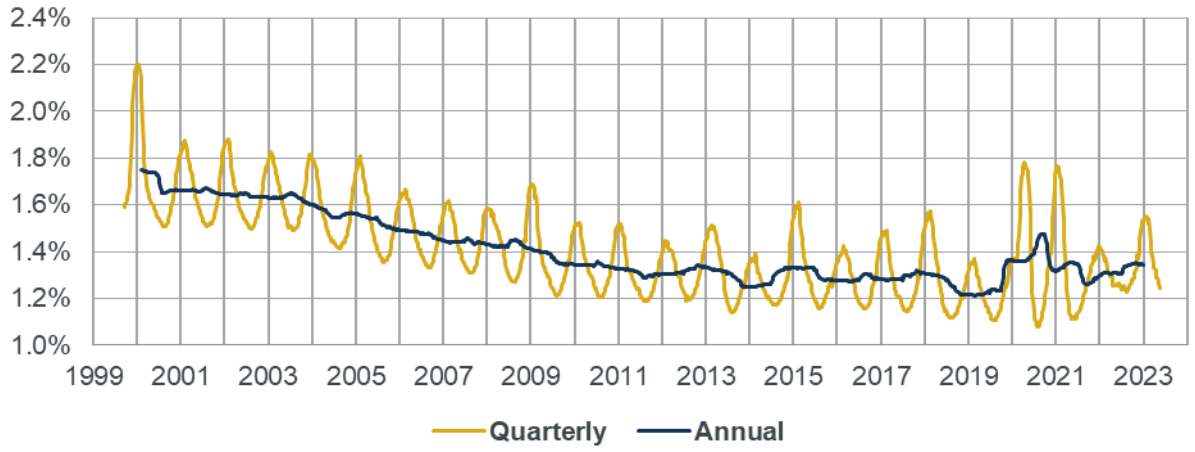


Chart B shows the same information as Chart A, magnified to show the current year and the previous five years more clearly.

Chart B: Quarterly and annual centred average SMRs – current and previous five years

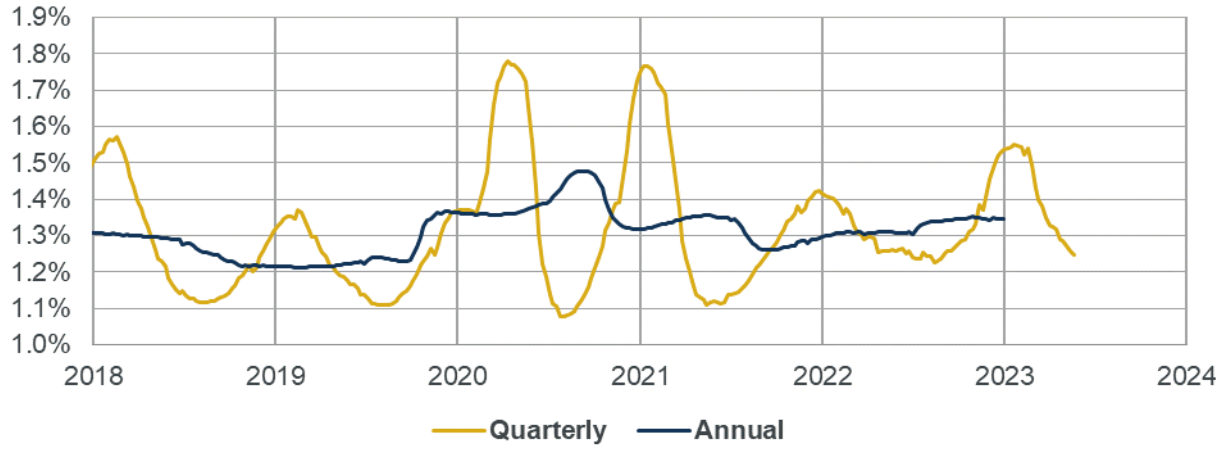
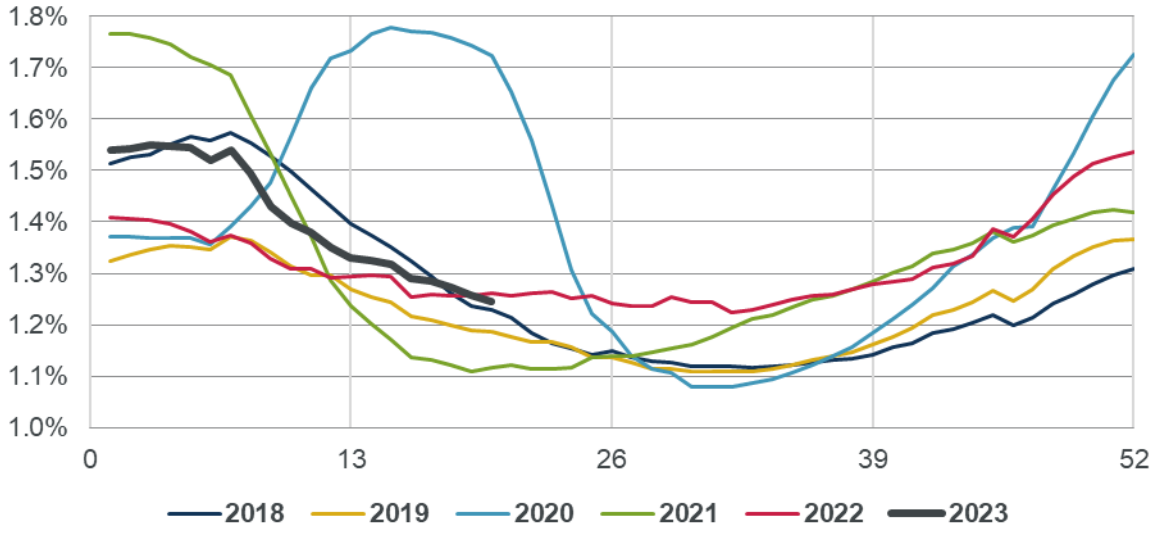


Chart C shows the quarterly average SMRs from Chart B for each year, with values plotted by week number to aid comparison. Although lines are labelled by calendar year, the quarterly averages for weeks towards the start and end of each year will be affected by mortality in earlier and later years respectively. The chart again illustrates the exceptional nature of mortality during the pandemic, with highs in Q2 of 2020 and Q1 of 2021, and lows in Q3 of 2020 and Q2 of 2021. The latest figure is similar to the corresponding point in 2022, higher than in 2018, 2019 and 2021, and lower than in 2020.

