

# **TITLE**

Why has mortality in England and Wales been increasing? What happened in 2015.

## **ABSTRACT**

### **Objectives**

To explore and define the change in mortality seen in England and Wales in 2015.

### **Design**

A descriptive study using publically available data from the Office for National Statistics (ONS).

### **Setting and participants**

England and Wales population, January 2015.

### **Main outcome measures**

Causes of death contributing to life expectancy changes.

### **Results**

There were 529,655 deaths in 2015, an increase of 5.6% from 2014. This came with a corresponding decline in the age-standardised mortality rate. January 2015 saw the largest excess of 10,479 deaths compared to the 5-year monthly average. This resulted in a reversal in previous trends in life expectancy. Although men saw a slight improvement at birth of 0.03 years between 2013 and 2015, declines were seen at ages 75 and 85, from 11.42 years to 11.39 years and from 6.16 years to 6.06 years respectively. Among women, life expectancy at birth declined from 82.91 years to 82.81 years. At age 75 the decline was from 13.04 years to 12.88 years and at age 85+ it was from 6.96 years to 6.73 years. In all cases, there had been a transient improvement in 2014 followed by a great decline. The largest contributors to changes in life expectancy were in those over 85 years, with dementia being the greatest contributors in both sexes. Changes in coding practices and diagnosis of dementia were noted. Caution in attributing the apparent rise in deaths mainly to dementia is required.

## **Conclusions**

2015 saw an excess of almost 30,000 deaths in England in Wales, largely in the older population. Decomposition showed the dementias were the greatest contributors to changes in life expectancy seen. Those most affected rely heavily on a well-functioning health and social care system, and the role this may have played will be explored in a further paper.

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# INTRODUCTION

The post-war period in Europe has been characterized by sustained year-on-year reductions in mortality, driven by a combination of improved living conditions, reduced exposure to hazardous substances such as tobacco, and better health care. Elsewhere, developments have not always been so favourable and, where progress is interrupted or halted, it has often been an early sign of deeper problems in society. Thus, observation that infant mortality in the USSR was increasing in the 1980s, reported not in a medical journal but in the *New York Review of Books*,<sup>1</sup> was a pointer to severe problems that would soon become apparent in other areas of health and society. The recent worsening of life expectancy in the USA is causing concern,<sup>2</sup> especially among political commentators following research showing that worsening health indicators were the strongest predictors of a shift by former Democrat voters to support for Donald Trump.<sup>3</sup>

There are now growing concerns about what is happening in the United Kingdom. The number of deaths in 2015 was substantially higher than in 2014, this represented the greatest percentage increase for almost 50 years. Importantly, initial data on weekly deaths for 2016 indicate that this increase is being sustained. Indeed, the number of weekly deaths since mid-October 2016 exceeds that in any of the preceding three years (Web appendix). Yet, while this phenomenon has attracted attention in official circles, the explanation is far from clear. Early analyses of the provisional data for 2015 reportedly left experts “grasping for answers”.<sup>4</sup> A major problem is the delay in release of detailed mortality data, so that the initial assessments were based on incomplete data and, of necessity, proposed explanations were somewhat speculative. Some were quick to attribute the rise in deaths to influenza, suggesting that cold weather may have played a part, while other experts called for investigation as to whether this could be linked to health and social care spending cuts,<sup>4</sup> drawing on a recent study linking increasing mortality at older ages in England between 2007 and 2013 to cuts in welfare spending.<sup>5</sup> Public Health England (PHE) argued that the deaths were “not exceptional”<sup>6</sup> noting that the influenza strain in 2015 was influenza A(H3N2), a strain they consider to affect older people predominantly.

It is, however, now possible to test the explanations that have been proposed for this increase. The more detailed mortality data from 2015 that are now available for England and Wales. In this, the first of two linked papers, we describe what happened to mortality in 2015 and explore a range of possible explanations. In the second paper, we look in detail at one particular aspect of the increase in mortality in 2015, a large increase in deaths in January of that year, again considering possible explanations.

## METHODS

We have adopted an iterative approach, interrogating the data to understand the nature of the phenomenon as far as possible. After standardizing for age, we place what happened in 2015 in a historical context, we then examine how mortality varied over the course of 2015 and compare this with what happened in previous years.

Having confirmed that mortality did rise substantially in 2015, with a corresponding fall in life expectancy, we then identify the contributors to the decline in life expectancy in terms of cause of death by sex and at different ages. We use Arriaga's method of decomposition,<sup>7</sup> which allows us to identify which causes of death, at which ages, contributed to the changes in life expectancy, whether positively or negatively. As the initial inspection showed that the increase in mortality was greatest among those at older ages and from certain causes common at those ages, and as consideration of causes that have been invoked in other investigations of this phenomenon, we selected a limited number of causes of death of interest (Table 1). These differ from other studies using this method, which have typically focused on deaths at younger ages.

