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WHY ARE IMPROVEMENTS SLOWING?

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TRENDS IN LIFE EXPECTANCY IN EU AND OTHER OECD COUNTRIES: WHY ARE IMPROVEMENTS SLOWING?

Why are improvements slowing?

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JEL: I12: Health Behavior; I14: Health and Inequality; I15: Health and Economic Development

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Abstract

This paper reports on levels and trends in life expectancy in the 28 EU countries and some other high-income OECD countries, and examines potential explanations for the slowdown in improvements in recent years. The aim is to raise awareness of the issue and prompt further investigative work, including through international collaboration in areas where the underlying drivers appear to be similar across countries, which can in turn inform the implementation of appropriate policies and interventions.

Life expectancy at birth in the EU countries varies significantly, although differences have narrowed somewhat over the years. Life expectancy in the USA is below the EU average, whereas in Australia, Canada and Japan it is higher than the EU average.

The slowdown in improvements in life expectancy since 2011 has been greatest in the USA (where life expectancy has in fact fallen in recent years) and UK, but France, Germany, Sweden and Netherlands have also experienced a significant slowdown. Overall, the pace of mortality improvement has slowed in several EU countries and some other OECD countries (Australia, Canada) since 2011.

Another feature of recent trends in life expectancy are the erratic changes in some years, notably a widespread fall in life expectancy across several EU countries in 2015, widely attributed to an influenza outbreak impacting most on older people. Excess winter and influenza-related deaths (especially among older people) are reported also for some other years, including 2018.

Diseases of older ages are major contributors to the slowdown in improvements in life expectancy. Improvements in cardiovascular (CVD) disease mortality have slowed in many countries, respiratory diseases (including influenza and pneumonia) have claimed excess lives in some winters, and deaths from dementia and Alzheimer's disease are rising. In some countries (notably the USA and the UK) mortality improvements have also slowed or even reversed among working age adults because of the rising numbers dying from drug-related accidental poisoning. The findings of a detailed review of the factors contributing to decelerating mortality improvements in England may be of interest to other countries.

Beyond these direct causes of death, this Working Paper also considers evidence about some wider factors that could be contributing to recent mortality trends. Although some risk factors, such as smoking, excessive alcohol consumption, high blood pressure and cholesterol levels, continue to decline in most EU countries, the prevalence of obesity and diabetes continues to rise. Adverse trends in inequalities could also have an impact if some population groups experience lower gains in longevity than others, thereby reducing the overall gain. In the USA and the UK, socio-economic inequalities in mortality have been widening; the impact of inequalities on overall mortality trends in other European countries has not been assessed but this remains a consideration.

Systematic reviews show that economic downturns and "austerity" are associated with deteriorating mental health and rising suicide rates, but the impact on overall mortality is less consistent. Across Europe, some countries such as Germany. Sweden and Netherlands which experienced relatively little austerity post-2008 have seen a greater slowdown in improvements in life expectancy than Greece, Spain, Portugal and Ireland where austerity was more severe. In England the findings of observational studies attributing the slowdown in mortality improvements to post-2008 fiscal "austerity" have been debated, leading to a

detailed review of mortality trends and potential explanatory factors. The review noted that fiscal austerity coincided with the slowdown in mortality improvements, which affected all areas but has been greatest in deprived areas, but that evidence about causation is limited,.

It's likely that many factors are contributing to recent mortality trends, some of which are country-specific and others common across countries. Mortality trends should be closely monitored and investigated, so that early action can be taken to address any adverse changes - whether they are intermittent as with influenza or gradual but persistent as with CVD. Detailed analyses at country and international levels to unpack mortality trends and their drivers would be necessary to identify the policy responses appropriate to each particular setting and those that apply more widely. Instead this paper proposes ways in which the understanding of epidemiological trends can be strengthened in order to support an informed response individually and collectively across countries.

Looking ahead, it is unclear whether the current slowdown in mortality improvements in some EU countries and the USA is a long-term trend or not, whether the slowdown in major killers such as CVD will persist, and whether or not the excess winter mortality seen in some years becomes a regular feature given population ageing and increasing numbers of frail, older people. The timely and effective monitoring and investigation of mortality trends, including through international collaboration where possible, can facilitate early implementation of remedial strategies.

Résumé

Ce document de travail décrit les niveaux et les tendances de l'espérance de vie dans les 28 pays de l'Union Européenne (UE) et d'autres pays de l'OCDE, et examine les raisons possibles du ralentissement des gains d'espérance de vie observé au cours des dernières années. L'objectif est de susciter une prise de conscience plus large de ce phénomène et de stimuler des travaux de recherche, y compris des collaborations internationales concernant les facteurs sous-jacents qui semblent jouer un rôle dans plusieurs pays. Ces travaux pourraient guider la mise en place de politiques et d'interventions appropriées.

L'espérance de vie à la naissance dans les pays de l'UE varie fortement, même si les différences se sont amoindries quelque peu au cours des dernières années. L'espérance de vie aux États-Unis est inférieure à la moyenne de l'UE, alors qu'en Australie, au Canada et au Japon elle est supérieure à la moyenne de l'UE.

Le ralentissement des gains d'espérance de vie depuis 2011 a été le plus marqué aux États-Unis (où l'espérance de vie a en fait diminué ces dernières années) et au Royaume-Uni, mais la France, l'Allemagne, la Suède et les Pays-Bas ont aussi connu un ralentissement important. Dans l'ensemble, le rythme de réduction de la mortalité a ralenti dans plusieurs pays de l'UE et d'autres pays de l'OCDE (Australie, Canada) depuis 2011.

Une autre caractéristique des tendances récentes de l'espérance de vie porte sur les variations erratiques d'une année sur l'autre, notamment la réduction généralisée de l'espérance de vie dans plusieurs pays de l'UE en 2015. Cette réduction a été largement attribuée à l'épidémie de grippe qui a particulièrement touché les personnes âgées. On a aussi observé des excès de mortalité durant l'hiver souvent liés à la grippe (touchant particulièrement des personnes âgées) durant certaines autres années, y compris en 2018.

Les maladies liées au vieillissement ont fortement contribué au ralentissement des gains d'espérance de vie. La réduction de la mortalité par maladies cardiovasculaires a ralenti dans plusieurs pays, les maladies respiratoires (y compris la grippe et la pneumonie) ont contribué aux excès de mortalité au cours de certains hivers, et la mortalité liée à la démence et à la maladie d'Alzheimer a augmenté. Dans certains pays (notamment aux États-Unis et au Royaume-Uni), la réduction de la mortalité a aussi ralenti ou s'est même inversée parmi la population en âge de travailler en raison de l'augmentation du nombre de décès causés par les empoisonnements accidentels liés à la prise de médicaments ou de drogues. Les résultats d'une revue détaillée des facteurs qui ont contribué à la décélération de la réduction de la mortalité en Angleterre pourront intéresser d'autres pays.

Au-delà de ces causes directes de mortalité, ce document de travail considère aussi l'impact potentiel de facteurs plus généraux qui ont pu aussi contribuer aux tendances récentes de la mortalité. Bien que certains facteurs de risque, comme le tabagisme, la consommation excessive d'alcool, l'hypertension et le cholestérol, continuent de diminuer dans la plupart des pays de l'UE, la prévalence de l'obésité et du diabète ne cesse d'augmenter. L'accroissement des inégalités peut aussi avoir un impact négatif si certaines couches de la population voient leur espérance de vie augmenter plus lentement que d'autres, réduisant ainsi les gains pour l'ensemble de la population. Aux États-Unis et au Royaume-Uni, les inégalités socio-économiques en terme de mortalité se sont creusées. L'impact des inégalités sur les tendances générales de mortalité n'ont pas été évalué dans d'autres pays européens, mais cela peut aussi jouer un rôle.

Des revues systématiques montrent que les récessions économiques et l'austérité sont associées à une détérioration de la santé mentale et une augmentation des suicides, mais l'impact total sur la mortalité est moins clair. En Europe, certains pays comme l'Allemagne, la Suède et les Pays-Bas, qui n'ont pas connu une forte période d'austérité après 2008, ont par ailleurs connu un ralentissement plus prononcé des gains d'espérance de vie que des pays comme la Grèce, l'Espagne, le Portugal et l'Irlande, où les mesures d'austérité ont été plus sévères. En Angleterre, les résultats d'études attribuant le ralentissement de la réduction de la mortalité après 2008 aux mesures d'austérité fiscale ont fait l'objet de débats, qui ont mené à une revue détaillée des tendances de mortalité et des facteurs explicatifs potentiels. Cette revue a noté que les mesures d'austérité fiscale avaient coïncidé avec le ralentissement de la réduction de la mortalité, qui a affecté toutes les régions mais dont l'impact a été le plus fort dans les régions désavantagées, tout en notant que les liens de causalité restaient limités.

Il est probable que plusieurs facteurs contribuent aux tendances récentes de mortalité, dont certains sont spécifiques à des pays en particulier et d'autres sont communs à plusieurs pays. Il est important de suivre et d'analyser de près les tendances de mortalité, pour pouvoir prendre des mesures sans tarder qui permettraient de contrer des effets négatifs, que ce soit en lien avec des facteurs plus ponctuels comme la grippe ou graduels mais persistants comme les maladies cardiovasculaires. Il est nécessaire d'entreprendre des analyses détaillées aux niveaux national et international pour mieux comprendre les différents facteurs qui affectent les tendances de mortalité et pouvoir ainsi identifier les réponses appropriées, qu'elles soient spécifiques ou générales. Ce document de travail propose des pistes d'approfondissement des tendances épidémiologiques dans le but de contribuer à la formulation de réponses nationales et collectives impliquant la communauté internationale.

Quant aux tendances à venir, on ne peut pas clairement déterminer si le ralentissement actuel de la réduction de la mortalité dans certains pays de l'UE et aux États-Unis est une tendance de long-terme ou non, si le ralentissement de la réduction des causes majeures de décès comme les maladies cardiovasculaires va persister, et si les excès de mortalité durant certaines des dernières périodes hivernales vont devenir un phénomène récurrent étant donné le vieillissement de la population et l'accroissement du nombre de personnes âgées fragiles. Le suivi et l'analyse effective des tendances de mortalité, y compris grâce à des collaborations internationales lorsque cela est possible, peut faciliter la mise en place rapide de stratégies correctives.

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1. INTRODUCTION

1. Life expectancy at birth[1] is used globally as a key measure of the health status of a population, and for making comparisons between different populations. Life expectancy worldwide has increased significantly since the nineteenth century, with rising living standards, the introduction of public health measures, improved healthcare provision, advances in medical technologies and changes in lifestyle. Although there have been periodic fluctuations in the pace of improvement, most countries have seen sustained improvements in life expectancy in recent decades. Since 1970 life expectancy in OECD countries has increased on average by ten years (OECD, 2017a). The determinants of life expectancy include the healthcare system, but also drivers beyond the healthcare system such as income, education, employment, living and working conditions, and the wider socio-economic environment.

2. Since 2010 the rate of improvement in life expectancy has slowed in many high-income countries - in Europe and beyond (Ho and Hendi, 2018; ONS, 2018a). This has led to comment and debate in some countries about what is causing the slowdown.

3. The aim of this paper is to report on levels and trends in life expectancy in the 28 European Union (EU) countries in recent years, and to examine the explanations that have been provided for the slowdown in recent years. Trends in some other high-income OECD countries, namely Norway, the United States of America (USA), Canada, Australia and Japan, are also discussed in brief. We also consider what follow-up action is required by national and international agencies to support effective monitoring and provide a better understanding of the underlying drivers of these changing trends, which can in turn inform the implementation of appropriate remedial policies and interventions.

4. Because of the many determinants of mortality, and multimorbidity in ageing populations, unpacking what is driving the slowdown in improvements in life expectancy in different countries is a vast and complex subject. While recent trends have been investigated and reported in some detail in some countries, the issue has received little or no consideration in others. Furthermore, although some causes of the slowdown are well-established for some countries, there is considerable uncertainty overall, and even debate, about the underlying causes. The aim of this paper is to raise awareness of the issue, open it up for further discussion, and trigger further investigative work, including through international collaboration - especially in areas where the underlying drivers appear to be similar across countries.

[1] Life expectancy is a summary measure of mortality in a population. Life expectancy can be measured in two ways, both of which are derived from calculations based on mortality rates: (a) **Period** life expectancy at birthis the most commonly used measure, and is used in this report. Period life expectancy is the average number of years a person would live from birth to death if he or she experienced the mortality rates prevailing in that population in a particular year/period throughout his or her lifetime. This measure makes no allowance for future actual or projected changes in mortality. In practice, a population's mortality rates are likely to change, so period-based life expectancy does not measure the number of years someone could actually expect to live. (b) **Cohort** life expectancy is less commonly used. Cohort life expectancy is the mean length of life of an actual birth cohort (all individuals born a given year) and can be computed only for cohorts born many decades ago, so that all their members have died by the time of computation.

5. This report covers issues relating to trends in life expectancy because of the recent slowdown in mortality improvements in several high-income countries. It does not extend to healthy life expectancy, an estimate of the number of years lived in good general health and free of disability, or other measures of health status. However, it should be noted that governments and health systems seek to improve both the longevity, and the health and wellbeing more generally, of individual and communities.

2. BACKGROUND

6. Increases in life expectancy since the nineteenth century have been greatest in high-income countries. For example, life expectancy at birth in Europe more than doubled from about 36 years in the mid-nineteenth century to 81 years by 2016 (Roser, 2018). Low life expectancy in the nineteenth century was largely due to high rates of infant mortality, ranging from about 100 per 1000 live births to over 200 in some countries, such as Germany and Austria. By the 1950s, infant mortality rates in Europe had converged and dropped to below 50 per 1000 live births. They now range between 2-7 per 1000 live births in the EU countries.

7. Historically, there are broadly three distinct periods of change in life expectancy: a slow increase over the latter part of the nineteenth century, followed by faster increases during the first half of the twentieth century, thereafter returning to a slower but steady increase. Improved nutrition, living standards, working conditions, housing and sanitation, and receding pandemics of diseases such as smallpox, cholera and tuberculosis, contributed to life expectancy increases in the late nineteenth century. The larger increases in life expectancy seen in the first half of the twentieth century resulted mostly from the reduction in infant and childhood mortality that followed public health measures such as childhood immunisation and the control of infectious diseases. The increases thereafter have been driven mainly by improvements in mortality at older ages resulting from the provision of universal healthcare, medical advances in the diagnosis and treatment of chronic diseases such as cancer and heart disease, and changes in lifestyle such as the decline in smoking. Such "epidemiological transitions" will continue to impact on the pace and nature of mortality decline as, for example, with the rising number and proportion of deaths from dementia and co-morbidities seen in countries with ageing populations.

8. Female life expectancy exceeds male life expectancy in all countries. The gender gap was smaller in the nineteenth century because the commonplace causes of death affected males and females indiscriminately. Thereafter the gap widened, because of faster improvements in mortality for women than men, resulting from adverse working conditions for men, more women surviving labour and childbirth (in part due to falling fertility), and control of tuberculosis which was rife and affected women more than men. In the mid-twentieth century the gender gap started to narrow with male life expectancy rising faster than female life expectancy, in part due to the decrease in mortality from cardiovascular disease (a big killer in men), fewer accidental deaths in males, reduced smoking in men and more female smokers. Although the gender gap has continued to narrow, with life expectancy rising faster for males than females, the gender gap still persists in all EU countries.

3. METHODS

3.1. Data

9. This report uses published data on life expectancy and mortality from selected causes, in the 28 EU countries and selected high-income OECD countries (Norway, the USA, Canada, Australia and Japan). The data on life expectancy for EU countries and Norway come from the Eurostat database,while the data for non-European countries are national data as submitted to the OECD. Data on age-standardised mortality rates for circulatory diseases are taken from the OECD Health Statistics database, and are calculated by OECD using the WHO Mortality Database for cause of death data which is standardised based on the OECD 2010 population structure. Although the main focus of this report is on European countries, brief commentary is also provided on some other high-income countries (the USA, Canada, Australia, Japan) to illustrate trends more widely. Information for these countries is summarised in boxes interspersed throughout the text.

3.2. Literature

10. The section 6 on causes of the slowdown in improvements in life expectancy synthesises the findings of published literature, but it is not a systematic or comprehensive review of the literature. With a subject as large and complex as the determinants of life expectancy changes in different countries, and the interactions between different determinants, it is not possible to present or discuss all the underlying issues comprehensively. Instead the aim is to provide an overview of the key findings. Furthermore, as the trends have been investigated in greater detail in some countries than others, inevitably the former are cited more often and feature more prominently in the discussion of causation.

4. LIFE EXPECTANCY AMONG THE EU COUNTRIES AND OTHER SELECTED OECD COUNTRIES SHOWS LARGE VARIATIONS

11. Life expectancy at birth in the EU countries varies significantly. In 2016, male life expectancy ranged from 69.5 years in Lithuania to 81.0 years in Italy, a difference of 11.5 years; female life expectancy showed less but nonetheless large variation, ranging from 78.5 years in Bulgaria to 86.3 years in Spain, a difference of 7.8 years. Life expectancy among males and females in Central and Eastern European countries (mainly the EU accession countries joining the EU from 2004 onwards*) other than Slovenia is lower than in the other EU countries, and below the EU average (Figure 4.1). Moreover, these countries show greater dispersion, especially for males: for example, male life expectancy in Lithuania is 8.7 years lower than the EU average, whereas Italy with the highest life expectancy exceeds the EU average by only 2.8 years. Portugal is the only EU country not in Central and Eastern Europe where male life expectancy is also marginally below the EU average. In contrast, female life expectancy is below the EU average also in Germany, Netherlands, the United Kingdom (UK) and Denmark.