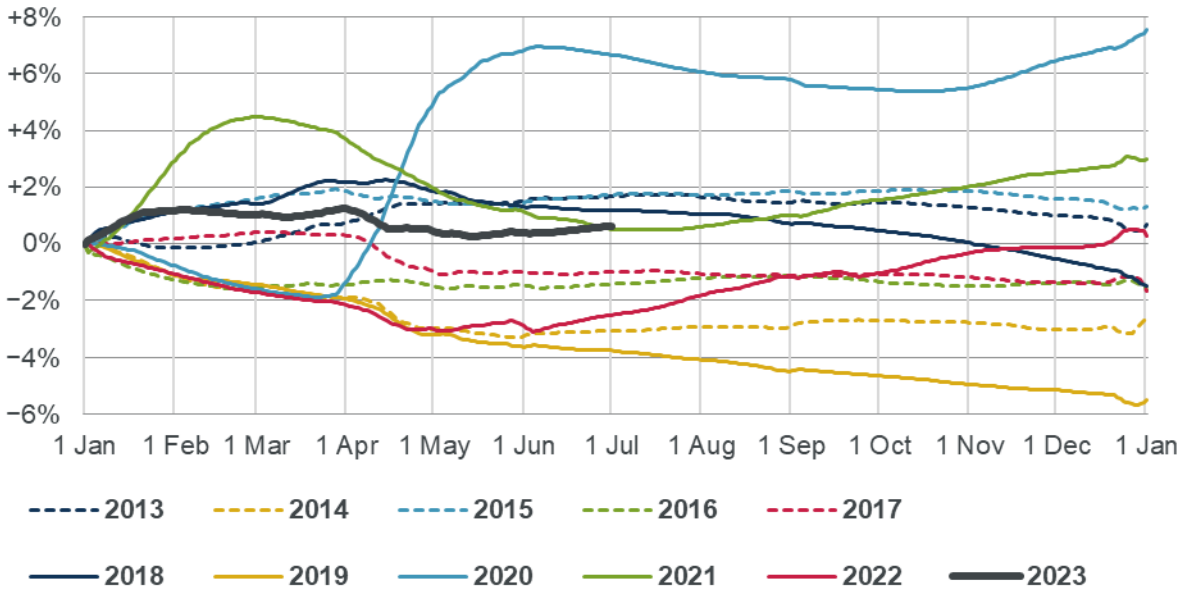
Chart C: Quarterly centred average SMRs, by week number



Cumulative mortality

Chart D shows cumulative standardised mortality rates for 2022 and the previous ten years compared to the 2013-2022 average. The calculation method is described in Section 4.2 of Working Paper 111. Chart D2 (in Appendix 1) shows the same information in a different format and may be easier for those with colour vision deficiency.

Chart D: Cumulative standardised mortality rate (cSMR) compared to the 2013-2022 average



All years have a value of 0% at the start of the year, by definition, as there has been no mortality at that point of the year; the year-end values show how mortality for each year as a whole compares to the 2013-2022 average; and intermediate points show how mortality has developed during the year, relative to the average. If mortality improvements had been constant throughout the period considered then the lines for each year would form a "fan", with the end-year values decreasing steadily from year to year. While we saw a decrease of this sort in the years up to 2011 (not shown), there is no clear pattern to the end-year values for later years, as mortality has been volatile with low improvements. Mortality for complete calendar years was lowest in 2019 and highest in 2020 (of the years shown).

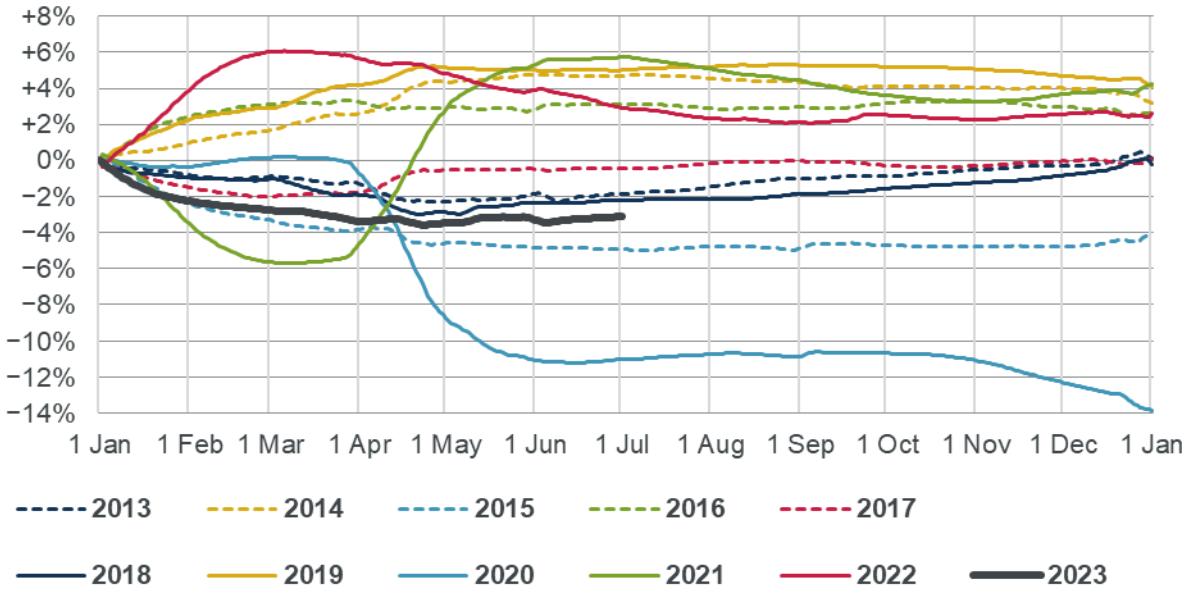
Chart D shows that cumulative standardised mortality in the first half of 2023 was above the ten-year average. It ended the second quarter at 0.6% above the ten-year average, equivalent to 4.7% above 2019.

Chart E shows the cumulative annual standardised mortality improvement (also described in Section 4.2 of Working Paper 111) for 2023 and for the previous ten years. Chart E2 (in Appendix 1) shows the same information in a different format and may be easier for those with colour vision deficiency.

All years have a value of 0% at the start of the year, by definition, as there has been no mortality at that point of the year; the year-end values show how mortality for each year as a whole compares to the previous year; and intermediate points show how mortality improvements have developed during the year.

Note that Chart E shows cumulative improvements, so a higher value represents a higher improvement and lower mortality; whereas in Chart D a higher value represents higher mortality.

Chart E: Cumulative annual standardised mortality improvement (cSMRI)



The cumulative mortality improvement at the end of Q2 of 2023, relative to 2022, is –3.1%.

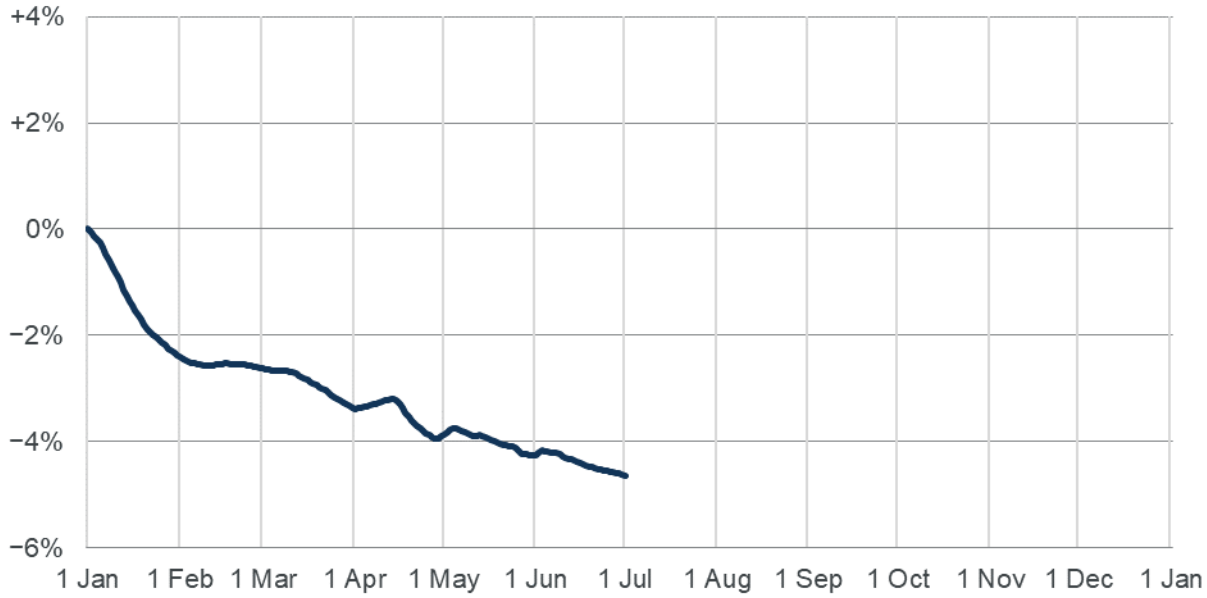
Note that:

- The cumulative values at the end of the year in Charts D and E may not necessarily agree precisely with the corresponding values based on annual data. This is because some weeks span two years, requiring us to estimate in which year those deaths were registered.
- Mortality improvements vary by age (as shown later in this report) and the mortality improvements shown in Chart E are sensitive to the age distribution of the chosen standard population.

