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The Geography of a rapid rise in elderly mortality in England and Wales, 2014-15

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ABSTRACT

Since at least the early 1900s almost all affluent nations in the world have continually experienced improvements in human longevity. Using ONS mid-year population and deaths estimates for Local Authorities for England and Wales, we show that these improvements have recently reversed. We estimate that in England and Wales there were 39,074 more deaths in the year to July 2015 as compared to the year to July 2014 (32,208 of these were of individuals aged 80+). We demonstrate that these increases occurred almost everywhere geographically; in poor and affluent areas, in rural and urban areas. The implications of our findings are profound given what has come before them, combined with the current political climate of austerity.

1. Introduction

One of the great successes globally since the early 1900s has been the continued improvement of human longevity (Oeppen and Vaupel, 2002; Leon, 2011). For example, life expectancy at birth in England and Wales has increased by 28 years over the last 100 years (i.e. from 51 in 1910/12 to 79 in 2010/12) (ONS, 2014). Developed countries passed through the epidemiological transition where their disease profiles moved away from the majority of deaths being due to infectious diseases towards chronic illnesses being the most likely precursor to mortality (Omran, 1971). While medical improvements have helped to treat ill health and disease, improvements in population health have been largely driven by better sanitation, education and general rising standards of living (Woolf et al., 2007). As a result, age-specific mortality rates have been falling consistently throughout the 20th Century and beyond in all affluent countries (Minton et al., 2013).

The 2008 Great Recession saw worldwide economic decline on a scale not observed in the UK (and many other countries) since the Great Depression that began in 1929. Many governments (including that of the UK) responded by cutting the size of the state under the assumption that lower public expenditure would lower public debt, leading to lower taxation (especially corporation tax) and hence increase economic growth. Other countries such as Finland, France, Denmark, Norway, Sweden and Japan increased the proportion of their GDP spent on public services to mitigate the effects of GDP falling (see Figure 2 in Author, 2016). The resulting changes to society in those countries that chose to cut public spending the most were all encompassing, affecting everyone (although some more than others). The only country to cut spending more than the UK was Ireland which consequently again experienced high rates of emigration (Dorling, 2016a). While primarily it has been the services mainly used by poorer individuals that were cut most severely, wider cuts to the NHS (Dunn et al., 2016) and adult social care (ADASS, 2016) have broader impacts which may negatively impact on population health.

The current evidence base on what the impact the 2008 Great Recession and subsequent period of austerity has had on population health is very small (this is partly due to the recent nature of the event, and possibly also because many health outcomes develop over long time periods). However, there is now a growing consensus that austerity is having a negative impact on both physical and mental health (Barr et al., 2012, 2015, 2016; Moffatt et al., 2015), particularly on elderly mortality (Loopstra et al., 2016). There have also been other associated issues which may indirectly impact on health including increases in food bank utilisation (Author and Author, 2015) and homelessness (Loopstra et al., 2015). Similar observations of the negative effects of recession and austerity policies on health have also been shown during other periods of economic downturn (Stuckler et al., 2009a, 2009b).

Given the widespread societal change, what does the geography of mortality look like in this new austerity society? In our study, we present evidence that longstanding mortality rate declines reversed between 2014 and 2015 particularly in the elderly (but also for most age groups). We

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explore how these changes have occurred geographically, as well as examine possible correlates of these changes. To date there is only one other published study that has examined the impact of cuts to income support and pensioner credits on old age mortality in the years up to 2013 (Loopstra et al., 2016). As yet no papers have been published on the further and faster rise in mortality that took place in 2015.

2. Methodology

We used mid-year population estimates data for England and Wales from the Office for National Statistics (ONS).[1] Annual data on mid-year (data for 1st July to 30th June) population estimates for Local Authorities[2] are provided (n=348, mean population size in 2015 was 166,337), and the dataset includes death counts as well. Data are supplied by sex and ages in single years (5 year age bands were used to minimise small number issues). We focus mostly on old age mortality for the age bands 80–84, 85–89 and 90+ because at these ages mortality rates are greatest (i.e. patterns are less likely to influenced by chance), as is their dependence on health and social care services due to the risky burden of morbidity that inevitably comes with age. We calculate age-specific rates by sex for Local Authorities by year. To measure the relative change between years, we calculate the rate ratio (i.e. divide the two mortality rates – the more recent one by the later one). Age-specific rates were adjusted using the single year of age data to account for any potential age-aggregation bias (i.e. adjusting rates based on differences in individual age composition rather than just calculating the overall 5 year age band mortality rate). This was important to account for whether differences between years were the result of differences in the composition of age bands or cohort effects[3] (Gelman and Auerbach, 2016). Data for 2015 were not available for Scotland at a local level, although it has been reported elsewhere that national patterns were similar (ONS, 2016b; Dorling, 2016c).

