UK Health Security Agency

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 14 (between 4 April and 10 April 2022).

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COVID-19 Pandemic Overview

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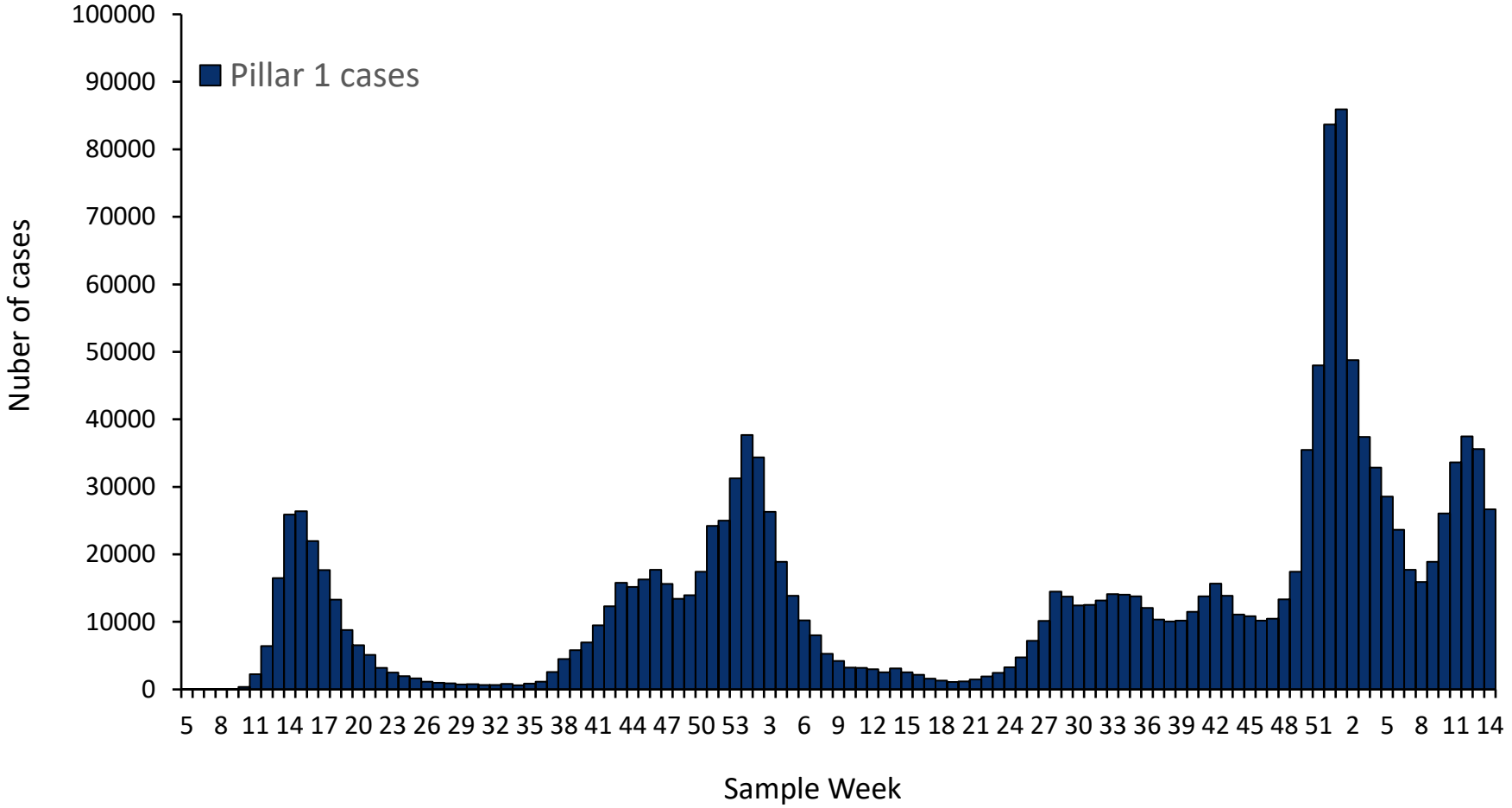
Confirmed COVID-19 episodes tested under Pillar 1, by sample week, since week 5 2020



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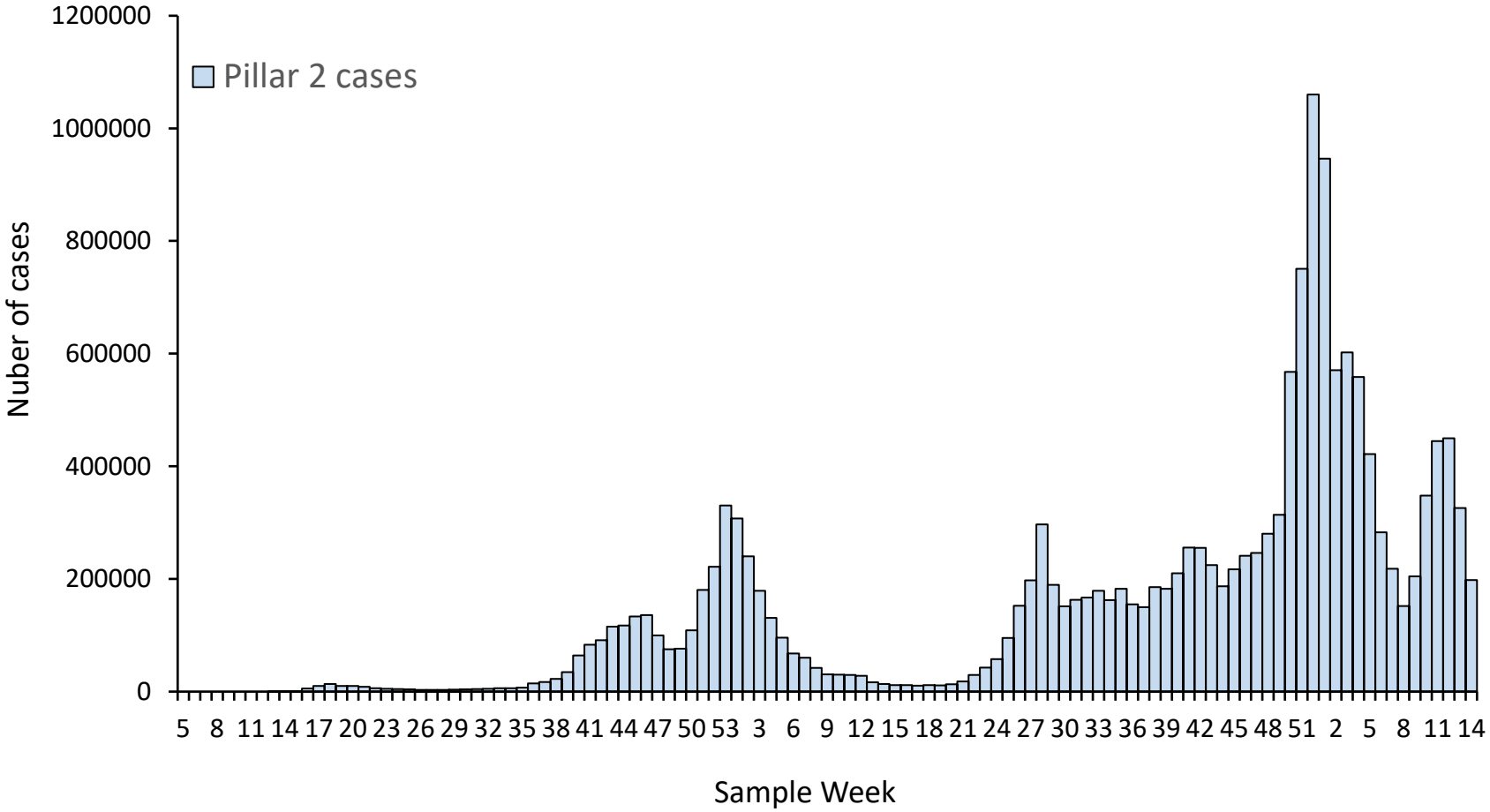
Confirmed COVID-19 episodes tested under Pillar 2, by sample week, since week 5 2020



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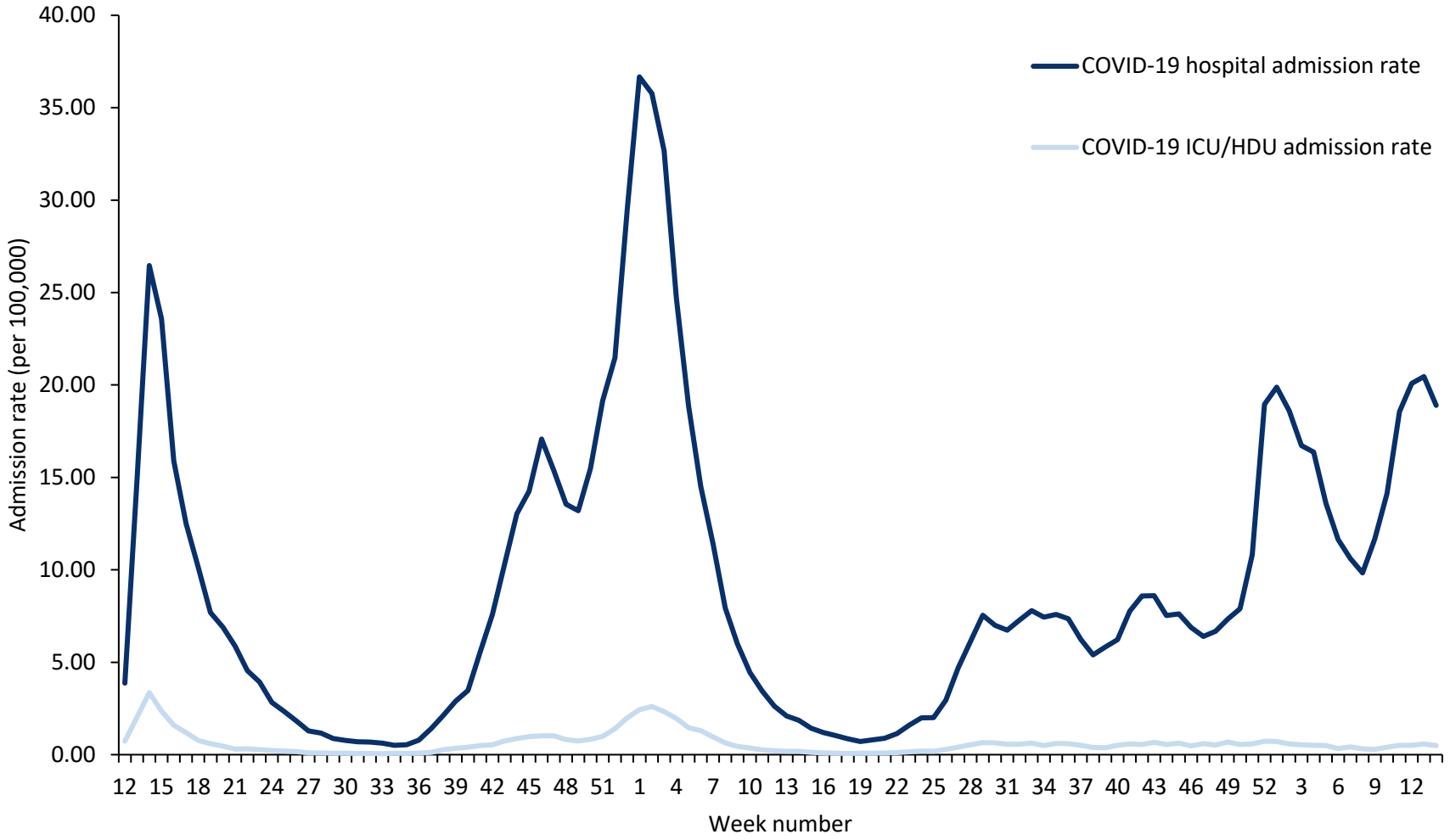
Weekly overall hospital and ICU/HDU admission rates per 100,000 of new COVID-19 cases reported through SARI Watch, England since week 12 2020



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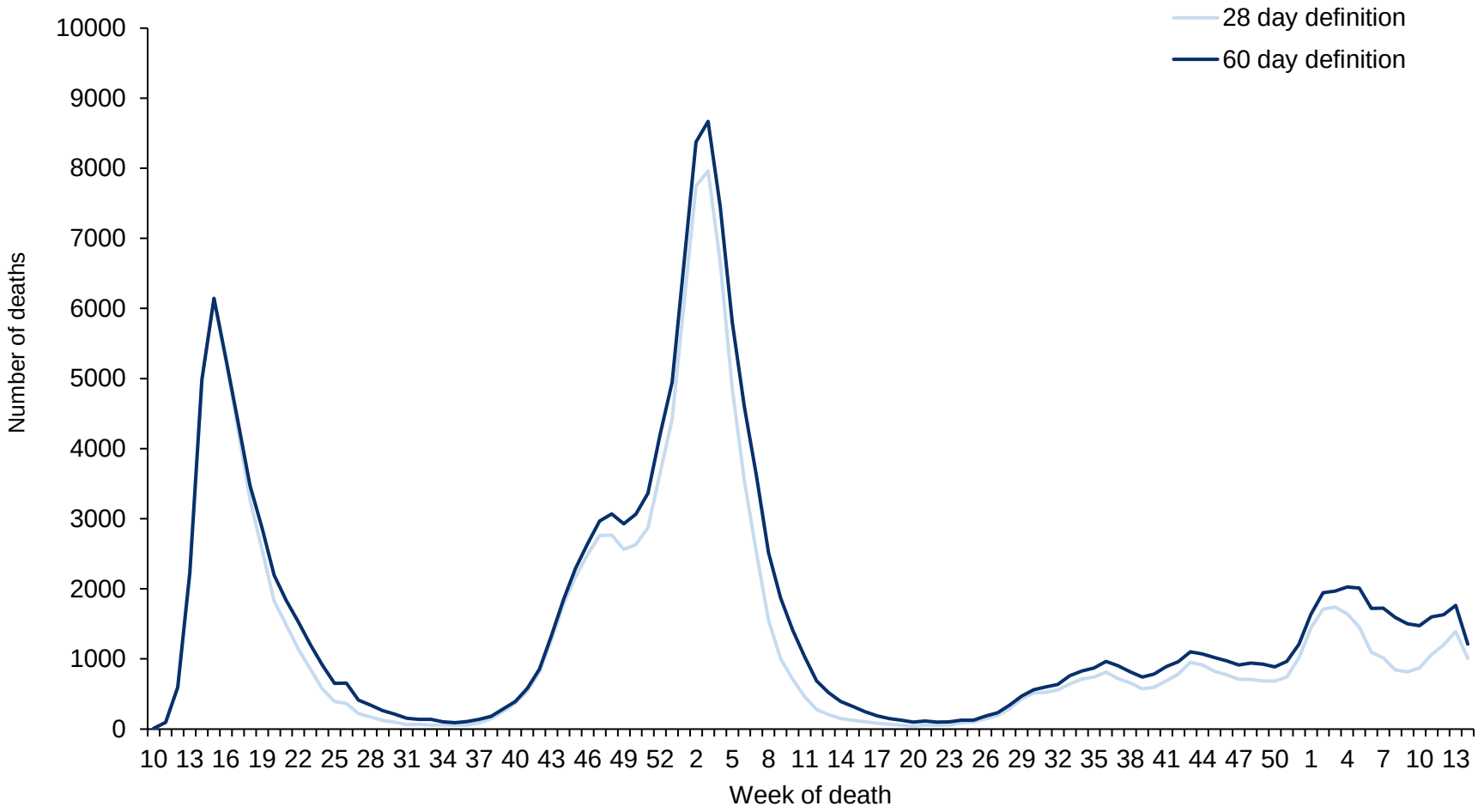
Number of deaths since week 10 2020 by week of death and time since laboratory confirmation of COVID-19, England



Since 1 April 2022, free universal symptomatic and asymptomatic testing for the general public in England is no longer available, as outlined in the plan for living with COVID-19. Data should be interpreted in the context of this change to testing.

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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
- From 11 January 2022 the requirement for confirmatory PCR testing in individuals who test positive using a lateral flow device was temporarily removed.
- 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.
- Since 1 April 2022, free universal symptomatic and asymptomatic testing for the general public in England is no longer available, as outlined in the plan for living with COVID-19. As such, there will be a reduction in the reporting of data obtained through Pillar 2 from April 2022 onwards. Data in this report should be interpreted in the context of this change to testing. Public health guidance remains in place for cases and their close contacts

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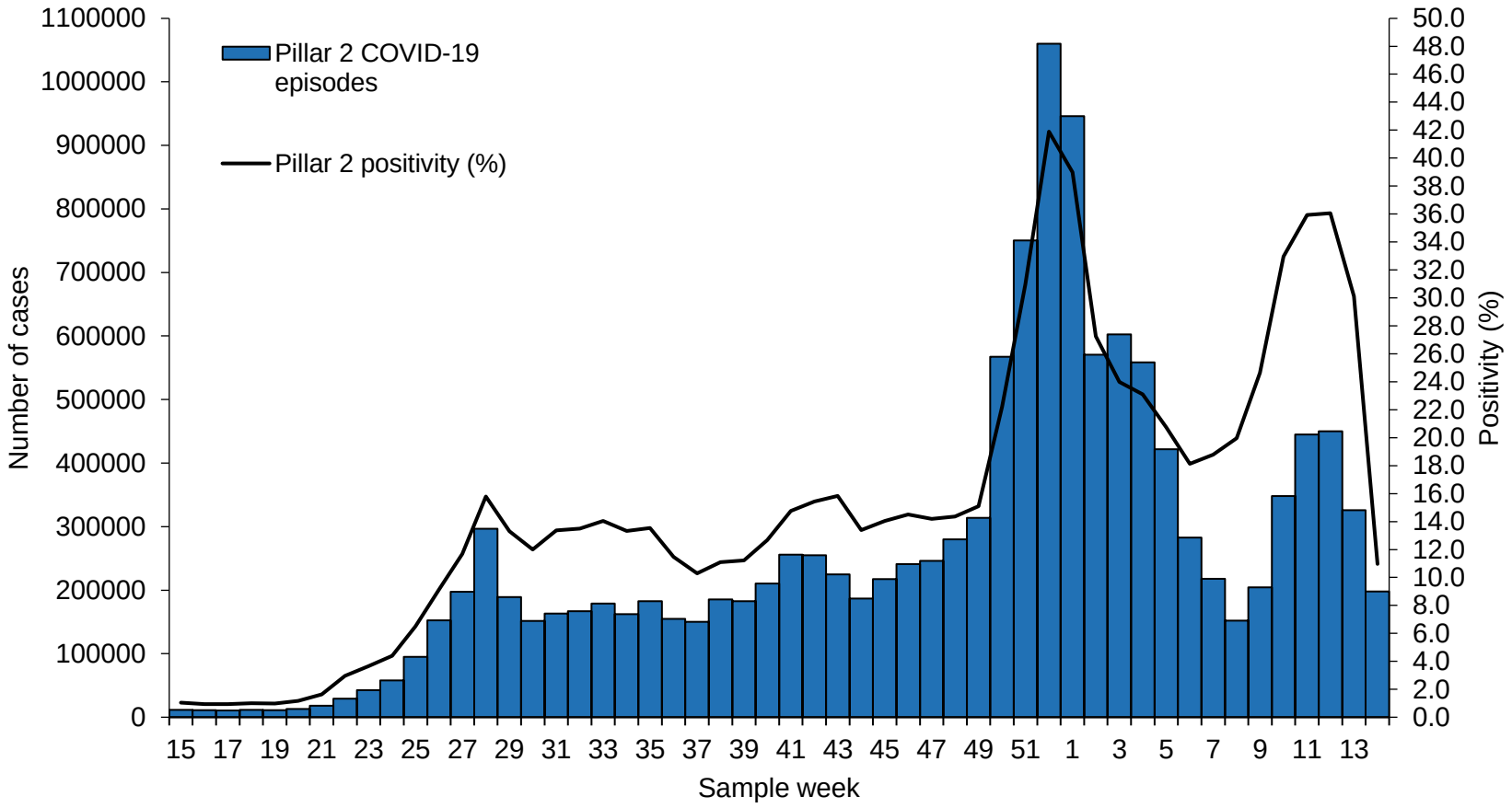
Confirmed COVID-19 episodes tested under Pillar 2, based on sample week with overall weekly PCR positivity for Pillar 2 (%)



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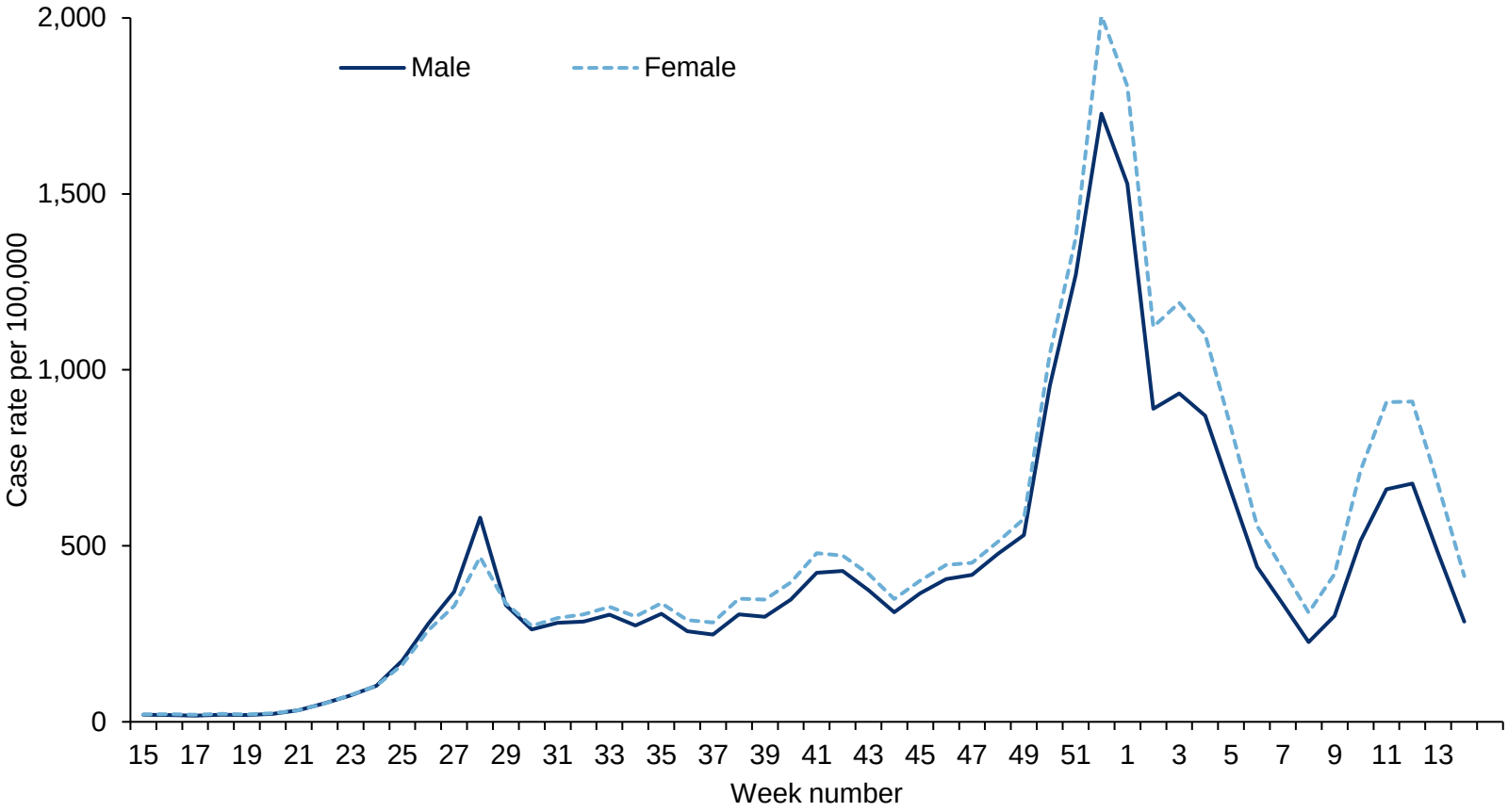
Weekly confirmed COVID-19 case rates per 100,000, by episode, tested under Pillar 2, by sex



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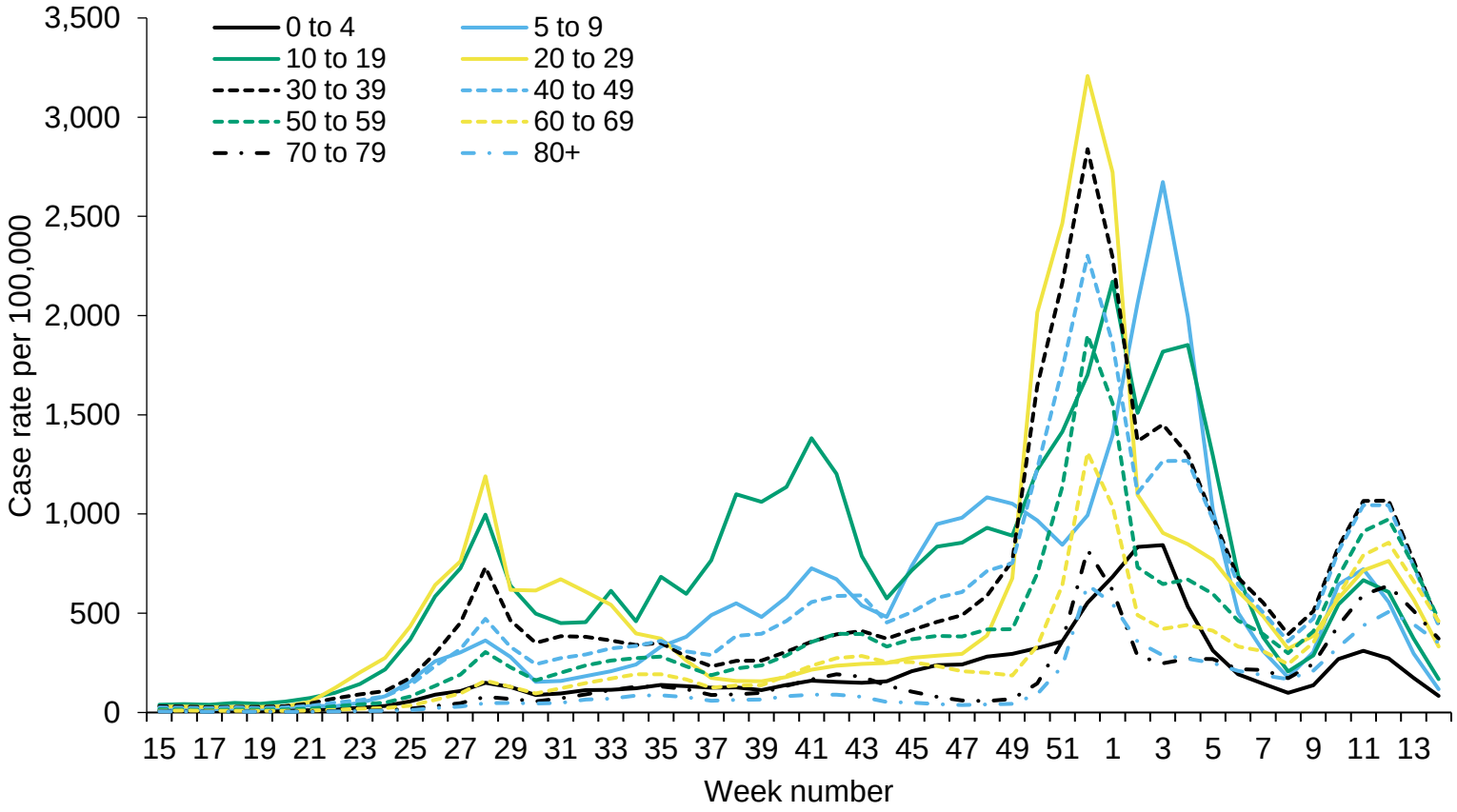
Weekly confirmed COVID-19 case rates per 100,000, by episode, tested under Pillar 2, by age group



