

1 **The Changing Health Needs of the UK Population**

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7 **Abstract**

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

22

23 **Introduction**

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

41 International comparative studies, particularly in earlier decades, indicate that the NHS has been
42 relatively good at such adaptations.⁵ Its system of funding manages to avoid many perverse
43 incentives seen in fee-for-service systems that encourage lucrative interventions to persist long after
44 they have become obsolete, and professional associations, such as the Royal Colleges, emphasise
45 maintaining high standards of training and research rather than negotiating terms and conditions as
46 is the case with some of their equivalents elsewhere. However, some would argue that progress has
47 been slow and inadequate in adapting to epidemiological transition (such as in mental health and
48 the rise in dementia) and in adopting research and innovation at pace (such as stroke management).
49 More recently, designated funding for health services research has built capacity enormously,

50 relative to what exists in many other countries, but there remain many gaps in the evidence base. A
51 culture of evaluation and audit has been promoted and has developed well in certain areas,
52 especially those supported by systematic national data collection, for example within the national
53 clinical audit programme.⁶ This research capacity is now needed to understand and develop
54 strategies to mitigate against potentially long-lasting physical and mental health impacts of the
55 COVID-19 pandemic.⁷

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

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

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

88 **The Health of the Population**

89 *Life Expectancy in the UK*

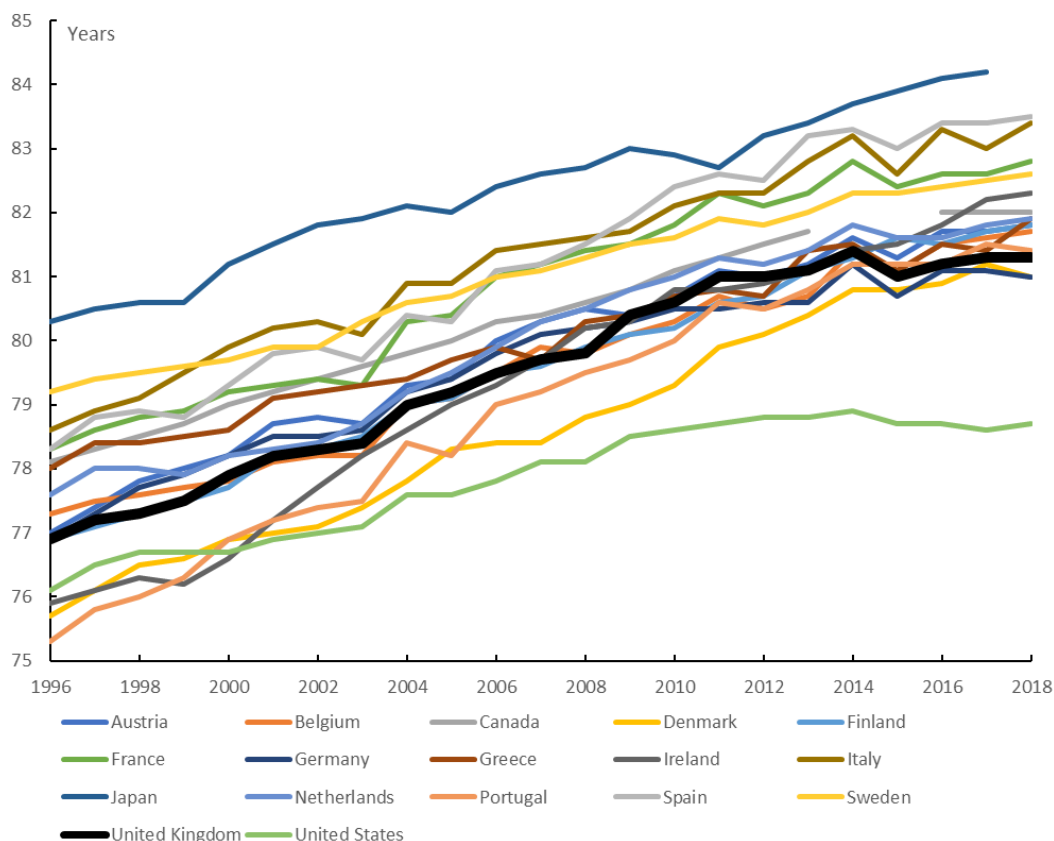
90 The health of the population of the UK is now lagging behind that of many comparable countries.
91 Having been in the middle of the range of high-income countries in 1960, life expectancy at birth is
92 now close to the bottom (Figure 1). Since 2010, the earlier rate of increase in life expectancy at birth
93 has slowed markedly.¹¹ A recent analysis compared life expectancy in England and Wales with 22
94 other high-income countries.¹² This showed how England and Wales diverged markedly from the
95 comparator group between 2011 and 2016. This was driven to a similar extent by diverging mortality
96 in working ages and at older ages. While more recent data are lacking for some comparator
97 countries, the situation in the UK now gives substantial cause for concern as there have been
98 continuing increases in death rates in several age groups and regions and the infant mortality rate in

99 England and Wales has now risen in each of the 3 years between 2014 and 2017, something that has
100 not happened for over a century.¹³

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

125 has experienced, so far, one of the highest death rates attributable to the COVID-19 pandemic, the
 126 gap in life expectancy between the UK and other developed nations may grow in the coming years.

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



129

130

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

132 There are also large differences between the four UK nations (Supplementary Material Figure 1). All
 133 have experienced a recent slowing of life expectancy at birth. Life expectancy has consistently been
 134 higher in England than in the other three nations, with Scotland lagging far behind. Between 1998
 135 and 2018, the gains in life expectancy at birth have been much less among women than men. For
 136 example, in England, it increased by 4.3 years but 3.1 among women. In Scotland the gap was even
 137 greater, at 4.2 years and 2.7 years respectively. For both sexes these were among the smallest

138 among industrialised countries. This is driven, to a considerable extent, by stagnating or falling life
139 expectancy among women aged 75 and above, who have been impacted especially harshly by
140 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)
150 (Supplementary Material Figure 2).