Chart F shows the cumulative standardised mortality improvement between 2019 and 2023. The calculation in this chart is consistent with the method for 2023 used for Chart E, other than the starting mortality year being 2019 rather than 2022.

Up to the end of Q2 of 2023, mortality deteriorated compared to 2019, ending the quarter at –4.7%.

Chart F: Cumulative standardised mortality improvement between 2019 and 2023



Implication for CMI_2023

The analysis in this section shows possible outcomes from CMI_2023 for a range of mortality scenarios. We currently expect that CMI_2023 will use the same method as CMI_2022, with a suitable choice for the weight placed on data for 2023. However, it is possible that we may need to make further changes to the method so that CMI_2023 meets Subscribers' needs. We aim to confirm our intentions for CMI_2023 towards the end of 2023.

We also note that the results of CMI_2022 and our illustrations for CMI_2023 are based on CMI estimates of the population, including our estimated revisions to the 2012-2020 populations in light of the results of the 2021 census in England & Wales. The ONS aims to publish its own revised population estimates in September 2023, based on a more detailed method, and this will affect the results of CMI_2023.

Table 1 is based on Section 7 of Working Paper 177 (which includes further detail on the methods used) and shows how life expectancy might change between CMI_2022 and hypothetical versions of CMI_2023, based on a range of possible mortality improvements between 2019 and 2023 and assuming no change in method. It shows illustrative results for overall mortality improvements between 2019 and 2023 of +6%, +3%, 0%, –3%, –6%, –9%, and –12% with an illustrative weight of 50% for 2023 data. We also show the equivalent mortality improvement relative to 2022.

We stress that we have not confirmed the actual weight for 2023 data that we will use when calibrating CMI_2023.

As seen in Chart D, users should be mindful that the progression of mortality within a year can vary significantly in different years. We note that while we have noted the cumulative improvement to the end of Q2 of 2023 relative to both 2019 and 2022 in the previous section, mortality in the second half of 2019 was quite different to that in the second half of 2022. Based on the table, in the absence of any change in method and if 50% weight is placed on data for 2023 when calibrating CMI_2023:

- If mortality in the second half of 2023 is like 2019, then the cumulative improvement would remain at around –5% relative to 2019, and cohort life expectancy at age 65 might fall by 1% to 2% compared to CMI_2022.
- If mortality in the second half of 2023 is like 2022, then the cumulative improvement would remain at around –3% relative to 2022, and cohort life expectancy at age 65 might fall by 3% or more compared to CMI_2022.

Table 1: Percentage difference in life expectancy between CMI_2022 Core and illustrative CMI_2023 for different mortality scenarios for 2023. Improvements are shown relative to 2019 and 2022 (mortality in 2022 was 6.2% higher than in 2019).

Improvements		Male	Male	Male	Male	Female	Female	Female	Female
v 2019	v 2022	25	45	65	85	25	45	65	85
+6%	**+12%**	+1.1%	+1.6%	**+2.5%**	+3.1%	+0.9%	+1.4%	**+2.1%**	+3.1%
+3%	**+9%**	+0.6%	+0.9%	**+1.3%**	+1.6%	+0.5%	+0.8%	**+1.1%**	+1.8%
Nil	**+6%**	+0.1%	+0.1%	**+0.1%**	+0.1%	+0.1%	+0.1%	**+0.1%**	+0.4%
−3%	**+3%**	−0.5%	−0.7%	**−1.1%**	−1.4%	−0.3%	−0.5%	**−0.9%**	−1.1%
−6%	**0%**	−1.0%	−1.6%	**−2.4%**	−3.0%	−0.8%	−1.2%	**−1.9%**	−2.5%
−9%	**−3%**	−1.6%	−2.5%	**−3.6%**	−4.5%	−1.2%	−1.9%	**−3.0%**	−4.0%
−12%	**−6%**	−2.2%	−3.4%	**−5.0%**	−6.1%	−1.7%	−2.7%	**−4.1%**	−5.4%

Variation by gender and age

Charts G and H shows how cSMR and cSMRI have varied by gender and age band. Tables 2 and 3 show the values at 30 June 2023.

Table 2: Cumulative standardised mortality rate (cSMR) compared to the 2013-2022 average, by gender and age-band, at 30 June 2023

	0-64	65-84	85+	20-100	20-44	45-64	65-74	75-84
Male	+2.7%	−0.5%	+1.2%	+0.6%	+6.0%	+1.9%	+0.7%	−1.2%
Female	+0.9%	−0.2%	+1.4%	+0.6%	+4.3%	+0.1%	+0.8%	−0.7%
Combined	+2.0%	−0.4%	+1.3%	+0.6%	+5.4%	+1.2%	+0.8%	−1.0%

Table 3: Cumulative annual standardised mortality improvement (cSMRI), by gender and age–band, at 30 June 2023

	0–64	65–84	85+	20–100	20–44	45–64	65–74	75–84
Male	−3.1%	−2.6%	−3.0%	−2.8%	−4.9%	−2.6%	−2.6%	−2.6%
Female	−2.2%	−3.1%	−4.4%	−3.5%	−2.7%	−2.0%	−3.5%	−2.9%
Combined	−2.8%	−2.8%	−3.6%	−3.1%	−4.1%	−2.4%	−2.9%	−2.7%

For the period from 2011 to 2019:

- The spread of mortality rates is widest for ages 65-84 and narrowest for ages 85+, for both genders.
- Mortality improvements have been most volatile for the 85+ age band, particularly for females.

Mortality rose during 2020 and 2021 due to the coronavirus pandemic:

- For ages 65 and above, mortality was higher in 2020 than in 2021.
- For ages 0-64, mortality was higher in 2021 than in 2020.

In 2022:

- Cumulative mortality rates for the older age groups were below the 2013-2022 average, but those for 20-44 were well above the 2013-2022 average.
- Cumulative mortality improvements were positive for almost all groups (the exception being the 85+ age group for both males and females) and were particularly high for the 45-64 age group.

In the first half of 2023:

- Cumulative mortality rates for the combined 20-100 age group are slightly higher than the 2013-2022 average, but there is considerable variation by age. Mortality for the 20-44 age group is higher than in any of the previous ten years, but mortality for the 75-84 age group is below the ten-year average.
- Cumulative mortality improvements are lower than for most years shown and are negative for all age groups.

