

## **TITLE**

Why has mortality in England and Wales been increasing? Exploring the spike in January.

## **ABSTRACT**

### **Objectives**

To explore possible explanations for the spike in mortality seen in England and Wales in January 2015.

### **Design**

A descriptive study using publically available data to test hypotheses for the spike in mortality.

### **Setting and participants**

England and Wales population, January 2015.

### **Main outcome measures**

Having identified in the first analysis that January 2015 saw the greatest rise in mortality seen during a year in which mortality rates rose greatly, an exploratory analysis was performed using available data to review the four main possible causes of this change. There were: data artefact, environmental event, epidemic disease, or failure in the healthcare system.

### **Results**

Through progressive analyses of available data, data artefact was excluded by reviewing changes in migration and death certification and coding. Environmental event, specifically cold weather, was excluded using data from the MET office and ONS. Epidemic disease, influenza, was analysed using trends in outbreaks, influenza-like-illness presentations in primary care, vaccine efficacy and comparison to other European countries. This found that firstly, although influenza may have played a role, it did not fully explain the large spike and secondly, evidence from Europe shows influenza does not have to inevitably result in such large mortality rises. Finally, using NHS performance data, clear evidence of system failures could be seen with almost all targets being missed including ambulance call out times, A&E

waiting times, despite unremarkable number of A&E attendances, but with staff absence spiking.

## **Conclusions**

The aim of this paper was exploratory and to promote debate as to how an unprecedented rise in mortality in England and Wales has gone unexplained. The analyses provided here suggest that failures in the health and social care system, due to disinvestment, appeared to play a role. We suggest urgent further review to quantify the impact of this.

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## INTRODUCTION

The percentage increase in deaths in England and Wales between 2014 and 2015 was the highest experienced for almost 50 years. As we noted in the accompanying paper, this phenomenon remains largely unexplained. In that paper we showed how the increase in mortality was driven by deaths among older people, with dementias the main contributors to worsening life expectancy at older ages. We suggested that, while more research was needed, there was reason for concern about the impact of austerity on the health and social care system. That paper focused on the increase in mortality that continued throughout most of the year. However, it also noted that there had been a very large spike in deaths in January that also remained unexplained. So far experts have failed to reach a consensus on what caused both the overall increase and the spike, with some suggesting influenza and cold weather, and others the cuts to health and social care.<sup>1,2</sup>

In this paper, we focus on the January spike, identifying a range of possible causes and, to the extent possible with the available data, testing them.

## METHODS

Our initial analysis revealed both an overall increase in mortality throughout 2015 and a marked spike in January. There are four possible causes of a large spike in mortality in a population. First, is it real or is it data artefact? Second, has there been an environmental shock, such as a natural disaster or extreme weather event? Third, was there a major epidemic? Fourth, could it be a widespread failure of the health and social care system?

First, we sought evidence of data artefact, such as unusual migration or issues related to death registration that could result in under- or over-estimation of deaths. Second, we looked for evidence of an extreme weather event with excessive cold, examining trends in temperature and mortality in recent years. For epidemic disease, we examined trends in influenza, invoked by some as contributing to the excess mortality, using data from Public Health England (PHE) to analyse outbreaks, efficacy of flu vaccine, and incidence compared to previous years and comparing what was seen in England and Wales with that in other European countries. Finally, we explore the possibility of failings in the health and social care system, reviewing data from NHS England on NHS performance in the same period.<sup>3-11</sup>

These data were selected using the markers NHS England employs to produce its

'Combined Performance Summary'.<sup>6</sup> This includes use of the NHS 111 service, ambulance quality indicators, A&E attendances and emergency admissions, waiting times for diagnostic tests, referral to treatment for consultant-led elective care, cancer services, delayed transfers of care, and early intervention in psychosis (not available for January 2015). Additional potential markers of the system are considered, and staff absence rates were taken from the Health and Social Care Information Centre (HSCIC).<sup>12,13</sup>

## RESULTS

Each explanation identified for the spike in January 2015 will be examined in turn. Some of these also relate to the overall increase throughout 2015 but they are considered here as they are more directly relevant to the spike.

### Data artefact

Any analysis of changes in mortality must consider data artefact. There have been many examples of changes in numerators or denominators giving rise to apparent anomalies. Problems with the denominator can arise where there is unusual mass migration, changes in criteria for inclusion in the population, or errors in the census or population register. For example, the first two were identified as problems in mortality data in countries involved in the wars in former Yugoslavia.<sup>14</sup> The apparent stagnation in life expectancy in Malta in the 1970s was due to a failure to update population estimates. Problems with numerators most often affect cause specific death rates, due to changes in death registration or coding.