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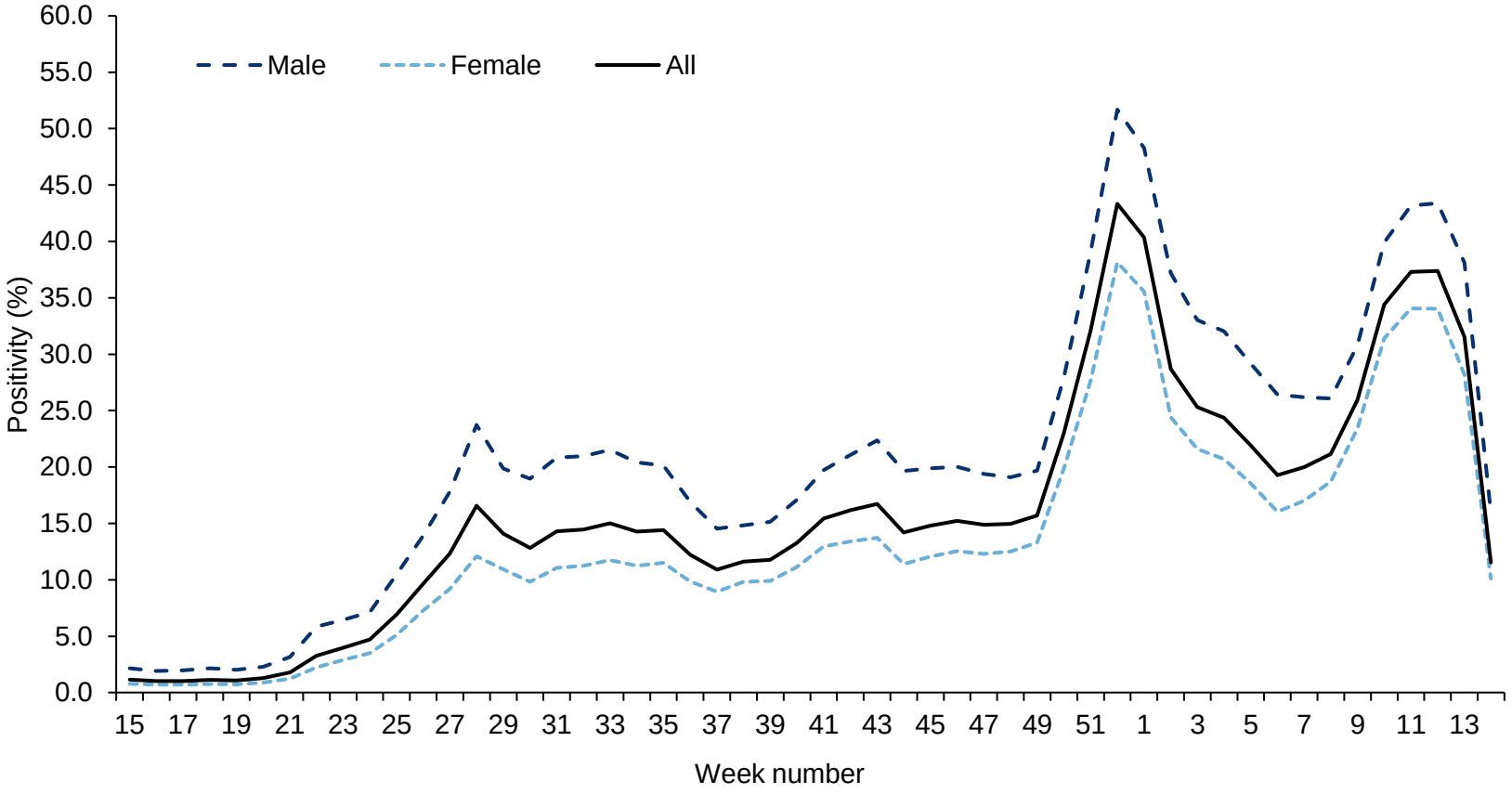
Weekly PCR positivity (%) of confirmed COVID-19 cases tested overall and by sex under Pillar 2



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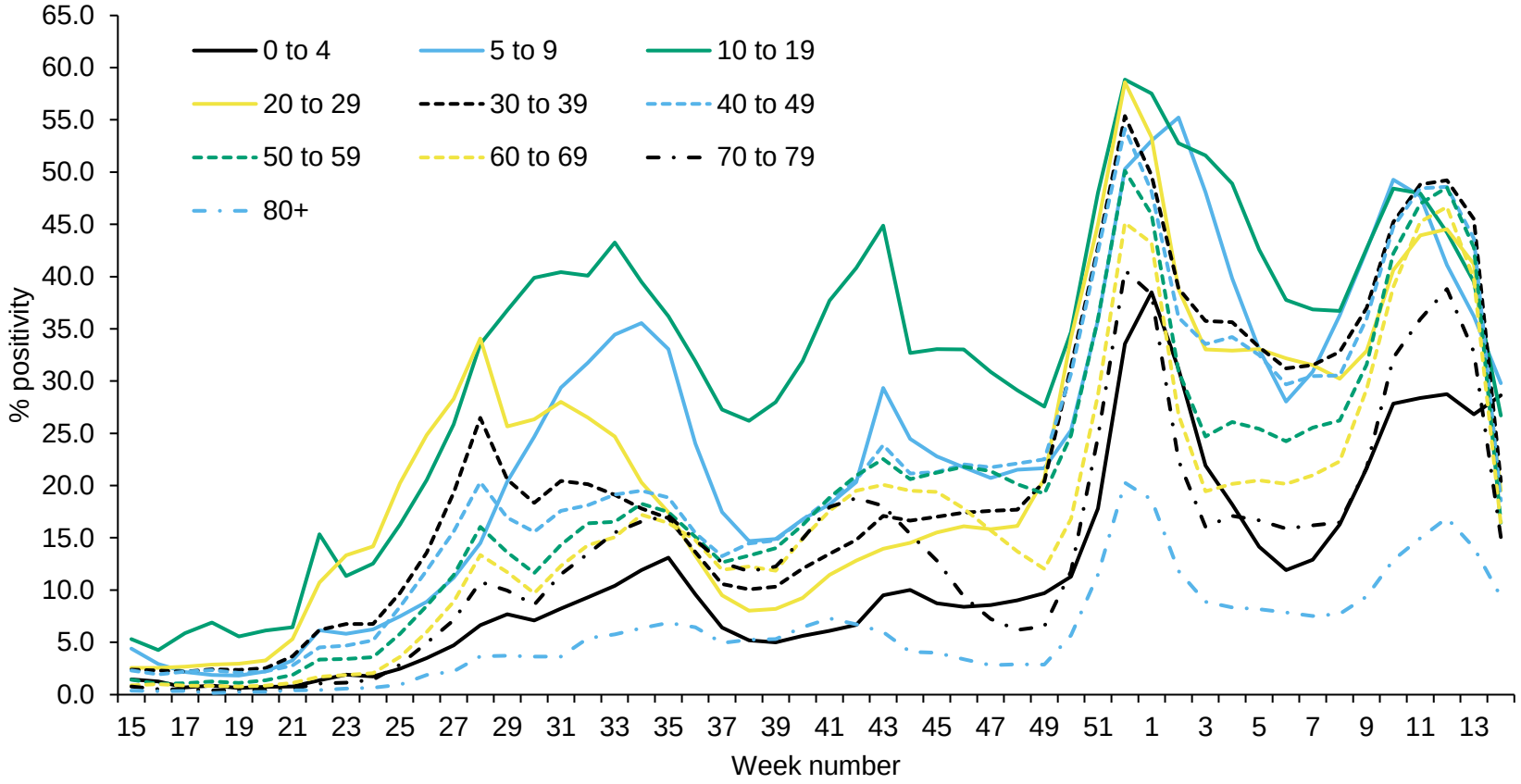
Weekly PCR positivity (%) of confirmed COVID-19 cases tested under Pillar 2, by male and age group



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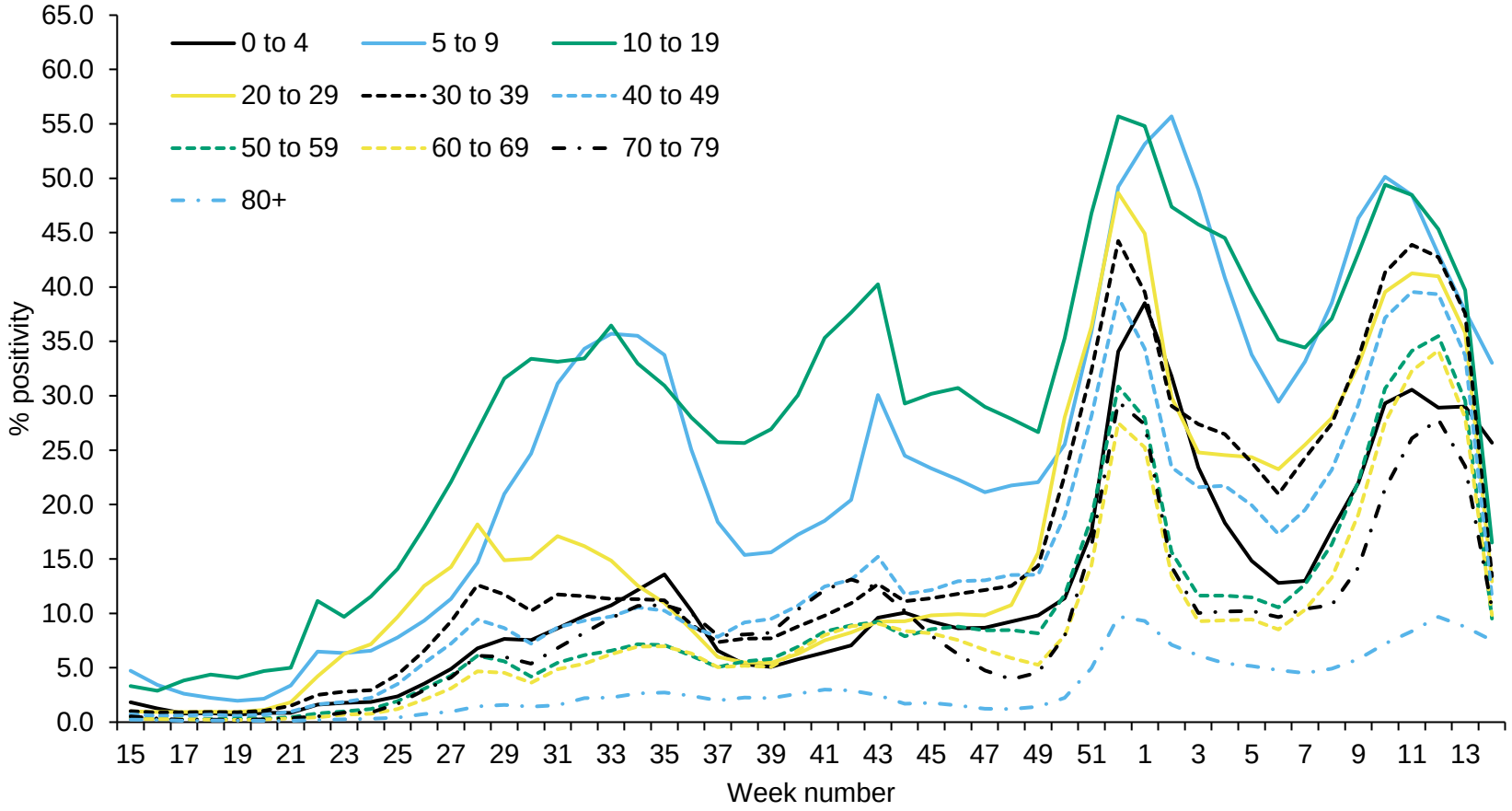
Weekly PCR positivity (%) of confirmed COVID-19 cases tested under Pillar 2, by female and age group



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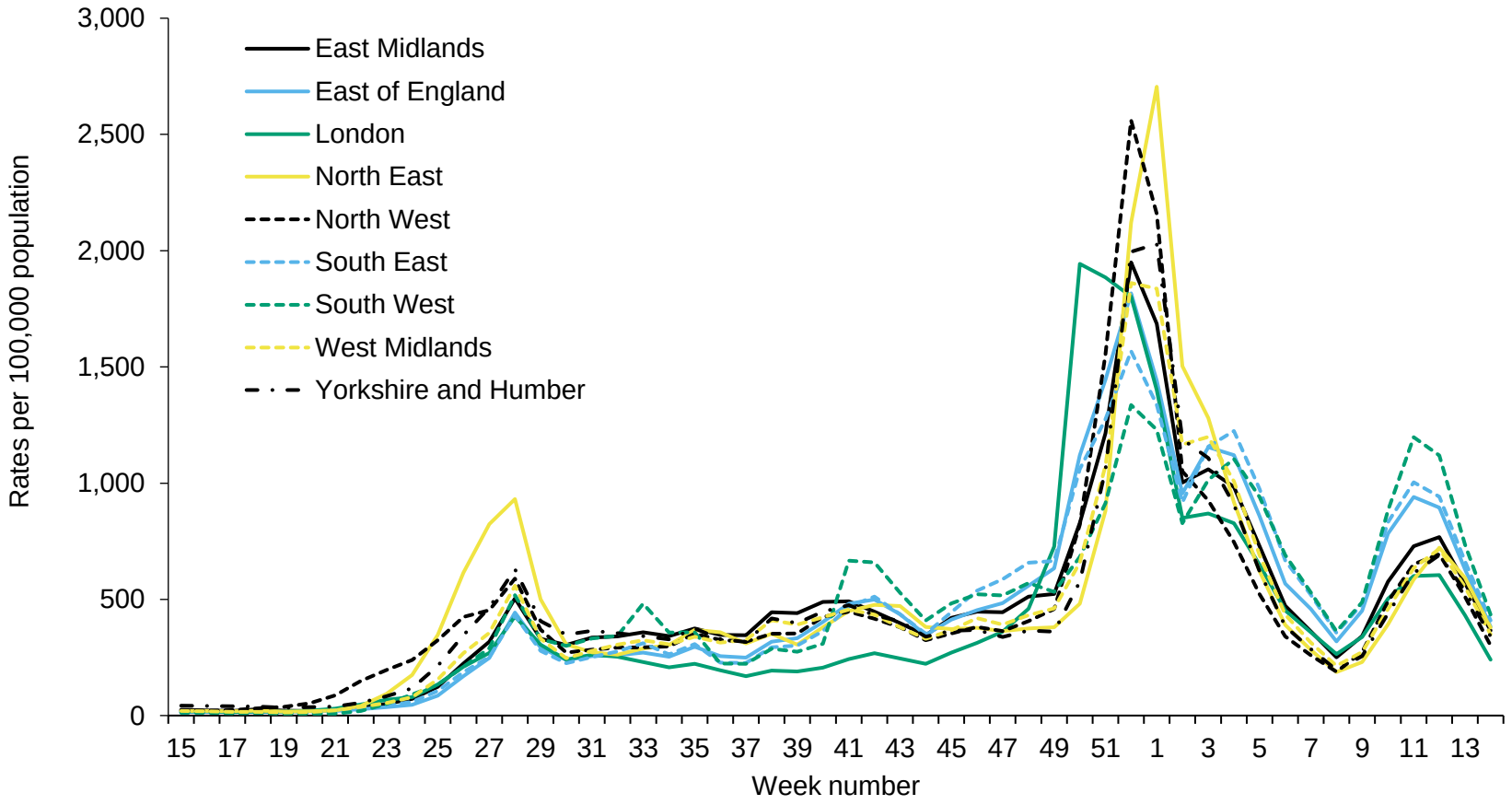
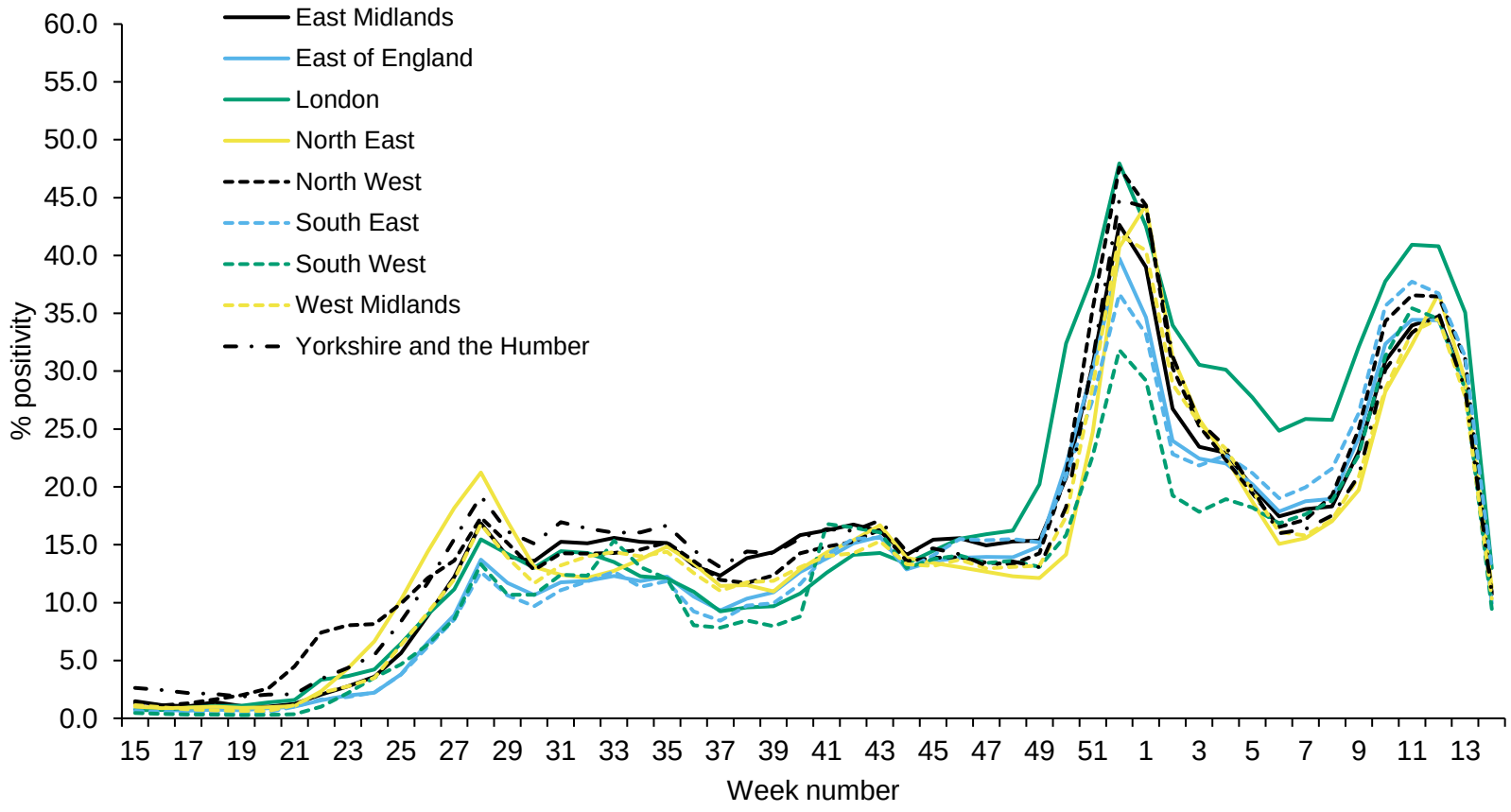
Weekly confirmed COVID-19 case rates by episode, per 100,000 population (Pillar 2), by UKHSA Centres and sample week



UK Health Security Agency

Weekly PCR positivity of confirmed COVID-19 cases tested under Pillar 2 (%) by UKHSA Centres and sample week



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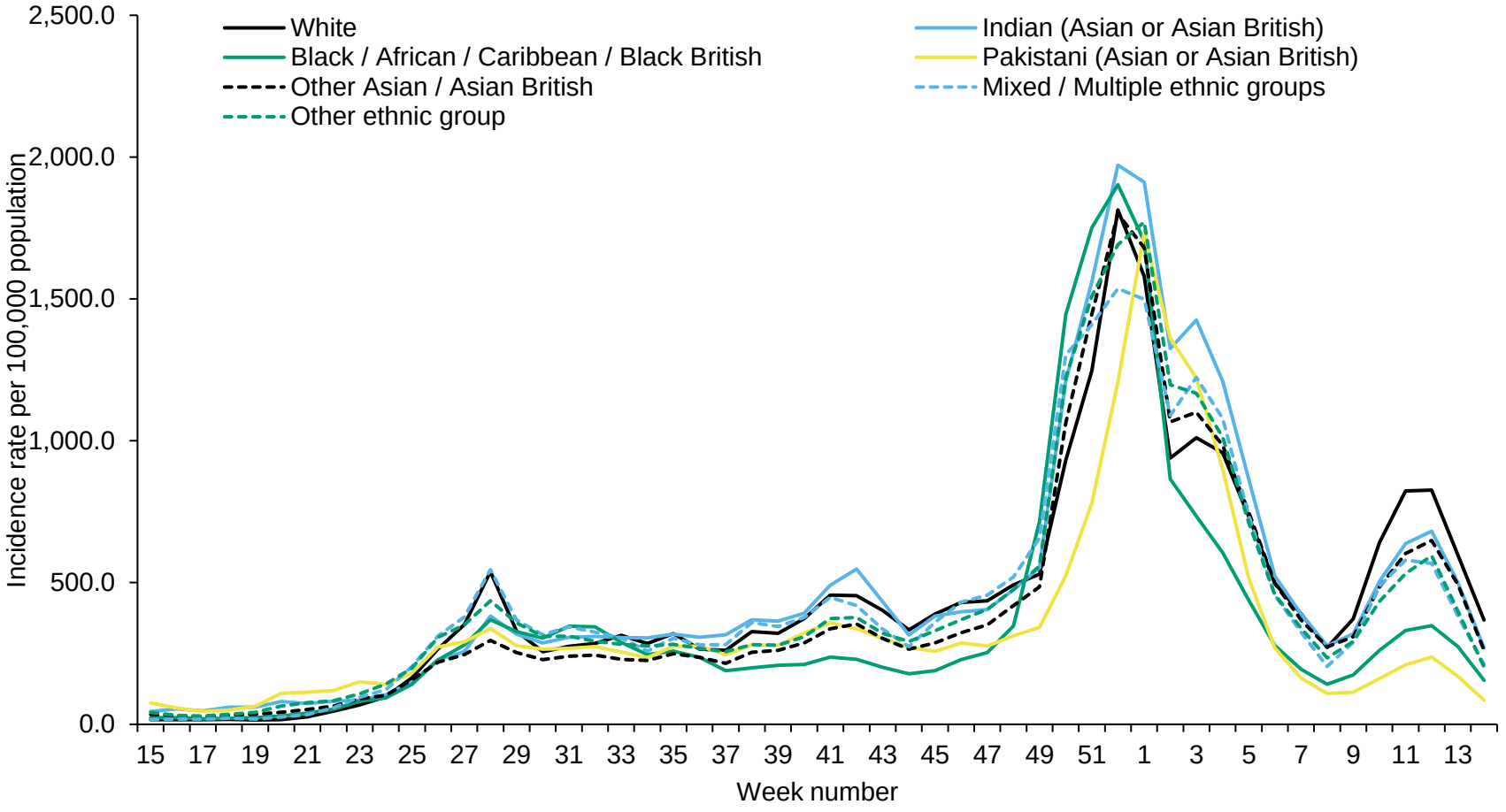
Weekly incidence per 100,000 population by ethnicity (Pillar 2), England