Chart G: Cumulative standardised mortality rate (cSMR) compared to the 2013-2022 average, by gender and age-band

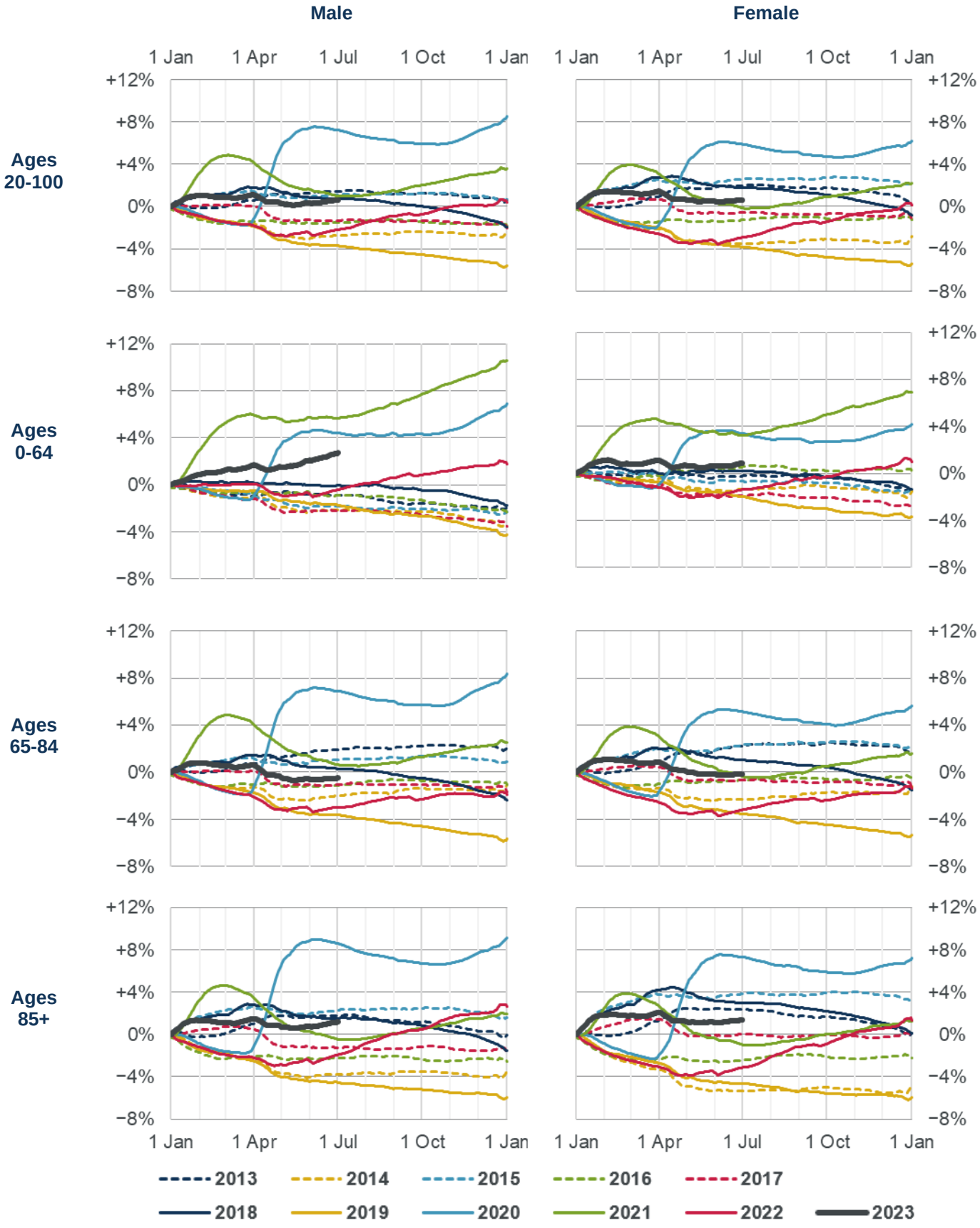


Chart G (cont): Cumulative standardised mortality rate (cSMR) compared to the 2013-2022 average, by gender and age-band

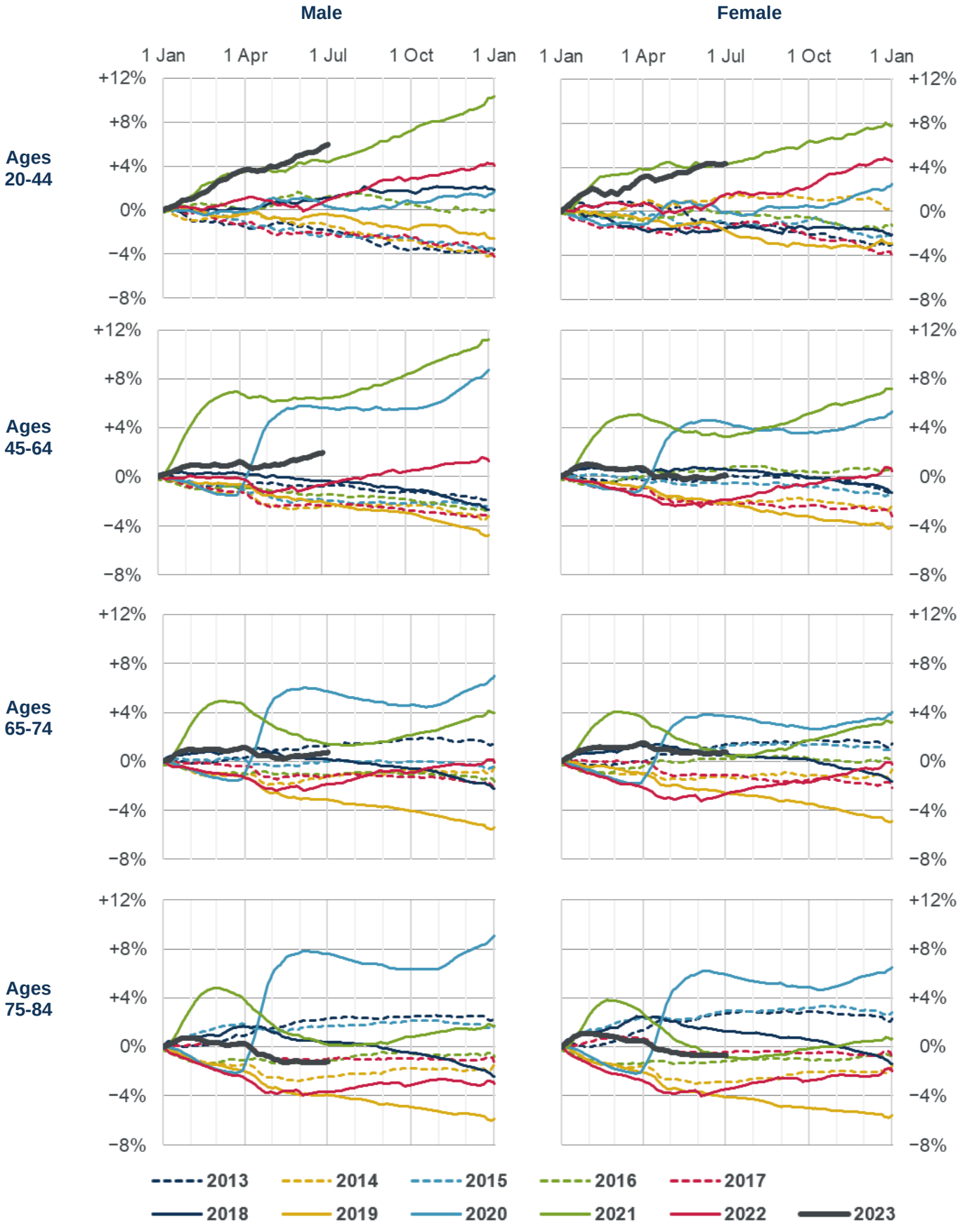


Chart H: Cumulative annual standardised mortality improvement (cSMRI), by gender and age band