12. Female life expectancy at birth in all countries (EU average 83.6 years) exceeded that of males (EU average 78.2 years). The average gender difference in Central and Eastern European countries (7.7 years) was greater than the EU average (5.4 years) and significantly greater than the average for the other EU countries (4.7 years). So the gender gap in life expectancy is greater in the EU countries that have higher mortality.

13. Comparisons with some other high-income countries are shown for illustrative purposes (Box 4.1). In 2016 life expectancy at birth in the USA was about 2 years below the EU average in both males and females, whereas in Australia, Canada and Japan it was higher than the EU average. Japan has the highest female life expectancy globally.

Box 4.1. Life expectancy at birth in Australia, Canada, Japan and USA

Life expectancy at birth, 2016

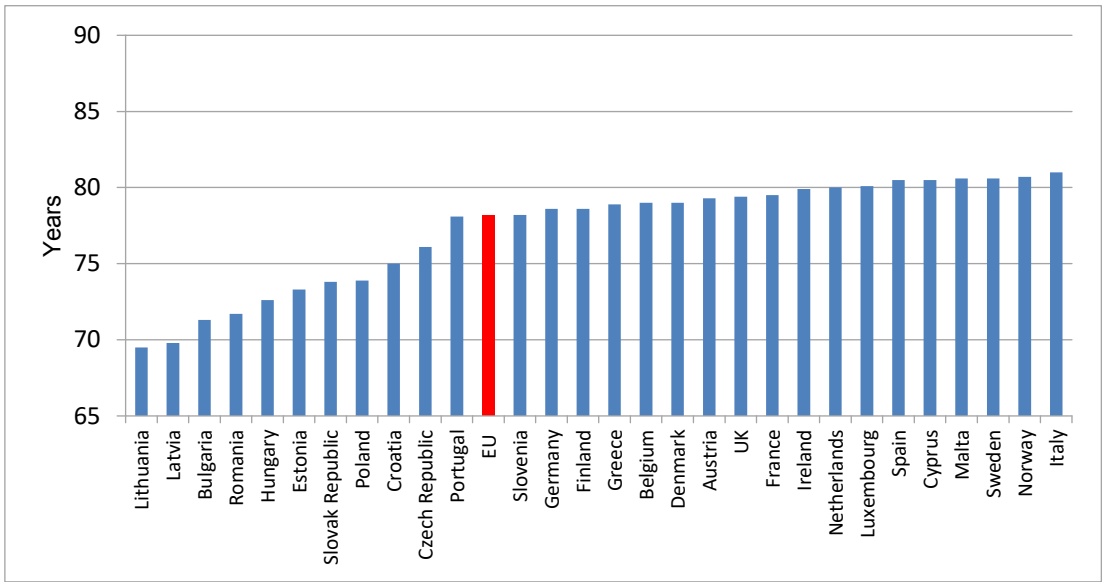
	Males	Females
Australia	80.4	84.6
Canada*	79.9	84.0
Japan	81.0	87.1
USA	76.1	81.1

** Data for 2014-16*
Source: OECD

* Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Slovenia.

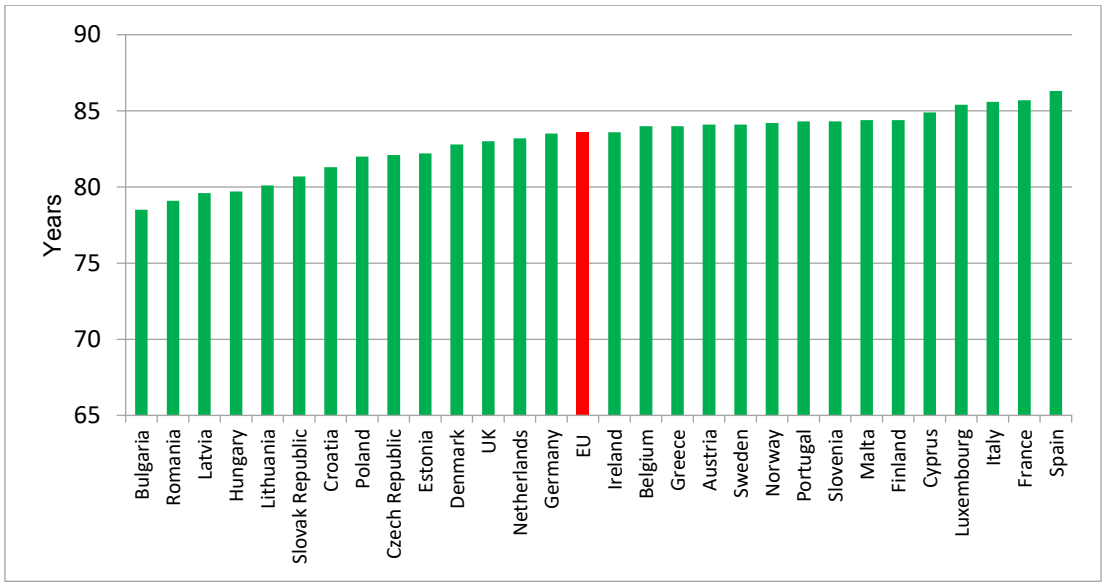
Figure 4.1. Life expectancy at birth in EU countries and Norway, 2016

A. Males



Source: Eurostat

B. Females



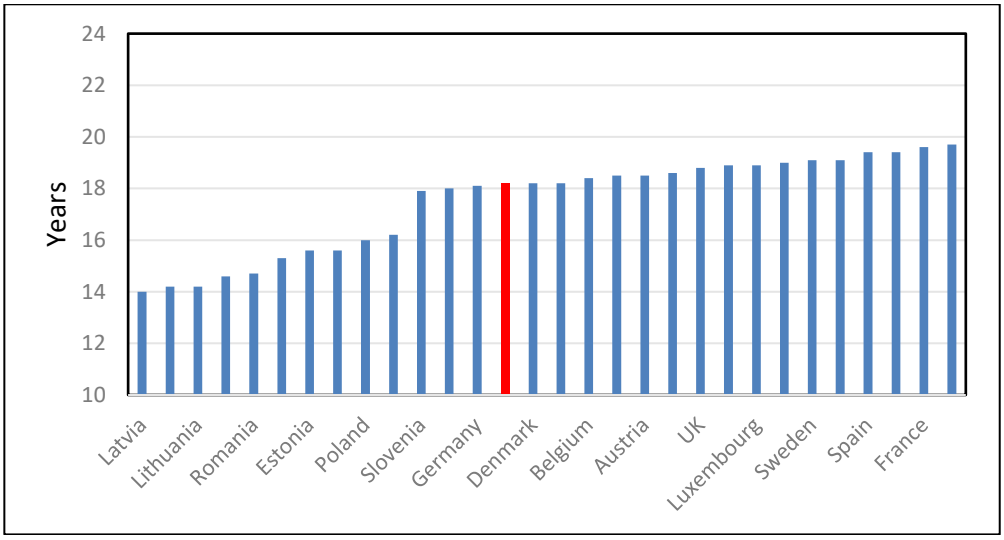
Source: Eurostat

14. Life expectancy at age 65 shows broadly similar patterns (Figure 4.2), with Central and Eastern European countries having lower levels. Male life expectancy at 65 ranged

from 14 years in Latvia to 19.7 years in Malta, a difference of 5.7 years; female life expectancy at 65 showed similar variation, ranging from 17.9 years in Bulgaria to 23.7 years in France, a difference of 5.8 years. In both genders, life expectancy at 65 was lower than the EU average in Central and Eastern European countries other than Slovenia. Among males, it was slightly lower than the EU average also in Germany and Portugal. Among females, it was lower than the EU average in several Western, Northern European countries: Sweden, Germany, the UK, Netherlands, Ireland and Denmark, with Denmark being almost one (0.8) year lower. In all countries, life expectancy at 65 in females (EU average 21.6 years) exceeded that of males (EU average 18.2 years).

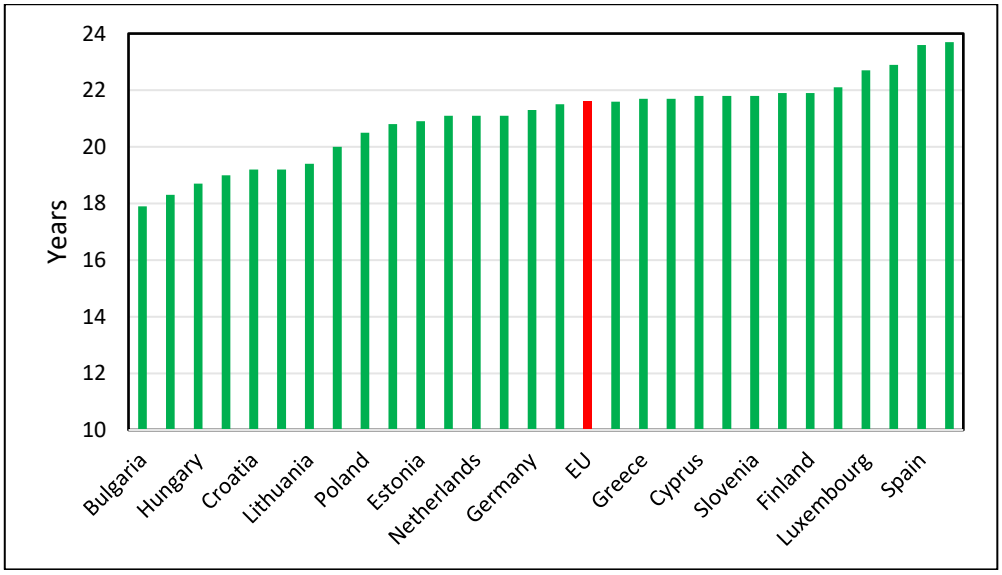
Figure 4.2. Life expectancy at 65 in EU countries and Norway, 2016

A. Males



Source: Eurostat

B. Females



Source: Eurostat

5. DIFFERENCES IN LIFE EXPECTANCY AT BIRTH AMONG EU COUNTRIES ARE NARROWING, BUT IMPROVEMENTS IN MOST HIGH-INCOME COUNTRIES HAVE SLOWED IN RECENT YEARS

15. Life expectancy at birth has increased significantly in all EU countries over the 2005-16 period. Some additional noteworthy trends are that (a) the pace of improvement differed between countries (b) differences in life expectancy between countries have narrowed over time (c) the pace of improvement since 2011 has slowed in several countries, and (d) several countries have experienced erratic changes in recent years, notably a significant fall in life expectancy in 2015. These trends are discussed in further detail below.

5.1. Differences in life expectancy across the EU are narrowing but improvements are slowing in many high-income countries

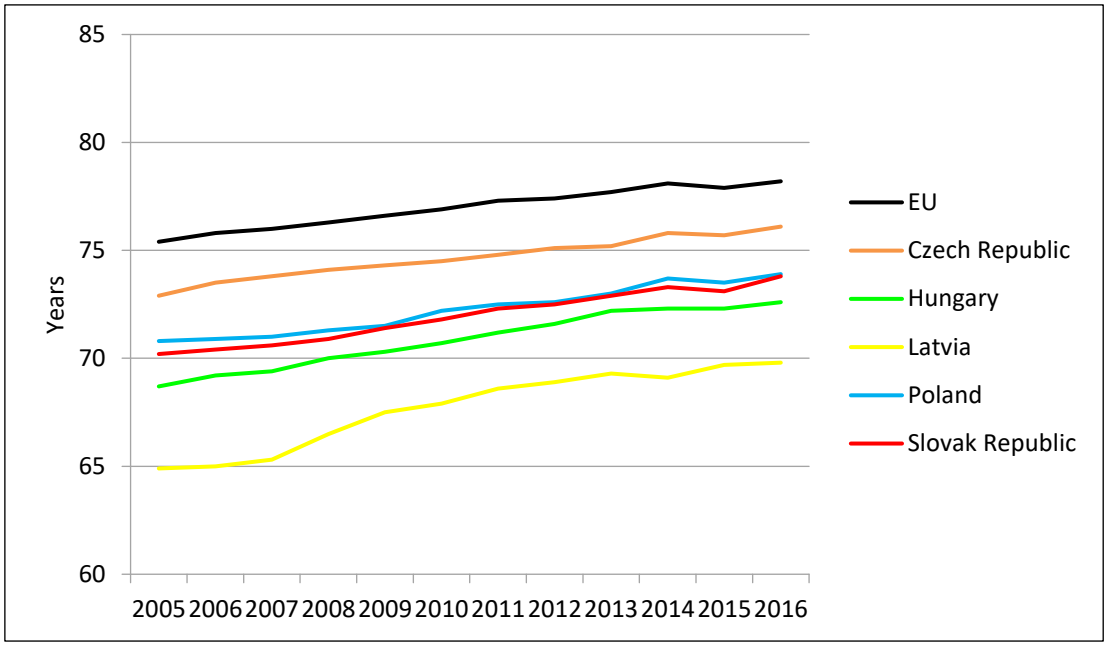
16. To facilitate inter-country comparisons across the 28 EU countries, trends in selected Central and Eastern European countries are shown separately (Figure 5.1) from those in some other EU countries where life expectancy is higher (Figure 5.2).[2]

17. With a few exceptions for some countries in some years, Central and Eastern European countries have experienced steady improvements in life expectancy at birth in both genders since 2005 (Figure 5.1). Life expectancy in males showed greater variation between countries than in females, although the convergence between countries over time has also been greater in males. Life expectancy trends in the remaining EU countries also showed improvements since 2005, but with some erratic changes in recent years (Figure 5.2). A striking feature is the significant and sustained female life expectancy advantage in France, Italy and Spain over other EU countries, including those not shown in Figure 5.2.

[2] As it is not possible to show all EU countries in these trend graphs, the complete data set on life expectancy at birth and at age 65 for all EU countries and Norway for 2005-16 are given in Annex Tables A.1 and A.2.

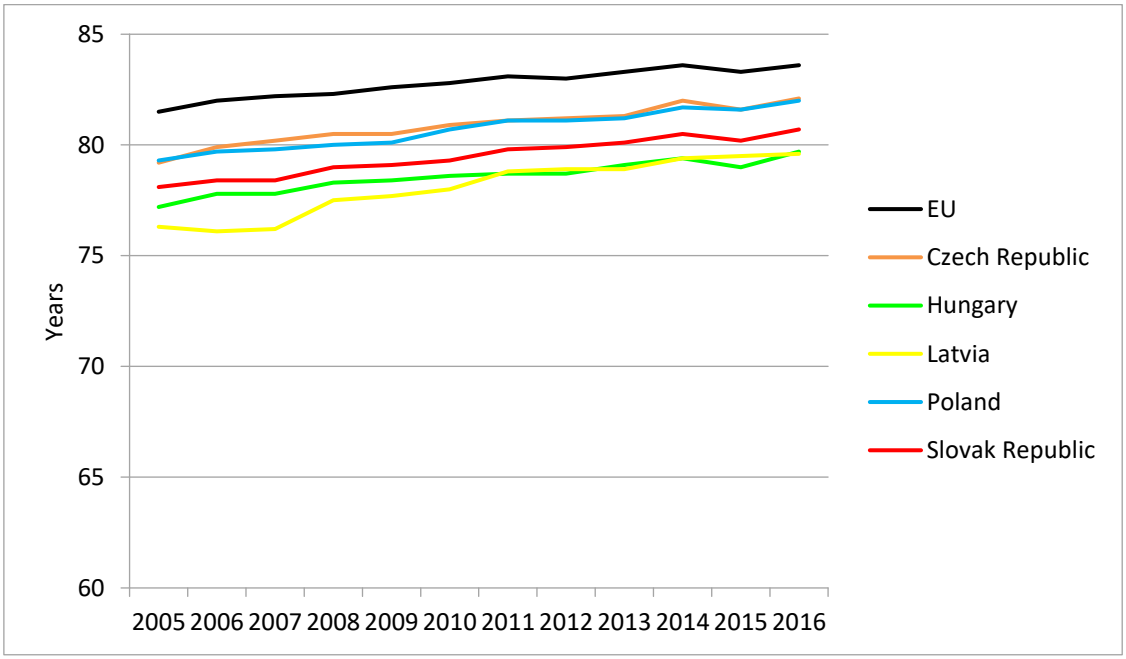
Figure 5.1. Life expectancy at birth in selected Central and Eastern European countries, 2005-16:

A. Males



Source: Eurostat

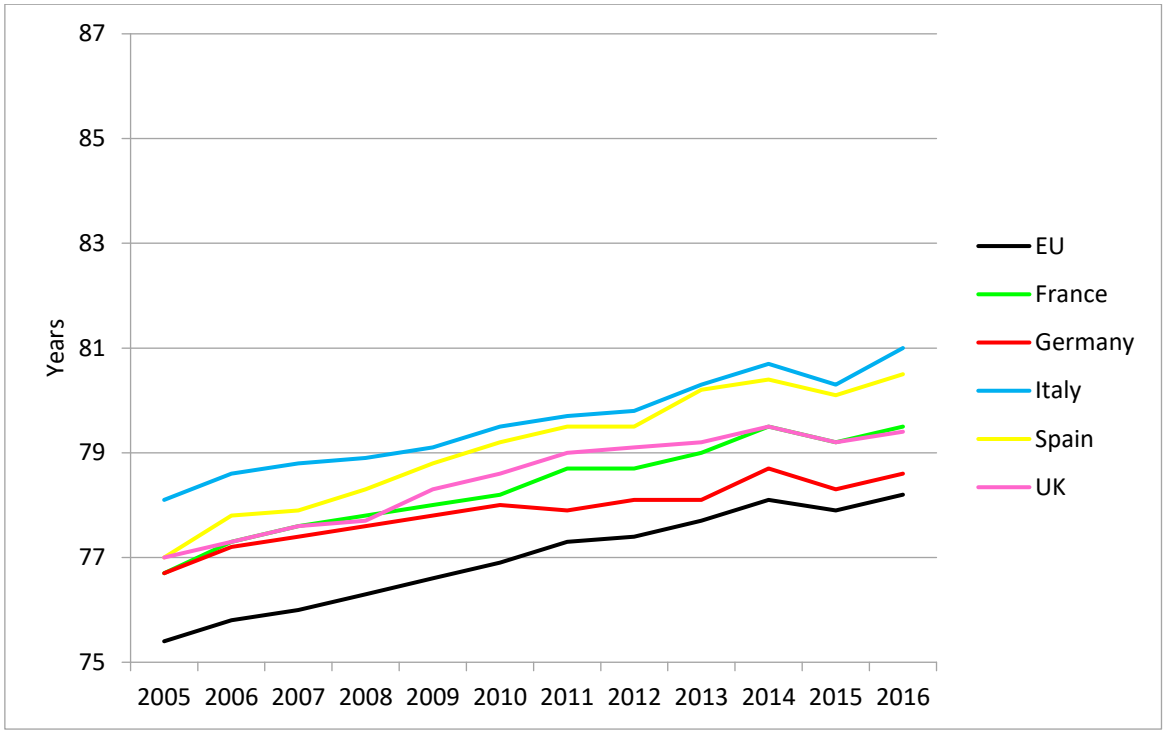
B. Females



Source: Eurostat

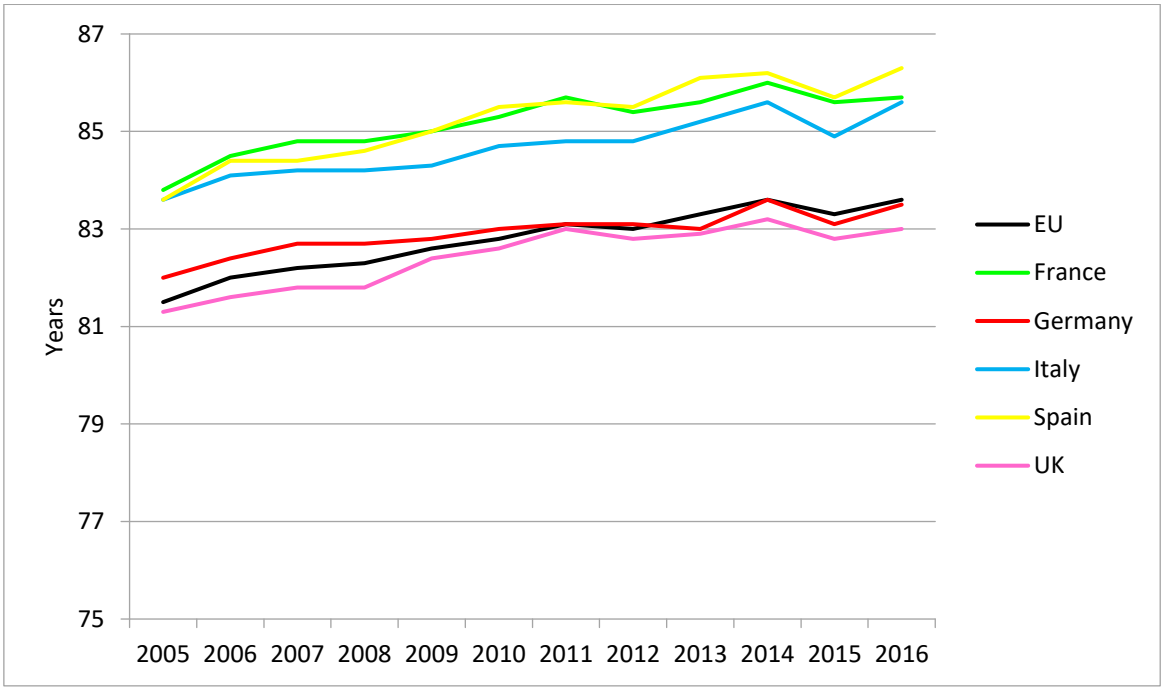
Figure 5.2. life expectancy at birth in selected Western European countries, 2005-2016

A. Males



Source: Eurostat

B. Females



Source: Eurostat

18. Gains in life expectancy at birth between 2005 and 2016 were on average greater in countries with lower life expectancy in 2005 (ie those in Central and Eastern Europe), thereby narrowing the gap with other EU countries in both genders. In 2005, male life expectancy in Central and Eastern European countries was on average 7.3 years lower than in the other EU countries; this difference fell to 6.3 years by 2016. The corresponding decline for females was a fall from 4.3 years to 3.3 years. There has therefore been some convergence in life expectancy at birth across EU countries.

19. To examine the slowdown in life expectancy improvements in recent years, changes in life expectancy at birth between 2006 and 2011 were compared with changes between 2011 and 2016 (Table 5.1, Figure 5.3). These periods were chosen because the slowdown in life expectancy improvements in many countries was observed from about 2011 onwards, and using 2006 as the base year (rather than 2005) enables comparisons between two consecutive five year periods. However, it should be noted that these figures are intended to be illustrative of recent trends, and that change patterns can differ depending on the periods used for comparison.

20. In all but 6 of the 28 EU countries, male life expectancy at birth increased more slowly during 2011-16 than during 2006-11; these 6 countries included Germany and Greece where life expectancy gains in the previous period had been relatively low anyway. Among females, the gain in life expectancy at birth during 2011-16 was lower than in the preceding period in all countries except Hungary, Cyprus, Italy, Luxembourg and Malta. Overall, the absolute impact of the slowdown was similar for males and females: EU average life expectancy at birth among males increased by 0.9 years during 2011-16 compared with 1.5 years during 2006-11, whereas for females the corresponding figures were 0.5 and 1.1 years respectively.

21. Some Western, Northern and Southern European countries (France, Germany, Greece, Sweden, Portugal, Netherlands and the UK) showed the smallest gains in male life expectancy between 2011 and 2016. Gains in female life expectancy were also generally weaker in some of these countries than in Central and Eastern European countries: in particular, France, the UK and Netherlands showed little or no change in female life expectancy between 2011 and 2016, and Austria, Germany, Greece and Sweden showed relatively small increases. The UK experienced the lowest gains in both male and female life expectancy in this period.

22. In contrast, countries that showed little or no slowdown in life expectancy improvements in both sexes during 2011-16 compared with 2006-11 were the Czech Republic, Cyprus, Italy, Luxembourg and Malta. Two Nordic countries also broadly maintained their pace of progress for both sexes during this period: Finland and Norway, with Norwegian male life expectancy showing the reverse trend of faster improvement during 2011-16 than during 2006-11.

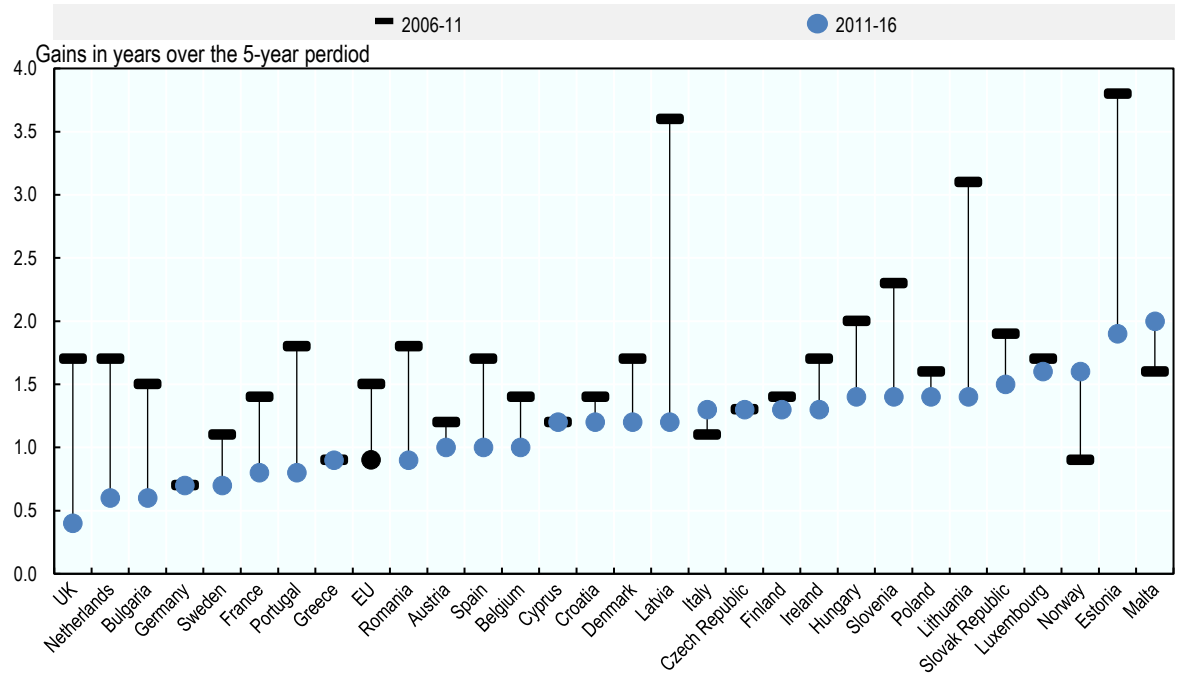
Table 5.1. Change in life expectancy at birth in EU countries and Norway during selected periods

	Change in life expectancy at birth (in years)					
	Males			Females		
	2006-11	2011-16	2014-15	2006-11	2011-16	2014-15
EU average	1.5	0.9	-0.2	1.1	0.5	-0.3
Bulgaria	1.5	0.6	0.1	1.5	0.7	0.2
Croatia	1.4	1.2	-0.3	1.1	0.9	-0.5
Czech Republic	1.3	1.3	-0.1	1.2	1.0	-0.4
Estonia	3.8	1.9	0.8	2.7	0.9	0.3
Hungary	2.0	1.4	0.0	0.9	1.0	-0.4
Latvia	3.6	1.2	0.6	2.7	0.8	0.1
Lithuania	3.1	1.4	0.0	2.2	0.8	-0.4
Poland	1.6	1.4	-0.2	1.4	0.9	-0.1
Romania	1.8	0.9	0.2	2.1	0.9	0.0
Slovak Republic	1.9	1.5	-0.2	1.4	0.9	-0.3
Slovenia	2.3	1.4	-0.4	1.3	1.0	-0.2
Austria	1.2	1.0	-0.3	1.0	0.3	-0.3
Belgium	1.4	1.0	-0.1	1.0	0.7	-0.5
Cyprus	1.2	1.2	-0.4	1.1	1.8	-0.6
Denmark	1.7	1.2	0.1	1.2	0.9	-0.1
Finland	1.4	1.3	0.3	0.7	0.6	0.3
France	1.4	0.8	-0.3	1.2	0.0	-0.4
Germany	0.7	0.7	-0.4	0.7	0.4	-0.5
Greece	0.9	0.9	-0.3	0.9	0.4	-0.4
Ireland	1.7	1.3	0.3	1.3	0.6	-0.1
Italy	1.1	1.3	-0.4	0.7	0.8	-0.7
Luxembourg	1.7	1.6	0.6	1.7	1.8	-0.5
Malta	1.6	2.0	-0.1	1.0	1.4	-0.2
Netherlands	1.7	0.6	-0.1	1.1	0.1	-0.3
Portugal	1.8	0.8	0.1	1.3	0.5	-0.1
Spain	1.7	1.0	-0.3	1.2	0.7	-0.5
Sweden	1.1	0.7	0.0	0.7	0.3	-0.1
UK	1.7	0.4	-0.3	1.4	0.0	-0.4
Norway	0.9	1.6	0.4	0.7	0.6	0.0

Source: These figures are derived from Eurostat data.

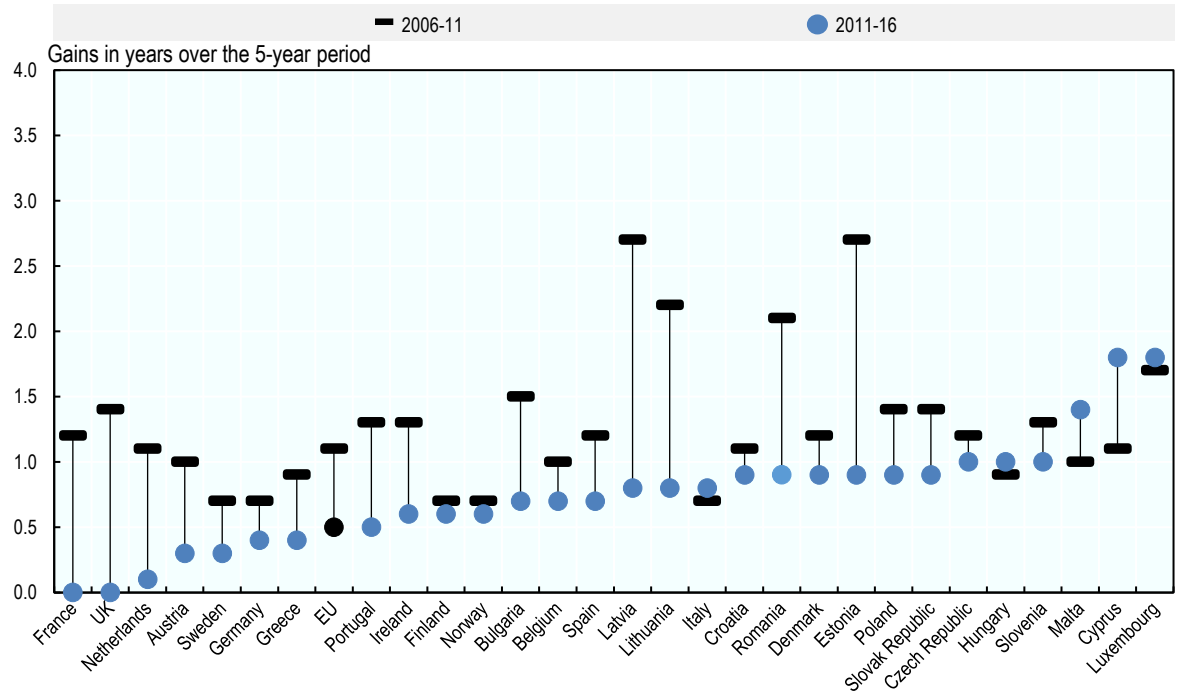
Figure 5.3. Change in life expectancy at birth in EU countries and Norway between 2006-11 and 2011-16

A. Males



Note on the interpretation of this figure: Across the EU 28 countries, life expectancy at birth among males increased by 1.5 between 2006 and 2011 whereas it only increased by 0.9 years between 2011 and 2016

B. Females



Note on the interpretation of this figure: Across the EU 28 countries, life expectancy at birth among females increased by 1.1 between 2006 and 2011 whereas it only increased by 0.5 years between 2011 and 2016.

Source: Eurostat

23. Among high-income countries beyond Europe, Canada and Australia also experienced a slowdown in life expectancy improvements in recent years (Box 5.1). The slowdown in improvement since 2010 has been greatest in the USA, where life expectancy improvements have not just slowed but have reversed in the most recent years (2015-17). An analysis of 18 high-income countries shows that the stagnation of life expectancy in the USA in both genders since 2010, despite it having the lowest life expectancy in 2010, has increased the gap with other countries (Ho and Hendi, 2018). In striking contrast to European and other high-income countries, Japan experienced slow improvement in life expectancy pre-2011 but was alone in showing rapid improvement post-2011 (ONS, 2018a).

