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Weekly Influenza and COVID-19 Surveillance graphs

UKHSA publishes a weekly national influenza and COVID-19 surveillance report which summaries the information from the surveillance systems which are used to monitor influenza, COVID-19 and other seasonal respiratory viruses in England.

Additional figures based on these surveillance systems are included in this slide set.

The figures presented in this slide set are based on data from week 10 (between 7 March and 13 March 2022).

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7) Secondary Care surveillance
8) Mortality surveillance
9) Possible reinfections in England
10) Co/secondary infections with COVID-19

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COVID-19 Pandemic Overview

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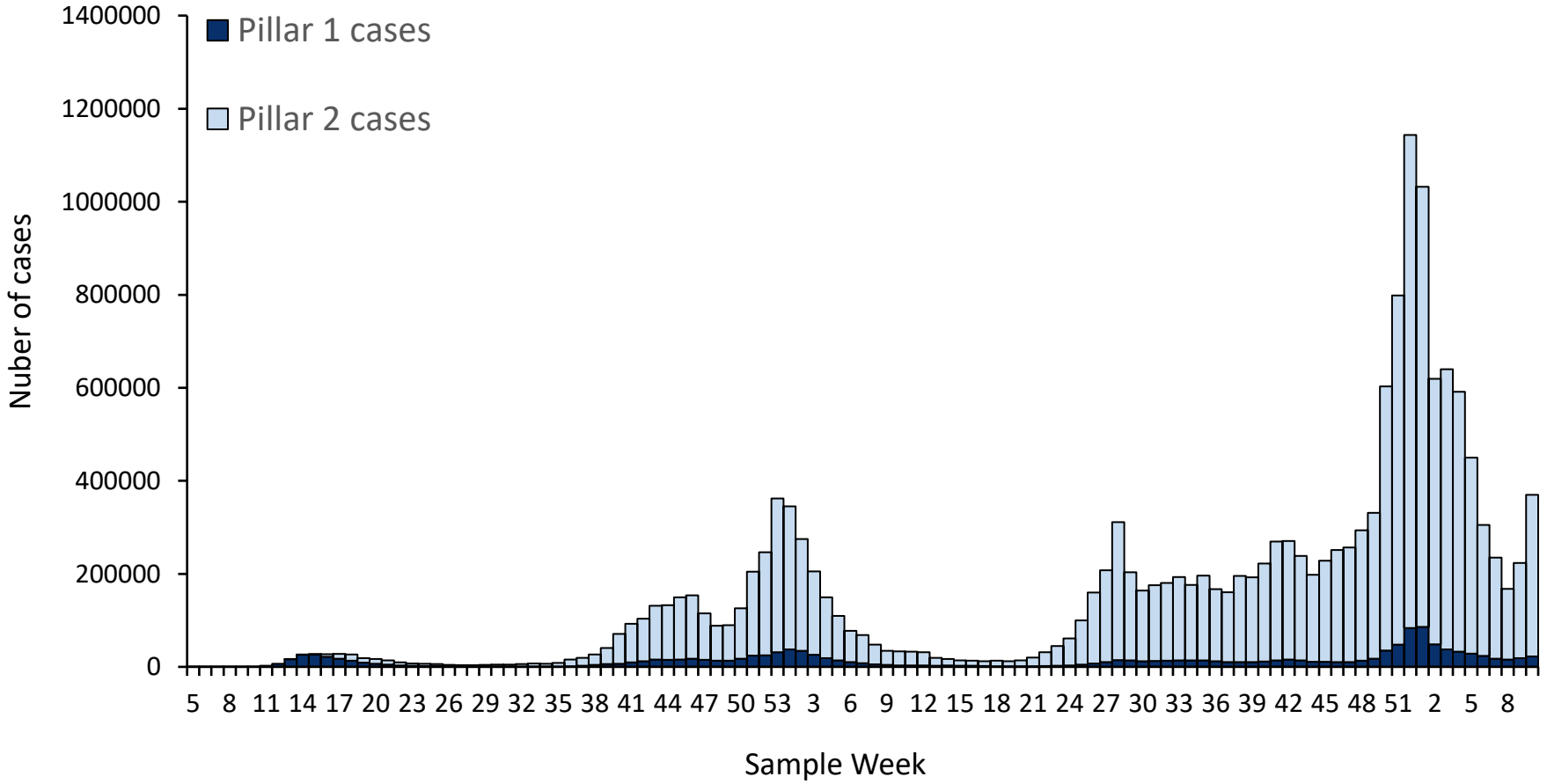
Confirmed COVID-19 episodes tested under Pillar 1 and Pillar 2, by sample week, since week 5 2020



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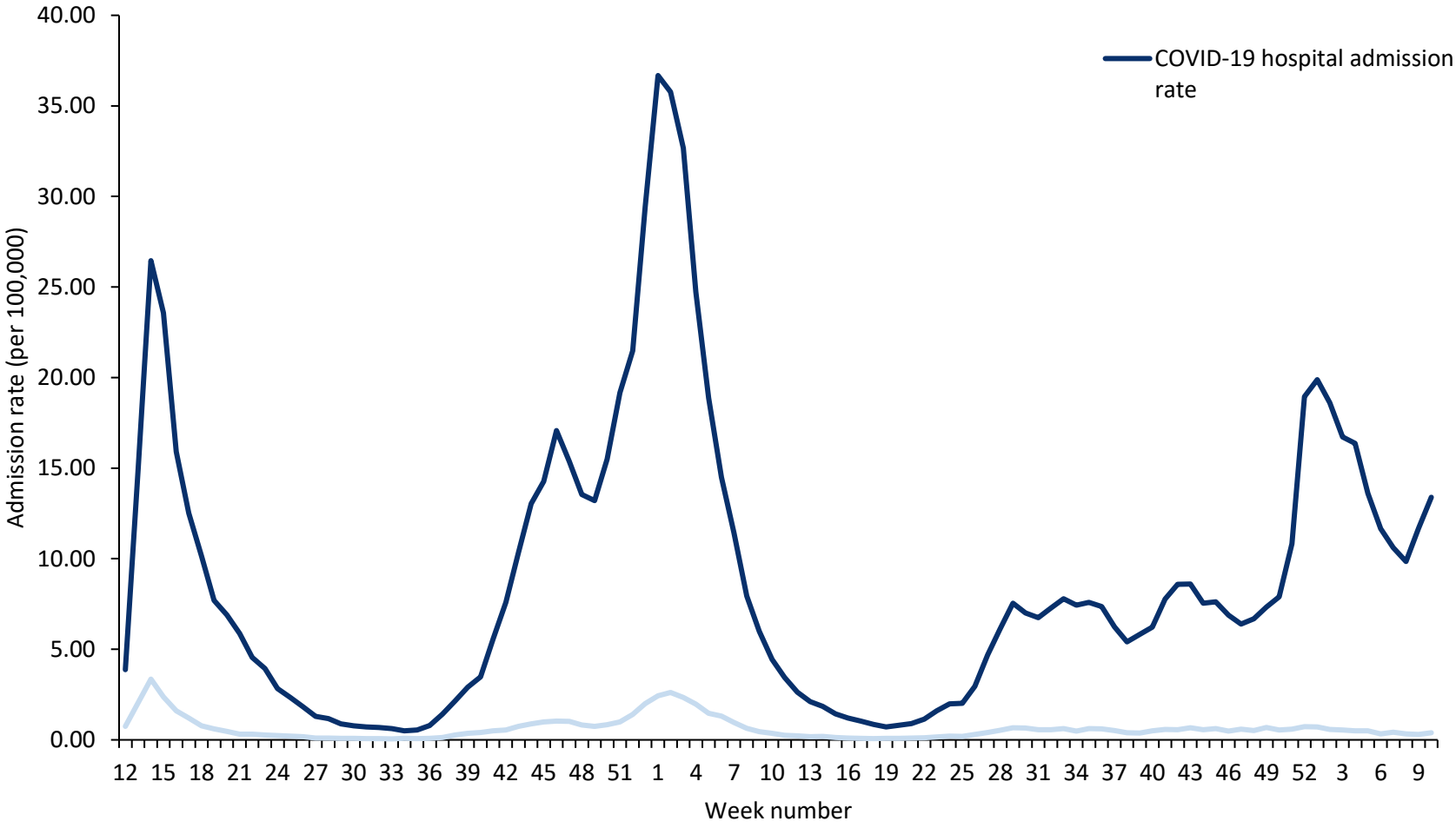
Weekly overall hospital and ICU/HDU admission rates per 100,000 of new COVID-19 cases reported through SARI Watch, England since week 12 2020



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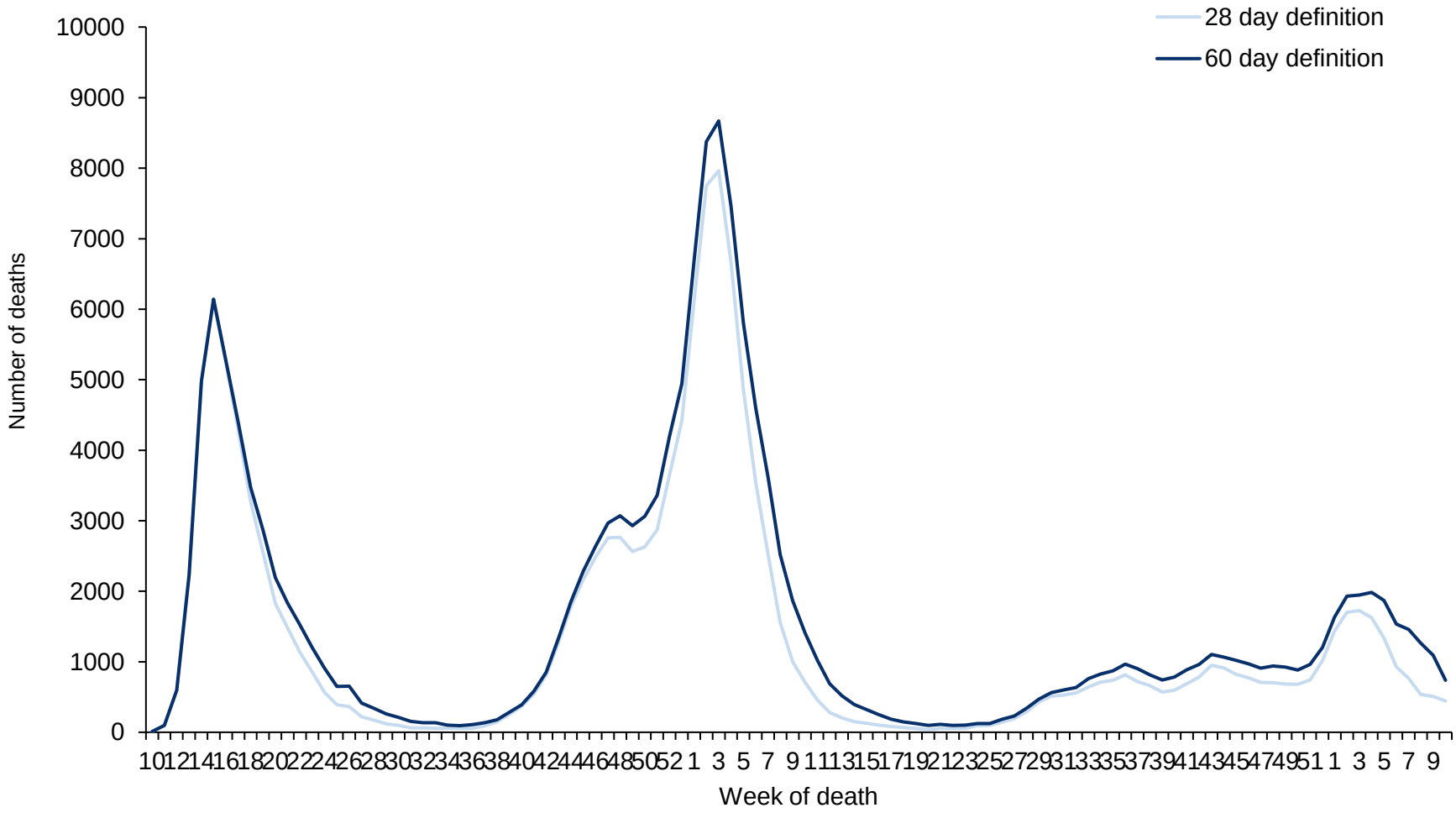
Number of deaths since week 10 2020 by week of death and time since laboratory confirmation of COVID-19, England



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Confirmed COVID-19 episodes in England

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Confirmed COVID-19 episodes in England

Data Information

- From the week 32 report onwards, case rates have been updated to use the latest ONS population estimates for mid-2020. Previously case rates were calculated using the mid-2019 population estimates
- Rates by ethnicity and IMD quantile will continue to be presented using the mid-2019 estimates, until the mid-2020 estimates become available.

From 31 January 2022, UKHSA moved all COVID-19 case reporting in England to use a new episode-based definition which includes possible reinfections. Each infection episode is counted separately if there are at least 91 days between positive test results (PCR or LFD). Each infection episode begins with the earliest positive specimen date. Further information can be found on the UK COVID-19 dashboard.

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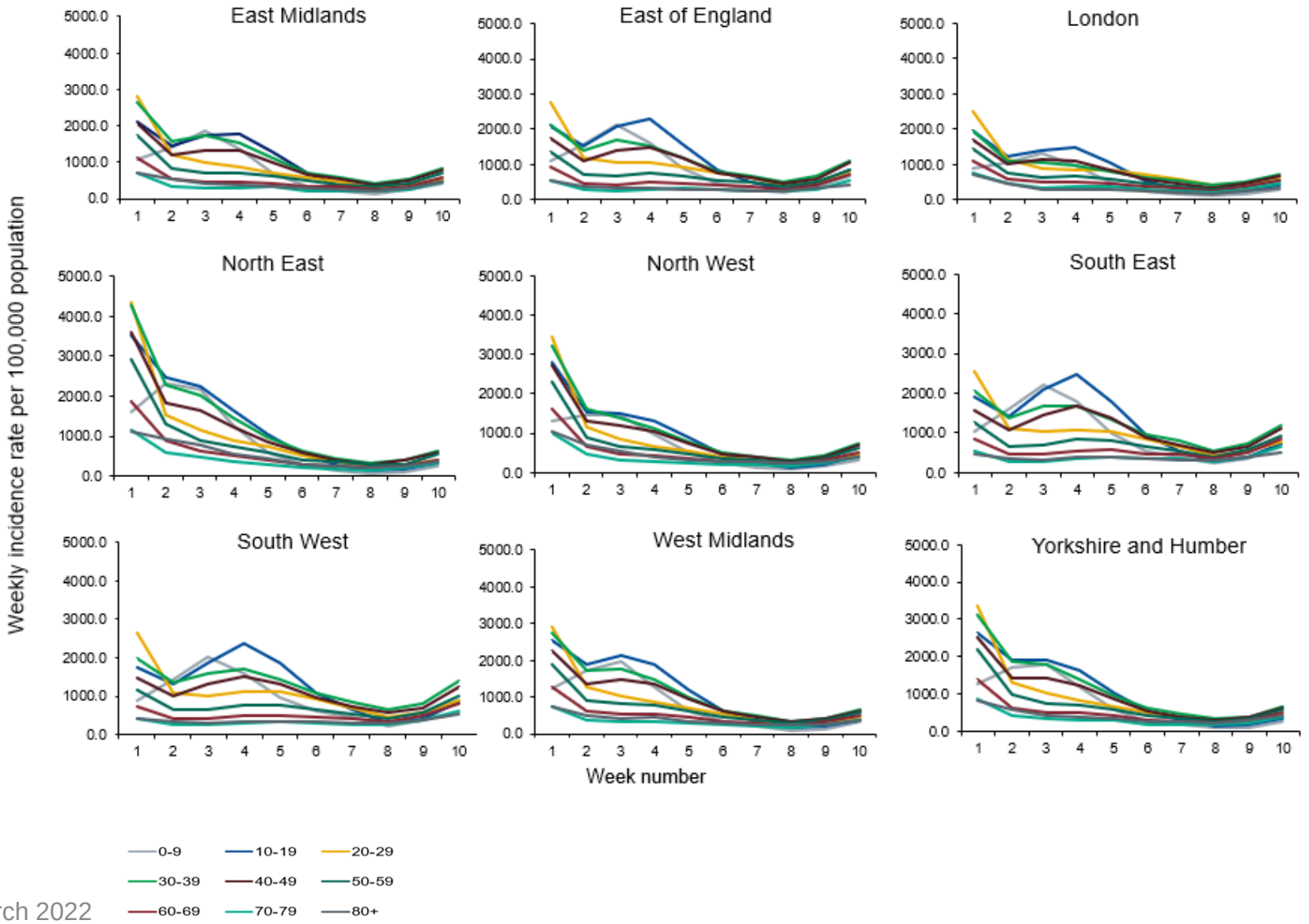
Weekly COVID-19 episodes per 100,000 population by age group and region, weeks 1 to 10



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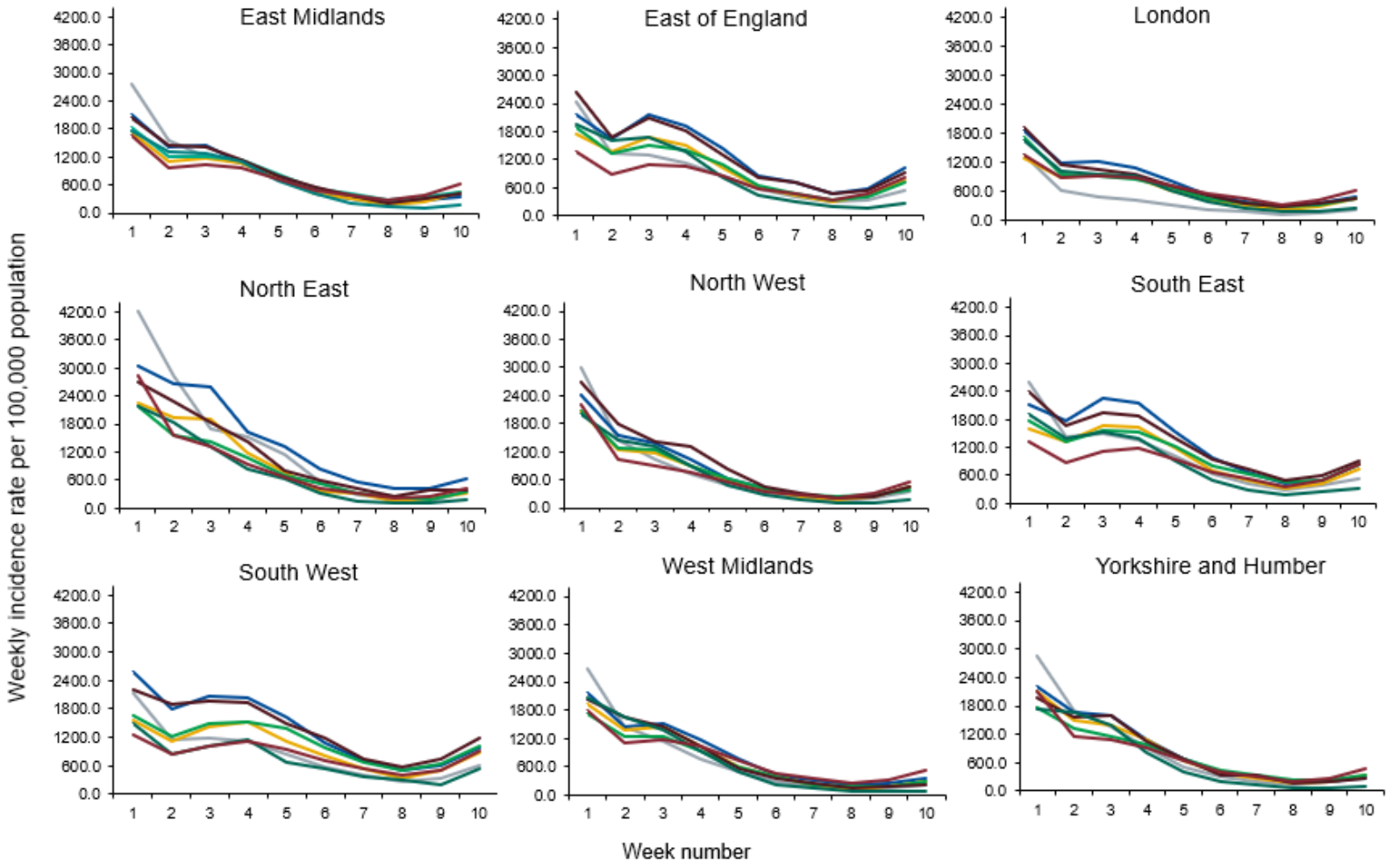
Weekly COVID-19 episodes per 100,000 population by ethnicity and region, weeks 1 to 10



*these incidence rates have been calculated using the mid-2019 ONS population estimates

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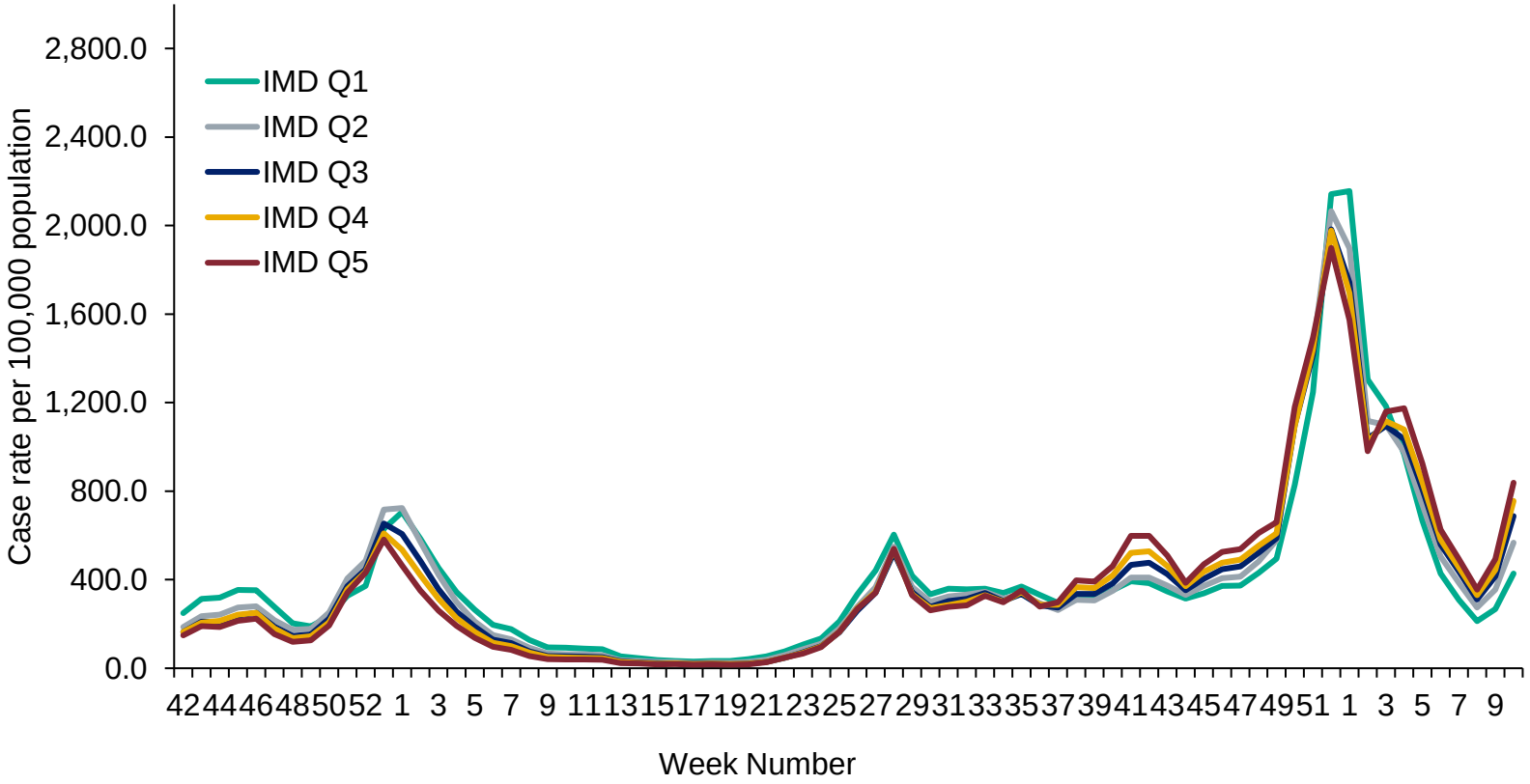
Weekly COVID-19 rate per 100,000 population by IMD quintile (1 being the most deprived and 5 being the least deprived)



*these incidence rates have been calculated using the mid-2019 ONS population estimates

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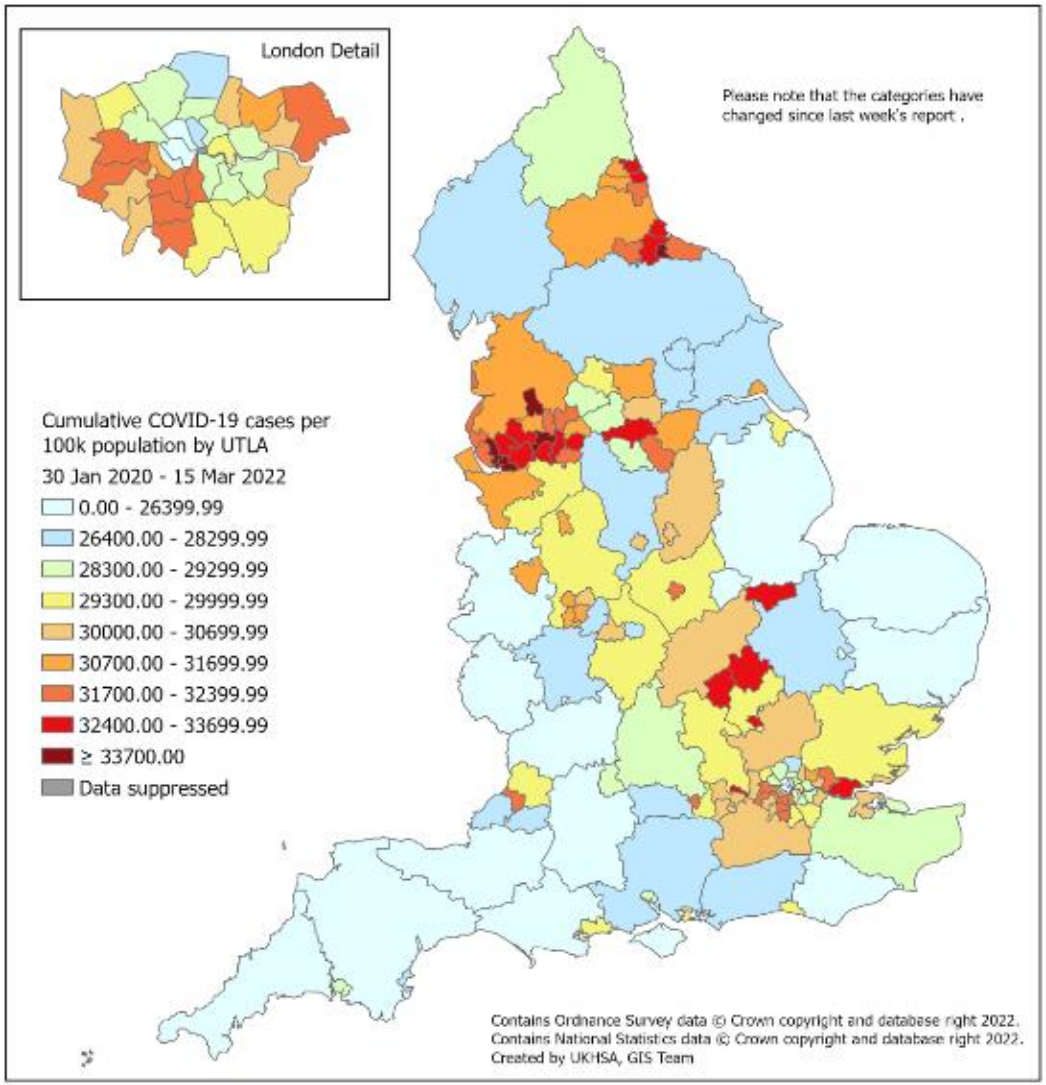
Cumulative rate of COVID-19 episodes per 100,000 population tested under Pillar 1 and 2, by upper-tier local authority, England (box shows enlarged map of London area)



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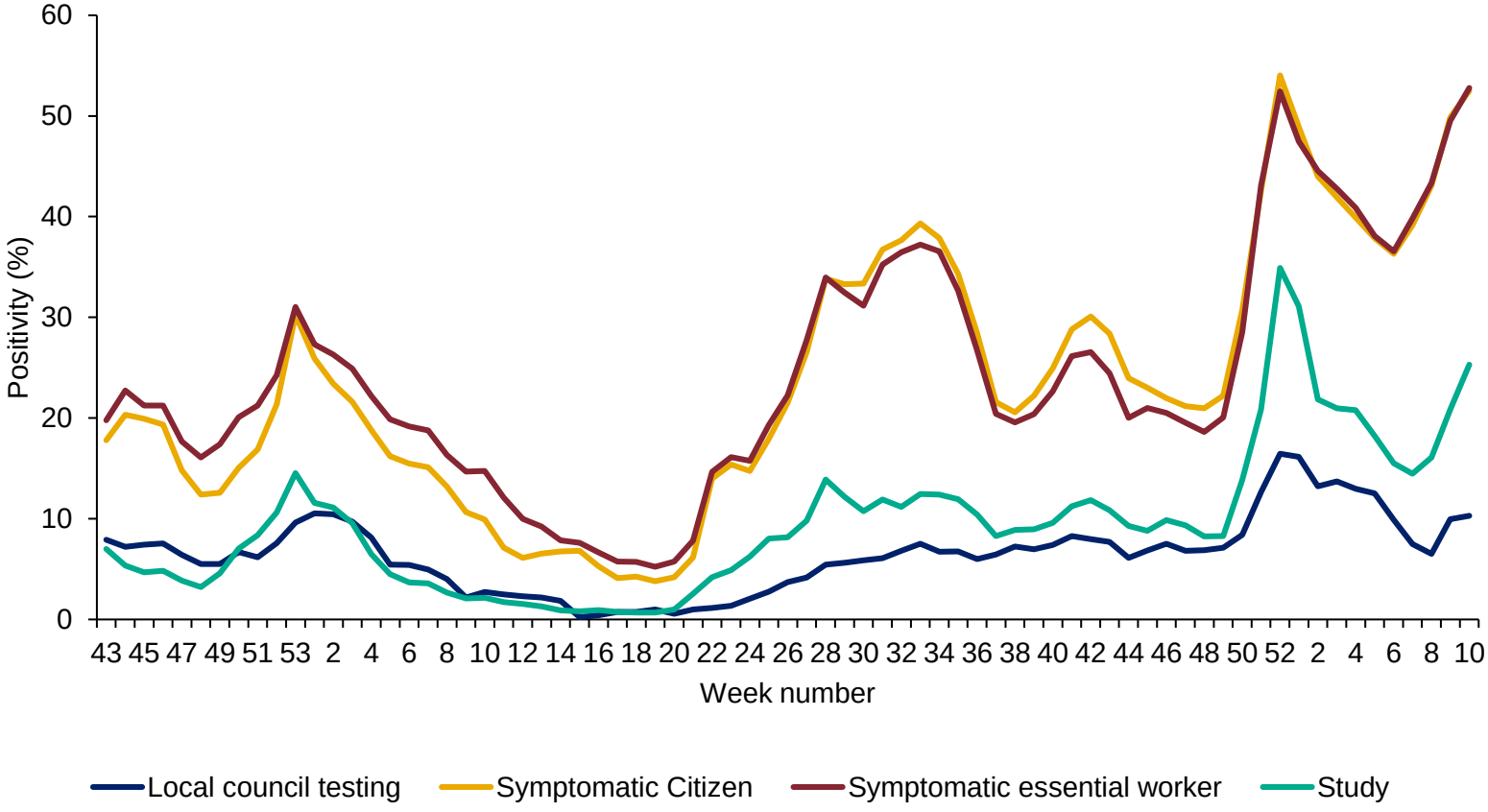
Weekly PCR positivity of COVID-19 case by reason for test, weeks 43 2021 to 10 2022



