Direct and Indirect Health Impacts of COVID-19 in England

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Executive Summary

Background

COVID-19 has had significant impacts on the health of the population in England both directly and indirectly. This paper by the Department of Health and Social Care (DHSC) and the Office of National Statistics (ONS), follows three previous papers examining these effects as the pandemic has evolved. This paper gives a detailed analysis of the short and long-term health harms arising as a consequence of infections and mitigating behaviours between March 2020 and spring 2021, where data is available[1]. It also examines how the health of different groups of the population has been affected. There is an accompanying paper that gives a briefer overview of the subject.

We have worked closely with the Institute for Fiscal Studies, the Health Foundation, the Royal College of General Practitioners, the authors of *Health in Hard Times: Local Effects, National Effect and Area Heterogeneity*[2] and the Institute and Faculty of Actuaries on different elements of the paper and are extremely grateful for their support.

The paper summarises four routes through which COVID-19 has had an impact on health:

- **Category A. Direct impacts of COVID-19** such as mortality impacts (A1) and morbidity impacts (A2).
- **Category B. Impact of COVID-19 on NHS critical care capacity.**
- **Category C. Indirect impacts of COVID-19 on health-related behaviours and healthcare** This considers changes in underlying health needs (C1) and health seeking behaviour (C2); the impact of COVID-19 on healthcare activity, capturing impacts of COVID-19 on general practice (C3), patient wait times (C4) and hospital activity (C5); and two case studies to assess the impact of COVID-19 on the care of specific conditions, one on cancer (C6) and the other one on mental health (C7).
- **Category D. Indirect impacts of COVID-19 on the wider population in the long-run such** as impacts on the wider population through changes to employment and the wider economic fallout (D1); health impacts from the loss of education (D2) and impacts on social care recipients due to changes in their lives (D3).

It presents information on how these health impacts have differed between groups in society, **subject to data availability[3].**

[1] End dates vary through the analysis reflecting availability of different data sets and the time required to provide additional analysis on these.
[2] Janke, K., Lee, K., Propper, C., Shields, K., and Shields, M., (2021). Health in Hard Times: Local Effects, National Effect and Area Heterogeneity. AEJ. Working Paper. Shared by authors.
[3] Data is not always available for considering impacts on different groups, often because characteristics are not recorded in data sets, or if they are, they are not recorded consistently.

Overview and key findings across characteristics

Health impacts from COVID-19 are still emerging. By looking back from spring 2021 we can observe the huge direct impacts on mortality and morbidity. Understanding the **impacts from behavioural, economic and health service change** is more complex. Our analysis suggests that there has been a fall in underlying need related to non-COVID infections, accidents, and air pollution. There has additionally been an increase in underlying need from substance abuse and domestic violence. Health-seeking behaviour has altered during the pandemic: Primary care consultations fell significantly after the start of the pandemic and only fully recovered by May 2021. It is complex to identify whether this fall in activity is the result of changes to underlying need, changes in health-seeking behaviour or adaptations put in place in the health system to respond to COVID-19.

Diagnosis of a range of chronic conditions fell significantly, though management of existing long-term conditions appears less negatively affected. There has been a fall in referrals to secondary care for routine appointments mirroring the fall in numbers of GP consultations. Routine referrals to January 2021 remained below the four-year average. Hospital activity declined sharply in the first wave, recovering steadily in most specialties but patient wait times have continued to increase. The adverse economic shock and impacts on education are likely to lead to poorer health in the population and future health care need.

People in the **most deprived socioeconomic groups** have experienced greater adverse health impacts in almost all categories of harm for which we could consider deprivation. From March 2020 to April 2021, the mortality rate in the most deprived quintile after controlling for age and population size was almost double that of the least deprived quintile (264.6 deaths per 100,000 people and 140.4, respectively). Recent estimates for “long COVID” (August 2021) also show that self-reported symptoms are 50% higher in people in the most deprived quintile, compared to the least deprived (1.89% of people experiencing long COVID compared to 1.24%).

The reduction in GP consultations per patient does not significantly differ by **socio-economic status** between 2019 and 2020 once age had been taken into account, but as there is greater health need in lower socioeconomic groups, this will have had greater impact in absolute terms. Similarly, reductions in admissions for elective care and outpatient appointments between February 2020 and February 2021 were similar across socio-economic groups. However, patients on long surgical lists who are in lower socio-economic categories have also reported worse outcomes in quality of life.

Regionally, the pandemic shock and its impacts on the healthcare system varied significantly. Greater London experienced greatest direct health impacts of COVID-19: it had the highest rate of deaths to April 2021 once population size and age were taken into account; it also had the greatest QALY losses from death and morbidity. It experienced relatively lower reductions in elective and outpatient activity than other regions, though the drop in emergency activity in Greater London was greater than most regions (28.4% reduction compared to median of 24.9%). The West Midlands, East Midlands and Yorkshire and the Humber suffered less from direct COVID-19 impacts, but experienced greater impacts through reduced non-COVID-19 activity in the NHS with elective care down more than 38% between February 2020 and February 2021.

Different **age groups** have experienced diverse impacts as a result of the pandemic. The majority of direct mortality impacts are seen in older age groups, with 99% of deaths recorded in people over the age of 45. However, the age group with the greatest percentage reporting symptoms 5 weeks post infection is the 35 to 49-year-old group (25.6% of infected individuals report symptoms at 5 weeks post infection) and the 25 to 34-year-old group have the greatest percentage reporting symptoms 12 weeks post infection (18.2%).

Young people, particularly under 11 years, saw the largest fall in consultation rates and were most likely to have reduced GP appointments relative to older age groups. Initially, from Feb 2020 to April 2020, there was a drop in mental illness referrals of around half in 0-18 year olds; compared to around a third in adults (19+), but these have recovered and have been above pre-pandemic levels since September 2020.

Impacts for males and females differed depending on the type of health impact: Although, more **males** died in each age group to April 2021, female death represents slightly more QALYs lost on average, due to women having a longer life expectancy than men. Females are more likely to suffer symptoms for an extended period of time compared to males. Reductions in hospital activity between February 2020 and February 2021 have been roughly similar.

During the first wave of the pandemic people from all **ethnic minority groups** (except for women in the Chinese or "White Other" ethnic groups) had higher rates of death involving COVID-19 compared with the White British population. The rate of death was highest for the Black African group, followed by the Bangladeshi, Black Caribbean and Pakistani ethnic groups. In the second wave of the pandemic the differences in COVID-19 mortality compared with the White British population increased for people of Bangladeshi and Pakistani ethnic backgrounds; the Bangladeshi group had the highest rates, 5.0 and 4.1 times greater than for White British males and females respectively. The greatest percentage fall in hospital activity to February 2021 is seen for White British, along with All Other White ethnic group, followed by Asian and Asian British. For emergency care, Other Ethnic groups and those from an Asian ethnic background saw the most significant fall in absolute volumes, similarly, for outpatient care other ethnic groups and White British saw the largest decreases.

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Introduction

Since March 2020, DHSC and ONS analysts have worked together to produce papers for SAGE, discussing and estimating the health impacts of the pandemic. These are considered both in terms of mortality (excess deaths) and morbidity, across four main categories of harm (categories of harm for this paper listed below).

In April 2020, the initial paper presented early estimates of excess deaths only. In July 2020, a more extensive paper was published which expanded the scope to capture morbidity impacts. The last paper which was published in December 2020, updated previous estimates using the expedited July RWCS ('Winter Scenario) and included updates to other estimates, including wider health impacts to reflect the ongoing levels of restrictions, early estimates of long COVID, impacts on elective care from a second wave and the potential impacts if there was a breach in NHS capacity.

For this paper, we use a retrospective approach. We accessed and analysed a rich and diverse set of sources to conclude on the impacts of COVID-19; the paper aims cover health harms arising as a consequence of infections and mitigating behaviours in Wave 1 and Wave 2, however, the precise period under assessment is dependent on the coverage of the data sources. In addition, and thanks to the data-based approach, in this version of the paper we also attempt to explore the presence of inequalities across groups and categories.

Considering the above, the following categories of harm structure the paper:

A. **Category A. Direct impacts of COVID-19** such as mortality impacts (A1) and morbidity impacts (long COVID) (A2).
B. **Category B. Health outcomes from COVID-19 worsened in the event of lack of NHS critical care capacity.**
C. **Category C. Indirect impacts of COVID-19 on population health due to living through a pandemic and restrictions.** The category is structured as follows: Individual-level behaviour changes, which includes Evidence on changes to underlying needs (C1) and Changes in health seeking behaviour (C2); The impact of COVID-19 on healthcare activity, capturing Impacts of COVID-19 on primary care (C3), patient wait times (C4) and hospital activity (C5); and two cases studies to assess the impact of COVID-19 on the care of specific conditions, one on cancer (C6) and the other one on mental health (C7).
D. **Category D. Indirect impacts of COVID-19 on the wider population in the long-run such** as Impacts on the wider population through changes to employment and the wider economic fallout (D1); Impacts from the loss of education (D2), Impacts on social care recipients due to changes in their lives (D3).

Subjected to data availability, for each category further analysis has been conducted based on the following socio-demographic characteristics:

- **Region:** East, East Midlands, London, North East, North West, South East, South West, West Midlands, Yorkshire and the Humber
- **Sex**
- **Age:** 0-17, 18-34, 35-49, 50-64, 65-79, 80+
- **Ethnicity:** White British, All other white, Mixed/Multiple ethnic groups, Black/African/Caribbean/Black British and Other ethnic group. To note, some data allows a greater level of granularity.
- **Deprivation:** Quintile 1 (least deprived) to Quintile 5 (most deprived)

A. Direct impacts of COVID-19

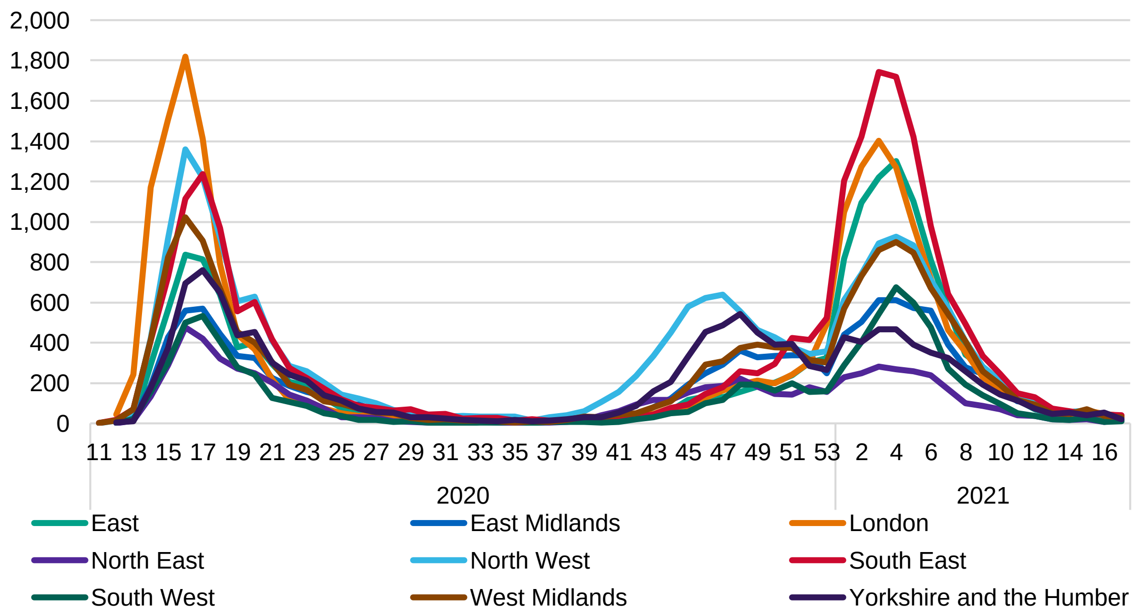
A.1 Mortality

Data on death registrations involving COVID-19 have been published by the Office for National Statistics (ONS) throughout the pandemic[4]. This includes registrations disaggregated by age, sex and regions of England.

A.1.1 Region

Death registrations involving COVID-19 are presented in Figure 1 below, from the first week when a death involving COVID-19 was registered ('Week 11' 2020: ending 13 March 2020).

Figure 1 – Weekly death registrations involving COVID-19, by England region: week ending 13th March 2020 to 30th April 2021



Source: Office for National Statistics - Deaths registered weekly in England and Wales, provisional

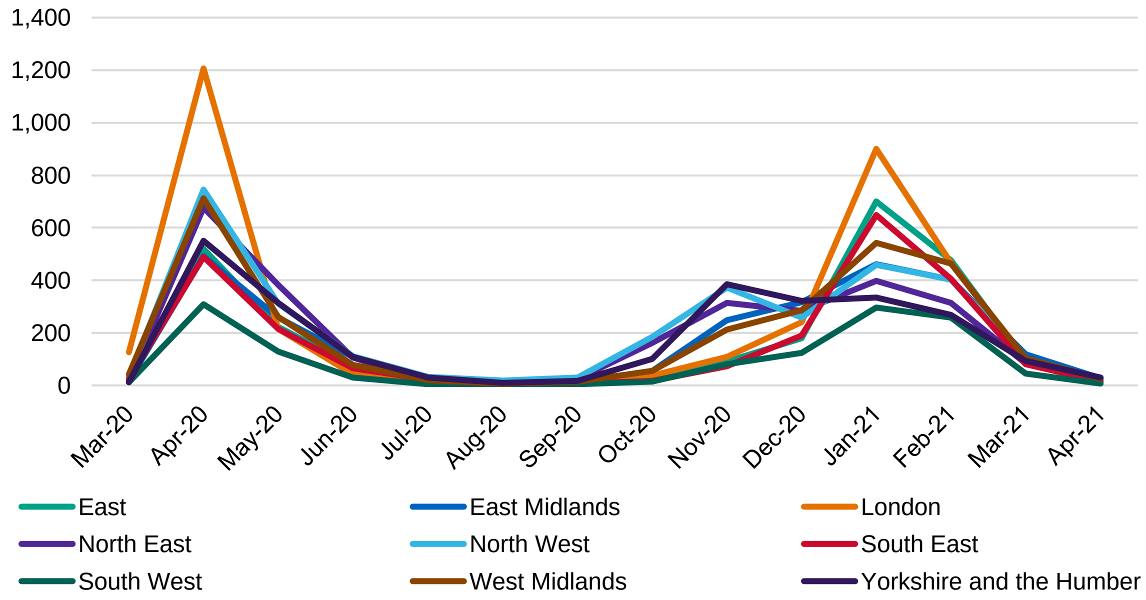
These data on deaths by region suggest the regions impacted most directly by COVID-19-related mortality are London and the South East. The regions experiencing least impact (fewest deaths involving COVID-19) were the North East, South West, and Yorkshire and the Humber. Those regional differences are similar between the first and second waves of the pandemic in England, except the North West experienced a notably high number of deaths in the first wave, and the East of England experienced more deaths in the second wave. Early in the second wave (between weeks 39 and 51, or mid-September to mid-December 2020), some regions experienced an earlier spike and then reduction in weekly COVID-19 death registrations. This trend is seen for the North West and Yorkshire and the Humber, and a less prominent but similar trend is observed in the East Midlands and West Midlands.

The data above tell us about the absolute numbers of deaths, but do not account for differences in population size or composition between regions. As such it is important to also consider the age-standardised mortality rate (ASMR) for each region. This calculates the

[4] Deaths registered weekly in England and Wales, provisional - Office for National Statistics (ons.gov.uk)

deaths involving COVID-19 as a number of deaths per 100,000 population and adjusts for differences in the age distributions of the populations in each region. The ONS publish ASMR by region as part of their monthly mortality analysis series[5], presented in Figure 2. The differences between regions observed when considering absolute numbers of deaths and ASMRs have some notable differences.

Figure 2 – Monthly age-standardised mortality rates[6] per 100,000 people for death registrations involving COVID-19, by region: week ending 13th March 2020 to week ending 30th April 2021



Source: Office for National Statistics: Monthly mortality analysis, England and Wales

Whether considering ASMR or total deaths, in the first wave of the pandemic (March to June 2020), London and the North West are the two most impacted regions. Where the North West had a high number of total deaths compared to other regions, the ASMR there in wave one is more consistent with other regions' ASMRs, such as those of the West Midlands and the North East. The South West was considerably less impacted by COVID-19-related mortality than any other region when population size and composition are accounted for. While it had the highest number of deaths in absolute terms, the South East was second lowest for ASMR impact of COVID-19 over the 14 months, once population size and age had been controlled for.

It is likely some non-COVID-19 excess mortality observed in the first wave could be deaths involving undiagnosed COVID-19, as a result of less testing and less clinical experience with a new disease. When investigating ASMRs for each region in this period for all-cause mortality, the differences between regions are broadly consistent with those presented in Figure 2 for deaths involving COVID-19 only. This suggests the issue of deaths potentially involving undiagnosed COVID-19 does not change the overall picture by region.

At the start of the second wave, there is a clear difference in ASMR for deaths involving COVID-19 between regions. Yorkshire and the Humber, the North West and the North East all saw increases in November 2020, with some reduction in December; the East and West Midlands also had a sharper increase in November, then a shallower increase in ASMR

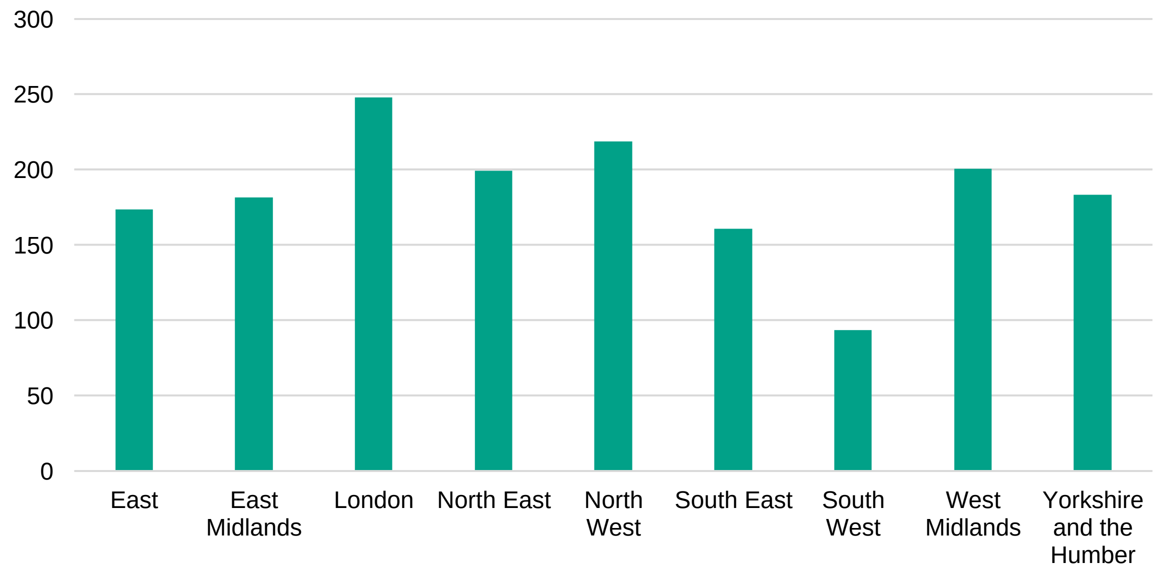
[5] Monthly mortality analysis, England and Wales - Office for National Statistics (ons.gov.uk)
[6] Monthly rates are from ONS monthly analysis of deaths involving COVID-19, adjusted to allow comparisons with annual rates. Further information on the methodology is available here:
Deaths involving COVID-19, England and Wales - Office for National Statistics (ons.gov.uk)

through to January 2021. Greater London, the East of England and the South East did not see this same spike in November but did have higher spikes in ASMR in January than the regions more impacted in November. As with the first wave, the South West observed the lowest ASMR for deaths involving COVID-19 throughout the second wave.

These differences between regions' ASMR in November are broadly consistent with regional differences observed in the COVID-19 Infection Survey's (CIS) positive test rates for that period[7]. The three regions with highest spikes in ASMR in November 2020 – Yorkshire and the Humber, the North West and the North East – also observed the greatest proportions of their populations testing positive for COVID-19 in the CIS from approximately Week 39 (18 to 24 September, results published in CIS on 2 October 2020) until around Week 44 (ending 31 October, CIS published 6 November). At that point the positive test results for the North East were no longer significantly higher than other regions, but proportions of positive test results in the North West and Yorkshire and the Humber survey results remained high. This is consistent with those two regions observing higher spikes in ASMR related to COVID-19 than the result for the North East in November, which was still the region with the third highest ASMR result that month.

Despite London observing a shorter spike of COVID-19 related ASMR in the second wave, this region still experienced the highest total ASMR for deaths involving COVID-19 between March 2020 and April 2021, as presented in Figure 3 – Age-standardised mortality rates per 100,000 people for deaths involving COVID-19, by region: 14 months March 2020 to April 2021.

Figure 3 – Age-standardised mortality rates per 100,000 people for deaths involving COVID-19, by region: 14 months March 2020 to April 2021



Source: Office for National Statistics: Monthly mortality analysis, England and Wales

The ONS monthly mortality statistics include breakdowns of ASMR by region and sex. While there are some changes in regions' ASMR rankings in each wave when disaggregated by sex,

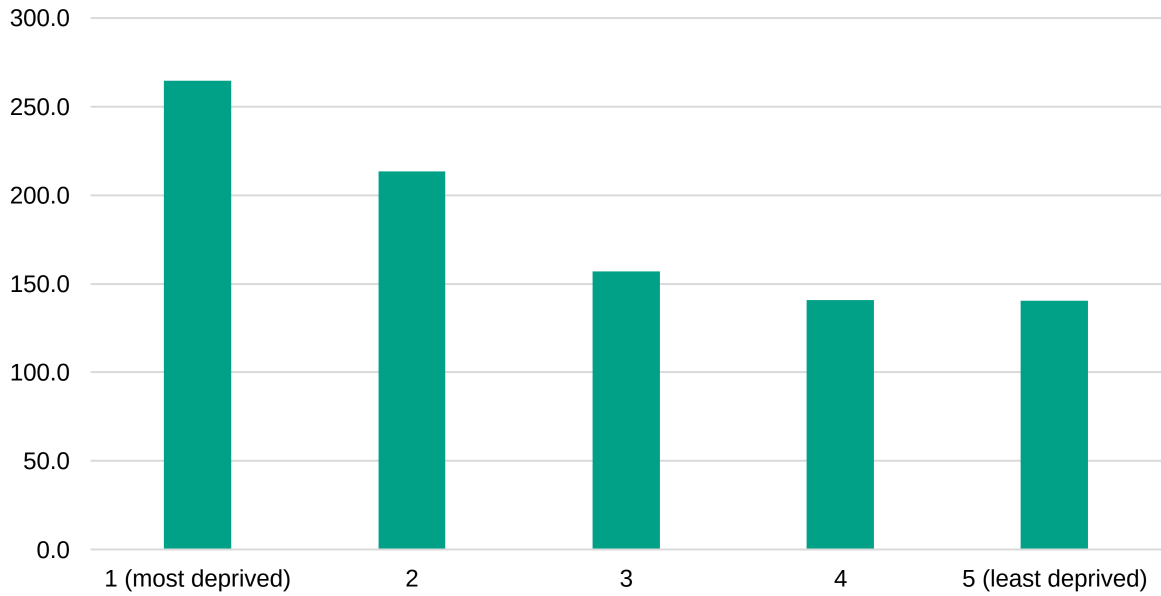
[7] Coronavirus (COVID-19) Infection Survey pilot - Office for National Statistics

the majority of observations above did not differ notably when regional ASMRs for males and females were considered separately.

A.1.2 Deprivation

Figure 4 below shows the ASMR for deaths due to COVID-19 by area deprivation quintile, as measured by the Index of Multiple Deprivation (IMD). More deprived areas had higher mortality rates than less deprived areas, although there was little difference between the two least deprived quintiles. The ASMR in the most deprived quintile was almost double that of the least deprived quintile (264.6 deaths per 100,000 people and 140.4, respectively). Please note that these data differ slightly from the rest of the mortality data in the sense that they are based on deaths due to COVID-19, i.e., where COVID-19 was the underlying cause, rather than deaths involving COVID-19, which include any mention of COVID-19 on the death certificate. There may therefore be some divergence but the differences between the two are known to be small.

Figure 4 – Age-standardised mortality rates per 100,000 people for deaths due to COVID-19, by IMD deprivation quintile: 14 months March 2020 to April 2021



Source: Office for National Statistics: Deaths due to COVID-19 by local area and deprivation[8]

The ONS monthly mortality statistics include breakdowns of ASMR by area deprivation and sex. While the ASMR for males was higher than for females, the trend in terms of area deprivation did not differ notably.

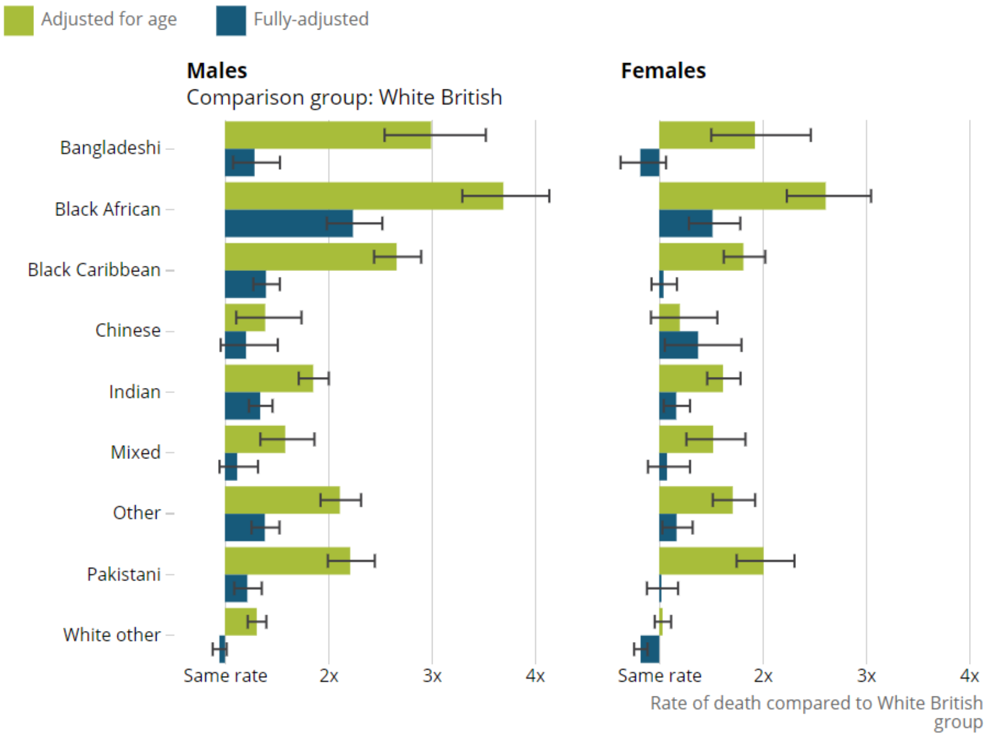
A.1.3 Ethnicity

ONS examined [differences in mortality by ethnic group](), using ethnic group recorded at the 2011 Census linked to death registrations and health data. During the first wave of the pandemic people from all ethnic minority groups (except for women in the Chinese or "White Other" ethnic groups) had higher rates of death involving COVID-19 compared with the White British population. The rate of death was highest for the Black African group (3.7 times greater than for the White British group for males, and 2.6 greater for females), followed by the Bangladeshi (3.0 for males, 1.9 for females), Black Caribbean (2.7 for males, 1.8 for females) and Pakistani (2.2 for males, 2.0 for females) ethnic groups.

[8] Deaths due to COVID-19 by local area and deprivation - Office for National Statistics (ons.gov.uk)

In the second wave of the pandemic (from 12 September 2020 onwards) the differences in COVID-19 mortality compared with the White British population increased for people of Bangladeshi and Pakistani ethnic backgrounds; the Bangladeshi group had the highest rates, 5.0 and 4.1 times greater than for White British males and females respectively. Adjusting for location, measures of disadvantage, occupation, living arrangements and pre-existing health conditions accounted for a large proportion of the excess COVID-19 mortality risk in most ethnic minority groups; however, most Black and South Asian groups remained at higher risk than White British people in the second wave even after adjustments.

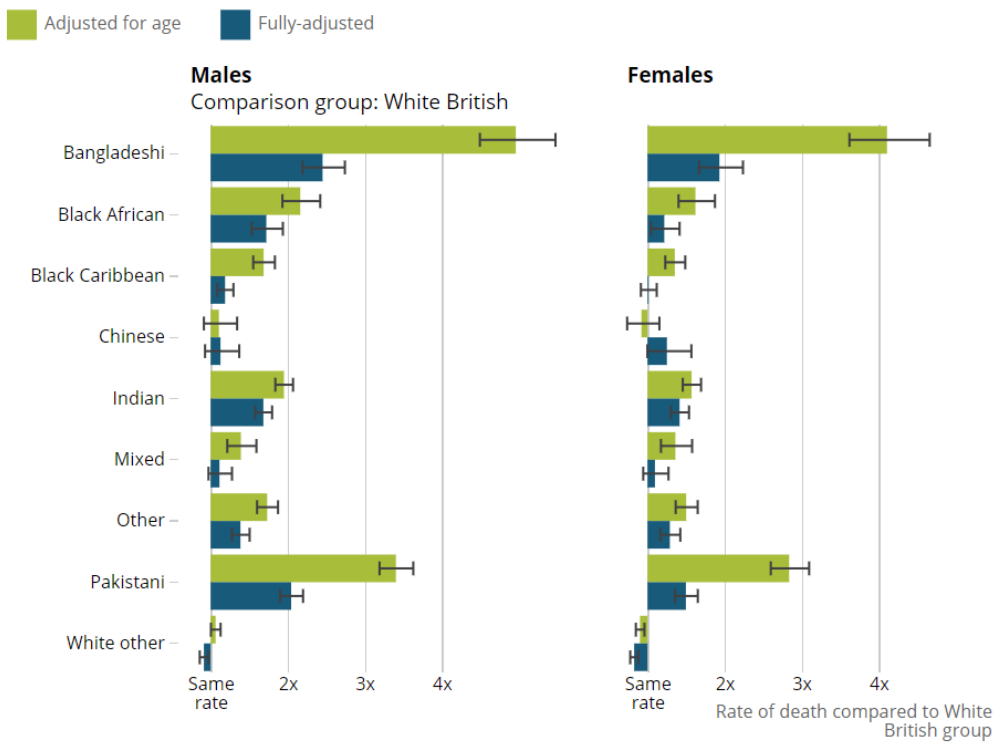
Figure 5 - Hazard ratios of death involving COVID-19 by ethnic group and sex, England: 24 January 2020 to 11 September 2020



Source: Office for National Statistics - Updating ethnic contrasts in deaths involving the coronavirus (COVID-19), England: 24 January 2020 to 31 March 2021[9]

[9] ONS figures based on death registrations up to 19 April 2021, for deaths involving COVID-19 that occurred between 24 January 2020 to 11 September 2020, of people aged 30 to 100 years that could be linked to the 2011 Census and General Practice Extraction Service Data for Pandemic and Planning Research; these figures are provisional.
Chart data: https://www.ons.gov.uk/visualisations/dvc1379/fig1/datadownload.xlsx

Figure 6 - Hazard ratios of death involving COVID-19 by ethnic group and sex, England: 12 September 2020 to 31 March 2021



Source: Office for National Statistics - Updating ethnic contrasts in deaths involving the coronavirus (COVID-19), England: 24 January 2020 to 31 March 2021[10]

A.1.4 Disability

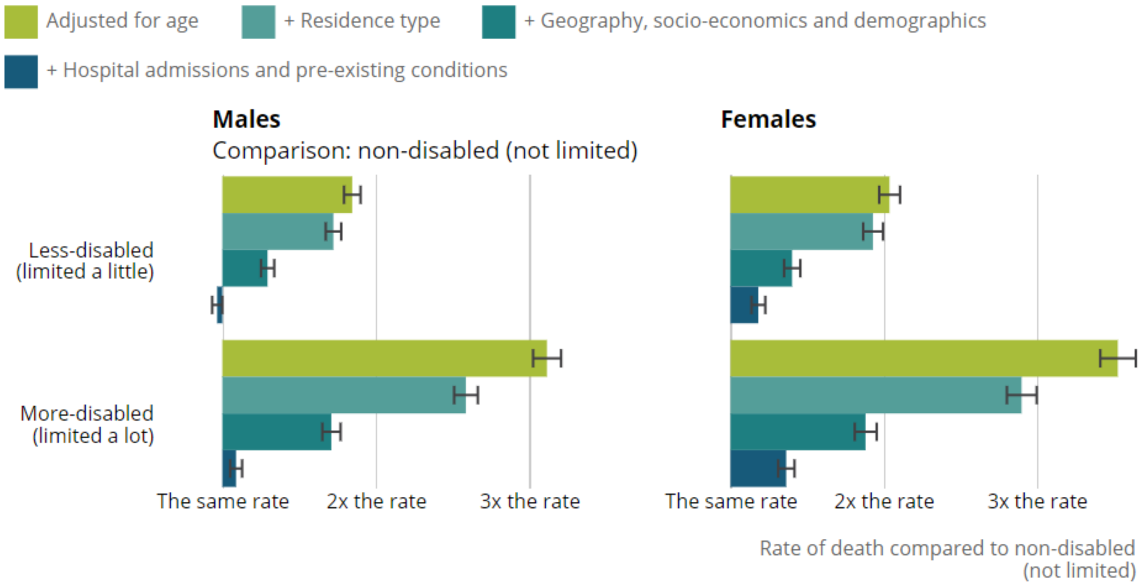
ONS also examined [deaths by disability status]() using disability recorded at the 2011 Census. The Census asked people to say if their day-to-day activities were 'limited a little' or 'limited a lot' as a result of a health condition, which corresponds to the Equalities Act 2010 definition of disability. Between 24 January and 20 November 2020 in England, the risk of death involving COVID-19 was 3.1 times greater for men who were 'limited a lot' and 1.9 times greater for men who were 'limited a little', compared with non-disabled men; among women, the risk of death was 3.5 times greater and 2.0 times greater respectively, compared with non-disabled women.

After using statistical models to adjust for personal and household characteristics, including residence type, geography, demographic and socio-economic factors, and pre-existing health conditions, smaller but statistically significantly raised risks of death remained unexplained except for men who were 'limited a little'. This means that no single factor explains the considerably raised risk of death involving COVID-19 among disabled people, and place of residence, socio-economic and geographical circumstances, and pre-existing health conditions all play a part; an important part of the raised risk is because disabled people are disproportionately exposed to a range of generally disadvantageous circumstances compared with non-disabled people.

[10] ONS figures based on death registrations up to 19 April 2021, for deaths involving COVID-19 that occurred between 12 September 2020 to 31 March 2021, of people aged 30 to 100 years that could be linked to the 2011 Census and General Practice Extraction Service Data for Pandemic and Planning Research; these figures are provisional.
Chart data: https://www.ons.gov.uk/visualisations/dvc1379/fig2/datadownload.xlsx

Looking separately at people with a medically diagnosed learning disability, the risk of death involving COVID-19 was 3.7 times greater for both men and women compared with people who did not have a learning disability; after using statistical models to adjust for a range of factors, a raised risk of 1.7 times remained unexplained for both sexes.

Figure 7: Hazard ratios for death involving COVID-19 for disabled men and women relative to non-disabled people of the same sex, adjusting for socio-demographic factors and comorbidities, England: 24 January to 20 November 2020



Source: Office for National Statistics – Updated estimates of coronavirus (COVID-19) related deaths by disability status[11]

A.1.5 Mortality impacts in QALYs – region

The total deaths involving COVID-19 can be represented as Quality-Adjusted Life Years (QALYs) lost. This estimate accounts for differences in the age distribution of people who died, as deaths occurring for people of younger ages would represent a greater amount of life lost; but do not account for population size differences between regions. QALYs have been calculated using the same methodology as for category A mortality impacts in previous papers in this series[12], and are presented by region in Figure 8 – Estimated QALYs lost due to deaths involving COVID-19: March 2020 to April 2021

Unfortunately, due to data limitations it is not possible to also present these by area deprivation. In this methodology, QALY loss is calculated by applying age-specific quality-of-

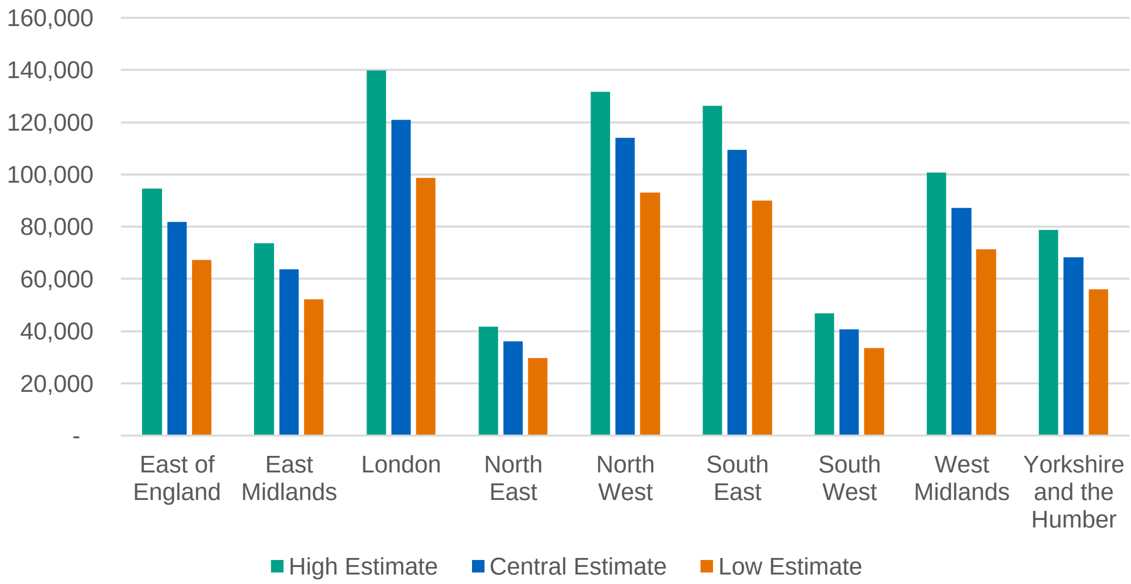
[11] (1) Cox proportional hazards models adjusting for age, residence type, geography (local authority and population density), socio-economic and demographic factors (ethnicity, area and household deprivation, household composition, socio-economic position, highest qualification held, household tenure, and occupation indicators (including keyworkers, exposure to disease and proximity to others), and health (hospital admissions since April 2017 and pre-existing health conditions identified from primary care records since January 2015).
(2) Office for National Statistics (ONS) figures based on death registrations up to 31 December 2020 of people aged 30 to 100 years that occurred between 24 January and 20 November 2020, that could be linked to the 2011 Census and General Practice Extraction Service Data for Pandemic Planning and Research.
(3) Deaths were defined using the International Classification of Diseases, 10th Revision (ICD-10). Deaths involving COVID-19 include those with an underlying cause, or any mention, of ICD-10 codes U07.1 (COVID-19, virus identified) or U07.2 (COVID-19, virus not identified).
(4) An error bar not crossing the x-axis at value 1.0 denotes a statistically significantly different rate of death compared with the reference category (non-disabled).
Chart data: https://www.ons.gov.uk/visualisations/dvc1172/self-reported/figure1.xlsx

[12] Methodology outlined in most detail in the September 2020 paper, S0650_Direct_and_Indirect_Impacts_of_COVID-19_on_Excess_Deaths_and_Morbidity.pdf (publishing.service.gov.uk)

life estimates[13] to ONS death registrations by age and sex. The high, central and low estimates presented below are calculated by applying the QALYs lost per death with 1, 2 and 3 comorbidities respectively as the assumed QALY loss for all deaths in which the deceased had at least one pre-existing condition.

Life expectancy by age, sex and region is not disaggregated by number of comorbidities. As such, in these analyses national life expectancy is used for all regions, and QALYs lost per death are national estimates too. This method attributes total QALYs lost compared to national life expectancy by region to COVID-19, whereas some of these QALYs are attributable to pre-existing inequalities between regions. The key impact of this methodology is that regions with lower average life expectancy will present higher QALYs lost under this approach, and regions with higher average life expectancy will present lower QALYs lost. It should be noted, however, that it would make little sense to try to separate COVID-19 impacts out from pre-existing health inequalities as such inequalities have contributed to COVID-19 deaths.

Figure 8 – Estimated QALYs lost due to deaths involving COVID-19: March 2020 to April 2021



Source: Internal analysis of death registrations in England (Office for National Statistics) by the Office for National Statistics

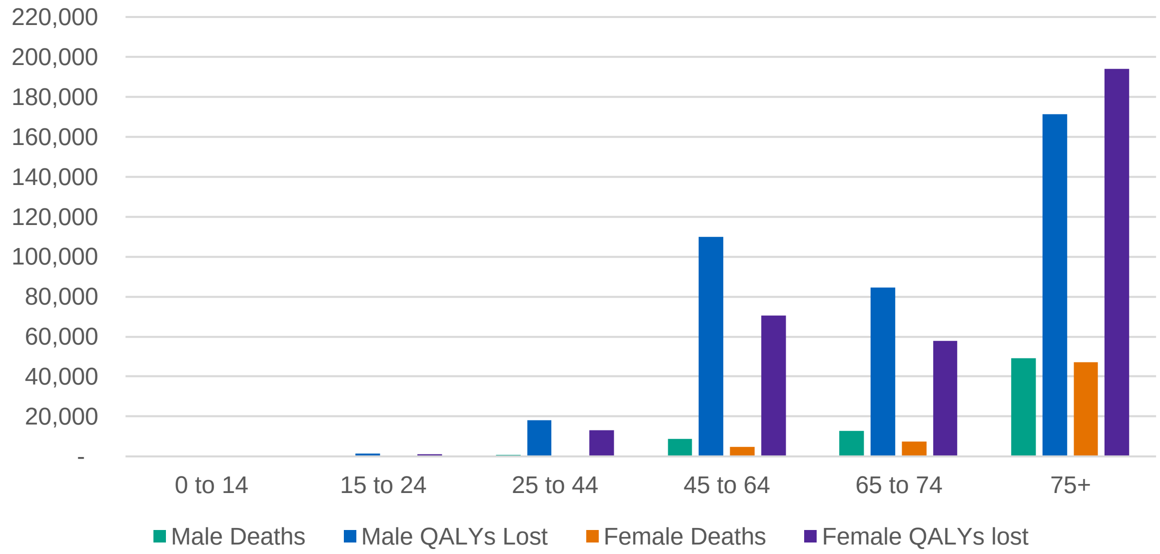
The estimated QALYs lost by region are mostly consistent with the total deaths per region over the course of the pandemic to April 2021. London, the North West and South East observed more deaths than other regions over this time and are also estimated to have lost most QALYs as a result of those deaths. In almost all cases, a region's ranks for total deaths and for QALYs lost are consistent. The only exceptions are London and the South East, where London has most estimated QALYs lost (121,000 compared to 109,000 in the South East) but fewer total deaths involving COVID-19 (17,600 compared to 18,500). This is because the age profile of those dying in the South East was older on average than for deaths in London. The South East has the largest population, and a higher proportion of older adults, while London has a relatively young population.

[13] Calculated using estimates from the Health Survey for England, 2017, available at: [Health Survey for England - NHS Digital] Calculated using estimates from the [Health Survey for England, 2017]

A.1.6 Mortality impacts in QALYs – age and sex

Deaths involving COVID-19 by age and sex for England as a whole are presented in Figure 9 below.

Figure 9 - Deaths and estimated QALYs lost due to deaths involving COVID-19, England: March 2020-April 2021



Source: Internal analysis of death registrations in England (Office for National Statistics) by the Office for National Statistics

The great majority of deaths involving COVID-19 (99%) from March 2020 to April 2021 were of adults aged 45 and over. More males died in each age group from this age onwards.

A female death is assumed to represent slightly more QALYs lost on average, due to women having a longer life expectancy than men. However, this difference by sex is small enough that in all age groups between ages 14 and 74, the higher number of male deaths means males as a whole are estimated to have lost a greater number of QALYs from mortality than females. Similarly, deaths of younger people represent more lost years of life than deaths at older ages, and therefore also represent more lost QALYs. However, the QALYs lost due to mortality for any age group are estimated to be higher than those for all younger age groups, due to the large differences in numbers of deaths involving COVID-19 by age.

A.2 Morbidity

The morbidity impacts suffered by a particular population depends on infection rates in the given population and the duration and severity of symptoms suffered. This section explores the morbidity impacts suffered directly by individuals infected with COVID-19 in England between April 2020 – April 2021.

The National Institute for Health and Care Excellence define three periods of a COVID-19 disease[14].

[14] Overview | COVID-19 rapid guideline: managing the long-term effects of COVID-19 | Guidance | NICE

Acute COVID-19	Signs and symptoms of COVID-19 lasting for up to 4 weeks
Ongoing symptomatic COVID-19	Signs and symptoms of COVID-10 from 4 to 12 weeks
Post-COVID 19 syndrome (Long COVID)	Signs and symptoms that develop during or after an infection consistent with COVID-19, continue for more than 12 weeks and are not explained by an alternative diagnosis

There is evidence that different populations have suffered different morbidity impacts from COVID-19. Certain groups tend to be more likely to be initially infected with the disease. There are also certain groups who suffer more severe impacts once infected. Evidence suggests that particular groups are at higher risk of experiencing symptoms for extended periods of time. King's College London's COVID Symptom Study suggest that older age, female sex and high BMI are risk factors for suffering prolonged symptoms[15]. A study by University of Leicester followed up over 1,000 patients admitted to hospital with COVID-19. The median follow-up time was 5 months post-discharge. Risk factors identified by the study to be associated with persistent symptoms were female sex, white ethnicity, middle age, two or more co-morbidities and more severe acute COVID-19 illness[16]. The ONS estimated that 1.5% of the people living in private households in the UK were experiencing self-reported "Long COVID" a 1st August 2021[17]. This figure ranged from 1.89% in the most deprived quintile to 1.24% in the least.

This section explores and quantifies morbidity impacts due to COVID-19 experienced by different groups between April 2020- April 2021. It explores historic data between Spring 2020-Spring 2021 on infection and hospitalisations to gain a view into the severity and impact of COVID-19 within different populations. It goes on to model morbidity impacts for each group, quantifying the impacts using QALYs.

QALYs modelling methodology

Morbidity impacts for each group are quantified using QALYs. The QALY loss is estimated based on a model created by volunteers from the Institute and Faculty of Actuaries (IFoA)[18]. The model quantifies ongoing and Long COVID impacts within its estimates. QALY impacts are estimated separately for three groups: 1) non-hospitalised survivors, 2) hospitalised ward survivors and 3) hospitalised ICU survivors.

The methodology for each group is the same; a) the prevalence of ongoing symptoms is estimated each day following infection, b) there is an estimated QALY impact of those ongoing symptoms, c) the expected QALY impact is summed over the time horizon of interest, d) and discounted back to present day to give a QALY impact. The parameterisation for each group varies to the extent that the current research allows.

[15] One in 20 people likely to suffer from 'Long COVID', but who are they? (joinzoe.com)
[16] Physical, cognitive and mental health impacts of COVID-19 following hospitalisation – a multi-centre prospective cohort study (medrxiv.org)
[17] Prevalence of ongoing symptoms following coronavirus (COVID-19) infection in the UK - Office for National Statistics (ons.gov.uk)
[18] A model framework for projecting the prevalence and impact of Long-COVID in the UK | medRxiv

Research using an EQ-5D index measure for quality of life (QoL) pre and post discharge for ICU and ward patients[19] provides parameterisation for hospitalised ward and hospitalised ICU survivors. No research was available to parameterise the non-hospitalised survivors' group, therefore the hospitalised ward QALY impact is assumed. The research does not yet provide age specific QALY impacts, so the same utility loss is assumed regardless of age. The difference in total QALY loss for each group therefore represents the differences in the number of infections and severity of disease per group. More bespoke parameterisation may become possible with further research into Long COVID.

The ONS estimates on the prevalence of ongoing symptoms following COVID-19 infection[20] are used to estimate the duration of symptoms suffered by individuals in the various populations. Note that the ONS do provide a breakdown of duration of symptoms by age and sex but not by region. Therefore, the population-wide estimates of prevalence of symptoms post-infection are applied to each of the 9 regions within the model. We therefore assume that the same proportion of individuals in each region suffer from Ongoing and Long COVID.

Individuals dying from COVID-19 are subtracted from the infected populations in the modelling and the morbidity impact of survivors are estimated. These deaths represent mortality QALY losses and so their impact is represented in Category A- COVID-19 mortalities.

We estimate the morbidity QALY loss for those infected and surviving between April 2020-April 2021 over a 1-year time horizon post-infection for each population group.

A.2.1 Region

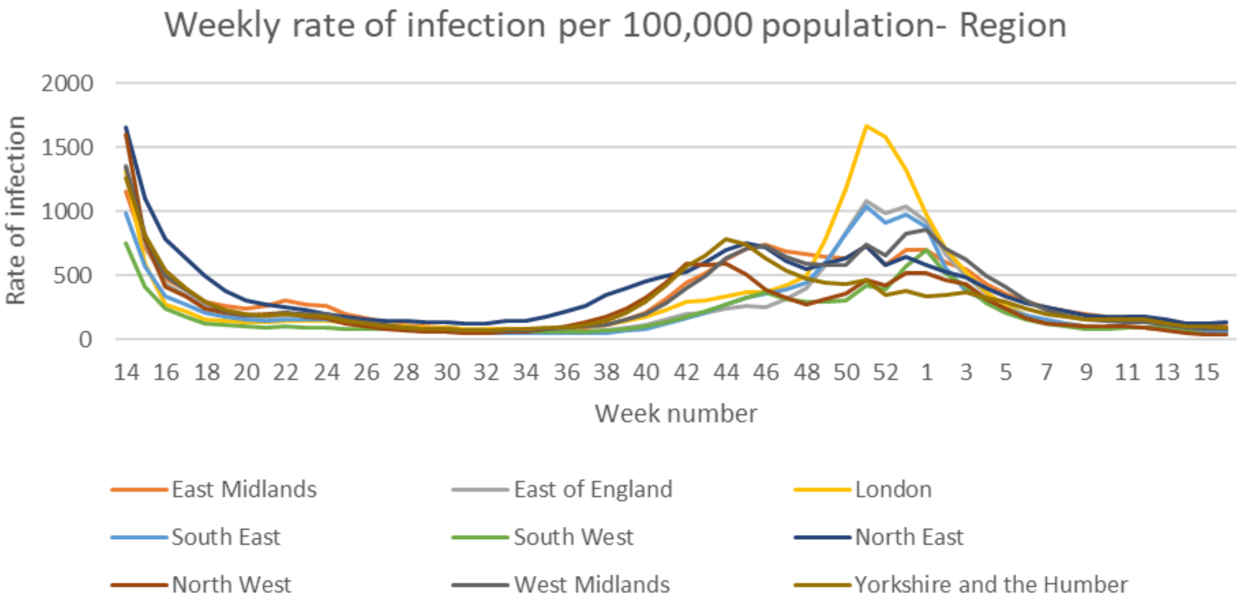
The Medical Research Council's (MRC) Biostatistics Unit has created modelled estimates of the weekly number of true infections per region throughout the pandemic[21].

The weekly rate of infection in all regions peaked during December 2020, with London experiencing the highest rate of infection, with 1,700 infections per 100,000 individuals in week 51 2020. To understand the overall morbidity impacts suffered by each age group the infection rate has to be considered alongside the severity of the outcomes of the infections suffered.

London had the greatest rate of infection during Winter 2020-2021, and also had the greatest rate of ICU admission during the same wave. Its non-ICU hospital admissions were however comparable to those of other regions such as the West Midlands and the East of England.

