Witness Name: Professor Sir Ian Diamond
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UK COVID-19 INQUIRY

ADDITIONAL WITNESS STATEMENT OF PROFESSOR SIR IAN DIAMOND

I, Professor Sir Ian Diamond, Chief Executive of the UK Statistics Authority and National Statistician, will say as follows:

Contents

Introduction

1. The UK Statistics Authority (the Authority) is an independent statutory body established under the Statistics and Registration Service Act 2007 ('the 2007 Act'). It operates at arm's length from government as a non-ministerial department and reports directly to the UK Parliament, the Scottish Parliament, the Welsh Parliament and the Northern Ireland Assembly.
2. The Office for National Statistics (ONS) is the Authority's executive office and operates the Authority's statistical production function. The ONS is the UK's internationally recognised National Statistical Institute and largest independent producer of official statistics in the UK. It is responsible for collecting and publishing statistics related to the economy, population and society at national, regional and local levels.
3. As the UK's National Statistical Institute, the ONS's role during the pandemic was to inform decision-makers and the public with regular data and analytical insights. This was across health, economic and social themes, and the intersectionality between them. We increased the level of insight that we provided within releases, such as mortality, to reflect the needs of our users (such as the public, media and decision-makers). For example, we linked data from multiple sources to produce new insights on Covid-19 deaths for different characteristics such as ethnic group, disability and occupation.
4. Where further insight was required, we introduced and adapted surveys at pace to rapidly inform policy decisions about the pandemic. For example, we established and ran the UK Covid Infection Survey (CIS), a longitudinal study (a survey design that contacts the same individuals over time to detect changes) that tracked the proportion of people in the community with Covid-19. We also safely procured and used new data sources such as financial transactions to provide novel insights for decision-makers.
5. The ONS worked in partnership with government departments and the devolved administrations. We provided expertise and support to facilitate effective surveillance of the virus. The ONS also collaborated with experts from various organisations, including academic institutions, and participated in peer review to maintain and deliver high quality analysis.
6. This statement sets out data and insights in relation to the health and social impacts of Covid-19 during the period of January 2020 to February 2022. The ONS is responsible for statistics on deaths registered in England and Wales, while data for Scotland and Northern Ireland was provided to the ONS by National Records

Scotland and Northern Ireland Statistics and Research Agency, respectively, throughout the pandemic. Where possible we have used UK-wide data, and other geographies have been used where specifically requested by the Inquiry. The relevant geographic coverage of the data is detailed within the statement.

Executive summary

7. This statement includes the following findings, which I will discuss in more detail:
    a. Death certificates show that there were 186,668 deaths involving Covid-19 in the UK registered between March 2020 and February 2022 (there were no death registrations involving Covid-19 in January or February 2020). Between the same dates, there were 138,909 more deaths from all causes ('excess deaths') than in an average period.
    b. Throughout this period, mortality rates were highest in the oldest age groups, and were higher in men than women.
    c. More than nine out of ten deaths involving Covid-19 in England occurred in a hospital or care home. Despite the number of deaths involving Covid-19 in private homes being small, the overall rate of deaths in private homes was above the five-year average throughout the whole pandemic period. In other words, there was excess in deaths not involving Covid-19 in private homes.
    d. The majority of Covid-19 deaths in England occurred among disabled people. Disabled people had a significantly greater risk of Covid-19 death than non-disabled people, even after accounting for factors including socio-economic and demographic characteristics and vaccination status.
    e. Covid-19 mortality in England varied widely for people in different occupations, with higher age-standardised mortality rates (explained in paragraph 42) among the groups '*transport and mobile machine drivers and operatives*' and '*elementary administration and service occupations*'. The difference in Covid-19 mortality risk between occupational groups might largely be explained by socio-economic and demographic characteristics (differences in age, sex, geography, ethnicity, deprivation, housing conditions, pre-existing health conditions and Covid-19 vaccine uptake).
    f. Many people have reported ongoing symptoms after infection, known as Long Covid. ONS has found highest rates of self-reported Long Covid among adults aged 35-69 years, women, those living in more deprived areas and disabled people.

Wave 1 (referring in this statement to 24 January 2020 to 11 September 2020)

8. Wave 1 of the pandemic was driven by the original wild-type variant of SARS-CoV-2. Prior to the availability of community testing, data on mortality and hospitalisations provided key indications of infection levels in the community.
9. Hospitalisations and mortality initially began to increase in March 2020, rising first in London and other urban areas. Comparing outcomes for different ethnic groups in this period, the Black African and Black Caribbean groups had the highest mortality rates.
10. From May 2020 when the CIS started reporting and availability of testing had increased for those with symptoms or in contact with people with Covid-19, greater insights were gained as to patterns of infection in the community, with the CIS showing the previously unknown levels of asymptomatic cases. The survey also found that those living in deprived areas and in larger households were more likely to test positive.
11. The ONS estimated that the first wave probably peaked between the end of March and early April 2020. (NHS Test and Trace data show that infections started rising in early March, but testing capacity was limited at that time.) Death registrations in England and Wales peaked at more than double the five-year average in weeks ending 17 and 24 April 2020. They fell back to average expected levels over the following eight weeks.
12. Between 20 March and 30 March 2020, almost half (49.6%) of adults in Great Britain reported high anxiety, which was sharply elevated compared with the end of 2019 (21%).

Wave 2 (12 September 2020 to 8 January 2021)

13. In Wave 2, CIS allowed us to start tracking the reinfections risk through antibodies and the repeated testing of participants, possible due to its longitudinal design.
14. By the time of the second English national lockdown (5 November to 2 December 2020), we were able to accurately estimate infection rates in all four nations of the UK. In England, 1 in 80 people (1.22% of the population) were testing positive in the week ending 14 November 2020. During the month-long lockdown, rising trends in infections and deaths were reversed. The number of people infected fell to 1 in 110 (0.9% of the population) by the time it lifted. Deaths again peaked three weeks after the lockdown started, at 3,040 deaths involving Covid-19 the week ending 27 November 2020.
15. From Wave 2 onwards, the highest mortality rates by ethnic group were among the Bangladeshi group followed by the Pakistani group.

Alpha (9 January 2021 to 12 June 2021)

16. In early 2021 the pandemic was driven by the Alpha variant. This was initially detected in Kent and the South-East of England but rapidly spread throughout the UK. CIS data showed the transmissibility of this variant to be around 50% greater than for the wild-type variant.

Delta (13 June 2021 to 9 January 2022)

17. Sequencing data from the CIS and other testing sources demonstrated that the Beta variant of the virus common elsewhere in the world did not become established in the UK despite multiple introductions. Instead, from summer 2021, infection was driven by the Delta variant.
18. Delta was shown to have a transmission advantage over Alpha and spread rapidly, however the establishment of this variant coincided with the roll out of the vaccine in the UK. As the vaccine rollout progressed we observed a reduced risk of adverse outcomes following infection in the most vulnerable, with the infection to hospitalisation ratio and infection to fatality ratio both reducing.
19. Data from CIS showed that vaccination significantly reduced the risk of people testing positive during the periods dominated by the Alpha and Delta variants. Two weeks or more after a second vaccine dose, the risk of testing positive was reduced by 79% during the Alpha-dominant period and by 67% during the Delta-dominant period. This trend has continued during the Omicron variant period. Those who were vaccinated were generally less likely to test positive for Covid-19. Since mid-2021, by which time most of the population had received at least two vaccine doses, there has been no return to the high number of deaths seen in the earlier parts of the pandemic.
20. For example, peak rates of infection in England were similar in January 2021 and October 2021 (2.08% and 2.02% of the population testing positive, respectively). However, the number of deaths in England involving Covid-19 in January 2021 peaked at over 8,000 registered in a week, while in October 2021 it was fewer than 1,000 per week.
21. Covid-19 mortality was higher for unvaccinated people than vaccinated people throughout the whole period when vaccines were widely available to the majority of the adult population. Protection against death from Covid-19 increased with each subsequent dose of vaccine received.

Omicron (From 10 January 2022 onwards)

22. In 2022 the pandemic was driven by Omicron variants, which, data from CIS showed, had a transmission advantage over Delta.

23. Sequencing data showed that as Omicron surged in the adult population, Delta was spreading through those of school age. The sequencing data provided insight on the progression of these concurrent waves and the subsequent evolution of Omicron which rapidly diverged into several subvariants.
24. The prevalence of self-reported Long Covid lasting at least four weeks from a previous SARS-CoV-2 infection among people in private households in the UK peaked at 2.3 million people (3.5% of the population) during the four weeks to 3 September 2022, before steadily falling over the next six months.
25. Following the lifting of lockdown restrictions, the CIS continued to track the occurrence of Covid-19 in the community and levels of antibodies. This showed that despite continuing high levels of infection in the community, the likelihood of serious outcomes requiring hospital treatment and leading to death remained low compared to the earlier stages of the pandemic.

Mortality – overall, and by nation, age, sex, and setting

Mortality statistics during the Covid-19 pandemic

26. The ONS regularly publishes mortality data by various characteristics in England and Wales. The *Deaths Registered in England and Wales* release is published annually and laid before Parliament. This provides information on death registrations by age, sex, cause of death and place of death. We also produce annual publications on specific areas of mortality such as avoidable mortality, excess winter mortality and cause specific analysis.
27. As well as annual statistics on finalised mortality records (death registrations that have been fully quality assured and will not change moving forward), we provide provisional analysis (death registrations that may not be fully coded or may be subject to change, for example, when more information is made available) on the number of deaths registered in a week by sex, age and geography. We also provide numbers on a small selection of causes, which increased during the pandemic.
28. We also increased the number of publications during the pandemic. We provided a monthly report that looked at both the number of deaths and age-standardised mortality rates by month to monitor mortality. Sections were added or reduced based on user need.
29. We publish full quality and methodology information for mortality statistics [ID3/01-INQ000271315] as well as detailed information in the user guide to mortality statistics [ID3/02-INQ000271316] which sets out information regarding the collection, production, and quality of mortality statistics.

30. To produce mortality data, the ONS use information supplied on the death certificate by the certifying doctor or coroner, which is the most robust measure to use when looking at the number of deaths involving or due to Covid-19 [ID3/03- INQ000271317]
31. During March 2020 - May 2022, there were two main published data sources available on deaths: the daily Department for Health and Social Care (DHSC) Covid-19 deaths data for the UK and the ONS weekly death registrations data for England and Wales (which contained a UK aggregate of deaths involving Covid-19).
32. The daily DHSC Covid-19 deaths data were published for the UK at 2pm every day; these data came from NHS England, Public Health Wales, Health Protection Scotland and Public Health Agency in Northern Ireland. This daily reporting of deaths provided an immediate estimate to understand the pandemic's current impact.
33. The ONS weekly death registrations data for England and Wales are released every Tuesday at 9:30am, relating to the week that ended 11 days prior (for example, data for the week ending 20 March are released 31 March). Post-pandemic, the release is occasionally delayed in weeks that contain a bank holiday.
34. Before 29 April 2020, DHSC published Covid-19 deaths that occurred in hospitals only where the patient had tested positive. From 29 April 2020, DHSC started to publish daily announced figures on deaths from Covid-19 for the UK; these were the number of new death notifications where a positive test was received. These figures provided a count for all deaths where a positive test had been confirmed, wherever that death took place. On 12 August 2020, timings for testing positive were introduced where deaths were counted as Covid-19 deaths if the patient died within 60 days of testing positive (or if Covid-19 was mentioned on the death certificate after the 60 days). These figures also included a breakdown of patients who died up to 28 days of testing positive.
35. The DHSC data was available more rapidly and provided a good indication of trends, however it was a measure of those who had tested positive and died without Covid-19 necessarily being the cause of death. At the start of the pandemic the data used by DHSC was confined to deaths in hospitals only. The ONS measure provides a more accurate assessment of deaths involving Covid-19, as estimates are based on all deaths where Covid-19 is mentioned on the death certificate, including those occurring outside of hospitals (for example, in care homes). Weekly ONS figures by registration date roughly followed the DHSC daily figures, with a short time lag. This reflected the time between a death taking place and being officially registered with cause of death recorded. More information on this issue can be found in our impact of registration delays release [ID3/04- INQ000271318]

36. To aid in explaining these different figures and improve clarity around which should be used when, we published a statement on our website "*Deaths relating to the coronavirus*" (31 March 2020) written in collaboration with DHSC, which included a full summary of the differences between the sources [ID3/05- INQ000271319 Further to this, the ONS, in partnership with Government Statistical Service (GSS) statistics producers, released comparisons on deaths relating to Covid-19 by the different organisations and the possible reasons why there may be differences in 'Comparison of weekly death occurrences in England and Wales: up to week ending 10 July 2020' [ID3/06- INQ000271320

Total number of Covid-19 related deaths between January 2020-February 2022

37. The first month in which a Covid-19 death was registered in the UK was March 2020. One death is known to have occurred in January 2020 and two in February, all of these being registered later in the year after coroner's inquests. However, as Covid-19 was not known or suspected as a cause of death until March, it is not possible to say whether there might have been other, undiagnosed cases in January or February. We are therefore unable to provide meaningful figures for deaths involving Covid-19 during January or February 2020.
38. The number of death registrations in the UK involving Covid-19, between March 2020 and February 2022 inclusive, was 186,668 (based on date of registration) or 143.2 deaths per 100,000 population. This has been broken down by wave and month in Tables 1 and 2 and is also exhibited at ID3/07- INQ000271321

Table 1: Number of deaths involving Covid-19 by wave, UK[1,2]

Wave	Dates	Number of deaths occurring in the UK	Average number of deaths involving Covid-19 per week of wave
Wave 1	24 January 2020 to 11 September 2020 (33 weeks)	58,092	1,760
Wave 2	12 September 2020 and 8 January 2021 (17 weeks)	44,630	2,625
Alpha	9 January 2021 and 12 June 2021 (22 weeks)	51,941	2,361
Delta	13 June 2021 and 9 January 2022 (30 weeks)	24,868	829
Omicron	10 January 2022 to 28 February 2022 (7 weeks)	*Figures for this period are not shown because they are unlikely to be representative of the full Omicron period, which persisted into 2023.*	

[1] Based on date a death occurred rather than date registered.
[2] Figures include deaths of non-residents.

Table 2: Deaths involving Covid-19 in the UK, March 2020-February 2022[3][4][5]

Month	Deaths involving Covid-19 (Numbers)	Deaths involving Covid-19 (Age-standardised Mortality rates per 100,000)
March 2020	1,927	34.9
April 2020	33,926	635.4
May 2020	14,734	266.8
June 2020	4,729	88.4
July 2020	1,496	27.2
August 2020	619	11.2
September 2020	829	15.6
October 2020	4,213	76.5
November 2020	12,228	229.3
December 2020	15,631	284.0
January 2021	32,869	596.2
February 2021	21,672	435.8
March 2021	6,269	113.7
April 2021	1,658	31.0
May 2021	644	11.7
June 2021	626	11.7
July 2021	1,525	27.6
August 2021	3,018	54.4
September 2021	4,574	84.9
October 2021	4,030	72.3
November 2021	4,899	90.5
December 2021	3,944	70.2
January 2022	6,214	110.2
February 2022	4,399	86.0

[3] Based on date a death was registered rather than occurred.
[4] Figures include deaths of non-residents.
[5] Figures by month will not sum to March 2020 to February 2022 total as the most recent data available has been used to calculate the pandemic period total.

Number of weekly deaths in England by lockdown periods

39. The ONS's *Deaths registered weekly in England and Wales* publication provides annual datasets for 2020 [ID3/08- INQ000271322 2021 [ID3/09- INQ000271323 and 2022 [ID3/10- INQ000271324 with the number of weekly all-cause deaths (registrations) and deaths involving Covid-19 (registrations and occurrences). Each dataset provides breakdowns by age, sex, geography and place of death.
40. Tables 3 and 4 below show deaths data for lockdown periods by sex and age for the UK. Breakdowns by nation have been exhibited at [ID3/11- INQ000271325 and show a similar pattern to the UK. For this analysis the lockdown periods are March to June 2020, August to December 2020 and January to May 2021.
41. Across all lockdown periods, males had a higher age-standardised mortality rate (ASMR) involving Covid-19 than females. This pattern is consistent with males all-cause mortality being consistently higher than females: figure 5 from our deaths registered in England and Wales release shows males with a higher ASMR than females in each year since 2001 [ID3/12- INQ000271326
42. As age is a key factor in Covid-19 mortality, ASMRs allow comparisons to be made between groups that have differing age structures. Interpreting differences in mortality rates between different groups without accounting for the differing age profiles or population sizes can lead to misleading conclusions. Rates are age-standardised using the 2013 European Standard Population (ESP), an international standard method which reflects a 'typical' population structure of a European country (including the UK). More information can be found in section 15 of the user guide [ID3/02- INQ000271316

Table 3: Number and age-standardised mortality rates of deaths involving Covid-19 by lockdown periods, UK[6,7]

		March 2020 to February 2022	March 2020 to June 2020	August 2020 to December 2020	January 2021 to May 2021
Numbers of deaths involving Covid-19	Persons	186,668	55,311	33,520	63,112
	Males	102,066	30,185	18,573	33,431
	Females	84,602	25,126	14,947	29,681
	Persons	143.2	255.6	123.3	235.1

[6] Figures include deaths of non-residents.
[7] Based on date a death was registered rather than occurred.

Age-standardised rate of deaths involving Covid-19 (per 100,000 population)	Males	183.9	330.3	161.8	292.9
	Females	112.1	198.6	94.6	190.6

43. A similar pattern was seen across all lockdown periods in terms of age groups, with the oldest age groups having the highest age-specific mortality rate.

Table 4: Number and age-specific mortality rates of deaths involving Covid-19 by lockdown periods, UK[8,9,10]

		March 2020 to February 2022	March 2020 to June 2020	August 2020 to December 2020	January 2021 to May 2021
Numbers	Aged under 1	14	1	1	1
	Aged 1 to 4	8	0	0	0
	Aged 5 to 9	13	0	0	3
	Aged 10 to 14	23	3	2	5
	Aged 15 to 19	61	9	4	16
	Aged 20 to 24	109	24	12	28
	Aged 25 to 29	205	50	23	59
	Aged 30 to 34	427	84	42	137
	Aged 35 to 39	750	141	70	245
	Aged 40 to 44	1,198	268	127	372
	Aged 45 to 49	2,138	498	260	736
	Aged 50 to 54	3,797	921	496	1,343
	Aged 55 to 59	6,053	1,569	809	2,151
	Aged 60 to 64	8,897	2,227	1,309	3,282
	Aged 65 to 69	11,833	3,024	1,988	4,146
	Aged 70 to 74	18,262	5,094	3,332	6,178
	Aged 75 to 79	24,932	7,397	4,780	8,095
	Aged 80 to 84	33,123	10,546	6,418	10,608
	Aged 85 to 89	36,028	11,397	6,863	12,047
	Aged 90 and over	38,797	12,058	6,984	13,660
Age-specific rates	Aged under 1	1.0	[x]	[x]	[x]
	Aged 1 to 4	0.1	[x]	[x]	[x]
	Aged 5 to 9	0.2	[x]	[x]	0.2
	Aged 10 to 14	0.3	0.2	[x]	0.3
	Aged 15 to 19	0.8	0.7	0.3	1.0

[8] Figures include deaths of non-residents.
[9] Based on date a death was registered rather than occurred.
[10] [x] indicated that the rate has been suppressed due to the low number of deaths.

	Aged 20 to 24	1.3	1.7	0.7	1.7
	Aged 25 to 29	2.3	3.3	1.2	3.2
	Aged 30 to 34	4.7	5.6	2.2	7.2
	Aged 35 to 39	8.4	9.6	3.8	13.3
	Aged 40 to 44	14.4	19.7	7.4	21.5
	Aged 45 to 49	25.3	34.6	14.5	42.0
	Aged 50 to 54	41.1	59.8	25.7	70.1
	Aged 55 to 59	66.6	104.8	42.7	114.1
	Aged 60 to 64	113.4	174.0	80.6	202.0
	Aged 65 to 69	175.9	270.2	141.7	298.8
	Aged 70 to 74	273.7	455.3	237.3	445.7
	Aged 75 to 79	502.8	928.2	470.7	793.7
	Aged 80 to 84	966.2	1834.7	893.6	1502.6
	Aged 85 to 89	1708.3	3260.7	1563.6	2772.9
	Aged 90 and over	3196.9	5942.0	2755.2	5485.5

Number of deaths by nation

44. The number of death registrations involving Covid-19 between March 2020 and February 2022 by each of the four UK nations is in Table 5; an example of national breakdowns by month has been exhibited at ID3/07-INQ000271321
45. The overall ASMR for deaths involving Covid-19 in the UK was 143.2 deaths per 100,000 people [for example ID3/13-INQ000271327]. England had the highest ASMRs of the four nations (145.0) followed by Wales (144.6), Northern Ireland (130.7) and Scotland (124.9).
46. Within England, London had the highest rate of deaths involving Covid-19 with 192.1 deaths per 100,000 population; this was significantly higher than any other region.
47. The columns detailing the lower and upper confidence limits show the confidence intervals. Confidence intervals give an indication of the degree of uncertainty of an estimate and help decide how precise an estimate is. It specifies a range of values in which we think the true value is likely to lie, defined by lower and upper limits. For example, we have used 95% confidence intervals which means we are 95% sure that the true value lies in this range. The width of the interval depends on the precision of the estimate and the confidence level used. A greater standard error will result in a wider interval; the wider the interval, the less precise the estimate is.
48. Confidence intervals are used in mortality statistics to take into account the fact that population estimates used to calculate rates are estimates, the larger the population estimate the smaller the corresponding confidence interval width would be. Also, the occurrence of deaths has a random element which follows a Poisson distribution, the confidence intervals represent the plausible spread of rates due to chance if we could

go back in time and re-run the year multiple times with the same population and circumstances.

Table 5: Death registrations involving Covid-19, March 2020-February 2022, UK, England, Wales, Scotland, Northern Ireland and region of England[11,12]

Country	Number of deaths involving Covid-19	Age-standardised mortality rates of deaths involving Covid-19 per 100,000 persons	95% Lower confidence interval	95% Upper confidence interval
UK	**186,668**	**143.2**	**142.6**	**143.9**
England	158,964	145.0	144.3	145.7
Northeast	8,738	161.7	158.3	165.1
Northwest	25,151	177.2	175.0	179.4
Yorkshire and The Humber	16,188	151.4	149.1	153.7
East Midlands	14,440	148.8	146.4	151.3
West Midlands	18,887	162.1	159.8	164.4
East of England	17,878	134.8	132.8	136.8
London	22,732	192.1	189.6	194.6
Southeast	24,416	124.8	123.2	126.4
Southwest	10,534	78.2	76.7	79.7
Wales	9,751	144.6	141.7	147.5
Scotland	13,334	124.9	122.8	127.1
Northern Ireland	4,309	130.7	126.7	134.6

Number of deaths by age

49. The number of death registrations by five-year age group for England and Wales for the period March 2020 to February 2022 can be found in exhibit [ID3/14- INQ000271328 Data for individual ages or months have also been exhibited. Please note that these figures include non-residents and therefore a small difference to the by-country total will be observed if the data are summed.

[11] Deaths shown as England and Wales occurred and were registered in England or Wales and assigned to either country, and to region within England, based on place of usual residence. Deaths shown as Scotland or Northern Ireland occurred and were registered in those countries, irrespective of place of residence. The UK total includes a small number of deaths of non-residents which occurred and were registered in England and Wales.

[12] Based on date a death was registered rather than occurred.

50. Table 6 shows the number of deaths in the UK by five-year age group and includes crude mortality rates. The largest number and rate of deaths involving Covid-19 was found in the eldest age-groups, specifically in those aged 90 and over.

Table 6: Number of death registrations by five-year age group, UK, March 2020 to February 2022[13,14]

	Deaths involving Covid-19	Age-specific rates
Aged under 1	14	1.0
Aged 1 to 4	8	0.1
Aged 5 to 9	13	0.2
Aged 10 to 14	23	0.3
Aged 15 to 19	61	0.8
Aged 20 to 24	109	1.3
Aged 25 to 29	205	2.3
Aged 30 to 34	427	4.7
Aged 35 to 39	750	8.4
Aged 40 to 44	1,198	14.4
Aged 45 to 49	2,138	25.3
Aged 50 to 54	3,797	41.1
Aged 55 to 59	6,053	66.6
Aged 60 to 64	8,897	113.4
Aged 65 to 69	11,833	175.9
Aged 70 to 74	18,262	273.7
Aged 75 to 79	24,932	502.8
Aged 80 to 84	33,123	966.2
Aged 85 to 89	36,028	1708.3
Aged 90 and over	38,797	3196.9

Number of deaths by setting (England and Wales only)

51. The number of deaths involving Covid-19 by place of death in England and Wales separately up to 25 February 2022 can be found in Table 7. The number of deaths involving Covid-19 by place of occurrence was published weekly as part of our deaths registered weekly in England and Wales publication. This information was not provided in the Scotland and Northern Ireland data deliveries to the ONS and the places of death are also defined differently in Scotland and Northern Ireland compared to England and Wales which makes comparisons between countries difficult.

[13] Figures include deaths of non-residents.