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Respiratory Datamart system (England)

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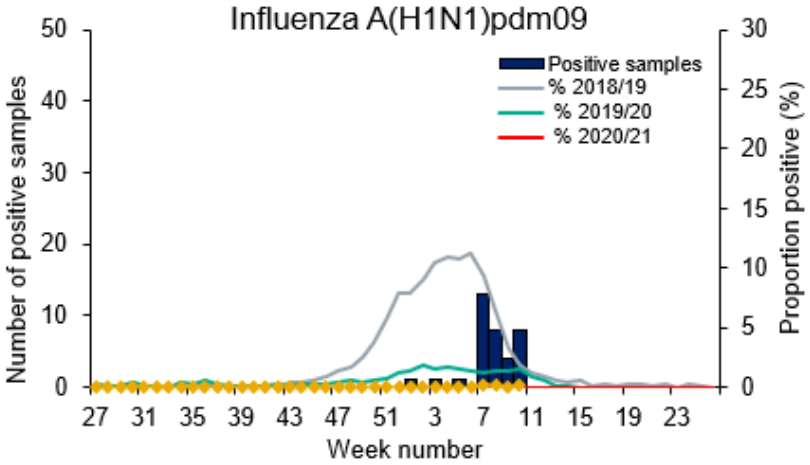
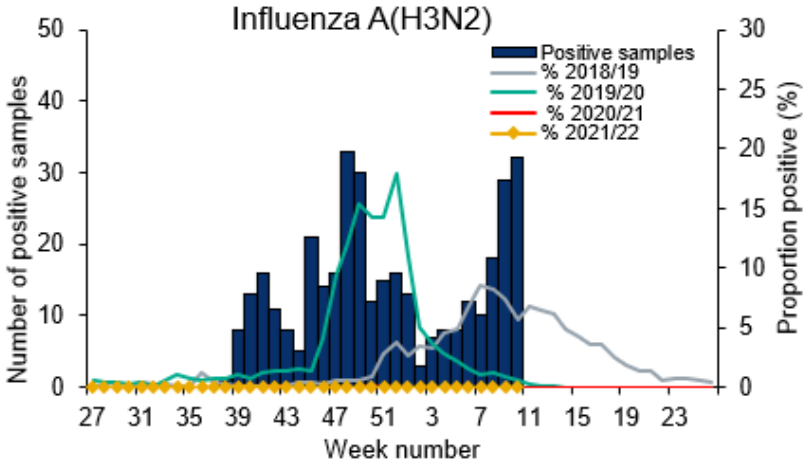
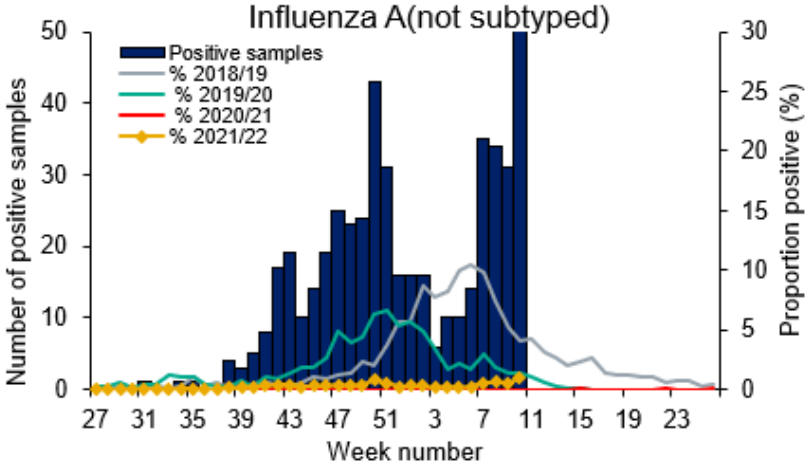
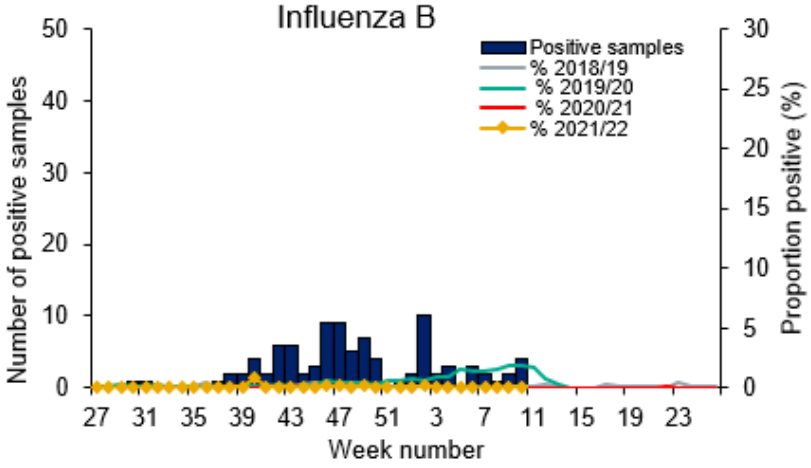
Respiratory DataMart – Influenza subtypes









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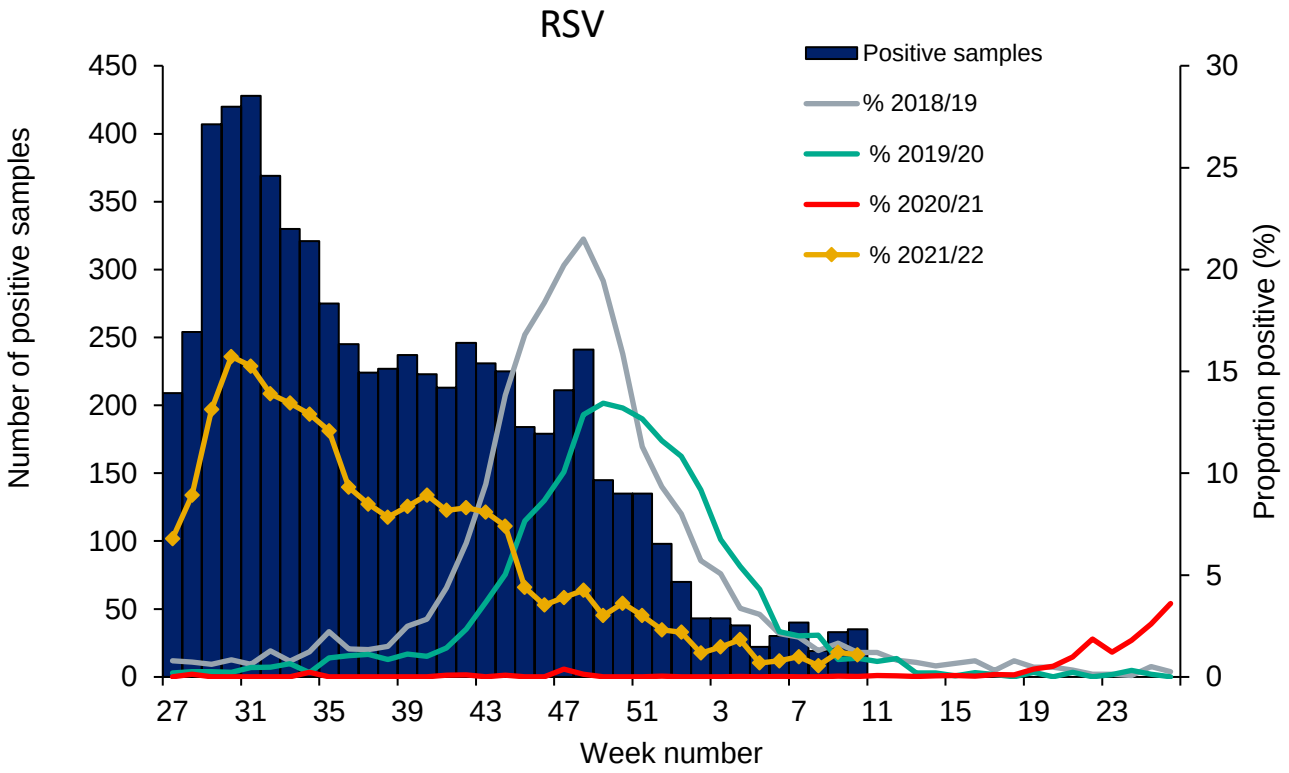
Respiratory DataMart – Respiratory syncytial virus (RSV)



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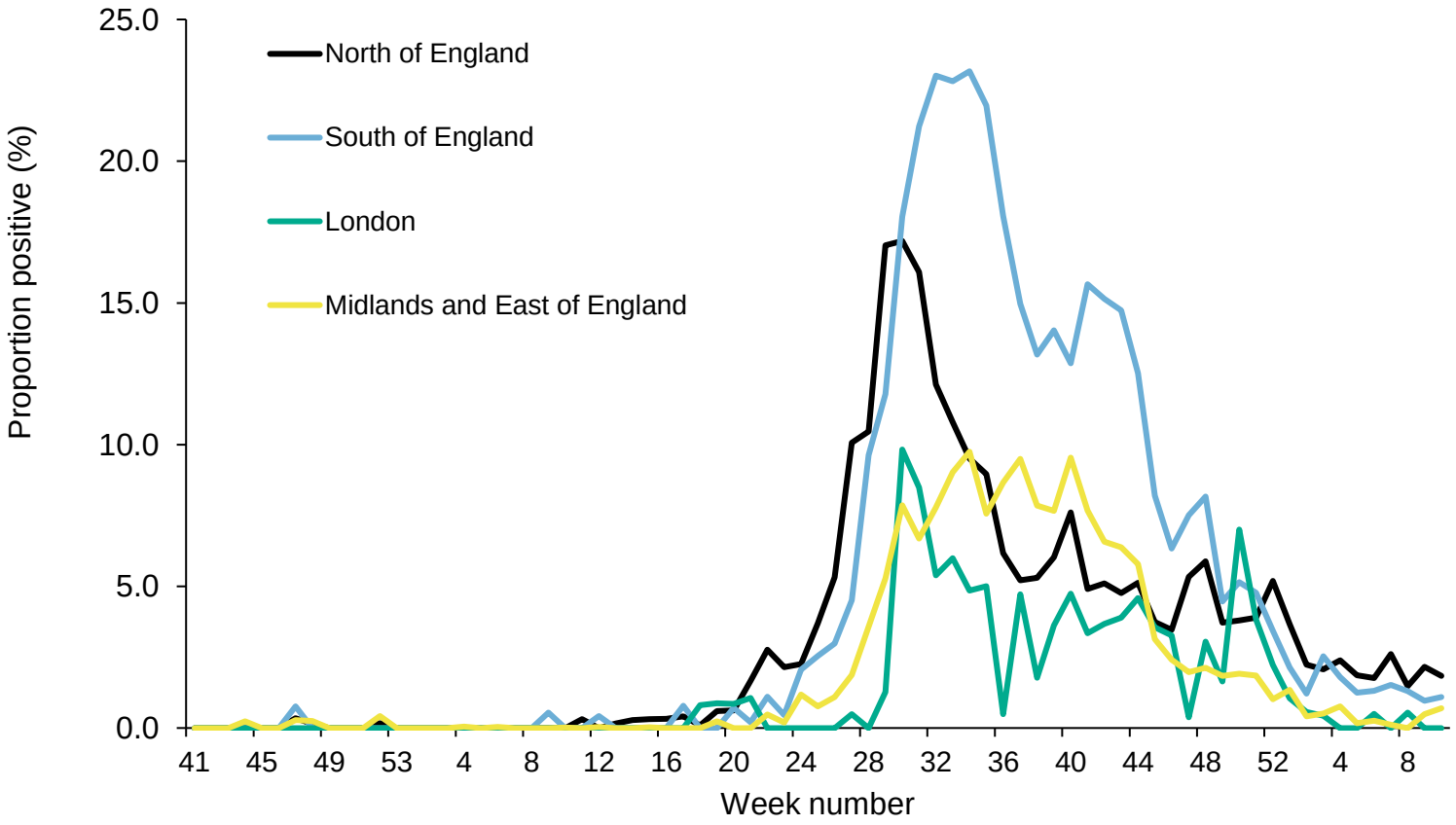
Respiratory DataMart – Respiratory syncytial virus (RSV) weekly positivity by UKHSA region



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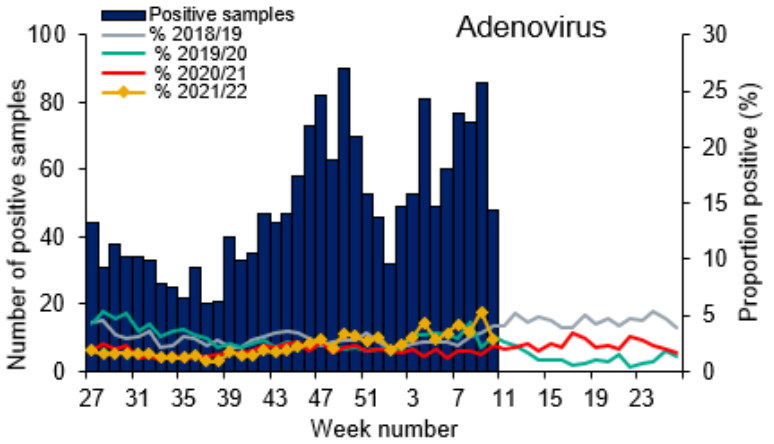
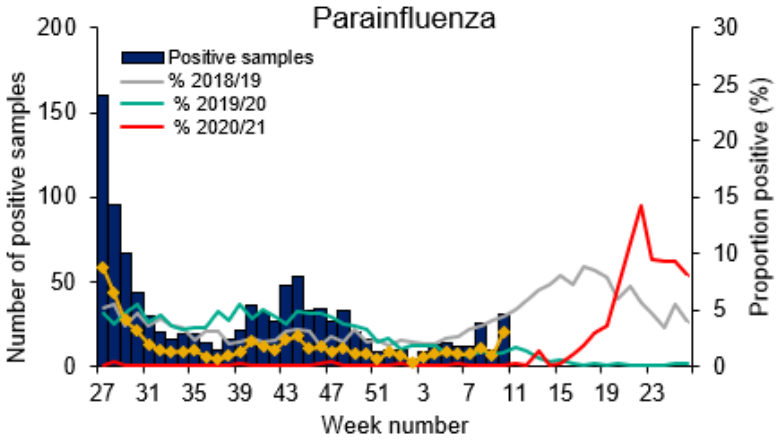
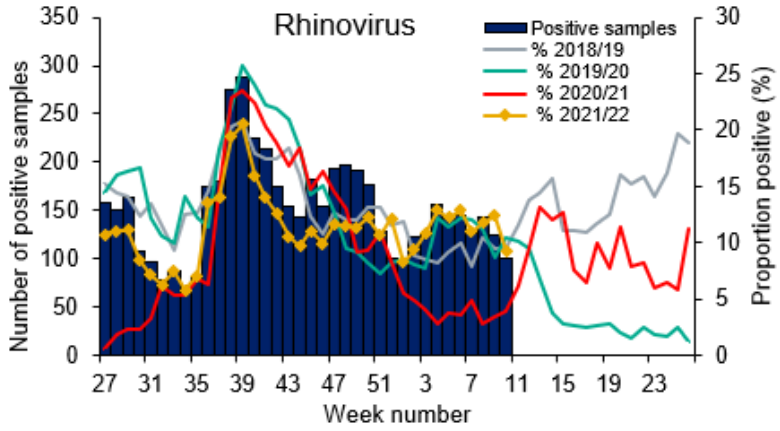
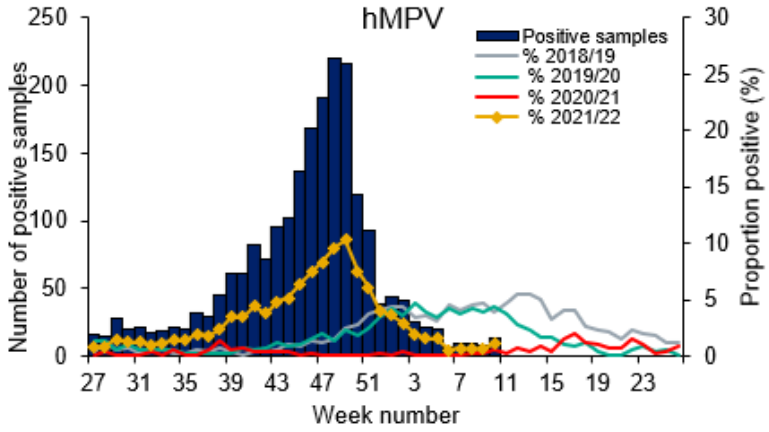
Respiratory DataMart – other respiratory viruses









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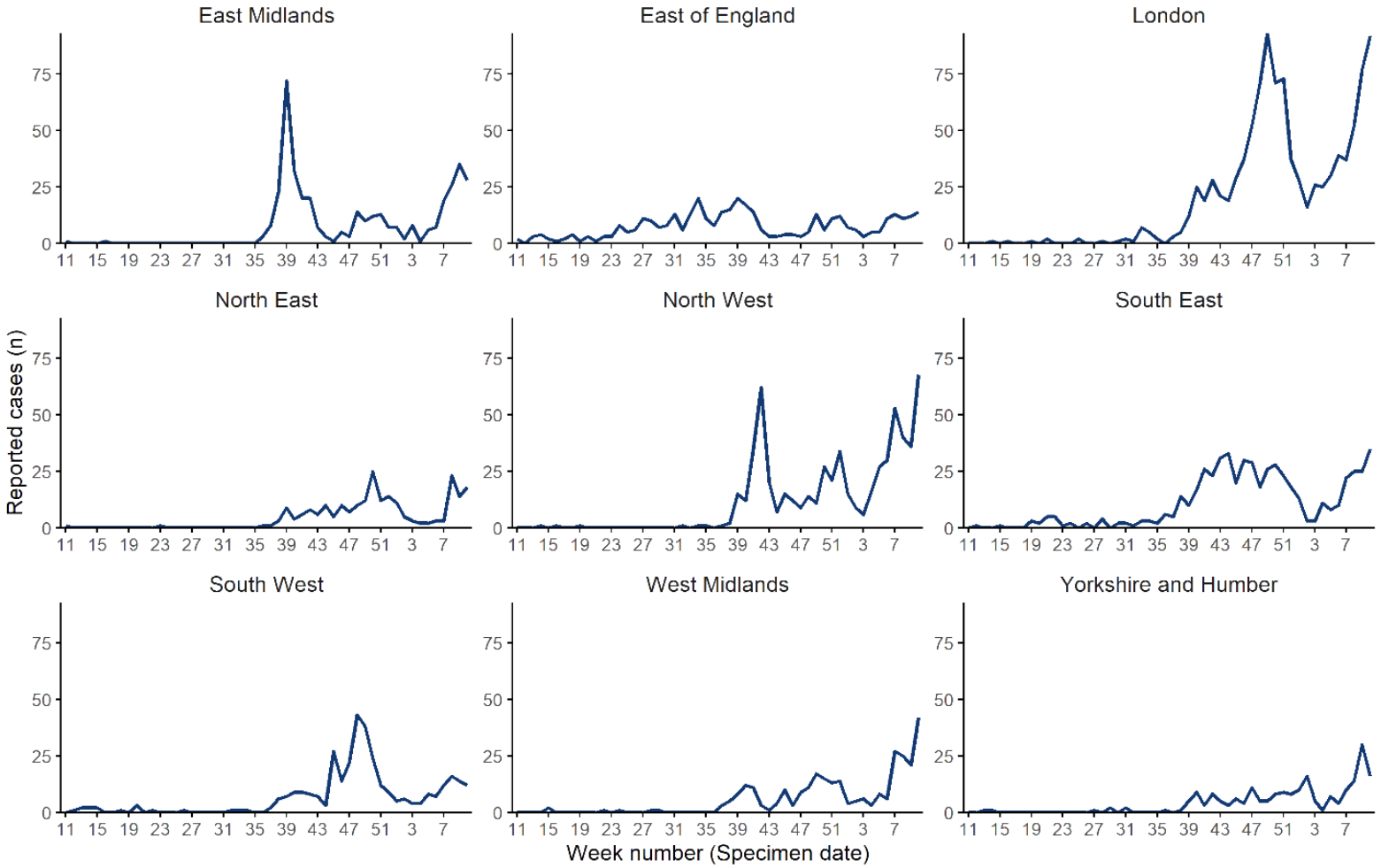
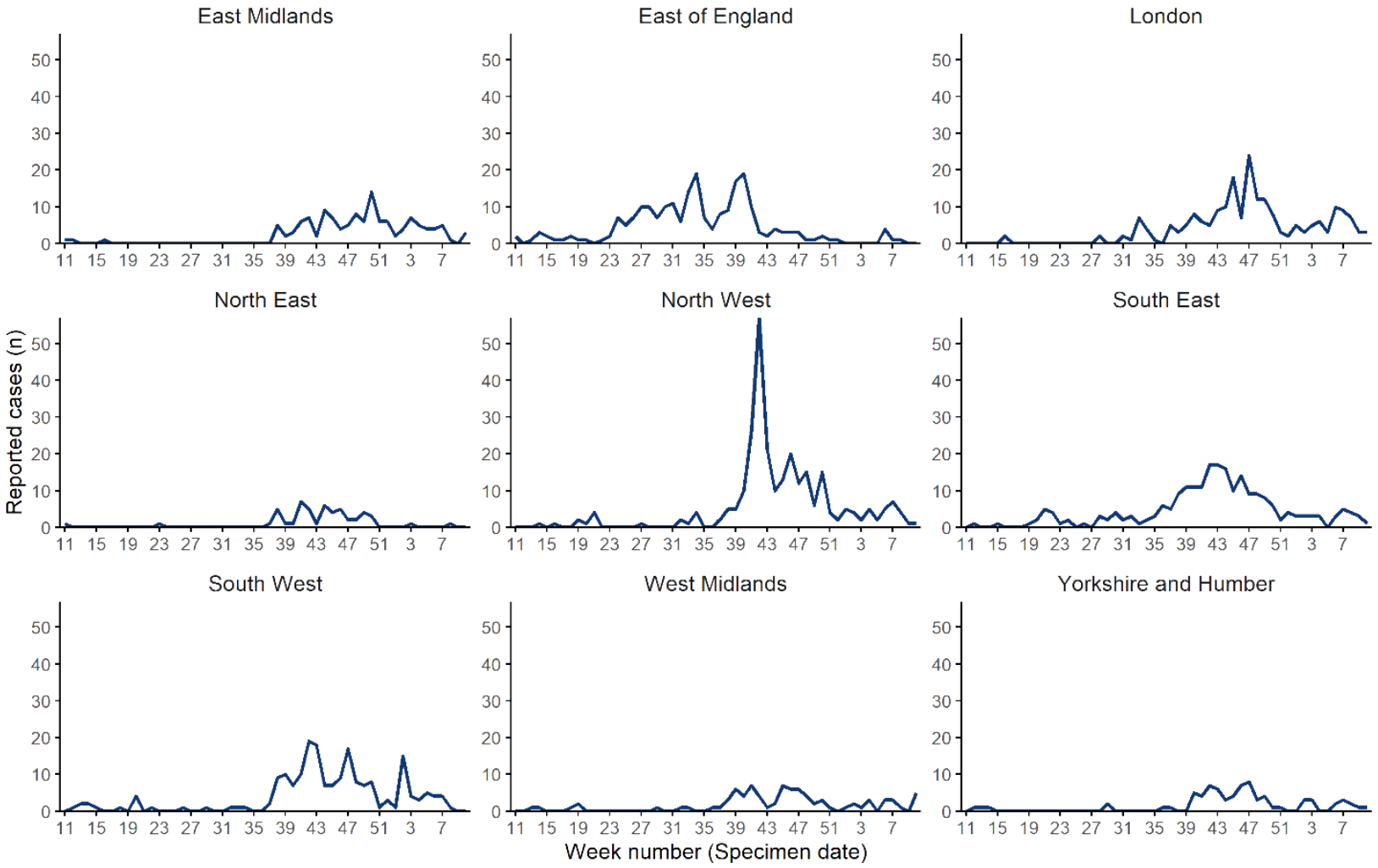
Second generation surveillance system (SGSS)

SGSS reported Influenza A cases by region (all ages)



The presented figures are based on laboratory reports through SGSS. Testing and reporting procedures vary by virus, UKHSA Centre and over time, including short-term trends in testing. Therefore comparisons should be done with caution.
Previously, this data was presented by report date however is now presented by specimen date.

SGSS reported Influenza B cases by region (all ages)



The presented figures are based on laboratory reports through SGSS. Testing and reporting procedures vary by virus, UKHSA Centre and over time, including short-term trends in testing. Therefore comparisons should be done with caution.
Previously, this data was presented by report date however is now presented by specimen date.

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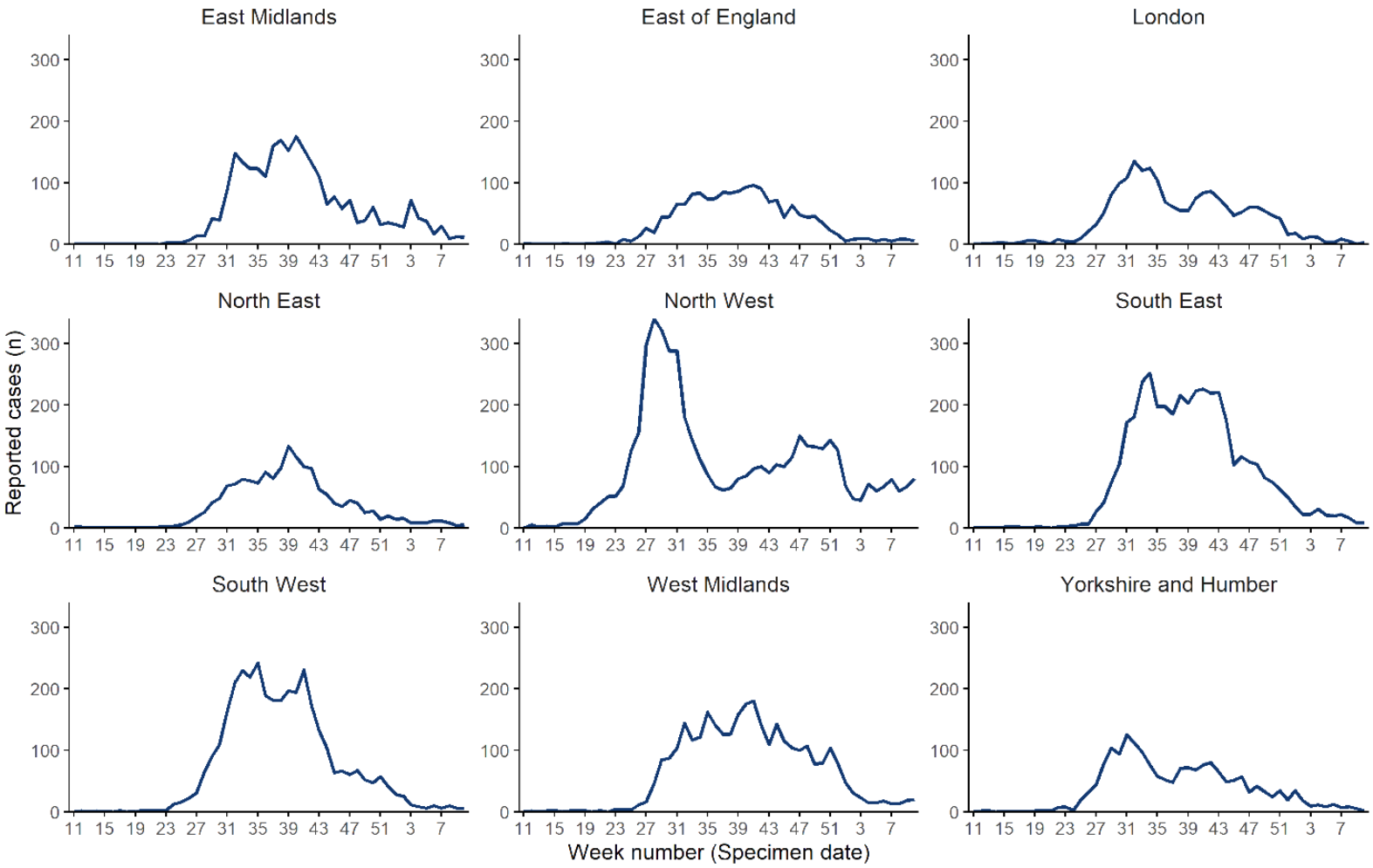
SGSS reported RSV cases by region (all ages)



The presented figures are based on laboratory reports through SGSS. Testing and reporting procedures vary by virus, UKHSA Centre and over time, including short-term trends in testing. Therefore comparisons should be done with caution. Previously, this data was presented by report date however is now presented by specimen date.