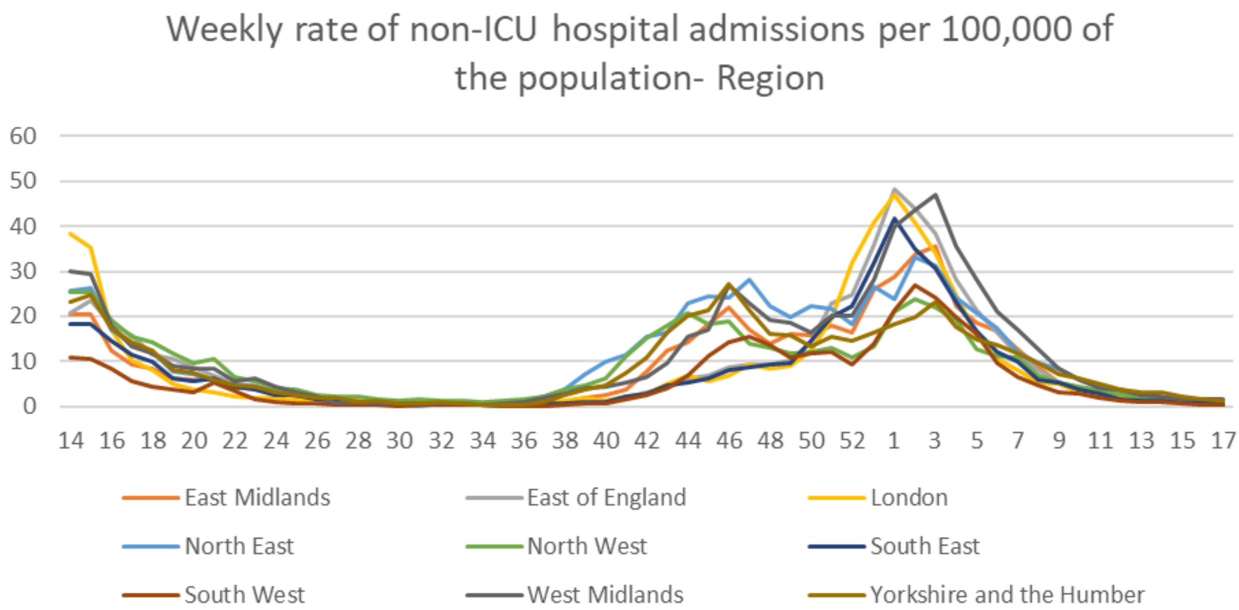
[19] Postdischarge symptoms and rehabilitation needs in survivors of COVID-19 infection: A cross-sectional evaluation - Halpin - 2021 - Journal of Medical Virology - Wiley Online Library
[20] Prevalence of ongoing symptoms following coronavirus (COVID-19) infection in the UK - Office for National Statistics (ons.gov.uk)
[21] Nowcasting and Forecasting of the COVID-19 Pandemic - MRC Biostatistics Unit (cam.ac.uk)

Figure 10- Weekly rate of infection per 100,000 of the population in each Region of England



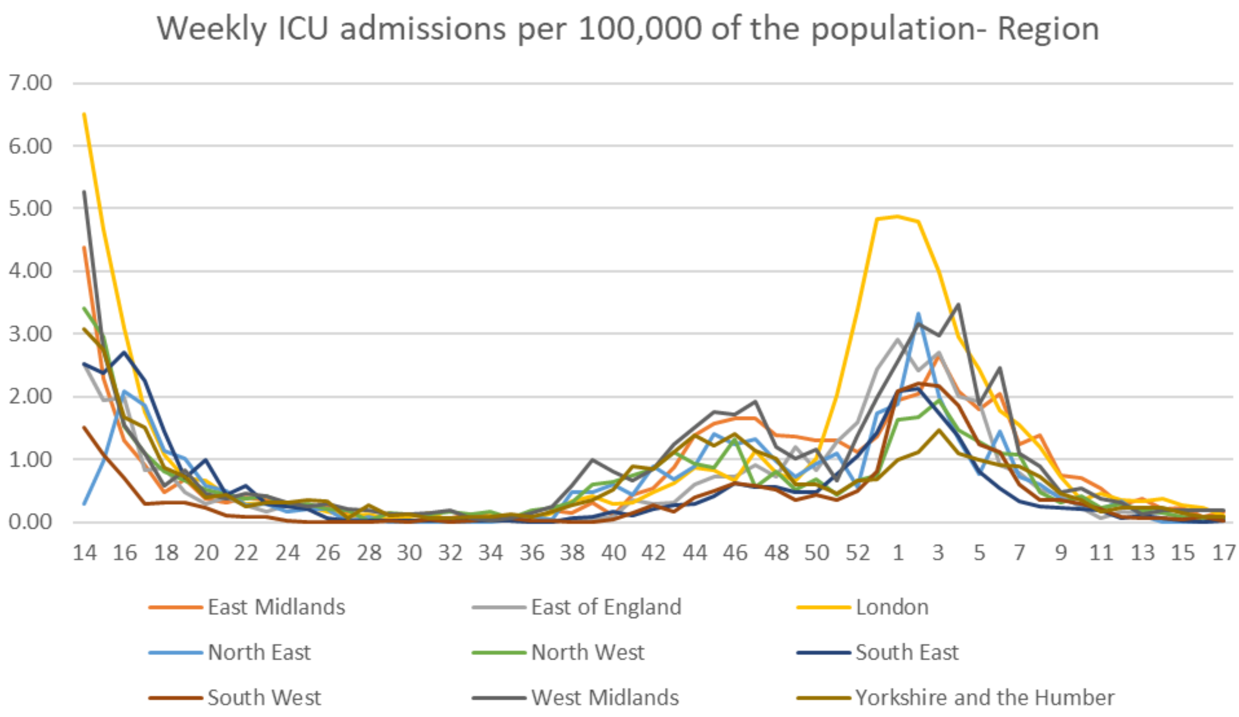
Source: The Medical Research Council's (MRC) Biostatistics Unit infections, ONS population estimates

Figure 11 – Weekly rate of non-ICU hospital admissions per 100,000 of the population in each Region of England



Source: Public Health England COVID-19 weekly surveillance

Figure 12 - Weekly rate of ICU hospital admissions per 100,000 of the population in each Region of England



Source: Public Health England COVID-19 weekly surveillance

Morbidity QALYs- region

Table 1 below shows the estimated morbidity QALY loss per region over a one-year time horizon post infection for survivors who were infected between April 2020- April 2021. The ONS Infection Survey follows up with COVID-19 infected individuals to create estimates for the proportion of individuals who suffer longer term impacts from COVID-19. The ONS stratify this data by age and sex, however they do not provide a breakdown of this data by region. The population wide ONS estimates of duration of disease were applied to each region. Therefore, these estimates assume the same proportions of infected individuals will suffer Ongoing and Long COVID in each of the 9 NHS England regions.

Table 1: Estimated QALY loss by region due to COVID-19 morbidity, April 2020 – April 2021

Region	Morbidity QALY loss
East of England	7,400
East Midlands	8,500
London	12,000
North East	4,300
North West	8,100
South East	9,800
South West	4,500
West Midlands	8,500
Yorkshire and the Humber	6,800

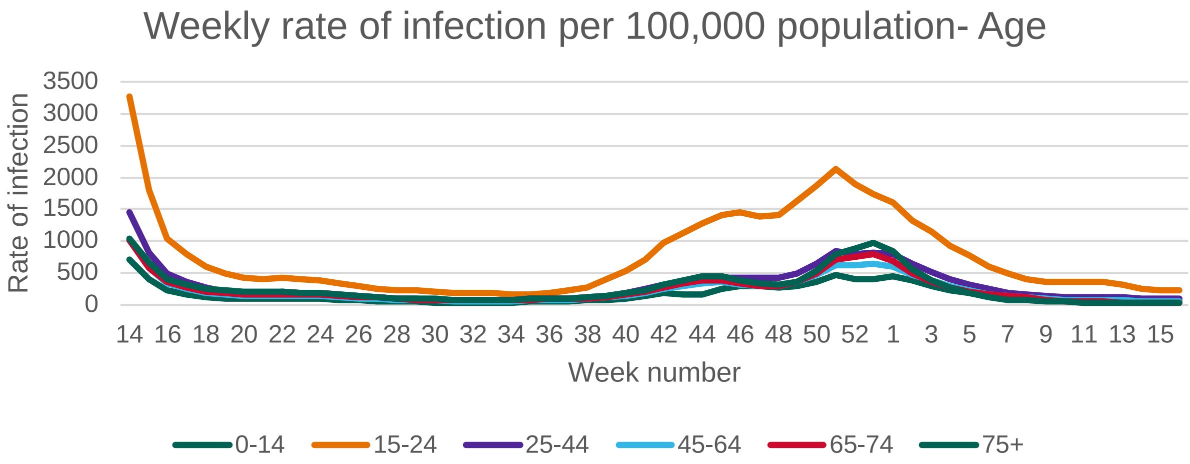
Source: Modelled estimates based on IFoA model, analysis by DHSC

A.2.2 Age

Evidence suggests that age is a major risk factor in the severity of outcome in COVID-19 patients. Older patients have been suffering more severe symptoms compared to younger cohorts.

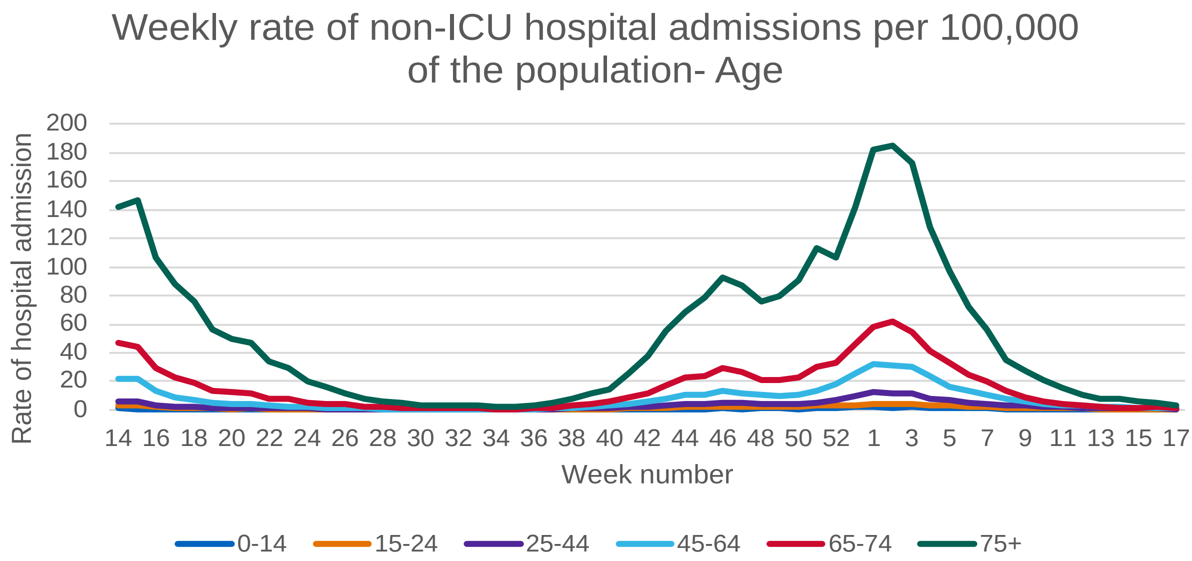
Figure 13 shows the rate of true infections occurring per 100,000 of the population for each age band between April 2020- April 2021. The number of true infections per age band was modelled by the Medical Research Council's (MRC) Biostatistics unit (BSU).

Figure 13 - Weekly rate of infections per 100,000 population by age band



Source: The Medical Research Council's (MRC) Biostatistics Unit infections, ONS population estimates

Figure 14 - Rate of hospital admission per 100,000 of the population- Age bands, April 2020- April 2021

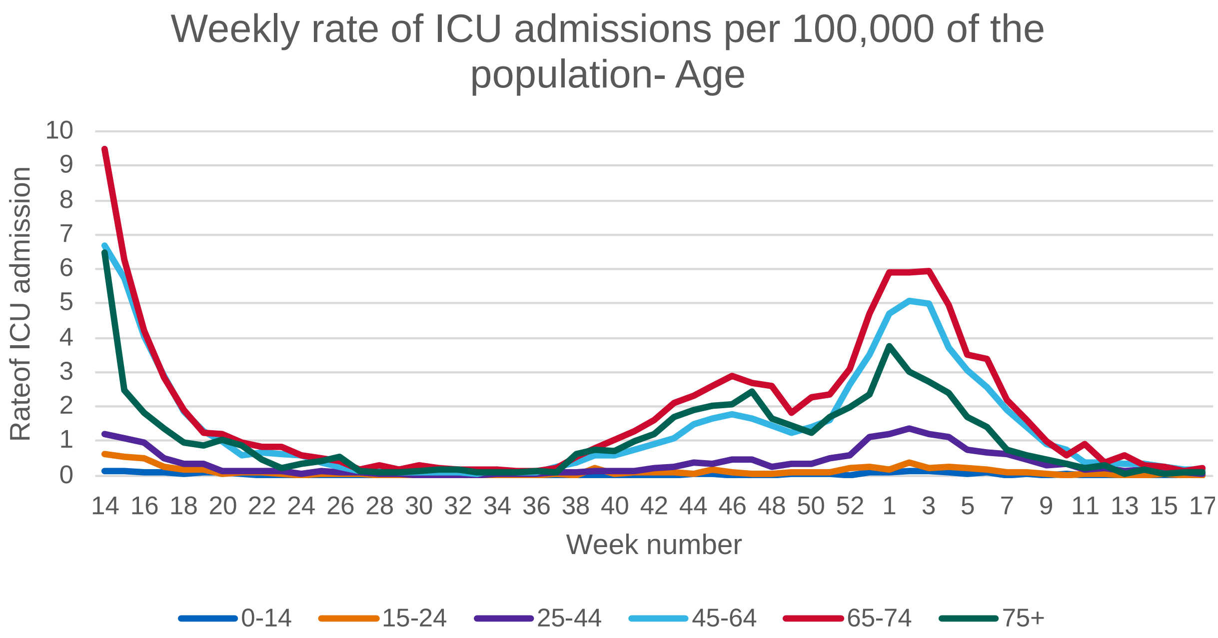


Source: Public Health England COVID-19 weekly surveillance

The number of true infections has consistently and quite significantly been highest in the 15-24-year-old age band. For each of the age bands, the peak infection rates occurred during Winter 2020-2021. The rate of infection in week 51 2020 in the 15-24-year-old age band was 2,100 per 100,000 of the population. The 75+ age band suffered the second greatest peak of infections per 100,000 of the population. Their peak occurred in the final week of 2020 and is 2.2 times smaller than the peak rate of infection in the 15-24-year-old population.

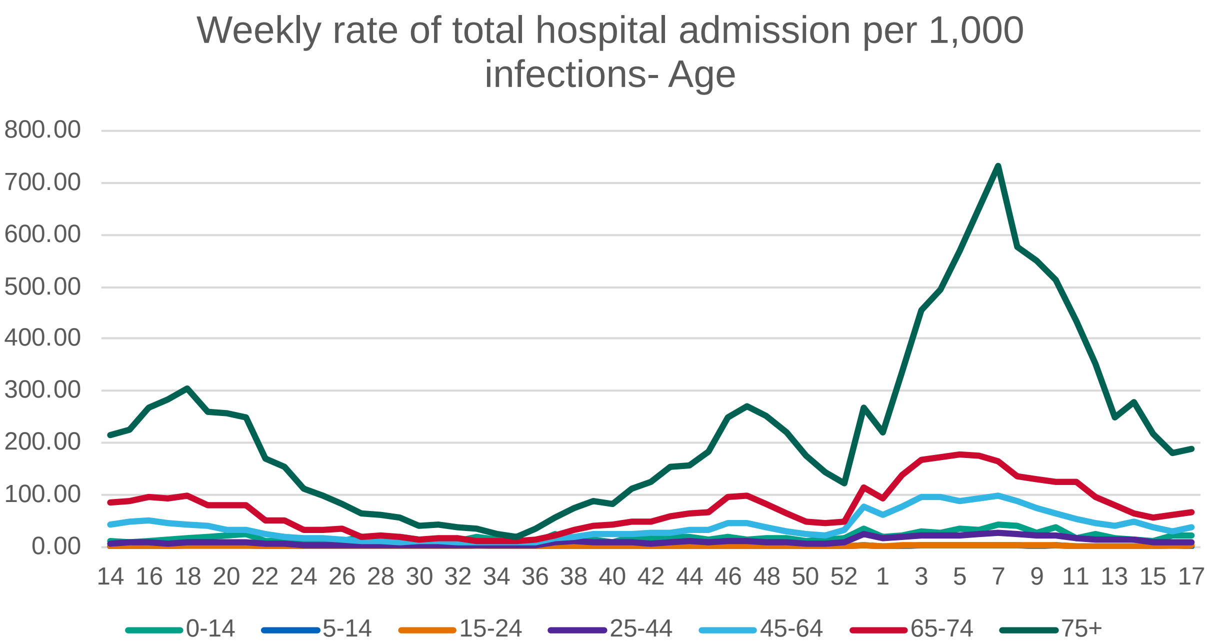
Although the peak of infections occurs in the 15-24-year olds, the greatest rate of COVID-19 non-ICU hospital admissions occurs in the 75+ group. The peak rate of hospital admission in the 75+ year old population is over 14 times greater than the peak admission rate per 100,000 of the population in the 15-24-year-old age band. The rate of infection for the 75+ year olds is also significantly greater than the age group with the second largest rate of admission-the 65-74-year-old group- with the rest of the age bands being more closely grouped together. Figure 14 shows that the older age groups consistently have the higher rates of hospital admission, highlighting the major role that age plays in the severity of the health impacts suffered by a COVID-19 infected individual.

Figure 15: Rate of ICU admission per 100,000 of the population- Age bands



Source: Public Health England weekly COVID-19 surveillance

Figure 16: Weekly rate of total hospital admission per 1,000 infections- Age



Source: The Medical Research Council's (MRC) Biostatistics Unit infections, Public Health England hospital admissions

Admission into ICU units occur in the most severely affected patients. Figure 15 shows the rate of ICU admission per 100,000 of the population for each age band between Spring 2020-Spring 2021. The 75+ year old population had the greatest rate of hospital admission however have the third highest rate of ICU admission after the 65-74 and 45-64-year age groups. Again, the graph shows it is the older age groups suffering from more serious outcomes, with the younger age bands having smaller rates of ICU and hospital admission. Figure 16 shows the rate of total hospitalisation per 1,000 infections per age band. It suggests that age plays a major role in the severity of disease suffered by infected individuals. The graph suggests that once infected older individuals are at a much greater risk of severe COVID-19 outcomes where hospital admission will occur. The peak rate of hospital admission in the 75+ population is 4 times greater than that of the 65-74-year-old population and 29 times greater than the peak for the 25-44-year-old population.

There is evidence that suggests that age not only plays a major factor in the severity of symptoms suffered, but also in the persistence of symptoms. The International Severe Acute Respiratory and Emerging Infections Consortium (ISARIC) Clinical Characterisation Protocol study found that working age women under the age of 50 are at a higher risk of suffering long-term health outcomes, and suffering from Long COVID compared with older cohorts and men[22]. The ONS study on prevalence of ongoing symptoms estimates the prevalence of long COVID and the duration of ongoing symptoms following confirmed coronavirus infection[23]. The age group with the greatest percentage reporting symptoms 5 weeks post infection is the 35-49 year old group, where 25.6% of infected individuals in the survey report suffering symptoms at 5 weeks post infection. The age group with the greatest percentage reporting symptoms 12 weeks post infection with 18.2% is the 25-34-year-old group. Those lowest percentage is 7.4% found in the 2-11-year-old cohort followed by the over 70-year-old cohort with 11.2% who self-report suffering from Long COVID (i.e. symptoms persisting at least 12 weeks post infection).

Morbidity QALYs-age

Table 2: Estimated QALYs lost due to COVID-19 morbidity by age band, April 2020 – April 2021

Age band:	Total morbidity QALY loss:
0-14	4,900
15-24	5,000
25-44	28,000
45-64	24,000
65-74+	9,900
75+	7,900

Source: Modelled estimates based on IFoA model, analysis by DHSC

We estimate the morbidity QALY loss for those infected and surviving between April 2020-April 2021 over a 1-year time horizon post-infection.

The estimated average QALY loss per individual does not differ for each year of age, as it does in the mortality QALY estimates presented in this paper. We assume the same utility loss for across all ages. Therefore, the difference in total QALY loss for each age band represents

[22] Long Covid in adults discharged from UK hospitals after Covid-19: A prospective, multicentre cohort study using the ISARIC WHO Clinical Characterisation Protocol | medRxiv
[23] Prevalence of ongoing symptoms following coronavirus (COVID-19) infection in the UK - Office for National Statistics (ons.gov.uk)

the differences in the number of infections and the severity and duration of disease in each age band. Table 2 shows the estimates for the morbidity QALY loss over a 1-year time horizon per age band for infected survivors between April 2020-April 2021.

The 25-44 year old population has the highest estimate for lost QALYs. This partly reflects the fact that this group have the highest proportion of individuals suffering persistent symptoms, experiencing the Ongoing and Long COVID phases of disease.

A.2.3 Sex

The MRC modelling of true infections does not provide a breakdown by sex. Imperial College London's REACT-1 study had been exploring community prevalence of COVID-19 since July 2020. They have consistently found that there has been no significant difference in prevalence of infection between males and females in the population with one exception[24]. Results from round 13 of the REACT-1 study showed a notable difference in the prevalence of the disease in the community between males and females for the first time. The period covered by round 13 was late June and early July 2021. It has been suggested that this discrepancy was due to a difference in social mixing patterns between the sexes due to the UEFA European Football Championship events occurring at this time.

Public Health England's report on the disparities in the risk and outcomes of COVID-19 explored hospitalisation by sex[25]. It showed that, as of May 2020, 70% of COVID-19 patients in critical care patients were male and 54% of patients hospitalised in lower levels of care were male. Given the assumption that rates of infection within the two groups are comparable, this suggests that once infected males are suffering from more severe health outcomes compared to infected females.

Evidence does however suggest that females are more likely to have symptoms that persist weeks and months post infection and are therefore more likely than men to suffer from both Ongoing COVID and Long COVID. The King's College London COVID symptom study suggests that this is particularly true in the younger cohorts, with the rate of Long COVID in older populations being more even between the sexes[26].The COVID symptom study suggests that 14.5% of infected females suffer from long COVID compared to 9.5% of infected males.

Morbidity QALYs- sex

In order to find the QALY impact for both sexes it is necessary to have an estimate for the number of true infections that occurred in each group between April 2020- April 2021. The Medical Research Council's (MRC) Biostatistics Unit (BSU) undertakes nowcasting and forecasting of COVID-19 infection in England however they do not provide a breakdown by sex[27]. As discussed above Imperial College London's REACT-1 study of prevalence of COVID-19 in the community found no notable difference in prevalence of the disease between July 2020- April 2021. We assume that this is also true for the period April 2020- June 2020. Using this assumption, the true infections modelled by the MRC BSU are split between the sexes evenly, adjusting for the difference in population size.

PHE hospitalisation surveillance does not provide a breakdown of hospitalisation and ICU admission by sex. PHE's disparities report showed that up to May 2020 70% of all ICU

[24] Spiral: REACT-1 round 13 interim report: acceleration of SARS-CoV-2 Delta epidemic in the community in England during late June and early July 2021 (imperial.ac.uk)
[25] COVID-19: review of disparities in risks and outcomes - GOV.UK (www.gov.uk)
[26] One in 20 people likely to suffer from 'Long COVID', but who are they? (joinzoe.com)
[27] Nowcasting and Forecasting of the COVID-19 Pandemic - MRC Biostatistics Unit (cam.ac.uk)

admission were male and 54% of admissions into lower levels of care were males. We applied these proportions to hospital admission between April 2020- April 2021 to estimate the hospitalisations occurring during this period by sex. Table 3 shows the estimated number of infections, ward hospitalisations and ICU hospitalisations as well as the number of COVID-19 deaths provided by the ONS that occurred for males and females in the period April 2020-2021.

Table 3 Estimated number of COVID-19 infections, hospitalisations and deaths occurring in males and females to April 2020-April 2021 in England

	Female	Male
Infections	4,700,000	4,600,000
Hospitalisations ward	130,000	160,000
Hospitalisations ICU	7,200	17,000
Deaths	63,000	75,000

Source: The Medical Research Council's (MRC) Biostatistics Unit, Public Health England, ONS

The rate of ward hospitalisation in males and females is 2,100 per 100,000 COVID-19 infections and 1,700 per 100,000 COVID-19 infections respectively. The rate of ward hospitalisation is therefore about 1.2 times greater in infected males compared to females. The rate of ICU admission in infected patients is about 2.4 times higher in males compared to females. The deaths are subtracted when modelling the morbidity impact of COVID-19 on the population as they represent mortality QALY losses (and so their impact is represented in Category A- COVID-19 mortalities).

The ONS prevalence of symptoms shows that females are more likely to suffer symptoms for an extended period of time compared to males. ONS found that 23% of female participants in their Coronavirus Infection Survey had symptoms 5 weeks post infection and 15% had symptoms 12 weeks post infection compared to 19% and 13% in males.

Table 4 below shows the morbidity QALY losses in those infected with COVID-19 between April 2020- April 2021 within a 1-year time horizon.

Table 4 -Estimated morbidity QALYs lost in COVID-19 infected individuals April 2020-April 2021 by sex

	Female	Male
Total QALY loss	43,000	38,000
QALY loss in acute phase (Up to 4 weeks)	14,000	13,000
QALY loss in ongoing phase (4 weeks -12 weeks)	16,000	14,000
QALY loss Long COVID (12 weeks to a year)	13,000	11,000

Source: Modelled estimates based on IFoA model, analysis by DHSC

Table 5 shows the QALY losses in males and females occurring in non-hospitalised, hospitalised ward and hospitalised ITU patients.

Table 5: Estimated QALY loss due to COVID-19 morbidity by hospitalisation status to April 2021

	Female	Male
QALY loss in non-hospitalised patients	40,000	33,000
QALY loss in hospitalised ward patients	2,600	3,200
QALY loss in ITU patients	510	1,300

Source: Modelled estimates based on IFoA model, analysis by DHSC

Overall, the estimated morbidity QALY loss occurring in individuals that were infected with COVID-19 and survived between April 2020-April 2021 over 1-year time horizon post-infection is greater in females. Overall females have an estimated QALY loss of 43,000 compared to 38,000 in males. Looking at table 3this discrepancy reflects that there are 100,000 more infected non-hospitalised female individuals compared to males. The increase also reflects the fact the females suffer symptoms for a longer period, and so suffer impacts for a longer period of time compared to males.

The higher QALY loss in females also slightly reflects the increased death rate in males compared to females. Per 100,000 infections males had an estimated rate of death of 1,000 per 100,000 COVID-19 infections compared to 840 in females. These deaths were subtracted from the modelling as they represent mortality impacts rather than morbidity impacts, thereby slightly decreasing morbidity impacts in males compared to females.

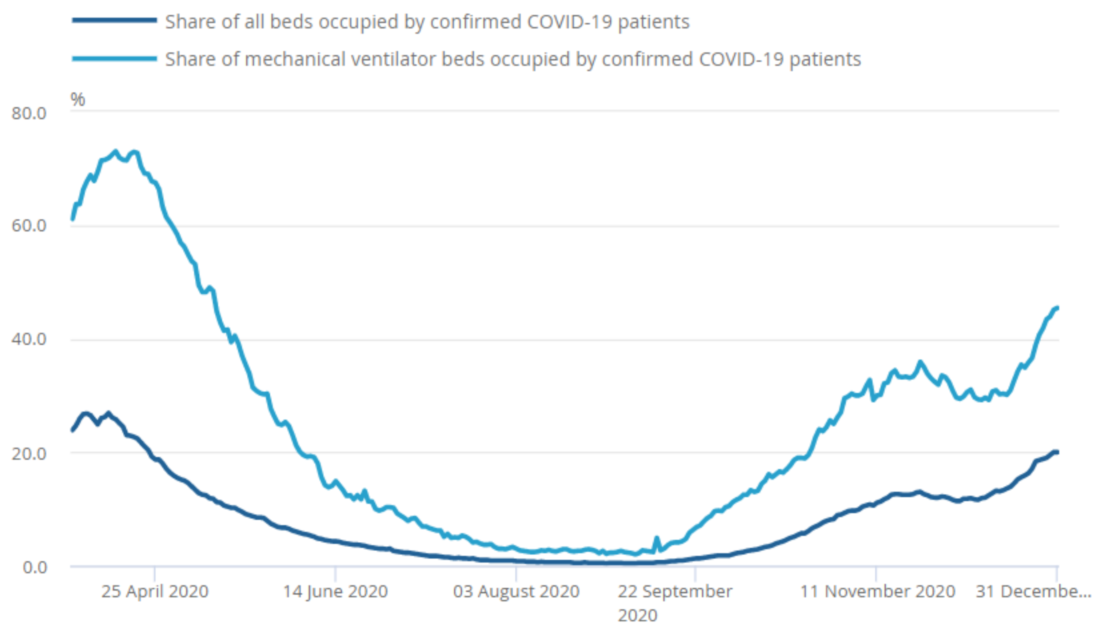
B. Impact of COVID-19 on critical care capacity

This series of papers has previously not considered a breach in healthcare capacity to have occurred, so deaths due to worsened COVID-19 impacts as a result of reduced or unavailable services were estimated as 0.

While national critical care bed capacity has not been breached, there is some evidence of local transfers of patients between hospitals due to lack of bed availability leading to delays in care for some patients, and critical care staff shortages resulting lower staffing ratios than clinically optimal[28,29].

The ONS's estimates of healthcare expenditure in 2020 present NHS England data on the daily percentage of total and mechanical ventilator beds occupied by confirmed COVID-19 patients[30]. In April 2020 over 60% of all mechanical ventilator beds nationally were occupied by confirmed COVID-19 patients. These data do not inform us whether remaining beds were occupied but given some capacity will be occupied by non-COVID-19 patients, national resource and national demand need to have been reasonably well-correlated to avoid any local areas reaching capacity.

Figure 17 - Proportion of all beds and mechanical ventilator beds occupied by confirmed COVID-19 patients daily, 2nd April to 31 December 2020



Source: Office for National Statistics: Healthcare Expenditure, UK Health Accounts provisional estimates30

Data on proportion of beds occupied or numbers of unoccupied beds do not inform us of any additional patients who would have needed a bed, so even if capacity is reached, it is not

[28] Critical care transfers and COVID-19: Managing capacity challenges through critical care networks - Eleanor Pett, Hai Lin Leung, Emily Taylor, Martin Shao Foong Chong, Teddy Tun Win Hla, Giulia Sartori, Vivian Sathianathan, Tariq Husain, Ganesh Suntharalingam, Alexander Rosenberg, Angela Walsh, Timothy Wigmore, 2020 (sagepub.com)
[29] Adapting hospital capacity to meet changing demands during the COVID-19 pandemic (biomedcentral.com)
[30] Healthcare expenditure, UK Health Accounts provisional estimates - Office for National Statistics (ons.gov.uk)

considered breached until additional demand is presented. We are unaware of such data at national level, nor by region, so robust regional estimates are not possible for this paper.

If COVID-19 deaths did occur due to lack of required beds, or due to receiving care later than needed because of healthcare capacity, these deaths will still be captured within this paper's quantified impacts, but for Category A rather than Category B. There is a possibility that some non-COVID-19 excess deaths observed in the first wave could have involved undiagnosed COVID-19; this is explored in Category A mortality estimates, and no notable regional differences were observed.

C. Indirect impacts of COVID-19 on health-related behaviours and healthcare

Introduction

COVID-19 has had an impact on both the demand for and the provision of healthcare. This chapter employs survey and administrative data to identify the indirect impacts of COVID-19 on the healthcare system and patient health. Chapter C is structured as follows:

- Individual-level behaviour changes
  - C.1: Evidence on changes to underlying need
  - C.2: Changes in health seeking behaviour
- The impact of COVID-19 on healthcare activity
  - C.3: Impact of COVID-19 on primary care
  - C.4: Impact of COVID-19 on patient wait times
  - C.5: Impact of COVID-19 on hospital activity
- Case studies: The impact of COVID-19 on the care of specific conditions
  - C.6: Impact on cancer
  - C.7: Impact on mental health

Overall, we have seen non-COVID-19 healthcare utilisation and activity decline since the pandemic began. This decline reflects the net impact of demand-side and supply-side effects. We do not attempt to separate out the demand and supply impacts from the observed net effects in the data. We have also looked at the impacts across patient characteristics and geographies where possible – notably age, sex, ethnicity, region and deprivation. We also consider differential impacts of COVID across different clinical specialties and patient groups.

On the demand-side, some of the decline in utilisation/activity may be driven by a decline in short-term underlying need. For example, we have seen fewer road traffic accidents during the pandemic, and thus there has been a decline in the demand for trauma care. Additionally, mandatory and voluntary social distancing has led to fewer non-COVID infections, which can have significant impacts on mortality and morbidity. However, some of the decline in utilisation is also driven by changes in people's behaviour in terms of seeking health care – "health-seeking behaviour" – as they have sought to reduce the burden on the NHS or have avoided health care facilities for fear of catching COVID-19. We cannot explicitly quantify the contribution of each of these drivers, although we can go some way to describing the behaviour changes by different agents in the health care system. Section C.1 presents evidence on changes to underlying need, and how this differs between groups of the population. Section C.2 then considers changes in health seeking behaviour in primary care.

On the provider side, we see a range of health system adaptations put in place to minimise the spread of COVID-19 and reallocation of resources to manage urgent care of COVID-19 patients. In many healthcare settings, interventions were postponed, conducted online, or cancelled to enable providers to focus on urgent care needs at peaks during the pandemic.

It is not possible to estimate the total health impact of the reduced demand, however the paper provides indicators of impact where this is possible. Section C.3 looks at the apparent reduced incidence of certain diseases in 2020 relative to 2019 and fall in routine screenings, which gives an indication of the extent to which people are not obtaining diagnosis and support for long term conditions. Again, these are net impacts from both demand and supply effects of the pandemic.

Section C.4 presents the impact of the pandemic on numbers of patients waiting for hospital care and how long they have been waiting for different conditions. This reflects the combined impacts of changes to underlying need, health-seeking behaviour and health system adaptations. Longer waits for treatment may result in poorer health outcomes and outcomes from treatment. We present some literature on this impact but are unable to quantify a total impact. Section C.5 then sets out the impact on hospital activity of changes to underlying need, health-seeking behaviour and health system adaptations.

In each of these areas there are nuances to interpreting the data that are discussed in the relevant section. This is particularly reflected in two case studies relating to cancer and mental health.

We also note here that it has not been possible to compare all the data against a consistent baseline. This is because in different settings necessitate different comparators. For example, in settings where there is a known time-trend in the data it is not appropriate to compare to a pre-pandemic baseline. On some occasions, we use an inconsistent baseline due to lack of data availability. This does present certain complexities when comparing between various datasets where the impacts have been assessed against different baselines. We note where this is the case, and issues that arise as a result.

This chapter has been drafted in collaboration with the Health Foundation's REAL[31] Centre, the Institute for Fiscal Studies (IFS) and Imperial College London. We have also received input and comments from the Royal College of General Practitioners (RCGP) on this work.

C.1 Evidence on changes to underlying need[32]

As we set out above, we expect there to be two key mechanisms that drive patient-led change in demand for health services. The first is a change in demand due to changes in the need for care as a result of voluntary or mandatory behaviour changes.

Recent literature suggests that there could be reduction in need linked to self-isolation, reduced traffic and pollution, workplace accidents[33,34]. Self-isolation, home working and social distancing reduce the spread of infectious diseases, as well as reducing the spread of COVID-19. Reductions to traffic lead to fewer road accidents[35] as well as reducing pollution which is associated with exacerbations of asthma and adverse effects for child development[36].

There is extensive literature on the impact of the pandemic itself, measures to control the pandemic and its economic consequences on mental health which is covered in a case study in section C.7.

In this section, for most cases we compare against a pre-pandemic 5-year average (2015-2019) baseline. There is no long-term trend in the data, and thus a five-year average provides a reasonable baseline to compare against, averaging out any volatility between years. In some

[31] Research and Economic Analysis for the Long-term

[32] In previous versions of this paper, this analysis was included in Category D but as this is directly related to demand for healthcare in the short-term we have included it in Category C.

[33] The Wider Impacts of the Coronavirus Pandemic on the NHS* - Propper - 2020 - Fiscal Studies - Wiley Online Library

[34] BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)

[35] Road Traffic Estimates in Great Britain: 2020 (publishing.service.gov.uk)

[36] Health matters: air pollution - GOV.UK (www.gov.uk) discusses impacts of exposure to pollution over a prolonged period. The particular two impacts mentioned here are likely to also arise from the shorter change in pollution levels that we have observed over the pandemic.

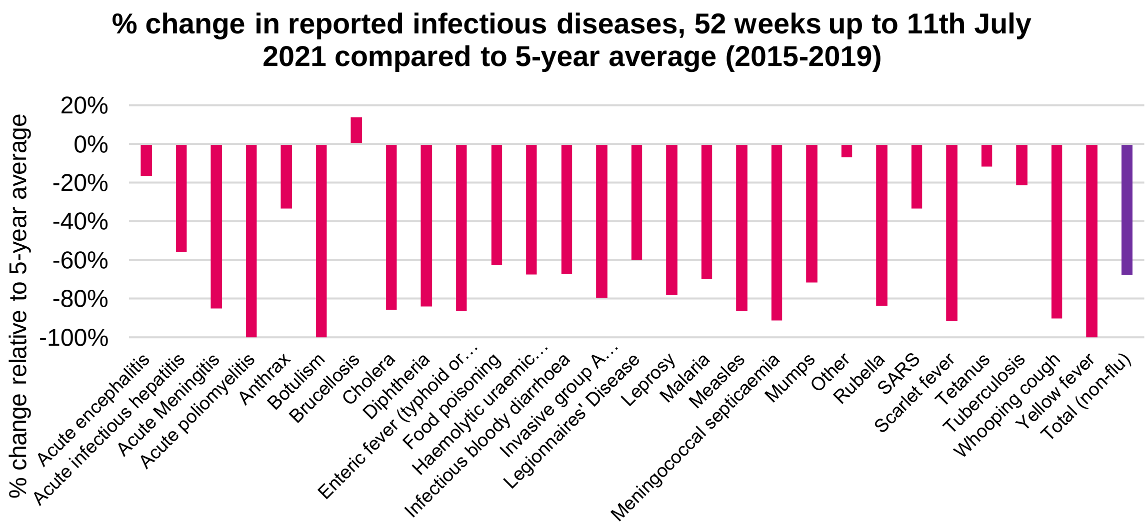
instances, direct comparisons made with 2019 calendar year and 2018/19 financial year are presented, and occasionally an implicit comparison is made pre-pandemic data in 2019 when presenting time series.

The next section presents data from England that indicates the change in underlying need for health care in the short term. Longer term impacts through changes to "healthy behaviours" such as healthy eating and reduced smoking are presented in section D.

C.1.1 Changes in infectious diseases

Figure 18 shows the changes in infectious disease prevalence for the 52 weeks up to the week ending 11th July 2021 relative to the 5-year average (2015-2019) as reported by PHE's Notifications of Infectious Disease database[37]. It clearly shows a significant fall in almost all infectious diseases. Similarly, as shown in Figure 19 the estimated daily rates of influenza are significantly below pre-pandemic years. The rates of infectious disease falling are likely to be a side-effect of social distancing measures, including lockdowns during normal 'flu season', reductions in foreign travel, and increases in take-up of the annual flu vaccine. PHE data shows an increase in the percentage of over 65-year olds being vaccinated from 72.4% in 2019/20 to 80.9% in 2020/21, and an increase from 44.9% to 53% for at risk under-65-year olds[38].

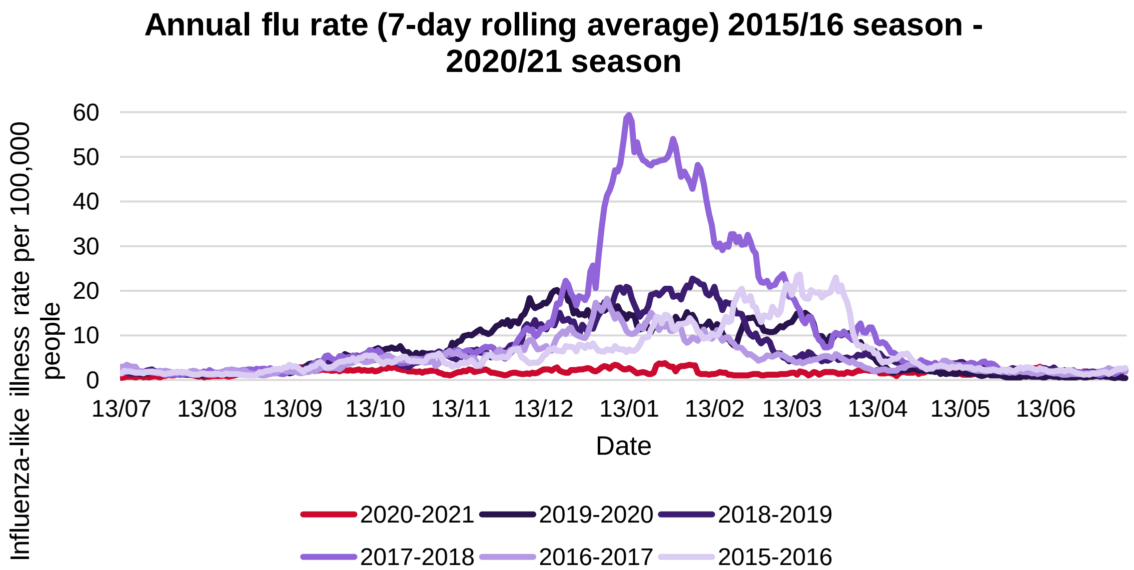
Figure 18 – Percentage change in reported infectious diseases



Source: PHE, Notifiable diseases: weekly reports for 2021

[37] Notifiable diseases: weekly reports for 2021 - GOV.UK (www.gov.uk)
[38] Seasonal flu vaccine uptake in GP patients: monthly data, 2020 to 2021 - GOV.UK (www.gov.uk)

Figure 19 – Annual flu rate 2015-16 to 2020/21

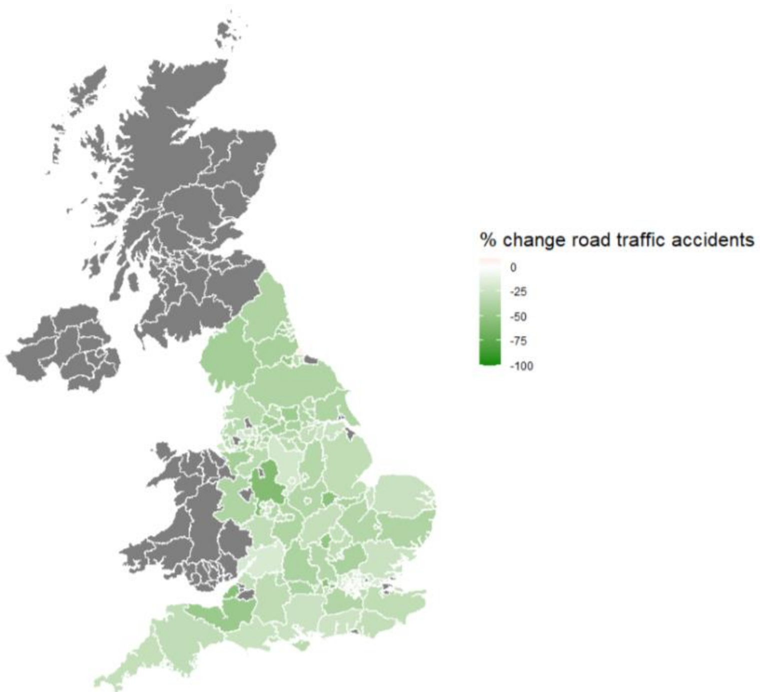


Source: I-Sense FLU

C.1.2 Accidents

Figure 20 below shows the change in reported road traffic accidents (all casualties, fatal and non-fatal) in England in 2020 relative to the 2015-2019 five-year average using published statistics from the Department for Transport[39]. The overall fall was 31% in England from an average of 154,559 in 2015-2019 to 106,634 in 2020, with a 16% fall in fatal accidents. This is likely to have an impact on demand for A&E and orthopaedic services.

Figure 20 - % change in road traffic accidents in 2020 relative to the five-year pre-pandemic average (2015-2019)



Source: Reported casualties by local authority 2015 – 2020, Department for Transport

[39] [Reported road casualties Great Britain, annual report: 2019 - GOV.UK (www.gov.uk)]

C.1.3 Alcohol

Alcohol can cause or contribute to over 200 diseases, conditions, and injuries and behavioural changes during the pandemic can be seen to have significant impacts on hospitalisations and deaths. A recent report by Public Health England[40] summarises the impact of the COVID-19 pandemic on alcohol consumption and harm. They use a range of data from alcohol sales, consumer purchasing panels, surveys measuring self-reported alcohol consumption, hospitalisations and deaths to assess alcohol-related behaviour changes and the consequences.

Alcohol duty receipts can be used as in imperfect proxy for consumption and indicate an overall reduction in alcohol consumption, with receipts for the 2020/21 financial year at 1.2% less than 2019/20 despite the approximately 31-week closure of on-trade premises such as pubs and bars. There were differences across product types: Spirits saw an increase of 7.3% and wine of 8.9%, while cider decreased by 16.7% and beer 14%. More beer and cider is sold in on-trade premises which were shut during national lockdowns.

Kantar's consumer purchasing panel includes approximately 30,000 adults and measures purchasing of alcohol in off-trade premises (shops and supermarkets). Compared to 2019, in 2020 (the year the pandemic started), there was an increase in purchasing of 24%, equivalent to an additional 12.6 million litres of alcohol. Of this additional 12.6 million litres, the heaviest buying 20% (based on pre-pandemic data) accounted for 42% of the total increase.

Self-reported surveys measuring alcohol consumption can highlight individual-specific behaviour changes. However, they can be subject to recall and desirability biases (thus lead to underestimates in overall consumption), and do not typically sample heavier drinkers. PHE's report synthesised the findings of 18 generally low-quality surveys/polls which suggest a polarisation in self-reported consumption with similar proportions reporting drinking more and less since the start of the pandemic/first national lockdown. However, those who reported drinking more tended to be those who were heavier drinkers before the pandemic. Higher quality repeated cross-sectional surveys such as UCL's Alcohol Toolkit Study shows an increase in the number of respondents drinking at increasing and higher-risk levels when social distancing measures were introduced from 10.8% in February 2020 to 19.4% in April. This returned to 14.3% by April 2021.

Similarly, in our analysis of Understanding Society, a weighted longitudinal survey of individuals in England with data from 2010[41] and 8 waves collected since the beginning of the pandemic[42], we see an increase in the proportion of people who had not had an alcoholic drink in recent weeks in 2020/21 relative to pre-COVID levels (Figure 21). However, Figure 22 shows of those who had recently had an alcoholic drink, an increase in the frequency of drinking (with the largest increase of 12% in people reporting drinking more than 4 times per week). Table 6 shows that men saw the largest increase in heavy drinking (more than 4 times per week) and the smallest drop in drinking less frequently (monthly) relative to women. Finally, Table 7 shows that older age groups were most likely to report an increase in heavy drinking relative to younger age groups.

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[40] Public Health England (2021). M*onitoring alcohol consumption and harm during the COVID-19 pandemic.* Available from: [Monitoring alcohol consumption and harm during the COVID-19 pandemic (publishing.service.gov.uk)]

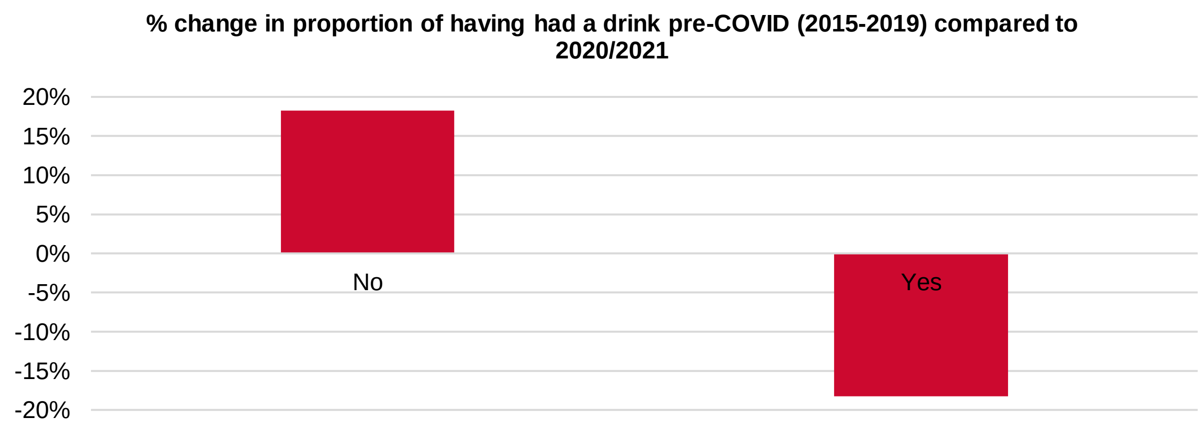
[41] University of Essex, Institute for Social and Economic Research, NatCen Social Research, Kantar Public. (2020). Understanding Society: Waves 1-10, 2009-2019 and Harmonised BHPS: Waves 1-18, 1991-2009. [data collection]. 13th Edition. UK Data Service. SN: 6614, http://doi.org/10.5255/UKDA-SN-6614-14.

[42] University of Essex, Institute for Social and Economic Research. (2021). Understanding Society: COVID-19 Study, 2020-2021. [data collection]. 9th Edition. UK Data Service. SN: 8644, http://doi.org/10.5255/UKDA-SN-8644-10

Figure 24 shows a decrease in unplanned hospital admissions associated with alcohol consumption by 3.2% relative to 2019, driven by reduced admissions for mental and behavioural disorders due to alcohol use. There was a 3.4% fall in mental and behavioural disorder admissions, and a 2% fall in alcohol poisonings. Unplanned admissions for alcoholic liver disease were the only type of admission to increase between 2019 and 2020, by 3.2%. Section C.2 describes in more detail the key drivers behind the changes in individuals accessing care relative to before the pandemic and gives some explanation as to why all hospital admissions were below normal levels in 2020.

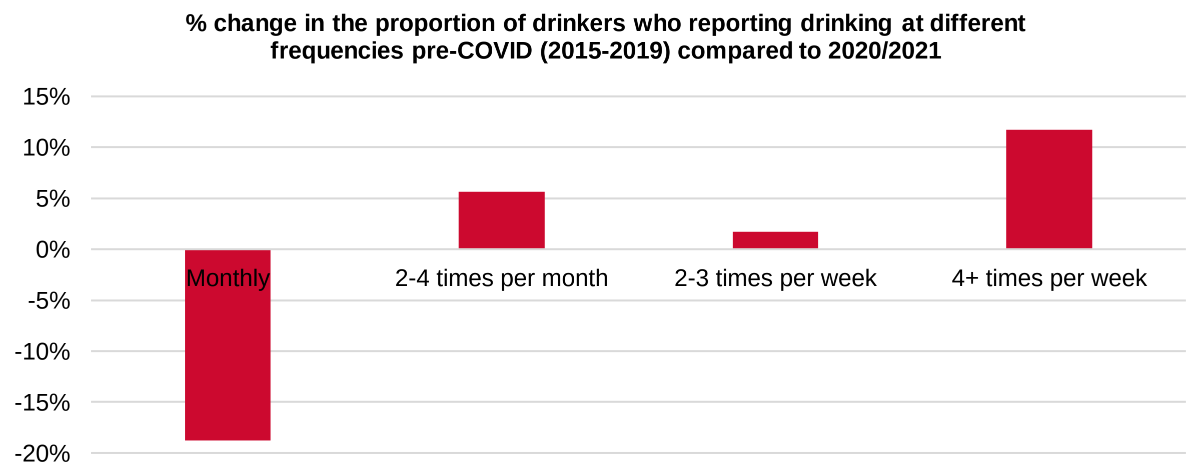
On the other hand, Figure 25 shows alcohol-related deaths have increased 20% relative to 2019, with an 11% increase in mental and behavioural disorder deaths, a 15% increase from alcohol poisonings and 21% from alcoholic liver disease. This may reflect an increase in alcohol consumption during the pandemic, particularly in groups that were the heaviest consumers before the pandemic, so the increase in alcohol liver disease hospitalisations and deaths is consistent with this pattern. Figure 26 shows that those in the most deprived group are the most likely to be hospitalised or die of alcohol-related conditions (making up 31-37% of hospitalisations/deaths) relative to the least deprived (9-11%).