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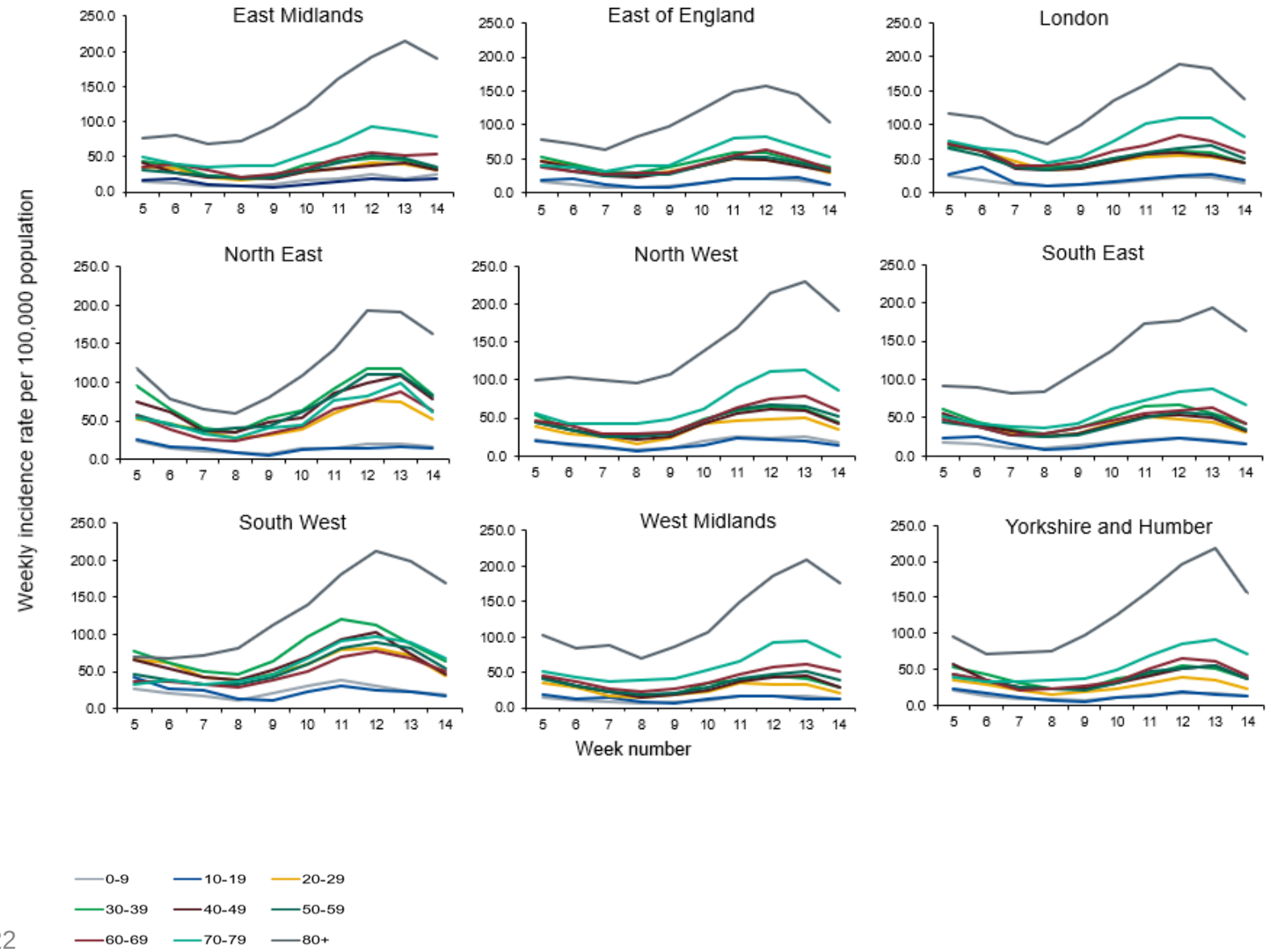
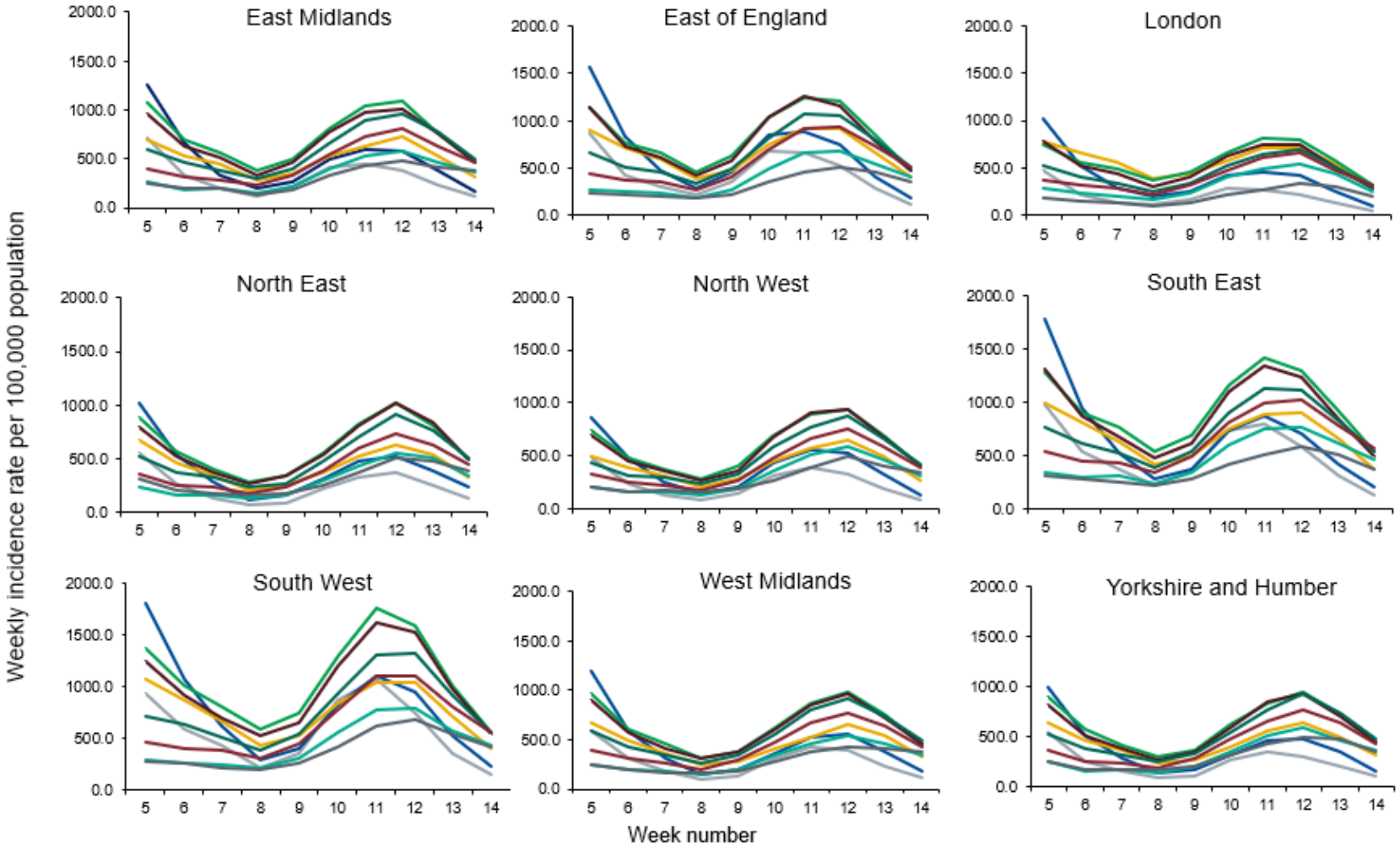
Weekly COVID-19 episodes tested under Pillar 1, per 100,000 population by age group and region, weeks 5 to 14



UK Health Security Agency

Weekly COVID-19 episodes tested under Pillar 2, per 100,000 population by age group and region, weeks 5 to 14



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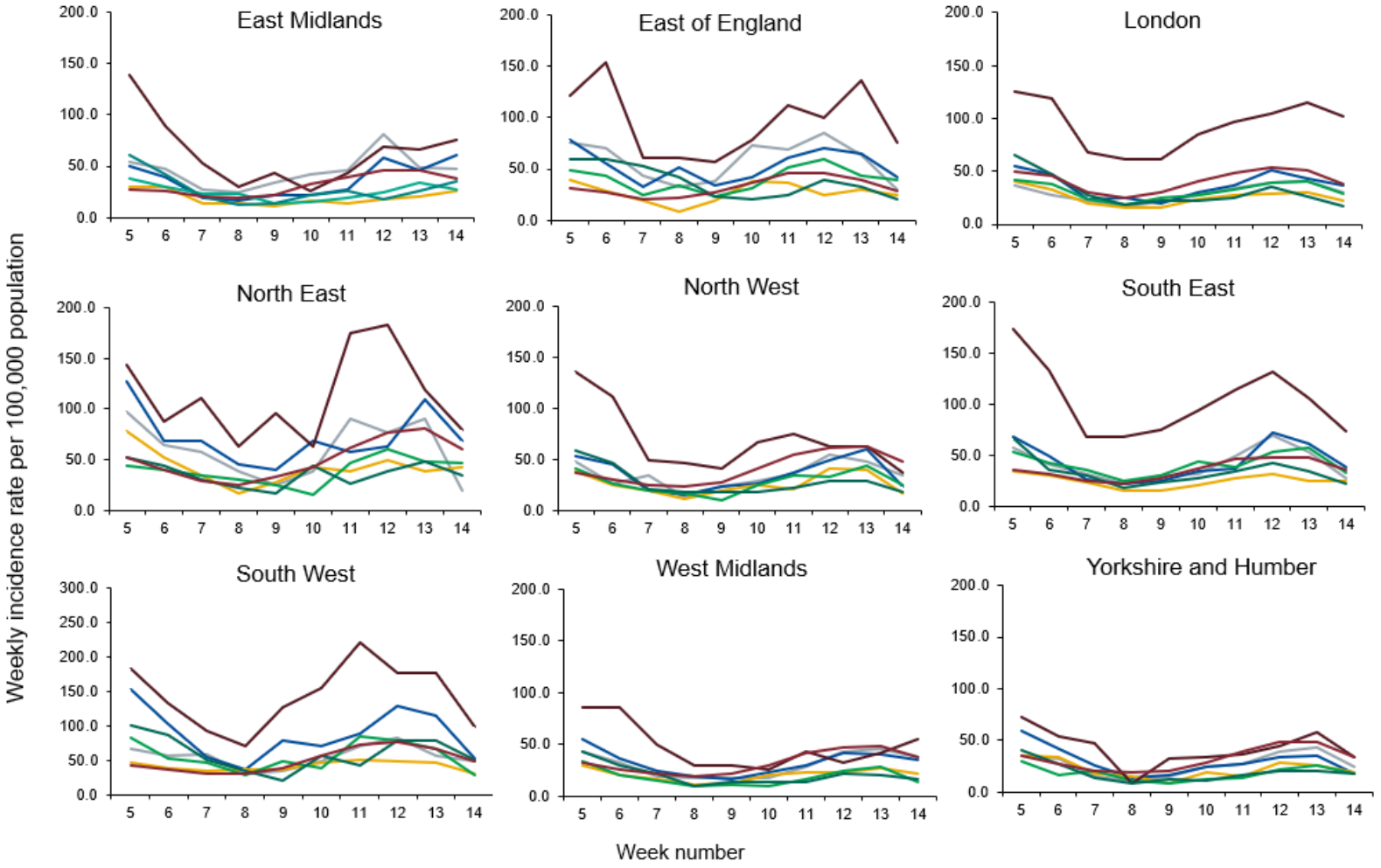
Weekly COVID-19 episodes tested under Pillar 1, per 100,000 population by ethnicity and region, weeks 5 to 14



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

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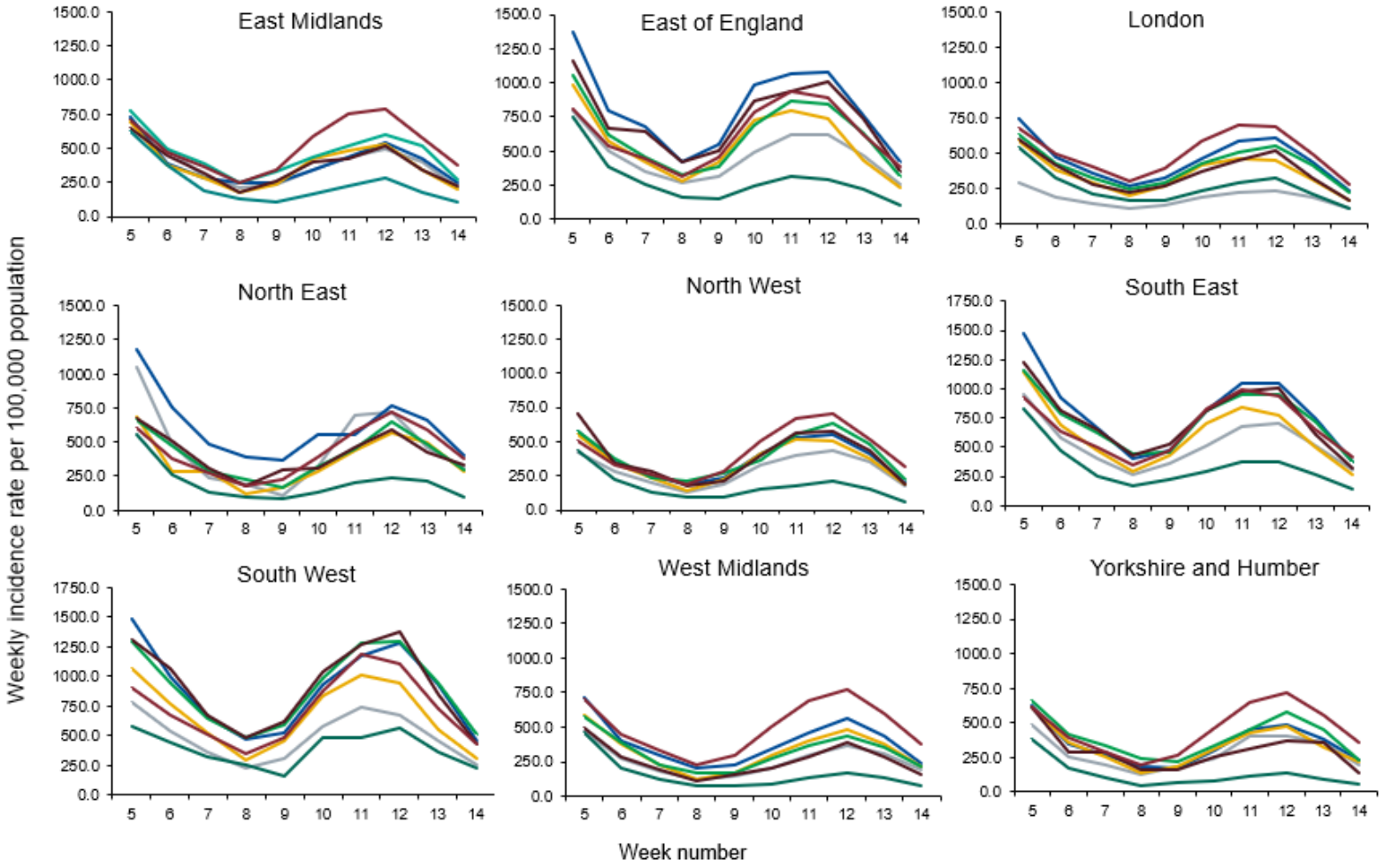
Weekly COVID-19 episodes tested under Pillar 2 per 100,000 population by ethnicity and region, weeks 5 to 14



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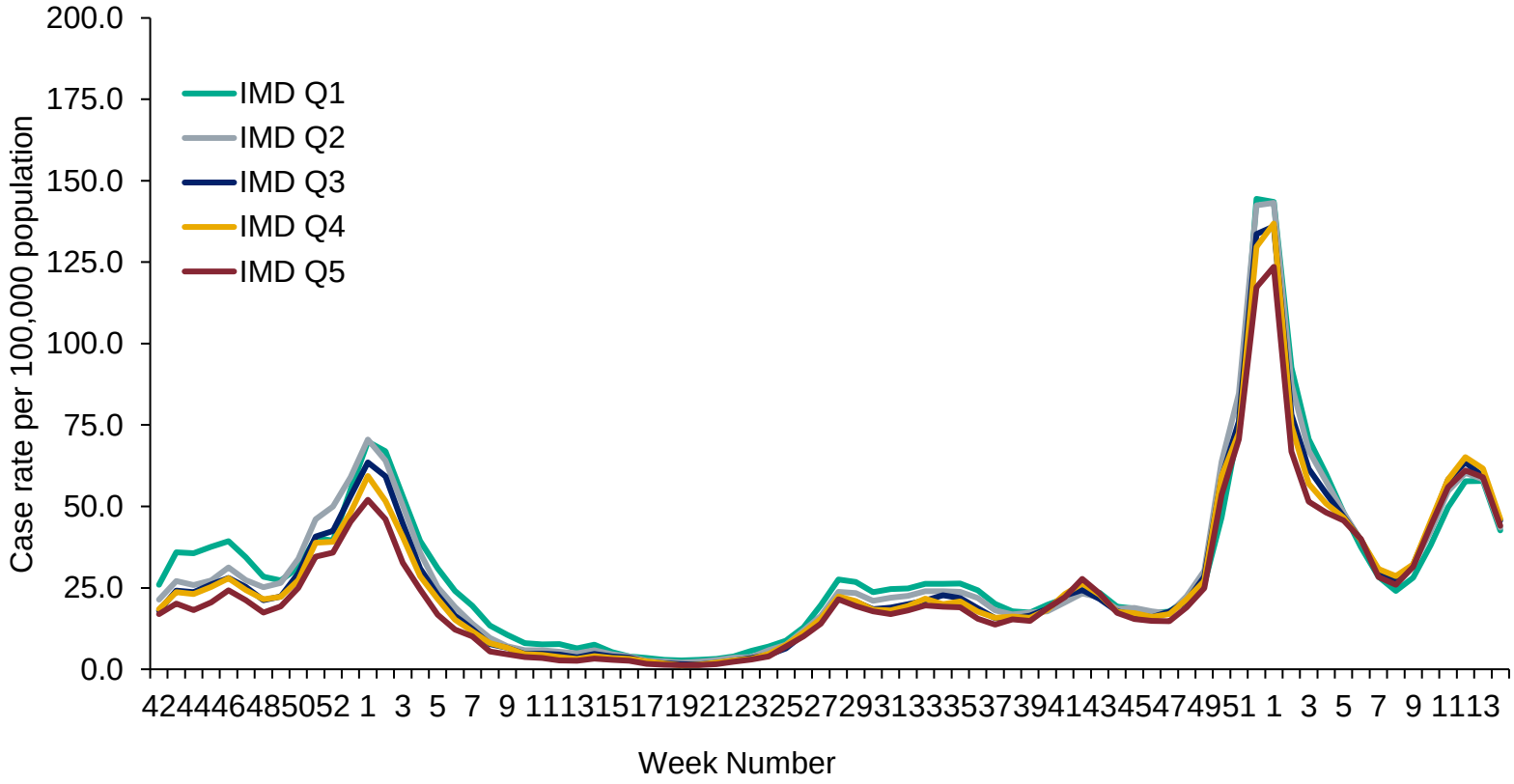
Weekly COVID-19 rate tested under Pillar 1, per 100,000 population by IMD quintile (1 being the most deprived and 5 being the least deprived)



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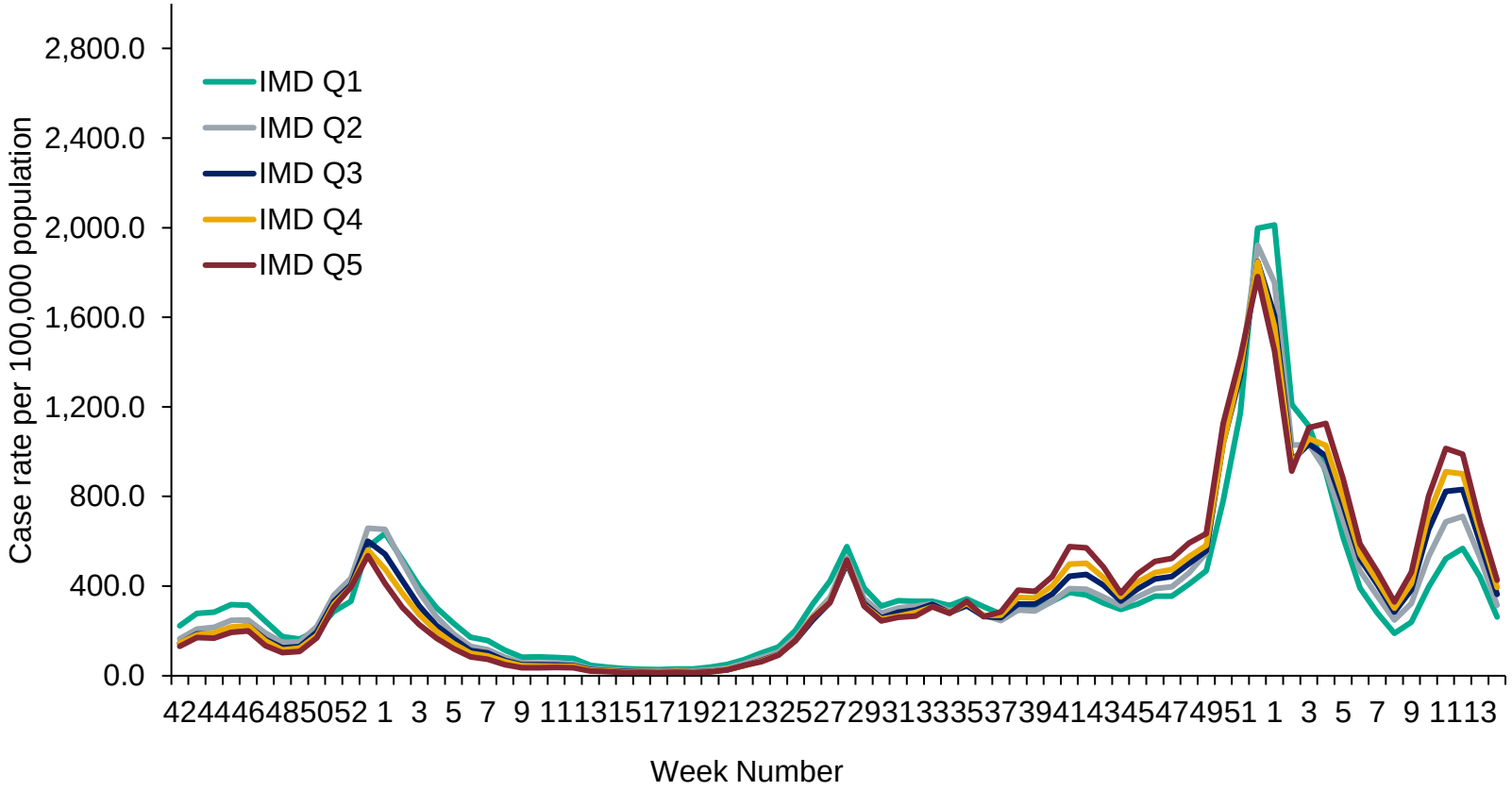

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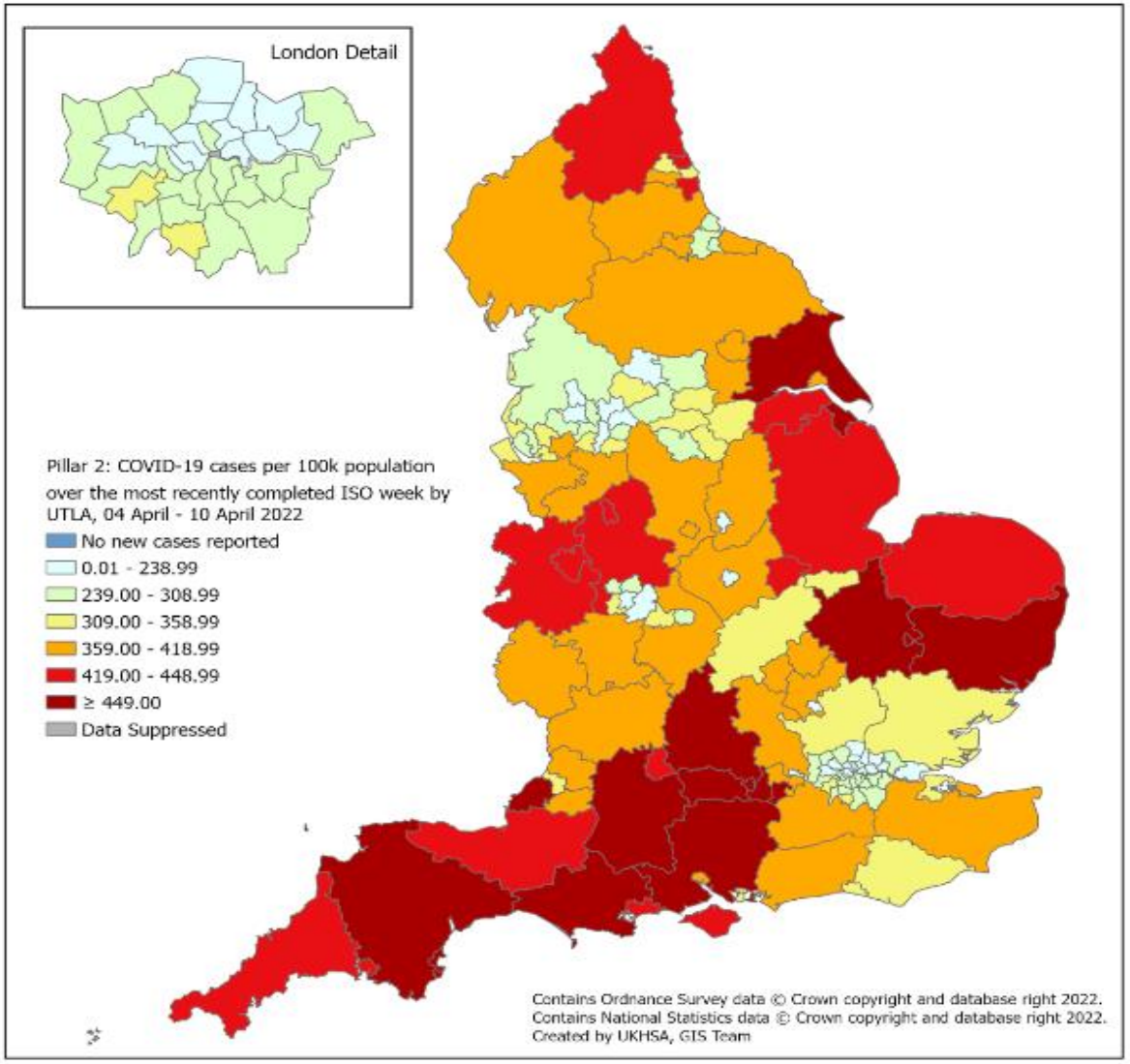
Weekly rate of COVID-19 episodes per 100,000 population (Pillar 2), by upper-tier local authority, England (box shows enlarged map of London area)