Several of these can easily be discounted. One is rapid mass inward migration of people with a higher risk of death. Most of the excess deaths were among the very elderly, who are least likely to be immigrants and most migrants arrive in the UK in good health, the 'healthy migrant effect'.<sup>15</sup> Furthermore, in-migration of the elderly would be recorded by ONS, which uses registration with an NHS general practitioner to record migrants and, where there have been problems in the past, this has always affected younger migrants who might not register and not the frail and old. It will, of course, be important to monitor this carefully in the future given the potential for large numbers of elderly British migrants who previously retired to Southern Europe to return if they lose their rights as EU citizens. There is, however, no evidence that this has happened yet.

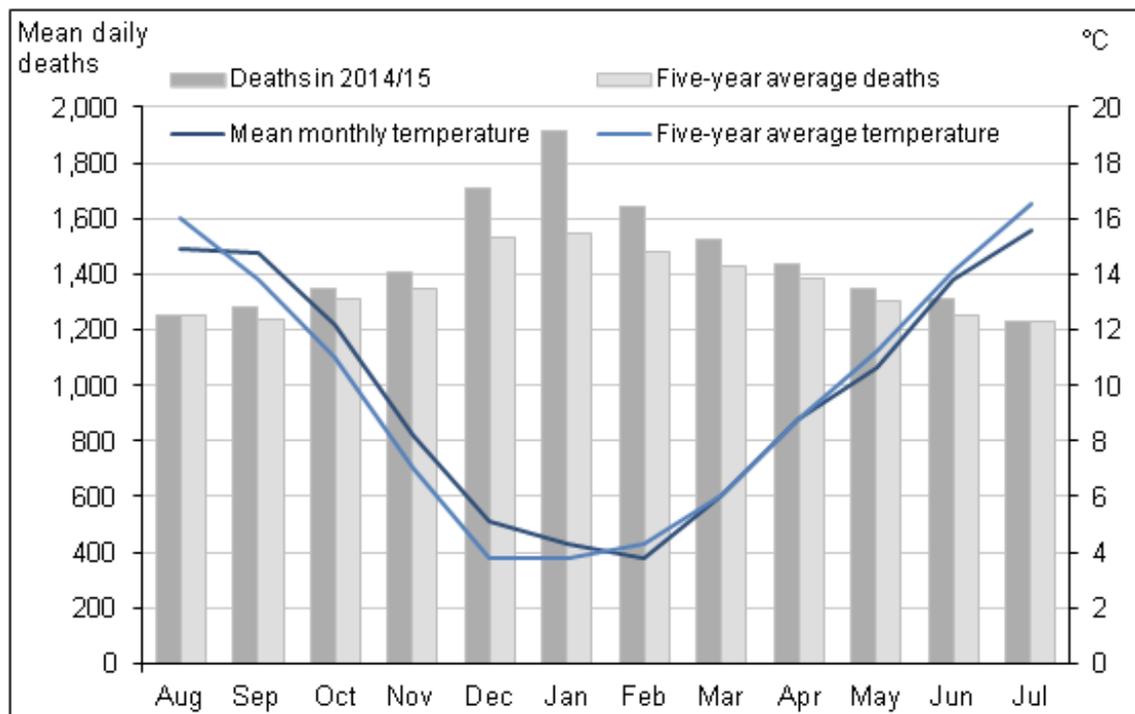
Given that dates relate to time of registration rather than death, there is always a possibility that an increase in January is due to delay in registration of deaths occurring at the end of the previous year but, if this was the case, we would expect a decline in weekly deaths in the

last few weeks of 2014, which did not occur.<sup>16</sup> There was an increase in number of inquests opened in this period,<sup>17</sup> but this would have delayed registration of deaths that did actually occur in early 2015. Thus, artefact does not seem a plausible explanation for the changes seen. We will examine the potential impact of changes in recording on specific causes of death later.

## Environmental shock

One possible explanation for a sharp spike is an environmental shock, such as war or natural disaster. While these particular explanations are easy to exclude, other large-scale causes are not always immediately clear. One example is the mortality seen from the London smog in 1952, where the increase mortality was also attributed initially to influenza but eventually recognised to be the result of air pollution.<sup>18</sup> Cold weather is known to have an impact on mortality, particularly in older populations, and has been cited as a cause of the rise in 2015.<sup>19</sup> However, the mean monthly temperature between September and January in 2014/15 was above the average for the years 2009 to 2014 (Figure 1).<sup>20</sup>

Figure 1: Mean number of daily deaths each month and mean monthly temperatures, England and Wales, August 2014 to July 2015.