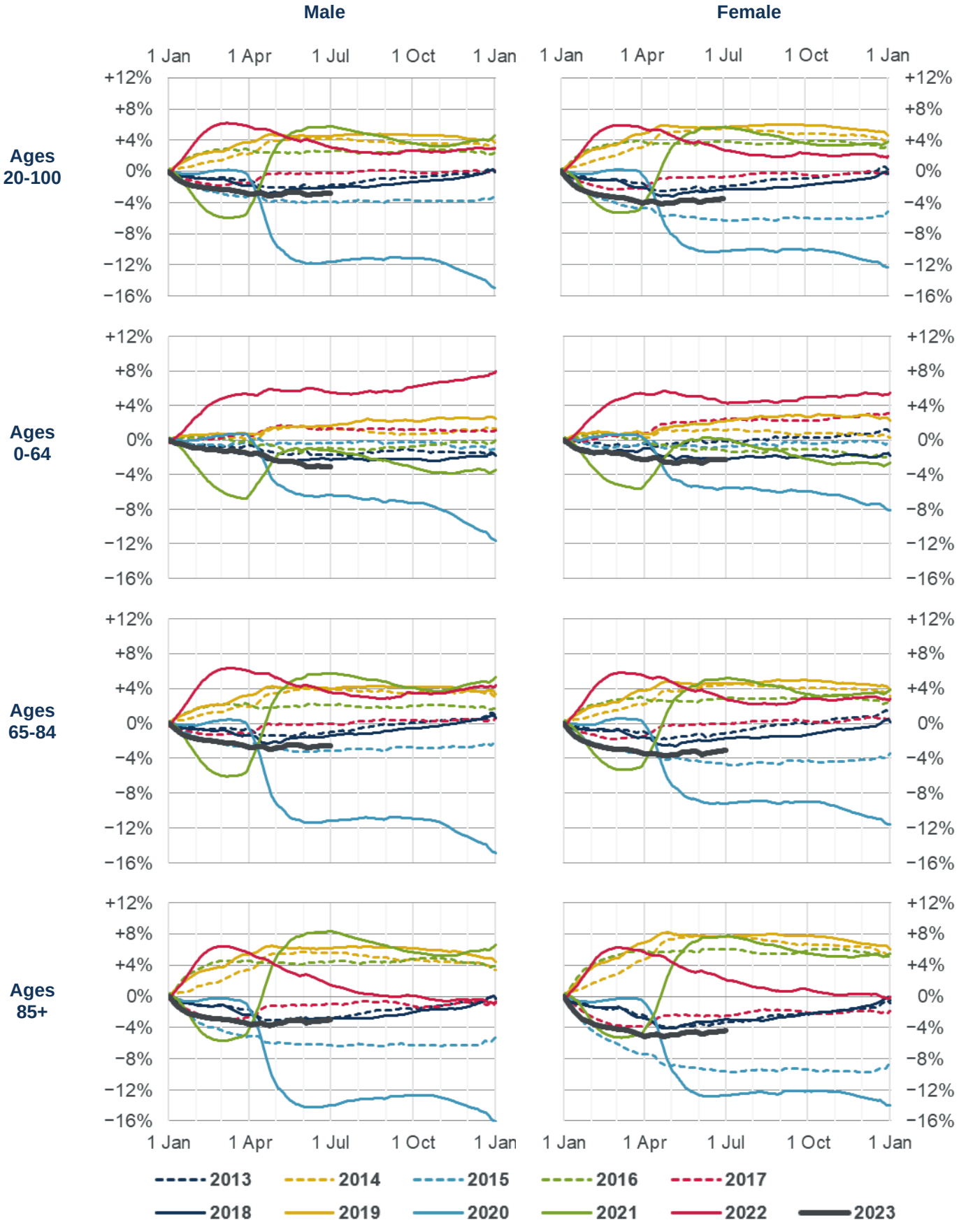
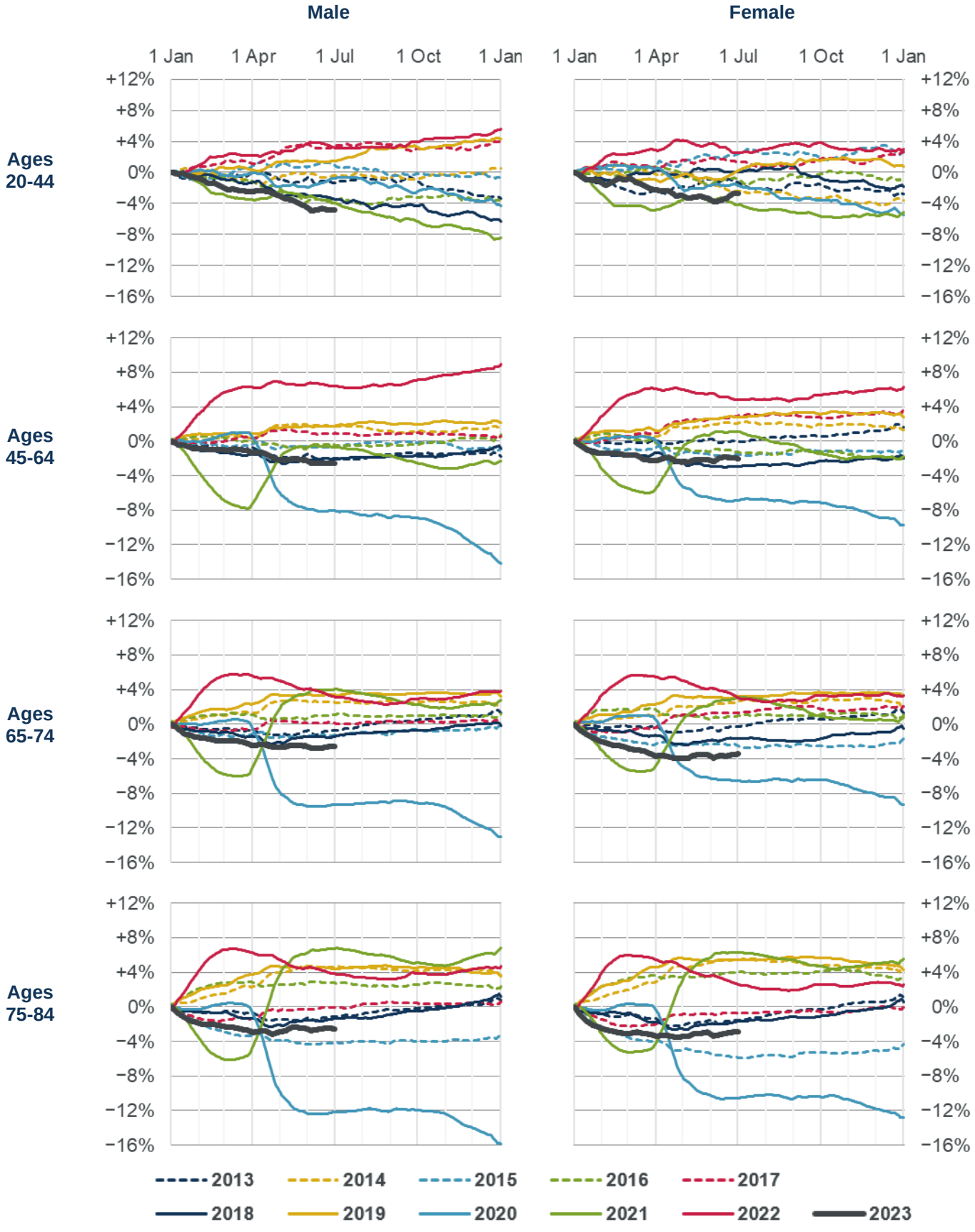


Chart H (cont): Cumulative annual standardised mortality improvement (cSMRI), by gender and age band