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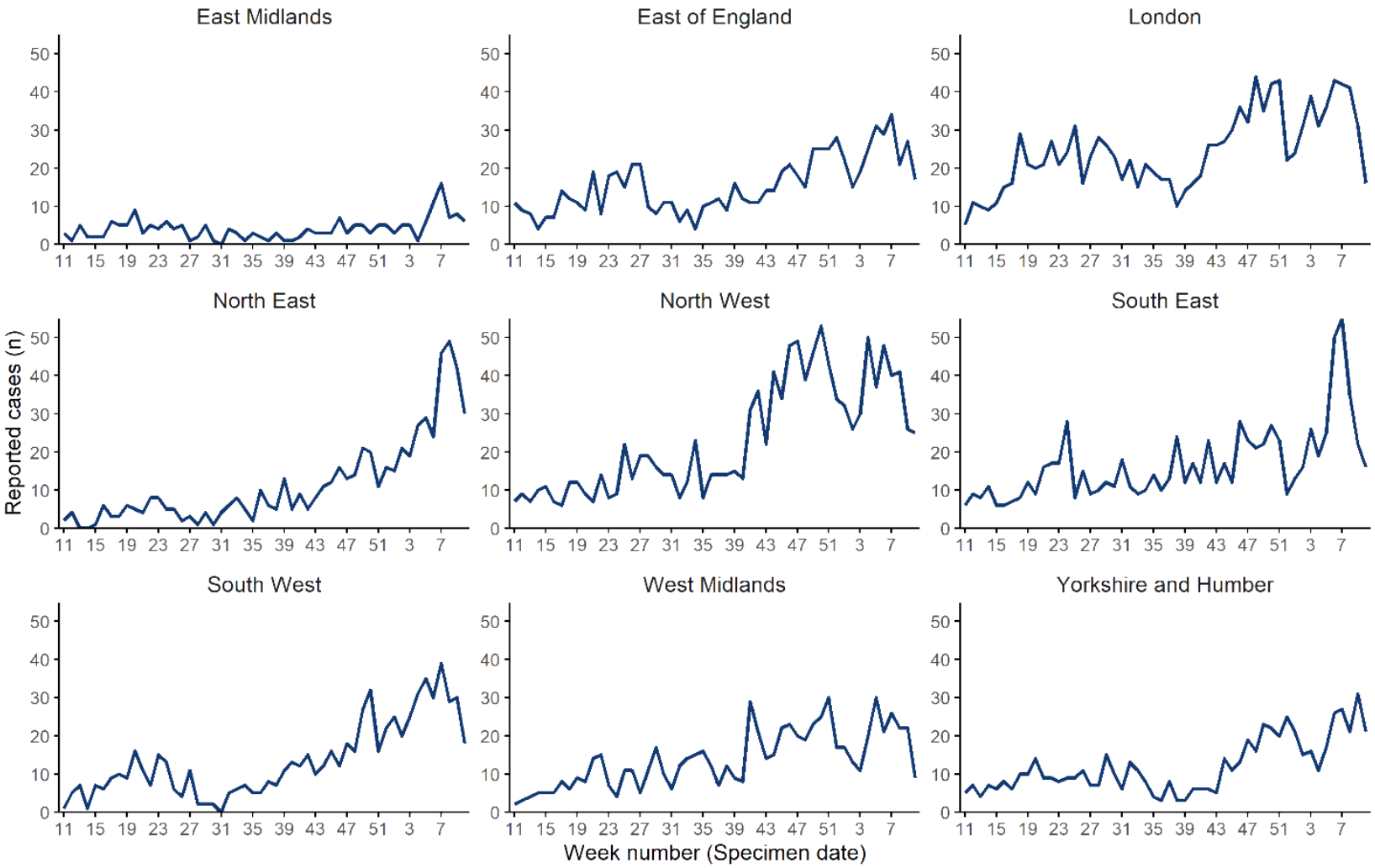
SGSS reported Adenovirus cases by region (all ages)



The presented figures are based on laboratory reports through SGSS. Testing and reporting procedures vary by virus, UKHSA Centre and over time, including short-term trends in testing. Therefore comparisons should be done with caution.

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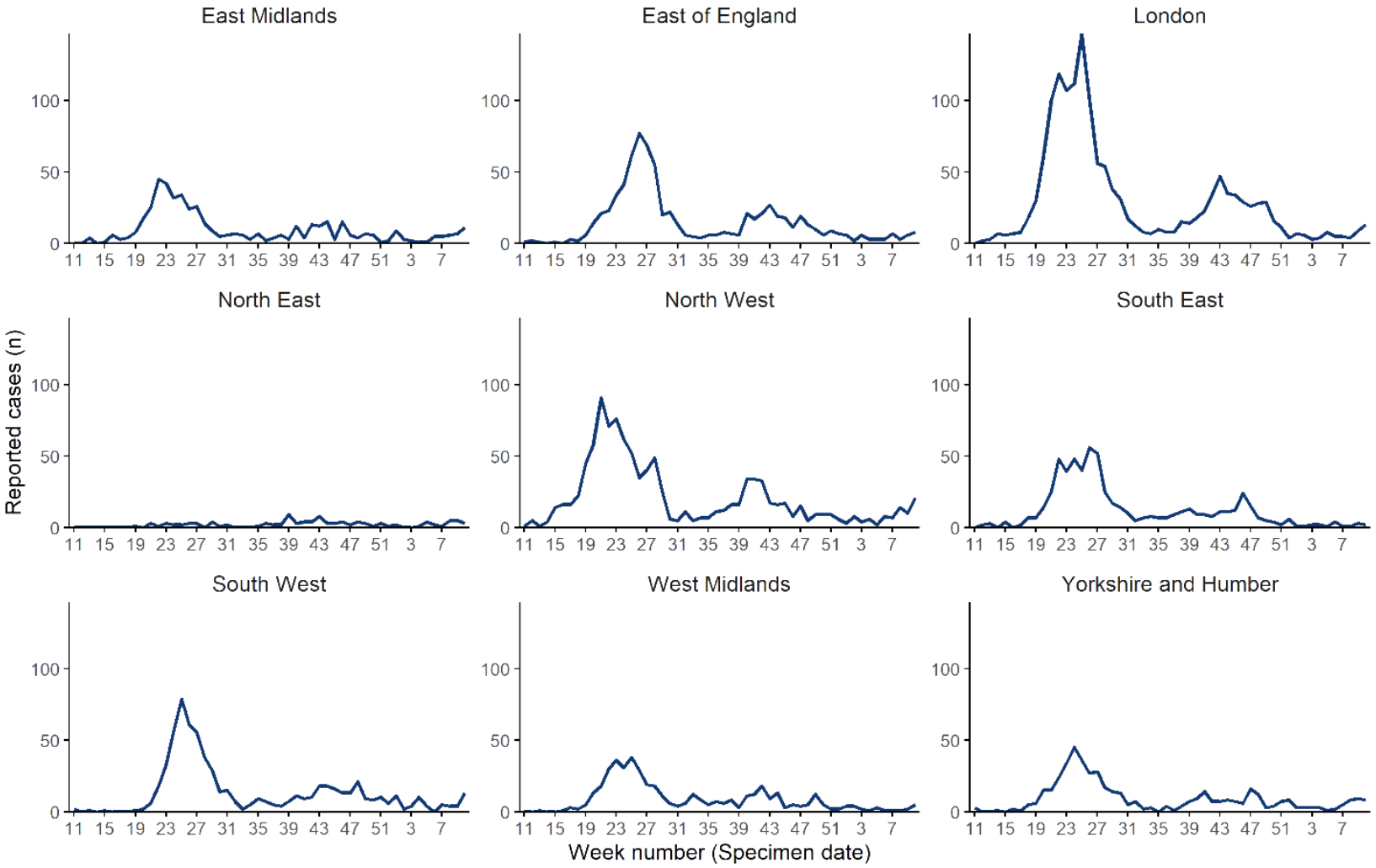
SGSS reported Parainfluenza cases by region (all ages)



The presented figures are based on laboratory reports through SGSS. Testing and reporting procedures vary by virus, UKHSA Centre and over time, including short-term trends in testing. Therefore comparisons should be done with caution.

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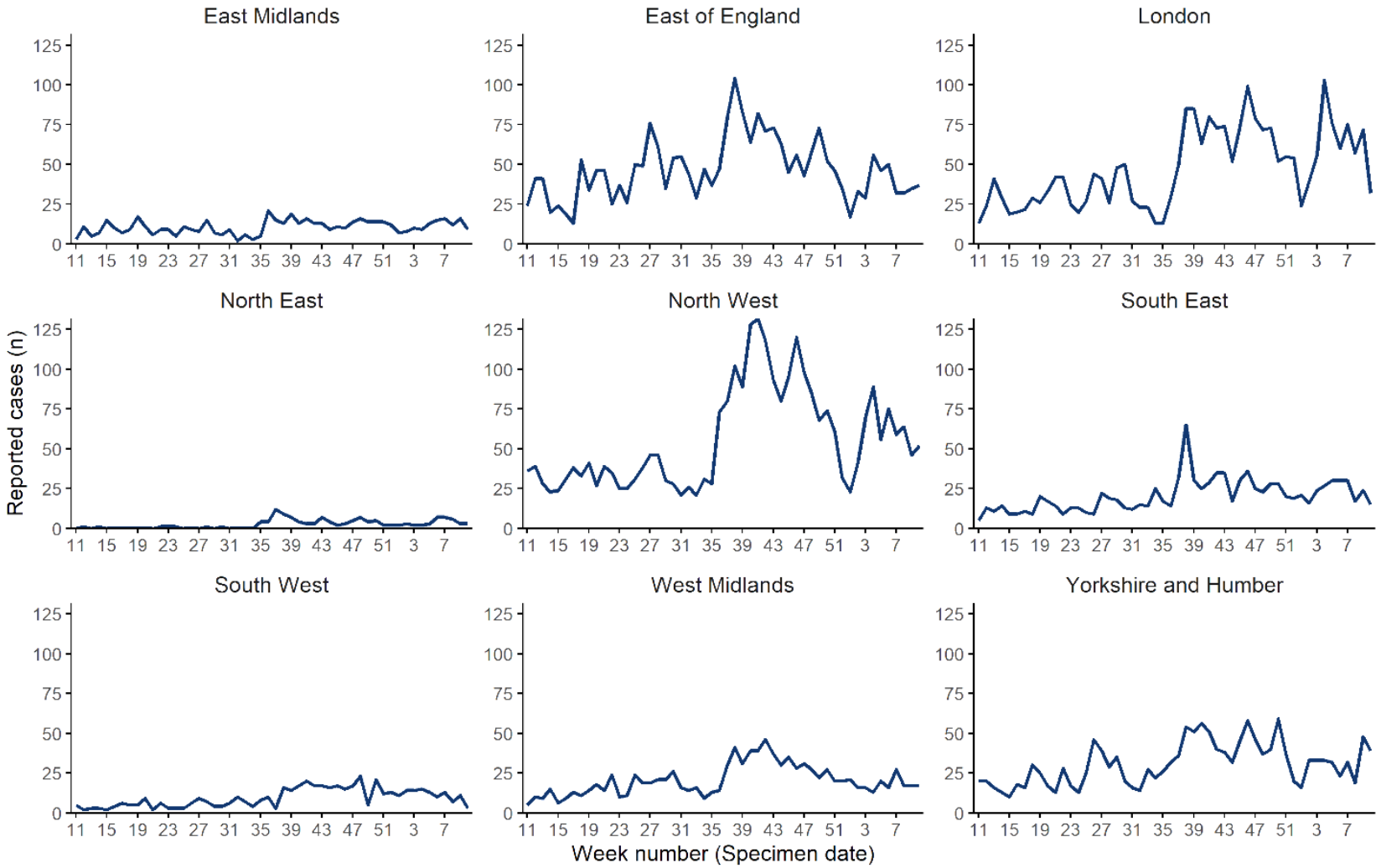
SGSS reported Rhinovirus cases by region (all ages)



The presented figures are based on laboratory reports through SGSS. Testing and reporting procedures vary by virus, UKHSA Centre and over time, including short-term trends in testing. Therefore comparisons should be done with caution.

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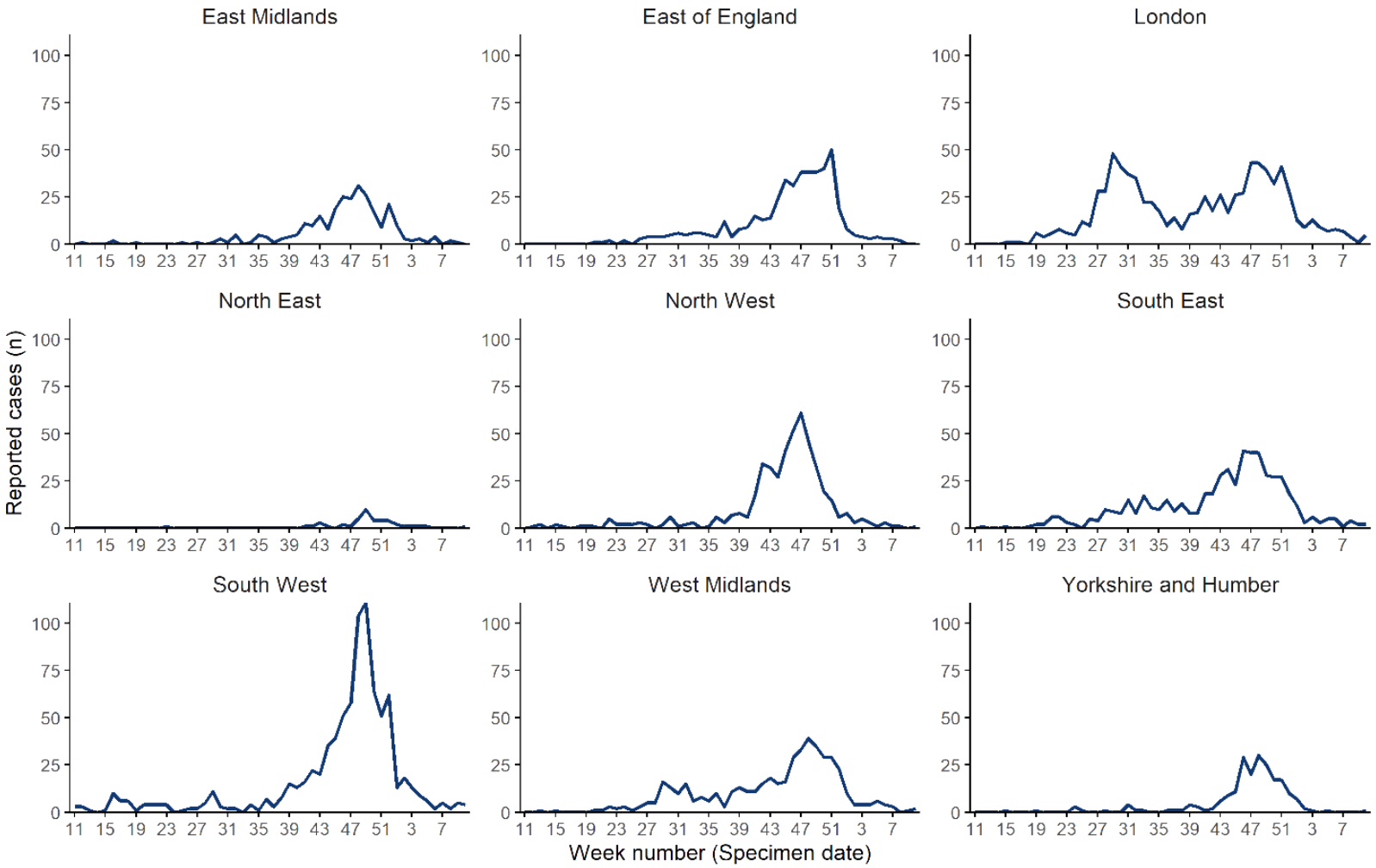
SGSS reported hMPV cases by region (all ages)



The presented figures are based on laboratory reports through SGSS. Testing and reporting procedures vary by virus, UKHSA Centre and over time, including short-term trends in testing. Therefore comparisons should be done with caution.

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Community surveillance

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COVID-19 clusters or outbreaks in educational settings

Data Information

- we report on new acute respiratory infection (ARI) incidents reported to Health Protection Teams (HPTs) and entered on HPZone in the previous reporting week in educational settings by locality
- individual case notes are reviewed by an epidemiologist and an assessment made about whether the criteria for a confirmed COVID-19 cluster or outbreak are met. See definitions below
- the incidents captured on HPZone represent a subset of all ongoing clusters and outbreaks in England. A variety of arrangements are in place with local authorities and other stakeholders supporting HPTs, however data may not routinely be documented on HPZone. As a result, the number of outbreaks reported for some of the regions are underestimates
- For the 2021-2022 academic year the thresholds for reporting an outbreak in an educational setting to HPTs and HPZone have been revised, therefore comparisons with the 2020 to 2021 season should be interpreted with caution. Please see the next slide for the updated thresholds.

Caveats

- National Schools and Universities helplines remain in place to support educational settings to manage cases and outbreaks that may not require HPT input
- From Monday 19 July 2021, schools, colleges and nurseries no longer carry out routine contact tracing. Close contacts are now identified and contacted by NHS Test and Trace.

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COVID-19 clusters or outbreaks in educational settings

Thresholds for reporting

For the 2021-2022 academic year the thresholds for reporting an outbreak in an educational setting to HPZone have been revised, therefore when comparing with the 2020-2021 season, please interpret with caution.

Clusters and outbreaks are now reported to HPZone if either of the two following criteria are met:

- 5 cases or 10% (whichever is reached first) test-confirmed cases of COVID-19 (either PCR testing or LFD Ag testing with follow-up PCR) within 10 days, among students or staff clustered in a consistent group or cohort. Dates should be calculated based on illness onset, or test date if asymptomatic

Or

- Evidence of severe illness e.g. students or staff members admitted to hospital or a death as a result of a COVID–19 infection (PCR or LFD Ag with follow up PCR) as the setting may require advice on risk assessment and communication.

Definitions

Cluster: two or more test-confirmed cases of COVID-19 among individuals associated with a specific non-residential setting with illness onset dates within a 14-day period (in the absence of detailed information about the type of contact between the cases).

Outbreak: two or more test-confirmed cases of COVID-19 among individuals associated with a specific non-residential setting with illness onset dates within 14 days, and one of:

- identified direct exposure between at least 2 of the test-confirmed cases in that setting (for example under one metre face to face, or spending more than 15 minutes within 2 metres) during the infectious period of one of the cases
- When there is no sustained local community transmission - absence of an alternative source of infection outside the setting for the initially identified cases

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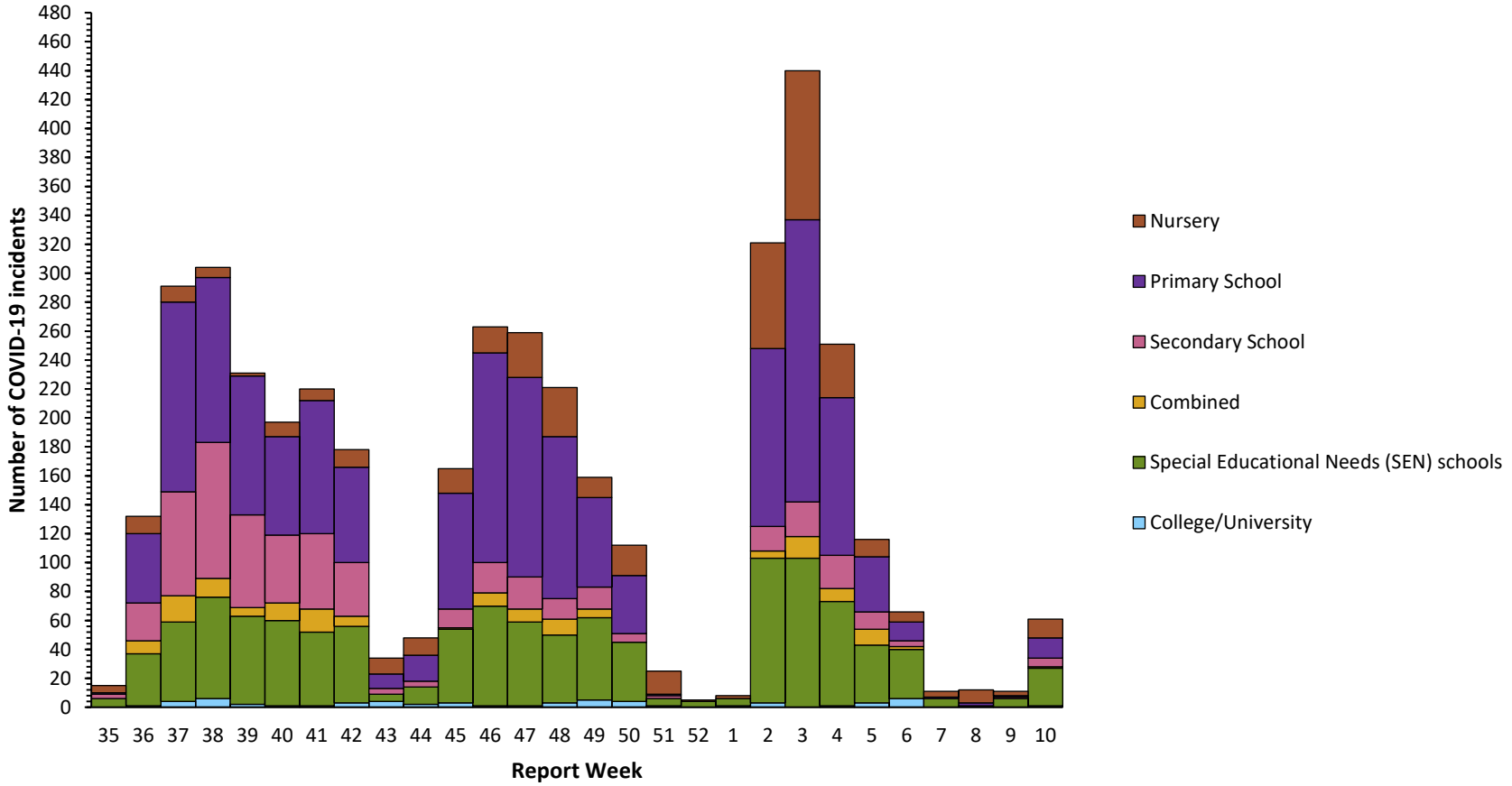
Number of COVID-19 confirmed clusters or outbreaks by type of educational setting, England



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Number of COVID-19 confirmed clusters or outbreaks by type of educational setting, England

End of academic year total

Week 36 2020- 34 2021

Centres	Cumulative number of confirmed COVID-19 clusters or outbreaks by type of educational setting for the 2020/21 academic year Week 36 2020- 34 2021						
	Nursery	Primary School	Secondary School	Combined	Special Educational Needs (SEN) schools	College University	Total
Total	846	2125	2122	40	666	268	6067

Week 10 2022

Main table

PHE Centres	Cumulative number of confirmed COVID-19 clusters or outbreaks by type of educational setting for the 2021/22 academic year from Week 35 2021						
	Nursery	Primary School	Secondary School	Combined	Special Educational Needs (SEN)	College University	Total
East Midlands Centre	68 (1)	54 (0)	29 (1)	14 (0)	150 (6)	5 (0)	**320 (8)**
East of England Centre	0 (0)	12 (0)	8 (0)	3 (0)	11 (0)	2 (0)	**36 (0)**
London Centre	348 (10)	1065 (13)	251 (3)	59 (0)	196 (3)	29 (0)	**1948 (29)**
North East Centre	0 (0)	2 (0)	0 (0)	0 (0)	1 (0)	0 (0)	**3 (0)**
North West Center	9 (0)	29 (0)	11 (0)	4 (0)	105 (2)	7 (0)	**165 (2)**
South East Centre	42 (0)	387 (1)	127 (0)	34 (0)	257 (6)	7 (1)	**854 (8)**
South West Centre	4 (1)	62 (0)	79 (2)	34 (1)	210 (5)	1 (0)	**390 (9)**
West Midlands Centre	17 (0)	72 (0)	51 (0)	7 (0)	128 (1)	6 (0)	**281 (1)**
Yorkshire & the Humbe	17 (1)	35 (0)	27 (0)	5 (0)	75 (3)	0 (0)	**159 (4)**
Total	**505 (13)**	**1718 (14)**	**583 (6)**	**160 (1)**	**1133 (26)**	**57 (1)**	**4156 (61)**

* Number of clusters or outbreaks for the most recent week in brackets

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Surveillance in ‘educational-age’ cohorts

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Methodology and limitations

- Data source: SGSS Pillar 1 (NHS and UKHSA testing) and Pillar 2 (community testing) – England
- Educational-age cohorts have been calculated using dates of birth that correspond to a particular year group. School year groups run from 1 September to 31 of August of the following calendar year.
- We include all cases regardless of whether or not they attended an educational setting or whether or not the educational setting was open during the reporting period
- Data for the most recent week are provisional and likely to be an underestimate
- The 2021-2022 school season commenced 1 September 2021. For information regarding the 2020-2021 school season please refer to the Weekly National Flu and COVID-19 reports published between 22 October 2020 to 2 September 2021.
- The following cohorts became eligible for COVID-19 vaccination on the dates indicated below :
  - All over 18 year olds, from week 24 2021
  - All 16 to 17 year olds, from week 33 2021
  - All 12 to 15 year olds, from week 38 2021
- More information on vaccine coverage can be found here: https://www.gov.uk/government/publications/covid-19-vaccine-surveillance-report
- From week 39 the data for the “Secondary age cohort” (Years 7-13) has been split into the “Secondary age cohort” and the “Sixth form age cohort” (Years 7-11 and Years 12-13 respectively)
- From 31 January 2022, UKHSA moved all COVID-19 case reporting in England to use a new episode-based definition which includes possible reinfections. Each infection episode is counted separately if there is at least 91 days between positive test results (PCR or LFD). Each infection episode begins with the earliest positive specimen date. Further information can be found here. This change has been reflected in slides 3 to 16.
- From 21 February 2022 the government published a new plan for living with COVID-19 with the following guidelines for educational settings:
  - Twice weekly asymptomatic testing in mainstream educational settings is no longer advised.
  - Children and young people who test positive will be advised not to attend their education setting while they are likely to be infectious.
  - Children and young people who usually attend an education or childcare setting and who live with someone who has COVID-19 will be advised to continue to attend the setting as normal.
- Changes in incidence and positivity data throughout the pandemic should be interpreted in the context of testing policy and behaviour

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Methodology and limitations - Birth cohort – Year group

- The table aside represents the birth cohorts for each year group

Birth cohort			Year group
01/09/1999	to	31/08/2000	Uni Year 4
01/09/2000	to	31/08/2001	Uni Year 3
01/09/2001	to	31/08/2002	Uni Year 2
01/09/2002	to	31/08/2003	Uni Year 1
01/09/2003	to	31/08/2004	Year 13
01/09/2004	to	31/08/2005	Year 12
01/09/2005	to	31/08/2006	Year 11
01/09/2006	to	31/08/2007	Year 10
01/09/2007	to	31/08/2008	Year 9
01/09/2008	to	31/08/2009	Year 8
01/09/2009	to	31/08/2010	Year 7
01/09/2010	to	31/08/2011	Year 6
01/09/2011	to	31/08/2012	Year 5
01/09/2012	to	31/08/2013	Year 4
01/09/2013	to	31/08/2014	Year 3
01/09/2014	to	31/08/2015	Year 2
01/09/2015	to	31/08/2016	Year 1
01/09/2016	to	31/08/2017	Reception
01/09/2017	to	31/08/2018	Pre-school
01/09/2018	to	31/08/2019	Nursery

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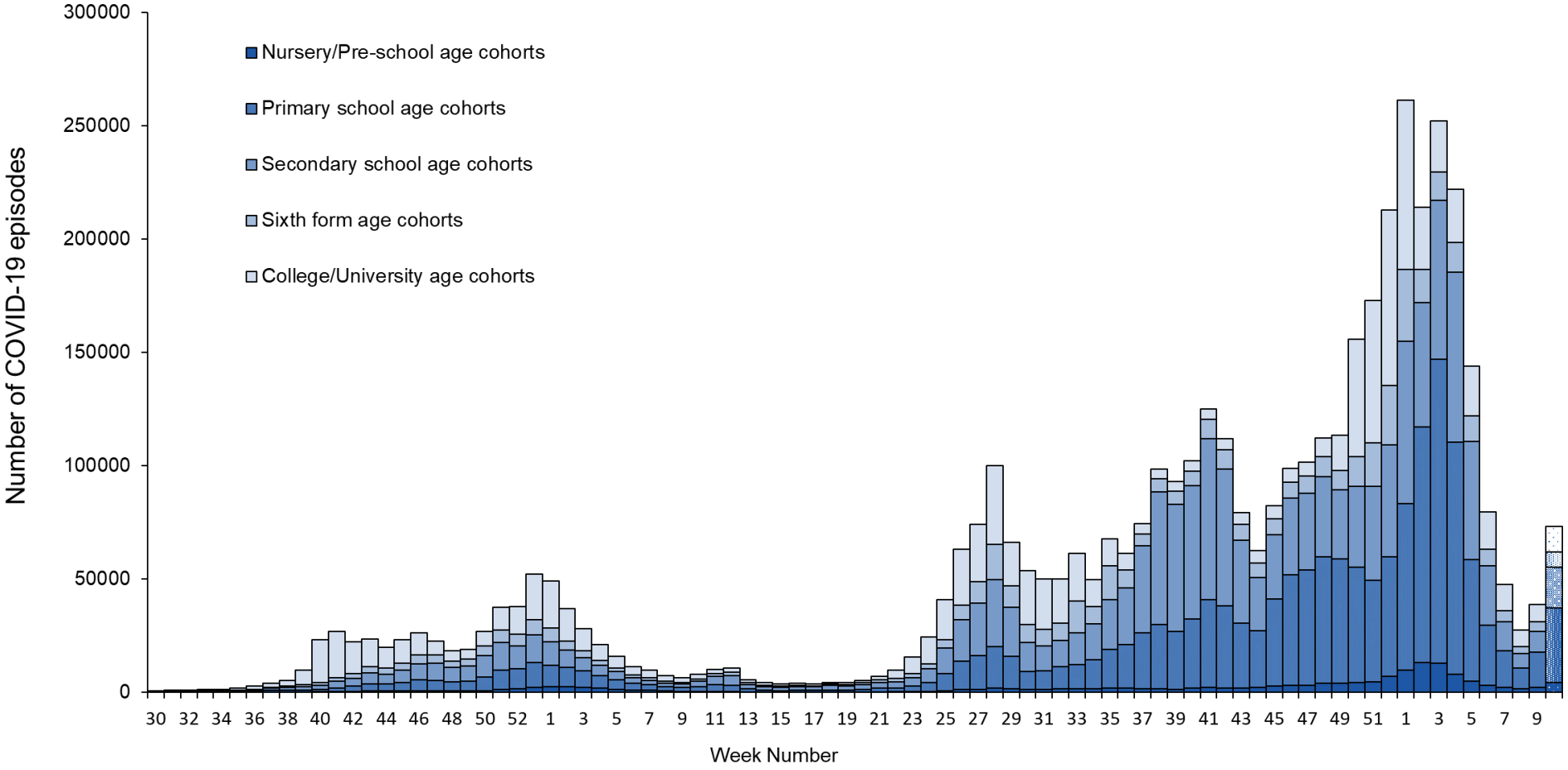
Weekly number of COVID-19 episodes, from Week 30 2020 in:
- nursery/preschool age cohorts
- primary school age cohorts
- secondary school age cohorts
- college/University age cohorts