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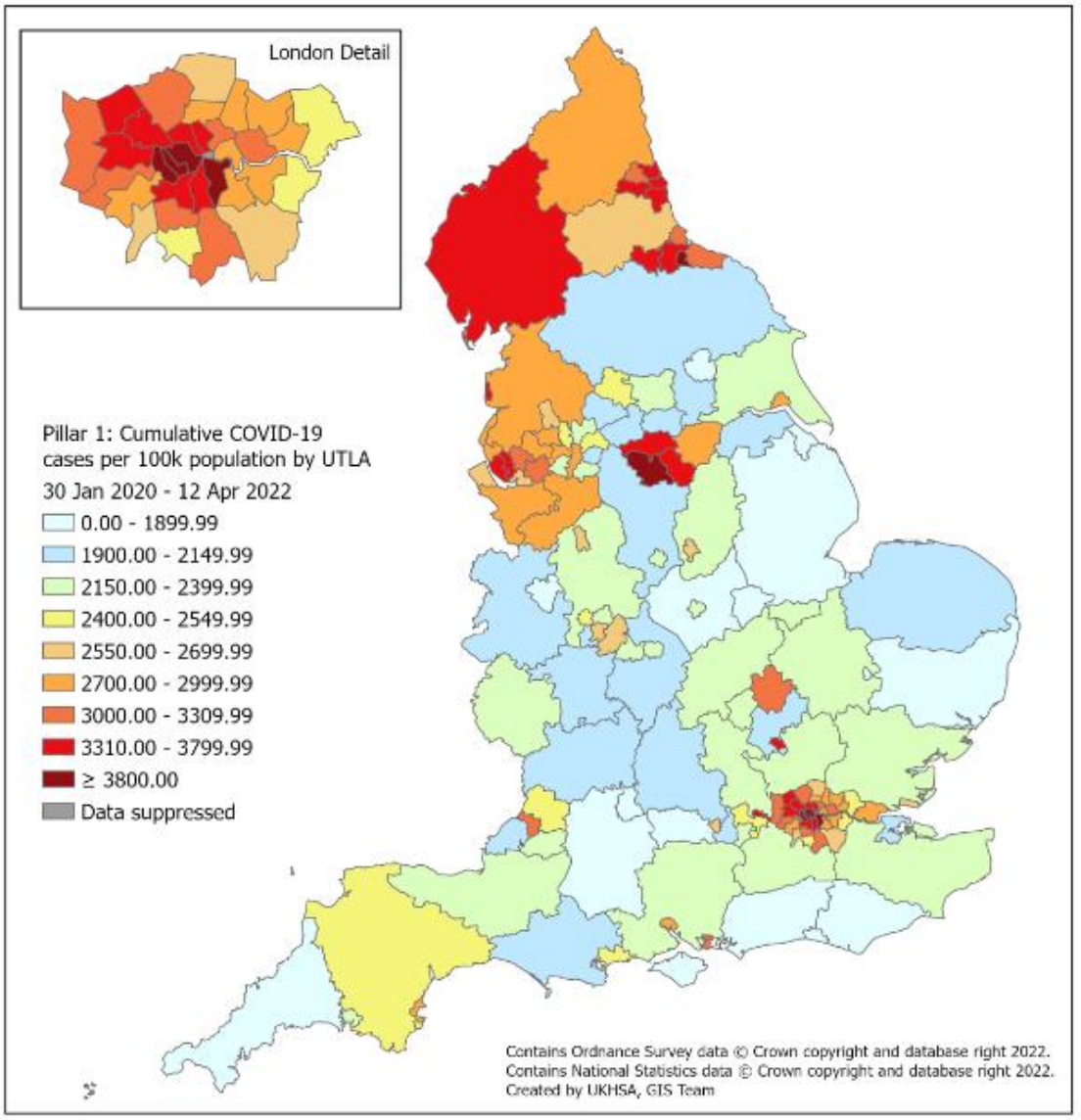
Cumulative rate of COVID-19 episodes per 100,000 population tested under Pillar 1, by upper-tier local authority, England (box shows enlarged map of London area)



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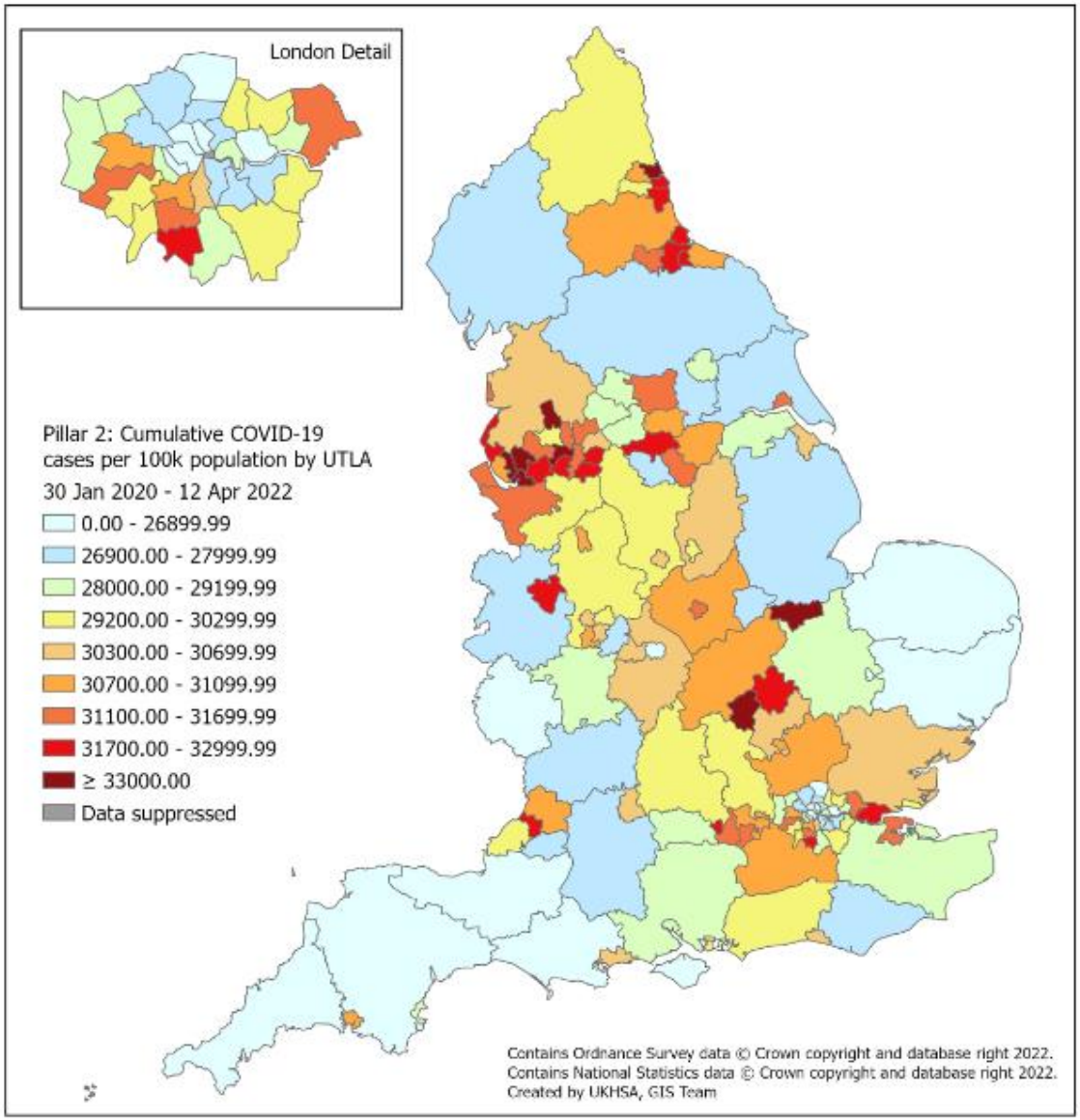
Cumulative rate of COVID-19 episodes per 100,000 population tested under Pillar 2, by upper-tier local authority, England (box shows enlarged map of London area)



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Respiratory Datamart system (England)

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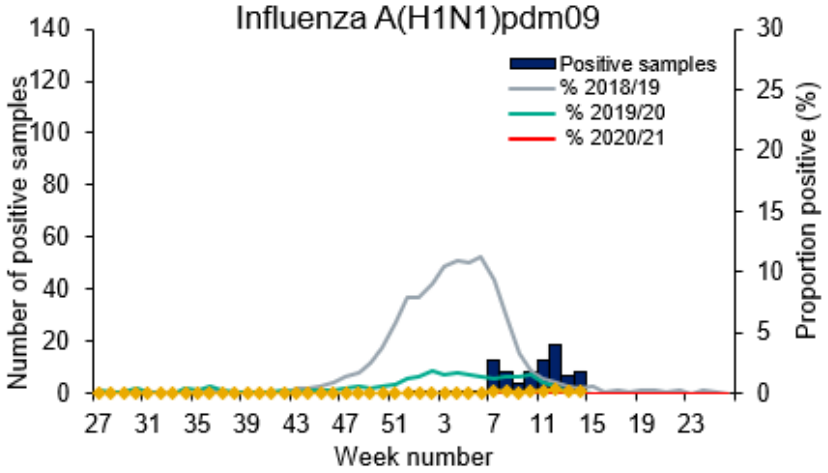
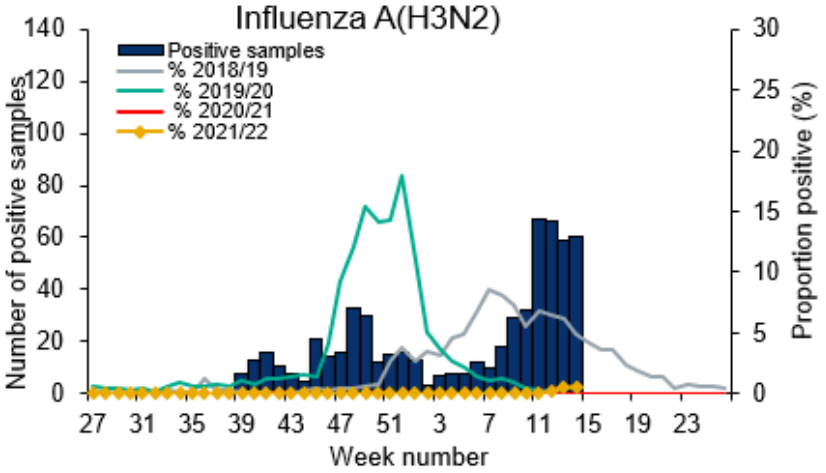
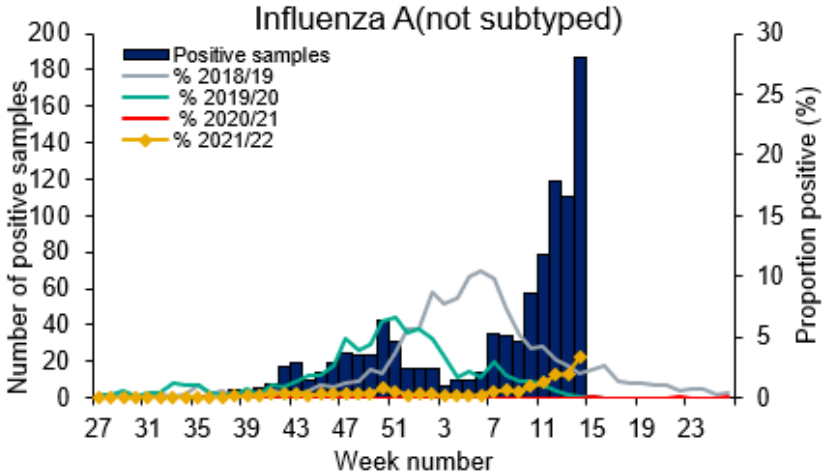
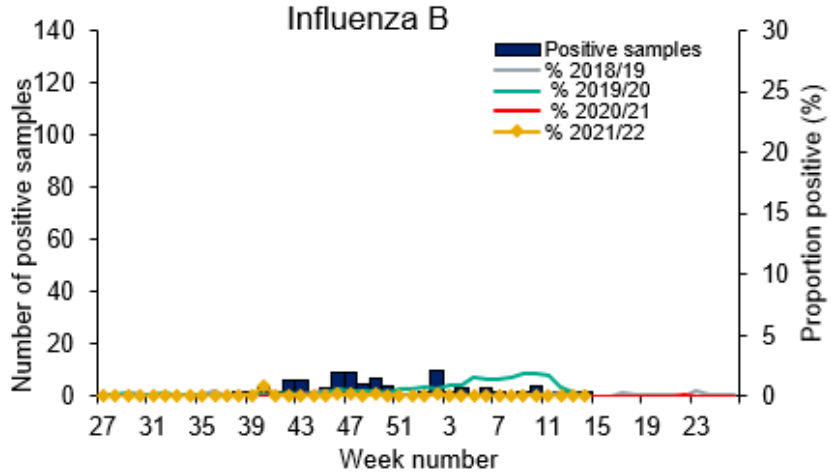
Respiratory DataMart – Influenza subtypes









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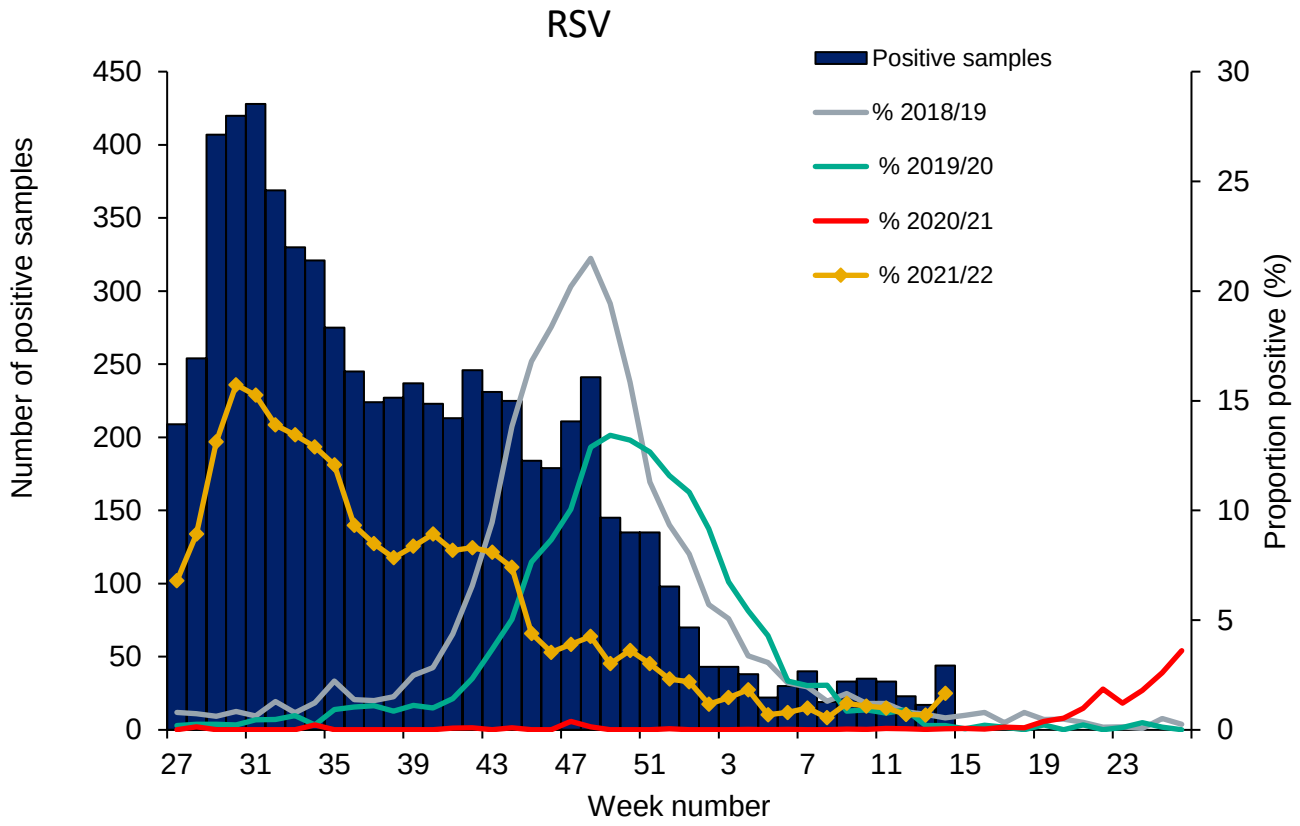
Respiratory DataMart – Respiratory syncytial virus (RSV)



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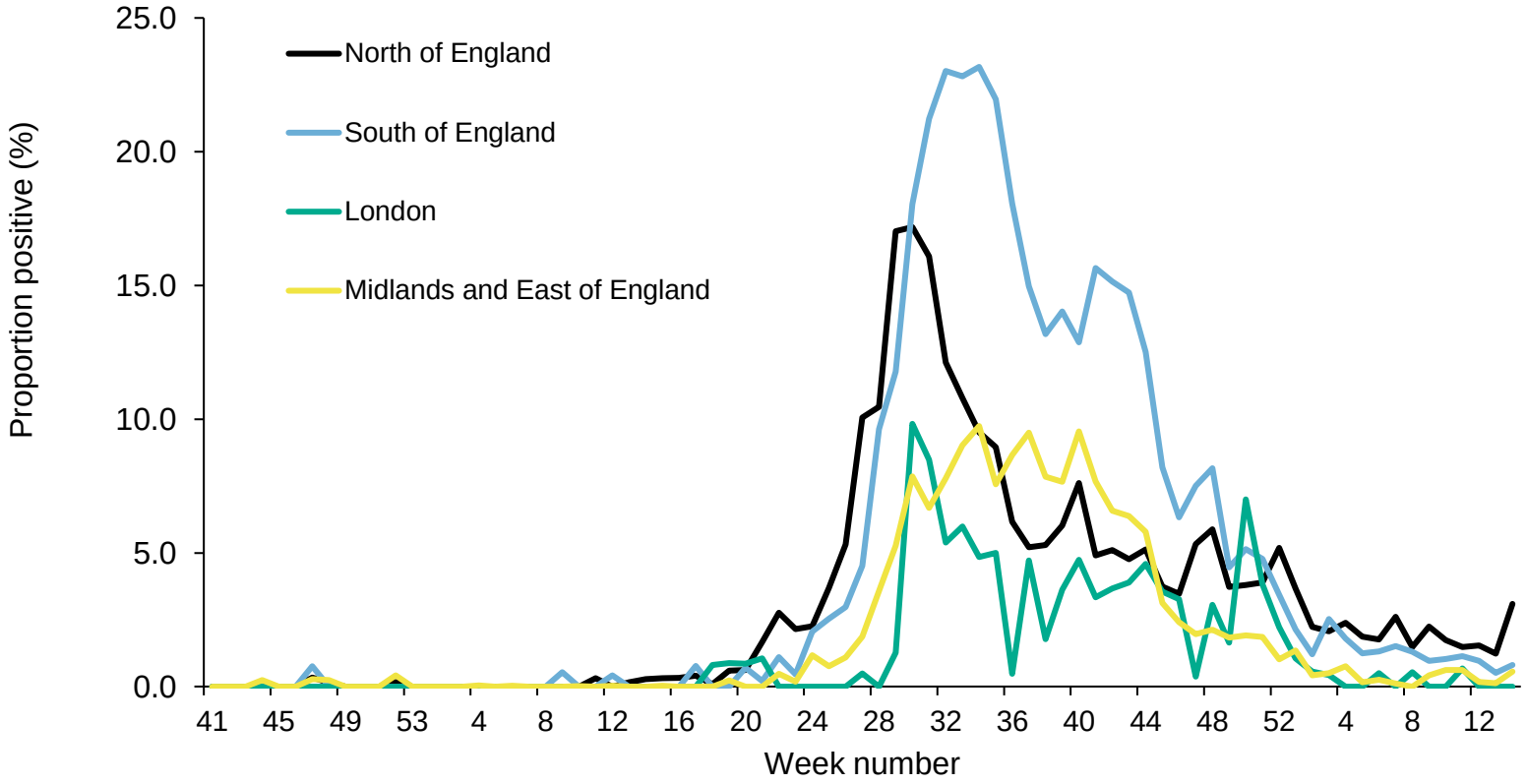
Respiratory DataMart – Respiratory syncytial virus (RSV) weekly positivity by UKHSA region



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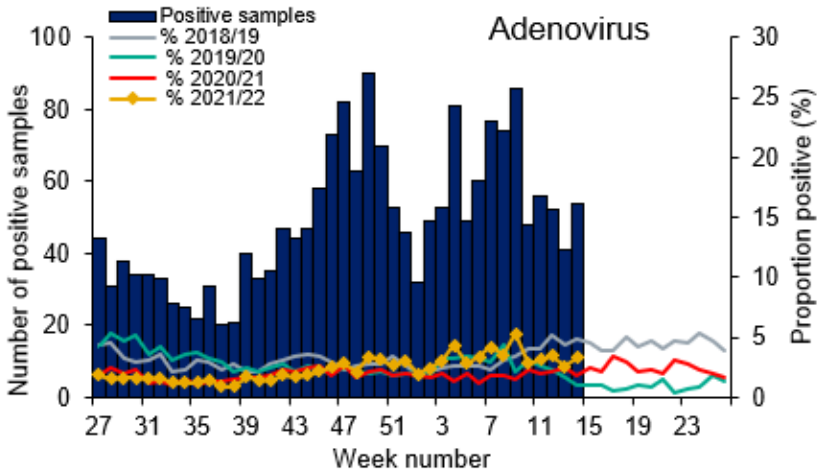
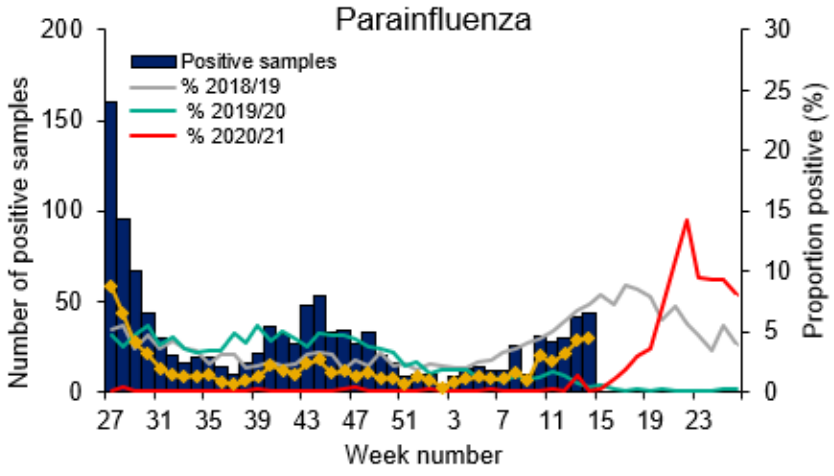
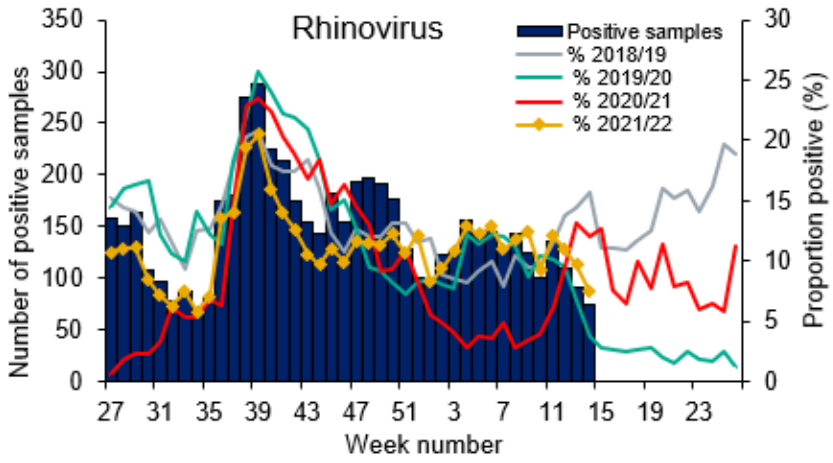
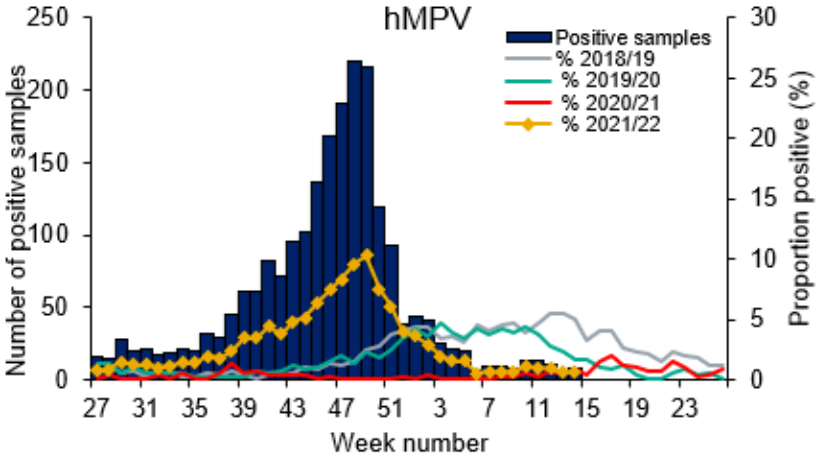
Respiratory DataMart – other respiratory viruses