[14] Based on date a death was registered rather than occurred.

52. The majority of deaths were in hospitals (70.1% in England, 73.4% in Wales), while around a fifth (21.4% in England and 19.3% in Wales) were in care homes.

Table 7: Number of deaths involving Covid-19 by place of death, in England and Wales, Week ending 13 March 2020 to week ending 25 February 2022[15,16]

	England		Wales	
	Number of deaths	**Percentage of deaths**	**Number of deaths**	**Percentage of deaths**
Home	9,707	6.2%	570	5.9%
Hospital	109,476	70.1%	7,105	73.4%
Care home	33,393	21.4%	1,813	19.3%
Other	3,485	2.2%	136	4.4%
TOTAL DEATHS	**156,061**	**100.0%**	**9,674**	**100.0%**

Number of deaths with Covid-19 as the underlying cause

53. The previous sections all detailed the number and rates of deaths involving Covid-19, this means that Covid-19 was involved in the death as the underlying cause or contributing factor. Deaths due to Covid-19 are those where Covid-19 was the underlying cause of death, in other words the condition that started the causal chain of events that led to the death.
54. This section looks at deaths registered in England and Wales, as we do not hold the data for Scotland and Northern Ireland.
55. In England, April 2020 had the highest proportion of deaths involving Covid-19 that were also due to Covid-19 (95.2%), whereas February 2022 had the lowest proportion (66.0%). May 2021 was previously the month with the lowest proportion of deaths involving Covid-19 that were also due to Covid-19 (68.8%).
56. In Wales, April 2020 had the highest proportion of deaths involving Covid-19 that were also due to Covid-19 (94.1%), whereas June 2021 had the lowest proportion (42.9%).
57. These proportions generally correspond with periods of low or high numbers of Covid-19 deaths in England and Wales.

Figure 1: Percentage of deaths involving Covid-19 which were due to Covid-19, England and Wales, deaths registered in March 2020 to February 2022[17,18,19]

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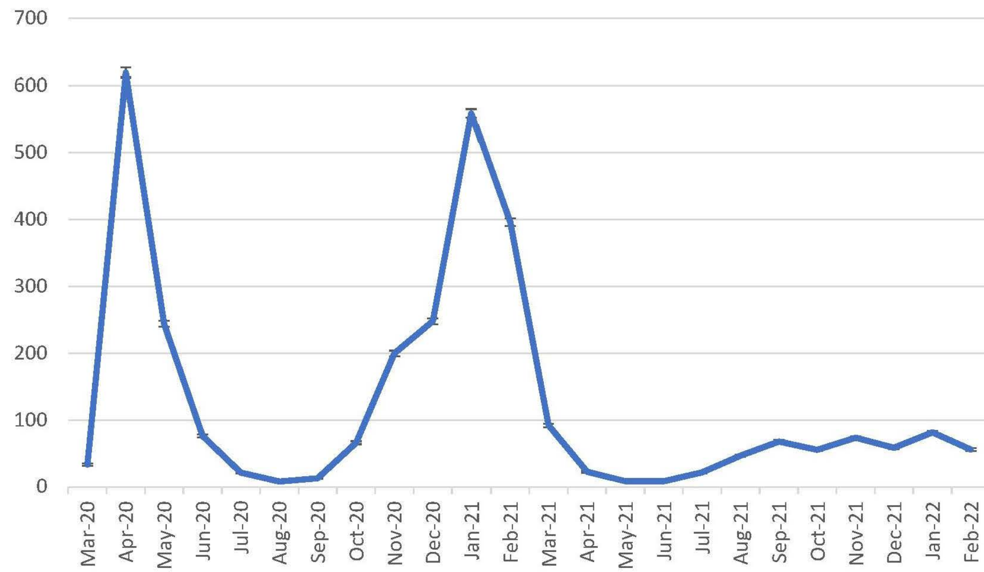
[15] Figures exclude deaths of non-residents of England.
[16] Based on date a death was registered rather than occurred.
[17] Figures exclude deaths of non-residents of England and Wales.
[18] Based on date a death was registered rather than occurred.
[19] This chart is taken from the February 2022 edition of the monthly mortality analysis and is therefore based on provisional data from that time.

58. The following chart shows the age-standardised mortality rate of deaths due to Covid-19 in England and Wales combined, these have also been exhibited separately.
59. As the majority of deaths that involved Covid-19 had this as the underlying condition, the overall trend in deaths due to Covid-19 is similar to that of deaths involving Covid-19.
60. There was a sharp increase between March 2020 and April 2020 where the number of deaths due to Covid-19 went from 33.4 per 100,000 persons to 619.3 deaths per 100,000 persons before declining to 244.1 deaths per 100,000 persons in May 2020.
61. The second peak was in January 2021 where the number of deaths registered due to Covid-19 was 558.6 deaths per 100,000 population.

Figure 2: Age-standardised Mortality Rate of deaths due to Covid-19, England and Wales, March 2020 to February 2022 [ID3/15- INQ000271329



Mortality statistics methodology

62. The ONS is aware of a death after it has been registered by the informant. This information is then used to provide regular analysis on death registrations in England and Wales. When relevant, the ONS also provides information on death occurrences (that is, registered deaths analysed by date of death) with the caveat that we do not know about any deaths that have already occurred but have not been registered. It is a legal requirement to register a death within 5 days, however there are some cases where there is a longer delay (mostly in deaths that need to be investigated by a coroner). These delays are mostly dependent on the cause of death with external causes (such as accidents or suicides) or unexplained/unexpected deaths more likely needing to be investigated by a coroner. The deceased's characteristics will be related to this, with deaths in the younger ages more likely to be unexpected or through a cause that needs to be investigated (as the most common causes of death vary by age). As the most frequent causes of death vary by sex, this can also play a part.
63. Mortality statistics in England and Wales are based on the details collected when deaths are certified and registered on the General Register Office's Registration Online system, the data then being passed on to ONS. Data for Scotland and Northern Ireland are provided by National Records of Scotland and the Northern Ireland Statistics and Research Agency, who are responsible for mortality data in those nations respectively.
64. This statement includes the counts of the number of Covid-19 deaths of across various groups and, where possible, the rates of mortality. These are important for

taking into account the relevant population denominators. For example, the number of Covid-19 deaths in England is expected to be larger than Scotland, because the population is larger. By using mortality rates, it is possible to compare deaths per 100,000 population in each country.

65. The rates presented in Tables 3,5,9,10, 11 and 12 are age-standardised mortality rates (ASMRs).

66. Where possible, data are provided for the UK and the four nations. Breakdowns for the four nations are divided by place of residence, for example England breakdowns contain only those whose usual residence was within England. There are a small number of deaths registered in each nation of non-residents, and these are included in the UK totals (but not the four nation breakdowns). In England and Wales, the percentage of deaths that are non-residents is around 0.1% [ID3/02- INQ000271316]

67. The doctor certifying a death can list all causes in the chain of events that led to the death and pre-existing conditions that may have contributed to the death. Using this information, we determine an underlying cause of death as the condition or disease that started the causal chain of events that led to the death, following rules set out by the World Health Organisation in the International Classification of Diseases, Tenth Edition (ICD-10). A doctor can certify the involvement of Covid-19 based on symptoms and clinical findings; a positive test result is not required. There are also cases where a person may test positive for Covid-19 but would not have Covid-19 noted on the death certificate, this is because the doctor had determined that the disease did not play a part in the death. Further information regarding this can be found in our publication on the quality of mortality statistics during the pandemic which details changes to death certification and registration under the Coronavirus Act 2020 and the impact they had on the quality of death registration data [ID3/16- INQ000271330]

68. We use the term "due to Covid-19" when referring only to deaths with an underlying cause of death of Covid-19, as defined using the rules of the ICD-10. We use the term "involving Covid-19" when taking into account all of the deaths that had Covid-19 mentioned anywhere on the death certificate, whether as an underlying cause or not. When Covid-19 or any other health condition is mentioned on the death certificate, this indicates that in the judgement of the doctor or coroner it played a role in the causation of death even if it was not the underlying cause.

69. A mention of Covid-19 (regardless of whether it was the underlying cause or mentioned elsewhere on the death certificate) includes some cases where the certifying doctor suspected the death involved Covid-19 but was not certain. For example, a doctor may have clinically diagnosed Covid-19 based on symptoms, but

this diagnosis may not have been confirmed because no test was available, or the test result was inconclusive. Confirmed cases were coded as U07.1 Covid-19, virus identified. Suspected cases were coded as U07.2 Covid-19, virus not identified. This follows World Health Organisation (WHO) guidance and practice.

70. Since 1993, the majority of ONS mortality data has been coded by automatic cause coding software. Specific text terms from the death certificate are converted to International Classification of Diseases (ICD) codes, and then selection and modification rules are used to assign the underlying cause of death. Using computer algorithms to apply rules increases the consistency and improves the international and temporal comparability of mortality statistics.
71. At the start of the pandemic, there were no automated algorithms for coding text recorded on the death certificate to ICD-10 codes U07.1 (Covid-19, virus identified) or U07.2 (Covid-19, virus not identified). This was because Covid-19 was a new variant of the coronavirus diseases, which meant it was not in the World Health Organisation's (WHO) coding framework. Therefore, we manually coded deaths involving Covid-19. To determine which texts and phrases should be coded to which code, we referred to WHO guidelines and consulted with medical and epidemiological experts. We also consulted with colleagues in other English-speaking countries to discuss ambiguous terms. We kept a log of coding variations to inform later decisions and analysis. All deaths coded to Covid-19 were checked for accuracy and consistency and were then run through the automated process when the coding framework became available.
72. The following ICD-10 codes and definitions are used to define deaths due to Covid-19 (where Covid-19 was the underlying cause):
    a. U07.1: Covid-19, virus identified
    b. U07.2: Covid-19, virus not identified
    c. U10.9: Multisystem inflammatory syndrome associated with Covid-19, unspecified
73. The following ICD-10 codes and definitions are used to define deaths involving Covid-19 (where Covid-19 was mentioned on the death certificate, not necessarily as the underlying cause):
    d. U07.1: Covid-19, virus identified
    e. U07.2: Covid-19, virus not identified
    f. U09.9: Post-Covid condition, unspecified (this cannot be assigned to the underlying cause of death so is not included in the "deaths due to Covid-19" definition)

g. U10.9: Multisystem inflammatory syndrome associated with Covid-19, unspecified

74. Definitions of Covid-19 for deaths in Scotland and Northern Ireland are the same as for England and Wales.

75. ICD-10 codes U09.9 (Post-Covid-19 condition, where the acute Covid-19 had ended before the condition immediately causing death occurred) and U10.9 (Multisystem inflammatory syndrome associated with Covid-19, also called Kawasaki-like syndrome, a specific, uncommon effect of Covid-19 in children) were issued by the WHO in early 2021 and implemented in the February 2021 monthly mortality bulletin [ID3/17 INQ000271331 and the Week 8 of 2021 weekly deaths bulletin [ID3/18- INQ000271332 Death registrations from earlier in the pandemic were revised to account for these new codes.

76. There are other codes relating to Covid-19 which are not part of the Covid-19 mortality definitions which we publish as part of our Monthly Mortality Analysis. These codes are U08.9 Personal history of Covid-19, U11.9 Need for immunisation against Covid-19 (an optional code that may be used when a person encounters health services for the specific purposes of receiving a Covid-19 vaccine), and U12.9 Covid-19 vaccines causing adverse effects in therapeutic use.

77. For England and Wales, the number of death registrations between March 2020 and February 2022 with ICD-10 codes included in our definition for involving Covid-19, and our definition for due to Covid-19, can be found in Table 8. The ONS is not able to produce this breakdown for data received from National Records of Scotland or Northern Ireland Statistics and Research Agency.

Table 8: Covid-19 death registrations between 1 March 2020 - 28 February 2022 by ICD-10 code, England and Wales [ID3/19 INQ000271333 [20,21,22,23]

[20] Deaths may be double-counted in the "involving" column, as a single death can have multiple contributory causes mentioned on the death certificate. Therefore, this column should not be aggregated to create a total of all deaths mentioning these codes. Figures published by ONS as total deaths involving Covid-19 do not include any double-counting.

[21] Deaths "due to" a cause refer only to deaths that had this as the underlying cause of death. ICD-10 code U09.9 cannot be assigned the underlying cause of death, so this data is marked as unavailable and denoted with [z].

[22] Figures exclude deaths of non-residents of England and Wales (a small number of deaths are registered in England and Wales for those not resident in England or Wales. These usually appear in our 'England and Wales combined' totals but do not appear in our separate 'England' and 'Wales' breakdowns. Figures also exclude deaths of residents of England and Wales that were registered outside of England or Wales (regardless of breakdown).

[23] Based on date a death was registered rather than occurred.

Country	ICD-10 Code	Description	Deaths involving this cause (any mention on the death certificate)	of which, deaths due to this cause (underlying cause only)
England	U07.1	Covid-19, virus identified	154,341	135,310
England	U07.2	Covid-19, virus not identified	4,360	3,787
England	U09.9	Post Covid-19 condition, unspecified	380	[z]
England	U10.9	Multisystem inflammatory syndrome associated with Covid-19, unspecified	3	3
Wales	U07.1	Covid-19, virus identified	9,303	8,028
Wales	U07.2	Covid-19, virus not identified	424	365
Wales	U09.9	Post Covid-19 condition, unspecified	27	[z]
Wales	U10.9	Multisystem inflammatory syndrome associated with Covid-19, unspecified	0	0

Mortality by other socio-demographic characteristics (England only)

Methodology

78. The ONS does not routinely produce counts of all death registrations by socio-demographic characteristics other than age or sex due to the lack of such information on death certificates. During the pandemic, however, to address this gap, the ONS carried out inequalities analysis using the Public Health Data Asset (PHDA).
79. The PHDA is a unique, anonymised dataset comprising approximately 40 million people aged 10 to 100 years who responded to the 2011 Census and were living in England and registered with a GP on 24 January 2020 (when the first confirmed Covid-19 cases arrived in the UK).
80. Whilst the following tables provide a count of the number of deaths involving Covid-19 for the study cohort, the cohort covers only around 80% of the population in England aged 10 years or over at the start of the pandemic. This is because not everyone in the population responded to the Census in March 2011, not everyone who responded to the Census was registered with a GP or can be linked to an NHS number, and the cohort does not include people who immigrated to England or were born since March 2011. Therefore, not all deaths that occurred during the period are included in these analyses.

81. Tables 9 to 12 give both counts of the number of Covid-19 deaths across various socio-demographic groups, as well as rates of mortality. These rates are important for taking into account the relevant population denominators. For example, we might expect the number of Covid-19 deaths among the White British population to exceed that among ethnic minority groups simply because there are more people of White British ethnicity in the population, even though the rate of Covid-19 death is generally higher among ethnic minority groups (see Table 9).
82. The rates presented in the tables below are ASMRs (See paragraph 42). As age is a key determinant of Covid-19 mortality, ASMRs allow comparisons to be made between groups that have differing age structures.
83. The ASMRs reported in tables 9-12 are standardised using the 2013 European Standard Population (See Paragraph 42), and are presented as the number of Covid-19 related deaths that would be expected to occur if 100,000 people were each followed-up for one year (i.e., on a 'per 100,000 person-years at risk' basis). This is a different denominator to the rates reported in the previous section, which were expressed per 100,000 *people* rather than per 100,000 *person-years*. The latter measure is used when the data are longitudinal, i.e. a group of people are 'followed' over time, and the duration for which they are followed (that is, at risk of death involved Covid-19) varies from person to person.
84. Counts and rates of mortality are shown for the whole period 24 January 2020 to 28 February 2022 and broken down by wave of the pandemic. In contrast to the preceding section, deaths were assigned to time periods based on the date of occurrence rather than the date of registration.
85. Like the preceding section, "death involving Covid-19" relates to all deaths that had Covid-19 mentioned anywhere on the death certificate, whether as an underlying cause or not. However, for consistency with previous ONS publications on Covid-19 and ethnicity, religion, disability and occupation, the definition used in the analysis below only includes the ICD-10 codes U07.1 (Covid-19, virus identified), U07.2 (Covid-19, virus not identified) and U09.9 (Post-Covid-19 condition, unspecified). Unlike the preceding tables, code U10.9 (Multisystem inflammatory syndrome associated with Covid-19, unspecified) is not included in the definition for the analysis below. However, as can be seen in Table 8, deaths involving U10.9 (Multisystem inflammatory syndrome associated with Covid-19, unspecified) are extremely rare, with only three deaths in England registered by February 2022.
86. In summary, there are four main reasons why the counts and rates of Covid-19 related mortality reported in the preceding section are not comparable with those in Tables 9-12 below. First, the preceding section records all deaths registered in

England during the time period, whereas this section is based on the ONS's PHDA study cohort, which has incomplete population coverage. Second, deaths were assigned to time periods based on date of registration in the preceding section, whereas they are assigned based on date of occurrence in this section. Third, the definition of "death involving Covid-19" includes the ICD-10 code U10.9 (Multisystem inflammatory syndrome associated with Covid-19, unspecified) in the preceding section, whereas this code is not included in the definition in this section. Fourth, the ASMRs in the preceding section are expressed on a 'per 100,000 people' basis, whereas those in this section are on a 'per 100,000 person-years' basis.

Deaths by ethnicity

87. Ethnic differences in age-standardised Covid-19 mortality rates have persisted throughout the pandemic, with people in ethnic minority groups generally having higher rates than those in the White British population. As the pandemic has unfolded, much of this difference has been explained by differential vaccine uptake, as well as differences in socio-economic profiles and underlying health conditions.
88. Table 9 provides numbers and ASMRs of death involving Covid-19 between 24 January 2020 and 28 February 2022 by ethnic group and sex for England only [ID3/20- INQ000271334]. For this analysis, some 2011 Census ethnic groups have been aggregated due to small counts. The labels referring to aggregated categories are 'Mixed' (which for this analysis includes White and Black Caribbean; White and Asian; White and Black African; and Other Mixed), 'Other' (which for this analysis includes Other Asian; Arab; Other Black; and Any other ethnic group) and 'White other' (which for this analysis includes Irish; Gypsy or Irish Traveller; and Other White)
89. The majority of Covid-19 deaths occurred in the White British group (62,775, 84.7% of the total, for males; and 54,230, 87.5% of the total, for females). However, for both sexes, the ASMR for death involving Covid-19 was statistically significantly higher for all non-White groups (except Chinese) than the White British group. For both sexes, the highest age-standardised rates were in the Bangladeshi group (711.2 Covid-19 deaths per 100,000 person-years for males, and 346.6 Covid-19 deaths per 100,000 person-years for females).

Table 9: Number and age-standardised mortality rates of death involving Covid-19 between 24 January 2020 and 28 February 2022 by ethnic group and sex, England only[24,25]

Ethnic group	Sex	Number of deaths involving Covid-19	ASMR for deaths involving Covid-19	Lower 95% confidence limit for ASMR	Upper 95% confidence limit for ASMR
Bangladeshi	Male	690	711.2	647.3	775.0
Black African	Male	732	394.4	354.4	434.5
Black Caribbean	Male	1,411	410.2	387.2	433.2
Chinese	Male	225	211.1	180.7	241.6
Indian	Male	2,169	318.9	304.1	333.8
Mixed	Male	442	272.0	243.7	300.2
Other	Male	1,356	303.8	284.7	322.8
Pakistani	Male	1,737	517.7	490.4	544.9
White British	Male	62,775	201.4	199.8	203.1
White other	Male	2,537	231.2	221.7	240.7
Bangladeshi	Female	402	346.6	308.0	385.2
Black African	Female	464	184.8	162.9	206.8
Black Caribbean	Female	1,016	211.3	197.7	224.8
Chinese	Female	160	129.0	107.6	150.4
Indian	Female	1,317	179.8	169.6	190.0
Mixed	Female	374	174.1	154.8	193.5
Other	Female	894	184.8	171.4	198.3
Pakistani	Female	980	286.7	266.9	306.6
White British	Female	54,230	125.5	124.4	126.6
White other	Female	2,155	119.8	114.7	124.9

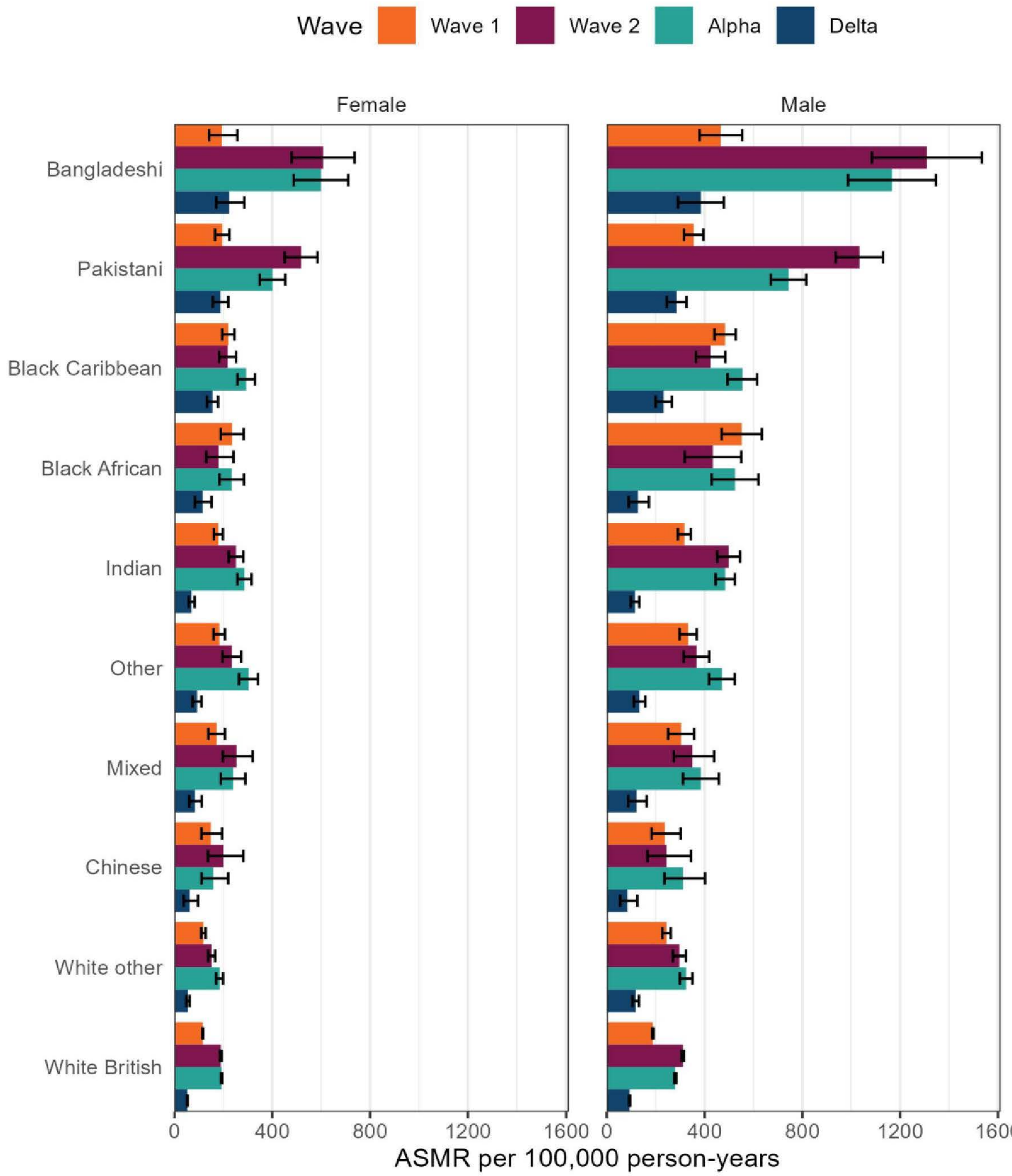
90. Figure 3 below shows the same ASMRs, but this time further disaggregated by wave of the pandemic, defined as follows for this analysis:
    - the Wave 1 period, which includes deaths occurring between 24 January 2020 and 11 September 2020
    - the Wave 2 period, which includes deaths occurring between 12 September 2020 and 8 January 2021
    - the Alpha period, which includes deaths occurring between 9 January 2021 and 12 June 2021

[24] The PHDA cohort covers around 80% of the population in England aged 10 years or over at the start of the pandemic. Therefore, not all deaths that occurred during the period are included.
[25] ASMRs are standardised to the ESP 2013, and are presented as the number of Covid-19 related deaths that would be expected to occur if 100,000 people were each followed-up for one year (i.e., on a 'per 100,000 person-years at risk' basis).