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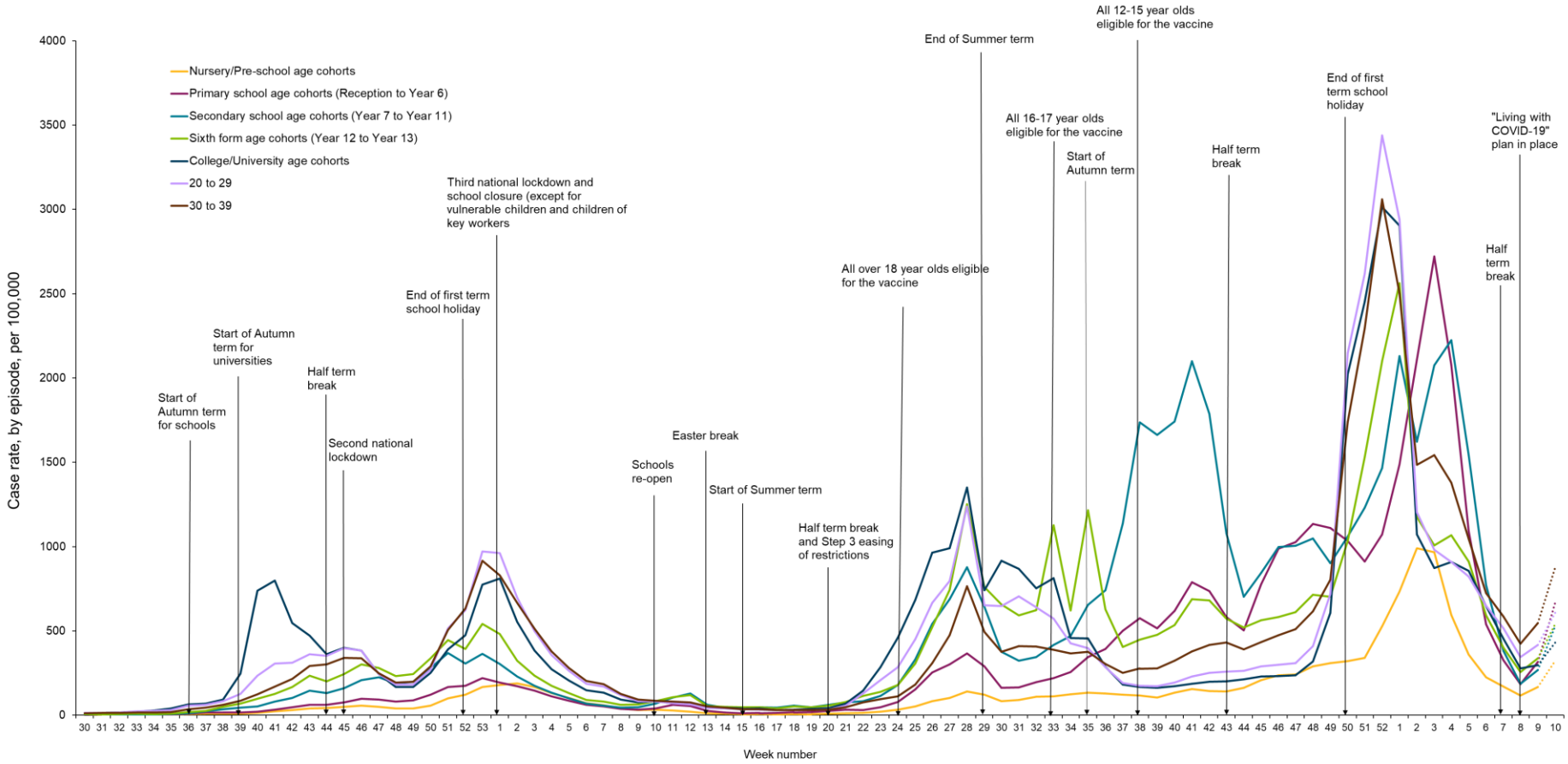
Weekly incidence of COVID-19 cases, by episode, per 100,000 population from Week 30 2020, in:
- nursery/preschool age cohorts
- primary school age cohorts (Reception to Year 6)
- secondary school age cohorts (Year 7 to Year 11)
- sixth form (Year 12 to Year 13)
- college/University age cohorts



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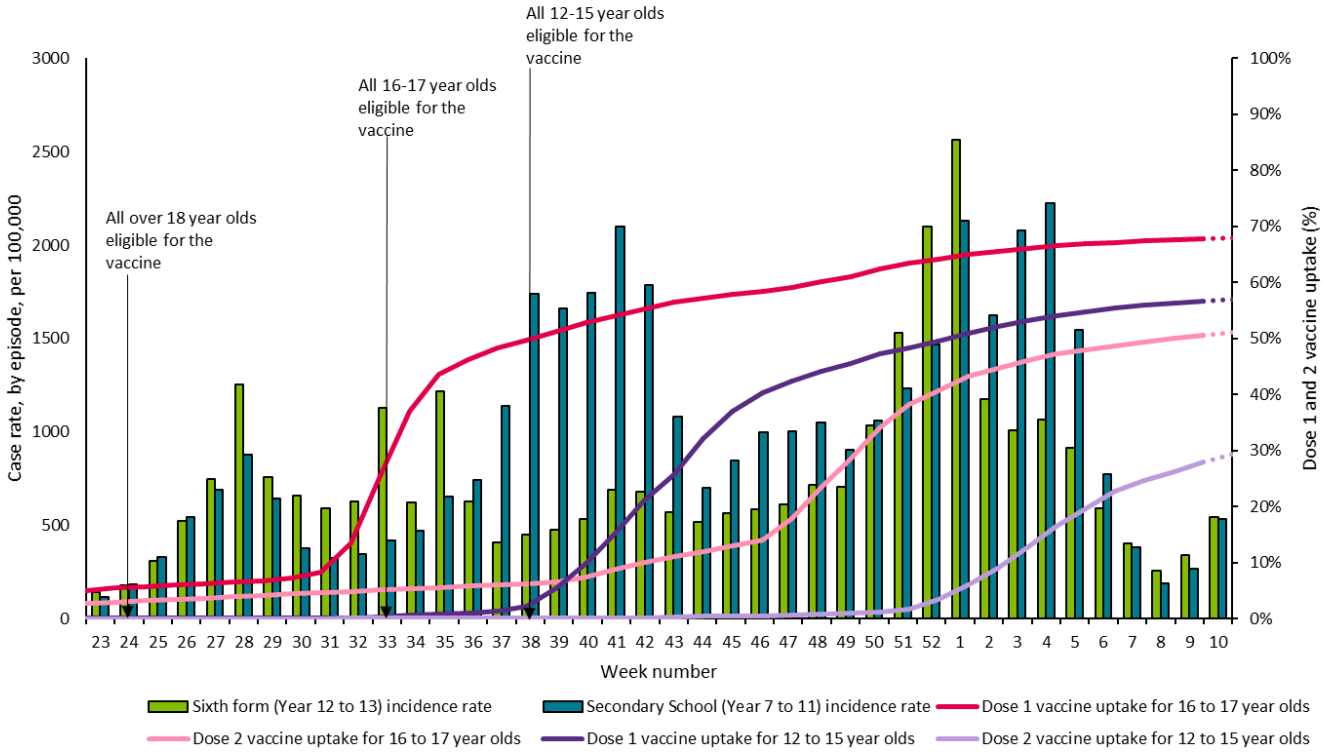
Weekly incidence of COVID-19 cases, by episode, per 100,000 population from Week 23 2021, in secondary age cohorts (Year 7 to 11) and sixth form age cohorts (Year 12 to Year 13) with dose 1 and dose 2 vaccine uptake in 12 to 15 year olds and in 16 to 17 year olds

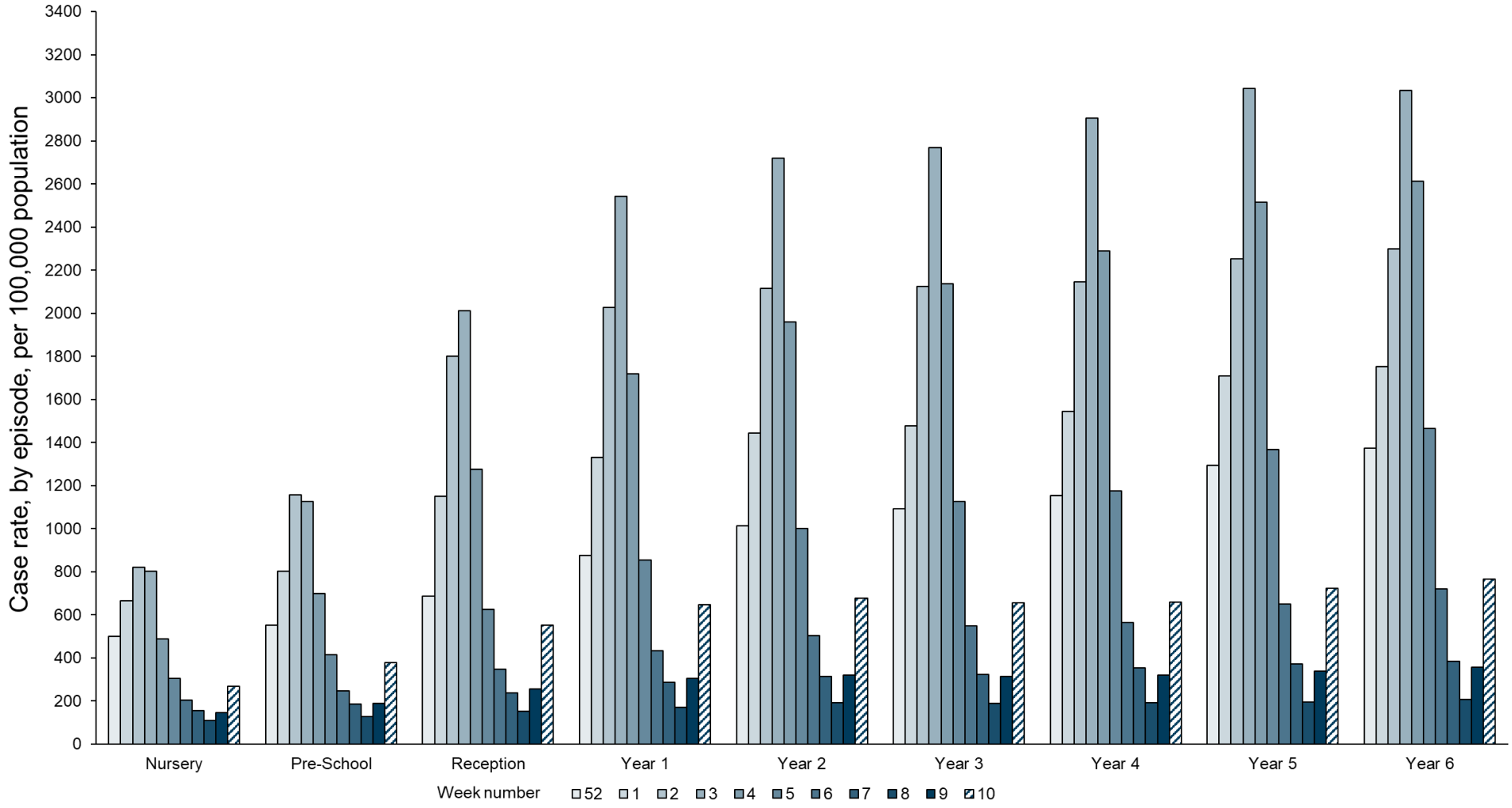


Incidence definition: School age cohorts are calculated based on academic year birth cohorts. Those born between 01/09/2004 – 31/08/2005 are included in the year 12 school group and those born between 01/09/2003 – 31/08/2004 are included in the year 13 school group. Case rate denominators are sourced from ONS 2020 mid-year estimates.

Vaccine coverage definition: From Week 42 the ages are calculated based on age as of 31 August 2021. The under 50 age group includes all those aged under 50 including those born after the 31 August 2021 (denominator). Those whose date of birth is after the 31 August 2021, have an age of zero and are included in the denominator. Only vaccinations recorded as given to persons aged greater or equal to 1 have been included (numerator). Both numerators and denominators are sourced from the NIMS and exclude deaths. All data presented are for vaccinations within the living population on the date of extraction and therefore removes both formal and informal registered deaths in the numerator and denominator for the purposes of calculating vaccine uptake.

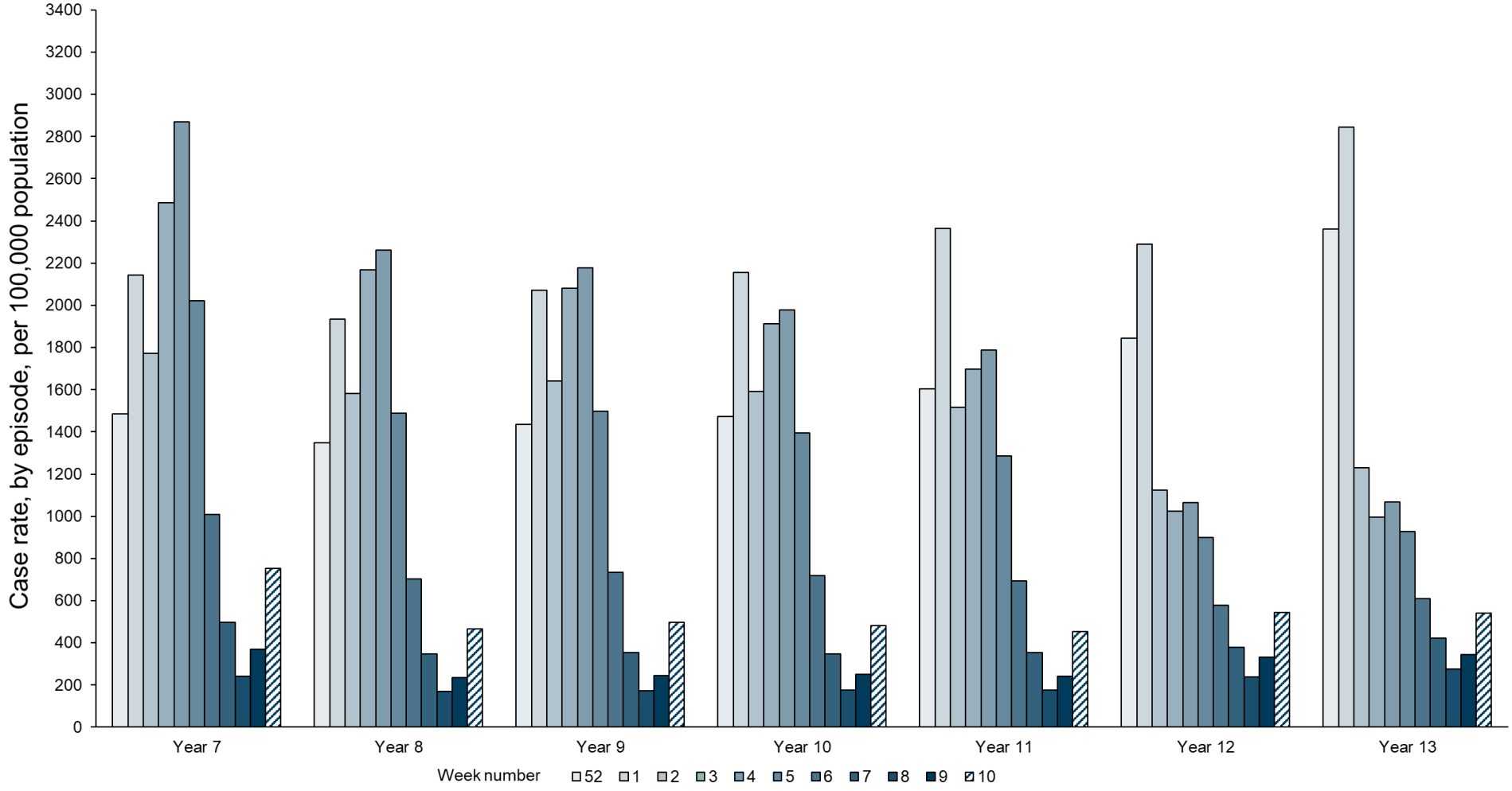
UK Health Security Agency

Weekly incidence of COVID-19 cases, by episode, per 100,000 population in educational age cohorts presented by Year group, from nursery to Year 6, weeks 52 2021 to 10 2022



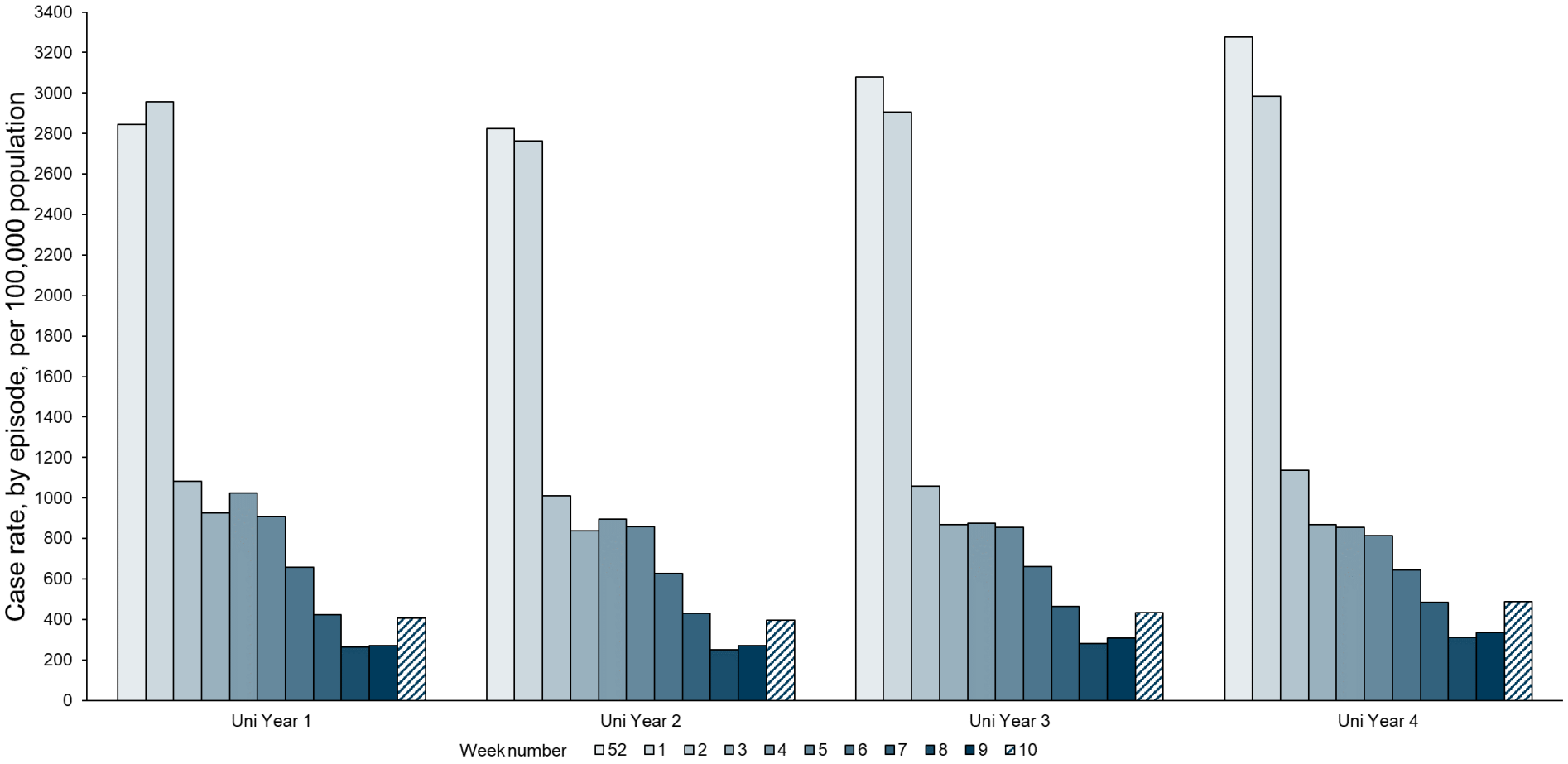
UK Health Security Agency

Weekly incidence of COVID-19 cases, by episode, per 100,000 population in educational age groups presented by secondary school year groups (Year 7 to Year 13), weeks 52 2021 to 10 2022



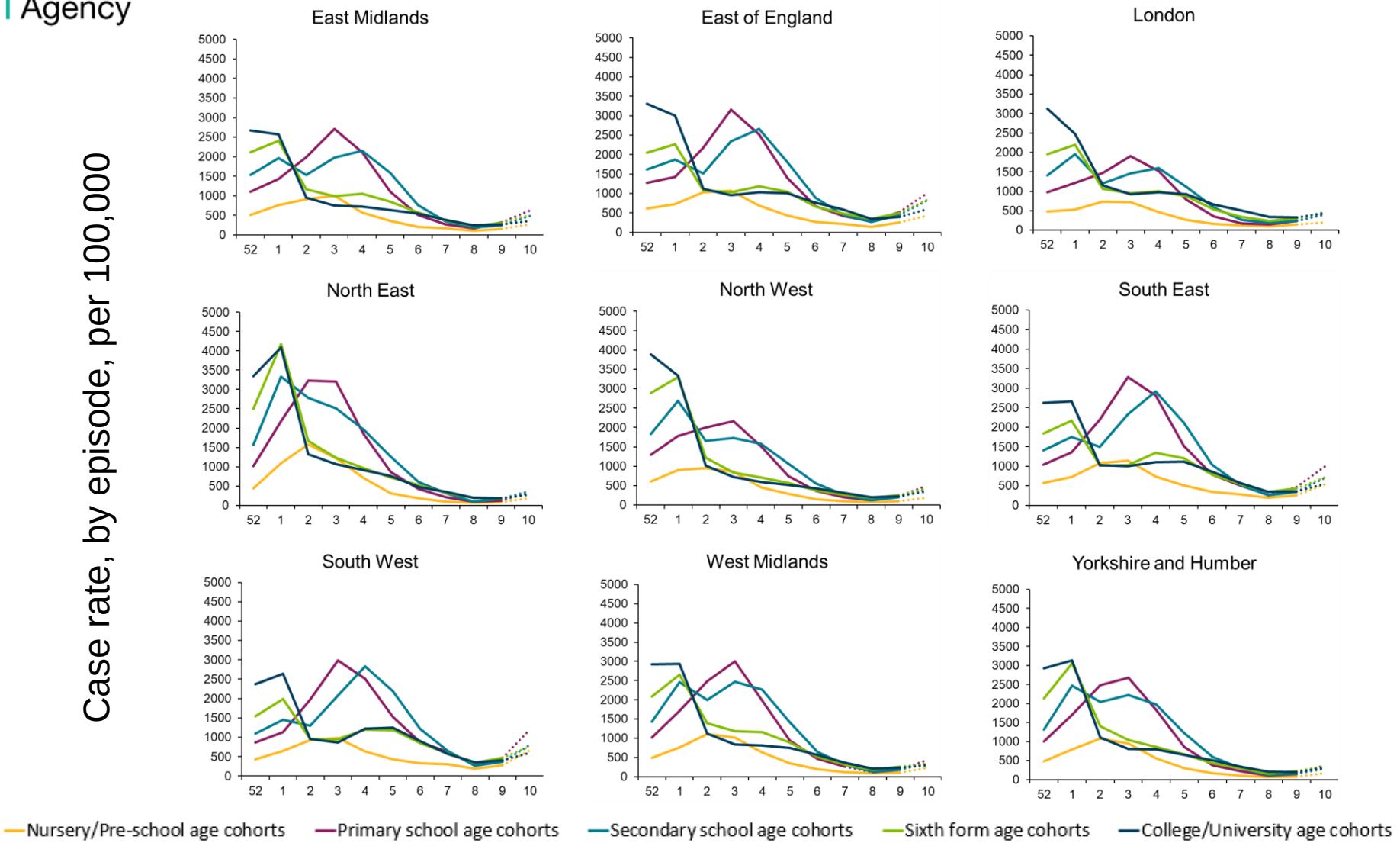
UK Health Security Agency

Weekly incidence of COVID-19 cases, by episode, per 100,000 population in educational age cohorts corresponding to university/college year groups, weeks 52 2021 to 10 2022



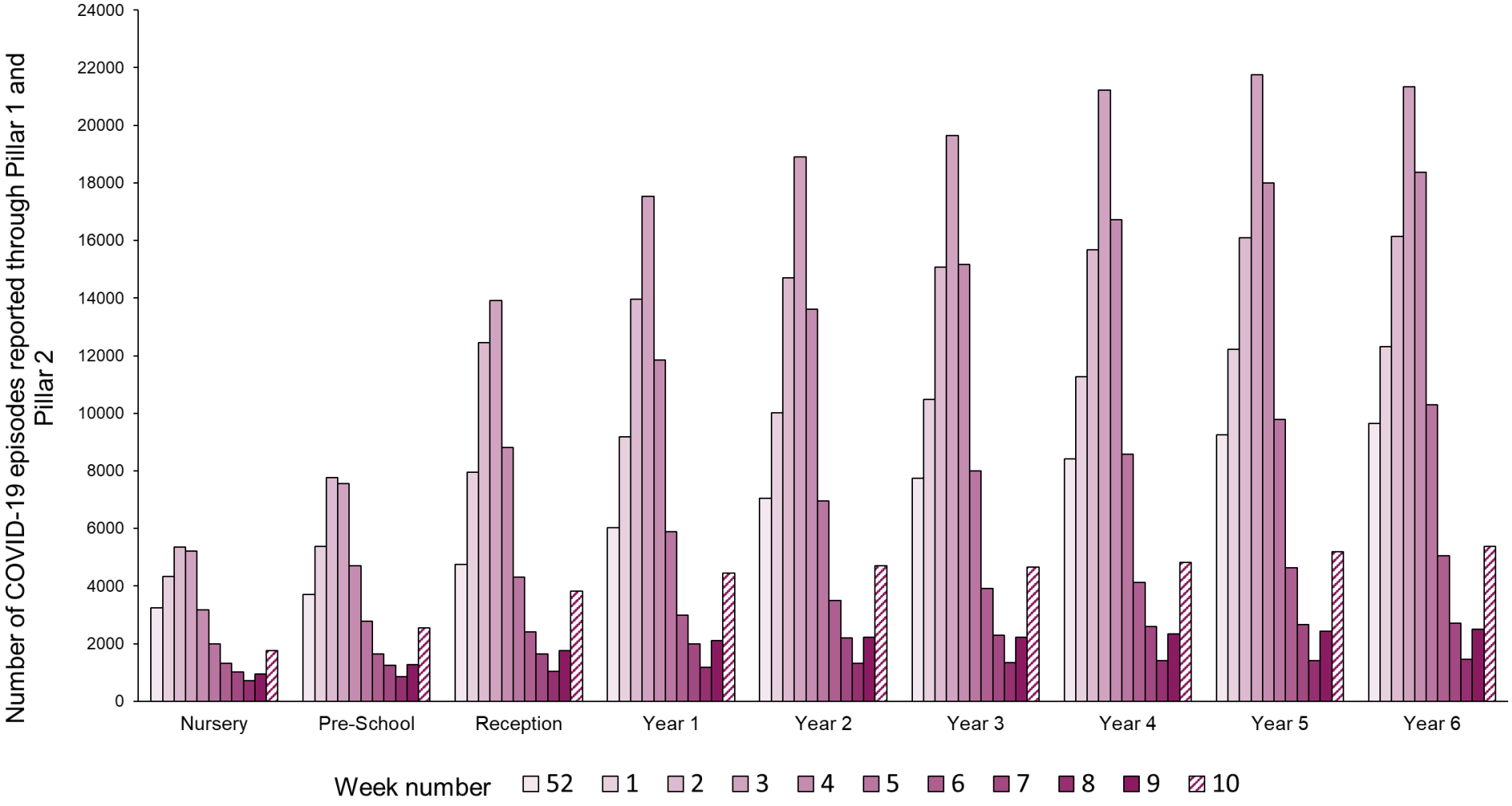
UK Health Security Agency

Weekly incidence of COVID-19 cases, by episode, per 100,000 population by educational age cohorts and UKHSA region, weeks 52 2021 to 10 2022



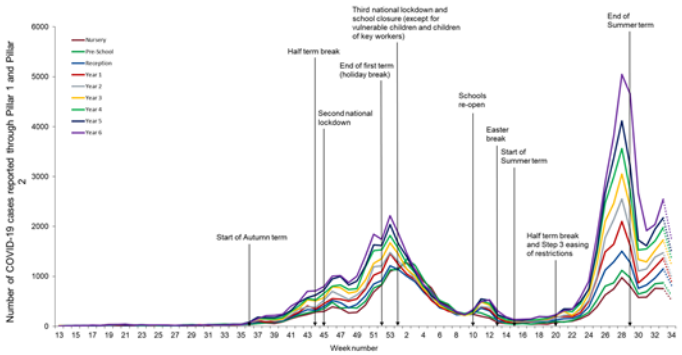
UK Health Security Agency

Weekly number of new COVID-19 episodes in educational age cohorts presented by Year group, from nursery to Year 6, weeks 52 2021 to 10 2022

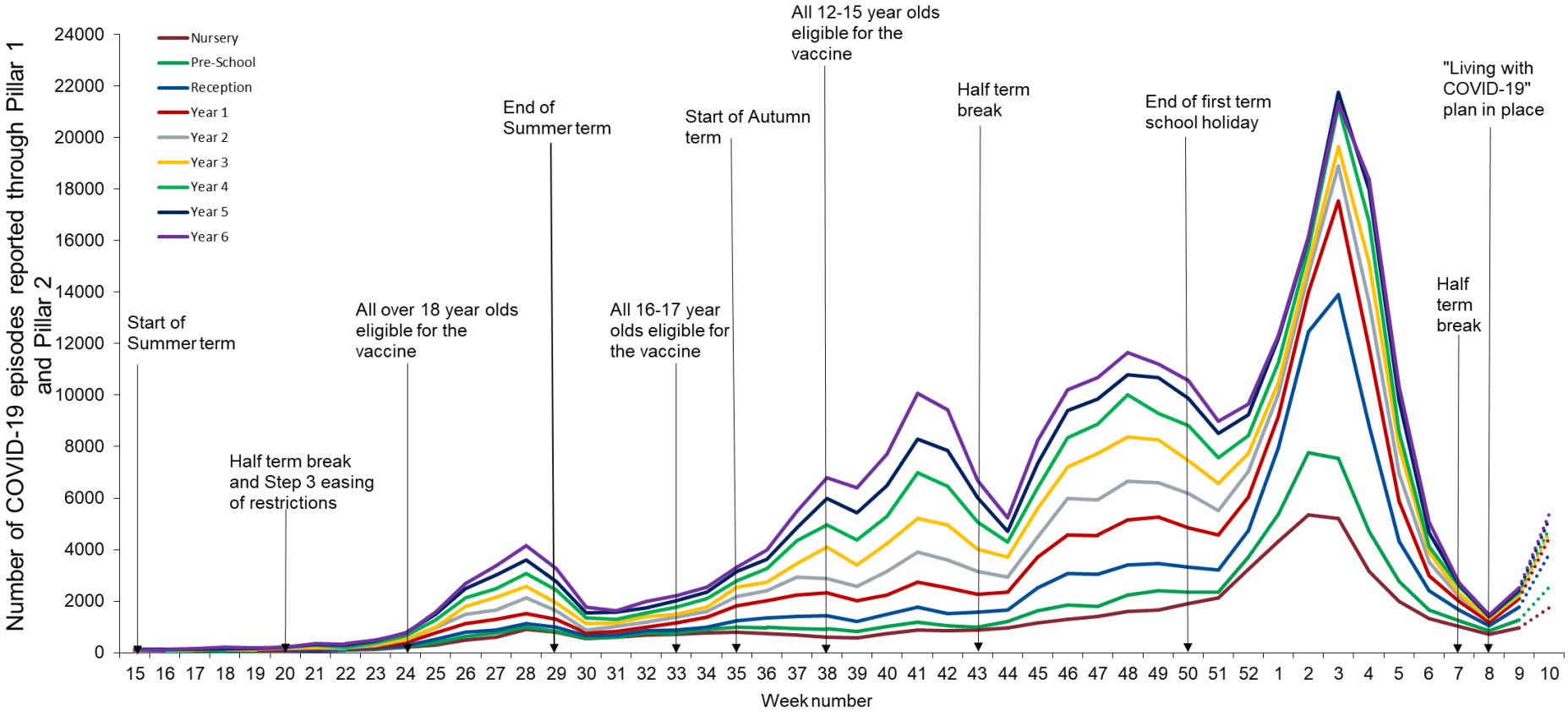


UK Health Security Agency

Weekly number of new COVID-19 episodes in educational age cohorts presented by Year group, from nursery to Year 6 (from Week 15 2021)

