

1 The LSE-Lancet Commission ‘The Future of the NHS’: The Changing 2 Health Needs of the UK Population

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8 **Abstract**

9 The demographics of the UK population are changing, and so is the need for healthcare. In this
10 paper we explore the current health of the population, changing health needs and future threats
11 which lie ahead. Relative to other high-income countries the UK is lagging behind on many health
12 outcomes such as life expectancy and infant mortality and there is a growing burden of mental
13 illness. Successes exist such as dramatic improvements in oral health, although inequalities are
14 present. The growth of the ageing population relative to the working age population, the rise in
15 people with multimorbidity and persistent health inequalities, particularly for preventable illness,
16 are all issues which will face the NHS in the years to come. Meeting the challenges of the future will
17 require an increased focus on health promotion and disease prevention involving a more concerted
18 effort to understand and tackle the multiple social, environmental and economic factors which lie at
19 the heart of health inequalities. The immediate priority of the NHS will be to mitigate the wider and
20 long-term health consequences of the COVID-19 pandemic but it must also strengthen its resilience
21 to reduce the impact of other threats to health, such as the UK leaving the European Union, climate
22 change and antimicrobial resistance.

23

24 **Introduction**

25 The NHS has adapted over time to many changing health needs and to advances in the technical and
26 organisational ability to address them. These include major declines in and changing nature of
27 infectious diseases and rising importance of non-communicable diseases. Paediatric wards are no
28 longer full of children with gastroenteritis, respiratory infections, and hepatitis A, and now provide
29 specialised neonatal, genetic, and chronic disease services, among others.¹ Innovations in
30 management of mental health and resulting reconfiguration of services such as the closure of long-
31 stay institutions, have completely altered treatment pathways, with both positive and negative
32 results. Cardio-thoracic surgeons now rarely dilate mitral valves damaged by rheumatic heart
33 disease, or resect tuberculous lung cavities, instead repairing congenital heart disease or performing
34 transplants. Orthopaedic surgeons no longer transplant tendons of children affected by polio,
35 instead replacing arthritic joints among older people.² General practitioners rarely deliver babies in
36 patients’ homes but instead contribute clinical expertise to a range of services provided by multi-
37 agency teams based in the community. Dentists very rarely provide full dentures for adults and
38 instead concentrate on prevention and provision of restorative care including implants and bridges.³
39 Entirely new clinical careers and specialties have emerged such as specialist nurses, interventional
40 radiologists and palliative care specialists, while geriatricians, managing the complex needs of frail
41 and ageing patients, work alongside a growing number of super-specialists.⁴

42 International comparative studies, particularly in earlier decades, indicate that the NHS has been
43 relatively good at such adaptations.⁵ Its system of funding manages to avoid many perverse
44 incentives seen in fee-for-service systems that encourage lucrative interventions to persist long after
45 they have become obsolete, and professional associations, such as the Royal Colleges, emphasise

46 maintaining high standards of training and research rather than negotiating terms and conditions as
47 is the case with some of their equivalents elsewhere. However, some would argue that progress has
48 been slow and inadequate in adapting to epidemiological transition (such as in mental health and
49 the rise in dementia) and in adopting research and innovation at pace (such as stroke management).
50 More recently, designated funding for health services research has built capacity enormously,
51 relative to what exists in many other countries, but there remain many gaps in the evidence base. A
52 culture of evaluation and audit has been promoted and has developed well in certain areas,
53 especially those supported by systematic national data collection, for example within the national
54 clinical audit programme.⁶ This research capacity is now needed to understand and develop
55 strategies to mitigate against potentially long-lasting physical and mental health impacts of the
56 COVID-19 pandemic.⁷

57 The goals of a health system were set out in the World Health Report 2000.⁸ They include improving
58 health outcomes, responding to legitimate public expectations, and achieving fair financing. The
59 third of these is addressed elsewhere in the Commission Report. The first and second require an NHS
60 that is cognisant of, and can adapt quickly and flexibly to, the changing needs of the population,
61 based on evidence where this is available and taking steps to generate it where it is not. Subsequent
62 thinking, developed more fully in the WHO Tallinn Charter,⁹ describes mutual relationships between
63 health systems, population health, and economic growth.¹⁰ Put simply, the goal of society should be
64 to create a health system that promotes better health and, through improved lives, secures
65 economic growth, which in turn secures revenues to support appropriate health care provision for
66 all, as well as associated developments elsewhere, such as in social care. Health and healthcare can
67 therefore be both inputs to and outputs from the economy.

68 Yet while it seems obvious that a key objective of the NHS should be to maximise the health of the
69 population of the UK to the extent that this is possible for a health system to achieve, this has not
70 always been how its leadership has interpreted its role. The mission of the NHS has in the past been
71 framed as the more limited but potentially more tractable problem of ensuring the provision of high
72 quality and safe health care to all in response to expressed need within available resources. This
73 longstanding mismatch between the need for a service that addresses optimisation of population
74 “health”, and a structure organised to cover the “health-care” problem, may well have contributed
75 to the UK’s relatively poor performance on health outcomes.

76 It is impossible, in a single paper, to provide a comprehensive analysis of the health of the UK
77 population and its implications for the NHS. Consequently, it has been necessary to be somewhat
78 selective. This paper proceeds as follows. It begins with an assessment of the current situation and
79 how it has developed, starting with the most widely used summary measure of the health of the
80 population, life expectancy. It then reviews some areas that have important implications for the
81 NHS. These are mental health, maternal and child health, oral health, an area that has long existed
82 on the margins of the NHS, and the growing challenge of multimorbidity, with major implications for
83 models of service delivery. It continues by looking at three ways in which the health of the
84 population is continuing to change. These are ageing, the composition of the working population,
85 and the burden of disease. The NHS is, in many respects, responding to failures in other areas of
86 policy. Consequently, a third section examines the scope for prevention, including measures to
87 tackle the social determinants of health. Finally, looking ahead, the concluding section examines two
88 of the immediate threats to the NHS, the COVID pandemic and Brexit.

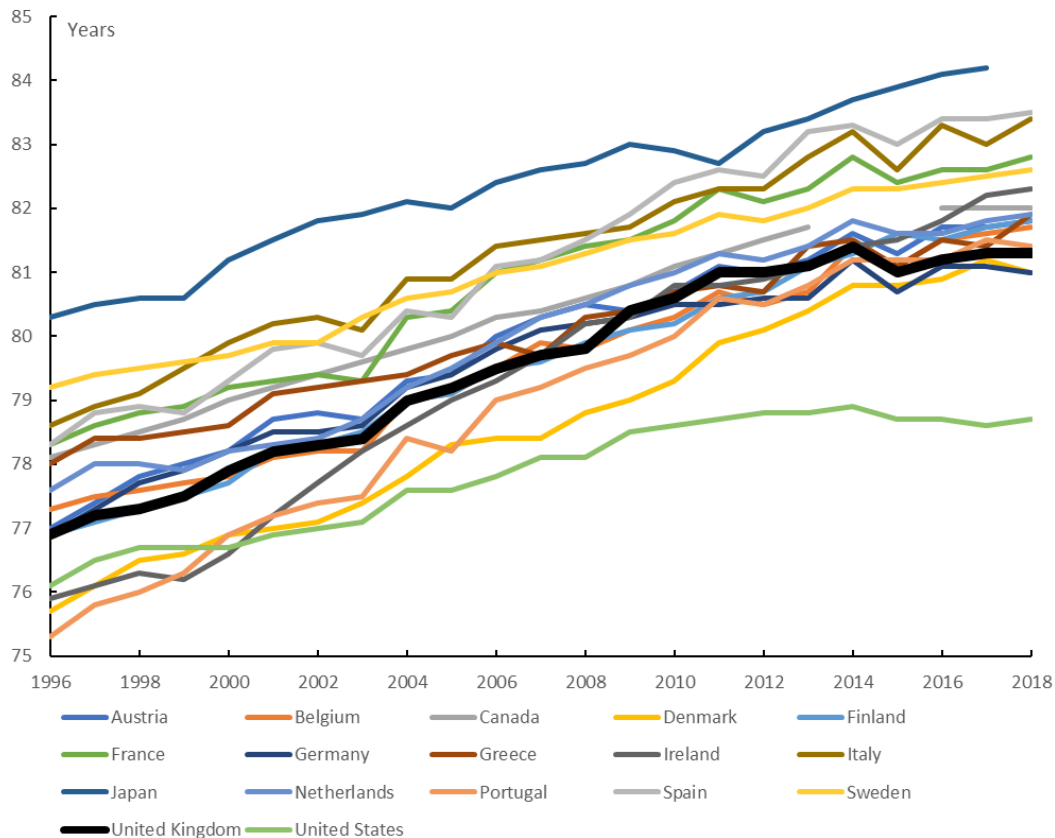
89 **The Health of the Population**

90 *Life Expectancy in the UK*

91 The health of the population of the UK is now lagging behind that of many comparable countries.
92 Having been in the middle of the range of high-income countries in 1960, life expectancy at birth is
93 now close to the bottom (Figure 1). Since 2010, the earlier rate of increase in life expectancy at birth
94 has slowed markedly.¹¹ A recent analysis compared life expectancy in England and Wales with 22
95 other high-income countries.¹² This showed how England and Wales diverged markedly from the
96 comparator group between 2011 and 2016. This was driven to a similar extent by diverging mortality
97 in working ages and at older ages. While more recent data are lacking for some comparator
98 countries, the situation in the UK now gives substantial cause for concern as there have been
99 continuing increases in death rates in several age groups and regions and the infant mortality rate in
100 England and Wales has now risen in each of the 3 years between 2014 and 2017, something that has
101 not happened for over a century.¹³

102 The reasons why the UK is falling behind other high-income countries have been debated intensely.
103 Some of the decline seems likely to reflect historical trends, in particular the timing of the smoking
104 epidemic,¹² but there is increasing evidence pointing to a link with the wide-ranging austerity
105 measures since 2010 affecting many areas of public policy. For example, while the explanation for
106 rising infant mortality is disputed, it has been noted that the increase is greatest in the poorest
107 areas.¹⁴ There have been substantial cuts to funding for local authorities, with resulting social care
108 service reductions that particularly affect older people and those living in poverty.^{15,16} An exceptional
109 surge in numbers of deaths in 2015 also coincided with widespread capacity problems across the
110 NHS, and while the particular strain of influenza circulating that year may have played a role, this
111 seems unlikely to have been the only reason for this particular spike in mortality.¹⁷ A further spike
112 occurred in 2018. Importantly, although the slowing is not unique, being seen in some (but not all)
113 European countries, it has been more pronounced in the UK than elsewhere, and it is not a survival
114 asymptote of maximum life expectancy being reached, as the UK has not achieved the same levels as
115 other comparable high-income countries. Within the UK, when measured by geography or socio-
116 economic indicators, it is apparent that there is much scope for the health of the most
117 disadvantaged to experience substantial improvements in healthy and disability-free life expectancy.
118 While differences in life expectancy between the richest and poorest people in the UK narrowed
119 during the 2000s, these have widened since 2011.¹⁸ The impact of the COVID-19 pandemic on life
120 expectancy is yet to be determined, but the combination of excess mortality directly attributable to
121 the acute effects of virus, emerging evidence of long-lasting health problems caused by the virus,¹⁹
122 and delayed diagnosis of many conditions such as cancer caused by the postponement of screening
123 and reduced access to healthcare services,²⁰ will likely lead to a sustained reduction in life
124 expectancy in many countries. The knock on effects on the economy, particularly exacerbating
125 existing inequalities, will also have longer term indirect effects. As the UK has experienced, so far,
126 one of the highest death rates attributable to the COVID-19 pandemic, the gap in life expectancy
127 between the UK and other developed nations may grow in the coming years.