151

152

153 Within the four nations, there is especially poor health in those areas that have experienced
154 deindustrialisation since the 1980s, such as the west of Scotland, parts of Northern Ireland, South
155 Wales and the North-east and North-west of England. Analysis by geography and deprivation shows
156 that although life expectancy varies by as much as 6 years between the regions of England, most of
157 the difference is accounted for by levels of deprivation.²³ This analysis also showed that, despite the
158 fact that all the regions of England are subject to broadly similar underlying health policies,
159 regulations and laws, and all are served by the NHS, outcomes such as life expectancy and years
160 lived with a disability in the more prosperous regions of the UK are comparable to those in the best
161 performing advanced high-income countries, such as Sweden and Australia, whereas in the less
162 prosperous they lag behind the worst, such as Denmark and Greece.²³ Similarly, disability-free life

163 expectancy varies significantly *within* each UK nation, the consequence being that in many parts of
164 the UK, the average person cannot expect to reach the statutory retirement age in good health.²⁴
165 There are also inequalities among ethnic groups, with estimates suggesting that differences in
166 disability-free life expectancy, at 11.5 years, are twice as large as those in life expectancy.²⁵ Chinese
167 men and women have the highest disability-free life expectancy at birth, while Bangladeshi men and
168 Pakistani women have the lowest. The COVID-19 pandemic has exacerbated these health
169 inequalities, particularly for black and minority ethnic groups who have experienced persistently
170 elevated mortality rates from COVID-19.²⁶ Differential exposure to coronavirus patterned by
171 occupation and housing conditions, differential severity of COVID-19 patterned by existing health
172 conditions, and differential interactions with the health service, have all been suggested as potential
173 contributory factors.^{27,28}

174

175 The scale and nature of these differences point to the importance of influences outside the health
176 care system on health outcomes.²⁴ The Dahlgren and Whitehead model highlights the potential
177 impact of the wider social determinants of health, such as housing, sanitation, unemployment,
178 education and food production.²⁹ Austerity measures adopted since 2010 have had a
179 disproportionate impact on the poor,³⁰ creating insecurity of income, employment, housing³¹ and
180 even food supply, as revealed by the growth of foodbanks.³² Addressing these social determinants of
181 ill health will require wide-ranging action across many sectors, recognising the need for action at
182 every stage of the human life course, also recognising the role of intergenerational transmission of
183 disadvantage, and risking a downward spiral.³³ These measures must recognise the concept of
184 intersectionality, whereby some individuals have a combination of characteristics, all of which
185 disadvantage them; and the existence of a health gradient between rich and poor. This points to the
186 need for what is termed proportionate universalism,²⁴ where provision of services is universal but
187 measures are taken to increase uptake by those in most need.

188 *Mental Health*

189 The burden of disease attributable to mental illness, including what are termed common mental
190 illnesses (anxiety, depression, panic disorder, phobias and obsessive compulsive disorder), has been
191 growing over the past 25 years.³⁴ The COVID-19 pandemic has also had a profound impact on mental
192 health, with many individuals suffering from anxiety, isolation and difficulties in accessing mental
193 health support.³⁵ High-quality data needs to be collected to understand this impact, particularly for
194 vulnerable groups such as older people, young people, people with pre-existing mental health
195 issues, and healthcare workers.³⁶ To mitigate against long-term consequences for mental health,
196 supportive measures are needed such as providing widespread access to emergency psychological
197 support and increased investment in mental health services.³⁷ This has important implications for
198 health inequalities and the wider economy. Mental illness is more common in socioeconomically
199 deprived populations.³⁸ Mental illness is the leading cause of lost work days in the UK and mental ill
200 health at work is estimated to cost the UK economy between £74 and £99 billion per year.^{39,40} This
201 includes important consequences for the labour-intensive health sector.

202 The mental health needs of the older population are significant. Although the age-specific
203 prevalence of dementia appears to be decreasing slightly,⁴¹ population ageing means that the
204 absolute numbers of older adults experiencing cognitive decline due to Alzheimer's or other
205 dementias will rise. Prevalence of dementia increases from one in 14 at the age of 65 to one in six in
206 those over 80.⁴² However, older people's mental health needs do not just relate to dementia.
207 Depression is the most common mental health disorder in this age group, with estimates of a
208 prevalence of 22% in men and 28% of women aged over 65, and over 40% of those in care homes.⁴³
209 There is also a high prevalence of anxiety disorder,⁴⁴ and other disorders such as bipolar disorder
210 and psychosis are less common but nonetheless significant. Research shows that older adults with
211 depression are significantly less likely to be diagnosed and treated than younger adults with the
212 condition,⁴⁵ and there is more generally lack of parity of esteem regarding services and funding for
213 mental health care for older people compared to that for working age adults.⁴⁶

214 There is growing evidence of a high burden of mental illness among British children and adolescents,
215 to the point that the situation has been described as a 'crisis'.⁴⁷ Data from 2017 in England showed
216 that one in eight 5 to 19 year olds had at least one mental illness and that one in twenty met criteria
217 for two or more mental illnesses.⁴⁸ The same data show a gradual increase in mental illness in young
218 people since 1999, with the prevalence increasing with age, particularly on transition to adolescence
219 and secondary school. ⁴⁸ Of particular concern is the high level of mental illness in girls aged 17-19.
220 Nearly one in four of this group have a diagnosable mental illness, and over half of these reported
221 self-harming behaviour or suicide attempts. Universities have reported a huge increase in pressure
222 on student mental health services and rising numbers of student suicides,⁴⁹ and research shows an
223 increase in adolescent girls presenting to UK Accident and Emergency departments with self-harm.⁵⁰

224 The reasons for the increasing burden of mental illness in young people are complex. Social media,
225 the impending threat of environmental catastrophe and political instability, uncertainty about future
226 prospects, higher rates of family breakdown and academic pressure have all been proposed as
227 causative factors. Unrealistic social pressure to excel in all areas of life, promoted by social media
228 and an ethos of consumerism is another toxic, relatively new phenomenon. However, it is crucial to
229 try to address this area of growing need as it is well established that around half of mental illnesses
230 start before the age of 14 and three-quarters are established by the age of 24,⁵¹ particularly because
231 adolescence into young adulthood is a pivotal life-stage for key decisions regarding education,
232 employment and relationships.