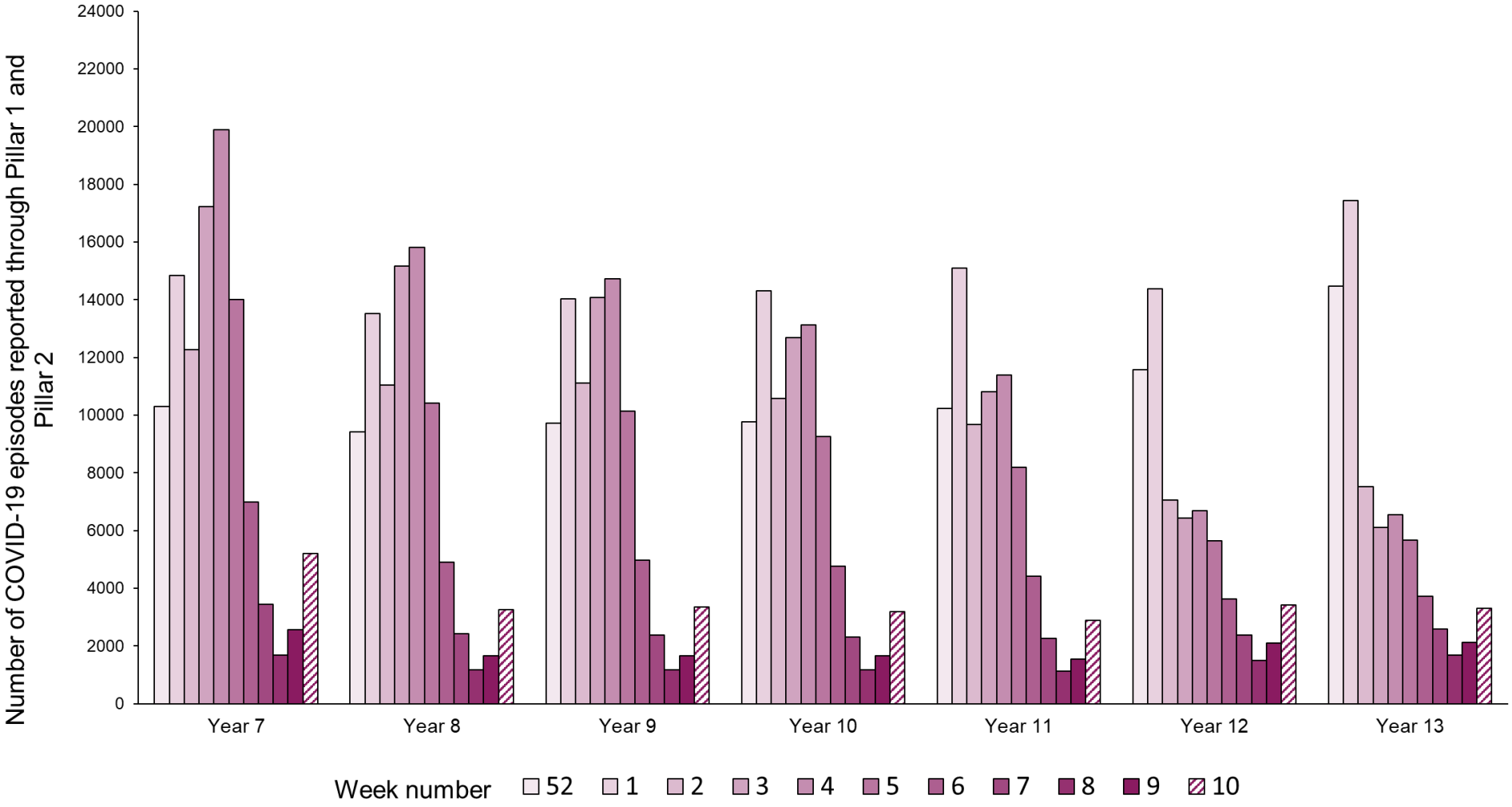


Above figure: Historic data - Weekly number of COVID-19 cases, from Week 13 2020 to Week 34 2021



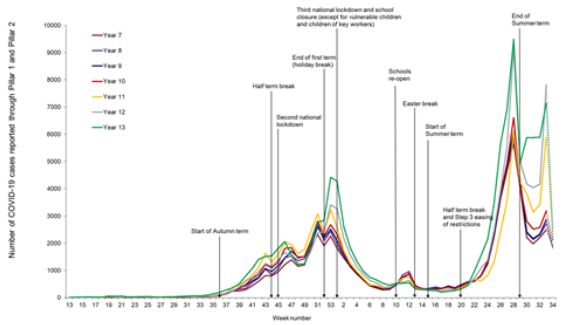
UK Health Security Agency

Weekly number of new COVID-19 episodes in educational age groups presented by secondary school year groups (Year 7 to Year 13), weeks 52 2021 to 10 2022



UK Health Security Agency

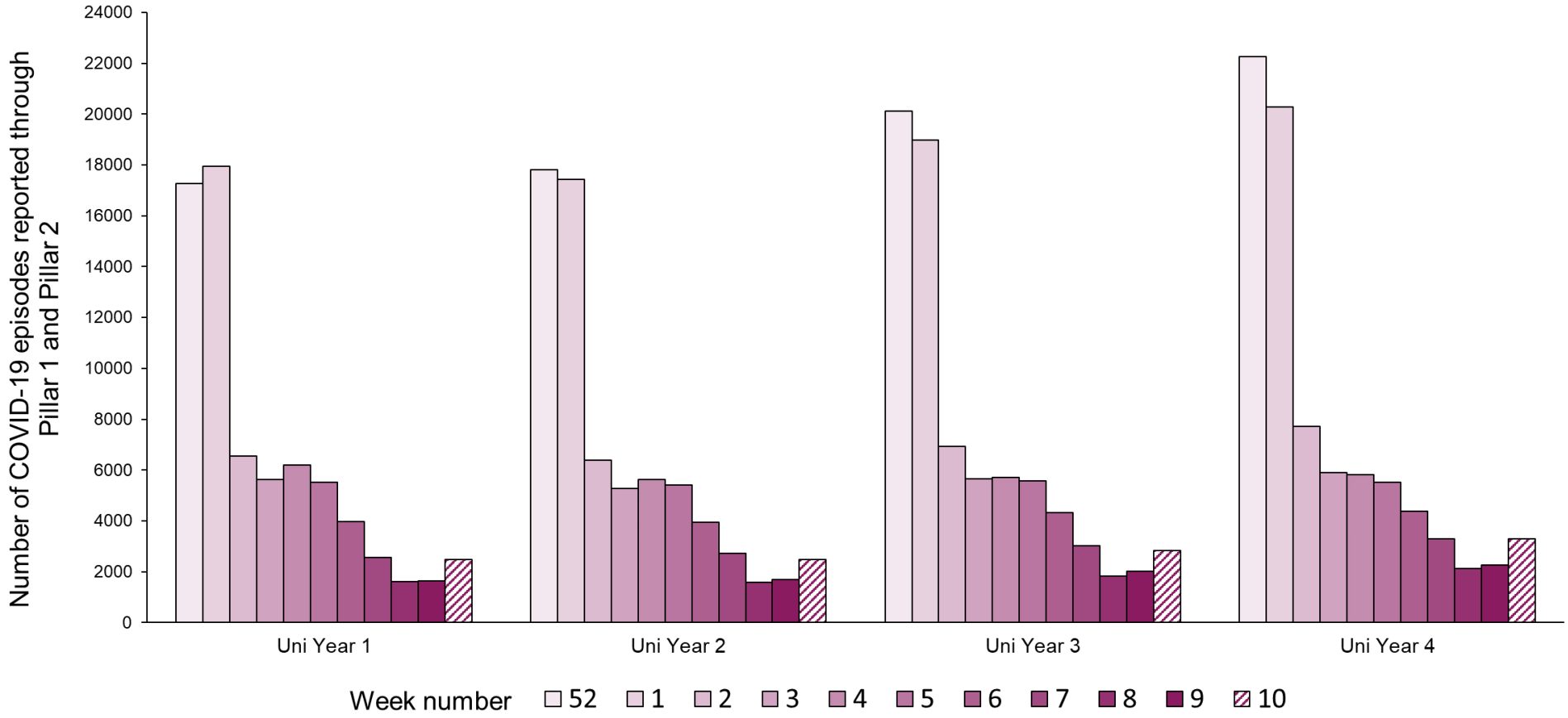
Weekly number of new COVID-19 episodes in educational age groups presented by secondary school year groups (Year 7 to Year 13) (from Week 15 2021)



Above figure: Historic data - Weekly number of COVID-19 cases, from Week 13 2020 to Week 34 2021

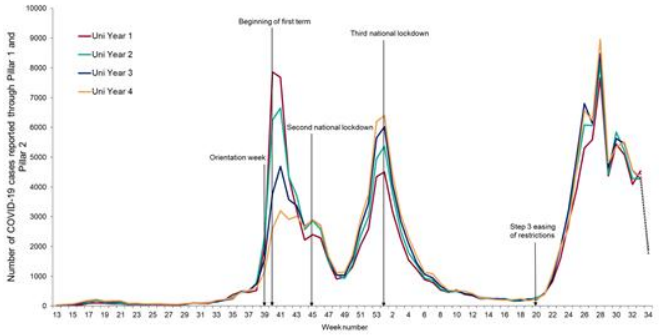
UK Health Security Agency

Weekly number of new COVID-19 episodes in educational age cohorts corresponding to university/college year groups, weeks 52 2021 to 10 2022

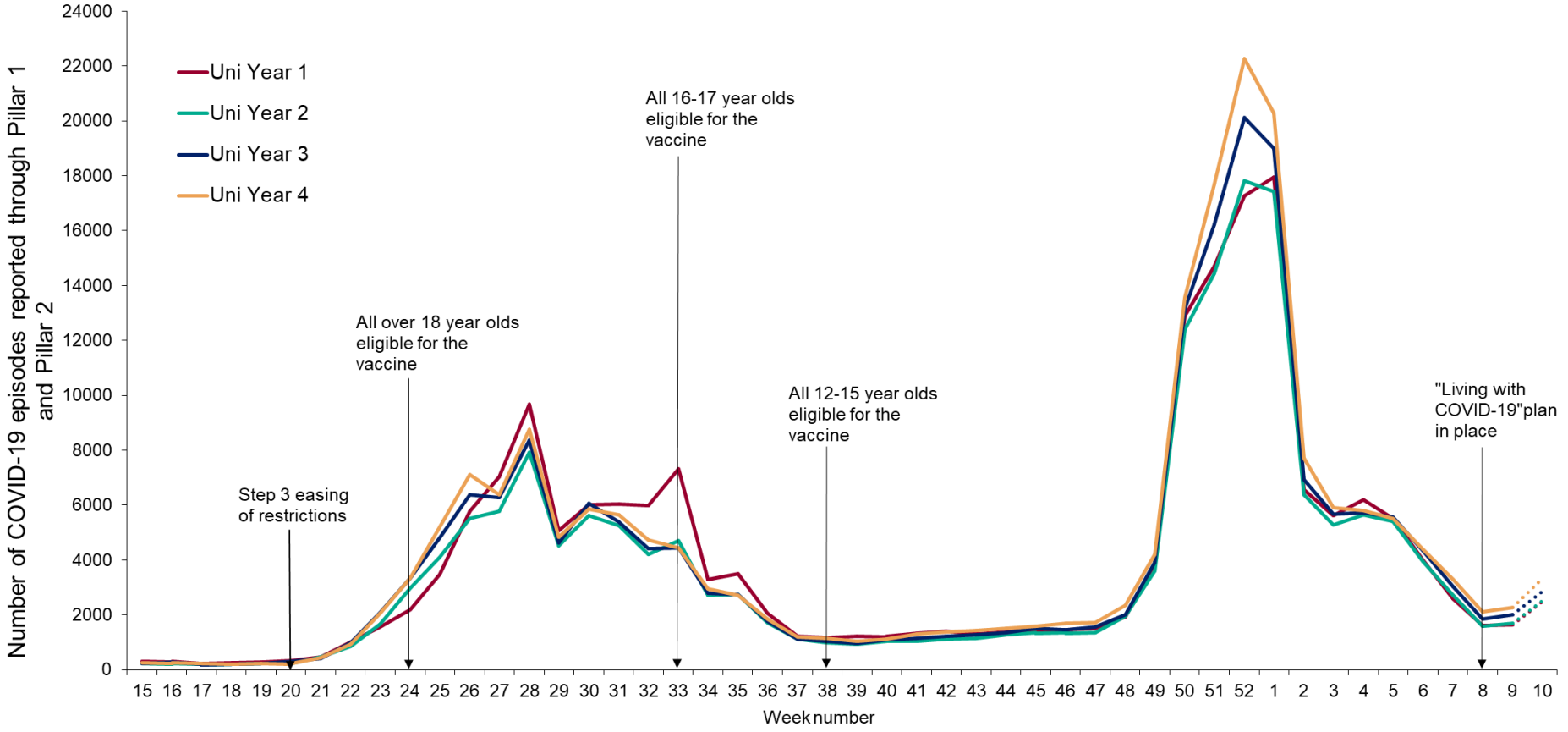


UK Health Security Agency

Weekly number of new COVID-19 episodes in educational age cohorts corresponding to university/college year groups (from Week 15 2021)

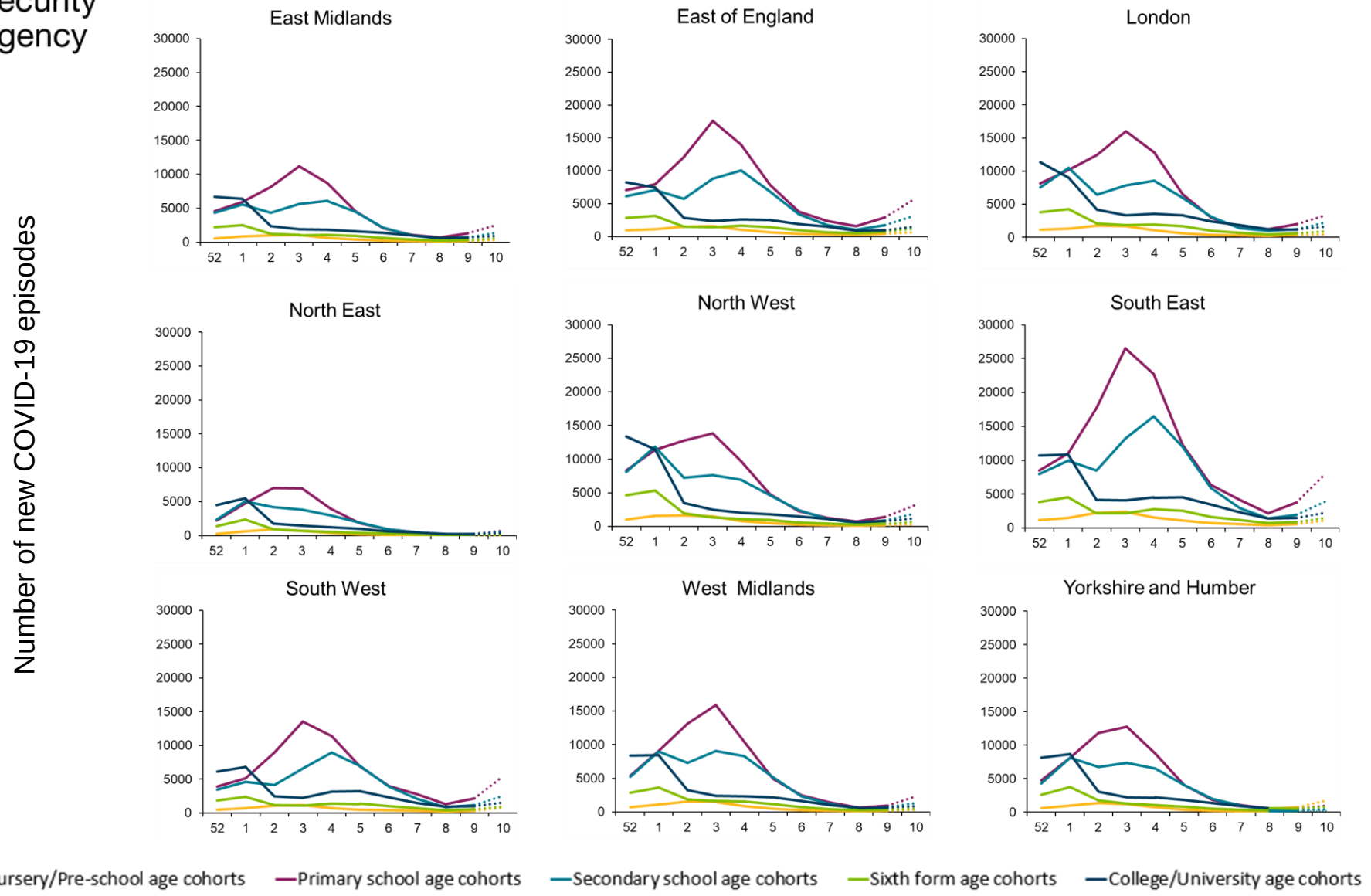


Above figure: Historic data - Weekly number of COVID-19 cases, from Week 13 2020 to Week 34 2021



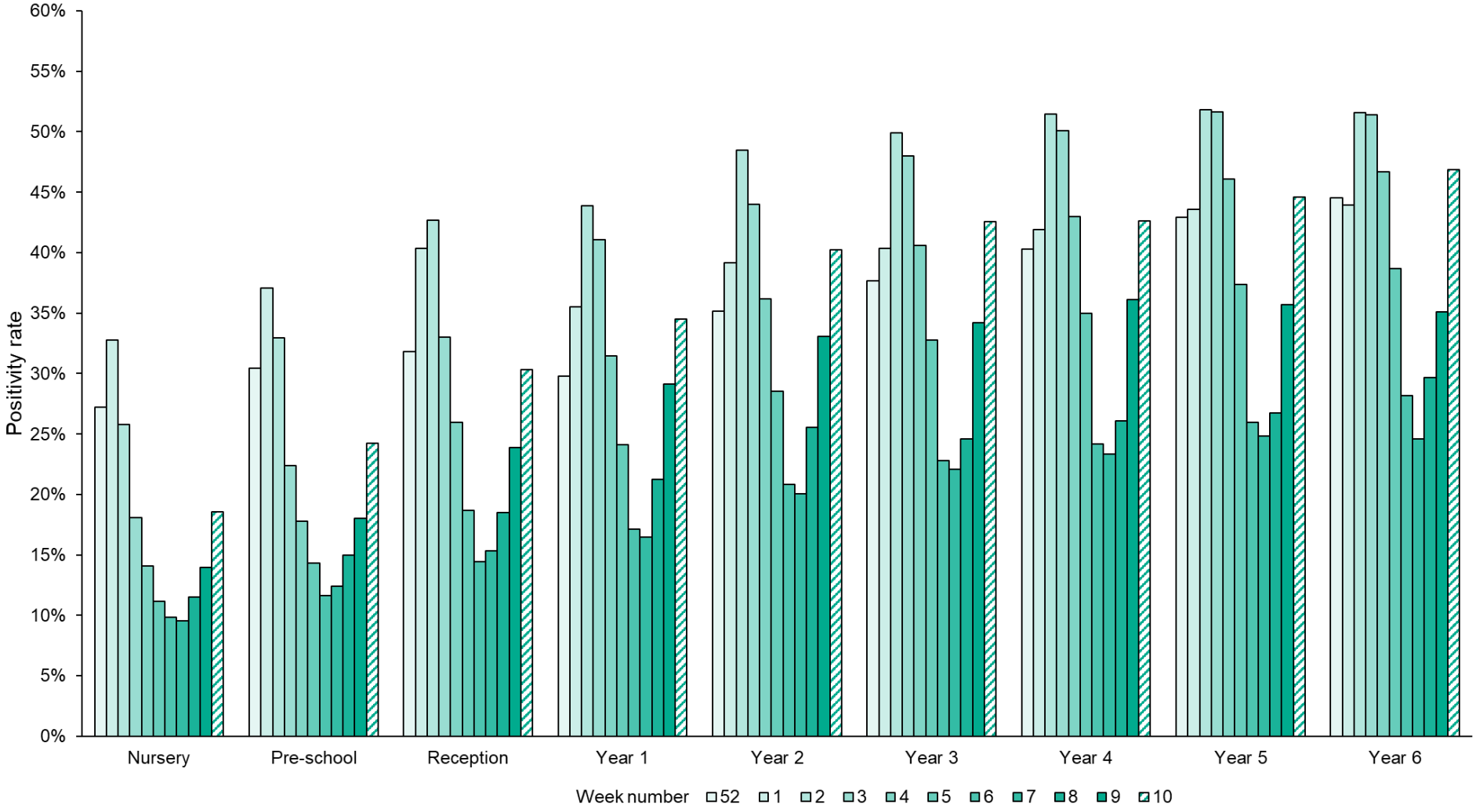
UK Health Security Agency

Weekly number of new COVID-19 episodes by educational age cohorts and UKHSA region, weeks 52 2021 to 10 2022



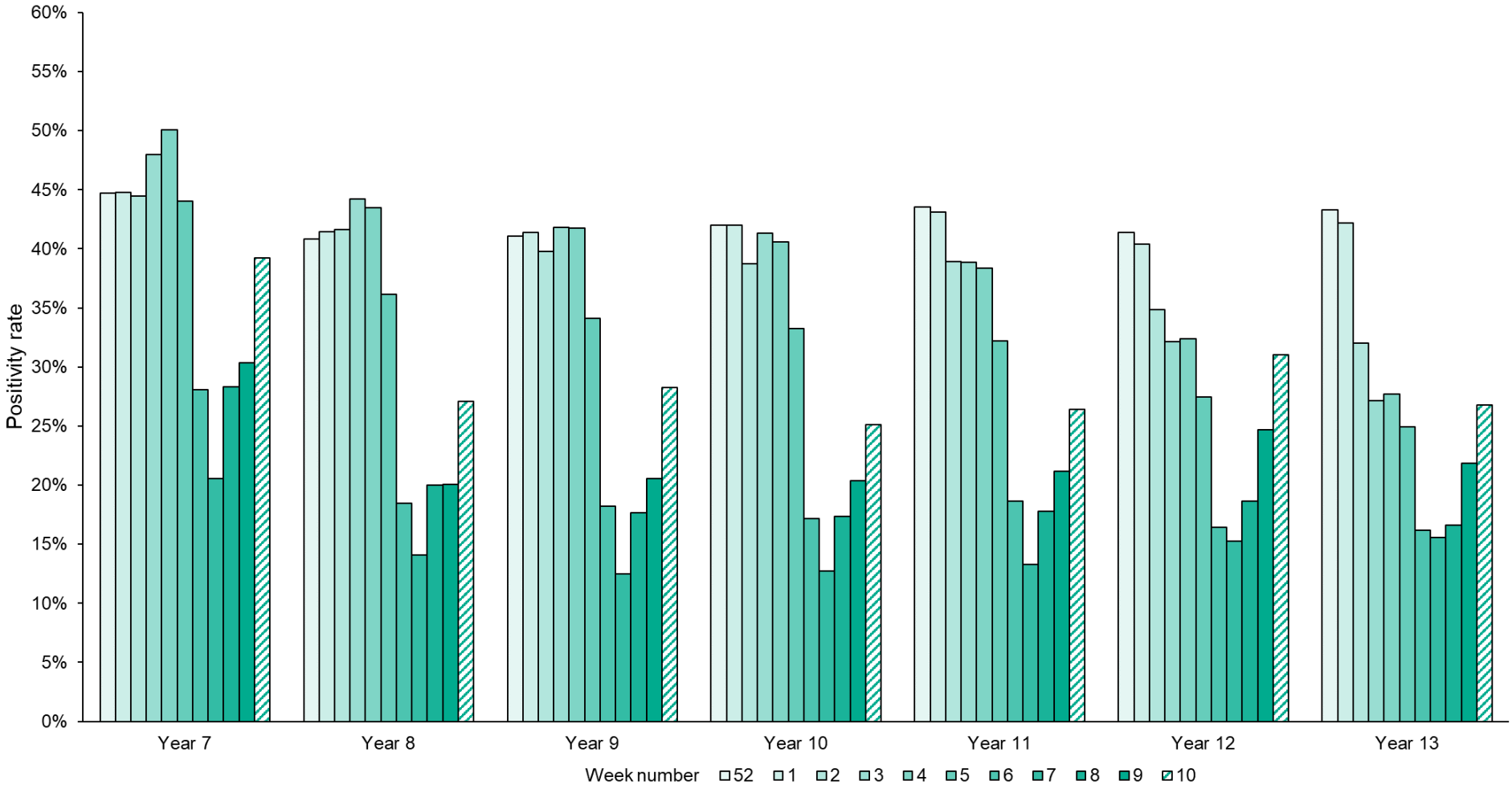
UK Health Security Agency

Weekly PCR positivity rates of COVID-19 cases in educational age cohorts presented by Year group, from nursery to Year 6, weeks 52 2021 to 10 2022



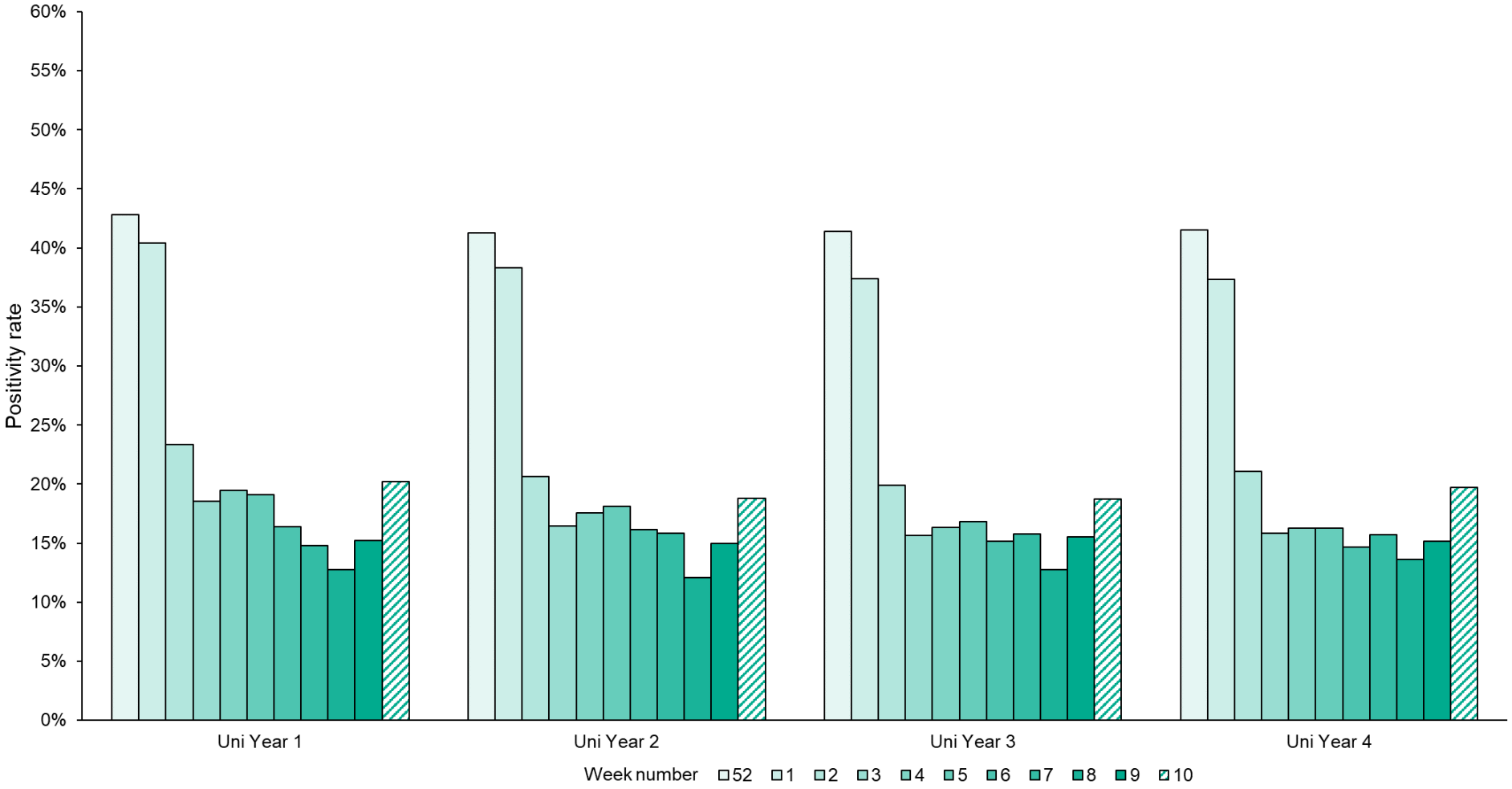
UK Health Security Agency

Weekly PCR positivity rates of COVID-19 cases in educational age cohorts presented by secondary school year groups (Year 7 to Year 13), weeks 52 2021 to 10 2022



UK Health Security Agency

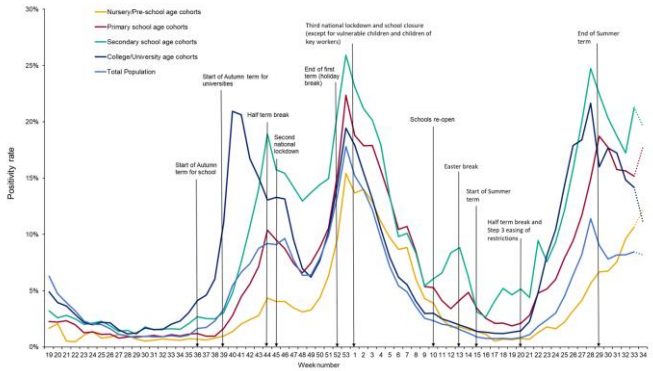
Weekly PCR positivity rates of COVID-19 cases in educational age cohorts corresponding to university/college year groups, weeks 52 2021 to 10 2022



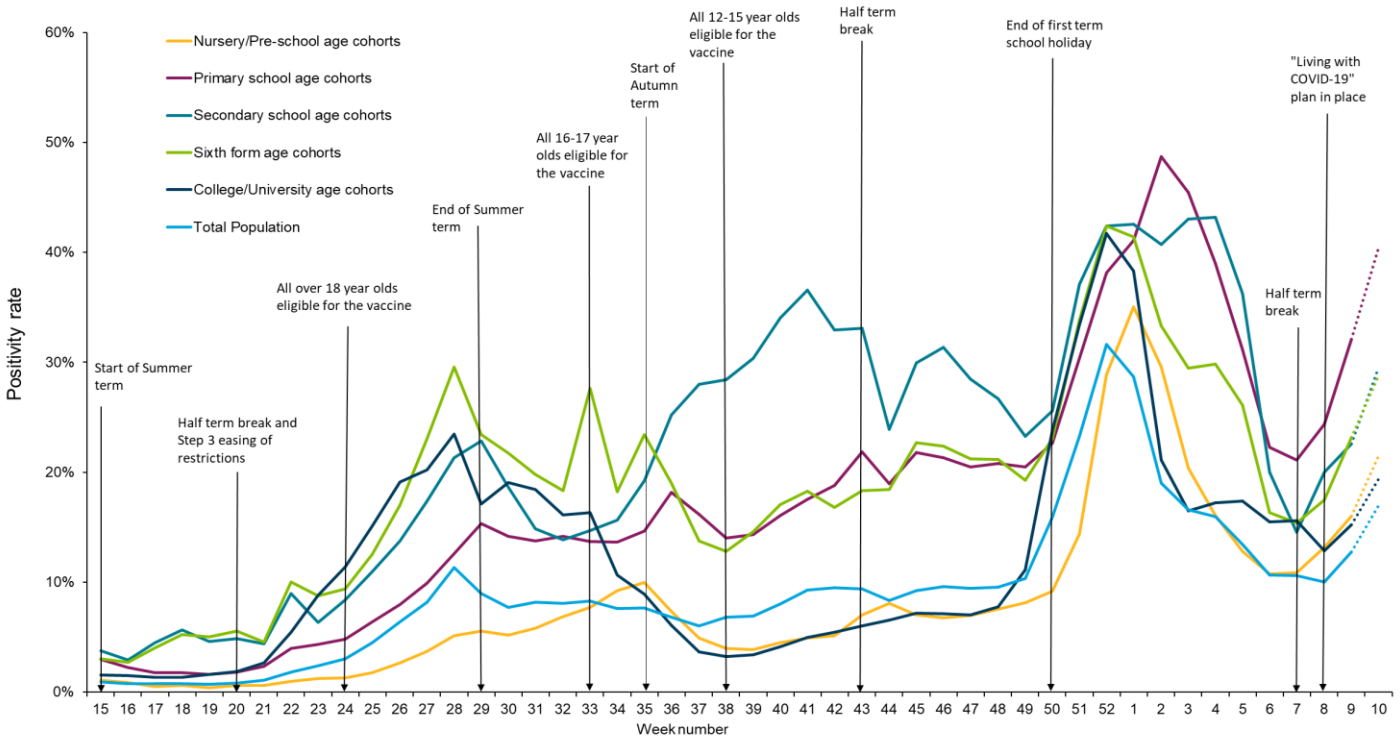
UK Health Security Agency

Weekly SARS-CoV-2 PCR positivity rates, Week 15 2021 to week 10 2022:

- nursery/preschool age cohorts
- primary school age cohorts
- secondary school age cohorts
- college/University age cohorts



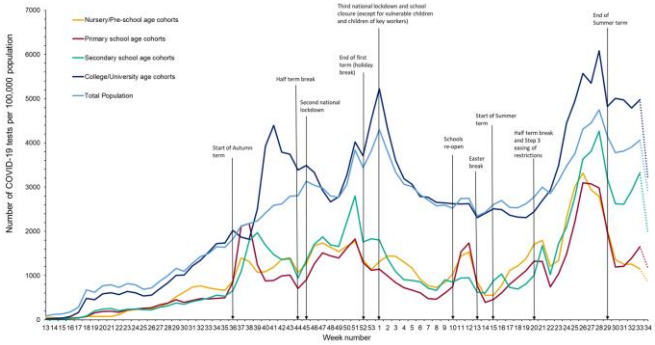
Above figure: Historic data - Positivity rate from Week 13 2020 to Week 34 2021



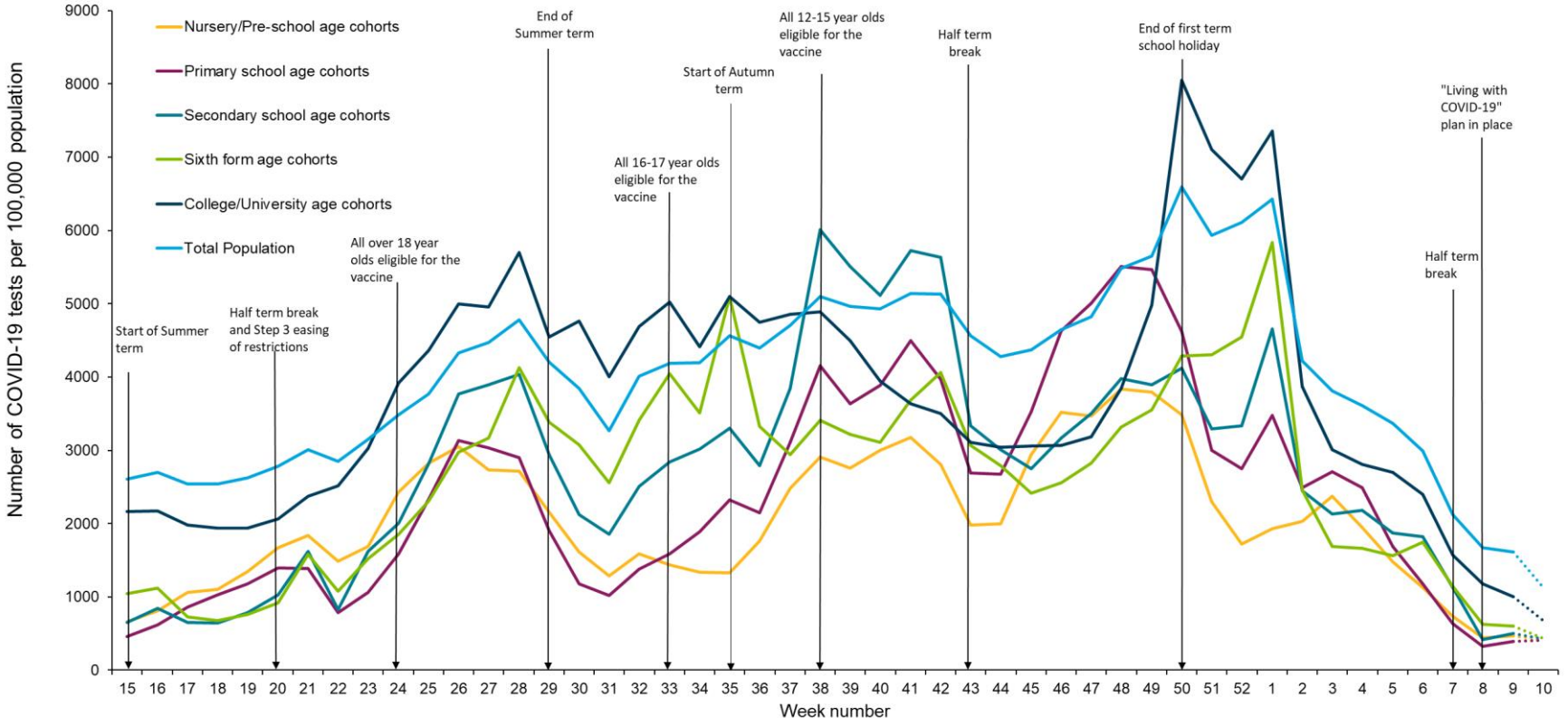
- Positivity data presented in this report has been calculated only using PCR from week 19 2020
- Previous reports have also included lateral flow device tests
- Changes to testing policies over time may impact on positivity rates. From 11 January 2022 the requirement for confirmatory PCR testing in individuals who test positive using a lateral flow device was temporarily removed

UK Health Security Agency

Weekly rate of individuals tested for SARS-CoV-2 by PCR per 100,000 population, from Week 15 2021:
- nursery/preschool age cohorts
- primary school age cohorts
- secondary school age cohorts
- college/University age cohorts



Above figure: Historic data - Weekly rate of individuals tested from Week 13 2020 to Week 34 2021



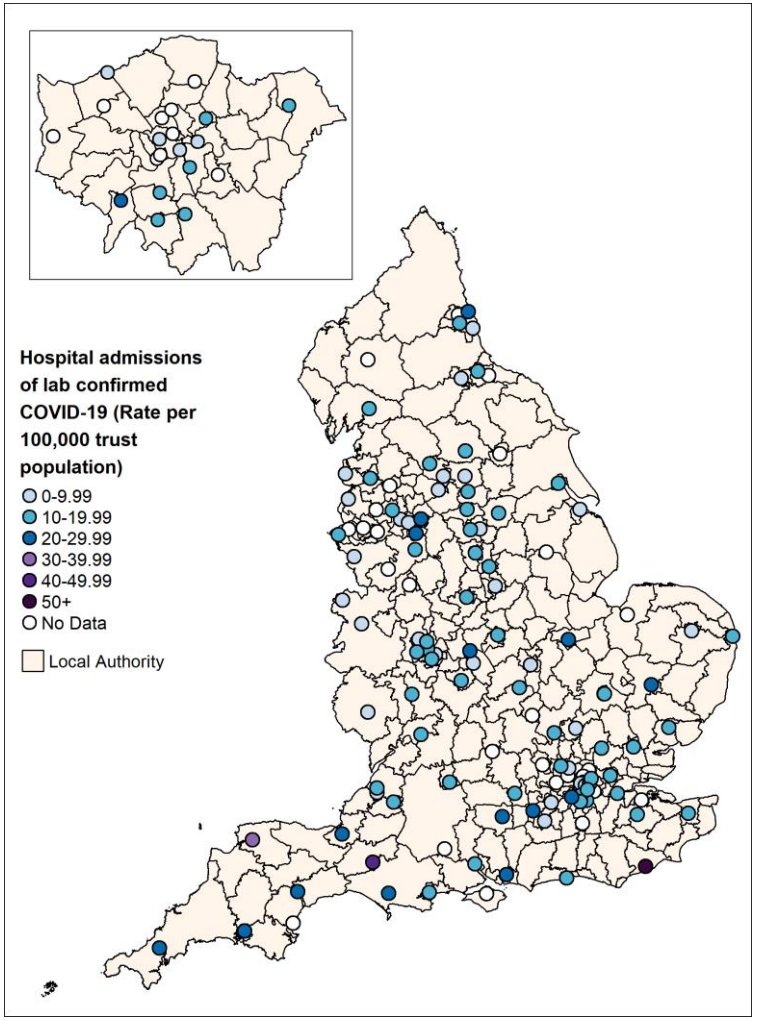
- Positivity data presented in this report has been calculated only using PCR from week 13 2020
- Previous reports have also included lateral flow device tests
- Changes to testing policies over time may impact on positivity rates. From 11 January 2022 the requirement for confirmatory PCR testing in individuals who test positive using a lateral flow device was temporarily removed

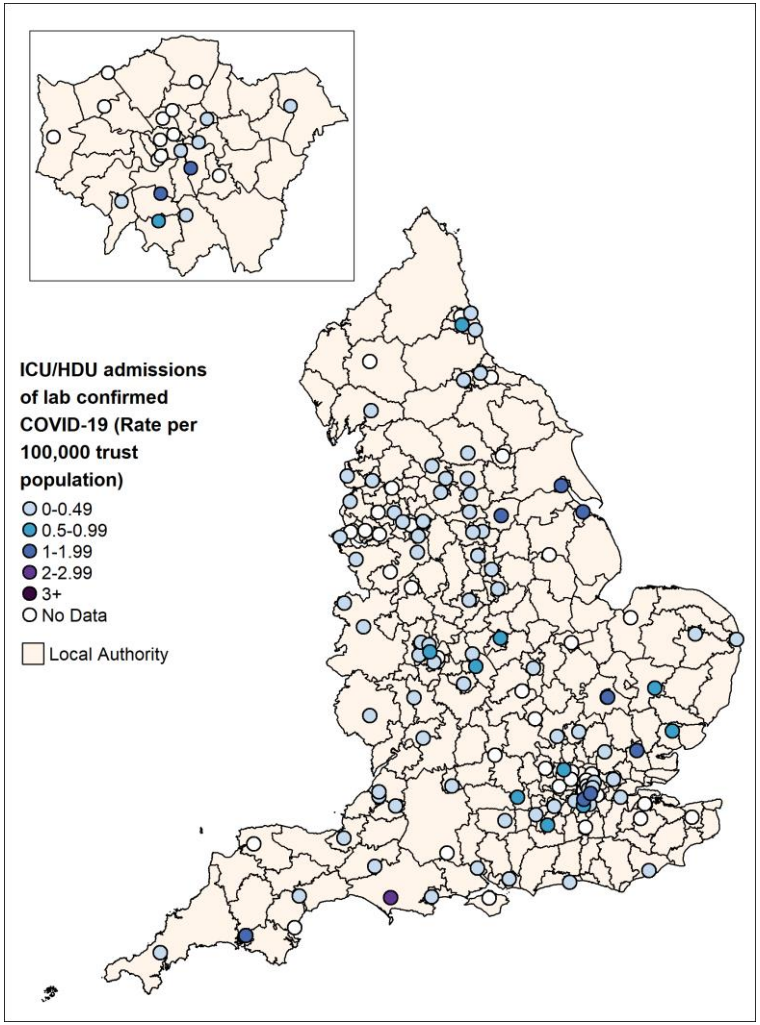
UK Health Security Agency

Secondary Care surveillance

UK Health Security Agency

Weekly admission rates for hospital and ICU/HDU laboratory confirmed COVID-19 cases reported through SARI Watch, week 10





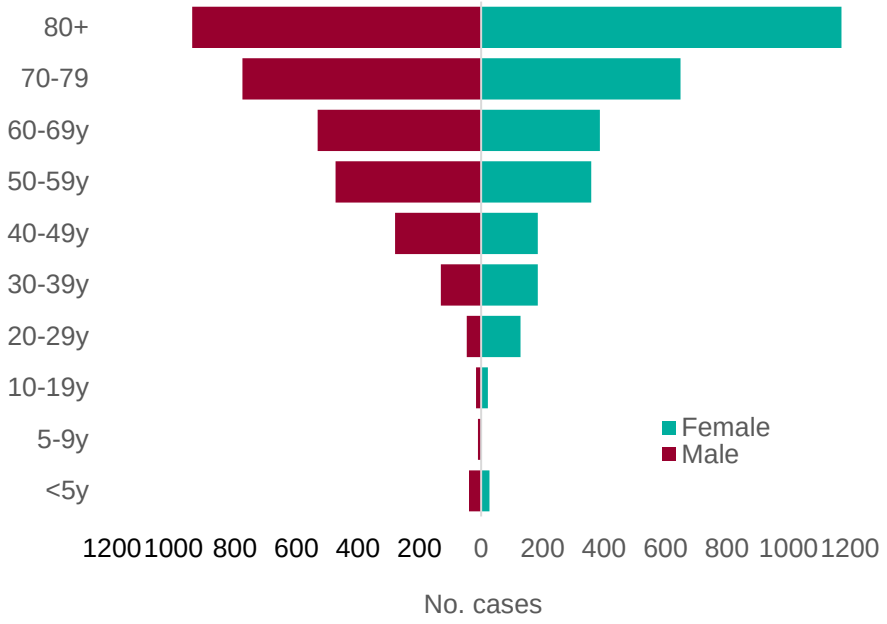
Source: PHE SARI-Watch (Severe Acute Respiratory Infection-Watch, formerly CHESS).

*Only NHS Acute trusts that have reported **≥1** day in the past week; excludes Specialist trusts. Acute NHS trusts (including Specialist trusts) reporting into SARI-Watch COVID-19 hospitalisation surveillance are typically around 100 per week. This was 105 for the hospitalisation (all levels of care) indicator in week 7 to 13 March 2022 inclusive and 96 trusts for the ICU/HDU indicator. For the maps, as Specialist trusts are excluded, the number of trusts providing data on COVID-19 hospitalisations in week ending 13 March 2022 was 97 and 88 for ICU/HDU admissions for COVID-19.

UK Health Security Agency

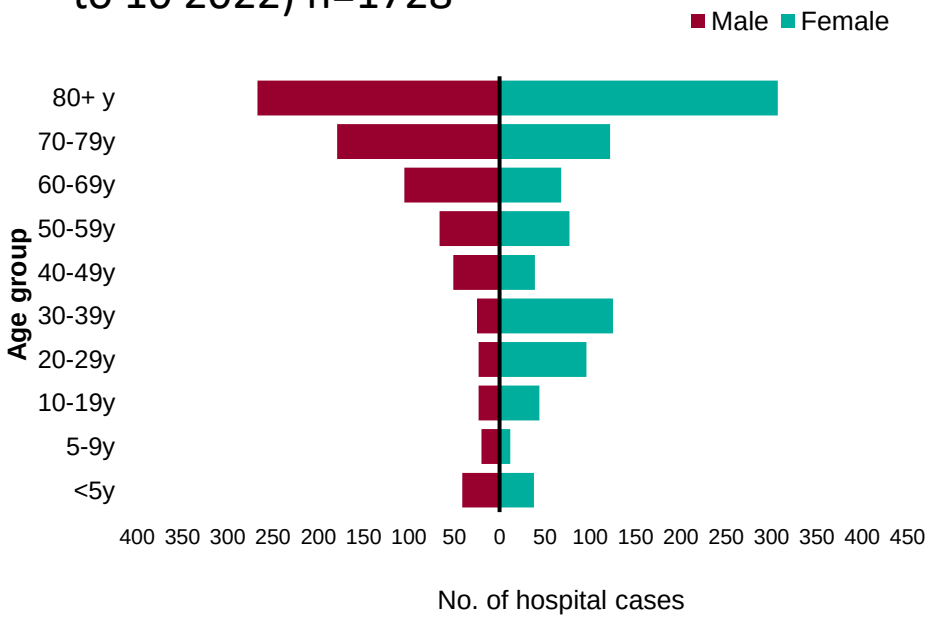
Age/sex pyramid of hospitalisations (all levels of care) for COVID-19, data from sentinel acute NHS trusts, England

(a) Peak of 2nd wave (week 53 2020 to week 3 2021) n= 6,359



Reporting trusts=22

(b) Most recent 4 weeks (week 7 2022 to 10 2022) n=1728



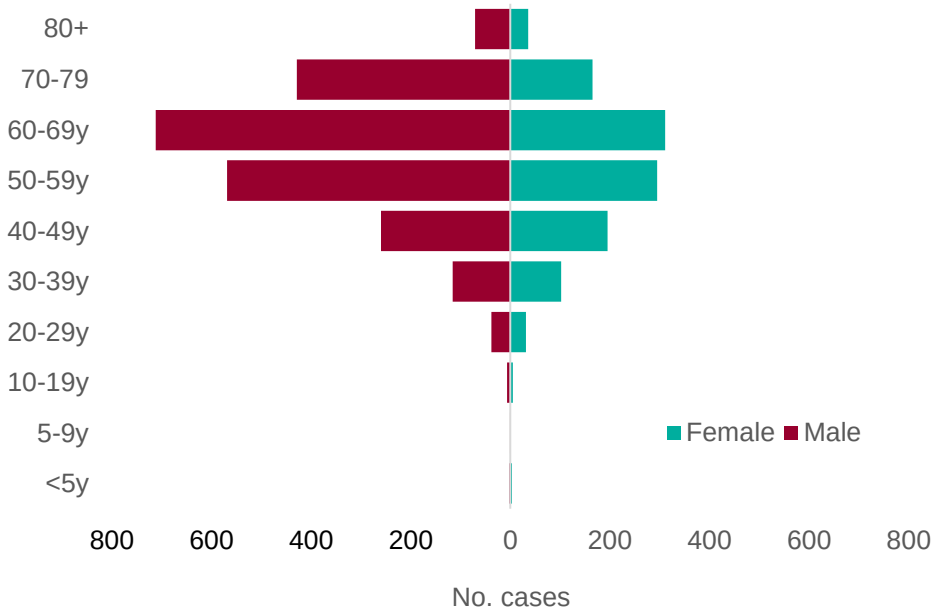
Reporting trusts=14

This figure is based on individual patient level data which are provided to SARI Watch from a subset of NHS Acute Trusts, therefore the data should be interpreted with caution as the distribution of age, sex and ethnic group may not be representative of all hospitalised patients.

UK Health Security Agency

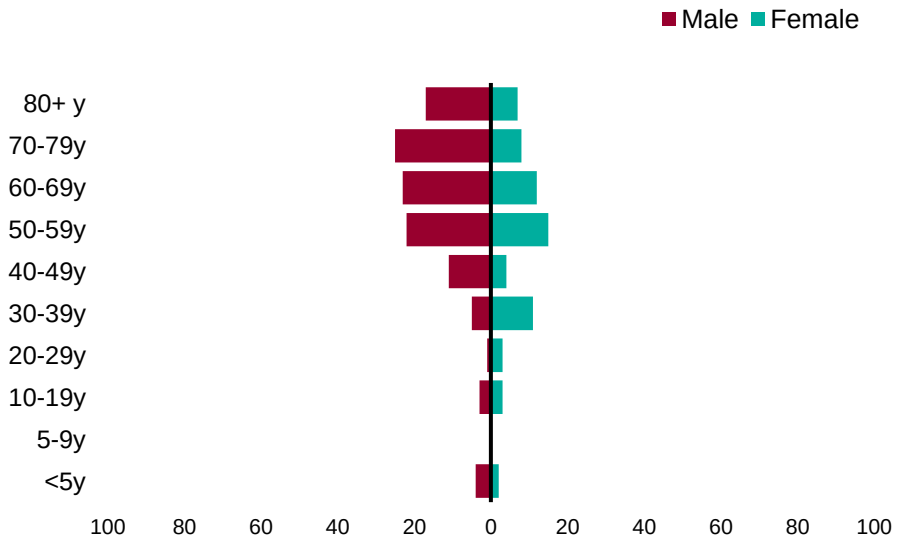
Age/sex pyramid for admissions to ICU/HDU for COVID-19, mandatory case level data, acute NHS trusts, England

(a) Peak of 2nd wave (week 53 2020 to week 3 2021) n= 3,349



Reporting trusts=70

(b) Most recent 4 weeks (week 7 2022 to 10 2022) n=176



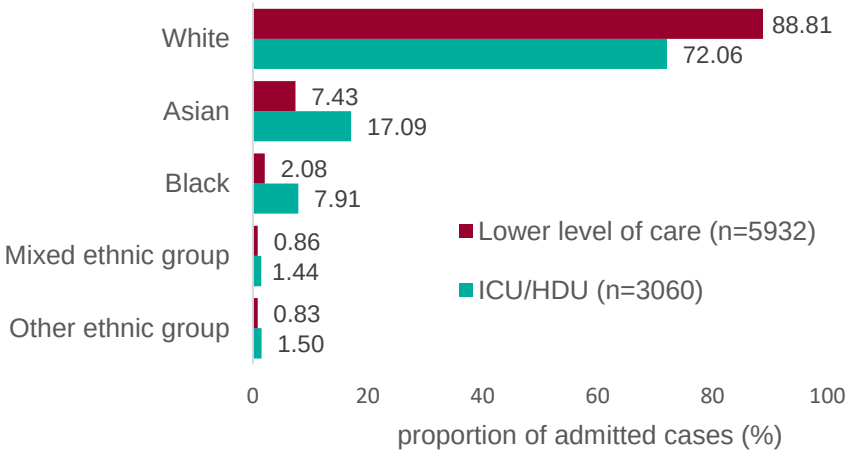
Reporting trusts=37

This figure is based on individual patient level data which are provided to SARI Watch from a subset of NHS Acute Trusts, therefore the data should be interpreted with caution as the distribution of age, sex and ethnic group may not be representative of all hospitalised patients.

UK Health Security Agency

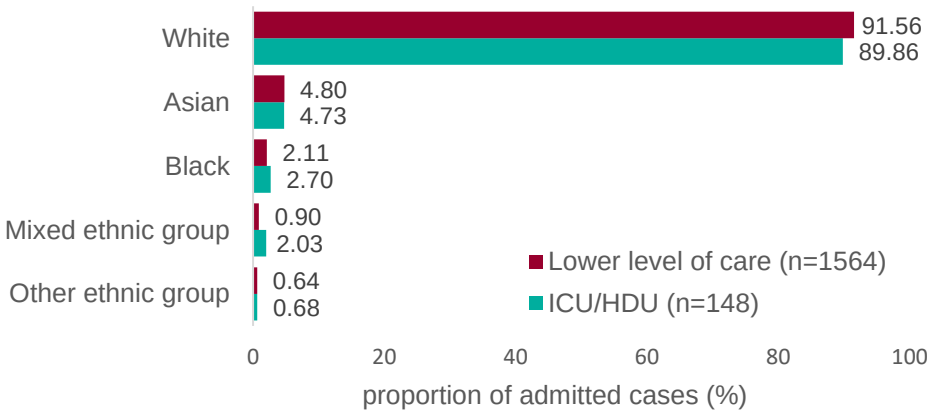
Laboratory confirmed admissions for COVID-19, to acute NHS trusts, by level of care and ethnicity

(a) Peak of 2nd wave (week 53 2020 to week 3 2021)



Reporting trusts
Lower level of care=5932
ICU/HDU=3060

(b) Most recent 4 weeks (week 7 2022 to 10 2022)



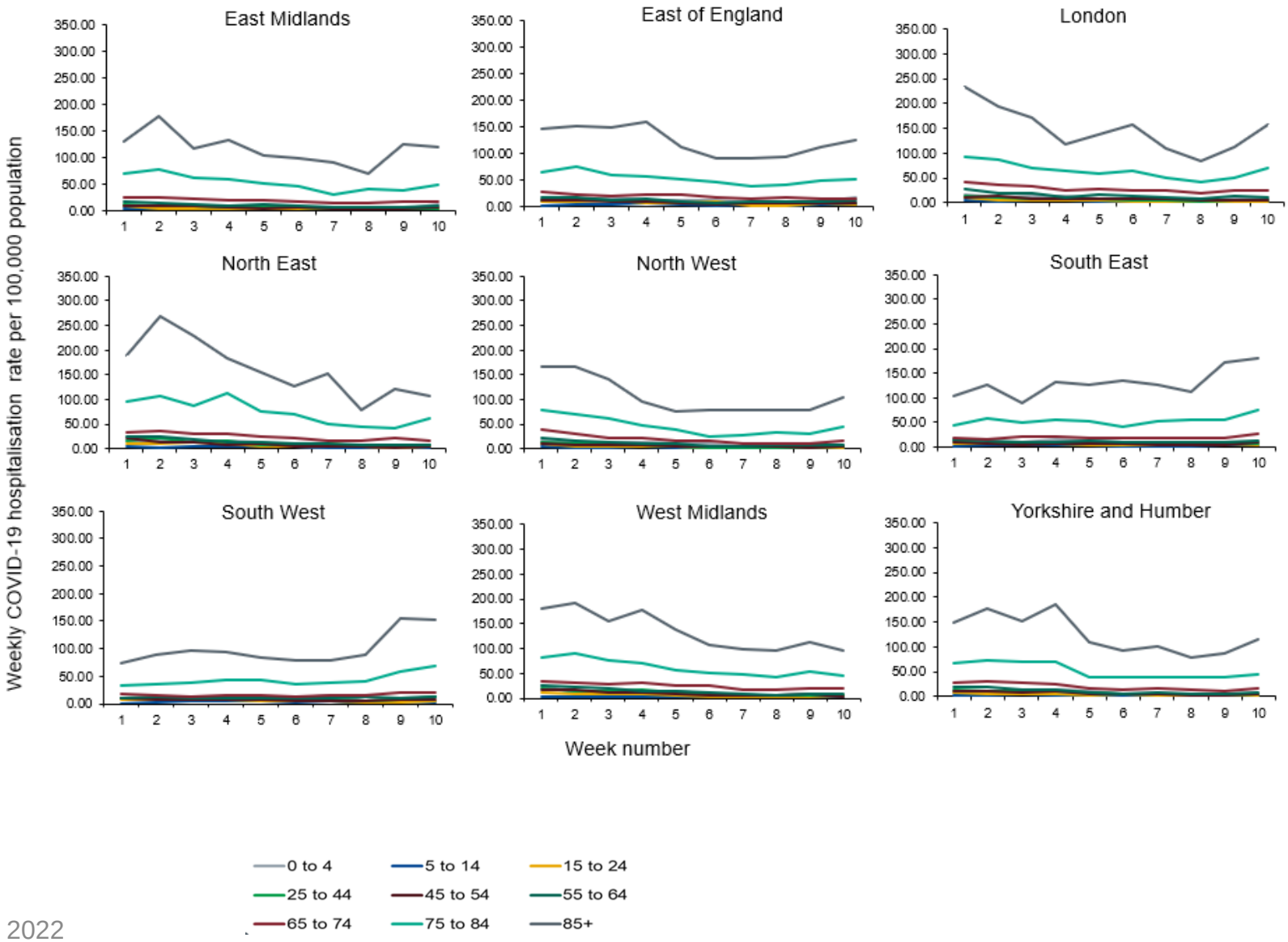
Reporting trusts
Lower level of care=1564
ICU/HDU=148

This figure is based on individual patient level data which are provided to SARI Watch from a subset of NHS Acute Trusts, therefore the data should be interpreted with caution as the distribution of age, sex and ethnic group may not be representative of all hospitalised patients.

Caveat: From week 24 the ethnicity analysis is based on a new method for assigning ethnicity, developed by UKHSA. The previous method used the most recent ethnicity recorded through linkage to Hospital Episode Statistics. However, this method led to unfeasibly high rates in the 'Other' ethnic group when applied to COVID-19 cases, hospitalisation or mortality. The new method uses the most frequent ethnicity recorded through linkage to Hospital Episode Statistics, unless the most frequent was 'Other' when the second most frequent was chosen.