128 *Figure 1: Trends in life expectancy at birth in the United Kingdom and comparable high-income*
129 *countries*



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132 Source: Organisation for Economic Co-operation and Development (OECD) ²¹

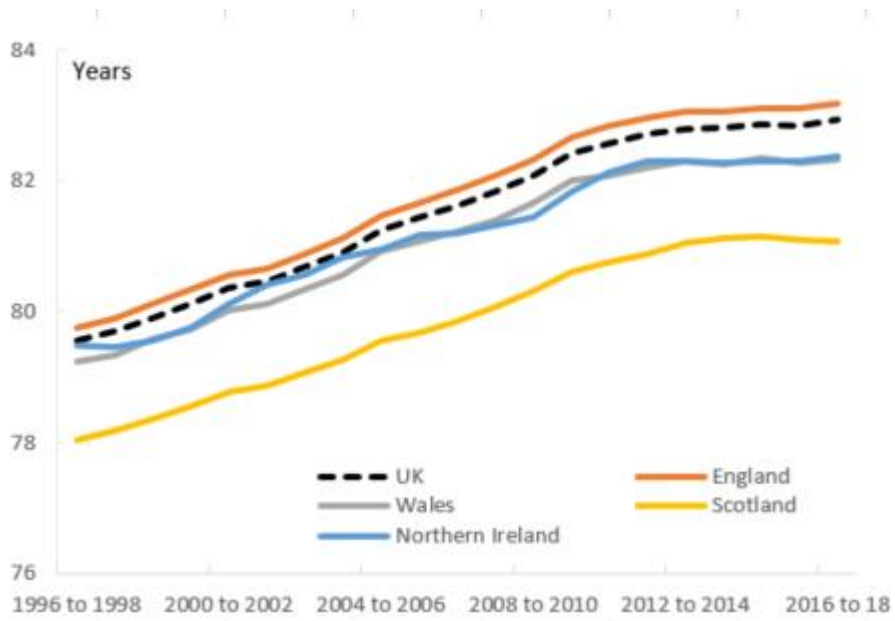
133 There are also large differences between the four UK nations (Figure 2). All have experienced a
 134 recent slowing of life expectancy at birth. Life expectancy has consistently been higher in England
 135 than in the other three nations, with Scotland lagging far behind. Between 1998 and 2018, the gains
 136 in life expectancy at birth have been much less among women than men. For example, in England, it
 137 increased by 4.3 years but 3.1 among women. In Scotland the gap was even greater, at 4.2 years and
 138 2.7 years respectively. For both sexes these were among the smallest among industrialised
 139 countries. This is driven, to a considerable extent, by stagnating or falling life expectancy among
 140 women aged 75 and above, who have been impacted especially harshly by austerity policies.²²

141 Life expectancy is, of course, derived from data on deaths. It can be combined with data on those
 142 still alive to generate measures of disability-free life expectancy (DFLE), and healthy life expectancy
 143 (HLE). DFLE is an estimate of the number of years lived without a long-lasting physical or mental
 144 health condition that limits daily activities. HLE is an estimate of the number of years lived in “Very
 145 good” or “Good” general health, based on how individuals perceive their general health. England has
 146 the highest life expectancy for both females (83.1) and males (79.6), and Scotland has the lowest life
 147 expectancy for both females (81.1) and males (77.0). England has the highest HLE and DFLE for both
 148 females (63.8, 62.2) and males (63.4, 63.1), whereas Wales has the lowest DFLE for females (59.5)
 149 and males (59.9), the lowest HLE for females (62.0) and second lowest HLE for males (61.4) (Figure
 150 3).

151

152 *Figure 2a: Trends in life expectancy at birth in the four nations of the United Kingdom, females*

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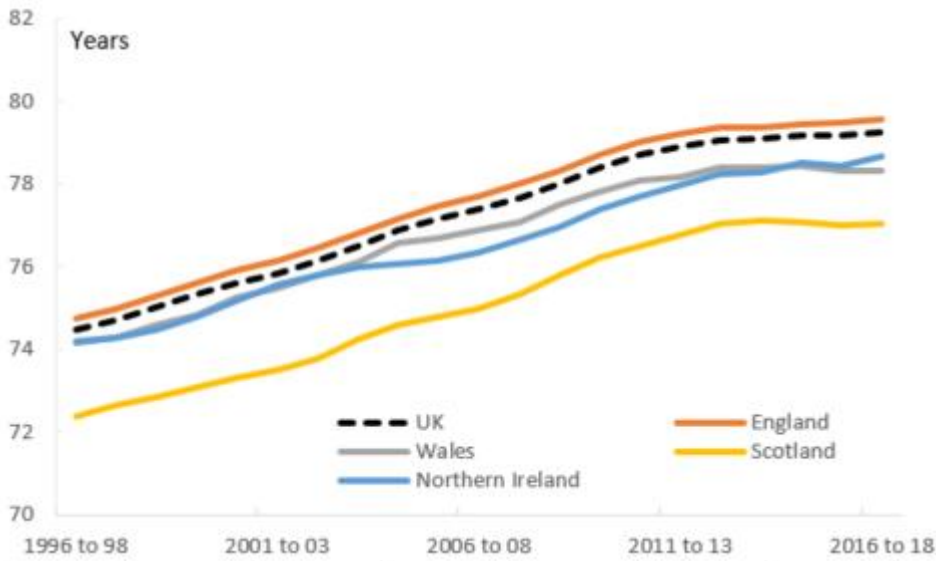
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155 Source: Office for National Statistics (ONS)²³

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157 *Figure 2b: Trends in life expectancy at birth in the four nations of the United Kingdom, males*

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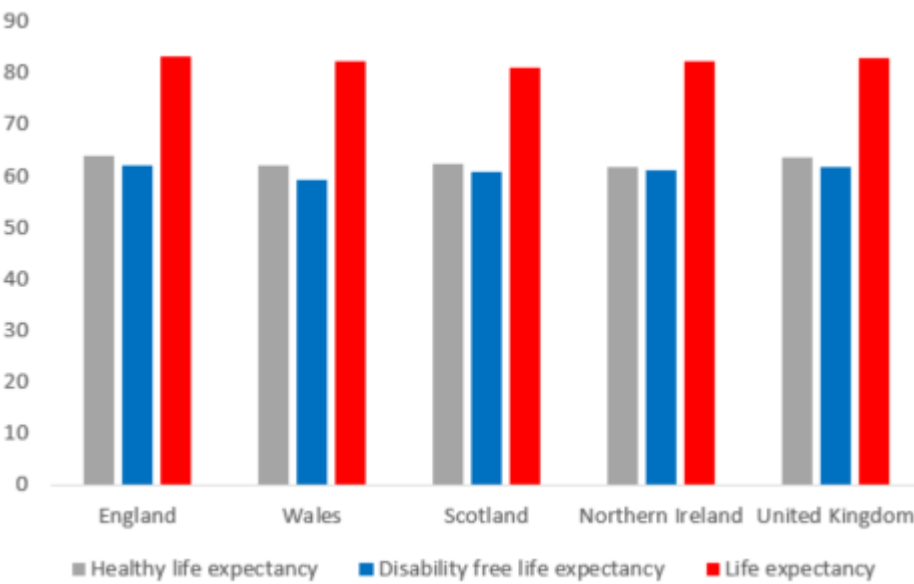
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161 Source: Office for National Statistics (ONS)²³

162 *Figure 3a: Life expectancy, healthy life expectancy, and disability-free life expectancy across the UK, 2016 to 2018, females*

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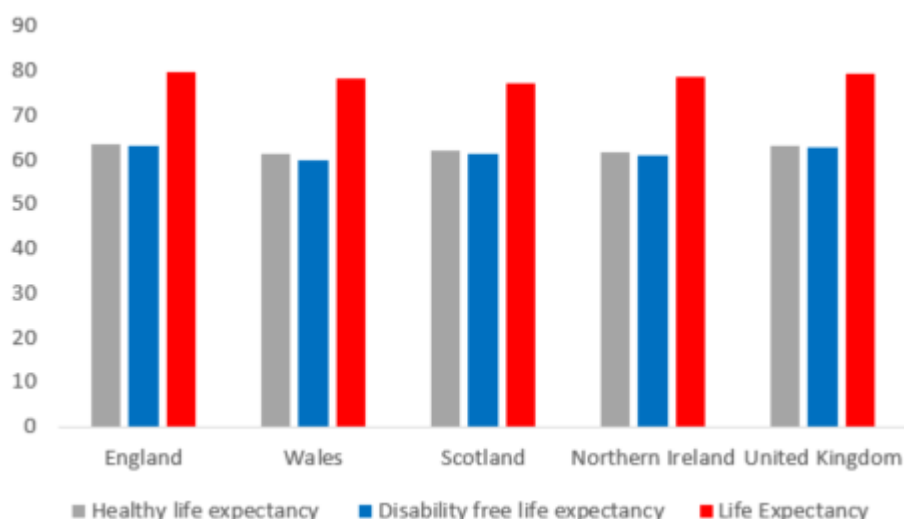
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166 Source: Office for National Statistics (ONS)²⁴

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168 *Figure 3b: Life expectancy, healthy life expectancy, and disability-free life expectancy across the UK, 2016 to 2018 males*

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174 Source: Office for National Statistics (ONS)²⁴

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176 Within the four nations, there is especially poor health in those areas that have experienced
 177 deindustrialisation since the 1980s, such as the west of Scotland, parts of Northern Ireland, South
 178 Wales and the North-east and North-west of England. Analysis by geography and deprivation shows
 179 that although life expectancy varies by as much as 6 years between the regions of England, most of
 180 the difference is accounted for by levels of deprivation.²⁵ This analysis also showed that, despite the
 181 fact that all the regions of England are subject to broadly similar underlying health policies,
 182 regulations and laws, and all are served by the NHS, outcomes such as life expectancy and years
 183 lived with a disability in the more prosperous regions of the UK are comparable to those in the best
 184 performing advanced high-income countries, such as Sweden and Australia, whereas in the less
 185 prosperous they lag behind the worst, such as Denmark and Greece.²⁵ Similarly, disability-free life
 186 expectancy varies significantly *within* each UK nation, the consequence being that in many parts of
 187 the UK, the average person cannot expect to reach the statutory retirement age in good health.²⁶
 188 There are also inequalities among ethnic groups, with estimates suggesting that differences in
 189 disability-free life expectancy, at 11.5 years, are twice as large as those in life expectancy.²⁷ Chinese
 190 men and women have the highest disability-free life expectancy at birth, while Bangladeshi men and
 191 Pakistani women have the lowest. The COVID-19 pandemic has exacerbated these health
 192 inequalities, particularly for black and minority ethnic groups who have experienced persistently
 193 elevated mortality rates from COVID-19.²⁸ Differential exposure to coronavirus patterned by
 194 occupation and housing conditions, differential severity of COVID-19 patterned by existing health
 195 conditions, and differential interactions with the health service, have all been suggested as potential
 196 contributory factors.^{29,30}

197

198 The scale and nature of these differences point to the importance of influences outside the health
 199 care system on health outcomes.²⁶ The Dahlgren and Whitehead model highlights the potential
 200 impact of the wider social determinants of health, such as housing, sanitation, unemployment,

201 education and food production.³¹ Austerity measures adopted since 2010 have had a
202 disproportionate impact on the poor,³² creating insecurity of income, employment, housing³³ and
203 even food supply, as revealed by the growth of foodbanks.³⁴ Addressing these social determinants of
204 ill health will require wide-ranging action across many sectors, recognising the need for action at
205 every stage of the human life course, also recognising the role of intergenerational transmission of
206 disadvantage, and risking a downward spiral.³⁵ These measures must recognise the concept of
207 intersectionality, whereby some individuals have a combination of characteristics, all of which
208 disadvantage them; and the existence of a health gradient, between rich and poor. This points to the
209 need for what is termed proportionate universalism,²⁶ where provision of services is universal but
210 measures are taken to increase uptake by those in most need.

211 *Mental Health*

212 The burden of disease attributable to mental illness, including what are termed common mental
213 illnesses (anxiety, depression, panic disorder, phobias and obsessive compulsive disorder), has been
214 growing over the past 25 years.³⁶ The COVID-19 pandemic has also had a profound impact on mental
215 health, with many individuals suffering from anxiety, isolation and difficulties in accessing mental
216 health support.³⁷ High-quality data needs to be collected to understand this impact, particularly for
217 vulnerable groups such as the elderly, young people, people with pre-existing mental health issues,
218 and healthcare workers.³⁸ To mitigate against long-term consequences for mental health, supportive
219 measures are needed such as providing widespread access to emergency psychological support and
220 increased investment in mental health services.³⁹ This has important implications for health
221 inequalities and the wider economy. Mental illness is more common in socioeconomically deprived
222 populations.⁴⁰ Mental illness is the leading cause of lost work days in the UK and mental ill health at
223 work is estimated to cost the UK economy between £74 and £99 billion per year.^{41,42} This includes
224 important consequences for the labour-intensive health sector.