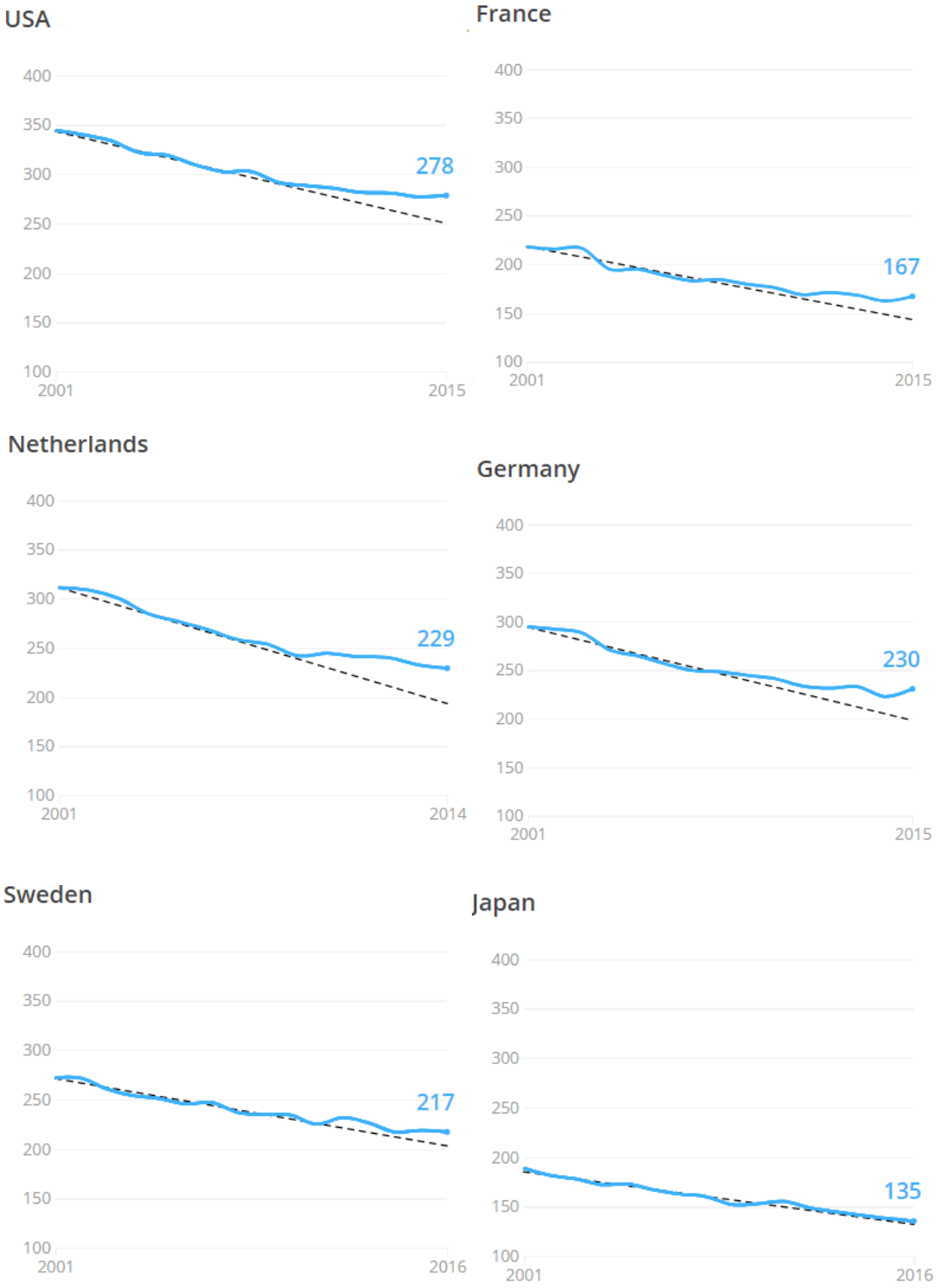
Box 5.1. Trends in life expectancy at birth in Australia, Canada, Japan, the USA

	Males						Females				
	2006	2011	2016	Change 2006-11	Change 2011-16		2006	2011	2016	Change 2006-11	Change 2011-16
Australia	78.7	79.7	80.4	1.0	0.7		83.5	84.2	84.6	0.7	0.4
Canada	77.9	79.1	79.9*	1.2	0.8		82.6	83.5	84.0*	0.9	0.5
Japan	79.0	79.4	81.0	0.4	1.6		85.8	85.9	87.1	0.1	1.2
USA	75.2	76.3	76.1	1.1	-0.2		80.3	81.1	81.1	0.8	0.0

* *Data for 2014-16.*
Source: OECD

24. Since most deaths occur at older ages, they are a major contributor to overall mortality trends. ONS's analysis of mortality trends in twenty countries shows that at ages 65-79 and 80+ all countries other than Japan experienced a slowdown in improvements in recent years (see Figure 5.4 for a sample of countries), with UK, France and Germany showing little or no improvement (ONS, 2018a). Improvements in recent years slowed also among young adults aged 40-64 except in Japan and Finland, and rates increased in the USA. At ages 15-39, Japan alone saw an acceleration of mortality improvements, despite having one of the lowest mortality rates at these ages of all the countries examined, whereas mortality increased in USA. Mortality at older ages is the primary driver of slowing improvements in life expectancy in countries other than USA, where it is mortality at younger ages.

Figure 5.4. Standardised age-specific mortality rates for selected OECD countries: females ages 65-79 years



Source: Office for National Statistics (2018a), *Changing Trends in Mortality: An International Comparison: 2011 to 2016*

5.2. Improvements in life expectancy at age 65 are also slowing

25. Life expectancy at 65 in EU countries showed similar patterns to life expectancy at birth (Table 5.2). Among males, all EU countries other than Greece, Italy, Luxembourg and Malta experienced smaller gains in life expectancy at 65 during 2011-16 than between 2006-11. Another exception was Norway where, as with male life expectancy at birth, the gain in male life expectancy at 65 during 2011-16 was significantly greater than in the preceding period.

26. Gains in life expectancy at 65 slowed also among females, the only exceptions being Italy and Cyprus. Moreover, between 2011 and 2016 female life expectancy at 65 remained unchanged in the UK and Austria, and fell slightly in France and Netherlands. The slowdown in the EU overall was greater among females than males.

Table 5.2. Change in life expectancy at age 65 in EU countries and Norway during selected periods

	Change in life expectancy at age 65 (in years)					
	Males			Females		
	2006-11	2011-16	2014-15	2006-11	2011-16	2014-15
EU average	0.9	0.5	-0.3	0.9	0.3	-0.4
Bulgaria	0.8	0.2	-0.1	1.0	0.6	0.0
Croatia	0.9	0.5	-0.3	0.8	0.6	-0.4
Czech Republic	0.8	0.6	-0.2	0.9	0.8	-0.4
Estonia	1.6	0.8	0.3	1.7	0.8	0.3
Hungary	0.7	0.3	-0.1	0.6	0.4	-0.4
Latvia	0.9	0.6	0.4	1.6	0.3	-0.1
Lithuania	0.7	0.2	-0.2	1.3	0.2	-0.3
Poland	0.9	0.6	-0.2	1.1	0.6	-0.3
Romania	1.0	0.2	-0.2	1.4	0.5	-0.1
Slovak Republic	1.1	0.8	-0.1	1.1	0.8	-0.3
Slovenia	1.1	1.0	-0.1	1.1	0.7	-0.2
Austria	0.8	0.4	-0.4	1.0	0.0	-0.5
Belgium	1.0	0.4	-0.2	1.0	0.3	-0.4
Cyprus	0.9	0.8	-0.3	0.9	1.5	-0.5
Denmark	1.1	0.9	-0.1	0.9	0.7	-0.1
Finland	0.8	0.5	0.1	0.5	0.2	0.2
France	1.1	0.3	-0.3	1.1	-0.1	-0.5
Germany	0.5	0.4	-0.3	0.6	0.2	-0.4
Greece	0.7	0.7	-0.3	0.8	0.5	-0.4
Ireland	1.3	0.7	0.0	1.0	0.2	-0.1
Italy	0.8	0.9	-0.3	0.6	0.7	-0.6
Luxembourg	0.8	1.1	0.5	1.3	1.1	-0.9
Malta	1.5	2.0	0.2	1.4	1.1	-0.1
Netherlands	1.3	0.4	-0.2	0.9	-0.1	-0.3
Portugal	1.2	0.2	-0.1	1.1	0.2	-0.2
Spain	1.0	0.6	-0.3	1.1	0.6	-0.5
Sweden	0.8	0.6	0.0	0.4	0.2	-0.1
UK	1.2	0.3	-0.2	1.0	0.0	-0.5
Norway	0.5	0.9	0.1	0.6	0.2	0.0

Source: These figures are derived from Eurostat data.

5.3. Some years have been exceptional

27. In recent years, 2015 stand outs as being exceptional, with several EU countries showing a fall in life expectancy. A similar pattern was seen also in 2012, although to a lesser extent.

28. Between 2011 and 2012, life expectancy at birth in the EU fell in 3 countries for males and 12 countries and Norway for females; at age 65 the fall was more widespread, with life expectancy falling in 12 countries for males and 18 countries and Norway for females. Several other countries showed no change.

29. In discussing trends, one year in particular is worthy of special comment. Compared with 2014, in 2015 life expectancy at birth in males fell in all but 12 of the 28 EU countries (the 12 countries being Bulgaria, Denmark, Estonia, Finland, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Portugal, Romania, Sweden) and for females in all but 5 countries (Bulgaria, Estonia, Latvia, Romania, Finland and also Norway) (Table 5.1, Figures 5.1 and 5.2). Overall, the falls in life expectancy were larger and more widespread than in 2012. In some cases, the falls were sizable: in 7 countries female life expectancy fell by half a year or more and in 4 countries male life expectancy fell by 0.4 years. Among older people the falls in life expectancy were more widespread (Table 5.2). Life expectancy at age 65 for males fell in all but 7 of the 28 EU countries (Estonia, Finland, Ireland, Latvia, Luxembourg, Malta, Sweden and also Norway), and for females it fell in all but 3 countries (Bulgaria, Estonia, Finland and also Norway).

30. In summary, there were widespread, and in some cases sizable, falls in male and female life expectancy in several EU countries in 2015. Notable exceptions were the Nordic countries including Norway, which experienced little or no fall in life expectancy between 2014 and 2015 among both males and females. Other exceptions were males in some Central and Eastern European countries where life expectancy has historically been relatively lower.

31. In almost all countries that experienced a decline in 2015, life expectancy rallied back in 2016 to about the 2014 level or higher. Such abrupt, large and widespread falls in life expectancy, followed by a swift recovery, are unprecedented in recent decades and suggest that a common cause (such as an influenza outbreak) could be implicated in the affected countries. These issues are discussed further in section 6. It should be noted that, while life expectancy in 2015 fell in most European countries, it did not fall in Australia, Canada and Japan.

32. As discussed in section 6.1, an excess (albeit smaller than in 2015) in winter deaths was observed across Europe also in 2017. Furthermore, although mortality data for 2018 will not be available for some time, mortality surveillance reports from Europe and the USA indicate a significant and widespread excess of deaths in early 2018, especially among older people, so it is possible that 2018 could be an adverse year for mortality. As an example, in England, excess deaths in the 2017/18 winter were higher than in any winter since 1975-76, including 2015, and the age-standardised mortality rate for the first nine months of 2018 was significantly higher than the rate for the same period in 2017 (ONS, 2018b; ONS, 2018c).

5.4. Summary of trends

33. In summary, improvements in life expectancy at birth slowed in most EU countries after 2011 compared with the previous 5 years, the slowdown being more widespread among females than males and at older ages. Some other high-income countries (the USA, Canada, Australia) have also experienced a slowdown, the singular exception being Japan where gains in life expectancy have accelerated in recent years. Overall, the slowdown has been greatest in the USA (where life expectancy is falling) and the UK, but other countries such as France, Germany, Sweden and Netherlands have also experienced significant downturns, although from a higher level than in the UK. 2015 was an exceptional year when life expectancy fell across many EU countries, and it warrants detailed scrutiny.

6. WHAT IS CAUSING THE SLOWDOWN IN LIFE EXPECTANCY IMPROVEMENTS IN THE EU AND OTHER SELECTED OECD COUNTRIES IN THIS DECADE?

34. The recent changes in life expectancy described above are characterised by (a) a general slowdown in the rate of improvement in several countries, and (b) fluctuations in some years. Both these aspects need consideration for a better understanding of trends because the underlying causes are likely to differ.

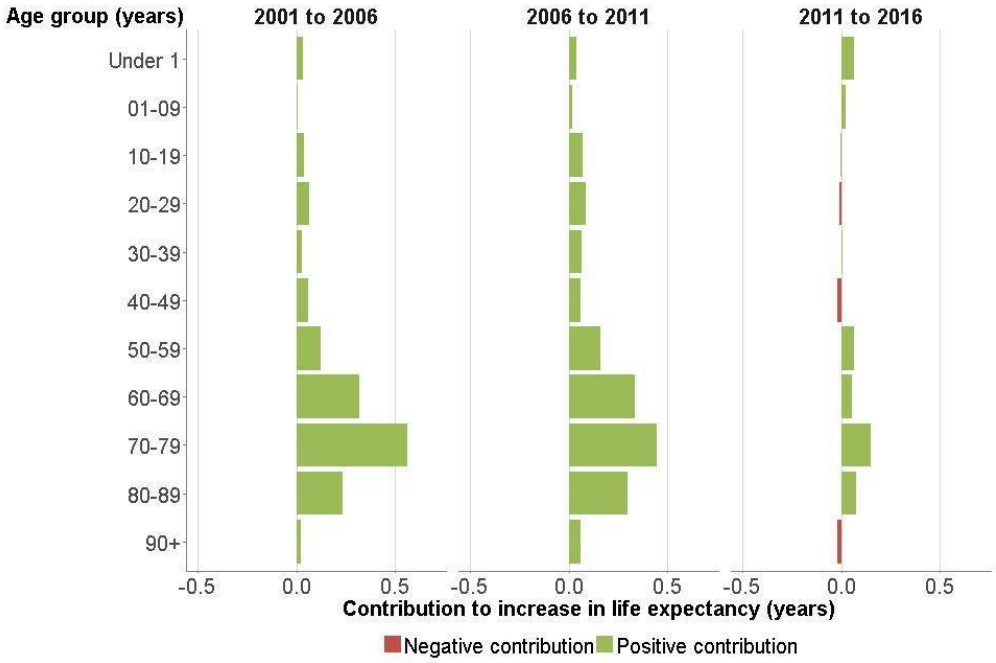
35. Below we examine the main causes of death that are reported to be among the most significant contributors to the slowdown in improvements in life expectancy - mainly diseases of older ages. These include respiratory diseases (including influenza and pneumonia), cardiovascular diseases (CVD), dementia and Alzheimer's disease. Evidence from some countries (notably the UK and the USA) that have examined recent mortality trends in more detail, including the contribution of different causes of death to the life expectancy slowdown, shows that mortality improvements have slowed (and in some cases reversed) also among working age adults ie the slowdown in mortality improvement in those countries is impacting not just on older people. External causes of death, which broadly cover accidents including drug-related deaths, suicide and assault (ie homicide), are one of the leading causes of death in this group, so we comment briefly also on what is known about trends in such deaths.

36. Beyond these direct causes of death, we consider some more general factors that could be contributing to recent mortality trends, including trends in risk factors such as obesity and diabetes, socio-economic inequalities, migration, the impact on health outcomes of "austerity" measures following the 2008 economic recession, and some others. However, original research into causation is limited. It is also important to note that there are interactions between the many determinants of mortality. For example, widening inequalities in mortality could reflect differential changes in risk factors, and in turn impact on the rate of CVD mortality improvements.

37. In England there has been a concerted attempt to examine recent mortality trends and the factors contributing to the slowdown in improvements in life expectancy. Public Health England's (PHE) *Health Profile for England 2018* includes an analysis of the contribution to changes in overall life expectancy over time of different age, gender and cause of death groups, to see where the greatest effects are coming from, using a method of 'life expectancy decomposition' (PHE 2018b). While the slowdown in life expectancy improvements during 2011-16 was evident for most age groups, in both genders it was greatest at older ages (Figure 6.1). The causes of death contributing most to the slowdown were heart disease and stroke (and a residual, miscellaneous group), with dementia and Alzheimer's disease and respiratory disease making a negative contribution to life expectancy (Figure 6.2). Following an increase in mortality in early 2018, PHE was commissioned by the Department of Health and Social Care (DHSC) to review mortality trends in England and examine possible explanations for stalling improvements. PHE's recent report (PHE 2018c) is the most detailed such work to date; this paper draws on its findings as they could have relevance for some other countries.