Table 1: Causes of death used in the decomposition of differences in life expectancy

ICD-10 Code	Description
J09; J10-J11.3	Influenza due to certain identified influenza virus; Influenza
J12-J18	Pneumonia
J40-44	Bronchitis, emphysema and other chronic obstructive pulmonary disease
F01, F03	Vascular and unspecified dementia
G20	Parkinson disease
G30	Alzheimer's disease
C00-D48	Neoplasms
U509, V01-Y80	External causes of morbidity and mortality
I00-I99	Diseases of the circulatory system
n/a	All other causes

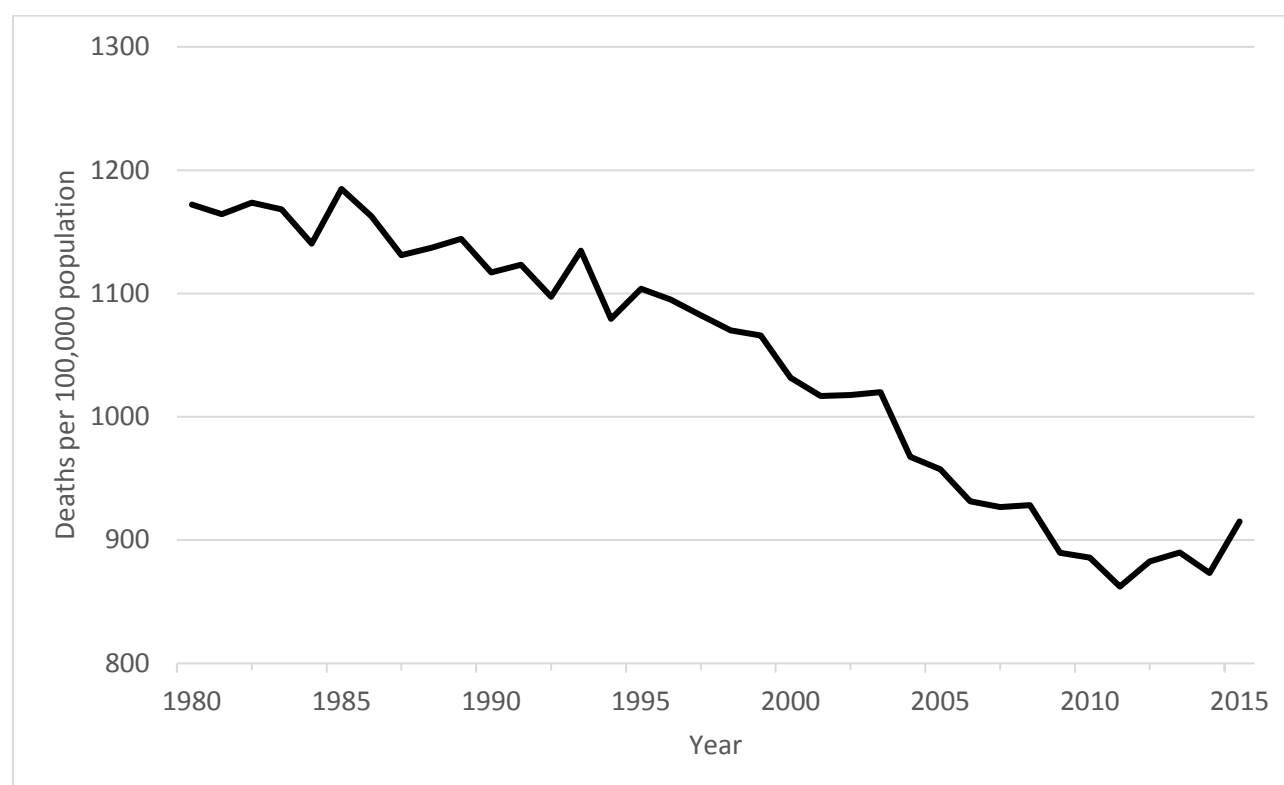
Having confirmed that deaths among the older population contributed most to worsening life expectancy, we turn to the predominant cause of death in this age group: dementia and Alzheimer's disease (AD). We examine trends in number of deaths and age-standardised mortality rates (AMSR) from Office for National Statistics (ONS) data, along with the potential impact of changes in coding and recording of dementia and AD on death certificates.