225 The mental health needs of the older population are significant. Although the age-specific
226 prevalence of dementia appears to be decreasing slightly,⁴³ population ageing means that the
227 absolute numbers of older adults experiencing cognitive decline due to Alzheimer's or other
228 dementias will rise. Prevalence of dementia increases from one in 14 at the age of 65 to one in six in
229 those over 80.⁴⁴ However, older people's mental health needs do not just relate to cognitive
230 decline. Depression is the most common mental health disorder in this age group, with estimates of
231 a prevalence of 22% in men and 28% of women aged over 65, and over 40% of those in care homes.
232 ⁴⁵ There is also a high prevalence of anxiety disorder,⁴⁶ and other disorders such as bipolar disorder
233 and psychosis are less common but nonetheless significant. Research shows that older adults with
234 depression are significantly less likely to be diagnosed and treated than younger adults with the
235 condition,⁴⁷ and there is more generally lack of parity of esteem regarding services and funding for
236 mental health care for older people compared to that for working age adults.⁴⁸

237 There is growing evidence of a high burden of mental illness among British children and adolescents,
238 to the point that the situation has been described as a 'crisis'.⁴⁹ Data from 2017 in England showed
239 that one in eight 5 to 19 year olds had at least one mental illness and that one in twenty met criteria
240 for two or more mental illnesses.⁵⁰ The same data show a gradual increase in mental illness in young
241 people since 1999, with the prevalence increasing with age, particularly on transition to adolescence
242 and secondary school. ⁵⁰ Of particular concern is the high level of mental illness in girls aged 17-19.
243 Nearly one in four of this group have a diagnosable mental illness, and over half of these reported
244 self-harming behaviour or suicide attempts. Universities have reported a huge increase in pressure
245 on student mental health services and rising numbers of student suicides,⁵¹ and research shows an
246 increase in adolescent girls presenting to UK Accident and Emergency departments with self-harm.⁵²

247 The reasons for the increasing burden of mental illness in young people are complex. Social media,
248 the impending threat of environmental catastrophe and political instability, uncertainty about future
249 prospects, higher rates of family breakdown and academic pressure have all been proposed as

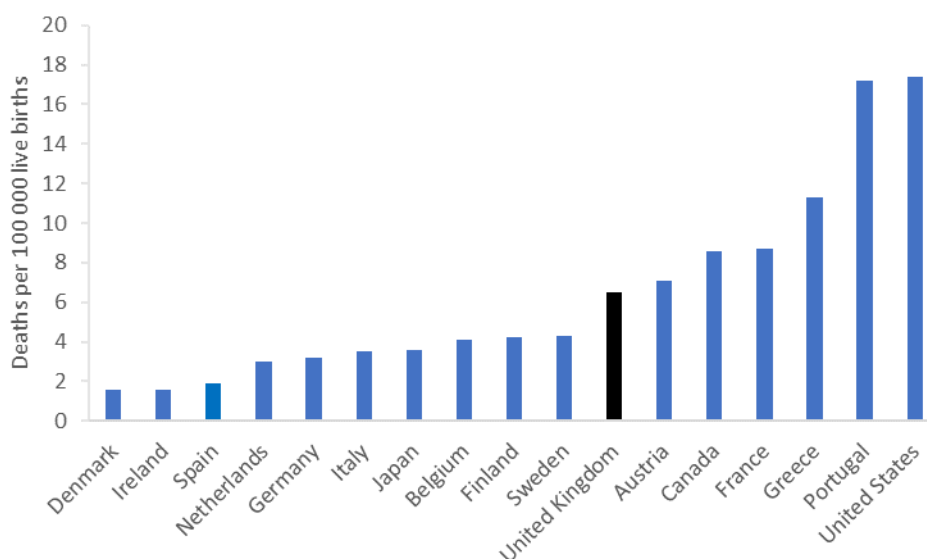
250 causative factors. Unrealistic social pressure to excel in all areas of life, promoted by social media
 251 and an ethos of consumerism is another toxic, relatively new phenomenon. However, it is crucial to
 252 try to address this area of growing need as it is well established that around half of mental illnesses
 253 start before the age of 14 and three-quarters are established by the age of 24,⁵³ particularly because
 254 adolescence into young adulthood is a pivotal life-stage for key decisions regarding education,
 255 employment and relationships.

256 The burden of disease due to alcohol and illicit drug use has increased across the UK in recent years.
 257 Alcohol-related deaths in the UK increased to an age standardised rate of 12.2 per 100,000 in 2017,
 258 which is similar to 2008 when deaths were at the highest recorded levels.⁵⁴ Whereas, Scotland
 259 consistently has the highest rate of alcohol-related deaths in the UK, at 20.5 per 100,000 in 2017,
 260 although this has significantly reduced from a peak of 28.5 per 100,000 in 2006.⁵⁴ Drug-related
 261 deaths in England and Wales have increased from an age-standardised rate of 42.9 per 1,000,000 in
 262 1993 to 66.1 per 1,000,000 in 2017.⁵⁵ In comparison, Scotland’s incidence of drug-related deaths is
 263 over three times the rate in England and Wales at 192.6 per 1,000,000 in 2017,⁵⁶ and the highest
 264 recorded drug-related death rate in the EU. There are also significant inequalities in alcohol and
 265 drug-related deaths across the UK, for example over half of the drug-related deaths in Scotland
 266 occur in people from the most deprived quintile,⁵⁷ and the rate of alcohol-related deaths is over
 267 three times higher in the most deprived quintile than the least deprived quintile in England.⁵⁸ These
 268 increases in alcohol and drug-related deaths have occurred during a period when drug and alcohol
 269 services are under intense financial pressure. For example, in England local authorities cut budgets
 270 by 18% in real terms between 2013/14 and 2017/18,⁵⁹ which contributed to a 11% reduction in
 271 people accessing treatment over the same time period.

272 *Maternal and Child Health*

273 Maternal mortality in the UK is higher than many countries in Central and Northern Europe (Figure
 274 4). Within the UK there are significant inequalities patterned according to both ethnicity and
 275 deprivation.⁶⁰ Compared to white women, there is a five-fold difference in maternal mortality rates
 276 for women from a black ethnic backgrounds, and a two-fold difference for women from an Asian
 277 ethnic background. Between the most and least deprived groups, there is a two-fold difference in
 278 maternal mortality. Rather than narrowing, these trends have been widening over the last decade.⁶⁰

279 *Figure 4 Maternal Mortality in the United Kingdom and comparable high-income countries (2018 or*
 280 *latest year available)*

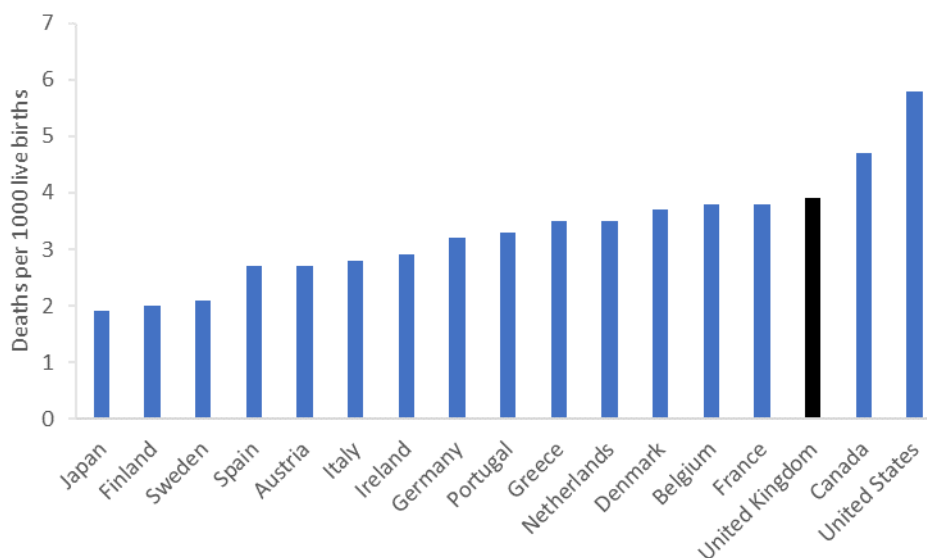


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283 Source: Organisation for Economic Co-operation and Development (OECD) ²¹The UK's high mortality
 284 from conditions such as asthma, epilepsy, pneumonia and meningococcal disease in childhood,
 285 compared to other European countries,^{61,62} also suggests a problem with paediatric care, with infant
 286 mortality lagging behind many other high-income countries (Figure 5).⁶³ A recent, extremely detailed
 287 comparison with Sweden found that newborns in the United Kingdom had many more problems at
 288 birth than their counterparts in Sweden, many of which could be traced to their worse
 289 socioeconomic status.⁶⁴ Influences on health outcomes start in utero, and there is a clear social
 290 gradient in the extent to which children are able to access positive experiences in their early years.²⁶
 291 As already mentioned, since 2010, the UK government has chosen to implement prolonged austerity
 292 policies, including reductions in entitlements to welfare provision, with measures that have
 293 impacted particularly on the most vulnerable.⁶⁵ Concerns have been expressed about the
 294 substantial increase in suicide rates among adolescents in England and Wales since 2010.⁶⁶ Child
 295 poverty in the UK is currently around 30%, and children are more likely to live in low-income
 296 households.⁶⁷ This is predicted to rise over the next few years, and children in single-parent families,
 297 with 3 or more siblings, in households where no-one is in work, and in rented or social housing are
 298 known to be at particular risk of poverty.⁶⁸

299

300 *Figure 5 Infant Mortality in the United Kingdom and comparable high-income countries (2018 or*
 301 *latest year available)*



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306 Source: Organisation for Economic Co-operation and Development (OECD) ²¹

307 *Oral Health*

308 Oral diseases (dental decay, periodontal (gum) diseases and oral cancers) are highly prevalent
 309 chronic conditions that have a significant impact on quality of life and are costly to health care
 310 systems. The Global Burden of Disease study has highlighted that dental decay in adults is the most

311 prevalent chronic health condition globally – overall it is estimated that 3.5 billion people are
312 affected by dental diseases.⁶⁹ A recent analysis shows that the treatment of dental diseases amongst
313 EU countries costs in excess of €90 billion per year, the third most expensive condition behind
314 diabetes (€119 billion), and cardiovascular diseases (€111 billion).⁷⁰ In recent decades there has
315 been a dramatic change in oral diseases in the UK population. When the NHS was first created the
316 state of oral health in the UK was appalling with the complete removal of all teeth (edentulism) a
317 relatively common occurrence for even young adults, often taking place before marriage. Now less
318 than 5% of adults in the UK have no natural teeth and overall oral health in the child and adult
319 population has improved greatly.⁷¹ The retention of more natural teeth is a positive change but as
320 individuals age and become more frail, complex and costly dental treatment is often required. Stark
321 socioeconomic and geographical inequalities in oral health exists. Steep and persistent social
322 gradients are found for oral conditions in both children and adults and oral health is worse in
323 Northern Ireland and Scotland, compared to Wales and England.⁷² Oral diseases are caused by the
324 broader social determinants in society and shared risk factors such as sugars, smoking and alcohol
325 use.

326 In the UK dental services are organised and funded in a different manner than medical services. The
327 vast majority of the 40,000 dentists in the UK work in primary care providing general dental services
328 to the population. Across the UK different payment systems exist but in all countries co-payments
329 operate where adult patients make a contribution to the costs of their dental treatment. Children
330 and exempt adult groups do not pay for their dental care. Patterns of dental attendance are strongly
331 influenced by socioeconomic status and concerns over the costs of treatment are a major barrier to
332 accessing dental services.⁷³

333 *Multimorbidity*

334 Older people are, individually, more likely to be healthy than in the past. However, the absolute
335 numbers with ill health are increasing. Many will remain healthy by virtue of being treated for
336 hypertension or diabetes thus averting their sequelae. Others, while not in perfect health,
337 experience considerable alleviation of their symptoms. The corollary of this and of earlier detection
338 of chronic diseases and their risk factors is that ever more people experience multimorbidity,
339 requiring some health care, even if only reviews in primary care every few months, for multiple
340 disorders.⁴⁰ Research in the UK estimates that around 23% of the population meet current criteria
341 for multimorbidity, increasing with age, and attention to early diagnosis, so that the figure is around
342 two-thirds in those over 65, with nearly half having three or more conditions.⁴⁰ There have been a
343 number of attempts to classify commonly occurring clusters of conditions, and some diseases
344 frequently co-exist, sharing common aetiologies, but there is also much heterogeneity, and illnesses
345 can also be completely unrelated. Chronic physical conditions often co-exist with mental health
346 disorders (particularly dementia), with evidence that the relationship is bi-directional.⁷⁴ There is a
347 clear association between multimorbidity and socioeconomic deprivation, and people living in
348 deprived areas are likely to develop multimorbidity 10-15 years earlier than those living in more
349 affluent areas.⁴⁰

350 This has profound implications for how health care is delivered. It demands a holistic approach,
351 often delivered by multidisciplinary teams. The model of primary care, with its generalist approach,
352 has found it easier to respond to this challenge than have some other countries, but the
353 disadvantage, in a country that has somewhat fewer medical specialists than many others (despite
354 growth in specialist posts in recent years), is that it may be difficult to obtain specialist expertise
355 when needed. Unfortunately, the accessibility of primary care is now being threatened, with
356 insufficient historical investment in these services. To compound the problem, chronic staffing

357 shortages coupled with administrative overload add to falling morale and cause physical and
358 psychological burnout. This leads to growing problems in recruiting and retaining general
359 practitioners and community nurses.