Source: ONS<sup>20</sup>

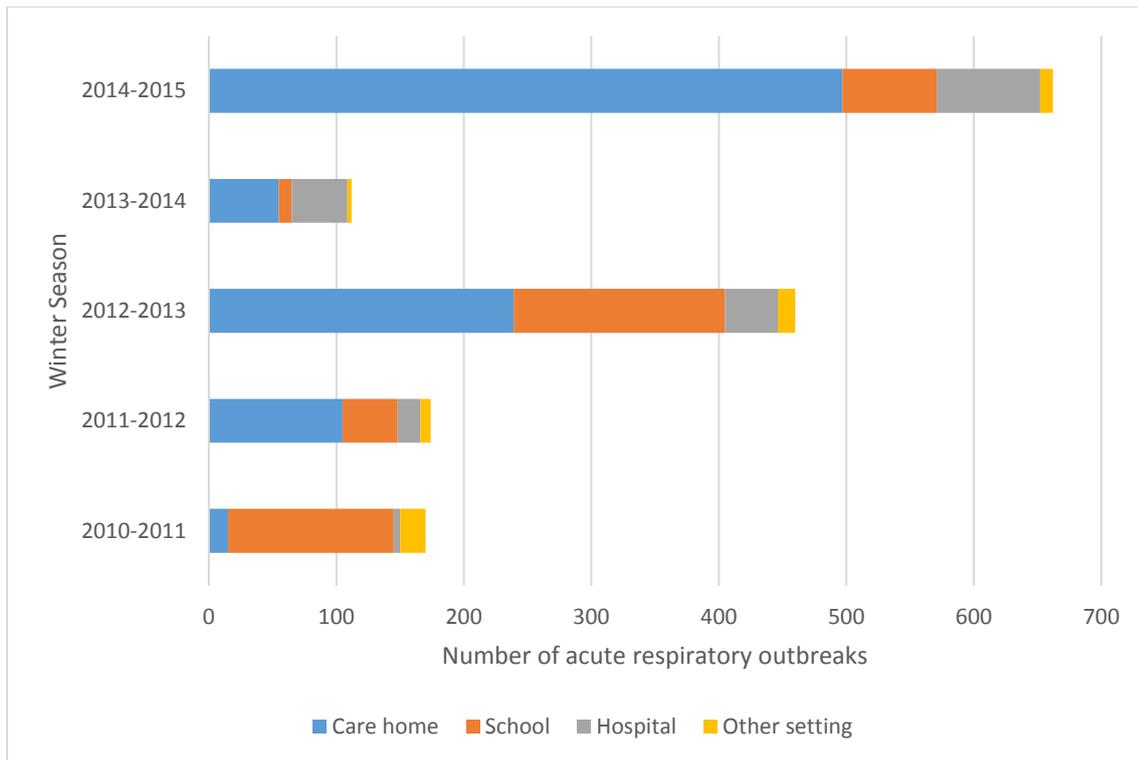
## Epidemic disease

PHE has suggested that the higher mortality in 2015 might, in part, be due to influenza.<sup>2</sup> Given, as noted above, how death rates were higher throughout almost all of the year, influenza, with its seasonal pattern can, at most, only be a very partial explanation. However, it is clearly one that requires exploration, and especially in relation to the January 2015 spike.

One argument that has been used to implicate influenza is that, in the 2014-15 season, the predominant circulating virus was A(H3N2), thought to affect older people disproportionately. Yet this strain is not necessarily especially lethal. There was no marked excess mortality when it last circulated, in 2008-9.<sup>21</sup> However, it has also been suggested that the vaccine in use in 2014-15 was less effective than usual. Vaccination can be 70-80% effective when there is a good match between the vaccine and strains in circulation, but in 2014/15 antigenic drift resulted in 29% effectiveness against influenza A and 46% against influenza B.<sup>22,23</sup> Vaccination is still recommended in these circumstances, and the uptake in England was 72.7% for those aged 65 years and over (5 year average uptake 73%).<sup>24</sup> However, it is plausible that more older people were at risk because of lower protection than usual.

