Web supplement 1 – Expansion of existing evidence on hypotheses

Artefact and migration

It was suggested that some or all of the recent change in mortality trends could be due to statistical artefact or migration (grouped here as both are related to denominator populations and populations at risk). Some of the early studies highlighting increased mortality used crude death counts or crude death rates, raising the possibility that changes in the age structure of the population (i.e. population ageing) might be partially responsible for the trends. However, fully age-standardised mortality rates and life expectancy calculations have confirmed the issue initially identified by the crude data, albeit with the changes in the age-standardised trends being less than the crude trends. Second, it was possible that there were inaccuracies in the denominator populations because of people migrating and being included in the numerator but not the denominator (i.e. as might be the case with UK nationals returning from other parts of Europe). Third, migration of populations at higher risk of mortality might change the vulnerability of the population (e.g. Eastern European people migrating to the UK might carry higher mortality risks; or elderly UK nationals living abroad and moving back to the UK might create a selective migration of higher risk individuals). Finally, there was concern that the lack of disaggregation of population denominators for those aged 90+ years might insufficiently standardise populations in the current period as the population ages. A review by Public Health England concluded that for the UK, the likelihood of any of these factors having a substantial impact on the mortality trends was very low.

However, the choice of time periods for comparisons of recent trends has an important impact on the apparent changes, as these are relative phenomena. In the UK, the period from the late 1990s to the late 2000s seems to have been associated with a more rapid period of mortality decline than the periods before or after. Thus, if a comparison is only made with the 2000s the recent period is worse than a comparison with a longer time series or earlier periods. Alternatively, it may be that the late 1990s to late 2000s period is the unusual one. UK data suggest that mortality rates did improve more quickly prior to 2012, but that the slowdown since is much more marked than any previous period back to at least the 1970s.

Attainment of a natural lifespan limit

It has been suggested that the recent mortality trends might simply be due to the population beginning to attain the natural limit to human lifespan, and thus something that does not require explained by new exposures. This thesis is undermined by the finding that there is little or no relation between the life expectancy of a population and the degree to which mortality rates have changed, the rate of mortality improvement has stalled across all age groups, and the slowdown is starker in more deprived areas which already have lower life expectancies. This does not therefore seem to be a relevant explanation.

Influenza

Influenza surveillance systems noted increases in crude mortality, particularly amongst the elderly, in the first half of 2015 and in winter 2017-8. Much of this increase was attributed to influenza because of the rapid rise in the increase internationally, the age groups...
affected, serology showing rapid increases in infection and increases in clinical reports of
cases. There was particular concern that there was low vaccine efficacy during this time due
to a vaccine-strain mismatch, and that this combined with a particularly virulent strain,
meant that there was a larger number of cases with a higher case-fatality rate than in
previous years. Finally, there was a suggestion that the population may have been
vulnerable due to a number of years in which influenza mortality was lower, leaving the
population with a higher prevalence of co-morbidities than would otherwise have been
expected.

Weather and climate

There is evidence that either temperature extremes, compared to the normal range for a
particular location, can worsen mortality rates.\textsuperscript{12,13} This was therefore an additional
hypothesis proposed to explain the recent changes in mortality trends across countries given
the increased likelihood of extreme weather events with climate change.

Loneliness/decreased social networks

Another suggestion is that the increased segregation of society, perhaps due to rising
income inequality and reductions in services, has contributed to social isolation and
loneliness.\textsuperscript{14} In essence, it is proposed that the community resilience (e.g. through
volunteering, informal social networks and support, clubs, etc.) against the impacts of
reductions in service provision has been eroded and thus the impact of austerity has been
greater than would otherwise be expected.

Mental health

A rise in mental health problems as a mechanism leading to higher mortality rates (as well as
an important outcome in its own right) has also been proposed. Increases in self-reported
depressive and anxiety symptoms have been observed in Scotland, and may be due to the
reduced generosity and increased conditionality within the social security system.\textsuperscript{5} This may
therefore be a further mediator of the impacts of austerity.

Obesity

During the rise in obesity in most high income countries, epidemiologists warned that this
might result in increases in a range of conditions such as Type 2 diabetes, osteoarthritis and
cancer, and through these mechanisms, mortality.\textsuperscript{15} Given that obesity rates increased
across most high income countries in the years prior to the recent change in mortality
trends, it is plausible that there is now a large cohort in the population who are either
experiencing the direct health impacts of obesity, or who are more vulnerable to the
negative impacts of other factors.
References