- the Delta period, which includes deaths occurring between 13 June 2021 and 9 January 2022

91. The period from 10 January 2022 to 28 February 2022 is considered to be the Omicron period. However, rates for this 7-week period are not shown because they are unlikely to be representative of the full Omicron period (which persisted into 2023).
92. Figure 3 uses a 95% confidence level. Confidence Intervals are described in paragraph 47. A 95% confidence level means that if we drew 20 random samples and calculated a 95% confidence interval for each sample using the data in that sample, we would expect that, on average, 19 out of the 20 (95%) resulting confidence intervals would contain the true population value and 1 in 20 (5%) would not. If we increased the confidence level to 99%, wider intervals would be obtained. Across most ethnic groups, mortality rates were generally highest in the Wave 2 and Alpha periods, and lowest in the Wave 1 and Delta periods. This reflects both differences in the severity of variants and vaccination coverage and are partly explained by the fact that our definition of Wave 1 included the summer of 2020 when the infection rate was lower.
93. There were changes in ethnic inequalities in mortality throughout the period. The Black African and Black Caribbean groups had the highest rates in Wave 1, but from Wave 2 onwards, the highest rates were among the Bangladeshi group followed by the Pakistani group. The White and Chinese groups generally had among the lowest rates throughout the periods.
94. Previous ONS analysis [ID3/21- INQ000271335 (covering the period 8 December 2020 to 1 December 2021) has shown that factors related to the probability of being infected with SARS-CoV-2 (geographic location, measures of socio-economic disadvantage, occupation, housing tenure, household composition) and factors related to prognosis following infection (pre-existing health conditions, Covid-19 vaccination status) account for a large proportion, but not all, of the excess risk of death involving Covid-19 in most ethnic minority groups compared with the White British group. After accounting for these factors, only Bangladeshi males and females, and Pakistani males, remained at statistically significantly elevated risk of Covid-19 mortality compared with the White British group.
95. It is important to recognise that while this previous analysis [ID3/21- INQ000271335 demonstrates that differential vaccine uptake (as well as socio-economic and underlying health profiles) *explained* an increasing proportion of the differences in mortality risk between ethnic groups as the pandemic unfolded, Figure 3 shows that ethnic inequalities in mortality rates did persist throughout the analysed period.

Figure 3: Age-standardised mortality rates involving Covid-19 between 24 January 2020 and 28 February 2022 by ethnic group, sex, and wave of the pandemic, England only[26,27,28]



[26] The PHDA cohort covers around 80% of the population in England aged 10 years or over at the start of the pandemic. Therefore not all deaths that occurred during the period are included.

[27] ASMRs are standardised to the ESP 2013,and are presented as the number of Covid-19 related deaths that would be expected to occur if 100,000 people were each followed-up for one year (i.e., on a 'per 100,000 person-years at risk' basis).

[28] Error bars are 95% confidence intervals.

Deaths by religion

96. Table 10 provides numbers and ASMRs of deaths involving Covid-19 between 24 January 2020 and 28 February 2022 by religious group and sex for England only [ID3/22- INQ000271336

97. During this period the majority of Covid-19 deaths occurred in the Christian group (53,771, 72.6% of the total, for males; and 49,916, 80.5% of the total, for females). However, for both sexes, the age-standardised rate of Covid-19 mortality was statistically significantly higher for the Muslim group than all other religious groups (497.7 Covid-19 deaths per 100,000 person-years for males, and 275.1 Covid-19 deaths per 100,000 person-years for females).

Table 10: Number and age-standardised mortality rates involving Covid-19 between 24 January 2020 and 28 February 2022 by religious group and sex, England only[29,30]

Religious group	Sex	Number of deaths involving Covid-19	ASMR for deaths involving C-19	Lower 95% confidence limit for ASMR	Upper 95% confidence limit for ASMR
Buddhist	Male	194	204.5	169.4	239.5
Christian	Male	53,771	210.9	209.0	212.7
Hindu	Male	1,177	302.8	283.1	322.5
Jewish	Male	579	253.9	233.1	274.7
Muslim	Male	3,561	497.7	479.0	516.4
No religion	Male	9,001	178.0	173.7	182.4
Not stated or required	Male	4,972	213.2	207.0	219.4
Other religion	Male	227	208.7	177.9	239.4
Sikh	Male	592	286.2	260.8	311.6
Buddhist	Female	113	117.6	93.0	142.2
Christian	Female	49,916	128.4	127.2	129.5
Hindu	Female	697	169.3	156.0	182.6
Jewish	Female	438	140.2	126.7	153.8
Muslim	Female	2,012	275.1	261.8	288.4
No religion	Female	4,018	112.0	108.1	115.9
Not stated or required	Female	4,221	133.4	129.4	137.5
Other religion	Female	180	114.1	95.1	133.0
Sikh	Female	397	172.0	154.3	189.7

[29] The PHDA cohort covers around 80% of the population in England aged 10 years or over at the start of the pandemic. Therefore, not all deaths that occurred during the period are included.

[30] ASMRs are standardised to the ESP 2013,and are presented as the number of Covid-19 related deaths that would be expected to occur if 100,000 people were each followed-up for one year (i.e., on a 'per 100,000 person-years at risk' basis).

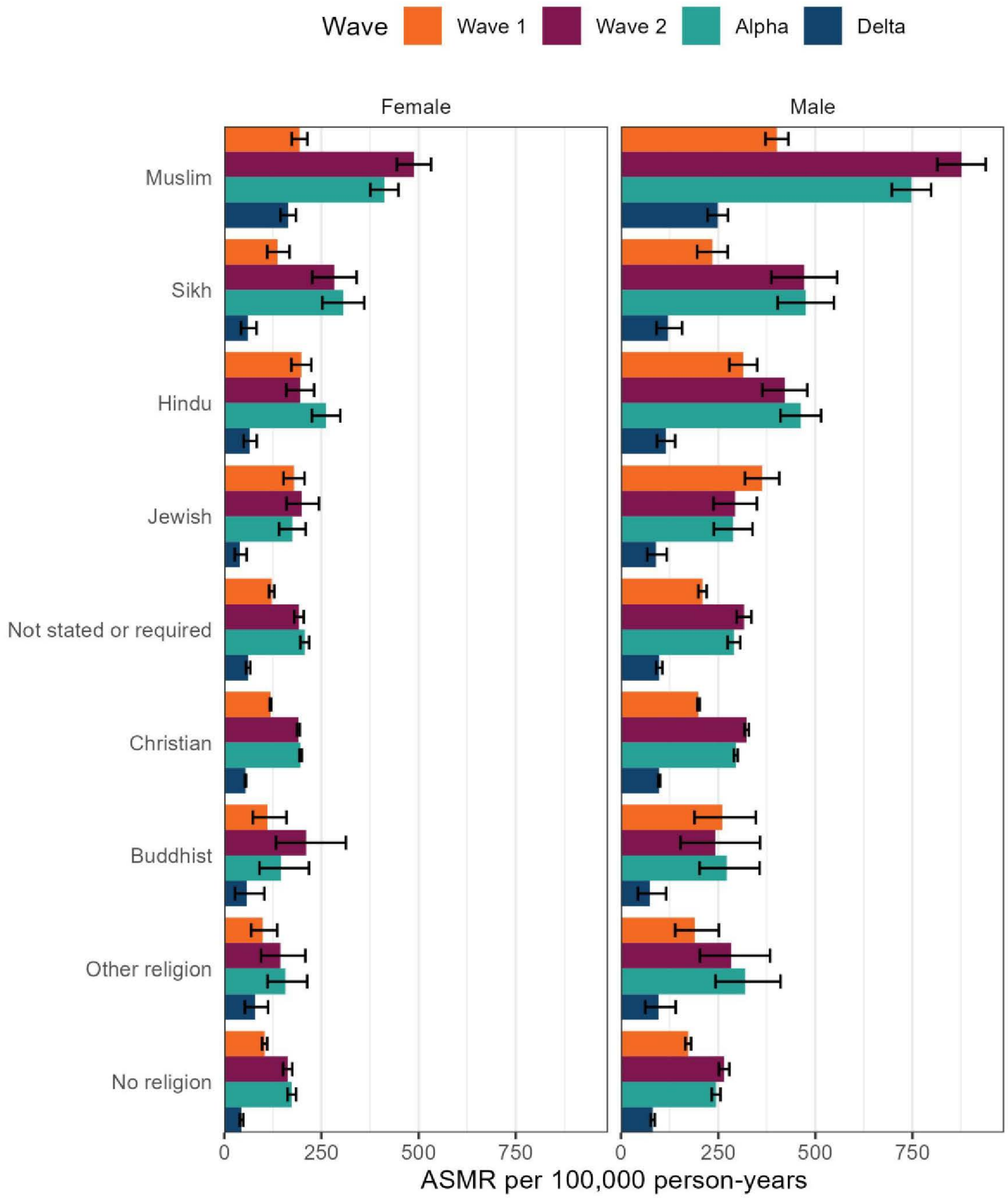
98. Figure 4 shows the same ASMRs, but this time further disaggregated by wave of the pandemic, defined in the same way as for the ethnicity breakdowns in Figure 3.

99. Across all religious groups, mortality rates were lowest in the Delta period. For both sexes, the Muslim group consistently had the highest mortality rates across all periods, except for females in Wave 1.

100. Previously published ONS analysis [ID3/23- INQ000271337 (covering the period 24 January 2020 to 28 February 2021) has shown that factors related to the likelihood of SARS-CoV-2 infection (geographic location, measures of socio-economic disadvantage, occupation, housing tenure, household composition) and prognosis following infection (pre-existing health conditions) account for a large proportion, but not all, of the observed inequalities in the risk of death involving Covid-19 between religious groups. However, even after accounting for these factors, the risk remained statistically significantly elevated for Muslim and Hindu males and females, as well as for Jewish males, compared with the Christian group.

101. Previous ONS analysis (covering the period 8 December 2020 to 12 December 2021) [ID3/24- INQ000271338 has also demonstrated that booster vaccine uptake was lowest among the Muslim group, with just 46.3% of people aged at least 50 years receiving a third or booster dose by 12 December 2021. This may partly explain the persisting raised risk of Covid-19 mortality among the Muslim group.

Figure 4: Age-standardised mortality rates involving Covid-19 between 24 January 2020 and 28 February 2022 by religious group, sex, and wave of the pandemic, England only[31,32,33]



[31] The PHDA cohort covers around 80% of the population in England aged 10 years or over at the start of the pandemic. Therefore, not all deaths that occurred during the period are included.

[32] ASMRs are standardised to the ESP 2013, and are presented as the number of Covid-19 related deaths that would be expected to occur if 100,000 people were each followed-up for one year (i.e., on a 'per 100,000 person-years at risk' basis).

[33] Error bars are 95% confidence intervals.

Deaths by self-reported disability status

102. Table 11 provides numbers and ASMRs of deaths involving Covid-19 between 24 January 2020 and 28 February 2022 by disability status and sex for England only [ID3/25- INQ000271339 Even though they cover the same time periods, the total number of deaths in Table 11 is slightly different to those in Table 9 and 10 because of differences in the dates when the underlying data were extracted (deaths can be registered weeks or months after they occur, for example if a coroner's inquest is required).

103. The analysis in Table 11 uses self-reported disability status from the 2011 Census using the question "Are your day-to-day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months? - Include problems related to old age" (Possible responses: Yes, limited a lot; Yes, limited a little; and No). Those who said that their day-to-day activities were "limited a little" or "limited a lot" are referred to as "less-disabled" and "more-disabled" respectively, whereas people reporting no limitation to their activities are referred to as "non-disabled". At the time of the 2011 Census, 9% of the population in England said their day-to-day activities were limited a little because of a health problem or disability which had lasted, or was expected to last, at least 12 months, while 8% said their activities were limited a lot [ID3/26- INQ000271340

104. The majority of Covid-19 deaths occurred among disabled people (38,671, 52.5% of the total, for males; and 39,271, 63.6% of the total, for females). For both sexes, the age-standardised rate of Covid-19 mortality was statistically significantly highest among more-disabled people, while less-disabled people had a statistically significantly higher mortality rate than non-disabled people. These differences in risk by disability status were consistent throughout the waves of the pandemic considered in this analysis [ID3/25- INQ000271339

105. Published ONS analysis (covering the period 24 January 2020 to 9 March 2022) [ID3/27- INQ000271341 has shown that even after accounting for residence type, geography, socio-economic and demographic factors, health characteristics, and vaccination status, a significantly greater risk of Covid-19 death remained for all disabled people compared with non-disabled people; this remained largely unchanged across the various waves of the pandemic.

Table 11: Number and age-standardised mortality rates involving Covid-19 between 24 January 2020 and 28 February 2022 by disability status and sex, England only[34,35]

Disability status	Sex	Number of deaths involving Covid-19	ASMR for deaths involving Covid-19	Lower 95% confidence limit for ASMR	Upper 95% confidence limit for ASMR
More-disabled (limited a lot)	Male	18,531	677.8	667.4	688.2
Less-disabled (limited a little)	Male	20,140	402.7	396.6	408.9
Non-disabled (not limited)	Male	34,943	214.7	212.1	217.2
More-disabled (limited a lot)	Female	20,296	468.9	461.2	476.6
Less-disabled (limited a little)	Female	18,975	233.7	229.7	237.6
Non-disabled (not limited)	Female	22,428	116.4	114.8	118.0

Deaths by occupation

106. This analysis is based on a subset of the ONS PHDA study cohort, comprising 13.1 million adults who were working and aged 31-55 years at the time of the 2011 Census, and were therefore likely to be in stable employment in both 2011 and 2020 (by which time they were aged 40-64 years). Our analysis uses self-reported occupation at the time of the 2011 Census, coded to Standard Occupation Classification (SOC) 2010 Sub-Major groups [ID3/28- INQ000271342 It should be noted that our occupation data were nine years out of date at the start of the pandemic, and some people may have changed occupations or exited the labour market during this time.

107. It is also important to note that this analysis does not account for factors that are likely to be related to both occupation and the risk of SARS-CoV-2 infection (such as living in deprived conditions) or those related to both occupation and prognosis following SARS-CoV-2 infection (such as underlying heath status). It is also possible that high rates of Covid-19 mortality are partly driven by factors typically associated with working in particular occupations, such as the need to travel to the workplace and thus increased exposure to the virus, rather than the occupation itself. Therefore,

[34] The PHDA cohort covers around 80% of the population in England aged 10 years or over at the start of the pandemic. Therefore, not all deaths that occurred during the period are included.

[35] ASMRs are standardised to the ESP 2013, and are presented as the number of Covid-19 related deaths that would be expected to occur if 100,000 people were each followed-up for one year (i.e., on a 'per 100,000 person-years at risk' basis).

it is not possible to say from this analysis whether working in a particular occupation is causally related to the risk of Covid-19 mortality.

108. Table 12 provides numbers and ASMRs of death involving Covid-19 between 24 January 2020 and 28 February 2022 by occupation group for England only.

109. People employed as 'transport and mobile machine drivers and operatives' had the highest age-standardised rates of Covid-19 mortality (78.7 Covid-19 deaths per 100,000 person-years), while those working in the following occupations also had relatively high rates: 'elementary administration and service occupations' (54.3), 'textiles, printing and other skilled trades' (49.0), 'process, plant and machine operatives' (46.9), and 'elementary trades and related occupations' (45.8).

110. Conversely, the lowest mortality rates were among people working in the following occupations: 'teaching and educational professionals' (16.9 Covid-19 deaths per 100,000 person-years), 'culture, media and sports occupations' (18.2), and 'secretarial and related occupations' (18.4).

Table 12: Number and age-standardised mortality rates involving Covid-19 between 24 January 2020 and 28 February 2022 by occupation group among people in employment in March 2011 and aged 40-64 years in January 2020, England only[36,37]

Occupation group (SOC 2010 Sub-Major group)	Number of deaths involving Covid-19	ASMR for deaths involving Covid-19	Lower 95% confidence limit for ASMR	Upper 95% confidence limit for ASMR
11: Corporate managers and directors	682	27.2	25.0	29.3
12: Other managers and proprietors	453	36.3	32.7	39.8
21: Science, research, engineering and technology professionals	270	21.4	18.7	24.2
22: Health professionals	282	22.2	19.5	24.9
23: Teaching and educational professionals	224	16.9	14.6	19.2
24: Business, media and public service professionals	380	26.2	23.4	29.0
31: Science, engineering and technology associate professionals	175	39.8	33.5	46.1
32: Health and social care associate professionals	126	32.6	26.6	38.6

36 The PHDA cohort covers around 80% of the population in England aged 10 years or over at the start of the pandemic. Therefore, not all deaths that occurred during the period are included.

37 ASMRs are standardised to the ESP 2013, and are presented as the number of Covid-19 related deaths that would be expected to occur if 100,000 people were each followed-up for one year (i.e., on a 'per 100,000 person-years at risk' basis).

33: Protective service occupations	86	23.1	18.0	29.1
34: Culture, media and sports occupations	89	18.2	14.3	22.7
35: Business and public service associate professionals	411	23.3	20.9	25.7
41: Administrative occupations	724	28.5	26.4	30.7
42: Secretarial and related occupations	172	18.4	15.5	21.3
51: Skilled agricultural and related trades	68	20.8	15.8	26.9
52: Skilled metal, electrical and electronic trades	480	40.7	36.8	44.6
53: Skilled construction and building trades	387	34.2	30.6	37.8
54: Textiles, printing and other skilled trades	334	49.0	43.4	54.5
61: Caring personal service occupations	717	33.2	30.6	35.8
62: Leisure, travel and related personal service occupations	190	34.0	28.9	39.2
71: Sales occupations	529	39.6	36.1	43.1
72: Customer service occupations	144	39.2	32.3	46.2
81: Process, plant and machine operatives	481	46.9	42.4	51.4
82: Transport and mobile machine drivers and operatives	1,028	78.7	73.5	83.8
91: Elementary trades and related occupations	189	45.8	38.9	52.7
92: Elementary administration and service occupations	1,214	54.3	51.1	57.5

111. Figure 5 shows the same ASMRs, but this time further disaggregated by wave of the pandemic, defined in the same way as for the ethnicity and religion breakdowns presented figures 3 and 4.

112. Across most occupation groups, the ASMRs were generally highest in the Wave 2 and Alpha time periods, and lower in the Wave 1 and Delta time periods. Trends in mortality risk between occupation groups were generally similar across the waves, with people employed as ‘transport and mobile machine drivers and operatives’ having the highest rates of Covid-19 death in every period. People working in ‘elementary administration and service occupations’, ‘textiles, printing and other skilled trades’, ‘process, plant and machine operatives’, and ‘elementary trades and related occupations’ also had relatively high mortality rates in most waves.

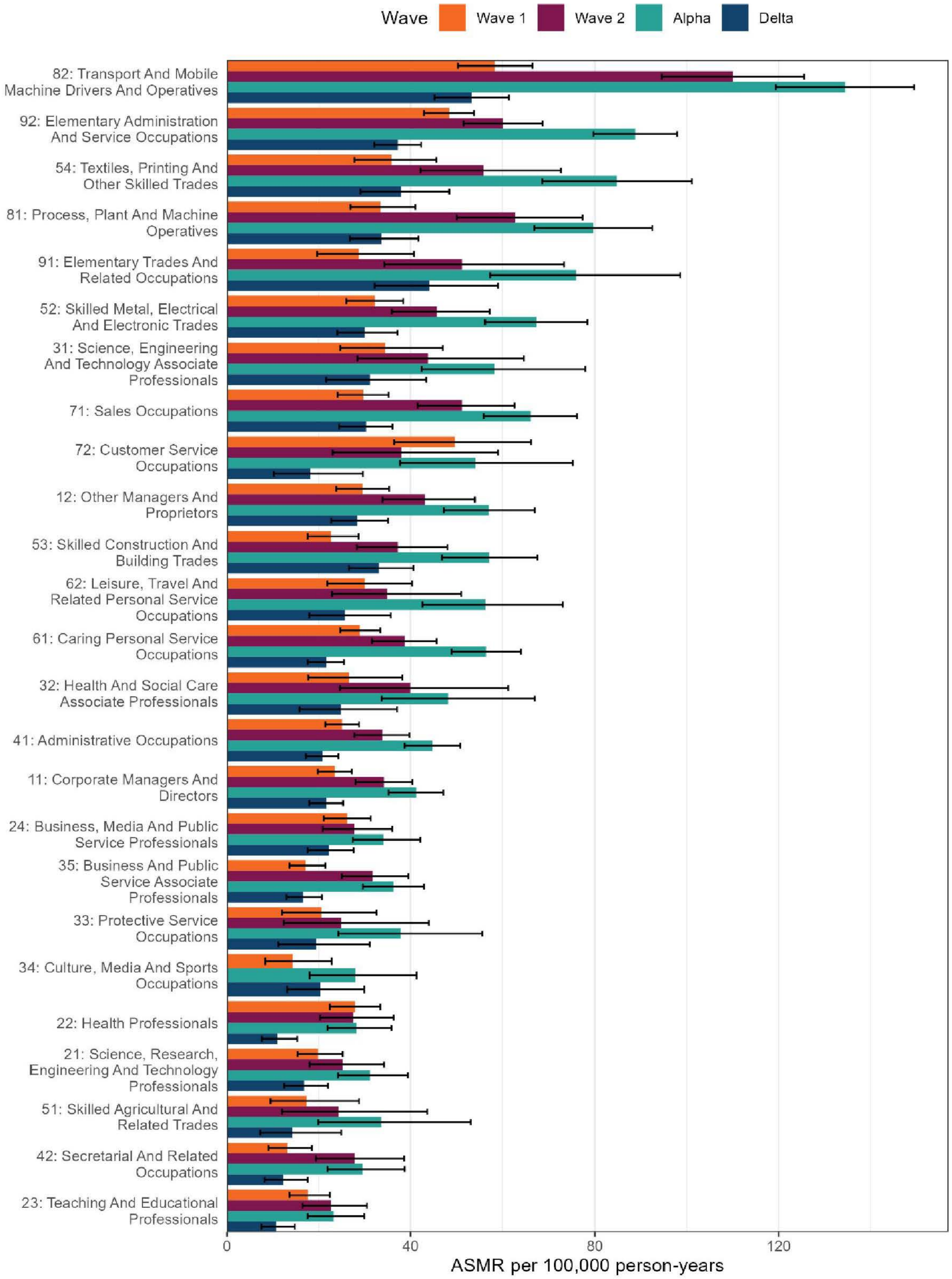
113. However, it is difficult to make reliable statistical comparisons between occupation groups and time periods due to smaller sample sizes and therefore wider confidence intervals when disaggregating the rates by wave of the pandemic.

Figure 5: Age-standardised mortality rates involving Covid-19 between 24 January 2020 and 28 February 2022 by occupation group and wave of the pandemic among people in employment in March 2011 and aged 40-64 years in January 2020, England only[38,39,40]

[38] The PHDA cohort covers around 80% of the population in England aged 10 years or over at the start of the pandemic. Therefore, not all deaths that occurred during the period are included.

[39] ASMRs are standardised to the ESP 2013, and are presented as the number of Covid-19 related deaths that would be expected to occur if 100,000 people were each followed-up for one year (i.e., on a 'per 100,000 person-years at risk' basis).

[40] Error bars are 95% confidence intervals.



114. The differences in the risk of death involving Covid-19 across occupation may not be due to differences in occupational exposure. People working in different occupations differ along many socio-demographic characteristics and have different vaccination uptake rates. Figure 6 describes socio-demographic characteristics and vaccination uptake by occupation group, ordered such that occupations with the

highest rates of Covid-19 mortality are at the top and those with the lowest rates are at the bottom.

115. The socio-demographic distributions relate to individuals in employment at the time of the Census in March 2011 and aged 40-64 years at the start of the pandemic on 24 January 2020; for this analysis, occupation is based on the 2011 Census (the latest available at the onset of the pandemic). The percentage of people who were unvaccinated were calculated in a separate analysis based on individuals who were aged 18-64 years on 28 February 2022, responded to both the 2011 and 2021 Censuses, and were in employment at the time of the Census in March 2021; for this analysis, occupation is based on the 2021 Census (the latest available at the onset of the Covid-19 vaccination campaign for many working age people).

116. Individuals working in occupations with the highest rates of Covid-19 mortality ('transport and mobile machine drivers and operatives', 'elementary administration and service occupations', 'textiles, printing and other skilled trades', 'process, plant and machine operatives', 'elementary trades and related occupations') generally had some of the highest concentrations of workers in poor health, living in deprived areas, and who were unvaccinated – all of which may be related to the likelihood of SARS-CoV-2 infection and poor prognosis once infected.

117. In addition, the majority of workers in these occupations are male (with the exception of 'elementary administration and service occupations') and have relatively high concentrations of workers from ethnic minority groups. These features suggest that occupation may partly explain the differences in Covid-19 mortality risk by sex and ethnicity observed elsewhere in this statement.

Figure 6: Socio-demographic characteristics from the 2011 Census and Covid-19 vaccination status at 28 February 2022 by occupation group, England only[41,42,43,44,45]

This figure shows, for each occupation group listed down the side, the percentage of people with the characteristic listed along the top. The shading of the squares has a different meaning for each column. Each characteristic has its own legend provided on the right hand side. Occupation groups with the lowest percentage of each characteristic will be shaded in the palest blue, and as the percentage increases, the blue shading becomes deeper.

[41] The socio-demographic distributions relate to individuals in employment at the time of the Census in March 2011 and aged 40-64 years at the start of the pandemic on 24 January 2020. The percentages of people who were unvaccinated were calculated in a separate analysis based on individuals who were aged 18-64 years on 28 February 2022, responded to both the 2011 and 2021 Censuses, and were in employment at the time of the Census in March 2021.