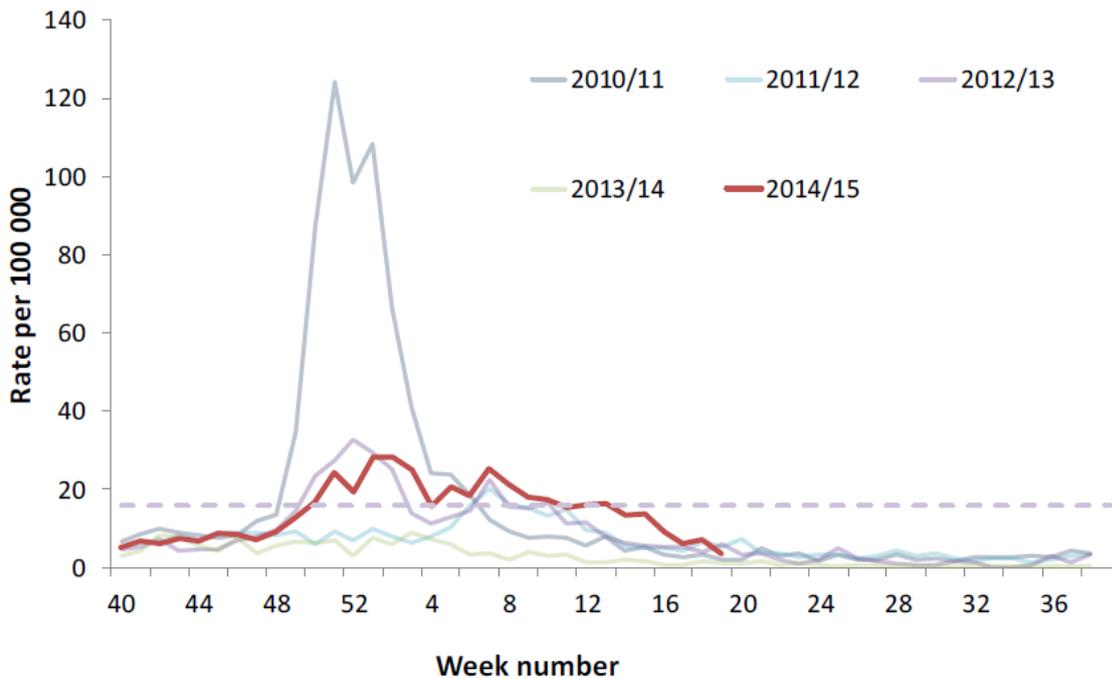
PHE has also suggested that the high number of deaths could be linked to outbreaks in care homes, and an especially high incidence among older people. This is borne out by data on the settings of outbreaks (defined as 2 or more cases within 7 days of each other - not necessarily virologically confirmed - in an institution such as a school or care home)<sup>21</sup> during the last 5 years between week 40 and week 20 shown in Figure 2 (except for 2014/2015 where data were for week 40 (2014) to 15 (2015) only)<sup>21,25-28</sup>.

Figure 2: Number of acute respiratory outbreaks by setting, UK, winter seasons 2010-2015



In marked contrast, consultations in primary care for influenza-like illness (ILI) in England in 2014/15 were not exceptional (Figure 3).<sup>29</sup>

Figure 3: RCGP ILI Consultation rate, England



Source: PHE<sup>29</sup>

If influenza were key, what would be unusual is that deaths in 2015 rose and remained high for months, in contrast to almost all previous influenza outbreaks which lasted only a few weeks, each associated with a dramatic rise and fall in mortality.<sup>30,31</sup> Fleming and colleagues have presented patterns of weekly incidence by age for a selection of the more severe epidemics prior to 2007<sup>30</sup> but 2015 does not fit this pattern. This suggests that what was being observed was not mainly due entirely to influenza. Moreover, influenza certainly does not explain the January spike.

Influenza does, of course, cross borders with impunity so it may be instructive to look at what happened in the UK's European neighbours. EuroMOMO is a system that monitors winter mortality above that expected in the absence of seasonal variation.<sup>32</sup> It estimated that there were 217,000 premature deaths in the population over 65 years in the European Union-28 in 2014-15,<sup>33</sup> a higher number than usual. Excess mortality varied among countries, with the UK (excluding Northern Ireland) ranking 5<sup>th</sup> behind Portugal, Hungary, Spain and the Netherlands. Despite colder winters, Denmark, Norway and Sweden had lower excess winter mortality rates, and Estonia and Finland did not experience any excess. An initial analysis has linked this to increased detection of influenza by European surveillance schemes.