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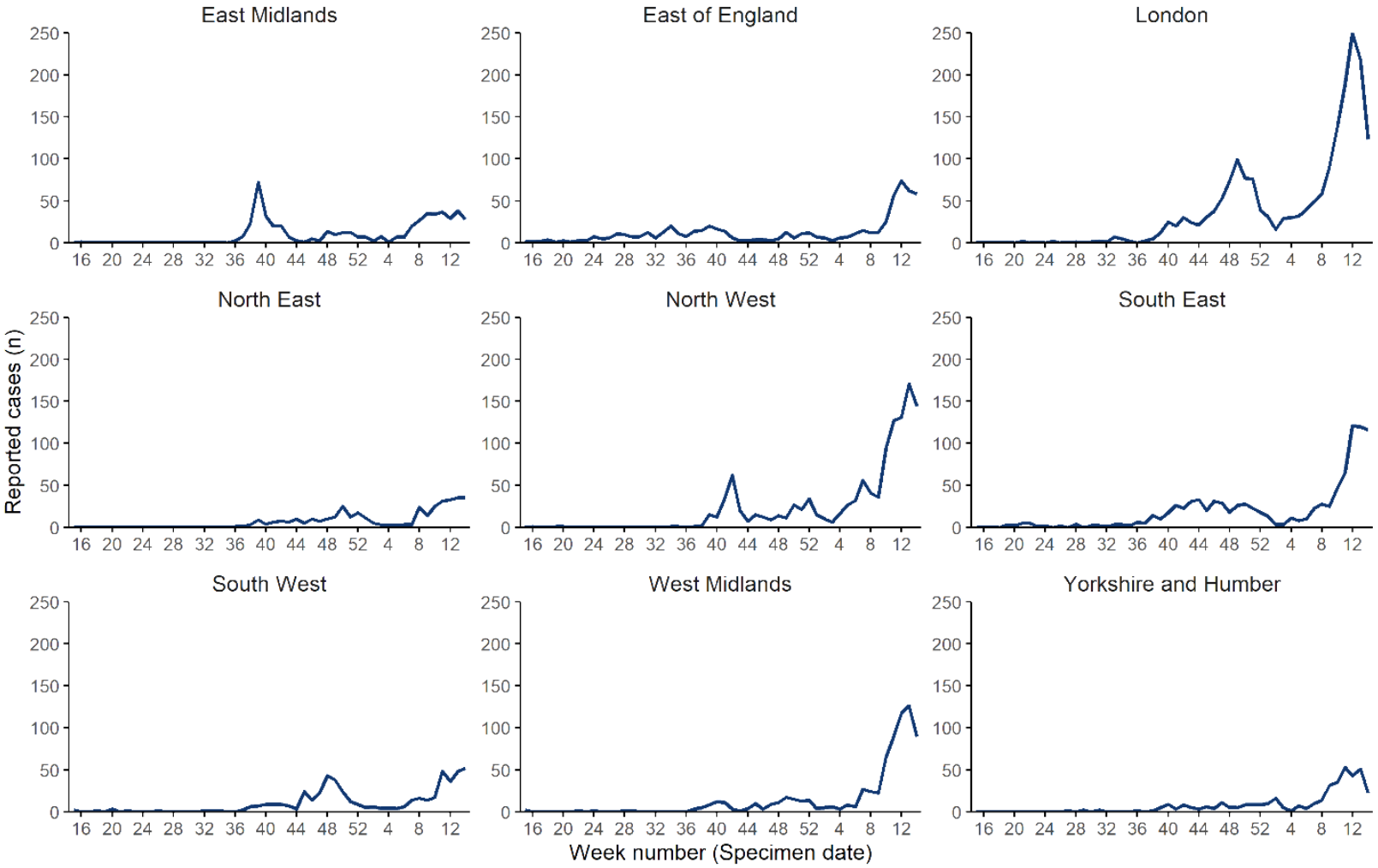
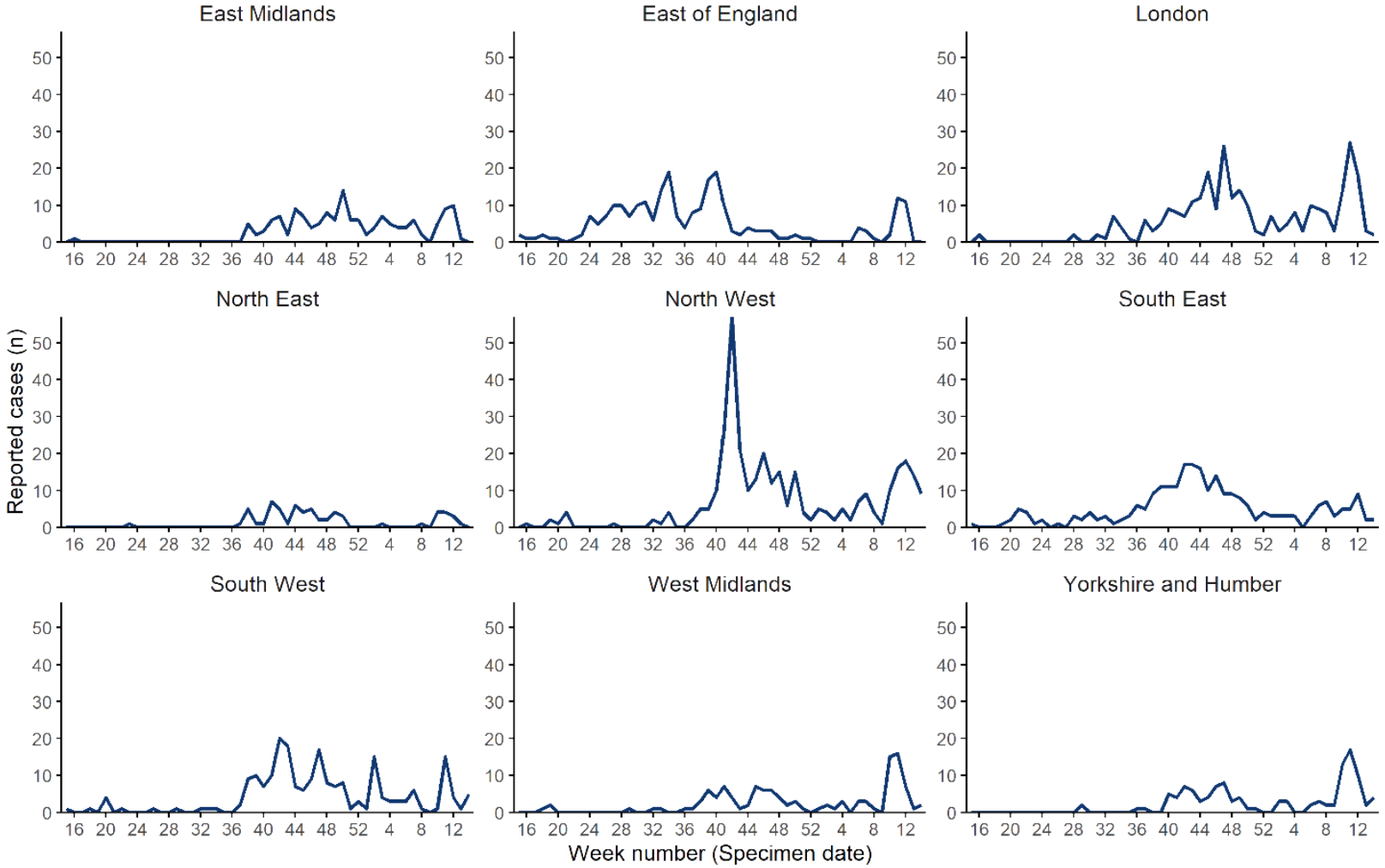
Second generation surveillance system (SGSS)

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)



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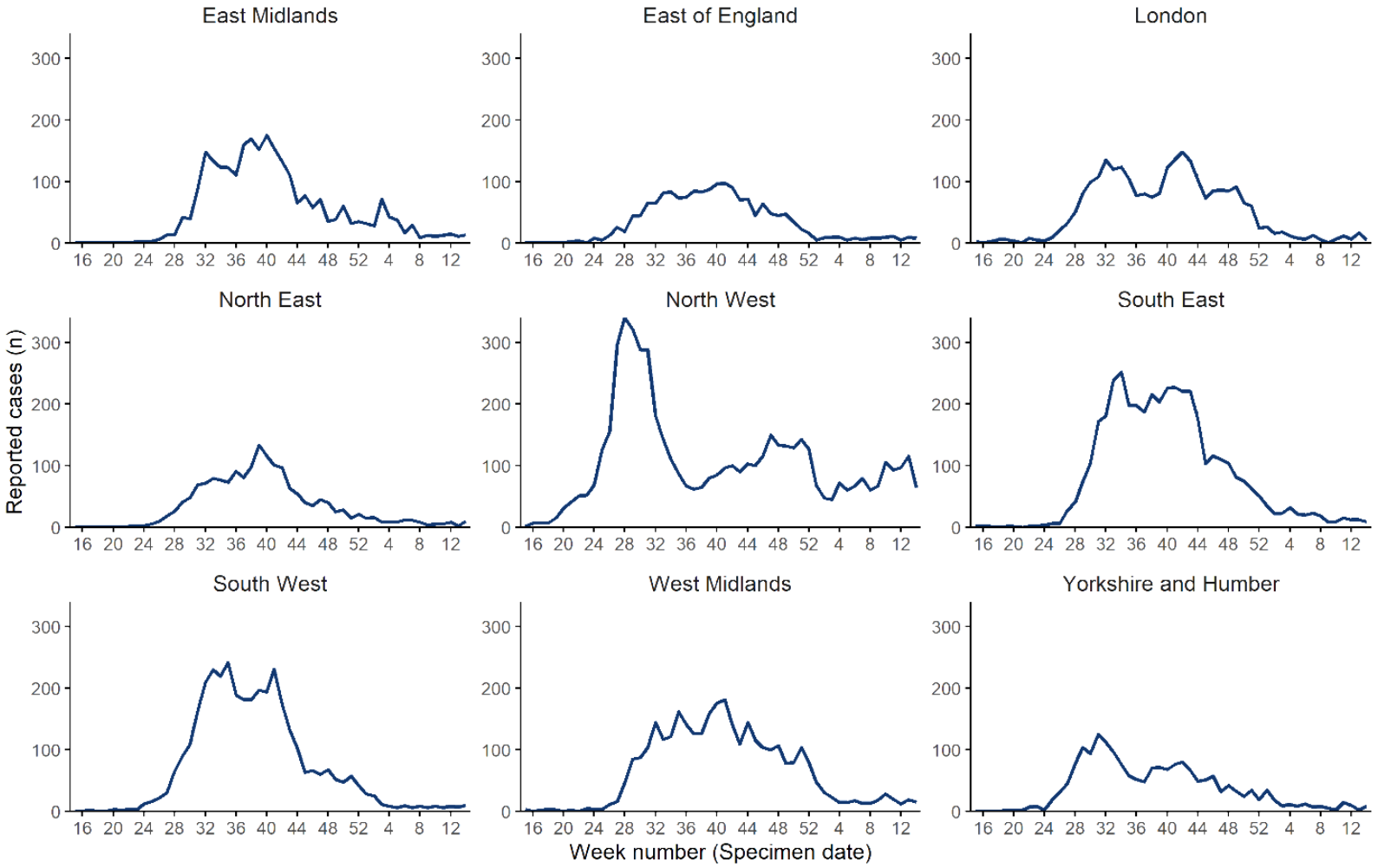
SGSS reported RSV cases by region (all ages)



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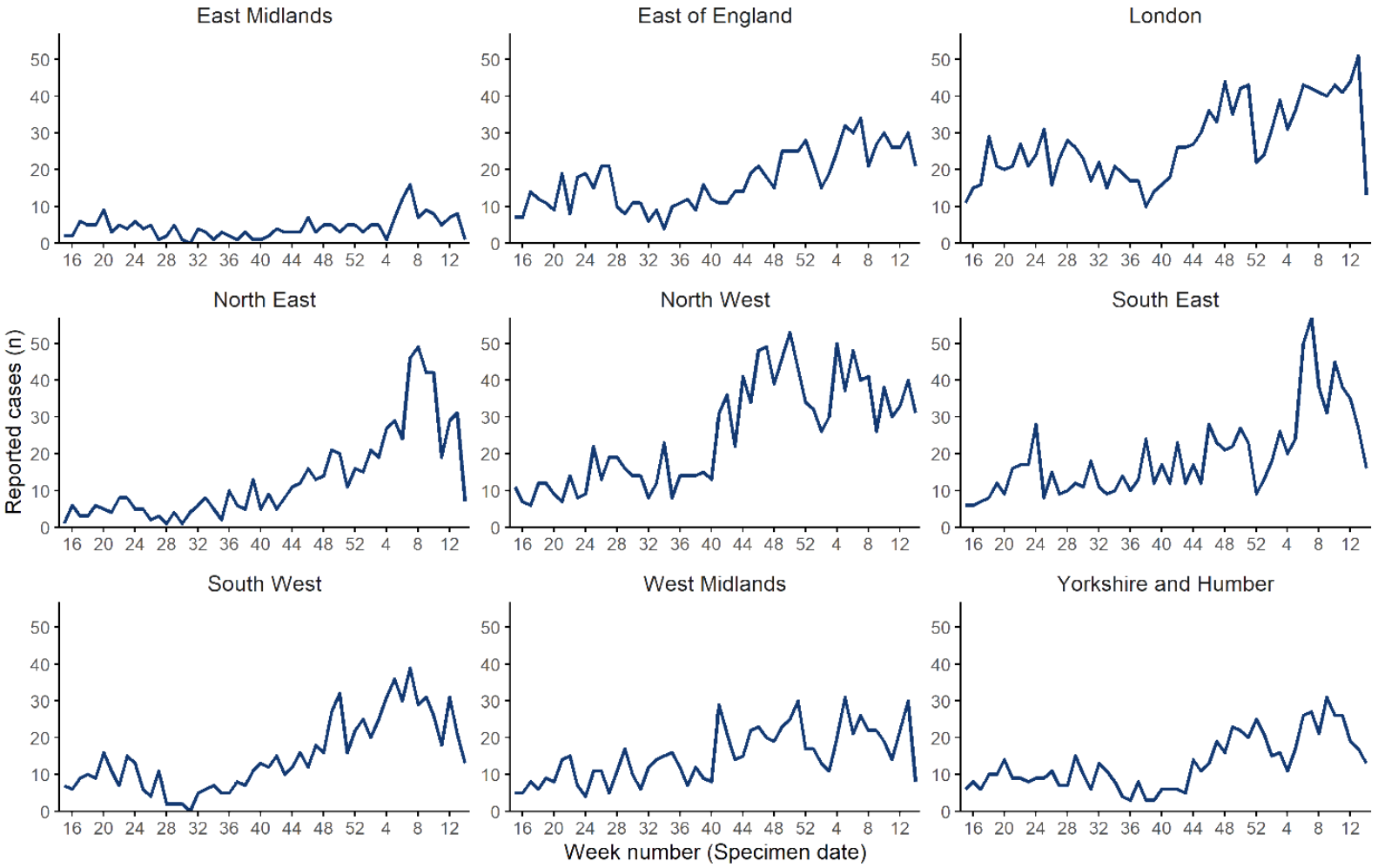
SGSS reported Adenovirus cases by region (all ages)



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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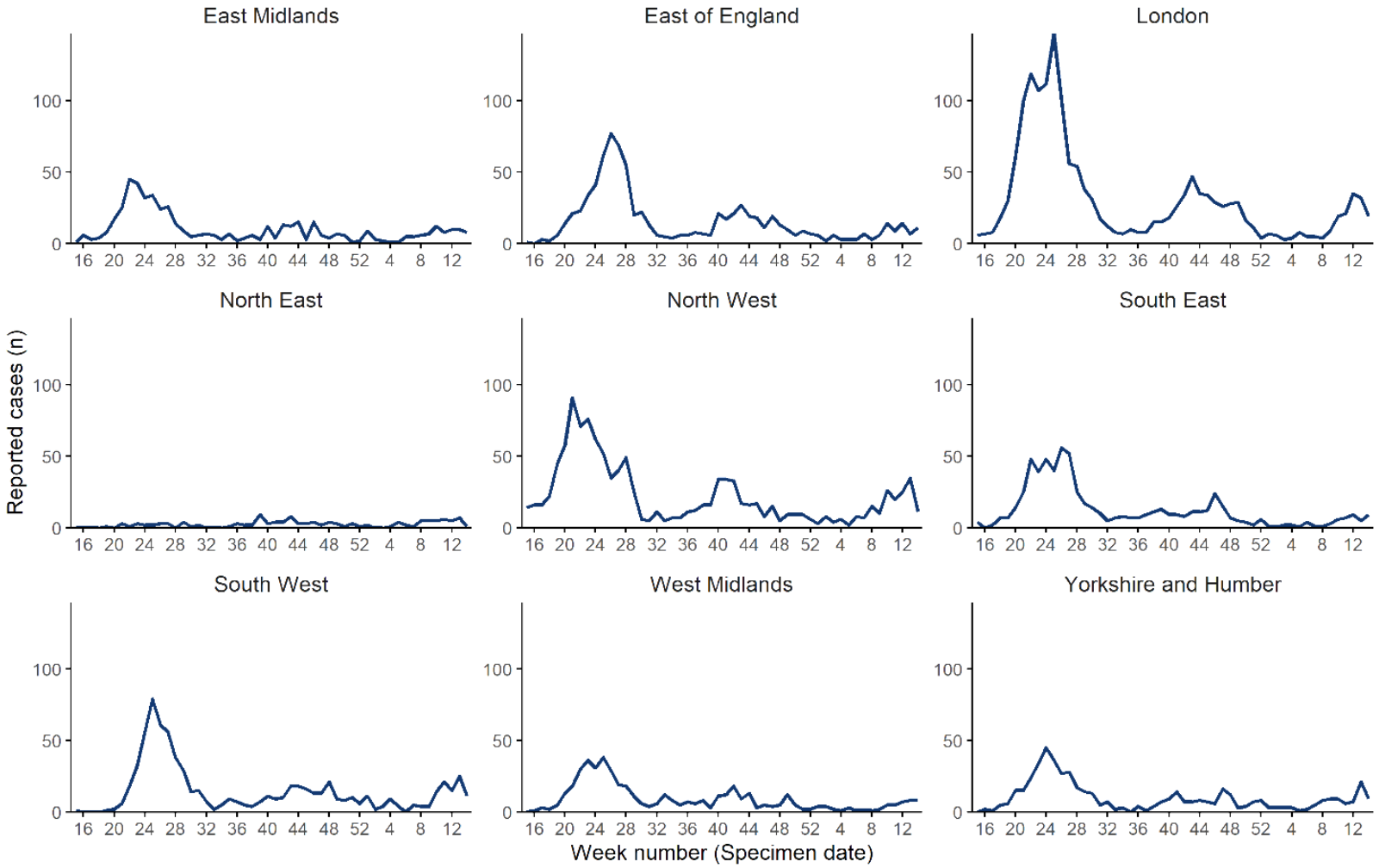
SGSS reported Parainfluenza cases by region (all ages)



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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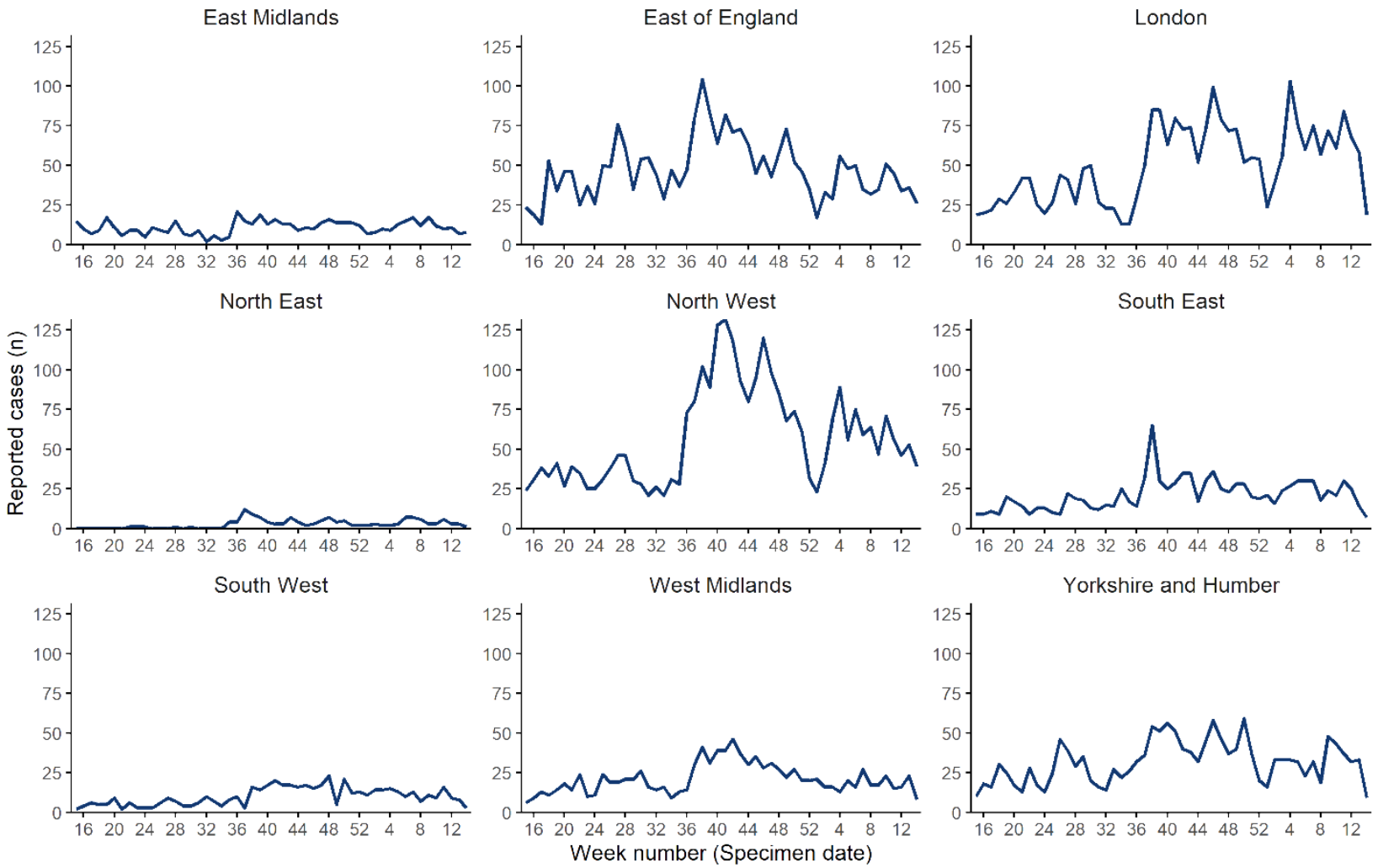
SGSS reported Rhinovirus cases by region (all ages)



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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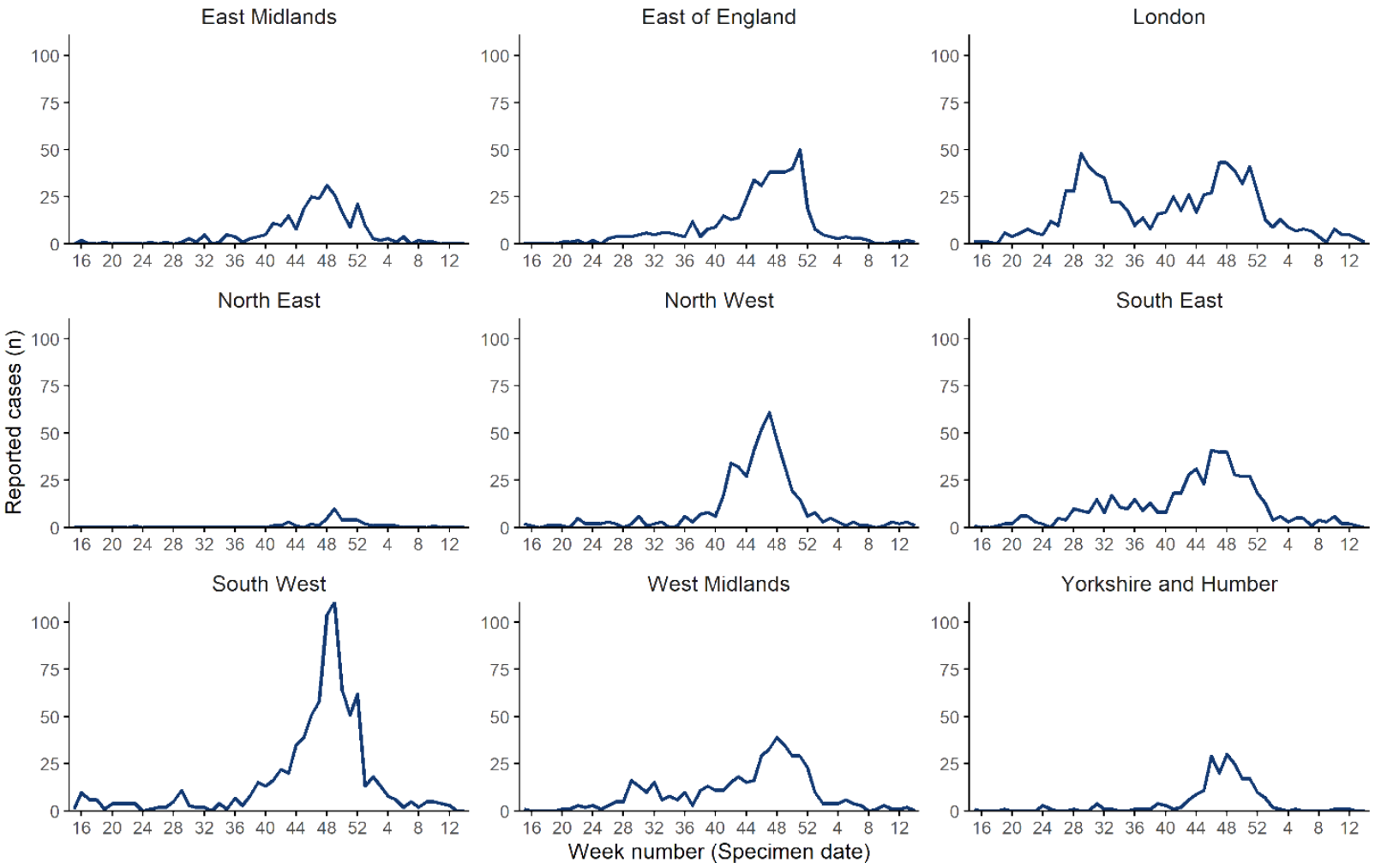
SGSS reported hMPV cases by region (all ages)



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.