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361 **The Changing Health Needs of the Population**

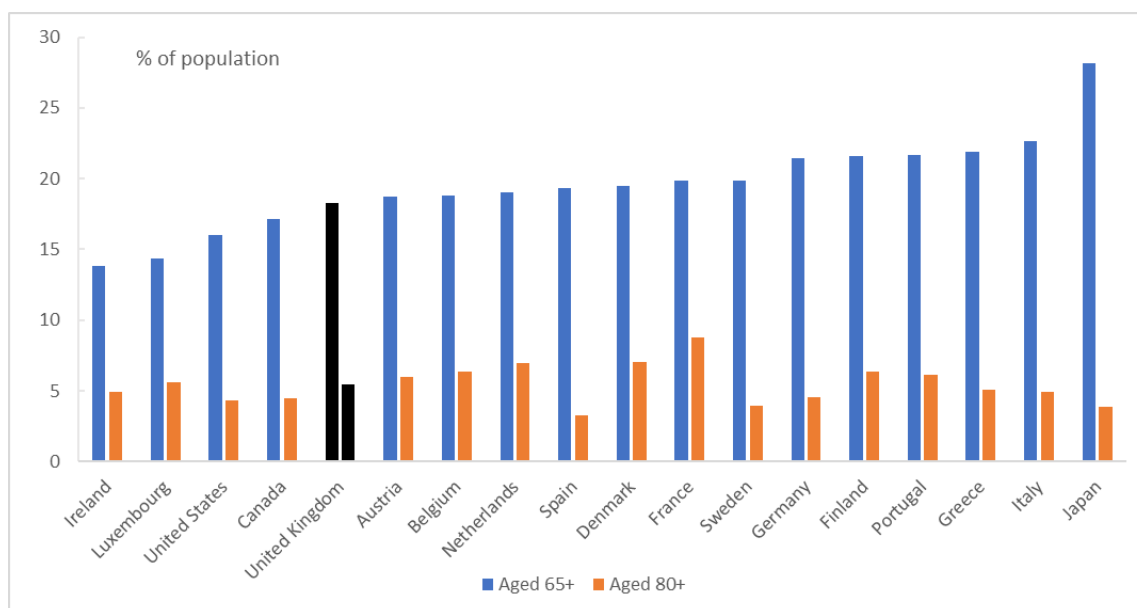
362 *The UK's Ageing Population*

363 Some changes in future health profiles can be predicted with relative certainty, such as the ageing of
364 the population and, to some extent, a relative fall in those aged 18-65, albeit with caveats about
365 future migration.⁷⁵ Forecasting with some confidence is possible when the association between risks
366 and disease are known and have long time periods, such as with smoking. It is more difficult when
367 lags between exposure and outcome are short, as with many of the consequences of hazardous
368 drinking, and where public policies can have a major impact in the short term.

369 Although the UK does not have an especially high proportion of older people relative to other high-
370 income countries, with the share of those over 65 and over 80 falling from 4th to 12th between 1995
371 and 2016 in one comparison of 17 countries (Figure 5), it will eventually face similar challenges to
372 other countries. While ageing per se does not necessarily impact on health care utilisation, if ageing
373 is associated with increased chronic illness and increased comorbidities this does add pressure to
374 constrained NHS resources by increasing healthcare utilisation.⁷⁶

375 *Figure 5: Percentage of the population at older ages in selected high-income countries (2018)*

376



377

378 *Source: Organisation for Economic Co-operation and Development (OECD) ⁷⁷*

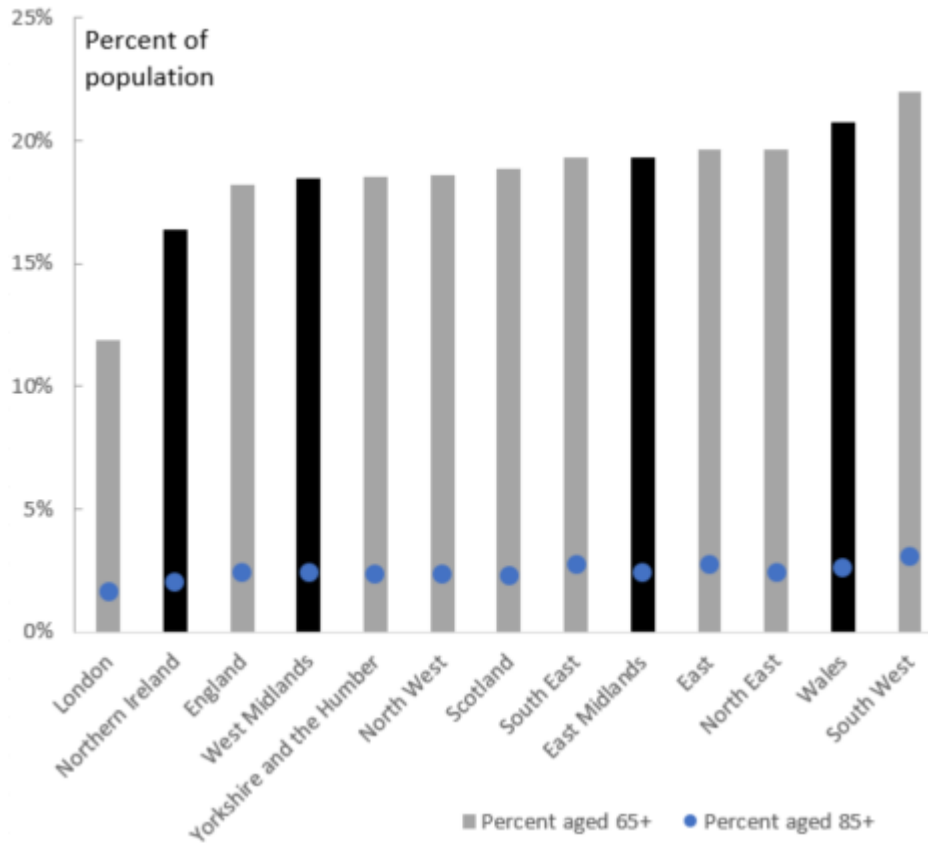
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380 There is considerable variation within the UK, with the largest share of older and very old people in
381 the South East of England and the smallest in the North East of England (Figure 7). There is also a
382 sizable discrepancy in the age distribution of different ethnic groups (Figures 8). Both the
383 geographical and ethnic spread of the older population matters, as it leads to specific pressure
384 points on NHS access, as well as contributing to the unequal concentration of ill health within the
385 UK. As ethnicity is not recorded on death certificates in the UK, it is not possible to routinely report
386 on life expectancy stratified by ethnicity. However, a number of recent studies which have used

387 various techniques to try to estimate life expectancy by ethnicity show significant discrepancies
388 between groups which vary by region.⁷⁸⁻⁸⁰

389

390 Figure 6: Percentage of population aged 65+ and 85+ (2019)



391

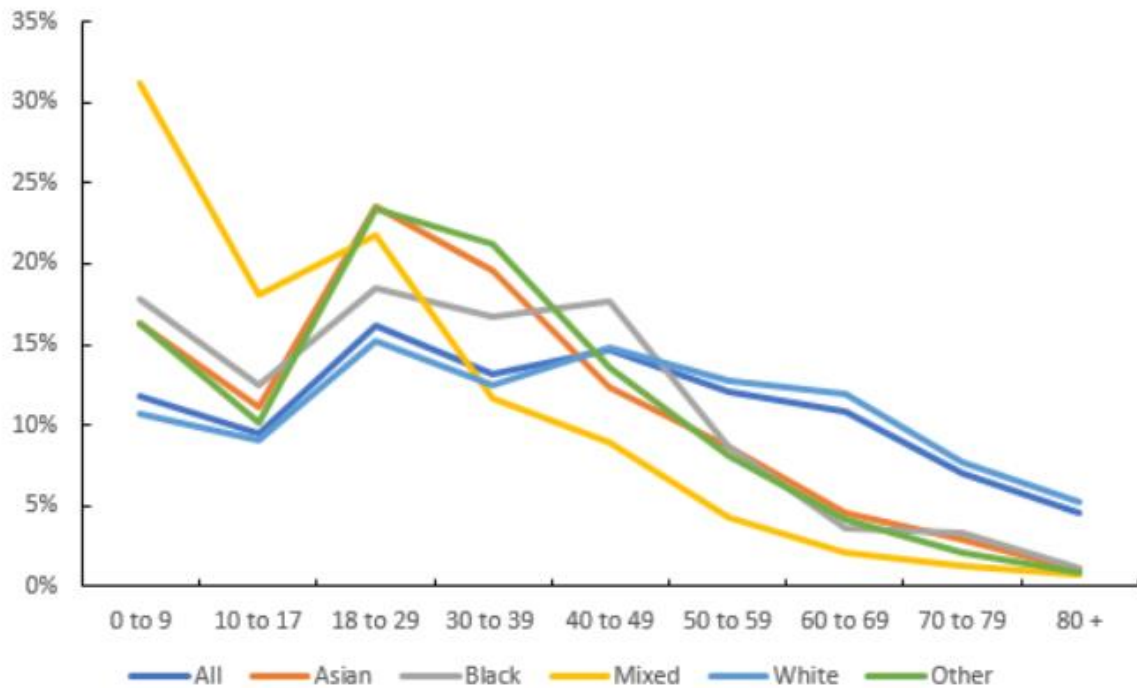
392

393 Source: Office for National Statistics (ONS)⁸¹

394

395

396 Figure 7: Percentage of people within selected age groups by ethnic group



397

398

399 Source: England and Wales 2011 Census⁸²

400

401

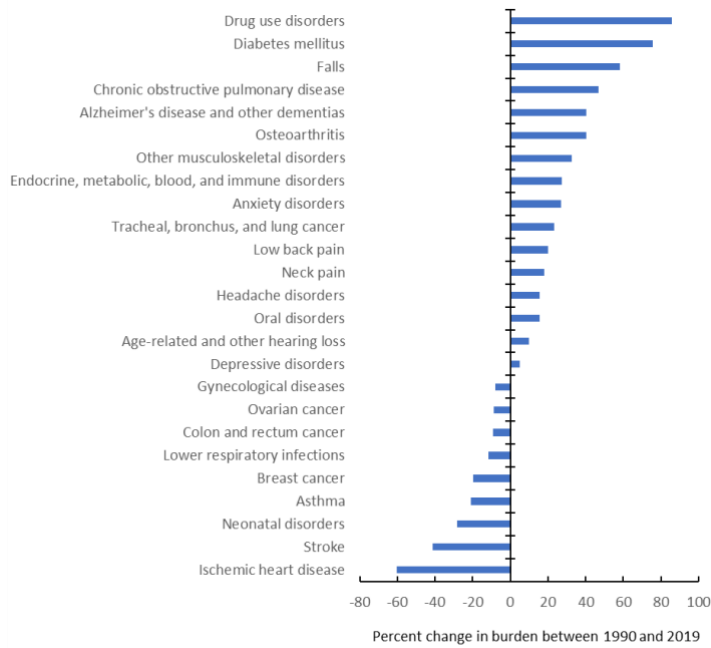
402 *The Working Population*

403 The participation of women in the labour market is at an all-time high,⁸³ but the threat of future
 404 reductions in the proportion of the population in employment will exert further pressure on this
 405 group, from whom health and care professionals are drawn. However, caution is needed. The
 406 widely-used measure, the old age dependency ratio, has been used in sometimes apocalyptic
 407 predictions, typically to argue for the unsustainability of the welfare state. Yet it assumes an
 408 economically (and socially) inactive stage of life beyond 65 years of age that is no longer the case.
 409 The raising of the retirement age, in the United Kingdom and many other countries, has changed
 410 such calculations considerably, even before taking account of how older people can be very actively
 411 engaged in work and in informal care of spouses, parents, adult children and grandchildren,
 412 sometimes with competing demands.^{84,85} There are, however, many uncertainties about the future
 413 composition of the UK population, and while it is important not to be alarmist, the experience of
 414 Japan,⁸⁶ a country that has experienced very little immigration, albeit for different reasons, is a
 415 concern as the young are attracted to major centres for their early working careers, while older
 416 people remain in rural or coastal regions, creating a skill gap for care.