## RESULTS

### Defining the problem

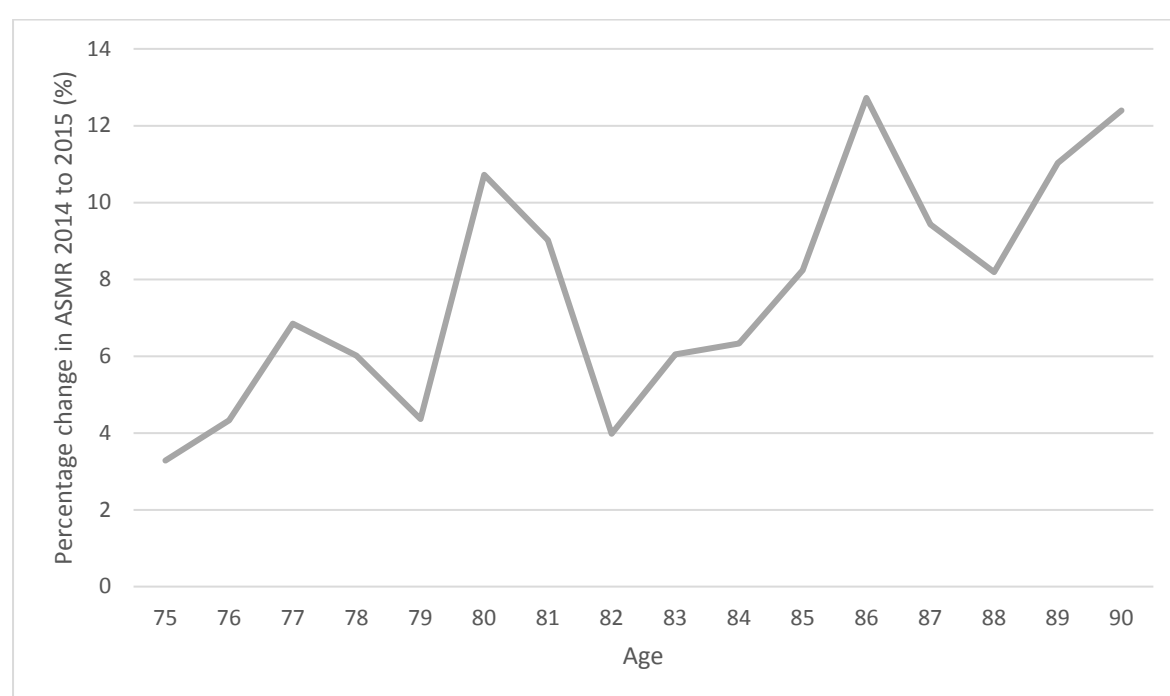
The overall number of deaths in 2015, at 529,655 deaths, was 28,231 more than 2014, an increase of 5.6%.<sup>8,9</sup> However, meaningful comparisons require absolute numbers to be related to the population at risk, adjusted for the age composition of the population. Figure 1 shows that, following many years of decline, albeit with some year to year fluctuations, the ASMR does indeed show a reversal since 2011 so that, by 2015, it was higher than in any year since 2008, although it should also be noted that there was a small decline between 2013 and 2014.

Figure 1: Age standardised death rate per 100,000 population, England and Wales, 1980-2015



These figures are age-standardized using 5-year age groups. With an ageing population it is necessary to exclude the possibility of a shift in the distribution of the population within each group. To address this issue, we have calculated the percentage change in the death rate at individual years of age between 2014 and 2015. As Figure 2 shows, at ages over 75, there is an increase at each age over 74. We also applied age specific death rates by single year of age in 2014 to the mid-year population in 2015 to estimate the difference from what would have been seen had there been no change in death rates. This reveals an excess of 33,798 deaths.

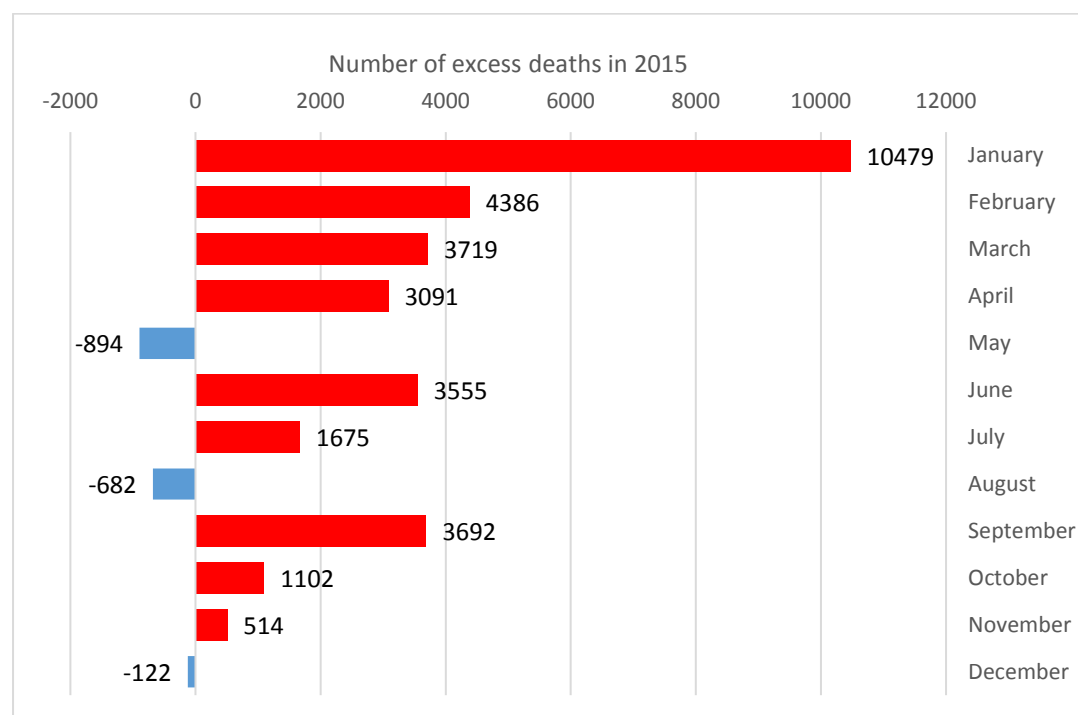
Figure 2: Percentage increase in age-specific death rates from 2014 to 2015, England and Wales