Figure 21 – % change in proportion drinking pre-COVID relative to post-COVID



Source: Understanding Society, data analysis by DHSC

Figure 22 – Number of alcoholic drinks consumed on a typical day



Source: Understanding Society, data analysis by DHSC

Table 6 – Increase in frequency of drinkers for those who report drinking by sex

	Sex	
	Men	Women
Monthly	-13%	-24%
2-4 times per-month	2%	9%
2-3 times per week	0%	3%
4+ times per week	12%	11%

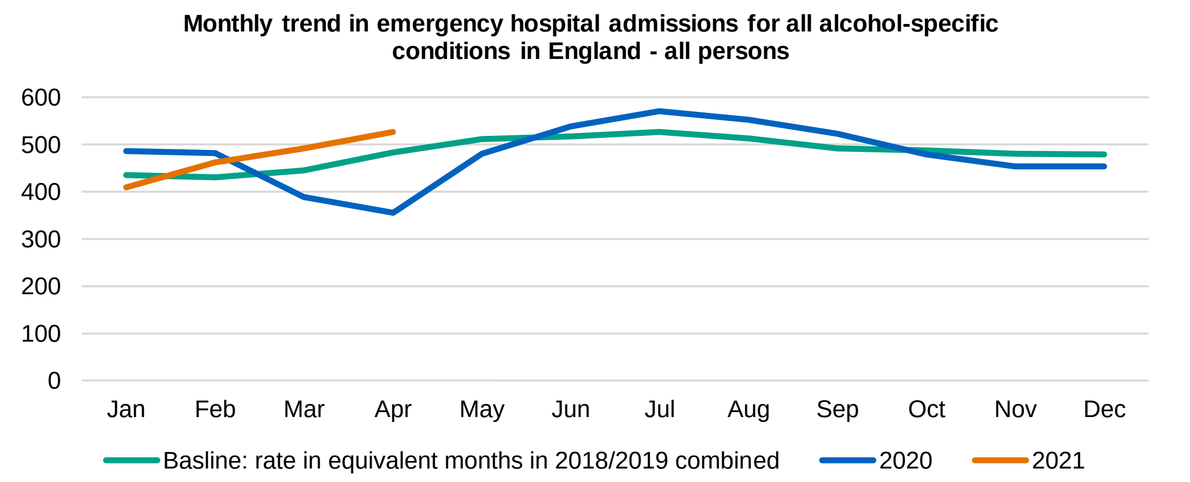
Source: Understanding Society, data analysis by DHSC

Table 7 - Increase in frequency of drinkers for those who report drinking by age group

	Age				
	18-34	35-49	50-64	65-79	80+
Monthly	-27%	-24%	-12%	-17%	-14%
2-4 times per-month	16%	8%	6%	4%	5%
2-3 times per week	7%	3%	0%	0%	-6%
4+ times per week	4%	13%	6%	13%	15%

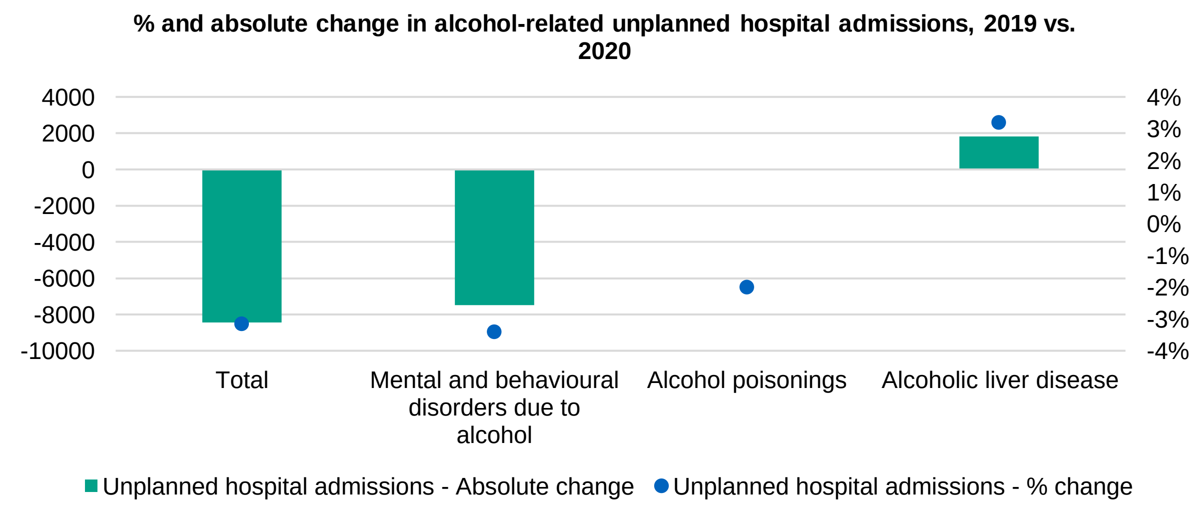
Source: Understanding Society, data analysis by DHSC

Figure 23 -Monthly trend in emergency hospital admissions for alcohol specific conditions



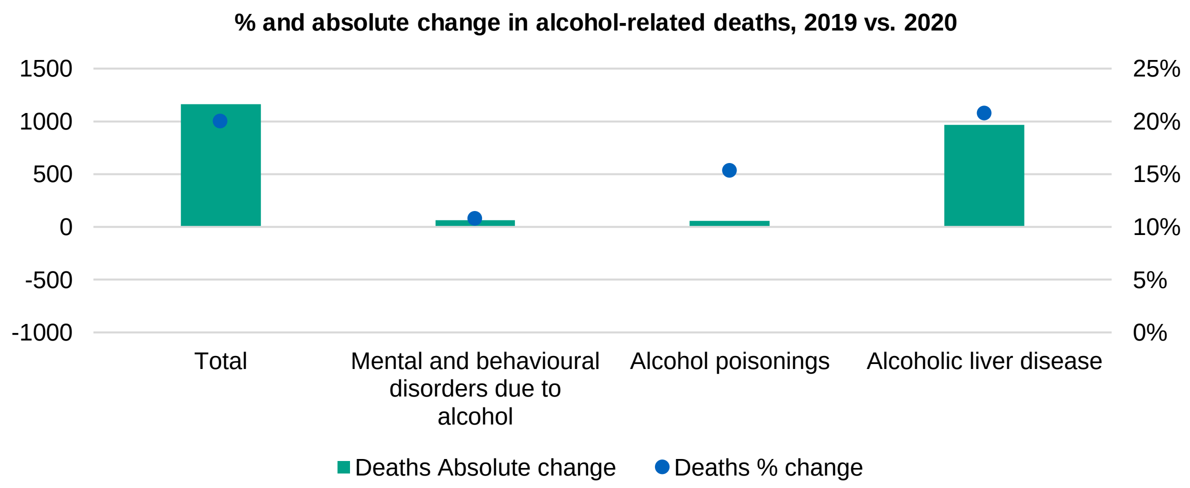
Source: Public Health England analysis of Hospital Episode Statistics

Figure 24 - % and absolute change in alcholol-related unplanned hospital admissions, 2019 vs 2020



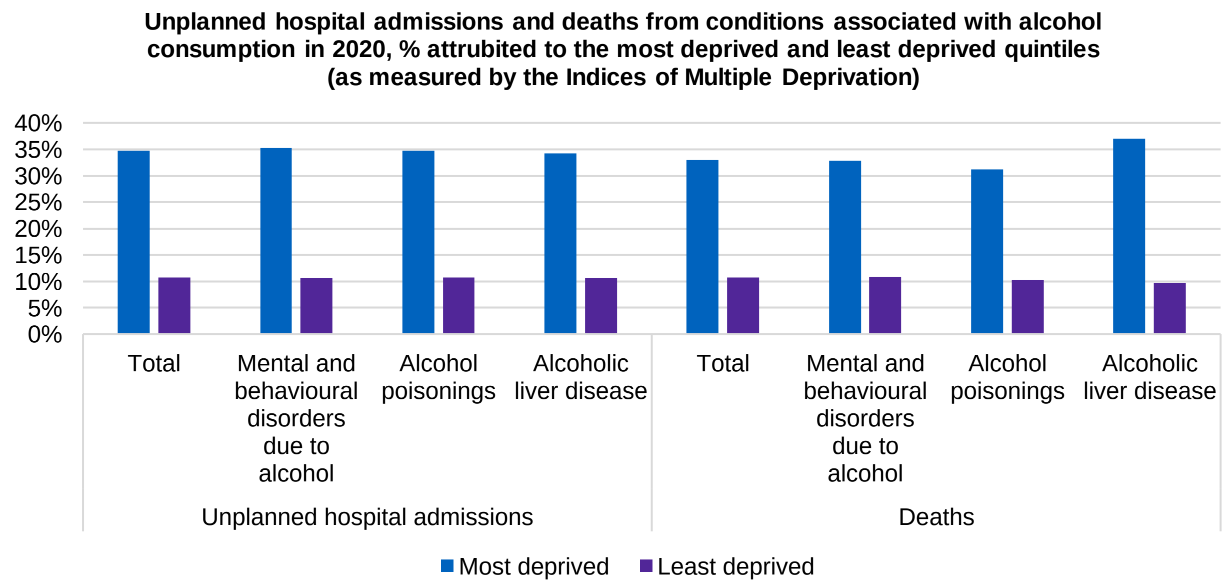
Source: Public Health England analysis of Hospital Episode Statistics

Figure 25 - % and absolute change in alcohol-related deaths, 2019 vs 2020



Source: Public Health England analysis of ONS mortality data

Figure 26 – Unplanned hospital admissions and deaths from conditions associated with alcohol conditiions in 2020 by most and least deprived quintiles



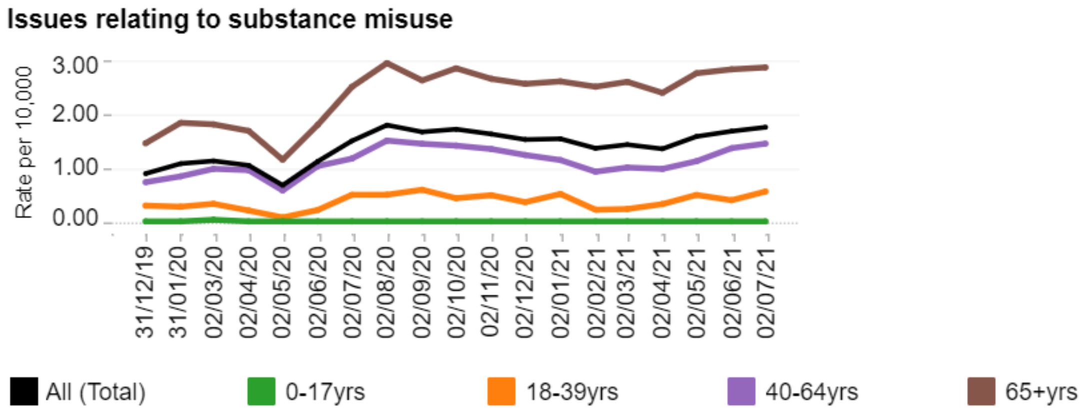
Source: Public Health England analysis of ONS mortality data (deaths) and Hospital Episode Statistics (unplanned hospital admissions)

C.1.4 Other substance misuse

Data from RCGP/University of Oxford Research Surveillance Centre[43] considers the social needs that are presenting in consultations in primary care. Note that as they data are focussed on needs that are presenting in primary care, they do not reflect all underlying need. The data shows that issues relating to substance misuse (including alcohol) became more prevalent during the pandemic for all age groups over the age of 18, all regions (particularly the North West) and higher rates of deprivation. However, there has been a reduction in overdoses presenting to A&E (Figure 27, Figure 28, Figure 29).

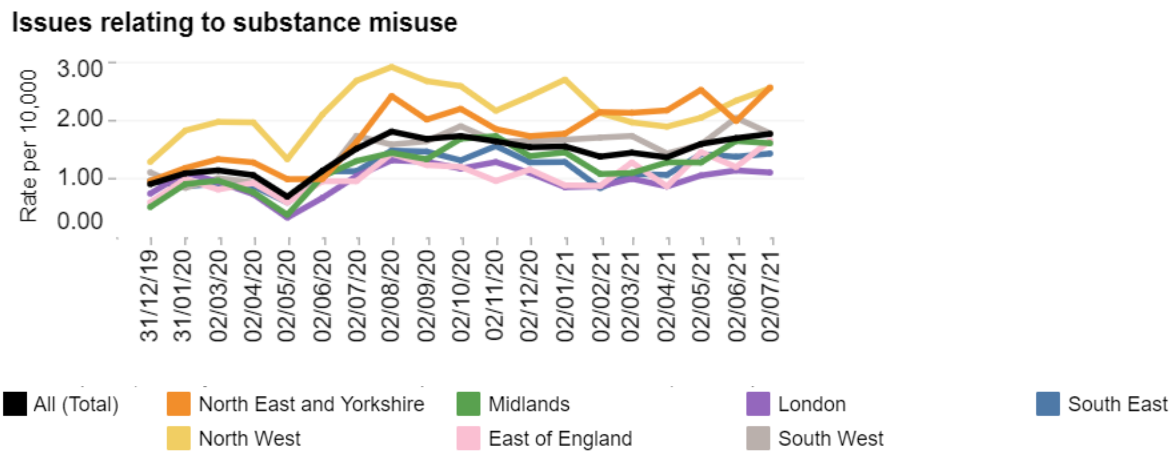
[43] RCGP RSC Workload Observatory | ORCHID ::: Oxford-RCGP RSC

Figure 27 - Issues relating to substance misuse by age



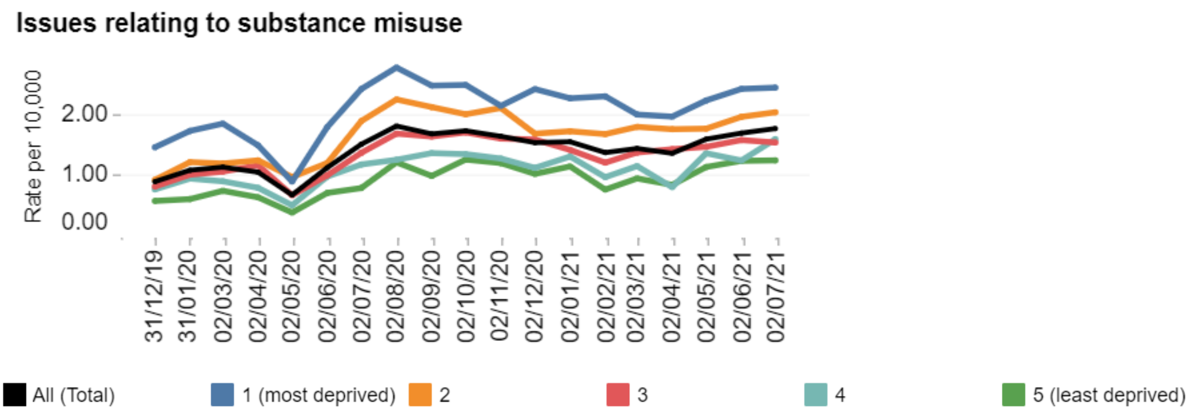
Source: Royal College of General Practitioners/University of Oxford Research & Surveillance Centre – Social Needs Observatory

Figure 28 - Issues relating to substance misuse by region



Source: Royal College of General Practitioners/University of Oxford Research & Surveillance Centre – Social Needs Observatory

Figure 29 - Issues relating to substance misuse by deprivation



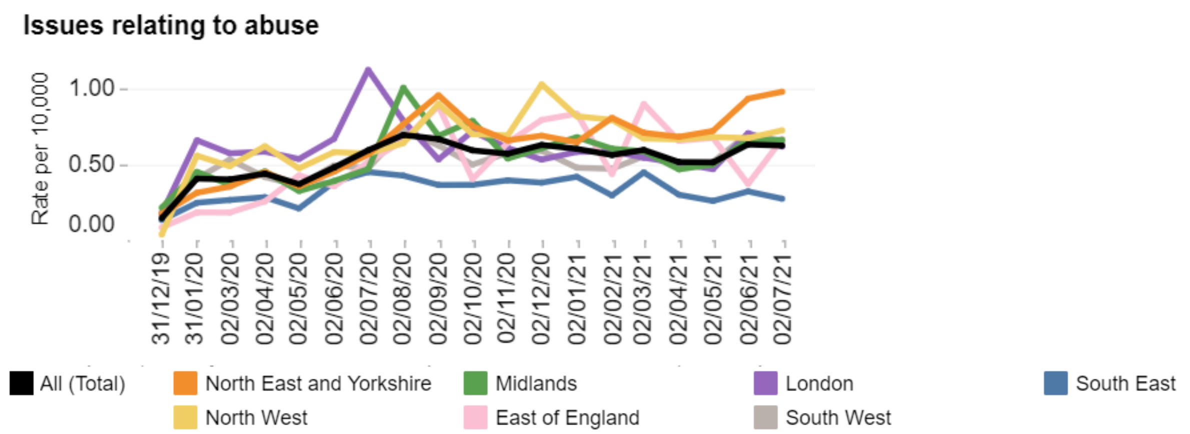
Source: Royal College of General Practitioners/University of Oxford Research & Surveillance Centre – Social Needs Observatory Interpersonal and domestic violence

C.1.5 Interpersonal violence and abuse

ONS statistics show a fall in 'violence against the person offences' of 13% between 2019 and 2020, including a 9% fall in violence with injury[44].

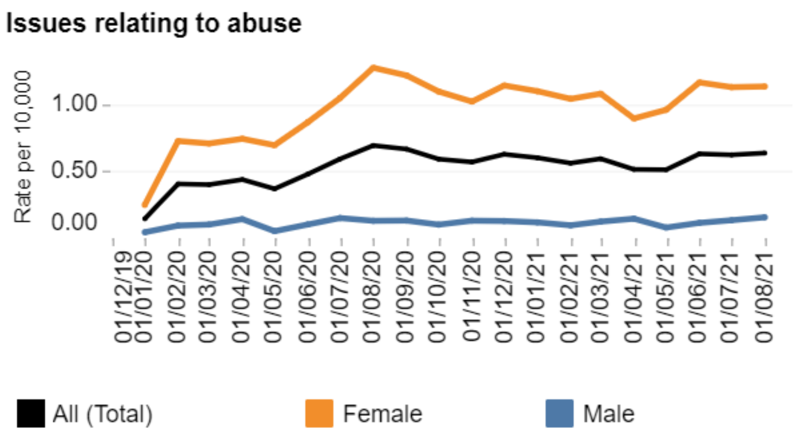
However, the RCGP/University of Oxford Surveillance data shows an increase in the prevalence of issues relating to abuse[45] during the pandemic for all age, ethnicity, levels of deprivation and regions (Figure 30 to Figure 34). The rate grew significantly faster for women during the lockdown.

Figure 30 – Issues relating to abuse by region



Source: Royal College of General Practitioners/University of Oxford Research & Surveillance Centre – Social Needs Observatory

Figure 31 - Issues relating to abuse by sex

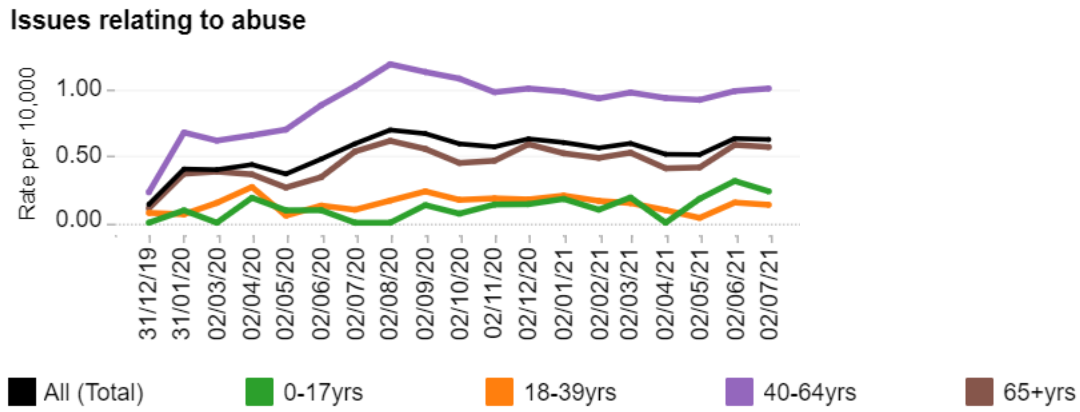


Source: Royal College of General Practitioners/University of Oxford Research & Surveillance Centre – Social Needs Observatory

44 [Crime in England and Wales Statistical bulletins - Office for National Statistics (ons.gov.uk)](#)

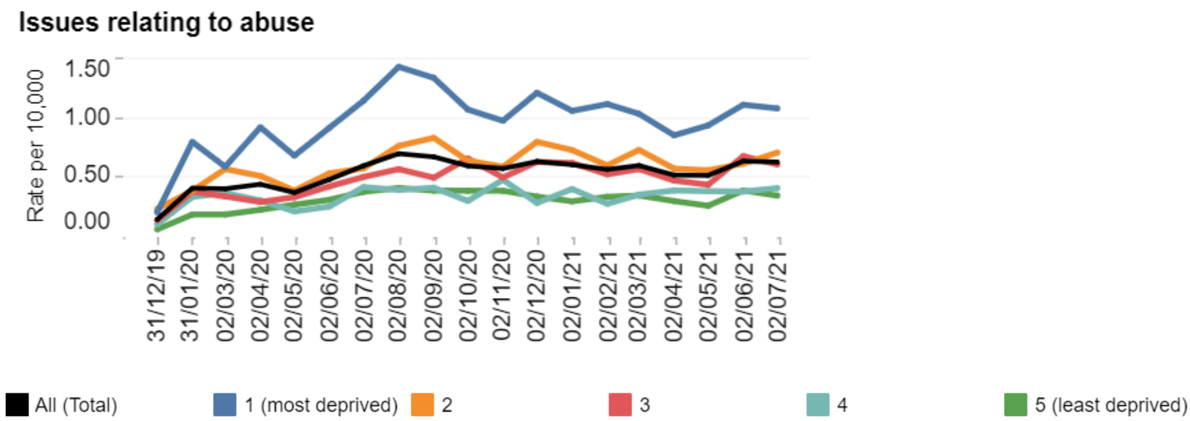
45 This includes all primary care consultations that are coded as 'Victim of abuse'

Figure 32 - Issues relating to abuse by age



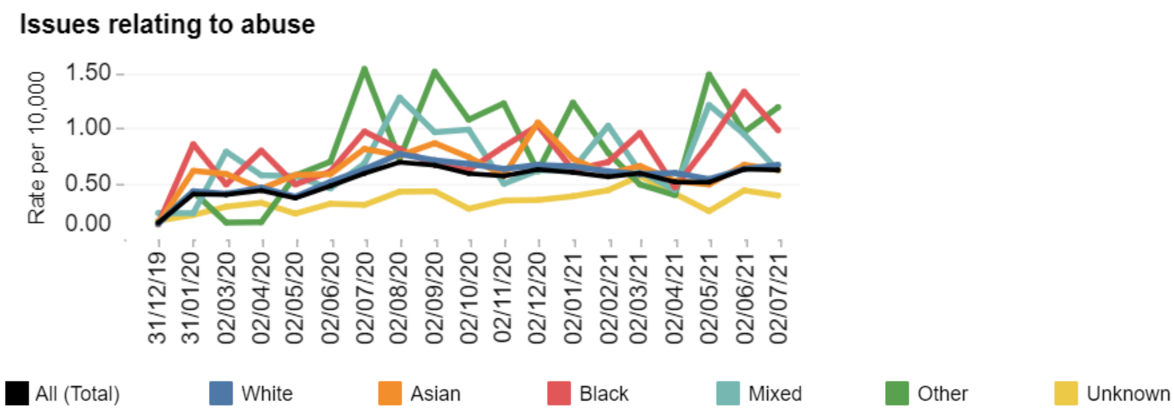
Source: Royal College of General Practitioners/University of Oxford Research & Surveillance Centre – Social Needs Observatory

Figure 33 - Issues relating to abuse by deprivation



Source: Royal College of General Practitioners/University of Oxford Research & Surveillance Centre – Social Needs Observatory

Figure 34 - Issues relating to abuse by ethnicity

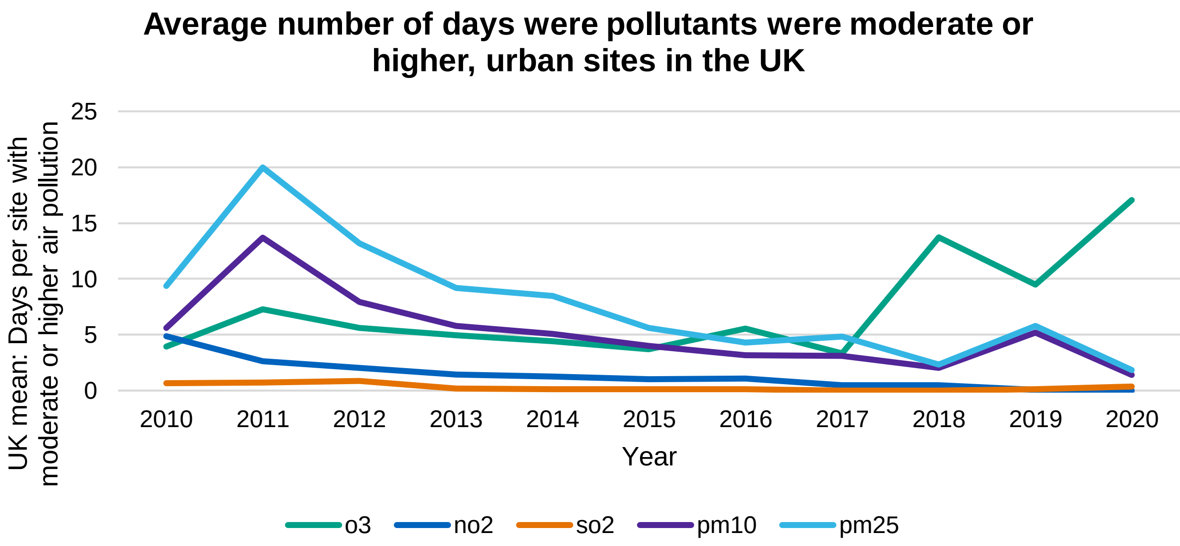


Source: Royal College of General Practitioners/University of Oxford Research & Surveillance Centre – Social Needs Observatory

C.1.6 Air pollution

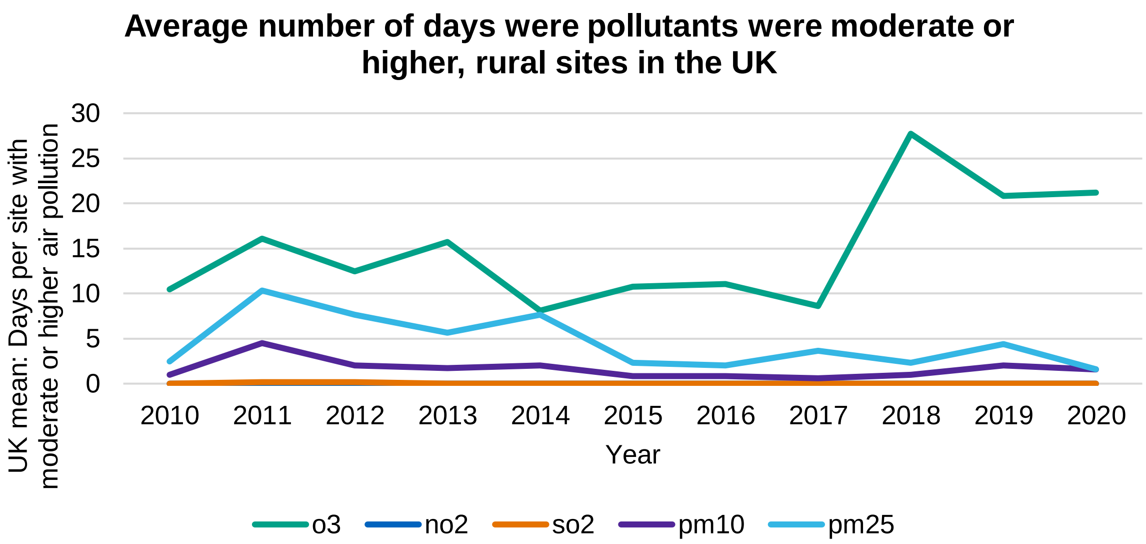
Short-term exposure to air pollution (over hours or days) can lead to a range of harmful health impacts, including exacerbating asthma, increases in respiratory and cardiovascular hospital admissions, and impacts on lung function. Most pollutants saw a fall during the pandemic, although Ozone (a key pollutant from the burning of household fuels) saw an increase (Figure 35, Figure 36). This reduction may be one of the reasons driving the fall in incidence of asthma as reported by the RCGP/University of Oxford Research and Surveillance Centre (Figure 37). The bars show the recorded rate by region and the dark blue line shows the 5-year average.

Figure 35 – Average number of days with moderate or higher air pollution for urban sites



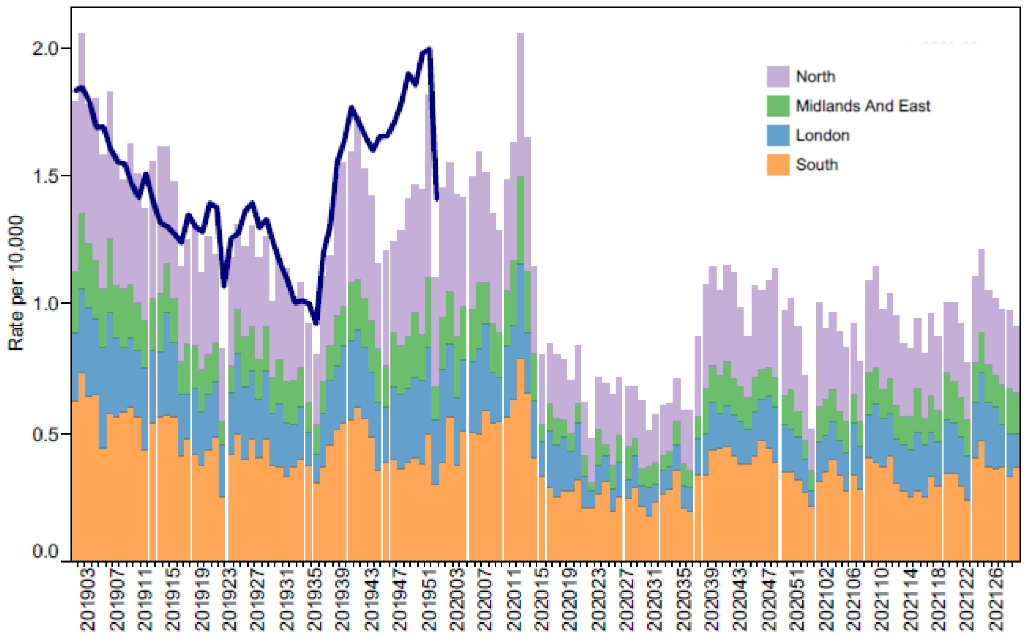
Source: DEFRA, Air quality statistics: Concentrations of major air pollutants as measured by the Automatic Urban and Rural Network (AURN), 2021

Figure 36 – Average number of days with moderate or higher air pollution for rural sites



Source: DEFRA, Air quality statistics: Concentrations of major air pollutants as measured by the Automatic Urban and Rural Network (AURN), 2021

Figure 37 – Weekly incidence of asthma by region



Source: Royal College of General Practitioners/University of Oxford Research & Surveillance Centre – Social Needs Observatory

C.2 Change in health seeking behaviour

During the pandemic people have changed their behaviour in terms of seeking health care. Areas highlighted in the literature include:

- Patients opting to postpone or forgo seeking treatment due to concerns over hospitals being high risk areas of infections[46, 47, 48]
- Changes to population health seeking behaviour from fear of overwhelming the NHS or lack of public awareness that medical help should still be sought in an emergency[49, 50, 51]

In this section, we focus on the indirect health impacts of COVID-19 from changes to health care demand behaviours. We have considered data from Understanding Society[52], the GP Patient Survey[53] and the Clinical Practice Research Datalink (CPRD)[54] to understand the extent of patient-led behaviour changes on demand for primary care. Note that as we do not observe supply-side conditions from survey data, we do not consider these here.

In this section, for most cases we compare against a pre-pandemic 4-year average (2016-2019) baseline. As before, there is no long-term trend in the data, and thus a four-year average

[46] The Wider Impacts of the Coronavirus Pandemic on the NHS* - Propper - 2020 - Fiscal Studies - Wiley Online Library
[47] Health inequalities: the hidden cost of COVID-19 in NHS hospital trusts? - Sophie Coronini-Cronberg, Edward John Maile, Azeem Majeed, 2020 (sagepub.com)
[48] Minimizing Population Health Loss in Times of Scarce Surgical Capacity During the Coronavirus Disease 2019 Crisis and Beyond: A Modelling Study - ScienceDirect
[49] Health inequalities: the hidden cost of COVID-19 in NHS hospital trusts? - Sophie Coronini-Cronberg, Edward John Maile, Azeem Majeed, 2020 (sagepub.com)
[50] Economic impact of avoidable cancer deaths caused by diagnostic delay during the COVID-19 pandemic: A national population-based modelling study in England, UK - European Journal of Cancer (ejcancer.com)
[51] BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)
[52] Understanding Society – The UK Household Longitudinal Study
[53] GP Patient Survey (gp-patient.co.uk)
[54] Clinical Practice Research Datalink | CPRD

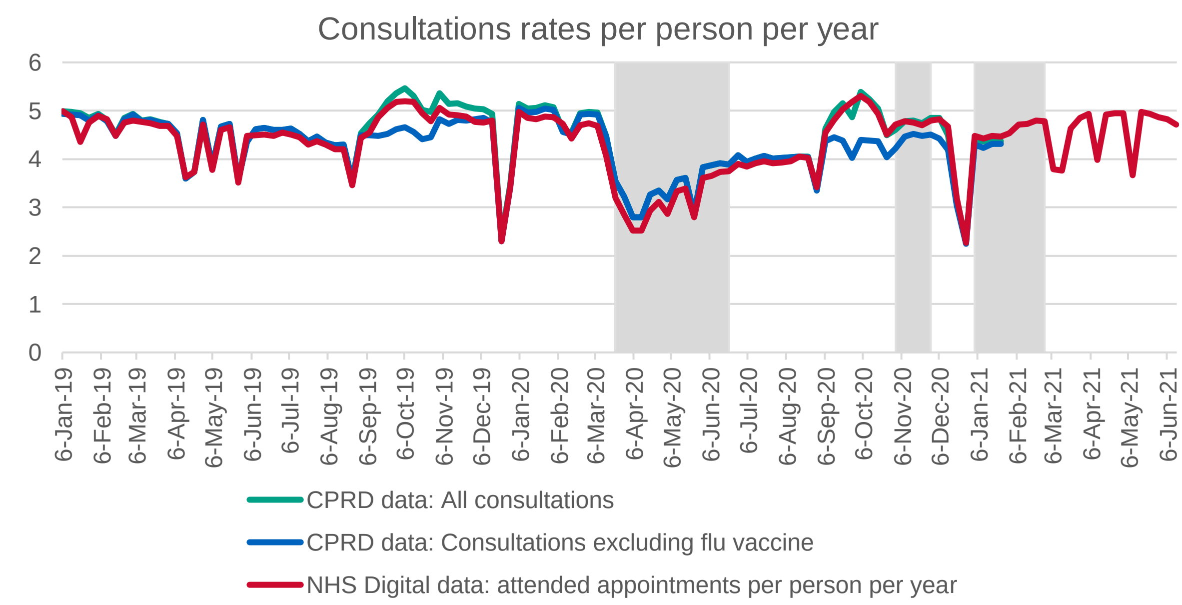
provides a reasonable baseline to compare against, averaging out any idiosyncratic shocks between years. Occasionally, where four-year average data is not available, we compare with 2019 only. An implicit comparison is made with pre-pandemic data in 2019 when we present time series.

C.2.1 Change in Primary Care consultations

This section has been developed in collaboration with colleagues at the REAL Centre and has benefitted from input from the RCGP.

Data from the 500,000-patient sample Clinical Practice Research Datalink (CPRD) [55] shows that there was a sharp decline in consultations when we entered lockdown in March 2020. Similar results are found with General Practice Appointments Data (GPAD)[56]. Comparing consultation rates to the same month the year before, total consultation rates seem to recover to pre-pandemic levels in the autumn. However, excluding flu vaccinations during the autumn 2020 campaign and Covid vaccinations since December 2020, consultation rates only recover to pre-pandemic levels by May 2021 (Figure 38). Note that data on consultations do not include activity in primary care such as clinical administration, some elements of triage and following up etc.

Figure 38 – Primary Care consultation rates, per person per year



Source: CPRD and NHS Digital GPAD data, analysis by the Health Foundation's REAL Centre. Shaded grey areas indicate national lockdowns.

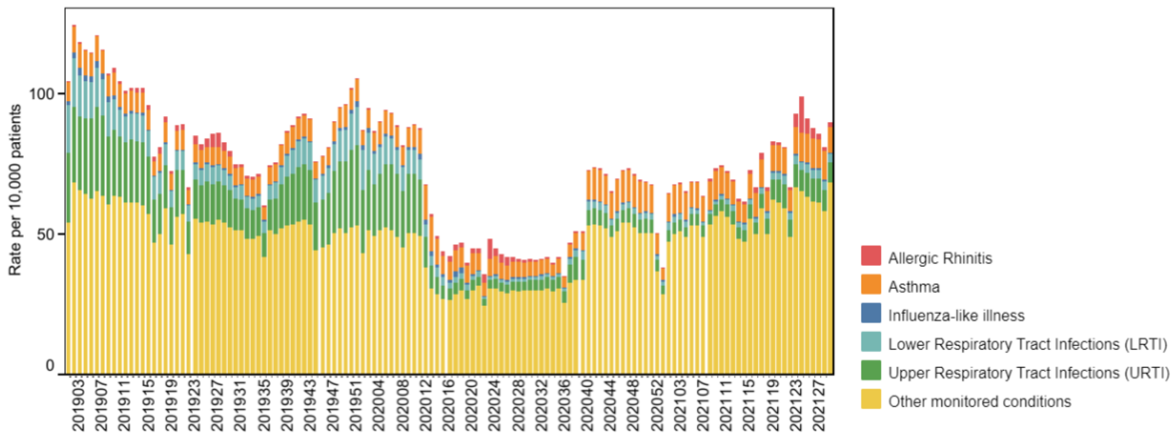
The fall in consultations reflects the combined impact of patient health-seeking behaviour and health system adaptations put in place to respond to the pandemic. In circumstances where underlying need may have fallen in the short-term, we're likely to see demand recover over time but not increase to above pre-pandemic levels. This can be seen in below – consultation rates are recovering to pre-pandemic levels for select conditions such as Allergic Rhinitis, Asthma, Influenza-like illnesses for which data is available via RCGP/University of Oxford Research & Surveillance Centre (Figure 39). However, as underlying need may have declined in the short-term for these conditions due to Covid-19 and mitigations put in place to contain

[55] Patient level was analysed under protocol number 20_143

[56] Appointments in General Practice - NHS Digital Appointments in General Practice - NHS Digital

it, demand is not increasing sharply thus suggesting there is not significant delayed demand for these conditions.

Figure 39– Consultation rates per 10,000 patients by select conditions

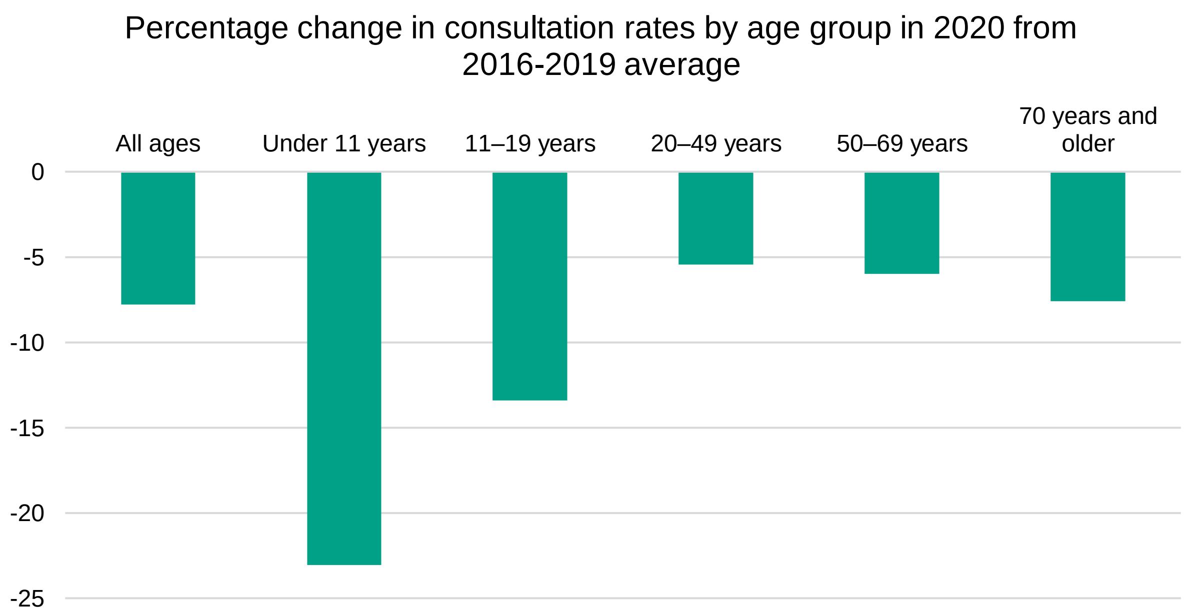


Source: RCGP/University of Oxford Research & Surveillance Centre

C.2.1.1 *Consultation rates by age group*

Breaking down consultations by age-groups (Figure 40) we see that under 11s have had the most sustained fall in consultations compared to a 2016-2019 average, followed by 11-19 year olds and then over 70s.

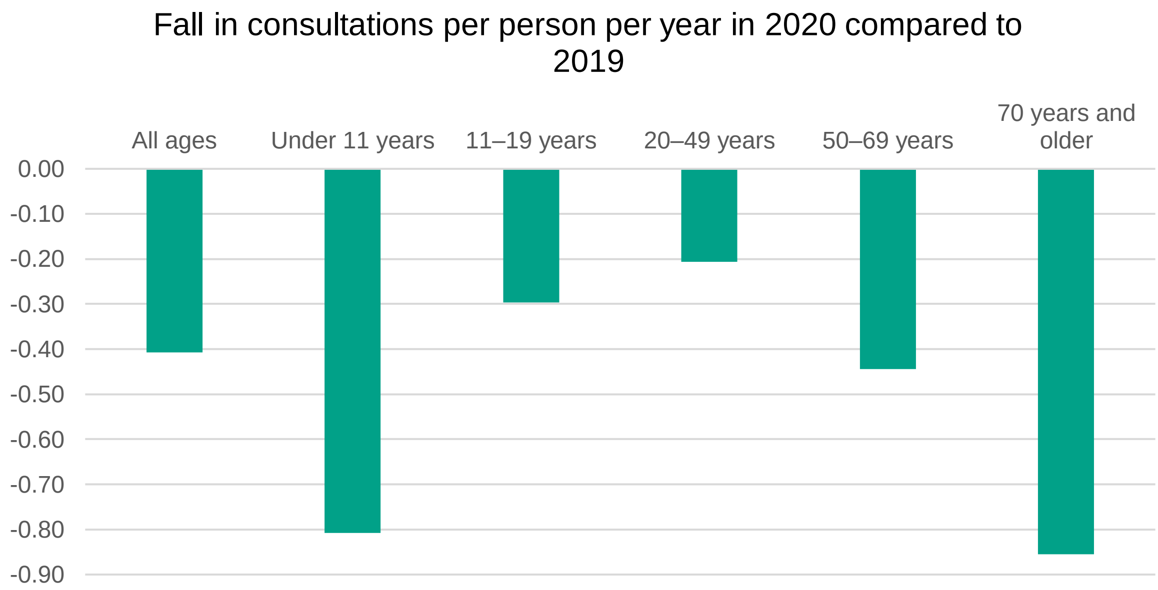
Figure 40 - % change in consultation rates relative to 2016-2019 average by age group



Source: CPRD data, analysis by the Health Foundation's REAL Centre

However, if we consider the average fall in consultations rates by age-group the highest fall is experienced by over 70s followed by under 11s (Figure 41). This reflects the greater need and utilisation of GP services by over 70s. It may also reflect where over 70s are shielding or in care homes where special arrangements/provisions may not be picked up in consultation data.

Figure 41: Consultation rates per person per year by age-group



Source: CPRD data, analysis by the Health Foundation's REAL Centre

These lower consultation rates in young people may reflect fewer infections in young people due to having fewer contacts (e.g., due to school closure and social distancing) and a fall in the number of accidents experienced at school during periods of education/organised sport closures. Data from the RCGP/University of Oxford Research and Surveillance Centre shows a significant and maintained fall in upper respiratory tract infections (Figure 42) and infectious intestinal diseases (Figure 43). The bars show the recorded rate by region and the dark blue line shows the 5-year average.

Figure 42 – Upper respiratory tract infections

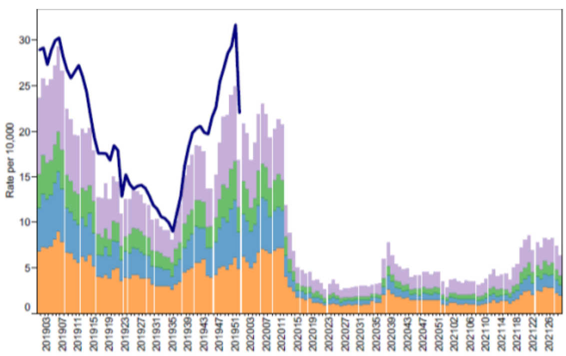
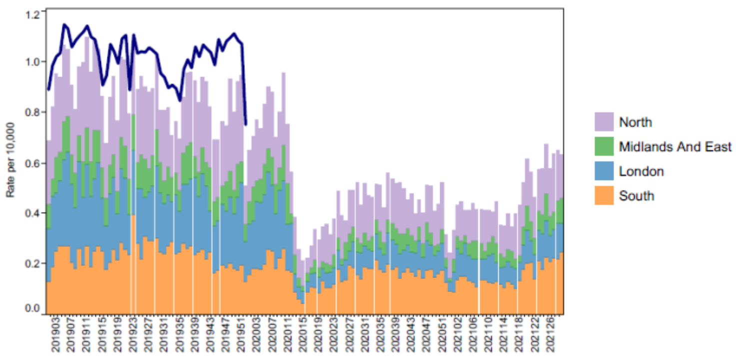


Figure 43 – Infectious intestinal diseases (IID)



Source: RCGP/University of Oxford Research & Surveillance Centre

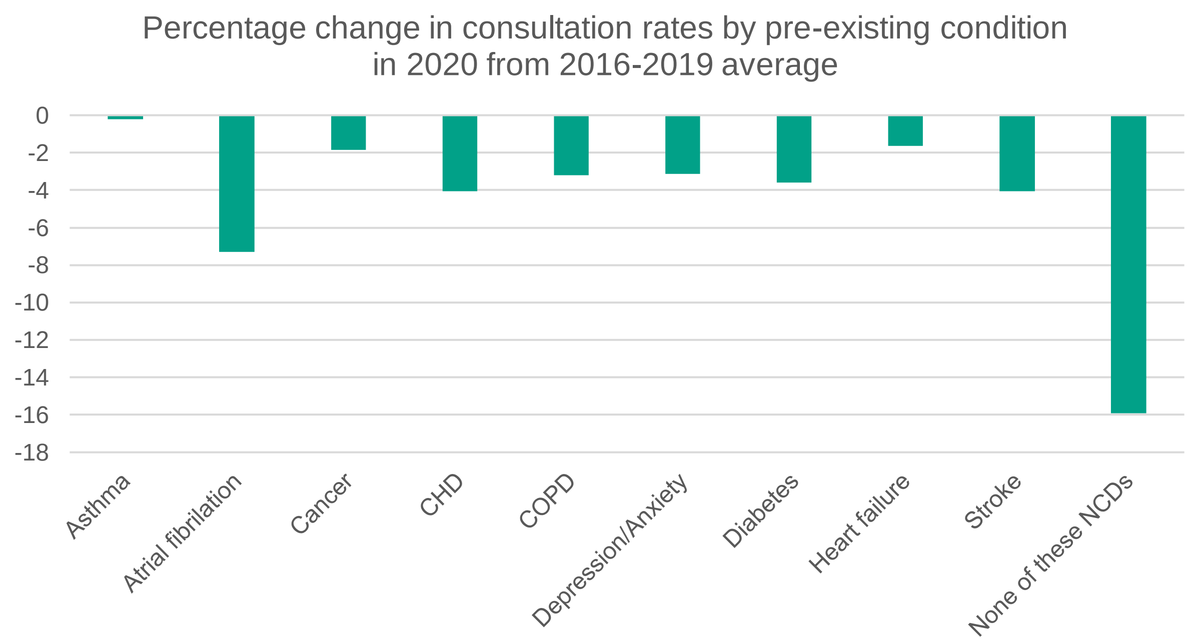
C.2.1.2 *Consultation rates by pre-existing conditions*

There were an estimated 23 million fewer primary care consultations in 2020 compared with 2019, with the number of consultations normally sitting at around 300 million per year (GPAD). Almost 16 million (70%) of these were for people without any of the pre-existing non-communicable diseases.

Consultation rates patients with for key non-communicable diseases and long-term conditions managed in primary care such as Asthma, Diabetes, Cancer, Chronic Obstructive Pulmonary Disease etc. remained higher relative to other non-communicable diseases. Note that these are percentage change in consultation rates are for people with these conditions, consultations may not necessarily to manage the condition. The percentage reduction for those with pre-existing non-communicable diseases was relatively small compared to those without, suggesting these patients accessed primary care. However, this is likely to vary depending to pre-pandemic tendency to engage with primary care for management of long-term conditions.

The largest percentage reduction in consultations was in patients without a pre-existing non-communicable disease. It's not clear whether this is the result of greater unmet demand in this group or the effect of a reduction in the incidence of communicable disease (Figure 44).

Figure 44 - % change in consultation rates relative to 2016-2019 average for patients with existing conditions



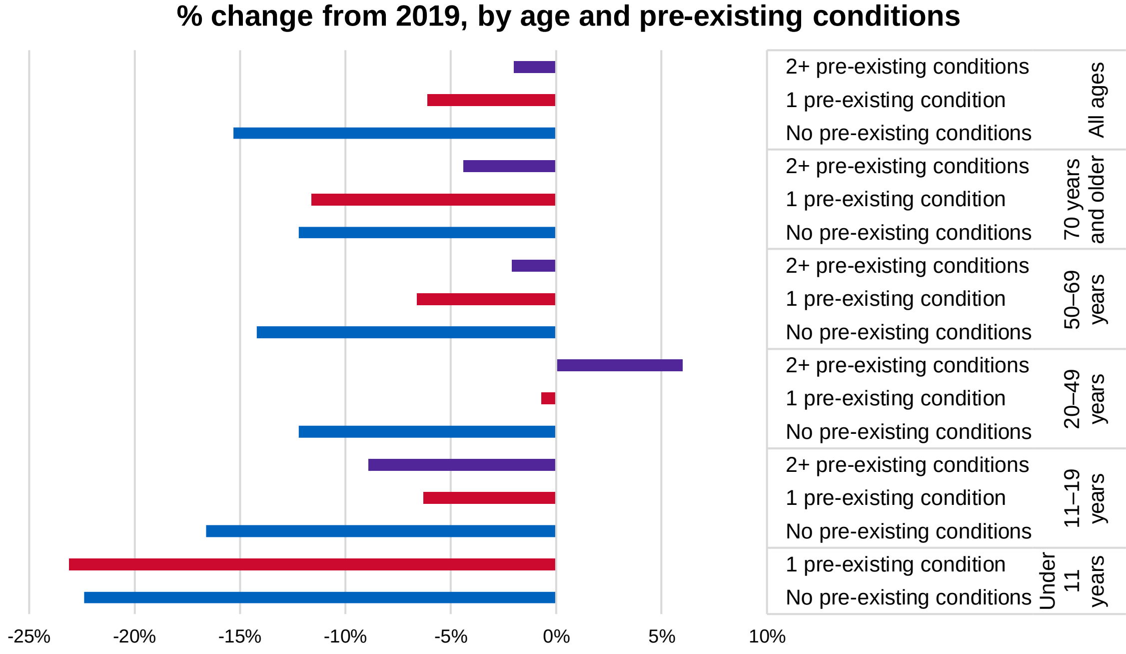
Source: CPRD, analysis by the Health Foundation's REAL Centre

C.2.1.3 *Consultation rates by age and pre-existing condition group*

Looking at the change in consultations relative to 2019 by age group and pre-existing conditions (Figure 45), we see that for all age-groups except under 11s the largest percentage fall in consultation rates is for patients with no pre-existing conditions. For under 11's, the greatest fall consultation rates are for patients with one pre-existing condition at around 23%. Also, notably for 11 to 19-year olds with two or more pre-existing conditions consultation rates fell by 9%, the highest across all age-groups with two or more pre-existing conditions.

20 – 49-year olds with two or more pre-existing conditions are the only group for which consultation rates increased. Over 70s with one pre-existing condition saw a decrease in consultation rates by approximately 12%, and with no pre-existing condition by 13%. Finally, for 50 – 69-year olds most of the fall in consultation rates is from patients with no pre-existing conditions.

Figure 45 – % change in consultation rates relative to 2019, by age and pre-existing conditions

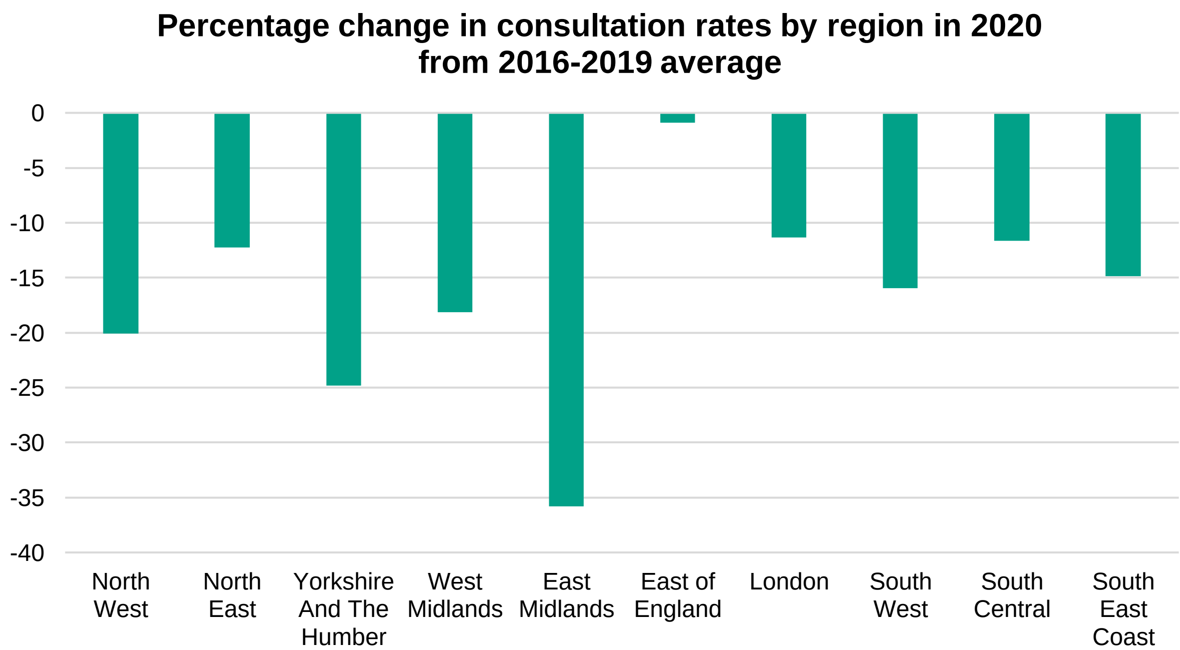


Source: CPRD data, analysis by the Health Foundation's REAL Centre

C.2.1.4 *Consultation rates by region*

Considering the consultation data broken down by region (Figure 46), we see that the East Midlands experienced the greatest reduction in consultations when compared with the average of previous years, however, this trend is not reflected in published GPAD data so has to be treated with caution. Yorkshire and the Humber and the North West have also seen significant falls in consultation rates in 2020 relative to the 2016-2019 average.

Figure 46 - % change in consultation rates relative to 2016-2019 average by region



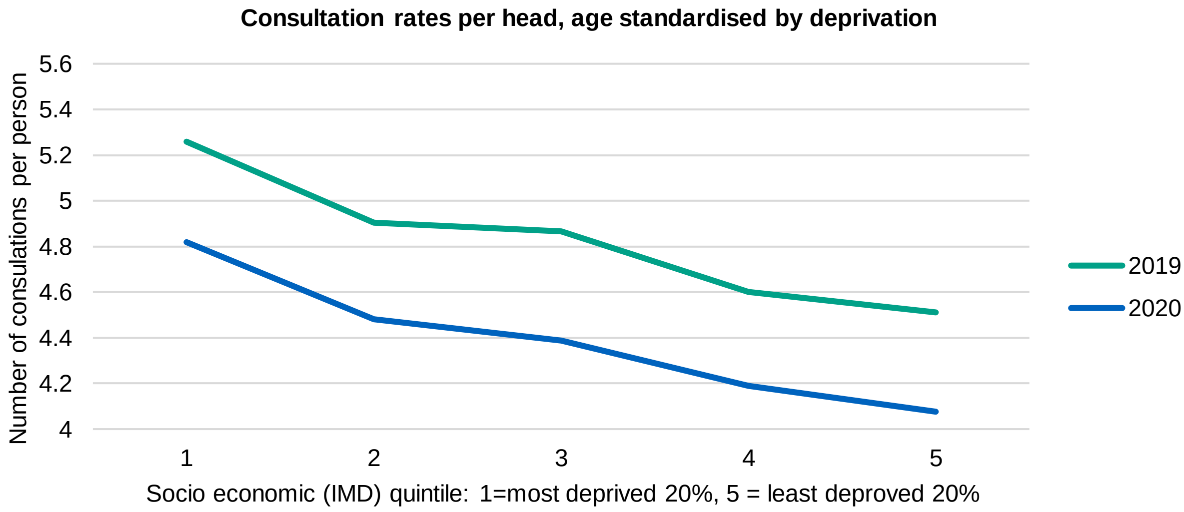
Source: CPRD data, analysis by the Health Foundation's REAL Centre

C.2.1.5 *Consultation rates by deprivation*

Figure 47 below shows the annual average consultation rates per registered patient (age standardized) Index of Multiple Deprivation (IMD) quintile in 2019 and 2020. Both before and throughout the pandemic we see that patients living in poorer areas have higher rates of primary care contact than those in rich areas as they have, on average, poorer health and more health conditions. Those living in the poorest quintile of local areas have much higher rates of consultation than the rest of population. The gap in rates between

The reduction in age standardized consultations per patient did not significantly differ by socio-economic status in 2020. The patients in the most deprived quintile saw an 8.4% drop in consultation rates (5.26 in 2019 to 4.82 in 2020) while rates for patients living in the least deprived areas fell by 9.6% (4.51 in 2019 to 4.08 in 2020).