UK Health Security Agency

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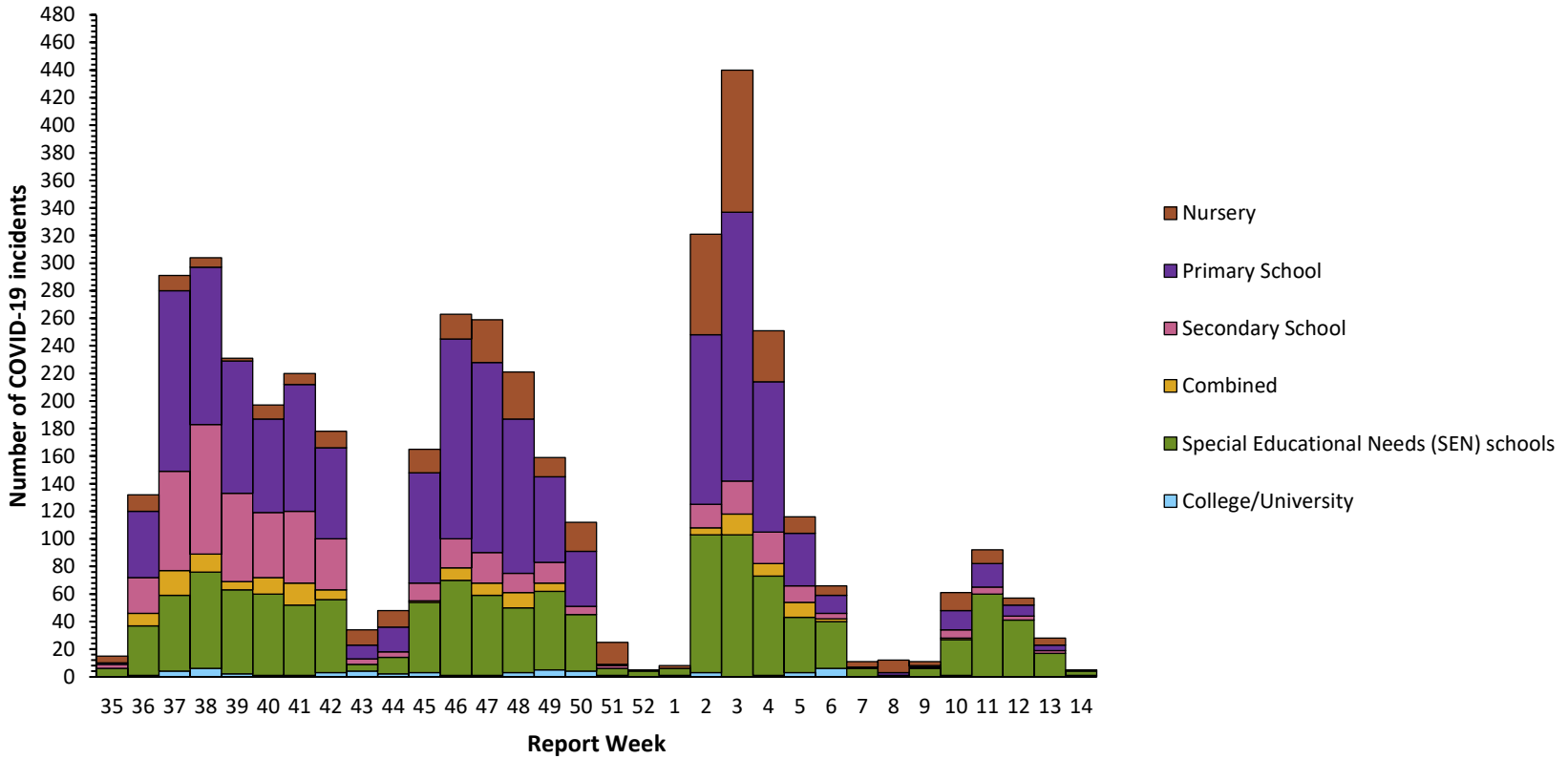
Number of COVID-19 confirmed clusters or outbreaks by type of educational setting, England



UK Health Security Agency

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 14 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	72 (0)	57 (0)	30 (0)	14 (0)	163 (0)	6 (1)	**342 (1)**
East of England Centre	0 (0)	12 (0)	8 (0)	3 (0)	11 (0)	2 (0)	**36 (0)**
London Centre	363 (0)	1084 (0)	257 (0)	59 (0)	208 (0)	29 (0)	**2000 (0)**
North East Centre	0 (0)	2 (0)	0 (0)	0 (0)	3 (1)	0 (0)	**5 (1)**
North West Center	10 (0)	31 (0)	13 (0)	4 (0)	120 (0)	7 (0)	**185 (0)**
South East Centre	42 (0)	388 (0)	127 (0)	34 (0)	283 (1)	7 (0)	**881 (1)**
South West Centre	4 (0)	64 (0)	79 (0)	35 (1)	246 (1)	1 (0)	**429 (2)**
West Midlands Centre	17 (0)	73 (0)	52 (0)	7 (0)	139 (0)	6 (0)	**294 (0)**
Yorkshire & the Humber	17 (0)	36 (0)	27 (0)	5 (0)	81 (0)	0 (0)	**166 (0)**
Total	**525 (0)**	**1747 (0)**	**593 (0)**	**161 (1)**	**1254 (3)**	**58 (1)**	**4338 (5)**

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

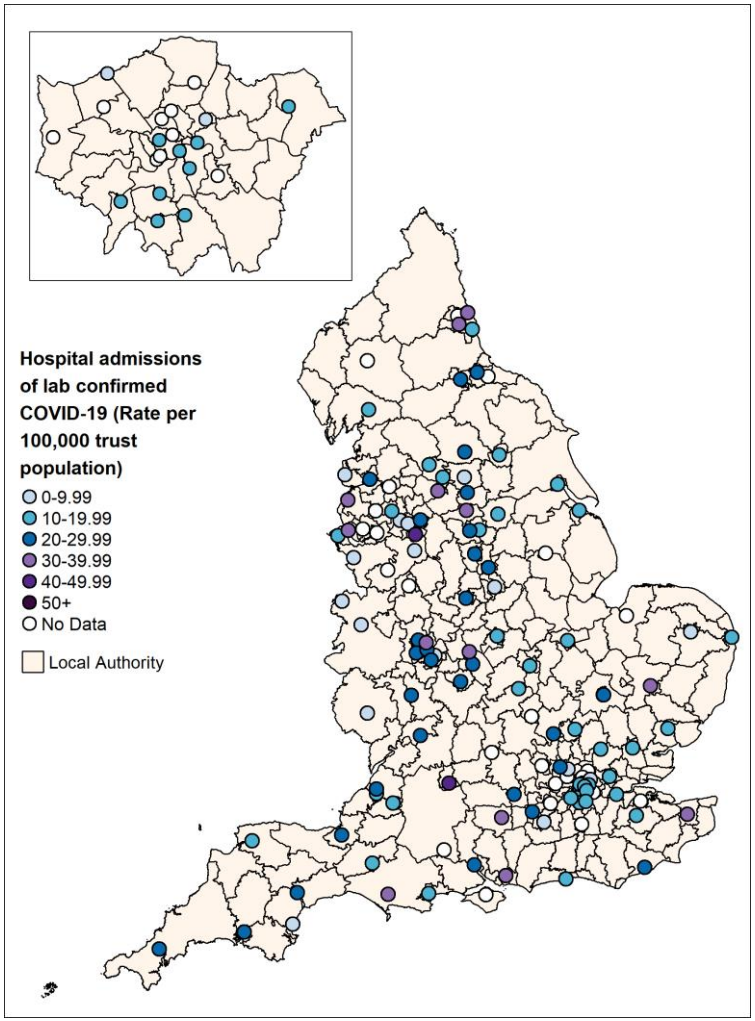
UK Health Security Agency

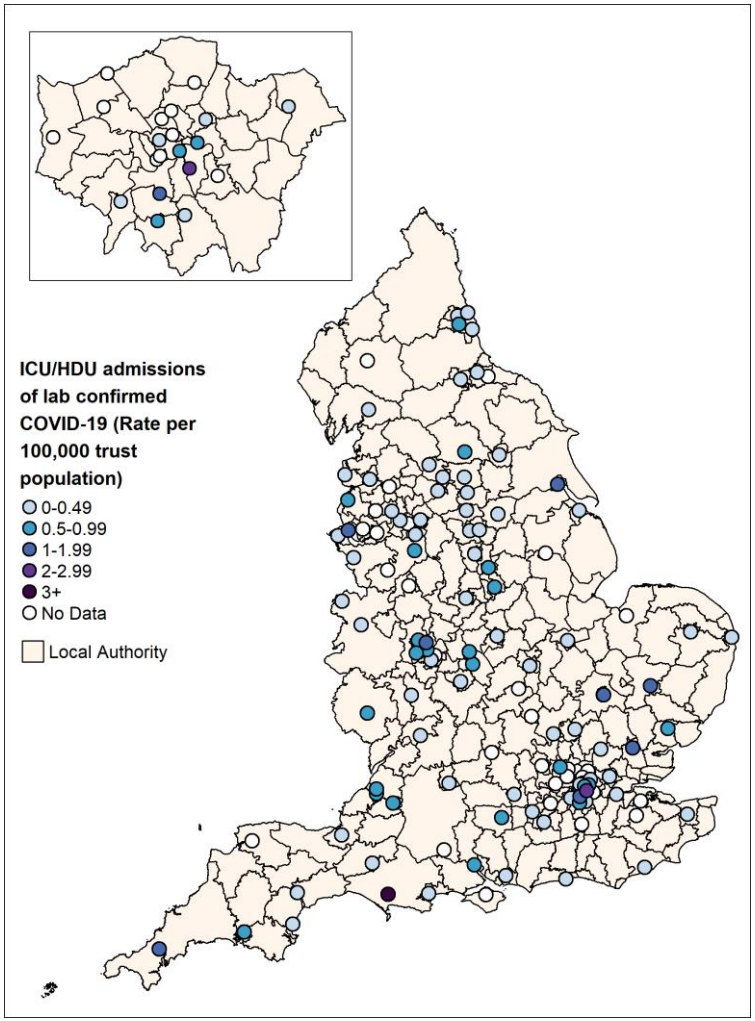
Secondary Care surveillance

Return to main menu

UK Health Security Agency

Weekly admission rates for hospital and ICU/HDU laboratory confirmed COVID-19 cases reported through SARI Watch, week 14





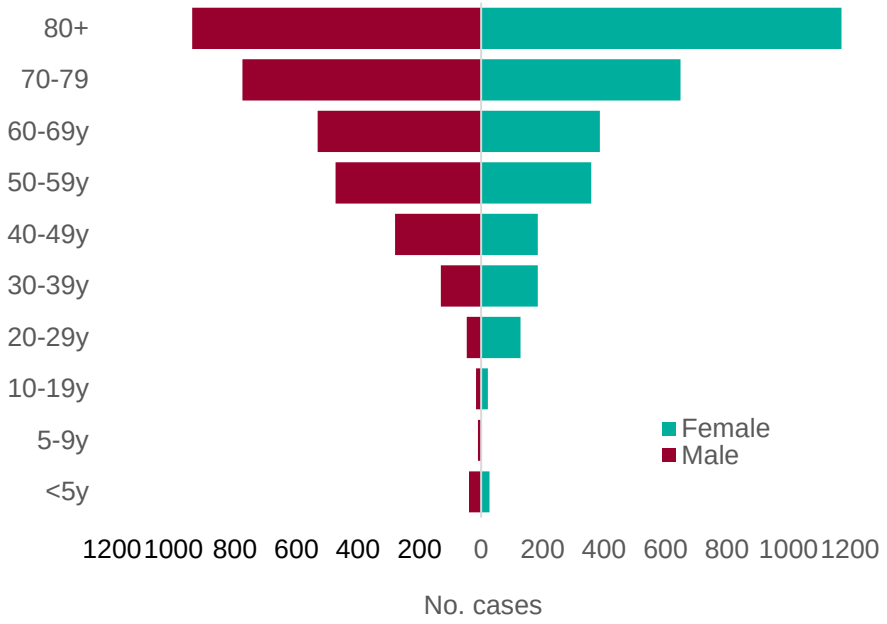
Source: PHE SARI-Watch (Severe Acute Respiratory Infection-Watch, formerly CHESS).

*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 107 for the hospitalisation (all levels of care) indicator in week 4 to 10 April 2022 inclusive and 102 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 10 April 2022 was 99 and 94 for ICU/HDU admissions for COVID-19.

UK Health Security Agency

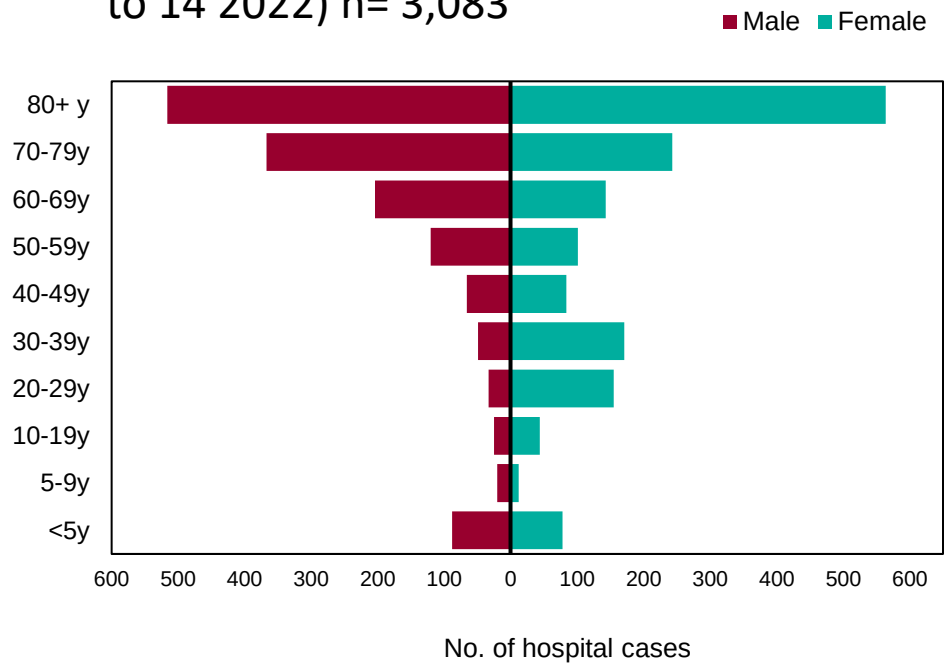
Age/sex pyramid of hospitalisations (all levels of care) for COVID-19, data from sentinel acute NHS trusts, England

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



Reporting trusts=22

(b) Most recent 4 weeks (week 11 2022 to 14 2022) n= 3,083



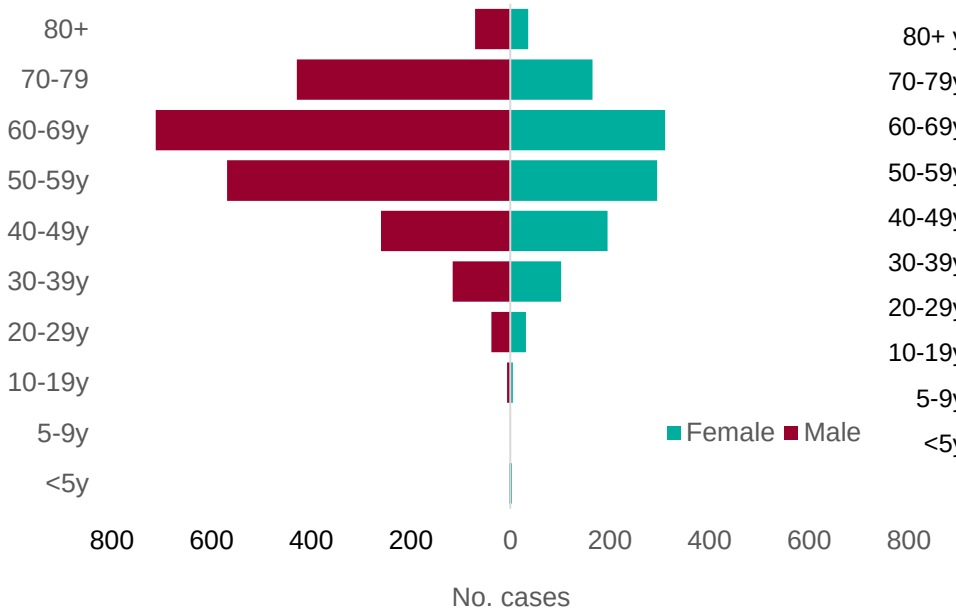
Reporting trusts=14

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

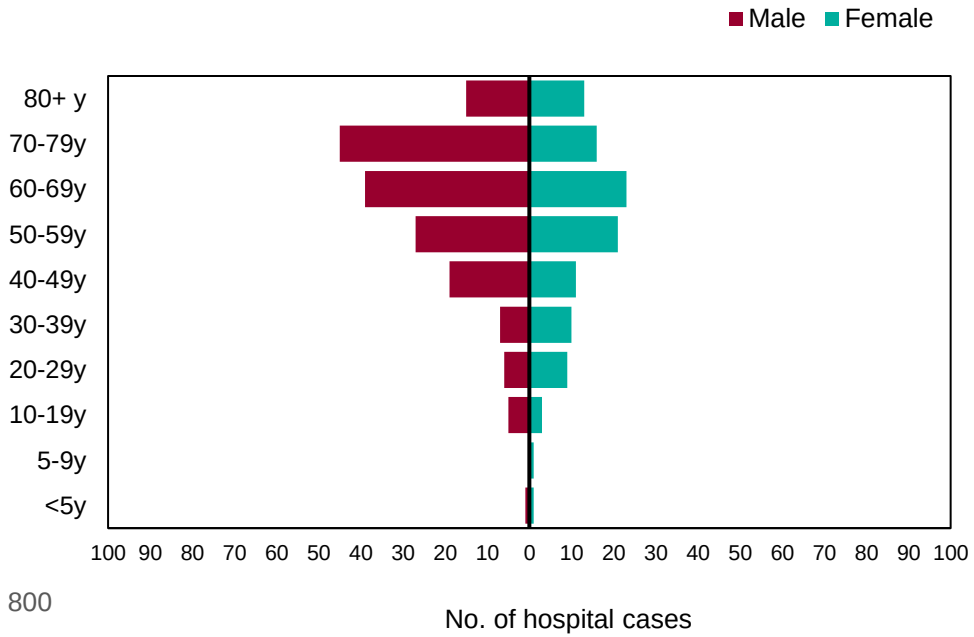
Age/sex pyramid for admissions to ICU/HDU for COVID-19, mandatory case level data, acute NHS trusts, England

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



Reporting trusts=70

(b) Most recent 4 weeks (week 11 2022 to 14 2022) n=272



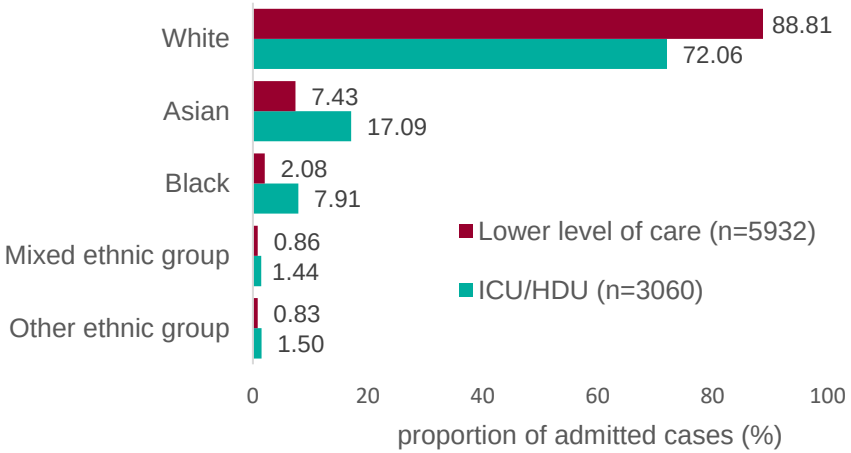
Reporting trusts=39

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

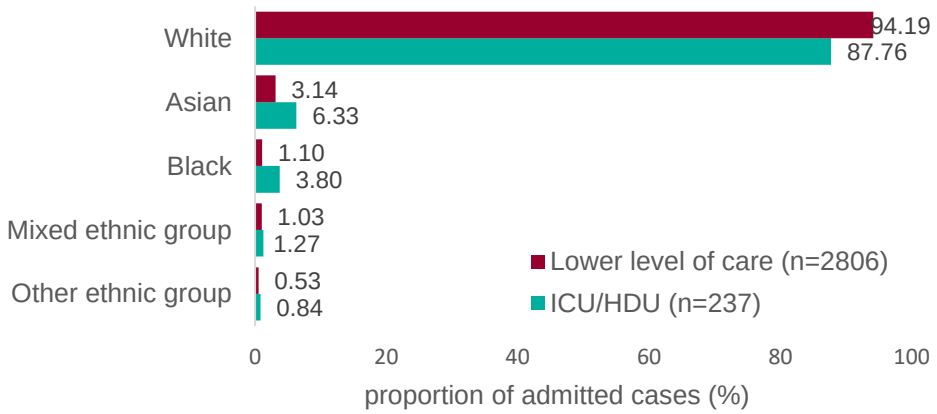
Laboratory confirmed admissions for COVID-19, to acute NHS trusts, by level of care and ethnicity

(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 11 2022 to 14 2022)



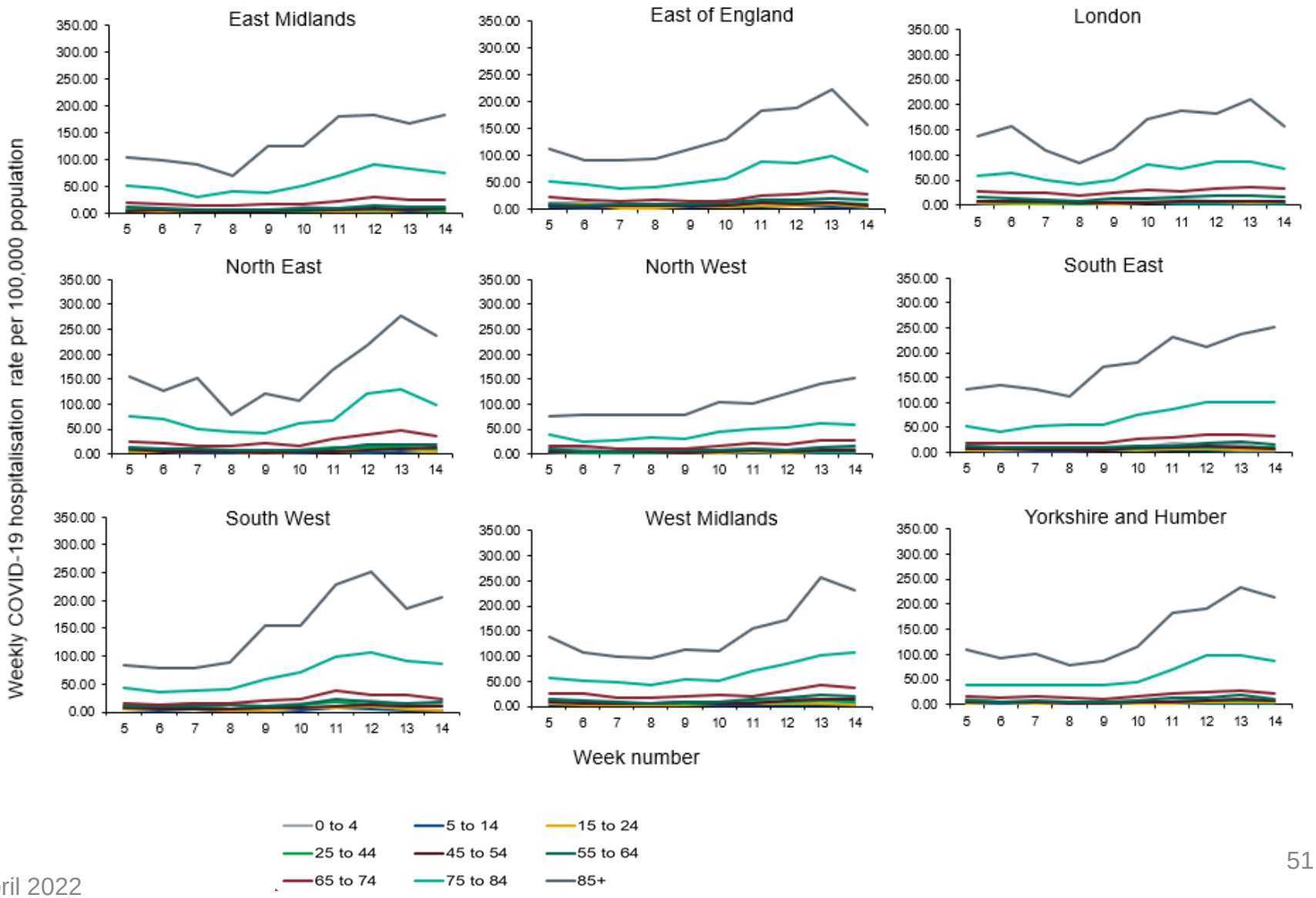
Reporting trusts
Lower level of care=2806
ICU/HDU=237

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.

