



EMBARGOED PRE-PUBLICATION COPY – NOT FOR WIDER  
CIRCULATION

# Resetting the course for population health

Evidence and recommendations to address  
stalled mortality improvements in Scotland  
and the rest of the UK.

May 2022



## Translations and alternative formats

If you require this report in a different language or format, such as a plain text version, accessible PDF, audio, braille, BSL or large print, please contact us at:

**info@gcph.co.uk** or on **0141 330 2747**



## Citation

This report should be cited as: McCartney G, Walsh D, Fenton L, Devine R. Resetting the course for population health: evidence and recommendations to address stalled mortality improvements in Scotland and the rest of the UK. Glasgow; Glasgow Centre for Population Health/University of Glasgow: 2022.

## Contact

For further information contact:

### **Dr Gerry McCartney**

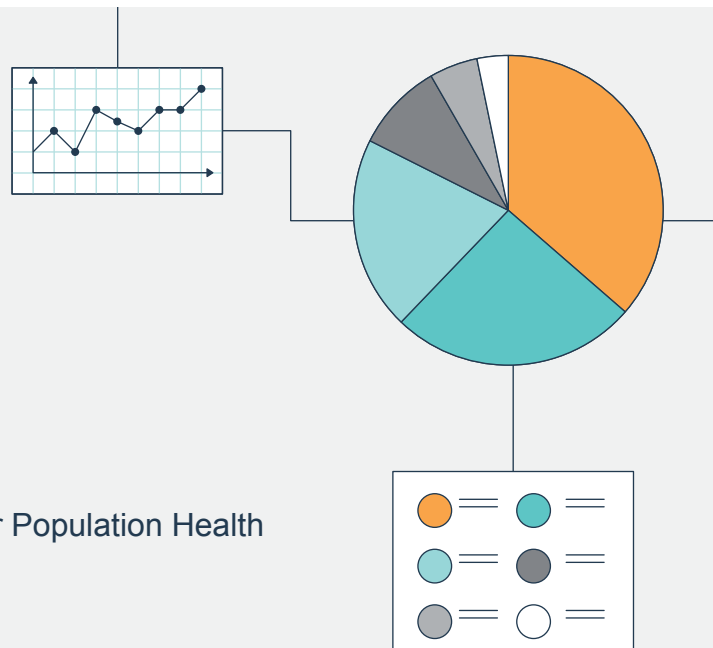
Professor of Wellbeing Economy, University of Glasgow

Email: [gerard.mccartney@glasgow.ac.uk](mailto:gerard.mccartney@glasgow.ac.uk)

### **Dr David Walsh**

Public Health Programme Manager, Glasgow Centre for Population Health

Email: [david.walsh.2@glasgow.ac.uk](mailto:david.walsh.2@glasgow.ac.uk)



## A note on terminology

For readers unaware of different metrics of population health, it is important to note that life expectancy is not (as it is sometimes misreported to be) a measure of the average lifespan of someone born today; rather, period life expectancy at birth is a measure of the average number of years a new-born is expected to live *if current mortality rates continue to apply*.<sup>1</sup> It is calculated from exactly the same data that are used to calculate age-standardised mortality rates and is simply a different (and arguably more intuitive) way of showing the same information. In this report both life expectancy and age-standardised mortality rates are used as summary measures of population mortality.

FINAL DRAFT

## Summary

### Background

Mortality rates, and related indicators such as life expectancy, are important markers of the overall health of a population. This report summarises the nature and causes of the deeply concerning changes to these indicators that have been seen in Scotland, and across the UK, since around 2012. While the focus is on Scotland and the UK nations, relevant data and evidence from around the world have been used where appropriate.

### Trends in mortality

With a few notable exceptions (e.g. during periods of war or pandemic, or in particular circumstances such as in the former USSR in the 1990s) mortality rates in high-income countries have improved for more than a century. However, around 2012 these improvements stalled in many countries, including all the UK nations. The stalling was seen for males and females, across almost all age groups, and for almost all causes of death. Mortality rates for people living in the most deprived areas increased; and as a consequence inequalities rapidly widened. These stalled trends predate the COVID-19 pandemic, but have been exacerbated by it.

### Suggested factors in the change in trends, and evidence for these

Several hypotheses have been suggested as possible contributors to the stalled mortality trends: reduced improvements in cardiovascular disease mortality; increased drug-related deaths; increased deaths due to dementia and Alzheimer's disease; increased deaths due to Influenza; increased prevalence of obesity; demographic factors; UK Government economic 'austerity' policies (implemented as cuts to public spending including social security and important services); and increased deaths due to weather and temperature extremes.

For some of these hypotheses there is little evidence that they are contributing causes. For several others there are identifiable inter-relationships, and it is possible to use the evidence to position them on a causal pathway.

Austerity is evidenced as making an important and substantial causal contribution, and is likely to underpin a number of the other observed changes. Obesity is also likely to be making some contribution, although this is unlikely to be large and is due to the increase in obesity during the 1990s and up to 2010. In contrast, influenza, weather/temperature, and all of the demographic factors (population ageing, age standardisation issues, population estimates and migration, so-called 'tempo effects' and mortality shifts over time, limits to life expectancy, and cohort effects) are unlikely to be making any meaningful, causal, contribution to the stalled trends. The specific causes of death that contribute most to the overall stalling are reduced improvements in cardiovascular mortality and increased drug-related deaths. Whilst there are some actions which can moderate these specific causes of mortality, substantial changes in trends will depend on also addressing the linked underlying 'causes of the causes'.

## **Recommendations**

A series of recommendations have been developed, based on evidence of what would be the most effective responses to address the identified economic causes of stalled mortality trends. These include proposals made by other organisations and experts. The recommendations are arranged in terms of different levels of governance (at UK Government level, Scottish Government level, and at local government/health board level). More detail on the rationale for the recommendations is provided in section 6.

### **Macroeconomic policy**

#### *At UK level*

1. Design fiscal policy to avoid austerity approaches which limit public spending, especially during periods of economic downturn.

#### *At all levels*

2. Seek opportunities to change the economic structures that lead to large wealth and income inequalities by introducing appropriate policies to reverse or mitigate the processes of: rent extraction (e.g. rent controls and public/community ownership), capital gains (e.g. land value taxation), profit (e.g. plural ownership of industry), monopoly (e.g. anti-trust regulations) and speculation (e.g. through financial regulation), and to diversify economic ownership (e.g. public ownership and co-operatives) as with Community Wealth Building.

### **Social security**

#### *At UK level*

3. Increase all benefits and tax credits in line with inflation every year, and put in place a one-off increase now to compensate for the loss of real income since 2010. The reinstatement of the £20 per week uplift in Universal Credit that was in place during the early part of the COVID-19 pandemic would be a contribution towards this.
4. Reduce welfare conditionality, starting with the increases in conditionality introduced since 2010.
5. Ensure that access to the social security system across the UK is seen as a right, and that citizens using the system are treated with dignity and respect.

#### *At Scottish level*

6. Use fiscal powers to top up reserved benefits and reverse UK cuts.
7. Create new benefits and increase existing benefits to support those in low income households. Specifically, increase the Scottish Child Payment to £40 per week to meet Child Poverty reduction targets.

#### *At Local level*

8. Provide high quality money advice and welfare rights services to ensure people receive all the benefits and other entitlements for which they are eligible.

### **Work**

#### *At UK level (and other levels where appropriate)*

9. Improve the availability of ‘good work’ by increasing in-work benefits, improving employee control at work and minimising health and safety risks in the work environment.
10. Increase the statutory living wage to the Real Living Wage.
11. Provide 30 hours per week of funded, good quality and flexible education and childcare for all children from age one to five.
12. Eradicate the restrictions on trade unions.

*At Scottish level*

13. Measure economic and social progress through health and wellbeing measures instead of Gross Domestic Product.

*At Local level*

14. Use public spend to advance progressive employment practices, including good/fair work, and to create healthier working environments.
15. Maximise the potential of City and Regional Growth Deals to reduce inequality and improve health.
16. Implement the principles of inclusive economies to ensure that the economy is redesigned to achieve economic, social and health equity.

**Taxation**

*At UK level*

17. Address tax evasion and avoidance among individuals and corporations as a means of achieving fairer taxation across the UK.
18. Increase taxation of wealth, assets and corporate profits, reverse the concentration of asset ownership and reregulate the financial industry.

*At UK and Scottish level*

19. Introduce more progressive, and therefore fairer, income tax bands and rates to narrow income inequalities across society.

*At Scottish level*

20. Use fiscal powers to narrow inequalities by replacing council tax with a fairer alternative.

**Public services**

*At UK and Scottish level*

21. Increase public sector funding for preventative services, resist privatisation of clinical care and ensure proportionate universalism of service provision.
22. Reverse the reductions to social care funding and put in place an increase now to compensate for the loss of real income incurred since 2010.
23. Change drugs legislation to reduce drug harms as part of accepting the recommendations of the cross-party Westminster committee on drugs harms in Scotland.

*At Scottish level*

24. Increase funding for public services back to 2010 levels as a minimum, particularly for local government.
25. Implement a public health approach to drugs services.

*At Local Level*

26. Design local services for the populations they serve, involving citizens in the design of services where possible.

### **Material needs**

#### *At UK and Scottish level*

27. In addition to the actions above to increase social security, we also need to eliminate fuel poverty through action on housing insulation and heating.
28. Help prevent poverty by growing a social rented housing sector that is accessible, affordable and provides secure tenancies.
29. Extend the housing quality standard to the private rented and tied housing sectors, avoiding associated rental increases or reduced housing availability.
30. Eliminate food poverty by addressing the causes of poverty and implementing a human-rights based approach to food access.
31. Develop and commit to targets to reduce child poverty across the UK.

#### *At Scottish level*

32. Increase the provision of social housing in Scotland.

#### *At a local level*

33. Reduce the cost of public transport for those most in need.

### **Obesity**

#### *At all levels*

34. Implement and evaluate an evidence-based whole-system obesity strategy which prioritises actions that addresses the commercial determinants of obesity and takes a structural approach.

### **Improved understanding**

#### *UK level*

35. Facilitate linkage between DWP, HMRC, NHS and mortality records to allow for the health and mortality impact of policy changes to be accurately evaluated.

#### *At all levels*

36. Commit to taking the necessary action to respond to the changes in life expectancy trends.
37. Public Health leaders should advocate for action to reduce the health inequity that leads to stark inequalities in premature mortality.
38. Commit to a programme of ongoing monitoring and research in relation to the stalled trends (including for groups where there are limited data, such as ethnic minorities), and to broaden understanding of the trends beyond high-income countries.
39. Improve and modernise the measurement of poverty.

### **Social recovery from COVID-19**

#### *At all levels*

40. Incorporate and prioritise the actions in this document within the plans for social recovery from the COVID-19 pandemic.

Given the substantial loss of life both from the stalled mortality trends and the COVID-19 pandemic, urgent policy action is now required if we are to reset our course towards improving population health.

FINAL DRAFT



## Contents

A note on terminology .....	3
Summary .....	4
Acknowledgements .....	10
1. Background .....	11
2. Methods .....	12
3. Descriptive epidemiology .....	14
4. Critical appraisal of causal evidence .....	21
4.1 Reduced improvements in cardiovascular disease mortality .....	22
4.2 Increase in drug-related deaths .....	25
4.3 Increase in deaths due to dementia and Alzheimer’s disease .....	30
4.4 Increased deaths due to Influenza .....	33
4.5 Increased prevalence of obesity .....	35
4.6 Demographic factors .....	38
4.7 Austerity policies .....	41
4.8 Increased deaths due to weather and temperature extremes .....	46
5. Synthesis of the evidence .....	48
6. Conclusions and recommendations .....	52
Appendix 1 – summary of obesity contribution methods .....	67
References .....	68

## Acknowledgements

We would like to thank the following individuals for helpful comments on a draft of the report: Emma Baird, Suzanne Connolly, Jennie Coyle, Jonny Currie, Danny Dorling, Emma Doyle and Jim McMenamin.

We would also like to thank the Scottish Directors of Public health group and the Mortality Special Interest Group organised by the Scottish Public Health Network (ScotPHN) for helpful comments on this work.

FINAL DRAFT

# 1. Background

Mortality rates, and related indicators such as life expectancy, are important markers of the overall health of a population. Using such indicators, we know a lot about how health in Scotland – and in other countries, including the different nations of the UK – has fared over time. We know that mortality rates increased (and life expectancy consequently decreased) in the last two years (2020 and 2021) because of the COVID-19 pandemic;<sup>2,3</sup> however, we would expect them to return to pre-pandemic levels once we emerge from the current crisis. Indeed, it is those pre-pandemic trajectories for population health, and in particular changes that have occurred to them in the last decade, that are the principal focus of this report.

We also know that prior to the pandemic, Scotland's mortality rates were higher than in other Western European countries. This has been influenced by two related factors: a slower rate of improvement from the latter half of the 20<sup>th</sup> Century onwards (including, especially, from the start of the 1980s); and very wide inequalities in mortality, driven by correspondingly wide *socioeconomic* inequalities, the well understood 'fundamental causes' of health inequalities.<sup>4,5</sup> Importantly, however, despite this *slower rate of* improvement over time, rates in Scotland had still been improving. And this is what we would expect: in high income countries, mortality rates have fallen consistently over time as a result of improved living conditions, public health interventions (e.g. vaccination programmes), medical advances and a range of other factors.<sup>6</sup> Indeed, in the hundred years or so before 2020, the only observed increases in UK mortality rates occurred at the time of the two world wars and the influenza pandemic of 1918-20.<sup>4,8</sup>

However, a profound change in mortality rates has been observed across the whole of the UK since the early 2010s. Described in much more detail in section 3 of this report, there has been a stalling of improvement overall, accompanied by *increasing* death rates among large sections of the population living in more socio-economically deprived areas.<sup>9,10,11</sup> This is hugely worrying: put simply, we should not see such trends in a wealthy society such as the UK.

These changes have also resulted in a dramatic widening of health inequalities across and within different parts of Scotland, England, Northern Ireland<sup>10</sup> and Wales<sup>12</sup> – inequalities that apart from anything else, are hugely important context for understanding the scale of COVID-19 inequalities that have been much publicised and discussed recently.<sup>13,14</sup> There is an urgent need, therefore, to understand the causes of these changes, and consequently what we need to do to reset our course towards improving population health. The aims of this report, therefore, are to do precisely that: to assess and synthesise all the evidence for these changing mortality and life expectancy trends across Scotland and the rest of the UK, and to propose solutions to address them.

The structure of the report is as follows: in section 2 we briefly describe the methods employed in this research; in section 3 we summarise the descriptive epidemiology that has been undertaken, including details of the timing and composition of the changes and international comparisons; in section 4 we present a critical appraisal of the evidence pertaining to various hypotheses that have been put forward to explain the changes; in section 5 we provide a synthesis of that evidence and identify the most likely causes of the trends and their inter-relationships; and in section 6 we set out policy recommendations which we believe must be implemented if we are to address the issues highlighted here – and ultimately, therefore, prevent more unnecessary premature deaths occurring among us.

## 2. Methods

The general methodological approach for this report is described briefly below in relation to each of the substantive parts. More detailed methods for the individual contributing studies and analyses are provided as appropriate in the references, footnotes and appendices.

### Descriptive epidemiology

The section on the descriptive epidemiology of the trends aims to provide the reader with an understanding of the nature of the problem we have identified and seek to explain. Using published data and analyses it covers: the timing of the change in the mortality trends; the magnitude of the change; the specific causes of death and age-specific mortality rates contributing to the rate of change in life expectancy; and a description of the inequalities in the trends.<sup>a</sup> The focus is on Scotland and the UK, but reference to data from other countries is included where it is available and relevant. It covers the period up to 2019 (where data are available) so as not to confuse the trends with the mortality effects of the COVID-19 pandemic.

### Critical appraisal of causal evidence

Hypotheses identified from workshops,<sup>b</sup> discussions and publications to explain the changed trends are described, and then the relevant published literature and data relevant to each hypothesis are summarised. Each hypothesis is then critically appraised in terms of: its cogency in explaining a contribution to the stalled trends; the sources of bias in the underlying evidence; and remaining uncertainties. An assessment of the causal contribution is undertaken at the synthesis stage.

---

<sup>a</sup> The best measures of mortality take into account the changing size of the population in each age group and for each sex over time, and are termed Age-Sex Standardised Mortality Rates (ASMRs). Life expectancy is a summary measure of the mortality rates that occur in any given population at a point in time. Life expectancy changes more with an increase or decrease in deaths at younger ages than with the same number of deaths at older ages. Life expectancy can be a more accessible number for public understanding than a mortality rate which involves a numerator and denominator that are of an unfamiliar scale, especially when these numbers have been further adjusted through the standardisation process. However, it is also easily misunderstood, as it is not a prediction of the age at which people will die. For smaller populations (e.g. local authorities or for younger age groups), ASMRs and life expectancy measures can be more variable over time due to their being fewer deaths and the random variation that can occur in their timing. For smaller populations and for populations with a small number of deaths, it is therefore more appropriate to consider trends over time (or averages over several years), instead of the data for any single year.

<sup>b</sup> A series of workshops involving colleagues from the national public health agencies of Scotland, England, Wales and Northern Ireland were held in 2018 and 2019 to discuss possible causes of the stalled mortality trends. See <https://www.scotpho.org.uk/population-dynamics/recent-mortality-trends/mortality-trends-uk-wide-workshops/> for more information.

## Synthesis

The framework for assessing causal contributions from observational evidence described by Gordis<sup>c</sup> is applied to each hypothesis in turn.<sup>15</sup> This involves assessment of the totality of the evidence for each hypothesis by four major and three other considerations. The major considerations are: evidence of a temporal relationship (i.e. cause before effect); biologic[al] plausibility; consistency (across data sources, methods, research groups, contexts); and the presence of alternative explanations (i.e. the likelihood of 'residual confounding'<sup>d</sup> in the effect estimates). The other considerations are: presence of a dose-response gradient (whereby a greater exposure leads to a greater effect); strength of association (where a larger effect size makes causality more likely); and cessation effects (where the reduction or cessation of an exposure is followed by a reduction or elimination of an observed effect). The hypotheses assessed to have evidence of a causal relationship to the stalled trends are then considered together for their fit into a single causal model with any uncertainties described.

## Recommendations

The recommendations included in this report were developed following discussion of the evidence of the causes of the stalled trends, to identify opportunities for intervention. In addition, an online scoping search was carried out to identify existing relevant recommendations, the ideas in which were summarised and synthesised.<sup>7 8 16-23</sup> The final recommendations echo what other organisations such as Oxfam, NHS Health Scotland, Joseph Rowntree Foundation and the Child Poverty Action Group have proposed would make a difference to the population's ability to lead long and healthy lives.

They were discussed, adapted and refined after presentation to the Scottish Mortality Special Interest Group and the Scottish Directors of Public Health group (see [www.scotphn.net](http://www.scotphn.net)). The recommendations were organised under six headings: social security, work, taxation, public services, material needs and improved understanding. We have made recommendations for action at UK, Scottish and local level.

Following on from this, a further heading has been added to acknowledge the need for incorporation and prioritisation of these actions within the social recovery from the COVID-19 pandemic.

---

<sup>c</sup> This is a causal inference framework developed for observational epidemiology which builds upon the Bradford-Hill framework for assessing whether an association is causal or not.

<sup>d</sup> Confounding is where a third factor, or set of factors, might explain the association between an exposure and outcome. Residual confounding is more specifically when there remains confounding after adjusting for measured confounding factors, from unmeasured variables.

### 3. Descriptive epidemiology

#### Timing of the stalled trends across countries

Since at least the mid-19<sup>th</sup> Century, average mortality rates for the UK have tended to improve year-on-year with exceptions only for times of pandemic disease (e.g. influenza in 1918-1919) and war (1940-1945).<sup>4,5</sup> However, around 2012-2014, the trends for all the UK nations changed,<sup>9</sup> with little or no subsequent improvement up until 2020 and the COVID-19 pandemic (which led to a rise in mortality rates). The net result of this was that life expectancy by 2018 across the UK nations was substantially below what would have been expected had the improving trends seen between 1990 and 2011 continued (Figure 3.1). In Scotland this meant that for both males and females, life expectancy was 1.3 years less than would have been expected had those previous trends continued.<sup>24</sup>

Across many, but not all, high income countries a similar change in trend was observed such that the rate of improvement in life expectancy and mortality was much less after around 2012-4 than beforehand (Figure 3.2). Up until 2012, all of the high-income countries with available data were gaining between 10 and 20 weeks of additional life expectancy each year. However, after 2012 the rate of improvement decreased in about half of those countries, with Iceland, the USA, England & Wales, Scotland, Germany and the Netherlands all displaying much slower rates of improvement. However, some other countries, such as Japan and South Korea, had more rapid rates of improvement than previously.<sup>11 e</sup>

#### Age, sex and certified causes of death

The stalled trends in life expectancy at birth across the UK are not the result of a change in mortality due to a particular age group, sex or specific certified cause of death.<sup>12,25-27</sup> Using the data from Scotland as an example, it can be seen that the rate of improvement in mortality has slowed across almost every age group, for both females and males (Figure 3.3), with some age groups displaying increasing mortality after 2012-14 (in particular 30-49 year old and 85+ year old females; and 40-54 year old, and 90+ year old males). Furthermore, the rate of improvement in almost all certified causes of death has also slowed in the later time period for females and males (Figure 3.4), indicating that it is not a single specific cause of death which has been driving the stalled overall trends. Declines in deaths due to ischaemic heart disease were the largest contributor to improved life expectancy prior to the stalling, and although these have continued to improve, they have improved much more slowly and make the largest contribution to the stagnation. Drug-related deaths are notable because of their exponential rise over this time period and the large contribution to lost life expectancy they make because they impact on middle-aged adults.<sup>10</sup> There has also been substantial rises in deaths certified as forms of dementia. The patterning of the stalling in Scotland is very similar pattern to that in England and Wales, where the stalled trends are also due to changes across all ages, both sexes, and almost all causes of death.<sup>12,26,27</sup>

---

<sup>e</sup> The exact timing and extent of the stalling varies depending on the length of the baseline period considered and the method of ascertaining a breakpoint, but consistent evidence of a stalling after 2010 is seen across many countries (see Minton et al., 2020).