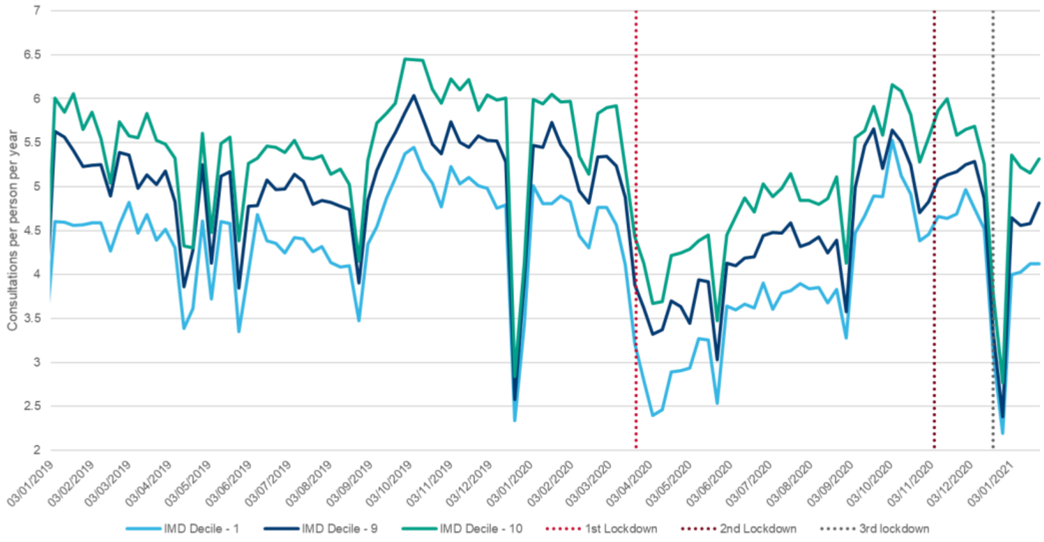
Figure 47 – Age standardised consultation rates per head by deprivation for 2019 and 2020



Source: CPRD data, analysis by the Health Foundation's REAL Centre

Figure 48 shows rates of consultation for IMD10 (the most deprived), IMD 9 (the next most deprived) and IMD1 (the least deprived). This further illustrates that while there is a gradient by IMD, the most deprived decile has disproportionately high primary care use both before and during the pandemic. In October 2020, we can see consultation rates recover at a faster rate for the least deprived decile, reaching their pre-pandemic level compared to October 2019, when compared to the top 20% most deprived.

Figure 48 – Age standardised consultation rates per person per year by least deprived (top 10%) and most deprived (bottom 20%)



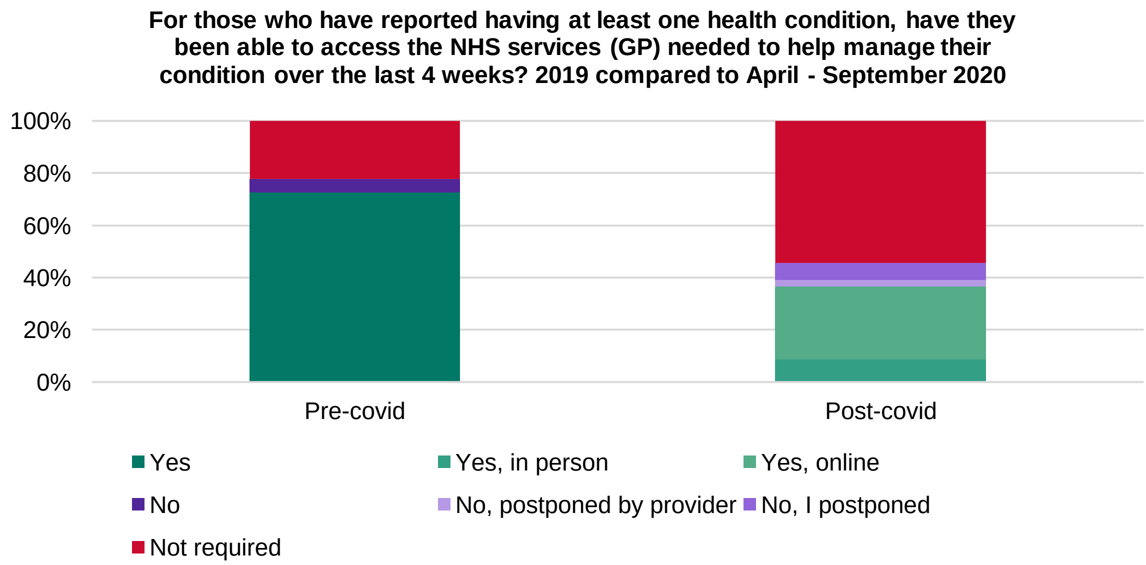
Source: CPRD data, analysis by the Health Foundation's REAL Centre

C.2.2 Access to primary care services

Understanding Society, a nationally representative cohort survey, gives a similar picture of access to GP services through the 1st wave of the pandemic until September 2020. Respondents stated whether they did access care (Yes), didn't need to (Not required) or felt they needed to but didn't (No) (Figure 49). 3% of respondents reported that they were not able to access or perceived that they could not access a GP.

The results of the GP Patient Survey (in Figure 50) indicate that a slightly higher proportion (10%) of respondents said they had avoided making a GP appointment because it was too difficult. This may be due to the movement of in-person consultations to online or tele-consultations via online triage services, although the ages reporting this as a factor in not making an appointment indicates this may not be the primary reason.

Figure 49 – Access to GP Services in 2019, relative to April-September 2020

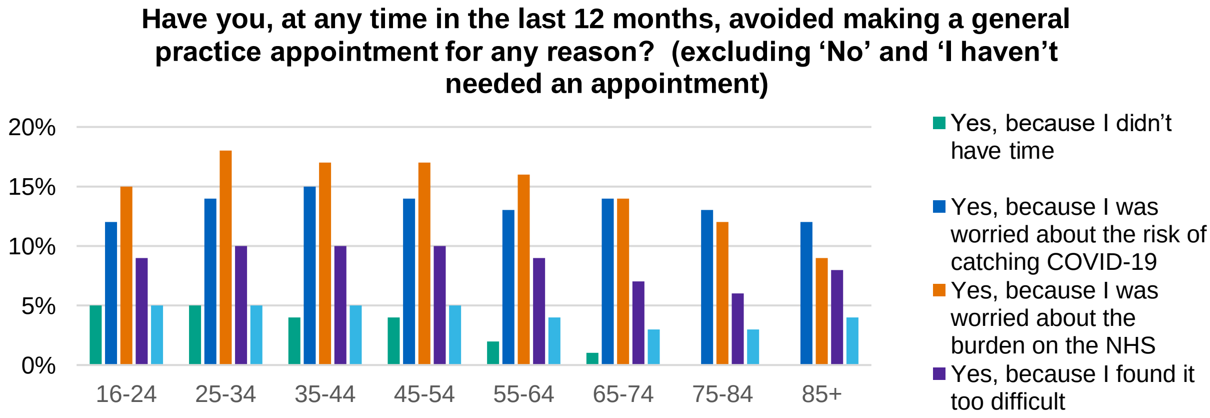


Source: Understanding Society, data analysis by DHSC

C.2.3 Reasons for patients not seeking primary care

We use the GP Patient Survey 2021[57] to understand the reasons behind individuals choosing not to access primary care (Figure 50). Note that the data for this survey was collected during the first the lockdown and thus only reflects patient behaviour during this period. Younger age groups were most likely not to make an appointment because of concerns about overburdening the NHS (particularly 25-34-year olds) relative to other concerns. A high proportion, particularly of older age groups, did not access primary care due to fear of catching COVID-19 relative to other concerns.

Figure 50 – Reasons for avoiding making a GP appointment by age group, weighted



Source: GP Patient Survey, data analysis by DHSC

C.2.4 Summary of change in health seeking behaviour

Demand for primary care fell during the pandemic, particularly the early months. This was driven mainly by people avoiding making appointments as they sought to protect the NHS and reduce their own risk of catching COVID. Appointment numbers have risen in later months, though many of these appointments have been conducted remotely, which may have a number of unintended consequences for care such as less accessible care and challenges around diagnosis and treatment.

The greatest percentage reductions in primary care consultation rates were for those below the age of 20. Rates were back to approximately normal levels for most patients by September 2020, although levels still appeared low for these groups at the end of January 2021.

Similar percentage reductions in consultation rates have been seen across all income deciles, but those in the most deprived quintiles are the heaviest users of primary care services so experienced larger absolute declines. Overall, those with no pre-existing conditions had the greatest absolute/percentage reductions in consultation rates.

These data highlight the extent of the health inequalities between people of different ethnic and socioeconomic backgrounds. Primary care consultations are used to diagnose, monitor and treat many long-term illnesses such as type II diabetes, CVD and lung conditions. The higher pre-pandemic usage of primary care by those living in more deprived areas and some ethnic minority groups points to pre-existing health inequalities that are likely to have been exacerbated by COVID-19.

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[57] Survey and Reports (gp-patient.co.uk)

C.3 Impact of COVID-19 on Primary Care Services

We now consider the impact COVID-19 on primary care in light of the data we have set out above on patient health-related behaviours.

Reduced primary care activity may is likely impact patients in the following ways:

(i) Impact the management of existing long-term conditions,
(ii) Reduce diagnosis and treatment of new chronic conditions that would otherwise be diagnosed in primary care,
(iii) Delay referrals for secondary care treatment

These are a consequence of both demand and supply-side factors. For example, changes to health-seeking behaviours resulting in fewer patients attending GPs has resulted in fewer diagnosis, and higher risks to patients from undiagnosed and untreated conditions. However, some of the fall in diagnosis will also reflect supply-side effects, such as the inability to diagnose certain conditions via teleconsultation.

Note that primary care data does not give us a complete picture of how patients have accessed care as patients may have sought care at A&E and/or NHS111 and/or pharmacies.

In this section, our baseline comparator is 2019 for diagnosis and management of chronic conditions and referrals. For routine screenings, we compare against a linear time-trend.

This section has been developed in collaboration with colleagues at the Health Foundation's REAL Centre.

C.3.1 Diagnosis and management of chronic conditions

The fall in consultations, partly driven by changes to health-related behaviours and partly driven by provider behaviours and health system adaptations, are likely to result in some delayed diagnoses, i.e. we observe a fall in recording of new illness in primary care data (which we refer to as 'missing' incidence) of chronic conditions which may increase subsequent demand and potentially lead to worse outcomes for patients. Specifically, there were Standard Operating Procedures (SOPs) and infection protocols put in place nationally which had a major impact on the way that care was delivered by providers, especially during 2020 and the early stage of 2021. As part of this it was necessary to change certain aspects of care delivery to reduce risk of transmission, including more remote delivery of care and de-prioritising non urgent routine clinical and administrative activities at certain peaks of the pandemic.

Analysis conducted by the REAL Centre is shown in Table 8 and uses the same sample as the consultations analysis above identifies the potential scale of 'missed' incidence in primary care. The 'missed' incidence does not reflect changes in demand – it should be understood in relation to changes to underlying need. This would be an overestimate for primary care demand if underlying need has fallen during the pandemic or an underestimate if underlying demand has risen due to the pandemic.

In some cases, this will be missed incidence due to changes in health-seeking behaviour but no change in underlying need, in some cases this may be the consequence of not being able to diagnose via teleconsultations or due to the steer not to use certain diagnostic techniques because of a risk of infection. Note though, that differential diagnosis is possible on the basis of patient history via teleconsultations, and often confirmatory tests are required to confirm diagnosis which have not been possible over the last year in some cases. This means that some patients will have been informally diagnosed and treated but not coded in the data. However, despite these caveats, the 'missed' incidence is likely to result in some patients not being diagnosed and treated for their conditions and is likely to result in deteriorating outcomes for these patients.

Table 8 – 'Missed' incidence in 2020 relative to 2019, across key conditions by pre-existing NCDs and age

	Diabetes (Type 1 & II)		**COPD**		**Atrial Fibrillation**		**CHD**		**Stroke & TIA**		**Heart Failure**	
	Missing	*% of 2019 incidence*	*Missing*	*% of 2019 incidence*	*Missing*	*% of 2019 incidence*	*Missing*	*% of 2019 incidence*	*Missing*	*% of 2019 incidence*	*Missing*	*% of 2019 incidence*
All	39,227	19%	44,216	51%	38,167	26%	20,561	17%	14,322	16%	18,640	20%
By prior NDCs												
0 NCDs prior	16,003	17%	15,046	57%	19,208	39.5%	-72	0%	5,349	19%	5,607	30%
1 NCD prior	8,327	14%	14,672	46%	9,599	19.7%	7,248	16%	2,071	7%	4,348	15%
2+ NCDs prior	14,896	32%	14,498	50%	9,360	18.4%	13,384	35%	6,902	21%	8,686	19%
By age												
Under 50s	9,824	18%	5,467	73%	1,437	25.7%	-998	-11%	1,708	28%	1,925	39%
50 to 69	9,015	10%	20,042	47%	11,586	29.3%	3,906	7%	6,710	22%	5,111	21%
70 and older	19,572	32%	18,669	50%	25,070	24.3%	17,472	30%	5,826	11%	11,551	18%

Source: CPRD data, analysis by the Health Foundation's REAL Centre

The numbers of 'missing' incidence are estimated and expressed as a percentage of 2019 incidence: Chronic Obstructive Pulmonary Disease (COPD, 51%), Atrial Fibrillation (AF, 26%), Heart Failure (HF, 20%), Diabetes (19%), Coronary Heart Disease (CHD, 17%) and Stroke & Transient Ischemic Attack (S&TIA, 16%).

In the case of COPD which has the most significant fall in incidence, this likely reflects that the condition is not able to be diagnosed via teleconsultation and that confirmatory diagnostic spirometry tests have been paused from use to prevent COVID-19 spread. It is unlikely that this reflects a fall in underlying need.

Equally, Atrial Fibrillation (AF) and Heart Failure (HF) incidence declined significantly as well, though in the case of AF this is likely to be due to a higher threshold to seek medical attention and may subsequently result in more severe clinical outcomes for some patients. It has not been possible to get Echocardiograms conducted to confirm the diagnosis during this period, which is likely to be the most significant contributory factor in this 'missing' diagnosis for Heart Failure.

For Diabetes, incidence also declined by 19%, however, this is likely to be a combination of factors including difficulty in diagnosing via a teleconsultation and changes to health-seeking behaviour. Note that Diabetes is often picked up as an incidental finding when patients present for other conditions.

Stroke & TIA had the smallest fall in incidence, relative to other conditions considered. Diagnosis shifted from in-person to telemedicine and evidence suggests that these consultations were not associated with an increased recurrence rate and cardiovascular hospital admissions[58]. As we will see in section C.4 and C.5, this is treated as a medical emergency and appropriate referral to acute services have also seen a smaller fall.

Note also that the incidence of AF, CHD, Stroke & TIA and HF are related – AF and CHD are both risk factors for HF and the risk increases if these conditions go undiagnosed and

[58] Delivering telemedicine consultations for patients with transient ischaemic attack during the COVID-19 pandemic in a comprehensive tertiary stroke centre in the United Kingdom - PubMed (nih.gov)

untreated. Therefore, it is likely that change in incidence in one condition is likely to impact the incidence of other conditions over time. For example, failure to diagnose diabetes and a delay in controlling blood sugar and blood pressure could lead to an increased chance of cardiovascular complications later. The complexity of managing multimorbid patients is important factor here, as is the consequences on one long term condition of treating another- both positive and negative. Most patients have multiple chronic and long-term conditions and the interplay of these and management of multimorbidity does mean that if ‘missing’ one condition likely to be missing another if patient not presenting. Not managing one condition is likely to make the incidence and acuity of another more pronounced when it is subsequently diagnosed.

Missing incidence appear to fall disproportionately in the older age group (70 years and older) for diabetes and coronary heart disease. For stroke and TIA however, more of the missing cases than expected are in the 50 – 69 years group.

Half of the missing atrial fibrillation cases are in those with no prior NCDs (more than might be expected). For coronary heart disease, there are no missing cases in those with no prior NCDs, suggesting more cases have been picked up in this group than previously.

It is not clear whether mitigation through the use of telemedicine has been effective as, people who have a poorer grasp of English, have lower levels of health literacy, suffer from hearing, cognitive or visual impairments[59] or do not have access to technology to assist with remote consultations may have been disproportionately impacted[60].

We have not been able to show how incidence rates have differed by socioeconomic status. due to sample size constraints. However, it seems highly likely that people in the most deprived deciles will suffer most missed diagnoses in absolute terms given the higher prevalence of long-term conditions in these groups. Analysis by the REAL Centre on prevalence of health conditions as well as a recent study[61] show that patients are more often living with multiple chronic conditions[62] in the most deprive deciles of the population, particularly at older age groups (Figure 51).

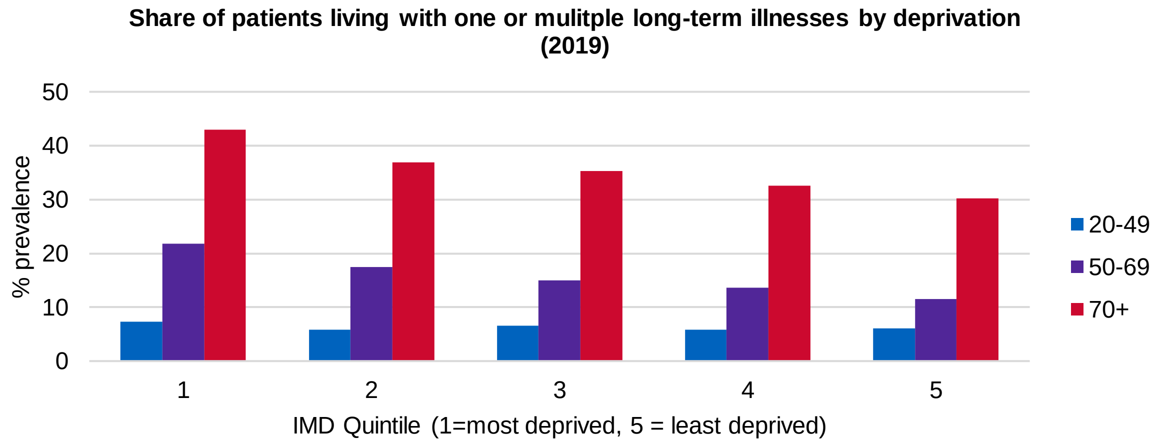
[59] Identifying and managing osteoporosis before and after COVID-19: rise of the remote consultation? | SpringerLink

[60] Health inequalities: the hidden cost of COVID-19 in NHS hospital trusts? - Sophie Coronini-Cronberg, Edward John Maile, Azeem Majeed, 2020 (sagepub.com)

[61] Inequalities in incident and prevalent multimorbidity in England, 2004-19: a population-based, descriptive study (thelancet.com)

[62] 2 or more of the following conditions diagnosed in primary care: Asthma, Atrial fibrillation, Cancer, CHD, COPD, Depression, Anxiety or other neuroses, Diabetes, Heart Failure, Stroke. These diseases are defined in CPRD’s Aurum database on the basis of code lists published here: GitHub - annalhead/CPRD_multimorbidity_codelists

Figure 51 – Share of patients living with one or multiple long-term illnesses by deprivation (2019)



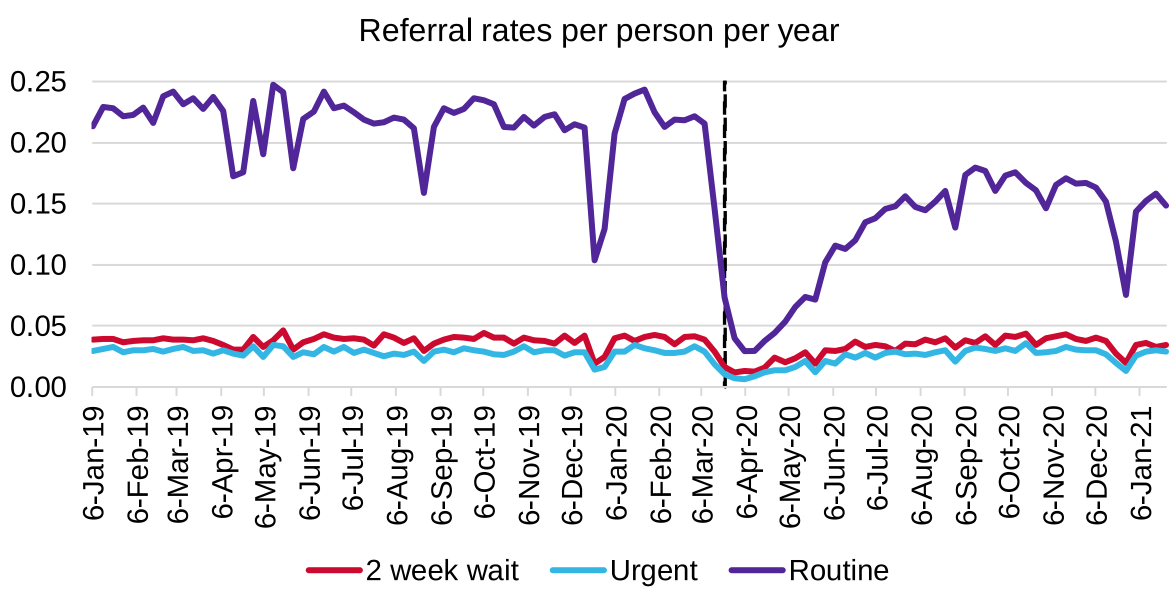
Source: CPRD data, analysis by the Health Foundation's REAL Centre

C.3.2 Referrals from primary to secondary care

Considering referral rates for urgent, two-week wait and routine referrals from the CPRD sample in Figure 52, we see sharp drops in referral rates at the beginning of the pandemic, followed by a slow recovering and falling sharply again over the Christmas period. Routine appointments show the sharpest decline compared to urgent and 2-week wait appointments, while also having the slowest recovery and remain well below their pre-pandemic level by Jan 2021. This suggests that there may be delayed demand into secondary care which has not been realised yet. Data published by NHS Digital also corroborates this trend[63].

We cross-validate this data with referral wait times data in the next section.

Figure 52 – Referral rates, per person per year



Source: CPRD data, analysis by the Health Foundation's REAL Centre

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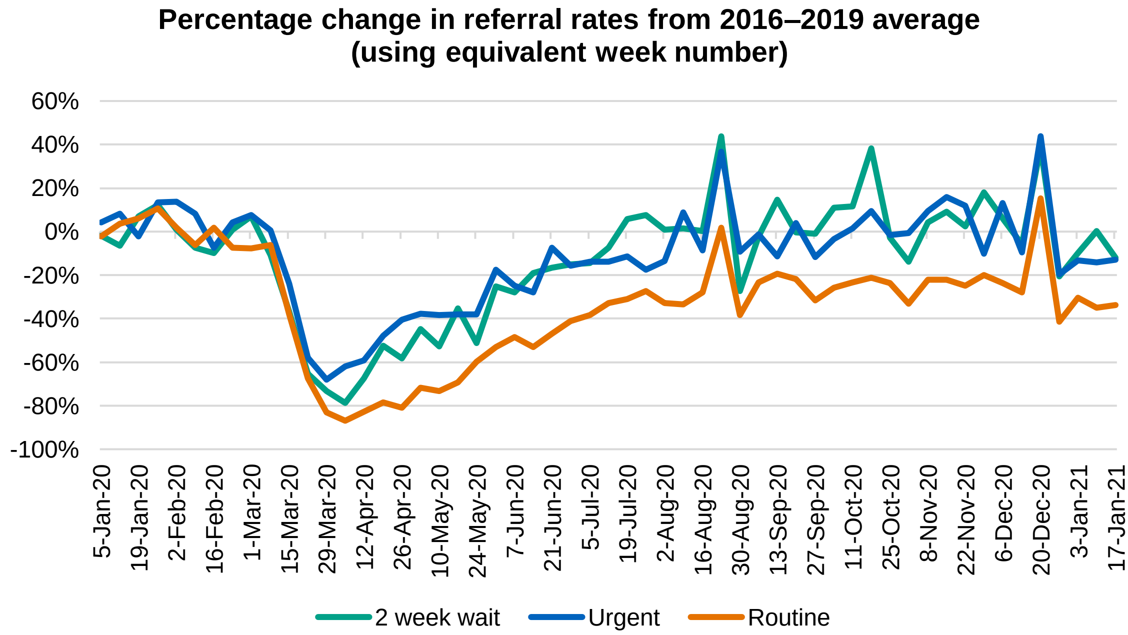
[63] NHS e-Referral Service (e-RS) open data dashboard - NHS Digital

When comparing the percentage change in referral rates to average referral rates between 2016-2019, routine referrals fell by the most, followed by 2 week waits and then urgent referrals between March and April (Figure 53). Two week waits and urgent referral rates recovered and even exceeded the pre-pandemic baseline between August – December and then falling in January 2021. Routine referrals remain below the four-year average – the two spikes in the data in August and December reflect that the late summer bank holiday and Christmas period fell over different weeks in the year.

Figure 53 – Percentage change in referral rates from 2016-19 average



Source: CPRD data, analysis by the Health Foundation's REAL Centre

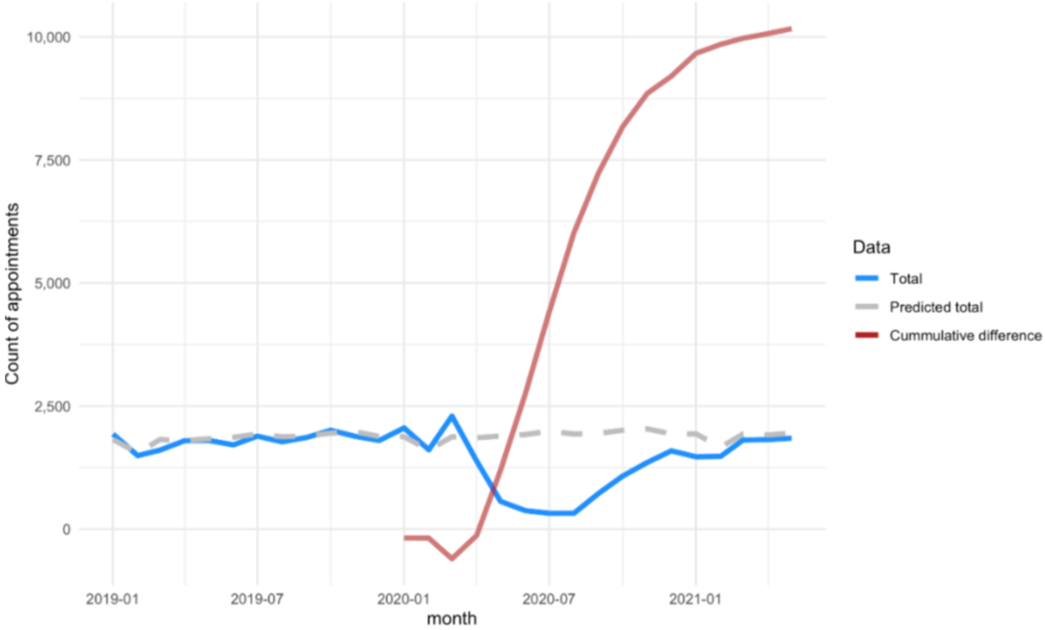
C.3.3 Routine screenings

Next, we consider the total number of appointments for screening pathway to cancer diagnosis to estimate the 'missed' diagnosis over this period from screenings. A predicted number of appointments is estimated[64], to identify the cumulative number of 'missed' appointments as an indication of delayed demand that is likely to present at a later stage and with higher need (Figure 54). For appointments for two month waits from screening to first treatment shows the most sustained fall over the pandemic, with cumulative difference relative to pre-pandemic predicted totals at around 10,000 by May 2021[65].

[64]The predication is a standard linear model with monthly dummies to account for time trend using monthly data from October 2009 onwards to December 2019.

[65] Code for analysis available at https://gitlab.com/tlswatt/cancer-wait-times

Figure 54 - Total and predicted Two Month Wait from a National Screening Service to a first treatment for cancer



Source: NHS England cancer wait times data[66], analysis by the Health Foundation's REAL Centre

Data on the take-up of routine cancer screenings is not yet available or were not published during the pandemic due to data quality concerns so we cannot draw complete conclusions on the impact of COVID-19 on screenings and the subsequent impact on treatment and outcomes. However, Breast Cancer Now estimates that around 966,000 women missed their mammograms in England due to breast screening programmes being paused in March 2020[67]. Furthermore, Bowel Cancer UK estimate that one million bowel cancer screening invitations have been delayed in England, with a backlog of thousands waiting for further investigation[68].

C.4 Impact of COVID-19 on Patient Wait Times

C.4.1 **Literature Overview**

The number of people in the UK estimated to be on NHS waiting lists for some type of elective or semi-elective health care has increased as a result of the COVID-19 pandemic, with the greatest impacts in descending order being felt in paediatrics, non-cancer elective surgery, followed by cancer surgery and emergency surgery[69]. A modelling-based analysis using data from May 2021 and published in August 2021 estimate that 65-80% of the approximately 7 million 'missing' patients return to access NHS care over the next year. They estimate that the NHS capacity for 2021 and 2022 compared to 2019 is 90-105% and from 2023-25 capacity relative to 2019 is 95-110%.Under these scenarios, waiting lists could increase to just under 4 million to 15- million by the end of 2025, depending on the scenario[70]. Since that paper was published, the UK has had a second wave of infections and two further national lockdowns in addition to other on-going non-pharmaceutical interventions. Between March and December 2020, the fall in hospital admissions for in-patient elective care was around 2.9 million (34.4%)

[66] Statistics » Cancer Waiting Times (england.nhs.uk) Statistics » Cancer Waiting Times (england.nhs.uk)
[67] Almost one million women in UK miss vital breast screening due to COVID-19 | Breast Cancer Now
[68] A million missed opportunities for bowel cancer screening | Bowel Cancer UK
[69] The impact of COVID-19 on anaesthesia and critical care services in the UK: a serial service evaluation* - Kursumovic - - Anaesthesia - Wiley Online Library
[70] Could NHS waiting lists really reach 13 million? - Institute For Fiscal Studies - IFS

compared to figures in 2019[71]. There was also a further reduction of out-patient appointments of 17.1 million (21.8%) during the same time period compared to 2019[72].

C.4.2 **Referral to Treatment Wait Times in Elective Care**

Health system adaptations during the pandemic have resulted in increasing wait times for patients across various pathways and clinical specialties. We have already seen in the CPRD data on referral rates that all referrals fell sharply in March 2020, with routine referrals having the sharpest fall, and slowest recovery. In this section, we analyse the monthly Referral to Treatment (RTT) Wait Times data published by NHS England[46] to understand how long people who have been referred for elective non-urgent treatment are waiting to be treated. Note that with this data we can only observe exact duration for patients who have been waiting for up to 52 weeks. Specific waiting times for cancer referral and treatment are published separately and discussed in the next section.

Data are available at a provider and CCG level across 19 specialties. Patients can be broadly grouped into two main categories – incomplete pathways or completed pathways. Patients that are still waiting for treatment in a given month fall in the incomplete pathway and patients whose pathway has come to end in a given month (either because they have been admitted for treatment or did not require inpatient admission) fall into completed pathways.

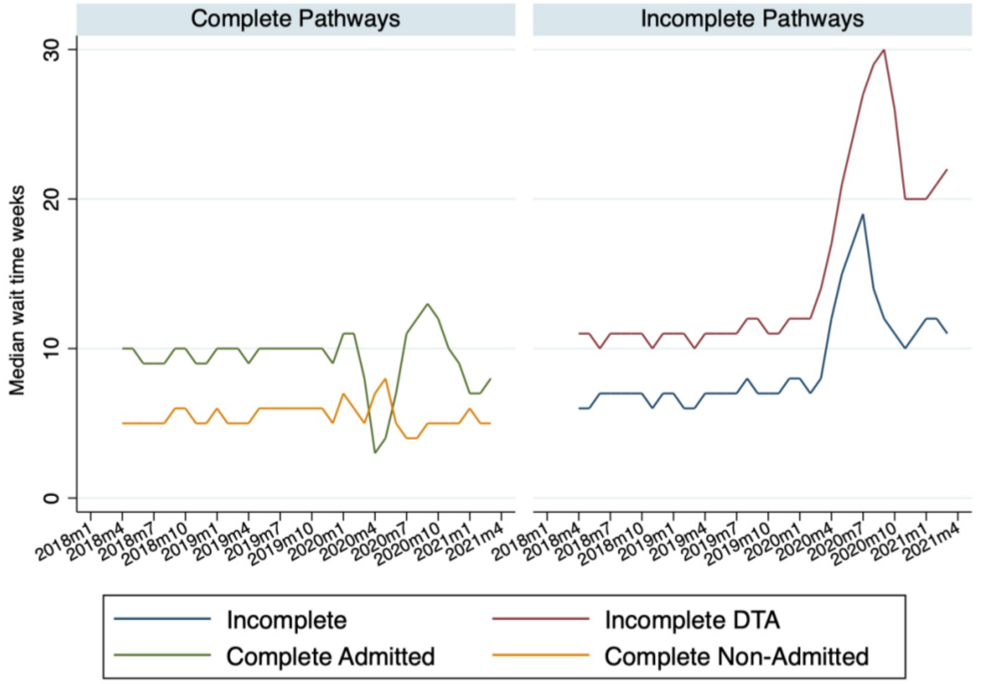
We consider the following key pathways in these two broad categories in our analysis:

1. **Incomplete pathway** – patients who are still waiting to be seen in the given month are included in this pathway
2. **Incomplete DTA pathway** – patients who are still waiting to be seen in the given month where the Decision to Admit (DTA) has already been taken. This is a subset of the incomplete pathway
3. **Admitted pathway** – patients whose treatment started during the period and involved admission to hospital. These are also often referred to as inpatient waiting times. They include the complete time waited from referral until start of inpatient treatment.
4. **Non-admitted** – Non-admitted pathways are the waiting times for patients whose wait ended during the period for reasons other than inpatient or day case admission for treatment. These are also often referred to as outpatient waiting times.

Figure 55 shows the median wait times by pathway. Incomplete waiting times refer to those on the waiting list at the end of a given month, whilst complete pathways are for those whose waiting had been stopped in month. Median wait times rose across the incomplete pathways sharply, with a sharper increase in wait times occurring for incomplete pathways where the decision to admit had already been taken, as urgent appointments were prioritised and those with less serious conditions, which make up most of the incomplete appointments, were deprioritised. Admitted wait times appear to have fallen after the pandemic but this reflects the fact that all non-urgent appointments were cancelled for a period at the start of the pandemic the pandemic and therefore only patients with more serious and urgent conditions are likely to have been admitted.

[71] BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)
[72] BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)

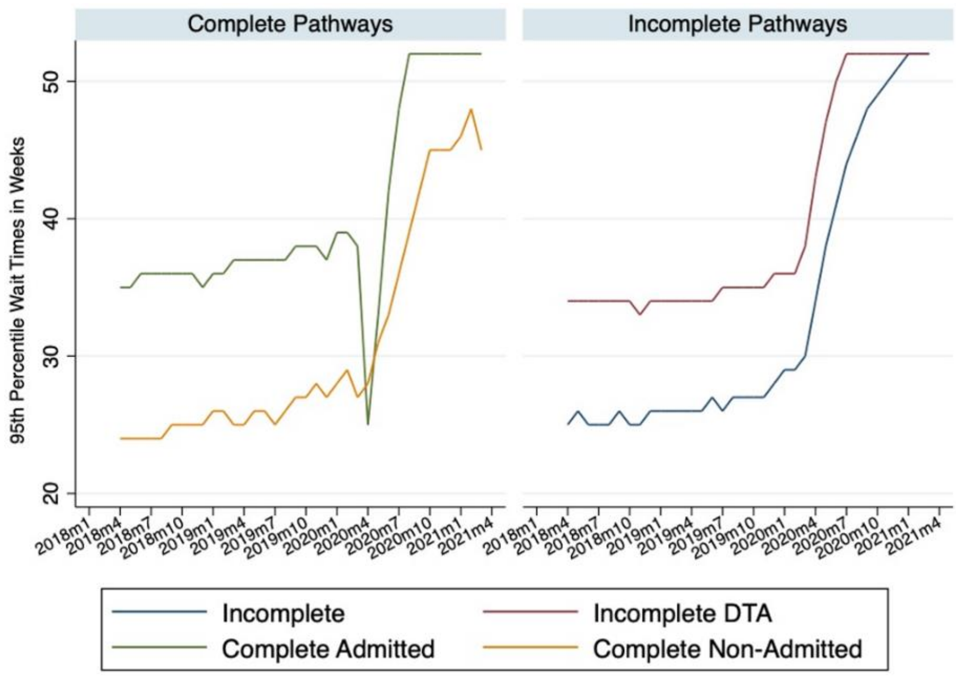
Figure 55 – Median wait times by pathway



Source: NHSE RTT monthly data, analysis by DHSC

When looking at impacts across the distribution, waiting times have increased at the 'long-wait' end of the distribution, whilst median waits have increased by a much smaller amount. For example, looking at the 95th percentile of the distributions the increase in wait times for incomplete pathways are sharper than for those at the median. This may be skewed by the right censoring the data, as we cannot observe whether wait times continue to rise sharply after 52 weeks or begin to decline (Figure 56).

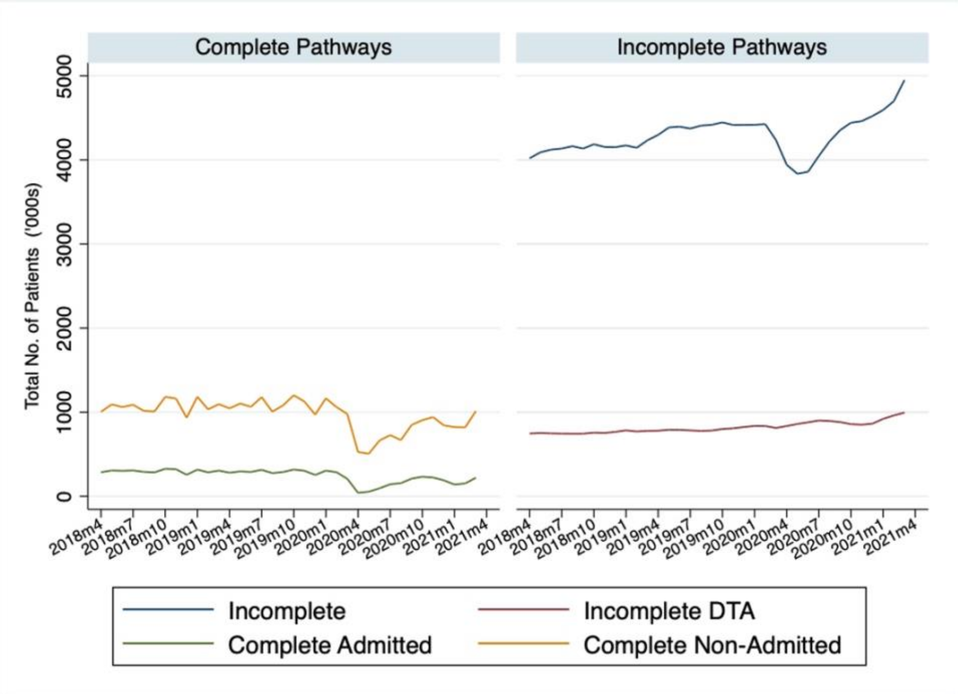
Figure 56 – Wait times at the 95th percentile of the distribution



Source: NHSE RTT monthly data, analysis by DHSC

The incomplete pathways refer to the stock of patients still waiting and consist of a) those who will need treatment (DTA) and b) those who either don't need admitted treatment or are too early in their pathway to have confirmed diagnosis. There were almost 5 million incomplete pathways by the end of April 2021 (Figure 57), of which around 1 million had a DTA[73]. Those who have had their service delivered (admitted and outpatients) number approximately 1.5m per month. Note that our CPRD data suggests that there has been a fall in the referral rates over the last year, so we are likely to see a further increase in patients being referred into secondary care.

Figure 57 – Volumes of patients by pathway



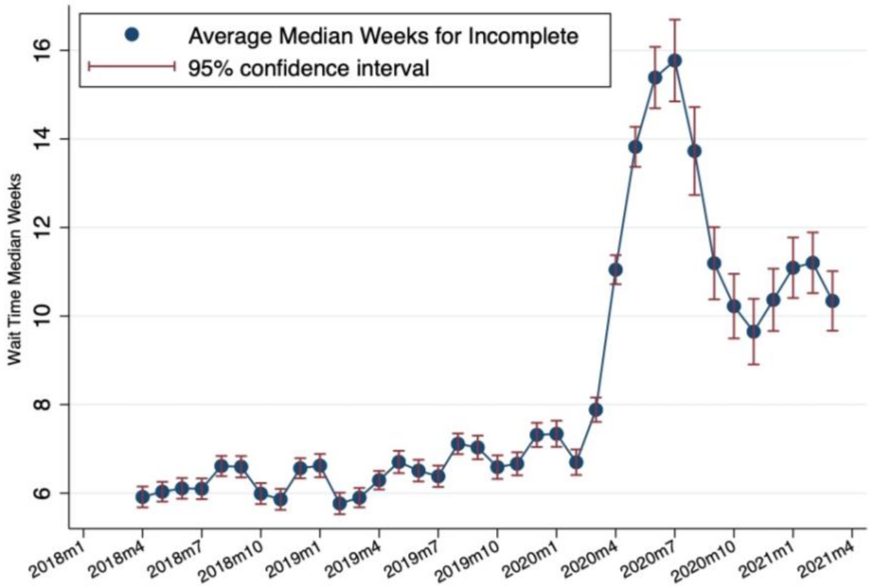
Source: NHSE RTT monthly data, analysis by DHSC

C.4.2.1 *Variation in impacts across trusts*

Looking at the variation in provider level data (trusts), we see that the variation around the median and the 95th percentiles of wait times, which has been relatively constant over time, has increased across trusts since the start of the pandemic. The increasing variation in wait times between trusts suggests that pandemic has impacted patients served by different trusts to different degrees (Figure 58, Figure 59).

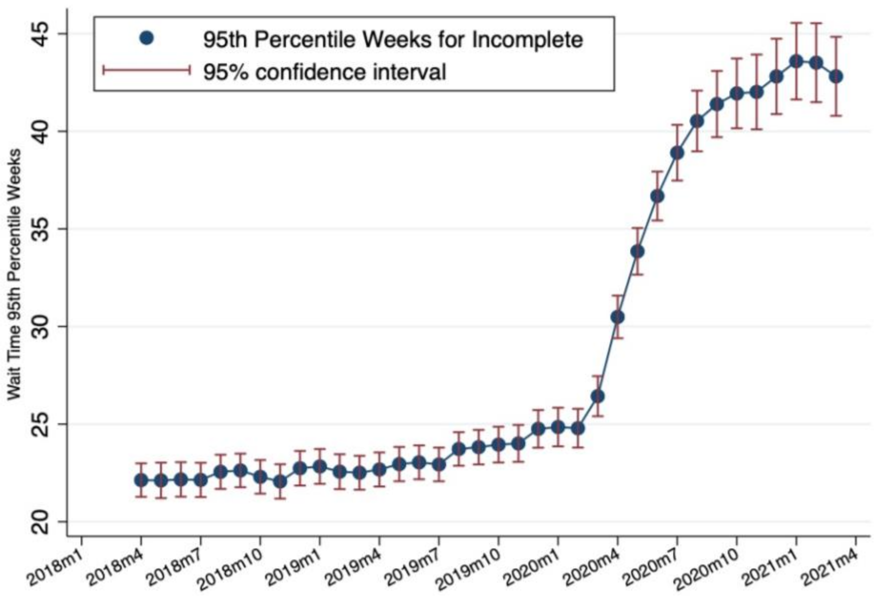
[73] RTT-statistical-press-notice-Jun21-PDF-410K-69343.pdf (england.nhs.uk)

Figure 58 – Median wait times for incomplete pathways, variation by trust



Source: NHSE RTT monthly data, analysis by DHSC

Figure 59 – 95th percentile wait times for incomplete pathways, variation by trust

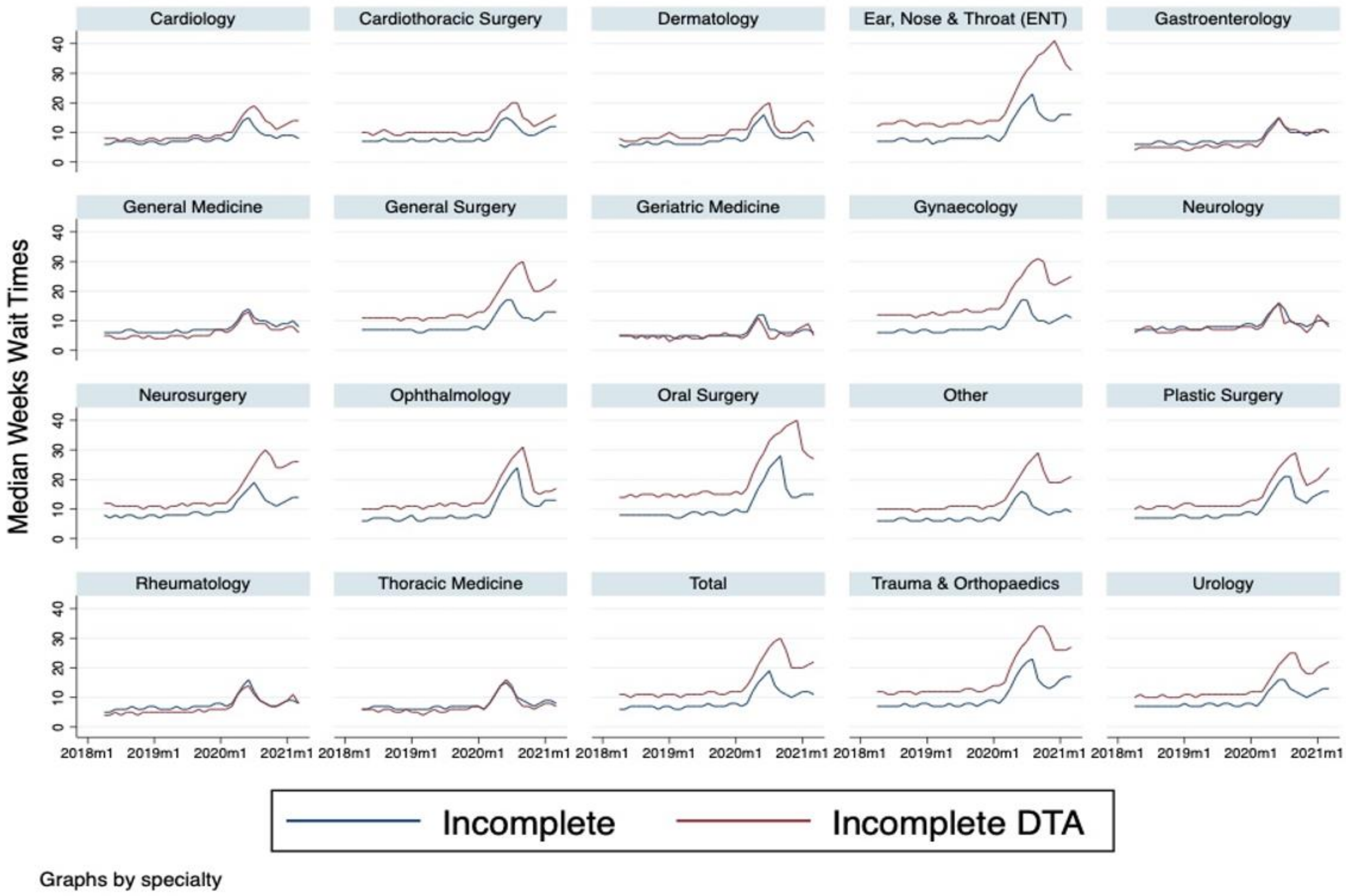


Source: NHSE RTT monthly data, analysis by DHSC

C.4.2.2 *Variation in impacts across specialties*

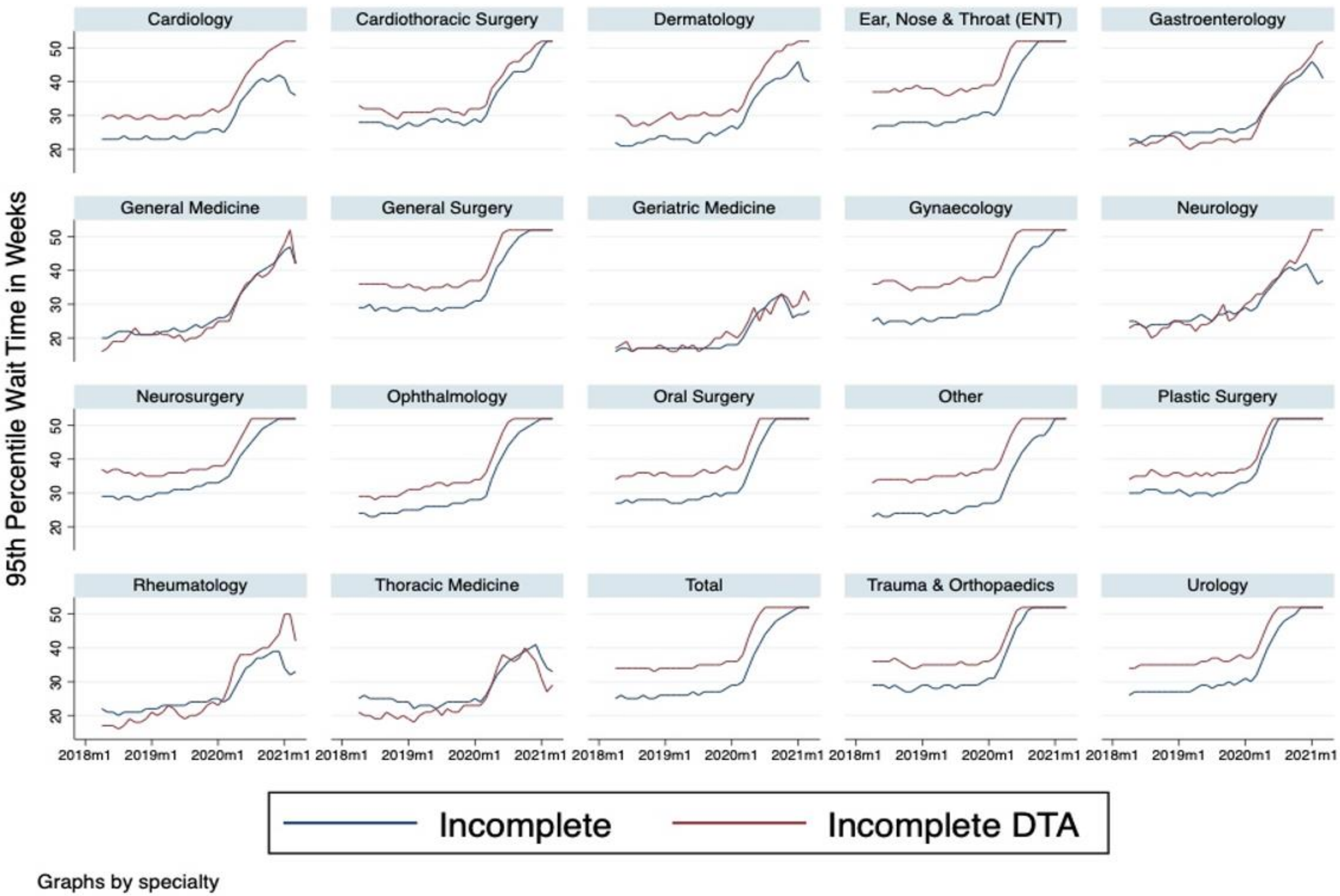
Next, we consider the variation in wait times and across pathways by clinical specialty, and there is considerable variation in the median wait times by speciality (Figure 60, Figure 61). For example, impact on median wait times for Neurology and Cardiology is relatively small when compared to the impact to wait times in Trauma & Orthopaedics, ENT and Oral Surgery. However, when you look at the 95th percentile we see that as with aggregate pathways, long-waits have increased to a much greater degree relative to median waits within specialties as well. For example, at the 95th percentile wait times have increased significantly more than at the median within specialties. Thus, we see significant variation between specialties but also an increase in variation within specialties.

Figure 60 – Median wait times by pathway and specialty



Source: NHSE RTT monthly data, analysis by DHSC

Figure 61 – 95th percentile wait times by pathway and specialty



Source: NHSE RTT monthly data, analysis by DHSC

C.5 Impact on Hospital Activity

This section has been developed in collaboration with the Institute for Fiscal Studies (IFS) and Imperial College London[74]. We first use data from Understand Society to briefly discuss patient behaviour regarding inpatient and outpatient services. Next, using patient level data from Hospital Episodes Statistics (HES)[75] up to February 2021, this section updates the analysis of recently published IFS work[76] setting out the impact on hospital activity in NHS England over the last year. Note that, as with primary care, this analysis shows the net impact on hospital activity driven by both patient healthy and health-seeking behaviour, provider behaviours and health system adaptations to respond to the pandemic.

This analysis focuses on the 12-month period from March 2020 to February 2021 and compares to the previous 12-month period, it therefore assumes that there were no pre-pandemic trends in hospital activity. This approach was adopted for ease of interpretation, however, if there were increasing trends pre-pandemic, then comparison with 2019 as a baseline would lead to an underestimate of the impact of the pandemic, although it would likely be small in magnitude due to the size of the COVID shock. Across this section, where possible, we present two measures of impact of the pandemic on hospital activity. First, we use absolute volumes in care per 1,000 population as a measure of impact per capita of the relevant population. This adjusts for the variation in the size of the population, allowing comparison of falls in activity for a given population. We also present the percentage change in activity which adjusts for prior need across populations to reflect impacts across groups, and to show which groups are most disproportionately impacted.