Source: Authors' calculations from ONS mortality data and population estimates

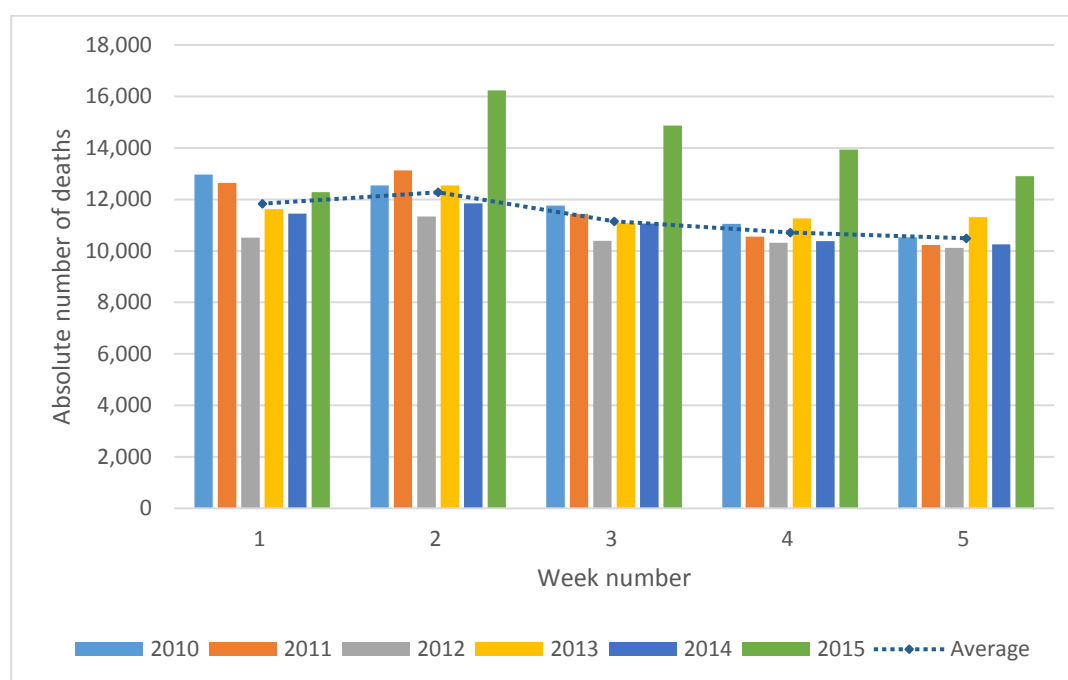
Having shown that there is a real increase in deaths that is a departure from previous trends that cannot be explained by ageing of the population, the next set of analyses ask whether the increase varied during the year. As Figure 3 shows, when deaths in each month in 2015 are compared with monthly averages for the period 2006 to 2014, the increase occurred in all but three months, but with a particularly large increase in January, when deaths were a remarkable 24.2% higher than in 2014. The increase in this month alone accounts for an excess of 10,479 deaths compared to what would have been expected if the mean monthly deaths in 2006-2014 had occurred.<sup>10</sup>

Figure 3: Excess deaths per month in 2015 compared to the monthly average 2006-2014, England and Wales



Looking in more detail at deaths in the first five weeks of each year since 2010, 2015 clearly stands out (Figure 4).<sup>11</sup> Other than in week 1, there were many more deaths in every week of January than in the same weeks in the previous years. The accompanying paper will explore this finding in detail.