Figure 3.1 - Projected life expectancy trends based on the 1990-2011 baseline compared with actual life expectancy trends (UK nations, females and males, 2012-2018)<sup>24</sup>

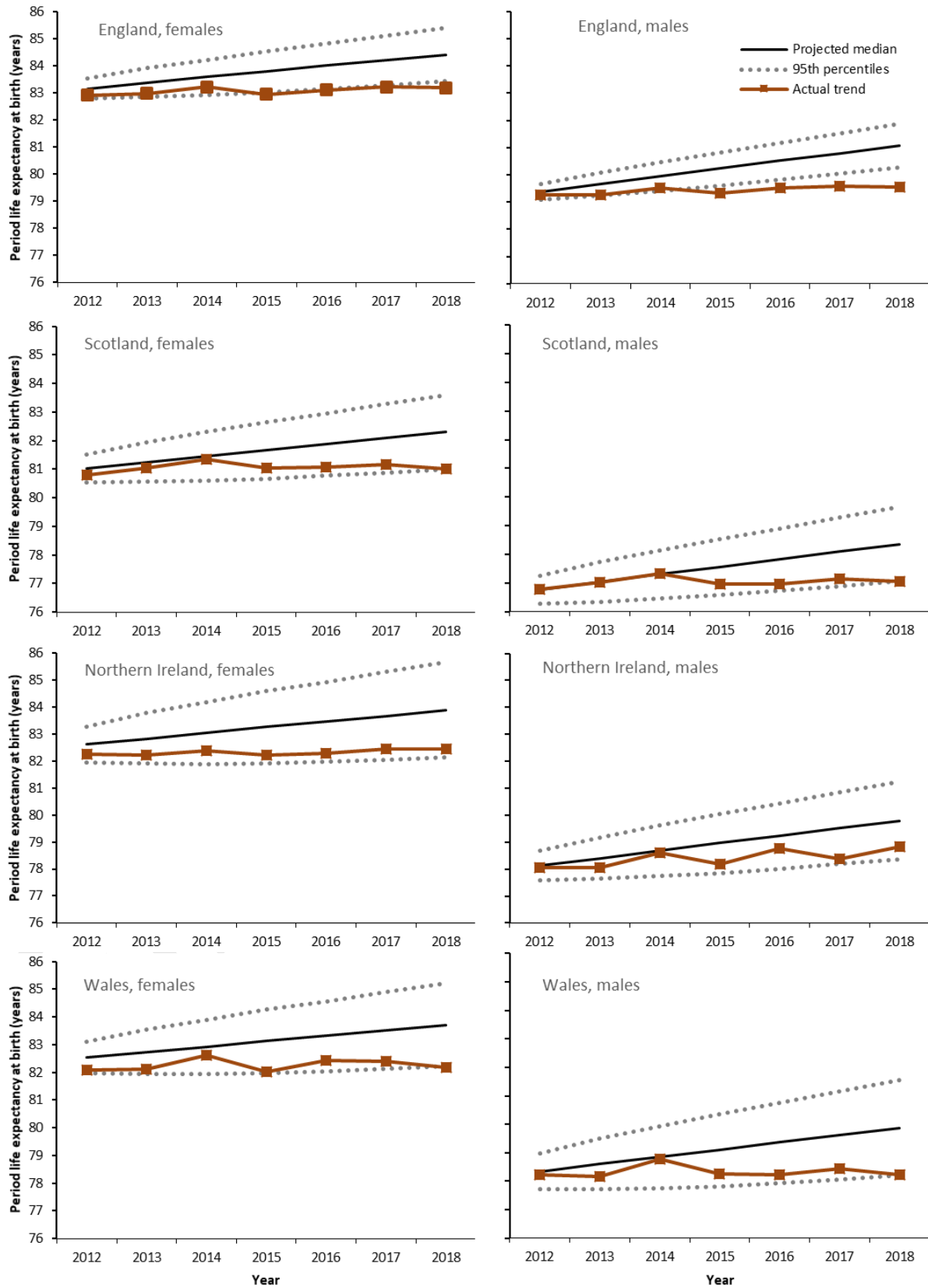
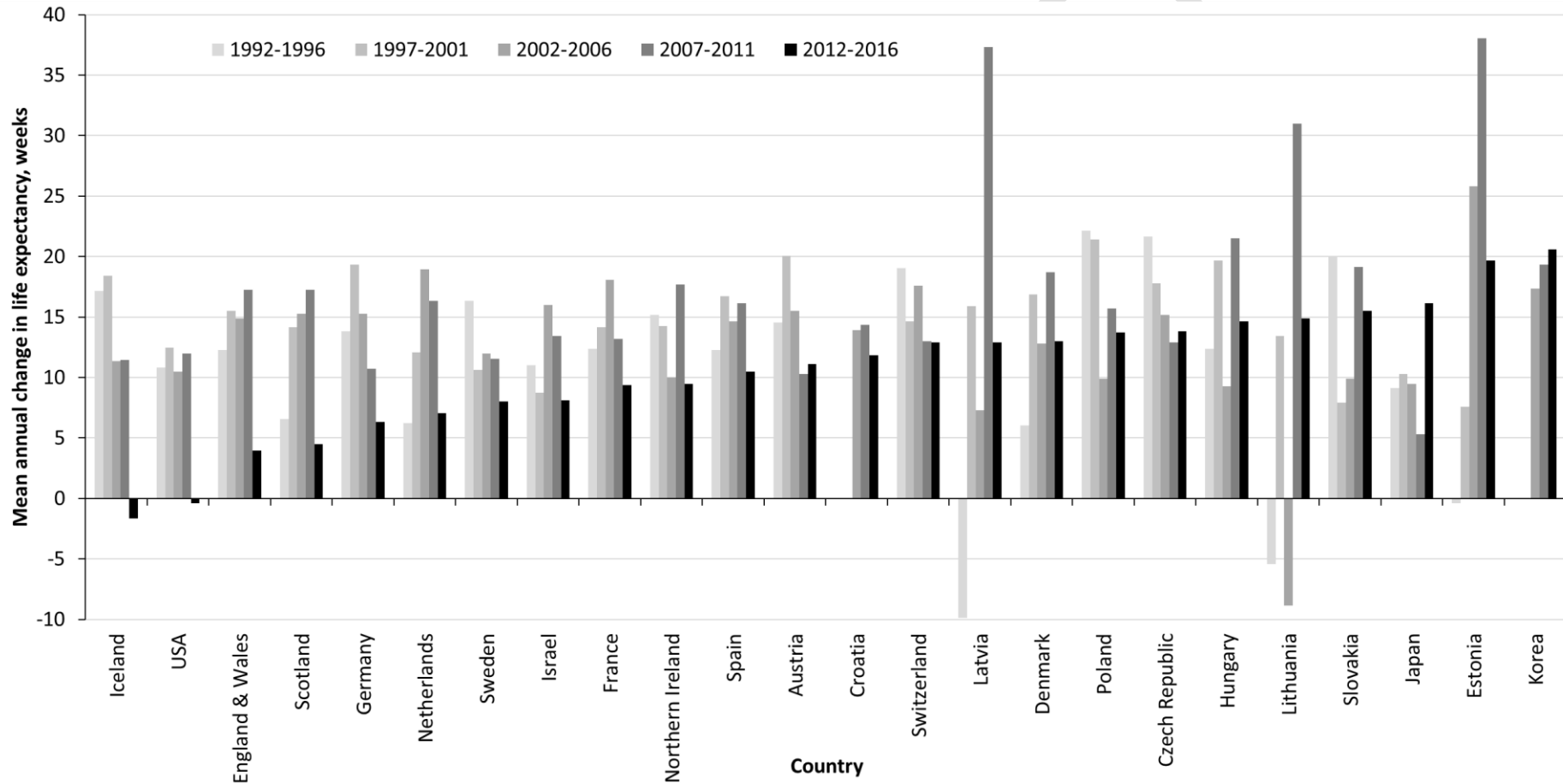
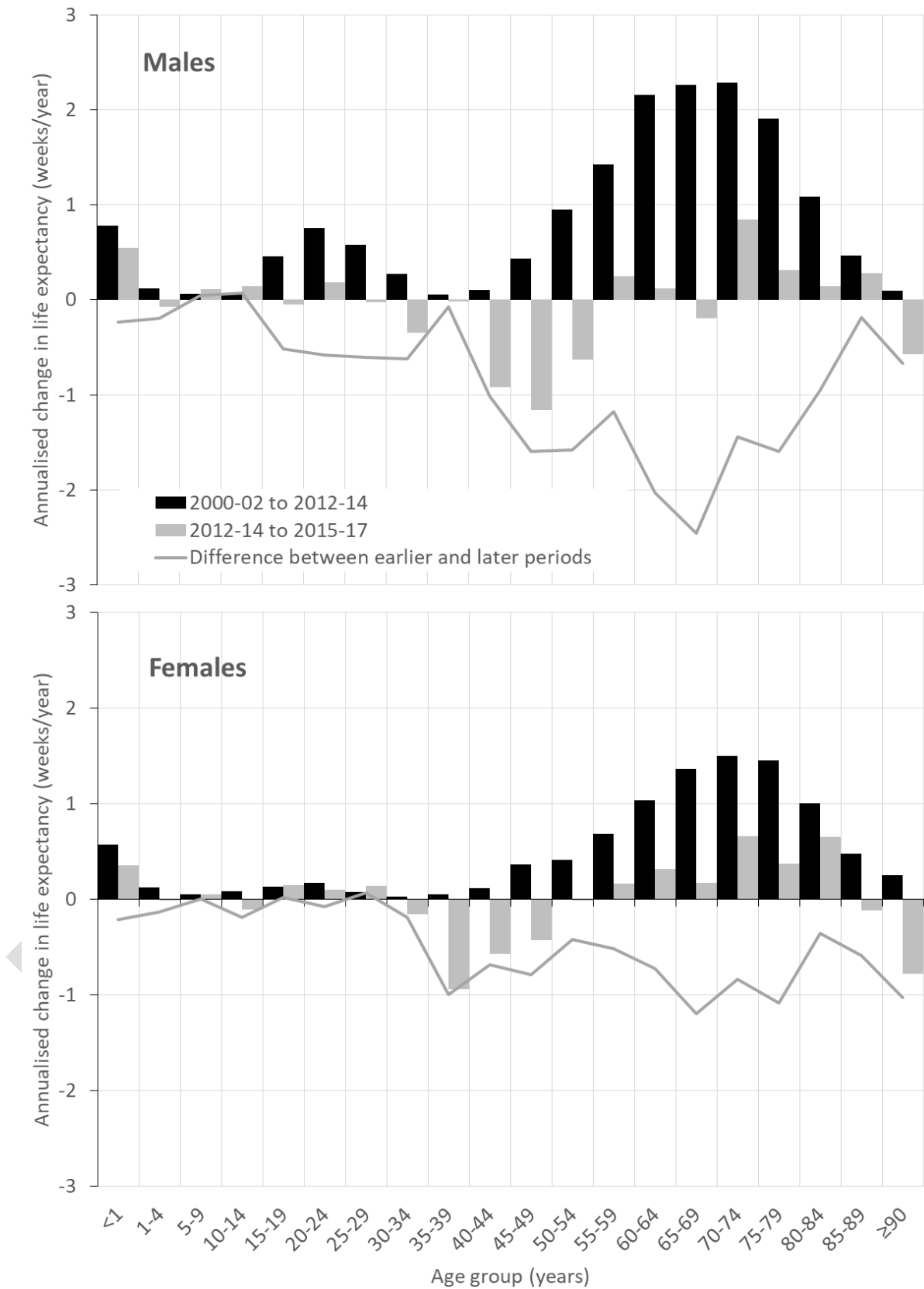


Figure 3.2 – Annualised change in period life expectancy at birth for 5 year periods between 1992-2016 for high income countries with data available via the Human Mortality Database, total population<sup>9</sup>

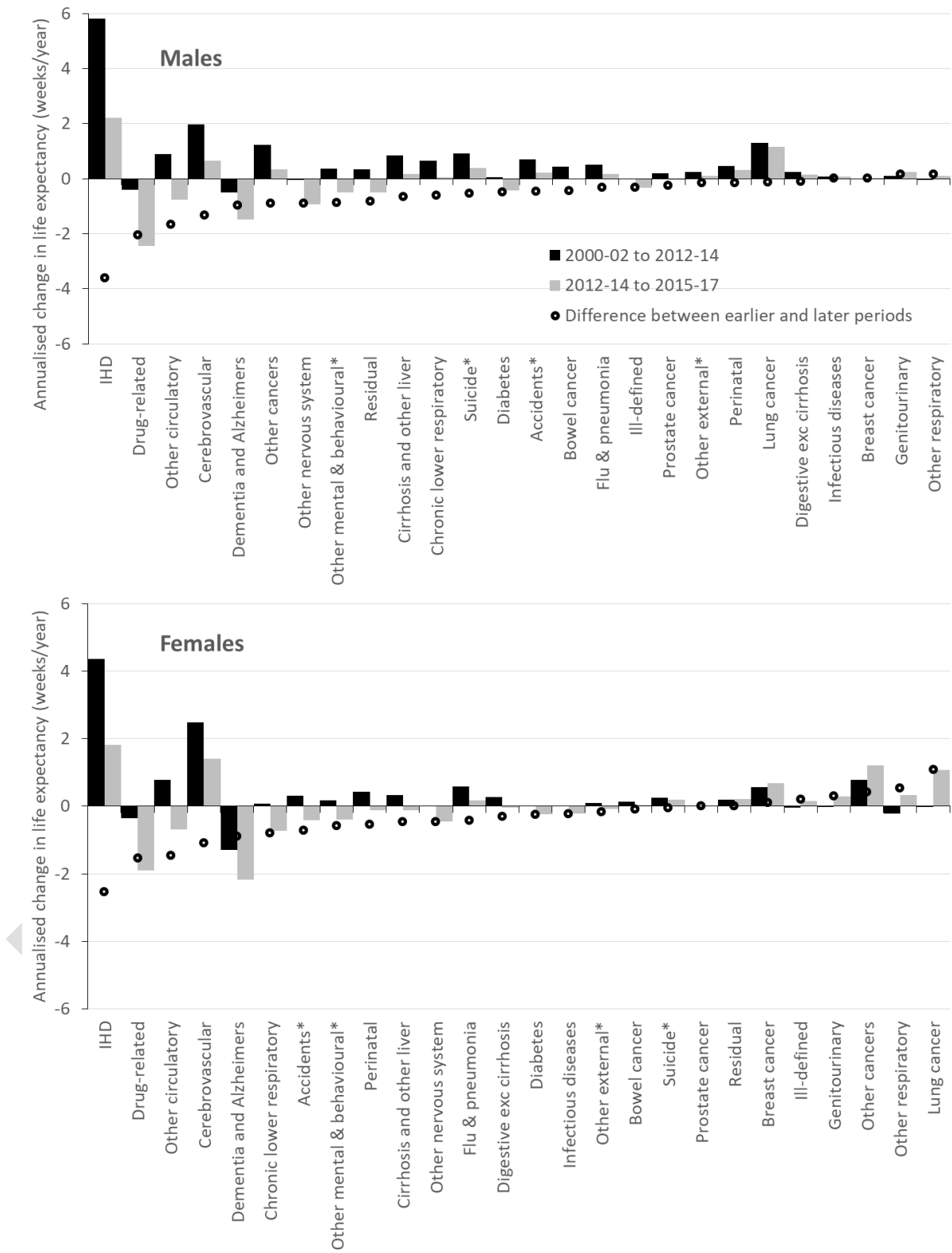




**Figure 3.3 - Contribution of changes in age-specific mortality to the change in life expectancy trends, Scotland, males and females<sup>25</sup>**



**Figure 3.4 - Contribution of changes in cause-specific mortality to the change in life expectancy trends, Scotland, males and females<sup>25</sup>**



### **Inequalities in the stalled trends**

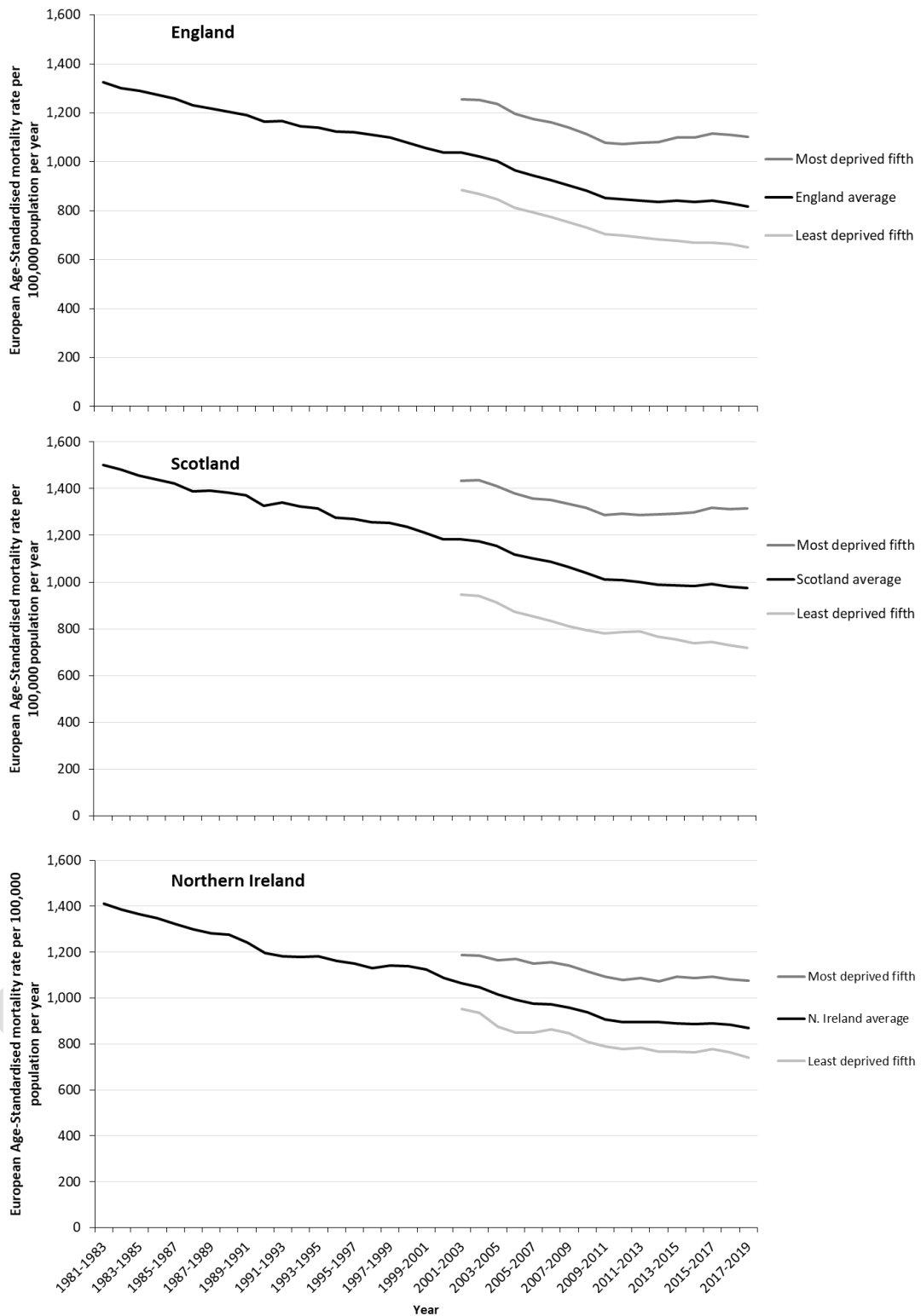
The stalled average trend in mortality masks a widening of inequalities. Although the rate of improvement in mortality has slowed across all socioeconomic groups, the trends have been worst for people living in the most deprived areas of Scotland,<sup>28</sup> England & Wales,<sup>12 29-31</sup> and across UK cities,<sup>10</sup> and on some measures in Northern Ireland.<sup>10 32</sup> Figure 3.5 illustrates these trends using data for females in England, Northern Ireland and Scotland. The slowing in the average rate of improvement is evident after 2012 across all three nations, but the worsening mortality (particularly in England and Scotland) for the most deprived groups contrasts with the continuing improvement (albeit at a slower rate) in the least deprived areas.

This report focuses on the pre-pandemic trends. Mortality inequalities were widening prior to the pandemic. However, these inequalities further worsened during the COVID-19 pandemic, with people living in the most deprived areas, working in less well rewarded jobs, and ethnic minorities all experiencing larger rises in mortality.<sup>33 34</sup> Although COVID-19 has already compounded the stalled mortality trends with a further decline in life expectancy, the Years of Life Lost (YLL) to inequalities in mortality has been estimated to be substantially more than the initial worse-case scenarios for the pandemic in the UK.<sup>35</sup>

### **Trends in other health outcomes**

Mortality is a narrow and negative measure of health, but it is routinely available and important. Broader measures include self-rated health, mental health and wellbeing, and Healthy Life Expectancy (HLE, which combines self-rated health with mortality). Analyses of trends in HLE show that this has declined in Scotland since around 2011 as a combined result of the stalled trends in life expectancy and worsening trends for self-rated health.<sup>36</sup> Again, this is a trend mirrored for the UK overall, where there has been a marked decline in HLE at birth between 2013-15 and 2017-19.<sup>37</sup> The trends for mental health outcomes are less clear, but there is some evidence that trends in mental health problems, particularly for younger adults, worsened between 2015 and 2019 in Scotland and England.<sup>38 39</sup>

**Figure 3.5 – Inequalities in rolling three-year average European age-standardised mortality rates (by deprivation fifth), all ages and all causes, females (Source: updated version of analysis published in Walsh et al, 2020). No equivalent data for Wales was available.**



## 4. Critical appraisal of causal evidence

This section of the report summarises and critically appraises the evidence for hypothesized causes of the stalled trends.

Decomposition approaches to analysing changes in life expectancy have facilitated identification of particular causes of death in which there have been changes contemporaneous with overall mortality stalling. The data available are drawn from death certificates, and the extraction from these of the disease process identified as the 'underlying' cause of death. It has been hypothesised that processes specific to some specific causes of death (cardiovascular disease, drug-related deaths, dementia and influenza) may have played an important role in the changed trends, and so these are considered first as separate categories. Information about certified causes of death, however, can only contribute a partial understanding of trends. This is due to limitations of the data itself, as discussed in the sections below, but more importantly because they are limited in what they can tell us about the broader causes of death due to the social determinants of health. Any contribution from specific causes of death needs to be understood in terms of changes in incidence, fatality or age at death, and how these might have been altered by changes in exposure to other societal factors or broader causal processes (the so-called 'causes of the causes').<sup>40</sup>

A number of population-level changes in determinants of health have been identified as being temporally associated with stalled mortality trends, and as such have been hypothesised as making a contribution. These include an increased prevalence of obesity, demographic changes, and austerity policies operating at national, sub-national and household level. Changes in weather and temperature have also been suggested as making a contribution.

These hypothesized causes are considered here in turn, recognising that there are likely to be substantial overlap and interaction between them. The potential interactions between identified plausible contributing causes are considered in section 5.

## 4.1 Reduced improvements in cardiovascular disease mortality

### Hypothesis

Analysis of cause-specific mortality trends and the certified causes of death contributing to changes in life expectancy has identified that there has been a slowing in improvement of cardiovascular disease deaths. Consequently, this change has been suggested as cause of the overall stalling in life expectancy gains. A number of hypotheses have, in turn, been proposed to explain these changes in cardiovascular deaths. These include reduced improvements in risk factors, such as smoking, and reduced gains from medical treatments. A worsening of other risk factors, such as obesity and diabetes, has also been suggested (the role of obesity is discussed in detail in section 4.5 below).<sup>27 41</sup>

### Critical appraisal of the evidence

Ischaemic heart disease and stroke (both forms of cardiovascular disease) are among the most frequent causes of death in the UK. In 2018 ischaemic heart disease remained the most common cause of death for males in the UK, and the second most common cause for females.<sup>42</sup> There were, however, substantial reductions in deaths due to these causes in the latter half of the 20<sup>th</sup>, and early 21<sup>st</sup>, Centuries, across the UK.<sup>43</sup> In England age-standardised mortality rates due to these conditions reduced by around 60% between 2001 and 2018;<sup>44</sup> however, the rate of decline has not been continuous, slowing in the more recent period.<sup>27</sup>

As shown in section 3, decomposition analyses of life expectancy changes have identified reduced improvements in cardiovascular mortality as the single largest contributor to life expectancy changes in the periods before and after 2012. In Scotland, reductions in deaths due to ischaemic heart disease had a positive effect on the change in life expectancy between both 2000-02 to 2012-14 and 2012-14 to 2015-17, but the positive contribution in the latter period was less than half that of the earlier period.<sup>25</sup> This is similar to the pattern and effect observed in England.<sup>27</sup> The average annual fall in age-standardised mortality due to both heart disease and stroke was substantially smaller in the period 2011-2016 than 2001-2006, for both males and females in England.<sup>25 27</sup>

These analyses split the data for comparison before and after 2012, and show a stark difference between periods. However, there is some evidence that the beginning of stalled improvements in cardiovascular mortality predate these wider changes by around 10 years. Stalled improvements in coronary artery disease mortality were found from the year 2000 in those aged under 55 years in England and Wales,<sup>45</sup> and in the same age groups in Scotland from 2003.<sup>46</sup> This means the sequence of events meets the criteria for a cause-and-effect temporal relationship; however, it may be argued that an ongoing background trend in stalled cardiovascular improvements is insufficient, alone, to explain the step-change in life expectancy trends around 2012.

There is evidence that this stalling of improvements in cardiovascular mortality does not represent the result of reaching a threshold of 'maximum achievable gain' for cardiovascular disease prevention or treatment in Scotland or the rest of the UK. International data show that whilst improvements in cardiovascular mortality have stalled in many high-income countries, a number are seeing continued improvements in age-standardised mortality rates which are lower than those in the UK, indicating that such stalling is not inevitable.<sup>47</sup> In

addition, the marked socio-economic inequalities in cardiovascular disease incidence and mortality within the UK show that further improvements are possible.<sup>48-50</sup>

The relative contributions of risk factor reduction and disease treatment to past gains in cardiovascular mortality are debated, and depend to some extent on the metrics selected.<sup>51</sup> However, changes in the occurrence of risk factors such as hypertension, diabetes, obesity and smoking are consistently found to be important, with reductions in these estimated to contribute around half of mortality improvements.<sup>52-54</sup> In the UK there is evidence to suggest that the age-sex standardised incidence of non-fatal cardiovascular disease fell between 2000 and 2014, with falling incidence in ischaemic heart disease in particular.<sup>55 56</sup> However, the reductions appear concentrated in the earlier part of this period, and another study did not find any change in age-sex standardised incidence of coronary artery disease between 2006 and 2015.<sup>57</sup> This supports the view that gains from primary prevention of ischaemic heart disease stalled in this period.

Increases in obesity and diabetes prevalence have been suggested as important factors that could explain a stalling of improvements in cardiovascular disease occurrence and outcomes. Estimations using the IMPACT model find that increases in diabetes and obesity reduce the potential improvements in cardiovascular mortality that would otherwise be realised through reductions in blood pressure, cholesterol and tobacco smoking, by around 10-14%.<sup>47</sup> However, although there is a biologically and temporally plausible relationship between population levels of diabetes and obesity and stalled cardiovascular disease improvements, the relationship between these factors, and others, in contributing to the trends is not fully understood. The role of obesity as a risk factor for cardiovascular disease is just one mechanism by which obesity prevalence may influence mortality trends; its potential contribution across all-cause mortality is considered in section 4.5.