417 In this context, the UK government's stated goal to reduce migration from the "hundreds of
 418 thousands" to the "tens of thousands" is a clear cause for concern. The NHS has a long history of
 419 relying on foreign recruitment in response to workforce shortfalls. For example, in light of ongoing
 420 uncertainty about future EU citizen arrangements, there has been a 90% reduction in nurses from
 421 other EU Member States joining the UK's register in 2017/18 as compared to 2016/17.⁸⁷ Growing
 422 numbers of medical posts remain unfilled, with the government refusing visas to non-EU doctors
 423 with job offers, and even those training in this country.⁸⁸

424 *Changing Burden of Disease*

425 *Figure 9a: Percentage change in burden due to the top 25 causes of DALYs in UK, 1990 to 2019,*
 426 *females*

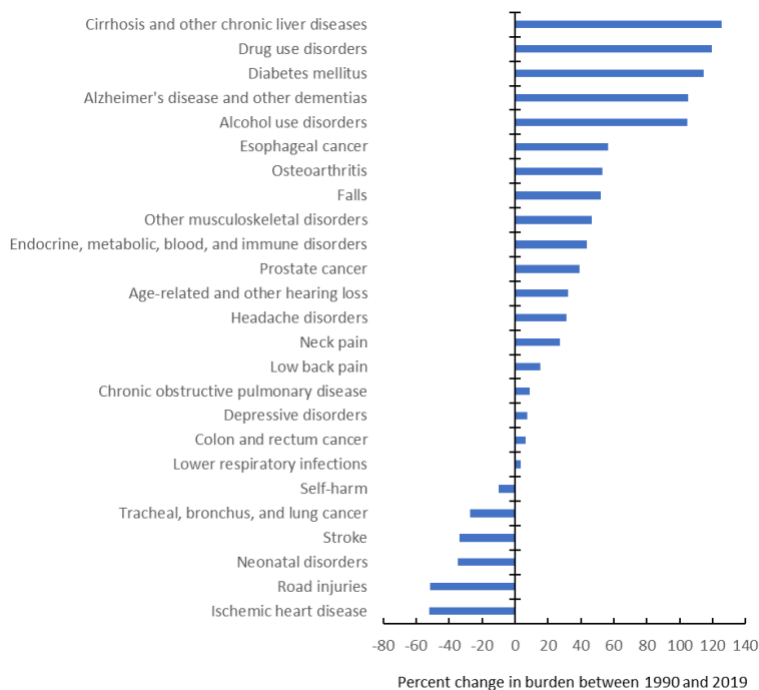


427

428 *Source: Global Burden of Disease* ⁸⁹

429

430 *Figure 9a: Percentage change in burden due to the top 25 causes of DALYs in UK, 1990 to 2019,*
 431 *males*



432

433 *Source: Global Burden of Disease* ⁸⁹

434

435 The combination of trends in underlying population health, the application of effective preventive
436 interventions and advances in health care have led to a shift in the predominant share of the burden
437 of ill health worldwide from conditions causing premature mortality to conditions that cause
438 disability. Health systems everywhere must thus adapt to the changing nature of health need. The
439 Global Burden of Disease study captures this in its analysis of DALYs. Figure 9 A and B shows the
440 percentage change in burden attributed to the top 25 causes of DALYs in UK for both genders from
441 1990 to 2019.⁸⁹ For both genders, there have been a significant increases in disease burden due to
442 drug use disorders. In males, addiction problems have been exacerbated further by increases in
443 disease burden due to alcohol use disorders. Addiction services have struggled to meet this rising
444 demand in a context of ongoing funding cuts over the last decade.⁹⁰ This has had implications for
445 NHS services, as harmful drinking has contributed to the increase in disease burden due to liver
446 cirrhosis. Smoking rates have fallen markedly, reducing the future risk of many smoking-related
447 diseases such as stroke and myocardial infarctions, which have been declining for several decades.
448 Although the benefits of this are yet to be felt, with increases in disease burden due to chronic
449 obstructive pulmonary disease experienced in both males and females. Conversely, rates of obesity
450 at younger ages are increasing, with implications for a range of common disorders such as diabetes
451 and cancer, as well as dementia.

452 Estimates of the proportion of the population aged 65 and over predict an increase of 17.8% to
453 24.6% between 2015 and 2045.⁹¹ Assuming no change in age-specific utilisation, this would increase
454 demand for health and, especially, social care. ⁹² The changing population structure has already led
455 to an absolute increase in numbers of deaths, as predicted, after many years of decline.⁹³ A major
456 component of health costs is driven by proximity to death, not by chronological age, while many
457 older people are now healthier than their counterparts in previous generations. However, the
458 absolute number of older people with multiple conditions is set to increase substantially over the
459 next few decades, potentially more so as the emphasis on early detection continues. As premature
460 mortality reduces, disabling conditions whose prevalence increases sharply with age (such as
461 sensory deficits, mobility problems, cognitive decline and incontinence) will progressively accrue,
462 leading to complex multimorbidity. These trends in common conditions have been brought together
463 with population ageing in a dynamic model. ⁹² This predicts that the net effect on the numbers of
464 people with four or more conditions will increase between 2015 and 2035 by 21% in those aged 65-
465 74, 130% in those aged 75-84, and 470% in those aged 85 and over. The changing nature of demand
466 for health and social care that results is a challenge for any health system and requires an explicit
467 response, even more so with a health care system that is encouraging populations to seek medical
468 care for conditions at earlier and earlier stages, sometimes before they are clinically manifest.
469 Therefore, the concern is less ageing *per se*, but ageing with multiple preventable conditions leading
470 to poor health and wellbeing.

471

472 **Reducing Need for Healthcare**

473 *The Need for a Preventive Focus*

474 One of the key messages of the Tallinn Charter,⁹ mentioned previously, was that effective
475 prevention could reduce the need for health care, and thus the need for scarce resources. This was
476 also a key message of the Wanless Report, commissioned by the UK Treasury.⁹⁴ It forecast potential
477 to moderate future NHS expenditure if what it called a “fully engaged” policy could be adopted. This
478 concept, of investing in health improvement to reduce future costs, also features prominently in the
479 NHS Long Term Plan.⁹⁵ An additional consideration is the compelling evidence linking better health
480 to economic growth through higher labour force participation and productivity.⁹⁶ There are many
481 examples of successes in implementing health-promoting policies in Europe.⁹⁷

482 The countries of the UK have been among the leaders internationally in many of the most effective
483 policies to reduce harms associated with use of hazardous substances, such as tobacco, alcohol and,
484 most recently, junk food. Governments have recognised that the most effective policies are those
485 based on price, availability and marketing. Examples include minimum alcohol pricing in Scotland,
486 above-inflation increases in tobacco taxation, a ban on smoking in public places and point-of-sales
487 displays, sugar tax, and standardised cigarette packaging. However, these face powerful lobbying
488 activities by the corresponding industries, both directly and through several “thinktanks” that they
489 fund.^{98,99} For a brief period, the alcohol and food industries benefitted from creation of so-called
490 “responsibility deals”, in which the UK government sought to engage with them in official fora.
491 However, the government’s own evaluation found that they typically proposed the least effective
492 measures and opposed those known to be effective.¹⁰⁰ These responsibility deals did lead to pledges
493 from many companies to reduce salt content in food and contributed to a reduction in overall salt
494 intake in the UK of 11% between 2006 and 2014.¹⁰¹ However, eventually key health advocacy
495 organisations withdrew.

496 Moving forward, there is a need for more joined-up approaches that bring together different groups
497 working on, for example, tobacco, alcohol or diet, working in close collaboration to secure maximum
498 benefit from shifting population norms on the five healthy living imperatives (Not smoking, adhering
499 to alcohol guidelines, a healthy weight, physically active and eating a healthy diet) that influence
500 rates of non-communicable diseases. This will require policies that address these issues specifically,
501 but others that take a concerted approach to the upstream determinants of health, including both
502 the well-recognised social determinants of health, but, even more now, the commercial
503 determinants,¹⁰² looking at how powerful vested interests are able to subvert health policies. It is
504 also necessary to address the political determinants of health, such as austerity and welfare and
505 immigration regimes, and the environmental determinants, such as in the design of health-
506 promoting cities.

507 *Addressing the Social Determinants of Health*

508 Although successive governments have adopted effective public health policies, these have
509 struggled in the face of wider societal problems. Consequently, despite noted successes in areas
510 such as tobacco control, the UK ranked only 12th overall in an assessment of public health policies
511 across the European Region of the World Health Organization.¹⁰³ Looking ahead, there is clearly a
512 need to address the underlying social determinants of health, or the conditions in which people are
513 born, grow, live, work and age,²⁶ with policies that address precariousness of employment, income,
514 housing and food security.¹⁰⁴ The UK has high rates of child poverty, lax building standards and
515 underinvestment in social housing, contributing to many people living in sub-standard
516 accommodation and, since 2010, a marked rise in food insecurity.³⁴ Other social problems relate to
517 the employment market: although introduction of a minimum wage was associated with a
518 demonstrable improvement in mental health,¹⁰⁵ and official unemployment rates are low, there are
519 growing numbers of people who remain below the minimum wage, which is illegal but largely
520 unenforced,¹⁰⁶ or who face severe uncertainty about income and employment in what is termed the
521 “gig” economy, characterised by piece-work and limited employment rights. Against this background
522 of the erosion of wider welfare policies and falling public expenditure in other areas of welfare, the
523 NHS is increasingly left as the one remaining pillar of the UK welfare state.

524 Health care is an important route through which health improvements can be channelled, but other
525 sectors remain important in addressing health promotion and inequalities. There is compelling
526 evidence, in many areas, that health promoting policies work, especially those that involve all
527 relevant sectors, enshrined in the concept of “Health in All Policies”. Wales is pioneering this
528 approach through The Wellbeing of Future Generations Act 2015 and the Public Health Act,
529 2017.^{107,108} As a major employer, this is an area where the NHS could play a major role, although this
530 would require a substantial culture change in an organisation that is more often associated with high
531 levels of work-related stress and burnout. Health-promoting policies do have the potential not only

532 to alleviate suffering but also to reduce further the demand on the NHS if there is the political will to
533 implement them.

534 **Immediate threats to the NHS**

535 *The need for a resilient NHS*

536 The initial version of this paper argued that the NHS must prepare for the unexpected, ensuring that
537 it was resilient in the face of potential threats, including a pandemic,¹⁰⁹ especially given the threat
538 posed by the loss of links with European agencies such as the European Centre for Disease Control
539 (ECDC) and the European Monitoring Centre for Drugs and Drug Addiction.^{110,111} The COVID-19
540 pandemic has, tragically, revealed that the UK was less prepared than it could have been.

541 As of November 2020 it was one of the worst affected countries in the world, whether deaths were
542 measured as those attributed directly to COVID-19 or by excess all-cause mortality, the preferred
543 measure for international comparisons. There will be many lessons to learn from the response:
544 confused messaging by ministers; outsourcing of essential functions to companies lacking expertise;
545 fragmentation of the NHS, public health, and social care systems; the role of institutional racism in
546 elevated mortality rates experienced by black and minority ethnic groups; relationships between
547 central and local government, as well as with devolved nations; serious failures in procurement of
548 essential items, from ventilators to test kits, personal protective equipment; and entire new, but
549 largely unused, hospital facilities.¹¹² It should also be recognised how many aspects of the response
550 by those working in the NHS was exceptional, repurposing existing hospital facilities, rapidly
551 expanding access to teleconsultations, reallocating staff, sharing knowledge about the emerging
552 clinical characteristics of this disease, and implementing a world leading clinical trial programme.¹¹³

553 The UK's response has, however, come at an enormous cost, both financially and in terms of the
554 long-term consequences for health. These can be considered under five headings, the long term
555 consequences of the infection on the body, delays in care as a consequence of suspension of certain
556 NHS services, the health effects of the lockdown, the impact on NHS staff, and the long term
557 economic impact. In the first category, it is becoming clear that many of those who survive COVID-19
558 are experiencing persisting health problems, many apparently associated with the action of the virus
559 on vascular endothelium and the associated immune response and hypercoagulability.¹¹⁴ In this
560 respect, some have questioned whether it will come to be compared with polio, which also left a
561 long-lasting legacy of ill health. In the second category, there was a large reduction in primary care
562 attendances,¹¹⁵ storing up considerable unmet need for the future, and routine surgery has been
563 suspended, leaving a massive backlog to be treated in what was an already struggling system.
564 Delayed diagnosis and treatment of early stage cancer has been estimated to lead to over 6,000
565 additional deaths in a year.¹¹⁶ Estimates suggest that 3,800 early cancers that would have been
566 picked up on screening have been missed.¹¹⁷ In the third category, prolonged isolation, coupled with
567 cessation of specialist services, is likely to contribute to an increased burden of mental illness, while
568 closure of schools is likely to contribute to mental illness in children and young people.⁷ The fourth
569 category includes the effects of psychological trauma on NHS and social care staff, including
570 responses more usually seen in survivors of armed conflict.¹¹⁸ Fifth, the pandemic is expected to lead
571 to a long-term reduction in economic growth,¹¹⁹ that could see many of the health problems
572 associated with austerity in the period after 2010 return.¹⁰⁴ To add to the problems, the ability of the
573 NHS to respond may be complicated by the need for new ways of working, including greater use of
574 personal protective equipment, social distancing, and remote consultations.