Molbak et al. analysed the deviation from expected mortality (Z-score) for those aged 65 years and over, alongside influenza detection rates.<sup>34</sup> Their findings suggest that influenza cannot be the sole, or even most important, explanation for the observed excess mortality, as influenza incidence remained high after week 3, when mortality began to return toward baseline. Moreover, even if it did make a contribution, there is a need to explain the marked inconsistencies among countries. To examine this closer, we compared the levels of transmission intensity in successive weeks in Sweden, Finland, England and Wales, with reference to when the z-score for excess mortality among those aged 65 and over equaled or exceeded 2.<sup>34</sup> Excess mortality occurred in only two weeks in Sweden, both of which saw high intensity of transmission, and none in Finland, even when transmission was high. However, this excess occurred in 11 weeks in England, even though intensity of transmission never rose above the medium, and 3 in Wales, with transmission low in 2 of them and unknown in the third.<sup>34</sup>

From this analysis, it can be seen that there are features of the mortality increase in 2015 that challenge the suggestion that influenza played an important role. While there is the problem of a relatively ineffective influenza vaccine, and some possible outbreaks in care homes accommodating especially vulnerable people, the pattern of mortality over time is quite different to that seen in previous outbreaks, and excess mortality occurred at levels of transmission intensity that, in other countries, were not associated with a large mortality excess.

To summarise the findings so far, explanations that have been suggested have failed to provide a convincing reason for the greatest increase in mortality rates in England and Wales for almost 50 years. Data artefact due to migration and change to death registration and certification have been excluded. There was no large-scale environmental event, specifically no very cold weather. There is some evidence implicating influenza but, on closer inspection, while it may have played some role it cannot be the key factor. Deaths from dementia increased, and the decomposition shows that they contributed substantially to negative changes in life expectancy. Changes in diagnosis, certification and coding may have influenced this, but this does not explain the overall increase in mortality.

### **Failure of the health and social care system**

January 2015 was the month when markers of NHS performance deviated substantially from earlier patterns.<sup>4,6-11,35</sup> All the standard measures, except cancer care, worsened markedly. Calls to NHS 111 rose dramatically, with a greater proportion than usual resulting in an ambulance being dispatched or attendance at primary or secondary care advised.<sup>7</sup> All ambulance call-out times fell below target, including those for immediately life-threatening responses.<sup>36</sup> Even though A&E attendances did not increase, (Figure 4) and were lower than in the same month in previous years (web appendix), both waiting times in A&E and for admissions increased (Figures 5-6). Waiting times for diagnostic tests<sup>8</sup> and consultant-led care increased,<sup>9</sup> and operations cancelled for non-clinical reasons rose markedly.<sup>37</sup> Delayed transfers for care peaked,<sup>11</sup> leading to a shortage of beds perpetuating the wait in A&E. Staff absence rates spiked and more posts remained empty as staff had not been appointed.<sup>12</sup>

Figure 4: Total attendances including specialty, A&E, minor injuries, 2010-2015, NHS England