In addition to the role of risk factor changes, improvements in treatment of cardiovascular disease are recognised to have an effect on mortality. Two studies exploring 30-day case fatality after acute myocardial infarction in the UK found that these had fallen in the decade up to 2010, with both changes in pharmaceutical management and increases in percutaneous coronary intervention identified as relevant.<sup>58</sup> This review did not find case fatality estimates for relevant conditions covering the period after 2010. Such estimates would allow clarification of the contribution of available treatments to cardiovascular survival in this period. Given the importance of timely, quality care and secondary prevention in explaining the improvements up to 2010, it is possible that any changes in healthcare access and equity, due to austerity policies or COVID-19 pressures, could impact on cardiovascular mortality trends. However, we are not aware of any evidence which addresses this question directly.

Finally, in common with some of the other specific causes of death, it is known that trends in deaths identified as due to cardiovascular conditions are affected by changes in the rules used to allocate ICD-10 diagnostic codes to death certificates in 2011 and 2014. These changes, and their potential impact, are considered more fully in the section on dementia. The coding changes implemented in 2014 were estimated by the ONS to reduce the number of deaths allocated to the 'circulatory' category of by 0.7%.<sup>59</sup>

## **Evidence summary**

Improvements in cardiovascular mortality contributed substantially to reductions in life expectancy in the latter half of the 20<sup>th</sup> Century. There is evidence of a levelling-off in the falling incidence of cardiovascular disease in the UK around 2006, and stalling improvements in cardiovascular mortality are noted for younger age groups from the early 2000s, and as such these changes slightly pre-date those in all-cause mortality. Positive trends in risk factors are noted to have played a substantial role in past declines in cardiovascular mortality, and there are plausible recent adverse trends in relevant risk factors which may contribute to reduced improvements. From this evidence, it is likely that stalled improvements in cardiovascular deaths are contributing to stalled life expectancy trends, and there are a number of relationships with other hypotheses. However, alone this hypothesis is insufficient to explain the timing and extent of the change observed around 2012 (not least because changes have been observed in many other causes of death). Changes in cardiovascular mortality are likely to also be due to common underlying drivers that are also impacting on those other causes.

FINAL DRAFT



## 4.2 Increase in drug-related deaths

### Drug-related deaths

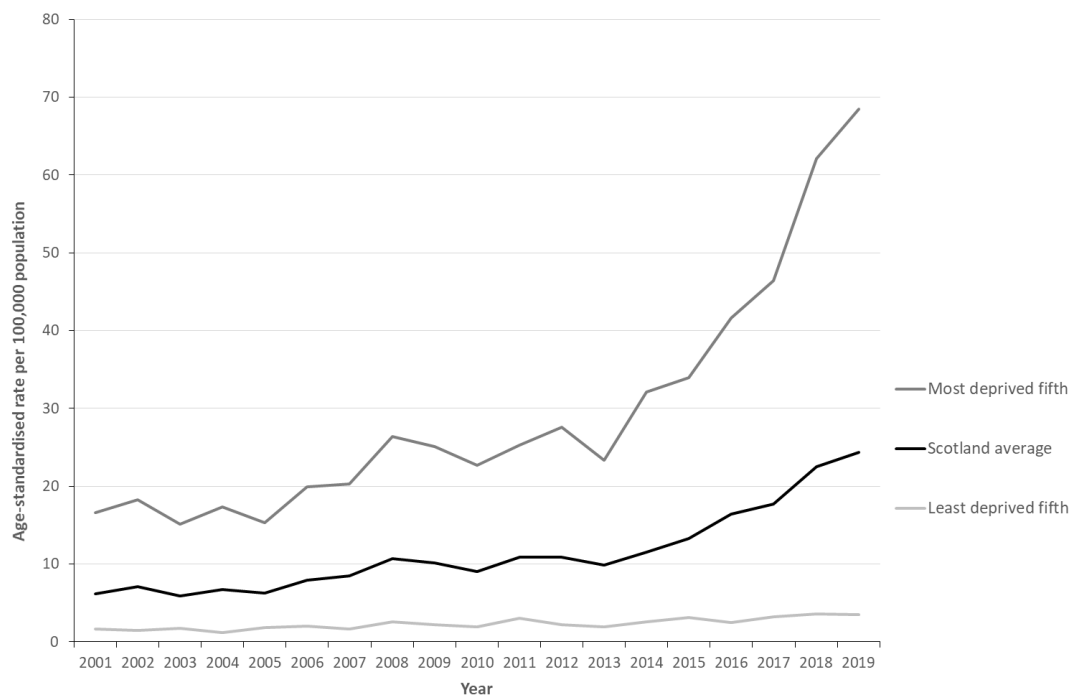
#### Hypothesis

In Scotland, the observed life expectancy/all-cause mortality changes have coincided with striking increases in the rate of drug-related deaths. It has therefore been hypothesised that changes in mortality associated with drugs misuse may have a causal role in the overall changed trends.<sup>60</sup>

#### Critical appraisal of the evidence

There are a number of factors in support of this hypothesis. In the decomposition analyses discussed in section 3, drug-related deaths were shown to have been the second largest negative contributor to the change in life expectancy after 2012. There is clear evidence of an increase in drug related deaths in Scotland over the relevant period, with death rates highest, and increasing to a greater degree, in the socioeconomically most deprived neighbourhoods (Figure 4.1).<sup>61</sup> Although rates are considerably lower in other parts of the UK, they also increased over the same period in England & Wales and Northern Ireland for both males and females.<sup>10 62</sup> Working-age adults are most affected which impacts to a greater degree on overall measures such as life expectancy at birth than the same number of deaths at older ages. All-cause premature mortality rates (<65 years) have increased in Scotland (where drug deaths are highest), rather than stalled as they have in England & Wales. In Scotland, rates were increasing in the period prior to the observed mortality changes, and are therefore plausibly linked in terms of timing.

**Figure 4.1 – Drug-related deaths for Scotland overall, and for the most and least deprived fifths of the Scottish population: age standardised rates, 2001 to 2019 (Source: National Records of Scotland, 2021)**



However, there are a considerable number of arguments against this hypothesis as a sole or majority contributor to stalled mortality trends. First, although rates have increased elsewhere in the UK, death rates from this cause are more than 3½ times higher in Scotland.<sup>63</sup> However, the magnitude of the changes to all-age, all-cause, mortality and life expectancy in Scotland and in England & Wales has been similar (Figure 3.5).<sup>10</sup>

Second, although increases in drug-related deaths have clearly impacted on overall rates of premature all-cause mortality in Scotland, especially among males, changes in rates can be observed even when drug-related deaths are excluded: this is shown in Figures 4.2 and 4.3 which compare premature mortality trends (for Scotland and two selected cities), including and excluding drug related deaths.<sup>f g</sup> This confirms that other factors are also driving the increase in all-cause mortality rates at these ages.

Third, related to the above, decomposition analyses (referred to in the previous section of the report) have shown that the overall mortality/life expectancy changes have been observed for the majority of age groups (not just younger ages) and, importantly, for many different causes of deaths, not just drug-related.<sup>25</sup>

<sup>f</sup> Note that Figure 4.3 employs a definition of drug related deaths ('drug related poisonings') which is different – and less accurate – to that used in official UK publications of drug-related mortality, including the NRS data shown in Figure 4.1.

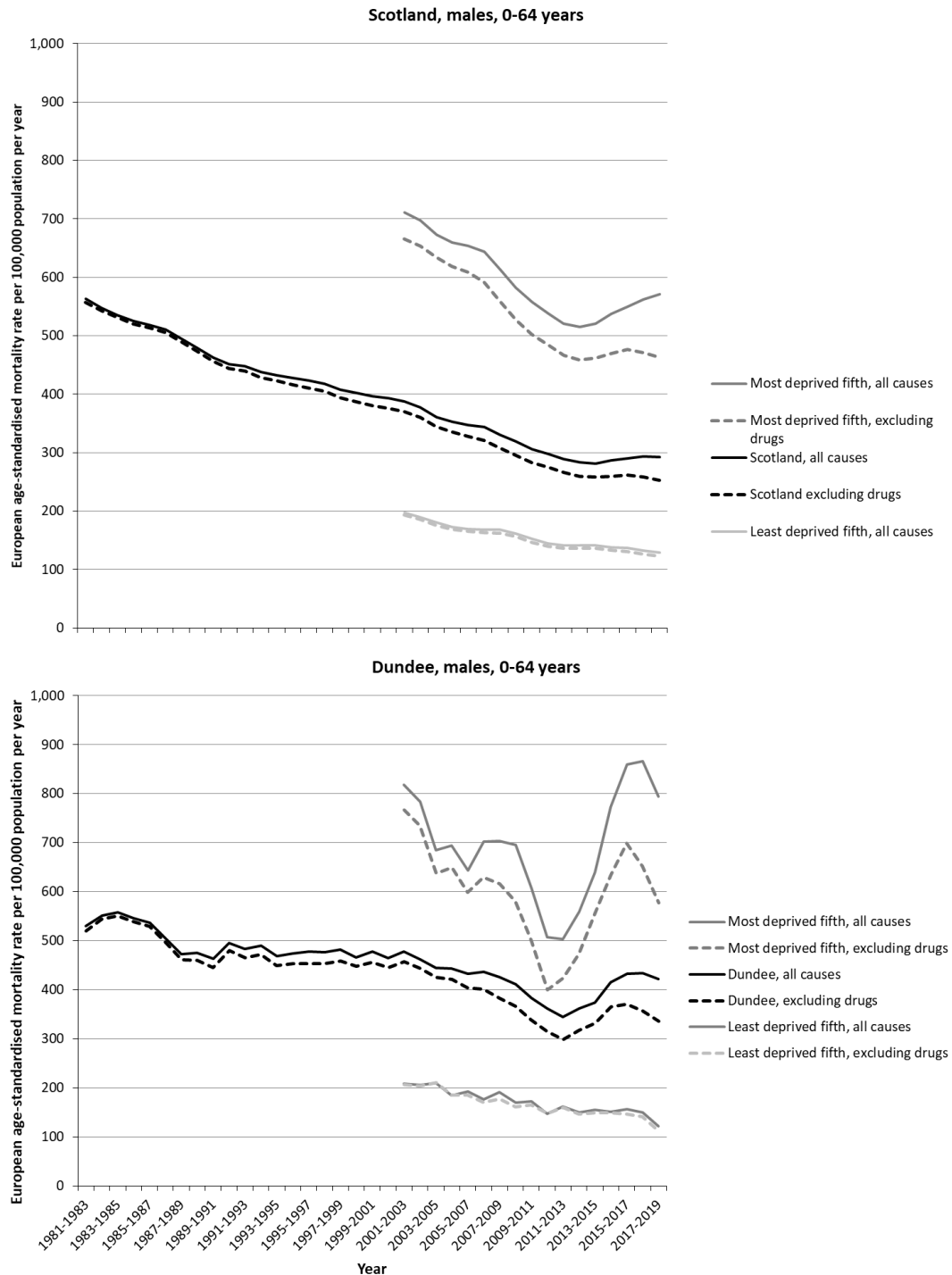
<sup>g</sup> Based on authors' own analyses of National Records of Scotland population and mortality data, 2020.

Importantly, the existing evidence also suggests that the increase in drug-related deaths is likely to have been partly caused by the same underlying factors associated with the overall mortality changes. The drivers of the increase in deaths from this cause in Scotland are known to be multiple: alongside a 'cohort effect' (an ageing, particularly vulnerable, cohort of drug users), and increased affordability and availability of drugs, there is evidence of the effects of UK Government 'austerity' measures, which are discussed elsewhere in this part of the report.<sup>64-67</sup> Their impact is seen as two-fold: reducing levels of important services such as addictions, housing, mental health, welfare rights etc.; and cutting individual incomes by reductions in social security payments, leading to further drug use as a 'coping mechanism'. In terms of the latter, recent published research demonstrated an association between cuts to disability-related social security payments and increased drug-related deaths across all local authority areas in Great Britain.<sup>68</sup>

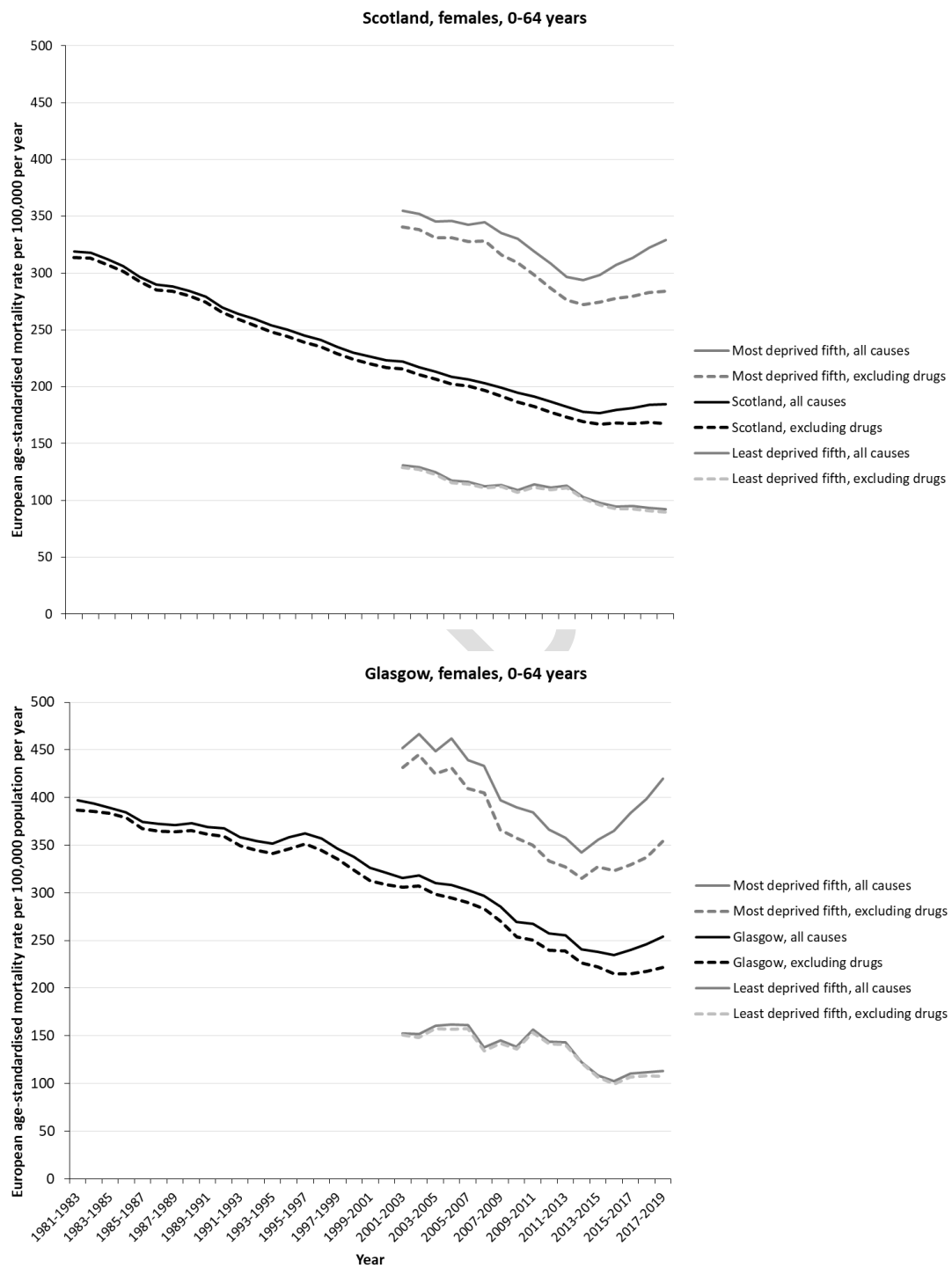
### **Evidence summary**

While increased rates of drug-related deaths are likely to have contributed to the overall stalled mortality trends, the evidence suggests that both are likely to share a common underlying cause, rather than the former causing the latter. Furthermore, the diverse age groups and causes of death associated with changes to overall (all age, all cause) mortality rates, alongside the fact that similar overall changes have been observed in England & Wales where drug related death rates are notably lower, suggests that the overall contribution of drug related deaths to the observed changes is in any case likely to be relatively small, with other factors more influential.

**Figure 4.2 - Age-standardised mortality rates, 0-64 years, males, Scotland and Dundee, overall and country/city-specific most and least deprived quintiles: all-causes (solid lines) and excluding drug related poisonings (dotted lines). Source: authors' analyses of National Records of Scotland (NRS) mortality and population data**



**Figure 4.3 - Age-standardised mortality rates, 0-64 years, females, Scotland and Glasgow overall and country/city-specific most and least deprived quintiles: all-causes (solid lines) and excluding drug related poisonings (dotted lines). Source: authors' analyses of National Records of Scotland (NRS) mortality and population data**



## 4.3 Increase in deaths due to dementia and Alzheimer's disease

### Hypothesis

The number of deaths certificated as due to dementia and Alzheimer's disease (hereafter referred to as dementia) have increased substantially in recent years. The change in deaths attributed to dementia over the relevant period is large and so nearly all reviews of potential causes of stalled mortality improvements have considered their contribution. However, nearly all also conclude that the observed changes in dementia deaths are predominantly attributable to a range of reporting artefacts, rather than reflecting a substantial causal contributor.<sup>27 69-71 92 93</sup> The appraisal below therefore sets out the various identified artefacts, as well as how any real increases in dementia deaths may fit with other causal explanations.

### Critical appraisal of the evidence

In England and Wales the number of deaths due to dementia increased from 27,161 in 2002 to 66,424 in 2019, with two-thirds of the increase occurring after 2010. The changing age-profile of the population has played a role, but the increase in the *age-standardised* rate from 65.3 to 115.1 per 100,000 population over the same period indicates that age alone is not responsible.<sup>72</sup>

Life expectancy decomposition analyses quantified the scale of, and change in, the contribution of deaths due to dementia. In England, among both males and females, deaths due to dementia had a negative effect on the change in life expectancy between 2011 and 2016, and also in the preceding period of 2006 to 2011. In the latter period the negative contribution was by far the largest of any cause of death (-0.2 years for males, -0.3 years for females). However, as dementia deaths were already exerting a negative effect on life expectancy prior to 2011, their impact on the difference in life expectancy gain before and after this time was smaller than several other causes of death.<sup>27</sup> This is similar to the pattern and effect observed in Scotland (see Figure 3.4).<sup>25</sup>

A number of factors are identified in the literature as playing a role in the apparent increase in dementia mortality. Several authors identify a role for national dementia strategies in increasing the diagnosis, and documentation of diagnosis, of dementia.<sup>93</sup> In England "Living well with dementia: A National Dementia Strategy" was published in 2009 and "Scotland's National Dementia Strategy" followed in 2010, which both indicated a need for increased and earlier diagnosis.<sup>73 74</sup> Whether driven by these strategies, particular incentives such as the GP Dementia Identification Scheme in England in 2014,<sup>75</sup> or other factors, there is clear evidence of an increase in recording of dementia diagnoses in primary care records in all UK countries between 2005 and 2015.<sup>76 77</sup>

There is evidence that the increased primary care recording of dementia diagnoses has been temporally associated with increased inclusion of the diagnosis on the death certificates,<sup>78</sup> and also that those meeting standard criteria for a dementia diagnosis were nearly 10 times more likely to have this included on their death certificate in 2013-16 than in 1989-92.<sup>79</sup> However, in contrast to these trends in certified deaths, evidence drawn from UK cohort studies indicates that age-specific incidence of dementia has actually been *falling* in recent years.<sup>80 81</sup>

The other factor influencing diagnostic recording were the updates to the automated coding software used to apply International Classification of Disease 10 (ICD-10) diagnostic codes to the information recorded on death certificates; this took place in 2011 and 2014 in England, and in 2017 in Scotland.<sup>82</sup> These changes affected both the allocation of codes to specific diagnoses (in particular for vascular dementia), and the sequences in which dementia or Alzheimer's disease were accepted as 'underlying causes' of other conditions recorded on the certificate. The effect was to increase both the number of 'dementia codes' applied to certificates, and the proportion in which this was assigned as 'underlying cause'. For dementia deaths (not including Alzheimer's disease) these coding changes were estimated to increase the mention of dementia on certificates by 1.58 times in 2011, and a further 1.07 times in 2014.<sup>82</sup> The impact of these changes was considered in a 2018 review by Public Health England (PHE),<sup>27</sup> with the time series cause-specific data being adjusted for coding changes. On the basis of analyses of those adjusted data,<sup>83 84</sup> coding changes accounted for around 40% of the increase in deaths due to dementia in England between 2001 and 2016.

The substantial changes in the recording of dementia mortality have been raised as a challenge for our ability to understand recent mortality data.<sup>41 69 70</sup> If increased dementia deaths do not reflect increased incidence or mortality risk from these conditions, then it might be assumed that the same events would previously have been attributed to some other cause, such as cardiovascular disease or respiratory infection (thereby changing the contribution of those specific causes of death to the stalled trends). Of the reporting factors at play, those which are most closely temporally associated with the stalling of life expectancy improvements are the coding changes in 2011 and 2014 in England, however these occurred later in Scotland. These are also the most straightforward to adjust for, as has been done in some decomposition analyses.<sup>27</sup> The trend of increased diagnosis and documentation in general is longer standing, and pre-dates stalled mortality trends by around 10 years.

Changes in recording are not neutral – they have at least in part been driven by appropriately seeking to improve care for those with these important causes of morbidity and mortality. There is evidence that between 2001 and 2016 there has been an increase in prescribing of pharmaceutical treatments for dementia, and a reduction in prescribing of antipsychotic drugs for people with dementia, which are associated with worse outcomes.<sup>85</sup> It is therefore possible that the factors associated with increased ascertainment are also associated with changes in treatment, care and survival.

### **Evidence summary**

Increases in age-standardised mortality rates for dementia over the past 20 years mean that deaths due to this cause have had a negative impact on life expectancy. This predates the stalling of mortality improvements under review here. There is good evidence that changes in diagnosis, documentation and coding of dementia in health records and death certificates are responsible for the substantial changes in mortality rates that have been observed. There is also evidence that age-specific incidence of dementia is not increasing. Dementia and Alzheimer's disease are important causes of both morbidity and mortality, which are now more fully represented in recent mortality data than previously. Step-changes in incidence and mortality from dementia do not appear to explain recent mortality trends,

however, as common conditions, deaths from these causes are likely to be affected by the same underlying drivers as the other causes of death.

FINAL DRAFT



## 4.4 Increased deaths due to Influenza

### Hypothesis

A rise in crude mortality was noted in the 2015 deaths data and the investigation of this rise led to the realisation that all-cause mortality rates had stopped improving around 2012. As a consequence of the temporal association between 2015 influenza mortality and early recognition of stalled all-cause mortality, a lot of the early hypothecation focused upon the role of influenza in explaining the stalled trends.<sup>27 86-94</sup>

### Critical appraisal of the evidence

Direct estimation of the contribution of influenza to mortality through decomposition approaches is not straightforward, due to it being clinically under-recognised or not documented as a precipitating cause of death. Certificated influenza deaths are likely to substantially underestimate the total contribution because influenza may be an unrecorded antecedent cause for a range of certified causes of death including pneumonia and heart disease.<sup>95</sup> In particular, some deaths certified as dementias may also have influenza as an unrecognised or undocumented precipitating cause. However, as described in section 3, the stalled trends are due to changed trends in almost all causes of death and almost all age groups, which is not what would be expected if influenza was a sole or major cause.

To reduce the impact of this under-recording, a combined category of 'influenza and pneumonia' has been used to estimate the potential influenza contribution. As noted in section 3 (Figure 3.4), the rate of improvement in mortality due to the combined category of 'influenza and pneumonia' slowed in Scotland<sup>25</sup> (and in England<sup>27</sup>) after the stalling of the overall trends. However, this slowdown in the rate of improvement was similar to other causes of death. In Scotland this accounted for only 2% of the total slowdown for males, and 4% of the total slowdown for females.<sup>25</sup> In England the contributions were 6% and 7% of the total slowdown in England for males and females respectively.<sup>27</sup> Although this may be an underestimate because it does not include any contribution of influenza to dementia or cardiovascular deaths, it could also be an overestimate as not all pneumonia deaths are related to influenza (indeed, the proportion could be quite small).

The EuroMOMO surveillance system seeks to detect and measure excess mortality, and the Flumomo model was developed to estimate the total attributable mortality fraction from influenza.<sup>96</sup> They use observed data on the prevalence of influenza-like illness within populations, alongside data on temperature and historical crude mortality data to adjust for other factors. They have suggested a substantial overall contribution of influenza in two of the winters in the past decade (for Scotland, the UK, and across Europe).<sup>97-99</sup> However, these studies do not provide a means of understanding the contribution of influenza to long-term trends because the baseline changes over time.