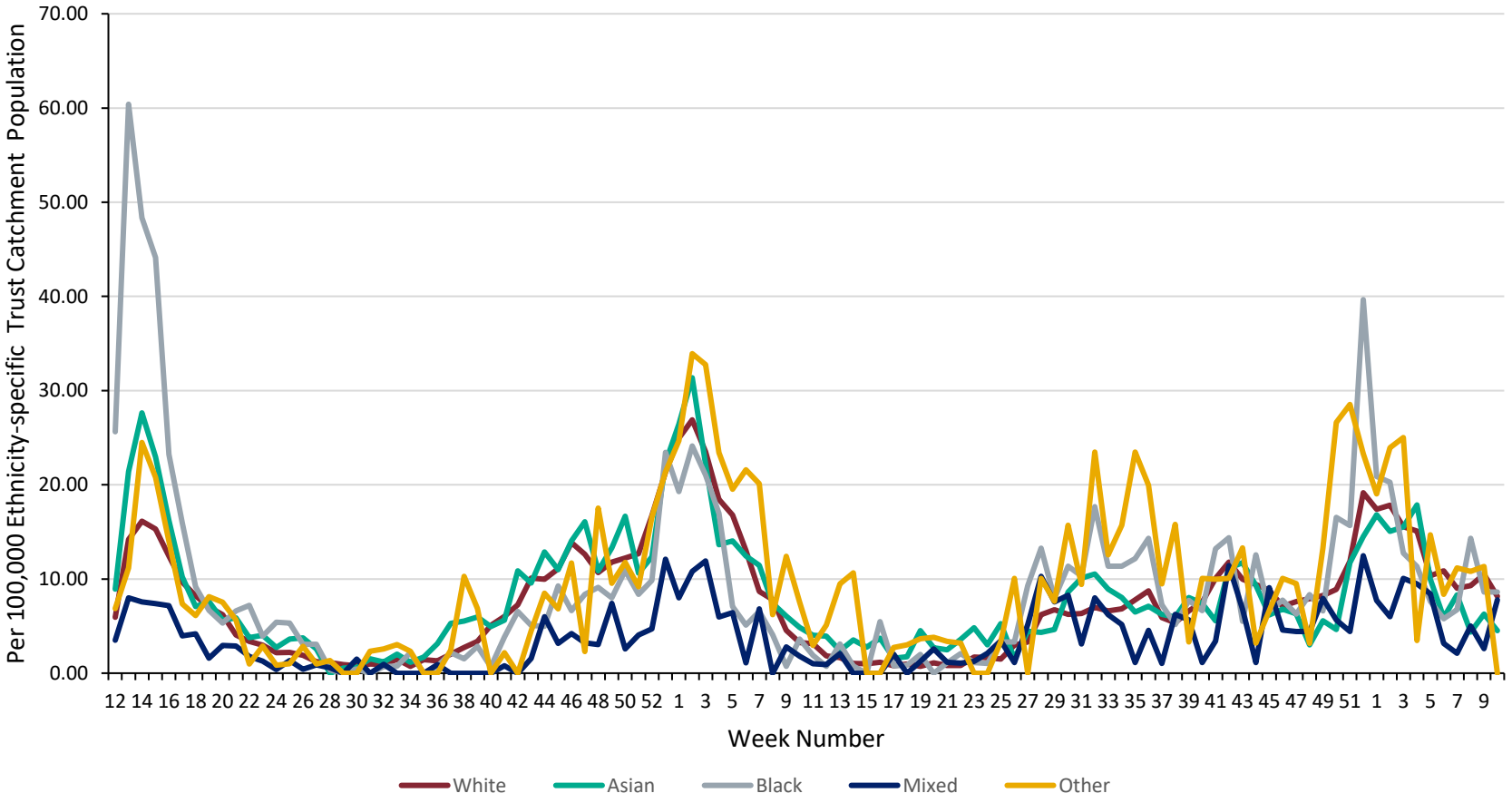
UK Health Security Agency

Weekly COVID-19 hospitalisation rate per 100,000 trust catchment population by age group and region, weeks 1 to 10



UK Health Security Agency

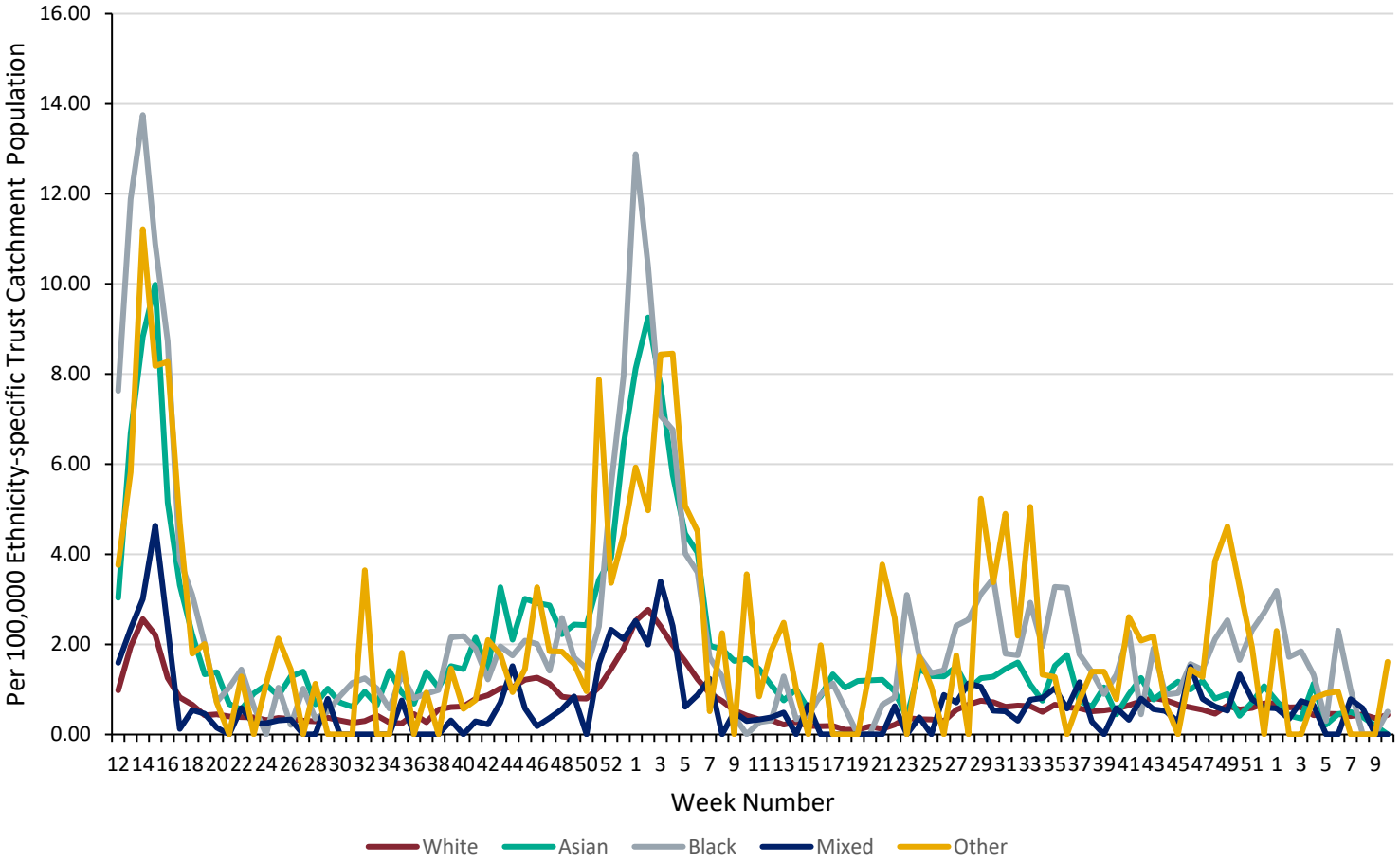
Hospital admission rate (excluding ICU/HDU) by ethnicity per 100,000 trust catchment population



Caveat: From week 24 the ethnicity analysis is based on a new method for assigning ethnicity, developed by UKHSA. The previous method used the most recent ethnicity recorded through linkage to Hospital Episode Statistics. However, this method led to unfeasibly high rates in the 'Other' ethnic group when applied to COVID-19 cases, hospitalisation or mortality. The new method uses the most frequent ethnicity recorded through linkage to Hospital Episode Statistics, unless the most frequent was 'Other' when the second most frequent was chosen.

UK Health Security Agency

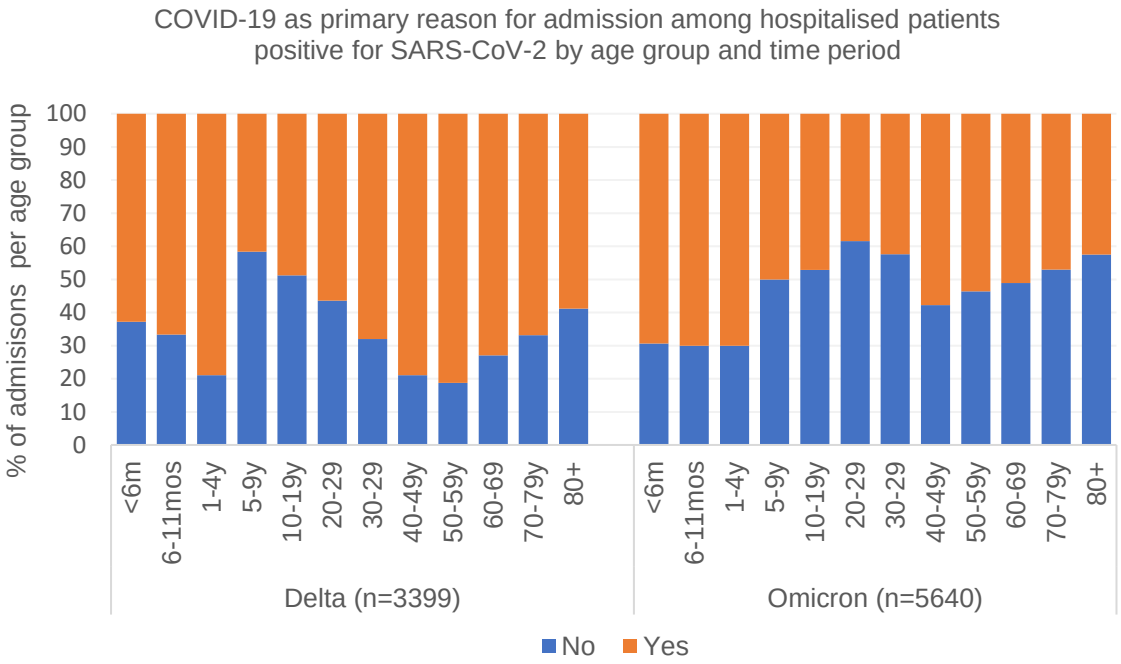
Rate of admission to ICU/HDU by ethnicity, per 100,000 trust catchment population



Caveat: From week 24 the ethnicity analysis is based on a new method for assigning ethnicity, developed by UKHSA. The previous method used the most recent ethnicity recorded through linkage to Hospital Episode Statistics. However, this method led to unfeasibly high rates in the 'Other' ethnic group when applied to COVID-19 cases, hospitalisation or mortality. The new method uses the most frequent ethnicity recorded through linkage to Hospital Episode Statistics, unless the most frequent was 'Other' when the second most frequent was chosen.

UK Health Security Agency

COVID-19 as primary reason for admission among hospitalised patients positive for SARS-CoV-2 by age group and time period



Notes:

1. The analysis uses data from a network of sentinel trusts in UKHSA's SARI-Wach surveillance system.
2. The analysis uses data from the variable 'Admissions due to COVID-19'. A trust can use this to indicate whether an admission was primarily due to COVID-19 (Yes/No/Unknown).
3. This variable is not mandatory. In the period under study, 20.5% of records had missing data for this indicator, hence n=2655 records excluded from this analysis leaving 10276 records for available for study
4. A date range is used to define a variant dominant period. This is because of the low yield of sequence-confirmed Delta and Omicron cases following data linkage.
5. The chart does not include 1237 records that fell in the Delta/Omicron transition period (from 27 November to 21 December 2022)
6. The period from 27 September to 26 November 2021 inclusive is used to define the Delta dominant period
7. The period from 22 December 2021 to 6 Mar 2022 inclusive is used to define the Omicron dominant period
8. Careful interpretation is advised as use of proxy dates for the Omicron period in particular may include some Delta hospitalisations.

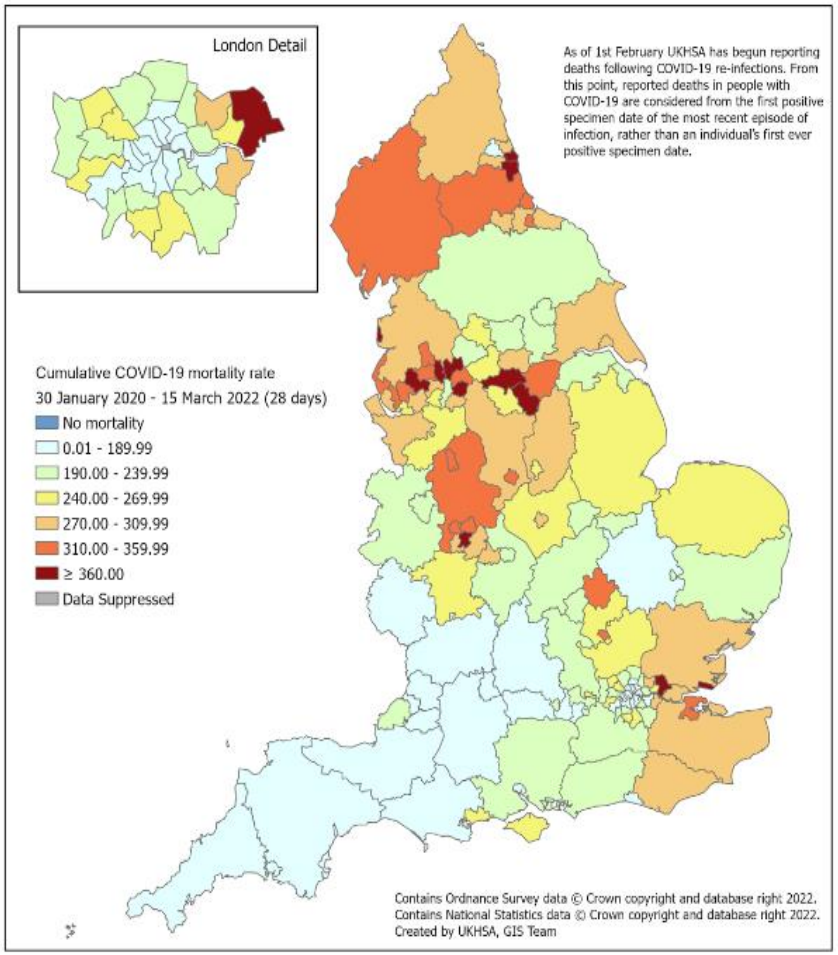
UK Health Security Agency

Mortality surveillance

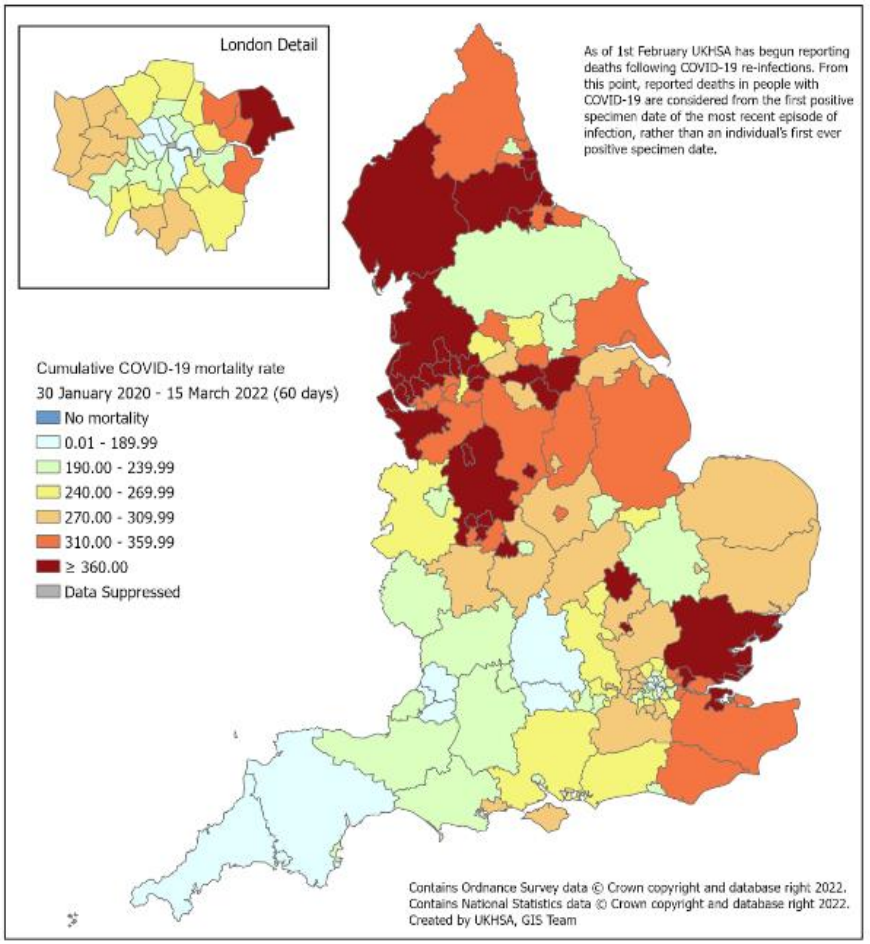
UK Health Security Agency

Cumulative mortality rate of COVID-19 cases per 100,000 population tested under Pillar 1 and 2 since the beginning of the pandemic by (a) 28 day definition and (b) 60 day definition

(a)

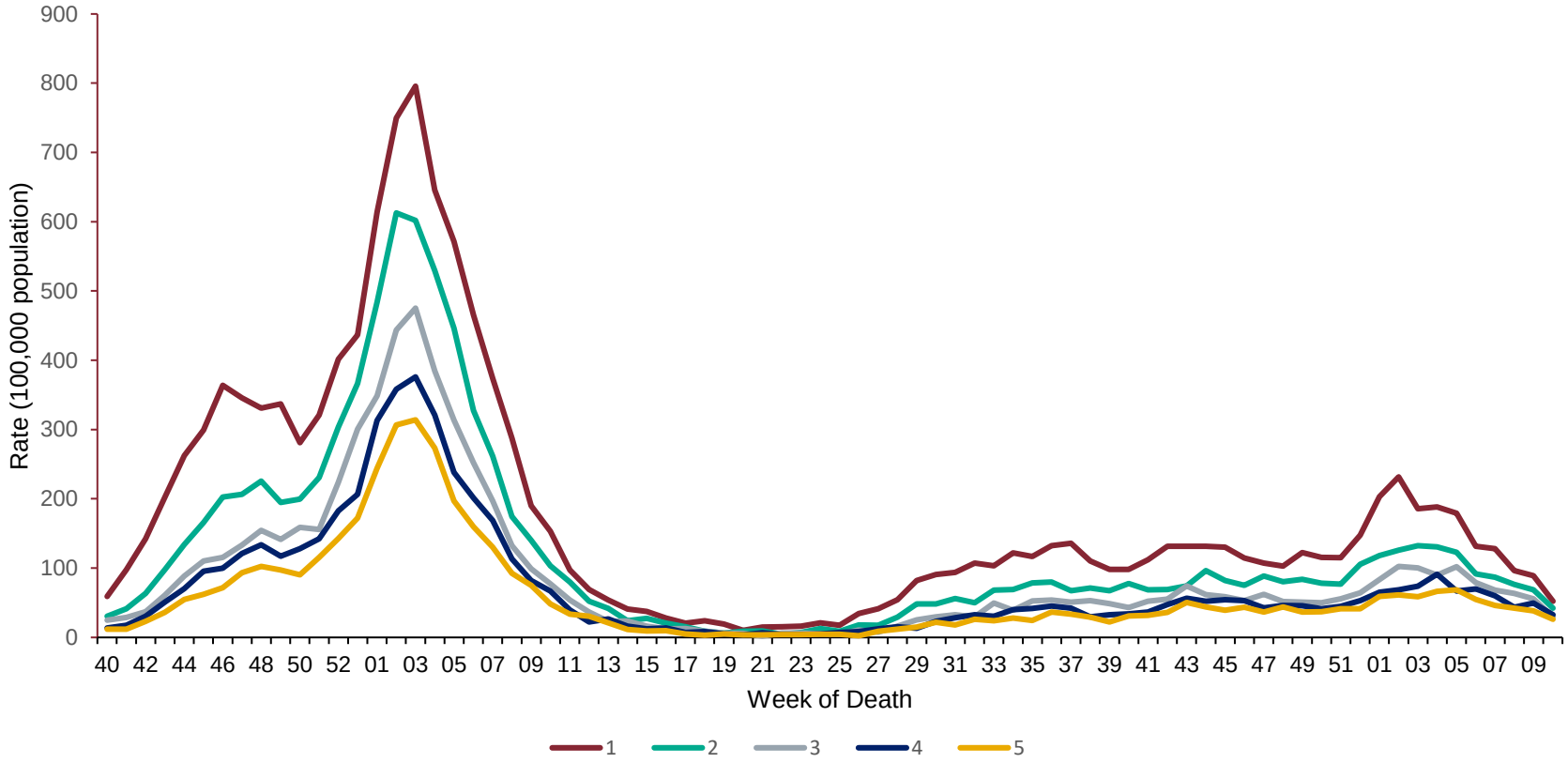


(b)



UK Health Security Agency

Age-adjusted mortality rate** (per 100,000 population) in confirmed cases of COVID-19 by IMD quintile, by week using the 60 day definition



**Rates are time-adjusted: a weekly population denominator has been used to calculate the mortality rate

UK Health Security Agency

Possible reinfections in England

(updated monthly – last update 28 February)

UK Health Security Agency

Possible reinfections in England

The following figures present population data based on the first time that individuals tested positive for SARS-CoV-2 through PCR and/ or lateral flow device testing in England together with those who have tested positive for SARS-CoV-2 through PCR and/ or lateral flow testing with an interval of at least 90 days between two consecutive positive tests. This excludes positive LFD test results removed from the main SGSS dataset because the LFD test positive result was followed by a negative PCR result within 3 days and LFD test results where we have had feedback that a positive result was entered in error. The interval of 90 days is in line with the definition currently adopted within Siren, by CDC in their definition of a person to prioritise for investigation of suspected SARS-CoV-2 reinfection and the draft definition being considered by the World Health Organisation for a suspected reinfection.

These figures present population level data that complements studies that can undertake more detailed investigation at an individual level as exemplified by SIREN the large multicentre prospective cohort study that has followed around 45,000 participants employed by NHS hospitals. In line with other studies, this suggested that those with serological evidence of a previous SARS_CoV-2 infection had an 84% lower risk of infection than those without evidence of prior infection over a median 7-month period.

For a possible reinfection to be categorised as confirmed they require sequencing of a specimen at each episode and for the second specimen to be genetically distinct from that sequenced from the first episode. Availability of such dual sequencing is currently very low for several reasons; sequencing was not widely undertaken early in the pandemic; LFD test results do not allow sequencing and some PCR samples have a low viral load where sequencing cannot be undertaken. To meet the definition of a probable reinfection requires sequencing at the second episode that identifies a variant that was not circulating at the time of the first episode.

Further data on reinfections is published in the weekly Influenza and COVID-19 surveillance report.

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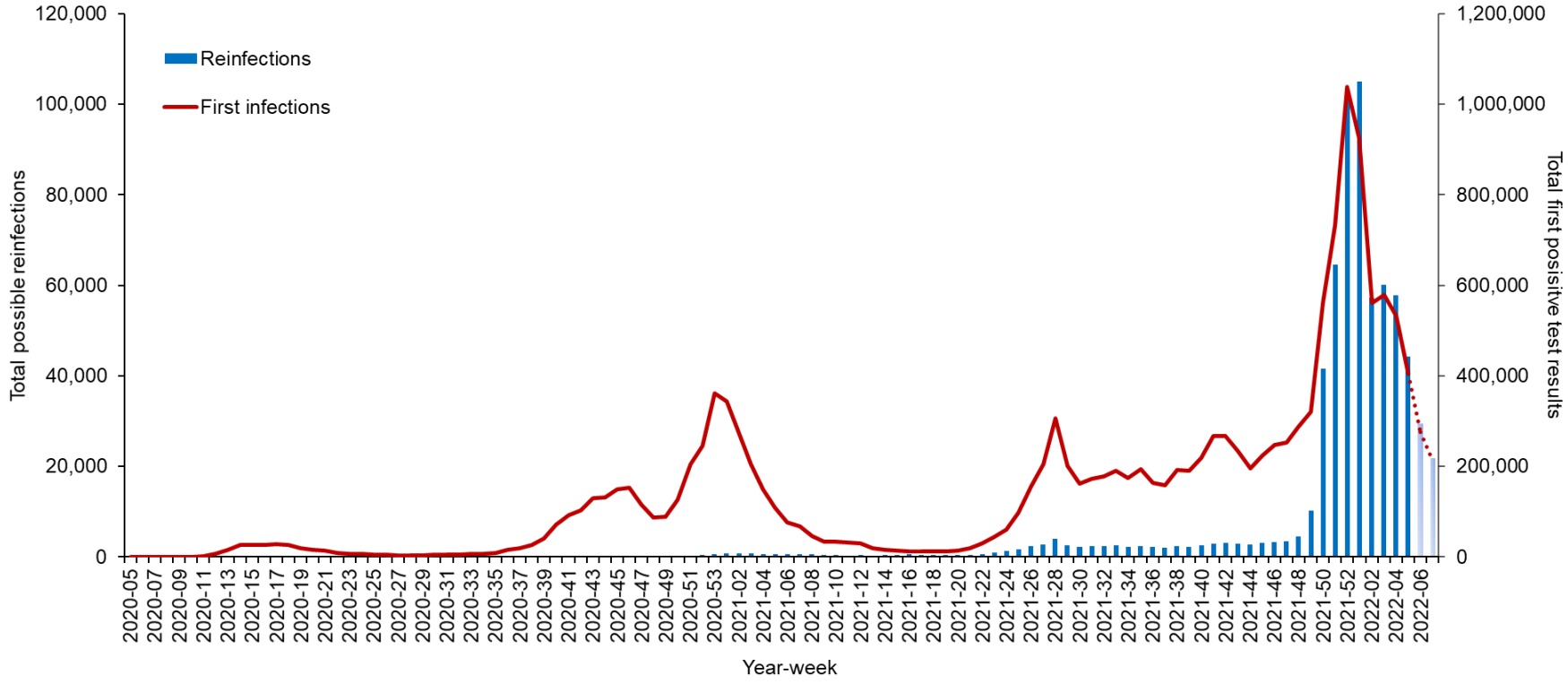
Possible reinfections and first infections in England to week 2022-07

It is important to consider reinfections in the context of first infections and there is a 90-day delay before people with a first infection can become eligible for reinfection. The graph below shows: numbers of possible reinfections and numbers of first infections (secondary Y-axis) by week of onset (based on sample date throughout) through the weeks of the pandemic. The data collected for weeks 06 and 07 are not complete and results are provisional (lighter bars).



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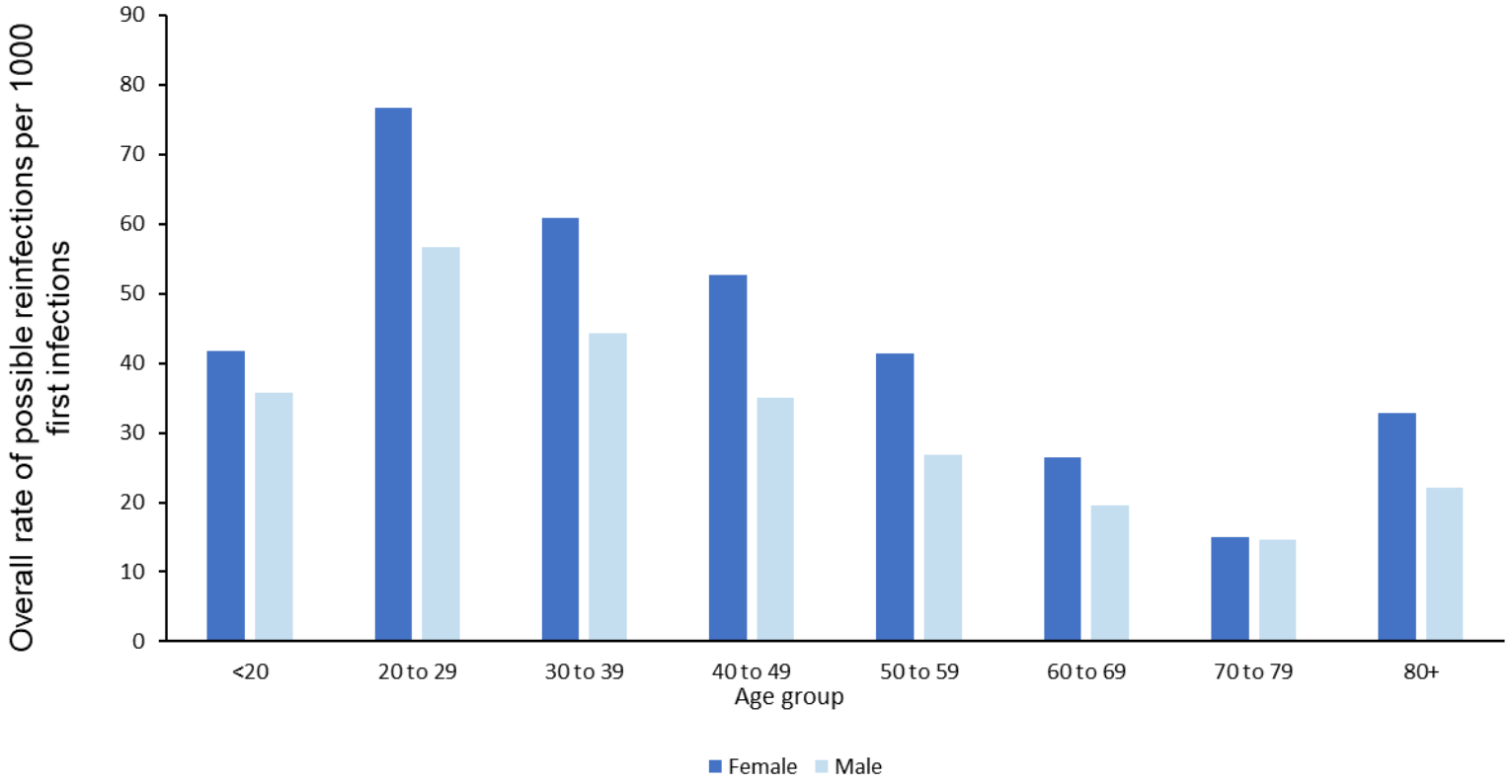
The age and sex distribution of possible reinfections by overall rate per 1000 first infections (up to week 07, provisional) by sex and age group in England



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Co/secondary infections with COVID-19

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Co/secondary infections with COVID-19

- Caveat - undertesting for other pathogens may result in an underestimate of co/secondary infection cases.
- Co/secondary infections refers to when a patient has an infection with more than one pathogen at the same time (co-infection), or acquires another infection after contracting the first infection (secondary infection). Please see Appendix 1 – Co and secondary infection with COVID-19 definitions.
- Numbers of co/secondary infection remain low across UKHSA surveillance systems.
- For patients with severe respiratory failure requiring Extra Corporeal Membrane Oxygenation (ECMO), analysis of data from five adult ECMO centres in England indicates that among patients with severe respiratory failure due to COVID-19, almost a third of these have co/secondary infections.
- Published data analysis from pandemic wave 1 (W-1) indicates increased mortality associated with COVID-19 and influenza, key bacterial and fungal infections and invasive pneumococcal disease (IPD) in comparison to patients without co/secondary infection.
- Data analysis from W-1 indicates that *Aspergillus* and *candidemia* cases have increased risk of mortality in comparison to patients without co/secondary infection.

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Co/secondary infections among patients with severe respiratory failure requiring Extra Corporeal Membrane Oxygenation (ECMO)

Analysis is based on cumulative data from five adult ECMO centres in England. The data covers ECMO activity from week 40 2019 (30 Sep 2019) to week 39 2021 (ending 3 Oct 2021) to cover two complete seasons. Data covering wave 1 of the pandemic was from week 40 2019 to week 39 2020. Data covering waves 2 and 3 of the pandemic was from week 40 2020 to week 39 2021. COVID-19 cases were reported from week 05 2020 (commencing 27 Jan 2020).

- In the 2020/21 season (as defined above), 30% (112/373) of ECMO patients admitted for severe respiratory failure due to laboratory confirmed COVID-19 had co/secondary infections. In the 2019/20 season (as defined above) this figure was 33% (79/236).

- In both seasons the majority of co/secondary infections among respiratory failure COVID-19 cases comprised Gram-negative bacilli from the order Enterobacterales: 46% (36/79) in 2019/20, decreasing significantly to 29% (33/112) in 2020/21.

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Surveillance of respiratory viral infections, in COVID-19 patients in England, January 2020 to January 2022

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Change to metric

- From 31 January 2022, UKHSA has changed the COVID-19 case definition to include multiple infection episodes
- Reported co-/secondary infections in England now use the new definition, revising all cases back to the beginning of the pandemic
- Please note data is provisional and is subject to change due to ongoing quality assurance checks

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Number of COVID-19 patient-episodes with other respiratory viral infections, reported to SGSS and Respiratory Datamart, in COVID-19 patients diagnosed in England since January 2020†, by virus and timing of diagnosis

Last updated 16 Mar 2022

Respiratory viral infection	COVID-19 patient-episodes with other respiratory viral infections		Timing of respiratory viral diagnosis in relation to COVID-19 diagnosis					
			Co-infection*		Secondary infection after COVID-19 infection**		Secondary COVID-19 infection after other respiratory infection***	
	n	% of COVID patient-episodes	n	%	n	%	n	%
Adenovirus	181	<0.01	87	48.1	52	28.7	42	23.2
Enterovirus	78	<0.01	36	46.2	21	26.9	21	26.9
hMPV‡	244	<0.01	117	48.0	47	19.3	80	32.8
Influenza A	203	<0.01	71	35.0	57	28.1	75	36.9
Influenza B	88	<0.01	47	53.4	18	20.5	23	26.1
Influenza untyped	6	<0.01	2	33.3	1	16.7	3	50.0
Parainfluenza	146	<0.01	63	43.2	39	26.7	44	30.1
Rhinovirus	571	<0.01	246	43.1	144	25.2	181	31.7
RSV‡‡	712	0.01	350	49.2	171	24.0	191	26.8
Seasonal coronavirus	256	<0.01	119	46.5	98	38.3	39	15.2
Any infection	**2,485**	**0.02**	**1,138**	**45.8**	**648**	**26.1**	**699**	**28.1**

†SARS-CoV-2 specimen dates from 30 Jan 2020 to 23 Jan 2022 (n=14,324,692). Data for wave 1 & 2 remains static (last updated 21 Feb 2022)
*detection of respiratory virus +/- 1 days either side of first COVID-19 specimen in patient-episode
**secondary respiratory virus detection 2-28 days after first COVID-19 specimen in patient-episode
***secondary COVID-19 detection 2-28 days after primary respiratory virus detection
‡ Human metapneumovirus ‡‡ Respiratory syncytial virus
Please note patients can have multiple viruses identified, numbers here do not reflect the number of patients.