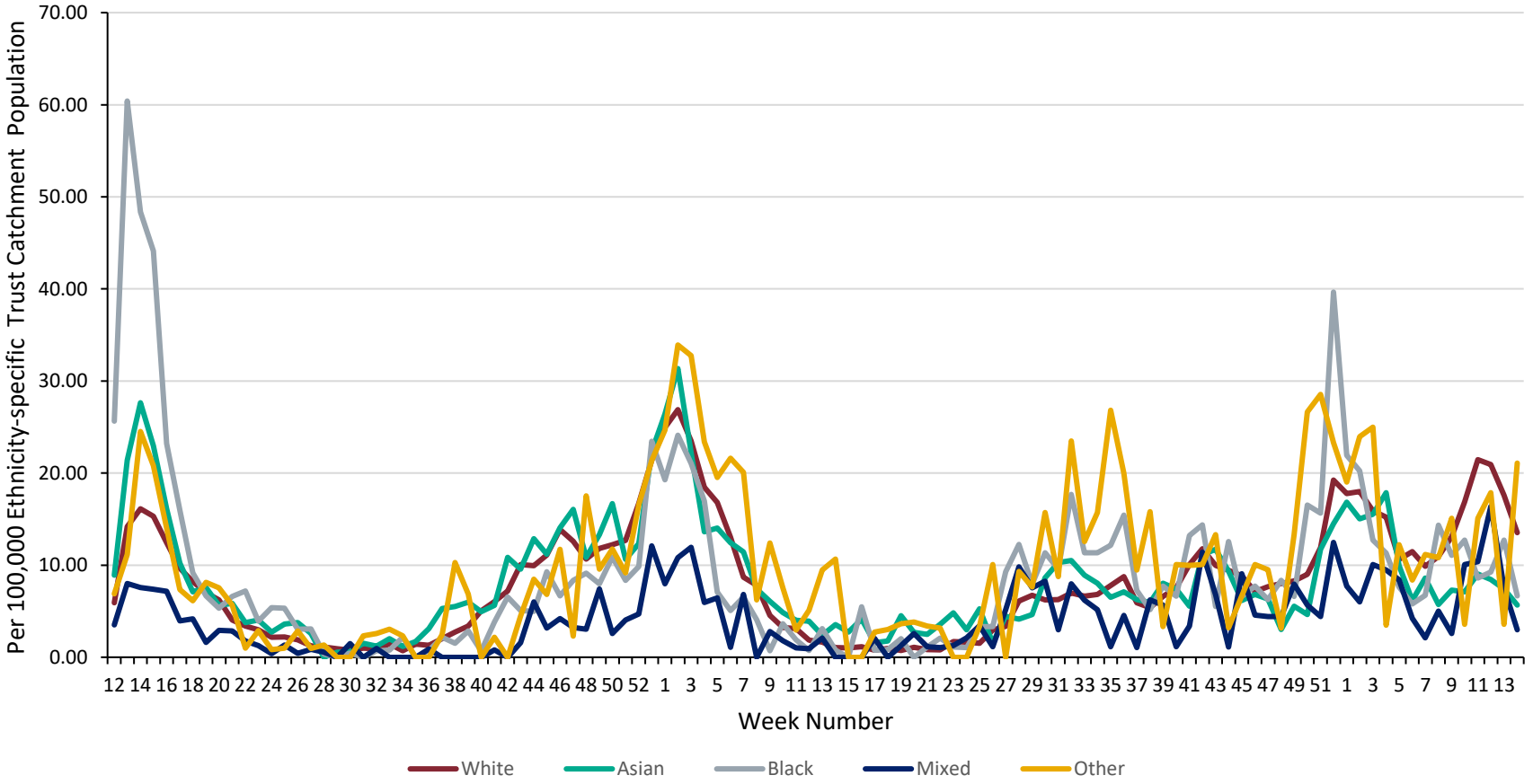
UK Health Security Agency

Weekly COVID-19 hospitalisation rate per 100,000 trust catchment population by age group and region, weeks 5 to 14



UK Health Security Agency

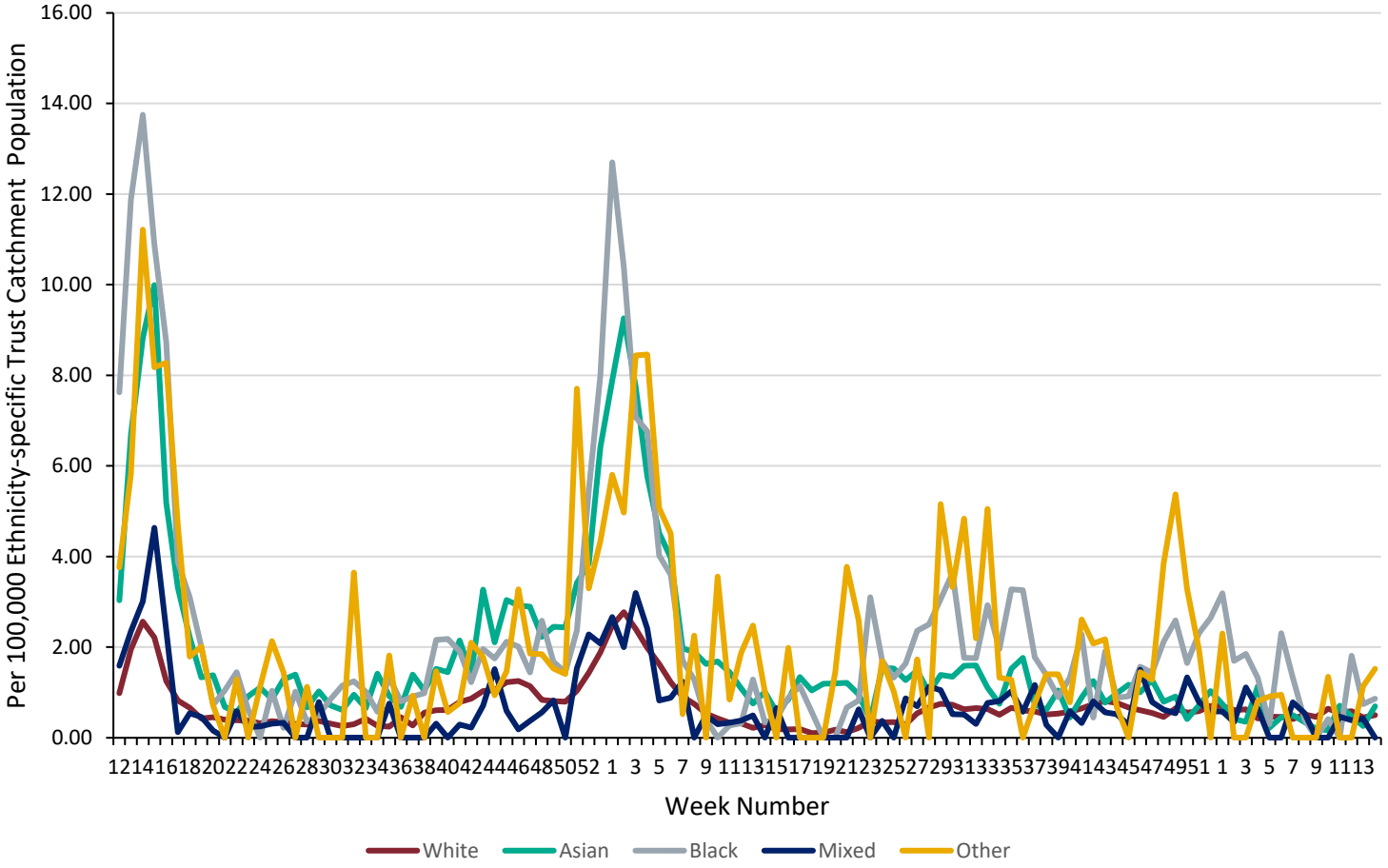
Hospital admission rate (excluding ICU/HDU) by ethnicity per 100,000 trust catchment population



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

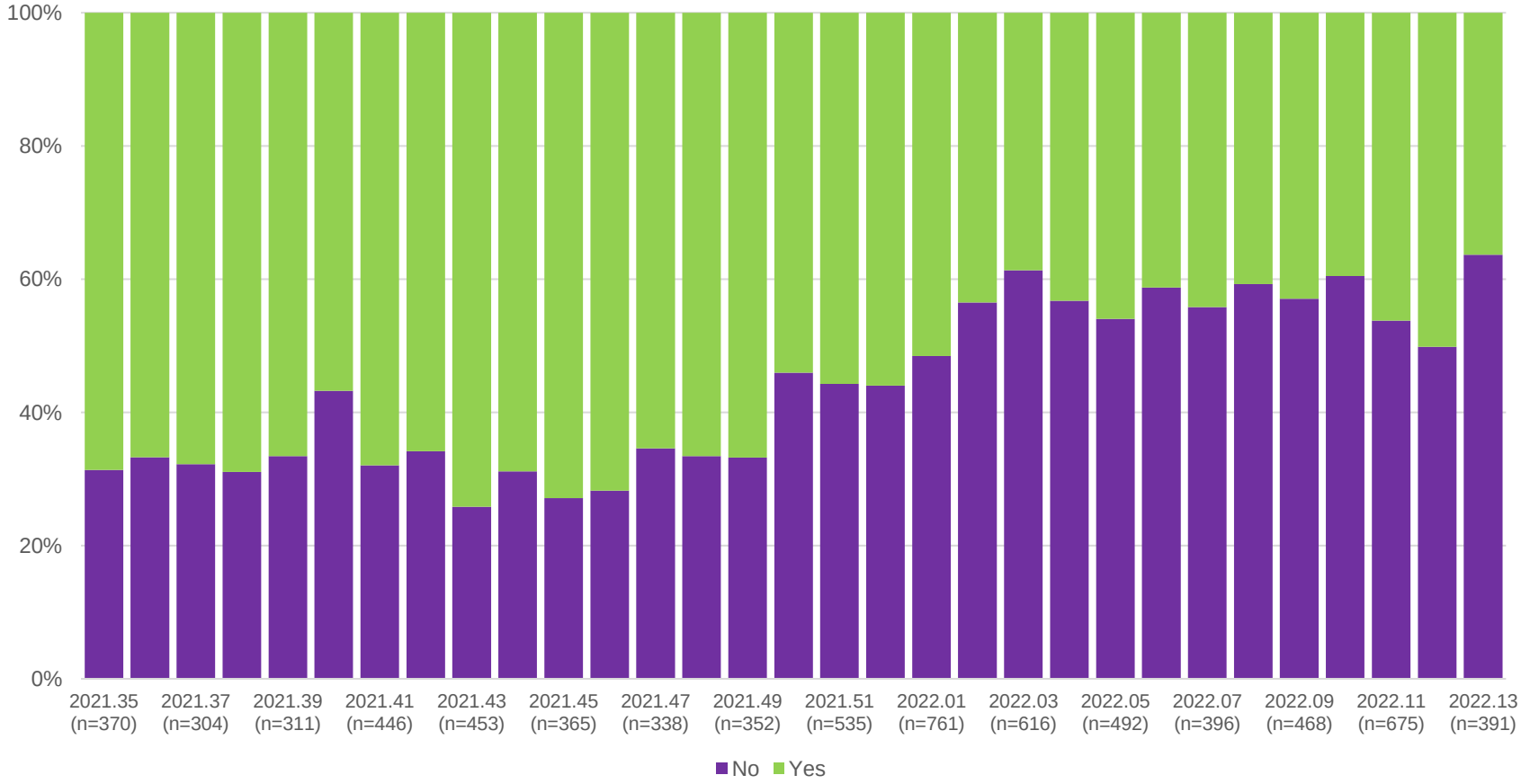


Caveat: From week 24 the ethnicity analysis is based on a new method for assigning ethnicity, developed by UKHSA. The previous method used the most recent ethnicity recorded through linkage to Hospital Episode Statistics. However, this method led to unfeasibly high rates in the 'Other' ethnic group when 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 SARS-CoV-2 positive patient by month of admission

Last updated
7 Apr 2022



Notes

1) Case-level sentinel data from week 35 2021 (commencing 30 August 2021) to week 13 2022 (ending 3 April 2022) inclusive
2) 20% (3696/18110) of total records in this period have missing data on the 'Admission due to COVID-19' indicator – these are excluded from analysis
3) London trusts under-represented

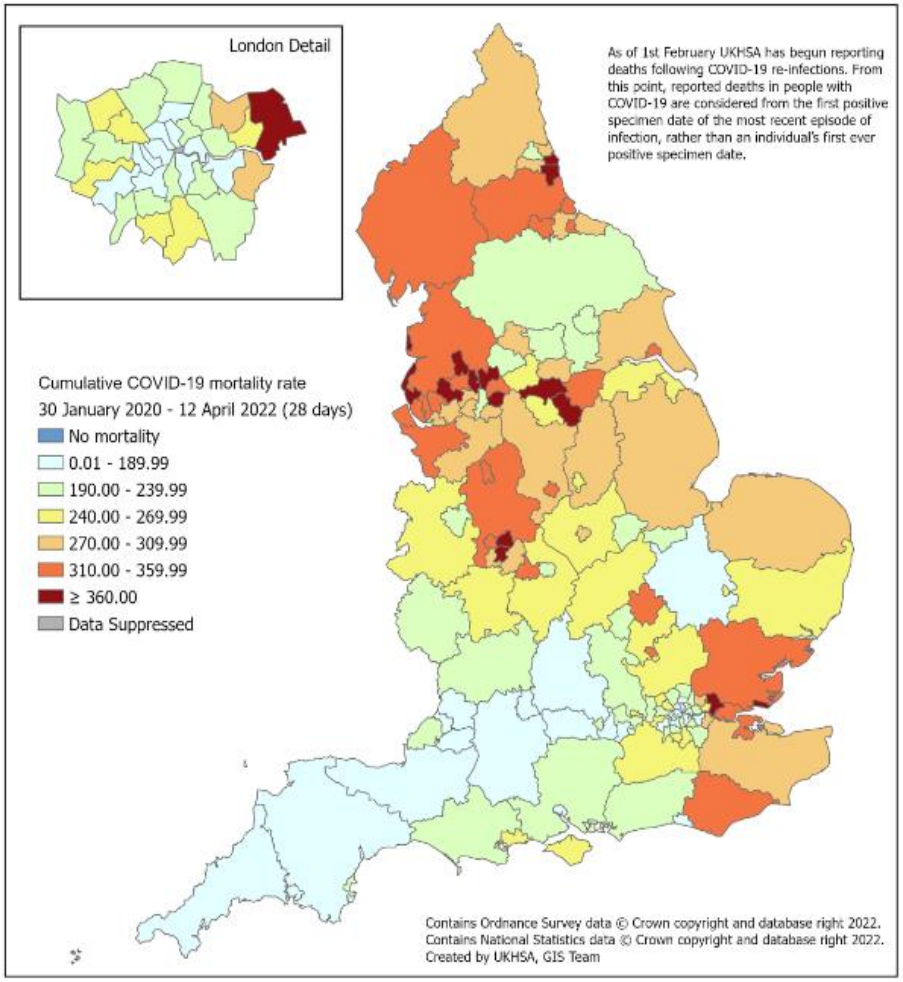
UK Health Security Agency

Mortality surveillance

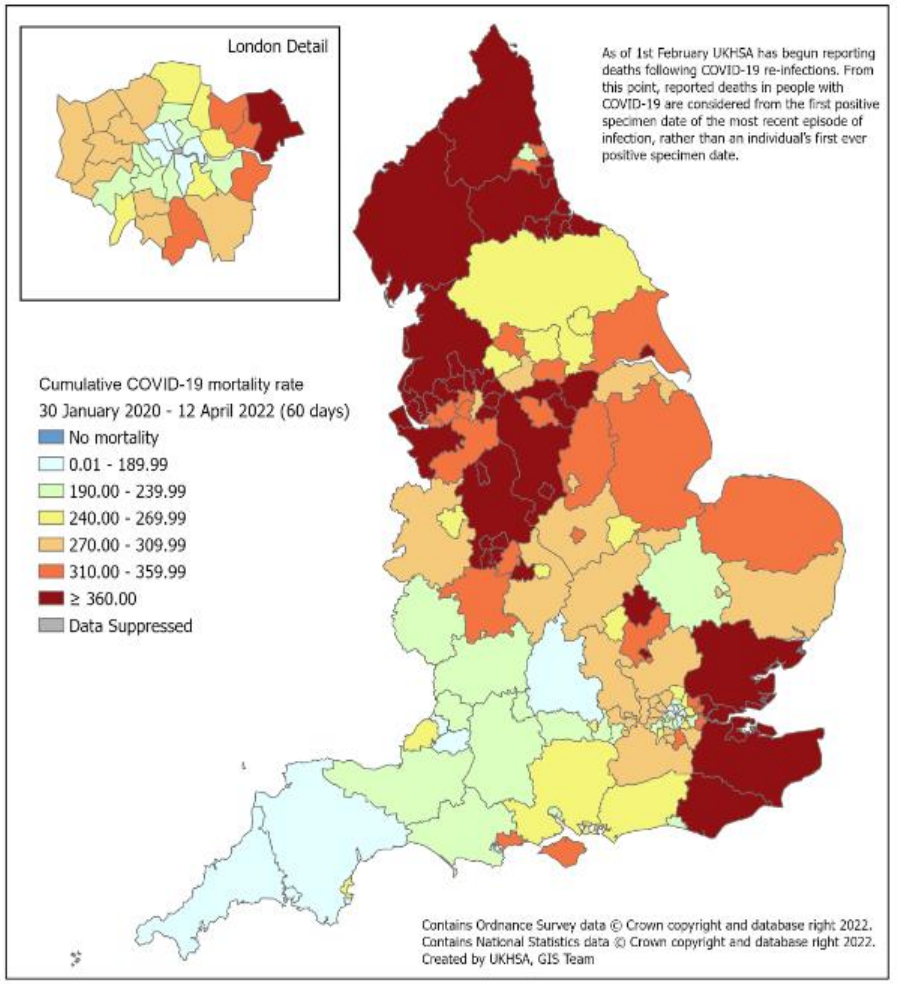
UK Health Security Agency

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)

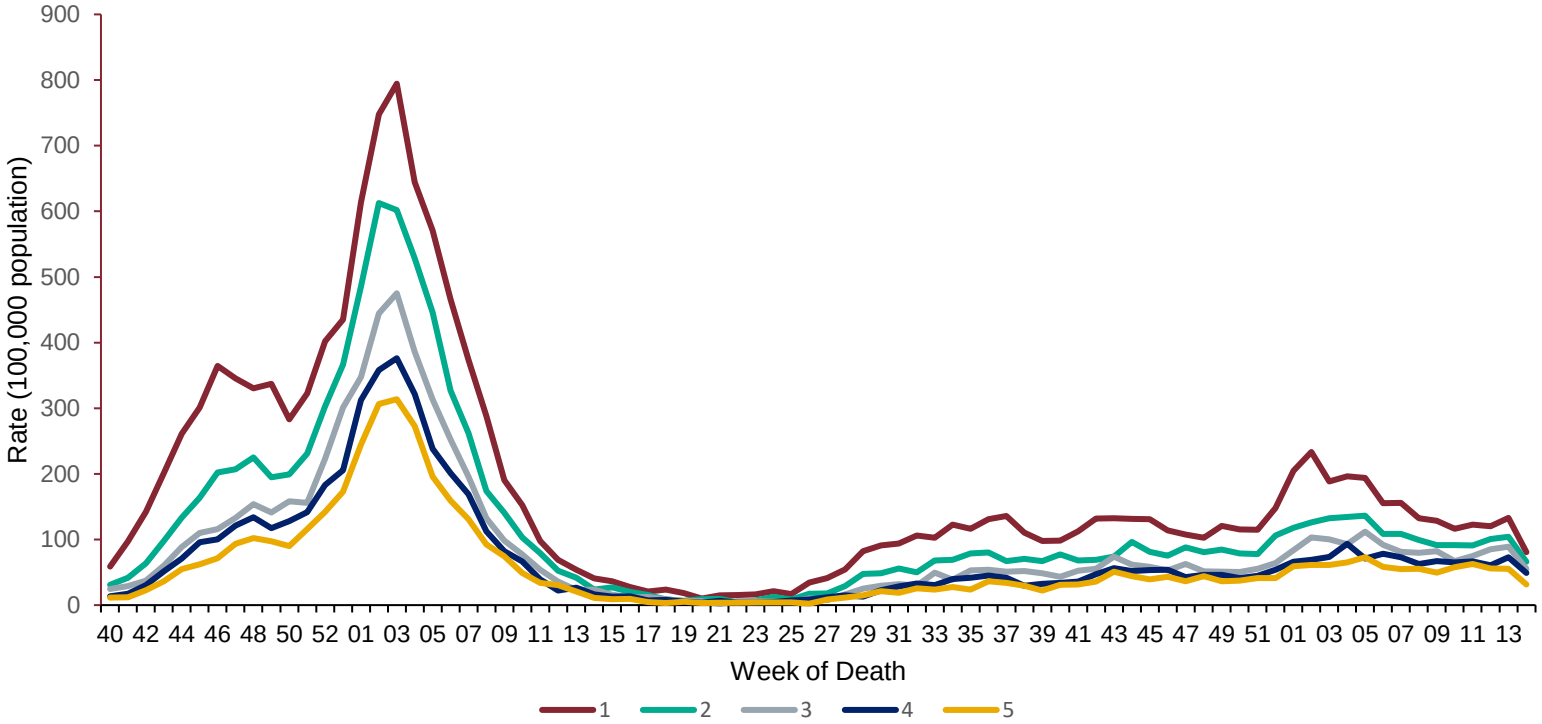


(b)



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.

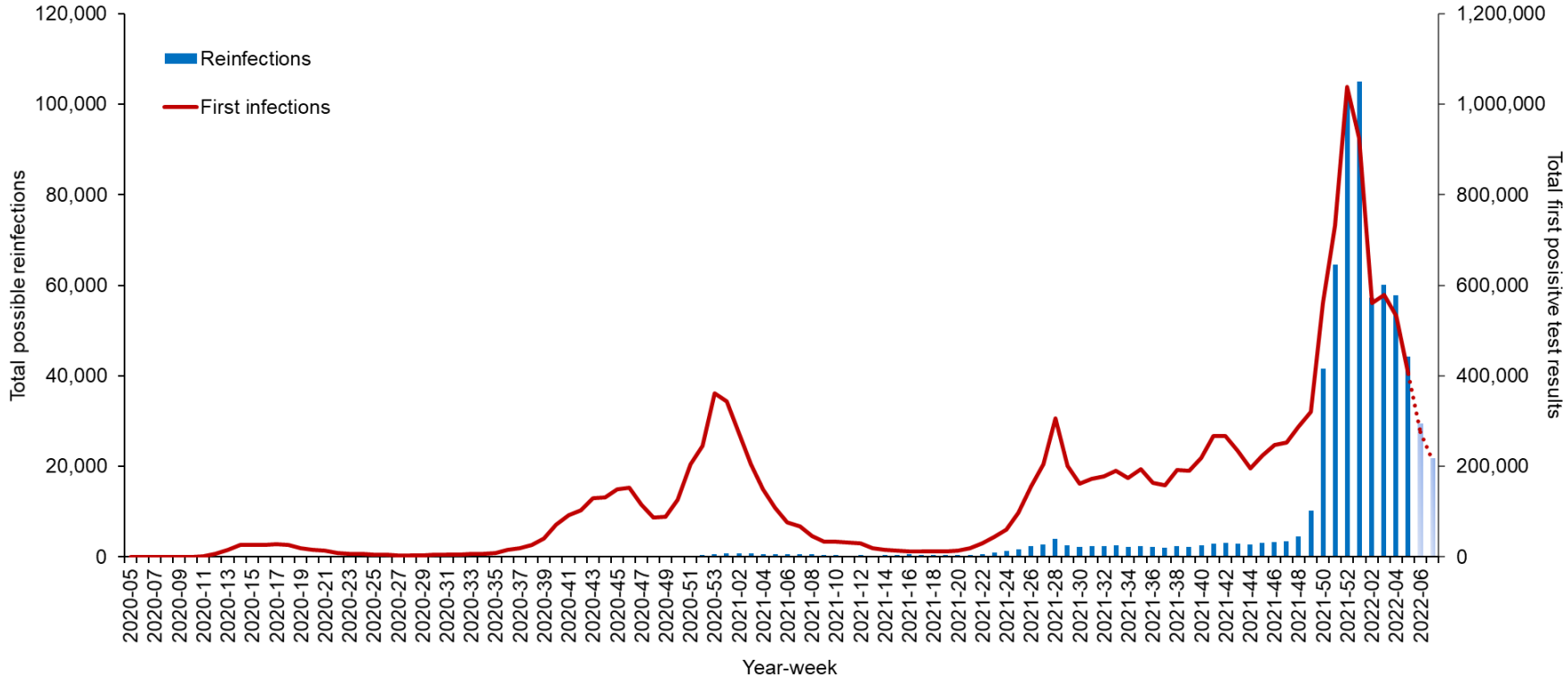
For a possible reinfection to be categorised as confirmed they require sequencing of a specimen at each episode and for the second specimen to be genetically distinct from that sequenced from the first episode. Availability of such dual sequencing is currently very low for several reasons; sequencing 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.

UK Health Security Agency

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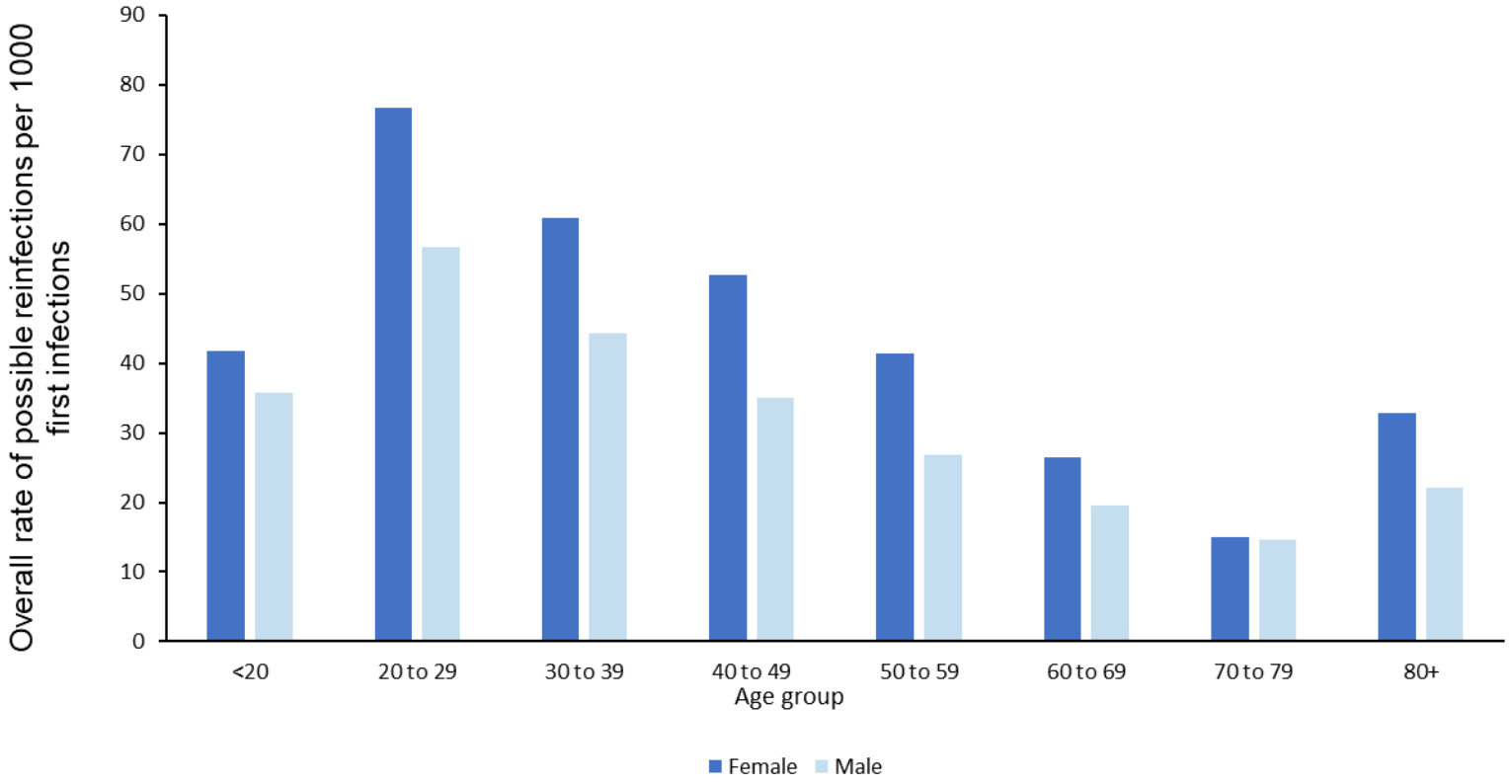
The age and sex distribution of possible reinfections by overall rate per 1000 first infections (up to week 07, provisional) by sex and age group in England



UK Health Security Agency

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.
- Preceding/co-/secondary infections refers to when a patient has a COVID-19 infection with one or more other pathogen (Please see Appendix 1 – Pre-/co-/secondary infection with COVID-19 definitions.)
  - Preceding infection: COVID-19 acquired after another pathogen
  - Co-infection: COVID-19 and other pathogen acquired at the same time
  - Secondary infection: COVID-19 acquired before another pathogen
- Numbers of pre-/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.