Figure 4: Number of deaths per week, weeks 1-5, 2010-2015, England and Wales



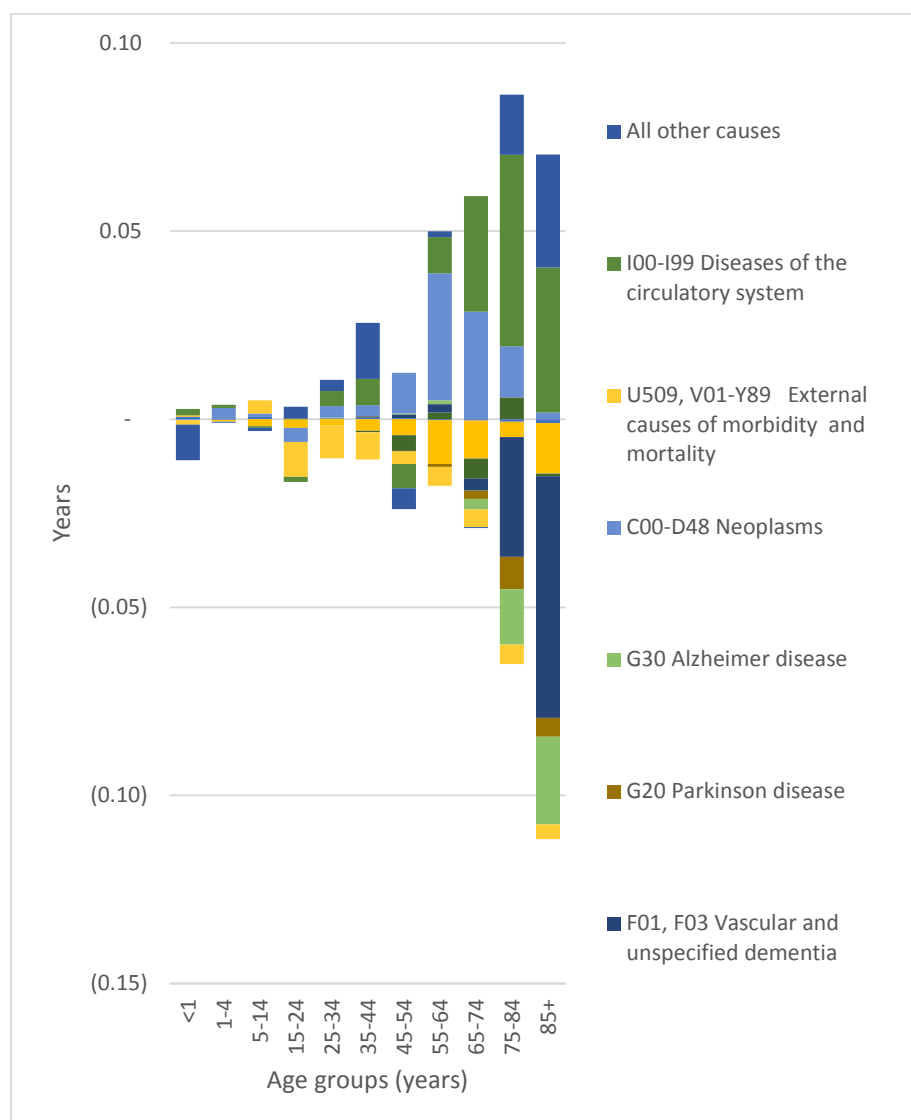
## **Contribution of deaths from different causes, at different ages, to the change in life expectancy**

We now examine in more detail deaths that contributed to recent changes in life expectancy. Although the deterioration was greatest between 2014 and 2015, we focus on the change between 2013 and 2015 in recognition of the slight improvement in 2014. Among men, life expectancy at birth improved very slightly, by 0.03 years between 2013 and 2015, but this was due entirely to continuing improvements at younger ages. Life expectancy at ages 75 and 85 declined, from 11.42 years to 11.39 years and from 6.16 years to 6.06 years respectively. Among women, the worsening life expectancy at older ages was sufficient to cause a decline in life expectancy at birth, from 82.91 years to 82.81 years. At age 75 the decline was from 13.04 years to 12.88 years and at age 85+ it was from 6.96 years to 6.73 years. In all cases, there was a transient improvement in 2014 followed by a greater decline. Figures 5 and 6 show the results of the decomposition of changes in life expectancy for both sexes, by age band and cause of death, in England and Wales. The corresponding figures for the change between 2014 and 2015 are included in a web appendix.

As expected, given the changes in life expectancy at each age, the largest contributors to change in life expectancy in both sexes were seen in the over 85 age band. Notably, influenza did not significantly contribute to changes in any group, although caution is needed as coding practices can record complications of influenza as the cause of death, such as pneumonia, rather than influenza itself.