C.5.1 Patient behaviour regarding inpatient and outpatient services

Much of the impact of COVID-19 on elective care has been as a consequence of the health service needing to prioritise urgent COVID-19 care over non-urgent treatments whilst dealing with increased staff absence due to illness and more demanding infection control protocols. However, in some cases patients may have delayed their own care. Data from Understanding Society shows that this is a small, but significant element of the total impact.

Figure 62 and Figure 63 show trends in patient access for NHS Inpatient and Outpatient services in 2019 relative to April-September 2020. It shows the number of people accessing services increased over the period but remained below 2019 levels. The number of people not accessing services can be divided into two groups: a) those who needed services but did not receive them and b) those who did not require services. Those who did not require services increased on 2019 and remained stable at around 90%. Those who did require services but did not access them fell sharply compared to 2019. The chart also sets out whether those who

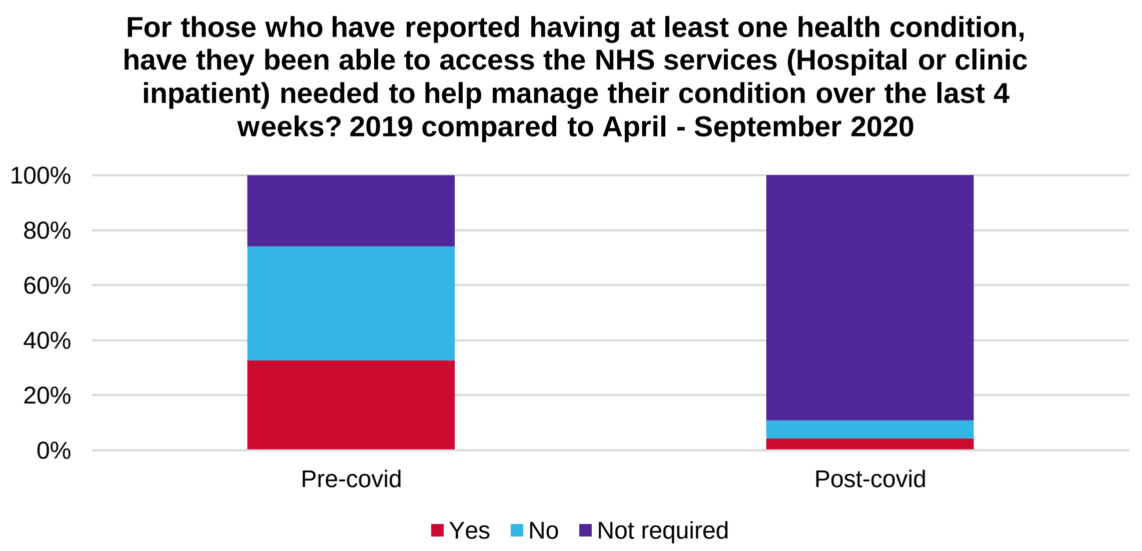
[74] This research was funded by the Economic and Social Research Council (ESRC), as part of UK Research and Innovation's rapid response to COVID-19 (ES/V009508/1). Co-funding from the ESRC-funded Centre for the Microeconomic Analysis of Public Policy (ES/T014334/1) is gratefully acknowledged by IFS researchers. The analysis was carried out at the Dr Foster Unit at Imperial College London, which is funded through a research grant from Dr Foster Intelligence (a wholly owned subsidiary of Telstra Health). The Imperial College London researchers are also funded through the National Institute for Health Research (NIHR) Patient Safety Translational Research Centre, Imperial College London, the NIHR under the Applied Health Research programme for North West London and the NIHR Imperial Biomedical Research Centre. The views expressed in this publication are those of the authors and not necessarily those of the National Health Service (NHS) or the NIHR.

[75] This work used data provided by patients and collected by the NHS as part of its care and support. The authors have approval from the Secretary of State and the Health Research Authority under Regulation 5 of the Health Service (Control of Patient Information) Regulations 2002 to hold confidential data and analyse them for research purposes (CAG ref 15/CAG/0005). They have approval to use them for research and measuring quality of delivery of healthcare, including for this analysis, from the London – South East Ethics Committee (REC ref 20/LO/0611).

[76] BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)

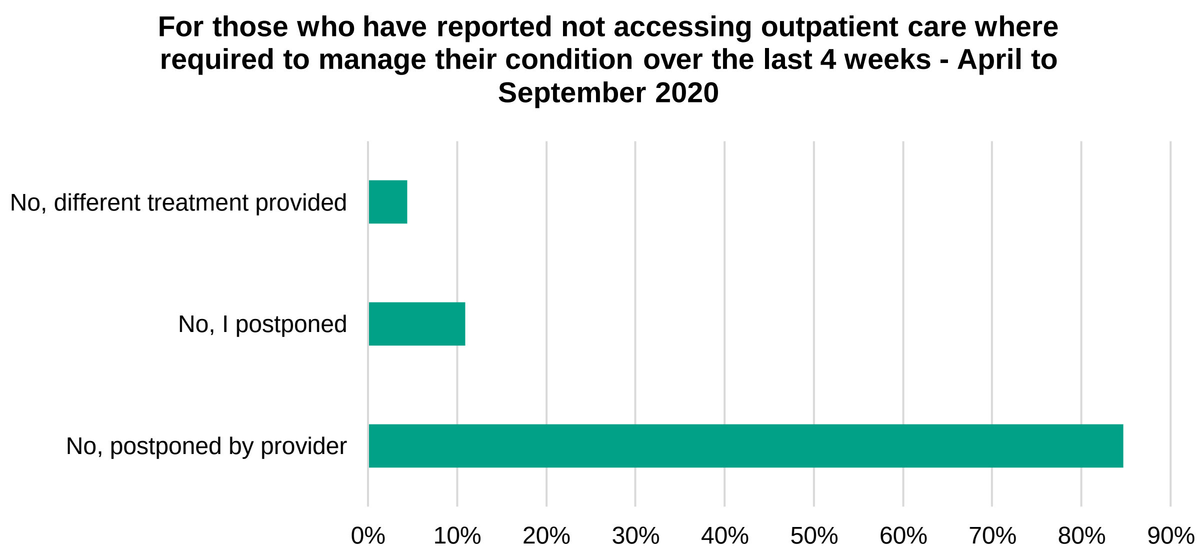
needed services did not access them because of a) changes to their own behaviour (i.e., they postponed or cancelled appointments) or b) as a result of provider/system-wide behaviour.

Figure 62 – Access of NHS inpatient services in 2019 relative to April-September 2020, national



Source: Understanding Society, data analysis by DHSC

Figure 63 - Why have respondents been unable to access outpatient services during the pandemic?



Source: Understanding Society, data analysis by DHSC

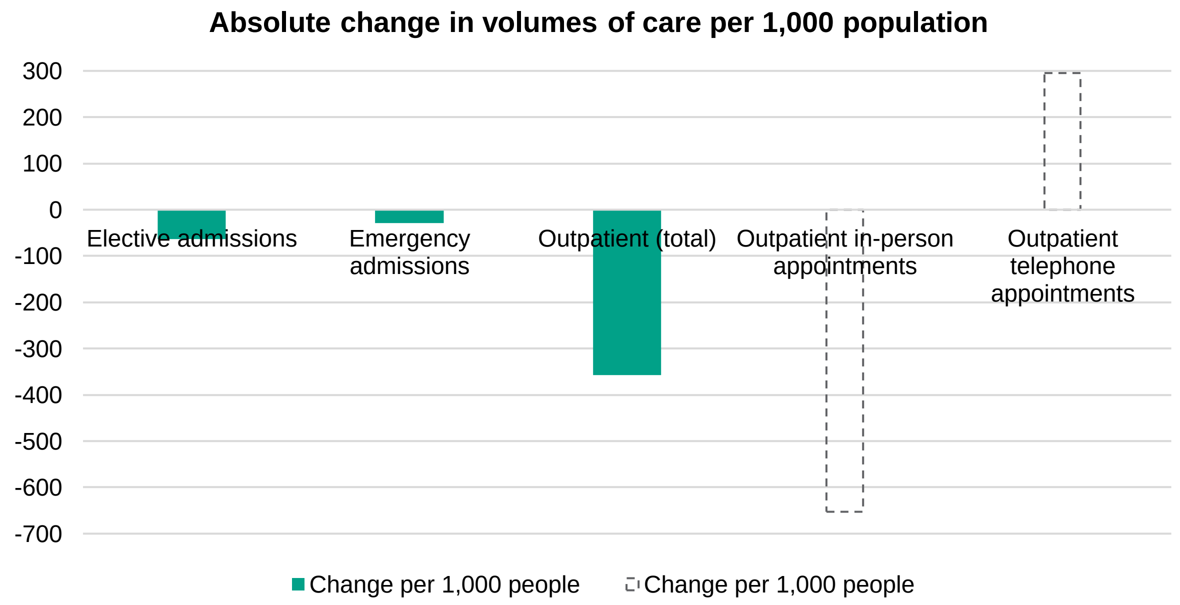
Understanding Society data for access to inpatient services for which most of the care cannot take place online, of those who did not access care, the majority (79% in April 2020) reported this as a result of their appointment being postponed or cancelled by November 2020, that number is estimated to have risen to around 4.5 million including 2.3 million waiting for surgical care, with the number of patients who had waited more than 52 weeks for planned surgery increasing from just over 1300 in November 2019 to over 436,000 in March 2021. This has now fallen to just over 300,000 due to a reduction in demand during the pandemic resulting in fewer inpatients entering the service over 52 weeks It is noted that the pandemic has not only resulted in the postponement of elective procedures, but also increased the time spent on the preparations involved with those that have been carried out due to infection control measures. Delays to surgical care may affect healthcare outcomes and accessibility going forward.

C.5.2 Overall changes in hospital use

In this section we consider the changes in the number of elective (planned) and emergency inpatient admissions, and outpatient appointments. Elective inpatient admissions are those where the decision to admit was made in advance of the admission itself (for example, admissions for surgery following a period on a waiting list). Emergency inpatient admissions are unplanned admissions (for example, patients who are admitted following an attendance at an Accident and Emergency department).

The changes in volumes of care per 1,000 population show a fall in activity across all types of care, with the largest fall in in-person outpatient care (-653 per 1,000), followed by elective (-63 per 1,000) and emergency care (-29 per 1,000). The per-capita increase in outpatient telephone appointments (295 per 1,000) only offsets the fall in outpatient in-person appointments by around a half. We cannot determine whether patient outcomes from telephone consultations differ from in-person consultations and therefore cannot determine if there was a quality loss

Figure 64 – Absolute change in volumes of care per 1,000 population by elective, outpatient, and emergency



Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London

Table 9 – Changes in national volumes of care between March 2020 and Feb 2021 compared to previous 12 months

	Absolute change (COVID-19 patients not included)	**Change per 1,000 people**	**% change**
Elective admissions	- 3,536,000	- 62.8	-34.9%
Emergency admissions	- 1,625,000	- 28.9	-23.9%
Outpatient in-person appointments	- 36,772,000	- 653.3	-40.3%
Outpatient telephone appointments	16,616,000	295.2	470.8%

Source: HES data, analysis by the Institute for Fiscal Studies and Imperial College London

C.5.2.1 *Impact on emergency care*

Next, we consider the impact on emergency care during the pandemic building on insights from the literature and using patient-level data from the Emergency Care Dataset (ECDS).

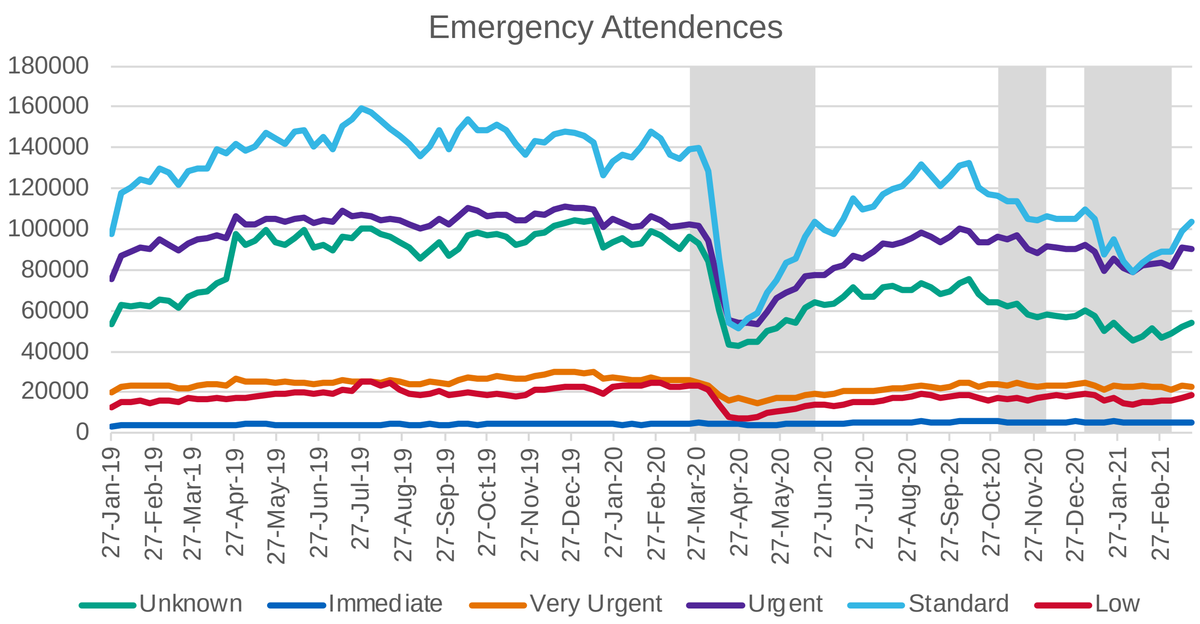
During the first months of lockdown (March and April), attendance at accident and emergency departments, and for emergency admissions fell sharply across the UK[77], suggesting that patients were no longer attending even if they needed urgent medical attention with specific concerns for children and families[78, 79]. In April 2020, visits to emergency departments in England fell by 57% compared to levels reported in April 2019 with the total number of visits being the lowest since data collection began in 2010[80]. A Scottish study[81] reported that the attendances to accident and emergency departments, and emergency hospital admissions in Scotland also fell sharply (40.7% and 25.8% respectively), following the World Health Organisation's announcement of a pandemic, and that they continued to fall until Scotland entered into lockdown. The drop in accident and emergency attendances was also reported by The Health Foundation in relation to England from February to April 2020 and by NHS England's statistical commentary in March 2020[82].

There is evidence that attendances started to increase from May 2020 (with emergency attendances for gastrointestinal and cardiac conditions above the seasonal average)[83], and that August 2020 saw the fourth consecutive month of increase in demand with 32,150 patients waiting more than 4 hours on a trolley up from 20,928 in July 2020[84]. However, by December 2020, the numbers of patients waiting 12 hours or more to be admitted was 3745, which is an increase of 60% from December 2019[85].

Using data from the ECDS, we see that A&E arrivals fell to below 50% during April before rising in the summer (but never back to pre-pandemic levels) before declining again in the autumn. Note that this data includes any COVID-19 patients arriving at A&E. Acuity is a measure of the urgency of severity of the condition with which the patient has presented. Considering the data by acuity, we see fewer patients arriving of all acuity types except the highest level (immediate care).

[77] BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)
[78] Health inequalities: the hidden cost of COVID-19 in NHS hospital trusts? - Sophie Coronini-Cronberg, Edward John Maile, Azeem Majeed, 2020 (sagepub.com)
[79] Impact of COVID-19 on accident and emergency attendances and emergency and planned hospital admissions in Scotland: an interrupted time-series analysis (sagepub.com)
[80] Covid-19: Urgent cancer referrals fall by 60%, showing “brutal” impact of pandemic | The BMJ
[81] Impact of COVID-19 on accident and emergency attendances and emergency and planned hospital admissions in Scotland: an interrupted time-series analysis (sagepub.com)
[82] Impact of COVID-19 on accident and emergency attendances and emergency and planned hospital admissions in Scotland: an interrupted time-series analysis (sagepub.com)
[83] The Wider Impacts of the Coronavirus Pandemic on the NHS* - Propper - 2020 - Fiscal Studies - Wiley Online Library
[84] Covid-19: Waiting times in England reach record highs | The BMJ
[85] How is the pandemic affecting non-covid services? - ProQuest

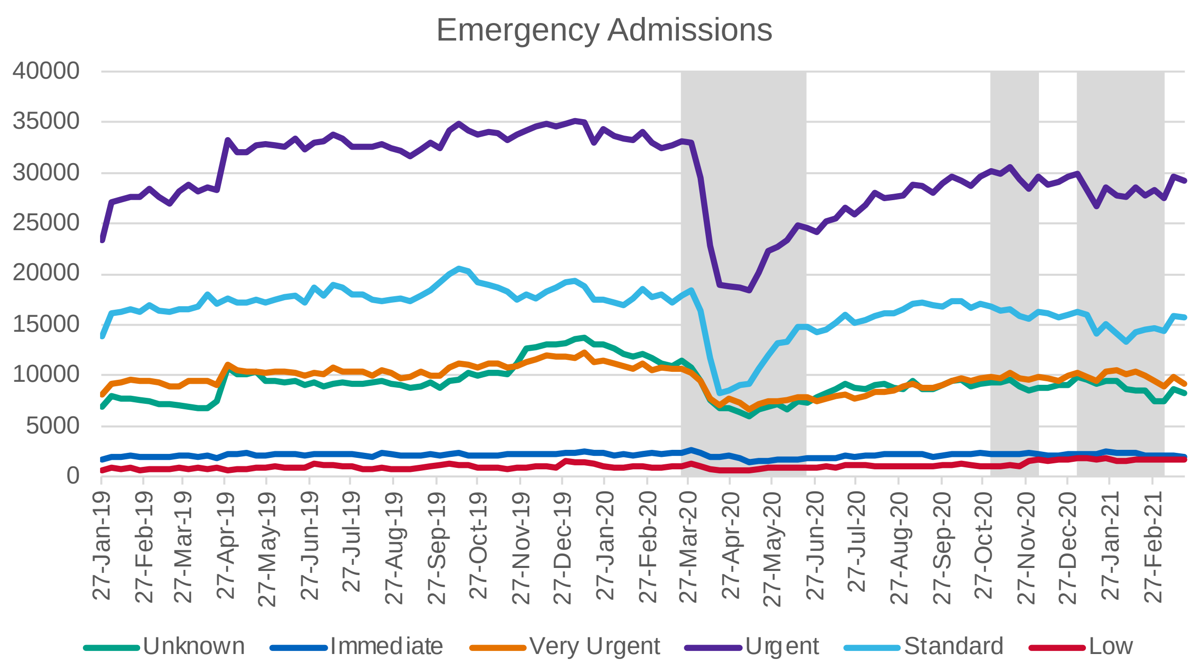
Figure 65 – Number of A&E attendances by acuity



Source: ECDS data, analysis by the Institute for Fiscal Studies and Imperial College London

Looking at admissions from A&E attendances by acuity we see the number of patients being admitted into A&E varies by acuity, with the greatest falls in numbers of admissions to hospital from A&E being for acuity levels of urgent standard.

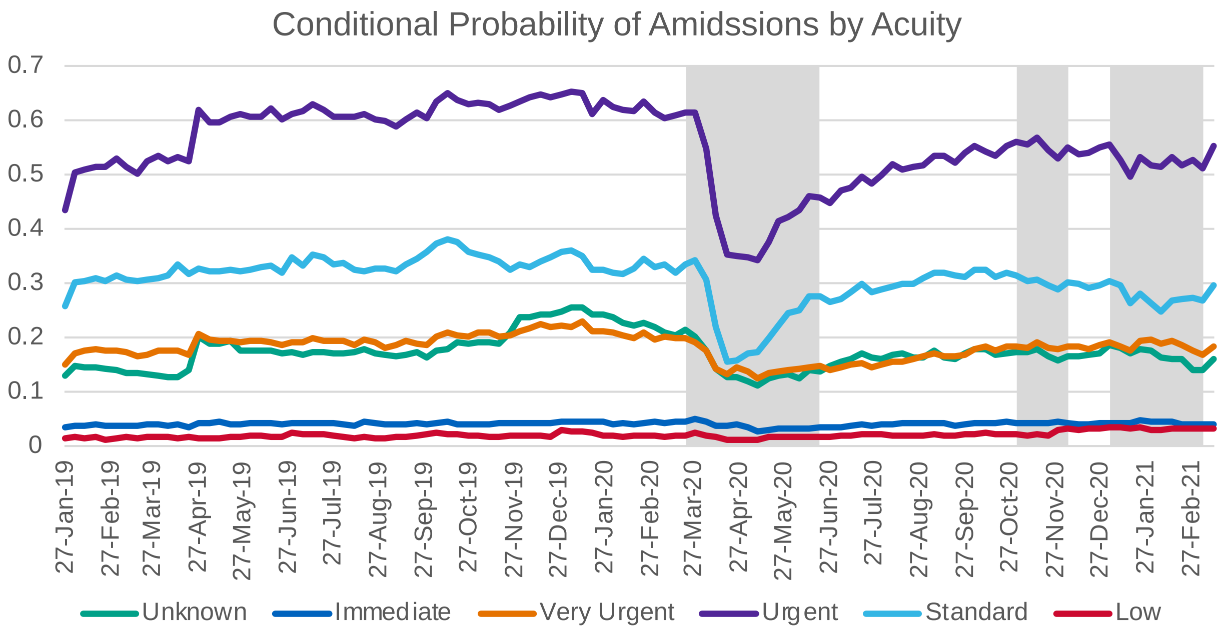
Figure 66 – Number of A&E admissions to A&E by acuity



Source: ECDS data, analysis by the Institute for Fiscal Studies and Imperial College London

Considering the conditional probability of admission given arrival at A&E we see that the probability for the most acute patients (including immediate care patients) fell during the first lockdown and for urgent and very urgent patients has remained below its pre-pandemic level ever since. Conditional probability of admitting lower acuity patients has increased slightly after the pandemic, potentially reflecting a more severe average case mix within the lower acuity categories.

Figure 67 - Conditional Probability of Admissions by Acuity

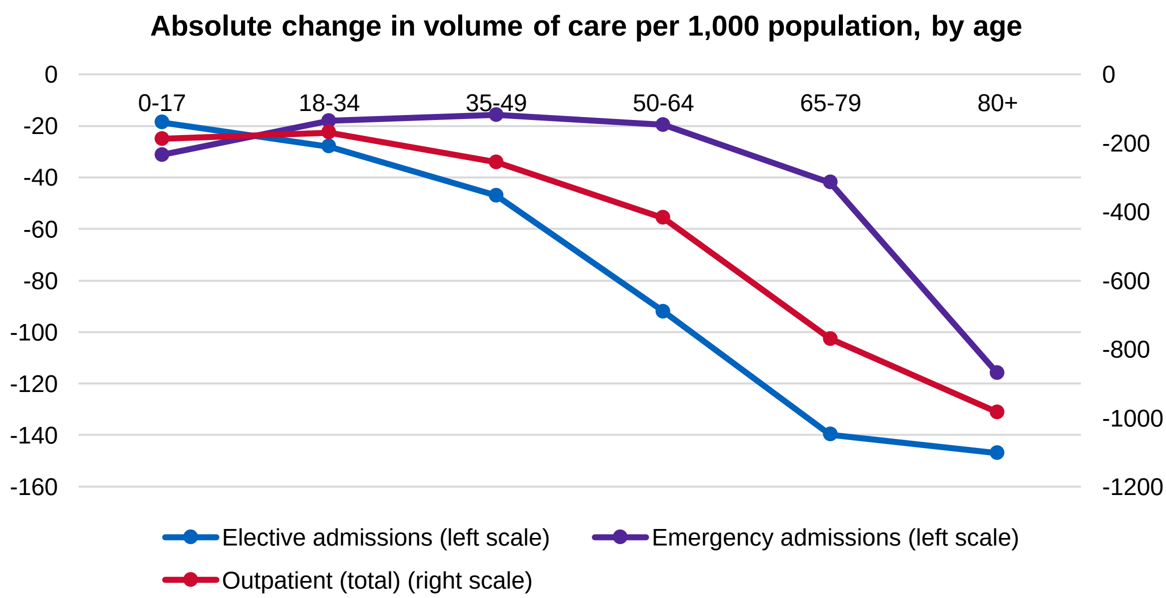


Source: ECDS data, analysis by the Institute for Fiscal Studies and Imperial College London

C.5.2.2 *Impact on hospital activity by age*

Considering the volume of care across the different types of care by age groups relative to the previous 12-month period, we see that there is a greater fall in volume of care per 1,000 population for older age groups, with the most significant trend in elective admissions. The number of outpatient appointments only falls substantially for those aged 65 and above who may not be able to access telephone appointments as easily.

Figure 68 - Absolute change in volumes of care per 1,000 population, by age



Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London

However, it is important to note that this in part reflects the fact that older groups have the highest need and use health care the most. When looking at percentage changes across age groups (Table 9), the biggest impact is on the youngest, between 0 -17 years of age. In emergency care, this is likely to reflect a fall in demand during period where children were off school while in elective care the fall is likely to reflect the cancellation or postponement of routine care to respond to the pandemic.

Table 10 – Percentage change in hospital activity by age

	% Change in activity				
Age group	**Elective**	**Emergency**	**Outpatient (total)**	*Outpatient (In person)*	*Outpatient (Telephone)*
0-17	-38%	-40%	-23%	*-42%*	*478%*
18-34	-37%	-24%	-14%	*-30%*	*490%*
35-49	-36%	-20%	-19%	*-39%*	*500%*
50-64	-36%	-19%	-22%	*-43%*	*498%*
65-79	-33%	-21%	-25%	*-45%*	*436%*
80+	-35%	-23%	-26%	*-43%*	*369%*

Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London

We know from the literature that disruptions to health care delivery are most likely to impact older individuals as they tend to be greater users of hospital care[86, 87, 88], and so any delays to elective procedures will likely impact them more than other age groups. This was also seen in an Italian study[89] that looked at a department in radiation oncology for a hospital in the Apulia region, which found that some elderly patients had asked to delay treatment, thought to be because the mortality rate for COVID-19 in Italy was higher for people aged 80 and older at the time[90]. Previous patterns would also suggest that older individuals and those living in more deprived areas are most likely to be affected by disruptions to healthcare which could potentially exacerbate existing health inequalities[91] (e.g., between April and June 2017, 517,000 patients over 70 were admitted for elective care and 184,000 patients in their 30's)[92].

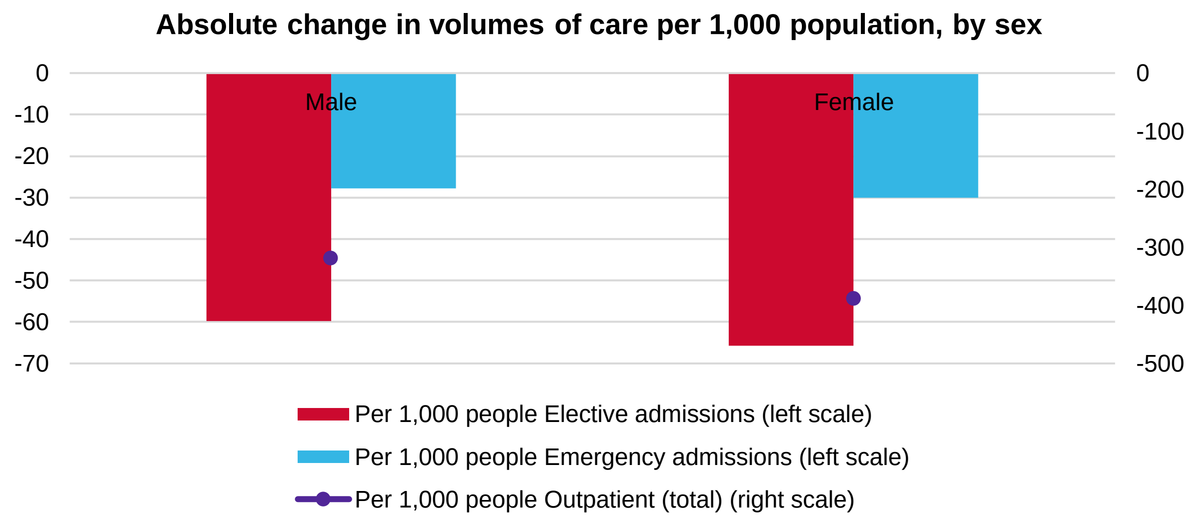
Several papers also report that when the World Health Organisation announced that the SARS-CoV-2 was now a global pandemic, admissions to emergency care including accident and emergency departments fell. This fall continued when the UK Government announced a nationwide lockdown on the 17th March 2020 until the week ending 19th April 2020. A study in Scotland found that during this period, under 15's and children were slower to recover for accident and emergency attendances and emergency hospital admission but were the quickest to recover in terms of planned hospital admissions[93].

[86] Health inequalities: the hidden cost of COVID-19 in NHS hospital trusts? - Sophie Coronini-Cronberg, Edward John Maile, Azeem Majeed, 2020 (sagepub.com)
[87] The Wider Impacts of the Coronavirus Pandemic on the NHS* - C. Propper, G. Stoye and B. Zaranko - 2020 - Fiscal Studies - Wiley Online Library
[88] BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)
[89] Southern Italy: How the Availability of Radiation Therapy, Patient Outcomes, and Risk to Health Care Providers Have Changed During the Coronavirus Disease 2019 Pandemic - ScienceDirect
[90] Southern Italy: How the Availability of Radiation Therapy, Patient Outcomes, and Risk to Health Care Providers Have Changed During the Coronavirus Disease 2019 Pandemic - ScienceDirect
[91] The Wider Impacts of the Coronavirus Pandemic on the NHS* - C. Propper, G. Stoye and B.Zaranko - 2020 - Fiscal Studies - Wiley Online Library
[92] The Wider Impacts of the Coronavirus Pandemic on the NHS* - C. Propper, G. Stoye and B.Zaranko - 2020 - Fiscal Studies - Wiley Online Library
[93] Impact of COVID-19 on accident and emergency attendances and emergency and planned hospital admissions in Scotland: an interrupted time-series analysis (sagepub.com)

C.5.2.3 *Impact on hospital activity by sex*

Splitting the data by sex, we see that across all three forms of hospital care, females had larger reductions per capita than male. This may in part reflect that females are greater users of the health system than males. Note that in this analysis we exclude maternity inpatient admissions, although maternity-related outpatient appointments are included.

Figure 69 – Absolute change in volumes of care per 1,000 population, by sex



Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London

Similarly, when looking at percentage change in hospital activity by sex we see that elective admissions fell more for females compared to males. However, outpatient activity has declined further for males than females, but this may reflect the fact that outpatient data includes maternity-related appointments.

Table 11 – Percentage change in hospital activity by sex

	% Change in hospital activity				
	Elective admissions	**Emergency admissions**	**Outpatient (total)**	*Outpatient (In person)*	*Outpatient (Telephone)*
Male	-33.9%	-23.9%	-22.2%	*-42%*	*465%*
Female	-35.9%	-24.0%	-20.3%	*-38%*	*476%*

Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London

Considering the impact on maternity and neo-natal care, a recent studying using the data from the UK Obstetric Surveillance System national cohort shows that there were 8,330 pregnant women notified to the study during the period covered by the most recent analysis. 3,371 pregnant women were admitted to hospital with symptomatic, as opposed to asymptomatic, COVID-19 during pregnancy, of whom 3,036 women have given birth[94].

In an observational study of this type, it is not possible to state that any particular pre-term birth has been caused by COVID-19, but the results show that of the 3,036 pregnant women admitted with symptomatic COVID-19 who have given birth, 650 (21%) gave birth preterm.

[94] Impact of SARS-CoV-2 variant on the severity of maternal infection and perinatal outcomes: Data from the UK Obstetric Surveillance System national cohort | medRxiv

308 women (10%) had a preterm caesarean birth or induced birth due to maternal COVID-19[95].

This implies that for every 100,000 pregnant women who get COVID-19, there will be 5,000 additional preterm births if you assume that approximately half will be asymptomatic and that if you are symptomatic 1 in 5 have a preterm birth. This is contingent on underlying disease incidence at any given point in time.

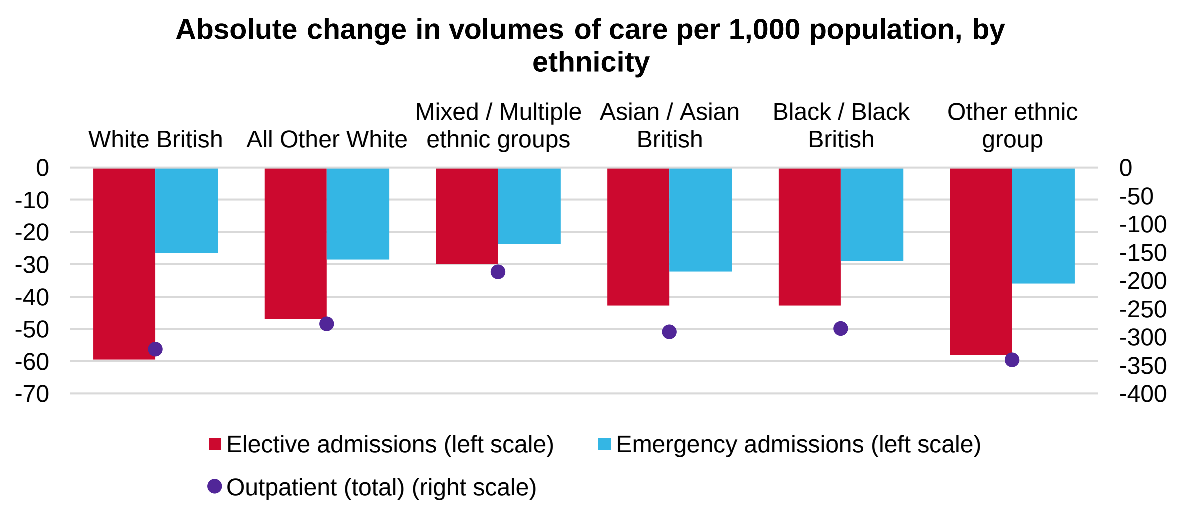
C.5.2.4 *Impact on hospital activity by ethnicity*

Next, we examine hospital activity by ethnicity. Note that HES does not have complete data on ethnicity, approximately 15% of the ethnicity data is missing. Comparing absolute and percentage changes from 2019 levels across ethnicity groups reveals large differences in changes in different types of activity across some groups. For elective admissions, the absolute change in volume per 1000 population is greatest among white (60 per 1000) and other ethnic groups (58 per 1000) patients. The greatest percentage fall in activity is also seen for White British, along with All Other White ethnic group, followed by Asian and Asian British.

For emergency care, Other Ethnic groups and those from an Asian ethnic background saw the most significant fall in absolute volumes by 1000 (36 per 1000 and 32 per 1000 respectively). People of mixed ethnic background and White British saw the smallest impact in absolute volumes of care per 1000 (24 per 1000 and 26 per 100 respectively). The largest percentage fall in activity was experienced by those of an Asian and Asian British background.

Finally, for outpatient care other ethnic groups and White British saw the largest decreases in absolute volumes per 1000 population at 341 and 321 per thousand respectively. People of an Asian and Black British ethnic background had relative similar declines in absolute volumes of care per 100, while those of Mixed ethnic background had the lowest impact on absolute volumes of care. In terms of percentage change impacts, White British saw the greatest percentage fall in hospital activity, followed by Asian and Asian British.

Figure 70 – Absolute change in volumes of care per 1,000 population, by ethnicity



Source: NHS Digital's HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London, ONS population data (2017).

[95] Impact of SARS-CoV-2 variant on the severity of maternal infection and perinatal outcomes: Data from the UK Obstetric Surveillance System national cohort | medRxiv

Table 12 - Percentage change in activity by ethnicity

	% Change in activity				
	Elective	Emergency	Outpatient (total)	*Outpatient (In person)*	*Outpatient (Telephone)*
White British	-36.9%	-23.2%	-22.6%	-42.5%	476.4%
All Other White	-36.9%	-26.1%	-21.2%	-38.3%	456.3%
Mixed / Multiple ethnic groups	-33.2%	-28.5%	-15.7%	-34.0%	471.3%
Asian / Asian British	-35.8%	-34.7%	-22.2%	-37.9%	524.6%
Black / Black British	-26.8%	-29.7%	-19.3%	-36.0%	512.6%
Other ethnic group	-34.5%	-28.4%	-21.7%	-37.7%	525.5%

Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London

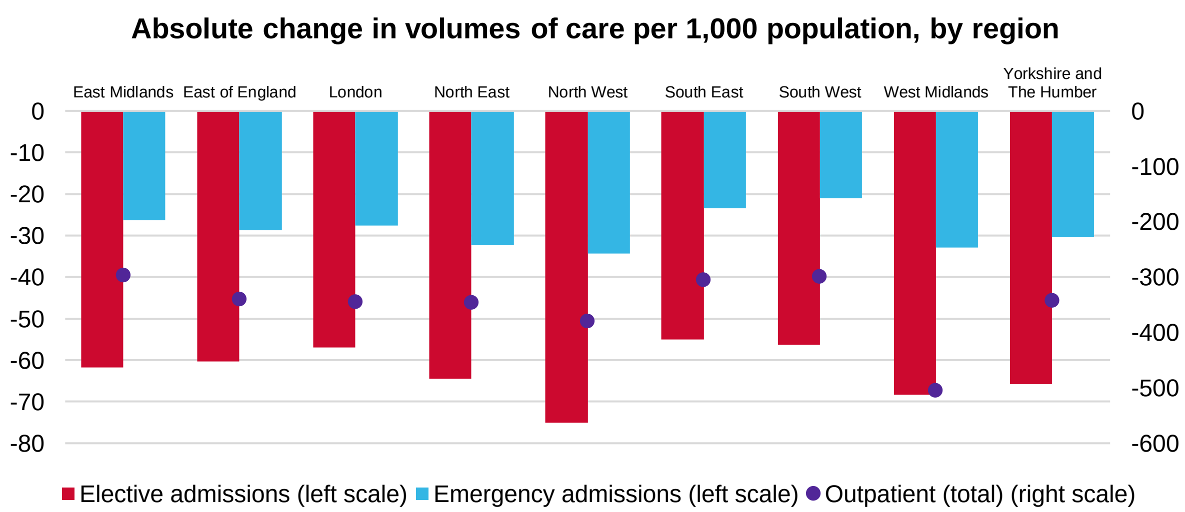
C.5.2.5 *Impact on hospital activity by region*

The greatest fall in absolute volume of elective care by population by region was in the North West at around 75 per 1000 population. The smallest fall in elective care was seen in the South East, South West and London (at around 55-56 per 1000 population). The greatest percentage fall in elective care activity, however, was in the East Midlands, followed by the West Midlands and Yorkshire and the Humber.

For emergency care, North West had the highest fall in absolute volumes of care per 1000 population (34 per 1000), with the South East and the South West have lowest fall in absolute care (23 per 1000 and 20 per thousand respectively). The greatest percentage fall in emergency care was in London, followed by Yorkshire and the Humber.

Looking at outpatients, the West Midlands experienced the greatest fall in volumes of care per 1000 population at 504 per 1000, followed by the North West at 380 per 1000. The East Midlands, South West and South East had the lowest fall in volumes of care per 1000 population (approximately 300 per 1000). This pattern is largely replicated in the percentage fall in in-person outpatient appointments.

Figure 71 – Absolute change in volume of care per 1000 population by region



Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London

Table 13 - Percentage change in activity by region

	% Change in activity				
	Elective	Emergency	Outpatient (total)	*Outpatient (In person)*	*Outpatient (Telephone)*
East Midlands	-38.5%	-22.0%	-20.9%	*-49.5%*	*533.5%*
East of England	-34.4%	-24.9%	-21.2%	*-41.5%*	*342.6%*
London	-34.0%	-28.4%	-19.8%	*-35.9%*	*454.5%*
North East	-35.8%	-22.3%	-20.2%	*-36.2%*	*648.6%*
North West	-35.5%	-25.0%	-22.3%	*-41.6%*	*713.8%*
South East	-33.6%	-21.0%	-18.7%	*-40.0%*	*425.7%*
South West	-29.9%	-17.7%	-20.1%	*-39.4%*	*371.1%*
West Midlands	-38.2%	-25.5%	-26.2%	*-40.3%*	*524.1%*
Yorkshire & The Humber	-38.2%	-25.7%	-22.0%	*-43.5%*	*511.1%*

Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London

Recent literature focused on the UK makes a similar observation that during the first lockdown in the UK, between March and June 2020, there was substantial temporal and geographical variation in the rates of patients accessing urgent referrals for cancer treatment[96]. Equally, in regions or hospitals with lower baseline capacities for critical care beds per head of population or staff per hospital bed, relatively small rises in community prevalence of COVID-19 might lead to higher system stress[97].

The literature also notes that regional differences between infection numbers and hospital admissions at different times (between March and May 2020[98], and between October 2020 to January 2021 for example[99]) are likely to have led to differences in the ability and need to re-deploy staff and hospital capacity for treating COVID-19 patients.

In addition to regional inequality in dealing with COVID-19, there is also ongoing inequality in terms of waiting times for elective admission in England, with 61 days being the average wait time for elective admission, but in London, 48% of admissions waited less than 1 month in 2018-19[100].

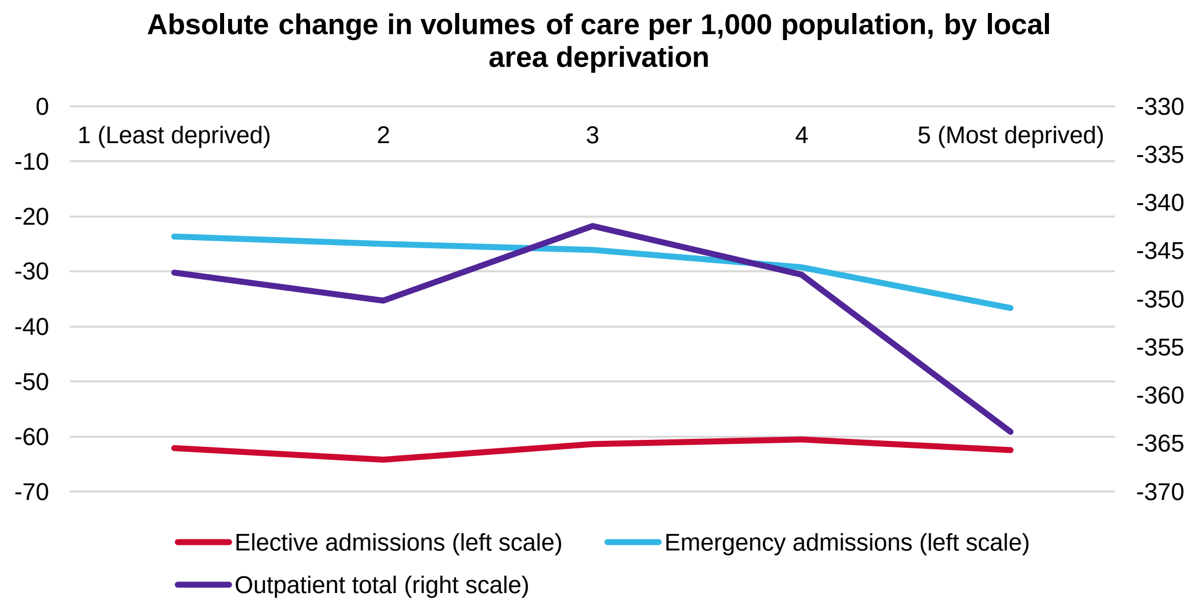
C.5.2.6 *Impact on hospital activity by deprivation*

Across all care types the most deprived[101] populations see a greater decline in absolute volumes of care relative to the less deprived populations (Figure 72). However, people living in the most deprived geographies tend to have greater need as well. Thus, when considering percentage change in activity as a measure, we control for the additional need in those geographies to identify disproportionate impacts (Table 14). Once we adjust for additional need in these geographies by considering the percentage change measure, we do not find large variation across deprivation quintiles in elective and outpatient care. However, in the case of emergency care, the most deprived two quintiles do see a greater percentage fall in activity relative to the lower deprivation quintiles.

[96] Effect of delays in the 2-week-wait cancer referral pathway during the COVID-19 pandemic on cancer survival in the UK: a modelling study - ScienceDirect
[97] The impact of COVID-19 on anaesthesia and critical care services in the UK: a serial service evaluation* - Kursumovic - - Anaesthesia - Wiley Online Library
[98] The impact of COVID-19 on anaesthesia and critical care services in the UK: a serial service evaluation* - Kursumovic - - Anaesthesia - Wiley Online Library
[99] The Wider Impacts of the Coronavirus Pandemic on the NHS* - Propper - 2020 - Fiscal Studies - Wiley Online Library
[100] Hospital Admitted Patient Care and Adult Critical Care Activity (digital.nhs.uk)
[101] Quintiles are volumes of appointments split by quintiles of MSOA of residence where residence is known, based on 2019 admissions

Change in absolute volume of care per 1,000 population for outpatients decreases sharply for the top 40% most deprived. Similarly, for emergency care, fall in absolute volumes per 1,000 increases for higher levels of deprivation, with the biggest jump when going from the 4th quintile to the 5th quintile (most deprived). However, when considering the percentage reduction in outpatient care, there is no substantial variation between quintiles.

Figure 72 – Absolute change in volumes of care per 1,000 population by local area deprivation



Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London

Table 14 - Percentage change in activity by deprivation

IMD Quintiles	% Change in activity				
	Elective	**Emergency**	**Outpatient total (right scale)**	*Outpatient (in person)*	*Outpatient (telephone)*
1 (Least deprived)	-35.0%	-22.8%	-20.9%	*-41%*	*419%*
2	-34.9%	-22.7%	-21.1%	*-41%*	*435%*
3	-34.8%	-23.0%	-21.4%	*-41%*	*460%*
4	-35.1%	-24.1%	-21.3%	*-40%*	*512%*
5 (Most deprived)	-35.5%	-25.7%	-21.4%	*-40%*	*555%*

Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London

The graphs presented above are consistent with commentary in the literature that states admissions for elective care are usually fairly evenly distributed across different socio-economic groups. However, patients on long surgical lists who are in lower socio-economic categories have also reported worse outcomes in quality of life[102]. Areas that score more highly

[102] The effectiveness of different patient referral systems to shorten waiting times for elective surgeries: systematic review | SpringerLink

on the deprivation scale show higher emergency admissions than other areas[103, 104], with the most deprived accessing emergency care more than twice as often as the least deprived[105].

An increase in NHS waiting times can lead to an increase in demand for private healthcare, however, which could exacerbate health inequalities further as individuals who are higher earners are more likely to be able to afford private healthcare[106]. Additionally, low earners are more likely to work in a shutdown sector, increasing the risk of exacerbating health inequalities[107].

Although not specific to the UK, one paper[108] argues that COVID-19 has also emphasised inequalities with regards to palliative care and end-of-life care, stating that individuals in impoverished or highly populated settings with weak health systems are more likely to have contracted the virus. However, they are also more likely to have less access to medical care and palliative and end-of-life care particularly those in low to medium income countries or those who are poor or marginalised in high income countries[109].

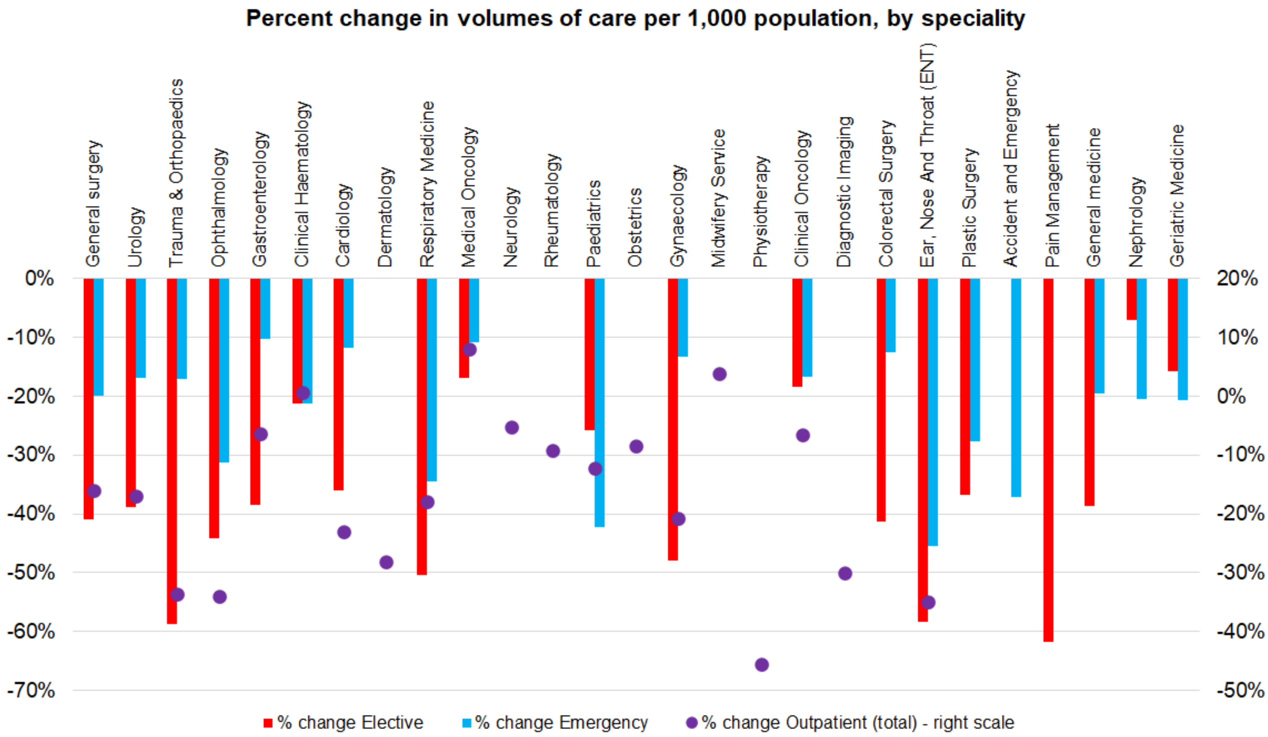
C.5.2.7 *Impact on hospital activity by specialty*

The greatest reductions in elective activity absolute volumes of care per 1000 were in pain management, Trauma and Orthopaedics, and ENT. This matches up with the RTT wait time data where we identified these specialties as having the longest wait times. Health system adaptations in place to respond to the pandemic are likely to explain for these variations in elective care use and wait times for these specialties.

For in-person outpatients the greatest reductions in absolute volumes of care per 1,000 are in physiotherapy, then ENT and a cluster of others at a similar level. Emergency activity saw the greatest reductions in absolute volumes of care per 1,000 in ENT and paediatrics.

[103] The Wider Impacts of the Coronavirus Pandemic on the NHS* - C. Propper, G. Stoye and B. Zaranko - 2020 - Fiscal Studies - Wiley Online Library
[104] BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)
[105] Health inequalities: the hidden cost of COVID-19 in NHS hospital trusts? - Sophie Coronini-Cronberg, Edward John Maile, Azeem Majeed, 2020 (sagepub.com)
[106] The Wider Impacts of the Coronavirus Pandemic on the NHS* - C. Propper, G. Stoye and B. Zaranko - 2020 - Fiscal Studies - Wiley Online Library
[107] The Wider Impacts of the Coronavirus Pandemic on the NHS* - C. Propper, G. Stoye and B. Zaranko - 2020 - Fiscal Studies - Wiley Online Library
[108] COVID-19, palliative care and public health - PubMed (nih.gov)
[109] COVID-19, palliative care and public health - PubMed (nih.gov)

Figure 73 – Percentage change in volumes of care per 1,000 population by specialty



Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies

C.5.3 Literature Overview – Elective Surgery

We can see from the data that some of the largest falls in hospital activity were in specialties where a significant amount of activity is elective surgery. Between October and December 2020, approximately a quarter of all surgical activity in the UK was lost, 1 in 5 operating theatres were shut, and 1 in 8 anaesthetic staff were absent from their normal duties[110]. In January 2021, national surgical activity had fallen to less than half including cancer and emergency surgeries, 42% of operating theatres were closed and approximately a third of anaesthetic staff were unavailable[111]. The paper giving these figures was based on staff-led surveys of UK hospitals, and there is an acknowledgement that these figures may underestimate the true impact due to low response rates in different regions at different survey points[112]. They also estimate that during the 2-week period between the 18th and 31st January 2021, there was a 54% reduction in surgical activity compared with the previous 12 months that equates to 9,770 operations lost per day across the UK[113].

Existing research also indicates that delays to surgical procedures mean that patients are more likely to report problems, with initial consequences of prolonged pain, discomfort, anxiety and disability[114]. In the US, one study stated that joint replacements were classified with the

[110] The impact of COVID-19 on anaesthesia and critical care services in the UK: a serial service evaluation* - Kursumovic - - Anaesthesia - Wiley Online Library
[111] The impact of COVID-19 on anaesthesia and critical care services in the UK: a serial service evaluation* - Kursumovic - - Anaesthesia - Wiley Online Library
[112] The impact of COVID-19 on anaesthesia and critical care services in the UK: a serial service evaluation* - Kursumovic - - Anaesthesia - Wiley Online Library
[113] The impact of COVID-19 on anaesthesia and critical care services in the UK: a serial service evaluation* - Kursumovic - - Anaesthesia - Wiley Online Library
[114] The effectiveness of different patient referral systems to shorten waiting times for elective surgeries: systematic review | SpringerLink

lowest urgency among surgical procedures[115]. The study considered the impact of delays to hip and knee replacement in patients with osteoarthritis and found that a moderate delay in surgical intervention could lead to; muscle wastage, exacerbate comorbidities and impact those driven by the osteoarthritis (depression) and even make patients suffering chronic pain susceptible to substance use (alcohol, prescription drugs etc)[116]. This was also suggested by a UK paper published in February 2021 stating that approximately 12-19% of patients waiting are in a perceived “state worse than death” due to functional deficit and pain from their joint disease[117]. Both papers added that a worse pre-operative function score was associated with a worse post-operative health state and lower rate of patient satisfaction[118,119]. Interestingly, an Italian study[120] found that quarantine may have had a beneficial effect on hip osteoarthritis pain and joint function. The effect was comparable or better to arthroplasty or pharmacological and physical therapies in short observation and there is a hypothesis that the restriction of normal daily activities could lead to a reduction in the self-perception of their clinical condition[121]. However, this was based on a very small sample of patients (34) and it was highlighted that there was a lack of previous research on the topic.