UK Health Security Agency

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. Data for the current and previous seasons are presented. Each season commences around October (ISO week 40) ending in September in the following year (ISO week 39).

Data for the current season (2021-22) is from 4 October 2021 to 6 March 2022 inclusive (week 40 2021 to week 09 2022). This period includes effects from the Delta and Omicron waves of the pandemic. The 2020-21 season is from 28 September 2020 to 3 October 2021 inclusive and includes effects from the Alpha and Delta waves. The 2019-20 season is from 30 September 2019 to 27 September 2020 inclusive and includes effects from the original Wuhan strain.

- In the 2021-22 season, 32% (18/56) of ECMO patients admitted for severe respiratory failure due to laboratory confirmed COVID-19 had clinically significant co/secondary infections. In the previous season (2020-21) this proportion was 30% (116/381). In the 2019-20 season this proportion was 33% (79/236).
- In all three seasons the majority of clinically significant co/secondary infections among respiratory failure COVID-19 cases comprised Gram-negative bacilli from the order Enterobacterales:
  - 39% (7/18) in the current season 2021-22
  - 29% (34/116) in 2020-21 and 46% (36/79) in 2019-20. The proportion decreased significantly in 2020-21 compared to 2019-20 and no change was detected in other key pathogens between these two periods.

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Surveillance of bacterial, fungal and viral infections, in COVID-19 patients in England, Jan 2020 – Apr 2022

HCAI, Fungal, AMR, AMU & Sepsis Division

UK Health Security Agency

Updates

- From 31 January 2022, UKHSA has changed the COVID-19 case definition to include multiple infection episodes. Reported co-/secondary/preceding infections in England now use the new definition, revising all cases back to the beginning of the pandemic.
- The Unified Infection Dataset (UID) project has been extended to incorporate the Co- and Secondary infections with COVID-19 datasets
- The following outputs included in this section have been produced via the UID, combining previously separate data pipelines
  - Key HCAI bacterial and fungal specimens reported to SGSS and HCAI data capture system
  - Respiratory viral specimens reported to SGSS and Respiratory Datamart
  - Fungal specimens reported to mycology reference lab (MRL)
- The Co- and secondary infections team have undertaken an extensive data validation exercise which has identified additional respiratory viral specimens from Respiratory Datamart and allowed us to make improvements to the methodologies.
  Preceding infections for all pipelines (other pathogen infections occurring before COVID-19 specimen) are now included. Please note, all cases since January 2020 have been revised in line with this validation.
- Data are provisional and subject to change due to possible delayed reporting of microbiological samples

UK Health Security Agency

Number of COVID-19 patient-episodes with bacterial, fungal or viral infections in COVID-19 patients diagnosed in England during wave 1*, by infection type and timing of diagnosis

Bacterial/ fungal/ viral infection by specimen type	COVID-19 patient-episodes with bacterial/ fungal/ viral infection		Timing of bacterial/fungal/viral diagnosis in relation to COVID-19 diagnosis								
			Preceding infection			Coinfection			Secondary infection		
	n	% of COVID cases	n	% infections by site	% of COVID cases	n	% infections by site	% of COVID cases	n	% infections by site	% of COVID cases
Bacterial/fungal bloodstream & lower respiratory infection	129	0.05	9	6.98	<0.01	2	1.55	<0.01	118	91.47	0.05
Bacterial/fungal bloodstream infection	3,077	1.26	1282	41.66	0.53	801	26.03	0.33	994	32.30	0.41
Bacterial/fungal lower respiratory infection	647	0.27	109	16.85	0.04	94	14.53	0.04	444	68.62	0.18
Clostridioides difficile infection	308	0.13	100	32.47	0.04	43	13.96	0.02	165	53.57	0.07
Fungal respiratory/bloodstream infection (MRL)‡	109	0.04	10	10.75	<0.01	2	1.83	<0.01	81	74.31	0.03
Other respiratory virus infection	373	0.15	136	36.46	0.06	193	51.74	0.08	44	11.80	0.02
Any site†	**4,652**	**1.91**	**1,647**	**35.53**	**0.68**	**1,136**	**24.42**	**0.47**	**1,853**	**39.83**	**0.76**

Please see appendix 1 for Co- and secondary infection definitions with COVID-19
Please note patients can have multiple COVID-19 infection-episodes, numbers here do not reflect the number of patients. Testing in W1 was not open to the community and therefore W1 cases are predominantly hospitalised patients vs. W2 and W3.
***SARS-CoV2 specimen dates from 30 Jan 2020 to 28 Jun 2020 (N=243,902)**
‡ Definition for preceding infection differs for MRL specimens - detection within 60 days
† includes the combination Bacterial/fungal bloodstream & *Clostridioides difficile* infection (1 coinfection, 5 secondary & 1 preceding), Bacterial/fungal bloodstream, lower respiratory & *Clostridioides difficile* infection (1 secondary), & Bacterial/fungal lower respiratory & *Clostridioides difficile* infection (1 secondary)

Key findings:

- 1.91% of COVID-19 patient-episodes had a bacterial, fungal or other respiratory viral infection detected in either the 28 days prior or 28 days following (60 days for MRL) their COVID-19 diagnosis
  - 1.26% had a key bacterial/fungal bloodstream infection
- The majority of infections with key organisms were categorised as secondary infections (39.83%).

UK Health Security Agency

Number of COVID-19 patient-episodes with bacterial, fungal or viral infections in COVID-19 patients diagnosed in England during wave 2*, by infection type and timing of diagnosis

Bacterial/ fungal/ viral infection by specimen type	COVID-19 patient-episodes with bacterial/ fungal/ viral infection		Timing of bacterial/fungal/viral diagnosis in relation to COVID-19 diagnosis								
			Preceding infection			Coinfection			Secondary infection		
	n	% of COVID cases	n	% infections by site	% of COVID cases	n	% infections by site	% of COVID cases	n	% infections by site	% of COVID cases
Bacterial/fungal bloodstream & lower respiratory infection	438	0.01	10	2.28	<0.01	5	1.14	<0.01	423	96.58	0.01
Bacterial/fungal bloodstream infection	7,829	0.21	3,515	44.90	0.10	1,032	13.18	0.03	3,282	41.92	0.09
Bacterial/fungal lower respiratory infection	2,166	0.06	335	15.47	0.01	145	6.69	<0.01	1,686	77.84	0.05
Clostridioides difficile infection	789	0.02	311	39.42	0.01	77	9.76	<0.01	401	50.82	0.01
Fungal respiratory/bloodstream infection (MRL)‡	227	0.01	26	12.09	<0.01	3	1.32	<0.01	186	81.94	0.01
Other respiratory virus infection	361	0.01	84	23.27	<0.01	140	38.78	<0.01	137	37.95	<0.01
Any site†	**11,842**	**0.32**	**4,293**	**36.29**	**0.12**	**1,404**	**11.86**	**0.04**	**6,133**	**51.79**	**0.17**

Please see appendix 1 for Co- and secondary infection definitions with COVID-19
Please note patients can have multiple COVID-19 infection-episodes, numbers here do not reflect the number of patients.
***SARS-CoV2 specimen dates from 29 Jun 2020 to 26 Apr 2021 (N=3,697,677)**
‡ Definition for preceding infection differs for MRL specimens - detection within 60 days
† includes the combination Bacterial/fungal bloodstream & *Clostridioides difficile* infection (2 coinfection, 12 secondary & 10 preceding), Bacterial/fungal bloodstream, lower respiratory & *Clostridioides difficile* infection (2 secondary), & Bacterial/fungal lower respiratory & *Clostridioides difficile* infection (4 secondary & 2 preceding)

Key findings:

- 0.32% of COVID-19 patient-episodes had a bacterial, fungal or other respiratory viral infection detected in either the 28 days prior or 28 days following (60 days for MRL) their COVID-19 diagnosis
- While the prevalence is lower in W2 than W1 (1.91%), the number of patient-episodes with a pre-/co-/secondary infection was much greater in W2 than W1 (11,842 vs. 4,652, respectively)
- The majority of infections with key organisms were secondary infections (51.79%).

UK Health Security Agency

Number of COVID-19 patient-episodes with bacterial, fungal or viral infections in COVID-19 patients diagnosed in England during wave 3*, by infection type and timing of diagnosis

Bacterial/ fungal/ viral infection by specimen type	COVID-19 patient-episodes with bacterial/ fungal/ viral infection		Timing of bacterial/fungal/viral diagnosis in relation to COVID-19 diagnosis								
			Preceding infection			Coinfection			Secondary infection		
	n	% of COVID cases	n	% infections by site	% of COVID cases	n	% infections by site	% of COVID cases	n	% infections by site	% of COVID cases
Bacterial/fungal bloodstream & lower respiratory infection	216	<0.01	11	5.09	<0.01	7	3.24	<0.01	198	91.67	<0.01
Bacterial/fungal bloodstream infection	4,573	0.04	1,714	37.48	0.01	845	18.48	0.01	2,014	44.04	0.02
Bacterial/fungal lower respiratory infection	1,895	0.02	345	18.21	<0.01	160	8.44	<0.01	1,390	73.35	0.01
Clostridioides difficile infection	584	0.01	212	36.30	<0.01	57	9.76	<0.01	315	53.94	<0.01
Fungal respiratory/bloodstream infection (MRL)‡	219	<0.01	11	5.70	<0.01	3	1.37	<0.01	179	81.74	<0.01
Other respiratory virus infection	1,997	0.02	594	29.74	0.01	888	44.47	0.01	515	25.79	<0.01
Any site†	**9,509**	**0.08**	**2,893**	**30.51**	**0.03**	**1,962**	**20.63**	**0.02**	**4,628**	**48.67**	**0.04**

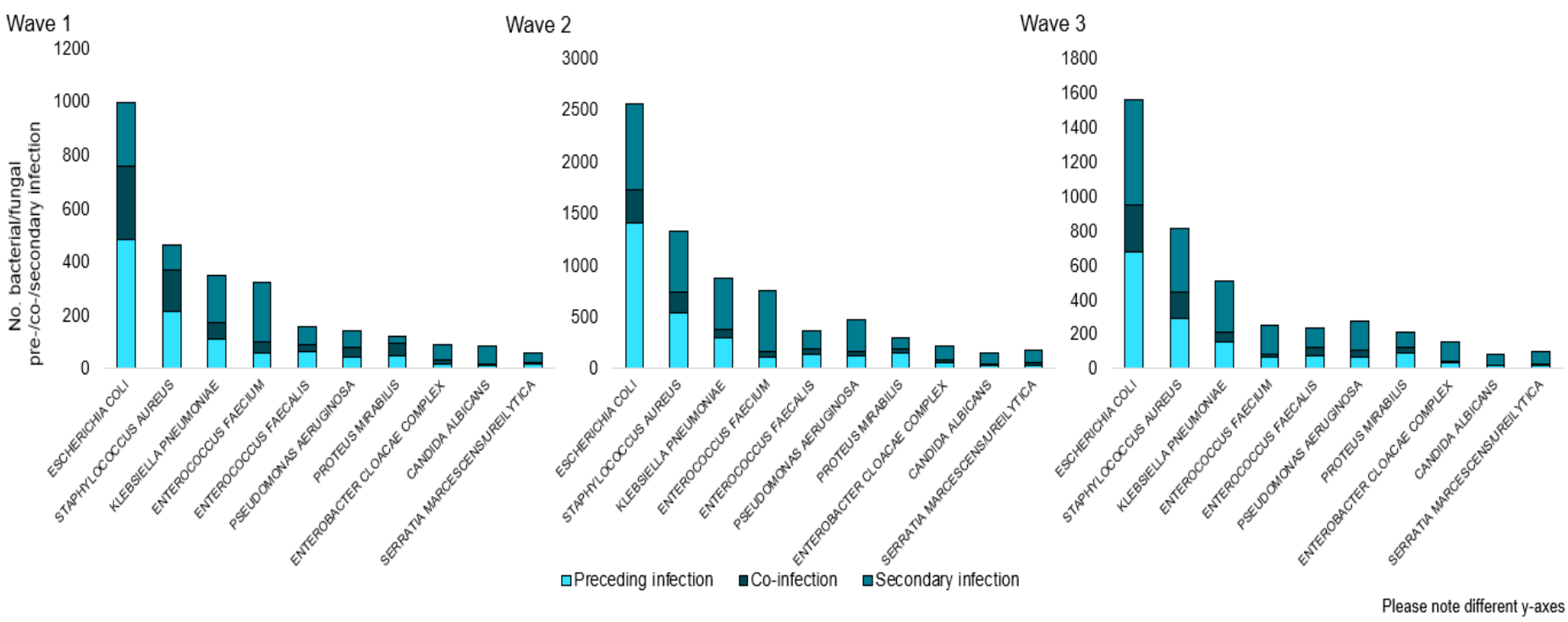
Please see appendix 1 for Co- and secondary infection definitions with COVID-19
Please note patients can have multiple COVID-19 infection-episodes, numbers here do not reflect the number of patients.
***SARS-CoV2 specimen dates from 27 Apr 2021 to 6 Feb 2022 (N=11,427,282)**
‡ Definition for preceding infection differs for MRL specimens - detection within 60 days
† includes the combination Bacterial/fungal bloodstream & *Clostridioides difficile* infection (15 secondary & 6 preceding), Bacterial/fungal bloodstream, lower respiratory & *Clostridioides difficile* infection (1 coinfection & 1 secondary), & Bacterial/fungal lower respiratory & *Clostridioides difficile* infection (1 coinfection & 1 secondary)

Key findings:

- 0.08% of COVID-19 patient-episodes had a bacterial, fungal or other respiratory viral infection detected in either the 28 days prior or 28 days following (60 days for MRL) their COVID-19 diagnosis
- Prevalence in W3 lower than W2 and W1; however, patient-episodes of COVID-19 and another key infection are still higher in W3 than W1 (9,509 vs 4,652, respectively)
- The majority of infections with key organisms were categorised as secondary infections (48.67%).

UK Health Security Agency

Most frequent bacterial/fungal species in blood specimens, by timing of diagnosis, in COVID-19 patients diagnosed in England



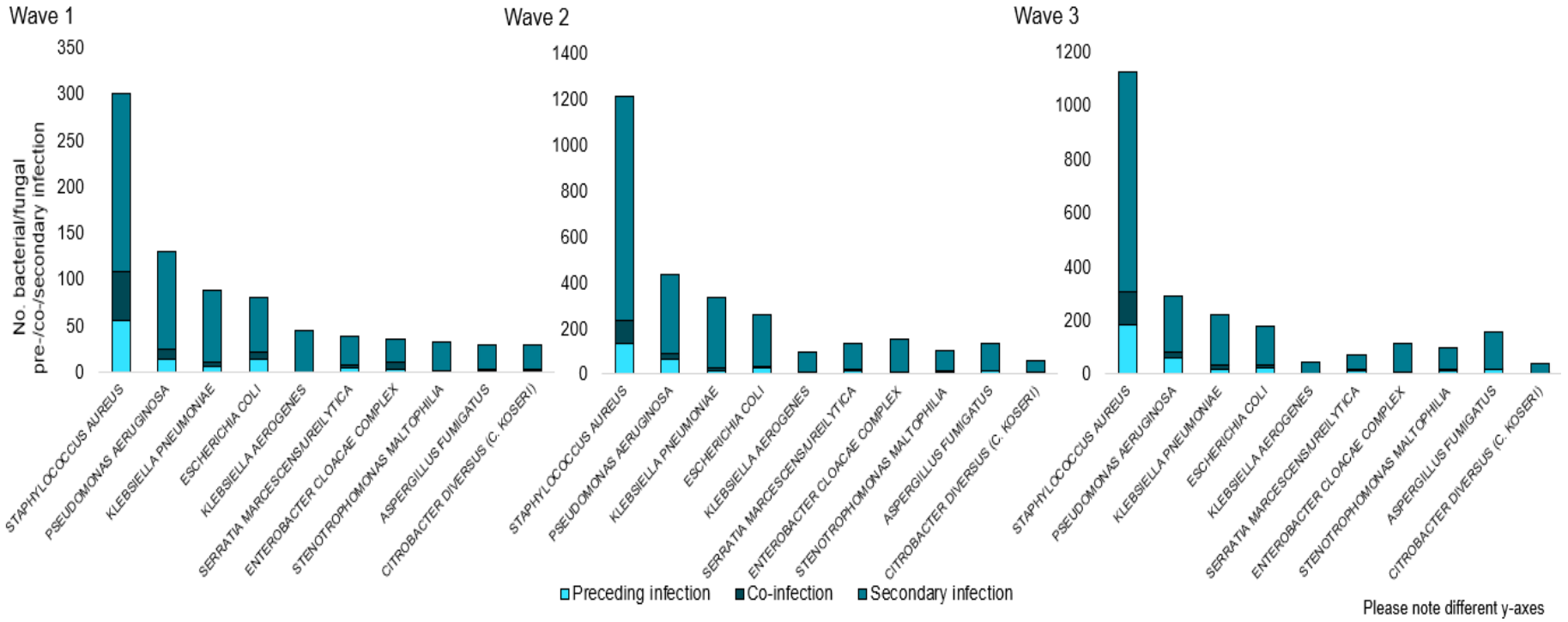
Key findings:

In all three waves, the most frequent bacterial/fungal organisms identified from blood specimens were *Escherichia coli*, *Staphylococcus aureus* and *Klebsiella pneumoniae*.

Please note, testing in W1 was not open to the community and therefore W1 cases are predominantly hospitalised patients vs. W2 and W3.

UK Health Security Agency

Most frequent bacterial/fungal species in lower respiratory tract specimens, by timing of diagnosis, in COVID-19 patients diagnosed in England



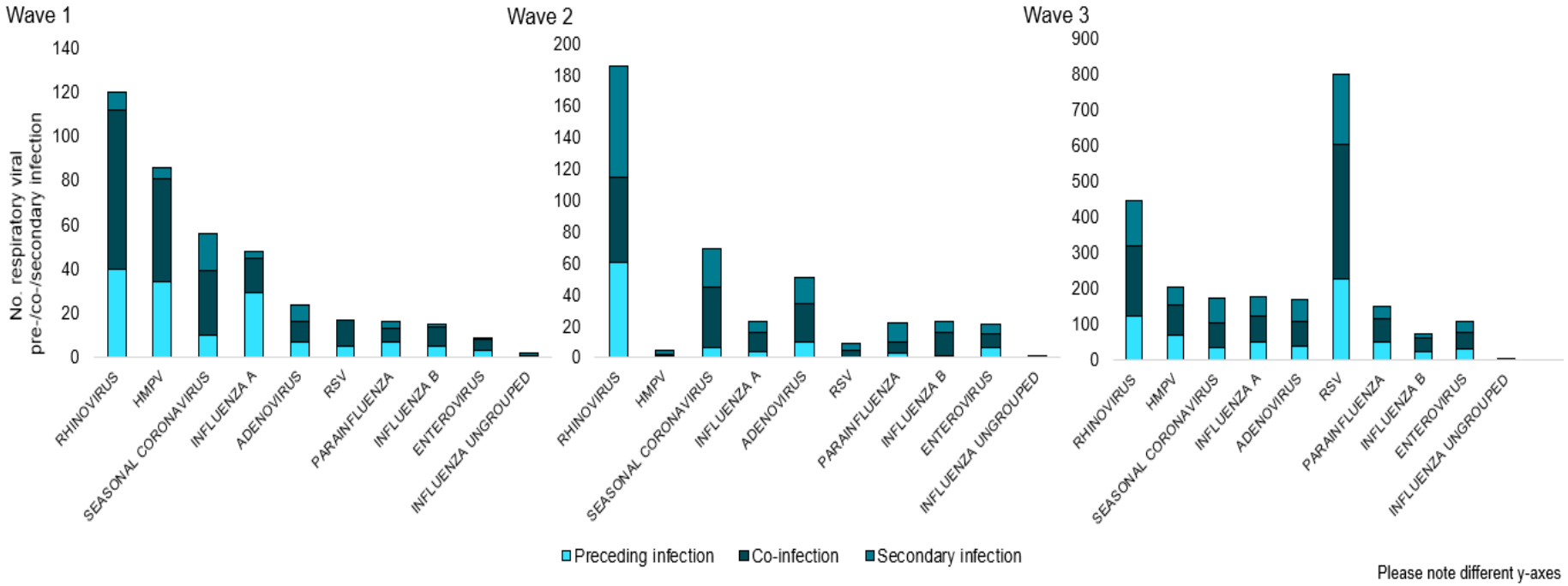
Key findings:

In all three waves, the most frequent bacterial/fungal organisms identified from respiratory specimens were *Staphylococcus aureus, Pseudomonas aeruginosa* and *Klebsiella pneumoniae*.

Please note, testing in W1 was not open to the community and therefore W1 cases are predominantly hospitalised patients vs. W2 and W3.

UK Health Security Agency

Most frequent viral specimens, by timing of diagnosis, in COVID-19 patients diagnosed in England



Please note different y-axes

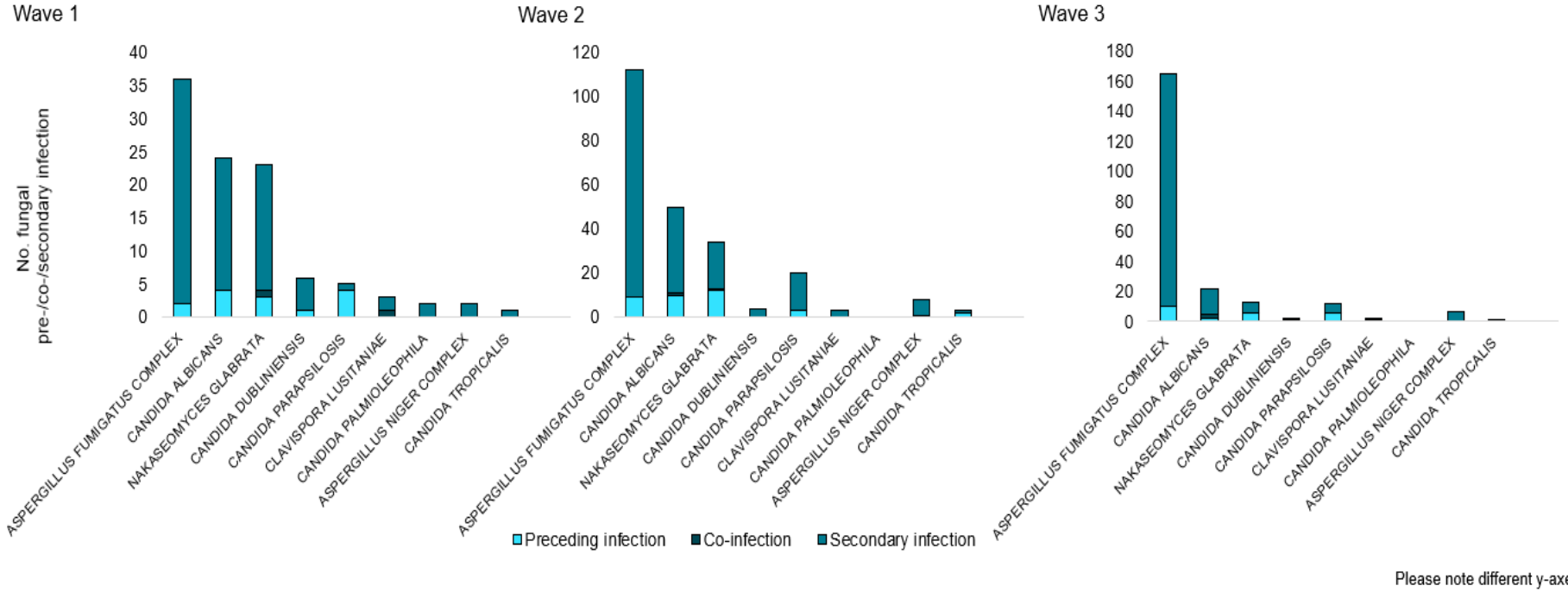
Key findings:

The most frequent viral organisms identified from respiratory specimens changed from wave to wave, rhinovirus was identified within the top three pre-/co-/secondary infection causative organisms for all waves and most prevalent organism for W1 and W2, with RSV accounting for the most pre-/co-/secondary infections in W3

Please note, testing in W1 was not open to the community and therefore W1 cases are predominantly hospitalised patients vs. W2 and W3.

UK Health Security Agency

Most frequent fungal species (MRL), by timing of diagnosis, in COVID-19 patients diagnosed in England



Please note different y-axes

Key findings:

In all three waves, the most frequent fungal organisms identified were *Aspergillus fumigatus complex* and *Candida albicans.*

Please note, testing in W1 was not open to the community and therefore W1 cases are predominantly hospitalised patients vs. W2 and W3.

UK Health Security Agency

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 February 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. Fungal data are also included in the overall numbers in slides 6-8 but have been stratified here with additional details. *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. Please note, testing in W1 was not open to the community and therefore W1 cases are predominantly hospitalised patients vs. W2 and W3.

Appendix 1: Pre-/co-/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: Pre-/co-/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: Pre-/co-/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*