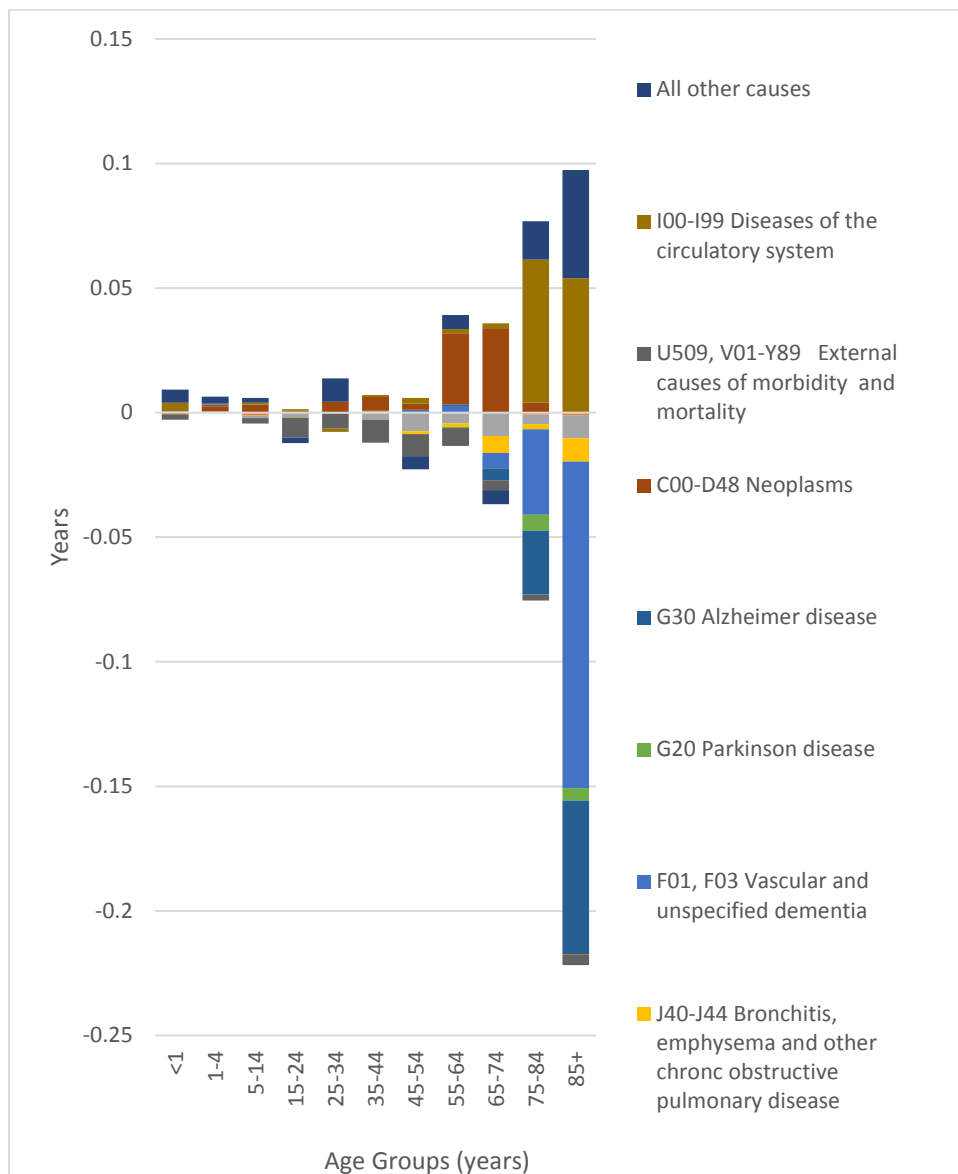
For men, continuing reductions in deaths from diseases of the circulatory system and 'all other causes' made positive contributions in the '85 and over' age band to improvements in life expectancy (0.04 and 0.03 years respectively). The greatest contributors to the deterioration in life expectancy were the dementias, with vascular and unspecified dementia contributing a loss of 0.06 years, and Alzheimer's disease (AD) a loss of 0.02 years. Pneumonia, responsible for a loss of 0.01 years, may include some deaths due to influenza. All age bands from 65 years and over saw a negative contribution of vascular and unspecified dementia, but the younger age groups experienced a positive contribution. Deaths at lower ages contributed very little to the worsening life expectancy, except those <1 years, where 'all other causes' contributed a loss of 0.01 years.

Figure 5: Decomposition showing the contribution of deaths at different ages from different causes to change in male life expectancy, England and Wales, 2013-15



For women in the years 2013 to 2015, the overwhelming negative contribution was from deaths in the over 85 age band, with vascular and unspecified dementia contributing a loss of 0.13 years and AD 0.06 years. Increasing deaths from pneumonia were the third most important cause of declining life expectancy, contributing 0.01 years, while deaths from diseases of the circulatory system and 'all other causes' made a modest positive contribution to life expectancy. As with men, increasing deaths from dementia impacted negatively from 65 years on, with modest positive contributions seen below this age group. In contrast to men, the <1 age band saw an overall positive contribution to life expectancy, predominantly due to 'all other causes'. For the present purposes, these findings indicate that increasing deaths in the over 75s contributed most to the reduction in life expectancy, with dementias the predominant cause. These results also raise questions about why male infant mortality has deteriorated in very recent years.