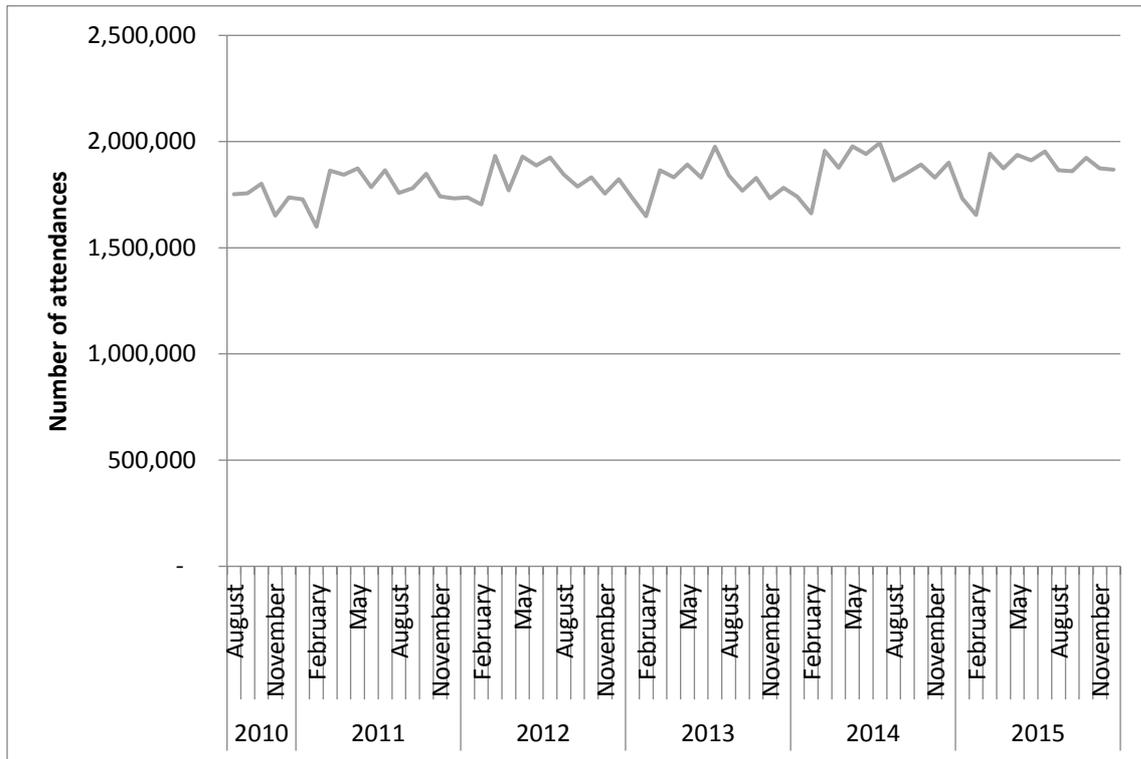


Figure 5: Total attendances at A&E waiting over 4 hours, 2010-2015, NHS England

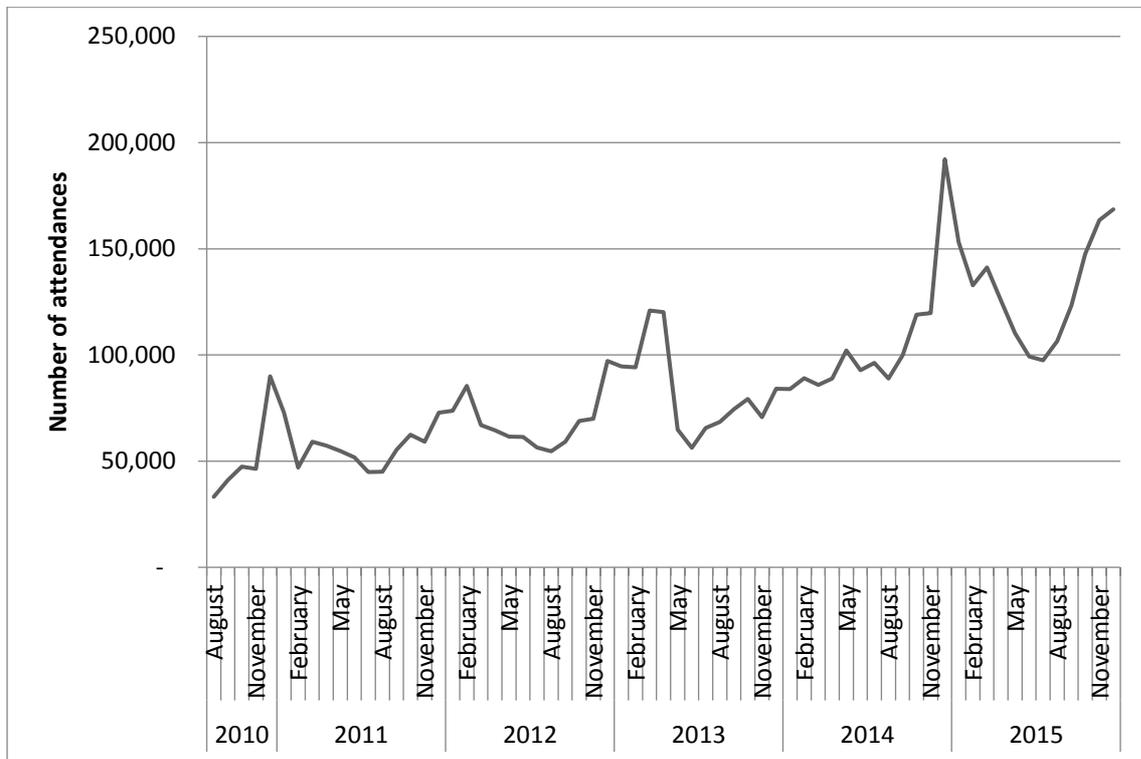
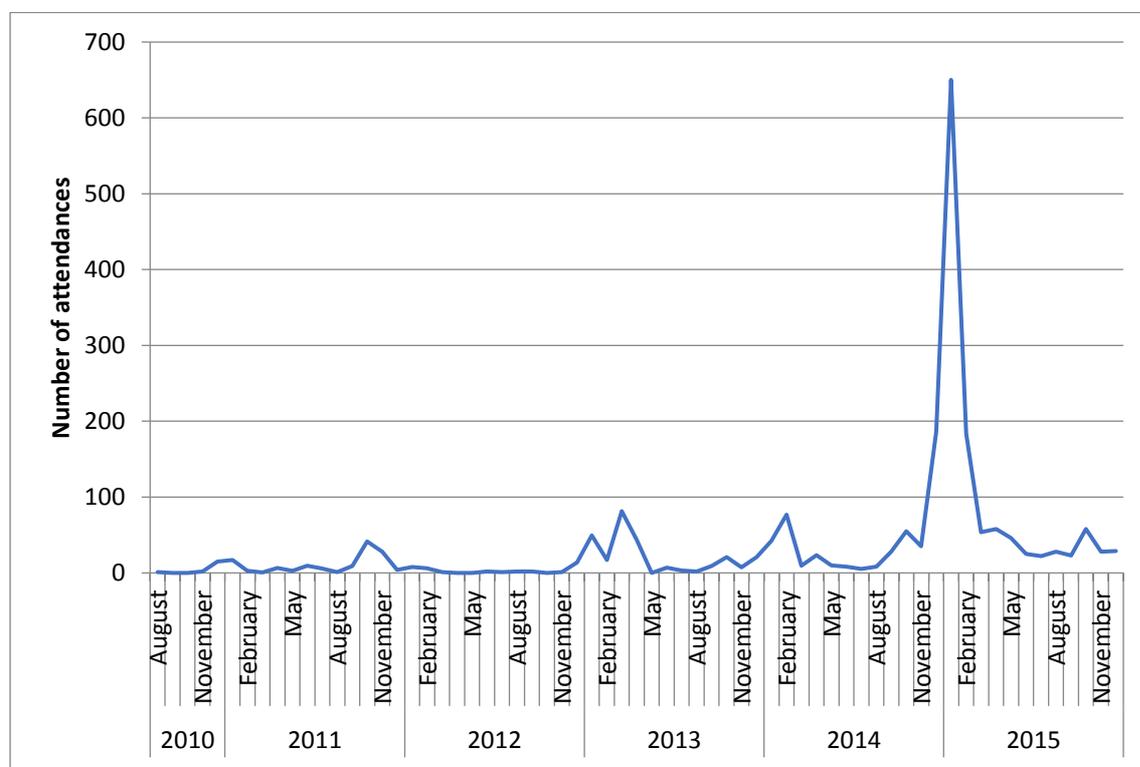