233 The burden of disease due to alcohol and illicit drug use has increased across the UK in recent years.
234 Alcohol-related deaths in the UK increased to an age standardised rate of 12.2 per 100,000 in 2017,
235 which is similar to 2008 when deaths were at the highest recorded levels.⁵² Scotland consistently has
236 the highest rate of alcohol-related deaths in the UK, at 20.5 per 100,000 in 2017, although this has
237 significantly reduced from a peak of 28.5 per 100,000 in 2006.⁵² Drug-related deaths in England and
238 Wales have increased from an age-standardised rate of 42.9 per 1,000,000 in 1993 to 66.1 per
239 1,000,000 in 2017.⁵³ In comparison, Scotland's incidence of drug-related deaths is over three times

240 the rate in England and Wales at 192.6 per 1,000,000 in 2017,⁵⁴ and the highest recorded drug-
241 related death rate in the EU. There are also significant inequalities in alcohol and drug-related
242 deaths across the UK, for example over half of the drug-related deaths in Scotland occur in people
243 from the most deprived quintile,⁵⁵ and the rate of alcohol-related deaths is over three times higher
244 in the most deprived quintile than the least deprived quintile in England.⁵⁶ These increases in alcohol
245 and drug-related deaths have occurred during a period when drug and alcohol services are under
246 intense financial pressure. For example, in England local authorities cut budgets by 18% in real terms
247 between 2013/14 and 2017/18,⁵⁷ which contributed to a 11% reduction in people accessing
248 treatment over the same time period.

249 *Maternal and Child Health*

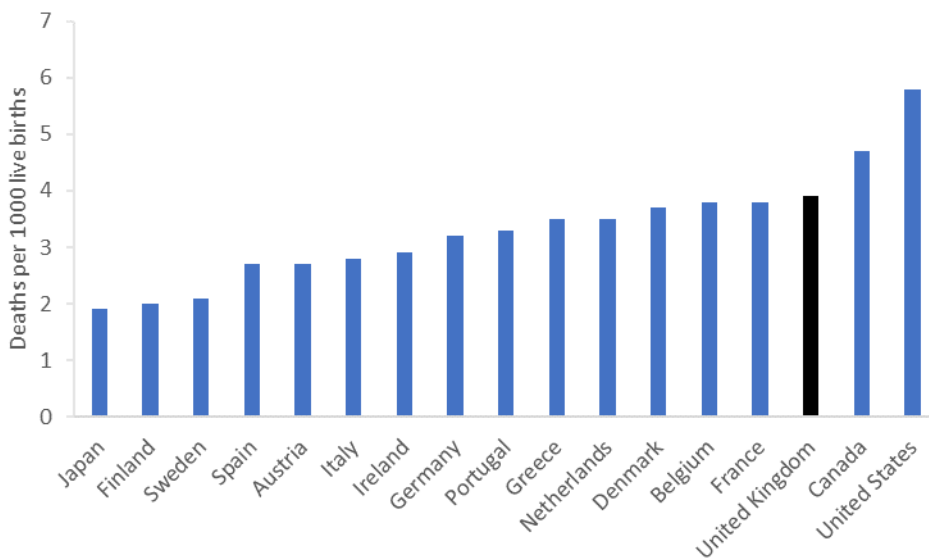
250 Maternal mortality in the UK is higher than many countries in Central and Northern Europe
251 (Supplementary Material Figure 3). Within the UK there are significant inequalities patterned
252 according to both ethnicity and deprivation.⁵⁸ Compared to white women, there is a five-fold
253 difference in maternal mortality rates for women from a black ethnic backgrounds, and a two-fold
254 difference for women from an Asian ethnic background. Between the most and least deprived
255 groups, there is a two-fold difference in maternal mortality. Rather than narrowing, these trends
256 have been widening over the last decade.⁵⁸

257 The UK's high mortality from conditions such as asthma, epilepsy, pneumonia and meningococcal
258 disease in childhood, compared to other European countries,^{59,60} also suggests a problem with
259 paediatric care, with infant mortality lagging behind many other high-income countries (Figure 2).⁶¹
260 A recent, extremely detailed comparison with Sweden found that newborns in the United Kingdom
261 had many more problems at birth than their counterparts in Sweden, many of which could be traced
262 to their worse socioeconomic status.⁶² Influences on health outcomes start in utero, and there is a
263 clear social gradient in the extent to which children are able to access positive experiences in their
264 early years.²⁴ As already mentioned, since 2010, the UK government has chosen to implement

265 prolonged austerity policies, including reductions in entitlements to welfare provision, with
 266 measures that have impacted particularly on the most vulnerable.⁶³ Concerns have been expressed
 267 about the substantial increase in suicide rates among adolescents in England and Wales since 2010.⁶⁴
 268 Child poverty in the UK is currently around 30%, and children are more likely to live in low-income
 269 households.⁶⁵ This is predicted to rise over the next few years, and children in single-parent families,
 270 with 3 or more siblings, in households where no-one is in work, and in rented or social housing are
 271 known to be at particular risk of poverty.⁶⁶

272

273 *Figure 2 Infant Mortality in the United Kingdom and comparable high-income countries (2018 or*
 274 *latest year available)*



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

280 *Oral Health*

281 Oral diseases (dental decay, periodontal (gum) diseases and oral cancers) are highly prevalent
282 chronic conditions that have a significant impact on quality of life and are costly to health care
283 systems. The Global Burden of Disease study has highlighted that dental decay in adults is the most
284 prevalent chronic health condition globally – overall it is estimated that 3.5 billion people are
285 affected by dental diseases.⁶⁷ A recent analysis shows that the treatment of dental diseases amongst
286 EU countries costs in excess of €90 billion per year, the third most expensive condition behind
287 diabetes (€119 billion), and cardiovascular diseases (€111 billion).⁶⁸ In recent decades there has
288 been a dramatic change in oral diseases in the UK population. When the NHS was first created the
289 state of oral health in the UK was appalling with the complete removal of all teeth (edentulism) a
290 relatively common occurrence for even young adults, often taking place before marriage. Now less
291 than 5% of adults in the UK have no natural teeth and overall oral health in the child and adult
292 population has improved greatly.⁶⁹ The retention of more natural teeth is a positive change but as
293 individuals age and become more frail, complex and costly dental treatment is often required. Stark
294 socioeconomic and geographical inequalities in oral health exists. Steep and persistent social
295 gradients are found for oral conditions in both children and adults and oral health is worse in
296 Northern Ireland and Scotland, compared to Wales and England.⁷⁰ Oral diseases are caused by the
297 broader social determinants in society and shared risk factors such as sugars, smoking and alcohol
298 use.