Appendix 1 – Accessible versions of charts D and E

Chart D2: Cumulative standardised mortality rate (cSMR) compared to the 2013-2022 average, showing 2013-2023 and highlighting individual years

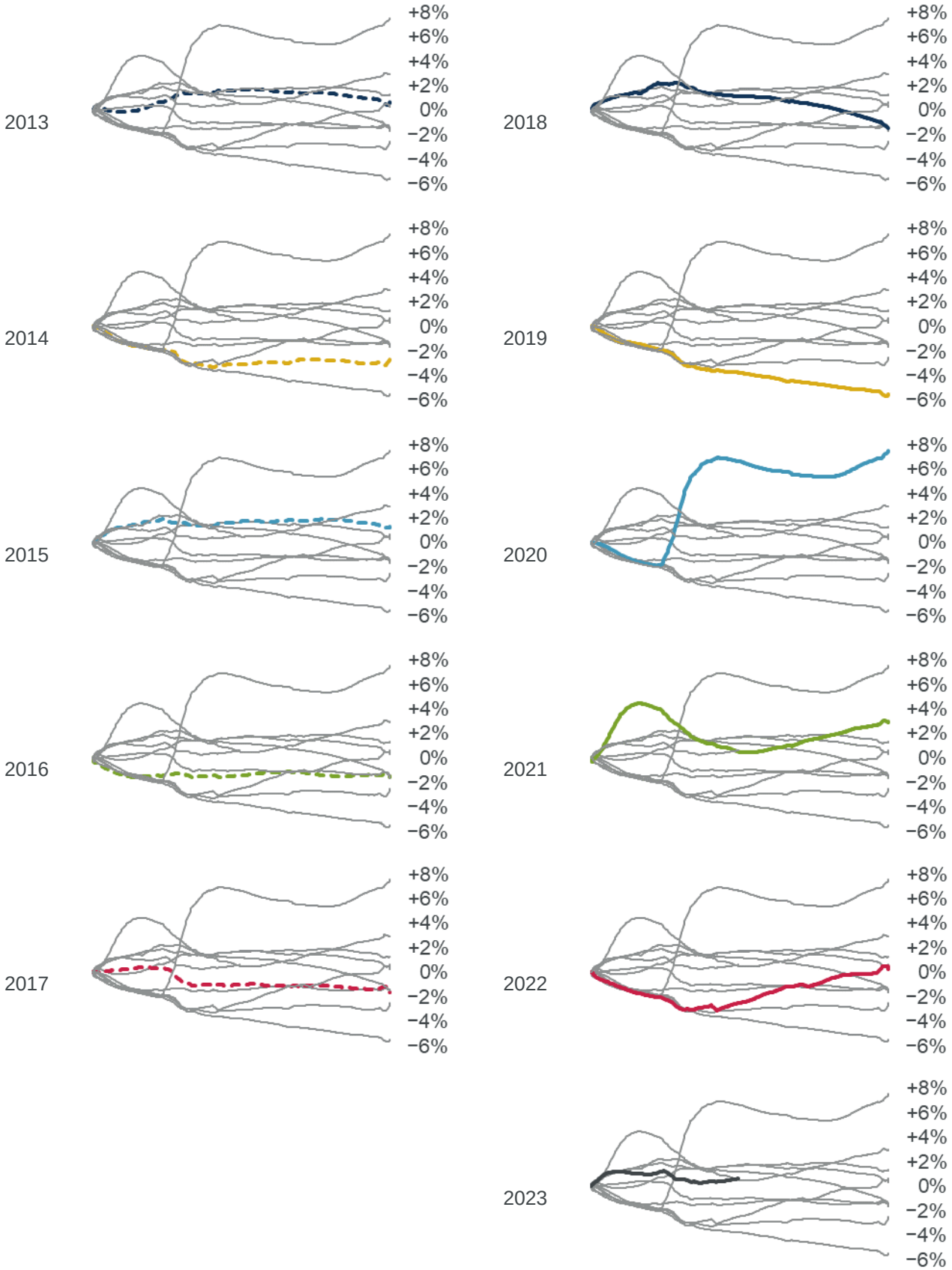
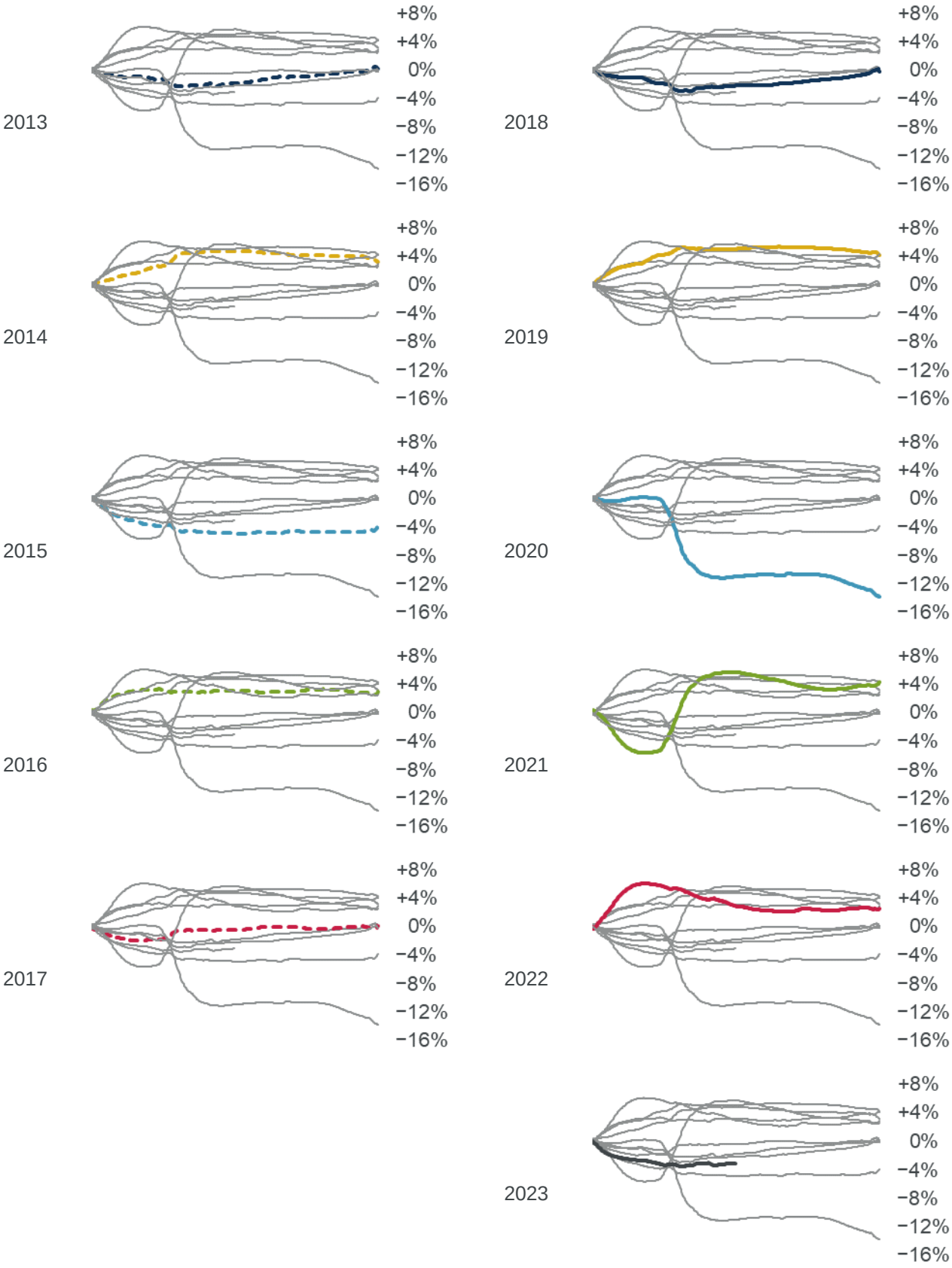


Chart E2: Cumulative annual standardised mortality improvement (cSMRI) for 2013-2023, highlighting individual years



Appendix 2 – Impact of the 2021 census on results

Our previous mortality monitor calculations have not taken account of the impact of the 2021 census in England & Wales on views of mortality rates and improvements. For the first time, this version of the mortality monitor does make allowance for the 2021 census. We have updated the results to use the same dataset as the latest version of the CMI Mortality Projections Model, CMI_2022.