For influenza to provide an explanation for the stalled mortality trends, it would require the contribution from influenza to age-standardised mortality to have increased over time, as there is no debate that influenza does contribute to mortality on a frequent basis. A study of deaths following hospital admission in England, using influenza codes at the point of admission rather than on death certification, shows that influenza had made little or no contribution to the changed mortality trends there.<sup>27</sup> A further analysis of English data considered whether the trends would have changed if winter deaths were excluded (as a crude proxy for influenza deaths). This found that the trends were largely unchanged, again reducing the likelihood that influenza has played an important role in explaining the trends.<sup>27</sup> Finally, an analysis of presentations to primary care for influenza-like-illnesses did not increase after 2010, making increased influenza an unlikely cause of the changed trends.<sup>92</sup>

Even if the contribution from influenza had increased over time, that wouldn't preclude other factors being causes as well, as influenza could plausibly be a mechanism (or effect modifier<sup>h</sup>) linking these to mortality. For example, it could be that an increasing prevalence of obesity or the implementation of austerity policies (and the impact that might have on social care provision, for example) could exacerbate the mortality from influenza.

### **Evidence summary**

There are several reasons why influenza is unlikely to be an important cause of the stalled trends. First, influenza would not be expected to have impacted on almost all ages and specific causes of death. Second, we would have expected deaths certified as 'influenza and pneumonia' to have made a much more substantial contribution to the stalling within decomposition analyses. Third, the study in England examining mortality trends following hospital admission with influenza as a cause does not suggest any increase in contribution. However, there is currently no simple means of ascertaining the contribution influenza may be making across specific causes of death such as dementia and cardiovascular disease.

Overall, therefore, it is highly unlikely that influenza has played an important role in driving the stalling of mortality trends in Scotland (or indeed in the rest of the UK or internationally).

---

<sup>h</sup> An effect modifier is an exposure or factor which changes the size of effect of another exposure.

## 4.5 Increased prevalence of obesity

### Hypothesis

It has been proposed that increases in obesity prevalence in recent decades have contributed to the overall stalling of improvement in mortality, including through a contribution to the stalling of improvements in cardiovascular mortality, as discussed earlier in this section. This has been suggested in relation to changing mortality rates in the UK,<sup>100</sup> the US,<sup>101 102</sup> Australia, and other high-income countries.<sup>103</sup>

### Critical appraisal of the evidence

National survey data for Scotland and England show that obesity levels have increased notably in both countries since the mid-1990s (when the surveys began). Adult obesity prevalence in 1995 was approximately 16% in both countries; by 2019 it was between 28% (England) and 29% (Scotland), with slightly higher figures for females compared to males. The biggest increases were seen between the mid-1990s and the late 2000s/start of the 2010s; much smaller increases were observed in the later period (e.g. only 1-2 percentage point increases between 2011 and 2019 for males and females in Scotland, and males in England). These trends are shown by sex in Figure 4.4.

Obesity has been shown to be associated with both cardiovascular disease<sup>104</sup> (as discussed in section 4.1) and, importantly, all-cause mortality.<sup>105</sup> The modelled impact of obesity prevalence on cardiovascular disease is referenced in section 4.1. For all-cause mortality, analyses of global data have highlighted associations based on an average c.14 year follow-up period, which is consistent with the time periods covering both the increase in obesity prevalence and the changing mortality trends in the UK. The hypothesis can be deemed plausible in terms of the strength of association between exposure (obesity) and outcome (mortality), the temporality of the association, and the consistency of evidence.<sup>14</sup>

Given this plausibility, new research has recently been undertaken in an attempt to better understand – and quantify – the potential contribution of obesity to the changing mortality and life expectancy trends in Scotland and England. Explained in more detail elsewhere,<sup>106</sup> this was based on the calculation of Population Attributable Fractions (PAFs),<sup>107</sup> defined in a particular way in order to provide estimates of the proportion of deaths deemed attributable to the change in obesity prevalence between the mid-1990s and late 2000s. The application of these PAFs to *recent* mortality data (thereby taking into the account the c.14 year time lag) allows us to estimate hypothetical, obesity-adjusted, mortality rates i.e. the rates that might have been observed had the earlier increase in obesity not taken place (Appendix 1 provides further details of the methods used). These estimates can then be compared with both the *actual* observed mortality rates, and the *projected* mortality rates that were presented in section 3, i.e. the rates that we would have expected to see if the changes to mortality in the last decade had not taken place. The analyses were undertaken for Scotland and England, for males and females aged 35-89 years.

The nature of such ‘hypothetical’ modelling and projections-based analyses mean that we must be very cautious in our interpretation of the results. Nevertheless, the analyses suggest that a small proportion of the difference between the projected and observed mortality rates for Scotland could potentially be explained by the earlier changes to obesity

prevalence rates. For example, in 2019, 9.8% of the gap for males, and 13.4% for females, was deemed potentially attributable to increased obesity prevalence (using 1991-based projections for 35-89 year-olds). For England, these figures are higher: 18% for males and 34% for females.

However, there is considerable uncertainty around the accuracy of these currently estimates. Although validated methods were employed, obesity-related PAFs have been subject to some criticism regarding the extent to which they accurately measure causality.<sup>108</sup><sup>-113</sup> Furthermore, the analyses were subject to a large number of caveats regarding some of the data used in their calculations.

### **Evidence summary**

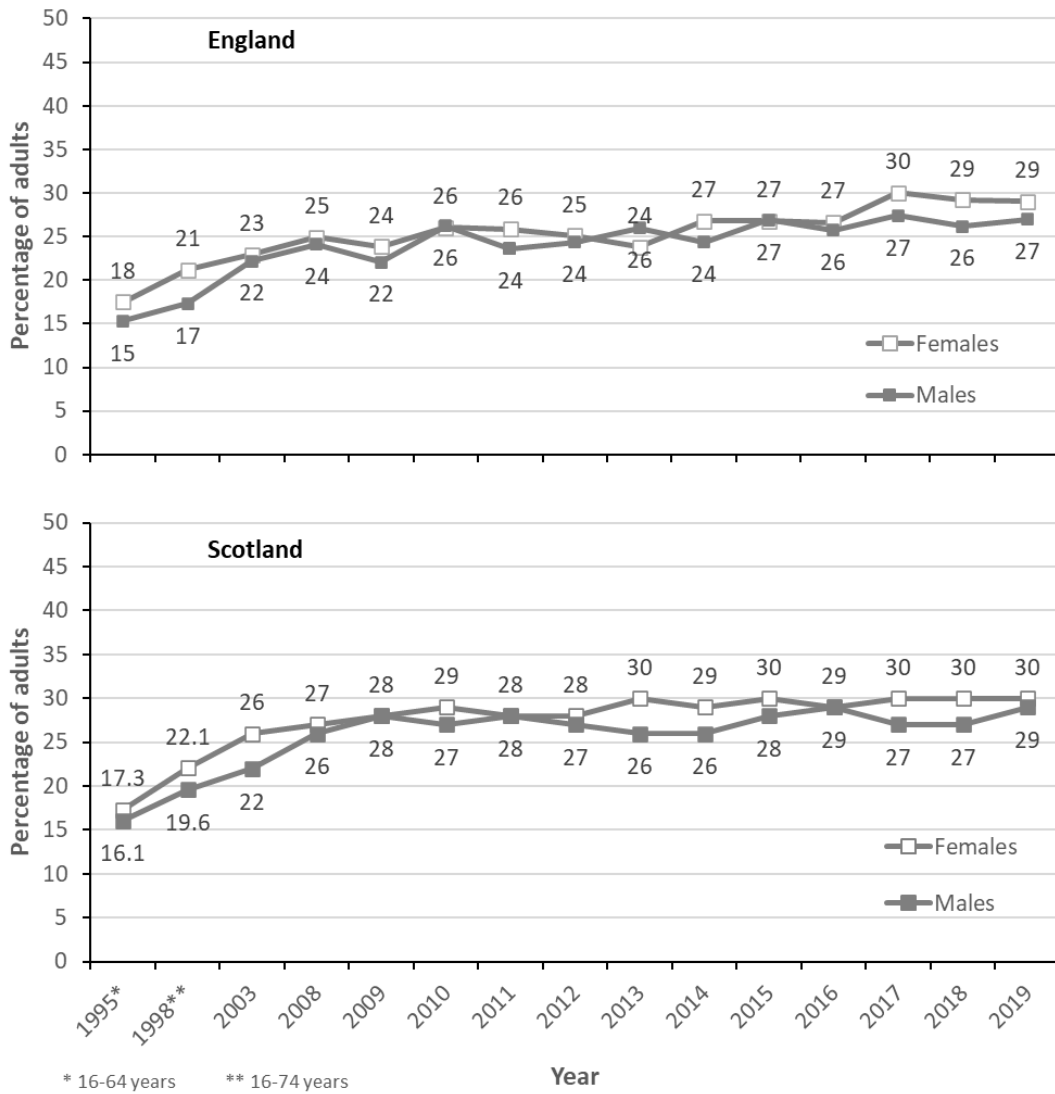
While the hypothesis discussed here is plausible, it requires contextualisation. At the population level, obesity is the result of a 'complex multifaceted system of determinants', including an 'obesogenic environment'<sup>i</sup>, with clear socioeconomic influences.<sup>114</sup> Thus, the increases in obesity prevalence that have been observed in recent decades in the UK are likely to be the consequence of many different factors, some of which are related to the underlying economic inequalities that have increased across the UK in the last 40 years.<sup>114</sup>

Our analyses suggest that a small amount of the change in mortality rates in Scotland may be attributable to earlier changes in obesity prevalence; the equivalent proportions for England are bigger. However, there are many uncertainties associated with these estimates. If accurate, they suggest *most* of the changes in mortality that have been observed in both Scotland and England since the early 2010s have been caused by factors other than obesity. This is supported by the evidence presented in section 3 of the report which shows changes in trends for many different causes of death, not just those associated with obesity.

---

<sup>i</sup> The obesogenic environment describes the context in which people live that makes increased obesity more likely through the marketing and provision of cheap and calorific food in combination with home, work, education, and broader environments that make physical activity more difficult and less commonplace.

**Figure 4.4 - Percentage of male and female adults classed as obese (BMI of 30+) in (a) Scotland and (b) England, 1995-2019. Adults are defined as aged 16 years and above apart from data for Scotland in 1995 (16-64 years) and 1998 (16-74 years). Sources: Health Survey for England and Scottish Health Survey.**



## 4.6 Demographic factors

### Hypothesis

There is a group of possible explanations for the stalled mortality trends that can be categorised as ‘demographic’ or ‘artefactual’, and which have been examined to varying degrees in other relevant reports.<sup>27 69</sup> These are: ageing of the population; issues relating to age-standardisation; issues relating to population estimates and migration; tempo effects and mortality shifts over time; natural limits to life expectancy; and cohort effects.

### Critical appraisal of the evidence

#### *Population ageing*

The hypothesis that the ageing of the population might be a contributory factor was based on early mortality data (for 2015), published as crude counts.<sup>86 89 90 97 98</sup> At that point age-standardised mortality rates, and life expectancy calculations based on age-specific mortality rates, were not available. Subsequent analyses using these statistical techniques to keep the age structure of the population constant, and thereby excluding population ageing as a cause, confirmed that population ageing is not a contributing factor to the stalled trends.<sup>24-27</sup>

#### *Age standardisation*

One of the techniques used to avoid changes in the age structure of the population being conflated with other causes of changes in mortality trends is to use a ‘standard population’. This is a fixed age structure (i.e. proportion of people in each age and sex group) to which the actual age and sex specific mortality rates are applied. This allows comparisons to be made between populations and over time which take account of differences in the age and sex structure of those populations (e.g. to account for population ageing, as noted above). The ‘standard population’, if it is to reflect actual mortality rates, should be close to the actual age structure of the population. In 2013 a new ‘standard population’ was introduced to better reflect the age structure of populations as the previously used standard dated from 1976 and was therefore much younger than the actual, current, populations of most European countries. However, this change would only impact on the trends if the same standard population was not used throughout the trend, or if a very inappropriate standard population was used which created an artefact by amplifying the mortality rates for a particular age or sex group which was not reflected in the actual population. This explanation can be discounted, however, as the analyses confirming the stalled trends avoid these problems.<sup>24-27</sup>

#### *Population estimates and migration*

Calculation of mortality rates or life expectancy depends both on the accurate counting of the number of deaths in each age-sex category and accurate estimates of the population denominator (i.e. the number of people at risk of death in each group). Population estimates are derived from the decennial census, and then adjusted between censuses using the Annual Population Survey and data on births, deaths, migration, etc. For inaccurate

population estimates to be responsible for the observed trends, the population across sexes and age groups would need to have been underestimated across the board. Linked to this is the potential for migration to have either changed the number of people at risk (by underestimating the number of people at risk in each population), or to have changed the risk profile of the country through healthy migrant effects<sup>115</sup> (which would have had to have worked in reverse with a substantial exodus of healthy individuals leaving).

The likelihood of denominator underestimation in the UK<sup>j</sup> being an explanatory factor is very low for two principal reasons. First, the phenomenon is not restricted to a single country which might have experienced particular problems with population estimation – instead, the stalling is seen across many countries at approximately the same time. Second, analyses of cohort data (which follows up the same population over time) has shown the same stalling effect, and this is not prone to denominator problems.<sup>27</sup>

Inward migration to the UK has continued to be higher than outwards migration since 1993. Net migration (the difference between the two figures) dropped slightly in 2012 before recording the highest figures since at least 1991 in 2014 and 2015 before subsequently dropping slightly. The EU exit referendum ('Brexit') in 2016 saw a decline in net immigration, but there were still around 200,000 more immigrants than emigrants to the UK, each year, between 2016 and 2019.<sup>116</sup> As such, the healthy migrant effect is likely to have been contributing to an improving rather than deteriorating health profile for the UK up until at least 2019, thereby, if anything, masking the extent of the mortality trend problem. The possibility of less healthy UK nationals returning to the UK after the Brexit referendum could feasibly be contributing to a higher mortality risk,<sup>69</sup> but this postdates the turning point in the mortality trends and so is very unlikely to be a substantial cause. The total number of deaths in England amongst migrants from EU accession countries was only 0.8% of the total deaths in 2017 and the scale of any effect of changes in mortality due to migration effects is very small.<sup>27</sup>

#### *Tempo effects and mortality shifts over time*

Tempo effects can be described as an artefactual inflation or deflation of life expectancy or mortality rates due to a mismatch between the numerator and denominator when changes occur between years.<sup>69</sup> The effect is temporary and can impact on estimates following years of particularly high or low mortality. Given that the changed mortality trends have persisted for many years, and are evident even with three year rolling average data, this is very unlikely to be a substantial contributing factor to the stalled trends.

A similar issue to tempo effects is that of mortality displacement over time, whereby a period of low mortality can create a population who are otherwise at high risk, or vice versa. An example of this might be where there is a prolonged period without expected mortality

---

<sup>j</sup> It has been suggested that this may have been a more important factor in Iceland although we are not aware of any work to test this hypothesis.

challenges (such as might be the case with a sequence of years with low influenza circulation or a more benign than expected climate) which leaves a larger population with pre-existing health conditions than the age-sex structure of the population might otherwise suggest. When an event then occurs, such as a heatwave or more virulent influenza strain, this might lead to a year of higher than expected mortality due to the presence of a large 'vulnerable population'. Again, the sustained stalling of the mortality trends over time, and the change in trend predating the peak influenza year in 2015, make this a highly unlikely explanation for the stalling.

#### *Natural limits to life expectancy*

In the early discussions of the causes of the stalled mortality trends it was suggested that life expectancy could have reached its 'natural' ceiling; consequently the stalled trends were not necessarily a matter of concern or a policy issue. However, this is clearly not the case given that life expectancy has continued to improve in countries who already enjoy the highest life expectancy (e.g. Japan), and the stalling (or reversal) in the trends is greater in the most deprived groups who likewise already have the lowest life expectancy. As such the stalling cannot be explained by the attainment of a natural limit to life expectancy.

#### *Cohort effects*

Cohort effects occur when a particular generation of people are at higher or lower risk than those born before or after. For example, people born around the time of the influenza pandemic c.1919 have been found to have a higher risk of mortality throughout their lives, whilst those born around 1930 (the so-called 'Golden Cohort') have had a lower risk.<sup>117 118</sup> It has been suggested that the passage of this 'Golden Cohort' to now being over 80 years old may mean that the mortality advantage that they have previously enjoyed is now lost, and that consequently this has contributed to the stalling;<sup>69</sup> it has also been proposed that there are cohort effects in smoking prevalence that may be contributing.<sup>27 69</sup> Although there is evidence of cohort effects for some (but not all) specific causes of death in Scotland,<sup>10 119-121</sup> it is very unlikely that cohort effects are a substantial cause of the stalling because all age groups have seen a simultaneous decline in the rate of improvement (or even reversing). Furthermore, the slowdown in the rate of improvement (or reversal) across almost all causes of death (including those which are highly unlikely to be caused by smoking, such as drug-related deaths), make this a very unlikely explanation.

#### **Evidence summary**

It is unlikely that any of the factors considered here (ageing of the population; issues relating to age-standardisation; issues relating to population estimates and migration; tempo effects and mortality shifts over time; natural limits to life expectancy; and cohort effects) are making a substantial contribution to the stalled mortality trends.



## 4.7 Austerity policies

The evidence in relation to austerity can be divided into three inter-related categories. The first is the evidence at international level of macroeconomic policies and the extent to which austerity implemented at country level is linked to mortality trends. The second is the evidence relating to the specific manifestations of austerity within the UK context, in particular the cuts to local government funding. The third is the evidence of the impact of changes to household incomes on health, much of which in the UK relates to austerity-related social security 'reforms'. Each of these are inter-related, but operate at different levels: countries; sub-national (local authorities, health boards/authorities, etc.); and households.

### 4.7.1 Austerity at international level

#### Hypothesis

The 'Great Recession' after 2008 was followed by changes in economic policy in many countries. In the UK the 2010 election led to a change in policy towards 'austerity', with the stated aim of reducing government debt (and through that increase economic growth), by reducing discretionary spending (particularly on social security and local government, but impacting across government departments).<sup>122</sup> Austerity was also implemented, to varying degrees, across many other countries at the same time.<sup>123</sup> Notwithstanding the economic effectiveness or otherwise of that policy approach, the implementation of austerity shortly before the change in the mortality trends alongside the existing evidence linking economic policy to health outcomes<sup>124</sup> led several authors to articulate austerity as a key cause of the stalling.<sup>92-94</sup>

#### Critical appraisal of the evidence

In this section (4.7.1) the evidence considers austerity defined in terms of the fiscal balance of governments (i.e. whether they are paying off government debt, as is the intention of austerity policy; or implementing fiscal stimulus where government borrowing is used to fund investments or services<sup>k</sup>) at country level.

A forthcoming systematic review of the relationship between austerity and mortality at international level identified five relevant studies, all of which only included data up to

---

<sup>k</sup> Note that more sophisticated measures of austerity also account for the 'automatic stabilisers' in the economy. These are the additional spending on social security benefits that occurs during economic downturns when unemployment increases, and tax revenues reduce due to lower earnings and profits, both of which increase fiscal deficits during recessions and reduce fiscal deficits during periods of economic growth. By accounting for these automatic stabilisers they focus on the impact of policy decisions and discretionary tax and spending rather than changes due to economic fluctuations. This is further complicated, however, by the fact that some austerity measures might intend to reduce those automatic stabilisers (e.g. by reducing taxes or reducing the value of unemployment benefits).

2013.<sup>125-129</sup> These demonstrated a consistent harmful impact of greater austerity on mortality trends across countries and time although the certainty of these estimates was low. There have also been studies that focused on specific outcomes in the immediate period after the Great Recession across Europe which also found negative health impacts, but these did not measure overall mortality or austerity as comprehensively, and were therefore not included in the systematic review.<sup>130-132</sup>

A subsequent analysis<sup>l</sup> of austerity and mortality using four different measures of austerity, a series of sensitivity analyses (for time lag, exclusion of oil-dependent economies, and restriction to years of economic downturns), and data up to 2019, found that austerity measured by government expenditure, public social spending and the Cyclically Adjusted Primary Balance (CAPB) had harmful impacts on mortality, but when measured with the Ardagna-Alesina Fiscal Index (AAFI) had little or no impact.<sup>m</sup> These impacts were seen immediately with the size of effect tailing off by five years.<sup>133</sup> The effects were robust to restriction of the data to years of economic downturn and non-oil-dominated economies.

### **Evidence summary**

There is now a series of studies which show that austerity implemented at national level, defined broadly as economic policies which aim to produce a government surplus to pay off debt, leads to slower improvements in mortality.

## **4.7.2 Austerity at sub-national level**

### **Hypothesis**

The increased mortality amongst the oldest age groups in 2015 led to an initial focus on the extent to which social care funding might have been important to explaining the stalled trends. Subsequently, analyses of funding for local authorities overall (which includes social care), and funding of health services have been examined as possible causes. Within the UK, cuts to funding (for local authorities), or a slower rate of increase in funding (for healthcare), form part of the overall austerity approach to economic policy.

### **Critical appraisal of the evidence**

As part of the austerity policies implemented across the UK, funding for many public services reduced in real terms after 2010.<sup>134</sup> The grant to local government from the UK and devolved governments (who in turn are also dependent to a large degree on UK Government funding) have been amongst the largest single area of budget reduction resulting from the broader imposition of economic austerity (which is covered in more detail in the next section). This

---

<sup>l</sup> This analysis has been submitted as a PhD thesis and awaits examination and publication.

<sup>m</sup> The CAPB and AAFI measures seek to assess the fiscal balance of government accounts (i.e. whether government debt is increasing or decreasing) after accounting for changes in spending or revenues due to changes in economic activity (and, in the case of AAFI, changes in asset prices).

reduction has been particularly acute in England (where the cut in service spending between 2009-10 and 2016-17 was 23.7% on average, compared to cuts of 12.1% in Wales and 11.5% in Scotland).<sup>134-136</sup> Local authorities do raise some of their own budgets through the council tax, business rates and other charges, and in England this has become a much greater proportion of their overall budget.<sup>135</sup> However, because the local authorities which are more dependent on central government funding are systematically more deprived, this has meant that the cuts to services have impacted most in more deprived areas.<sup>135 137</sup> The patterning of the reduction in local government service spending by deprivation in Scotland is not quite as clear cut as in England, although Glasgow City Council is amongst the Scottish councils with the largest reduction.<sup>134</sup>

The other large area of public service provision outside of local government is healthcare spending. Similar to the picture for local authorities in England, the trends in NHS funding changed after 2010, with a slower rate of increase (as opposed to the decrease seen for local government),<sup>138</sup> with the rate slower again in more deprived areas after 2012.<sup>139</sup>

There is evidence that changes in overall or specific aspects of local government spending in England are associated with changes in health outcomes, although the complicated relationship between deprivation, funding decisions and mortality trends make it difficult to disentangle the causes. Local government funding in England has declined most in the more deprived areas, and so the observed association between changes in spending and mortality in some analyses<sup>143</sup> could be due to other factors such as changes in deprivation. However, more advanced statistical techniques<sup>n</sup> used in another study found that each £100 decline in annual per person local government funding in England was associated with a decrease in life expectancy at birth of 1.3 months.<sup>140</sup> Similar results were found in another study using a different approach, again finding that the slower increase in healthcare funding, and reduction in social care funding, after 2010, have been detrimental to mortality trends, with social care having particularly adverse impacts.<sup>141</sup>

An as yet unpublished study in Scotland, considering changes in health and social care spending and changes in mortality trends at local authority and health board level, does not show any substantial relationship.<sup>142</sup> <sup>o</sup> Reductions in health and social care spending in England were associated with an additional c.45,000 deaths using a fixed effects regression analysis.<sup>143 144</sup> Finally, the cuts in local government spending across England were also associated with increased homelessness<sup>145</sup> and higher mortality at older ages.<sup>146</sup>

---

<sup>n</sup> This involved panel regression analysis which removes time-invariant confounding (i.e. the impacts of factors that don't change over time, but which are different between areas, can be discounted as a cause).

<sup>o</sup> This may be partially related to the reductions in local government budgets in Scotland being approximately half the reduction in England.

### **Evidence summary**

There is mixed quality, but consistent, evidence of a negative impact on mortality, and other health outcomes, of reduced funding of a range of services. There is a particularly well-conducted study which shows that declining local government spending in England is likely to have contributed substantially to the stalled mortality rates.<sup>140</sup>

### **4.7.3 Austerity at household level**

#### **Hypothesis**

The hypothesis here is that the changes to household incomes resulting from austerity, in particular due to the reduced real-terms value and increased conditionality of social security benefits, has led to the stalled mortality trends. Household incomes may also have been impacted by broader changes in the economy,<sup>p</sup> in particular the labour market (e.g. changes to minimum wages, precarious or zero-hours employment contracts, unemployment rates, etc.), inflation (which is differentially experienced across income groups and includes aspects such as changes to housing rents and transport costs), and changes to taxation.