299 In the UK dental services are organised and funded in a different manner than medical services. The
300 vast majority of the 40,000 dentists in the UK work in primary care providing general dental services
301 to the population. Across the UK different payment systems exist but in all countries co-payments
302 operate where adult patients make a contribution to the costs of their dental treatment. Children
303 and exempt adult groups do not pay for their dental care. Patterns of dental attendance are strongly
304 influenced by socioeconomic status and concerns over the costs of treatment are a major barrier to
305 accessing dental services.⁷¹

306 *Multimorbidity*

307 Older people are, individually, more likely to be healthy than in the past. However, the absolute
308 numbers with ill health are increasing. Many will remain healthy by virtue of being treated for
309 hypertension or diabetes thus averting their sequelae. Others, while not in perfect health,
310 experience considerable alleviation of their symptoms. The corollary of this and of earlier detection
311 of chronic diseases and their risk factors is that ever more people experience multimorbidity,
312 requiring some health care, even if only reviews in primary care every few months, for multiple
313 disorders.³⁸ Research in the UK estimates that around 23% of the population meet current criteria
314 for multimorbidity, increasing with age, and attention to early diagnosis, so that the figure is around
315 two-thirds in those over 65, with nearly half having three or more conditions.³⁸ There have been a
316 number of attempts to classify commonly occurring clusters of conditions, and some diseases
317 frequently co-exist, sharing common aetiologies, but there is also much heterogeneity, and illnesses
318 can also be completely unrelated. Chronic physical conditions often co-exist with mental health
319 disorders (particularly dementia), with evidence that the relationship is bi-directional.⁷² There is a
320 clear association between multimorbidity and socioeconomic deprivation, and people living in
321 deprived areas are likely to develop multimorbidity 10-15 years earlier than those living in more
322 affluent areas.³⁸

323 This has profound implications for how health care is delivered. It demands a holistic approach,
324 often delivered by multidisciplinary teams. The model of primary care, with its generalist approach,
325 has found it easier to respond to this challenge than have some other countries, but the
326 disadvantage, in a country that has somewhat fewer medical specialists than many others (despite
327 growth in specialist posts in recent years), is that it may be difficult to obtain specialist expertise
328 when needed. Unfortunately, the accessibility of primary care is now being threatened, with
329 insufficient historical investment in these services. To compound the problem, chronic staffing
330 shortages coupled with administrative overload add to falling morale and cause physical and
331 psychological burnout. This leads to growing problems in recruiting and retaining general
332 practitioners and community nurses.

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

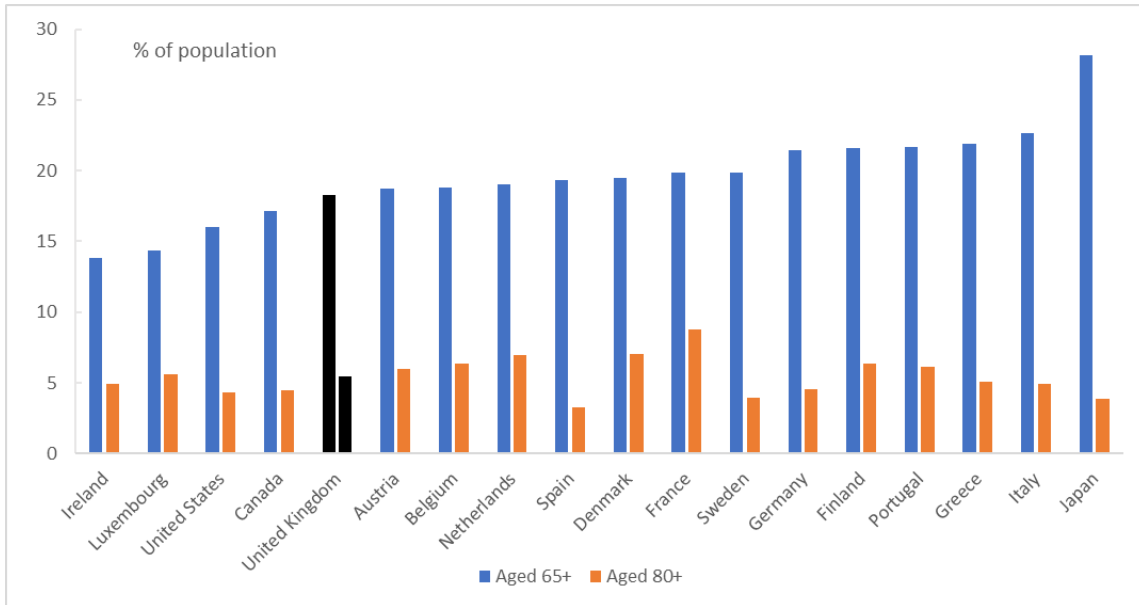
335 *The UK's Ageing Population*

336 Some changes in future health profiles can be predicted with relative certainty, such as the ageing of
337 the population and, to some extent, a relative fall in those aged 18-65, albeit with caveats about
338 future migration.⁷³ Forecasting with some confidence is possible when the association between risks
339 and disease are known and have long time periods, such as with smoking. It is more difficult when
340 lags between exposure and outcome are short, as with many of the consequences of hazardous
341 drinking, and where public policies can have a major impact in the short term.