Key findings:

- 0.02% of COVID-19 patient-episodes had infection with another respiratory virus detected within 28 days of their COVID-19 diagnosis
- Infections with other respiratory viruses were most commonly categorised as co-infections (45.8%)

UK Health Security Agency

Number of COVID-19 patient-episodes with other respiratory viral infections, reported to SGSS and Respiratory Datamart, in COVID-19 patients diagnosed in England in wave 1†, by virus and timing of diagnosis

Respiratory viral infection	COVID-19 patient-episodes with other respiratory viral infections		Timing of respiratory viral diagnosis in relation to COVID-19 diagnosis					
			Co-infection*		Secondary infection after COVID-19 infection**		Secondary COVID-19 infection after other respiratory infection***	
	n	% of COVID patient-episodes	n	%	n	%	n	%
Adenovirus	21	0.01	9	42.9	6	28.6	6	28.6
Enterovirus	8	<0.01	4	50.0	1	12.5	3	37.5
hMPV‡	88	0.04	51	58.0	6	6.8	31	35.2
Influenza A	43	0.02	13	30.2	3	7.0	27	62.8
Influenza B	15	0.01	9	60.0	1	6.7	5	33.3
Influenza untyped	2	<0.01	0	0.0	1	50.0	1	50.0
Parainfluenza	14	0.01	5	35.7	2	14.3	7	50.0
Rhinovirus	116	0.05	67	57.8	10	8.6	39	33.6
RSV‡‡	16	0.01	12	75.0	0	0.0	4	25.0
Seasonal coronavirus	52	0.02	28	53.8	15	28.8	9	17.3
Any infection	**375**	**0.15**	**198**	**52.8**	**45**	**12.0**	**132**	**35.2**

Key findings, Wave 1:

- 0.15% of COVID-19 patient-episodes had infection with another respiratory virus detected within 28 days of their COVID-19 diagnosis
- Infections with other respiratory viruses were most commonly categorised as co-infections (52.8%)

†SARS-CoV-2 specimen dates from 30 Jan 2020 to 28 Jun 2020 (n=243,898). Data for wave 1 remains static
*detection of respiratory virus +/- 1 days either side of first COVID-19 specimen in patient-episode
**secondary respiratory virus detection 2-28 days after first COVID-19 specimen in patient-episode
***secondary COVID-19 detection 2-28 days after primary respiratory virus detection
‡ Human metapneumovirus ‡‡ Respiratory syncytial virus
Please note patients can have multiple viruses identified, numbers here do not reflect the number of patients.

UK Health Security Agency

Number of COVID-19 patient-episodes with other respiratory viral infections, reported to SGSS and Respiratory Datamart, in COVID-19 patients diagnosed in England in wave 2†, by virus and timing of diagnosis

Respiratory viral infection	COVID-19 patient-episodes with other respiratory viral infections		Timing of respiratory viral diagnosis in relation to COVID-19 diagnosis					
			Co-infection*		Secondary infection after COVID-19 infection**		Secondary COVID-19 infection after other respiratory infection***	
	n	% of COVID patient-episodes	n	%	n	%	n	%
Adenovirus	44	<0.01	23	52.3	14	31.8	7	15.9
Enterovirus	16	<0.01	7	43.8	5	31.3	4	25.0
hMPV‡	4	<0.01	1	25.0	3	75.0	0	0.0
Influenza A	13	<0.01	4	30.8	5	38.5	4	30.8
Influenza B	17	<0.01	11	64.7	6	35.3	0	0.0
Influenza untyped	1	<0.01	0	0.0	0	0.0	1	100.0
Parainfluenza	17	<0.01	4	23.5	11	64.7	2	11.8
Rhinovirus	151	<0.01	48	31.8	54	35.8	49	32.5
RSV‡‡	5	<0.01	1	20.0	3	60.0	1	20.0
Seasonal coronavirus	63	<0.01	38	60.3	21	33.3	4	6.3
Any infection	**331**	**0.01**	**137**	**41.4**	**122**	**36.9**	**72**	**21.8**

Key findings, Wave 2:

- 0.01% of COVID-19 patient-episode had infection with another respiratory virus detected within 28 days of their COVID-19 diagnosis
- Infections with other respiratory viruses were most commonly categorised as co-infections (41.4%)

†SARS-CoV-2 specimen dates from 29 Jun 2020 to 26 Apr 2021 (n=3,695,593). Data for wave 2 remains static
*detection of respiratory virus +/- 1 days either side of first COVID-19 specimen in patient-episode
**secondary respiratory virus detection 2-28 days after first COVID-19 specimen in patient-episode
***secondary COVID-19 detection 2-28 days after primary respiratory virus detection
‡ Human metapneumovirus ‡‡ Respiratory syncytial virus
Please note patients can have multiple viruses identified, numbers here do not reflect the number of patients.

UK Health Security Agency

Number of COVID-19 patient-episodes with other respiratory viral infections, reported to SGSS and Respiratory Datamart, in COVID-19 patients diagnosed in England in wave 3†, by virus and timing of diagnosis

Last updated 16 Mar 2022

Respiratory viral infection	COVID-19 patient-episodes with other respiratory viral infections		Timing of respiratory viral diagnosis in relation to COVID-19 diagnosis					
			Co-infection*		Secondary infection after COVID-19 infection**		Secondary COVID-19 infection after other respiratory infection***	
	n	% of COVID patient-episodes	n	%	n	%	n	%
Adenovirus	116	<0.01	55	47.4	32	27.6	29	25.0
Enterovirus	54	<0.01	25	46.3	15	27.8	14	25.9
hMPV‡	152	<0.01	65	42.8	38	25.0	49	32.2
Influenza A	147	<0.01	54	36.7	49	33.3	44	29.9
Influenza B	56	<0.01	27	48.2	11	19.6	18	32.1
Influenza untyped	3	<0.01	2	66.7	0	0.0	1	33.3
Parainfluenza	115	<0.01	54	47.0	26	22.6	35	30.4
Rhinovirus	304	<0.01	131	43.1	80	26.3	93	30.6
RSV‡‡	691	0.01	337	48.8	168	24.3	186	26.9
Seasonal coronavirus	141	<0.01	53	37.6	62	44.0	26	18.4
Any infection	**1,779**	**0.02**	**803**	**45.1**	**481**	**27.0**	**495**	**27.8**

Key findings, Wave 3:

- 0.02% of COVID-19 patient-episode had infection with another respiratory virus detected within 28 days of their COVID-19 diagnosis
- Infections with other respiratory viruses were most commonly categorised as co-infections (45.1%)

†SARS-CoV-2 specimen dates from 27 Apr 2021 to 23 Jan 2022 (n=10,385,201)
*detection of respiratory virus +/- 1 days either side of first COVID-19 specimen in patient-episode
**secondary respiratory virus detection 2-28 days after first COVID-19 specimen in patient-episode
***secondary COVID-19 detection 2-28 days after primary respiratory virus detection
‡ Human metapneumovirus ‡‡ Respiratory syncytial virus
Please note patients can have multiple viruses identified, numbers here do not reflect the number of patients.

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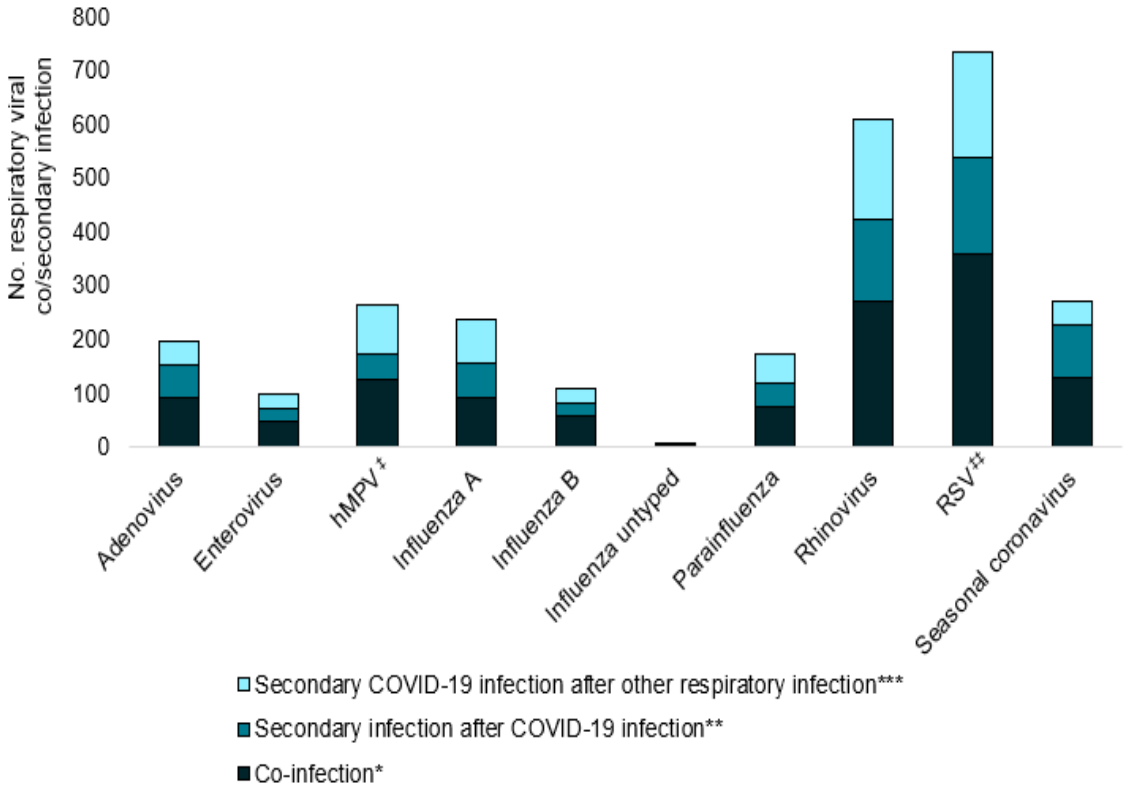
Number of other respiratory viral infections, reported to SGSS and Respiratory Datamart, in COVID-19 patients diagnosed in England since January 2020†, by virus and timing of diagnosis



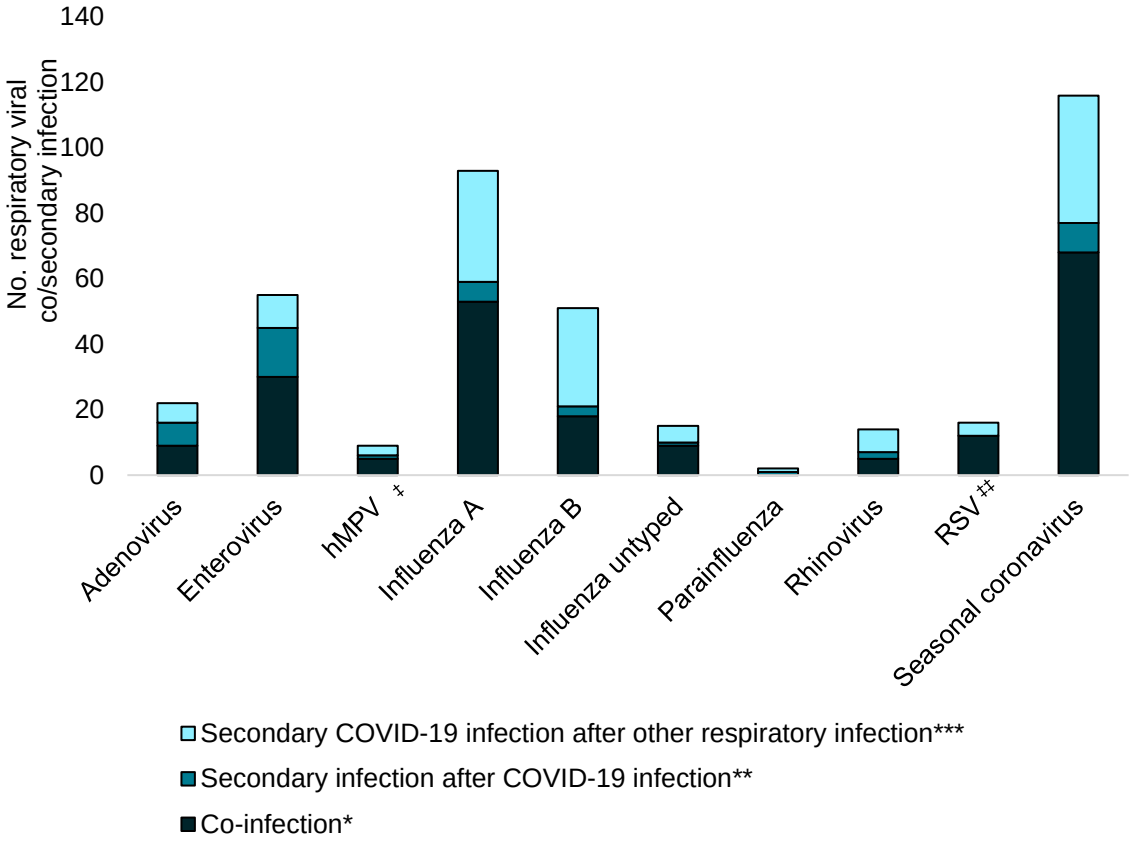
Key findings:

- Most frequent viruses identified from co-/secondary infection isolates were RSV and rhinovirus

†SARS-CoV-2 specimen dates from 30 Jan 2020 to 23 Jan 2022. Data for wave 1 & 2 remains static (last updated 21 Feb 2022)
*detection of respiratory virus +/- 1 days either side of first COVID-19 specimen in patient-episode
**secondary respiratory virus detection 2-28 days after first COVID-19 specimen in patient-episode
***secondary COVID-19 detection 2-28 days after primary respiratory virus detection
‡ Human metapneumovirus ‡‡ Respiratory syncytial virus
Please note patients can have multiple viruses identified, numbers here do not reflect the number of patients.

UK Health Security Agency

Number of other respiratory viral infections, reported to SGSS and Respiratory Datamart, in COVID-19 patients diagnosed in England in wave 1†, by virus and timing of diagnosis



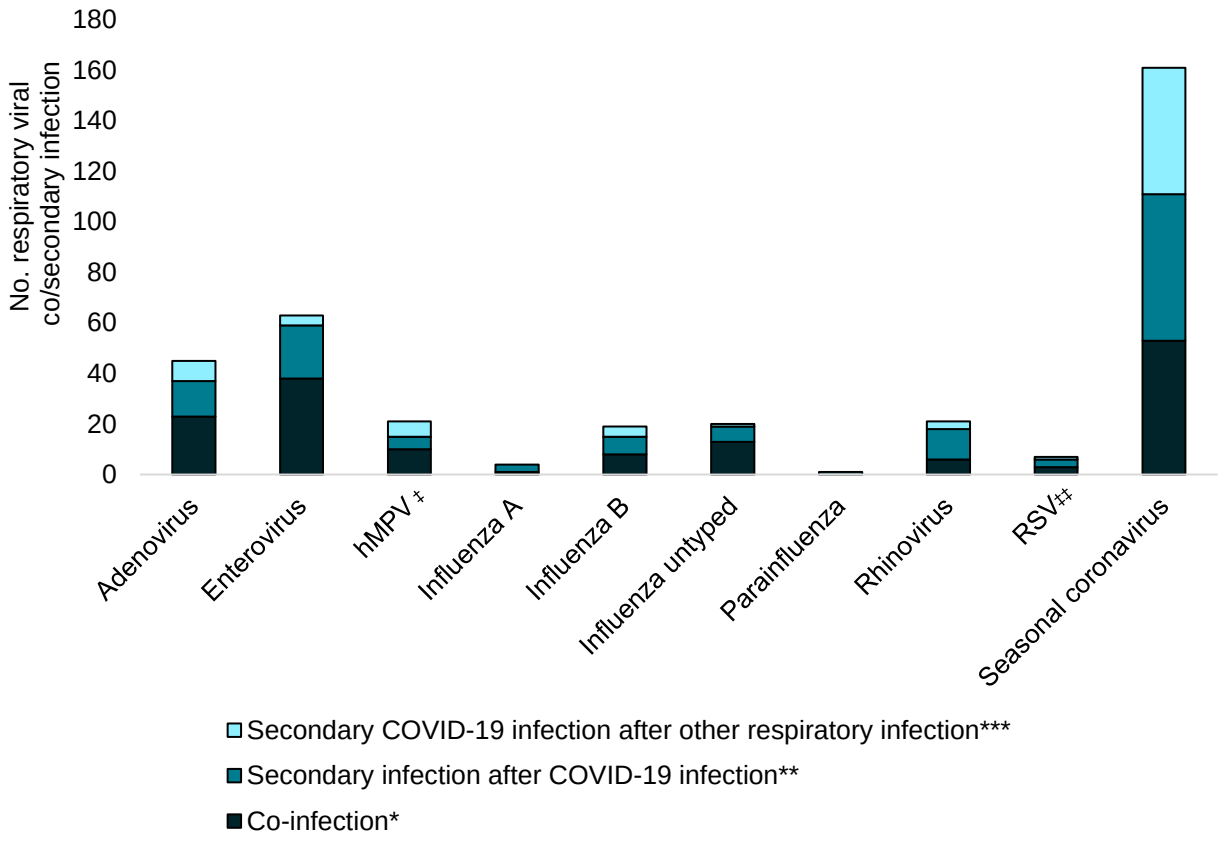
Key findings:

- Most frequent viruses identified from co-/secondary infection isolates were seasonal coronavirus and Influenza A

†SARS-CoV-2 specimen dates from 30 Jan 2020 to 28 Jun 2020. Data for wave 1 remains static
*detection of respiratory virus +/- 1 days either side of first COVID-19 specimen in patient-episode
**secondary respiratory virus detection 2-28 days after first COVID-19 specimen in patient-episode
***secondary COVID-19 detection 2-28 days after primary respiratory virus detection
‡ Human metapneumovirus ‡‡ Respiratory syncytial virus
Please note patients can have multiple viruses identified, numbers here do not reflect the number of patients.

UK Health Security Agency

Number of other respiratory viral infections, reported to SGSS and Respiratory Datamart, in COVID-19 patients diagnosed in England in wave 2†, by virus and timing of diagnosis



Key findings:

- Most frequent viruses identified from co-/secondary infection isolates were seasonal coronavirus and enterovirus

†SARS-CoV-2 specimen dates from 29 Jun 2020 to 26 Apr 2021. Data for wave 2 remains static
*detection of respiratory virus +/- 1 days either side of first COVID-19 specimen in patient-episode
**secondary respiratory virus detection 2-28 days after first COVID-19 specimen in patient-episode
***secondary COVID-19 detection 2-28 days after primary respiratory virus detection
‡ Human metapneumovirus ‡‡ Respiratory syncytial virus
Please note patients can have multiple viruses identified, numbers here do not reflect the number of patients.

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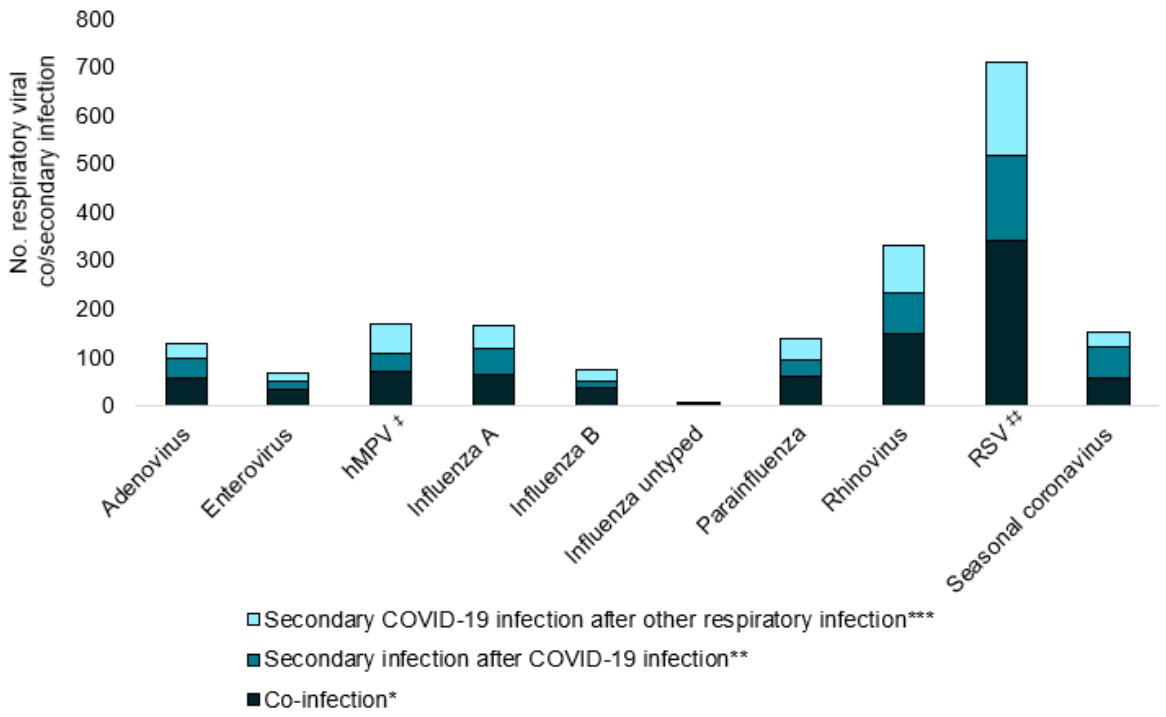
Number of other respiratory viral infections, reported to SGSS and Respiratory Datamart, in COVID-19 patients diagnosed in England in wave 3†, by virus and timing of diagnosis



Key findings:

- Most frequent viruses identified from co-/secondary infection isolates were RSV and rhinovirus

†SARS-CoV-2 specimen dates from 27 Apr 2021 to 23 Jan 2022
*detection of respiratory virus +/- 1 days either side of first COVID-19 specimen in patient-episode
**secondary respiratory virus detection 2-28 days after first COVID-19 specimen in patient-episode
***secondary COVID-19 detection 2-28 days after primary respiratory virus detection
‡ Human metapneumovirus ‡‡ Respiratory syncytial virus
Please note patients can have multiple viruses identified, numbers here do not reflect the number of patients.

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COVID-19 Co/secondary infection with fungi and vaccine preventable bacteria

Bacteria/Fungi	First Wave (30 Jan 2020 - 28 June 2020)	Second Wave (29 June 2020 – 30 April 2021)	Third Wave (1 May 2021 – 24 December 2021)	Total Cases
***Aspergillus fumigatus* isolates (azole resistant)**	46 (4)	120 (2)	137(12)	**303(18)**
Probable/Proven cases of CAPA*	15	38	44	**97**
Candida spp.: Candidemia	63	133	17	**213**
Bordetella pertussis	0	0	0	**0**
Haemophilus influenzae	3	2	0	**5**
Neisseria meningitidis	2	0	0	**2**
Streptococcus pneumoniae	40	45	14	**99**

*COVID-19-associated pulmonary aspergillosis

Please note fungal data refers to secondary infections only. Mycology data contains results from Mycology reference laboratory data, Candidaemia is representative of deep infection. One case of osteomyelitis, one case of ventriculitis and one case of endocarditis was documented in wave two. *Bordetella pertussis* co-infection is defined as +/- 28 d Culture/PCR (based on pertussis sample date), +/- 28 Serology/Oral fluid (anti-pertussis toxin Ig) (based on pertussis symptom onset date, excluding cases without onset date). *Haemophilus influenzae*, *Neisseria meningitidis* and *Streptococcus pneumoniae* co-infection is defined as +/- 2d. *Legionella*, *Mycoplasma* and gastrointestinal infection data not included.

Appendix 1: Co and secondary infection definitions with COVID-19

The day pertains to the date of the sample collection that yielded a positive result. These definitions do not apply to persistent COVID-19 patients. Patients with persistent COVID-19 require independent clinical assessment.

Organism	Definition co-infection with SARS-CoV-2 †	Definition of infection pre-SARS-CoV-2 infection (other pathogen is primary infection) or Definition of post SARS-CoV-2 secondary infection (SARS-CoV-2 is primary infection)
Influenza A	+/- 1d	2-28d^
Influenza B	+/- 1d	2-28d^
RSV	+/- 1d	2-28d
Adenovirus	+/- 1d	2-28d
Enterovirus	+/- 1d	2-28d
Human metapneumovirus	+/- 1d	2-28d
Parainfluenza (any subtype)	+/- 1d	2-28d
Seasonal coronavirus	+/- 1d *	2-28d
Rhinovirus	+/- 1d	2-28d
Co-infections in ECMO patient (patients with most severe clinical respiratory signs)		
ECMO patients	Individual case review	Individual case review
Blood stream and respiratory infections (bacterial and fungal)		
Achromobacter xylosoxidans	+/- 1d	2-28d
Acinetobacter spp.,	+/- 1d	2-28d
Aspergillus	+/- 1d	2-28d (pre) 2-60d (post, continually hospitalised patients only)
Bordetella pertussis	+/- 28 d Culture/PCR (based on pertussis sample date) +/- 28 Serology/Oral fluid (anti-pertussis toxin Ig) (based on pertussis symptom onset date, excluding cases without onset date)	N/A (Pertussis presentation is often delayed)
Burkholderia cepacia	+/- 1d	2-28d
Candida spp	+/- 1d	2-28d (pre) 2-60d (post, continually hospitalised patients only)
Chlamydia pneumoniae	0-7d PCR	PCR within 14-28 d (8-13d PCR*)
Enterobacter spp.,	+/- 1d	2-28d
Enterococcus spp.	+/- 1d	2-28d
E. coli	+/- 1d	2-28d
Haemophilus influenzae	+/- 2d	3-28d

Continued overleaf

Appendix 1 continued: Co and secondary infection definitions with COVID-19

The day pertains to the date of the sample collection that yielded a positive result. These definitions do not apply to persistent COVID-19 patients. Patients with persistent COVID-19 require independent clinical assessment.

Organism	Definition co-infection with SARS-CoV-2 †	Definition of infection pre-SARS-CoV-2 infection (other pathogen is primary infection) or Definition of post SARS-CoV-2 secondary infection (SARS-CoV-2 is primary infection)
Blood stream and respiratory infections (bacterial and fungal)		
Klebsiella spp.	+/- 1d	2-28d
Legionella pneumophila/species	Individual case review	Individual case review
Mycoplasma pneumoniae	0-7d PCR, IgM serology 0-21d <16y	PCR within 14-28 d (8-13d PCR*)
Neisseria meningitidis	+/- 2d	3-28d
Pseudomonas spp.,	+/- 1d	2-28d
Serratia spp.,	+/- 1d	2-28d
Staphylococcus aureus	+/- 1d	2-28d
Coag-neg Staphylococcus (*S. haemolyticus*)	+/- 1d	2-28d
Stenotrophomonas spp., (*S. maltophilia)*	+/- 1d	2-28d
Streptococcus spp. ‡	+/- 1d	2-28d
Streptococcus pneumoniae	+/- 2d	3-28d
Tuberculosis		
Mycobacterium tuberculosis	Individual case review	Individual case review
Pathogens of the immunocompromised (eg HIV)		
HIV	Individual case review	Individual case review
Gastrointestinal infections		
Listeria	0-5d *	Individual case review
Campylobacter	0-5d *	Individual case review
Shiga toxin-producing *E. coli* (STEC)	0-5d *	Individual case review
Norovirus	0-5d *	Individual case review
Salmonella	0-5d *	Individual case review
Shigella	0-5d *	Individual case review
Anaerobes		
C. difficile	+/- 1d	2-28d
Bacteroides sp. (*B. fragilis* and non-fragilis Bacteroides)	+/- 1d	2-28d

See next slides for notes

Appendix 1 continued: Co and secondary infection definitions with COVID-19

Notes

† From SARS-CoV-2 first detection date. Not including multiple episodes of SARS-CoV-2 per patient.

* Additional data check required. (Resistance is not detailed, data for MERS is not currently available).

^ Definition post- SARS-CoV-2 secondary infection (SARS-CoV-2 is primary infection).This has been extended from prior 14d secondary infection definition for influenza used by PHE to account for disparities in testing throughout the 28d period after SARS-CoV-2 detection.

‡ Streptococcus species includes the following groups and species:

Group	Species/other names
Anginosus Group	*Streptococcus anginosus; Streptococcus constellatus (Streptococcus constellatus subspecies constellatus Streptococcus constellatus subspecies pharynges); Streptococcus* Group F; *Streptococcus intermedius; Streptococcus milleri* group; *Streptococcus sinensis*
Bovis Group	*Streptococcus alactolyticus; Streptococcus bovis* untyped; *Streptococcus equinus; Streptococcus gallolyticus subspecies gallolyticus (Streptococcus bovis* biotype I); *Streptococcus infantarius (Streptococcus infantarius sp infantarius; Streptococcus bovis* biotype II); *Streptococcus lutetiensis; Streptococcus infantarius subspecies coli (Streptococcus bovis* biotype II); *Streptococcus pasteurianus (Streptococcus bovis* biotype II)
Closely Related Genera	*Abiotrophia spp.; Aerococcus spp.; Faklamia spp.; Gemella* spp.; *Globicatella sanguinis; Granulicatella* spp.; *Leuconostoc* spp.; *Pedicoccus* spp.; *Peptostreptococcus* spp.
Mitis Group	*Streptococcus cristatus; Streptococcus mitior; Streptococcus mitis; Streptococcus oralis; Streptococcus pseudopneumoniae; Streptococcus infantis; Streptococcus peroris*
Mutans Group	*Streptococcus mutans; Streptococcus sobrinus*
Other streptococci (including but not limited to)	Anaerobic streptococcus; *Streptococcus acidominimus; Streptococcus* spp., other named/not fully identified; *Streptococcus suis; Streptococcus uberis*
Salivarius Group	*Streptococcus vestibularis; Streptococcus thermophilus*
Sanguinis Group	*Streptococcus gordonii; Streptococcus massiliensis; Streptococcus parasanguinis; Streptococcus sanguinis*
Streptococcus Group A	Group A; *Streptococcus pyogenes; Streptococcus dysgalactiae* subspecies *equisimilis*
Streptococcus Group B	Group B; *Streptococcus agalactiae*
Streptococcus Group C	Group C; *Streptococcus dysgalactiae* subspecies *equisimilis; Streptococcus equi* subspecies *zooepidemicus*
Streptococcus Group G	Group G; *Streptococcus canis; Streptococcus dysgalactiae* subspecies *equisimilis*