#### **Critical appraisal of the evidence**

Within the UK, austerity policies have led to substantial cuts to, and changes in the eligibility for, social security benefits.<sup>147</sup> This has meant that the incomes of the poorest groups have at best been static since 2010 (even after accounting for changes in wages and taxes).<sup>148 163</sup> Given the importance of income (and stability of income) for health, through a number of material and psychosocial pathways,<sup>40</sup> this is a very plausible explanation for the stalled trends, and especially the worsening trends in the most deprived areas.

Using assumptions surrounding the relationship between changes in income and subsequent mortality, the impact of changes in incomes in Scotland due to tax and benefit changes was modelled. This estimated that the reduction in incomes could explain a decline of 0.38 and 0.44 years in life expectancy for females and males respectively, as well as increased inequalities, thereby accounting for a substantial proportion of the difference between the actual trends and those that would have occurred if the pre-2012 trends had continued.<sup>149</sup>

The impact of the introduction of Universal Credit (which, as part of the broader austerity policy, involved increased conditionality and decreased real value compared to the previous benefits) was estimated to have resulted in c.64,000 more people experiencing psychological distress.<sup>150</sup> Furthermore, for lone parents, reducing the length of time after their children are born before they must move into work, resulted in worsening of mental

---

<sup>p</sup> Austerity is normally defined in terms of the fiscal balance (i.e. spending and tax policy) of governments after accounting for automatic stabilisers in the economy. Changes to the labour market and inflation are not strictly speaking austerity policies, but can form part of the broader approach to economic policy.

health.<sup>151</sup> Although mental health is only one indicator of morbidity, it gives an indication of the likely health and mortality impacts of these changes.

Finally, the increase in poverty associated with austerity policies was ecologically associated with adverse trends in infant mortality across England.<sup>144</sup>

### **Evidence summary**

There are no empirical evaluations of the mortality impacts of changed incomes after 2010 in the UK.<sup>9</sup> However, it is clear that the austerity-related changes to social security in the UK have led to decreased incomes for the poorest groups, and studies using panel data have shown that these changes in incomes (and the increased conditions put on the receipt of the benefits) have led to worsening mental health outcomes. A modelling study estimates a large adverse mortality impact, and rising mortality inequalities, from the policies.

#### **4.7.4 Overall evidence summary for Austerity policies**

Overall, there is good evidence that austerity has contributed to the stalled mortality trends when implemented at international level, and when implemented as local authority cuts in England. There is also good evidence that the cuts in the real value of social security benefits and the increased conditionality have been damaging for a broader range of health outcomes. Other studies also show consistently negative health and mortality impacts of austerity, but are of mixed quality. Taken together, this represents a strong and triangulated<sup>152</sup> body of evidence demonstrating the negative impacts of austerity.

---

<sup>9</sup> The Department for Work and Pensions has not yet approved applications for data linkage that would allow such evaluations to take place.

## 4.8 Increased deaths due to weather and temperature extremes

### Hypothesis

Periods of high or low temperature can increase mortality, especially when combined with other factors in societies which make populations more vulnerable to adverse impacts (including underlying levels of deprivation and poverty, housing quality, energy affordability, urban planning, social support, etc.).<sup>153-157</sup> One hypothesis generated from workshops and discussion has been that periods of particularly high or low temperature, perhaps associated with climate change, might be an explanation for the stalled trends.

### Critical appraisal of the evidence

For climate to explain the stalled mortality trends, a change in exposure for a series of years would be required rather than one particularly adverse summer or winter. With climate change, such a systematic shift in exposure might be expected and plausible. Direct estimation of the contribution of heat and cold to mortality through decomposition approaches is not straightforward. Certified deaths due to these causes are small in number in the UK, but are likely to substantially underestimate the total contribution of climate to mortality, as they may operate through increasing the risk of other causes of death.<sup>156</sup> Attributing mortality to heatwaves and cold spells is analogous to the approach for influenza (section 4.4), and is likely to be similarly related to the broader social determinants of health which create vulnerabilities (e.g. poverty-related ill-health) or resilience to such events (e.g. through affordable and effective home heating systems). The rapid rises in energy prices in early 2022, and the projected future increases, may create a situation in the future where mortality due to cold weather will have a larger impact than we have seen over the period from 2010.

Modelled estimates have been made of the excess deaths from extreme temperatures that have been observed up to now,<sup>158</sup> and that are forecast to result from future climate change.<sup>159</sup> Although the impacts are substantially more severe outside Europe and North America (where the evidence of stalled trends has largely arisen), numbers of excess deaths have also been estimated in the latter areas. The best estimates of the contribution of excess deaths from heatwaves over time show an exponential increase since 2010. However, the contribution from excess deaths due to cold remains much larger than that due to heatwaves, amounting to around 86,000 excess deaths per year across Northern Europe (which includes the UK, Republic of Ireland, Nordic and Baltic countries).<sup>160</sup> There is a sparsity of synthesised evidence of the contribution of other climate-related pathways (e.g. flooding), but it is likely to be small in the UK at present. This means that heatwaves are not a cause of the stalled trends because they are not contributing to excess deaths in the UK in recent years. Cold weather has been a longstanding cause of excess deaths in the UK but this has not increased in recent years.

If temperature was a substantial contributor to the trend it would have been expected that extreme temperatures would: impact particularly on the very old and very young (rather than across all age groups as is the case from the UK data); be confined to the summer and/or winter months (which is again not the case from the UK data<sup>27</sup>); and be concentrated on specific causes of death. There is strong evidence now that climate change is contributing to excess deaths through summer heatwaves, including in Europe and North America, and that this acceleration in excess deaths coincides with the stalled trends. However, the actual number of deaths attributable to excess cold and heat for the UK has changed little since 2000 (less than 0.5% for either cold or heat) and so the contribution to the stalled trends is very small.<sup>158</sup>

#### **Evidence summary**

Extreme weather/temperatures are not contributing to the stalled trends in life expectancy. Although excess deaths due to heat are increasing across Northern Europe, they remain very small. There has been a longstanding excess mortality due to cold, but this has not changed and therefore also cannot explain the stalled trends.

## 5. Synthesis of the evidence

The evidence for each of the hypotheses has been summarised above. On the basis of that evidence, this section of the report assesses the likelihood of each hypothesis making a causal contribution to the stalled trends. As described in section 2, the causal contributions are assessed through application of the Gordis major criteria (temporal relationship, biologic[al] plausibility, consistency, and alternative explanations (confounding)) and other considerations (dose-response relationship, strength of association, and cessation effects). Table 4.1 summarises the evidence for a causal contribution for each hypothesis. It shows that, of the original hypotheses, several factors are likely to be making a causal contribution on the basis of the evidence currently available. In terms of specific causes of death, cardiovascular disease (ischaemic heart disease and cerebrovascular disease) and drug-related deaths are assessed as contributing causes. However, each of these have to be considered in the context of their own causal mechanisms and not in isolation. Importantly however, having discounted a range of 'artefactual' explanations, it is possible to conclude that stalled mortality trends do represent a real and important population health concern.

For exposures, austerity is supported by the evidence as making an important and substantial causal contribution, operating at international, sub-national and household level. Obesity is also evidenced as likely to be making some contribution. However, any obesity contribution needs to be considered within the societal and economic context which has led to such a marked change in body mass across the population, particularly between the 1990s and around 2010.

In contrast, the suggested demographic and measurement factors (population ageing, age standardisation issues, population estimates and migration, tempo effects and mortality shifts over time, limits to life expectancy, and cohort effects) are unlikely to be making any causal contribution to the stalled trends of consequence. Likewise, the measured contribution of dementia to stalled life expectancy appears to be largely attributable to certification and coding changes, rather than changes in incidence or mortality of these conditions. These factors, however, are important to recognise and consider for in the methodology and interpretation of work on stalled mortality.

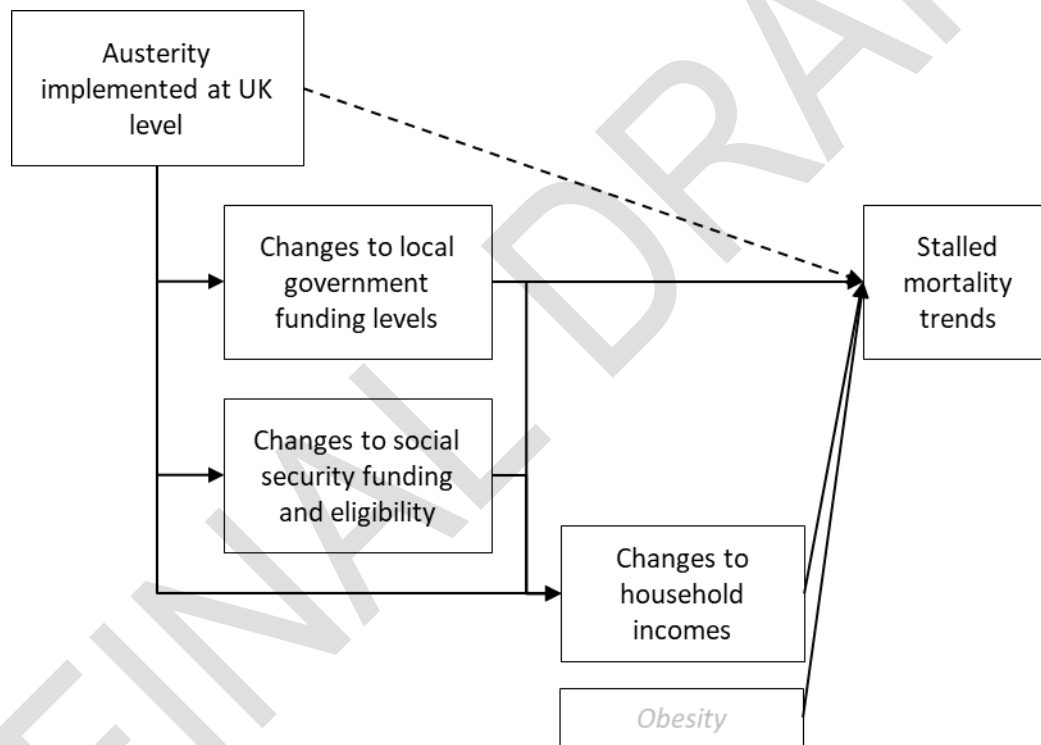
The hypotheses that are evidenced as making a causal contribution are not in tension (in that one hypothesis cannot be true if the other is true). Furthermore, there are clear causal links between many of the hypotheses such that they fit together into consistent and coherent causal chains. As noted in section 2, the stalled trends are due to changes across specific causes of death and age group. However, of the specific causes, cardiovascular disease and drug-related deaths are more likely to be important for the stalled trends, but are themselves related to other factors (including austerity, obesity, and for drug-related deaths cohort effects). The rise in obesity during the 1990s and 2000s is likely to have made some contribution to some deaths (e.g. cardiovascular disease). Austerity, operating at



multiple levels, is likely to have impacted across causes of death and made a substantial contribution to the overall stalled trends.

Figure 4.1 provides a diagrammatic representation of how the evidenced causal forces of the stalled mortality trends fit together. It shows that austerity operating at multiple levels is likely to be an important cause of the stalled trends. The direct link between austerity and stalled mortality is evidenced by the international evidence of austerity and mortality trends, and within a UK context is evidenced to operate through changes to local government funding, social security and household incomes. Obesity is also a likely contributing factor, but the extent of this is smaller and less certain.

**Figure 4.1 – A diagrammatic representation of how the evidenced causal forces for the stalled mortality trends fit together, with obesity in grey italicised font as it is making a smaller and less certain contribution**



**Table 4.1 – Assessment of the quality of evidence for different hypothesised causes of the stalled mortality trends in the UK**

Hypothesis	Causal viewpoints							Summary of insight
	Major criteria				Other considerations			
	Temporal relationship	Biologic plausibility	Consistency	Alternative explanations (confounding)	Dose-response relationship	Strength of association	Cessation effects	
<b><i>Specific causes of death</i></b>								
Influenza	No	No	n/a	n/a	n/a	n/a	No	Increased influenza is not a substantive contributor to the stalled trends.
Cardiovascular disease (CVD)	Yes	Yes	Yes	n/a	Yes	Yes	n/a	CVD is one of the specific causes of death which contribute to the changed trends There is some evidence increased obesity may have contributed.
Drug-related deaths	Yes	Yes	Yes	n/a	Yes	Yes	n/a	Drug-related deaths is one of the specific causes of death which contribute to the changed trends driven by drug specific causes (cohort effects and availability) and austerity mechanisms.
Dementia	Yes	Yes	Yes	Yes	Yes	Yes	n/a	Artefactual changes in how dementia is recorded accounts for much of the changed trends in England but the remaining real changes in the trends are similar in scale to other specific causes of death, and may be related to austerity.
<b><i>Exposures and overall explanations</i></b>								

Austerity	Yes	Yes	Yes	Low risk	Yes	Yes	Yes	Austerity is a cause of the stalled trends.
Demography: ageing of the population	Yes	No	No	n/a	No	No	n/a	Population ageing is not a cause of the stalled trends.
Demography: age standardisation issues	No	No	No	n/a	No	No	n/a	Age standardisation issues are not a cause of the stalled trends.
Demography: issues relating to population estimates and migration	No	No	No	n/a	No	No	No	Issues relating to population estimates and migration are not a cause of the stalled trends.
Demography: tempo effects and mortality shifts over time	n/a	No	No	n/a	n/a	n/a	n/a	Tempo effects are not a cause of the stalled trends.
Demography: limit to life expectancy	Yes	No	No	n/a	No	No	n/a	'Natural' limits to life expectancy are not responsible for the stalled trends.
Demography: cohort effects	No	No	Missing	n/a	No	No	No	Cohort effects are not responsible for the stalled trends.
Obesity	Yes	Yes	Yes	High risk	Missing	Missing	Missing	There is some evidence that obesity may be part of the cause of the stalled trends.
Weather and temperature	Yes	Yes for some causes	Missing	n/a	Yes	Yes	n/a	The contribution of weather and temperature is too small to be an important explanation of the stalled trends.

n/a = not applicable

## 6. Conclusions and recommendations

### Conclusions

Austerity is highly likely to be the most substantial causal contributor to the stalled mortality trends seen in Scotland and across the UK (and more tentatively across other high income countries). There is likely to be a smaller contribution to the changed trends through the mechanism of obesity.

### Recommendations

Given the conclusion that austerity, and its impact on funding for services and household incomes, is likely to be the largest and best evidenced causal force for the stalled mortality trends, the recommendations below detail what a sufficient policy response would look like given the public health importance of this phenomenon. These recommendations build upon existing recommendations around the alleviation of poverty and in responding to the related public health challenges of excess mortality in Scotland and Glasgow, and rising health inequalities. The methods (section 2) briefly described how these recommendations were developed.

#### Section 1: Macroeconomic policy

Work has recently been published which describes the importance of addressing economic relationships between social groups (i.e. the numerous ways in which economic resources flow from poorer groups to richer groups through the design of the economy) if economic inequalities (and as a result, health inequalities) are to be reduced.<sup>161</sup> It highlights the importance of the ownership of economic capital, rents, capital gains, profit extraction, monopoly and speculation. This understanding is reflected below. This report has also highlighted the central importance of macroeconomic fiscal policy, and particularly austerity, as a causal factor in driving the stalled mortality trends (both in the UK and internationally). The recommendations in this section seek to address these causes, and are arranged by level of governance (UK Government, Scottish Government, and local government/health boards).

#### *At UK level*

1. Design fiscal policy to avoid austerity approaches which limit public spending, especially during periods of economic downturn.

#### *At all levels*

2. Seek opportunities to change the economic structures that lead to large wealth and income inequalities by introducing appropriate policies to reverse or mitigate the processes of: rent extraction (e.g. rent controls and public/community ownership),

capital gains (e.g. land value taxation), profit (e.g. plural ownership of industry), monopoly (e.g. anti-trust regulations) and speculation (e.g. through financial regulation), and to diversify economic ownership (e.g. public ownership and co-operatives) as with Community Wealth Building.

## Section 2: Social security

Aim: Households can meet their material needs

The recent reductions in real household incomes for some groups and resulting increase in poverty have been detrimental to health. Since 2010 there have been changes to the social security system which have resulted in decreased incomes and increased conditionality<sup>f</sup> for low income and vulnerable groups.<sup>162</sup> The Equality and Human Rights Commission has reported that changes to UK social security systems (including freezes to working age benefits and tax credits and the introduction of Universal Credit) have negatively impacted low income families, and will have a disproportionately negative impact on several protected groups, including disabled people, certain ethnic minorities, and women, lone parents in particular.<sup>163</sup>

By comparison, the UK is less generous in its social security support than most other countries in Western Europe. In the UK, social security to support those out of work amounts to less as a percentage of median wage than other countries in Europe; the estimated European Union average replacement rate in 2018 was 69% compared with 48% of median earnings in the UK.<sup>164</sup>

The evidence suggests that policy changes since 2010 have been accompanied by: increases in child poverty; an increase in prevalence of overweight/obesity among the poorest; higher-than anticipated working-age mortality from ischaemic heart disease and alcohol-related causes among men from deprived areas; increased drug-related deaths across the UK;<sup>68</sup> and some evidence of a higher number of working-age deaths than anticipated from respiratory disease and all-cause mortality.<sup>162</sup>

The principles of a good social security system have been well articulated by the Child Poverty Action Group: a social security system should (i) prevent and reduce poverty by assisting with costs across the life course, including childcare and the costs associated with having a disability; (ii) provide income security by providing contingencies for adverse circumstances and at all times, in or out of work - no one should be unprotected as a result of sanctions and delays and (iii) promote social solidarity and be non-stigmatising.<sup>165</sup> The feasibility of piloting a Universal Basic Income or Citizens' Basic Income has been discussed elsewhere.<sup>166</sup> A universal pilot was not found to be feasible in Scotland, but a specific pilot in

---

<sup>f</sup> Conditionality is when access to certain social security benefits is dependent on an individual agreeing to particular behaviours.

care-experienced young people is to be trialled in Wales which is likely to provide useful learning in this area.

*At UK level*

3. Increase all benefits and tax credits in line with inflation every year, and put in place a one-off increase in benefits and tax credits now to compensate for the loss of real income incurred since 2010. The reinstatement of the £20 per week uplift in Universal Credit that was in place during the early part of the COVID-19 pandemic would be a contribution towards this.
4. Reduce welfare conditionality, starting with the increases in conditionality introduced since 2010.

This uprating of the value of benefits is required in order to reverse the real terms reductions since 2010. The issues with Universal Credit which have been shown to cause unnecessary harm, including a five week wait for benefits, poor administration and sanctions, need to be addressed.

The increases in conditionality in the social security system introduced since 2010 need to be reversed, as an initial step towards further reductions in conditionality over time. It should be noted that this has been shown to be feasible in the devolved nations: the benefits cap is offset in Northern Ireland and the spare room subsidy is offset in Scotland. Conditions on social security payments have increased since the 1980s, with sanctions being extended to previously exempt groups such as lone parents and people with disabilities.<sup>167</sup> Social security conditionality in the form of benefit sanctions is not effective in assisting entry into the paid labour market over time;<sup>168</sup> in evidence to the Commons Work & Pensions Committee inquiry into benefit sanctions, Professor Peter Dwyer stated that benefit sanctions are not appropriate for disabled people or universal credit recipients who are in work.<sup>169</sup> Written evidence from Dr Ben Geiger noted the ineffectiveness of sanctions for people with health problems or disabilities.<sup>170</sup> Written evidence from NHS Health Scotland recommended that sanctions be abolished for parents with children and pregnant women.<sup>171</sup>

5. Ensure that access to the social security system across the UK is seen as a right, and that people using the system are treated with dignity and respect.

Access to the social security system is a right (as is the case currently with the NHS, and how Social Security Scotland has been developed), and citizens must be treated with dignity and respect by clarifying this in the purpose and aims of the Department of Work and Pensions, and by embedding these values into the ways of working and organisational culture. An ideal social security system should be widely understood and supported by the public as mutual societal co-operation, not as charity.<sup>172</sup> In a 2018 report by the United Nations 'Special Rapporteur on extreme poverty and human rights',<sup>173</sup> it was explicitly recommended that DWP staff be trained to use *"more constructive and less punitive approaches to encouraging*

*compliance*". All opportunities should be taken to ensure the culture of the system is one that is focussed on the needs of claimants.<sup>5</sup>

We welcome that the Social Security Scotland charter takes an explicit human rights based approach.<sup>174</sup>

#### *At Scottish level*

6. Use fiscal powers to top up reserved benefits and reverse UK cuts.
7. Create new benefits and increase existing benefits to support those in low income households. Specifically, increase the Scottish Child Payment to £40 per week to meet child poverty reduction targets.

The Scottish Government could use their fiscal powers to top up UK benefits, reverse UK cuts and reforms and potentially create new benefits to support those in low income households.<sup>175</sup> Revenue could be generated from increases to personal taxation. We welcome the introduction of the Best Start Grant, Carers Allowance and new Scottish Child Payment but believe all should be monitored to ensure maximum impact for low income families. While it has been stated that UK Government policy has driven much of the story of poverty over the last two decades,<sup>19</sup> it is also true that Scottish Government has gained fiscal powers steadily since devolution. Some social security powers were transferred with the Scotland Act 2016; a set of benefits related to disability and caring and some payments for low income households have also been transferred.<sup>19</sup> As has been recommended previously, positive actions include reversing the effects of UK Government cuts and reforms (e.g. to tax credits, incapacity benefits, housing benefit and child benefits) to provide more efficient safeguards and protection for the most vulnerable in our society.<sup>7 8</sup> A 50% increase to means-tested benefits rates could improve health and narrow health inequalities with an estimated 4.7% fewer premature deaths and 8% reduction in relative inequalities.<sup>176</sup> It has also been noted that increasing the Scottish Child Payment is an effective means of meeting the Child Poverty reduction targets.<sup>177 178</sup>

#### *At Local level*

8. Provide high quality money advice and welfare rights services to ensure people receive all the benefits and other entitlements for which they are eligible.

All eligible people should receive the benefits they are entitled to through funding of high-quality money/welfare rights services. Up to half a million families in the UK are not claiming the means-tested benefits to which they are entitled.<sup>179</sup> Local authorities and NHS Boards are major employers across Scotland and should provide their employees with access to money/welfare rights advice. Formal referral pathways from health and other universal

---

<sup>5</sup> Note that monitoring of claimant experience of the reserved system in Scotland could be conducted using existing data sources.

services to money/welfare advice could be developed; asking about money worries can be part of the routine assessment of needs of universal service users. Health Boards have been asked by Scottish Government to create pathways for service users where they do not exist and ensure they are effective where they do exist.<sup>180</sup> Further income maximisation opportunities could be taken by embedding money advice in frequently used services or introducing an outreach service.<sup>181 182</sup> Money/welfare rights advice in such an embedded model would be provided via the setting the person is referred from, such as school, nursery, GP practice or community hub.

## **Section 2: Work**

Aim: improve quality and flexibility of working conditions

Various policies affecting working conditions have had important implications for health outcomes. These include those relating to wages, the availability of work, and the security and quality of employment.<sup>162</sup> It is important to note that 65% of children in poverty in Scotland live in families where at least one adult is in work.<sup>183</sup>

*At UK level (and other levels where appropriate)*

9. Improve the availability of 'good work' by increasing in-work benefits, improving employee control at work and minimising health and safety risks in the work environment.

As has been previously recommended,<sup>7 8</sup> the UK Government should support the vision set out in the Fair Work Framework<sup>184</sup> to attempt to ensure that all work in the UK offers security, fulfilment and respect. Forms of flexible working where the burden of risk falls disproportionately on workers (including most zero hours contracts) are not fair work.<sup>184</sup> Flexible vacancies that allow people to reach a minimum income standard could help improve living standards overall.<sup>185</sup>

10. Increase the statutory living wage to the Real Living Wage.

Since low pay is a major contributor to in-work poverty, it is crucial that all employees receive at least the Real Living Wage as set out by the Living Wage Foundation.<sup>186</sup> This would narrow income inequalities and focus investment on those in the worst health. For example, care work can be seen as insecure, low-wage, low-skilled, gendered employment;<sup>187</sup> in reality, these workers are performing crucial work that should be valued by society and this should be demonstrated by substantial increases in their salaries. UK Government can ensure that public sector care workers in nursing care homes, people's homes, and childcare settings are paid at least the Real Living Wage, thereby supporting early years' education and social care services.



11. Provide 30 hours per week of funded, good quality and flexible education and childcare for all children from age one to five.