We note that the ONS expects to published its revised mid-year population for mid-2012 to mid-2020 in September 2023. This will use a more detailed method and more detailed data to assess the 2012 to 2020 population than the CMI_2022 dataset that we use for this monitor. We intend to analyse the impact of the ONS dataset on the mortality monitor once it is available.

This appendix provides an indication of the impact of updating the dataset used for the monitor by comparing:

- the results in the body of this mortality monitor, which make allowance for the impact of the census, using the CMI_2022 dataset; and
- illustrative results, which use the same method but the dataset used for earlier mortality monitors that do not allow for the impact of the census on population estimates.

Datasets

When calculating the mortality rate for a specific week, we need to estimate the population for that week. We do so by interpolating between the mid-year populations estimates either side of that week. For example, our calculations for results in the first half of 2023 require us to interpolate between the mid-2022 and mid-2023 populations. The ONS has not yet published estimates for these years, so we need to make our own estimate, based on ONS data for deaths and populations in earlier years.

For previous versions of the mortality monitor we followed the principle, set out in Working Paper 111 when we consulted in the first mortality monitor, that “once rates have been published, they will not be restated”. While the change to the dataset that we are making now is contrary to that principle, we think the change is clearly in the interest of users of the monitor.

Because of the previous principle of not restating published rates:

- The “previous” monitor dataset, used for the calculations in earlier mortality monitors, make no allowance for the impact of the 2021 census; and
- Populations for recent years in that dataset do not match ONS estimates published subsequently. For example, the mid-2020 population in the monitor dataset was estimated before the ONS published its estimate for mid-2020 and has not been revised since.

Results in this mortality monitor are based on a “new” dataset, which is consistent with the data that was used to calibrate the latest version of the CMI Mortality Projections Model, CMI_2022, which was published alongside Working Paper 177 which is restricted to Authorised Users. The new dataset is based on the mid-2021 population published by the ONS in December 2022 so does allow for the impact of the 2021 census, although we have had to make our own estimates for 2022 and 2023.

Because the ONS has not yet published its revised population estimates for 2012 to 2020, we have made our own estimates for these years, taking into account the ONS estimate for 2021. We note in Working Paper 177 that: “We have consciously taken a simple and pragmatic approach and recognise that [our] approach may not reflect changes to mortality and migration in light of the pandemic and Brexit. The ONS approach is likely to be more detailed and differ from ours, mainly due to the ONS having access to additional non-public information regarding migration and more granular data in respect of the census and deaths.”

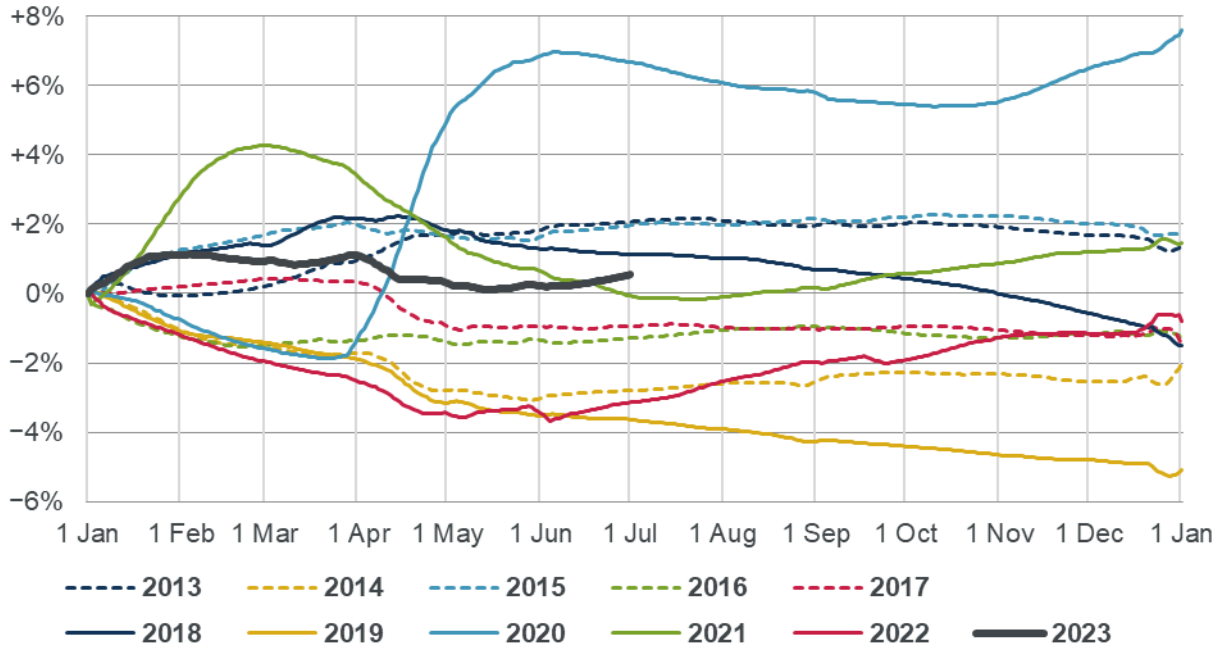
Results

This section shows the results from a version of the mortality monitor that uses the “previous” dataset and comparisons these to results from the “new” dataset.

We emphasise that while results based on the new dataset provide an indication of how the 2021 census changes views of past mortality rates and improvements, we expect a further change in view once the ONS figures are available, as noted above.

Chart I is a version of Chart D, showing cumulative mortality rates compared to the 2013-2022 average. The end-year figures for 2021 and 2022 are lower relative to the 2013-2022 average in Chart X2 (using the previous dataset) than in Chart D (using the new dataset), with a difference of 1.5% for 2021 and 1.1% for 2022.

Chart I: (Like Chart D) Cumulative standardised mortality rate compared to the 2013-2022 average – using the previous dataset



Charts J and K compare results from the two datasets directly to make the differences clearer:

- Chart J shows that the difference in SMRs relative to the ten-year (2013-2022) average between the two datasets is also greatest in 2021 and 2022.
- Chart K shows that the difference in mortality improvements between the two datasets is greatest in 2021. All other years shown have a difference of 0.5% or less.