In a European-wide study published in July 2020[122], 90% of participating surgeons indicated that their institutions were no longer providing primary total joint arthroplasty. In England, the number of patients on the orthopaedic elective waiting list was estimated to be between 880,000 and 1.4 million by November 2020[123]. NHS Statistics have ceased to collect and publish some of the official statistics to release capacity across the NHS, which includes the data for cancelled elective surgery[124]. However, a paper published in December 2020[125], estimated that based on 2019 figures, a rough estimate of around 400,000 surgeries per month would be backlogging due to the cancellation or postponement of elective surgeries (excluding paediatric specialties), equating to an estimate of 1.2 million over a 3-month period. In terms of hip and knee replacements, in 2018, 97,972 hip replacements and 90,017 knee replacements were performed. Based on these figures, 3 months of cancelled procedures, would generate a backlog of ~24,448 hip replacements and ~22,504 knee replacements[126]. Though another UK paper published February 2021, estimated these figures at 18,298 and 16,567 respectively by August 2020 for England, Wales, Northern Ireland, Isle of Man and

[115] Unintended consequences of COVID-19 safety measures on patients with chronic knee pain forced to defer joint replacement surgery (nih.gov)

[116] Unintended consequences of COVID-19 safety measures on patients with chronic knee pain forced to defer joint replacement surgery (nih.gov)

[117] Elective orthopaedic cancellations due to the COVID-19 pandemic: where are we now, and where are we heading? (boneandjoint.org.uk)

[118] Unintended consequences of COVID-19 safety measures on patients with chronic knee pain forced to defer joint replacement surgery (nih.gov)

[119] Elective orthopaedic cancellations due to the COVID-19 pandemic: where are we now, and where are we heading? (boneandjoint.org.uk)

[120] Clinical outcome before and after COVID-19 quarantine in patients affect of knee and hip osteoarthritis.Experience of orthopedic department in one of the first European country involved in COVID-19 pandemic (nih.gov)

[121] Clinical outcome before and after COVID-19 quarantine in patients affect of knee and hip osteoarthritis.Experience of orthopedic department in one of the first European country involved in COVID-19 pandemic (nih.gov)

[122] Resuming hip and knee arthroplasty after COVID-19: ethical implications for wellbeing, safety and the economy - Nanne P Kort, Luigi Zagra, Enrique Gomez Barrena, Reha N Tandogan, Martin Thaler, James R Berstock, Theofilos Karachalios, 2020 (sagepub.com)

[123] Elective orthopaedic cancellations due to the COVID-19 pandemic: where are we now, and where are we heading? (boneandjoint.org.uk)

[124]Statistics » COVID-19 and the production of statistics (england.nhs.uk) Statistics » COVID-19 and the production of statistics (england.nhs.uk)

[125] Tackling the elective case backlog generated by Covid-19: the scale of the problem and solutions | Journal of Public Health | Oxford Academic (oup.com)

[126] Tackling the elective case backlog generated by Covid-19: the scale of the problem and solutions | Journal of Public Health | Oxford Academic (oup.com)

Channel Islands, based on the 2019 figures of the National Joint Registry[127]. For heart disease, one article notes that the number of heart operations (coronary by-pass, heart valve surgery) fell from 37,000 in November 2019 to 25,000 in November 2020[128].

Another Canadian modelling study focussing on abdominal aortic aneurysms[129], found that even a temporary reduction in the scheduled operations could create a substantial backlog as well as negatively influence the prognosis of patients. They found that not only did the waiting list size increase (197 increasing to 344, 75% over 22 weeks in a COVID scenario), but so did the number of ruptures and deaths both on and off the waiting lists, and the number of in-hospital deaths after repair (increase to 4.4% from 2.8%).

C.6 Case Study: Cancer

Introduction

This case study provides an overview for the impact of COVID-19 on the management of cancer care services. The format is reflective of the different stages of the patient journey from initial consultations, diagnosis, treatment and health outcomes using a combination of available data and literature studies.

C.6.1 Overview

At the start of the COVID-19 pandemic in the UK, a letter was issued by Sir Simon Stevens on 17th March 2020[130] to the CEOs of all NHS Trusts and Foundations advising them to suspend elective care procedures for 3 months from April 2020, but it also stated to continue with cancer related and emergency procedures[131]. In July 2020, another letter was sent, setting out NHS priorities between September 2020 and March 2021 to 'accelerate the return to near-normal levels of non-COVID health services' including restoring the 'full operation of all cancer services[132]. A further instruction to the CEOs was issued in January 2021 to ensure that urgent cancer care was given the same priority as COVID-19[133].
Despite best efforts, existing literature shows that there appears to have been disruption to the diagnosis and treatment of cancers in the UK, (and also shows this was not unique to the UK[134,135]).

The cancer diagnosis pathway in England is complex. Patients can present through screening, primary care, consultant upgrade following a routine referral or emergency presentation. Cancer targets are set to diagnose new cases as early as possible through primary care or screening. This requires:

I. patients' knowledge and understanding of signs and symptoms associated with cancer and their ability and desire to present these to a clinician,
II. primary care's ability to identify, through consultation with the patient, any potential cancer and make a referral (either urgent or routine),

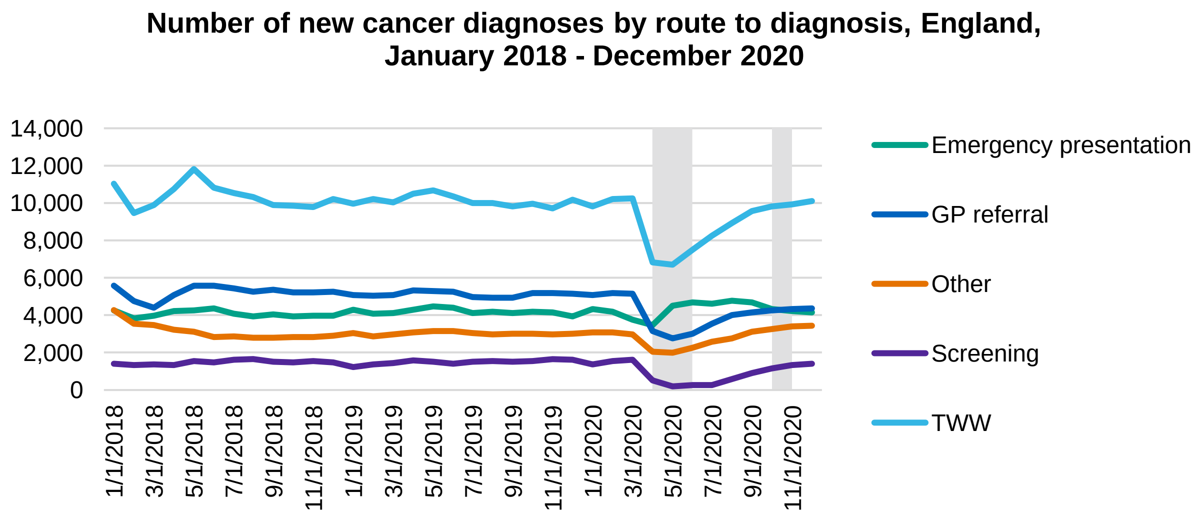
[127] Elective orthopaedic cancellations due to the COVID-19 pandemic: where are we now, and where are we heading? (boneandjoint.org.uk)
[128] How is the pandemic affecting non-covid services? - ProQuest
[129] Predicting surgery waiting list volumes and health outcomes among people with an abdominal aortic aneurysm | British Journal of Surgery | Oxford Academic (oup.com)
[130] 20200317-NHS-COVID-letter-FINAL.pdf (england.nhs.uk)
[131] Tackling the elective case backlog generated by Covid-19: the scale of the problem and solutions | Journal of Public Health | Oxford Academic (oup.com)
[132] 20200731-Phase-3-letter-final-1.pdf (england.nhs.uk)
[133] How is the pandemic affecting non-covid services? - ProQuest
[134] Southern Italy: How the Availability of Radiation Therapy, Patient Outcomes, and Risk to Health Care Providers Have Changed During the Coronavirus Disease 2019 Pandemic - ScienceDirect
[135] Ramping Up Delivery of Cardiac Surgery During the COVID-19 Pandemic: A Guidance Statement From The Society of Thoracic Surgeons COVID-19 Task Force - ScienceDirect

III. secondary care's ability to see, test and diagnose and, if desired by the patient, begin treatment.

C.6.2 Routes to Diagnosis

There are several routes available to diagnose new cancers, all of which were negatively impacted over the last year. The number of diagnoses can be broken down into the different pathways as shown by the graph below.

Figure 74: Volume of new cancer diagnosis by route to diagnosis



Source: Rapid Cancer Registration Data, Cancer Outcomes and Services Dataset

Looking at the different pathways, numerically the biggest fall was seen in two week waits (2WW), falling from around 10,000 to just below 7,000 a month between March and May 2020. Although the number relative to 2019 continued to increase from May 2020 to December 2020, it only reached 2019 levels towards the end of 2020. Emergency presentations had the smallest fall to under 4,000 by mid-April 2020 but recovered to match 2019 levels by May 2020. Through June to September, the number of emergency presentations relative to 2019 increased and remained above 2019 levels up to November. (Emergency presentations were on average 2.77% higher in 2020 than 2019, but August 2020 had the highest number of presentations with the number of patients increasing by 13.9% compared to the 2019 average) [136] However, this increase in emergency presentations is to be expected as symptoms cannot be ignored any longer, or an acute event occurs.

Screening fell to below 25% relative to 2019 levels between March and May 2020, and although the proportion continued to increase between July and December 2020, this was still lower in comparison to 2019 levels. However, it should be noted that the Routes to Diagnosis: 2006 to 2017 study (produced by National Cancer Intelligence Network, a UK-UK wide partnership operated by PHE), shows that the percentage of all malignant neoplasms (excluding non-melanoma skin cancer) diagnosed through screening was approximately 6% in 2017[137]. These results were published in an overview on the government's website in July 2020[138].

GP referrals and other pathways also fell during the same time period as screening, though not as severe (down to 70-50% of 2019 levels). These pathways also started to recover over

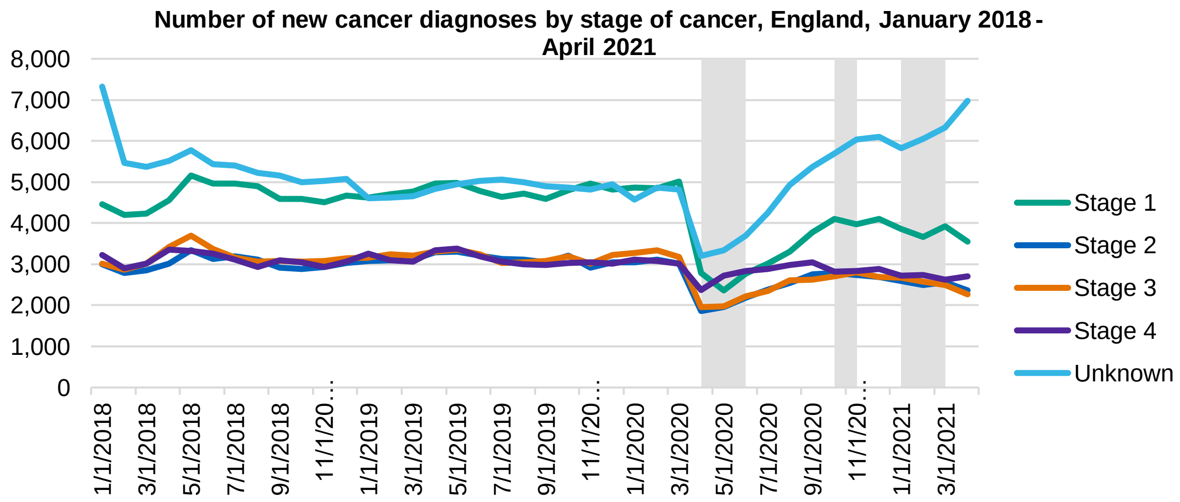
[136] Rapid Cancer Registration and Treatment Data Set, Public Health England
[137] Routes to diagnosis (ncin.org.uk)
[138] Routes to Diagnosis: 2006 to 2017 results - GOV.UK (www.gov.uk)

the summer months, with other and 2WWs returning to match 2019 levels from September onwards along with emergency presentation. Although GP referrals also increased, they remained at around 80% of 2019 levels through the end of 2020.

C.6.3 Cancer Diagnosis

Given the decline in the various routes to diagnosis, we would expect a decline in new cancer diagnoses. Looking over the first 12 months of the pandemic, the graph below shows the number of new cancer diagnoses at each stage relative to previous years.

Figure 75 – Number of new cancer diagnoses by stage of cancer



Source: Rapid Cancer Registration Data, Cancer Outcomes and Services Dataset

Relative to 2019, there was a fall between March and May 2020 across all stages of cancer diagnosis, with stage 4 diagnosis showing the smallest fall relative to the previous year, and stage 1 the largest fall. Stage 4 diagnoses recovered to match the previous year's levels during the summer, however from November 2020, through to March 2021, they had again fallen to below 3,000. This recovery is likely to be related to the rise of emergency presentations previously highlighted in Figure 75 above, where presentations exceeded 2019 levels of around 4,000. Stages 1, 2 and 3 diagnoses started to recover between May and November 2020 with stages 2 and 3 recovering to around 3,000 which is close to the number of diagnoses seen during the same period in 2019 and 2018. Stage 1 diagnoses had increased to around 4,000 by November 2020, but this was around 1,000 lower than the same period in 2019. From November 2020 to March 2021, stages 1,2 and 3 again show a fall below 2018 and 2019 figures for the same period. Between August 2020 and February 2021, the proportion of cancer diagnoses where the stage is unknown has increased to over 7,000. However, as it can take several months for all the cancer testing to be carried out and reported, this proportion is artificially high, and is expected to fall as results are reported. Unknown diagnoses include cancers for the staging process that is not yet complete and cancers that cannot be staged such as leukaemia.

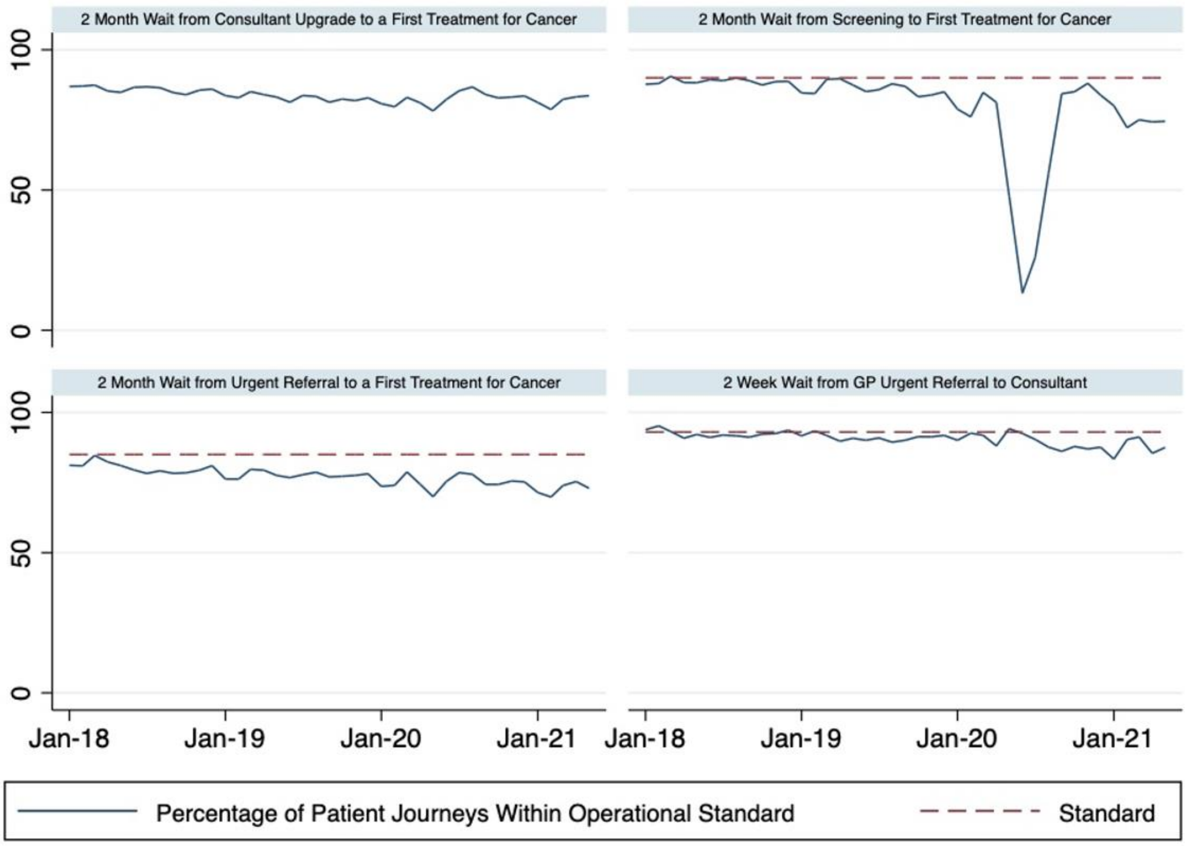
The timings of the falls in the proportion of diagnoses across all stages correlates with the timings of the UK national lockdowns.

From the graph, it is impossible to determine what portion of the reduction could be attributable to healthcare provider behaviour, or individual health seeking behaviour. For instance, it is possible that the fall in the proportion of diagnoses for stage 1 cancers was in part due to people choosing to live with symptoms longer before presenting to a GP due to the perception of them being high risk areas for infection, or were they influenced by messaging such as "protect the NHS".

C.6.4 Cancer Wait Times

In addition to the fall in consultation across the routes to diagnosis, patients presenting at a later stage and an increase in emergency presentations, there has also been an increase in cancer waiting times. The NHS Constitution[139] outlines that the operational standard for an urgent referral from a GP to the first appointment with a consultant specialist is two weeks and the operational standard for an urgent referral from a GP to the first treatment is two months, alongside screening to first treatment and consultant upgrade referral to first treatment. The expectation is that 93% of patient journeys will meet the 2-week standard, and 85% of patient journeys will meet the 2-month standard. Figure 76 (top right) shows that while the percentage in the two-month target for screening to first treatment has been declining since mid-2018, there is a sharp fall at the beginning of the pandemic. The percentage of patients in this pathway meeting operational standards rose through mid-2020 to levels close to those recorded pre-pandemic, then fell again towards the end of 2020, however this fall was smaller than the one at the start of the pandemic.

Figure 76: Percentage of patient journeys on different pathways compared to the operational standard



Source: NHS England cancer wait times data, analysis by DHSC

It should be noted that the decline since 2018 in the targets for waiting times for suspected and diagnosed cancer patients can be seen in most of the waiting time measures[140]. Although the waiting times fall below the operational standards, the number of patients being diagnosed and treated for cancer has been increasing. For example, the operational standard for urgent referrals for suspected cancer to first treatment (62 days) is 85% and in 2017/18[141], 82.3% of patient journeys met this standard, but in 2019/20[142] this fell to 77.2%. However, in 2017/18

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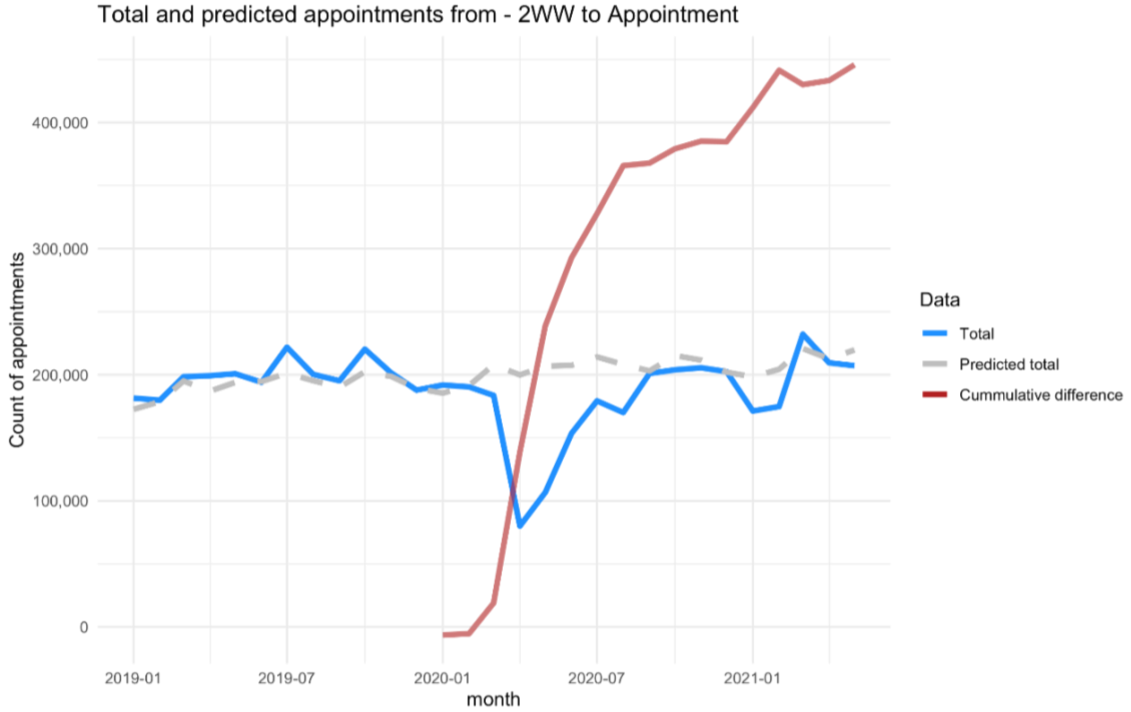
139 National Cancer Waiting Times Monitoring Dataset (england.nhs.uk)
140 Statistics » Cancer Waiting Times Annual Reports (england.nhs.uk)
141 Cancer-Waiting-Times-Annual-Report-201718.pdf (england.nhs.uk)
142 Statistics » Cancer Waiting Times Annual Report, 2019-20 (england.nhs.uk)

the number of patients in this setting was 149,046 (122,664 met the standard) whereas in 2019/20 the number of patients had risen to 167,101 (129,001 met the standard). More patients for urgent referrals for suspected cancer to first treatment were seen within the 62-day operational standard in 2019/20 than in 2017/18.

Next, we consider the total number of appointments within each pathway and a predicted number of appointments[143], to identify the cumulative number of 'missed' appointments as an indication of delayed demand that is likely to present at a later stage and with higher need.

The graph below presents total and predicted number of appointments for a two week wait from GP urgent first referral to a specialist, and the cumulative difference between the two.

Figure 77 – 'Missed' two week wait appoints from GP urgent first referral to specialist



Source: NHS England cancer wait times data, analysis by the Health Foundation's REAL Centre

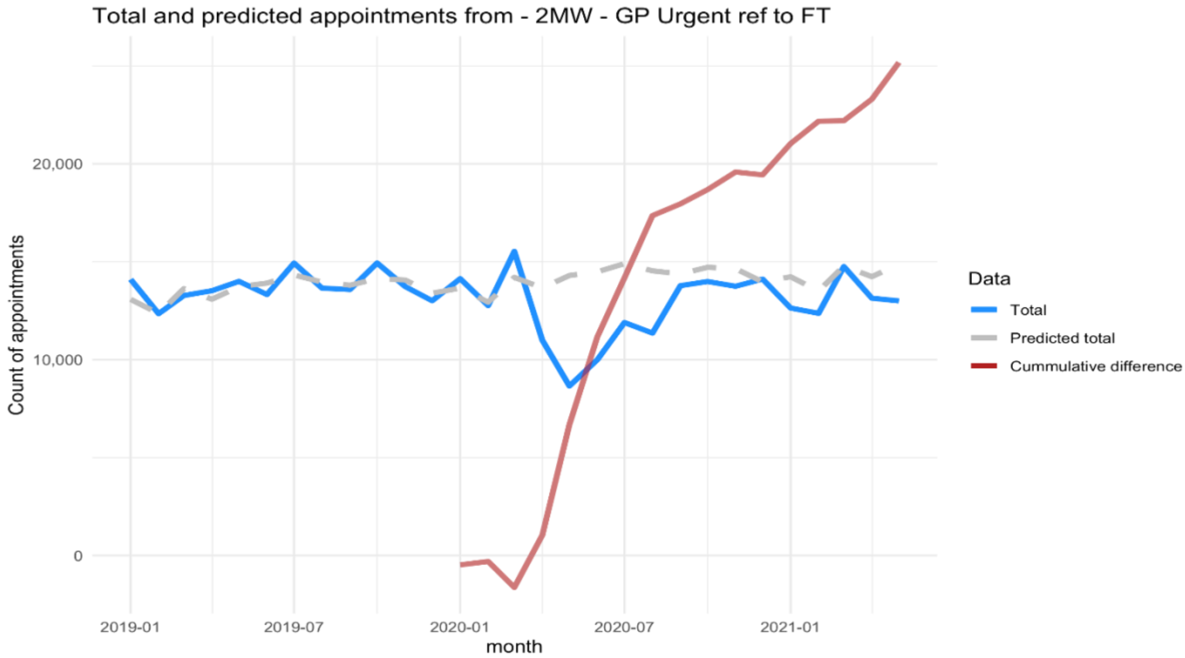
Figures 74 and 75 demonstrate that the number of patients diagnosed through the different pathways relative to 2019 had fallen between March and April 2020, before starting to recover from up until September/October 2020, with some experiencing further falls through November/December 2020. Thus, it follows that the total number of appointments on the two weeks wait to first appointment has matched that pattern in comparison to the predicted total. The effect of these total falls is shown by the cumulative difference between the two in that after January 2021, showing the number of 'missed' urgent GP referrals to consultants were at about 450,000 missed appointments by April 2021.

It should be noted that the falls in patient numbers for cancer diagnosis has been seen across all specialties.

The cumulative effect of a reduction in urgent referrals from GPs referrals pathway is shown on the graph below:

[143] The predication is a standard linear model with monthly dummies to account for time trend using monthly data from October 2009 onwards to December 2019.

Figure 78 – 'Missed' two month wait from GP urgent referral to First Treatment appointments



Source: NHS England cancer wait times data, analysis by the Health Foundation's REAL Centre

The blue line shows the total number of referrals from GPs to the first treatment over the last two years, with the grey line showing a predicted total[144] and the red line the cumulative difference between the two. Before the first 3 to 4 months of 2020, the cumulative difference was below 0, but from there until April 2021, the cumulative difference between predicted and total urgent GP referrals to first treatment is over 25,000 relative to 2019.

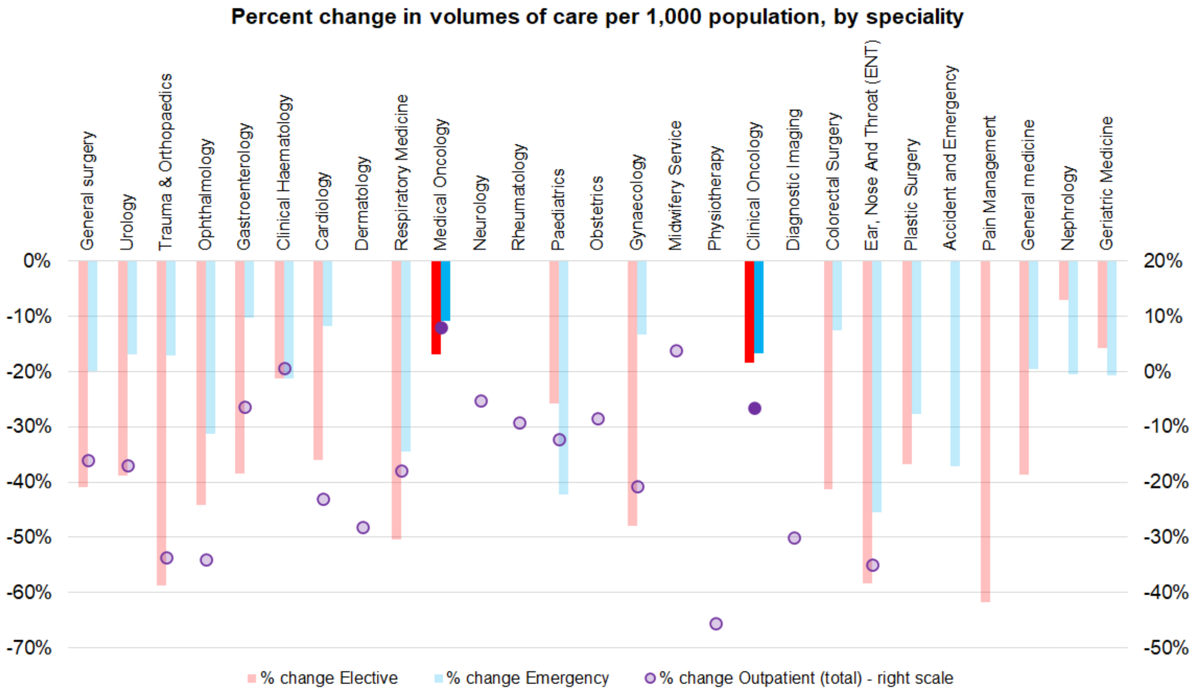
Similarly, the cumulative effect of a reduction of screening appointments to first treatment following within the two-month wait time is shown on the graph above. Much like the graph for urgent GP referrals to first treatment, the cumulative difference of the predicted and actual screening appointments had reached over 10,000 by February 2021 relative to 2019.

C.6.5 Cancer activity in hospitals

Lastly, we consider the impact of COVID-19 on hospital activity in clinical and medical oncology.

[144] The predication is a standard linear model with monthly dummies to account for time trend using monthly data from October 2009 onwards to December 2019.

Figure 79 – Percentage change in volume of care per 1,000 population by clinical and medical oncology



Source: HES data up to February 2021, analysis by the Institute for Fiscal Studies and Imperial College London

The graph above shows the percentage changes in care across a broad range of specialties, with the scale for elective and emergency care on the left, and outpatient on the right. As NHS Trusts were instructed in March to suspend elective procedures (with cancer being an exception) for a minimum of 12 weeks from April, the falls in elective care volumes for these specialties (red) would be expected.

The specialties involved with the diagnosis, treatment and management of cancer are:

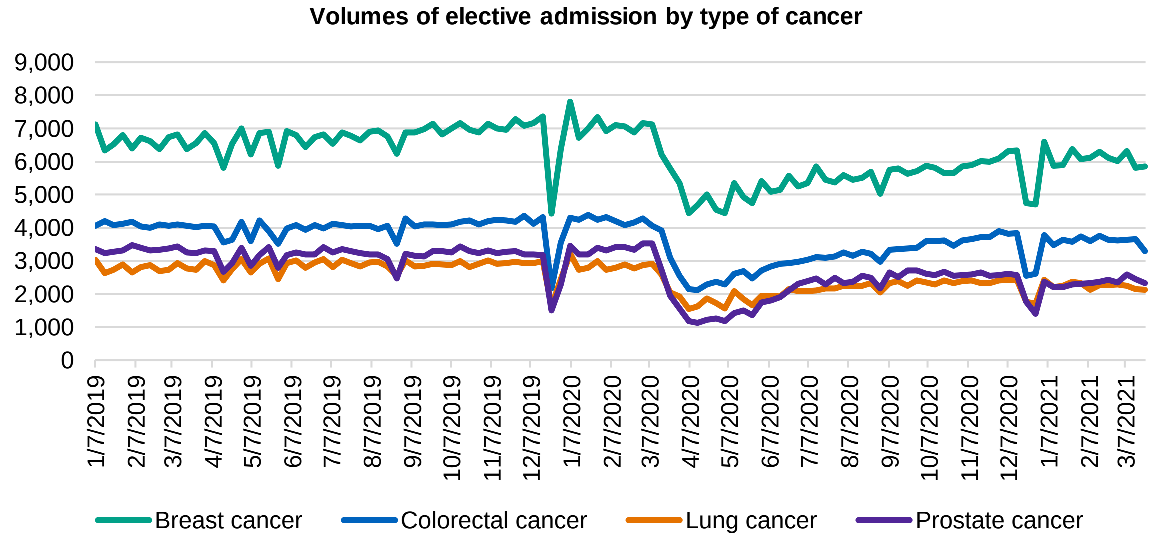
- Medical Oncology (diagnosing, assessing, treating and managing cancer patients – excludes radiotherapy)[145]
- Clinical Oncology (radiotherapy and chemotherapy and other non-surgical treatments)[146]
- Clinical Haematology (blood and bone marrow specialists, also part of delivery of chemotherapy)[147]

Looking at Medical Oncology (involves the diagnosis of cancer), the effects of the fall in diagnoses along the different pathways is reflected in the fall in the percentage of elective care of between 15 and 20%. The falls in the emergency pathway although smaller and recovering more quickly, are also reflected here in the fall of over 10% in emergency care for medical oncology.

The graph below shows the volume of elective cancer admissions for four types of cancer in the UK between 31 December 2018 until after 31 January 2021. During the weeks following the first UK lockdown in March 2020, the volume of elective admissions across all four cancers fell, which is consistent with the falls in consultations and diagnoses. While admissions recovered over the year, elective admissions are still lower than the pre-pandemic level for all cancers apart from colorectal. There is a smaller fall around December 2020, however, there was also a fall around December 2019 showing that this is more likely to be a seasonal norm rather than an impact of COVID-19.

[145] Medical oncology | Health Careers
[146] Clinical oncology | Health Careers
[147] Haematology (doctor) | Health Careers

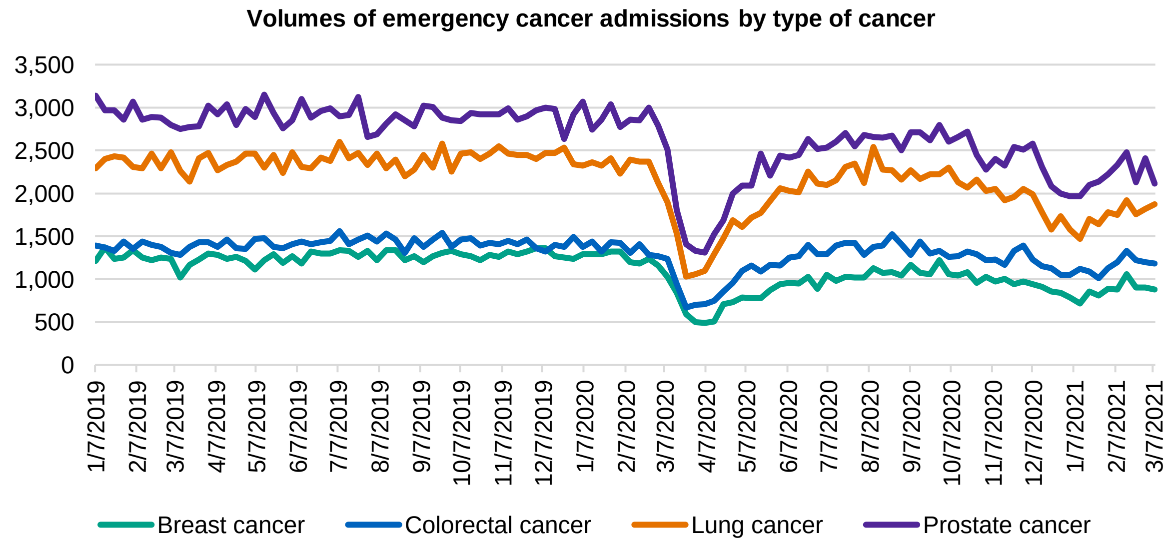
Figure 80: Volumes of elective admission by type of cancer between January 2019 and March 2021



Source: HES data up to February 2021, analysis by Institute for Fiscal Studies and Imperial College London

The next graph shows the volume of emergency cancer admissions for the same cancer types over the same period of time in the UK. Again, the volume of emergency admissions across all four cancers fell, during the early part of 2020, before rising throughout 2020. The levels for colorectal cancer for late 2020 appear to have returned to levels close to those in 2019, however breast, lung and prostate cancers appear to be lower. The fall seen in late 2020 for elective admissions does not seem to be as pronounced for emergency admissions, with the exception of prostate cancer.

Figure 81: Volumes of emergency admission by type of cancer between January 2019 and March 2021



Source: HES data up to February 2021, analysis by Institute ~~of~~ for Fiscal Studies and Imperial College London

This graph is consistent with the earlier graph (Figure 74) shows the emergency route as part of the routes to diagnosis. As discussed previously, some of the rise in the emergency admissions of these four cancers following the initial fall in March 2020, will contribute to the increases in stage 4 diagnoses, and potentially some of the unknown stage as well once the diagnoses have been reported.

C.6.6 Observations from literature

Observations of falls in consultations and diagnoses across all conditions are supported by literature which suggests that some of the falls can be attributed to changes to individual health seeking behaviour, and provider behaviour/adaptations. For falls in the demand for emergency care, they suggest:

- Patients opting to postpone or forgo seeking treatment (particularly evident in younger age groups 15-44) due to concerns over hospitals being high risk areas of infections[148,149]
- Reductions could be linked to self-isolation, reduced traffic and pollution, workplace accidents[150,151]
- Changes to population health seeking behaviour from fear of overwhelming the NHS or lack of public awareness that medical help should still be sought in an emergency[152] [153,154]
-

In addition, for falls in elective care, they also suggest:

- Staff shortages, sickness and/or redeployment[155, 156, 157, 158, 159, 160]
- Equipment shortages/redeployment[161, 162, 163, 164, 165]
- Increased demand for critical care capacity[166, 167, 168]
- Infection control procedures reducing the number of procedures performed per day[169, 170, 171]

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148 The Wider Impacts of the Coronavirus Pandemic on the NHS* - Propper - 2020 - Fiscal Studies - Wiley Online Library
149 Health inequalities: the hidden cost of COVID-19 in NHS hospital trusts? - Sophie Coronini-Cronberg, Edward John Maile, Azeem Majeed, 2020 (sagepub.com)
150 The Wider Impacts of the Coronavirus Pandemic on the NHS* - Propper - 2020 - Fiscal Studies - Wiley Online Library
151 BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)
152 Health inequalities: the hidden cost of COVID-19 in NHS hospital trusts? - Sophie Coronini-Cronberg, Edward John Maile, Azeem Majeed, 2020 (sagepub.com)
153 Economic impact of avoidable cancer deaths caused by diagnostic delay during the COVID-19 pandemic: A national population-based modelling study in England, UK - European Journal of Cancer (ejcancer.com)
154 BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)
155 Growing backlog of planned surgery due to covid-19 | The BMJ
156 How is the pandemic affecting non-covid services? - ProQuest
157 Elective orthopaedic cancellations due to the COVID-19 pandemic: where are we now, and where are we heading? (boneandjoint.org.uk)
158 The Wider Impacts of the Coronavirus Pandemic on the NHS* - Propper - 2020 - Fiscal Studies - Wiley Online Library
159 Minimizing Population Health Loss in Times of Scarce Surgical Capacity During the Coronavirus Disease 2019 Crisis and Beyond: A Modeling Study - ScienceDirect
160 BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)
161 Elective orthopaedic cancellations due to the COVID-19 pandemic: where are we now, and where are we heading? (boneandjoint.org.uk)
162 The impact of COVID-19 on anaesthesia and critical care services in the UK: a serial service evaluation* - Kursumovic - - Anaesthesia - Wiley Online Library
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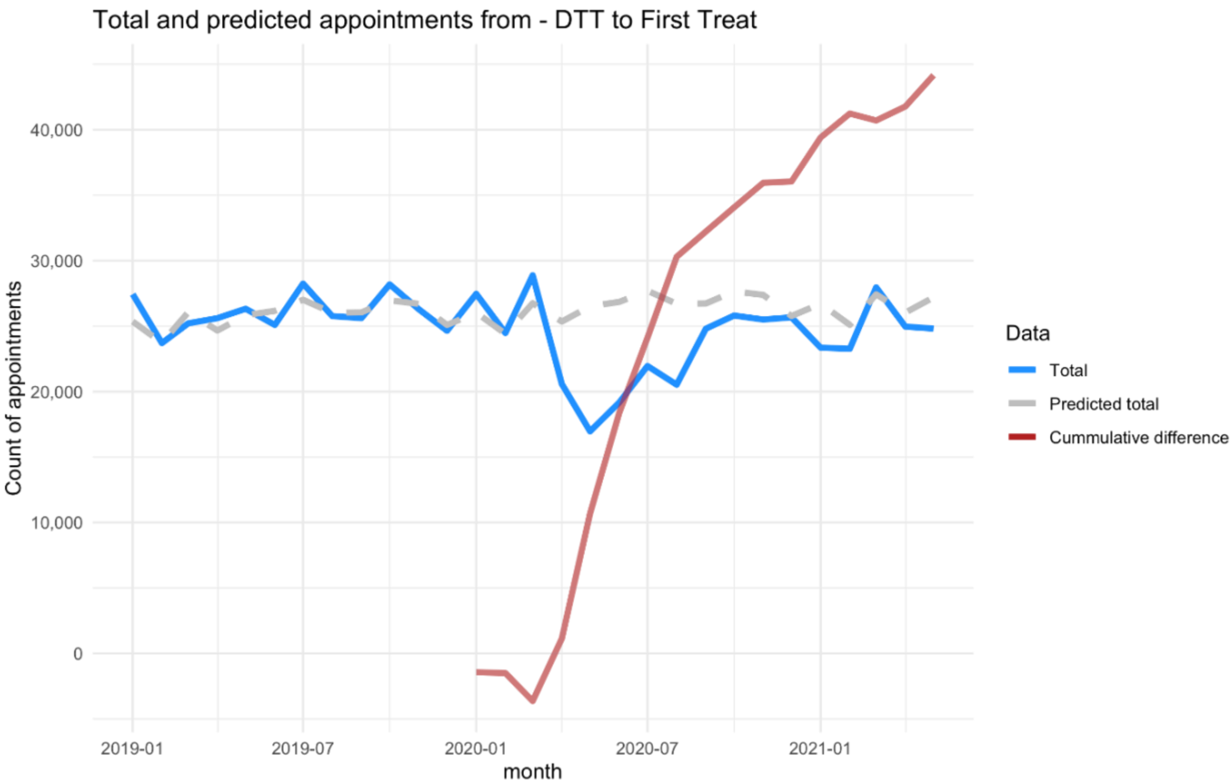
164 Minimizing Population Health Loss in Times of Scarce Surgical Capacity During the Coronavirus Disease 2019 Crisis and Beyond: A Modeling Study - ScienceDirect
165 BN328-What-happened-to-English-NHS-hospital-activity-during-the-COVID-19-pandemic.pdf (ifs.org.uk)
166 How is the pandemic affecting non-covid services? - ProQuest
167 Southern Italy: How the Availability of Radiation Therapy, Patient Outcomes, and Risk to Health Care Providers Have Changed During the Coronavirus Disease 2019 Pandemic - ScienceDirect
168 Tackling the elective case backlog generated by Covid-19: the scale of the problem and solutions | Journal of Public Health | Oxford Academic (oup.com)
169 Covid-19: Urgent cancer referrals fall by 60%, showing "brutal" impact of pandemic | The BMJ
170 Elective orthopaedic cancellations due to the COVID-19 pandemic: where are we now, and where are we heading? (boneandjoint.org.uk)
171 The effectiveness of different patient referral systems to shorten waiting times for elective surgeries: systematic review | SpringerLink

With regards to the impact on cancer services, it has been reported that during the first wave of the pandemic (March to July 2020), it is estimated that up to 3 million individuals did not receive screening investigations due to suspension of services, fewer patients were referred, and 3.2 million fewer investigations were performed due to cancellation or referral[172]. (Includes colonoscopy, cystoscopy, gastroscopy, CT scans, MRI etc). For example, there was a 35% reduction in the number of urgent referrals for lung cancer between March and November 2020 compared to the same period in 2019[173], and approximately 3,500 fewer patients than expected were given a diagnosis of bowel cancer between April and October 2020[174].

C.6.7 Effects of delays to consultations, referrals, and screenings

The delaying of consultations, referrals and screenings will have a knock-on effect on the number of people who ultimately receive treatment for new cancer.

Figure 82 – 'Missed' Decision to Treat appointments to First Treatment



Source: NHS England cancer wait times data, analysis by the Health Foundation's REAL Centre, code for analysis available at https://gitlab.com/tlswatt/cancer-wait-times

Following the first consultation, where cancer is diagnosed, a decision to treat (DTT) will be made, and treatment will commence. The graph above shows the cumulative difference between then total number of patients receiving a treatment for a newly diagnosed cancer and the predicted number based on previous years' data. The same pattern observed across all the earlier graphs during 2020 is also observable here, and by mid-2021, the cumulative difference is more than 40,000 appointments. This implies there are more than 40,000 patients who are living with undiagnosed cancer, have died with undiagnosed cancer, or have decided not to undergo treatment. The NHS operational standard for the decision to treat to first

[172] Economic impact of avoidable cancer deaths caused by diagnostic delay during the COVID-19 pandemic: A national population-based modelling study in England, UK - European Journal of Cancer (ejcancer.com)
[173] Economic impact of avoidable cancer deaths caused by diagnostic delay during the COVID-19 pandemic: A national population-based modelling study in England, UK - European Journal of Cancer (ejcancer.com)
[174] How is the pandemic affecting non-covid services? - ProQuest

treatment is a maximum of one month (31 days) for 96% of patients[175] and during the pandemic performance against this target has also worsened. In the 12 months from March 2020 to February 2021, the 96% target was hit 3 times. In the 12 months before March 2020, the NHS only failed to meet this target once[176,177].

C.6.8 Health Outcomes from delays to diagnosis and treatment from literature

An article published by the BMJ stated that the number of urgent GP cancer referrals in April 2020 had fallen from 196,775 in April 2019 to 79,573 – a reduction of approximately 60%[178]. The same article then stated that treatment following an urgent referral had fallen from 13,147 in April 2019 to 10,792 in April – a reduction of approximately 18%[179]. A later article reported that the proportion of patients receiving their first cancer treatment within 2 months of screening in July 2020 was 25.4%, down from 85.8% in July 2019[180]. The NHS operational standard for urgent referrals for suspected cancer to first treatment, and an urgent referral from an NHS cancer screening programme for suspected cancer treatment to first treatment is a maximum of two months (62 days) for 85% and 90% of patients respectively. The comments with regards to operational standards for waiting times also apply here.

Increased waiting times for all pathways further impact on the treatment options and health outcomes for patients, and this is reflected in UK and international literature[181,182]. One modelling study for England, estimates that even a 4-week delay in cancer treatment can increase the risk of mortality by approximately 10% and a 3-month delay in cancer surgery across all incident solid tumours is estimated to incur 4755 excess deaths[183] An Italian study also highlighted that it was difficult for cancer patients to complete tumour staging on an outpatient basis due to restrictions of ordinary health procedures[184].

Another UK modelling study[185] looked at the effect of delays in the two week-wait cancer referral pathway used data from the first wave of the pandemic with base line data in 2013/16. They found that over a 3-month lockdown period, with an average presentational delay of 2 months, a 25% backlog of referrals led to an estimated 181 additional deaths (3316 life years lost), 50% backlog of referrals an estimated 361 additional deaths (6632 life years lost) and a 75% backlog led to an estimated 542 additional deaths (9948 life years lost)[186]. They predict that these backlogs will first put pressure on the diagnostic services in secondary care before affecting other stages of the patient pathways[187]. This paper, (looking at colorectal, lung, breast and oesophageal cancers), estimated that over a 5-year period, the number of deaths resulting from diagnostic delay will be 1646 (colorectal), 1290 (lung), 344 (breast) and 335

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175 National Cancer Waiting Times Monitoring Dataset (england.nhs.uk)
176 Statistics » Cancer Waiting Times (england.nhs.uk)
177 NHS England (2021) Cancer Waiting Times. Available from: Statistics » Cancer Waiting Times (england.nhs.uk)
178 Covid-19: Urgent cancer referrals fall by 60%, showing "brutal" impact of pandemic | The BMJ
179 Covid-19: Urgent cancer referrals fall by 60%, showing "brutal" impact of pandemic | The BMJ
180 Covid-19: Waiting times in England reach record highs | The BMJ
181 Effect of delays in the 2-week-wait cancer referral pathway during the COVID-19 pandemic on cancer survival in the UK: a modelling study - ScienceDirect
182 Southern Italy: How the Availability of Radiation Therapy, Patient Outcomes, and Risk to Health Care Providers Have Changed During the Coronavirus Disease 2019 Pandemic - ScienceDirect
183 Economic impact of avoidable cancer deaths caused by diagnostic delay during the COVID-19 pandemic: A national population-based modelling study in England, UK - European Journal of Cancer (ejcancer.com)
184 Southern Italy: How the Availability of Radiation Therapy, Patient Outcomes, and Risk to Health Care Providers Have Changed During the Coronavirus Disease 2019 Pandemic - ScienceDirect
185 Effect of delays in the 2-week-wait cancer referral pathway during the COVID-19 pandemic on cancer survival in the UK: a modelling study - ScienceDirect
186 Effect of delays in the 2-week-wait cancer referral pathway during the COVID-19 pandemic on cancer survival in the UK: a modelling study - ScienceDirect
187 Effect of delays in the 2-week-wait cancer referral pathway during the COVID-19 pandemic on cancer survival in the UK: a modelling study - ScienceDirect

(oesophageal), a total of 3,615[188]. These estimates equated to approximately 32,700 QALY's with an approximate productivity loss of 103.8 million[189]. These figures were for the first wave only, and only include bowel, breast, colorectal and oesophageal cancers. (They estimate that excess COVID deaths during this time result in a loss of 21,450 QALY's and 76.4 million in excess productivity losses)[190].

In November 2020, it was reported that the percentage of patients receiving cancer surgery within one month of the decision had fallen from 92% to 88% compared with November 2019[191]. In the two-week period of January 18th to 31st 2021, in hard-pressed regions, there appears to have been a fall to below half of normal activity in cancer surgery[192] (based on a survey of hospitals in the UK where 140 out of the 273 local co-ordinators representing 420 NHS hospitals with anaesthesia provisions responded). Many post-operative cancer patients, (and other conditions) require the use of intensive care beds, however, these beds were (and are currently) being used for treating severe cases of COVID-19. As a result, some hospitals were forced to alter the treatment schedules of cancer patients while they awaited a bed for surgery on a short-term basis and postpone elective surgeries when levels of COVID-19 are significant. Following the cancellations of cancer surgery in London and the East of England, regional health bosses were instructed to ensure that urgent cancer care was given the same priority as COVID-19 in January 2021[193].

C.6.9 Conclusion

The data and literature show that there have been delays to consultations, diagnoses and treatment schedules for cancer care services. Some of the delays will be the result of changes to individuals' health seeking behaviour and others, the adaptations made by healthcare providers due to the COVID-19 pandemic. It is not possible to separate the two.
Although it is not possible to quantify the full impact of the delays in presentation, consultation and diagnoses stages at this point, the data shows that these delays result in further delays between diagnoses and first treatments. The literature then shows that these treatment delays are likely to lead to poorer health outcomes for some patients. It is noted that when considering the health outcomes of patients alone, it is not necessary to determine what portions of delays can be attributed to the different stages of the patient journey.
However, what the data also shows is that there were sharper falls in the number of patients seen at different stages of the patient journey during the first months of the pandemic in 2020, and that during the later months, cancer care services were recovering as the number of patients seen returned to close to pre-pandemic levels.

C.6.9.1 *Limitations in the Literature*

It must be acknowledged that the full impact of COVID-19 on cancer health services (and other non-COVID services) will not be seen for a number of years, and whilst some literature attempts to quantify this impact, there are limitations with these quantifications:

- Quantifications are usually based on data gathered during the first wave, and do not account for the second or third wave.
- Some studies are based in a particular hospital, group of hospitals or region meaning the sample sizes were relatively small and may not give an accurate picture.

[188] Economic impact of avoidable cancer deaths caused by diagnostic delay during the COVID-19 pandemic: A national population-based modelling study in England, UK - European Journal of Cancer (ejcancer.com)
[189] Economic impact of avoidable cancer deaths caused by diagnostic delay during the COVID-19 pandemic: A national population-based modelling study in England, UK - European Journal of Cancer (ejcancer.com)
[190] Economic impact of avoidable cancer deaths caused by diagnostic delay during the COVID-19 pandemic: A national population-based modelling study in England, UK - European Journal of Cancer (ejcancer.com)
[191] Growing backlog of planned surgery due to covid-19 | The BMJ
[192] The impact of COVID-19 on anaesthesia and critical care services in the UK: a serial service evaluation* - Kursumovic - - Anaesthesia - Wiley Online Library
[193] How is the pandemic affecting non-covid services? - ProQuest

- Modelling assumptions included health services returning to full capacity in a shorter time frame than was observed due to a second wave of infections.
- A limited number of cancers were considered in the modelling studies (bowel, breast, lung and oesophageal) – and additional modelling would be needed to account for other cancers.
- Not all the direct or indirect impacts of cancer was included in the modelling e.g., costs of treatment (financial and health effects) or the impact on family members (caring responsibilities).
- Non-COVID factors were not part of the modelling e.g., impacts of winter flu season.
- Response rates to surveys varied by region and by hospital, and those that did not respond are more likely to have been under more stress than those that did respond.

However, the limitations do support the assertions that the scale of impacts presented in the literature are likely to be underestimates including; deaths, quantification of economic productivity losses, the effect on cancer (and other non-COVID) services (such as staffing or equipment), the time it will take to address waiting lists, and the costs, investment and resources needed to address these impacts.