High quality early years education is good for children. Good quality universal childcare benefits all children and those from disadvantaged circumstances the most; targeted interventions benefit disadvantaged children still further.<sup>20 188</sup> Supporting low income families with free or affordable early years childcare helps parents to obtain employment<sup>189</sup> and therefore increases household income with consequent benefits for health.<sup>190</sup>

12. Eradicate the restrictions on trade unions.

New balloting rules and restrictions on campaigning create a greater imbalance of power between workers and employers which can be detrimental to health. Researchers have proposed that industrial relations and workplace regulation are crucial to public health and that weakening unions will contribute to health inequalities in the future.<sup>191</sup> In addition, the Trade Unions Congress has reported that trade union involvement helps reduce injuries at work and leads to reductions in the levels of ill-health caused by work.<sup>192</sup>

#### *At Scottish level*

13. Measure economic and social progress through health and wellbeing measures, instead of Gross Domestic Product.

When economic and social progress is measured through health and wellbeing parameters, it is clear that improvement of the health of a population is a key priority of their government. Recognising that health and wellbeing outcomes are the ultimate goal of government policy, and that economic policy and activity is in support of such outcomes, would help prioritise policies and practice which support an inclusive economy. We welcome the First Minister's prioritisation of the Beyond GDP agenda<sup>193</sup> which aims to develop indicators that measure economic and social progress but are more inclusive of environmental and social aspects of progress. This is essential to Scotland's long-term sustainability and productivity.

#### *At Local level*

14. Use public spend to advance progressive employment practices, including good/fair work, and to create healthier working environments.

Building on the Community Wealth Building agenda, suggestions for action have been outlined in the NHS Health Scotland briefing, 'Maximising the role of NHS Scotland in reducing health inequalities'.<sup>194</sup> These include: (i) providing high quality services with allocation of resources proportionate to need; (ii) training the workforce to understand their role in reducing inequalities; (iii) forming effective partnerships with different sectors to help reduce health inequalities; (iv) mitigating inequalities through employment and

procurement processes; and (v) advocating to reduce health inequalities. Local authorities should ensure public sector employers have enough knowledge and awareness of the challenges with Universal Credit to address them for their employees. They should also ensure that local childcare providers are well informed and supported to deal with Universal Credit's approach to childcare costs. The NHS can be considered an "anchor institution" in that it usually remains in one geographical place, has significant assets and influences the health of communities just by being there. Importantly, by choosing to work with communities and invest responsibly, the NHS can have a very large impact on the wider determinants of health.<sup>195</sup>

15. Maximise the potential of City and Regional Growth Deals to reduce inequality and improve health.

Building on the 'Economies for Healthier Lives' programme of work, consideration should be given as to how to maximise the potential of City and Regional Growth 'Deal' investments to help mitigate against the effects of vulnerability in the population<sup>7 8</sup> and shape the economy to be more inclusive. For example, this could be done through capital investment in social housing or the creation of sustainable high-quality employment where surpluses are retained locally and by the workforce.

16. Implement the principles of inclusive economies to ensure that the economy is redesigned to achieve economic, social and health equity.

Inclusive economies are those which are designed to reduce inequalities across the population.<sup>196</sup> This is one of the main overall priorities set out in the Scottish Government's economic strategy, with a focus on actions relating to employment and access to this employment.<sup>197</sup> It is key that the principles of inclusive economies are implemented in practice in Scotland.

### **Section 3: Taxation**

**Aim:** The inequality of extreme wealth concentration which leads to health inequalities is reduced

As outlined above, the poorest people in society suffer the highest levels of illness<sup>198 199</sup> and income inequality across a society affects public health and wellbeing overall.<sup>200</sup> On a population level, lifting the poorest people out of poverty can benefit the health of the whole population, as well as reduce health inequalities.<sup>201</sup> Fairer individual and corporate taxation could generate revenue to increase funding for public services.

*At UK level*

17. Address tax evasion and avoidance among individuals and corporations as a means of achieving fairer taxation across the UK.

18. Increase taxation of wealth, assets and corporate profits, reverse the concentration of asset ownership and reregulate the financial industry.

We know that inequalities in wealth are detrimental to population health.<sup>201</sup> Wealth inequality allows richer groups to receive substantial unearned income (e.g. from rents, profits, capital gains) which exacerbates income inequalities. The UK currently has an extreme level of wealth concentration. This has resulted from the deregulation, privatisation and reduced taxation in relation to the ownership of housing, land, companies and financial transactions. As Oxfam recommends, “governments must ensure corporations pay...fair taxes and take responsibility for their impact on the planet”.<sup>21</sup> The income generated from these approaches could provide greater resources for public services, including NHS treatment services, public health services and social care services.

*At UK and Scottish level*

19. Introduce more progressive, and therefore fairer, income tax bands and rates to narrow income inequalities across society.

*At Scotland level*

20. Use fiscal powers to narrow inequalities by replacing council tax with a fairer alternative.

Population health can be improved by any policy that increases average household income, but to reduce health inequalities a policy must be progressive, disproportionately increasing incomes for the most deprived people over the least deprived people. Analysis has shown that council tax is only weakly linked to property valuation (being based on property values which are between 15 and 27 years out of date). It is also a regressive tax which takes a higher proportion of the incomes of poorer groups, and could be replaced with fairer alternatives.<sup>202</sup> The money generated could be used to invest in public services, which would in turn support population health.

#### **Section 4: Public services**

**Aim:** public services are able to contribute significantly to preventing ill-health and premature mortality and can provide timely, high-quality services

After the introduction of the range of policies aimed at reducing the deficit in the UK (austerity), real terms reductions in some aspects of public spending led to pressures on NHS and local authority service provision. There have been greater reductions in England than in Scotland or Wales.<sup>134 203</sup> These cuts impact on a wide range of services, including education, culture and leisure, housing and some support services for those with particular needs (e.g. disabilities or substance misuse issues).

Public funding for social care for adults has fallen considerably; it was reduced by 21% between 2009/10 and 2015/16.<sup>204</sup> Adult social care comprises a support system which aims to encourage independence, and support the wellbeing, of those in our communities who have a disability or frailty from increasing age or a long-term condition. This support can range from providing meals and help with medication at home, to the running of care homes. In England, Scotland and Wales, local authorities are charged with purchasing and delivering adult social care. Pressures on such services can increase or become obvious when additional external challenges are present, for example a particularly severe winter or a bad influenza season.

*At UK and Scottish level*

21. Increase public sector funding for preventative services, resist privatisation of clinical care and ensure proportionate universalism of service provision.

Privatisation of health and social care services in the UK increased after the introduction of the Health and Social Care Act 2012; this appears to have increased costs without commensurate improvements in services, and with increased inequalities by age and socio-economic position.<sup>205-209</sup> As described by Julian Tudor Hart, we know that where there are market incentives within the health service, the availability of good healthcare tends to vary inversely with the need of the population served (the 'inverse care law').<sup>206</sup> Enhancing provision of health services in areas of greater need (e.g. through longer appointment times and greater support in the most deprived communities/with groups who have higher needs) is likely to help mitigate against inequality (i.e. 'proportionate universalism').<sup>210</sup>

22. Reverse the reductions to social care funding and put in place an increase now to compensate for the loss of real income incurred since 2010.

There is evidence that cuts to health and social care spending, along with increased service demands and unmet need, may partly explain the recent mortality trends in England.<sup>211</sup> When financial pressures are coupled with an ageing population and associated increased demands, even an uplift in social care spending to pre-2010 levels may not be enough; the social care system will still be underfunded in real terms if that increase does not match the increase in service demand.

23. Change drugs legislation to reduce drug harms as part of accepting the recommendations of the cross-party Westminster committee on drugs harms in Scotland.

Make the necessary changes to the Misuse of Drugs Act 1971 to enable the Scottish Government to pursue their public health approach to drugs policy (including the piloting of harm reduction interventions such as safer consumption facilities and drug checking services), or devolve the powers in this area. Change legislation to decriminalise possession of drugs for personal use. Review the potential for the legalisation of drugs in order to

reduce associated harms. Accept all of the recommendations of the cross-party Westminster committee on drugs harms in Scotland.<sup>212</sup>

#### *At Scottish level*

24. Increase funding for public services back to 2010 levels as a minimum, particularly for local government.

Increasing available funding will increase the capabilities and resilience of NHS treatment services, public health services, addiction services, housing services and health and social care, all of which support the health of the population.

25. Implement a public health approach to drugs services.

A public health approach to drugs services would mean improving accessibility and acceptability of services by ensuring easy access to same day prescribing and choice of treatment to effectively meet individual needs. Develop effective person-centred multi-agency addiction service delivery models that engage service users as partners in the management of their own health needs in order that an effective whole-system response can be made to problematic drug use in Scotland, and result in lives saved. We note that Scottish Government's pre-COVID-19 Programme for Government stated they would "consult on drug law reform, setting out the changes we would want to make to the 1971 Act in the event that UK Government agrees to devolve the powers in the Act".<sup>213</sup> We recommended any drug law reform takes a public health approach. For a timely and proportionate response we recommend that Police Scotland, under the authority of the Lord Advocate, is enabled to implement Recorded Police Warnings for all controlled drugs (not just cannabis) as an alternative for personal possession offences. By providing police officers with an alternative to arrest in appropriate cases with immediate effect this can reduce barriers to services by tackling stigma and preventing disruption in people's lives. The recent increases in the availability of naloxone, including by Police Scotland, are welcome.

#### *At Local Level*

26. Design local services for the populations they serve, involving citizens in the design of services wherever possible.

Local services should be designed in line with the best available evidence in proportion to need through the use of public health needs assessment and service redesign processes. In the medium term, Scottish NHS Health Boards should work together to determine the true needs of the population and design services in accordance to those needs, such that they will address the longstanding inequalities and improve outcomes. This should include non-price barriers; a 'did not attend' event could be used as a signal that extra help is needed (not as a signal that someone needs to be punished by denying them healthcare). Such an

approach should be aligned with the Scottish Government's Realistic Medicine work,<sup>214</sup> moving away from high cost, low value medical interventions towards more effective, efficient and culturally-appropriate care.

## **Section 5: Material needs**

Aim: Address the prohibitively high cost of living well

The next subset of recommendations focuses on policy approaches to help mitigate the negative impacts of poverty on health including those related to poor housing and poor nutrition. The recommendations in this section build upon those described under social security. These recommendations have become even more urgent as costs have increased rapidly in early 2022, particularly for the lowest income groups.

*At UK and Scottish level*

### 27. Eliminate fuel poverty.

Target cold and damp housing, and people who struggle to afford fuel, by implementing affordable heating, ventilation and quality energy efficiency measures. This should ensure that housing across all sectors achieves this standard quickly without barriers being put in place that lead to differential access across the population. Lack of protection from the cold indoors has been identified as a factor in excess winter mortality.<sup>215</sup> This is particularly crucial given the recent increases in fuel costs in the UK.

### 28. Help prevent poverty by growing a social rented housing sector that is accessible, affordable and provides secure tenancies.

### 29. Extend the housing quality standard to the private rented and tied housing sectors, avoiding associated rental increases or reduced housing availability.

The role of social housing is becoming more prominent in an insecure labour market and supporting the growth of affordable and secure housing prevents poverty. In addition, the implementation of the JRF's proposal for a 'living rent', whereby social housing rental costs would be directly linked to local earnings, would make housing costs across the country fairer.<sup>216</sup>

An extension of the Scottish Housing Quality Standards to the private rented sector and tied housing sectors in Scotland, alongside measures to control rents, would help to ensure that the whole population has access to affordable high quality housing.

### 30. Eliminate food poverty.

To increase understanding of their prevalence, nature, causes and consequences, food poverty levels should be appropriately monitored. It should be publicly recognised by

government that emergency food provision should not replace, or form an integral part of an adequate social security net; a human rights-based approach means a move away from the benevolence model of food aid and food banks towards enabling environments that support people in feeding themselves. Poverty influences what people can afford to buy, cook and consume, partly because 'healthy' diets are around a third more expensive than 'unhealthy' diets.<sup>217</sup> In addition, precarious employment can influence eating patterns both via stress eating due to a low-control job and lack of regular mealtimes due to work patterns. This can influence obesity, diabetes and cardiovascular disease patterns in people experiencing both poverty and precarious employment. It is therefore important to ensure that effective actions on both food poverty and the obesogenic environment are quickly implemented.

31. Develop and commit to targets to reduce child poverty across the UK.

These could be at least as ambitious as those detailed in the Child Poverty (Scotland) Act 2017. By 2030, Scotland aims to have:

- fewer than 10% of children living in families in relative poverty
- fewer than 5% of children living in families in absolute poverty
- fewer than 5% of children living in families living in combined low income and material deprivation
- fewer than 5% of children living in families in persistent poverty.

The plans to deliver on these commitments in Scotland are detailed in Every Child, Every Chance: The Tackling Child Poverty Delivery Plan 2018-22.<sup>218 219</sup> It has been estimated that eliminating child poverty in the UK would save the lives of 1,400 children under 15 years of age annually.<sup>220 221</sup>

*At Scottish level*

32. Increase the provision of social housing in Scotland.

As the Joseph Roundtree Foundation has stated, Scotland has an advantage in both the cost of housing and type of housing available and, because of this, poverty rates measured after housing costs in Scotland are markedly lower than in the rest of the UK. However, there are still long social housing waiting lists across Scotland and housing remains unaffordable in many local authority areas to young adults.<sup>19 222 223</sup>

*At a local level*

33. Reduce the cost of public transport for those most in need.

The cost of public transport is significant for those living in poverty; particularly for those living in peripheral estates and rural areas. Transport services may be better managed locally, and free or subsidised transport for those on low incomes could significantly improve accessibility to education, employment and services. Lack of access to transport restricts access to activities and opportunities that improve people's life chances, such as education, work, food shopping and health care, and thereby contributes to social exclusion.<sup>224</sup> This should be implemented alongside the SG's Scotland-wide free bus travel for those aged under 22 years of age.

## **Section 6: Obesity**

### *At all levels*

34. Implement and evaluate an evidence-based whole-system obesity strategy which prioritises actions that address the commercial determinants of obesity, and takes a structural approach.

The prevalence of obesity increased rapidly between the 1990s and around 2010. The Foresight report<sup>114</sup> detailed how this was due to the creation of an obesogenic environment in which multiple systems interacted to make an average gain in weight more likely across the population. It is clear that an effective strategy would take a population-wide, structural approach, which addresses the commercial determinants of obesity, and which would be more likely to reduce inequalities.<sup>225</sup>

## **Section 7: Improved understanding**

**Aim:** Ensure both the public and policymakers are aware of structural drivers of health and wellbeing, the recent negative impacts of changes and are ready to act

This section is included to recognise the importance of, and prioritise the need to work to further understand, deprivation and the mechanisms which are leading to the unprecedented stalling and decline of life expectancy in the UK.

These two recommendations reflect the importance of the public understanding of the nature of the evidence base around the recent mortality trends and the implications of what we have seen.

### *UK level*

Despite numerous approaches, the Department for Work and Pensions (DWP) and Her Majesty's Revenue and Customs (HMRC) have blocked requests by researchers to link NHS and mortality data to DWP or HMRC records which would allow better quality evaluations to take place, and facilitate the mortality impacts of policy changes to be estimated. The current situation reduces collective understanding of the impacts of policy and restricts the implementation of evidence-informed policy and reduces public policy accountability.



35. Facilitate linkage between DWP, HMRC, NHS and mortality records to allow for the health and mortality impact of policy changes to be accurately evaluated.

*At all levels*

36. Commit to taking the necessary action to respond to the changes in life expectancy trends.

The causes and implications of stalling life expectancy are important to the UK and all devolved governments; collaborative discussion about the reasons and opportunities for action through policy will remain important until life expectancy trends return to their pre-2012 trajectory.

37. Public Health leaders should advocate for action to reduce the health inequity that leads to stark inequalities in premature mortality.

Public Health advocates, including local public health professionals and national bodies should take action to support the public, and wider public health community's understanding of recent adverse mortality trends. Explicit teaching on the impact of health inequity should be incorporated into training of multi-disciplinary professionals in all relevant areas of health and care training.

38. Commit to a programme of ongoing monitoring and research to deepen understanding of the causes of the stalling (including for groups where there are limited data, such as ethnic minorities), and to broaden understanding of the trends beyond high-income countries.

Ongoing monitoring of mortality trends within Scotland, across the UK, and internationally, are all required to assess whether the responses to the trends have been sufficient. Deepening the understanding of the causes of the trends through further high quality and peer reviewed research is necessary if policy is to be informed by evidence. This should extend to analyses beyond high income countries as the extent to which there is evidence of stalling elsewhere has not been assessed in detail.

39. Improve and modernise the measurement of poverty.

This could follow the recommendations of the Social Metrics Commission.<sup>226</sup> This measurement framework captures unavoidable costs people face in childcare and disability costs, and considers the wider financial resources available to people. It also assesses the depth and persistence of poverty and includes data on 'lived experience indicators' to give a broader picture of the nature of poverty as it is experienced in the UK today.

## **Section 8: Social recovery from COVID-19**

Aim: Ensure the prioritisation of the actions in this document within the social recovery from the pandemic

This section has been added in response to the COVID-19 pandemic. The pandemic has exacerbated the issues of stalling and worsening life expectancy as a result of both the health, social and economic impacts of COVID-19 infection, and of the measures put in place to control the virus.<sup>227</sup> These impacts have been felt most acutely by those on lower incomes, more deprived areas, and by those in ethnic minorities.

*At all levels*

40. Incorporate and prioritise the actions in this document within the plans for social recovery from the COVID-19 pandemic.

Incorporation of actions in this document into local, Scottish and UK level plans for social recovery from the pandemic would provide important opportunities to effect change. Work towards these actions should continue to be prioritised alongside the other key areas requiring the attention of public health professionals at this critical time.

# Appendix 1 – summary of obesity contribution methods

This appendix briefly summarises the work to estimate how much of the recent stalling of improvement in mortality in Scotland and England is attributable to increased obesity prevalence.

## Methods

We calculated population attributable fractions (PAFs) for the increase in obesity prevalence between the mid-1990s and late 2000s in relation to all-cause mortality for 35-89 year-olds in Scotland and England. We used obesity prevalence data from the Scottish Health Survey and the Health Survey for England, and previously-published hazard ratios (HRs) from a meta-analysis of 89 European studies (based on c.14 years' follow-up). PAFs were applied to mortality data for 2017-19, enabling calculation – and comparison – of observed rates, obesity-adjusted rates (i.e. excluding deaths attributable to the obesity increase) and 1991-based projected rates (i.e. predicted rates had the stalling in improvement not occurred). All rates were European age-standardised (EASRs) and stratified by sex. Sensitivity analyses included the use of different HRs, age groups, and base-years for projections. DAGs and other tools were used to assess likely bias.

## Results

The observed EASR for 35-89 year-old males in Scotland averaged across 2017-19 was 1750.7 (95% CIs 1728.6, 1772.8). This reduced marginally to 1718.8 (1696.9, 1740.7) after exclusion of obesity related deaths, but was still notably higher than the projected EASR of 1447.1 (1426.9, 1467.3). The values for the individual years are used in section 4.5. The change in obesity therefore potentially 'explained' 10.5% of the difference between the observed and projected rates. For females, 13.6% of the difference could be attributed in this manner. However, the figures for England were notably higher: 20.1% for males; 35.1% for females. Sensitivity analyses and bias assessment suggested the potential for overestimation of effect size; however, the degree is difficult to quantify.

## Conclusions

A number of uncertainties are associated with PAF-based methodologies: thus cautious interpretation of results is required. A proportion of recent mortality changes may be associated with earlier changes in obesity prevalence. However, much larger proportions are not explained by obesity, and are therefore likely attributable to previously-articulated causes such as austerity. Policies are therefore required to both reverse the damaging effects of austerity, as well as to address the negative consequences of the well understood obesogenic environment in the UK.

## References

- <sup>1</sup> Definitions and metadata. Geneva, World Health Organisation, 2006, <https://www.who.int/whosis/whostat2006DefinitionsAndMetadata.pdf>.
- <sup>2</sup> Deaths involving coronavirus (COVID-19) in Scotland. Week 49 (6 December to 12 December 2021). Edinburgh, National Records of Scotland, 2020.
- <sup>3</sup> Life Expectancy in Scotland, 2018-2020. Edinburgh, National Records of Scotland, 2021.
- <sup>4</sup> McCartney G, Walsh D, Whyte B, Collins C. Has Scotland always been the 'sick man' of Europe? An observational study from 1855 to 2006. *European Journal of Public Health* 2011; 22(6): 756-60.
- <sup>5</sup> Whyte B, Ajetunmobi T. Still 'the sick man of Europe'? Scottish Mortality in a European Context 1950 – 2010. An analysis of comparative mortality trends. Glasgow, Glasgow Centre for Population Health, 2012.
- <sup>6</sup> Leon DA. Trends in European life expectancy: a salutary view. *International Journal of Epidemiology* 2011; 40(2): 271–277.
- <sup>7</sup> Walsh D, McCartney G, Collins C, Taulbut M, Batty GD. History, politics and vulnerability: explaining excess mortality. Glasgow, Glasgow Centre for Population Health, 2016.
- <sup>8</sup> Walsh D, McCartney G, Collins C, Taulbut M, Batty GD. History, politics and vulnerability: explaining excess mortality in Scotland and Glasgow. *Public health* 2017; 151: 1-12.
- <sup>9</sup> Fenton L., Minton J., Ramsay J. et al. Recent adverse mortality trends in Scotland: comparison with other high-income countries. *BMJ Open* 2019; 9: e029936.
- <sup>10</sup> Walsh D., McCartney G., Minton J., Parkinson J., Shipton D., Whyte B. Changing mortality trends in countries and cities of the UK: a population-based trend analysis. *BMJ Open* 2020; 10: e038135.
- <sup>11</sup> Fenton L., Wyper G.M., McCartney G., Minton, J. Socioeconomic inequality in recent adverse all-cause mortality trends in Scotland. *Journal of Epidemiology & Community Health* 2019; 73: 971-974.
- <sup>12</sup> Currie J., Boyce T., Evans L., Luker M. et al. Life expectancy inequalities in Wales before COVID-19: an exploration of current contributions by age and cause of death and changes between 2002 and 2018. *Public Health*. 2021; 193: 48-56.
- <sup>13</sup> Marmot M., Allen J., Goldblatt P., Herd E., Morrison J. Build Back Fairer: the COVID-19 Marmot Review. The Pandemic, Socioeconomic and Health Inequalities in England. London, Institute of Health Equity, 2020
- <sup>14</sup> Galea S. Compassion in a time of COVID-19. *Lancet* 2020; 395(10241): 1897-1898.
- <sup>15</sup> Celentano D, Szklo M. From Association to Causation: deriving inferences from epidemiologic studies. In: Celentano D, Szklo M (eds). *Gordis Epidemiology*, sixth edition. Philadelphia, PA, Elsevier, 2019.
- <sup>16</sup> Walsh D, Lowther M, Reid K, McCartney G. Can Scotland achieve its aim of narrowing health inequalities in a post-pandemic world? *Public Health in Practice* 2020; 1: 100042, <https://doi.org/10.1016/j.puhip.2020.100042>.
- <sup>17</sup> A Scotland without poverty. York, Joseph Rowntree Foundation, 2016, <https://www.jrf.org.uk/report/scotland-without-poverty>.
- <sup>18</sup> UK poverty: causes, costs and solutions. York, Joseph Rowntree Foundation, 2016, <https://www.jrf.org.uk/report/uk-poverty-causes-costs-and-solutions>.
- <sup>19</sup> Poverty in Scotland 2019. York, Joseph Rowntree Foundation, 2019, <https://www.jrf.org.uk/report/poverty-scotland-2019>.