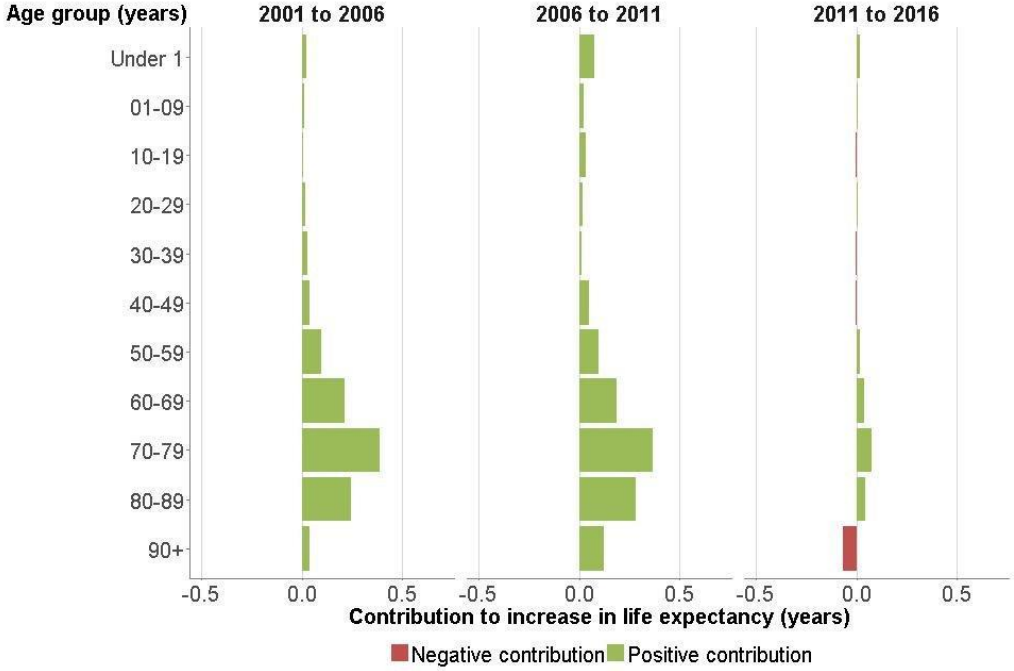
Figure 6.1. Decomposition of change in life expectancy at birth by age and sex, England

A. Males



Source: Public Health England (2018b), *Health Profile for England 2018*

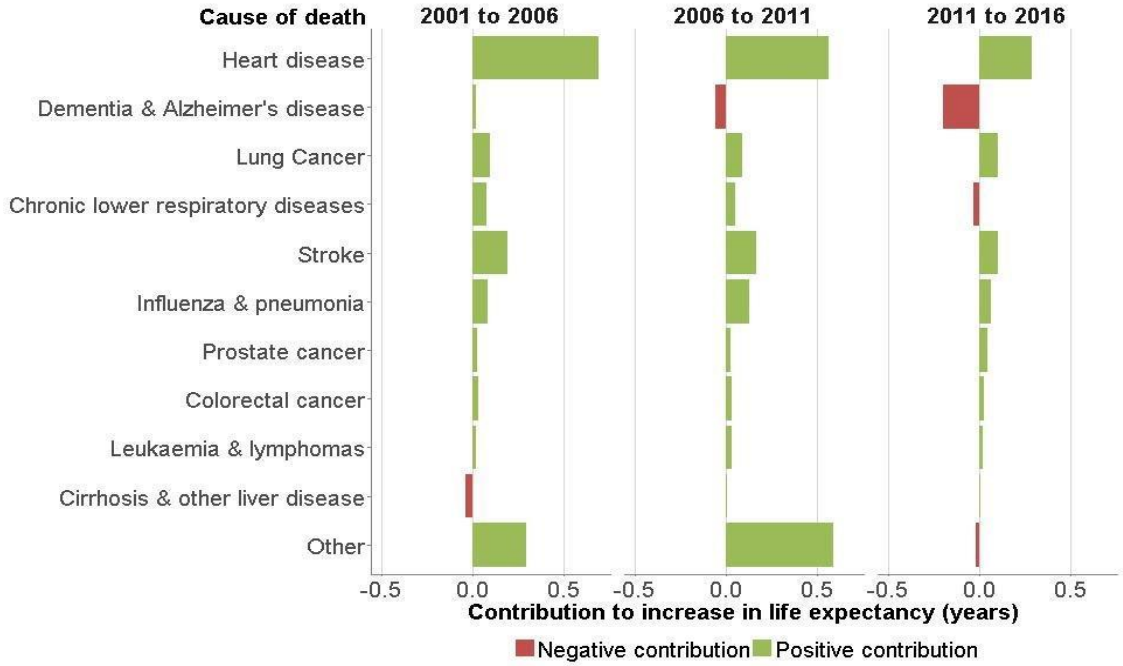
B. Females



Source: Public Health England (2018b), *Health Profile for England 2018*

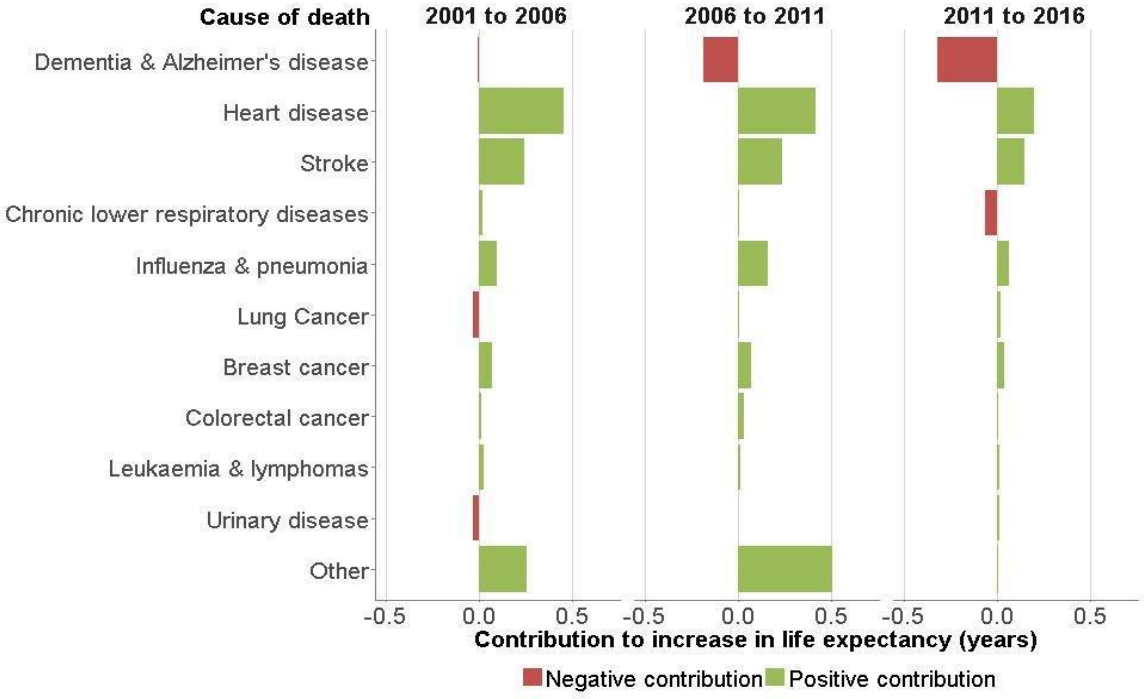
Figure 6.2. Contribution of causes of death to changes in life expectancy by sex, England

A. Males



Source: Public Health England (2018), *Health Profile for England 2018*

B. Females



Source: Public Health England (2018), *Health Profile for England 2018*

6.1. Mortality from influenza, pneumonia and other respiratory diseases has been erratic, rising sharply in some years

38. Influenza, pneumonia and other respiratory diseases are major causes of death among older people, causing excess mortality in some years. In particular, 2015 was an exceptional year when life expectancy fell in most EU countries. Only the Nordic countries and some Central and Eastern European countries were relatively unaffected. As Ho and Hendi noted, "*the 2014-15 declines in life expectancy are more widespread and larger in magnitude than anything observed in decades*" (Ho and Hendi, 2018). Such large (eg a fall of 0.5 years or more in female life expectancy in 7 EU countries), abrupt and widespread declines in life expectancy, followed by a recovery in 2016, are unprecedented in recent decades and suggest a common cause. Ho and Hendi note that causes of death that predominate at older ages, including influenza and pneumonia, CVD, Alzheimer's disease and other nervous system diseases, were primarily responsible for the fall in life expectancy in 2015 (Ho and Hendi, 2018). As noted below, influenza can precipitate deaths from other causes, such as CVD and chronic obstructive pulmonary disease (COPD).

39. In particular, the severe influenza outbreak in 2014-15 is cited as causing excess deaths in Europe in 2015, especially among older people (Mølbak et al., 2015; Pebody et al., 2018). The particular influenza virus strain A(H3N2) in circulation was reported to have low vaccine efficacy and affected older people disproportionately, leading to increased morbidity and mortality in this group. Factors such as cold weather and infections resulting from other respiratory agents also played a role.

40. A significant excess of deaths has been linked to influenza also in some other winters such as 2012-13 (Mazick et al., 2012; CDC, 2013) and 2016-17 (Vestergaard et al., 2017). Although mortality data for 2018 will not be available for some time, a severe and prolonged influenza season, excess deaths and ensuing pressures on health services in many EU countries are reported also for the 2017-18 winter (ECDC and WHO, 2018; Adlhoch, 2018; EuroMOMO, 2018; Appleby, 2018; PHE, 2018a; PHE, 2018c). In the USA, influenza and pneumonia deaths were at or above epidemic threshold for 16 consecutive weeks in 2017-18, one of its longest influenza seasons in recent years (CDC, 2018a). It is possible that 2018 could be an adverse year for mortality, especially among older people, with excess deaths resulting from influenza and a cold spell; the impact on mortality rates could be exacerbated if the long, hot summer that followed also claimed excess lives.

41. Assessing the impact of influenza is not straightforward. It may not be recorded on the death certificates of people who die from influenza-related complications, or when death occurs some days after the initial infection (eg when influenza aggravates an existing chronic illness such as COPD or congestive heart failure). Furthermore, influenza and pneumonia can precipitate deaths from other causes, such as cardiovascular events. The impact of influenza is seen across a range of causes of death, but it is frequently under-recorded as the underlying cause of death (Pebody, 2018b; CDC, 2018b; Ho and Hendi, 2018).

42. For example, the UK data show that over one-third of deaths with an underlying cause of dementia or Alzheimer's disease also have respiratory disease (which includes influenza and pneumonia) coded as a secondary cause, and respiratory disease contributes to deaths from many causes (ONS, 2016a). More specifically, in 2016, 21% of death certificates with dementia coded as the underlying cause also had

influenza/pneumonia in the first position of the death certificate (PHE, 2018c). These patterns suggest certification practices have changed, with dementia now more likely than influenza/pneumonia to be recorded on the death certificate as underlying cause. This is further corroborated by linked data from England which show that in January 2015 (when excess winter deaths spiked in the UK and across Europe), among patients aged 75+ admitted to hospital in the week before death, or dying after admission to hospital, diagnoses for influenza /pneumonia increased sharply (Baker et al, 2018, PHE, 2018c). Only 5% of those who died from dementia and Alzheimer's disease were admitted for these conditions: 45% were admitted for influenza, pneumonia and other respiratory diseases, and these conditions made up a sizeable proportion of admissions for people who died from most causes of death.

43. For these reasons, only counting deaths where influenza was recorded on a death certificate would result in a gross underestimation of the true impact of seasonal influenza. Hence, public health agencies in Europe, the USA and several other countries use supplementary sources of information and statistical models to estimate more accurately the annual number of seasonal influenza-related deaths.*

44. In England mortality rates from chronic lower respiratory diseases generally flat-lined in both males and females between 2011 and 2016, with fluctuations in the annual rates and a peak in 2015 - the year when life expectancy overall fell in many EU countries (PHE, 2018b). Chronic respiratory disease also made a negative contribution to life expectancy changes in England in both sexes between 2011 and 2016 (Figure 6.2) (PHE, 2018b). The significant contribution of mortality from respiratory diseases overall, including influenza and pneumonia, to the 2015 fall in life expectancy is reported also more widely for other European countries (Ho and Hendi, 2018). Such episodic events apart, it's unclear how significant the contribution of influenza, pneumonia and other respiratory diseases has been to the general, longer-term slowdown in life expectancy improvements seen in many EU countries in recent years.

6.2. Improvements in cardiovascular disease mortality are slowing in several countries

45. Since the 1970s there have been dramatic declines (up to two-thirds) in CVD mortality rates throughout the industrialised world, attributable to medical advances in prevention, diagnosis and treatment, and changes in risk factors such as smoking, blood pressure and cholesterol levels (OECD, 2015; Mensah et al., 2017; Ezzati et al, 2015) (see Box 6.1). However, CVD still remains one of the leading causes of death in many OECD countries and there are signs in some countries of a slowdown in the rate of mortality reduction from it in recent years. Countries face significant challenges in matching past progress, including from population ageing and adverse changes in some risk factors, in particular rising levels of obesity and diabetes.

* The European Mortality Monitoring Project (EuroMOMO) is a public health mortality monitoring system aimed at measuring excess deaths, including those related to influenza and other possible public health threats, on a real-time basis across participating European countries. It was launched following the influenza pandemic of 2009. Many non-European countries have similar public health surveillance systems.

Box 6.1. Causes of the decline in CVD mortality since the 1970s

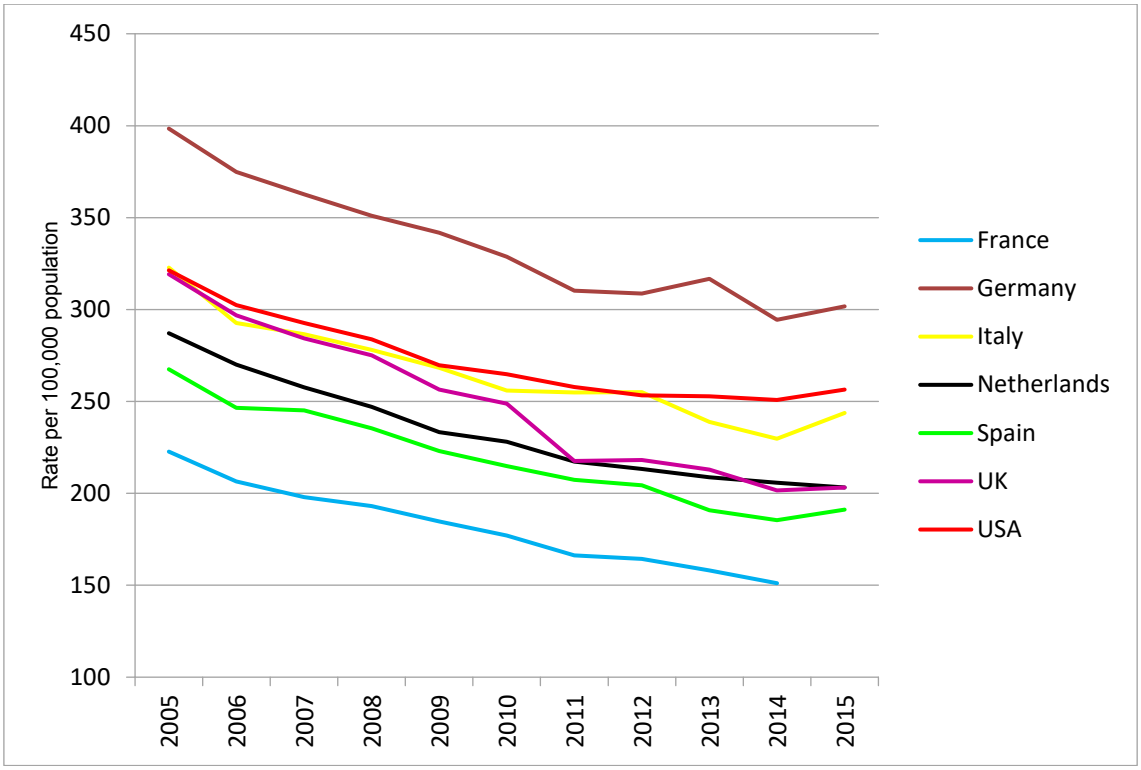
Despite the vast body of research on CVD mortality trends internationally, the multiple determinants of CVD make it challenging to identify the relative contributions of each to the dramatic declines in CVD mortality rates in developed countries since the 1970s (Mensah et al., 2017; Ezzati et al, 2015). Key insights have been gained from sentinel projects such as MONICA (Multinational MONItoring of trends and determinants in CArdiovascular disease), designed to examine the contributions of risk factors and treatment to reducing IHD mortality in 21 countries in the 1980s and 1990s, but definitive explanations remain elusive. Some studies from the USA and the UK suggest that the sharp decline in the latter part of the twentieth century was attributable about equally to prevention and treatment ie risk factor control (in particular the reduced prevalence of smoking but also of high blood pressure and high cholesterol), and pharmacological and technological advances in acute and long-term treatment of coronary heart disease (CHD) and stroke (Mensah et al, 2017; Unal et al, 2004). Another study suggests two-thirds of the improvements to date in premature CVD mortality can be attributed to decreases in smoking, cholesterol, and blood pressure, and about a third are due to improved therapies (Ford and Capewell, 2011).

46. Although data sources for CVD mortality and related measures are relatively plentiful for Europe (WHO, OECD, Eurostat, European Heart Network, etc), there is relatively little research into recent CVD mortality trends in EU countries and whether they show any exceptional features. Evidence from the Global Burden of Disease (GBD) study shows a slowdown in CVD mortality improvements in recent years across many countries (PHE, 2018c).

47. For this paper, OECD's data on mortality from circulatory diseases for selected EU countries and USA, Canada, Japan and Australia were examined to see whether and how trends have changed over time. As reported by OECD, comparisons between countries are subject to caveats because of cross-country differences in conventions for coding cause of death. But the data are useful for reviewing country-specific trends over time, and they show a convergence in mortality rates for circulatory disease over time. Comparison of the average mortality rates for 2010-2015 with the average for 2005-10 shows that in several EU countries the decline has slowed in recent years, as Figure 6.3 for selected countries shows[3]. The slowdown is evident also in Australia, Canada and the USA, but not in Japan.

[3] Central and Eastern European countries are not shown because of their significantly higher mortality rates for circulatory disease.

Figure 6.3. Age-standardised mortality from circulatory diseases in selected EU countries and the USA: persons, 2005-15



Source: OECD

48. In the UK a slowdown in the decline in mortality rates for circulatory diseases from 2011 is cited as a major factor driving the slowdown in mortality improvements for people aged 55 and over (ONS, 2018d; PHE 2018c; Steel et al, 2018). A detailed analysis for England of the causes of death contributing to the recent slowdown in life expectancy improvements found that during 2011-16, although reductions in mortality rates from heart disease and stroke had a positive effect on life expectancy, this was a much smaller contribution than in previous years because the rate of improvement has slowed (PHE, 2018b; PHE 2018c). And it was more than offset by rising mortality from dementia - making these two causes the biggest contributors to the reduction in the rate of improvement in life expectancy since 2011.

49. A recent analysis of trends in cerebrovascular disease (stroke) mortality rates in Europe found that, while large declines have continued steadily in several countries, there is evidence of recent plateauing in stroke mortality in some countries in both sexes and in all four geographical sub-regions of Europe (Shah et al., 2018). The plateauing was most common for haemorraghic stroke and increases were most common for ischaemic stroke. Evidence of a recent plateau in cerebrovascular mortality trends spanned selected Western and Central European countries, including Austria, France and Germany for both sexes, Denmark, Greece, Czech Republic and Hungary for males only, and Belgium, Ireland and Switzerland for females only. Possible explanations for the attenuation of stroke mortality declines offered are plateauing or increases in risk factors such as the increasing prevalence of overweight/obesity and diabetes, the recent

stabilisation of smoking prevalence and blood cholesterol levels in many countries after steep declines, and limited improvements in case fatality rates for stroke.