C.7 Case Study: Mental Health

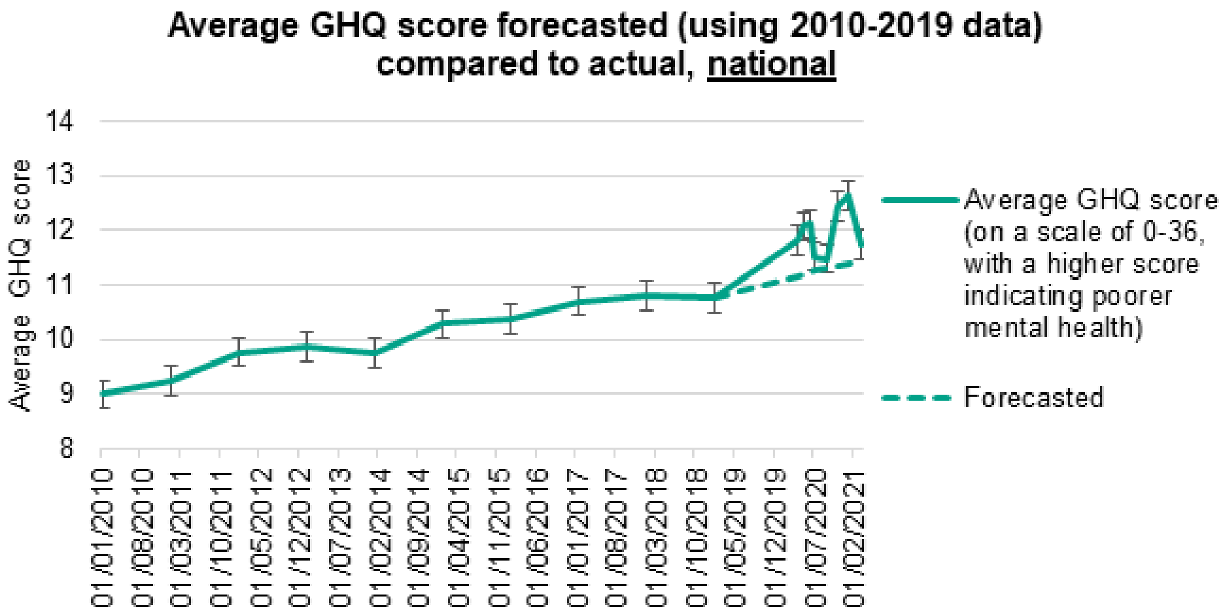
In this case study, we consider the impacts on mental health across all the categories of impacts set out in this chapter: changes to underlying need and health seeking behaviour, impacts in primary care consultations and diagnosis and finally impact on mental health services and patient waiting times.

C.7.1 **Changes to underlying needs on mental health**

We use a subjective wellbeing score as a measure of mental health in the population as recorded in Understanding Society. This measure converts valid answers to 12 questions of the General Health Questionnaire (GHQ) to a single scale by summing the score for each individual variable to give a score between 0 (least distressed) and 36 (most distressed). As shown in Figure 83, the average population's wellbeing score was worsening prior to the pandemic, but the rate increased faster during the pandemic, particularly during periods of strict restrictions. We cannot distinguish whether this impact on mental health is as a result of generally living through a pandemic, pandemic related restrictions or the economic downturn. We expect it to be a combination of all three factors.

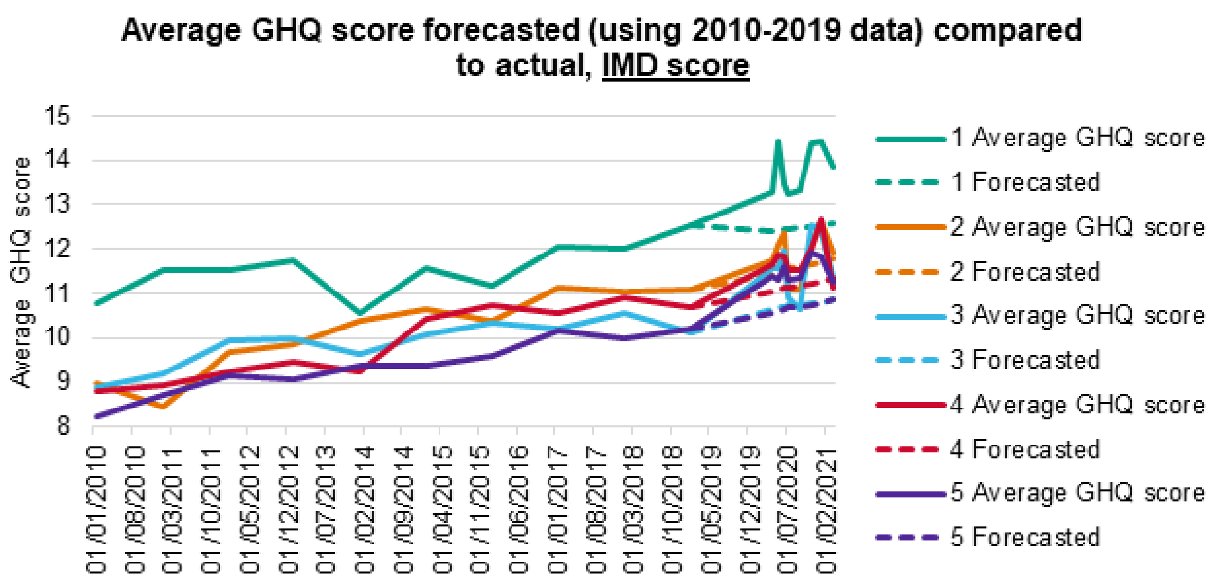
Figure 84 shows worse GHQ scores for more deprived areas, particularly those in the lowest quintiles of deprivation and Figure 85 shows that the largest percentage change in Average GHQ scores was in London during the pandemic. The worsening of mental health shown indicates that there is likely an increase in the prevalence of mental health disorders relative to pre-pandemic levels. However, as shown in the next section, there has been a 7% fall in diagnosis of new cases of anxiety and depression, indicating a likely larger than 7% increase in un-diagnosed mental health disorders.

Figure 83: Average GHQ score forecasted between January 2010 and February 2021 compared to actual, (National)



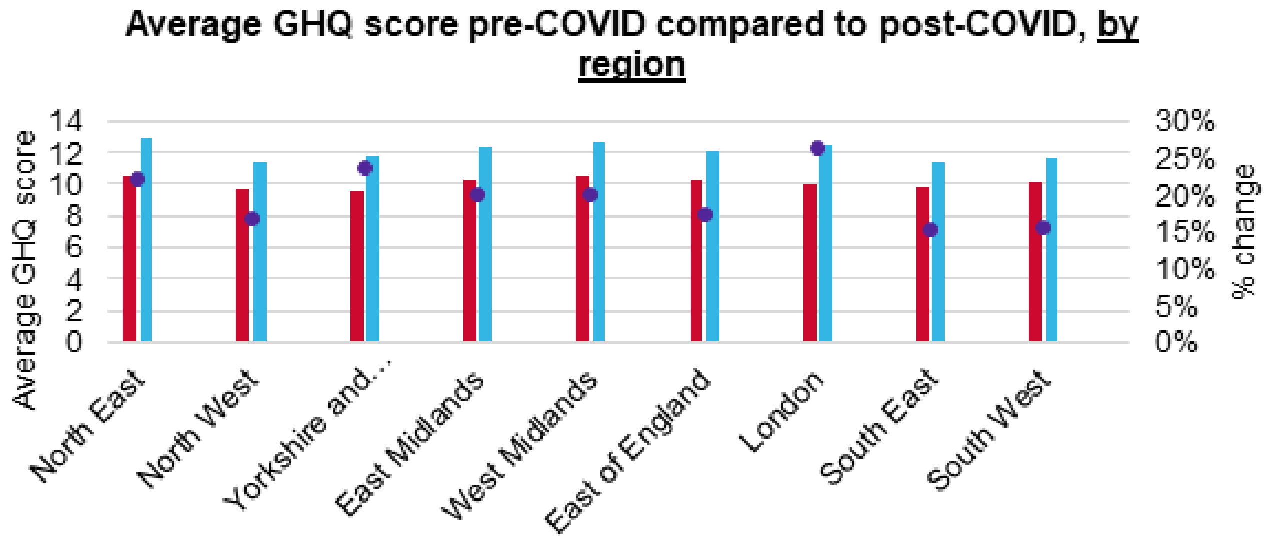
Source: Understanding Society, 2009-2021.

Figure 84: Average GHQ score forecasted between January 2010 and February 2021 compared to actual, (IMD score)



Source: Understanding Society, 2009-2021.

Figure 85: Average GHQ score pre-COVID compared to post-COVID by region



Source: Understanding Society, 2009-2021.

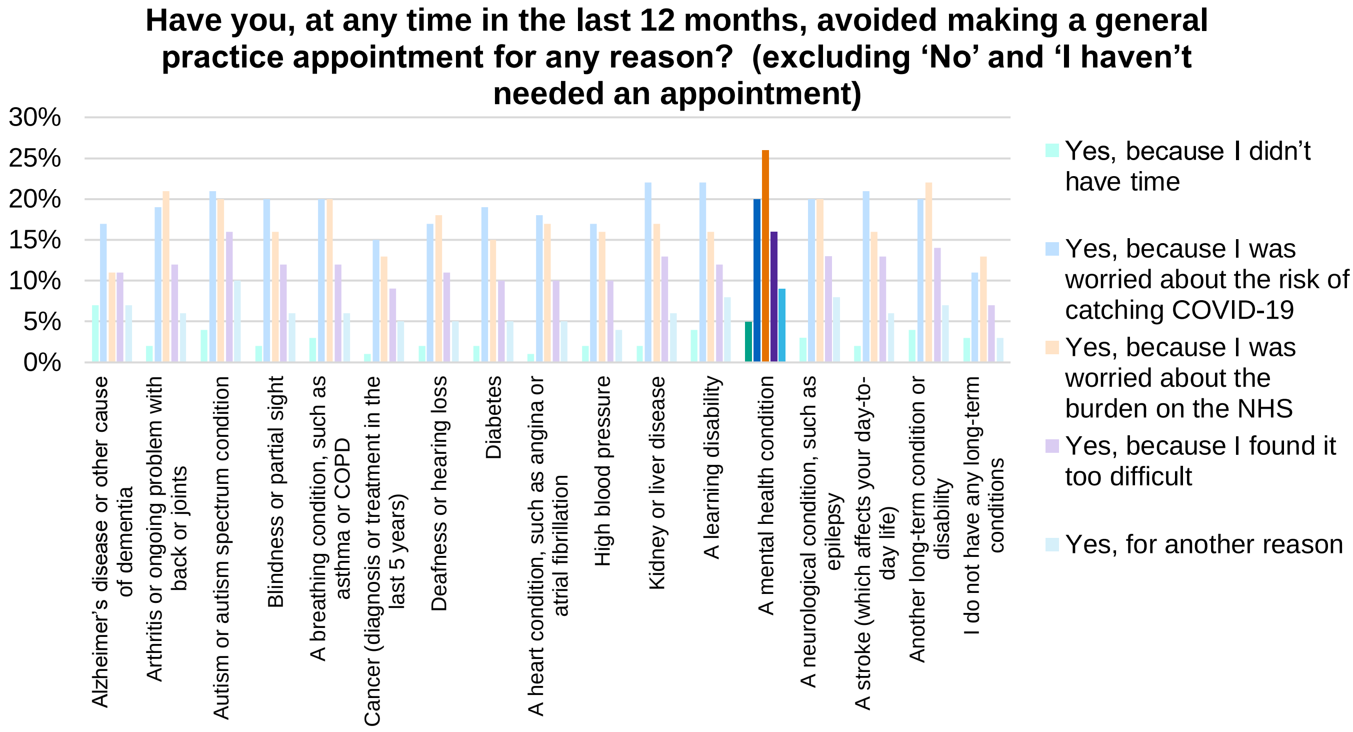
C.7.2 Consultations and Diagnosis of Mental Health conditions

Despite this worsening of self-reported mental health, this is not reflected in the use of mental health services.

First, we consider consultations with GPs for patients seeking help with mental health conditions. We know from section C.2 that there was a significant decline in consultations with GPs from March last year. We use the GP Patient Survey 2021[194] to understand the reasons to not seek care patients with mental health conditions. 25% of patients with mental health conditions did not seek care because they were worried about the burden to the NHS, the highest for all other conditions. 20% were worried about the risk of catching COVID-19 and 15% found it too difficult.

[194] Survey and Reports (gp-patient.co.uk)

Figure 86 – Reasons to avoid making a GP appointment for Mental Healh conditions



Source: GP Survey, 2021

This is likely to result in a fall in diagnosis, even though the evidence on underlying need suggests to us that the incidence of mental health conditions in the pandemic is increasing.

Analysis conducted by the REAL Centre using patient level data from CPRD data as set out in section C.2 and C.3 shows that diagnosis of Anxiety and Depression fell by 7% relative to 2019; however, this does not account for the likely substantial increase in underlying need, as indicated by results from Understanding Society. Note that mental health conditions are coded in a complex way in primary care data. For example, many individuals presenting to primary care may be coded as low mood or stress where the clinician feels the symptoms are part of a normal reaction to a difficult situation. Therefore, we restrict ourselves to only conditions coded as 'Anxiety', 'Depression' in the diagnosis, which is likely to underestimate the full extent of the effect of the pandemic on diagnosis and treatment of mental health conditions. Equally, we do not include pharmaceutical prescribing in our identification of mental health conditions. It is not always straightforward to do so, as many pharmaceutical products used to treat mental health conditions are also prescribed for conditions not related to depression or anxiety[195]. Similarly, there has been a recent trend in avoiding pharmaceutical treatment and use talking therapies, many of which are accessed through self-referral and will therefore not be coded in patients' notes.

[195] Code lists for conditions identified in CPRD's Aurum database are available here: GitHub - annalhead/CPRD_multimorbidity_codelists

Table 15 – 'Missed' incidence of anxiety and depression in Primary care, overall and by non-communicable disease and age

	2019			2020		Difference	
	Approximate England population	Estimated England incidence	% of incidence	Approximate England population	Estimated England incidence	Missing	As a % of 2019 incidence
All	56,286,961	641,864	100.0%	56,678,470	597,159	44,705	7.0%
	By Non-Communicable Disease (NCD)						
0 NCDs prior	32,290,527	466,315	72.7%	34,083,473	435,938	30,377	6.5%
1 NCD prior	13,500,648	141,054	22.0%	14,546,443	129,937	11,116	7.9%
2+ NCDs prior	5,300,265	34,495	5.4%	5,796,548	31,284	3,211	9.3%
	By age						
Under 50s	37,020,572	489,079	76.2%	37,278,072	460,371	28,708	5.9%
50 to 69	12,484,643	102,927	16.0%	12,983,557	99,672	3,255	3.2%
70 and older	6,781,747	49,858	7.8%	7,087,482	45,398	4,460	8.9%

Source: CPRD data, analysis by the Health Foundation's REAL Centre

C.7.3 Impacts on mental health services

C.7.3.1 *Improving Access to Psychological Therapies (IAPT) – adults*[196]

February 2020 Figures are used as the 'pre-pandemic level' for the purposes of comparison.

Monthly referrals data for IAPT in 2020 show a sharp dip in referrals in April 2020, where there were 61.4% fewer referrals than in February 2020 (and 56.6% fewer than in April 2019)[197]. While there has been a steady increase in the absolute number of new referrals each month, this has not reached pre-pandemic levels seen in February 2020.

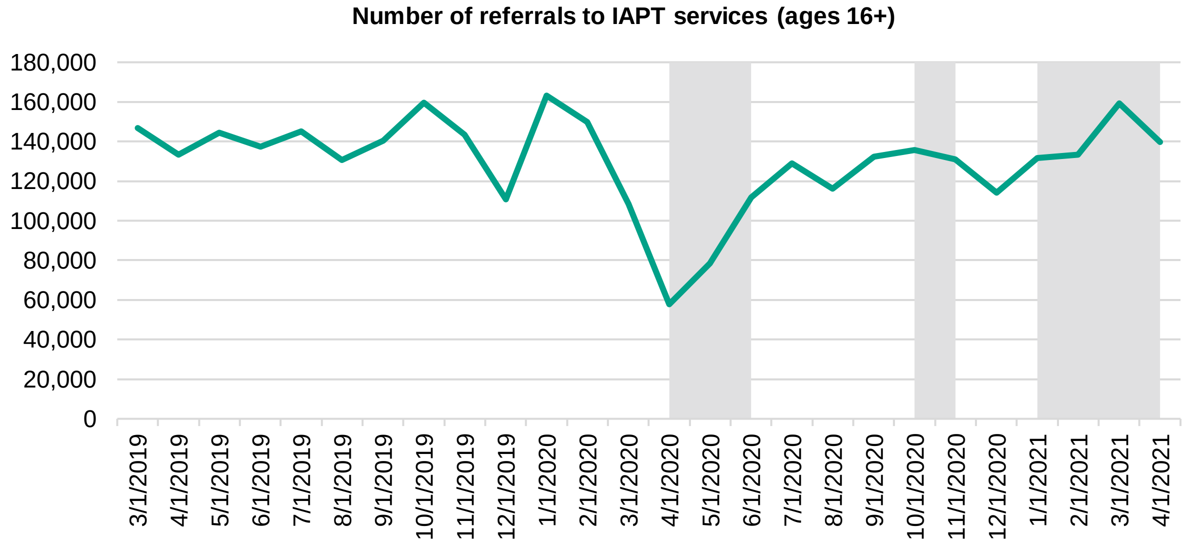
In April 2021, the number of people referred to IAPT services (nearly 140,000) was 6.6% lower than the pre-pandemic level and this figure was 141.7% higher than April 2020, where March to May 2020 were particularly affected the Covid-19 pandemic and the first lockdown (see Figure 87 below).

[196] Note on 2019/20 data: NHSEI have advised that, due to the COVID-19 disruption, there were fewer referrals, particularly from GPs as fewer patients saw their GP in March 2020. The impact on the 2019/20 data is marginal as service delivery was only affected from late March (the last month covered by the annual report), but significant. Overall, 2019/20 figures are lower than expected.

Note on 2020/21 data: The figures in 2020 show the impact of disruption to services and patient interaction with services due to COVID-19. Changes to figures should be interpreted with caution

[197] NHS Digital Psychological Therapies: reports on the use of IAPT services, England, including report on the IAPT pilots Accessed here: [Psychological Therapies, Reports on the use of IAPT services - NHS Digital]

Figure 87- Number of referrals to IAPT services (ages 16+)

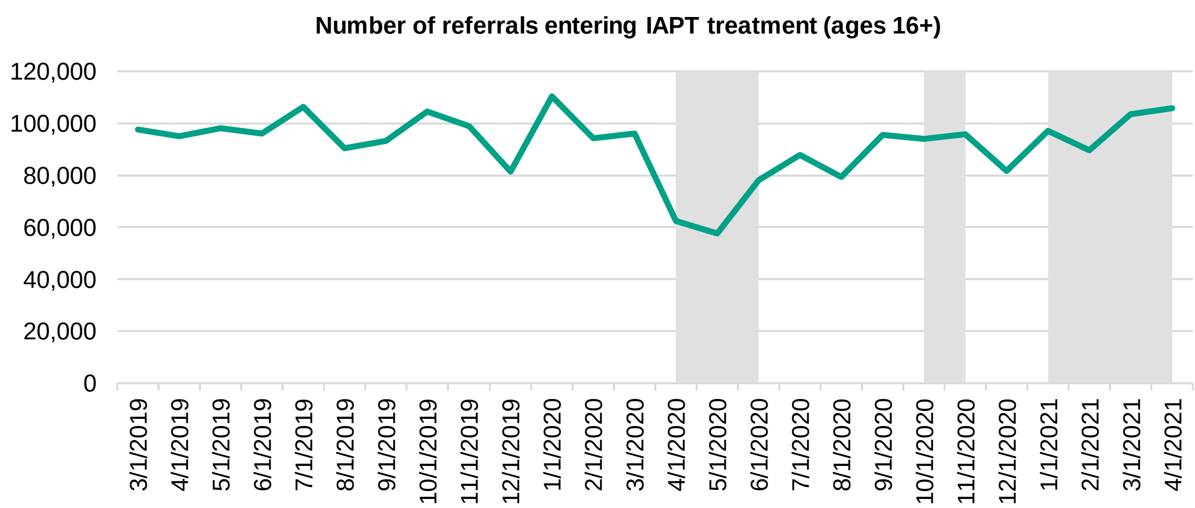


Source: NHS Digital

Like the number of referrals, there was a sharp drop in number of people entering IAPT treatment in April 2020, where there were 33.9% fewer people entering treatment than in February 2020 (and 34.4% fewer than in April 2019).

In April 2021, there was 12.1% higher referrals entering treatment compared with February 2020 (11.2% higher than April 2019) with nearly 106,000[198]. The number of referrals in April 2021 is 69.6% higher than April 2020 (see Figure 88 below).

Figure 88 - Number of people entering IAPT treatment (ages 16+)



Source: NHS Digital

Latest figures for April 2021 indicate 92.4% of people completing treatment waited less than 6 weeks against a target of 75% – this is similar to March 2021 where the figure was 92.3%[199].

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[198] NHS Digital *Psychological Therapies: reports on the use of IAPT services, England, including report on the IAPT pilots* Accessed here: [Psychological Therapies, Reports on the use of IAPT services - NHS Digital]

[199] NHS Digital *Psychological Therapies: reports on the use of IAPT services, England, including report on the IAPT pilots* Accessed here: [Psychological Therapies, Reports on the use of IAPT services - NHS Digital]

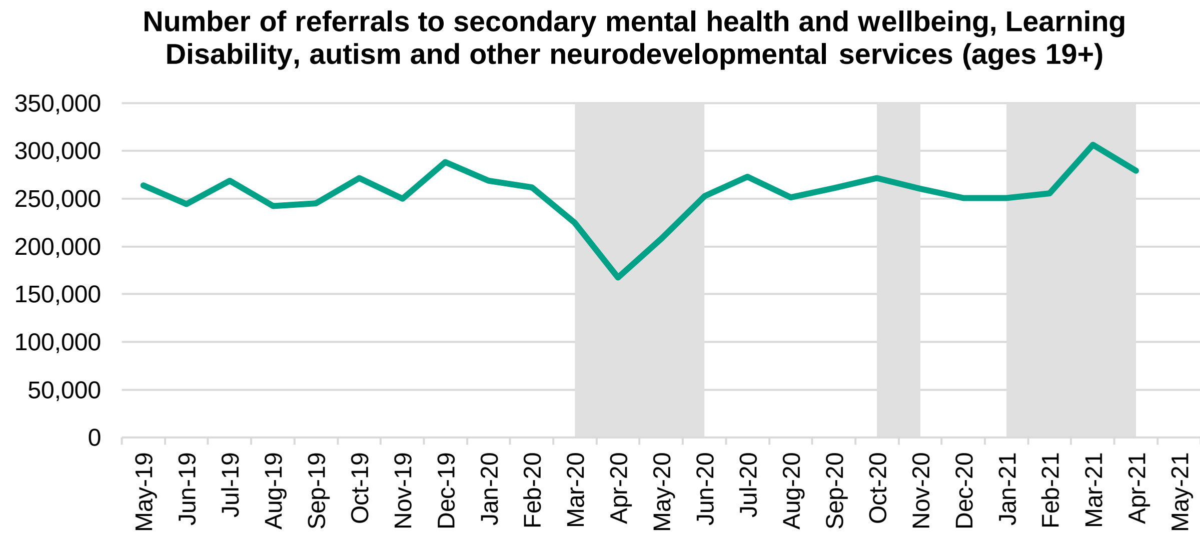
In April 2021, 98.9% of people completing treatment waited less than 18 weeks for their treatment to start against a target of 95% – this is similar to March 2021 where the figure was 98.8%[200]

C.7.3.2 *Secondary services for mental health and wellbeing, Learning Disability, autism and other neurodevelopmental conditions (MHSDS) – adults [201]*

At the start of the pandemic, in April 2020, there were 36.0% fewer adult referrals to services for mental health and wellbeing, Learning Disability, autism and other neurodevelopmental conditions, than in February 2020 (and 30.9% fewer than in April 2019)[202]. Since June 2020, adult referral levels for mental health and wellbeing, Learning Disability, autism and other neurodevelopmental conditions have been similar to pre-pandemic levels[203].

In April 2021 there were 66.7% more adult referrals than in April 2020 and it is 6.7% higher than the pre-pandemic February 2020 level (see Figure 89 below).

Figure 89 - Number of referrals to services covered in MHSDS (ages 19+)



Source: NHS Digital

There was a marked reduction, first seen in March 2020, in the number of adults in contact with mental health and wellbeing, Learning Disability, autism and other neurodevelopmental conditions services. This reduction was sustained throughout 2020, and in April 2021 there were 5.0% more people in contact with these services than in April 2020, and it is 4.1% lower than pre-pandemic level[204] (See Figure 90).

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[200] NHS Digital *Psychological Therapies: reports on the use of IAPT services, England, including report on the IAPT pilots.* Accessed [Psychological Therapies, Reports on the use of IAPT services - NHS DigitalPsychological Therapies, Reports on the use of IAPT services - NHS Digital]

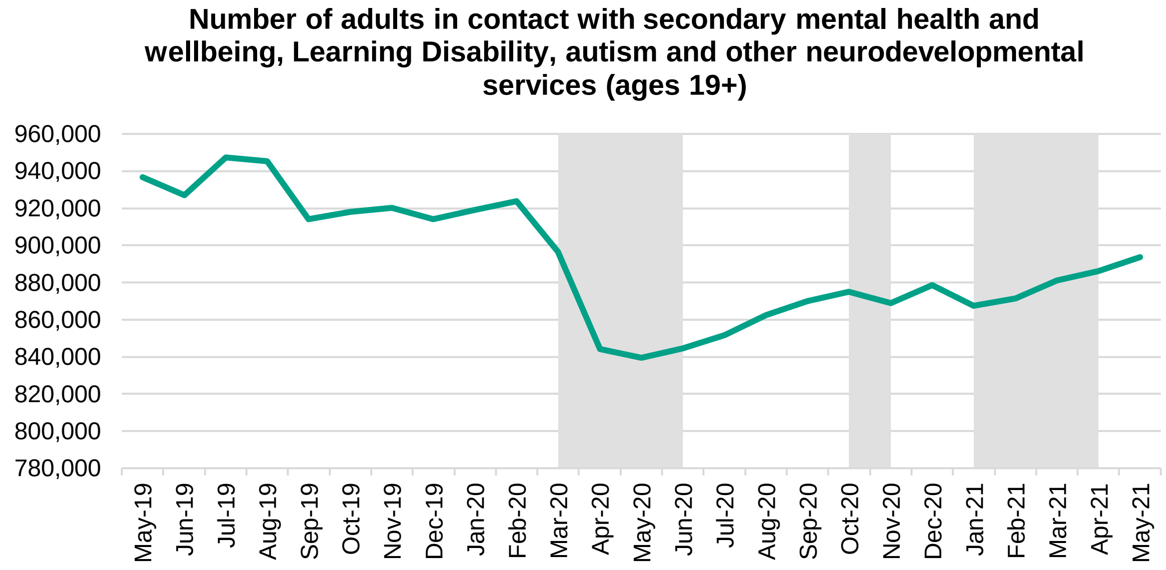
[201] The Mental Health Services Data Set (MHSDS) collects data from the health records of individual children, young people and adults who are in contact with NHS funded mental health services.
Note on 2020/21 data: The figures in 2020 show the impact of disruption to services and patient interaction with services due to COVID-19. Changes to figures should be interpreted with caution.

[202] NHS Digital, Mental Health Services Monthly Statistics. Indicator MH32. Accessed here: Mental Health Services Monthly Statistics - NHS Digital

[203] NHS Digital, Mental Health Services Monthly Statistics. Indicator MH32. Accessed here: Mental Health Services Monthly Statistics - NHS Digital

[204] NHS Digital, Mental Health Services Monthly Statistics. Indicator MH01b + MH01c. Accessed here: Mental Health Services Monthly Statistics - NHS Digital

Figure 90 - Number of adults in contact with services covered in MHSDS (ages 19+)

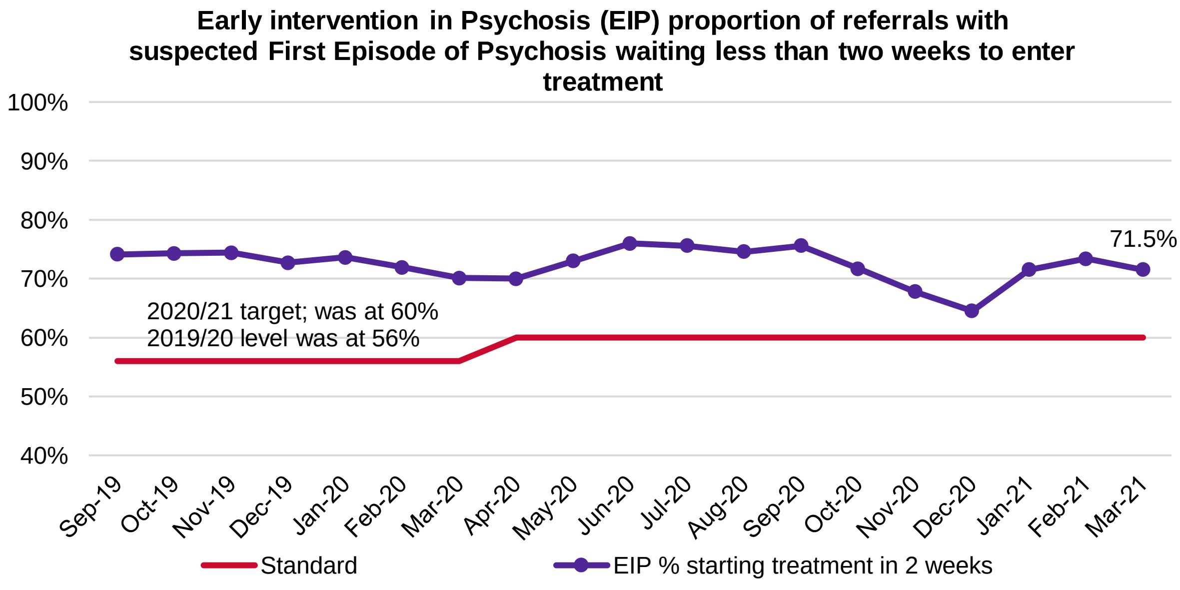


Source: NHS Digital

C.7.3.3 *Early Intervention in Psychosis (EIP) – adult waiting times*

Latest figures for February 2021 to April 2021 show 71.5% of referrals (2,902 out of 4,058 referrals) started treatment within two weeks, remaining above the 60% target set by the Five Year Forward View for Mental Health[205]. The figure for January 2021 to March 2021 was 73.4% (2,843 out of 3,873 referrals)[206] (See Figure 91 below).

Figure 91– Early intervention in Psychosis (EIP) proportion of referrals with suspected First Episode of Psychosis waiting less than two weeks to enter treatment



Source: NHS Digital, data are 3-month averages, centred on the middle month

[205] NHS England. Implementing the Five Year Forward View for Mental Health. Accessed here: [NHS England » Mental Health Taskforce]()

[206] Note that the data source for this measure changed to MHSDS in October 2019, collected by NHS Digital. Prior to that, the interim EIP data collection was collected by NHS England which has been decommissioned (from October 2019).

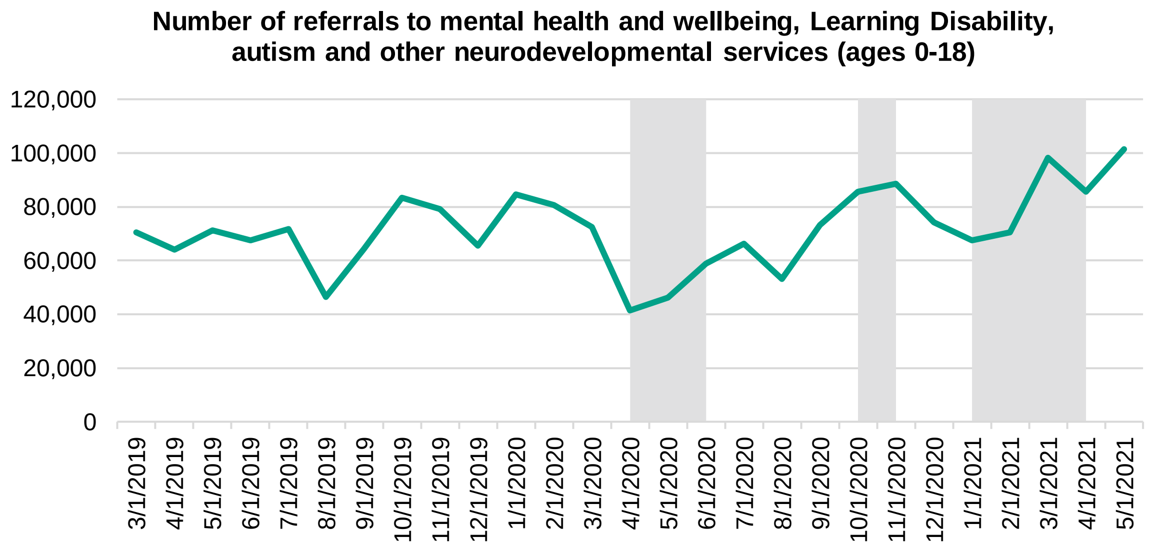
C.7.3.4 *Secondary services for mental health and wellbeing, Learning Disability, autism and other neurodevelopmental conditions (MHSDS) – children and young people*

Among children and young people aged 0 to 18, referrals to services for mental health and wellbeing, Learning Disability, autism and other neurodevelopmental conditions dropped sharply in April 2020 (47.9% fewer referrals than in February 2020 and 32.2% fewer referrals than in April 2019)[207].

Since September 2020, children and young people aged 0 to 18 referral levels for mental health and wellbeing, Learning Disability, autism and other neurodevelopmental conditions have been above pre-pandemic levels[208].

Referrals in April 2021 were 7.6% higher than the pre-pandemic level and were 106.7% higher than in April 2020, where the effect of the pandemic was first observed and recorded the lowest level in the last 12 months (See Figure 92 below).

Figure 92 - Number of referrals to services covered in MHSDS (ages 0-18)



Source: NHS Digital

The number of children and young people aged 0 to 18 in contact with mental health and wellbeing, Learning Disability, autism and other neurodevelopmental conditions services has not seen the same sharp reduction, as the number of adults in contact with these services.

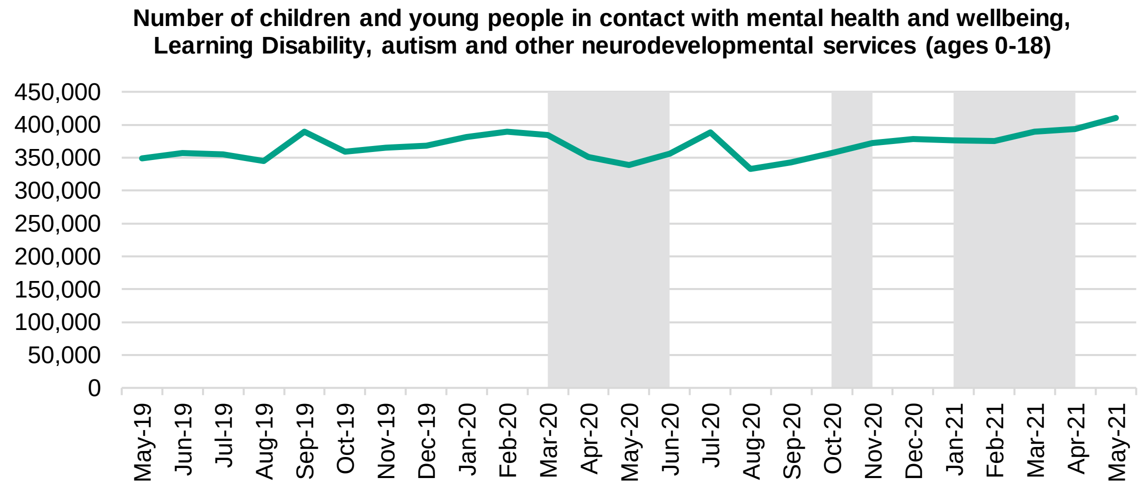
In April 2021, the number of children and young people aged 0 to 18 in contact with these services was 1.1% more than pre-pandemic level and was 12.1% higher than April 2020[209]. (See Figure 93 below).

[207] NHS Digital, Mental Health Services Monthly Statistics. Indicator MH32a. Accessed here. [Mental Health Services Monthly Statistics - NHS Digital]

[208] NHS Digital, Mental Health Services Monthly Statistics. Indicator MH32a. Accessed here: [Mental Health Services Monthly Statistics - NHS Digital]

[209] NHS Digital, Mental Health Services Monthly Statistics. Indicator MH01a. Accessed here: [Mental Health Services Monthly Statistics - NHS Digital]

Figure 93– Number of children and young people in contact with services covered in MHSDS (ages 0-18)



Source: NHS Digital

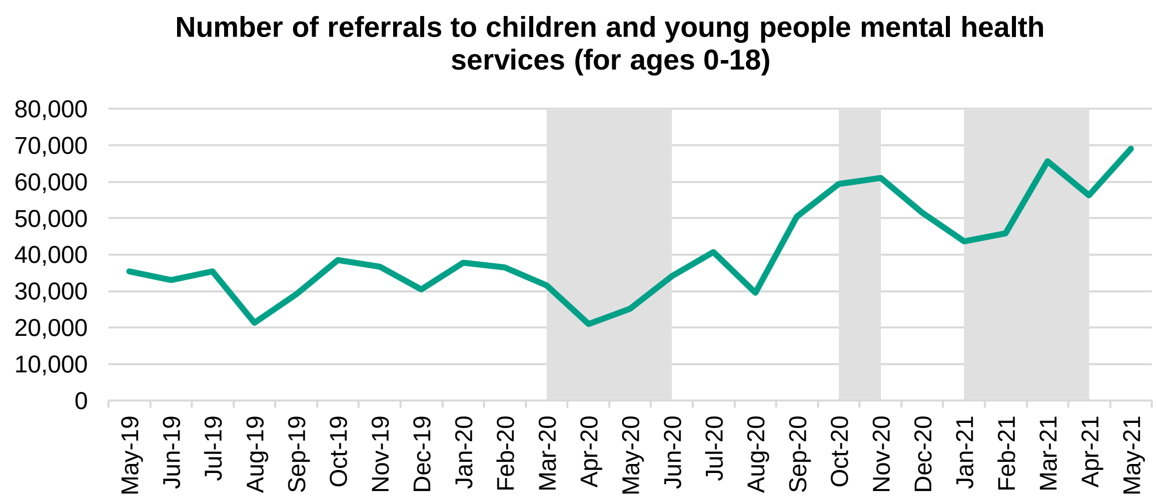
C.7.3.5 *Children and Young People Mental Health Services (subset of MHSDS)*

2019/20, for children and young people aged 0 to 18, there were 397,265 new referrals to Children and Young People Mental Health services – 42% higher than in 2018/19 (381,528)[210].

In April 2020, there were 42.4% fewer referrals to children and young people mental health services (ages 0 to 18) than in February 2020, and 33.4% fewer than in April 2019. By July 2020, referrals have returned to pre-pandemic levels and from September 2020 referrals have been substantially higher than pre-pandemic.

In April 2021, the number of referrals to children and young people mental health services (for ages 0 to 18) were 54.5% higher than pre-pandemic level and 168.4% higher than in April 2020. (See Figure 94).

Figure 94– Number of children and young people in contact with CYPMH services within MHSDS (ages 0-18)



Source: NHS Digital

[210] MHSDS time series calculated from total for 12 months of CYP32a referrals to children and young people's mental health services starting in Reporting Period, aged 0-18.

C.7.3.6 *Children and Young People Eating Disorders – waiting times*

The Government has set a target of 95% of children with an eating disorder to receive treatment within one week for urgent cases and four weeks for routine cases by 2020/21[211]. In Q4 2020/21, 70.5% of children and young people who started treatment for an urgent case were seen within 1 week, down 2.2 percentage points from Q3 (72.7%)[212]. 72.7% of patients started routine treatment within four weeks in Q4 2020/21, a 10.0 percentage points decrease compared to the previous quarter (Q3 2020/21, 82.7%)[213].

C.7.3.7 *Unmet need for access to mental health treatment for children and young people*

In 2020, one in twelve children (8.2%) aged 5 to 16 who had a probable mental disorder had parents who decided to not seek help for a concern regarding their child's mental health.

Around one in five (21.7%) of 17 to 22-year-olds with a probable mental disorder reported that they had decided to not seek help for a mental health concern due to the pandemic, and girls this age were more likely than boys to report needing contact with services regarding mental health issues (73.3% reported not needing contact and 85.9%, respectively)[214].

In 2020, young people aged 17 to 22 were more likely to have received help from services as normal (7.2%) than 5 to 16-year-olds (3.6%). When it came to receiving help for mental health problems during the pandemic, 7.4% of all 17 to 22-year-olds reported they tried to seek help for mental health problems but didn't receive the help they needed, this rose to 21.7% of those with a probable mental disorder. This is compared to 3.8% of all 5 to 16-year-olds and 17.5% with a probable mental disorder in this age group[215].

C.8 Conclusions

In this section, we have considered a range of data to identify impacts of COVID-19 on the healthcare system and patient health.

Our analysis suggests that there has been a fall in underlying need related to non-COVID infections, accidents, and air pollution. There has additionally been an increase in underlying need from substance abuse and domestic violence. We do not observe data on underlying need on all conditions, but for the ones we do observe there isn't a clear picture emerging.

We also see in our data that health-seeking behaviour has altered during the pandemic. Primary care consultations fell significantly after the start of the pandemic and have only fully recovered by May 2021. It is complex to identify whether this fall in activity is the result of changes to underlying need, changes in health-seeking behaviour or adaptations put in place in the health system to respond to COVID-19 and we have not attempted to do this here. Primary care consultations for the youngest patients fell the most sharply, though this is likely to be at least partially explained by the fall in underlying need related to non-COVID conditions

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[211] NHS England. Implementing the Five Year Forward View for Mental Health. Accessed here: NHS England » Implementing the Mental Health Forward View

[212] NHS England. Children and Young People with an Eating Disorder Waiting Times. Accessed here: Statistics » Children and Young People with an Eating Disorder Waiting Times (england.nhs.uk)

[213] NHS England. Children and Young People with an Eating Disorder Waiting Times. Accessed here: Statistics » Children and Young People with an Eating Disorder Waiting Times (england.nhs.uk)

[214] NHS Digital (22 October 2020) Mental Health of Children and Young People in England, 2020: Wave 1 follow up to the 2017 survey. Accessed here: Mental Health of Children and Young People in England, 2020: Wave 1 follow up to the 2017 survey - NHS Digital

[215] NHS Digital (22 October 2020) Mental Health of Children and Young People in England, 2020: Wave 1 follow up to the 2017 survey. Accessed here: Mental Health of Children and Young People in England, 2020: Wave 1 follow up to the 2017 survey - NHS Digital

for this age group. Consultation rates fell the least for the most deprived regions over the course of the pandemic.

Administrative data from primary care shows that diagnosis of all chronic conditions considered in this report fell significantly, with the diagnosis of COPD falling by up to 50% relative to 2019. As before, it has not been possible to identify in the data whether is due to changes in health-seeking behaviour, underlying need or health system adaptations. However, the delayed diagnosis and management of these conditions is likely to have adverse impacts on patient outcomes, and potentially also increase demand elsewhere in the health system. Management of already diagnosed long-term conditions may be slightly less affected given the data that suggests that consultations did not fall to the same degree as new diagnosis over this period.

We also see that patient wait times increased significantly over this period, with wait times increasing to a much greater degree for orthopaedic & trauma conditions and ophthalmic conditions when compared to cardiovascular conditions. The longer wait times for patients are likely to have adverse consequences for patient outcomes as well.

Finally, we also see that hospital activity declined significantly during the pandemic. Again, it is complicated to separate out the impacts from changes to underlying need and demand, and health system adaptations to respond to the pandemic. In-person outpatients appointments fell by 40% relative to 2019 but a substantial number of these appointments were substituted for telephone outpatient appointments. Elective admissions fell by 34% relative to 2019 while emergency admissions fell by 23% over this period. Additionally, the probability of admitting the most severe COVID patients arriving at A&E over the period fell too. There was also variation in activity across various patient characteristics and geographies.

Overall, the impacts on the pandemic have affected different patient groups differently and through different mechanisms, as is demonstrated by our case studies. However, the net effects of pandemic on health system and patient outcomes are likely to be significantly adverse, with delayed and pent-up demand from patients across the system being realised in the near-term alongside delayed diagnosis, management and treatment of conditions resulting in poorer outcomes for patients.

D. Indirect impacts of COVID-19 on the wider population in the long-run

So far in this paper we have explored the direct impact of COVID-19 on the population through infections, deaths and long-COVID; the impact of COVID-19 on individual behaviour and, when combined with changes to provider and health system behaviour during the pandemic, the impact on the healthcare sector. Finally, we explore the impacts of COVID-19 on the wider population through three key groups: those in the labour force, full-time education, and in receipt of social care.

COVID-19 induced a significant economic downturn in 2020 and 2021. The subsequent impact on employment can have significant impact on individuals' health, through a variety of mechanisms. The employment rate of 16-64-year olds in England fell to 75.0% in January – March 2021, the lowest rate since October – December 2016. Since then it has recovered slightly to 75.3% in April – June 2021[216]. There is substantial heterogeneity in the change in employment between local areas. For example, Mid Lancashire saw a 6.9-percentage point fall in their employment rate from 83.7% to 76.8%, whereas Bedford saw an increase in employment in the same period by 7.6 percentage points.

The impact on individuals' health from a reduction in employment is complex, and there is extensive literature studying the impact of unemployment and economic downturns on health, specifically mortality. The direction of health impacts after an economic downturn is also contentious in the relevant academic literature. Early studies suggest a procyclical relationship between mortality and the business cycles; mortality increases as economic activity increases, with the exception of suicide. For example, Ruhm (2000)[217] found a 0.5-0.6 percent decrease in mortality for a one percentage point rise in the unemployment rate using data from the US. He identified several key reasons for why this relationship may exist: tobacco use, excessive alcohol consumption (and driving under the influence of alcohol), and obesity might fall during economic downturns whole, time invested in preventative activities might increase.

On the other hand, more recent literature suggests a countercyclical relationship between health outcomes and the business cycle. Janke et al. (2020)[218] use self-reported health measures from the UK's Quarterly Labour Force Survey from 2002-2016 to estimate the impact of a change in the growth rate of local employment rates on the prevalence of chronic health conditions. They find a countercyclical relationship in morbidity from chronic illnesses: a 1 percentage point increase in the growth rate of the employment rate is associated with a 2% fall in the prevalence of chronic conditions in the long run. The differences in findings may be due to a variety of factors. For example, different unemployment protections and labour regulation laws in the US may partly reflect their pro-cyclical relationship.

In this section, we estimate the health outcomes following the economic downturn using Janke et al's estimates at a NUTS2/3 local level. Due to this paper being based on evidence from the previous recession (2008/9), we then go on to use micro-level data (section D.1.1), as Ruhm did, to explore the reported change in behaviour of individuals during the pandemic. Specifically, we look at changes in alcohol consumption, tobacco use, diet, exercise and

[216] ONS (2021) *Labour Force Survey Headline Indicators*. Available from: [Labour Market Profile - Nomis - Official Labour Market Statistics (nomisweb.co.uk)]

[217] Ruhm, CJ. (2000). *Are recessions good for your health?* Quarterly Journal of Economics, 115, pp. 617-650

[218] Janke, K., Lee, K., Propper, C., Shields, K., and Shields, M., (2021). *Health in Hard Times: Local Effects, National Effect and Area Heterogeneity*. Working Paper. Shared by authors.

measures of individual mental health. Then we discuss the unique features of this recession (section D.1.2), notably the furlough scheme and its impact on income, the sectors most impacted from this recession (and how this differs from previous economic downturns), and how behaviour was impacted not only by the economic downturn, but also by strict restrictions put in place to manage COVID-19. Sections D.1.1 and D.1.2 provide a discussion of the limitations of comparing this recession to previous trends in employment growth rates and different factors that may lead to the estimates we present not being reflective of the COVID-19 induced recession.

The nature of the pandemic also means that it is not just changes to employment levels that will impact long-term health of the population. The restrictions to manage the pandemic had impacts on children and young people in education. There is an extensive literature examining the impact of education on health, so we discuss the potential health impacts of individuals having reduced access to education for the majority of a school year. Finally, we discuss the wellbeing impact of the pandemic for those in receipt of both informal and formal care.

D.1 Impacts on the wider population through changes to employment and the wider economic fallout

There are expectations that the national unemployment rate will continue to rise, with the Bank of England forecasting unemployment to peak at 4.7% in Q3 2021[219]. This is lower than the Bank of England's forecast in May 2021[220], which predicted a peak unemployment rate at 5.4%. This reflects the extension of the furlough scheme, the faster than expected vaccine roll out and more sustained economic recovery. The Bank of England do not publish their forecasts at a sub-national level, and given the focus of this paper on inequalities, we have changed our methodology from previous versions of this paper. We continue to use recent academic evidence on the impact of changes to the growth rate of employment on the prevalence of chronic health conditions. We estimate the change in the growth rate of employment using the ONS' Quarterly Labour Force Survey at both a national and NUTS2/3 level. We calculate the change in the employment growth rate by taking the log differences of the employment rate for each NUTS2/3 level and apply these to the estimates of long-run (accumulated) employment growth elasticities at a local level. These elasticities have been generously shared by the authors of *'Health in Hard Times: Local Effects, National Effect and Area Heterogeneity'* and we thank them for their comments and advice on the use of their work.

Areas differ in their response to employment shocks due to several reasons, as highlighted by Janke et al. They suggest that the estimated effects are largest in areas with more traditional industrial composition, a higher proportion of older people and areas with previously worse long-term health. The level of spatial disaggregation they use is determined by assessing the relative performance of models at different geographical levels. 81 areas are used, 60 at a NUTS3 level and 21 at NUTS2. We replicate these geographies for England only in this paper.

Their estimates allow us to estimate the impact of the fall in the employment growth rate on the prevalence of chronic health conditions at a local area level. Figure 95 shows the impact of the change in employment rate observed from Quarter 2 2019 – Quarter 1 2020 relative to Q2 2020 to Q1 2021 (the most recent Quarterly LFS data available).

[219] Bank of England (2021) Monetary Policy Report August 2021. Available from: Bank of England Monetary Policy Report August 2021

[220] Bank of England (2021) Monetary Policy Report May 2021. Available from: Bank of England Monetary Policy Report May 2021

Figure 95 – Change in employment rate growth Q2 2019 – Q1 2020 vs Q2 2020 – Q22021

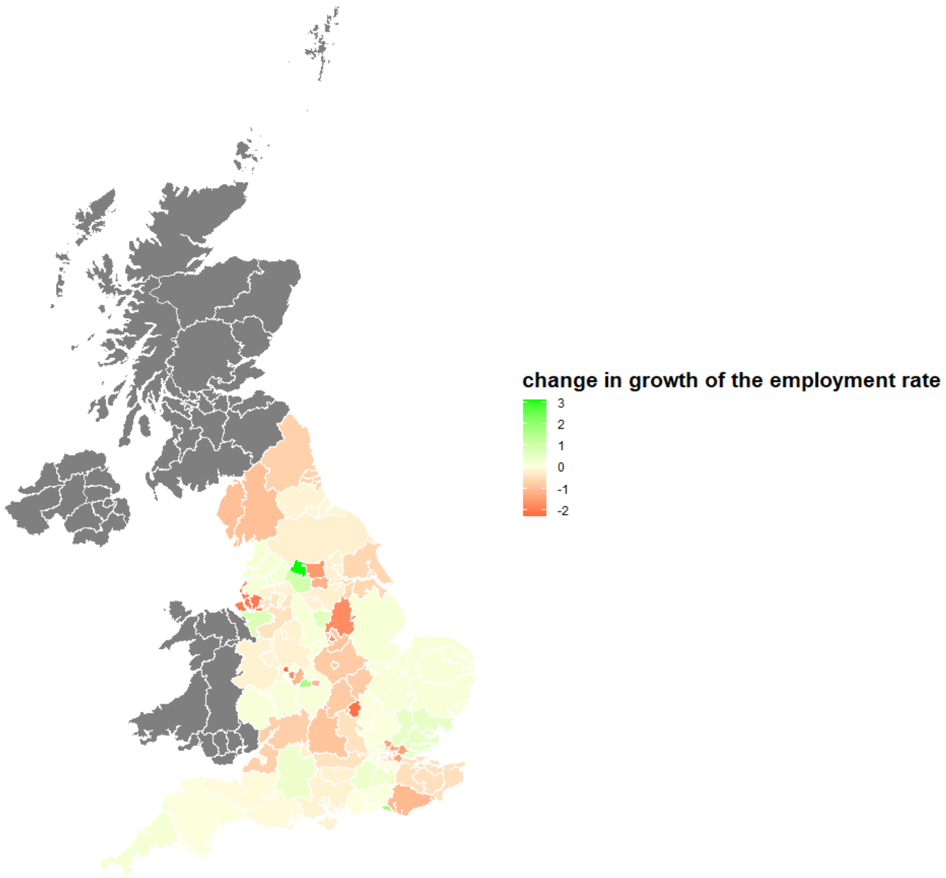
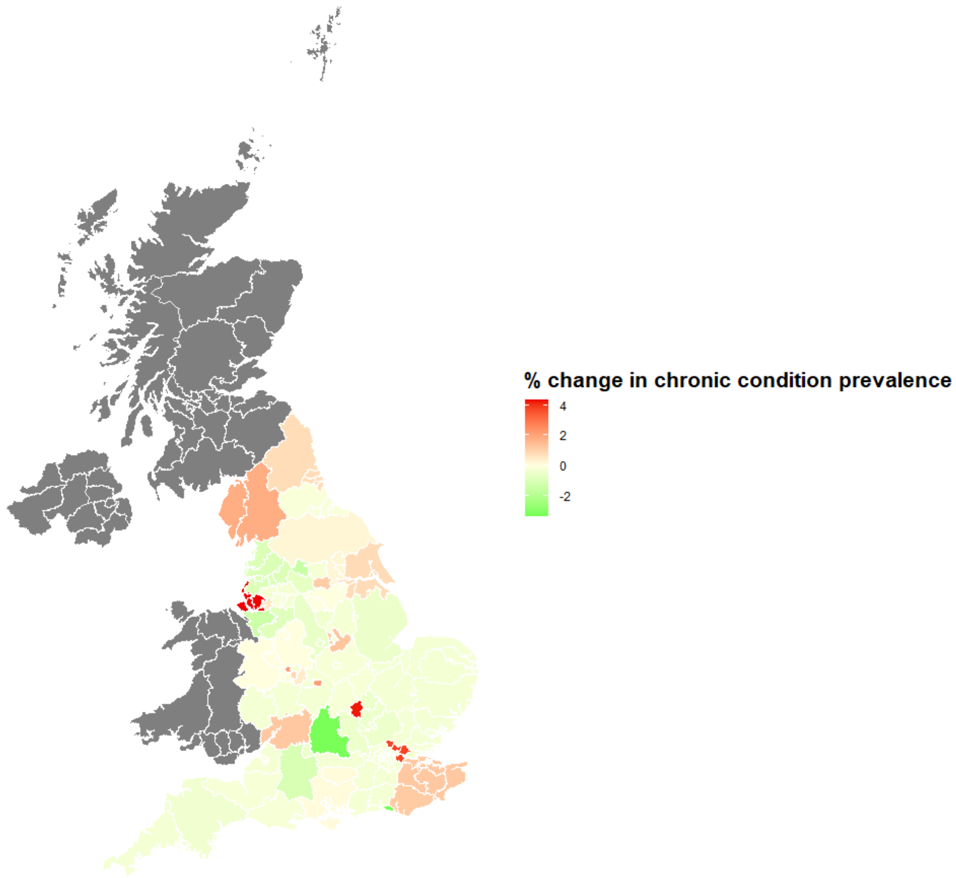


Figure 96 – Predicted change in chronic condition prevalence due to the change in unemployment growth in Figure 95

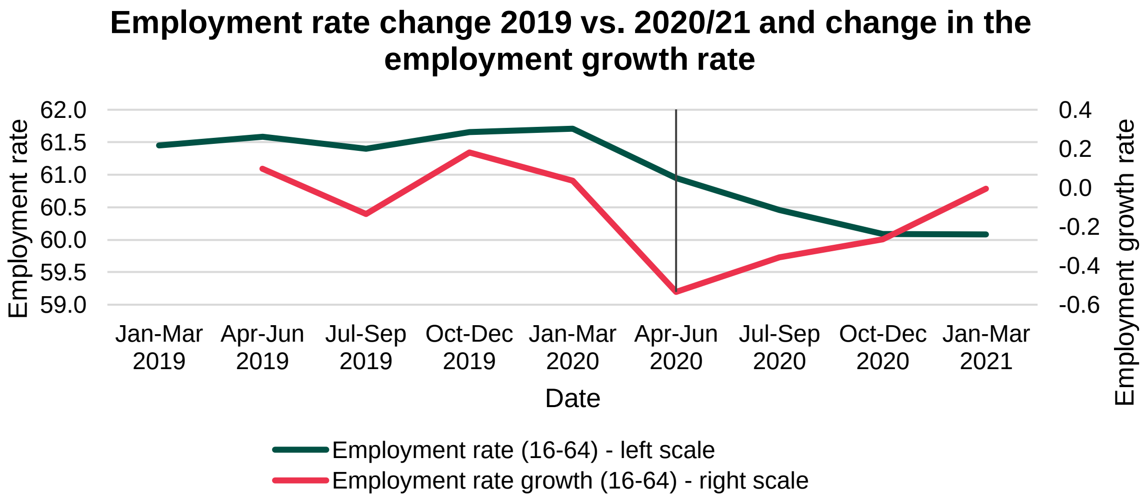


Source: Calculations using ONS Quarterly Labour Force Statistics (2021) and local accumulated employment growth elasticity estimates reported in Janke et al. (2021)

Figure 96 shows negative employment growth in the North East, North West, parts of London, the South East, and the Midlands. Figure 96 presents the predicted change in chronic conditions prevalence as a result of the change in the employment growth rate. These changes reflect the pattern in the employment growth rate in Figure 95. It is clear that the impact of the COVID-19 induced economic downturn will likely result in unequal health impacts across the country. Overall, we expect there to be an increase in the prevalence of chronic conditions.