- <sup>20</sup> What needs to be done? Glasgow, Child Poverty Action Group in Scotland, undated, <https://cpag.org.uk/scotland/child-poverty/what-needs-be-done>.
- <sup>21</sup> An Economy for the 99%. Oxford, Oxfam, 2017, [https://www-cdn.oxfam.org/s3fs-public/file\\_attachments/bp-economy-for-99-percent-160117-en.pdf](https://www-cdn.oxfam.org/s3fs-public/file_attachments/bp-economy-for-99-percent-160117-en.pdf).
- <sup>22</sup> Even it up: Scotland's Role in Tackling Poverty by Reducing Inequality at Home and Abroad. Glasgow, Oxfam Scotland, 2015, <https://oxfamilibrary.openrepository.com/bitstream/handle/10546/579309/cr-even-it-up-scotland-manifesto-061015-en.pdf;jsessionid=A3F771200FFAFBDE9BAF69A86C70E6A4?sequence=1>.
- <sup>23</sup> Inequality Briefings: A series of briefings to promote action to reduce health inequalities. Glasgow, NHS Health Scotland, undated, [http://www.healthscotland.scot/publications?q=&fq=publicationType\\_solis\\_s%3AInequality+briefing%23](http://www.healthscotland.scot/publications?q=&fq=publicationType_solis_s%3AInequality+briefing%23).
- <sup>24</sup> Minton J, Fletcher E, Ramsay J, Little K, McCartney G. How bad are life expectancy trends across the UK, and what would it take to get back to previous trends? *J Epidemiol Community Health* 2020; 74: 741-746, <https://doi.org/10.1136/jech-2020-213870>.
- <sup>25</sup> Ramsay J, Minton J, Fischbacher C, Fenton L, Kayte-Bardgett M, Wyper GMA, Richardson E, McCartney G. How have changes in death by cause and age group contributed to the recent stalling of life expectancy gains in Scotland? Comparative decomposition analysis of mortality data, 2000–2002 to 2015–2017. *BMJ Open* 2020; 10: e036529, <https://doi.org/10.1136/bmjopen-2019-036529>.
- <sup>26</sup> Bennett JE, Pearson-Stuttard J, Kontis V, Capewell S, Wolfe I, Ezzati M. Contributions of diseases and injuries to widening life expectancy inequalities in England from 2001 to 2016: a population-based analysis of vital registration data. *Lancet Public Health* 2018; 3(12): E586-597, [https://doi.org/10.1016/S2468-2667\(18\)30214-7](https://doi.org/10.1016/S2468-2667(18)30214-7).
- <sup>27</sup> A review of recent trends in mortality in England. London, Public Health England, 2018.
- <sup>28</sup> Long-term monitoring of health inequalities: January 2021 report. Edinburgh, Scottish Government, 2021.
- <sup>29</sup> Rashid T, Bennett JE, Paciorek CJ, et al. Life expectancy and risk of death in 6791 communities in England from 2002 to 2019: high-resolution spatiotemporal analysis of civil registration data. *Lancet Public Health* 2021; 6(11): E805-816, [https://doi.org/10.1016/S2468-2667\(21\)00205-X](https://doi.org/10.1016/S2468-2667(21)00205-X).
- <sup>30</sup> Socioeconomic inequalities in avoidable mortality, England and Wales: 2001 to 2017. London, Office for National Statistics, 2019, <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/articles/measuring socioeconomic inequalities in avoidable mortality in England and Wales/2001 to 2017>.
- <sup>31</sup> Kraftman L, Hardelid P, Banks J. Age specific trends in mortality disparities by socio-economic deprivation in small geographical areas of England, 2002-2018: A retrospective registry study. *Lancet Regional Health Europe* 2021; 7: 100136, <https://doi.org/10.1016/j.lanepe.2021.100136>.
- <sup>32</sup> Health inequalities annual report 2021. Belfast, Department of Health, 2021, <https://www.health-ni.gov.uk/publications/health-inequalities-annual-report-2021>.
- <sup>33</sup> Updated Analysis of COVID-19 Outcomes by Ethnic Group. Glasgow, Public Health Scotland, 2020.
- <sup>34</sup> Inequalities in mortality rise due to COVID-19 and non-COVID-19 causes. Glasgow, Public Health Scotland, 2020.

- <sup>35</sup> McCartney G, Leyland A, Walsh D, Dundas R. Scaling COVID-19 deaths against other causes of death: should the policy response consistently match the mortality challenge? *J Epidemiology Community Health* 2020, 75: 315-320, <https://doi.org/10.1136/jech-2020-214373>.
- <sup>36</sup> Walsh D, Wyper G, McCartney G. Trends in healthy life expectancy in the age of austerity. *Journal of Epidemiology & Community Health* 2022 (in press).
- <sup>37</sup> Health state life expectancies, UK: 2017 to 2019. London, Office for National Statistics, 2021, <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/bulletins/healthstatelifeexpectanciesuk/2017to2019>.
- <sup>38</sup> Scottish Health Survey 2019. Edinburgh, Scottish Government, 2020.
- <sup>39</sup> Health Survey for England 2019. London, NHS Digital, 2020.
- <sup>40</sup> WHO Commission on Social Determinants of Health. Closing the gap in a generation: health equity through action on the social determinants of health. Geneva, World Health Organization, 2008.
- <sup>41</sup> Raleigh, V. Trends in life expectancy in EU and other OECD countries: Why are improvements slowing? Paris, OECD, 2019, <https://doi.org/10.1787/223159ab-en>.
- <sup>42</sup> Leading causes of death, UK. London, Office for National Statistics, 2020, <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/datasets/leadingcausesofdeathuk>.
- <sup>43</sup> Bhatnagar P, Wickramasinghe K, Wilkins E, Townsend N. trends in the epidemiology of cardiovascular disease in the UK. *Heart* 2016; 102: 1945-1952.
- <sup>44</sup> Deaths registered in England and Wales 2019. London, Office for National Statistics, 2020, <https://www.ons.gov.uk/file?uri=%2fpeoplepopulationandcommunity%2fbirthsdeathsandmarriages%2fdeaths%2fdatasets%2fdeathsregisteredinenglandandwalesseriesdrrefrencetables%2f2019/finalreftables2019.xlsx>.
- <sup>45</sup> O'Flaherty M, Ford E, Allender S, et al Coronary heart disease trends in England and Wales from 1984 to 2004: concealed levelling of mortality rates among young adults. *Heart* 2008; 94: 178-181.
- <sup>46</sup> O'Flaherty M, Bishop J, Redpath A, McLaughlin T, Murphy D, Chalmers J et al. Coronary heart disease mortality among young adults in Scotland in relation to social inequalities: time trend study *BMJ* 2009; 339: b2613, <https://doi.org/10.1136/bmj.b2613>.
- <sup>47</sup> Is Cardiovascular Disease Slowing Improvements in Life Expectancy? : OECD and The King's Fund Workshop Proceedings. Paris, OECD and King's Fund, 2020, <https://doi.org/10.1787/47a04a11-en>.
- <sup>48</sup> Di Girolamo C, Nusselder WJ, Bopp M, et al. Progress in reducing inequalities in cardiovascular disease mortality in Europe. *Heart* 2020;106:40-49.
- <sup>49</sup> Leyland AH, Dundas R. Declining cardiovascular mortality masks unpalatable inequalities. *Heart* 2020; 106: 6-7.
- <sup>50</sup> Long-term monitoring of health inequalities: January 2021 report. Edinburgh, Scottish Government, 2021, <https://www.gov.scot/publications/long-term-monitoring-health-inequalities-january-2021-report/>.
- <sup>51</sup> Mensah GA, Wei GS, Sorlie PD, et al. Decline in Cardiovascular Mortality. Possible causes and implications. *Circulation Research* 2017; 120: 366-380, <https://doi.org/10.1161/CIRCRESAHA.116.309115>.

- <sup>52</sup> Smolina K, Wright F L, Rayner M, Goldacre MJ. Determinants of the decline in mortality from acute myocardial infarction in England between 2002 and 2010: linked national database study BMJ 2012; 344: d8059, <https://doi.org/10.1136/bmj.d8059>.
- <sup>53</sup> Hotchkiss JW, Davies CA, Dundas R, Hawkins N, Jhund PS, Scholes S, et al. Explaining trends in Scottish coronary heart disease mortality between 2000 and 2010 using IMPACTSEC model: retrospective analysis using routine data. BMJ 2014; 348: g1088, <https://doi.org/10.1136/bmj.g1088>.
- <sup>54</sup> Unal B, Critchley JA, Capewell S. Explaining the decline in coronary heart disease mortality in England and Wales between 1981 and 2000. Circulation 2004; 109(9): 1101-7, <https://doi.org/10.1161/01.CIR.0000118498.35499.B2>.
- <sup>55</sup> Davies AR, Smeeth L, Grundy EMD. Contribution of changes in incidence and mortality to trends in the prevalence of coronary heart disease in the UK: 1996–2005. European Heart Journal 2007; 28(17): 2142–2147, <https://doi.org/10.1093/eurheartj/ehm272>.
- <sup>56</sup> Tran J, Norton R, Conrad N, Rahimian F, Canoy D, et al. Patterns and temporal trends of comorbidity among adult patients with incident cardiovascular disease in the UK between 2000 and 2014: A population-based cohort study. PLOS Medicine 2018; 15(3): e1002513, <https://doi.org/10.1371/journal.pmed.1002513>.
- <sup>57</sup> Sundaram V, Bloom C, Zakeri R, et al. Temporal trends in the incidence, treatment patterns, and outcomes of coronary artery disease and peripheral artery disease in the UK, 2006–2015. European Heart Journal 2020; 41(17): 1636–1649, <https://doi.org/10.1093/eurheartj/ehz880>.
- <sup>58</sup> Chung SC, Gedeberg R, Nicholas O, et al. Acute myocardial infarction: a comparison of short-term survival in national outcome registries in Sweden and the UK. Lancet 2014; 383(9925): 1305-1312.
- <sup>59</sup> Evaluating the impact of IRIS on mortality statistics. In: Impact of the Implementation of IRIS Software for ICD-10 Cause of Death Coding on Mortality Statistics, England and Wales. London, Office for National Statistics, 2014, <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/impactoftheimplementationofirissoftwareforicd10causeofdeathcodingonmortalitystatisticsenglandandwales/2014-08-08#evaluating-the-impact-of-iris-on-mortality-statistics>.
- <sup>60</sup> Gordon T. Drugs deaths behind stalling of Scottish life expectancy. The Herald newspaper, August 2019: <https://www.heraldscotland.com/news/17836153.drugs-deaths-behind-stalling-scottish-life-expectancy/>.
- <sup>61</sup> Drug-related deaths in Scotland in 2020. Edinburgh, National Records of Scotland, 2021.
- <sup>62</sup> Walsh D, McCartney G, Minton J, Parkinson J, Shipton D, Whyte B. Deaths from ‘diseases of despair’ in Britain: comparing suicide, alcohol-, and drug-related mortality for birth cohorts in Scotland, England & Wales, and selected cities. J Epidemiology Community Health 2021; 75: 1195-1201.
- <sup>63</sup> Drug-related deaths in Scotland in 2020. Edinburgh, National Records of Scotland, 2021, <https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/deaths/drug-related-deaths-in-scotland/2020>.
- <sup>64</sup> Drugs policy. London, UK Parliament Health and Social Care Committee, 2019, <https://publications.parliament.uk/pa/cm201919/cmselect/cmhealth/143/14302.htm>.
- <sup>65</sup> Friebel R, Jison Yoo K, Maynou L. Opioid abuse and austerity: Evidence on health service use and mortality in England. Social Science & Medicine 2022; 298: 114511, <https://doi.org/10.1016/j.socscimed.2021.114511>.

- <sup>66</sup> Problem drug use in Scotland. London, UK Parliament Scottish Affairs Committee, 2019, <https://publications.parliament.uk/pa/cm201919/cmselect/cm Scotaf/44/4402.htm>.
- <sup>67</sup> Parkinson J, Minton M, Lewsey J, Bouttell J, McCartney G. Drug-related deaths in Scotland 1979–2013: evidence of a vulnerable cohort of young men living in deprived areas. *BMC Public Health* (2018) 18: 357, <https://doi.org/10.1186/s12889-018-5267-2>.
- <sup>68</sup> Koltai J, McKee M, Stuckler D. Association between disability-related budget reductions and increasing drug-related mortality across local authorities in Great Britain. *Social Science & Medicine* 2021; 284: 114225.
- <sup>69</sup> Murphy M, Luy M, Torrisi O. Stalling of mortality in the United Kingdom and Europe: an analytical review of the evidence. London, London School of Economics Department of Social Policy, 2019, <https://www.lse.ac.uk/social-policy/Assets/Documents/PDF/working-paper-series/11-19-Mike-Murphy.pdf>.
- <sup>70</sup> Raleigh V. England's stalling life expectancy – pointers for action? [blog]. London, BMJ, 2018, <https://blogs.bmj.com/bmj/2018/12/12/veena-raleigh-englands-stalling-life-expectancy-pointers-action/>.
- <sup>71</sup> Marshall L, Finch D, Cairncross L, Bibby J. Mortality and life expectancy trends in the UK. London, Health Foundation, 2019, <https://www.health.org.uk/publications/reports/mortality-and-life-expectancy-trends-in-the-uk>.
- <sup>72</sup> Dementia and Alzheimer's disease deaths including comorbidities, England and Wales: 2019 registrations. London, Office for National Statistics, 2020, <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/dementiaandalzheimersdiseasedeathsincludingcomorbiditiesenglandandwales/2019registrations>.
- <sup>73</sup> Scotland's national dementia strategy. Edinburgh, Scottish Government, 2010, <http://www.wdhsc.org.uk/media/1270/dementia-strategy-2010.pdf>.
- <sup>74</sup> Living well with dementia: a national dementia strategy. London, Department for Health, 2009, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/168220/dh\\_094051.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/168220/dh_094051.pdf).
- <sup>75</sup> Enhanced Service Specification. Dementia identification scheme. London, NHS England, 2014, <https://www.england.nhs.uk/wp-content/uploads/2014/10/dementia-ident-schm-fin.pdf>.
- <sup>76</sup> Donegan K, Fox N, Black N, et al. Trends in diagnosis and treatment for people with dementia in the UK from 2005 to 2015: a longitudinal retrospective cohort study. *Lancet Public Health* 2017; 2(3): e149-e156.
- <sup>77</sup> Mukadam N, Livingston G, Rantell K, Rickman S. Diagnostic rates and treatment of dementia before and after launch of a national dementia policy: an observational study using English national databases. *BMJ Open* 2014; 4: e004119, doi:10.1136/bmjopen-2013-004119.
- <sup>78</sup> Ahmad, S., Carey, I.M., Harris, T. et al. The rising tide of dementia deaths: triangulation of data from three routine data sources using the Clinical Practice Research Datalink. *BMC Geriatr* 2021; 21: 375, <https://doi.org/10.1186/s12877-021-02306-7>.
- <sup>79</sup> Gao L, Calloway R, Zhao E, Brayne C, Matthews FE, Medical Research Council Cognitive Function and Ageing Collaboration. Accuracy of death certification of dementia in population-based samples of older people: analysis over time. *Age and Ageing* 2018; 47(4): 589–594, <https://doi.org/10.1093/ageing/afy068>.



- <sup>80</sup> Matthews F, Stephan B, Robinson L, et al. A two decade dementia incidence comparison from the Cognitive Function and Ageing Studies I and II. *Nature Communications* 2016; 7: 11398, <https://doi.org/10.1038/ncomms11398>.
- <sup>81</sup> Ahmadi-Abhari S, Guzman-Castillo M, Bandosz P, Shipley MJ, Muniz-Terrera G, Singh-Manoux A, et al. Temporal trend in dementia incidence since 2002 and projections for prevalence in England and Wales to 2040: modelling study *BMJ* 2017; 358 :j2856, <https://doi.org/10.1136/bmj.j2856>.
- <sup>82</sup> Using ONS mortality data – taking account of changes to cause of death coding from 2014. London, Public Health England, 2015, <https://fingertips.phe.org.uk/documents/PHDS%20Guidance%20-%20ICD%20Coding%20Changes%202014.pdf>.
- <sup>83</sup> Deaths registered in England and Wales, 2019. London, Office for National Statistics, 2020, <https://www.ons.gov.uk/file?uri=%2fpeoplepopulationandcommunity%2fbirthsdeathsandmarriages%2fdeaths%2fdatasets%2fdeathsregisteredinenglandandwalesseriesdrreferencetables%2f2019/finalreftables2019.xlsx>.
- <sup>84</sup> A review of recent trends in mortality in England [datapack]. London, Public Health England, 2018, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/762866/Section\\_3\\_Data\\_Pack\\_06Dec2018-Final.ods](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/762866/Section_3_Data_Pack_06Dec2018-Final.ods).
- <sup>85</sup> Porter B, Arthur A, Savva GM. How do potentially inappropriate medications and polypharmacy affect mortality in frail and non-frail cognitively impaired older adults? A cohort study. *BMJ Open* 2019; 9: e026171, <https://doi.org/10.1136/bmjopen-2018-026171>.
- <sup>86</sup> Newton J, Pebody R, Fitzpatrick J. Re: Sharp spike in deaths in England and Wales needs investigating, says public health expert. *BMJ* 2016; 352: i981.
- <sup>87</sup> Newton J, Baker A, Fitzpatrick J, Ege F. What's happening with mortality rates in England? [blog]. London, Public Health England, 2017 [accessed at: <https://publichealthmatters.blog.gov.uk/2017/07/20/whats-happening-with-mortality-rates-in-england/>].
- <sup>88</sup> Baker A, Ege F, Fitzpatrick J, Newton J. Response to articles on mortality in England and Wales. *Journal of the Royal Society of Medicine* 2018; 111(2): 40-41.
- <sup>89</sup> Pebody RG, Green HK, Warburton F, Sinnathamby M, Ibak MA, Nielsen J, De Lusignan S, Andrews N. Epidemiology and Infection Significant spike in excess mortality in England in winter 2014/15-influenza the likely culprit. *Epidemiology & Infection* 2018; 146(9): 1106-1113.
- <sup>90</sup> Pebody RG, Sinnathamby M, Andrews N, Fitzpatrick J, Newton J, Ramsay M. Rapid response: excess mortality during the 2017/8 winter – the role of flu? *BMJ* 2018; 360: k1090.
- <sup>91</sup> Dorling D. The Scottish mortality crisis. *The Geographer* 2016; Summer: 8-9.
- <sup>92</sup> Hiam L, Dorling D, McKee M. Austerity, not influenza, caused the UK's health to deteriorate. Let's not make the same mistake again. *J Epidemiology and Community Health* 2021; 75(3): 312.
- <sup>93</sup> Hiam L, Dorling D, Harrison D, McKee M. What caused the spike in mortality in England and Wales in January 2015? *J Royal Society Medicine* 2017; 110: 131-137.
- <sup>94</sup> Hiam L, Dorling D, McKee M. The cuts and poor health: when and how can we say that one thing causes another? *J Royal Society Medicine* 2018; 111(6): 202.

- <sup>95</sup> Siriwardena AN. Increasing Evidence That Influenza Is a Trigger for Cardiovascular Disease. *The Journal of Infectious Diseases* 2012; 206(11): 1636-1638.
- <sup>96</sup> Flumomo. Copenhagen, Statens Serum Institut, undated, <https://www.euromomo.eu/how-it-works/flumomo>.
- <sup>97</sup> EuroMOMO network. Excess mortality in Europe in the winter season 2014/15, in particular amongst the elderly. EuroMOMO, 2015.
- <sup>98</sup> Nielsen J, Vestergaard LS, Richter L, et al. European all-cause excess and influenza-attributable mortality in the 2017/18 season: should the burden of influenza B be reconsidered? *Clinical Microbiology and Infection* 2019; 25(10): 1266-1276.
- <sup>99</sup> Nicoll A, Ciancio BC, Lopez Chavarrias V, et al. Influenza-related deaths - available methods for estimating numbers and detecting patterns for seasonal and pandemic influenza in Europe. *Eurosurveillance* 2012; 17(18): 20162.
- <sup>100</sup> Raleigh VS. Stalling life expectancy in the UK. *BMJ* 2018; 362 :k4050.
- <sup>101</sup> Preston SH, Vierboom YC, Stokes A. The role of obesity in exceptionally slow US mortality improvement. *Proc Natl Acad Sci* 2018; 115(5): 957-961.
- <sup>102</sup> Adair T, Lopez AD. The role of overweight and obesity in adverse cardiovascular disease mortality trends: an analysis of multiple cause of death data from Australia and the USA. *BMC Medicine* 2020; 18(1): 199.
- <sup>103</sup> Lopez AD, Adair T. Is the long-term decline in cardiovascular-disease mortality in high-income countries over? Evidence from national vital statistics. *Int J Epidemiol* 2019; 48(6): 1815-1823.
- <sup>104</sup> Riaz H, Khan MS, Siddiqi TJ, Usman MS et al. Association Between Obesity and Cardiovascular Outcomes: A Systematic Review and Meta-analysis of Mendelian Randomization Studies. *JAMA Netw Open* 2018; 1(7): e183788.
- <sup>105</sup> Global BMI Mortality Collaboration. Body-mass index and all-cause mortality: individual-participant-data meta-analysis of 239 prospective studies in four continents. *Lancet* 2016; 388(10046): 776-86.
- <sup>106</sup> Walsh D, Tod E, McCartney G. Is there an association between increasing obesity prevalence rates and changes to all-cause mortality in Scotland and England? Forthcoming.
- <sup>107</sup> Mansournia MA, Altman DG. Population attributable fraction. *BMJ* 2018; 360 :k757.
- <sup>108</sup> Hernán MA, Taubman SL. Does obesity shorten life? The importance of well-defined interventions to answer causal questions. *International Journal of Obesity* 2008;32: S8-14.
- <sup>109</sup> Vidra N, Bijlsma MJ, Janssen F. Impact of Different Estimation Methods on Obesity-Attributable Mortality Levels and Trends: The Case of The Netherlands. *Int J Environ Res Public Health* 2018; 15(10): 2146.
- <sup>110</sup> Poole C. A history of the population attributable fraction and related measures. *Annals of Epidemiology* 2015; 25(3): 147-54.
- <sup>111</sup> McHugh M.D. Fit or fat? A review of the debate on deaths attributable to obesity. *Public Health Nursing* 2006; 23(3): 264-70.
- <sup>112</sup> Flegal KM, Panagiotou OA, Graubard BI. Estimating population attributable fractions to quantify the health burden of obesity. *Annals of Epidemiology* 2015; 25(3): 201-7.
- <sup>113</sup> Levine BJ. The other causality question: estimating attributable fractions for obesity as a cause of mortality. *International Journal of Obesity* 2008; 32: S4-7.
- <sup>114</sup> Foresight. *Tackling Obesities: Future Choices - Project Report (2nd edition)*. London, UK Government Office for Science, 2007.

- <sup>115</sup> Borhade A, Dey S. Do migrants have a mortality advantage? *Lancet* 2018; 392(10164): 2517-2518, [https://doi.org/10.1016/S0140-6736\(18\)33052-6](https://doi.org/10.1016/S0140-6736(18)33052-6).
- <sup>116</sup> Net migration to the UK. Oxford, The Migration Observatory, 2020, <https://migrationobservatory.ox.ac.uk/resources/briefings/long-term-international-migration-flows-to-and-from-the-uk/>.
- <sup>117</sup> Goldring S, Henretty N, Mills J, Johnson K, Smallwood S. Mortality of the 'Golden Generation': What can the ONS Longitudinal Study tell us? *Population Trends* 2011; 145: 1-30.
- <sup>118</sup> Minton J, Vanderbloemen L, Dorling D. Visualizing Europe's demographic scars with coplots and contour plots, *International Journal of Epidemiology* 2013; 42(4): 1164–1176, <https://doi.org/10.1093/ije/dyt115>.
- <sup>119</sup> Parkinson J, Minton J, Bouttell J, Lewsey J, Shah A, McCartney G. Do age, period or cohort effects explain circulatory disease mortality trends, Scotland 1974-2015? *Heart* 2020; 106: 584-589, <https://doi.org/10.1136/heartjnl-2019-315029>.
- <sup>120</sup> Parkinson J, Minton J, Lewsey J, Bouttell J, McCartney G. Recent cohort effects in suicide in Scotland: a legacy of the 1980s? *J Epidemiology and Community Health* 2017; 71: 194-200.
- <sup>121</sup> Parkinson J, Minton J, McCartney G. Analysis of age-sex and deprivation stratified trends in assault deaths in Scotland (1974-2015) to identify age, period or cohort effects. *BMJ Open* 2020; 10: e030064, <https://doi.org/10.1136/bmjopen-2019-030064>.
- <sup>122</sup> Budget June 2010. London, HM Treasury, 2010.
- <sup>123</sup> Varoufakis Y. *Adults in the room: my battle with Europe's deep establishment*. London, Vintage, 2017.
- <sup>124</sup> McCartney G, Hearty W, Arnot J, Popham F, Cumbers A, McMaster R. Impact of Political Economy on Population Health: A Systematic Review of Reviews. *American J Public Health* 2019; 109(6): e1-e12.
- <sup>125</sup> Rajmil L, Fernández de Sanmamed MJ. Austerity Policies and Mortality Rates in European Countries, 2011-2015. *Am J Public Health* 2019; 109(5): 768-770, <https://doi.org/10.2105/AJPH.2019.304997>.
- <sup>126</sup> Toffolutti V, Suhrcke M. Does austerity really kill? *Econ Hum Biol* 2019; 33: 211-223, <https://doi.org/10.1016/j.ehb.2019.03.002>.
- <sup>127</sup> Antonakakis N, Collins A. The impact of fiscal austerity on suicide mortality: evidence across the 'Eurozone periphery'. *Social Science & Medicine* 2015; 145: 63-78, <https://doi.org/10.1016/j.socscimed.2015.09.033>.
- <sup>128</sup> Green MA. Austerity and the new age of population health? *Scandinavian Journal of Public Health* 2018; 46(1): 38-41.
- <sup>129</sup> Rajmil L, Taylor-Robinson D, Gunnlaugsson G, Hjern A, Spencer N. Trends in social determinants of child health and perinatal outcomes in European countries 2005–2015 by level of austerity imposed by governments: a repeat cross-sectional analysis of routinely available data. *BMJ Open* 2018; 8(10): e022932.
- <sup>130</sup> McKee M, Karanikolos M, Belcher P, Stuckler D. Austerity: a failed experiment on the people of Europe. *Clinical Medicine* 2012; 12(4): 346-50, <https://doi.org/10.7861/clinmedicine.12-4-346>.
- <sup>131</sup> Reeves A, Basu S, McKee M, Marmot M, Stuckler D. Austere or not? UK coalition government budgets and health inequalities. *J Royal Society of Medicine* 2013; 106(11): 432-436, <https://doi.org/10.1177/0141076813501101>.
- <sup>132</sup> Stuckler D, Basu S. *The Body Economic: why austerity kills*. New York, Basic Books, 2013.