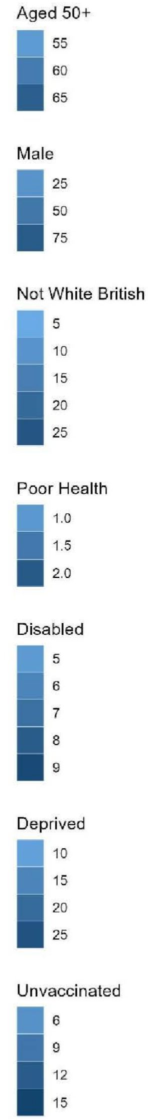
[42] The socio-demographic distributions are based on Census 2011 responses, for which occupation was coded using the 2010 edition of the SOC. The vaccination distributions are based on Census 2021 responses, for which occupation was coded using the 2020 edition of the SOC. There were some changes in the way that occupations are coded against the SOC between the 2010 and 2020 editions, hence the occupation groupings shown in the table are not completely comparable between the socio-demographic and vaccination columns.

[43] 'Poor health' represents people who described their health status as being "Bad" or "Very bad" on the 2011 Census.

[44] 'Disabled' represents people who said their day-to-day activities are limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months on the 2011 Census.

[45] 'Deprived' represents people living in an area in the most deprived quintile group of the Index of Multiple Derivation.

%	Aged 50+	Male	Not White British	Poor Health	Disabled	Deprived	Unvaccinated
82: Transport And Mobile Machine Drivers And Operatives	68.8	93.8	21.3	1.7	7.6	25.0	9.5
92: Elementary Administration And Service Occupations	64.4	47.7	24.2	2.1	9.3	28.2	10.9
54: Textiles, Printing And Other Skilled Trades	61.8	60.7	27.4	1.8	7.3	22.7	8.4
81: Process, Plant And Machine Operatives	65.9	80.5	17.7	1.7	7.3	23.9	10.9
91: Elementary Trades And Related Occupations	63.8	74.2	23.4	2.4	8.7	27.4	15.1
52: Skilled Metal, Electrical And Electronic Trades	63.9	97.7	9.9	1.2	5.9	14.9	10.3
31: Science, Engineering And Technology Associate Professionals	56.4	71.7	15.9	1.2	6.2	13.3	6.6
71: Sales Occupations	63.3	27.9	17.4	1.8	9.1	22.1	9.7
72: Customer Service Occupations	54.9	30.5	18.1	1.8	8.6	19.4	10.2
12: Other Managers And Proprietors	65.4	56.8	19.1	1.2	6.1	11.9	6.0
53: Skilled Construction And Building Trades	64.7	98.0	11.4	1.3	6.2	15.1	12.7
62: Leisure, Travel And Related Personal Service Occupations	60.1	27.6	20.4	1.5	6.9	18.8	10.5
61: Caring Personal Service Occupations	64.6	11.9	17.7	1.5	8.0	20.3	6.6
32: Health And Social Care Associate Professionals	63.3	25.3	18.4	1.6	8.9	16.9	7.2
41: Administrative Occupations	63.9	23.1	14.4	1.4	7.6	13.5	6.4
11: Corporate Managers And Directors	63.2	67.9	13.5	0.7	4.2	8.3	4.5
24: Business, Media And Public Service Professionals	55.4	56.7	20.6	0.8	4.6	9.2	4.3
35: Business And Public Service Associate Professionals	54.4	53.4	14.7	0.8	4.8	9.1	5.5
33: Protective Service Occupations	57.1	75.7	7.7	0.7	6.0	7.9	4.7
22: Health Professionals	59.7	23.1	29.9	0.7	5.1	12.1	3.1
21: Science, Research, Engineering And Technology Professionals	52.9	80.9	20.9	0.7	4.2	8.3	4.7
51: Skilled Agricultural And Related Trades	69.9	82.9	4.6	1.3	7.8	7.9	8.9
42: Secretarial And Related Occupations	68.8	4.6	12.2	1.2	6.6	11.2	5.8
34: Culture, Media And Sports Occupations	52.4	54.7	18.2	1.2	5.9	12.9	8.6
23: Teaching And Educational Professionals	59.8	29.3	16.5	0.8	5.2	9.3	4.2



118. Previous ONS analysis (covering the period 24 January 2020 to 28 December 2020) [ID3/29- INQ000271343 has demonstrated that 70-80% of the differences in age-adjusted Covid-19 mortality risk between occupation groups might be explained by non-occupational socio-demographic factors (sex, geography, ethnicity, deprivation, housing conditions, pre-existing health conditions).

119. Analysis using data from the ONS's Covid-19 Infection Survey (CIS) [ID3/30- INQ000271344 has also shown that workplace-related factors (use of face coverings, ability to work from home, ease of distancing in the workplace) may explain much of the remaining inequality in the likelihood of SARS-CoV-2 infection (an obvious

precursor to Covid-19 mortality) between most occupation groups after socio-demographic characteristics are taken into account.

Covid-19 Vaccinations

120. The UK was the first country in the world to introduce Covid-19 vaccines outside of clinical trials. The first dose was administered on 8 December 2020, around 10 months after the virus entered the country. By September 2022, over 150 million doses had been administered in the UK, with almost 9 in 10 people aged 12 years and over having received two doses.

Deaths by vaccination status

121. It is possible to report age-adjusted rates of Covid-19 related deaths by vaccination status. This is an important consideration when interpreting the mortality rates across socio-demographic characteristics, because Covid-19 vaccine uptake among adults aged 50 years or older has varied by factors including ethnicity (lowest for Black African and Black Caribbean groups), religion (lowest for those of 'Other religion'), and disability status (lowest for more-disabled people) [ID3/31- INQ000271345

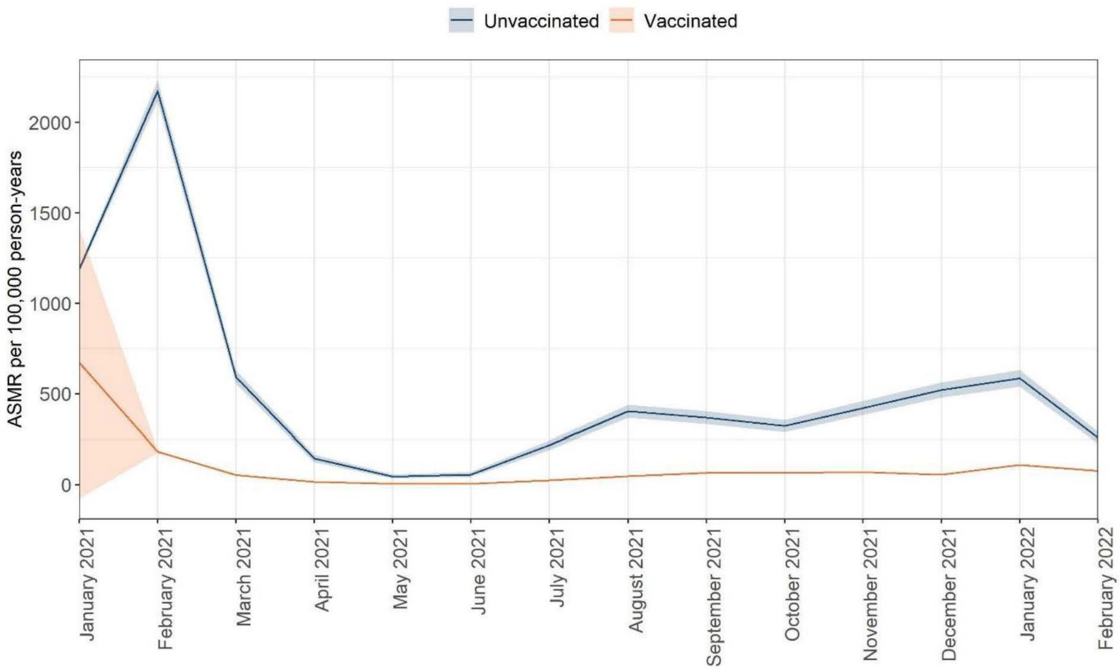
122. Figure 7 shows monthly ASMRs for deaths involving Covid-19 between January 2021 and February 2022 by Covid-19 vaccination status for England only [ID3/32-I INQ000271346

123. ASMRs were statistically significantly higher for unvaccinated people than vaccinated people in every month during the time period (apart from in January 2021, which was early in the vaccination campaign when relatively few people had been vaccinated, and therefore statistical uncertainty was high). The ASMR for the unvaccinated group peaked at 2,174 Covid-19 related deaths per 100,000 person-years in February 2021.

124. It should be noted that the ASMRs presented here are not equivalent to measures of vaccine effectiveness. They account for differences in age structure and population size, but there may be other differences between the groups that affect mortality rates. For example, some people may not have received a Covid-19 vaccine due to the presence of underlying health conditions that also put them at increased risk of death if infected with SARS-CoV-2. On the other hand, people with certain underlying health conditions, which may also be related to poor prognosis if infected, were prioritised for vaccination; thus the picture is complex.

Figure 7: Monthly age-standardised mortality rates involving Covid-19 between January 2021 and February 2022 by Covid-19 vaccination status, England only[46,47]

Please note: the shaded area around the lines show the level of uncertainty around the estimated age-standardised rate in each month (based on 95% confidence intervals)



Vaccine effectiveness against Covid-19 mortality and hospitalisation

125. Expanding upon the ASMRs by vaccination status presented in Figure 7, we have adjusted for factors that can affect both the likelihood to be vaccinated and the risk of death (over and above age), to produce estimates of vaccine effectiveness against severe Covid-19 outcomes (hospitalisation and death) [ID3/33- INQ000271347 The full list of factors that are accounted for comprises:

- age
- sex
- self-reported ethnic group
- religious affiliation
- region of residence
- index of multiple deprivation
- level of highest qualification
- English language proficiency

[46] The PHDA cohort covers around 80% of the population in England aged 10 years or over at the start of the pandemic. Therefore, not all deaths that occurred during the period are included.

[47] ASMRs are standardised to the ESP 2013, and are presented as the number of Covid-19 related deaths that would be expected to occur if 100,000 people were each followed-up for one year (i.e., on a 'per 100,000 person-years at risk' basis).

- National Statistics Socio-economic classification (NS-SEC)
- key worker status, derived from the SOC 2020 classification
- care home residency
- long-term health problem or disability
- self-reported general health
- body mass index (BMI)
- the number of pre-existing health conditions
- frailty
- hospitalisation within the last 21 days

126. The study population included individuals who were enumerated in Census 2021, could be linked to an NHS number, were usual residents of England, were alive and aged 16 years and over on Census Day (41,950,323 individuals) and had non-ambiguous and non-erroneous vaccination data (41,855,563 individuals).

127. Unlike the preceding subsections that were based on people who responded to the 2011 Census, this analysis uses data from the 2021 Census, the latest available data at the start of the study period. Census Day was 21 March 2021, over three months after the start of the vaccination campaign on 8 December 2020. The requirement for people in our study population to be alive on Census Day means that outcomes that occurred earlier than this day are excluded. This will mainly affect people who were unvaccinated, and older people who were initially unvaccinated, then received a first and potentially second dose. The unvaccinated older population who are excluded are likely to be healthier as they were vaccinated when eligible rather than delaying vaccination because of poorer health. This may mean our vaccination estimates are underestimates, as outcomes for healthier unvaccinated people will be excluded, therefore reducing vaccine effectiveness estimates, as these are calculated compared with the unvaccinated population.

128. Between 21 March 2021 and 20 March 2022, vaccine effectiveness against hospitalisation for Covid-19 was 52.2% (95% confidence interval: 51.4% to 52.9%) for a first dose, 55.7% (confidence interval: 55.2% to 56.1%) for a second dose, and 77.6% (confidence interval: 77.3% to 80.0%) for a third dose [ID3/33- INQ000271347

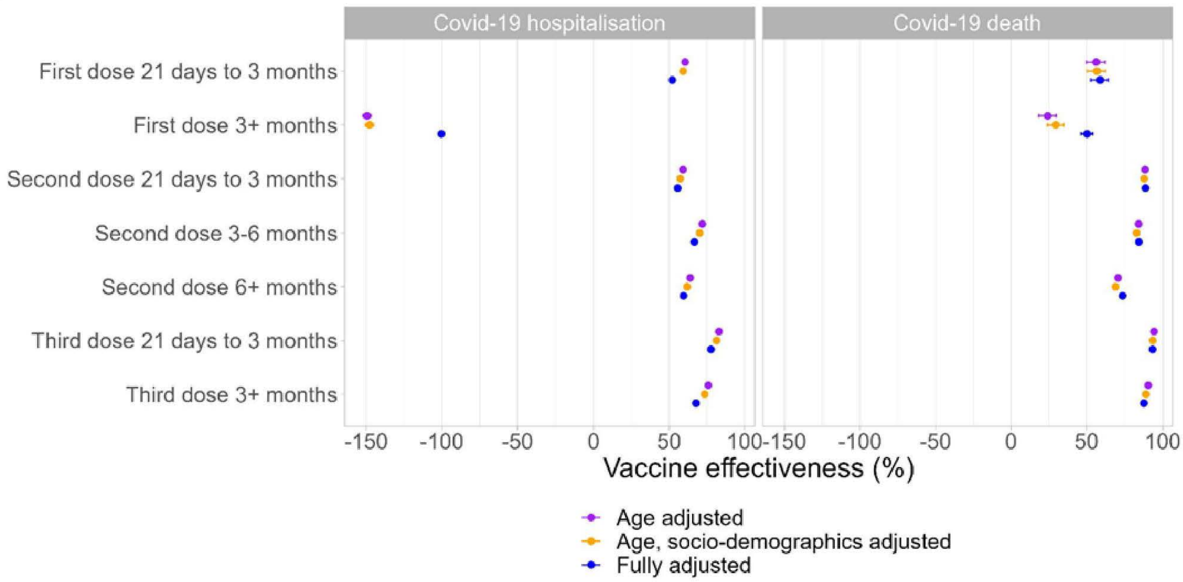
129. Vaccine effectiveness against Covid-19 mortality was 58.7% (confidence interval: 52.7% to 65.9%) for a first dose, 88.6% (confidence interval: 87.5% to 89.5%) for a second dose, and 93.2% (confidence interval: 92.9% to 93.5%) for a third dose.

130. Protection increased with subsequent doses and was high for the third dose or booster as has been shown in previous research, however results are slightly

lower in general than previously published estimates, including academic studies to which ONS contributed earlier in the pandemic for example [ID3/34- INQ000271348

131. The ONS has found that Covid-19 vaccination was associated with reduced risk of SARS-CoV-2 infection (a necessary precursor to Covid-19 hospitalisation and death) in the Alpha and Delta periods of the pandemic. For details, see the 'Vaccination effectiveness against infection' subsection in the 'Infections' section, Paragraph 216.

Figure 8: Vaccine effectiveness against Covid-19 hospitalisation and deaths involving Covid-19, by vaccine dose and model type, England[48,49,50,51]



Excess deaths

By nation and by lockdown periods (March 2020-June 2020, August 2020-December 2020, January 2021-May 2021)

132. The number of excess deaths registered between March 2020 and February 2022 for each of the four nations and lockdown periods is provided in Table 13.

133. England had the highest percentage excess in death registrations when looking at the whole time period and two of the three lockdown periods (March to

48 95% confidence intervals are indicated by the horizontal bars.

49 The time at risk was the earliest of time until the outcome occurred or 20 March 2022.

50 Covid-19 hospitalisation is based on the date of the start of a hospital episode and is defined as an inpatient episode in Hospital Episode Statistics where the primary diagnosis was Covid-19, identified by the International Classification of Diseases 10th Revision (ICD-10) codes U07.1 (Covid-19, virus identified) or U07.2 (Covid-19, virus not identified).

51 Deaths involving Covid-19 are based on date of occurrence and are defined as a death where either of the (International Classification of Diseases 10th Revision (ICD-10) codes U07.1 (Covid-19, virus identified) or U07.2 (Covid-19, virus not identified) is mentioned on the death certificate.

June 2020 and January to December 2021). This was true when looking at excess using numbers of death registrations or age-standardised mortality rates.

134. During the second lockdown (August to December 2020), Northern Ireland had the highest percentage above average when looking at numbers of death registrations, but Wales had the highest percentage when looking at age-standardised mortality rates.

135. When looking at age-standardised mortality rates, Wales, Scotland and Northern Ireland all displayed rates below average during the last lockdown period.

Table 13: Excess deaths (deaths above average) for January 2020-February 2022, by nation and lockdown period (February-June 2020; August- December 2020; January-May 2021)[52,53,54]

	UK	England	Wales	Scotland	Northern Ireland
Number of excess deaths					
March 2020 to February 2022	138,909	118,503	6,192	11,017	3,638
March 2020 to June 2020	62,903	55,003	2,150	4,889	908
August 2020 to December 2020	24,668	20,009	1,925	1,871	1,031
January 2021 to May 2021	22,423	20,962	539	770	265
Percentage above average (numbers)					
March 2020 to February 2022	11.4%	11.9%	9.2%	9.5%	11.5%
March 2020 to June 2020	31.5%	33.5%	19.3%	26.0%	17.6%
August 2020 to December 2020	10.2%	10.1%	14.4%	8.0%	16.3%
January 2021 to May 2021	8.3%	9.4%	3.6%	3.0%	3.8%
Percentage above average (ASMRs)					
March 2020 to February 2022	6.1%	6.5%	4.9%	3.9%	4.0%

52 Figures exclude deaths of non-residents.

53 Based on date a death was registered rather than occurred.

54 Figures for the four countries individually exclude deaths of non-residents, as place of residence is used to assign to a country. A small difference to the UK total will therefore be observed as the UK figure also includes deaths of non-residents.

March 2020 to June 2020	25.5%	27.3%	14.3%	21.3%	11.1%
August 2020 to December 2020	5.8%	5.8%	10.5%	3.5%	10.1%
January 2021 to May 2021	2.8%	4.0%	-0.6%	-4.1%	-4.6%

Excess deaths by region of England

136. When looking at both percentage of excess deaths based on numbers and age-standardised mortality rates, London has the highest excess of the period March 2020 to February 2022 with the number of deaths registered being 16.5% above average and the age-standardised mortality rate being 12.6% above average. This was also the region with the highest rate of deaths involving Covid-19.

137. All regions showed above average mortality when looking across the period, but the South West showed the lowest with the number of deaths being 7.1% above average and the age-standardised rate being 1.1% above average. This was also the region with the lowest age-standardised mortality rate of deaths involving Covid-19.

Table 14: Excess deaths (deaths above average) in regions of England, March 2020 to February 2022[55],[56]

		Percentage above average	
	Number of excess deaths	**Numbers**	**ASMRs**
North East	6,374	11.3%	6.4%
North West	19,029	13.2%	8.3%
Yorkshire and The Humber	11,956	11.4%	6.3%
East Midlands	11,731	12.9%	6.8%
West Midlands	15,938	14.4%	8.9%
East of England	11,711	10.2%	4.7%
London	16,503	16.5%	12.6%
South East	17,164	10.5%	4.9%
South West	8,097	7.1%	1.1%

Excess deaths by setting

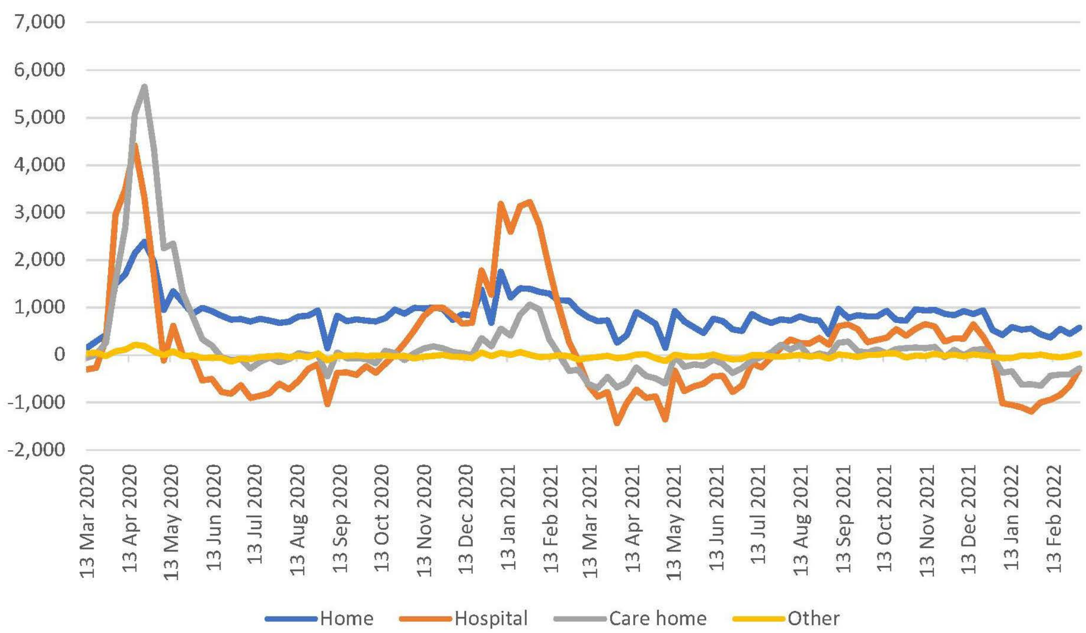
138. The ONS published deaths registered weekly in England and Wales by place of death, which includes excess deaths for England and Wales combined. Data for the individual countries of England and Wales have been published independently of the deaths registered weekly in England and Wales release.

[55] Figures exclude deaths of non-residents.
[56] Based on date a death was registered rather than occurred.

139. As noted in the previous sections on deaths involving Covid-19, the majority of deaths occurred in hospitals and care homes. In England and Wales, as can be seen in figure 9, excess deaths in care homes and hospitals peaked at the same time as the first wave of mortality involving Covid-19 and then add a smaller peak during the second wave of deaths involving Covid-19.

140. A small number of deaths involving Covid-19 occurred in private homes, however deaths in private homes have been above average throughout the pandemic. We released information on deaths in private homes during the pandemic [ID3/35- INQ000271349

Figure 9: Number of excess deaths by place of occurrence, deaths registered weekly in England and Wales, week ending 13 March 2020 to week ending 04 March 2022[57,58,59]



Global comparative excess deaths

141. The ONS published international comparisons (between European countries and regions) of excess mortality for 28 December 2019 to week ending 1 July 2022 [ID3/36- INQ000271350 This analysis includes the UK, its four constituent countries, and a further 28 European countries, and data is provided by week, age and sex.

57 Figures include deaths of non-residents.

58 Deaths at home are those at the usual residence of the deceased (according to the informant), where this is not a communal establishment. Care homes includes homes for the chronic sick; nursing homes; homes for people with mental health problems and non-NHS multi function sites.

59 Care homes represents deaths that occurred in care homes, rather than deaths of care home residents.

142. The best way of comparing the mortality impact of the Covid-19 pandemic internationally is by looking at all-cause mortality compared with the five-year average. All-cause mortality avoids the problem of different countries recording Covid-19 deaths in different ways and takes into account the indirect impact of the pandemic, such as deaths from other causes that might be related to delayed access to healthcare.

143. Earlier analysis of excess deaths is calculated by comparing the current ASMR with an ASMR created from the previous five year's deaths and populations. Relative age-standardised mortality rates (rASMR) used here compare the current ASMR with the average of the previous five years ASMRs. Both measures produce similar results.

144. The ONS sourced the European mortality and population data from databases published by Eurostat. There are strict criteria that data must meet to be included, so analysing data from this source provides an opportunity to be as comparable as possible. This is reliant on the availability of data submitted to Eurostat by participating countries. Further information has been published on the data used [ID3/37- INQ000271351

145. The completeness and timeliness of the data varies by country because of differing civil registration and statistical systems. UK data are based on date of death registration rather than date of death occurrence, while most other European countries are based on date of death occurrence. The average difference between date of death and registration in England and Wales during the pandemic period was approximately 4 days.

146. Between the week ending 3 January 2020 (week 1 2020) and the week ending 1 July 2022 (week 26 2022), the UK's relative cumulative excess mortality was 3.1% above the average of 2015 to 2019.

147. The UK had the 16th highest relative cumulative excess mortality of the 33 countries analysed (UK, its constituent countries, and 28 European countries), and 15th highest of 28 countries when constituent countries are removed.

148. The majority of European countries analysed (25 of 33) experienced above average relative cumulative excess mortality for the whole period, with eight countries showing relative cumulative mortality below average.

149. The UK had the fifth highest relative cumulative excess mortality rate in those aged under 65 years (8.3% above average); in those aged 65 years and over in the UK, the cumulative excess mortality rate was the 19th highest (2.2% above average).

150. Looking at the period to week ending 25 February 2022 (week 8 2022) the UK's relative cumulative excess mortality was 4.0% above average, ranked 15th

highest of the 33 European countries analysed; or 14th highest of 28 countries when constituent countries are removed.

151. For the same period, the UK had the 5th highest rcASMR for those aged under 65 with 9.5% above average (or 4th with constituent countries removed) and 16th highest rcASMR for those aged 65 and over with 3.1% above average (15th with constituent countries removed).

152. Italy, Spain and France recorded high excess mortality around the same time as the UK; however, the high excess mortality appeared in clusters (northern Italy, central Spain and around the capital of France), whereas excess mortality was distributed across the whole of the UK.