Figure 6: Number of patients spending over 12 hours from decision to admit, to admission, 2010-2014, NHS England



## DISCUSSION

While the reduced efficacy of the influenza vaccine being used may have played some role in the January 2015 mortality spike, this is likely to have been limited. We can also exclude common sources of data artefact. Instead, the evidence points to a major failure of the health system, possibly exacerbated by failings in social care.

Our findings should be seen in the context of the worsening financial situation of the NHS. Since the 2010 election in the UK, the impact of cuts resulting from the imposition of austerity on the NHS has been profound. Expenditure has failed to keep pace with demand, and the situation has been exacerbated by dramatic reductions in the welfare budget of £16.7 billion and in social care spending.<sup>38</sup> Although recent changes to accounting practice have increased the reported share of GDP spent on health in the UK by including money previously recorded under social care, it still lags well behind neighbouring countries such as France, Germany, and the Netherlands.<sup>39</sup> NHS Foundation Trusts reported that 2015 was an ‘exceptionally challenging year’, culminating for the first time in a net deficit of £348m,<sup>52</sup> and in May 2016 the NHS reported its largest ever deficit at £2.45 billion.<sup>40,41</sup>

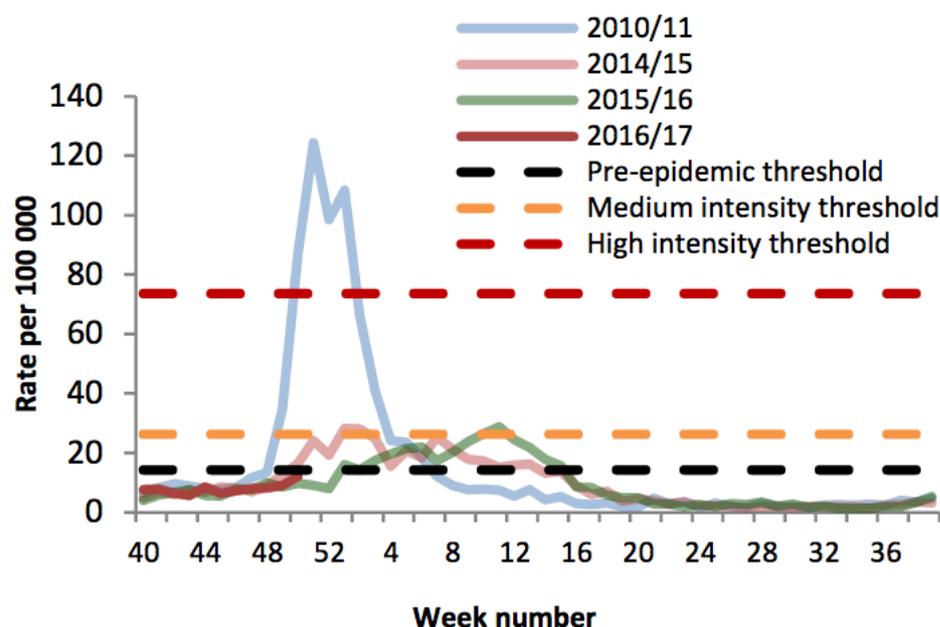
With an aging population, the NHS is ever more dependent on a well-functioning social care system, both to prevent people from becoming ill so often and to ensure that they have somewhere to go on discharge from hospital. Yet, this has also faced severe cuts,<sup>42</sup> with a 17% decrease in spending on social care for older people since 2009, whilst the number of people aged 85 years and over has increased by almost 9%.<sup>43,44</sup> The Association of Directors of Adult Social Services (ADASS) reported there was a 3% increase in the older population between 2014/15 and 2015/16, without an increase in the number of people receiving services.<sup>45</sup> To maintain current levels of care would require an extra £1.1 billion, but no such funding is available. Indeed, the situation is likely to become much worse given the higher prices of imported drugs and equipment consequent on the fall of the value of the pound after the EU referendum, while the potential loss of health and social care workers from other EU countries will exacerbate the staffing situation.