342 Although the UK does not have an especially high proportion of older people relative to other high-
343 income countries, with the share of those over 65 and over 80 falling from 4th to 12th between 1995
344 and 2016 in one comparison of 17 countries (Figure 3), it will eventually face similar challenges to
345 other countries. While ageing per se does not necessarily impact on health care utilisation, if ageing
346 is associated with increased chronic illness and higher rates of multiple long-term conditions, this
347 does add pressure to constrained NHS resources by increasing healthcare utilisation.⁷⁴

348 *Figure 3: Percentage of the population at older ages in selected high-income countries (2018)*

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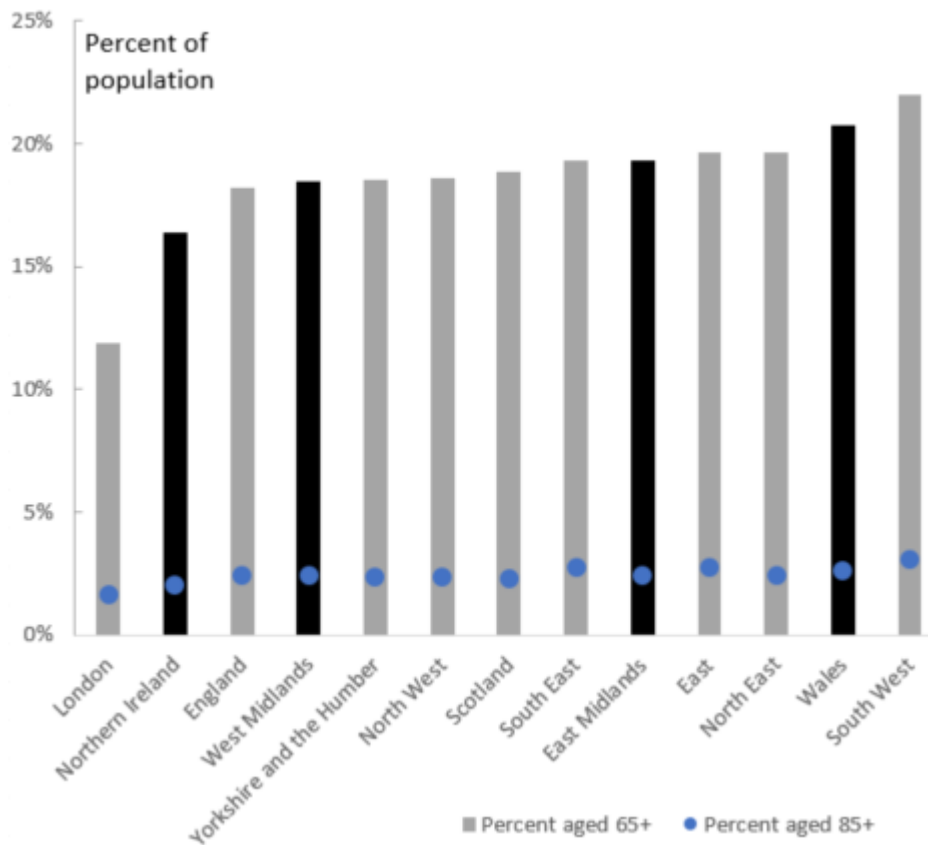
351 *Source: Organisation for Economic Co-operation and Development (OECD) ⁷⁵*

352

353 There is considerable variation within the UK, with the largest share of older and very old people in
 354 the South East of England and the smallest in the North East of England (Figure 4). There is also a
 355 sizable discrepancy in the age distribution of different ethnic groups (Supplementary Material Figure
 356 4). Both the geographical and ethnic spread of the older population matters, as it leads to specific
 357 pressure points on NHS access, as well as contributing to the unequal concentration of ill health
 358 within the UK. As ethnicity is not recorded on death certificates in the UK, it is not possible to
 359 routinely report on life expectancy stratified by ethnicity. However, a number of recent studies
 360 which have used various techniques to try to estimate life expectancy by ethnicity show significant
 361 discrepancies between groups which vary by region.⁷⁶⁻⁷⁸

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363 Figure 4: Percentage of population aged 65+ and 85+ (2019)



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366 Source: Office for National Statistics (ONS)⁷⁹

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371 *The Working Population*

372 The participation of women in the labour market is at an all-time high,⁸⁰ but the threat of future

373 reductions in the proportion of the population in employment will exert further pressure on this

374 group, from whom health and care professionals are drawn. However, caution is needed. The

375 widely-used measure, the old age dependency ratio, has been used in sometimes apocalyptic

376 predictions, typically to argue for the unsustainability of the welfare state. Yet it assumes an

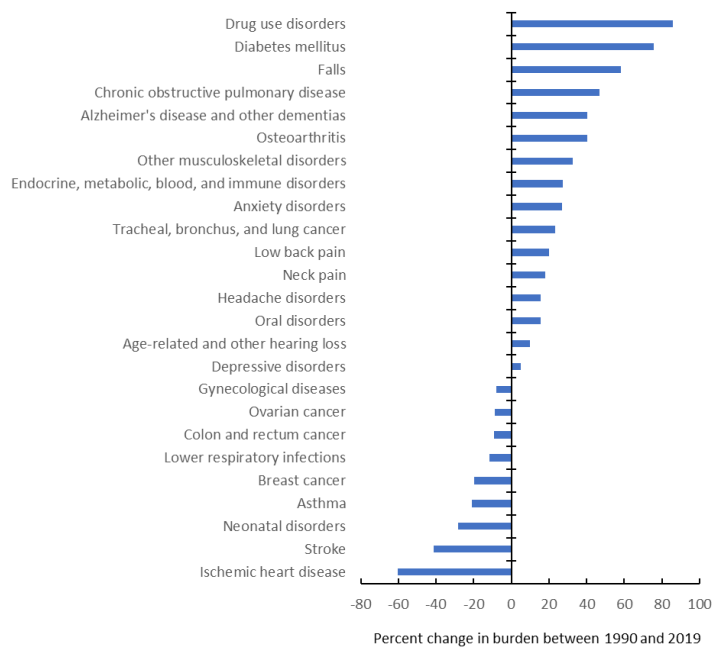
377 economically (and socially) inactive stage of life beyond 65 years of age that is no longer the case.
378 The raising of the retirement age, in the United Kingdom and many other countries, has changed
379 such calculations considerably, even before taking account of how older people can be very actively
380 engaged in work and in informal care of spouses, parents, adult children and grandchildren,
381 sometimes with competing demands.^{81,82} There are, however, many uncertainties about the future
382 composition of the UK population, and while it is important not to be alarmist, the experience of
383 Japan,⁸³ a country that has experienced very little immigration, albeit for different reasons, is a
384 concern as the young are attracted to major centres for their early working careers, while older
385 people remain in rural or coastal regions, creating a skill gap for care.