153. The Nomenclature of Territorial Units for Statistics (NUTS) area with the highest relative age-standardised mortality rate across the timeseries was Bergamo, Italy, with 800.5% above average for the area in week ending 20 March 2020.

154. Spain and France both had their peak ASMR in week ending 3 April 2020, with the mortality concentrated in and around their respective capitals, Madrid and Paris.

155. In England, mortality was mainly concentrated in the capital, London, in the countries peak ASMR week (week ending 17 April 2020), but excess mortality was more spread out than most other European country analysed, with 50.4% of NUTS regions showing at least double the average mortality in its peak week. This was the 5th highest of all countries that had data available.

<u>Infections</u>

Covid-19 Infection Survey

156. The Coronavirus Infection Survey (CIS) was a gold standard survey set up in rapid time to measure Covid-19 infections and antibodies in partnership with the University of Oxford and others. The survey was the largest of its kind across the UK, collecting at its peak some 400,000 samples each month. It formed a critical evidence base for the government's ongoing surveillance of the prevalence of Covid-19 across the UK, delivering data breakdowns by age and region across all four nations. These breakdowns were fundamental in many of the policy decisions made to contain the pandemic and save lives. CIS was commissioned to discover how many people in private households:

- had Covid-19, with or without symptoms;
- had previously caught Covid-19, with or without symptoms; and
- had a strong response to a Covid-19 vaccination.

157. CIS used a random sample of households where all residents aged over two years were invited to join the study. Whether or not they had symptoms, participants were regularly asked to:

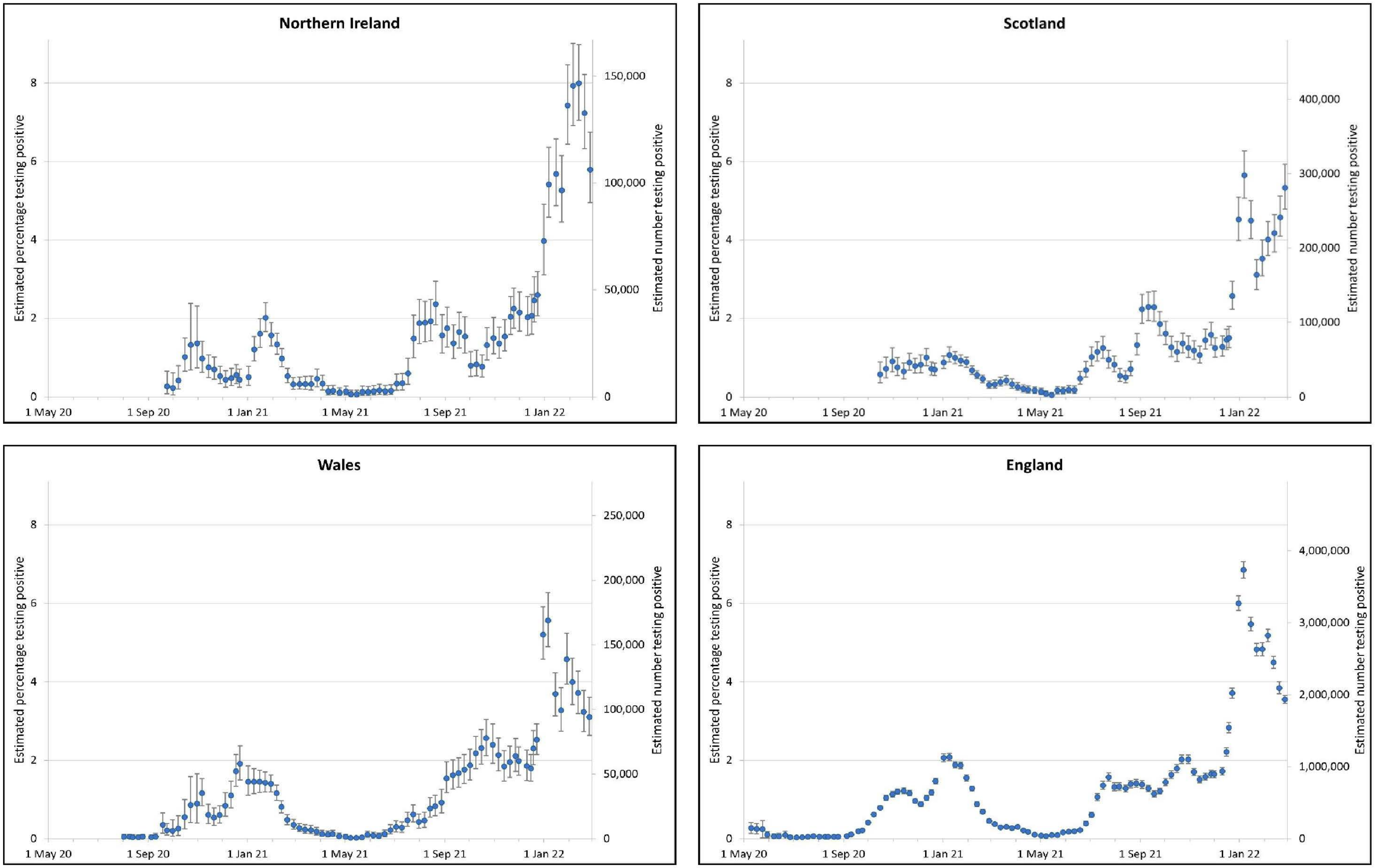
- provide nose and throat swabs;
- answer a questionnaire; and
- for some participants, provide a blood sample.

158. Working with academic partners including the University of Oxford, the data from this sample of households were then modelled to ensure the results provided representative estimates of infection across the general population. Responses from the questionnaire provided more insights into where, and in which types of people, Covid-19 infection was changing.

159. CIS was launched in England on 26 April 2020 and published first provisional results on 10 May. It was expanded to include Wales on 29 June 2020, Northern Ireland on 26 July 2020 and Scotland on 21 September 2020. CIS continued to run until March 2023. Figure 10 shows the official reported estimates of Covid-19 prevalence across the four nations from the week ending 10 May 2020 until week ending 26 February 2022.

160. Originally, swab samples were collected in person by CIS study workers, working independently from other Covid-19 testing programmes. We started collecting digital data from July 2022 (a small number of participants in a pilot moved over during June 2022) and had transitioned all participants to this mode by September 2022. This allowed participants to return samples through the post or via a courier and complete the questionnaire online.

Figure 10: Official reported estimates of the percentage and number of the population testing positive for Covid-19, week ending 10 May 2020 to week ending 26 February 2022, Covid Infection Survey



Methodology

161. The survey was based on a random sample of households to provide a nationally representative survey. We asked everyone aged two years and over in each household sampled to take a nose and throat swab. These were tested for SARS-CoV-2 using reverse transcriptase polymerase chain reaction (RT-PCR). This is an accredited test that was part of the national testing programme. These samples were collected to enable the ONS to estimate the number of people infected.

162. Using a random sample of households and testing participants regardless of symptoms enabled CIS to pick up non-symptomatic cases, which would mostly have been missed by other testing (such as Test and Trace) and meant that CIS estimates were not affected by changes in testing policy. At the beginning of the pandemic, case numbers from government testing are thought to have under-reported the true number of infections because of low testing capacity. Test and Trace played an important role during the pandemic, particularly in allowing people to confirm whether they were infected but was not designed to accurately measure how many people nationwide had Covid-19. CIS was widely regarded to provide the most accurate estimates of Covid-19 cases throughout the pandemic.

163. The people included in the survey were only those living in private households. Those in hospitals, care homes or other communal establishments were not included in the sample and were therefore not accounted for in the estimates of infections from CIS.

164. Any estimate based on a random sample contains some uncertainty. To quantify this uncertainty, the ONS reported estimates from CIS with credible intervals and confidence intervals. A credible or confidence interval gives an indication of the degree of uncertainty of an estimate. (A wider interval indicates more uncertainty in the estimate. Overlapping intervals indicate that there may not be a true difference between two estimates.)

165. Each CIS participant provided a nose and throat swab for testing via polymerase chain reaction (PCR). Data from these swab test results were used to estimate the percentage of the private-residential population that would test positive for SARS-CoV-2 using a PCR test, if the whole population had been sampled. Note that this is not necessarily the same as the true percentage *infected* on a given day. To calculate the true number of infections, we would need an accurate understanding of the swab test's sensitivity (true-positive rate, estimated to be between 85% and 98%) and specificity (true-negative rate, estimated to be close to 100%). This caveat to the data is explained in the Quality and Methodology report [ID3/38- INQ000271352

166. The ONS has published complete datasets for all periods April 2020 to March 2023 from which the following data are drawn. Full quality and methodology information for the study has been exhibited to this statement [ID3/39- INQ000271353

Infections in the period February- June 2020

167. As the CIS began on 26 April 2020 in England; it is not possible to account for infections resolved before the start of the survey, i.e. before 26 April 2020.

168. During the period from the start of the survey to 5 July 2020, fortnightly weighted estimates of the positivity rate were reported. The figures below estimate the average percentage of the population who would have tested positive for SARS-CoV-2 on any given day in the fortnight. This positivity rate was used to give an overall estimate of the number of people who would have tested positive for Covid-19 in England.

169. During this period, the estimated percentage of the population of England testing positive declined from 0.27 per cent (95% confidence interval: 0.17 to 0.41) to 0.03 per cent (0.01 to 0.06) [ID3/40- INQ000271354

Infections in the periods August 2020 to May 2021

170. In July 2020, ONS methodology was updated to produce modelled positivity estimates based on the midpoint of the week. The headline figures in Table 2 of exhibit ID3/40-INQ000000 are therefore not comparable to the previous estimates. During this period the estimated percentage of the population of England testing positive rose from 0.05 per cent (95% confidence interval: 0.03 to 0.07) to a peak of 2.08 per cent (2.00 to 2.17) at the start of January before declining again.

171. By mid-October, CIS was also providing estimates for all four UK nations. As in England, infections rose and fell, peaking around the new year. Of the weekly headline estimates given in exhibit ID3/40- INQ000271354 the highest level of infections during this period was 1.91 per cent (1.50 to 2.37) in Wales, 2.01 per cent (1.66 to 2.39) in Northern Ireland, and 1.06 per cent (0.88 to 1.27) in Scotland.

Infections in the period November 2021 - January 2022

172. The data given in exhibit ID3/40- INQ000271354 for this period use the same methodology as in the period August 2020 to May 2021 above.

173. During this period, the estimated percentage of the population testing positive peaked around the start of January 2022 in England, Scotland, and Wales. Of the weekly headline estimates given in exhibit ID3/40- INQ000271354, the highest level of infections during this period was 6.85 per cent (95% confidence interval: 6.65 to 7.06) in England, 5.65 per cent (5.06 to 6.27) in Scotland, and 5.56 per cent (4.89 to 6.27) in Wales. In Northern Ireland, levels of infection were still increasing at the end of

January 2022, with an estimated 7.93 per cent (6.91 to 9.01) of the population testing positive at the midpoint of the week ending 5 February 2022.

Infections by different characteristics

174. Being infected with Covid-19 disproportionately affected older people, those from certain ethnic backgrounds, and those in crowded or deprived areas. Some factors, like age, have been consistent over the course of the pandemic, but others have varied. The most common factors influencing the risk of becoming infected with Covid-19 were:

a. age
b. deprivation
c. ethnicity
d. work location
e. urban or rural status
f. number of people living in household
g. vaccination

175. These factors have varied at different times during the pandemic. Those living in deprived areas, in larger households, and unvaccinated people (after vaccine rollout) have been more likely to test positive for Covid-19 in most periods of the pandemic [ID3/41- INQ000271355

Infections by age (non-overlapping 14 day periods)

176. Different techniques were used to estimate the number of people testing positive for Covid-19 by age. The following data provide estimates of infection by age group in 14-day non-overlapping periods to provide comparability for all lockdown time periods. The ONS sampled only a proportion of the population. Due to this, these estimates were adjusted (weighted) to be representative of the wider community population.

177. Individuals and households featured in multiple 14 day non-overlapping periods. For this reason, it is not appropriate to sum up counts from multiple periods, as this would lead to double counting.

178. The age categories separated children and young people by school age

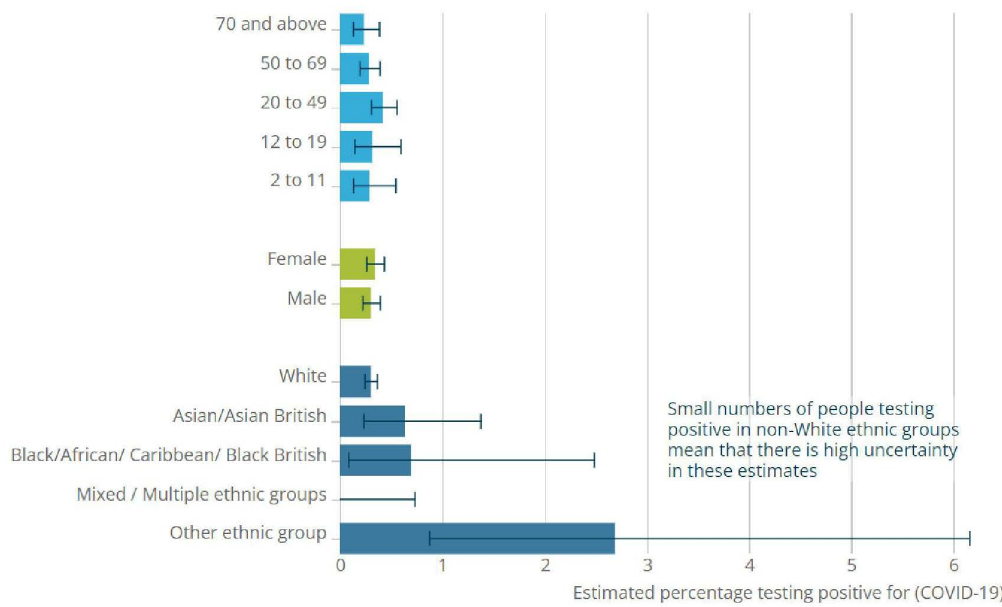
a. "aged 2 years to school Year 6" included children in primary school and below
b. "school Year 7 to school Year 11" included children in secondary school
c. "school Year 12 to those aged 24 years" included young adults who may be in further or higher education

This meant that those aged from 11 to 12 years and those aged 16 to 17 years were split between different age categories depending on whether their birthday is before or after 1 September. Daily modelled rates of infection by age group were also available in published data tables.

Infections by age, sex and ethnicity, April to June 2020

179. Infection rates by age, sex and ethnicity for the combined study period 26 April to 27 June were reported in the first characteristics article published July 2020; this was based on swab results from those who had ever tested positive over the study period to that point [ID3/42 INQ000271356 These rates are presented in Figure 11 (and Table 11 of Exhibit ID3/40- INQ000271354 with 95% confidence intervals for each estimate. The small sample sizes for some of these groups and the low rates of infection at the time (and hence small number of participants testing positive) mean that these confidence intervals are wide and overlapping. This limits our ability to determine the true differences in rates.

<u>Figure 11: Estimated percentage testing positive for Covid-19 on a swab test, by sex, age bands and ethnic groups, England, 26 April to 27 June 2020</u>



180. While it may appear that the share of females infected with Covid-19 was slightly higher at this time, statistical testing indicated that there was in fact no evidence of differences in the proportions of males or females testing positive for the coronavirus (Covid-19) at that time, and the differences were compatible with chance.

181. It was also not possible to say with confidence that there were any differences in infection rates across age groups over the early study period. However, it is

important to recognise that the survey only took place in private households and therefore did not include people in institutional settings, such as care homes. This is particularly important in understanding the infection rate provided for those aged 70 years or over.

182. Based on data from the study period late April to June 2020, there was limited evidence of differences in the percentage of individuals ever testing positive between people of different ethnic groups, but the confidence intervals were wide. The study was established in late April 2020, by which time the pandemic had peaked in England. Other analysis from the ONS, of mortality data, showed that the impact of the pandemic was more geographically spread in May than in April, when it was highly concentrated in London and other urban areas [ID3/43- INQ000271357] Mortality analysis also showed a narrowing of differences between white and other ethnic groups in May, compared with the period March and April.

Risk of infection by sex, age and ethnicity

183. Subsequent to this first release, separate infection rates by individual characteristic were not produced. Instead, modelled estimates to identify the risk associated with core demographic and inequalities characteristics were produced, while controlling for the effects of other characteristics. This provided a better reflection of the true risk associated with each characteristic.

184. These characteristic models are mixed-effect multivariable logistic regression models, which simultaneously estimate the effect of different factors that impact on the odds of testing positive for Covid-19. The models include various fixed effects and a random effect for region which allows for the variation at the regional level to be accounted for in these calculations. The odds ratios from the fixed effects explain relative likelihood of infection while controlling for the effects of the other characteristics.

185. The ONS included characteristics within the models to describe two different groups of the population, one of the entire population and one of the working age population (those aged 16 to 74 years). Both models included a set of general characteristics: sex, age, ethnicity, and household size. The working age model also included characteristics that relate to work: working location and whether individuals work in patient-facing healthcare roles.

186. These models were developed over time with expert academic input and considering a range of user needs and control factors. The full methodology underlying these models is described in the exhibit [ID3/44- INQ000271358]

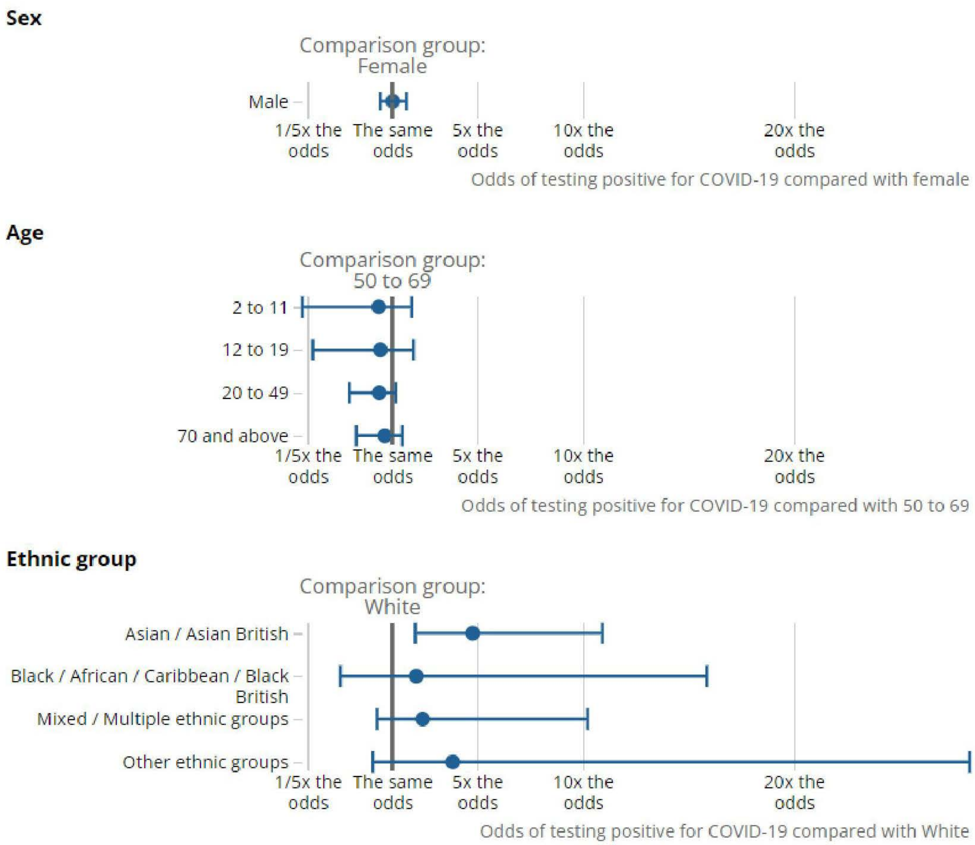
187. The odds are presented as compared with the odds for testing positive in a base category (that is, as an odds ratio). When a characteristic has an odds ratio of one, this means that there is neither an increase nor a decrease in the likelihood of infection compared with the base category. An odds ratio of higher than one means that there is an increased likelihood of infection compared with the base category; while an odds ratio of lower than one means that there is a reduced likelihood of infection compared with the base category. The base category was always the category for which we had the largest sample, for example, each other age category is compared to 50 to 69 year olds.

188. The odds ratios are presented with 95% confidence intervals. If the range of the confidence interval crosses the threshold of one, it isn't possible to say with any certainty whether infection is more or less likely for that characteristic compared with the base category, even if the central estimate is not close to one. In some instances, this will be because we estimate there to be no differences (where the odds ratio estimate is close to one), but it can also reflect less information about a characteristic in our sample.

189. The first modelled analysis was based on nose and throat swab test results taken from survey participants between 8 June and 2 August 2020. In addition to other general characteristics described above, the model also controlled for whether individuals had come into recent contact with confirmed or suspected cases of Covid-19. The model takes one observation per participant in the period – their latest positive if they test positive and otherwise their latest negative result.

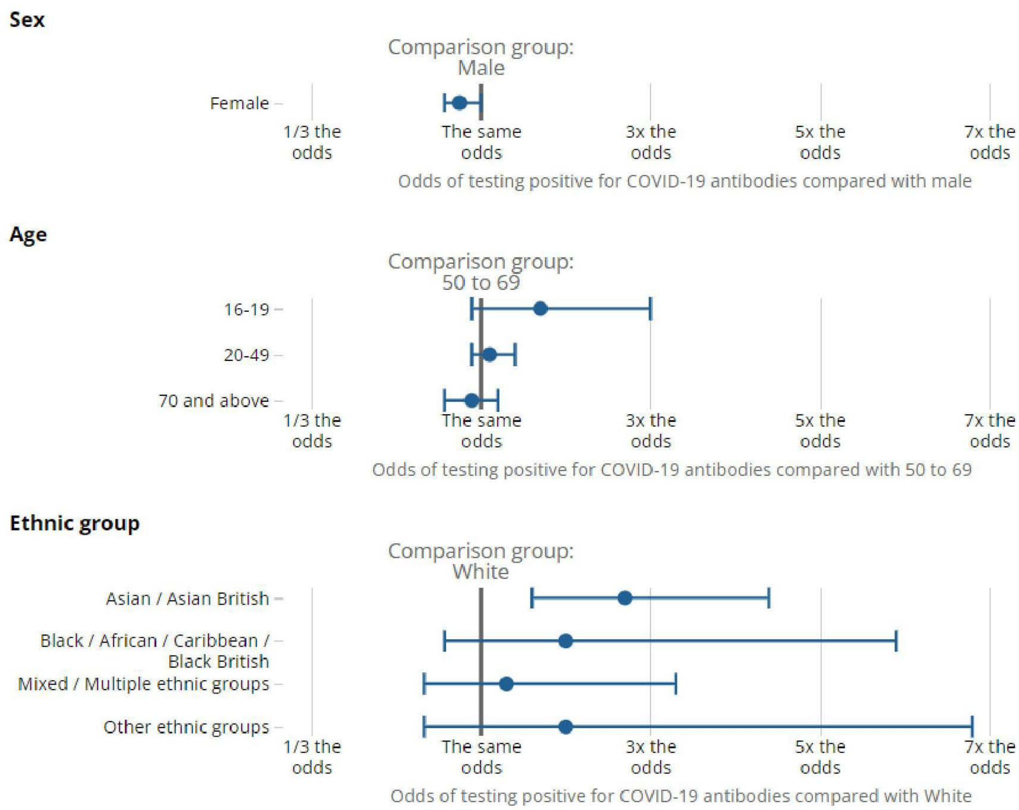
Figure 12: Odds ratio of an individual testing positive for Covid-19 by sex, age band and ethnic group, England, 8 June to 2 August 2020 [ID3/45-INQ000271359

Note that the error bars in this chart denote 95% confidence intervals around the estimated odds ratios. Where these confidence intervals include the ratio of 1 ('the same odds'), as in all but one of the characteristics below, it is not possible to say with confidence whether the group in question has higher or lower odds of testing positive than the reference group.



190. The next modelled analysis was based on blood test results from a randomly selected subsample of CIS participants aged 16 years and over. These blood tests were used to test for antibodies against SARS-CoV-2 to identify individuals who had the infection in the past. This analysis is different to the earlier analysis based on swab tests which could only identify current infections. In addition to other general characteristics described above, the model also controlled for whether individuals thought that they had had Covid-19 in the past.