- <sup>133</sup> McCartney G. Political economy and population health: from theory to an empirical assessment of the impact of austerity on mortality trends [PhD thesis]. Glasgow, University of Glasgow, submitted.
- <sup>134</sup> Gray M, Barford A. The depths of the cuts: the uneven geography of local government austerity, *Cambridge Journal of Regions, Economy and Society* 2018; 11(3): 541–563, <https://doi.org/10.1093/cjres/rsy019>.
- <sup>135</sup> Harris T, Hodge L, Phillips D. England local government funding: trends and challenges in 2019 and beyond. London, Institute for Fiscal Studies, 2019, <https://ifs.org.uk/publications/14563>.
- <sup>136</sup> Hastings A, Bailey N, Bramley G, Gannon M, Watkins D. The cost of the cuts: the impact on local government and poorer communities. York, Joseph Rowntree Foundation, 2015, <https://www.jrf.org.uk/sites/default/files/jrf/migrated/files/CostofCuts-Full.pdf>.
- <sup>137</sup> Taylor-Robinson D, Gosling R. Local authority budget cuts and health inequalities. *BMJ* 2011; 342: d1487, <https://doi.org/10.1136/bmj.d1487>.
- <sup>138</sup> How funding for the NHS in the UK has changed over a rolling ten year period. London, Health Foundation, 2015, <https://www.health.org.uk/chart/chart-how-funding-for-the-nhs-in-the-uk-has-changed-over-a-rolling-ten-year-period>.
- <sup>139</sup> Currie J, Guzman Castillo M, Adekanmbi V, et al. Evaluating effects of recent changes in NHS resource allocation policy on inequalities in amenable mortality in England, 2007–2014: time-series analysis. *J Epidemiol Community Health* 2019;73:162–167.
- <sup>140</sup> Alexiou A, Barr B, Mason K, Bennett D, Fahy K, Taylor-Robinson D. Levelling up health will only succeed if we invest across the whole of local government. Liverpool, Liverpool and Lancaster Universities, 2021, <https://lilac-healthequity.org.uk/what-did-local-government-ever-do-for-us/>.
- <sup>141</sup> Martin S, Longo F, Lomas J, et al. Causal impact of social care, public health and healthcare expenditure on mortality in England: cross-sectional evidence for 2013/2014. *BMJ Open* 2021;11: e046417, doi:10.1136/bmjopen-2020-046417.
- <sup>142</sup> Wraw C, Minton J, Mitchell R, Wyper GMA, Campbell C, McCartney G. Can changes in spending on health and social care explain the recent mortality trends in Scotland? A protocol for an observational study. *BMJ Open* 2020; 10: e036025, <https://doi.org/10.1136/bmjopen-2019-036025>.
- <sup>143</sup> Watkins J, Wulaningsih W, Da Zhou C, et al. Effects of health and social care spending constraints on mortality in England: a time trend analysis. *BMJ Open* 2017; 7: e017722, <https://doi.org/10.1136/bmjopen-2017-017722>.
- <sup>144</sup> Taylor-Robinson D, Lai ETC, Wickham S, et al. Assessing the impact of rising child poverty on the unprecedented rise in infant mortality in England, 2000–2017: time trend analysis. *BMJ Open* 2019; 9: e029424, <https://doi.org/10.1136/bmjopen-2019-029424>.
- <sup>145</sup> Loopstra R, Reeves A, Barr B, Taylor-Robinson D, McKee M, Stuckler D. The impact of economic downturns and budget cuts on homelessness claim rates across 323 local authorities in England, 2004–12, *Journal of Public Health* 2016; 38(3): 417–425, <https://doi.org/10.1093/pubmed/fdv126>.
- <sup>146</sup> Loopstra R, McKee M, Katikireddi SV, Taylor-Robinson D, Barr B, Stuckler D. Austerity and old-age mortality in England: a longitudinal cross-local area analysis, 2007–2013. *J Royal Society Medicine* 2016; 109(3):109–16, <https://doi.org/10.1177/0141076816632215>.
- <sup>147</sup> Beatty C, Fothergill S. Welfare reform in the UK 2010–16: Expectations, outcomes and local impacts. *Social Policy & Administration* 2018; 52(5): 950–968, <http://doi.org/10.1111/spol.12353>.

- <sup>148</sup> Households Below Average Income, 2019/2020. London, Department for Work and Pensions, 2021.
- <sup>149</sup> Richardson EA, Taulbut M, Robinson M, Pulford A, McCartney G. The contribution of changes to tax and social security to stalled life expectancy trends in Scotland: a modelling study. *Journal of Epidemiology and Community Health* 2021; 75: 365-370, <https://doi.org/10.1136/jech-2020-214770>.
- <sup>150</sup> Wickham S, Bentley L, Rose T, et al. Effects on mental health of a UK welfare reform, Universal Credit: a longitudinal controlled study. *Lancet Public Health* 2020; 5(3): E157-E164, [https://doi.org/10.1016/S2468-2667\(20\)30026-8](https://doi.org/10.1016/S2468-2667(20)30026-8).
- <sup>151</sup> Katikireddi SV, Molaodi OR, Gibson M, Dundas R, Craig P. Effects of restrictions to Income Support on health of lone mothers in the UK: a natural experiment study *Lancet Public Health* 2018; 3(7): E333-E340, [https://doi.org/10.1016/S2468-2667\(18\)30109-9](https://doi.org/10.1016/S2468-2667(18)30109-9).
- <sup>152</sup> Lawlor DA, Tilling K, Smith GD. Triangulation in aetiological epidemiology. *International Journal of Epidemiology* 2016; 45(6): 1866–1886, <https://doi.org/10.1093/ije/dyw314>.
- <sup>153</sup> Kovats RS, Kristie LE. Heatwaves and public health in Europe. *European Journal of Public Health* 2006; 16(6): 592–599, <https://doi.org/10.1093/eurpub/ckl049>.
- <sup>154</sup> Guo Y, Gasparrini A, Li S, Sera F, Vicedo-Cabrera AM, et al. Quantifying excess deaths related to heatwaves under climate change scenarios: A multicountry time series modelling study. *PLOS Medicine* 2018; 15(7): e1002629, <https://doi.org/10.1371/journal.pmed.1002629>.
- <sup>155</sup> Fowler T, Southgate RJ, Waite T, Harrell R, Kovats S, Bone A, Doyle Y, VMurray V. Excess Winter Deaths in Europe: a multi-country descriptive analysis. *European J Public Health* 2015; 25(2): 339–345, <https://doi.org/10.1093/eurpub/cku073>.
- <sup>156</sup> Extreme temperatures and health. Copenhagen, European Environment Agency, 2021 <https://www.eea.europa.eu/data-and-maps/indicators/heat-and-health-2/assessment>.
- <sup>157</sup> Healy JD. Excess winter mortality in Europe: a cross country analysis identifying key risk factors. *J Epidemiology Community Health* 2003; 57: 784-789.
- <sup>158</sup> Zhao Q, Guo Y, Ye T, et al. Global, regional, and national burden of mortality associated with non-optimal ambient temperatures from 2000 to 2019: a three-stage modelling study. *Lancet Planetary Health* 2021, 5(7): E415-425, [https://doi.org/10.1016/S2542-5196\(21\)00081-4](https://doi.org/10.1016/S2542-5196(21)00081-4).
- <sup>159</sup> Vicedo-Cabrera AM, Scovronick N, Sera F, et al. The burden of heat-related mortality attributable to recent human-induced climate change. *Nature Climate Change* 2021; 11: 492-500, <https://doi.org/10.1038/s41558-021-01058-x>.
- <sup>160</sup> Watts N, Amann M, Arnell N, et al. The 2020 report of The Lancet Countdown on health and climate change: responding to converging crises. *Lancet* 2021 ; 397(10269) : 129-170, [https://doi.org/10.1016/S0140-6736\(20\)32290-X](https://doi.org/10.1016/S0140-6736(20)32290-X).
- <sup>161</sup> Sayer A, McCartney G. Economic relationships and health inequalities: improving public health recommendations. *Public Health* 2021; 199: 103-106, <https://doi.org/10.1016/j.puhe.2021.08.017>.
- <sup>162</sup> Taulbut M, Agbato D, McCartney G. Working and Hurting? Monitoring the health and health inequalities impacts of the economic downturn and changes to the social security system. Glasgow, NHS Health Scotland, 2018, <http://www.healthscotland.scot/publications/working-and-hurting>.

- <sup>163</sup> Portes J, Reed H. The cumulative impact of tax and welfare reforms. London, Equality and Human Rights Commission, 2018, <https://www.equalityhumanrights.com/en/publication-download/cumulative-impact-tax-and-welfare-reforms>.
- <sup>164</sup> Net Replacement Rates in unemployment. Paris, OECD, undated, <https://stats.oecd.org/Index.aspx?DataSetCode=NRR> (accessed 27 January 2020).
- <sup>165</sup> Secure Futures for Children and Families. London, Child Poverty Action Group, undated, <https://cpag.org.uk/policy-and-campaigns/secure-futures-children-and-families#Principles> (accessed 13 February 2020).
- <sup>166</sup> Assessing the Feasibility of Citizens' Basic Income Pilots in Scotland: Final Report. Citizens' Basic Income Feasibility Study Steering Group, 2020, [https://www.basicincome.scot/\\_\\_data/assets/pdf\\_file/0024/175371/Draft-Final-CBI-Feasibility\\_Main-Report-June-2020.pdf](https://www.basicincome.scot/__data/assets/pdf_file/0024/175371/Draft-Final-CBI-Feasibility_Main-Report-June-2020.pdf).
- <sup>167</sup> Watts B, Fitzpatrick S, Bramley G, Watkins D. Welfare sanctions and conditionality in the UK. York, Joseph Rowntree Foundation, 2014.
- <sup>168</sup> Taulbut M, Mackay DF, McCartney G. Job Seeker's Allowance (JSA) benefit sanctions and labour market outcomes in Britain, 2001–2014. *Cambridge J Econ* 2018; 42: 1417–1434, <https://doi.org/10.1093/cje/bex088>.
- <sup>169</sup> Dwyer P, Scullion L, Wright S. Work & Pensions Committee inquiry: benefits sanctions. May 2018. Available at: <http://www.welfareconditionality.ac.uk/publications/evidence-to-benefit-sanctions-inquiry/#more-1976> (accessed 9 October 2019).
- <sup>170</sup> Geiger B. Work & Pensions Committee inquiry: benefits sanctions. Written evidence - Dr Ben Geiger, 2018. Available at: <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/work-and-pensions-committee/benefit-sanctions/written/83483.html> (accessed 2 December 2019).
- <sup>171</sup> Work & Pensions Committee inquiry: benefits sanctions. Written evidence - NHS Health Scotland, 2018. Available: <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/work-and-pensions-committee/benefit-sanctions/written/83439.html> (accessed 2 December 2019).
- <sup>172</sup> Spicker, P (2022), Welfare and Society, An introduction to Social Policy, <http://spicker.uk/social-policy/society.htm>, obtained on 21 January 2022.
- <sup>173</sup> Visit to the United Kingdom of Great Britain and Northern Ireland: Report of the Special Rapporteur on extreme poverty and human rights. New York, United Nations, 2019, <https://undocs.org/A/HRC/41/39/Add.1>.
- <sup>174</sup> What you can expect from the Scottish Government and Social Security Scotland. Edinburgh, Scottish Government, 2019, <https://www.gov.scot/publications/charter/>.
- <sup>175</sup> Hirsch D. The Cost of a Child in Scotland. Glasgow, Child Poverty Action Group in Scotland, 2022, [https://cpag.org.uk/sites/default/files/files/The\\_cost\\_of\\_a\\_child\\_in\\_Scotland.pdf](https://cpag.org.uk/sites/default/files/files/The_cost_of_a_child_in_Scotland.pdf).
- <sup>176</sup> Richardson E, Fenton L, McCartney G, Parkinson J, Pulford A, et al. Income-based policies in Scotland: how would they affect health and health inequalities? Glasgow, NHS Health Scotland, 2018, <http://www.healthscotland.scot/media/2465/briefing-paper-income-based-policies-health-and-health-inequalities.pdf>.
- <sup>177</sup> Birt C, Milne B. Turning the tide on child poverty in Scotland. York, Joseph Rowntree Foundation, 2021, <https://www.jrf.org.uk/report/turning-tide-child-poverty-scotland>.

- <sup>178</sup> Birt C. Scotland's child poverty targets are possible - with political confidence and urgency. York, Joseph Rowntree Foundation, 2021, <https://www.jrf.org.uk/blog/scotlands-childpoverty-targets-are-possible-political-confidence-and-urgency>.
- <sup>179</sup> Burrage J, Isaac S. Income-Related Benefits: Estimates of Take-up Data for financial year 2016/17. London, Department of Work and Pensions, 2018.
- <sup>180</sup> Scottish Government, Housing and Social Justice Directorate, Social Justice and Regeneration Division. Income Maximisation Funding for 2019/20 - Directors Letter. Edinburgh, Scottish Government, 2019.
- <sup>181</sup> Tackling child poverty: Actions to prevent and mitigate child poverty at the local level - Evidence Review. Glasgow, What Works Scotland, 2017, <http://whatworksscotland.ac.uk/publications/tackling-child-poverty-actions-to-prevent-and-mitigate-child-poverty-at-the-local-level/>.
- <sup>182</sup> Healthier, Wealthier Children. Glasgow, Glasgow Centre for Population Health, undated, [https://www.gcph.co.uk/children\\_and\\_families/family\\_and\\_child\\_poverty/healthier\\_wealthier\\_children](https://www.gcph.co.uk/children_and_families/family_and_child_poverty/healthier_wealthier_children) (accessed 17 October 2019).
- <sup>183</sup> Poverty and Income Inequality in Scotland 2015-18. Edinburgh, Scottish Government, 2019, <https://www.gov.scot/publications/poverty-income-inequality-scotland-2015-18/pages/4/>.
- <sup>184</sup> Fair Work Framework 2016. Edinburgh, Fair Work Convention, 2016, <https://www.fairworkconvention.scot/wp-content/uploads/2018/12/Fair-Work-Convention-Framework-PDF-Full-Version.pdf>.
- <sup>185</sup> Stewart E, Bivand P. How flexible hiring could improve business performance and living standards. York, Joseph Rowntree Foundation, 2016, <https://www.jrf.org.uk/report/how-flexible-hiring-could-improve-business-performance-and-living-standards>.
- <sup>186</sup> What is the real Living Wage? London, Living Wage Foundation, undated, <https://www.livingwage.org.uk/what-real-living-wage>.
- <sup>187</sup> Scott G, Campbell J, Brown U. The contribution of childcare to local employment: poor work or work for the poor? *Local Economy: The Journal of the Local Economy Policy Unit* 2001; 16: 187–197, <https://doi.org/10.1080/02690940122196>.
- <sup>188</sup> Scobie G, Scott E. Rapid evidence review: Childcare' ' quality and children's outcomes. Edinburgh, NHS Health Scotland, 2017, <http://www.healthscotland.scot/publications/rapid-evidence-review-childcare-quality-childrens-outcomes>.
- <sup>189</sup> Sainsbury D. *Gender and Welfare State Regimes*. Oxford, Oxford University Press, 1999.
- <sup>190</sup> Scobie G, Pringle J, Arnot J, McAteer J, Doi L, et al. Provision of early learning and childcare and parents' outcomes: an evidence brief. Edinburgh, NHS Health Scotland, 2017, <http://www.healthscotland.scot/publications/provision-of-early-learning-and-childcare-and-parents-outcomes-an-evidence-brief>.
- <sup>191</sup> Greer SL. Labour politics as public health: how the politics of industrial relations and workplace regulation affect health. *Eur J Public Health* 2018; 28: 34–37, <https://doi.org/10.1093/eurpub/cky163>.
- <sup>192</sup> The Union Effect: how unions make a difference on health and safety. London, Trades Union Congress, 2016, <https://www.tuc.org.uk/research-analysis/reports/union-effect>.
- <sup>193</sup> Beyond GDP. Brussels, European Commission, 2019, [https://ec.europa.eu/environment/beyond\\_gdp/index\\_en.html](https://ec.europa.eu/environment/beyond_gdp/index_en.html).

- <sup>194</sup> Maximising the role of NHS Scotland in reducing health inequalities. Edinburgh, NHS Health Scotland, 2017, <http://www.healthscotland.scot/publications/maximising-the-role-of-nhsscotland-in-reducing-health-inequalities>.
- <sup>195</sup> Reed S, Göpfert A, Wood S, Allwood D, Warburton W. Building healthier communities: the role of the NHS as an anchor institution. London, Health Foundation, 2019, <https://www.health.org.uk/publications/reports/building-healthier-communities-role-of-nhs-as-anchor-institution>.
- <sup>196</sup> te Velde DW. Inclusive economies: To be sustainable, economies must allow all people, not just a privileged few, to benefit from development. London, United Nations Association, 2019, <https://www.sustainablegoals.org.uk/inclusive-economies/>.
- <sup>197</sup> Scotland's Economic Strategy – March 2015. Edinburgh, Scottish Government, 2015, <https://www.gov.scot/publications/scotlands-economic-strategy/>.
- <sup>198</sup> Morris JN, Wilkinson P, Dangour AD, Deeming C, Fletcher A. Defining a minimum income for healthy living (MIHL): older age, England. *Int J Epidemiol* 2007; 36: 1300–1307. <https://doi.org/10.1093/ije/dym129>.
- <sup>199</sup> Marmot M, Friel S, Bell R, Houweling TAJ, Taylor S, et al. Closing the gap in a generation: health equity through action on the social determinants of health. *The Lancet* 2008; 372: 1661–1669. [https://doi.org/10.1016/S0140-6736\(08\)61690-6](https://doi.org/10.1016/S0140-6736(08)61690-6).
- <sup>200</sup> Pickett KE, Wilkinson RG. Income inequality and health: a causal review. *Soc Sci Med* 2015; 128: 316–326, <https://doi.org/10.1016/j.socscimed.2014.12.031>.
- <sup>201</sup> Wilkinson R, Pickett K. *The Spirit Level: Why Equality is Better for Everyone*. London, Penguin, 2010.
- <sup>202</sup> Home affairs: options for reforming property taxation. London, Resolution Foundation, 2018, <https://www.resolutionfoundation.org/publications/home-affairs-options-for-reforming-property-taxation/>.
- <sup>203</sup> Smith N, Phillips D, Simpson P, Eiser D, Trickey M. A time of revolution? British local government finance in the 2010s. London, Institute for Fiscal Studies, 2016, <https://www.ifs.org.uk/uploads/publications/comms/R121.pdf>.
- <sup>204</sup> What do we know about the effects of cutting public funding for social care? London, The Health Foundation, 2018, <https://www.health.org.uk/blogs/what-do-we-know-about-the-effects-of-cutting-public-funding-for-social-care>.
- <sup>205</sup> Green MA, Dorling D, Minton J, Pickett KE (2017) Could the rise in mortality rates since 2015 be explained by changes in the number of delayed discharges of NHS patients? *J Epidemiol Community Health* 2017; 71: 1068–1071, <https://doi.org/10.1136/jech-2017-209403>.
- <sup>206</sup> Hart JT. The inverse care law. *The Lancet* 1971; 1: 405–412, [https://doi.org/10.1016/s0140-6736\(71\)92410-x](https://doi.org/10.1016/s0140-6736(71)92410-x).
- <sup>207</sup> Pollock AM, Price D. The final frontier: The UK's new coalition government turns the English National Health Service over to the global health care market. *Health Sociology Review* 2011; 20: 294–305, <https://doi.org/10.5172/hesr.2011.20.3.294>.
- <sup>208</sup> Kirkwood G, Pollock AM. Patient choice and private provision decreased public provision and increased inequalities in Scotland: a case study of elective hip arthroplasty. *J Public Health* 2017; 39: 593–600. <https://doi.org/10.1093/pubmed/fdw060>.
- <sup>209</sup> Spencelayh E. *Evolution, revolution or confusion? Competition and privatisation in the NHS*. London, Health Foundation, 2015, <http://www.health.org.uk/sites/default/files/EvolutionRevolutionOrConfusion.pdf>.



- <sup>210</sup> Marmot M (2010) Fair Society, Healthy Lives: The Marmot Review. Available: <http://www.instituteofhealthequity.org/projects/fair-society-healthy-lives-the-marmot-review/fair-society-healthy-lives-executive-summary.pdf>.
- <sup>211</sup> Green MA, Dorling D, Minton J, Pickett KE. Could the rise in mortality rates since 2015 be explained by changes in the number of delayed discharges of NHS patients? *J Epidemiol Community Health* 2017; 71: 1068–1071, <https://doi.org/10.1136/jech-2017-209403>.
- <sup>212</sup> Problem drug use in Scotland. London, UK Parliament Scottish Affairs Committee, 2019, <https://publications.parliament.uk/pa/cm201919/cmselect/cmselect/cmselect/44/4402.htm>.
- <sup>213</sup> Protecting Scotland's Future: the Government's Programme for Scotland 2019-2020 - gov.scot.pdf. Edinburgh, Scottish Government, 2019, <https://www.gov.scot/publications/protecting-scotlands-future-governments-programme-scotland-2019-20/>.
- <sup>214</sup> Realistic Medicine: Chief Medical Officer's Annual Report 2014-15. Edinburgh, Scottish Government, 2016.
- <sup>215</sup> Healy JD. Excess winter mortality in Europe: a cross country analysis identifying key risk factors. *J Epidemiol Community Health* 2003; 57: 784–789, <https://doi.org/10.1136/jech.57.10.784>.
- <sup>216</sup> Housing and poverty. York, Joseph Rowntree Foundation, 2015, <https://www.jrf.org.uk/report/housing-and-poverty>.
- <sup>217</sup> Jones NRV, Tong TYN, Monsivais P. Meeting UK dietary recommendations is associated with higher estimated consumer food costs: an analysis using the National Diet and Nutrition Survey and consumer expenditure data, 2008-2012. *Public Health Nutr* 2018; 21: 948–956, <https://doi.org/10.1017/S1368980017003275>.
- <sup>218</sup> Child Poverty (Scotland) Act 2017. Edinburgh, Scottish Parliament, 2017, <http://www.legislation.gov.uk/asp/2017/6/contents/enacted>.
- <sup>219</sup> Scottish Government (2018) Every Child, Every Chance: The Tackling Child Poverty Delivery Plan 2018-2. Available: <https://www.gov.scot/publications/child-chance-tackling-child-poverty-delivery-plan-2018-22/>.
- <sup>220</sup> Williams J. 50 facts that should change the world. New York, Disinformation Company, 2007.
- <sup>221</sup> Wickham S, Anwar E, Barr B, Law C, Taylor-Robinson D. Poverty and child health in the UK: using evidence for action. *Archives Diseases Childhood* 2016; 101: 759–766, <https://doi.org/10.1136/archdischild-2014-306746>.
- <sup>222</sup> Shelter Scotland Briefing Paper - Build Scotland's Future. Glasgow, Shelter Scotland, 2020, [https://scotland.shelter.org.uk/professional\\_resources/policy\\_library/policy\\_library\\_folder/shelter\\_scotland\\_briefing\\_paper\\_-\\_build\\_scotlands\\_future](https://scotland.shelter.org.uk/professional_resources/policy_library/policy_library_folder/shelter_scotland_briefing_paper_-_build_scotlands_future).
- <sup>223</sup> Has 'affordable housing' remained affordable across Scotland? Glasgow, Shelter Scotland, 2020, [https://scotland.shelter.org.uk/professional\\_resources/policy\\_library/policy\\_library\\_folder/has\\_affordable\\_housing\\_remained\\_affordable\\_across\\_scotland](https://scotland.shelter.org.uk/professional_resources/policy_library/policy_library_folder/has_affordable_housing_remained_affordable_across_scotland).
- <sup>224</sup> Titheridge H, Christie N, Mackett R, Oviedo Hernández D, Ye R (2014) Transport and Poverty: A review of the evidence. London, UCL, 2014, <https://www.ucl.ac.uk/transport/sites/transport/files/transport-poverty.pdf>.
- <sup>225</sup> Theis DRZ, White M. Is obesity policy in England fit for purpose? Analysis of government strategies and policies, 1992-2020. *Millbank Quarterly* 2021; 99(1): 126-170, <https://doi.org/10.1111/1468-0009.12498>.

<sup>226</sup> A new measure of poverty for the UK. The Final Report of the Social Metrics Commission. London, Social Metrics Commission, 2018.

<sup>227</sup> Douglas M, Katikireddi SV, Taulbut M, McKee M, McCartney G. Mitigating the wider health effects of covid-19 pandemic response. *BMJ* 2020; 369: m1557 doi: 10.1136/bmj.m1557.

FINAL DRAFT