386 In this context, the UK government's stated goal to reduce migration from the "hundreds of
387 thousands" to the "tens of thousands" is a clear cause for concern. The NHS has a long history of
388 relying on foreign recruitment in response to workforce shortfalls. For example, in light of ongoing
389 uncertainty about future EU citizen arrangements, there has been a 90% reduction in nurses from
390 other EU Member States joining the UK's register in 2017/18 as compared to 2016/17.⁸⁴ Growing
391 numbers of medical posts remain unfilled, with the government refusing visas to non-EU doctors
392 with job offers, and even those training in this country.⁸⁵ The social care sector is also heavily
393 dependent on foreign recruitment, yet senior care workers are currently not on the government's
394 'shortage occupation list'.⁸⁶

395 *Changing Burden of Disease*

396 *Figure 5a: Percentage change in burden due to the top 25 causes of DALYs in UK, 1990 to 2019,*

397 *females*



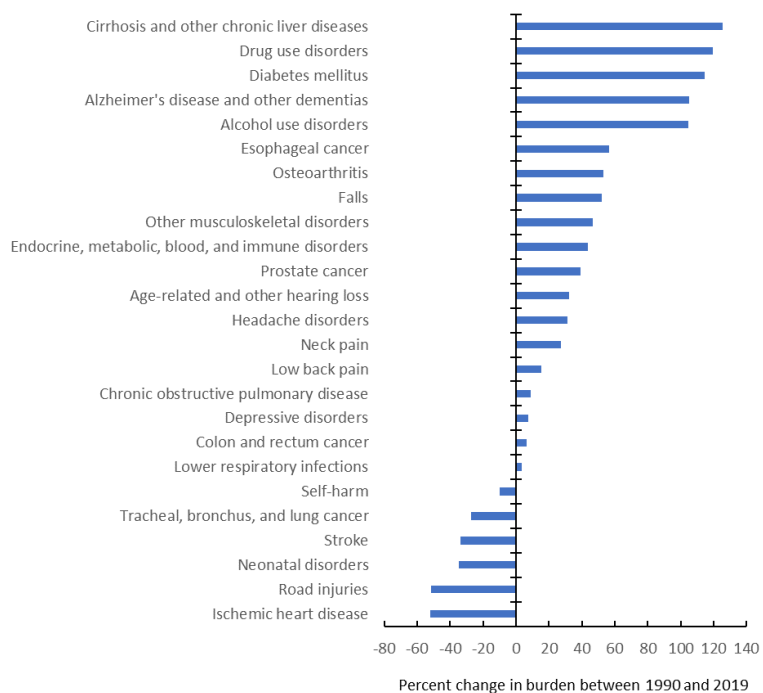
398

399 Source: Global Burden of Disease ⁸⁷

400

401 Figure 5b: Percentage change in burden due to the top 25 causes of DALYs in UK, 1990 to 2019,

402 males



403

404 Source: Global Burden of Disease ⁸⁷

405

406 The combination of trends in underlying population health, the application of effective preventive
407 interventions and advances in health care have led to a shift in the predominant share of the burden
408 of ill health worldwide from conditions causing premature mortality to conditions that cause
409 disability. Health systems everywhere must thus adapt to the changing nature of health need. The
410 Global Burden of Disease study captures this in its analysis of DALYs. Figure 5 A and B shows the
411 percentage change in burden attributed to the top 25 causes of DALYs in UK for both genders from
412 1990 to 2019.⁸⁷ For both genders, there have been a significant increases in disease burden due to
413 drug use disorders. In males, addiction problems have been exacerbated further by increases in
414 disease burden due to alcohol use disorders. Addiction services have struggled to meet this rising
415 demand in a context of ongoing funding cuts over the last decade.⁸⁸ This has had implications for
416 NHS services, as harmful drinking has contributed to the increase in disease burden due to liver
417 cirrhosis. Smoking rates have fallen markedly, reducing the future risk of many smoking-related
418 diseases such as stroke and myocardial infarctions, which have been declining for several decades.
419 Although the benefits of this are yet to be felt, with increases in disease burden due to chronic
420 obstructive pulmonary disease experienced in both males and females. Conversely, rates of obesity
421 at younger ages are increasing, with implications for a range of common disorders such as diabetes
422 and cancer, as well as dementia.

423 Estimates of the proportion of the population aged 65 and over predict an increase of 17.8% to
424 24.6% between 2015 and 2045.⁸⁹ Assuming no change in age-specific utilisation, this would increase
425 demand for health and, especially, social care.⁹⁰ The changing population structure has already led
426 to an absolute increase in numbers of deaths, as predicted, after many years of decline.⁹¹ A major
427 component of health costs is driven by proximity to death, not by chronological age, while many
428 older people are now healthier than their counterparts in previous generations. However, the
429 absolute number of older people with multiple conditions is set to increase substantially over the
430 next few decades, potentially more so as the emphasis on early detection continues. As premature

431 mortality reduces, disabling conditions whose prevalence increases sharply with age (such as
432 sensory deficits, mobility problems, cognitive decline and incontinence) will progressively accrue,
433 leading to complex multimorbidity. These trends in common conditions have been brought together
434 with population ageing in a dynamic model.⁹⁰ This predicts that the net effect on the numbers of
435 people with four or more conditions will increase between 2015 and 2035 by 21% in those aged 65-
436 74, 130% in those aged 75-84, and 470% in those aged 85 and over. The changing nature of demand
437 for health and social care that results is a challenge for any health system and requires an explicit
438 response, even more so with a health care system that is encouraging populations to seek medical
439 care for conditions at earlier and earlier stages, sometimes before they are clinically manifest.
440 Therefore, the concern is less ageing *per se*, but ageing with multiple preventable conditions leading
441 to poor health and wellbeing.