We defined six categories based on the numbers of age groups involved and the size on the increases in mortality rates. These six categories were arbitrarily defined, but were defined before we saw what they revealed based on cut-offs automatically provided by the software used. The results were so interesting that we have simply used these, and additional analyses presented in the Appendix suggest that other combinations would have produced similar results. Note that a rise of 6.5% is one extra death for every 15 that usually occur and a rise of 15% is one extra death for just under every 7 that normally occur. Our categorisation divided up areas into the following hierarchical groups (i.e. areas belonged to only one category based on the 'severity' of their changes):

1. Three or more sex-specific age groups with a rate ratio of greater than 15%
2. Two sex-specific age groups with a rate ratio of greater than 15%
3. Three or more sex-specific age groups with a rate ratio in greater than 6.5%
4. Two sex-specific age groups with a rate ratio in greater than 6.5%
5. One sex-specific age group with a rate ratio in greater than 6.5%
6. None of the above.

Two explanatory factors for the relative changes in mortality were considered. The mid-year population estimates also included internal and international migration flow data by sex and five year age band. We compared these measures to the rate ratios to examine whether migratory patterns may help to explain changes in Local Authorities (i.e. the inflow of older unhealthy migrants returning from abroad). There is limited migration of these age groups, so we hypothesise that it is unlikely to explain any patterns. We also used the English Indices of Multiple Deprivation (IMD) 2015 Local Authority summary statistics to examine whether the changes varied in areas with different levels of deprivation (n=326). We do not include the Welsh Local Authorities (n=22) in our analysis of deprivation since their multiple deprivation measure is different.

We used Geographic Information Systems (GIS) to visualise the spatial distribution of the rate ratio. Two types of maps are used to visualise our data: standard equal area maps that are geographically correct, and cartograms whereby the size of areas are adjusted in relation to their population size whilst also maintaining topology (Tobler, 2004). Both approaches present different geographies – one dictated by space, the other by people. Rate ratios were divided into quantiles based on all sex-specific age band values to allow for fairer comparisons when plotted together. Our geographical analysis was supplemented through calculating the Moran's I coefficient (Moran, 1950) which measures the extent of spatial autocorrelation (i.e. how spatially clustered the data are) to give us a formal measure of the existence of geographical patterns. Queen contiguity (order=1) was used to define the spatial structure of the data (i.e. compare Local Authorities with all surrounding areas that share a common boundary in any direction). We also examine the association of the rate ratio variables to our explanatory factors using Pearson's correlation coefficient. A paired sample t-test was used to test whether mortality rates between years were significantly different. Analyses were undertaken using QGIS, GeoDa, R and Microsoft Excel.

3. Results

3.1. Relative changes in mortality rates in England and Wales, 2014-15

Fig. 1 presents the relative change (rate ratio) of mortality rates by age band and sex for England and Wales (2014–15). Deaths rose by 11.8% and 18.2% for males and females respectively who had survived to age 90; by 9.2% and 11.2% for those aged 85–89; and 5.7% and 9.3% for those aged 80–84. We estimate that if 2015 mortality rates had remained the same as 2014 rates, then we would have seen 39,074 fewer deaths in 2015. The majority of these excess deaths were above the age of 80 (an additional 32,208 deaths, equivalent to 82.4% of all additional deaths).

Whilst the relative change in mortality rates increased with age, not all age groups saw increases. There were falls for infants and in adults aged 25–29. These falls reflect patterns observed elsewhere such as declining car use (i.e. driving has become less affordable) during the period of austerity which may be having a positive effect on some aspects of population health (Stuckler et al., 2011; Minton et al., 2016). Furthermore the age 25–29 age group had the highest net international in-migration in the year to July 2015 of over 60,000 additional young and presumably very healthy people coming into England and Wales, mostly from the rest of the EU.

When both relative risk and baseline mortality risk are considered together, the effects of rising mortality risks are greatest in people above retirement age, rising monotonically (females) or near monotonically (males) with age after the age of 65. The relative change in mortality rates was also higher for females for most ages (particularly the age group 90+). However older men's mortality rates had been declining faster than older women's in the decade before 2010, partly due to the later take up of smoking among females (Pampel, 2005).

A paired sample t-test of differences in mortality rates for 2014 and 2015 data across Local Authorities demonstrated that mortality rates in

[1] Data are available here: https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland/mid2015/ukmye2015.zip

[2] We refer to all 'London Boroughs', 'Districts' and 'Unitary Authorities' collectively as Local Authorities since this is how they are referred to by the ONS as a collective set of areas.

[3] Using the non-adjusted age-specific rates did not alter the findings, suggesting that age-aggregation bias was not an important factor.

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