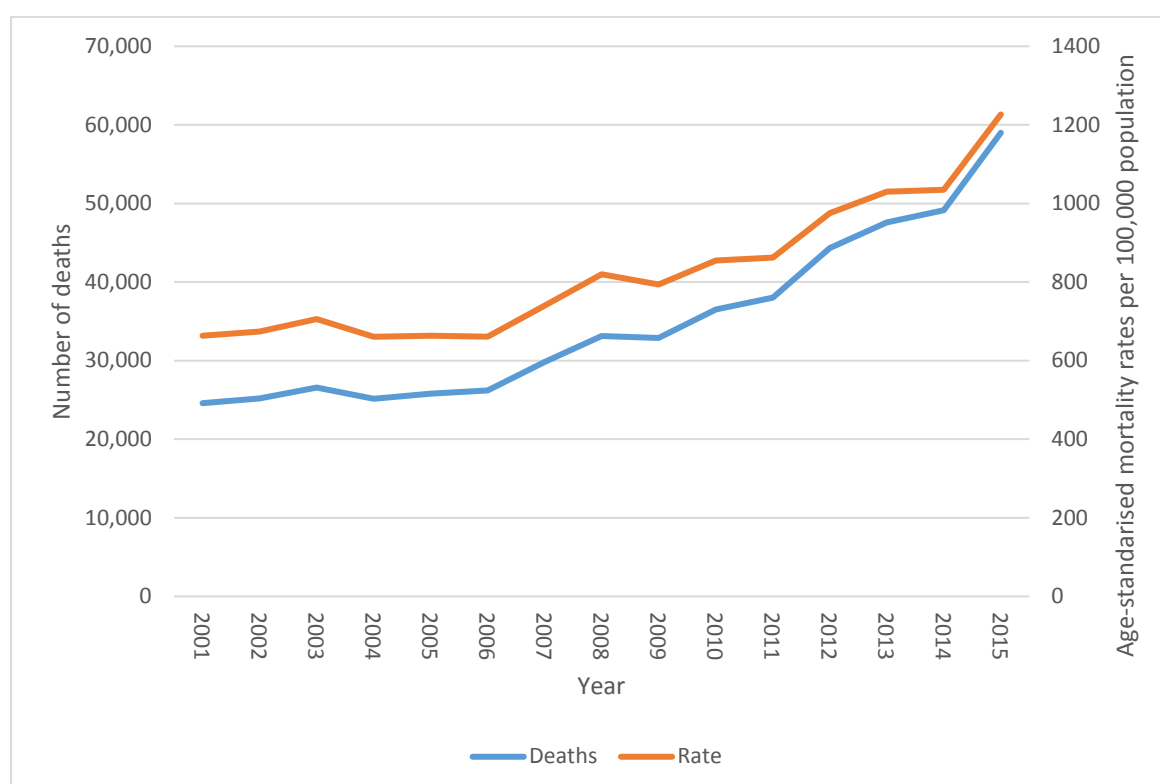
Figure 6: Decomposition showing the contribution of deaths at different ages from different causes to change in female life expectancy, England and Wales, 2013-15



## Changes in reported deaths from dementia

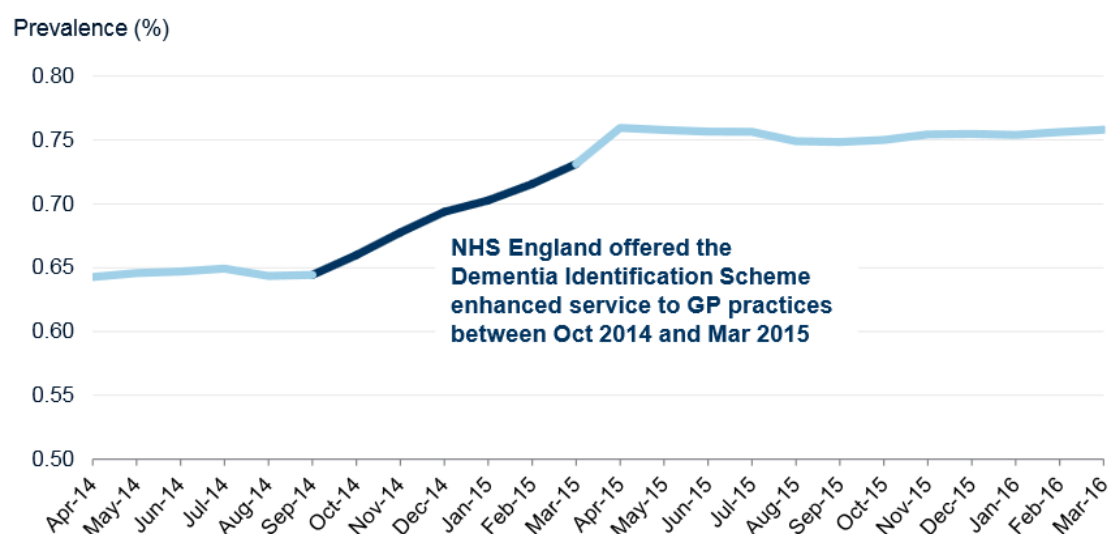
Given the frequency of multi-morbidity,<sup>12</sup> coupled with the challenges of attributing deaths at older ages to a specific cause, it is important to ensure that the changes observed are not a function of changes in recording or coding. We now consider this possibility for the dementias, noting that the initial data show an upward acceleration in deaths attributed to both dementia and AD, above the trend line in 2015 (Figure 7).<sup>13</sup>

Figure 7: Number of deaths and age-standardised mortality rates for dementia and Alzheimer's disease, persons 75 and over, England and Wales 2001-2015



Our findings must, however, be interpreted in the context of other changes at the time. Historically, AD and dementia have rarely been recorded as a cause of death.<sup>14, 15</sup> The ONS codes deaths using specialist software and highly trained coders, and in January 2014 the software package was changed.<sup>16</sup> This change has been associated with a 7.1% increase in deaths coded with an underlying cause as dementia.<sup>16</sup> In addition, financial incentives encouraging early diagnosis of dementia in primary care were put in place between October 2014 and March 2015. That was associated with a marked increase in recorded prevalence, as seen in Figure 8.<sup>17, 18</sup> In contrast, epidemiological research using standardized diagnostic criteria show a declining age standardized prevalence of dementia,<sup>19</sup> although in terms of absolute numbers, this is counteracted by population ageing. However, it is important to note that the overall rise in mortality is not due to population ageing.