442

443 **Reducing Need for Healthcare**

444 *The Need for a Preventive Focus*

445 One of the key messages of the Tallinn Charter,⁹ mentioned previously, was that effective
446 prevention could reduce the need for health care, and thus the need for scarce resources. This was
447 also a key message of the Wanless Report, commissioned by the UK Treasury.⁹² It forecast potential
448 to moderate future NHS expenditure if what it called a “fully engaged” policy could be adopted. This
449 concept, of investing in health improvement to reduce future costs, also features prominently in the
450 NHS Long Term Plan.⁹³ An additional consideration is the compelling evidence linking better health
451 to economic growth through higher labour force participation and productivity.⁹⁴ There are many
452 examples of successes in implementing health-promoting policies in Europe.⁹⁵

453 The countries of the UK have been among the leaders internationally in many of the most effective
454 policies to reduce harms associated with use of hazardous substances, such as tobacco, alcohol and,
455 most recently, junk food. Governments have recognised that the most effective policies are those

456 based on price, availability and marketing. Examples include minimum alcohol pricing in Scotland
457 and Wales, above-inflation increases in tobacco taxation, a ban on smoking in public places and
458 point-of-sales displays, sugar tax, and standardised cigarette packaging. However, these face
459 powerful lobbying activities by the corresponding industries, both directly and through several
460 “thinktanks” that they fund.^{96,97} For a brief period, the alcohol and food industries benefitted from
461 creation of so-called “responsibility deals”, in which the UK government sought to engage with them
462 in official fora. However, the government’s own evaluation found that they typically proposed the
463 least effective measures and opposed those known to be effective.⁹⁸ These responsibility deals did
464 lead to pledges from many companies to reduce salt content in food and contributed to a reduction
465 in overall salt intake in the UK of 11% between 2006 and 2014.⁹⁹ However, eventually key health
466 advocacy organisations withdrew.

467 Moving forward, there is a need for more joined-up approaches that bring together different groups
468 working on, for example, tobacco, alcohol or diet, working in close collaboration to secure maximum
469 benefit from shifting population norms on the five healthy living imperatives (not smoking, adhering
470 to alcohol guidelines, a healthy weight, physically active and eating a healthy diet) that influence
471 rates of non-communicable diseases. This will require policies that address these issues specifically,
472 but others that take a concerted approach to the upstream determinants of health, including both
473 the well-recognised social determinants of health, but, even more now, the commercial
474 determinants,¹⁰⁰ looking at how powerful vested interests are able to subvert health policies. It is
475 also necessary to address the political determinants of health, such as austerity and welfare and
476 immigration regimes, and the environmental determinants, such as in the design of health-
477 promoting cities.

478 *Addressing the Social Determinants of Health*

479 Although successive governments have adopted effective public health policies, these have
480 struggled in the face of wider societal problems. Consequently, despite noted successes in areas

481 such as tobacco control, the UK ranked only 12th overall in an assessment of public health policies
482 across the European Region of the World Health Organization.¹⁰¹ Looking ahead, there is clearly a
483 need to address the underlying social determinants of health, or the conditions in which people are
484 born, grow, live, work and age,²⁴ with policies that address precariousness of employment, income,
485 housing and food security.¹⁰² The UK has high rates of child poverty, lax building standards and
486 underinvestment in social housing, contributing to many people living in sub-standard
487 accommodation and, since 2010, a marked rise in food insecurity.³² Other social problems relate to
488 the employment market: although introduction of a minimum wage was associated with a
489 demonstrable improvement in mental health,¹⁰³ and official unemployment rates are low, there are
490 growing numbers of people who remain below the minimum wage, which is illegal but largely
491 unenforced,¹⁰⁴ or who face severe uncertainty about income and employment in what is termed the
492 “gig” economy, characterised by piece-work and limited employment rights. Against this background
493 of the erosion of wider welfare policies and falling public expenditure in other areas of welfare, the
494 NHS is increasingly left as the one remaining pillar of the UK welfare state.

495 Health care is an important route through which health improvements can be channelled, but other
496 sectors remain important in addressing health promotion and inequalities. There is compelling
497 evidence, in many areas, that health promoting policies work, especially those that involve all
498 relevant sectors, enshrined in the concept of “Health in All Policies”. Wales is pioneering this
499 approach through The Wellbeing of Future Generations Act 2015 and the Public Health Act,
500 2017.^{105,106} As a major employer, this is an area where the NHS could play a major role, although this
501 would require a substantial culture change in an organisation that is more often associated with high
502 levels of work-related stress and burnout. Health-promoting policies do have the potential not only
503 to alleviate suffering but also to reduce further the demand on the NHS if there is the political will to
504 implement them.

505 **Immediate threats to the NHS**

506 *The need for a resilient NHS*

507 The initial version of this paper argued that the NHS must prepare for the unexpected, ensuring that
508 it was resilient in the face of potential threats, including a pandemic,¹⁰⁷ especially given the threat
509 posed by the loss of links with European agencies such as the European Centre for Disease Control
510 (ECDC) and the European Monitoring Centre for Drugs and Drug Addiction.^{108,109} The COVID-19
511 pandemic has, tragically, revealed that the UK was less prepared than it could have been.