575 There are also other threats ahead, some more certain than others. One is antimicrobial resistance,
576 an area where the UK has shown global leadership.¹²⁰ Another is the consequences of a generation
577 transitioning into retirement in a much more precarious state than their parents because of closure
578 or reduction of pension schemes and less home ownership, who may struggle to come to terms with
579 their straitened circumstances.⁹⁷ A third is climate change, with evidence that the climate is

580 changing even faster than predicted, potentially nearing a tipping point of runaway global warming.
581 The COVID-19 pandemic has ushered in a temporary period of reduced carbon emissions,
582 government actions and economic incentives post pandemic will determine whether carbon
583 emissions continue on the same path.¹²¹

584 In summary, the future is uncertain. Some of the uncertainties can be anticipated, to some extent.
585 For others, it is more difficult. The lesson from the COVID-19 pandemic is that the NHS must both
586 anticipate predictable developments and build in sufficient resilience for the unexpected and work
587 with other sectors to develop holistic solutions.

588 *Leaving the European Union*

589 The UK leaving the European Union will have adverse consequences for health.¹²² However, the UK
590 has failed to engage effectively with the process of negotiating a future trade deal with the EU.¹²³ As
591 of November 2020, the prospect of anything more than a minimal agreement in place in early 2020
592 seems remote. This makes it very difficult to have any clear understanding of what the future
593 situation might be. There will be many direct impacts on the health system, including those on the
594 workforce and employment law, access to medicines and medical devices, funding for research and
595 sharing of vital public health information about communicable diseases. “No deal” planning has been
596 focussed on developing alternative systems to mitigate risks but these have suffered greatly during
597 the COVID-19 pandemic. Beyond the immediate problems, the health of the UK population is
598 affected by many other aspects of public policy. Food quality and safety, agriculture, land-
599 management and environmental regulations are just a few of the areas of concern currently
600 addressed by EU legislation which have significant implications for human health.¹²⁴ Of particular
601 concern to health and health services will be the nature of any future international trade
602 agreements. Issues around Intellectual Property Rights, Technical Barriers to Trade and Investor
603 Protection need to be thought through carefully,¹²⁵ and protections for health and healthcare put in
604 place. It is vitally important that in the new trade agreements health is not subverted by commercial
605 interests for economic gain.¹²⁶ Overall economic performance following departure from the
606 European Union will also be very important, with implications not just for the available funds to
607 spend on health, but for the wellbeing of the UK population and the consequent demand for
608 healthcare.

609 **Conclusion**

610 This paper has reviewed the current health of the UK population, changing health needs and
611 considered what future challenges lie ahead. From this we can draw several conclusions.

612 First, despite significant improvements in life expectancy, many physical and mental health
613 outcomes are suboptimal relative to other high income countries. Driving this sub-optimality is that,
614 across all ages, but especially in childhood and old age, the population has high levels of preventable
615 ill health which are unfairly distributed across society. As the UK has experienced a relatively high
616 excess mortality rate attributable to COVID-19, the gap in life expectancy between the UK and other
617 developed countries is likely to grow.

618 Second, in the future there will be relatively fewer people in the working population, especially if
619 current policies on migration continue, and a sharp rise in people with complex multimorbidity. This
620 creates a mismatch between needs and capacity to address those needs, both through workforce
621 availability and securing the economic basis for sustainable funding. To address these issues there
622 needs to be an increased focus on prevention and health promotion that takes a multisectoral
623 approach to the social, political and commercial causes of poor health. The crucial role the NHS can
624 play by setting an example as a healthy employer, reducing risk factors for chronic diseases,
625 promoting healthy ageing, enhancing confidence and promoting social engagement, should be
626 addressed explicitly. However, the NHS is increasingly operating in an environment where other

627 sectors (especially social care), instead of being maintained as supportive, are being eroded in terms
628 of expenditure and general infrastructure.

629 Finally, there are many immediate threats which will affect the health of the population and service
630 provision. Crucially the UK will need to develop strategies to mitigate against the wider and long-
631 term consequences for health of the COVID-19 pandemic. Alongside this, the UK's impending
632 departure from the EU, growing antimicrobial resistance and increasing climate change are all major
633 challenges with significant consequences for the NHS. Other unforeseen risks such as economic
634 downturn or even conflict would impact the NHS but are practically difficult to plan for. Instead the
635 focus should be on building a resilient and preventative healthcare service, so that the NHS is better
636 prepared for any future challenges.

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638

639

640 **References**

641 1 Wolfe I, Mckee M. *European Child Health Services And Systems: Lessons Without*
642 *Borders*. UK: Open University Press, 2013.

643 2 McKee M, Healy J. The role of the hospital in a changing environment. *Bull World Health*
644 *Organ* 2000; **78**: 803–10.

645 3 Kleinman ER, Harper PR, Gallagher JE. Trends in NHS primary dental care for older
646 people in England: implications for the future. *Gerodontology* 2009; **26**: 193–201.

647 4 Dubois C-A, Mckee M. Cross-national comparisons of human resources for health – what
648 can we learn? *Health Econ Policy Law* 2006; **1**: 59–78.

649 5 Nolte E, McKee M. *Caring for People with Chronic Conditions: A Health System*
650 *Perspective*. McGraw-Hill Education (UK), 2008.

651 6 Healthcare Quality Improvement Partnership. The National Clinical Audit Programme.
652 <https://www.hqip.org.uk/a-z-of-nca/#.XSxOXuhKhPZ> (accessed July 18, 2020).

653 7 Douglas M, Katikireddi SV, Taulbut M, McKee M, McCartney G. Mitigating the wider
654 health effects of covid-19 pandemic response. *BMJ* 2020; **369**. DOI:10.1136/bmj.m1557.

655 8 World Health Organization. *The World Health Report 2000: health systems: improving*
656 *performance*. Geneva: WHO, 2000. <https://www.who.int/whr/2000/en/> (accessed July 18,
657 2020).

658 9 World Health Organisation. *The Tallinn Charter: Health Systems for Health and Wealth.*
659 *2008* [http://www.euro.who.int/en/media-centre/events/events/2008/06/who-european-](http://www.euro.who.int/en/media-centre/events/events/2008/06/who-european-ministerial-conference-on-health-systems/documentation/conference-documents/the-tallinn-charter-health-systems-for-health-and-wealth)
660 [ministerial-conference-on-health-systems/documentation/conference-documents/the-](http://www.euro.who.int/en/media-centre/events/events/2008/06/who-european-ministerial-conference-on-health-systems/documentation/conference-documents/the-tallinn-charter-health-systems-for-health-and-wealth)
661 [tallinn-charter-health-systems-for-health-and-wealth](http://www.euro.who.int/en/media-centre/events/events/2008/06/who-european-ministerial-conference-on-health-systems/documentation/conference-documents/the-tallinn-charter-health-systems-for-health-and-wealth) (accessed July 18, 2020).

662 10 McKee M, Suhrcke M, Nolte E, *et al.* Health systems, health, and wealth: a European
663 perspective. *Lancet* 2009; **373**: 349–51.

664 11 Public Health England. A review of recent trends in mortality in England. 2019.
665 [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_d](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/786515/Recent_trends_in_mortality_in_England.pdf)
666 [ata/file/786515/Recent_trends_in_mortality_in_England.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/786515/Recent_trends_in_mortality_in_England.pdf) (accessed July 18, 2020).

667 12 Leon DA, Jdanov DA, Shkolnikov VM. Trends in life expectancy and age-specific
668 mortality in England and Wales, 1970–2016, in comparison with a set of 22 high-income
669 countries: an analysis of vital statistics data. *Lancet Public Health* 2019; **4**: e575–82.

670 13 Office for National Statistics. Child and infant mortality in England and Wales. 2019.
671 [https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/childhoodinfantandperinatalmortalityinenglandandwales/2017)
672 [bulletins/childhoodinfantandperinatalmortalityinenglandandwales/2017](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/childhoodinfantandperinatalmortalityinenglandandwales/2017) (accessed July 18,
673 2020).

674 14 Taylor-Robinson D, Lai ETC, Wickham S, *et al.* Assessing the impact of rising child
675 poverty on the unprecedented rise in infant mortality in England, 2000-2017: time trend
676 analysis. *BMJ Open* 2019; **9**: e029424.

677 14 Loopstra R, McKee M, Katikireddi SV, Taylor-Robinson D, Barr B, Stuckler D. Austerity
678 and old-age mortality in England: a longitudinal cross-local area analysis, 2007-2013. *J R*
679 *Soc Med* 2016; **109**: 109–16.

680 16 Hiam L, Harrison D, McKee M, Dorling D. Why is life expectancy in England and Wales
681 ‘stalling’? *J Epidemiol Community Health* 2018; **72**: 404–8.

682 17 Hiam L, Dorling D, Harrison D, McKee M. What caused the spike in mortality in England
683 and Wales in January 2015? *J R Soc Med* 2017; **110**: 131–7.

684 17 Marshall L, Finch D, Cairncross L, Bibby J. Mortality and life expectancy trends in the
685 UK. 2019. [https://www.health.org.uk/publications/reports/mortality-and-life-expectancy-](https://www.health.org.uk/publications/reports/mortality-and-life-expectancy-trends-in-the-uk)
686 [trends-in-the-uk](https://www.health.org.uk/publications/reports/mortality-and-life-expectancy-trends-in-the-uk) (accessed July 18, 2020).

687 19 Roberts CM, Levi M, McKee M, Schilling R, Lim WS, Grocott MP. COVID-19: a
688 complex multi-system disorder. *Br J Anaesth* 2020.

689 20 Richards M, Anderson M, Carter P, Ebert BL, Mossialos E. The impact of the COVID-19
690 pandemic on cancer care. *Nat Cancer* 2020; : 1–3.

691 20 OECD. Health Statistics. <http://www.oecd.org/els/health-systems/health-data.htm>
692 (accessed July 18, 2020).

693 22 Hiam L, Dorling D, Harrison D, McKee M. Why has mortality in England and Wales been
694 increasing? An iterative demographic analysis. *J R Soc Med* 2017; **110**: 153–62.

695 21 Office for National Statistics. National life tables, UK. 2019.
696 [https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexp](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/bulletins/nationallifetablesunitedkingdom/2016to2018)
697 [ectancies/bulletins/nationallifetablesunitedkingdom/2016to2018](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/bulletins/nationallifetablesunitedkingdom/2016to2018) (accessed July 18, 2020).

698 22 Office for National Statistics. Health and life expectancies.
699 [https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlife](https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/bulletins/healthstatelifeexpectanciesuk/latest)
700 [expectancies/bulletins/healthstatelifeexpectanciesuk/latest](https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/bulletins/healthstatelifeexpectanciesuk/latest) (accessed July 18, 2020).