Chart J: Annual SMRs for 2011-2022, relative to 2013-2022 average – comparing new and previous datasets

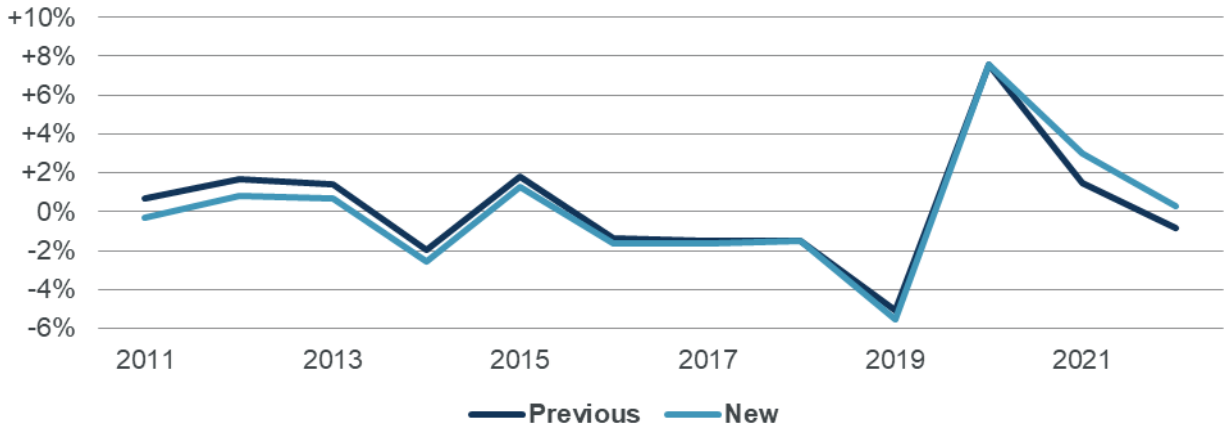


Chart K: Annual mortality improvements for 2011-2022– comparing new and previous datasets

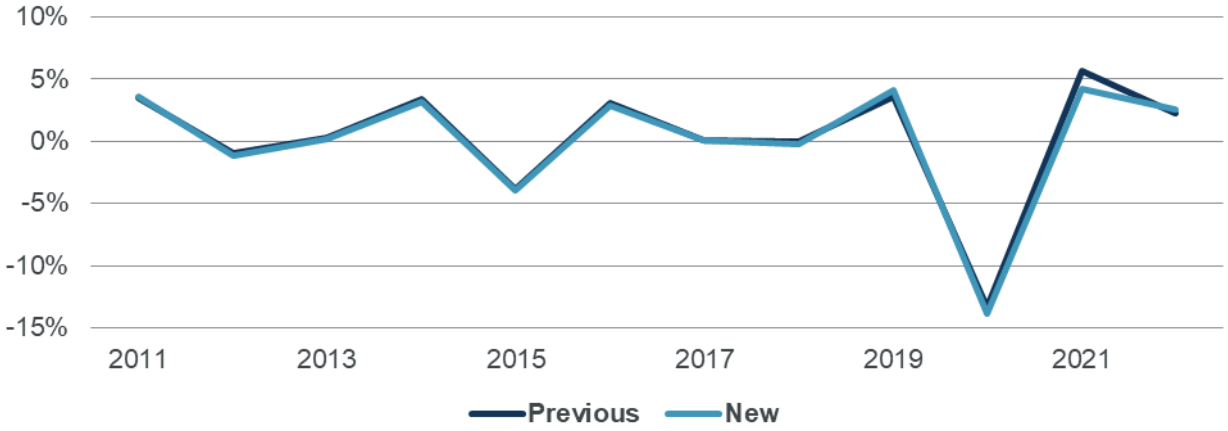


Chart L compares the cumulative standardised mortality improvement between 2019 and 2023 between the two datasets. Using the previous dataset leads to a cumulative improvement at 30 June 2023 of -4.3% rather than -4.7% when using the new dataset. The difference between them is nil at the start of the year, by definition, and has grown fairly steadily through the year, so we would expect a larger difference between results for the two datasets at the end of the year.

Chart L: (Like Chart F) Cumulative standardised mortality improvement between 2019 and 2023 – comparing new and previous datasets

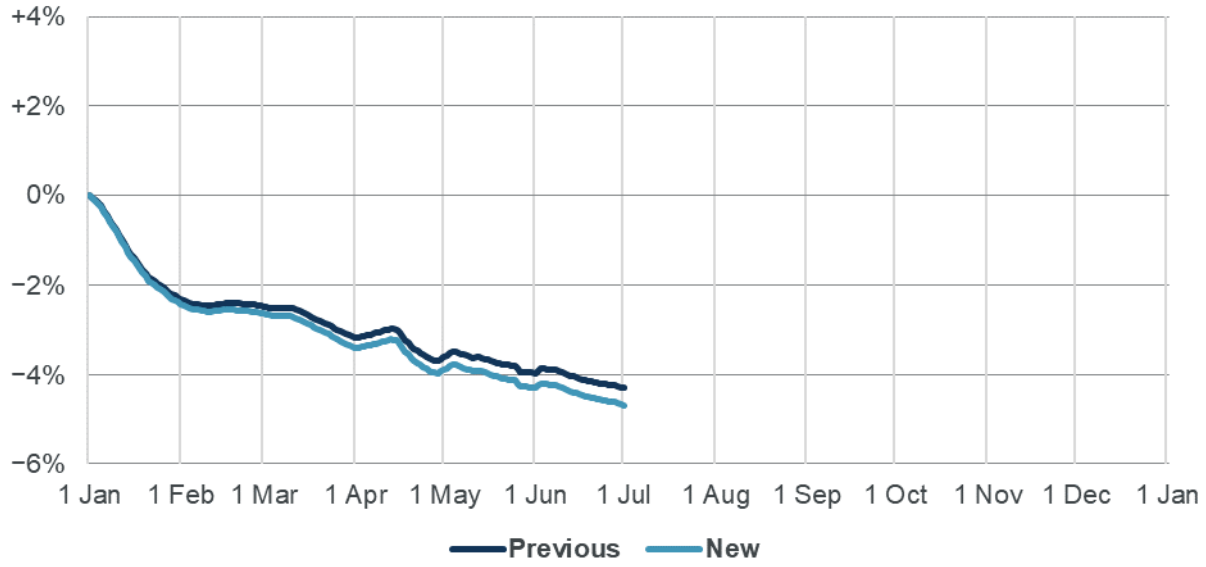


Table A2.1 compares the cumulative mortality improvement at 30 June 2023 between the two datasets for different age ranges. The difference is notably larger for the age 85+ age band than for other ages.

Table A2.1: (Like Table 3) Cumulative mortality improvement at 30 June 2023 by age band, comparing datasets

Dataset	0–64	65–84	85+	20–100	20–44	45–64	65–74	75–84
Previous	−2.9%	−3.0%	−4.6%	−3.6%	−4.2%	−2.5%	−3.0%	−2.9%
New	−2.8%	−2.8%	−3.6%	−3.1%	−4.1%	−2.4%	−2.9%	−2.7%
Difference	+0.1%	+0.2%	+1.0%	+0.5%	+0.1%	+0.1%	+0.1%	+0.2%

Reliances and limitations

The purpose of the mortality monitor is to provide regular updates on standardised mortality in England & Wales, adjusting ONS data to allowing for changes in the size and age of the population. This can be used to inform a view on the outcome of the next version of the CMI Model, in the absence of any change in method.

The CMI aims to produce high-quality outputs and takes considerable care to ensure that the mortality monitor and the accompanying spreadsheet of results are accurate. However:

- We cannot guarantee their accuracy (see the Disclaimer).
- There is a reliance on the underlying data, published by the ONS and described as provisional.
- We have also applied judgement and assumptions in deciding on the calculation methods and the presentation of results.
- Anyone using the results of the mortality monitor should ensure that it is appropriate for their particular use, and note that care is needed when estimating full year experience from partial year experience. This is particularly true during the coronavirus pandemic.
- While the results allow for the 2021 census data published to date by the ONS, populations for years after 2011 are our own estimates. The final revised estimates published by the ONS are due in September 2023.

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