50. A sudden deceleration from 2011 in the decline of all CVD, heart disease and stroke mortality rates is reported for the USA, with age-standardised mortality rates showing little change between 2011-17 (Figure 6.3). The slowdown brings a warning that it could jeopardise achievement of the strategic goals set by the American Heart Association (a 20% reduction by 2020 in total CVD and stroke mortality) and the Million Hearts Initiative (preventing one million myocardial infarctions and strokes) (Sidney et al., 2016; Lloyd-Jones, 2016). The deceleration has occurred in both males and females, and in all race/ethnicity groups.

51. What is driving the current slowdown in CVD mortality improvements in some countries is unclear, although the rising prevalence of obesity and diabetes are cited as potential causes (Mensah et al., 2017; Lloyd-Jones, 2016; Sidney et al, 2016). There is also the possibility of other contributory factors, for example, that the "low hanging fruit" in terms of risk factor reduction have been largely realised and the pace of further advances in the prevention and treatment of CVD is slowing. The early 21st century experienced a particularly high rate of decline in CVD mortality because of earlier prevention programmes, and the decline may have slowed as implementation approached a saturation level in the community (Sidney et al, 2016). However, as noted for the UK, despite the recent deceleration in CVD mortality improvements, there remains significant scope for further reduction in CVD risk factors (Steel et al, 2018).

6.3. Mortality from dementia and Alzheimer's disease is increasing

52. A recent OECD report notes that in recent years many governments have developed national plans and strategies to address the rising morbidity from dementia, and for better diagnostic services (OECD, 2018a). However, many people remain undiagnosed and there are significant differences between countries, and within countries over time, in diagnosing and recording dementia. Prevalence rates in Europe are estimated to be 1-2% (OECD, 2017a; Alzheimer Europe, 2013), and about 7% at ages 60 and over (OECD, 2018b).

53. The coding conventions for recording dementia and Alzheimer's disease on death certificates also vary and can change over time, reflecting changes in diagnostic, death certification and coding practices. Rising trends in mortality from dementia and Alzheimer's disease are seen in most EU countries, possibly in part reflecting such changes. These are also likely to explain the significant cross-country differences in mortality rates ranging, for example, from 279 per 100,000 population in 2013 in Finland (notable for its high mortality from dementia) to <5 in Malta and Latvia (Niu et al., 2017).

54. Alzheimer's disease and other nervous system diseases were among the causes that contributed most to the 2015 decline in life expectancy seen across Europe and other high-income countries. However, it is possible that although coded as the underlying cause, some of these deaths were precipitated by another condition such as influenza or CVD (Ho and Hendi, 2018). For example, in England and Wales, over a third of all deaths with an underlying cause of dementia or Alzheimer's disease are reported to also have a respiratory disease mentioned on the death certificate (ONS, 2016a). And most of the increased deaths among older people in 2015 had an underlying cause of dementia/Alzheimer's disease or respiratory disease, and excess winter deaths from

dementia reached a record high in winter 2014/15. Although the reasons for the seasonal pattern in deaths from dementia and Alzheimer's disease are not clear, it may be related to the greater vulnerability of people with these conditions to respiratory diseases.

55. More generally, in England the mortality rate from dementia and Alzheimer's disease has increased steadily since 2006, reflecting several factors such as increased awareness of dementia, historical NHS policies encouraging GPs to diagnose, and changes in death certification practices (PHE, 2018b; PHE 2018c; ONS, 2018d). Coding changes from 2011 also led to increased recording of dementia and Alzheimer's disease on death certificates, with deaths reallocated from some groups including cerebrovascular disease and pneumonia eg deaths from vascular dementia would once have been coded to circulatory disease but are now coded to dementia (PHE 2018c; Campbell, 2017). This, along with the examples given earlier in relation to influenza/pneumonia, suggests that death certification practices have changed in recent years, with some deaths being classified as dementia that would not have been in the past. Mortality from dementia and Alzheimer's is now the leading cause of death among women in England and the second leading cause among men. PHE's decomposition of contributors to the stalling of life expectancy improvements in England during 2011-16 shows that a slowdown in heart disease mortality improvements and rising mortality from dementia have made the biggest contribution to the reduction in the rate of improvement in life expectancy since 2011, although the latter largely reflects changes in diagnostic and death certification practices (PHE, 2018b; PHE 2018c).

56. Globally, heart disease and stroke were the leading causes of death in high-income countries in 2016, followed by Alzheimer's disease and other dementias (WHO, 2018a).

57. Overall, diagnostic and coding changes present significant challenges in interpreting time trends in mortality related to dementia and Alzheimer's disease for individual countries, and in comparisons between countries (Ho and Hendi, 2018). Because of changing practices in the recording of these conditions, and the knock-on effects on recording of other causes of death, even time trends for individual countries for these and other causes of death can be difficult to interpret.

6.4. Deaths from accidents, including drug overdoses, are rising in some countries

58. Although the impact of external cause mortality on life expectancy overall is low in most countries (with the USA being a notable exception), we comment on this because of the adverse trends among younger ages observed in some countries in recent years.

59. In the UK, while CVD, dementia and Alzheimer's disease and respiratory disease have largely determined mortality trends overall and in older adults, other causes of death have influenced the trend in younger people. Among young adults under 50, rising mortality rates from accidental poisoning (a large proportion of which were due to drug misuse) increased overall mortality rates at these ages during 2011-16, making a small negative contribution to changes in life expectancy at birth in England (PHE, 2018c; ONS, 2018d).

60. High or rising levels of drug overdose mortality are apparent in several high-income countries (eg the UK, Sweden, Canada, Australia) although not approaching the levels in the USA (Ho and Hendi, 2018). Opioids (such as heroin) are responsible for the majority of drug overdose deaths, but there are concerns in several European countries

about the increasing use of synthetic opioids (OECD, 2016). In the USA sharply rising death rates from the large-scale drug overdose crisis among younger men and women, and from unintentional injuries overall, are significant contributors to falling life expectancy (Box 6.2) (Sherry et al, 2018). The USA's opioid "crisis" includes use of both illegal opiates and prescribed opioid-based painkillers. Canada is also experiencing a serious opioid crisis, especially among young and middle-aged adults, which is slowing improvements in life expectancy (Government of Canada, 2018).

61. As noted elsewhere in this paper, several studies have reported an increase in suicide rates during economic downturns, especially among men, but also that social protection and labour market programmes can mitigate this risk. Suicide rates in a number of EU countries increased following the 2008 recession and the EU financial crisis of 2009, mainly among men, and were associated in part with rising unemployment levels - but this trend did not persist in most countries (OECD, 2016).

Box 6.2. Trends in deaths from external and other causes in the USA

In contrast to other high-income countries where mortality at older ages is the primary driver to the slowdown in improvements in life expectancy at birth, in the USA falling life expectancy in 2015, 2016 and 2017 is attributed mainly to rising mortality rates among adults aged 25-64 years (Kochanek et al., 2017; Ho and Hendi, 2018). Mortality rates at these "midlife" ages have been increasing since the 1990s, a trend attributed primarily to drug overdoses, alcohol related liver disease, and suicides ("deaths of despair"), and to decelerating improvements in mortality from heart disease and cancer (Woolf et al, 2018, Bernstein and Ingraham, 2017).

In 2016 the death rate from unintentional injuries, which include drug overdoses, became the third leading cause of death in the USA after heart disease and cancer, having increased by 10% over 2015 (Kochanek et al., 2017). The death rate from drug overdoses more than tripled between 2000 and 2016, with a sharp rise from 2014 (Hedegaard et al., 2017).

Suicide rates increased by 30% between 2000 and 2016, to become the tenth leading cause of death in 2016 (Hedegaard et al., 2018).

Mortality trends in the USA deteriorated further in 2017. Age-adjusted death rates increased for seven leading causes and decreased for one (Sherry et al, 2018). Life expectancy at birth fell by 0.1 year between 2016 and 2017, largely because of increases in mortality from unintentional injuries, suicide, diabetes, and influenza and pneumonia, with unintentional injuries making the largest contribution. Age-adjusted death rates increased at ages 25-44 and 85+.

6.5. Some risk factors show adverse trends

62. Long-term trends in some risk factors, such as smoking, alcohol consumption, high blood pressure and cholesterol levels have generally been favourable in most EU countries, significantly lowering mortality from major killers such as cancer and CVD and making large contributions historically to improvements in life expectancy (OECD, 2017a). However, trends in some risk factors - obesity and diabetes in particular - have

been unfavourable to increased longevity, and could have contributed to the slowdown in life expectancy improvements in recent years.

63. Obesity is a major risk factor for many chronic diseases including diabetes, CVD and cancer. The prevalence of obesity has been rising in many EU and other OECD countries (OECD, 2016), affecting all population groups, and could have contributed to the recent slowdown in mortality improvements, for example, from CVD. From 1980 to 2014 mean BMI increased in all European countries among men and in nearly all European countries among women, with the exception of some Central and Eastern European countries. Consistent with the increase in mean BMI, the prevalence of overweight or obesity increased between 2010 and 2014 among both men and women in all European and EU countries for which data are available (Wilkins et al., 2017). Childhood obesity is increasing, the average for self-reported overweight rates among 15 year olds in the EU having increased from 11% in 2001-02 to 18% in 2013-14. The rising trend in child and adolescent body mass index (BMI) has plateaued in many high-income countries, but at a high level (NCD-RisC, 2017). These adverse patterns are likely to have negative consequences for current and future morbidity and mortality rates.

64. In the USA, obesity is cited as a significant contributor to the stagnation of CVD mortality improvements in recent years (Lloyd-Jones, 2016; Sidney et al, 2016).

65. On the other hand, internationally, obesity was already a public health problem before 2011 and mortality improvements during that time were still robust. The nearly universal increase in adiposity does not seem to have attenuated the long-term declining trend of CVD mortality in high-income countries since the 1960s; it's possible that the rate of decline in these countries would have been even steeper if the obesity epidemic had not occurred (Ezzati et al, 2015). It's not clear why the impact of adverse obesity trends would accelerate from 2011; possible explanations include that they are accompanied by a concurrent abatement in CVD mortality improvements resulting from other interventions.

66. The prevalence of diabetes has been rising in many EU countries, due largely to population ageing and rising levels of obesity and physical inactivity. Between 2006 and 2012 the prevalence of diabetes in the EU increased by 20%, increasing in all countries with available data between the year 2000 and the latest available year, except for Greece (Wilkins et al., 2017).

67. There are many other risk factors for CVD which are not discussed here, such as salt and alcohol consumption, diet, physical activity, and others beyond these “classical” risk factors, such as environmental and occupational factors, infections, foetal and childhood growth and nutrition.

68. Overall, despite the gains in reducing CVD mortality thus far, in most countries the major risk factors continue to present serious risks in terms of morbidity, disability and mortality. For example, in the UK over half of the current mortality burden is attributable to behavioural risk factors such as tobacco use, poor diet, alcohol and drug use, obesity and high blood pressure, and to environmental factors, such as air pollution, so there is ample scope to do more in almost all areas of primary prevention (Steel et al, 2018).

6.6. Could widening inequalities contribute to the slowdown in mortality improvements?

69. Widening inequalities in mortality among different population sub-groups (eg geographic or socio-economic sub-groups) within a country could potentially contribute to a slowdown in life expectancy improvements at national level. For example, if some population groups fail to experience the longevity gains experienced by others, it could reduce the overall gain. It is beyond the scope of this paper to review all the literature on inequalities in life expectancy within EU countries, but some selected references are cited below.

70. OECD reports have highlighted significant inequalities in longevity within OECD countries, the differences being particularly large in Central and Eastern European countries (OECD, 2017b; Murtin et al., 2017; OECD, 2018b). Inequalities in life expectancy by education level are generally larger among men than women. Regional life expectancy inequalities in the EU did not narrow between 1991 and 2008, and among Central and Eastern European males they widened (Richardson et al, 2013). Mortality differentials between racial-ethnic groups in the USA continue to be wide (Box 6.3).

71. In England, socio-economic and geographical health inequalities have persisted despite several government initiatives over the decades to reduce them. In 2014-16, the life expectancy gap between the most and least deprived decile of areas was 9.3 years for males and 7.4 years for females, having increased from 9.0 years and 6.9 years respectively in 2011-13 (ONS, 2018e). With widening inequalities and falling female life expectancy post-2010 in the most deprived decile areas, the PHE review noted that the causes of the slowdown in mortality improvements are having greater impact in more deprived areas and are slowing improvements in overall mortality (PHE, 2018c). Another study found that major contributors to the life expectancy inequality gap in 2016 were deaths in children under 5 years, some cancers, respiratory diseases, ischaemic heart disease and dementia; on the other hand, the declining contribution to inequality of ischaemic heart disease over time shows the role that prevention, risk factor control and treatment strategies can play in reducing inequalities (Bennett et al, 2018).

72. To our knowledge there has been no attempt to assess the impact of trends in inequalities in mortality on overall mortality trends in European countries, but this remains a consideration, especially for countries such as the UK where inequalities have widened at a time when life expectancy improvements have slowed.

Box 6.3. Inequalities in mortality in the USA and Canada

Non-Hispanic (NH) whites in the USA have experienced increasing midlife mortality since the late 1990s, due to the rising number of "deaths of despair"- death by drugs, alcohol and suicide - and to slowing progress against mortality from heart disease and cancer (Case and Deaton, 2017). A recent study shows that midlife (ages 25-64) mortality rates in the US are increasing not only among midlife non-Hispanic (NH) whites but also among other racial-ethnic groups (Woolf et al. 2018). Although all-cause mortality initially decreased among NH blacks, Hispanics, and NH Asians and Pacific Islanders, this trend reversed from 2012 with increasing midlife mortality among non-white populations often matching or exceeding that of NH whites - a troubling trend given the historically high baseline

mortality rates among these populations. Although drug overdoses, alcohol related liver disease, and suicides played a major role, mortality rates increased across a broad spectrum of diseases, pointing to the need to examine systemic causes of declining health in the US population.

The latest data for the USA shows a rise in mortality between 2016 and 2017 among non-Hispanic males and females but not among other racial-ethnic groups (Sherry et al, 2018). It also shows the wide (greater than two-fold) mortality differentials between racial-ethnic groups.

In Canada, there is a wide earnings-related differential in life expectancy, of 8.1 years between low and high earning men, and 3.6 years between low and high earning women. However, the gains over time have been uniform over the earnings distribution, with equal improvements for high and low earners (Milligan and Schirle, 2018).

6.7. What has been the health impact of austerity measures following the 2008 economic recession?

73. The 2008 economic crisis led a number of EU governments to introduce "austerity" measures to reduce public deficits including, in some countries, extensive spending cuts for health and social welfare programmes. There is a large literature on the health and other impacts of economic downturns, including the 2008 recession. It is beyond the scope of this paper to review the literature comprehensively, instead, this paper reports on some key findings relating to the impact of economic recessions and the post-2008 austerity measures on mortality.

74. Reviews show that economic downturns and austerity, including following the 2008 recession, are associated with some adverse health outcomes, in particular deteriorating mental health and rising suicide rates especially among men (van Gool and Pearson, 2014; Karanikolos et al., 2013; Parmar et al., 2016; Franklin et al., 2017; Margerison-Zilko., 2016; Drydakins, 2016; Modrek et al., 2013). Evidence about the impact on overall mortality is less consistent. Some studies show mortality is unaffected, while several studies show that economic downturns are, paradoxically, associated with lower mortality, especially from road traffic accidents. A recent systematic review of the health impact of the 2008 financial crisis in Europe found similar patterns, but noted also that many papers are susceptible to bias (Parmar et al, 2016).

75. Based on mortality data to 2013, one analysis found that that although improvements in mortality slowed across many European countries during the post-2008 austerity years, there was no association with levels of austerity (Franklin et al., 2017). For example, Greece and Spain experienced rising life expectancy despite having a relatively high base and facing some of the severest spending cuts. The more recent mortality data in this report (to 2016) also shows that some countries such as Germany. Sweden and Netherlands which experienced relatively little austerity have seen a greater slowdown in improvements in life expectancy in recent years than Greece, Spain, Portugal and Ireland where austerity was most severe.

76. In England there has been considerable speculation and debate, more so than in other EU countries, about what's causing the slowdown in recent mortality

improvements. In part this is because the slowdown has been worse than in most comparable EU and other high-income countries other than the USA (ONS, 2018a; ONS, 2018d; PHE 2018c). The negative impact of post-2008 austerity on health, social care and other public spending is cited as a potential cause in studies examining temporal associations between mortality trends and markers of NHS performance and public spending (Hiam et al., 2017a; Hiam et al., 2017b; Loopstra et al., 2016; Green et al., 2017; Watkins et al., 2017).

77. While acknowledging that austerity could have had some adverse impacts in England, including on health and the quality of care, others question austerity as an explanation for the recent slowdown in mortality improvements, noting that observational studies of this type cannot prove cause and effect and that other factors also need consideration (Steventon, 2017; Milne, 2017; Fordham and Roland, 2017; Newton et al, 2017; Baker at al, 2018). For example, it is noted that some features of recent mortality trends, such as the role of influenza and slowdown in CVD mortality improvements, span several countries - these international parallels are not readily explained by austerity within England and require further investigation (PHE, 2018c; Raleigh, 2018a). That said, austerity could quite plausibly have accelerated or even caused some deaths, especially among frail older people, and the reasons why the slowdown in life expectancy improvements has been greatest in the UK also need investigation.