Figure 13: Odds ratio of an individual testing positive for Covid-19 antibodies, by sex, age band and ethnic group, England, 26 April to 2 September 2020 [ID3/46 INQ000271360

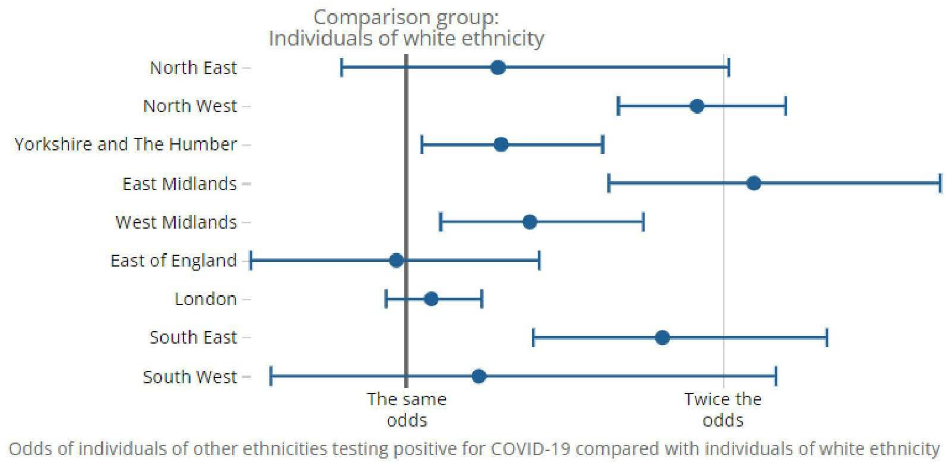


Risk of infection by ethnicity and region

191. In December 2020, the ONS produced analysis on the likelihood of testing positive for Covid-19 by ethnicity and region in England [ID3/47 INQ000271361]. For this analysis, because of low numbers, ethnicity was grouped into two categories: white ethnic group and other ethnic group.

192. The analysis considered whether people ever tested positive or always tested negative on swab tests between 4 October and 28 November 2020, and included all swab tests from the entire survey sample, regardless of age (individuals aged two years and over). After adjusting for changing positivity rates in different regions and ages, there was evidence that the effect of ethnicity varied across the different regions.

Figure 14: Odds ratio of an individual testing positive for Covid-19 by ethnicity and region, England, 4 October to 28 November 2020 [ID3/47- INQ000271361



193. Individuals from the Other ethnic groups had significantly greater positivity rates in the Northwest, Yorkshire and The Humber, East Midlands, West Midlands, and the Southeast. Confidence intervals were wide for the Southwest and the Northeast so it is not possible to say whether individuals from the Other ethnic group were more likely to test positive in those regions.

194. There was no evidence supporting a lower risk of testing positive in those from the Other ethnic group in any region; and after adjusting for differential effects of ethnicity by region, there was no evidence that the effect of ethnicity varied over time or by age.

Modelled odds of infection by occupation

195. This analysis was based on self-reported occupation. Occupation data are based on [ID3/48- INQ000271362 and relate to the self-reported role indicated by the survey respondents, for example, skilled metal, electrical and electronic trades.

196. The analysis used a logistic regression model adjusting for age, sex, region, the interaction between region and ethnicity, household size, multigenerational households, index of multiple deprivation, face coverings, working from home and, in those not working from home, ease of distancing at work. This model helped understanding of the link between occupation and testing positive for the coronavirus (Covid-19) when adjusting for these factors.

197. The model included data from England for the period 1 September 2020 to 7 January 2021. It considered whether people ever tested positive or always tested negative on swab tests during the period outlined and only included working age adults (those aged 16 to 74 years) in work.

198. To aid interpretation, rather than presenting results as odds ratios from the logistic model, the ONS presented results as overall probabilities that participants will test positive over the period included in the analyses, averaged over their other characteristics.

199. It was found that across 25 occupations, the likelihood of testing positive for Covid-19 between 1 September 2020 and 7 January 2021 ranged from 2.1% to 4.8%. The average likelihood across the 25 occupations was 3.9%, and over half of these occupations had likelihoods between 3.5% and 4.2%. Caution should be taken when considering the conclusions drawn from this analysis, as many of the occupations have lower sample sizes relative to others.

Table 15: Estimated Probability of Testing Positive by Self-reported Occupation

SOC Code	Occupation	Estimated probability of testing positive (%)	95% Lower Confidence Interval	95% Upper Confidence Interval
33	Protective service occupations	4.79%	3.88%	5.70%
61	Caring personal service occupations	4.56%	4.07%	5.06%
42	Secretarial and related occupations	4.42%	3.62%	5.22%
23	Teaching and other educational professionals	4.39%	3.99%	4.79%
12	Other managers and proprietors	4.33%	3.74%	4.91%
62	Leisure, travel and related personal service occupations	4.23%	3.18%	5.27%
92	Elementary administration and service occupations	4.15%	3.60%	4.70%
53	Skilled construction and building trades	4.03%	3.30%	4.77%
31	Science, engineering and technology associate professionals	4.02%	3.19%	4.84%
41	Administrative occupations	4.00%	3.66%	4.34%
32	Health and social care associate professionals	3.98%	3.19%	4.76%
52	Skilled metal, electrical and electronic trades	3.92%	3.29%	4.55%
81	Process, plant and machine operatives	3.90%	3.05%	4.75%
82	Transport and mobile machine drivers and operatives	3.86%	3.14%	4.59%
71	Sales occupations	3.85%	3.29%	4.41%
11	Corporate managers and directors	3.70%	3.33%	4.07%
22	Health professionals	3.68%	3.23%	4.12%
91	Elementary trades and related occupations	3.64%	2.35%	4.93%
35	Business and public service associate professionals	3.54%	3.21%	3.87%
34	Culture, media and sports occupations	3.39%	2.81%	3.97%

24	Business, media and public service professionals	3.34%	3.01%	3.67%
72	Customer service occupations	3.26%	2.48%	4.04%
21	Science, research, engineering and technology professionals	2.97%	2.62%	3.32%
54	Textiles, printing and other skilled trades	2.87%	2.03%	3.72%
51	Skilled agricultural and related trades	2.09%	1.18%	2.99%

Asymptomatic and symptomatic infections

196. The CIS gathered self-reported symptoms from participants alongside nose and throat swabs. Regular analysis of these data primarily focused on the sample of people who reported symptoms, to evaluate the proportion of this group that were positive for SARS-CoV-2. These publications did not attempt to make an estimate of symptomatic and asymptomatic infections and therefore do not answer the question posed. However, at several points during the pandemic the ONS carried out additional analyses on the presence or absence of reported symptoms among only Covid-19 positive participants.

197. The first relevant analysis included all participants who tested positive for Covid-19 between 26 April and 27 June 2020 and was published in July 2020 [ID3/42- INQ000271356 In this period of the survey, participants were asked whether they had experienced a range of possible symptoms on the day that they were tested, and separately, whether they felt that they had symptoms compatible with Covid-19 infection. Those not reporting symptoms included individuals who did not report having any of the specific or general symptoms on the day of their test, or did not answer both questions.

198. It is important to note that this first analysis was based on 115 individuals in the sample who tested positive for Covid-19. This is a very small denominator, meaning the confidence intervals are wide. Additionally, with such a small number of cases included in this analysis, if any of these are false positives this would have a large effect on the results. Our analysis is extended to consider symptoms reported at the previous or subsequent test to account for the fact that we do not know at what stage of their infection the positive swab test was obtained.

Table 16: Percentage testing positive for Covid-19 by symptoms [ID3/49 INQ000271361

26 April to 27 June 2020	% of those testing positive for Covid-19	95% Confidence Interval		Sample testing positive for Covid-19	Total sample
		Lower	Upper		
Reporting symptoms on the day of the positive test					
Individuals reporting symptoms	22%	15%	30%	25	115

Individuals not reporting symptoms	78%	70%	85%	90	115
Reporting symptoms on the day of the positive test, or the previous or subsequent test					
Individuals reporting symptoms	33%	25%	43%	39	115
Individuals not reporting symptoms	67%	57%	75%	76	

199. The survey was subsequently updated to ask individuals at each visit whether they had experienced a range of possible symptoms. The ONS looked at strong positive test results, determined by how quickly the virus is detected, measured by a cycle threshold (Ct) value. The lower the Ct value, the higher the viral load and stronger the positive test. The ONS looked at strong positive test results with a Ct of less than 30 to exclude the possibility that symptoms are not identified because individuals are picked up very early or later on in their infection.

200. The published analysis in Table 17 addresses the period December 2020 to January 2022 [ID3/50- INQ000271364 again looking at strong positive test results with a Ct of less than 30. This analysis considers the percentage of these individuals who reported symptoms within 35 days of the first positive test.

Table 17: Percentage testing strongly positive (with a Ct less than 30) by symptoms reported within 35 days of a positive test [ID3/50- INQ000271364

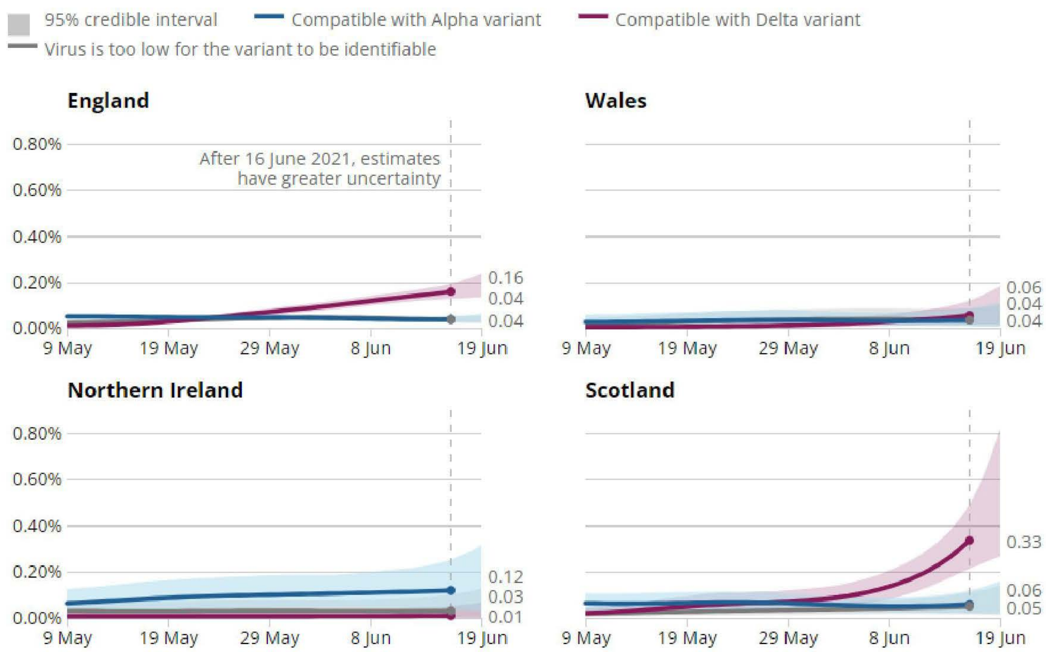
Month	Number of people testing positive for Covid-19	% testing positive for Covid-19 who did not report symptoms	95% Lower confidence interval	95% Upper confidence interval	% testing positive for Covid-19 who reported symptoms	95% Lower confidence interval	95% Upper confidence interval
December 2020	3,126	44.91	43.16	46.68	55.09	53.32	56.84
January 2021	3,385	38.73	37.08	40.39	61.27	59.61	62.92
February 2021	1,006	40.16	37.11	43.26	59.84	56.74	62.89
March 2021	441	49.21	44.45	53.98	50.79	46.02	55.55
April 2021	175	45.71	38.18	53.40	54.29	46.60	61.82
May 2021	148	41.89	33.84	50.27	58.11	49.73	66.16

June 2021	544	40.26	36.11	44.51	59.74	55.49	63.89
July 2021	2,301	37.77	35.78	39.78	62.23	60.22	64.22
August 2021	2,322	40.27	38.26	42.29	59.73	57.71	61.74
Septembe r 2021	2,878	35.41	33.66	37.19	64.59	62.81	66.34
October 2021	4,704	34.48	33.12	35.86	65.52	64.14	66.88
November 2021	3,936	35.14	33.64	36.65	64.86	63.35	66.36
December 2021	7,323	40.15	39.02	41.28	59.85	58.72	60.98
January 2022	14,154	39.49	38.68	40.30	60.51	59.70	61.32

Infection by different variants of Covid-19

201. At different times during the pandemic, new variants of the SARS-CoV-2, the virus causing the Covid-19 disease, became dominant in the population. The ONS produced analyses to track these variants by drawing on viral gene patterns alongside primary infection figures, when appropriate. For example, during the emergence of the Delta variant, the regular positivity reporting was supplemented by outputs showing how infection patterns differed by variant.

Figure 15: Modelled percentage of cases compatible with the Alpha variant, compatible with the Delta variant, and where the virus was too low for the variant to be identified based on nose and throat swabs, daily, from 9 May to 19 June 2021 [ID3/51- INQ000271365



201. To provide a longer-term view of the patterns of variant infections in England, the ONS also produced several stand-alone technical articles, which are summarised below. These show how the percentage of people testing positive for Covid-19 across England varied over time, considering initially the first two 'waves' of the pandemic in England; and then more specifically the three time periods when the Alpha, Delta and Omicron variants were dominant.

202. A wave of an epidemic is considered to be a period of increased transmission of a disease. However, there is no strict definition for a wave or how to determine when it starts or ends. Here, the start of a wave is defined as the beginning of sustained increase in transmission and infections. A wave ends when infections return to the low levels seen before it started. To establish the start and end of a wave, the ONS considered three measures:

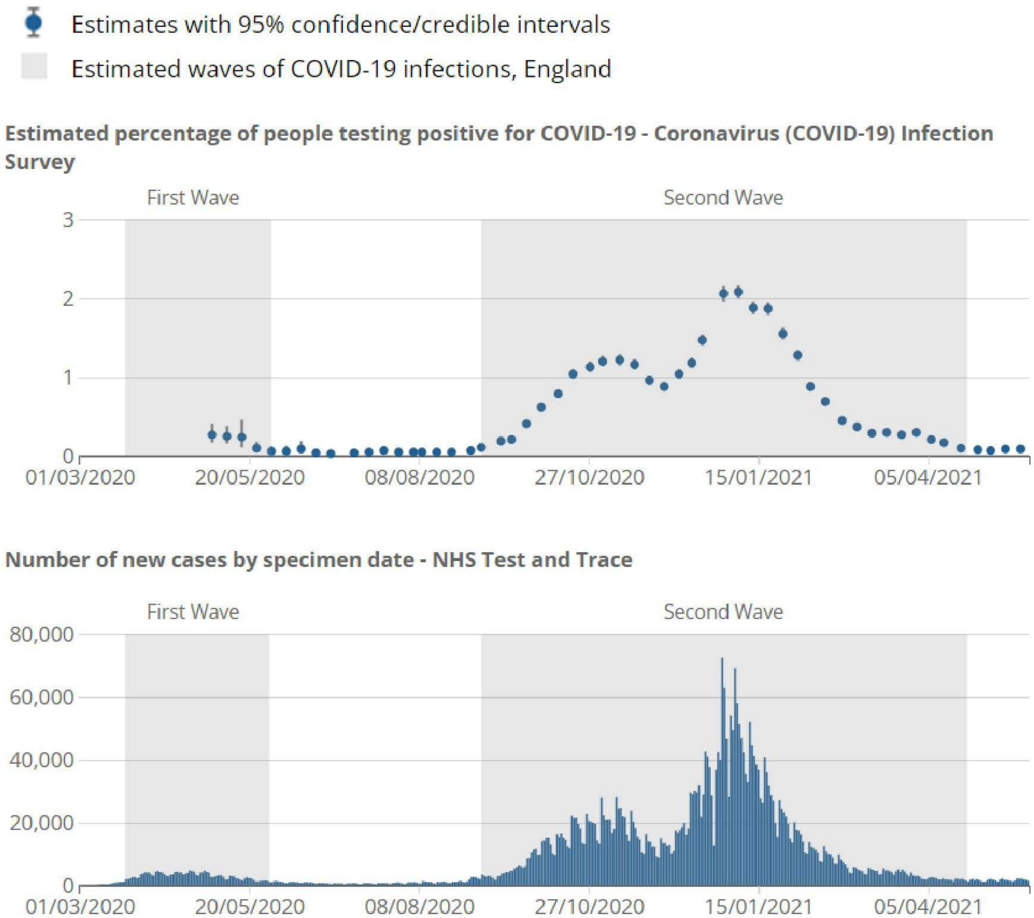
- reproduction (R) rate (how many people one person infects on average) – taken from calculations by the Scientific Advisory Group for Emergencies (SAGE)
- growth rate (percentage change in the number of infections each day)
- positivity rate (the percentage of people testing positive for Covid-19)

203. Using these measures, The ONS can estimate indicative dates for when a wave has started and ended, but these estimates are not exact and should be treated with caution. Both R and growth rates are computed using epidemiological data (such as infection and hospitalisation statistics) from preceding weeks and therefore are not real-time measures.

204. The first wave of Covid-19 is estimated to have started in March 2020 and ended at the end of May 2020. Testing capacity was limited at the time, the Coronavirus Infection Survey did not start producing positivity rate estimates until 26 April 2020, and the reporting of R by SAGE did not start until 29 May 2020. The ONS estimated that the first wave probably peaked between the end of March and early April 2020; from the time when the CIS commenced at the end of April 2020 the estimated percentage testing positive for Covid-19 first fell below 0.1% between 25 May and 7 June 2020.

205. The second wave of Covid-19 started at the beginning of September 2020. Infections initially peaked in mid-November when the positivity rate was estimated at 1.22% (95% credible interval: 1.15% to 1.29%) then started to decline. The positivity rate was falling until 5 December 2020, when it was estimated at 0.88%. In early December, the R rate, positivity rate and growth rate all began rising again; these increases were driven by the emergence of the Alpha variant which was first identified in the UK in September 2020.

Figure 16: Estimated percentage of the population testing positive for Covid-19 on nose and throat swabs in the CIS, and number of new Covid-19 cases by specimen date, 1 March 2020 to 22 May 2021. [ID3/52- INQ000271366



206. With the emergence of the Alpha variant, followed later by the Delta and Omicron variants, ONS analysis of infections over time presents the data based on time periods in which each new variant was dominant (estimated 60% or greater of infections compatible with this variant) in the community.

207. The following three periods of Covid-19 positivity by variant are considered:

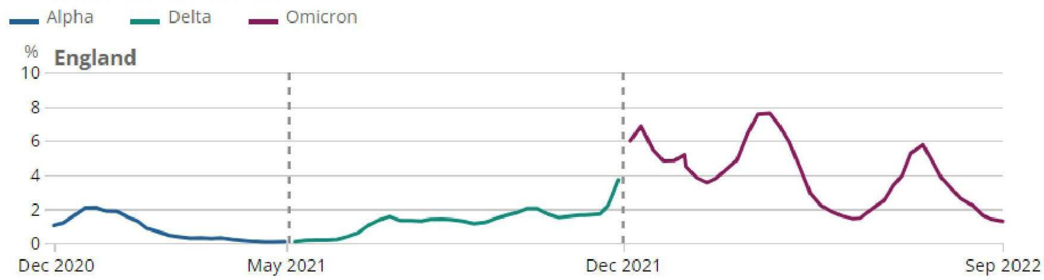
a. the first, from the week ending 18 December 2020 to the week ending 15 May 2021, when the Alpha variant was dominant
b. the second, from the week ending 22 May 2021 to the week ending 19 December 2021, when the Delta variant was dominant
c. the third, from the week ending 23 December 2021 to the week ending 5 September 2022, when the Omicron variants were dominant

208. These dates anticipate the dates used to describe variant periods for mortality measures by three to four weeks. This is due to the leading indication of infection rates to mortality, given that deaths from Covid-19 would be expected to occur some weeks after initial infection.

209. Across regions, sub regions and time periods, different factors have influenced Covid-19 positivity estimates, including both variants in circulation and

social restrictions in place at the time. Other variants were also in circulation in each of these time periods. Furthermore, these time periods are defined based on the dominant variant at national levels, which may not reflect regional and sub-regional variant levels.

Figure 17: The percentage of people testing positive for Covid-19 in England, for the three periods in which the Alpha, Delta, and Omicron variant were dominant [ID3/53- INQ000271367



210. ONS latest analysis on this topic applied an alternative methodology to re-estimate the total number of people who had been infected with Covid-19 during each variant time period [ID3/54- INQ000271368 is because the regular positivity estimates as visualised above use simpler models over a short period (six weeks). It is reasonable to assume the variation across region and time is approximately constant over these shorter time periods, however this is not necessarily the case over longer periods.

211. In this analysis, daily positivity is calculated using an Integrated Nested Laplace Approximation (INLA) model, estimated at regional level within England and weighted to national level. The model is fitted with an interaction between time and sex and an interaction between time and age. The models are post ranked by age and sex to reflect the population living in each region, based on the findings from the Census 2021. Estimates of positivity and duration to obtain daily incidence are combined. The daily incidences are cumulated by period to give the estimated number of people who have tested positive over time within that period.

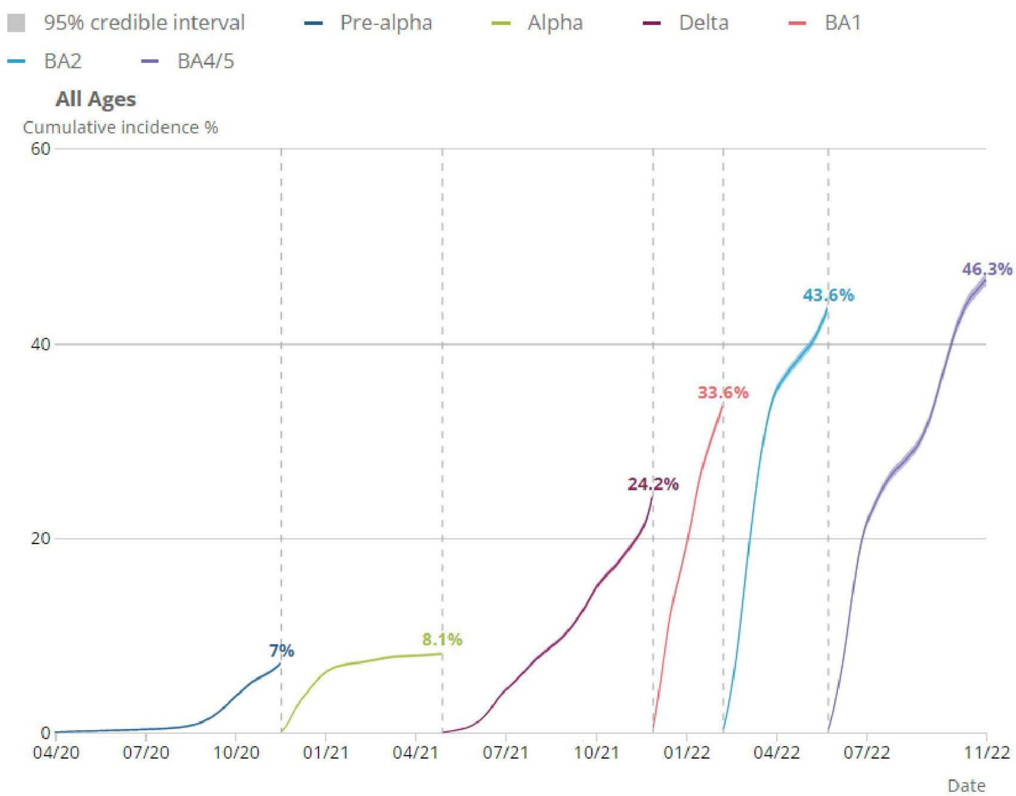
212. The cumulative incidence analysis by period produces estimates of the percentage of people who have been infected with coronavirus (Covid-19) at least once during each period. These estimates were also produced by age.

213. It is not appropriate to add these together to estimate total cumulative incidence, as some people will have been infected more than once, causing totals to exceed 100%. The duration of the periods is not the same but reflect the time in which particular variants were most common.