Nationally, as shown in Figure 97 Employment rate change and change in the employment growth rate (2019 vs 2020/21), the growth in the employment rate fell to a minimum of -0.5 percentage points in Q2 2020. It has since recovered substantially; in the latest period (March to May 2021), there was an increase in the employment rate of 0.1 percentage points[221].

Figure 97 Employment rate change and change in the employment growth rate (2019 vs 2020/21)



Source: ONS Quarterly Labour Force Survey, 2021

Applying Janke et al.'s mean national employment growth elasticity estimate of -0.026 to the minimum employment growth rate of -0.5 percentage points, we would predict a 1% increase in chronic condition prevalence at the national level. Janke et al. estimate the full health impacts would take between two and three years to realise.

The estimates in Janke et al. are based on the period 2002 to 2016, which includes the recession induced by the global financial crisis. The COVID-19 induced recession, however, is unlike previous recessions given the extensive restrictions in place to alter individual behaviour, alongside voluntary changes in behaviour. We use the Understanding Society survey data to examine the impact of COVID-19 on tobacco use, alcohol consumption, obesity, and physical activity (key behavioural factors in determining individual health). We also examine the impact on the mental health of those surveyed.

D.1.1 Micro-level data exploring how individual behaviour changes during the pandemic and the potential consequences for long-term health

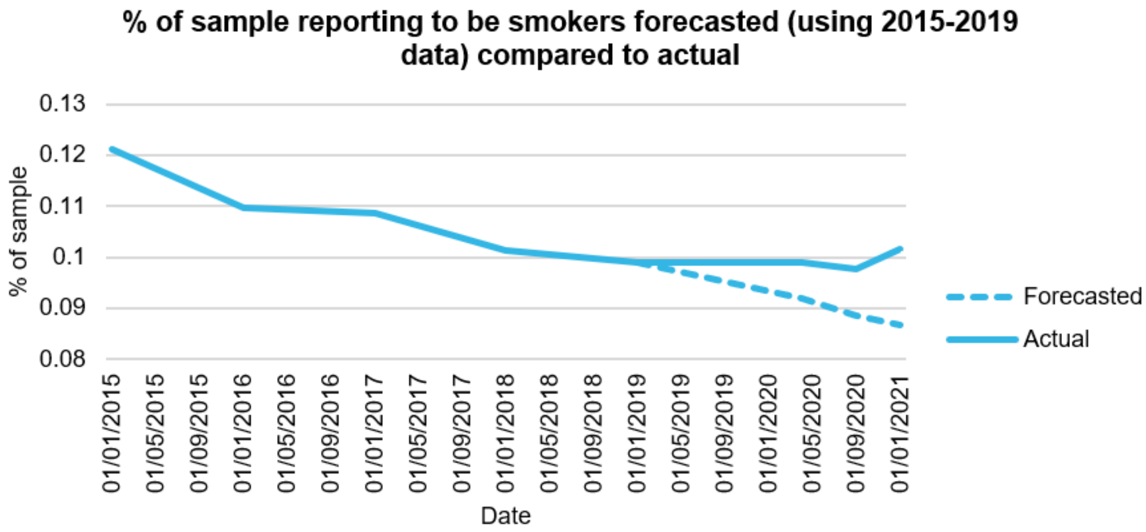
D.1.1.1 *Tobacco use*

Ruhm (2000) suggests that an economic downturn is associated with reduced smoking as tobacco is a good where demand reduces as incomes decrease. Historically, Understanding

[221] ONS (2021) *UK Labour Market, July 2021*. Available from: [Labour market overview, UK - Office for National Statistics (ons.gov.uk)](https://www.ons.gov.uk)

Society data suggests an overall trend of falling tobacco consumption since 2015. However, as shown in Figure 98 Percentage of sample reporting to be smokers forecast (using 2015-19 data) compared to actual, during the pandemic this fall slowed and potentially reversed slightly. This may be due to a reduction in NHS stop smoking services or increased stress in the population[222]. This provides further indication that the long-run effects of the pandemic on population health will be detrimental. This pattern holds for men and women, although the number of women smoking has fallen below the proportion of men since 2018. The data also shows that the 35-49 age group were most likely to see an increase in the proportion smoking, and the 17-34 age group were most likely to see a decrease. We continue to see those in lower deprivation quintiles being more likely to smoke relative to higher quintiles. This pattern is similarly seen in the UCL Smoking Toolkit study that shows a small reduction in the number of people smoking at the beginning of 2020 before a flattening/potential increase during the pandemic[223].

Figure 98 Percentage of sample reporting to be smokers forecast (using 2015-19 data) compared to actual



Source: Understanding Society, 2009-2021

D.1.1.2 *Alcohol consumption*

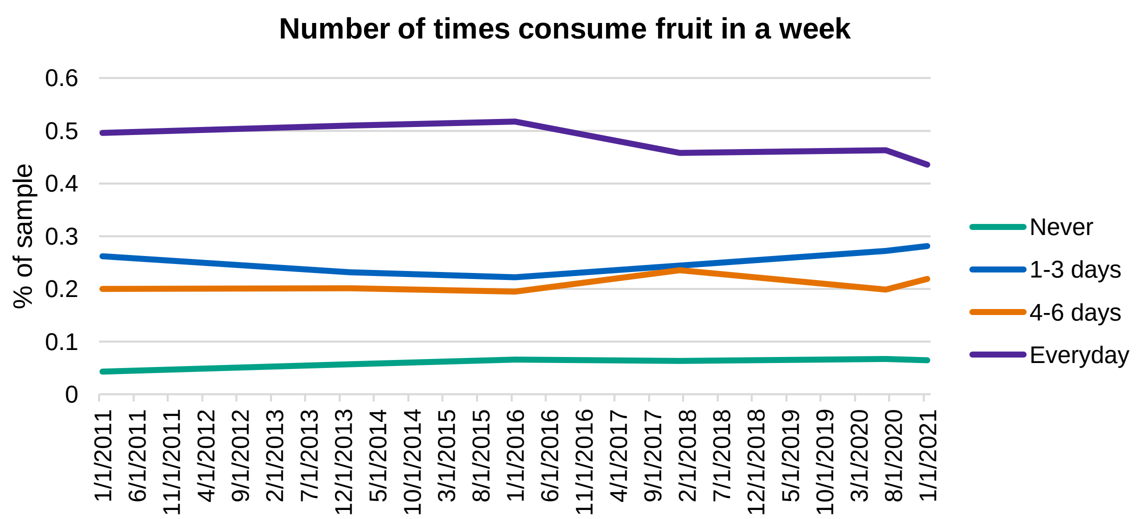
Analogous to smoking, Ruhm (2000) suggests that alcohol is a good where demand decreases as income decreases and will thus see a reduction in consumption during an economic downturn, particularly heavy drinking. As shown in Category C, this does not hold; the amount of heavy and at-risk drinking has increased during the pandemic, although the proportion of people drinking less than before the pandemic also increased. The 20% increase in deaths also indicates that the mortality impacts of recessions on alcohol consumption is unlikely to hold in this recession, although the long-term impacts are yet to be realised. This may be particularly the case in this recession due to the furlough scheme, with individuals maintaining their income with additional free time to undertake risky behaviours. On the other hand, Ruhm suggests that a significant proportion of alcohol-related deaths are as a result of alcohol-involved driving accidents. Restrictions on individuals' movement may have gone some way to reduce these accidents.

[222] Pomerleau, C., Pomerleau, O., (1991), *Research on stress and smoking: progress and problems.* British Journal of Addiction, 86: 599-603.
[223] UCL (2021). *Smoking Toolkit Study.* Available from: www.smokinginengland.info

D.1.1.3 *Diet*

During the pandemic, 2% of the survey sample in Understanding Society reported cutting meal size or skipping meals as a result of food insecurity. Furthermore, the proportion of individuals accessing foodbanks increased from 0.7% pre-pandemic to 1.6% in May 2020and show how fruit and vegetable consumption has changed during the pandemic. There does not seem to be a significant change, although perhaps a reduction in the number of people eating fruit and vegetables every day. Furthermore, a longitudinal analysis of data from the HEBECO study find that in UK adults, average weight/BMI increased in 2020 before returning to normal levels by the end of 2020, although this was highly dependent on individual characteristics[224]. They find that this was because of behavioural factors such as alcohol consumption and high fat, salt and sugar snacks intake. The IFS similarly found that the loss of calories from not eating out was more than compensated for by increased consumption in the home and that calories consumed went up by 15%[225]. They therefore speculate that the proportion of adults who are overweight may increase from 63% to 75%. The nature of the pandemic and the food insecurity it created may be a factor in why this data does not support Ruhm's findings that an economic downturn leads to individuals having more time to consume healthy diets, thus having a positive impact on health.

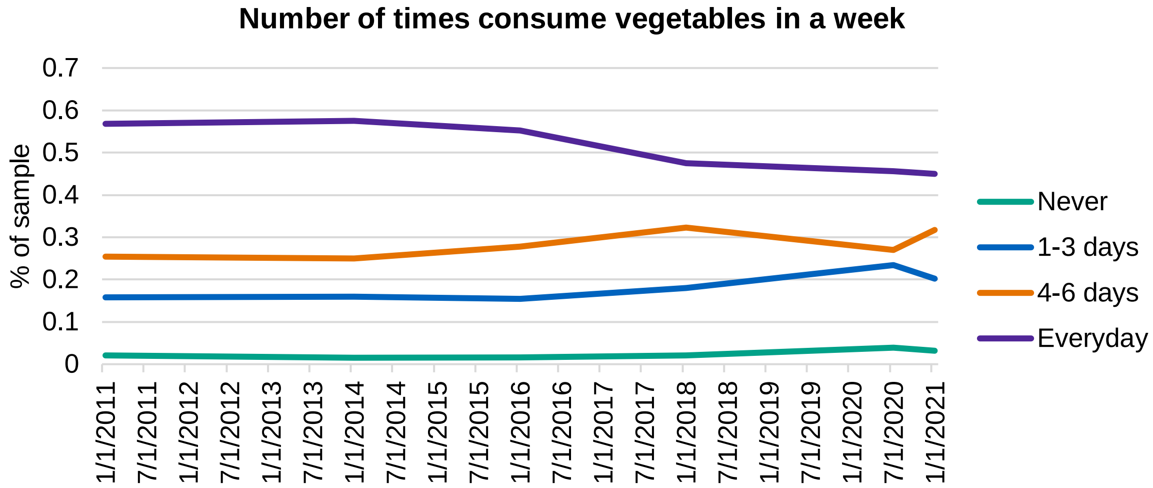
Figure 99 – Number of times consume fruit in a week



Source: Understanding Society, 2009-2021

[224] [Impact of COVID-19 pandemic on weight and BMI among UK adults: a longitudinal analysis of data from the HEBECO study | medRxiv]
[225] [WP202118-The-dietary-impact-of-the-COVID-19-pandemic.pdf (ifs.org.uk)]

Figure 100 – Number of times consume vegetables in a week

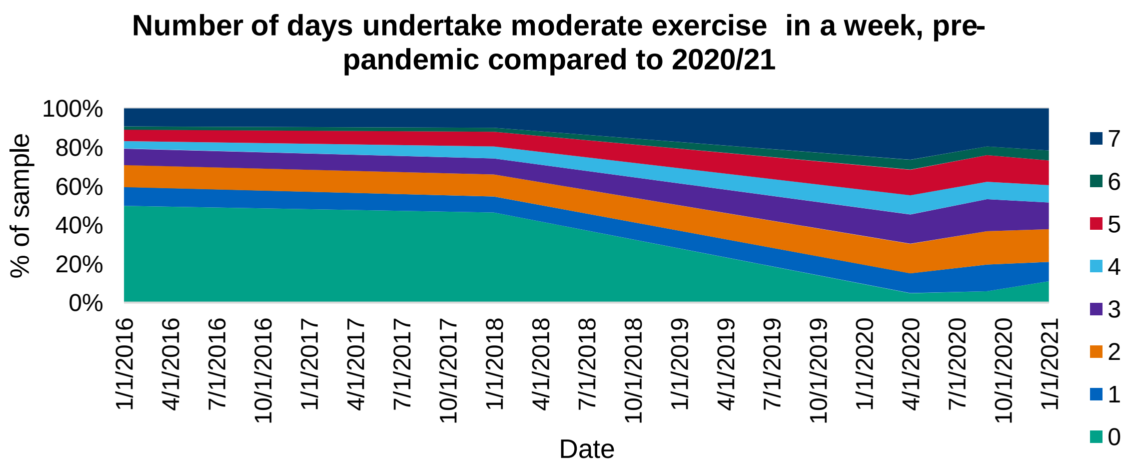


Source: Understanding Society, 2009-2021

D.1.1.4 *Exercise*

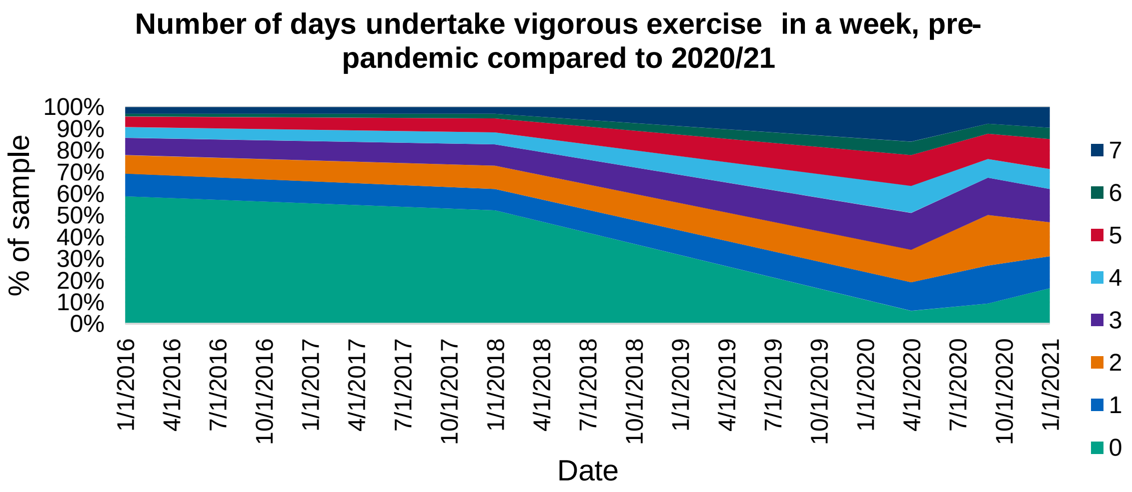
Ruhm (2000) suggests that economic downturns and their subsequent reduction in employment can lead to people having more time to invest in preventative behaviour, such as increasing the amount of exercise undertaken. This is reflected in Understanding Society data as shown in Figure 101: Number of days where moderate exercise is undertaken per week, comparing pre-pandemic to 2020/21. Relative to the pre-pandemic average, the mean number of days in a week people do moderate and vigorous exercise increased substantially during the pandemic, despite the closure of leisure facilities. Figure 103: Average number of days completing vigorous exercise by age group shows the breakdown by age, with each age group showing an initial significant increase followed by a gradual decline (this may also be due to poor weather). The largest return to normal levels was the oldest age group, over 80-year-olds. This increase in exercise levels may be due to fewer people commuting to work, people having additional time to invest in healthy behaviours due to being unemployed or on furlough, or the closure of recreational venues.

Figure 101: Number of days where moderate exercise is undertaken per week, comparing pre-pandemic to 2020/21



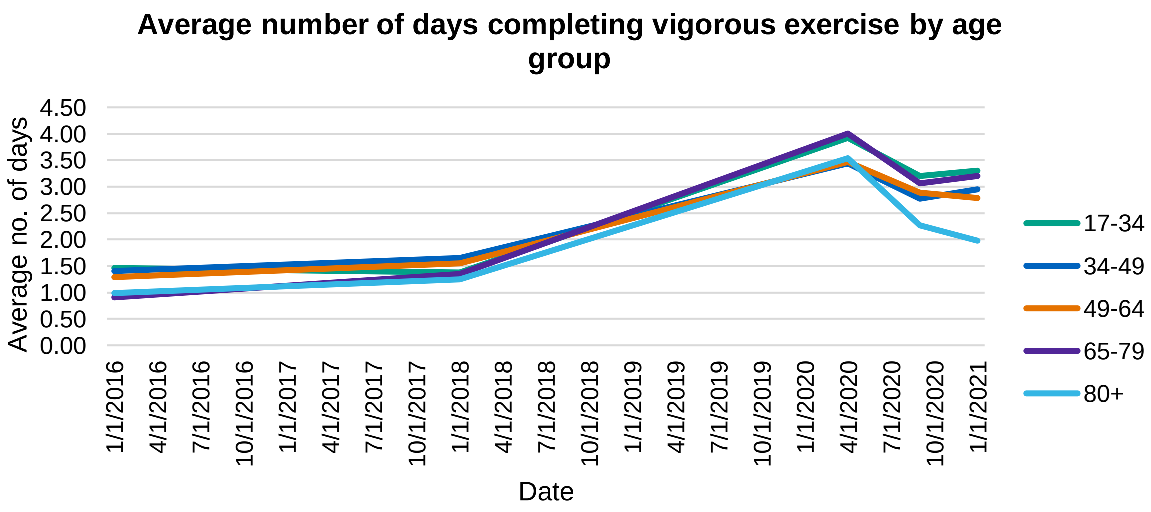
Source: Understanding Society, 2009-2021

Figure 102 Number of days where vigorous exercise is undertaken per week, comparing pre-pandemic to 2020/21



Source: Understanding Society, 2009-2021

Figure 103: Average number of days completing vigorous exercise by age group

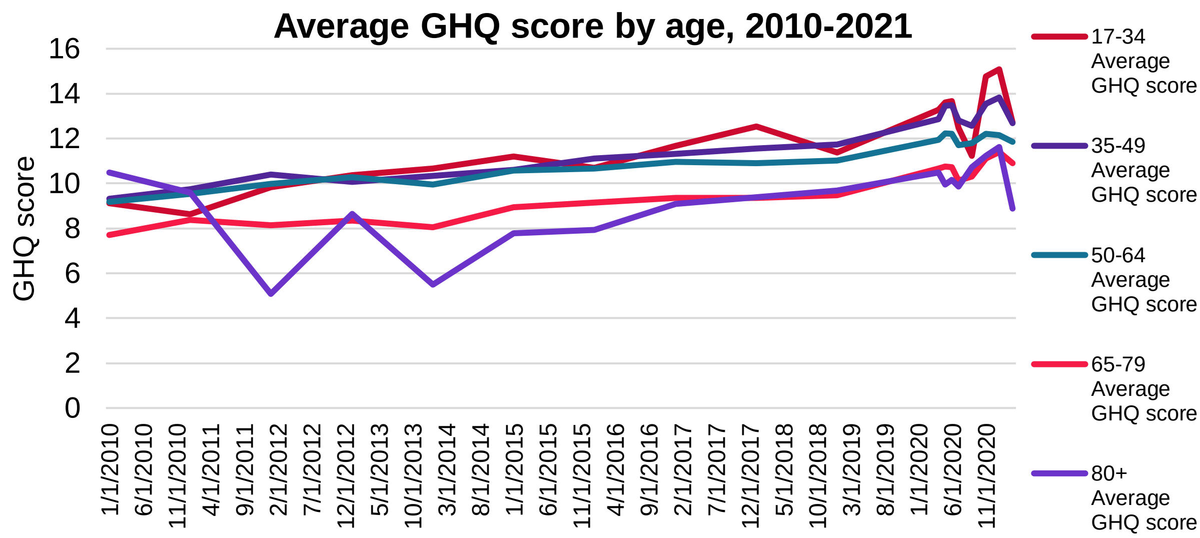


Source: Understanding Society, 2009-2021

D.1.1.5 *Mental Health and wellbeing*

The majority of evidence on the impact of economic downturns on mental health conditions suggest a countercyclical relationship; a worsening of economic conditions leads to a worsening of mental health. The same has been seen during the pandemic. As shown in category C, we use a subjective wellbeing score as a measure of mental health in the population, as shown in section C.6.1. This measure converts valid answers to 12 questions of the General Health Questionnaire (GHQ) to a single scale by summing the score for each individual variable to give a score between 0 (least distressed) and 36 (most distressed). The average population's wellbeing score was worsening prior to the pandemic, but the rate increased faster during the pandemic, particularly during periods of strict restrictions. This finding is in line with the literature discussed in this section that economic downturns will have a significant negative impact on mental health. We cannot distinguish whether this impact on mental health is as a result of generally living through a pandemic, pandemic related restrictions or the economic downturn. We expect it to be a combination of all three factors. Figure 104: Average GHQ score by age, January 2010 to November 2020 shows that younger and older people saw the most significant change to their mental health during the pandemic, but the ranking of age groups remained consistent to pre-pandemic levels.

Figure 104: Average GHQ score by age, January 2010 to November 2020



Source: Understanding Society, 2009-2021

D.1.2 How the economic conditions during the COVID-19 pandemic may differ relative to the 2008/9 recession

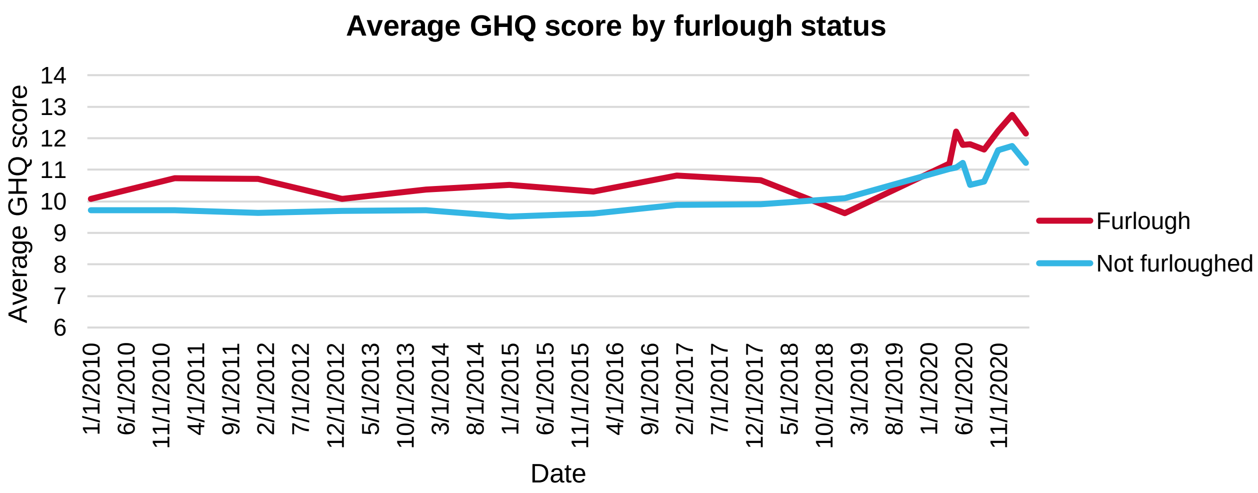
The elasticity parameters used in section D.1 to predict changes in chronic condition rate are based on data from the 2008/9 recession. The differences in the 2008/9 recession and the COVID-19 induced recession may lead to different outcomes than expected. For example, the fiscal response (both in the short-term with the furlough scheme and in the longer-term), the different sectors impacted and the impact of Brexit, may all have impacts on the employment growth rate and health of the population. We therefore expect our estimates presented above to be an **overestimate** of the true impacts.

D.1.2.1 *Furlough*

Relative to other economic downturns, many jobs and incomes in 2020/21 have been protected through the Coronavirus Job Retention Scheme. Figure 106 - Number of employees on furlough, March 2020 to May 2021 shows the number of employees protected by the scheme in 2020/21. This will have prevented a large number of redundancies being made and protected up to 80% of workers' incomes. We have still seen changes in the employment growth rate so the health impacts will be captured in Janke et al.'s estimates but in the absence of the CJRS, the employment rate growth rate would likely be much more negative. However, the estimates will not capture the impact on health of those on furlough. This may go some way to explain why we have not seen a reduction in alcohol consumption and why levels of smoking have increased relative to the forecasted trend during the pandemic. This may reflect individuals using harmful behaviour as a coping strategy to deal with the stress of living through a pandemic. It may also explain why the amount of exercise being undertaken has increased, as individuals have more time to spend on investing time into their health (this is in line with Ruhm (2000)).

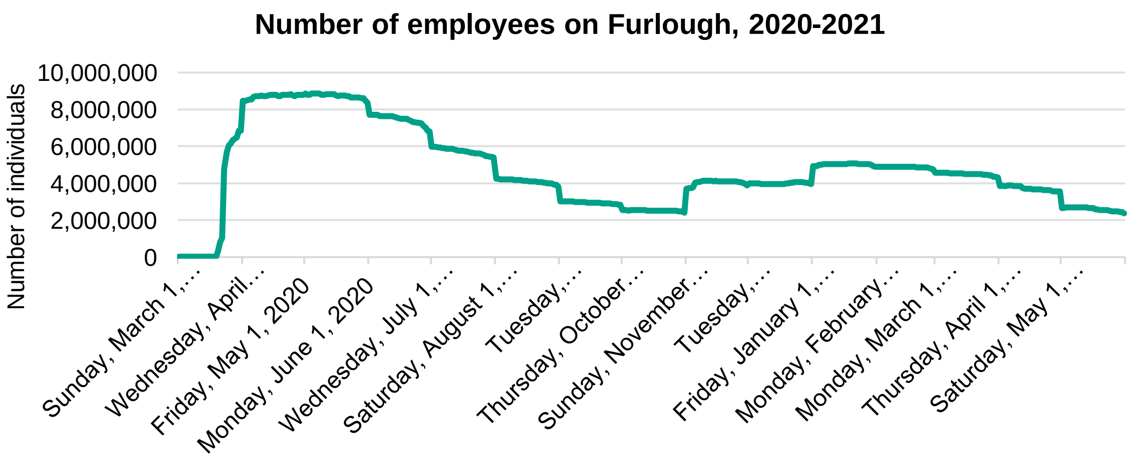
At an individual level, initial findings from early in the pandemic show that becoming unemployed during the pandemic was significantly related to worse mental health. On the other hand, those who had some paid work or were on reduced hours/furloughed all had similar levels of mental health (Burchell et al., 2020). We show a similar picture in Figure 105: Average GHQ score by furlough status, with individuals furloughed likely to see a higher GHQ score relative to the rest of the adult population before the pandemic. It is unclear if this relationship will persist once the furlough scheme ends.

Figure 105: Average GHQ score by furlough status



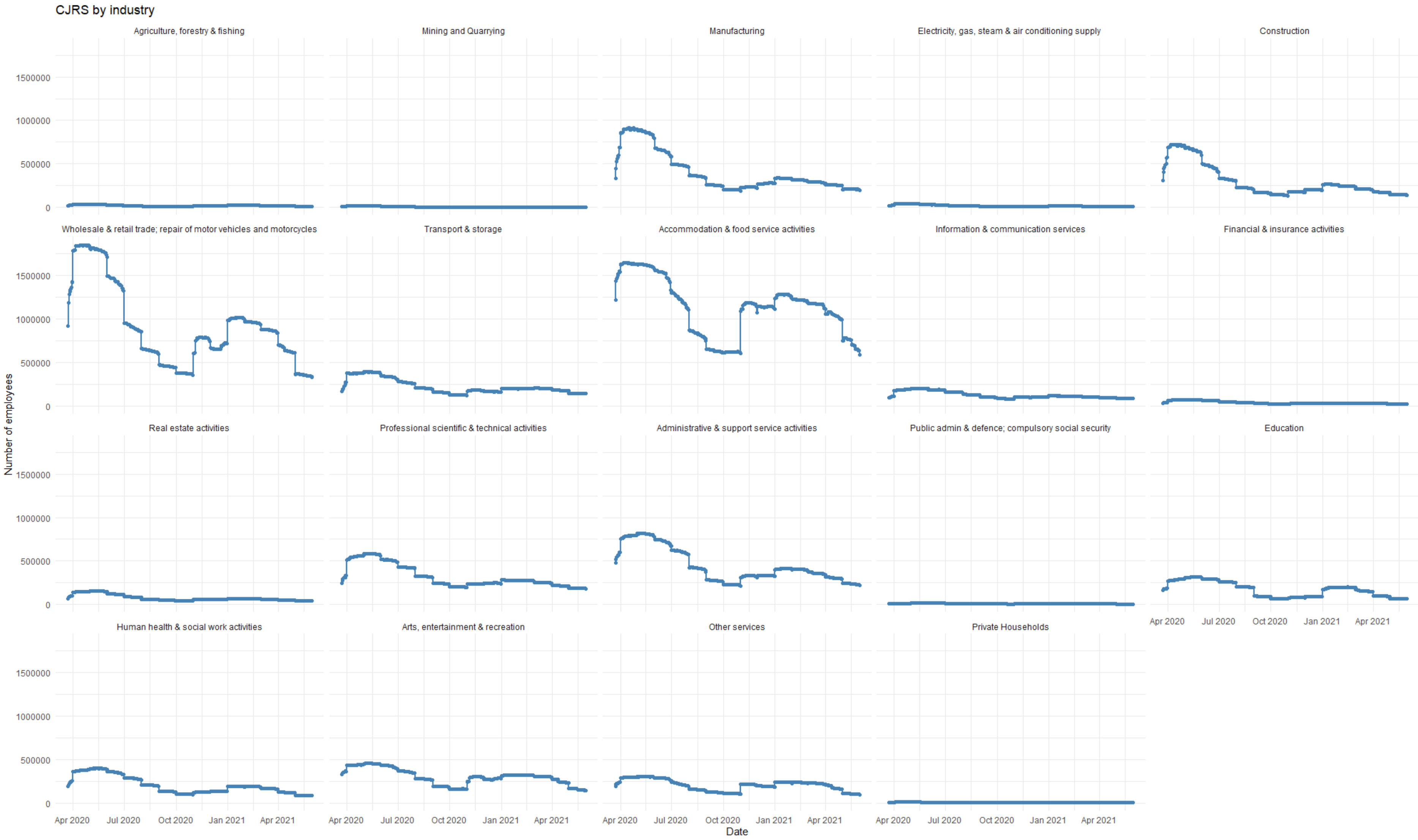
Source: Understanding Society, 2009-2021

Figure 106 - Number of employees on furlough, March 2020 to May 2021



Source: HMRC Coronavirus Job Retention Scheme Statistics, 2021

Figure 107 – Number of employees on Coronavirus Job Retention Scheme by Industry



Source: Coronavirus Job Retention Scheme statistics: 29 July 2021. Available from: [GOV.UK]()

D.1.2.2 *Fiscal response post-recession*

After the 2008/9 recession, the Government implemented a programme of fiscal austerity. The fiscal response to the COVID-19 recession may diverge from this for a variety of reasons, including the face pace of recovery. Therefore, the health impacts may be lower under a situation without cuts to health-related public services.

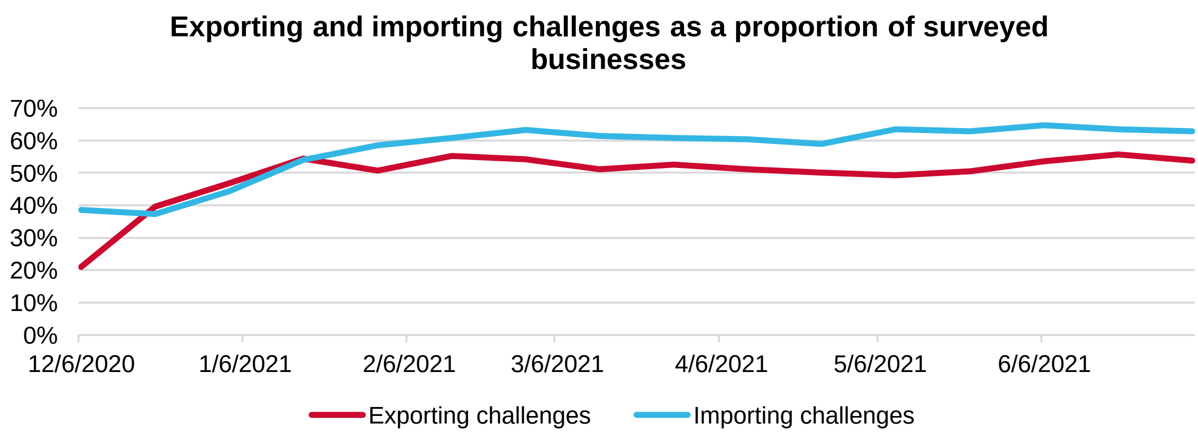
D.1.2.3 *Sectors impacted*

A key reason estimates of chronic conditions using data from previous recessions may result in incorrect conclusions is that different sectors have been impacted during the COVID-19 pandemic relative to pre-pandemic levels. Figure 109 shows the growth rate of employment by different industries from 2002-2021 (Janke et al.'s estimates use data from 2002-2016). The majority of industries see similar falls in employment growth compared to the 2008/9 recession with the exception of accommodation and food services. This may reflect the impact of the furlough scheme in successfully preventing the expected slowdown in employment growth expected of such a significant recession, particularly when considering the large falls in output seen in many NPI effected sectors. However, it also reflects the impact of restrictions on certain sectors, such as hospitality and the arts. As these sectors tend to employ younger age groups, the chronic conditions may see a different pattern of change relative to previous recessions.

D.1.2.4 *Brexit and other trade impacts*

Some of the employment impacts observed in Figure 108: Proportion of businesses surveyed reporting exporting and importing challenges (December 2020 to June 2021) may reflect the result of disruptions to trade flows after the UK left the customs union in January 2021. As Figure 108: Proportion of businesses surveyed reporting exporting and importing challenges (December 2020 to June 2021) shows, the ONS' Business Insights survey suggests over 50% of businesses who trade outside of the UK are reporting exporting and importing challenges. This may result in lost income both for sectors that rely heavily on exports or that sell important goods, as well as other sectors which import inputs for their production processes, and who can therefore not produce enough to meet demand. If this leads to a sufficient loss of income, it may result in an increase in unemployment, particularly for the key sectors impacted. Therefore, we cannot attribute all the employment impacts to the COVID-19 pandemic.

Figure 108: Proportion of businesses surveyed reporting exporting and importing challenges (December 2020 to June 2021)

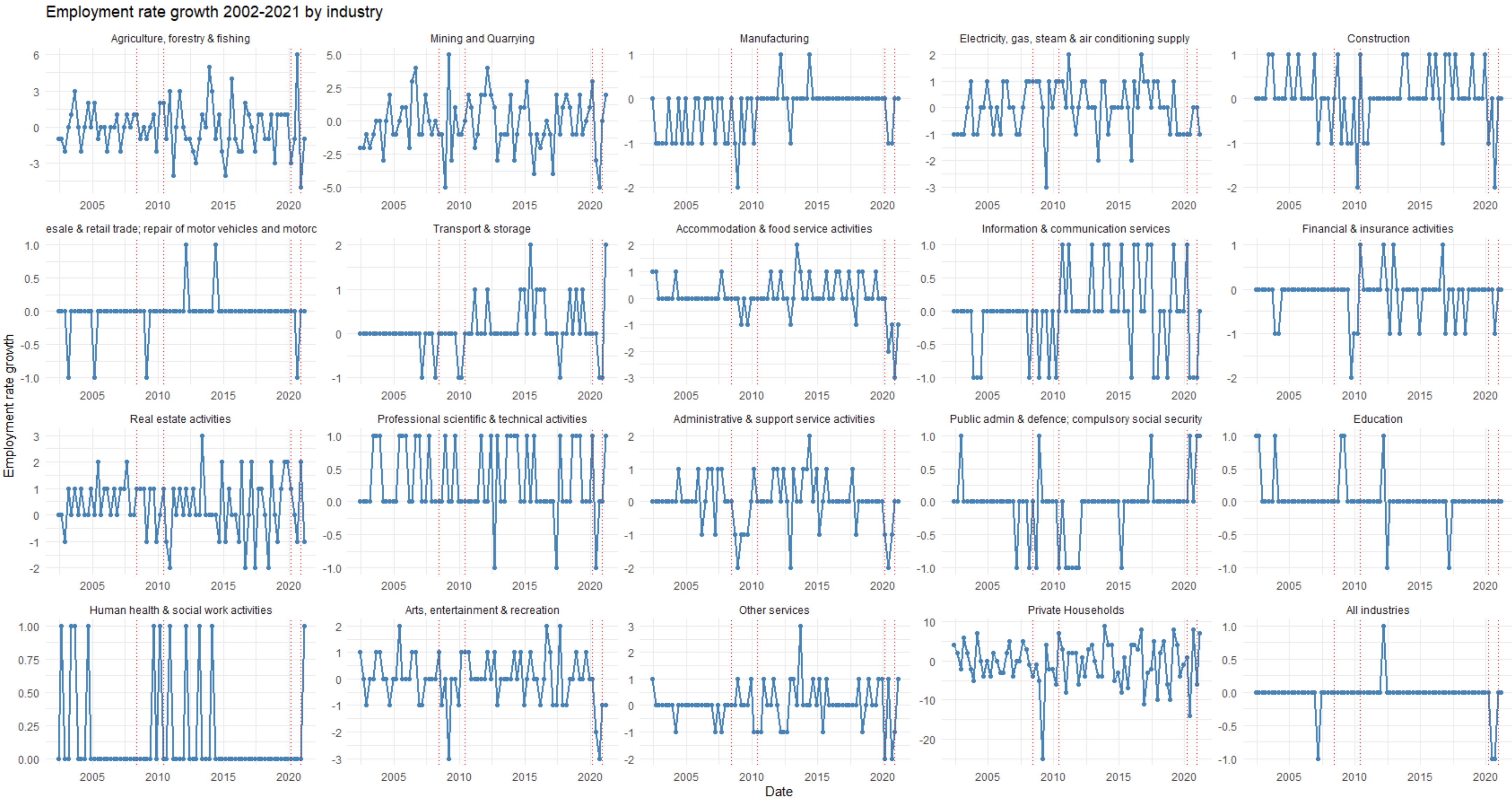


Source: ONS Business Insights Survey, 2021

D.1.2.5 *Impacts that are yet to be realised*

Our estimates of the chronic condition impact of a slowdown in the employment growth rate in England may underestimate the impact due to the protective nature of the furlough scheme. The Bank of England suggest that around half a million jobs are expected to remain on furlough, on average, over Q3 2021. This provides uncertainty to the recovery of the employment rate over the coming quarters, as it is unclear how the ending of the furlough scheme will affect the labour market. This will likely increase the rate of chronic conditions within areas where Janke et al. record a countercyclical relationship between unemployment and health.

Figure 109 – Employment growth rate by industry. Red lines show periods of recession

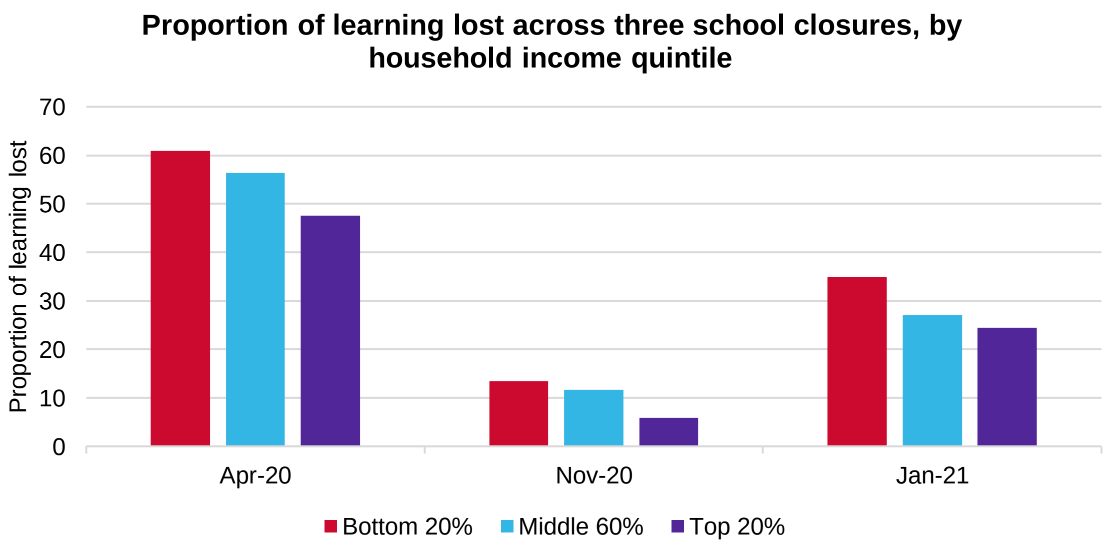


Source: Labour Force Survey, 2021. Available from: [NOMIS]()

D.2 Impacts from the loss of education on health

The Centre for Economic Performance[226] provides an estimate of the amount of education lost across the three periods of school closures during the pandemic by income quintile using Understanding Society data. Their estimates are presented in Figure 110: Proportion of learning lost across three school closures by household income quintile below. This clearly shows that more deprived children were more likely to experience higher rates of learning loss relative to less deprived individuals. Furthermore, as shown in a summary of relevant studies assessing the impact of partial school closures by the Education Endowment Foundation[227], pupils have made less academic progress relative to previous year groups, and disadvantaged pupils are the most likely to see COVID-19 related disruption to their education. Analysis by the Department for Education[228] suggests that, by their return to the classroom in the spring, primary pupils were around 2-3.5 months behind similar pupils in 2019/20 in reading and maths. Findings from the 2020/21 Autumn term report show that, on average, pupils from disadvantaged backgrounds (pupils eligible for free school meals at any point in the last 6 years) saw higher learning losses relative to their non-disadvantaged peers of around half a month in reading and a month in mathematics. Furthermore, they find the learning loss is highest for pupils in the North East and Yorkshire and the Humber.

Figure 110: Proportion of learning lost across three school closures by household income quintile



Source: Children's Commissioner

The relationship between education and health is complex, there is general agreement that the education-health relationship exists, although the mechanisms and causal relationship behind how education impacts health is multi-factorial. The immediate lost education may not be sufficient to result in considerable long-term physical health differences across all students. However, the resulting fall in attainment for groups at the margin of, for example, attending

[226] Major, L., Eyles, A., Machin, S. (2021). *Learning loss since lockdown: variation across the home nations.* Centre for Economic Performance. Available from: [Microsoft Word - lem ae sm briefing june 30 2021 (lse.ac.uk)]
[227] [Best evidence on impact of Covid-19 on pupil attainment | Education Endowment Foundation | EEF]
[228] Department for Education, Renaissance Learning, Education Policy Institute (2021). *Understanding progress in the 2020/21 academic year. Interim findings.* Available from: [Research report template (publishing.service.gov.uk)]

higher education, may result in increased rates of poorer health associated with lost education in the future.

A review from 2011[229] suggests the following reasons through which education impacts health:

- Firstly, lower expected lifetime income from reduced education has the potential to impact future health through poorer health and health-seeking behaviours. For example, lower income may lead to poor living environments and therefore poorer health.
- Lost education can reduce the efficiency of health production (Grossman, 1972)[230] as individuals lose the ability to make better choices to protect their health with less exposure to information, such as the benefits of undertaking healthy eating and exercising.
- Lost education may reduce an individual's ability to understand and process health information. It can also change time preferences, so individuals put less emphasis on their future health relative to their current health.

Furthermore, as shown in section C.7, the loss of face-to-face teaching will have had significant wellbeing impacts on young people in education, as reflected in increasing rates of younger people accessing mental health services and increase in average GHQ score for younger age groups in Figure 104: Average GHQ score by age, January 2010 to November 2020. PHE[231] find that between March and September 2020, some children and young people coped with life satisfaction only slightly reduced and happiness remaining relatively stable. However, young females with pre-existing health issues experience negative impacts to their mental health. Similarly, as reflected in Figure 104: Average GHQ score by age, January 2010 to November 2020, PHE data shows an increase in wellbeing/mental health difficulties in January 2021 but these had subsequently decreased by March. Children with Special Educational Needs, girls, pupils from minority ethnic groups, pupils with pre-existing mental health needs and pupils from disadvantaged backgrounds were all more likely to report poorer mental health and wellbeing during the pandemic relative to their peers. Similarly, the OECD[232] examine the influence of education on health for OECD countries 1995-2015. They find that adults with higher educational attainment have better health and lifespans compared to their less educated peers.

Recent literature has tried to identify the causal relationship between education and health by controlling for the potential confounders/reverse causality of the impact of health on education: early health endowments may impact future education and, other unobservable characteristics (e.g. ability, time preference, family background) may impact both education and health. There are several ways researchers have tried to control for these biases. A paper from the academic literature on the impact of education on health[233] identifies the causal effect of schooling on health outcomes and healthy behaviours. They find the existence of a causal effect of education on self-reported health (and smoking) in men and women.

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[229] Lochner, L. (2011). *Non-Production Benefits of Education: Crime, Health, and Good* Citizenship. E. Hanushek, S. Machin and L. Woessmann (eds.), Handbook of the Economics of Education, Vol. 4, Chapter 2, Amsterdam: Elsevier Science

[230] Grossman, M. (1972). *The Demand for Health: A Theoretical and Empirical Investigation*. NEW YORK: Columbia University Press. doi:10.7312/gros17900

[231] PHE (2021). *COVID-19 mental health and wellbeing surveillance report – Chapter 4: Children and young people.* Public Health England. Available from: 4. Children and young people - GOV.UK (www.gov.uk)

[232] The influence of education on health: an empirical assessment of OECD countries for the period 1995–2015 | Archives of Public Health | Full Text (biomedcentral.com)

[233] Conti, G., J. Heckman and S. Urzua (2010a). "The Education-Health Gradient". American Economic Review, 100(2):234 – 38

Others exploit national educational reforms as a natural experiment. For example, Fonseca et al[234] use educational reforms in the US, UK and Europe and find that one additional year of schooling is associated with a 6.85 percentage point reduction in reporting poor health, 4.6 percentage point reduction in having ADL limitations, a 2.7 percentage point reduction for a diabetes diagnosis, a 3.3 percentage point reduction for heart disease, a 4.6 percentage point reduction for hypertension, a 7-percentage point reduction for arthritis and a 1.4 percentage point reduction for lung disease. Siles (2009)[235] exploit education reforms in the UK in 1947 and 1972 and finds, using General Household Surveys and find that an extra year of education reduces the probability of reporting a long-term illness by around 5 percentage points. Clark and Royer (2013)[236], on the other hand, find no statistically significant effect of education on having a long-term condition exploiting the education reforms in 1947 and 1972. However, the limitations of Health Survey for England (HSE)'s survey size may be a factor behind these results. James (2015)[237] exploits the increase in educational attainment in the 1990s and uses HSE data. They find that one more year of education reduces the probability of having an early adulthood limiting illness by 5.7 percentage points and a reduction in obesity, however, the long-term impacts and impacts on hypertension are not statistically significant. Similarly, Janke et al. (2019)[238] examine the 1972 education reform and 1990s educational attainment increase. They find that neither the extra year of schooling arising from the 1972 reform nor the rise in education in the 1990s had large effects on chronic health in adults. However, they find a reduction in the probability of having cardiovascular disease and diabetes.

Income is a key determinant of future health and has been shown to be partially as a result of educational attainment. The IFS[239], in their assessment of the economic benefits of education, suggest that there is a positive return from education on wages. The Health Foundation summarise that an increase of £1,000 in an area's average income is associated with 0.5 years of additional good health in men[240]. This may be as a result of reduced stress from increased earnings, and higher income to spend on protective measures such as better-quality food and housing.

Therefore, there may be a future health impact of the lost education experienced by children and young adults during the COVID-19 pandemic which will not be realised for several decades. It may be seen particularly in groups that sit at the margin of attending higher education, with higher numbers not attending in the future if the impact on their attainment is persistent. As areas with higher rates of deprivation lost the most amount of face-to-face teaching time, the health impacts are likely to be more substantial in these areas, without considering previously existing health inequalities.

D.3 Impacts on social care recipients due to changes in their lives

The population receiving both formal and informal social care have seen a significant impact on their lives as a result of the COVID-19 pandemic. The key drivers in the changes are

[234] The effect of education on health: evidence from national compulsory schooling reforms | SpringerLink
[235] Siles, M., (2009) *The causal effect of education on health: evidence from the United Kingdom*. Educ. Rev. 28, pp. 122-128
[236] Clark, D., Royer, H., (2013). *The effect of education on adult health and mortality: evidence from Britain.* American Economic Review (103), pp. 2087-2120
[237] James, J., (2015). *Health and education expansion.* Economic Review (49) pp. 193-215
[238] Janke, K., Johnston, D., Propper, C., Shields, M. (2019) *The causal effect of education on chronic health conditions in the UK.* Journal of Health economics vol (70)
[239] Cattan, S., Crawford, C. (2013). *Assessing the Economic Benefits of Education: Reconciling Microeconomic and Macroeconomic Approaches.* Available from: caytreport04.pdf (ifs.org.uk)
[240] Living in poverty was bad for your health long before COVID-19 - The Health Foundation

mitigation measures put in place to control the spread of COVID-19, changes in behaviour of formal and informal care providers and generally living in a pandemic where older and vulnerable people are at significantly higher risk[241]. The IFS found that 74.3% of older people who reported that they needed to use community health and social care services since the COVID-19 outbreak had not done so. 55% had tried and were unsuccessful, 45% did not attempt to contact these services[242].

D.3.1 People living in care homes

There were 418,000 people living in care homes in England in 2016 (Laing and Buisson survey). There is increasing evidence that measures put in place to reduce the risk of infection in care homes have negatively impacted the mental health of people living in care homes. In a survey of care home providers in England, 85% of the sample reported observing 'low mood and agitation' in their residents following the introduction of COVID-19 isolation. 30% reported reduce oral intake/weight loss and 12% reported reduced mobility. The key drivers behind these changes were identified as 'fewer social interactions from visitors and other residents' (98%); 'reduced access to clinical support for residents' (36%); fewer activities (52%) and impacts of PPE on relationships with care staff (48%).

D.3.2 People receiving care in the community

People living in the community who use long-term care have also seen changes to the provision of their care during the pandemic. Giebel et al (2020)[243] found in a study of older adults, people with dementia and carers, that the mean hour of weekly social support service usage and the number of people accessing formal reduced significantly during the pandemic. They found that higher variations in social support service hours had a detrimental impact on levels of anxiety in people with dementia and older adults, lower levels of mental well-being in unpaid carers and older adults. There is evidence to suggest that this was particularly worse for ethnic minority groups.

D.3.3 People receiving/providing unpaid or informal care

An Office for National Statistics[244] report shows that the number of people providing unpaid care to friends/neighbours/relatives has increased significantly during the pandemic. In 2017/18, 11% of adults reported providing some regular service or help for a sick, elderly or disabled person not living with them. In April 2020, this had increased to 48% during the pandemic. Women are more likely than men (51% compared to 45%) to provide care and people aged 45 to 54 were most likely to report caring. However, the same ONS report also suggests that shielding and lockdown measures have prevented some people providing care to others. 11% of the ONS Opinions and Lifestyle Survey population reported that COVID-19 was affecting their caring responsibilities, and 47% of this group said they were unable to care for someone they usually supported.

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[241] Coronavirus and the social impacts on older people in Great Britain - Office for National Statistics (ons.gov.uk)
[242] Propper, C., Stockton, I., Stoye, G. *COVID-19 and disruptions to the health and social care of older people in England.* Institute for Fiscal Studies. Available from: IFS Briefing Note Template
[243] A UK survey of COVID-19 related social support closures and their effects on older people, people with dementia, and carers - Giebel - 2021 - International Journal of Geriatric Psychiatry - Wiley Online Library
[244] Coronavirus and the social impacts on unpaid carers in Great Britain - Office for National Statistics (ons.gov.uk)