- 701 23 Newton JN, Briggs ADM, Murray CJL, *et al.* Changes in health in England, with analysis
702 by English regions and areas of deprivation, 1990–2013: a systematic analysis for the
703 Global Burden of Disease Study 2013. *Lancet* 2015; **386**: 2257–74.
- 704 24 Marmot M. Fair Society Healthy Lives (The Marmot Review). 2010.
705 [http://www.instituteofhealthequity.org/resources-reports/fair-society-healthy-lives-the-](http://www.instituteofhealthequity.org/resources-reports/fair-society-healthy-lives-the-marmot-review)
706 [marmot-review](http://www.instituteofhealthequity.org/resources-reports/fair-society-healthy-lives-the-marmot-review) (accessed July 18, 2020).
- 707 27 Wohland P, Rees P, Nazroo J, Jagger C. Inequalities in healthy life expectancy between
708 ethnic groups in England and Wales in 2001. *Ethn Health* 2015; **20**: 341–53.
- 709 26 Office for National Statistics. Coronavirus (COVID-19) related deaths by ethnic group,
710 England and Wales. 2020.
711 [https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/articles/coronaviruscovid19relateddeathsbyethnicgroupenglandandwales/2march2020to15may2020)
712 [articles/coronaviruscovid19relateddeathsbyethnicgroupenglandandwales/2march2020to15](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/articles/coronaviruscovid19relateddeathsbyethnicgroupenglandandwales/2march2020to15may2020)
713 [may2020](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/articles/coronaviruscovid19relateddeathsbyethnicgroupenglandandwales/2march2020to15may2020) (accessed July 18, 2020).
- 714 27 Devakumar D, Selvarajah S, Shannon G, *et al.* Racism, the public health crisis we can no
715 longer ignore. *Lancet* 2020; **395**: e112–3.
- 716 28 Godlee F. Racism: the other pandemic. *BMJ* 2020; **369**.
- 717 29 Whitehead M, Dahlgren G. What can be done about inequalities in health? *Lancet* 1991;
718 **338**: 1059–63.
- 719 30 Cummins I. The Impact of Austerity on Mental Health Service Provision: A UK
720 Perspective. *Int J Environ Res Public Health* 2018; **15**.
- 721 33 Reeves A, Clair A, McKee M, Stuckler D. Reductions in the United Kingdom’s
722 Government Housing Benefit and Symptoms of Depression in Low-Income Households.
723 *Am J Epidemiol* 2016; **184**: 421–9.
- 724 34 Loopstra R, Reeves A, Taylor-Robinson D, Barr B, McKee M, Stuckler D. Austerity,
725 sanctions, and the rise of food banks in the UK. *BMJ* 2015; **350**: h1775.
- 726 33 OECD, World Health Organisation. Poverty and Health: DAC Guidelines and Reference
727 Series. Paris: OECD, 2003.
728 https://www.who.int/tobacco/research/economics/publications/oecd_dac_pov_health.pdf
729 (accessed July 18, 2020).
- 730 34 UK Parliament. Mental health statistics for England: prevalence, services and funding -
731 Commons Library briefing.
732 <https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN06988> (accessed
733 July 18, 2020).
- 734 35 The Academy of Medical Sciences. Survey results: Understanding people’s concerns
735 about the mental health impacts of the COVID-19 pandemic. 2020.
736 <https://acmedsci.ac.uk/file-download/99436893> (accessed July 18, 2020).
- 737 38 Holmes EA, O’Connor RC, Perry VH, *et al.* Multidisciplinary research priorities for the
738 COVID-19 pandemic: a call for action for mental health science. *Lancet Psychiatry* 2020;
739 **7**: 547–60.

740 37 United Nations. COVID-19 and the Need for Action on Mental Health. 2020.
741 [https://www.un.org/sites/un2.un.org/files/un_policy_brief-](https://www.un.org/sites/un2.un.org/files/un_policy_brief-covid_and_mental_health_final.pdf)
742 [covid_and_mental_health_final.pdf](https://www.un.org/sites/un2.un.org/files/un_policy_brief-covid_and_mental_health_final.pdf) (accessed July 18, 2020).

743 38 Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of
744 multimorbidity and implications for health care, research, and medical education: a cross-
745 sectional study. *Lancet* 2012; **380**: 37–43.

746 39 Health and Safety Executive. Working days lost in Great Britain.
747 <http://www.hse.gov.uk/statistics/dayslost.htm> (accessed July 18, 2020).

748 40 Farmer P, Stevenson D. Thriving at Work: The Stevenson/ Farmer review of mental health
749 and employers. 2017 [https://www.gov.uk/government/publications/thriving-at-work-a-](https://www.gov.uk/government/publications/thriving-at-work-a-review-of-mental-health-and-employers)
750 [review-of-mental-health-and-employers](https://www.gov.uk/government/publications/thriving-at-work-a-review-of-mental-health-and-employers) (accessed July 18, 2020).

751 41 Matthews FE, Arthur A, Barnes LE, *et al.* A two-decade comparison of prevalence of
752 dementia in individuals aged 65 years and older from three geographical areas of England:
753 results of the Cognitive Function and Ageing Study I and II. *Lancet* 2013; **382**: 1405–12.

754 42 Prince M, Knapp M, Guerchet M, *et al.* Dementia UK. Second Edition. *Alzheimer's*
755 *Society*. 2014.
756 [https://www.alzheimers.org.uk/sites/default/files/migrate/downloads/dementia_uk_update.](https://www.alzheimers.org.uk/sites/default/files/migrate/downloads/dementia_uk_update.pdf)
757 [pdf](https://www.alzheimers.org.uk/sites/default/files/migrate/downloads/dementia_uk_update.pdf) (accessed July 18, 2020).

758 43 Age UK. Hidden in plain sight: The unmet mental health needs of older people. 2016.
759 [https://www.ageuk.org.uk/brandpartnerglobal/wiganboroughvpp/hidden_in_plain_sight_of](https://www.ageuk.org.uk/brandpartnerglobal/wiganboroughvpp/hidden_in_plain_sight_of_der_peoples_mental_health.pdf)
760 [der_peoples_mental_health.pdf](https://www.ageuk.org.uk/brandpartnerglobal/wiganboroughvpp/hidden_in_plain_sight_of_der_peoples_mental_health.pdf). (accessed July 18, 2020).

761 46 Bryant C, Jackson H, Ames D. The prevalence of anxiety in older adults: methodological
762 issues and a review of the literature. *J Affect Disord* 2008; **109**: 233–50.

763 45 Burns A. Better access to mental health services for older people. NHS England, 2015.
764 <https://www.england.nhs.uk/blog/mh-better-access/> (accessed July 18, 2020).

765 46 Royal College of Psychiatrists. Suffering in silence: age inequality in older people's
766 mental health care. 2018 [https://www.rcpsych.ac.uk/improving-care/campaigning-for-](https://www.rcpsych.ac.uk/improving-care/campaigning-for-better-mental-health-policy/college-reports/2018-college-reports/cr221)
767 [better-mental-health-policy/college-reports/2018-college-reports/cr221](https://www.rcpsych.ac.uk/improving-care/campaigning-for-better-mental-health-policy/college-reports/2018-college-reports/cr221) (accessed July 18,
768 2020).

769 49 Gunnell D, Kidger J, Elvidge H. Adolescent mental health in crisis. *BMJ* 2018; **361**:
770 k2608.

771 48 NHS Digital. Mental Health of Children and Young People in England, 2017. 2018
772 [https://digital.nhs.uk/data-and-information/publications/statistical/mental-health-of-](https://digital.nhs.uk/data-and-information/publications/statistical/mental-health-of-children-and-young-people-in-england/2017/2017)
773 [children-and-young-people-in-england/2017/2017](https://digital.nhs.uk/data-and-information/publications/statistical/mental-health-of-children-and-young-people-in-england/2017/2017) (accessed July 18, 2020).

774 49 Universities UK. Minding our future: starting a conversation about the support of student
775 mental health. 2018. [https://www.universitiesuk.ac.uk/policy-and-](https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Pages/minding-our-future-starting-a-conversation-support-student-mental-health.aspx)
776 [analysis/reports/Pages/minding-our-future-starting-a-conversation-support-student-mental-](https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Pages/minding-our-future-starting-a-conversation-support-student-mental-health.aspx)
777 [health.aspx](https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Pages/minding-our-future-starting-a-conversation-support-student-mental-health.aspx) (accessed July 18, 2020).

778 52 Morgan C, Webb RT, Carr MJ, *et al.* Incidence, clinical management, and mortality risk
779 following self harm among children and adolescents: cohort study in primary care. *BMJ*
780 2017; **359**: j4351.

781 53 Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime
782 prevalence and age-of-onset distributions of DSM-IV disorders in the National
783 Comorbidity Survey Replication. *Arch Gen Psychiatry* 2005; **62**: 593–602.

784 52 Office for National Statistics. Alcohol-specific deaths in the UK: registered in 2017. 2018.
785 [https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeat](https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/bulletins/alcoholrelateddeathsintheunitedkingdom/registeredin2017#comparisons-between-the-four-countries-of-the-uk)
786 [h/bulletins/alcoholrelateddeathsintheunitedkingdom/registeredin2017#comparisons-](https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/bulletins/alcoholrelateddeathsintheunitedkingdom/registeredin2017#comparisons-between-the-four-countries-of-the-uk)
787 [between-the-four-countries-of-the-uk](https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/bulletins/alcoholrelateddeathsintheunitedkingdom/registeredin2017#comparisons-between-the-four-countries-of-the-uk) (accessed July 18, 2020).

788 53 Office for National Statistics. Deaths related to drug poisoning in England and Wales:
789 2017 registrations. 2018.
790 [https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsrelatedtodrugpoisoninginenglandandwales/2017registrations#drug-poisoning-deaths-in-2017-remained-stable)
791 [bulletins/deathsrelatedtodrugpoisoninginenglandandwales/2017registrations#drug-](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsrelatedtodrugpoisoninginenglandandwales/2017registrations#drug-poisoning-deaths-in-2017-remained-stable)
792 [poisoning-deaths-in-2017-remained-stable](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsrelatedtodrugpoisoninginenglandandwales/2017registrations#drug-poisoning-deaths-in-2017-remained-stable) (accessed July 18, 2020).

793 54 National Records of Scotland. Drug-related deaths in Scotland in 2018. 2019.
794 [https://www.nrscotland.gov.uk/files/statistics/drug-related-deaths/2018/drug-related-](https://www.nrscotland.gov.uk/files/statistics/drug-related-deaths/2018/drug-related-deaths-18-pub.pdf)
795 [deaths-18-pub.pdf](https://www.nrscotland.gov.uk/files/statistics/drug-related-deaths/2018/drug-related-deaths-18-pub.pdf) (accessed July 18, 2020).

796 55 Barnsdale L, Guonari X, Graham L. The National Drug Related Deaths Database
797 (Scotland) Report Analysis of Deaths occurring in 2015 and 2016. ISD Scotland. 2018.
798 [https://www.isdscotland.org/Health-Topics/Drugs-and-Alcohol-Misuse/Publications/2018-](https://www.isdscotland.org/Health-Topics/Drugs-and-Alcohol-Misuse/Publications/2018-06-12/2018-06-12-NDRDD-Report.pdf)
799 [06-12/2018-06-12-NDRDD-Report.pdf](https://www.isdscotland.org/Health-Topics/Drugs-and-Alcohol-Misuse/Publications/2018-06-12/2018-06-12-NDRDD-Report.pdf) (accessed July 18, 2020).

800 56 Office for National Statistics. Alcohol-specific deaths in the UK: liver diseases and the
801 impact of deprivation. 2018.
802 [https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeat](https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/datasets/alcohol-specific-deaths-in-the-united-kingdom-supplementary-data-tables)
803 [h/datasets/alcohol-specific-deaths-in-the-united-kingdom-supplementary-data-tables](https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/datasets/alcohol-specific-deaths-in-the-united-kingdom-supplementary-data-tables) (accessed
804 July 18, 2020).

805 57 Rhodes D. Drug and alcohol services cut by £162m as deaths increase. BBC News. 2018
806 <https://www.bbc.com/news/uk-england-44039996> (accessed July 18, 2020).

807 60 Knight M, Bunch K, Kenyon S, Tuffnell D, Kurinczuk JJ. A national population-based
808 cohort study to investigate inequalities in maternal mortality in the United Kingdom, 2009-
809 17. *Paediatr Perinat Epidemiol* 2020; **34**: 392–8.

810 58 Shah R, Hagell A, Cheung R. International comparisons of health and wellbeing in
811 adolescence and early adulthood. 2019. [https://www.nuffieldtrust.org.uk/files/2019-](https://www.nuffieldtrust.org.uk/files/2019-02/1550657729_nt-ayph-adolescent-health-report-web.pdf)
812 [02/1550657729_nt-ayph-adolescent-health-report-web.pdf](https://www.nuffieldtrust.org.uk/files/2019-02/1550657729_nt-ayph-adolescent-health-report-web.pdf) (accessed July 18, 2020).

813 59 Royal College of Paediatrics and Child Health. Child health in 2030 in England:
814 comparisons with other wealthy countries. 2018.
815 [https://www.rcpch.ac.uk/sites/default/files/2018-10/child_health_in_2030_in_england_-](https://www.rcpch.ac.uk/sites/default/files/2018-10/child_health_in_2030_in_england_report_2018-10.pdf)
816 [report_2018-10.pdf](https://www.rcpch.ac.uk/sites/default/files/2018-10/child_health_in_2030_in_england_report_2018-10.pdf) (accessed July 18, 2020).

817 60 Wolfe I, Thompson M, Gill P, *et al.* Health services for children in western Europe.
818 *Lancet* 2013; **381**: 1224–34.