214. The estimates for each period for all ages are:

- 7.0% (95% credible intervals: 6.9% to 7.2%) of people infected with Covid-19 from 26 April 2020 in the pre-Alpha period
- 8.1% (credible intervals: 7.9% to 8.2%) in the Alpha period
- 24.2% (credible intervals: 23.9% to 24.5%) in the Delta period
- 33.6% (credible intervals: 33.1% to 34.0%) in the BA.1 period
- 43.6% (credible intervals: 43.1% to 44.1%) in the in BA.2 period
- 46.5% (credible intervals: 45.9% to 47.1%) in the BA.4/BA.5 period

Figure 18: The percentage of people who have had Covid-19 across all variant periods

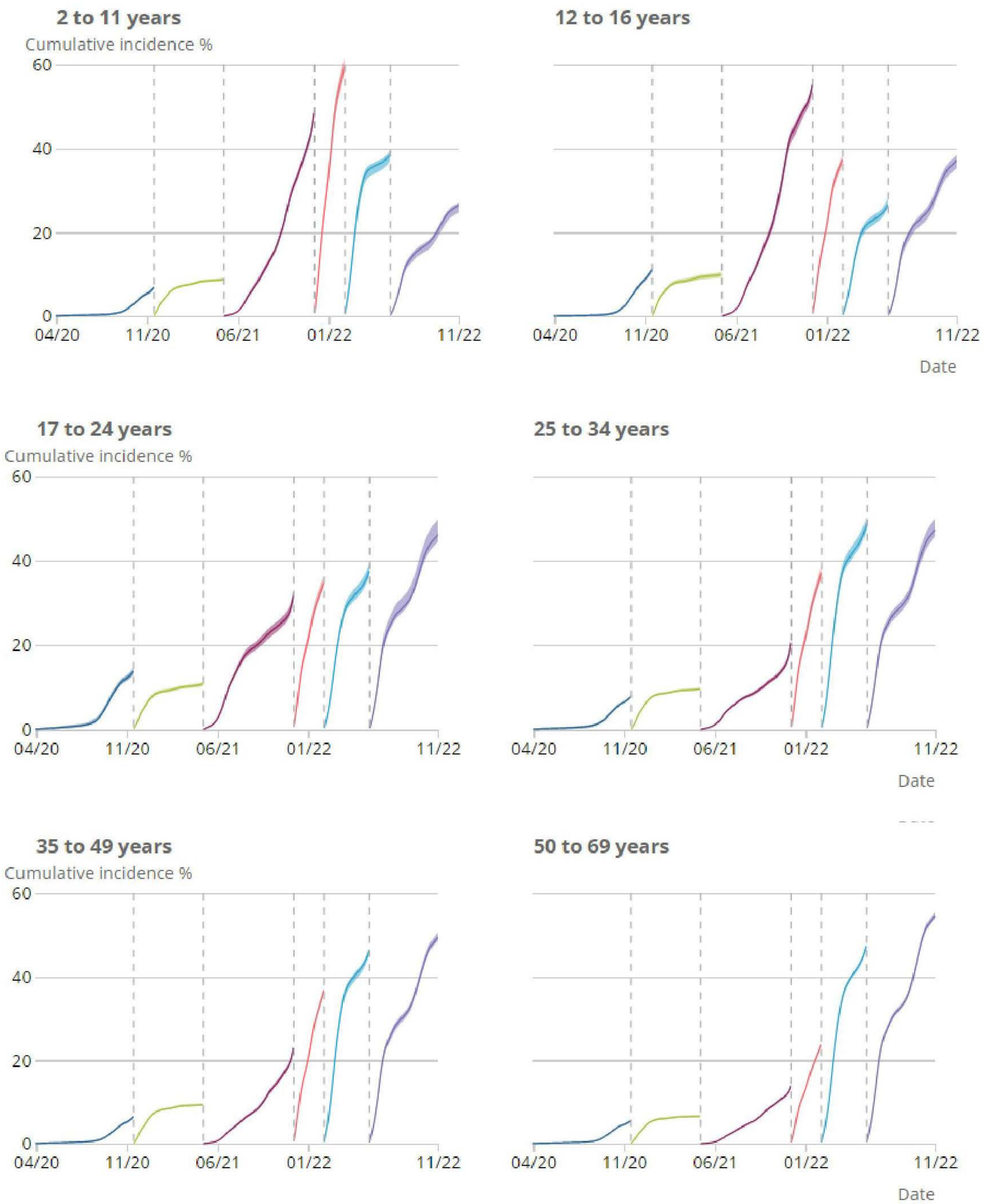


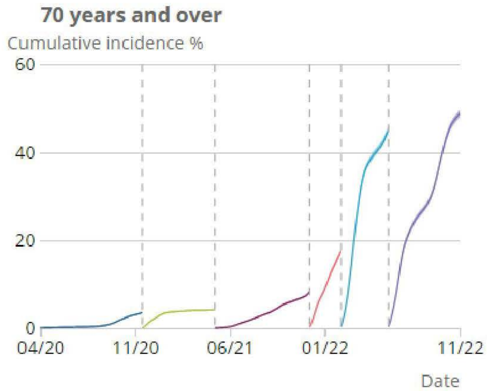
215. For each age group, the highest estimates in any period are:

- 59.5% (credible intervals: 58.0% to 61.6%) of those aged 2 to 11 years old in the BA.1 period
- 55.1% (credible intervals: 53.5% to 55.8%) of those aged 12 to 16 years old in the Delta period
- 46.0% (credible intervals: 44.4% to 50.0%) of those aged 17 to 24 years old in the BA.4/BA.5 period
- 48.7% (credible intervals: 47.4% to 50.5%) of those aged 25 to 34 years old in the in BA.2 period

- 49.3% (credible intervals: 48.4% to 50.5%) of those aged 35 to 49 years old in the BA.4/BA.5 period
- 54.5% (credible intervals: 53.8% to 55.4%) of those aged 50 to 69 years old in the BA.4/BA.5 period
- 48.8% (credible intervals: 48.0% to 49.7%) of those aged 70 years and over in the BA.4/BA.5 period

Figure 19: The percentage of people who have had Covid-19 across all variants by age group





Vaccination effectiveness against infection

216. In addition to other infection analysis requested, the following research considered the reduction in risk of testing positive for Covid-19 associated with vaccination overall, and by different vaccine types [ID3/55- INQ000271369

217. ONS analysis on vaccine effectiveness was developed with our study lead, Professor Sarah Walker and partners at Oxford University. Professor Walker's research on vaccine effectiveness using CIS data precede the following ONS output and include the June 2021 Nature publication Impact of vaccination on new SARS-CoV-2 infections in the United Kingdom; [ID3/56- INQ000271370 and October 2021 Nature publication Impact of Delta on viral burden and vaccine effectiveness against new SARS-CoV-2 infections in the UK [ID3/57- INQ000271371 Subsequent to the below ONS release, Professor Walker's work has also resulted in a third Nature publication, Correlates of protection against SARS-CoV-2 Omicron variant and anti-spike antibody responses after a third/booster vaccination or breakthrough infection in the UK general population (May 2023).

218. The ONS used results from the Coronavirus (Covid-19) Infection Survey (CIS) and pillars 1 and 2 of NHS Test and Trace to estimate the reduction in risk of testing positive for Covid-19. Two time periods were analysed: when the Alpha variant was dominant in the UK (1 December 2020 to 16 May 2021), and when the Delta variant was dominant (17 May to 14 August 2021). This allowed the study to assess vaccine effectiveness against these different strains.

219. The ONS found that, during the Alpha-dominant period (1 December 2020 to 16 May 2021):

- two vaccine doses (14 days or more previously) reduced the risk of testing positive by 79% (95% confidence interval: 73% to 84%). This was the greatest reduction in risk compared with the other groups
- one dose (21 days or more previously) reduced the risk by 62% (95% confidence interval: 58% to 66%)

- for those not vaccinated but previously positive, their risk was reduced by 65% (95% confidence interval: 58% to 71%)
- both Pfizer-BioNTech and Oxford AstraZeneca vaccines provided similar levels of protection

220. The ONS found that, during the Delta-dominant period (17 May to 14 August 2021):

- two vaccine doses (14 days or more previously) reduced the risk of testing positive by 67% (95% confidence interval: 64% to 70%) during the Delta period. During the Alpha period this figure was 79% (95% confidence interval: 73% to 84%)
- there was no evidence that the reduction in risk of infection from two vaccine doses (14 days or more previously) differed from that of previous natural infection (71% risk reduction, 95% confidence interval: 65% to 77%)
- two doses (14 days or more previously) provided a greater reduction in risk than one dose (21 days or more previously), which reduced the risk of testing positive by 49% (95% confidence interval: 44% to 53%)

Intra-household transmission

221. Those living in a household with multiple occupants can either catch Covid-19 from someone outside of the household or from another infectious household member. Using data from the Coronavirus Infection Survey, ONS partners Thomas House, Heather Riley, Lorenzo Pellis, Emma Pritchard and Sarah Walker, carried out regression analysis on the types of transmission.

222. Analysis was split into tranches to allow analysis of household transmission during diverse situations, which are described in terms of prevalence, whether schools are open, which variant is dominant and vaccination levels. Below are 12 tranches that were analysed, as shown in Table 18.

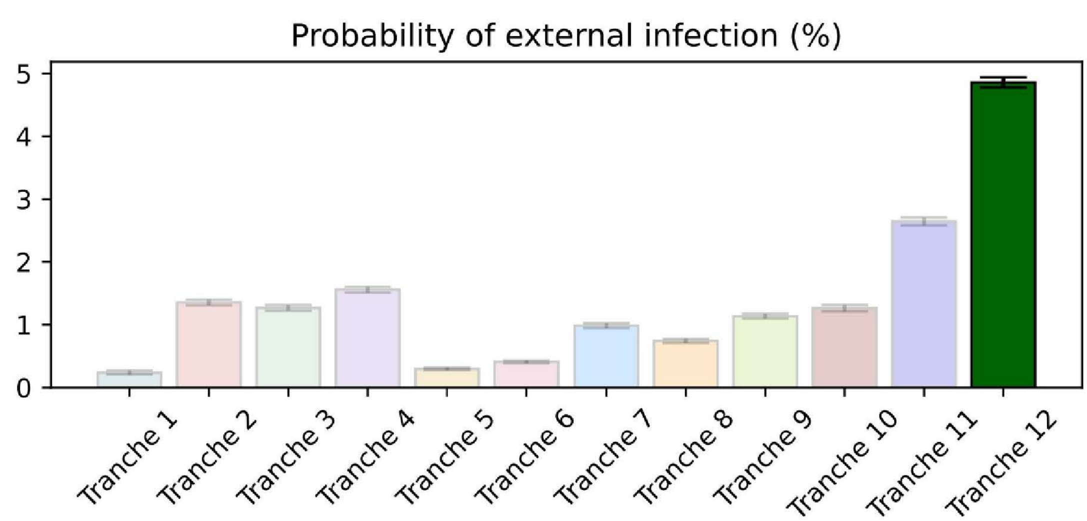
Table 18:Tranches of analysis on intra-household transmission in England described by Covid-19 prevalence, school closures, dominant variant, and vaccination levels

Tranche	Start date	End date	Prevalence	Schools	Variant	Vaccination
1	26-Apr-20	31-Aug-20	Low	Closed	Alpha not emerged	None
2	1-Sep-20	14-Nov-20	High	Open	Alpha negligible	None
3	15-Nov-20	31-Dec-20	High	Open	Alpha becomes dominant	Negligible

4	1-Jan-21	14-Feb-21	High	Mainly Closed	Alpha dominant	>10M 1st, negligible 2nd
5	15-Feb-21	29-Apr-21	Low	Open	Alpha dominant, Delta negligible	> 35M 1st, > 15M 2nd
6	30-Apr-21	15-Jul-21	High	Open	Alpha declining, Delta becomes dominant	> 45M 1st, > 35M 2nd
7	16-Jul-21	31-Aug-21	High	Holidays	Delta dominant	> 48M 1st, > 42M 2nd
8	1-Sep-21	14-Oct-21	High	Open	Delta dominant	> 49M 1st, > 45M 2nd
9	15-Oct-21	3-Dec-21	High	Open	Delta dominant	> 50M 1st, > 46M 2nd, > 19M 3rd
10	4-Dec-21	6-Jan-22	High	Open	Omicron BA.1 becomes dominant	> 51M 1st, > 47M 2nd, > 35M 3rd
11	7-Jan-22	5-Feb-22	High	Open	Omicron BA.1 dominant, Omicron BA.2 growing	> 52M 1st, > 48M 2nd, > 37M 3rd
12	6-Feb-22	5-Apr-22	High	Open	Omicron BA.2 becomes dominant	> 52M 1st, > 49M 2nd, > 38M 3rd

223. The following plot shows the baseline probability of infection from outside the household, expressed as a percentage.

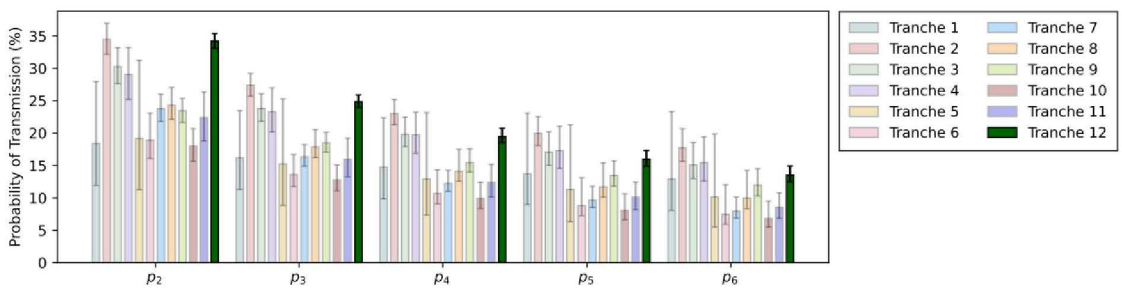
Figure 20: Baseline probability of external infection (infection from outside the household) (%)



224. The following plot shows the probability of a single secondary infection within the household. *P2* is the probability of infection in households of size *2, p3* for household size of 3*, p4* for household size of 4*, p5* for household size of 5 and *p6* for household size of 6 or greater. Please note that this does not include onward transmission after the first secondary infection is found.

225. The data show the probability each other person within a household will be infected by the first person in a household with the virus (assuming no tertiary infection). These probabilities are for each person in a household, this means that each person in a six-person household experiences the reported percentage chance of being infected, so the overall chance of within-household transmission is higher in larger households.

<u>Figure 21: Per-pair baseline probabilities of secondary transmission within the household, not including tertiary transmission effects</u>



226. Analysis of data for traches 1 to 6 found that:

a. Numbers of households with two or more positives were much greater than would be expected under the assumption of independent infections [ID3/58-INQ000271372

b. Rates of introduction of infection into households varied over time, broadly following the trajectory of the overall epidemic and vaccination programme;

c. Within-household transmission rates fell in the 15-35% range;

d. The Alpha variant was around 50% more infectious within households than the previous wildtype variant, and the Delta variant was 35% more infectious within households than the Alpha variant There was significantly (in the range 25-300%) more risk of bringing infection into the household for workers in patient-facing roles pre-vaccine;

e. There was increased risk for secondary school-age children of bringing the infection into the household when schools were open;

f. There was increased risk for primary school-age children of bringing the infection into the household when schools were open since the emergence of new variants.

227. Updates to the above published analysis for later tranches is available at [ID3/59- INQ000271373]

Long Covid

228. The long-term health effects of Covid-19 are still unclear, but many people have reported ongoing symptoms after infection, known as Long Covid.

229. The ONS published a regular prevalence of ongoing symptoms bulletin which estimated the number of people in the UK that had self-reported Long Covid. Self-reported Long Covid is defined as symptoms persisting for more than four weeks after a first Covid-19 infection, that were not explained by something else.

230. Since spring 2021, the groups most likely to experience Long Covid have consistently been: females, those living in more deprived areas and those with another activity-limiting condition. The most at-risk age groups have varied between those aged 50 to 69 years and 35 to 49 years.

Population prevalence of self-reported Long Covid in the UK

231. The prevalence of self-reported Long Covid lasting at least four weeks from a previous SARS-CoV-2 infection among people in private households in the UK peaked at 2.3 million people (3.5% of the population) during the four weeks to 3 September 2022, before steadily falling over the next six months. [ID3/60- INQ000271374]

232. In the ONS's final publication of the prevalence of ongoing symptoms following coronavirus release covering the four weeks to 5 March 2023 [ID3/61- INQ000271375], we estimated that 1.9 million people (2.9% of this population) were experiencing self-reported Long Covid.

233. Of people with self-reported Long Covid during the four weeks to 5 March 2023, 92% first had (or suspected they had) Covid-19 at least 12 weeks previously, 69% at least one year previously, and 41% at least two years previously.

234. Long Covid symptoms adversely affected the day-to-day activities of 79% of those with self-reported Long Covid during the four weeks to 5 March 2023, with 20% reporting that their ability to undertake their day-to-day activities had been "limited a lot".

235. As a percentage of the UK population, the prevalence of self-reported Long Covid during the four weeks to 5 March 2023 was greater in:

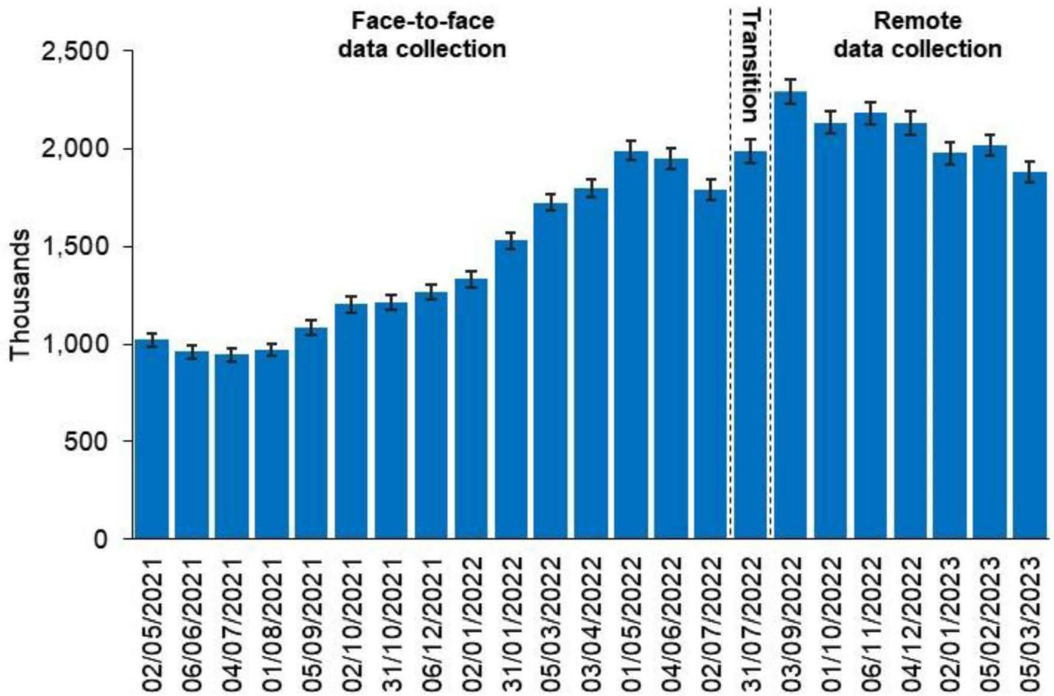
a) Adults aged 35-49 years or 50-69 years compared with those in younger age groups
b) Females compared with males
c) People living in the most deprived quintile group in terms of area deprivation compared with those in the least deprived quintile group
d) Disabled people for people whose day-to-day activity is limited a lot compared to people whose day-to-day activity is limited a little, those with a long-term health condition that does not affect day-to-day activities and people without a long-term health condition

236. These patterns in the prevalence of self-reported Long Covid across socio-demographic groups may reflect differences in both the likelihood of being infected with SARS-CoV-2 and the likelihood of developing Long Covid symptoms once infected.

237. It should be noted that these time series comparisons should be treated with caution because different data collection methods were in place throughout the period (as indicated in Figure 22) [ID3/62- INQ000271376

Figure 22: Estimated prevalence of self-reported Long Covid lasting at least four weeks from a previous confirmed or suspected SARS-CoV-2 infection among people aged 2 years or above in private households, four-week periods ending 2 May 2021 to 5 March 2023, UK[60,61,62]

[60] Estimates include people living in private households, and do not include those in communal establishments such as halls of residence, prisons, schools, hospitals, or care homes.
[61] Estimates prior to the period covering the four weeks to 31 July 2022 are based on data collected in face-to-face interviews. Estimates from the period covering the four weeks to 3 September 2022 onwards are based on data collected remotely (online or via telephone). The estimate for the period covering the four week to 31 July 2022 is based on a mixture of face-to-face and remote data collection. Estimates based on different modes of data collection should not be compared with one another; compared with face-to-face data collection, and after accounting for differences in participants' socio-demographic characteristics, remote data collection has been found to be associated with a 30% increase in the likelihood of self-reporting Long Covid on the CIS.
[62] Error bars are 95% confidence intervals.



Case rates of self-reported Long Covid

238. The ONS does not have data on the absolute number of SARS-CoV-2 infections that have led to Long Covid. However, the ONS has periodically estimated case rates of self-reported Long Covid. That is the *percentage* of people infected with SARS-CoV-2 who subsequently report Long Covid at least 12 weeks later. The case rates vary according to Covid-19 vaccination status, variant period of infection, and reinfection status.

239. Using CIS data to 1 August 2021, the ONS estimated that 11.7% of people infected with SARS-CoV-2 for the first time were experiencing self-reported Long Covid at least 12 weeks post-infection [ID3/63-INQ000271377]. This cohort comprised both children and adults, predominantly infected during the Alpha and Delta waves of the pandemic and some, but not all, were vaccinated when infected.

240. Using CIS data to 30 November 2021, with a cohort again predominantly first infected during the Alpha and Delta waves but this time considering only adults aged 18-69 years, the ONS estimated that 14.6% of adults who were unvaccinated when first infected with SARS-CoV-2 reported Long Covid at least 12 weeks post-infection [ID3/64-INQ000271378].This compared with 9.5% of adults in a socio-demographically similar cohort who were double-vaccinated when first infected over the same period – a 41.1% decrease in the likelihood of subsequently self-reporting Long Covid for those who were first infected after receiving two doses of a Coronavirus vaccine, after controlling for socio-demographic characteristics.

241. Using CIS data from 17 May 2021 to 27 May 2022 [ID3/65-INQ000271379], of triple-vaccinated adults aged at least 18 years, 4.5%, 4.2% and 5.0% reported having Long Covid 12-16 weeks after a first SARS-CoV-2 infection compatible with the Omicron BA.1, Omicron BA.2 or Delta variants, respectively. Of double-vaccinated adults, 4.0% reported Long Covid 12-16 weeks after a first infection compatible with the Omicron BA.1 variant, compared with 9.2% for those compatible with the Delta variant. Hence case rates of self-reported Long Covid were similar between the BA.1, BA.2 and Delta variants among triple-vaccinated adults, but it was more than twice as high for Delta compared with BA.1 infections among double-vaccinated adults.

242. Based on a sample of predominantly Omicron infections from 1 November 2021 to 8 October 2022 identified in the CIS [ID3/66-INQ000271380], among those who did not report having Long Covid after first infection, 2.4% of adults (aged 16 years and over) and 0.6% of children (aged 2-15 years) reported Long Covid 12-20 weeks after a second SARS-CoV-2 infection (i.e., a first reinfection). This compares to self-reported Long Covid in 4.0% of adults and 1.0% of children after a first infection. After adjusting for factors related to the risk of both SARS-CoV-2 reinfection and self-reported Long Covid status, the likelihood of reporting new-onset Long Covid among adults was 28% lower after a second Covid-19 infection, compared with a first infection. However, there was no statistical evidence of a difference in the adjusted odds of new-onset Long Covid between first and second infections among children.

243. These analyses were based on the same underlying CIS data as described in paragraph 231 (previous subsection). However, unlike those prevalence estimates, the numerators for the estimated case rates reported in this subsection are people who self-reported Long Covid after having a positive test for SARS-CoV-2 (i.e., self-reported Long Covid after a previous *test-confirmed infection*; suspected, *non-confirmed infection* was not sufficient). Furthermore, the denominator for the case rates is the number of people *infected with SARS-CoV-2*, rather than the number of people in the *whole population* (as is the case for the prevalence estimates reported in the previous subsection).

Methodology

244. The ONS produced monthly estimates of the population prevalence of self-reported Long Covid in the UK from April 2021 to March 2023. Estimates were produced from responses to the CIS during four-week reference periods, the final one being the four weeks to 5 March 2023.

245. The CIS question used to identify self-reported Long Covid was “Would you describe yourself as having 'long Covid', that is, you are still experiencing symptoms

more than 4 weeks after you first had Covid-19, that are not explained by something else?" All participants were given the opportunity to answer this question each month, irrespective of whether they had previously tested positive for SARS-CoV-2 (i.e., our prevalence estimate includes people with previous *suspected or confirmed* infections). Parents and carers answered the survey question on behalf of children aged under 12 years.

246. It is important to note that these estimates relate to self-reported Long Covid, as experienced by study participants who responded to a representative survey, rather than clinically diagnosed ongoing symptomatic Covid-19 or post-Covid-19 syndrome in the full population. The self-reported nature of our Long Covid measure means that some degree of misclassification is possible. For example, some participants may have been experiencing symptoms because of a health condition unrelated to SARS-CoV-2 infection. Others who did have long-term symptoms caused by a previous SARS-CoV-2 infection may not have described themselves as experiencing Long Covid (for example, because of lack of awareness of the term or not knowing they were initially infected with SARS-CoV-2).

247. Given that Long Covid is an emerging phenomenon that is not yet fully scientifically understood, all ONS estimates relating to Long Covid are designated as Experimental Statistics [ID3/67- INQ000271381 rather than National Statistics. We therefore advise caution when using the data. This designation is based on the fact that there is no universally agreed method for identifying Long Covid and estimating its prevalence, rather than any concerns over the quality of the data we have collected.

Covid-19 Latest Insights Tool

248. The Covid-19 Latest Insights Tool was developed and published by December 2020 so that members of the public could find reliable, easy to understand information about the Covid-19 pandemic in one place.

249. It was built on top of an existing product, the Coronavirus roundup, which had launched at the start of the pandemic in March 2020. The roundup was designed to provide a daily summary of ONS analysis relating to the pandemic on the ONS website. It was aimed at the public. It did not include data from other departments.

250. At the time, the main source of Covid-19 information on the ONS website was the CIS publication. This was a long and technical publication when it first began, aimed primarily at expert users.

251. Separately, the GOV.UK Covid-19 dashboard for daily Covid-19 case figures and deaths was very data focused and did not provide context.

252. The idea to provide an understandable narrative across departments involved collaboration between DHSC, Joint Biosecurity Centre (JBC) and UK Health Security Agency (UKHSA) (formerly Public Health England (PHE)). The ONS was also providing weekly reports from the Opinions and Lifestyle Survey (OPN) and death registrations, as well as other ad-hoc publications, meaning daily updates and key information were often published across multiple websites and outputs.