A recent report from the Care Quality Commission (CQC) has raised alarm about the impact of social care cuts.<sup>46</sup> It has suggested that A&E departments are struggling, leaving elderly people at risk, increasing both admissions and delaying discharges due to lack of social care in the community, with figures showing a 70% increase in those unable to be discharged for this reason from April 2012 to July 2016.<sup>47</sup> A report by the Nuffield Trust attributes this to issues with 'patient flow' within hospitals,<sup>48</sup> but does not link increased vulnerability in the community to increased mortality, despite the many failings that might, through their accumulated effects, be expected to play a role.

The total number of beds available in care homes has fallen between 2010 and 2016 from 255,289 to 235,799 – a drop of 19,490 in almost six years.<sup>49</sup> Summer is traditionally a quieter period for the NHS, yet it is reported that 1 in 10 patients waited over 4 hours in A&E in June, July and August 2016.<sup>50</sup> An inability to respond effectively to surge demand in the summer months raises concerns about how the health and social care system will be able to cope in the winter of 2016 /17.<sup>51</sup>

Alarming, evidence that the health and social care system is not coping in the winter of 2016/17 is already emerging.<sup>52</sup> What some portrayed as “unexceptional” in 2015, or due to influenza, now appears to be an established pattern. Provisional weekly death data from the ONS show from week 40, deaths have increased by 7% when compared to the 5 year average, including the exceptional year 2015.<sup>53</sup> Between week 40 and week 49 there were 102,083 deaths. Influenza can once again be excluded as the main cause, with the RCGP ILI rate (Figure 7) showing levels below pre-epidemic level, as they were for 2015.<sup>54</sup> Additionally, it has thus far been a very warm winter, with a mean temperature of almost 8°C in the UK this December, one of the highest on record.<sup>55</sup>

Figure 7: RCGP ILI consultation rates, England and Wales



Source: PHE Weekly National Influenza Report<sup>54</sup>

## CONCLUSION

2015 saw an unprecedented rise in mortality in England and Wales—the greatest rise for almost 50 years—with a particularly large spike seen in January. Explanations presented up until now do not conclusively explain that rise, but do create serious cause for concern, with the deaths occurring in the context of massive disinvestment in both health and social care, and almost all NHS performance markers falling below their targets. The possibility that the cuts to health and social care are implicated in almost 30,000 excess deaths is one that needs further exploration. Given the relentless nature of the cuts, and potential link to rising mortality, we ask why is the search for a cause not being pursued with more urgency?

The CQC's report on the situation in summer 2016 should act as a powerful warning. Taken with the evidence reviewed here, there is a strong case for arguing that more staff and funding for both health and social care are required urgently to prevent further avoidable mortality. Yet, despite claims by some current cabinet ministers that leaving the EU would generate an extra £350 million per week for the NHS, the government reportedly has no plans to increase funding.<sup>56</sup> Simply reorganising and consolidating existing urgent care

systems or raising the 'agility' of the current A&E workforce capacity is unlikely to be sufficient to meet the challenges that high levels of admissions of frail elderly people and others who are vulnerable are likely to present this winter and in future winters.

Unfortunately, it seems the increase in mortality seen in 2015 is already repeating itself in 2016. Without urgent intervention it is likely that this trend will continue.

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