- 819 61 Zylbersztejn A, Gilbert R, Hjern A, Wijlaars L, Hardelid P. Child mortality in England
820 compared with Sweden: a birth cohort study. *Lancet* 2018; **391**: 2008–18.
- 821 62 Karanikolos M, Mladovsky P, Cylus J, *et al.* Financial crisis, austerity, and health in
822 Europe. *Lancet* 2013; **381**: 1323–31.
- 823 63 Bould H, Mars B, Moran P, Biddle L, Gunnell D. Rising suicide rates among adolescents
824 in England and Wales. *Lancet* 2019; **394**: 116–7.
- 825 64 UK Government National Statistics. Households below average income: 1994/95 to
826 2017/18. 2019. [https://www.gov.uk/government/statistics/households-below-average-](https://www.gov.uk/government/statistics/households-below-average-income-199495-to-201718)
827 [income-199495-to-201718](https://www.gov.uk/government/statistics/households-below-average-income-199495-to-201718) (accessed July 18, 2020).
- 828 65 Resolution Foundation. The Living Standards Outlook
829 2019. [https://www.resolutionfoundation.org/publications/the-living-standards-outlook-](https://www.resolutionfoundation.org/publications/the-living-standards-outlook-2019/)
830 [2019/](https://www.resolutionfoundation.org/publications/the-living-standards-outlook-2019/) (accessed July 18, 2020).
- 831 69 Kassebaum NJ, Smith AGC, Bernabé E, *et al.* Global, Regional, and National Prevalence,
832 Incidence, and Disability-Adjusted Life Years for Oral Conditions for 195 Countries,
833 1990-2015: A Systematic Analysis for the Global Burden of Diseases, Injuries, and Risk
834 Factors. *J Dent Res* 2017; **96**: 380–7.
- 835 67 Peres MA, Macpherson LMD, Weyant RJ, *et al.* Oral diseases: a global public health
836 challenge. *Lancet* 2019; **394**: 249–60.
- 837 71 Steele JG, Treasure ET, O’Sullivan I, Morris J, Murray JJ. Adult Dental Health Survey
838 2009: transformations in British oral health 1968-2009. *Br Dent J* 2012; **213**: 523–7.
- 839 72 Shen J, Wildman J, Steele J. Measuring and decomposing oral health inequalities in an UK
840 population. *Community Dent Oral Epidemiol* 2013; **41**: 481–9.
- 841 73 Watt RG, Steele JG, Treasure ET, White DA, Pitts NB, Murray JJ. Adult Dental Health
842 Survey 2009: implications of findings for clinical practice and oral health policy. *Br Dent*
843 *J* 2013; **214**: 71–5.
- 844 71 The Academy of Medical Sciences. Multimorbidity: a priority for global health research.
845 2018. <https://acmedsci.ac.uk/policy/policy-projects/multimorbidity> (accessed July 18,
846 2020).
- 847 72 Astolfi R, Lorenzoni L, Oderkirk J. A comparative analysis of health forecasting methods.
848 Paris, France: OECD, 2012. [https://www.oecd-ilibrary.org/docserver/5k912j389bf0-](https://www.oecd-ilibrary.org/docserver/5k912j389bf0-en.pdf?expires=1574098032&id=id&accname=guest&checksum=5008F7893831B7246DF3827F9410C95E)
849 [en.pdf?expires=1574098032&id=id&accname=guest&checksum=5008F7893831B7246D](https://www.oecd-ilibrary.org/docserver/5k912j389bf0-en.pdf?expires=1574098032&id=id&accname=guest&checksum=5008F7893831B7246DF3827F9410C95E)
850 [F3827F9410C95E](https://www.oecd-ilibrary.org/docserver/5k912j389bf0-en.pdf?expires=1574098032&id=id&accname=guest&checksum=5008F7893831B7246DF3827F9410C95E) (accessed July 18, 2020).
- 851 76 Palladino R, Tayu Lee J, Ashworth M, Triassi M, Millett C. Associations between
852 multimorbidity, healthcare utilisation and health status: evidence from 16 European
853 countries. *Age Ageing* 2016; **45**: 431–5.
- 854 74 OECD. Elderly population - OECD Data. <http://data.oecd.org/pop/elderly-population.htm>
855 (accessed July 18, 2020).

894 92 Kingston A, Robinson L, Booth H, Knapp M, Jagger C, MODEM project. Projections of
895 multi-morbidity in the older population in England to 2035: estimates from the Population
896 Ageing and Care Simulation (PACSim) model. *Age Ageing* 2018; **47**: 374–80.

897 93 Gomes B, Higginson IJ. Where people die (1974--2030): past trends, future projections
898 and implications for care. *Palliat Med* 2008; **22**: 33–41.

899 94 Wanless D. Securing our future health: taking a long-term view. 2002.

900 91 NHS England. NHS Long Term Plan. 2019. <https://www.england.nhs.uk/long-term-plan/>
901 (accessed July 18, 2020).

902 96 Suhrcke M, McKee M, Arce RS, Tsoolova S, Mortensen J. Investment in health could be
903 good for Europe's economies. *BMJ* 2006; **333**: 1017–9.

904 93 Mackenbach JP, Karanikolos M, McKee M. The unequal health of Europeans: successes
905 and failures of policies. *Lancet* 2013; **381**: 1125–34.

906 94 Williams R, Alexander G, Aspinall R, *et al.* Gathering momentum for the way ahead: fifth
907 report of the Lancet Standing Commission on Liver Disease in the UK. *Lancet* 2018; **392**:
908 2398–412.

909 99 McCambridge J, Daube M, McKee M. Brussels Declaration: a vehicle for the
910 advancement of tobacco and alcohol industry interests at the science/policy interface? *Tob*
911 *Control* 2019; **28**: 7–12.

912 100 Knai C, Petticrew M, Durand MA, Eastmure E, Mays N. Are the Public Health
913 Responsibility Deal alcohol pledges likely to improve public health? An evidence
914 synthesis. *Addict Abingdon Engl* 2015; **110**: 1232–46.

915 97 Public Health England. Salt Reduction Programme. 2018.
916 <https://publichealthengland.exposure.co/salt-reduction-programme> (accessed July 18,
917 2020).

918 102 McKee M, Stuckler D. Revisiting the Corporate and Commercial Determinants of
919 Health. *Am J Public Health* 2018; **108**: 1167–70.

920 99 Mackenbach J. Successes and failures of health policy in Europe. *Eur J Public Health*
921 2013; **23**.

922 104 McKee M, Reeves A, Clair A, Stuckler D. Living on the edge: precariousness and
923 why it matters for health. *Arch Public Health* 2017; **75**: 13.

924 105 Reeves A, McKee M, Mackenbach J, Whitehead M, Stuckler D. Introduction of a
925 National Minimum Wage Reduced Depressive Symptoms in Low-Wage Workers: A
926 Quasi-Natural Experiment in the UK. *Health Econ* 2017; **26**: 639–55.

927 102 Low Pay Commission. Non-compliance and enforcement of the National Minimum
928 Wage. UK Government. 2019 [https://www.gov.uk/government/news/minimum-wage-](https://www.gov.uk/government/news/minimum-wage-underpayment-on-the-rise-low-pay-commission-finds)
929 [underpayment-on-the-rise-low-pay-commission-finds](https://www.gov.uk/government/news/minimum-wage-underpayment-on-the-rise-low-pay-commission-finds) (accessed July 18, 2020).

- 930 103 World Health Organization. Sustainable development in Wales and other regions in
 931 Europe – achieving health and equity for present and future generations. 2017.
 932 <http://www.euro.who.int/en/publications/abstracts/sustainable-development-in-wales-and->
 933 [other-regions-in-europe-achieving-health-and-equity-for-present-and-future-generations-](http://www.euro.who.int/en/publications/abstracts/sustainable-development-in-wales-and-)
 934 [2017](http://www.euro.who.int/en/publications/abstracts/sustainable-development-in-wales-and-) (accessed July 18, 2020).
- 935 104 UK Government Public Health (Wales) Act 2017.
 936 <http://www.legislation.gov.uk/anaw/2017/2/contents/enacted> (accessed July 18, 2020).
- 937 109 Castleden M, McKee M, Murray V, Leonardi G. Resilience thinking in health
 938 protection. *J Public Health Oxf Engl* 2011; **33**: 369–77.
- 939 106 Fahy N, Hervey T, Greer S, *et al.* How will Brexit affect health services in the UK? An
 940 updated evaluation. *Lancet* 2019; **393**: 949–58.
- 941 107 Roman-Urrestarazu A, Yang J, Robertson R, *et al.* Brexit threatens the UK’s ability to
 942 tackle illicit drugs and organised crime: what needs to happen now? *Health Policy* 2019
 943 123(6): 521-525
- 944 112 Horton R. The COVID-19 Catastrophe: What’s Gone Wrong and How to Stop It
 945 Happening Again, 1st edition. Cambridge: Polity, 2020.
- 946 113 Wilkinson E. RECOVERY trial: the UK covid-19 study resetting expectations for
 947 clinical trials. *BMJ* 2020; **369**: m1626.
- 948 114 Roberts C, Levi M, Schilling R, Lim W, Grocott M, McKee M. Covid-19: a complex
 949 multisystem clinical syndrome. *The BMJ*. 2020; published online May 1.
 950 [https://blogs.bmj.com/bmj/2020/05/01/covid-19-a-complex-multisystem-clinical-](https://blogs.bmj.com/bmj/2020/05/01/covid-19-a-complex-multisystem-clinical-syndrome/)
 951 [syndrome/](https://blogs.bmj.com/bmj/2020/05/01/covid-19-a-complex-multisystem-clinical-syndrome/) (accessed June 23, 2020).
- 952 115 Mansfield KE, Mathur R, Tazare J, *et al.* COVID-19 collateral: Indirect acute effects
 953 of the pandemic on physical and mental health in the UK. *medRxiv* 2020; :
 954 2020.10.29.20222174.
- 955 116 Lai AG, Pasea L, Banerjee A, *et al.* Estimating excess mortality in people with cancer
 956 and multimorbidity in the COVID-19 emergency. *medRxiv* 2020; : 2020.05.27.20083287.
- 957 111 Campbell D. Millions in UK miss cancer screenings, tests and treatments due to Covid-
 958 19. *The Guardian*. 2020. [https://www.theguardian.com/society/2020/jun/01/millions-in-uk-](https://www.theguardian.com/society/2020/jun/01/millions-in-uk-miss-cancer-screenings-tests-and-treatments-due-to-covid-19)
 959 [miss-cancer-screenings-tests-and-treatments-due-to-covid-19](https://www.theguardian.com/society/2020/jun/01/millions-in-uk-miss-cancer-screenings-tests-and-treatments-due-to-covid-19) (accessed July 18, 2020).
- 960 112 Greenberg N, Docherty M, Gnanapragasam S, Wessely S. Managing mental health
 961 challenges faced by healthcare workers during covid-19 pandemic. *BMJ* 2020; **368**.
- 962 119 McKee M, Stuckler D. If the world fails to protect the economy, COVID-19 will
 963 damage health not just now but also in the future. *Nat Med* 2020; : 1–3.
- 964 120 Keown OP, Warburton W, Davies SC, Darzi A. Antimicrobial resistance: addressing
 965 the global threat through greater awareness and transformative action. *Health Aff Proj*
 966 *Hope* 2014; **33**: 1620–6.

967 121 Le Quéré C, Jackson RB, Jones MW, *et al.* Temporary reduction in daily global CO₂
968 emissions during the COVID-19 forced confinement. *Nat Clim Change* 2020; **10**: 647–53.

969 118 Fahy N, Hervey T, Greer S, *et al.* How will Brexit affect health and health services in the
970 UK? Evaluating three possible scenarios. *Lancet* 2017; **390**: 2110–8.

971 123 Fahy N, Hervey T, Dayan M, *et al.* Assessing the potential impact on health of the
972 UK’s future relationship agreement with the EU: analysis of the negotiating positions.
973 *Health Econ Policy Law* 2020; : 1–18.

974 120 Green L, Edmonds N, Morgan L, *et al.* The Public Health Implications of Brexit in
975 Wales: A Health Impact Assessment Approach. 2019.
976 <http://www.wales.nhs.uk/sitesplus/888/news/50275> (accessed July 18, 2020).

977 125 Schalkwyk MCI van, Jarman H, Hervey T, Wouters OJ, Barlow P, McKee M. Risks
978 to health and the NHS in the post-Brexit era. *BMJ* 2020; **369**. DOI:10.1136/bmj.m2307.

979 122 BMA. Beyond Brexit - International trade and health. 2018
980 [https://www.bma.org.uk/collective-voice/influence/europe/brexit/bma-brexit-](https://www.bma.org.uk/collective-voice/influence/europe/brexit/bma-brexit-briefings/beyond-brexit-international-trade-and-health)
981 [briefings/beyond-brexit-international-trade-and-health](https://www.bma.org.uk/collective-voice/influence/europe/brexit/bma-brexit-briefings/beyond-brexit-international-trade-and-health) (accessed July 18, 2020).

982