78. PHE's review (PHE, 2018c) notes that the tightening of health and social care spending that began in 2009-10 has coincided with the life expectancy slowdown, which affected all areas but has been greatest in more deprived areas; additionally, female life expectancy in the most deprived areas fell after 2010-12. PHE adds that the causes of the slowdown are therefore impacting most on more deprived areas, and widening health inequalities have exacerbated the slowdown in life expectancy improvements. PHE concludes that, although evidence about the causal mechanisms operating between changes in health and social care provision and mortality trends in England and other countries is lacking, recent mortality trends need to be interpreted in the context of population ageing and rising numbers of older people vulnerable to influenza and other risk factors, and needing health and social care services, against a backdrop of constraints in government expenditure.

79. Apart from the impact on mortality, austerity impacts negatively on health more generally in two ways: directly, through cuts to healthcare services, reductions in health coverage and restricted access to care, and indirectly, a 'social risk effect' of increasing unemployment, poverty, homelessness and other socio-economic risk factors (Stuckler et al., 2017). Commentators note that austerity measures mainly affect vulnerable population groups, and that stronger safety nets can provide buffers against the negative health impacts of an economic downturn (Stuckler et al., 2017; Margerison-Zilko et al., 2016; Modrek et al., 2013; Drydakis, 2016; Karanikolos et al., 2013).

80. The 2008 recession was one of the deepest and most extensive economic downturns in recent history. Its aftermath is reported to have had wide-ranging adverse impacts on health, economic and social wellbeing among populations of the European countries most affected (Karanikolos, 2013: Stuckler et al., 2017; Parmar et al., 2016; Franklin et al., 2017; van Gool and Pearson, 2014). These impacts could have long-term consequences for health and wellbeing. Many countries in Europe have had prolonged recessions since 2008 and, although the evidence to date doesn't show a consistent negative impact on mortality trends, or an association with the degree of austerity, the

full scale of consequences in severely affected countries may become apparent only in the future.

6.8. Other factors that could be contributing to the slowdown in mortality improvements

81. Several other factors could potentially contribute to the slowdown in improvements in life expectancy observed across EU countries in recent years. Some examples are listed below, but they are illustrative and not intended to be comprehensive:

- Migration: Refugee and migrant health is a complex topic and research findings often cannot be generalised to different settings (WHO, 2018b). The migration process, social determinants of health and the risks and exposures in the origin, transit and destination environments interact with biological and social factors to create different health outcomes. There has been significant migration to some EU countries in recent years (OECD, 2018b), including from countries within and outside the EU where life expectancy is lower. For example, Germany and Sweden have seen a large influx of refugees and asylum seekers from Syria and other conflict countries in 2015-16; one commentator noted that the large influx of Syrian refugees in 2015, including many who were old and ill, could have contributed to the slowdown of mortality improvements in Germany (McKee, 2018). England has had significant migration from Central and Eastern European countries since their accession to the EU from 2004 onwards, and some of these groups have higher mortality than the average for England (PHE, 2018c); however, it's also noted that some migrant groups have lower than average mortality, most migrants are young adults among whom mortality is low relative to older ages, and migrants comprise a relatively small proportion of the population. Assessing the impact of migration on mortality trends is therefore complex, and will differ depending on the circumstances in each country. One study found that, within Europe, death rates and migratory change were negatively correlated ie the highest rates of population loss were in eastern regions where mortality was high, whereas regions that experienced large gains in population through migration were more likely to have low death rates; these migration patterns could contribute to Europe's persistent inequalities in mortality (Tunstall, 2016), and also impact on mortality patterns in recipient countries.
- Cohort effects: Selective cohort effects could contribute to the slowdown in mortality improvements in recent years. For example, in the UK, the cohort of people born between 1926 and 1935, referred to as the “Golden Cohort”, experienced greater mortality improvements throughout their lifetime than other cohorts previously or since, contributing significantly to the overall improvements in life expectancy at older ages up to 2010 (ONS, 2016b, Goldring et al., 2011). A similar "golden" cohort effect has been observed for some European countries also. The reasons for this are not fully understood - it may be that this generation benefited from a combination of better childhood health, improving preventive and treatment regimes for infectious diseases affecting young and middle-aged adults, and, in later middle-age, changes in smoking habits, improvements in the treatment of circulatory diseases, cancer and many other illnesses and diseases.
- Medical advances: Is it possible that much of the potential gains in medical advances for the primary and secondary prevention of major killers such as CVD

and cancer have been largely realised? The death rate from CVD, in particular, has dropped by two-thirds since the 1960s, a pace that is not likely to be maintained in future years. However, the prevalence of major risk factors in many high-income countries still offers much scope for prevention, and Japan's life expectancy is higher than most countries and yet it has achieved significant reductions in mortality since 2011.

- Epidemiological transition: Over the long term, improvements in life expectancy in most countries have shown phases of both faster and slower improvement, so the possibility that the current slowdown is transitional remains. For example, the recent slowdown for the UK may have been over-interpreted because it is often compared with unprecedented improvements in the early 2000s. Even in the pre and post 2011 periods examined in this report, some countries show exceptional swings. For example, Japan had the highest improvements in life expectancy at birth during 2011-16 after a period of slow improvement during 2001-11; in contrast, the UK experienced the weakest improvement during 2011-16 after making among the greatest gains during 2001-11 (ONS, 2018a). A recent analysis for the UK by the Global Burden of Disease group (Steel et al, 2018) provides some support for this hypothesis: it suggests that the overall change in mortality trend is the result of an evolving epidemiological transition, with multiple condition-specific and possibly cohort-based changes occurring concurrently, including changing exposure to certain risk factors eg those resulting from effective public health measures. Another example is of population ageing, resulting in rising numbers of older people living with dementia and other long-term conditions that may make them vulnerable to the effects of influenza, temperature extremes and other risk factors (PHE, 2018c). Such epidemiological changes could lead to changes in the number of deaths and the underlying causes of death.
- Limits to human longevity: Overall, life expectancy in EU countries is converging, with countries that have relatively lower life expectancies experiencing greater gains on average than those with high life expectancies. The gender gap is also narrowing, with male life expectancy improving faster than female life expectancy. These patterns suggest that the potential for improvement is greater when baselines are lower. However, the possibility that some countries may be reaching the limits to prolonging human life is unlikely to be tenable, given that (a) the post-2011 slowdown is observed also in many countries where life expectancy is lower than in comparator countries, (b) some countries with relatively high life expectancy have nonetheless shown large gains in recent years, for example, Japan and Italy, and (c) there is ample residual scope for primary prevention and risk factor control in most EU countries.

82. Box 6.4 provides further information about PHE's review of mortality trends in England and factors contributing to the recent slowdown in the pace of improvement (PHE, 2018c). Some of these considerations may apply also to other countries.

Box 6.4. Understanding the factors contributing to a slowdown in improvements in life expectancy: an example from England

Public Health England's (PHE's) *Health Profile for England 2018* includes an analysis of the contribution to changes in overall life expectancy of different age, gender and cause of death groups, to see where the greatest effects of slowing improvements are coming from (Figures 6.1 and 6.2) (PHE, 2018b). Possible explanatory factors are examined in a review commissioned by the Department for Health and Social Care following the stalling of life expectancy improvements since 2011 and the sharp increase in winter deaths in 2015 and 2018 (PHE, 2018c).

PHE examined a range of factors that may be impacting on recent mortality trends in England, although inevitably it could not consider all mortality determinants and many questions remain unanswered. The report illustrates the challenges in unpacking the multiple determinants of mortality, the concurrent changes in them, and the interactions between them. The analyses provide key, early pointers to what is driving the slowdown and where interventions can be targeted. While the context and patterns may differ in other countries, this report could provide relevant information for countries wanting to undertake similar lines of enquiry.

Some key findings are:

- the slowdown in mortality improvement is due to factors operating across both sexes and many age groups, geographies and causes of death
- ages 50-89 have had the biggest effect on reducing improvements in overall life expectancy
- the slowdown in CVD mortality improvements and rising mortality rates from dementia and Alzheimer's disease were significant contributors
- deaths (many related to influenza) among older people increased sharply in some winters
- with population ageing there are rising numbers of older people with dementia and other long-term conditions that may make them vulnerable to the effects of influenza and other risk factors
- younger ages made almost no contribution to life expectancy gains between 2011 and 2016 - largely because of the increased mortality from accidental poisonings at ages 20-44, a large proportion of which were from drug misuse
- life expectancy improvements slowed in all local areas but the slowdown was greatest in the more deprived areas and inequalities have widened
- it is likely that a number of factors operating simultaneously are driving the slowdown
- these changes have been occurring against a backdrop of fiscal austerity
- the slowdown is seen in many EU countries but has been greatest in UK
- while areas for further research are identified, so too are areas where health, care and other public services can take action based on what the findings show.

7. CONCLUSIONS AND NEXT STEPS

7.1. Overview

84. Overall, this report shows that in many EU and some other high-income OECD countries:

- improvements in life expectancy have been slowing since about 2010 because of a slowdown in mortality improvements; in the USA, life expectancy has fallen in recent years
- the slowdown is more pronounced at older ages, but is apparent also at other ages and in some countries (eg the USA, the UK) mortality in younger adults has been rising
- the slowdown is more pronounced for older females than older males
- there is a slowdown, in particular, in CVD mortality improvements, and mortality from dementia and Alzheimer's disease is increasing (although some of this could be due to diagnostic, death certification and coding changes); some countries (for example the UK, the USA, Canada) show adverse trends in deaths from accidental poisoning among younger adults, including opioid use
- mortality changes have been erratic in some years with deaths associated with influenza, pneumonia and other respiratory diseases showing a significant excess over seasonal levels in some winters, notably 2015 and 2018
- although the prevalence of some risk factors, such as smoking, high blood pressure and cholesterol, is continuing to fall, the prevalence of obesity and diabetes is rising, continuing a longer-term trend which may impact on mortality reduction from CVD and some other causes
- epidemiological transitions are continuing to impact on the pace and nature of mortality decline as, for example, with the rising number and proportion of deaths among older people from dementia, respiratory disease and co-morbidities seen in countries with ageing populations
- there has been considerable speculation and debate in some countries (notably the UK) about the causes of the slowdown in life expectancy improvements in recent years, in particular the role of post-2008 "austerity" programmes; the evidence suggests that causation is likely to be multifactorial.

85. The twentieth and the early years of the twenty-first century have seen dramatic increases in life expectancy, especially in high-income countries. The slowdown in mortality improvements in recent years seen in some EU and OECD countries therefore warrants scrutiny so that appropriate measures can be taken to address any underlying drivers amenable to intervention.

86. The slowdown has been most marked in the USA and the UK, where there has been considerable analysis of and comment on these trends. In the USA life expectancy is falling largely due to the rising midlife "deaths of despair" (especially from drug overdoses), and the slowdown in CVD mortality improvements. In England, the slowdown in CVD mortality improvements was a major contributor, with excess deaths

from influenza, pneumonia and other respiratory diseases also playing a role in some years (PHE, 2018c). Given also increasing mortality rates from accidental poisoning among young adults and widening inequalities, PHE's review noted that several factors are operating simultaneously across several age groups, geographies and causes of death. There has been debate in England about the impact of "austerity" on health, care and other public services, and the knock-on effects on slowing mortality improvements among older people. Overall, the evidence suggests that causation is likely to be multifactorial (PHE, 2018c, Raleigh, 2018a).

87. Other than in the USA and the UK, there has been little commentary in other EU countries that have experienced a slowdown in mortality improvements, possibly because the slowdown has been more moderate than in the UK and the USA. However, some of the causal factors are common across countries.

88. Although the slowing of improvements in life expectancy at birth is being driven mainly by the deceleration of mortality improvements among older people, there is evidence from several countries that younger ages are also experiencing a slowdown. The UK and the USA are perhaps the extreme examples, with mortality rates - especially from external causes, in particular drug misuse - among young adults increasing in recent years. However, in an international comparison (ONS, 2018a), most of the 20 countries studied experienced a slowdown in mortality improvements between 2011 and 2016 among adults aged 40 to 64 years to some extent. The current epidemiological trends are not therefore confined to older ages.

89. The slowdown in CVD mortality improvements in many EU and other high-income OECD countries, and possible contributory factors, needs further investigation. It was over two years before the large, abrupt and widespread falls in life expectancy in 2015 seen in many European countries raised comment, and the early indications are that excess deaths from influenza and a severe winter could make 2018 another bad year for mortality in some countries. These salient examples provide strong justification for close and timely monitoring of mortality trends, and prompt investigation of adverse changes, both being imperative for the early identification and targeting of appropriate policy levers (Raleigh, 2018b).

90. For example, although it identifies areas where further research is needed, PHE's review (PHE, 2018c) has provided clear pointers for action: the need to reduce CVD by addressing risk factors and the underlying wider determinants of health, more comprehensive coverage of influenza vaccination among older people and other at-risk groups, and targeting drug misuse among young adults. Increased winter deaths in some years and widening inequalities highlight the need to support the most vulnerable in society, particularly older people, to minimise the impact of poverty and diseases such as dementia and influenza.

7.2. Analysing the causes of mortality change presents several challenges

91. Although some countries are more affected by these trends than others, the slowdown in mortality improvements is widely observed and should be investigated. Some recent years have seen significant and widespread increases in winter and overall annual mortality, which adds to the importance and urgency of such monitoring and scrutiny. That said, there are several challenges in unpacking what's causing mortality improvements to slow across most EU countries, for example:

(a) Mortality is multifactorial in causation, with many social, economic, environmental, lifestyle and healthcare related factors determining outcomes. These factors also interact with each other and change over time, for better or for worse, making for significant challenges in interpreting mortality trends and what's driving the changes in them. This report lists some of the many factors that may be contributing to the recent slowdown in improvements in life expectancy in some EU countries, but it is not a comprehensive list. Identifying the different drivers, distinguishing between their relative impacts, and taking account of the interactions between them is complex, conceptually challenging, and requires good data.

(b) Interpreting changing mortality trends and identifying causation for older ages is especially challenging, given the high prevalence of co-morbidities among older people and the overlaying of chronic diseases with other triggers (eg a fall or respiratory infection that may cause or accelerate death).

(c) Analyses of individual causes of death can help to understand where improvements are lagging, but they can also present challenges in interpretation. For example, under-recording or diagnostic, death certification and coding changes leading to increased recording can make it difficult to interpret trends in deaths from dementia and Alzheimer's disease. Respiratory disease at or around the time of death is not always recorded as the underlying cause of death; in addition, as in 2015, deaths from other causes increase in seasons when influenza is circulating, and the impact of influenza is seen across a range of causes of death. Death certificates, especially for older people, may have several causes listed in addition to the underlying cause of death.

7.3. Suggestions for ways forward

92. The complexities notwithstanding, mortality trends should be closely monitored and investigated, so that early action can be taken to address any adverse changes - whether they are intermittent as with influenza or gradual but persistent as with CVD - when indicated. It's likely that many factors are contributing to recent mortality trends, some of which are country-specific and others common across countries (PHE, 2018c; Raleigh, 2018a). Further, detailed analyses at country and international levels to unpack mortality trends and their drivers would be necessary to identify the policy responses appropriate to each particular setting and those that apply more widely. It would therefore be premature and inappropriate to make generalised recommendations about policy interventions in this paper. Instead, this paper proposes ways in which the understanding of epidemiological trends can be strengthened in order to support an informed response individually and collectively across countries.

93. National strategies for monitoring mortality trends should be, and are, supplemented by international coordination and collaboration to support monitoring on a wider scale and investigation of patterns observed beyond individual country borders. Now is an opportune time to consider how national and international systems and processes for monitoring mortality trends can be strengthened further, with a view to informing policy-oriented action. Listed below are some suggestions for how this can be facilitated.

National level

1. At a national level, the timeliness of mortality data is imperative for identifying potential long and short term adverse trends early. But even in some high-income countries, national mortality data are often published after substantial delays, highlighting the importance of timely updating of vital registration systems (Jasilionis, 2018). Ho and Hendi (2018) note that although many high-income countries simultaneously experienced declines in life expectancy in 2015, this phenomenon was not identified until several years later, and to date, cause-specific mortality data for 2016 are not available for many countries, and few countries have all-cause mortality data for 2017. The timely release of vital statistics data should be a priority and would support improved monitoring of mortality trends.
2. With the increasing prevalence of multimorbidity in many populations, countries should be encouraged to undertake timely analyses of mortality records not just by underlying cause of death, but also by secondary causes of death (Raleigh, 2018a). Such analyses can help to identify patterns of co-morbidity and the true burden of conditions that trigger death but may not be coded as the underlying cause (eg CVD, heart failure or influenza), and circumvent some of the problems posed by changes in diagnostic, death certification and coding practices (as with dementia and Alzheimer's disease),
3. Disaggregated analyses by age, sex, region and socio-economic status can provide further insights into changing mortality patterns, disparities and population sub-groups that may be vulnerable or falling further behind others. Such analyses can inform the targeting of interventions at population sub-groups most at risk of premature or avoidable death.
4. In addition to vital statistics data, register-based or linked data can provide valuable insights into understanding epidemiological trends and disparities (Jasilionis, 2018, Raleigh 2018a). This is especially important given the increasing prevalence of multi-morbidities in the ageing populations of many countries, which make it difficult to interpret analyses of mortality records. For example, as shown in this report, linkage of inpatient hospital and mortality records shows that diagnosis on admission can be more informative about what caused the fatality than the recorded underlying cause of death. National agencies should be encouraged to invest in robust register-based and linked data systems that allow timely and accurate monitoring of changes in longevity.
5. Country participation in multinational mortality monitoring schemes can provide early warning of unusual mortality patterns and potential threats to health. For example, EuroMOMO is a routine public health mortality monitoring system aimed at measuring and detecting, on a real-time and weekly basis, excess numbers of deaths related to influenza and other public health hazards in participating European countries, using a standardised analytical approach that also allows for comparisons across countries. An illustration of the practical value of such schemes in informing early responsive action are EuroMOMO's weekly bulletins that were signalling excess winter deaths, especially among older people, in 2015 and throughout the early weeks of 2018. Similarly, during the 2009/10 influenza pandemic, the EuroMOMO network demonstrated how a timely, standardised, coordinated approach to mortality monitoring aided Europe's capacity to assess the impact of events with a potential public health impact.