Figure 8: Recorded prevalence of dementia, all ages, England, 2014/15 to 2015/16.



Source: HSCIC<sup>18</sup>

In summary, while the change in coding cannot explain all of the increase from 2014 to 2015, the incentives for early diagnosis may contribute in part. This cannot explain the increase in overall deaths, but does caution against reading too much into the apparent rise in deaths from dementia.

## DISCUSSION

This study has many limitations, largely arising from the limitations in the data available. For example, at the time of analysis, data by single year of age and area were not available. Data on the number of deaths in England and Wales varied – if weekly deaths are totaled, the figure is 539,007, equating to 37,583 excess deaths compared to 2014, and a rise of 7.5%.<sup>11</sup> We believe that we have gone as far as the data available to us currently allow. However, these data issues raise an important question about the priority given to monitoring the health of the population. Almost 30,000 excess deaths have occurred, yet, as far as we can ascertain, this has stimulated no significant interest among politicians. A search of Hansard reveals only one question from a Members of Parliament (MP) about mortality in 2015. Scottish Nationalist Party MP Ian Blackford asked “The Minister will be aware that mortality rates in England and Wales have increased by 5.4% in 2015—the biggest increase in the death rate for decades. She will also be aware that mortality rates have been rising since 2011. Has she done any analysis of what has been behind those

trends?” and received the reply “We welcome the overall trend towards longer life expectancy. There are annual fluctuations, but overall the trend remains positive. The key thing is helping people to live longer, healthier lives”.<sup>20</sup>

Our findings must be seen in the context of the severe disruption to the operation of the ONS following its move from London to Newport, with the loss of many key staff and institutional memory, coupled with severe cuts to its budgets—changes that have been blamed for the downgrading of the quality of the UK’s trade statistics.<sup>21</sup> Given the delays and problems we have faced, there is a strong case for viewing the strengthening of ONS as a strategic national priority.

The results show firstly a rise in deaths for the whole of 2015. As noted, there is also a large spike in January, is of necessity examined in a separate accompanying paper, but even without it mortality in 2015 would have increased. The decomposition shown in this paper reveals that deaths in those aged 75 and over contributed most to changes in life expectancy, with dementias the predominant cause. Even if the figures are taken at face value it is not clear why more people would have died from dementia,.

As noted above, attributing a specific cause of death to older people is recognised to be challenging, given the presence of multi-morbidity. However, the causes of death that contribute to the increase share the characteristic of being either a cause of frailty in older people or a common terminal event. This pattern, coupled with the earlier finding of an increase in deaths throughout the year, point to a general failure of care for this group, whose members are typically dependent on others for many aspects of their daily life. Clearly, many live lives that are precarious, at risk of infections, falls and fractures, so the question is not why any particular individual died but why, after many years of declining mortality, death rate should increase so much?

The older population particularly relies on a functioning health and social care system, and it has been suggested that the increase in mortality 2015 could be related to austerity and the resulting health and social care cuts.<sup>4, 22</sup> There is already evidence linking austerity and increasing suicide rates<sup>23</sup> and dependence on food banks.<sup>24</sup> One study has examined in detail changes in life expectancy in England in the years 2007 to 2013,<sup>5</sup> finding a close correlation with cuts in pension credits at the level of local authorities. Although these findings predate the current increase in mortality, they offer possible clues.

For those working in health and social care, the impact of austerity is already clear, with one survey of general practitioners finding that 94% of respondents reported that their workload had increased as a direct result of the financial hardship of their patients.<sup>25</sup> Recent reports from the British Medical Association<sup>26</sup> and the Royal College of Physicians<sup>27</sup> have both

highlighted the serious public health consequences of austerity and the underfunding of the NHS, with the BMA calling for 'robust action' to mitigate its adverse impacts. Some further clues can be found in the second part of our analysis, of the January 2015 spike in mortality. Cuts to local authorities' budgets have resulted in the withdrawal of many services that older people depend on. Rural bus routes have been reduced dramatically, increasing isolation of those dependent on them.<sup>28, 29</sup> Meals on wheels services have been stopped in a third of top tier councils, with the National Association of Care Catering (NACC) drawing attention to the consequences, noting how a daily visit can reduce loneliness and isolation, prevent admission to hospital by supporting independent living and reducing medical problems resulting from malnutrition.<sup>30</sup> Given these circumstances, it is unsurprising that, in 2014-2015, 29.2% of those 80 years and above reported high levels of loneliness.<sup>31</sup>

## CONCLUSION

Approximately 30,000 more people died in 2015 than 2014 in England and Wales, with the increase in year on year deaths the greatest since WWII. Decomposition methods showed that the deaths in those over 75 years contributed most to changes in life expectancy, with dementias the predominant cause recorded. Changes in diagnosis and coding of dementia likely had an impact on these figures, and as such this should be interpreted with caution. What is clear is that the older population, who rely heavily on a well-functioning health and social care system, were the most impacted by the mortality rate increase.

With no satisfactory explanation provided for this increase so far, the next paper in this series will aim to explore possible causes for such a rise in mortality, along with closer consideration of the impact of the cuts to the health and social care system.

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