512 As of November 2020 it was one of the worst affected countries in the world, whether deaths were
513 measured as those attributed directly to COVID-19 or by excess all-cause mortality, the preferred
514 measure for international comparisons. There will be many lessons to learn from the response:
515 confused messaging by ministers; outsourcing of essential functions to companies lacking expertise;
516 fragmentation of the NHS, public health, and social care systems; understanding the factors which
517 underpin elevated mortality rates experienced by black and minority ethnic groups; relationships
518 between central and local government, as well as with devolved nations; serious failures in
519 procurement of essential items, from ventilators to test kits, personal protective equipment; and
520 entire new, but largely unused, hospital facilities.¹¹⁰ It should also be recognised how many aspects
521 of the response by those working in the NHS was exceptional, repurposing existing hospital facilities,
522 rapidly expanding access to teleconsultations, reallocating staff, sharing knowledge about the
523 emerging clinical characteristics of this disease, and implementing a world leading clinical trial
524 programme.¹¹¹ Impacts in parts of the social care sector (especially in care homes), have been
525 devastating, and responses by staff similarly exceptional, again with many lessons to be learned.¹¹²

526 The UK's response has, however, come at an enormous cost, both financially and in terms of the
527 long-term consequences for health. These can be considered under five headings: the long-term
528 consequences of the infection on the body, delays in care as a consequence of suspension of certain
529 NHS services, the health effects of the lockdown, the impact on NHS staff, and the long-term
530 economic impact. In the first category, it is becoming clear that many of those who survive COVID-19

531 are experiencing persisting health problems, many apparently associated with the action of the virus
532 on vascular endothelium and the associated immune response and hypercoagulability.¹¹³ In this
533 respect, some have questioned whether it will come to be compared with polio, which also left a
534 long-lasting legacy of ill health. In the second category, there was a large reduction in primary care
535 attendances,¹¹⁴ storing up considerable unmet need for the future, and routine surgery has been
536 suspended, leaving a massive backlog to be treated in what was an already struggling system.
537 Delayed diagnosis and treatment of early stage cancer has been estimated to lead to over 6,000
538 additional deaths in a year.¹¹⁵ Estimates suggest that 3,800 early cancers that would have been
539 picked up on screening have been missed.¹¹⁶ In the third category, prolonged isolation, coupled with
540 cessation of specialist services, is likely to contribute to an increased burden of mental illness, while
541 closure of schools is likely to contribute to mental illness in children and young people.⁷ The fourth
542 category includes the effects of psychological trauma on NHS and social care staff, including
543 responses more usually seen in survivors of armed conflict.¹¹⁷ Fifth, the pandemic is expected to lead
544 to a long-term reduction in economic growth,¹¹⁸ that could see many of the health problems
545 associated with austerity in the period after 2010 return.¹⁰² To add to the problems, the ability of the
546 NHS to respond may be complicated by the need for new ways of working, including greater use of
547 personal protective equipment, social distancing, and remote consultations.

548 There are also other threats ahead, some more certain than others. One is antimicrobial resistance,
549 an area where the UK has shown global leadership.¹¹⁹ Another is the consequences of a generation
550 transitioning into retirement in a much more precarious state than their parents because of closure
551 or reduction of pension schemes and less home ownership, who may struggle to come to terms with
552 their straitened circumstances.⁹⁵ A third is climate change, with evidence that the climate is
553 changing even faster than predicted, potentially nearing a tipping point of runaway global warming.
554 The COVID-19 pandemic has ushered in a temporary period of reduced carbon emissions,
555 government actions and economic incentives post pandemic will determine whether carbon
556 emissions continue on the same path.¹²⁰

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

561 *Leaving the European Union*

562 The UK leaving the European Union will have adverse consequences for health.¹²¹ However, the UK
563 has failed to engage effectively with the process of negotiating a future trade deal with the EU.¹²² As
564 of November 2020, the prospect of anything more than a minimal agreement in place in early 2020
565 seems remote. This makes it very difficult to have any clear understanding of what the future
566 situation might be. There will be many direct impacts on the health system, including those on the
567 workforce and employment law, access to medicines and medical devices, funding for research and
568 sharing of vital public health information about communicable diseases. “No deal” planning has been
569 focussed on developing alternative systems to mitigate risks but these have suffered greatly during
570 the COVID-19 pandemic. Beyond the immediate problems, the health of the UK population is
571 affected by many other aspects of public policy. Food quality and safety, agriculture, land-
572 management and environmental regulations are just a few of the areas of concern currently
573 addressed by EU legislation which have significant implications for human health.¹²³ Of particular
574 concern to health and health services will be the nature of any future international trade
575 agreements. Issues around Intellectual Property Rights, Technical Barriers to Trade and Investor
576 Protection need to be thought through carefully,¹²⁴ and protections for health and healthcare put in
577 place. It is vitally important that in the new trade agreements health is not subverted by commercial
578 interests for economic gain.¹²⁵ Overall economic performance following departure from the
579 European Union will also be very important, with implications not just for the available funds to
580 spend on health, but for the wellbeing of the UK population and the consequent demand for
581 healthcare.

582 **Conclusion**

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

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

591 Second, in the future there will be relatively fewer people in the working population, especially if
592 current policies on migration continue, and a sharp rise in people with complex multimorbidity. This
593 creates a mismatch between needs and capacity to address those needs, both through workforce
594 availability and securing the economic basis for sustainable funding. To address these issues there
595 needs to be an increased focus on prevention and health promotion that takes a multisectoral
596 approach to the social, political and commercial causes of poor health. The crucial role the NHS can
597 play by setting an example as a healthy employer, reducing risk factors for chronic diseases,
598 promoting healthy ageing, enhancing confidence and promoting social engagement, should be
599 addressed explicitly. However, the NHS is increasingly operating in an environment where other
600 sectors (especially social care), instead of being maintained as supportive, are being eroded in terms
601 of expenditure and general infrastructure.

602 Finally, there are many immediate threats which will affect the health of the population and service
603 provision. Crucially the UK will need to develop strategies to mitigate against the wider and long-
604 term consequences for health of the COVID-19 pandemic. Alongside this, the UK's impending
605 departure from the EU, growing antimicrobial resistance and increasing climate change are all major
606 challenges with significant consequences for the NHS. Other unforeseen risks such as economic

607 downturn or even conflict would impact the NHS but are practically difficult to plan for. Instead the
608 focus should be on building a resilient and preventative healthcare service, so that the NHS is better
609 prepared for any future challenges.

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