International level

1. At an international level, there is a need for monitoring and reporting on trends across countries in the major causes of death by age and sex, and possibly a role for issuing alerts when exceptional patterns are observed. International organisations such as the OECD play a key role in benchmarking; this could be extended to include commentary on changing trends (such as the recent slowdowns in the pace of life expectancy and CVD mortality improvements) and exceptional patterns (such as the widespread falls in life expectancy in 2015 followed by a recovery in 2016).
2. Investigations of salient epidemiological trends that are widely observed, such as the recent slowdowns in life expectancy and CVD mortality improvements in many countries, are challenging to undertake, as described elsewhere in this report, and could benefit from a pooling of international expertise and effort. The OECD, possibly in partnership with other international agencies such as WHO and leading researchers, could lead the dialogue and collaboration on investigating such notable and widely prevalent epidemiological trends. Likewise, consideration should be given to analysing annual mortality peaks and troughs if they are observed consistently across several countries (ie what makes some years "good" and some "bad" in terms of mortality), and whether such fluctuations are likely to become more frequent with population ageing and increasing numbers of frail, multi-morbid older people. The investigation of annual volatility could also include consideration of whether "scarring versus selection" plays a role (ie whether adverse health events leave either more frail or more robust survivors), depending on the extent of scarring and mortality selection.

7.4. Future trends are unclear

94. Looking ahead, it's unclear whether the current slowdown in mortality improvements in some EU countries is a long-term trend or not, whether the slowdown in major killers such as CVD persists, and whether or not the excess winter mortality seen in some years becomes a regular feature given population ageing and increasing numbers of frail, older people. Historically, there have been periods of fast and slow improvements in life expectancy across Europe. The current slowdown itself follows a period of more rapid improvement in the earlier years of this century, so changes in the pace of improvements are not unprecedented. Japan (although an exception) is an example of earlier stagnation in mortality improvements followed by robust increases recently, whereas the UK shows the reverse pattern, swinging from one of the fastest "improvers" pre-2011 to the slowest post-2011 (a similar pattern is seen in many other EU countries although with more moderate changes). The recurrence of sharp fluctuations in mortality, such as that seen in 2015, is also unpredictable and likely to depend on intermittent and changeable factors such as extremes of weather and circulation of viral infections, influenza in particular. The timely and effective monitoring and investigation of mortality trends, including through international collaboration where possible, can facilitate early implementation of remedial strategies.

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Annex A.

Table A.1. Life expectancy at birth

	Males												Females											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU (28 countries)	75.4	75.8	76	76.3	76.6	76.9	77.3	77.4	77.7	78.1	77.9	78.2	81.5	82	82.2	82.3	82.6	82.8	83.1	83	83.3	83.6	83.3	83.6
Austria	76.6	77.1	77.4	77.7	77.6	77.8	78.3	78.4	78.6	79.1	78.8	79.3	82.2	82.8	83.1	83.3	83.2	83.5	83.8	83.6	83.8	84	83.7	84.1
Belgium	76.2	76.6	77.1	76.9	77.4	77.5	78	77.8	78.1	78.8	78.7	79	81.9	82.3	82.6	82.6	82.8	83	83.3	83.1	83.2	83.9	83.4	84
Bulgaria	69	69.2	69.5	69.8	70.2	70.3	70.7	70.9	71.3	71.1	71.2	71.3	76.2	76.3	76.6	77	77.4	77.4	77.8	77.9	78.6	78	78.2	78.5
Croatia	71.7	72.4	72.2	72.3	72.8	73.4	73.8	73.9	74.5	74.7	74.4	75	78.8	79.3	79.2	79.7	79.7	79.9	80.4	80.6	81	81	80.5	81.3
Cyprus	76.5	78.1	77.6	78.2	78.5	79.2	79.3	78.9	80.1	80.3	79.9	80.5	80.8	82	82.1	82.9	83.5	83.9	83.1	83.4	85	84.3	83.7	84.9
Czech Rep.	72.9	73.5	73.8	74.1	74.3	74.5	74.8	75.1	75.2	75.8	75.7	76.1	79.2	79.9	80.2	80.5	80.5	80.9	81.1	81.2	81.3	82	81.6	82.1
Denmark	76	76.1	76.2	76.5	76.9	77.2	77.8	78.1	78.3	78.7	78.8	79	80.5	80.7	80.6	81	81.1	81.4	81.9	82.1	82.4	82.8	82.7	82.8
Estonia	67.6	67.6	67.5	68.9	70	70.9	71.4	71.4	72.8	72.4	73.2	73.3	78.2	78.6	78.9	79.5	80.3	80.8	81.3	81.5	81.7	81.9	82.2	82.2
Finland	75.6	75.9	76	76.5	76.6	76.9	77.3	77.7	78	78.4	78.7	78.6	82.5	83.1	83.1	83.3	83.5	83.5	83.8	83.7	84.1	84.1	84.4	84.4
France	76.7	77.3	77.6	77.8	78	78.2	78.7	78.7	79	79.5	79.2	79.5	83.8	84.5	84.8	84.8	85	85.3	85.7	85.4	85.6	86	85.6	85.7
Germany	76.7	77.2	77.4	77.6	77.8	78	77.9	78.1	78.1	78.7	78.3	78.6	82	82.4	82.7	82.7	82.8	83	83.1	83.1	83	83.6	83.1	83.5
Greece	76.8	77.1	76.9	77.5	77.5	78	78	78	78.7	78.8	78.5	78.9	82.5	82.7	82.5	83	83.3	83.3	83.6	83.4	84	84.1	83.7	84
Hungary	68.7	69.2	69.4	70	70.3	70.7	71.2	71.6	72.2	72.3	72.3	72.6	77.2	77.8	77.8	78.3	78.4	78.6	78.7	78.7	79.1	79.4	79	79.7
Ireland	76.7	76.9	77.3	77.9	77.8	78.5	78.6	78.7	78.9	79.3	79.6	79.9	81.3	81.7	82.1	82.4	82.7	83.1	83	83.1	83.1	83.5	83.4	83.6
Italy	78.1	78.6	78.8	78.9	79.1	79.5	79.7	79.8	80.3	80.7	80.3	81	83.6	84.1	84.2	84.2	84.3	84.7	84.8	84.8	85.2	85.6	84.9	85.6
Latvia	64.9	65	65.3	66.5	67.5	67.9	68.6	68.9	69.3	69.1	69.7	69.8	76.3	76.1	76.2	77.5	77.7	78	78.8	78.9	78.9	79.4	79.5	79.6
Lithuania	65.2	65	64.5	65.9	67.1	67.6	68.1	68.4	68.5	69.2	69.2	69.5	77.4	77.1	77.2	77.6	78.7	78.9	79.3	79.6	79.6	80.1	79.7	80.1
Luxembourg	76.7	76.8	76.7	78.1	78.1	77.9	78.5	79.1	79.8	79.4	80	80.1	82.3	81.9	82.2	83.1	83.3	83.5	83.6	83.8	83.9	85.2	84.7	85.4
Malta	77.3	77	77.5	77.1	77.9	79.3	78.6	78.6	79.6	79.9	79.8	80.6	81.4	82	82.2	82.3	82.7	83.6	83	83	84	84.3	84.1	84.4
Netherlands	77.2	77.7	78.1	78.4	78.7	78.9	79.4	79.3	79.5	80	79.9	80	81.7	82	82.5	82.5	82.9	83	83.1	83	83.2	83.5	83.2	83.2
Poland	70.8	70.9	71	71.3	71.5	72.2	72.5	72.6	73	73.7	73.5	73.9	79.3	79.7	79.8	80	80.1	80.7	81.1	81.1	81.2	81.7	81.6	82
Portugal	74.9	75.5	75.9	76.2	76.5	76.8	77.3	77.3	77.6	78	78.1	78.1	81.5	82.5	82.5	82.7	82.8	83.2	83.8	83.6	84	84.4	84.3	84.3
Romania	68.4	69	69.5	69.7	69.8	70	70.8	70.9	71.6	71.3	71.5	71.7	75.4	76.1	76.8	77.5	77.7	77.7	78.2	78.1	78.7	78.7	78.7	79.1
Slovak Rep.	70.2	70.4	70.6	70.9	71.4	71.8	72.3	72.5	72.9	73.3	73.1	73.8	78.1	78.4	78.4	79	79.1	79.3	79.8	79.9	80.1	80.5	80.2	80.7
Slovenia	73.9	74.5	74.6	75.5	75.9	76.4	76.8	77.1	77.2	78.2	77.8	78.2	80.9	82	82	82.6	82.7	83.1	83.3	83.3	83.6	84.1	83.9	84.3
Spain	77	77.8	77.9	78.3	78.8	79.2	79.5	79.5	80.2	80.4	80.1	80.5	83.6	84.4	84.4	84.6	85	85.5	85.6	85.5	86.1	86.2	85.7	86.3
Sweden	78.5	78.8	79	79.2	79.4	79.6	79.9	79.9	80.2	80.4	80.4	80.6	82.9	83.1	83.1	83.3	83.5	83.6	83.8	83.6	83.8	84.2	84.1	84.1
UK	77	77.3	77.6	77.7	78.3	78.6	79	79.1	79.2	79.5	79.2	79.4	81.3	81.6	81.8	81.8	82.4	82.6	83	82.8	82.9	83.2	82.8	83
Norway	77.8	78.2	78.3	78.4	78.7	79	79.1	79.5	79.8	80.1	80.5	80.7	82.7	82.9	82.9	83.2	83.2	83.3	83.6	83.5	83.8	84.2	84.2	84.2

Table A.2. Life expectancy at 65

	Males												Females											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU (28 countries)	16.4	16.8	16.9	17.1	17.3	17.5	17.7	17.7	17.9	18.2	17.9	18.2	19.9	20.4	20.5	20.6	20.8	21	21.3	21.1	21.3	21.6	21.2	21.6
Austria	17	17.3	17.5	17.7	17.6	17.9	18.1	18.1	18.2	18.5	18.1	18.5	20.3	20.7	21	21.1	21.2	21.4	21.7	21.3	21.5	21.8	21.3	21.7
Belgium	16.6	17	17.3	17.3	17.6	17.6	18	17.7	17.8	18.4	18.2	18.4	20.2	20.6	21	20.9	21.2	21.3	21.6	21.3	21.4	21.9	21.5	21.9
Bulgaria	13.1	13.2	13.3	13.6	13.9	13.8	14	13.9	14.2	14.1	14	14.2	16.2	16.3	16.5	16.8	17.1	17.1	17.3	17.3	17.9	17.6	17.6	17.9
Czech Rep.	14.4	14.8	15.1	15.3	15.2	15.5	15.6	15.7	15.7	16.1	15.9	16.2	17.7	18.3	18.5	18.8	18.8	19	19.2	19.2	19.3	19.8	19.4	20
Denmark	16.1	16.2	16.5	16.6	16.8	17	17.3	17.5	17.7	18.1	18	18.2	19.1	19.2	19.2	19.5	19.5	19.7	20.1	20.2	20.4	20.8	20.7	20.8
Germany	16.9	17.2	17.4	17.5	17.6	17.8	17.7	17.8	17.8	18.2	17.9	18.1	20.1	20.5	20.7	20.7	20.8	20.9	21.1	21	20.9	21.4	21	21.3
Estonia	13.1	13.2	13.2	13.7	14.1	14.3	14.8	14.8	15.2	15.2	15.5	15.6	18.1	18.4	18.5	18.9	19.3	19.5	20.1	20.3	20.3	20.4	20.7	20.9
Ireland	16.5	16.6	17	16.8	17.4	17.7	17.9	17.8	18.1	18.4	18.4	18.6	19.7	19.9	20.1	20.3	20.7	20.8	20.9	20.9	20.8	21.1	21	21.1
Greece	17.3	17.5	17.4	17.8	18	18.2	18.2	18.1	18.7	18.8	18.5	18.9	20.3	20.4	20.2	20.6	20.9	21	21.2	20.9	21.6	21.7	21.3	21.7
Spain	17.2	17.8	17.7	18.1	18.3	18.6	18.8	18.7	19.2	19.3	19	19.4	21.2	21.9	21.9	22.1	22.5	22.9	23	22.8	23.4	23.5	23	23.6
France	17.7	18.2	18.4	18.5	18.7	18.9	19.3	19.1	19.3	19.7	19.4	19.6	22	22.7	23	23	23.2	23.4	23.8	23.4	23.6	24	23.5	23.7
Croatia	13.8	14.2	14.1	14.4	14.5	14.7	15.1	15	15.3	15.5	15.2	15.6	17.3	17.8	17.8	18	18	18.2	18.6	18.7	19.1	19.1	18.7	19.2
Italy	17.3	17.7	17.9	17.9	18.1	18.3	18.5	18.5	18.9	19.2	18.9	19.4	21.1	21.6	21.7	21.7	21.8	22.1	22.2	22.1	22.6	22.8	22.2	22.9
Cyprus	16.7	17.3	17.2	17.8	18	18.3	18.2	17.9	18.6	18.7	18.4	19	19	19.4	19.5	20.3	20.7	21	20.3	20.4	21.6	21.3	20.8	21.8
Latvia	12.3	12.5	12.6	12.8	13.2	13.1	13.4	13.6	13.9	13.8	14.2	14	17	17.1	17.1	17.7	18.1	18.1	18.7	18.5	18.6	19	18.9	19
Lithuania	13.2	13.3	13.1	13.6	13.6	13.8	14	14.1	14.1	14.3	14.1	14.2	17.9	17.9	18.2	18.4	18.8	18.8	19.2	19.2	19.2	19.5	19.2	19.4
Luxembourg	16.7	17	16.4	17.4	17.6	17.3	17.8	18.4	19.1	18.4	18.9	18.9	20.4	20.3	20.3	21	21.4	21.6	21.6	21.4	21.9	22.7	21.8	22.7
Hungary	13.3	13.6	13.7	13.9	14	14.1	14.3	14.3	14.5	14.6	14.5	14.6	17.2	17.7	17.8	18.1	18.2	18.2	18.3	18.1	18.4	18.6	18.2	18.7
Malta	16.3	16.2	16.7	17.1	16.8	18.5	17.7	17.6	18.4	18.6	18.8	19.7	19.4	19.6	20.3	20.1	20.6	21.1	21	21	21.4	21.7	21.6	22.1
Netherlands	16.4	16.8	17.1	17.4	17.6	17.7	18.1	18	18.2	18.6	18.4	18.5	20.1	20.3	20.7	20.7	21	21	21.2	21	21.2	21.4	21.1	21.1
Poland	14.3	14.5	14.6	14.8	14.8	15.1	15.4	15.4	15.5	15.9	15.7	16	18.5	18.8	18.9	19.1	19.2	19.5	19.9	19.8	19.9	20.4	20.1	20.5
Portugal	16.1	16.6	16.8	17	17.2	17.2	17.8	17.6	17.8	18.1	18	18	19.7	20.5	20.4	20.6	20.8	21	21.6	21.3	21.6	21.9	21.7	21.8
Romania	13.1	13.5	13.9	14.2	14.3	14.2	14.5	14.4	14.7	14.7	14.5	14.7	15.9	16.4	16.9	17.7	17.8	17.6	17.8	17.7	18.1	18.1	18	18.3
Slovenia	15.2	15.8	15.9	16.4	16.4	16.8	16.9	17.1	17.2	17.7	17.6	17.9	19.3	20	20.2	20.5	20.5	21	21.1	21.1	21.4	21.6	21.4	21.8
Slovak Rep.	13.3	13.4	13.6	13.8	14.1	14.1	14.5	14.6	14.7	15.1	15	15.3	17.1	17.3	17.5	17.8	18	18	18.4	18.5	18.8	19.1	18.8	19.2
Finland	16.8	16.9	17	17.5	17.3	17.5	17.7	17.8	18	18.2	18.3	18.2	21	21.2	21.2	21.3	21.5	21.5	21.7	21.6	21.8	21.7	21.9	21.9
Sweden	17.4	17.7	17.9	18	18.2	18.3	18.5	18.5	18.8	18.9	18.9	19.1	20.7	20.9	20.8	20.9	21.2	21.2	21.3	21.1	21.3	21.6	21.5	21.5
UK	17	17.3	17.5	17.6	18	18.2	18.5	18.5	18.6	18.8	18.6	18.8	19.7	20.1	20.2	20.2	20.7	20.8	21.1	20.9	20.9	21.3	20.8	21.1
Norway	17.2	17.7	17.4	17.6	18	18	18.2	18.3	18.5	18.8	18.9	19.1	20.9	20.8	20.8	21	21.1	21.2	21.4	21	21.4	21.6	21.6	21.6

Source for tables A.1 and A.2: Eurostat

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