253. The insights tool was commissioned in November 2020 to fill these gaps. It provided a quick look of key measures and some simplified narrative. It combined narrative and an ability for users to find all the information in one place. It also enabled users to find the more detailed information as needed. The development of the insights tool involved many different teams across the ONS, as well as DHSC, and we engaged in user testing at key stages to make sure it met user need.

254. The first version of the Covid-19 Insights Tool was developed in five weeks and was first published in mid-December 2020, alongside the weekly articles. By May 2021 the Covid-19 Latest Insights Tool had been expanded and developed to include additional data sources, bespoke charts, narrative for each section (rather than only a description of the chart), and comparisons of the different data sources.

255. In July 2021 the Covid-19 Latest Insights Tool was merged with the Coronavirus roundup. The two products were similar and attracted a similar audience. The coronavirus roundup became the 'front page' of the Covid-19 Latest Insights Tool and has remained in this format since.

256. The Covid-19 Latest Insights Tool is the most widely read product in the history of the ONS website. Google Analytics shows that there were almost 1.7 million views across the different pages of the tool between July 2021 (when the merger with the coronavirus roundup occurred) and May 2022. The true figure is likely to be far higher than this as these figures only include users who accept analytics/non-essential cookies on the ONS website (estimated at 30% of all visitors.)

Social impacts of Covid-19 on particular groups

257. Covid-19 has had a major impact on all parts of society, not just health. During the pandemic, the ONS published various articles and analysis considering the social impacts of Covid-19.

258. The data series entitled *Coronavirus and the Social Impacts on Great Britain,* later renamed as the Public Opinions and Social Trends release included indicators from the OPN on the impact of the Covid-19 pandemic on people, households and communities in Great Britain.

Ethnicity

259. The impact of the pandemic on different ethnic groups varied, and people's circumstances before the pandemic could affect their experience.

260. In December 2020 the ONS published an article using data from the UK Household Longitudinal Study (UKHLS) [ID3/68- INQ000271382 matched with data from the Understanding Society: Covid-19 Study, 2020 [ID3/69- INQ000271383 to explore the social impacts of the coronavirus (Covid-19) pandemic initial period of lockdown on the health, employment, and living standards of people of different ethnicities in the UK. The publication also used data from the Wealth and Assets Survey (WAS) [ID3/70- INQ000271384 to understand the financial resilience of different ethnic groups in Great Britain before the pandemic [ID3/71- INQ000271385

261. This publication found that most ethnic groups in the UK experienced a worsening of their self-reported mental health between 2019 and April 2020, based on a measure of self-reported mental health difficulties (the General Health Questionnaire (GHQ-12) which is a screening questionnaire used to measure the severity of mental health problems) after adjusting for age, sex, socioeconomic classification, change in help and support received since the outbreak of the pandemic, and whether they had a health condition.

262. The mental well-being of those in the Indian ethnic group in the UK may have been particularly affected by the pandemic as respondents reported both greater difficulty with sleep over worry between 2019 and the initial period of lockdown (April 2020) and had higher scores than other groups on GHQ-12 score.

263. After adjusting for age, around half of working-age adults of White British (46%) and Other White (51%) ethnicities in paid work reported a decrease in their weekly hours worked between the first two months of 2020 and April 2020. This was higher than those from Indian (33%), Black, African, Caribbean or Black British (33%) and Pakistani or Bangladeshi (34%) ethnicities.

264. In April 2020 in the UK, over a quarter (27%) of those from Black, African, Caribbean or Black British ethnic groups reported finding it very or quite difficult to get by financially. This compares with 22% in 2019 and was significantly more than those from White Irish (6%), Other White (7%), Indian (8%) and Pakistani or Bangladeshi (13%) ethnic groups.

265. These estimates are adjusted for age as a minimum, but it was not possible to adjust for all relevant factors. As such these estimates should not be used to infer causality but to determine whether relationships between ethnic groups and notable outcomes exist when holding specific factors constant.

266. The ONS also published a summary article in December 2020 which explored how Covid-19 affected some parts of society more than others. When looking at social, economic and environmental factors there were differences, particularly for Black and South Asian ethnic groups [ID3/72 INQ000271386]. This article reported that:

a) Black and Asian men were more likely to have a job associated with higher Covid-19 death rates.
b) People in large households had a higher Covid-19 risk, and multi-generational households are much more common among ethnic minority groups, particularly people of Pakistani or Bangladeshi ethnicity or people of Indian ethnicity.
c) Most ethnic minorities were more likely to live in urban or more deprived areas, where death rates from Covid-19 are higher.
d) In England, Black people were nearly four times as likely as White people to have no access to outdoor space at home.

Disability

267. Throughout the pandemic, disabled people consistently reported higher levels of worry about Covid-19 than non-disabled people and they were more likely to feel uncomfortable leaving their home because of Covid-19 (45% of disabled people reported this in comparison to 24% of non-disabled people) [ID3/73- INQ000271387]

268. This analysis published in February 2022 (covering March 2020-December 2021 for Great Britain) used self-reported disability status by respondents to the OPN at the same time as their answers to the questions on Covid-19. This identifies someone “disabled” as a person who has a physical or mental health condition or illness that lasted or was expected to last 12 months or more and that reduced their ability to carry-out day-to-day activities. As such, this group included those with mental health conditions such as depression [ID3/73 INQ000271387]

269. Disabled people indicated that Covid-19 had affected their life more than non-disabled people in two areas in particular: access to healthcare and treatment for non-coronavirus related issues (58% for disabled people, compared with 31% for non-disabled people) and well-being (55% compared with 35%).

270. In contrast, non-disabled people more often indicated Covid-19 affected their life in the following areas: travel plans (55% for non-disabled people, compared with 41% for disabled people), work (29% compared with 21%) and schools, colleges and universities (21% compared with 15%).

Young people

271. The Covid-19 pandemic impacted people of all ages. A publication drawing from the OPN in June 2020 which looked at the impact of the early lockdown period on those ages 16-29 years old [ID3/74- INQ000271388]found that:

a. Among young people (aged 16 to 29 years) who were worried about the effect the coronavirus (Covid-19) was having on their lives, their main concerns were the effects on schools or universities (24%), their well-being (22%), work (16%) and household finances (16%).

b. For those young people (aged 16 to 29 years) who reported that the coronavirus was affecting their work, the most commonly reported impacts were a reduction in hours worked (21%), concerns about health and safety at work (18%) and having been asked to work from home (19%).

c. Other than being unable to attend their educational establishments, most young people who reported an impact on schools or universities expressed concerns about the uncertainty over exams and qualifications (58%), the quality of education being affected (46%) and a move to home-schooling (18%).

d. Young people who reported that their well-being was being affected were much more likely than either those aged 30 to 59 years or those aged 60 years and over to report being bored (76%) and lonely (51%); they were also much more likely to say the lockdown was making their mental health worse (42%).

e. Young people were generally more optimistic than the older age groups about how long they expected the effect of the pandemic to last, and over half of them (55%) reported they expect their lives to return to normal within six months.

Home-schooling

272. An analysis of home-schooling in Great Britain using OPN data published in July 2020 [ID3/75- INQ000271389]provided insights on the experiences of parents and children affected by the first round of school closures. It found that:

a. Between 7 May and 7 June 2020, 87% of parents said a child in their household had been home-schooled because of the coronavirus (Covid-19) pandemic, with the percentage decreasing as the age of the only or eldest child increased.

b. The average number of hours spent doing schoolwork per week significantly increased as the age of the child increased from 5 to 10 years (10 hours) to

11 to 15 years (16 hours), with the hours spent learning by those aged 5 to 10 years being significantly lower when there was a child aged 0 to 4 years in the household.

c. The percentage of parents who said their children had used real-time interactive online learning resources provided by schools (for example, live lessons) significantly increased as the age of the child increased, with 44% of parents saying their children aged 16 to 18 years had used this compared with 13% for children aged 5 to 10 years.

d. Over half (52%) of parents with school-aged children said a child in their household was struggling to continue their education while at home, with just over three in four of these parents (77%) giving lack of motivation as one of the reasons.

e. While under 1 in 10 (9%) parents with a child who was struggling gave a lack of devices as a reason for struggling, this was significantly higher for households with one adult (21%) than households with two or more adults (7%).

f. Most older children aged 16 to 18 years in full-time education (64%) thought that continuing their education at home would negatively affect their future life plans.

g. Between 3 April and 10 May 2020, of parents who were home-schooling, one in three women (34%) agreed that it was negatively affecting their well-being compared with one in five men (20%), while 43% of home-schooling parents agreed that it was negatively affecting the well-being of their children.

273. This analysis used two pooled datasets each containing five waves of this weekly OPN data. One dataset covers the period 3 April to 10 May 2020. During this period, respondents were asked whether they had home-schooled their children and about their experiences of home-schooling. For those who were not home-schooling, other adults in the household may have been home-schooling the children in the home. The second pooled dataset covers the period 7 May to 7 June 2020. Here, respondents were asked if a child in the home had been home-schooled and about the experiences of the child. This change was made to better capture where home-schooling was taking place regardless of whether the person responding was the person home-schooling.

274. The ONS later revisited these home-schooling questions on the OPN during the second phase of school closures. This refers to data collected between 13 January and 7 February 2021 and found that:

a. Of parents who had personally home-schooled, half (50%) said it was negatively affecting their well-being in January 2021 compared with 28% in April 2020; whilst almost two-thirds (63%) said that it was negatively affecting their children's well-being, compared with 43% in April 2020.

b. In January 2021, nearly half (45%) of parents said their child spent 21 hours or more learning using resources provided by their school in the past seven days; this was up from 18% in May 2020.

c. Fewer parents of school-aged children said that their child struggled to continue their education at home in January 2021 (38%) than in May 2020 (52%).

d. We also asked those aged 16 to 18 years in full-time education directly about their experiences, with two-thirds (65%) agreeing that they were concerned that their future life plans will be negatively affected by continuing their education at home.

*Higher Educa*tion

275. Between December 2020 to March 2022 the ONS published experimental statistics on the behaviours, plans, opinions and well-being of higher education students in the context of guidance on the pandemic [ID3/76- INQ000271390 . Given the experimental nature of the statistics and the small sample size care should be taken when interpreting them. Due to changes in the weighting methodology, figures from prior to March 2021 have been revised and so may not match the original bulletin published at the time. Where this is the case the updated data table is exhibited.

276. In the 2020-21 academic year, the ONS found that:

a. Of those who responded to the survey, more than half (60%) reported a worsening in their mental health and well-being between the beginning of the 2020 autumn term (September 2020) and the date of the pilot survey 20-25 November 2020. By January 2021 this had increased to 68% of students reporting a worsening in their well-being and mental health, decreasing to just over half (53%) by April 2021 [ID3/77 INQ000271391 .

b. Student experience changed because of the coronavirus. In November 2020 and considering academic experience, 34% of students reported being dissatisfied or very dissatisfied with their experience in the autumn term, while over half (58%) of students reported being dissatisfied or very dissatisfied with their social experience in the autumn term. By January 2021, 45% of students reported being dissatisfied with their academic experience in the autumn term [ID3/78- INQ000271392

c. In late February 2021, 31% of students reported feeling lonely often or always [ID3/78-INQ000271392], compared with 8% of the adult population in Great Britain over a similar period [ID3/79-INQ000271393] This proportion decreased to 22% in April 2021 [ID3/78 INQ000271392], compared with 6% of the adult population in Great Britain over the same period [ID3/80-INQ000271394].

d. In early May 2021, over half (56%) of students who were in higher education prior to the coronavirus (Covid-19) pandemic reported that the lack of face-to-face learning had a major or moderate impact on the quality of their course; around half (49%) said that the pandemic had a major or significant impact on their academic performance [ID3/81-INQ000271395]. By June 2021, this had increased to 61% and 52% respectively [ID3/82-INQ000271396].

277. In the 2021-22 academic year:

a. Between 27 September and 4 October 2021, over half (53%) of students reported that their academic performance had been significantly or majorly affected since the start of the coronavirus pandemic [ID3/83-INQ000271397].

b. In November 2021, the proportion of students feeling lonely often or always was 17%, significantly higher than those aged 16 to 29 years (9%) and the adult population in Great Britain (7%) [ID3/84-INQ000271398]. By late November this had decreased to 14%, significantly higher than the adult population in Great Britain (6%), but not significantly different to the 16- to 29-year-old age group (10%) [ID3/85-INQ000271399]

c. In November 2021, over a quarter (27%) of students reporting having had zero hours of in-person teaching in the previous seven days; this is consistent with late October (28%) and significantly lower than late May (77%) [ID3/78-INQ000271392]

d. In November, of students who were enrolled in an educational institution during the 2020/21 academic year, 43% indicated that their academic performance had been better since the start of the autumn 2021 term compared with the previous academic year [ID3/84-INQ000271398 repeat].

e. In late November, less than a third (28%) of students reported that their mental health and well-being had worsened since the start of the autumn 2021 term [ID3/85-INQ000271399], similar to figures for November 2021 (30%) [ID3/84 INQ000271398 and late October (32%) [ID3/86-INQ000271400]

Older People

278. Similar analysis was also conducted for older people which we class as those aged sixty and above. From our publication in June 2020 using OPN data [ID3/87-INQ000271401], the ONS found:

a) Among older people (aged 60 years and over) who were worried about the effect Covid-19 was having on their lives, their main concerns were being unable to make plans in general (64.5%), personal travel plans such as holidays (53.4%) and their own well-being (51.4%).
b) Of those who said their well-being had been affected by the coronavirus, the most common ways older people said it had been affected were being worried about the future (70%), feeling stressed or anxious (54.1%) and being bored (43.3%).
c) Staying in touch with family and friends remotely was the main way those aged 60 years and over said they were coping whilst staying at home, followed by gardening, reading and exercise, with those aged in their 60s and 70s equally as likely as younger age groups to say that exercise was helping them to cope.
d) People aged in their 60s and 70s were more likely to have checked on neighbours who might need help three or more times and they were equally as likely to have gone shopping or done other tasks for neighbours at least one or two times as those aged under 60 years.
e) Those aged 60 years and over were most likely to say they expect the financial situation of their household to stay the same over the next 12 months and more likely to say this than younger age groups; this is probably because older people are less likely to be working and more likely to be on fixed pension incomes.

Mental health

279. In addition to the impacts to physical health recorded during the pandemic period, there was also an impact on mental health. The ONS published findings on the impact of the pandemic on mental health during the pandemic period.

280. For self-reported depressive symptoms, ONS analysis indicated an increase in moderate to severe depression symptoms in adults during the pandemic. Around 1 in 5 adults were likely to be experiencing some form of depression, indicated by moderate to severe depression symptoms, in June 2020 (19%), November 2020 (19%) and early 2021 (21%, 27 January to 7 March). This had doubled from around 1 in 10 (10%) before the pandemic (July 2019 to March 2020) [ID3/88- INQ000271402 Data from the OPN showed that between 20 March and 30 March 2020, almost half (49.6%) of adults in Great Britain reported high anxiety, which was sharply elevated compared with the end of 2019 (21%) [ID3/89- INQ000271403

281. Around 1 in 6 (17%) of adults experienced some form of depression in summer 2021. This represented a decrease from early 2021 (21%) but remained above levels before the pandemic (10%).

282. Over the period 27 January 2021 to 7 March 2021 [ID3/88- INQ000271402

a. Younger adults and women were more likely to experience some form of depression, with over 4 in 10 (43%) women aged 16 to 29 years experiencing depressive symptoms, compared with 26% of men of the same age.

b. Disabled (39%) and clinically extremely vulnerable (CEV) adults (31%) were more likely to experience some form of depression than non-disabled (13%) and non-CEV adults (20%).

c. A higher proportion of adults renting their home experienced some form of depression (31%) when compared with adults who own their home outright (13%).

d. Almost 3 in 10 (28%) adults living in the most deprived areas of England experienced depressive symptoms; this compares with just under 2 in 10 (17%) adults in the least deprived areas of England.

283. Over the period 21 July to 15 August 2021 [ID3/90- INQ000271404]:

a. Younger adults and women were more likely to experience some form of depression, with around 1 in 3 (32%) women aged 16 to 29 years experiencing moderate to severe depressive symptoms, compared with 20% of men of the same age.

b. Disabled (36%) and clinically extremely vulnerable (CEV) adults (28%) were more likely to experience some form of depression than non-disabled (8%) and non-CEV adults (16%).

c. Unemployed adults (31%) were twice as likely to experience some form of depression than those who were employed or self-employed (15%).

d. Around 1 in 4 (24%) adults living in the most deprived areas of England experienced some form of depression; this compared with around 1 in 8 (12%) adults in the least deprived areas of England.

e. Of adults experiencing some form of depression, almost three-quarters (74%) reported that the coronavirus pandemic was affecting their well-being; this compared with around one in three (32%) adults with no or mild depressive symptoms.

Loneliness

284. The ONS also published analysis on who was more likely to be experiencing loneliness during the first year of the pandemic in Great Britain [ID3/91- INQ000271405

Levels of loneliness in Great Britain increased during the first year of the pandemic. Between 3 April and 3 May 2020, 5.0% of people (about 2.6 million adults) said that they felt lonely "often" or "always" [ID3/92- INQ000271406 From October 2020 to February 2021, OPN results showed that proportion increased to 7.2% of the adult population (about 3.7 million adults).

285. Areas with a higher concentration of younger people (aged 16-24) and areas with higher rates of unemployment tended to have higher rates of loneliness during the study period (October 2020 to February 2021). Local authorities in countryside areas also had a lower loneliness rate than urban, industrial, or other types of area.

286. From October 2020 to February 2021, of those who said their well-being had been affected in the last seven days by the pandemic, 38.6% (about 10.5 million people) said it was because they were lonely. Accounting for groups we know are particularly affected by loneliness more generally, we found young people and single people have also been most affected by this seven-day measure or "lockdown loneliness".

287. Unemployment has been closely tied to loneliness levels during the pandemic. This was one of the most important factors identified through our analyses. Local authority areas with a higher unemployment rate (as measured between October 2019 and September 2020) had higher proportions of residents who said they were often or always lonely (from OPN results in the period from October 2020 to February 2021). Additionally, in areas where residents earn more on average per week, loneliness rates tended to be lower. The effect of unemployment on loneliness was particularly strong in urban areas outside London, while in London there was no clear correlation.

Life Satisfaction

288. The OPN Survey also allowed the ONS to provide a comparison of life satisfaction scores throughout the pandemic period [ID3/93- INQ000271407 . By April 2022, the ONS found that over one-third (35%) of adults reported they were very or somewhat worried about the effect of the coronavirus (Covid-19) pandemic on their lives. This figure was lower than the 66% reporting the same during the period 15 December 2021 to 3 January 2022.

289. Figure 23 tracks responses to four OPN questions regarding life satisfaction between March 2020 to March 2022.

<u>Figure 23: Levels of personal well-being, adults in Great Britain, March 2020 to March 2022</u>

Adults in Great Britain, March 2020 to March 2022

Covid-19 Schools Infection Survey (SIS)

290. DHSC commissioned the ONS in late 2020 to investigate the prevalence of infections and presence of antibodies to Covid-19 among pupils and staff in sampled primary and secondary schools in England. The survey was led by a partnership between PHE (later moved to the UKHSA in 2021), London School of Hygiene and Tropical Medicine (LSHTM) and the ONS.

291. The ONS's role was to operationalise the study and disseminate results. The survey ended in March 2022. Repeated surveys were carried out during the 2020-2021 and 2021-2022 academic years to collect risk factor information together with virus and antibody samples in a cohort of pupils and staff.

292. Round 4 of the study (15-31 March 2021) was conducted shortly after schools in England reopened following the third Covid-19 lockdown and results suggested that current infection was lower amongst staff and pupils in secondary schools compared with results from November and December [ID3/94-I INQ000271408

293. A LSHTM study in the Lancet reported infection rates remained low in schools compared with the level of infection of school age children within the community, suggesting that the policy of keeping pupils testing positive out of school was working [ID3/95- INQ000271409 The policy of removing children from school who tested positive

for Covid-19 meant that the study primarily identified pupils and staff who were asymptomatic.

294. In March 2022 the study reported:

a. It is estimated that 82% of secondary school pupils and 40% of primary school pupils had coronavirus (Covid-19) SARS-CoV-2 antibody levels above the limit of detection in Round 1 of the Covid-19 Schools Infection Survey (SIS) during the academic year ending 2022 after adjusting for sensitivity and specificity [ID3/96- INQ000271410

b. Antibody prevalence was higher in secondary school pupils as most secondary school pupils testing positive for SARS-CoV-2 antibodies were vaccinated.

c. SARS-CoV-2 antibody prevalence steadily increased by age for all pupils during the pandemic.

d. A third (33.9%) of pupils aged 4 to 7 years tested positive for SARS-CoV-2 antibodies.

Survey Methodology

295. 2020/21 Study. A study team visited each school to collect the biological samples for testing from the staff and pupils who had enrolled in the study. Tests for pupils involved a nose swab for current coronavirus (Covid-19) infection, and an oral fluid (saliva) sample for SARS-CoV-2 (Covid-19) antibodies against the virus. Tests for staff involved a nose swab for current Covid-19 infection and a finger prick blood test for Covid-19 antibodies against the virus. Everyone enrolled was offered testing regardless of whether they were experiencing Covid-19 symptoms, although people experiencing Covid-19-like symptoms should not be attending school.

296. The aim of the study was to recruit 100 secondary schools and 50 primary schools across the 15 selected upper-tier local authorities, with approximately 70% (70 secondary and 35 primary) schools in high-prevalence areas and 30% (30 secondary and 15 primary) in low-prevalence areas.

297. Within the selected schools, primary and secondary, all staff were eligible and invited to participate in the study. Within primary schools, all pupils were eligible to participate, however, because of the larger number of pupils in secondary schools, eligibility was restricted to two consecutive year groups in each secondary school. Year groups in secondary schools were chosen at random and in equal proportions across the schools and local authorities. Low response however, in Rounds 1 and 2, led to a decision to widen eligibility to pupils in all year groups (except Year 11) within secondary schools from Round 4 onwards. In Round 6, 63 out of the 80 participating secondary schools had extended participation to other year groups. (Pupils from

Year 11 were not eligible for enrolment. It was deemed that this study would be too disruptive for these pupils during their final year of secondary school.)

298. 2021-2022 Study. By September 2021 the Covid vaccine had been rolled out and the majority of school staff had been vaccinated and therefore the decision was taken to not monitor staff (instead we linked Department for Education staff data to the vaccine register to understand level of immunity). Pupils were tested using a nose swab for current coronavirus (Covid-19) infection, and an oral fluid (saliva) sample for SARS-CoV-2 (Covid-19) antibodies against the virus.

299. The sample was rebalanced for the academic year 2021-2022 to make it representative of the English regions, to align with CIS results. The 2020-2021 SIS schools were invited to participate in the 2021-2022 study. The 2021-2022 study included questions about pupil mental health, eating disorders, the impact of Covid-19 on remote learning and school mitigation measures.

Daily Contact Test – Clinical Study

300. The ONS collaborated with DHSC and the University of Oxford to operationalise a clinical study in April to July 2021 which measured the effectiveness of daily testing for close contacts of positive cases in schools produced data through Polymerase Chain Reaction (PCR) and Lateral Flow Tests. The data was uploaded to the Secure Research Service (SRS) platform, which included anonymised data on close contacts, test and trace, and Covid-19 symptoms. The ONS used a management reporting dashboard which provided a breakdown of schools' progress with testing and data reporting, to support the ONS' role of cleaning data to facilitate the publication of the final report (with Oxford University responsible for the analysis and reporting).

301. The study was conducted in England, with a sample design that provided a control and intervention sample (approximately 80 secondary schools in each sample). The schools in the control sample continued their policy of sending a large number of pupils home when an individual tested positive for covid (the "bubble" – this ranged from identified associates to entire year groups) – the rationale being to limit transmission within the school. Those schools in the intervention sample sent only the child testing positive home, and required their close friends and associates to test daily before entering school only if the test was negative.

302. The study findings published by the University of Oxford [ID3/97- INQ000271411] found that transmission within the intervention group was not significantly higher than in the control group and the findings provided valuable insights for policy making around school Covid-19 procedures for the 2021-2022 academic term.

Additional sources of analysis on Covid-19 impacts

303. The ONS published a wide variety of publications covering many different impacts of the pandemic. Whilst it has not been possible to detail them all in this statement, the ONS website includes a wide range of content that may be of interest to the Inquiry covering Covid related impacts on employment, the economy, crime, working patterns, travel and more.

304. As I noted in my earlier statement, I am incredibly proud of the extensive work that the ONS delivered during the Covid-19 pandemic, working at pace, in extremely challenging circumstances to deliver high quality insights for decision makers and the public. I hope that the information detailed in this statement is helpful to the Inquiry and I would be happy to clarify or provide further information should that be helpful.

Statement of Truth

I believe that the facts stated in this witness statement are true. I understand that proceedings may be brought against anyone who makes, or causes to be made, a false statement in a document verified by a statement of truth without an honest belief of its truth.

Signed: Personal Data

Dated: 11/09/2023