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 17 (between 24 April and 30 April 2023).
Contents

1) Confirmed COVID-19 episodes in England
2) Respiratory Datamart system (England)
3) Second generation surveillance system (SGSS)
4) Community surveillance
5) Surveillance in ‘educational-age’ cohorts
6) Secondary Care surveillance
7) SARS-CoV-2 Whole Genome Sequencing (WGS) coverage, England
8) Co/secondary infections with COVID-19
Confirmed COVID-19 episodes in England
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.

- From 1 April 2023, changes to coronavirus (COVID-19) testing came into effect to ensure testing continues to focus on those at highest risk. As such, there will be a reduction in the reporting of data obtained through Pillar 2 from April 2023 onwards. Data in this report should be interpreted in the context of this change to testing.
Confirmed COVID-19 episodes tested under Pillar 2, based on sample week with overall weekly PCR positivity for Pillar 2 (%)
Weekly confirmed COVID-19 case rates per 100,000, by episode, tested under Pillar 2, by sex
Weekly confirmed COVID-19 case rates per 100,000, by episode, tested under Pillar 2, by age group
Weekly PCR positivity (%) of confirmed COVID-19 cases tested overall and by sex under Pillar 2
Weekly PCR positivity (%) of confirmed COVID-19 cases tested under Pillar 2, by male and age group
Weekly PCR positivity (%) of confirmed COVID-19 cases tested under Pillar 2, by female and age group.
Weekly confirmed COVID-19 case rates by episode, per 100,000 population (Pillar 2), by UKHSA centres and sample week.
Weekly PCR positivity of confirmed COVID-19 cases tested under Pillar 2 (%) by UKHSA centres and sample week

% positivity

Week number

East Midlands
East of England
London
North East
North West
South East
South West
West Midlands
Yorkshire and the Humber
Weekly incidence per 100,000 population by ethnicity (Pillar 2), England

- White
- Indian (Asian or Asian British)
- Black / African / Caribbean / Black British
- Pakistani (Asian or Asian British)
- Other Asian / Asian British
- Mixed / Multiple ethnic groups
- Other ethnic group

Incidence rate per 100,000 population

Week number

18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 2 4 6 8 10 12 14 16

0.0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540 560 580 600

4 May 2023
Weekly COVID-19 episodes tested under Pillar 1, per 100,000 population by age group and region, weeks 8 to 17

- East Midlands
- East of England
- London
- North East
- North West
- South East
- South West
- West Midlands
- Yorkshire and Humber

Week number: 8 to 17

Age groups: 0-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80+

Weekly incidence rate per 100,000 population
Weekly COVID-19 episodes tested under Pillar 2, per 100,000 population by age group and region, weeks 8 to 17

- East Midlands
- East of England
- London
- North East
- North West
- South East
- South West
- West Midlands
- Yorkshire and Humber

Legend:
- 0-9
- 10-19
- 20-29
- 30-39
- 40-49
- 50-59
- 60-69
- 70-79
- 80+
Weekly COVID-19 episodes tested under Pillar 1, per 100,000 population by ethnicity and region, weeks 8 to 17
Weekly COVID-19 episodes tested under Pillar 2 per 100,000 population by ethnicity and region, weeks 8 to 17

Week number

East Midlands

East of England

London

North East

North West

South East

South West

West Midlands

Yorkshire and Humber

Weekly incidence rate per 100,000 population

- Black/African/Caribbean/Black British
- Indian (Asian or British)
- Mixed/Multiple Ethnic Groups
- Other Asian/Asian British
- Other ethnic group
- Pakistani (Asian or British)
- White
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)

*incidence rates have been calculated using the mid-2019 ONS population estimates
Weekly COVID-19 rate tested under Pillar 2, per 100,000 population by IMD quintile (1 being the most deprived and 5 being the least deprived)
Respiratory Datamart system (England)
Respiratory DataMart – Influenza subtypes

Influenza A(H1N1)pdm09

- Positive samples
- % 2018/19
- % 2019/20
- % 2020/21
- % 2021/22
- % 2022/23

Influenza A(H3N2)

- Positive samples
- % 2018/19
- % 2019/20
- % 2020/21
- % 2021/22
- % 2022/23

Influenza A(not subtyped)

- Positive samples
- % 2018/19
- % 2019/20
- % 2020/21
- % 2021/22
- % 2022/23

Influenza B

- Positive samples
- % 2018/19
- % 2019/20
- % 2020/21
- % 2021/22
- % 2022/23
Respiratory DataMart – Respiratory syncytial virus (RSV)
Respiratory DataMart – Respiratory syncytial virus (RSV) weekly positivity by UKHSA region

Week number

Proportion positive (%)
Second generation surveillance system (SGSS)
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.
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.
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.
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.
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.
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.
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.
Community surveillance
Acute respiratory infection (ARI) outbreaks linked to educational settings

Data Information

• We report on new acute respiratory infection (ARI) incidents reported to UKHSA Health Protection Teams (HPTs) and entered on HPZone in the previous reporting week by setting and locality.

• Daily and weekly aggregated surveillance reports are extracted from HPZone to generate the line listing.

• The weekly extracts include incidents reported in the previous epidemiological week (Monday to Sunday) by locality and context (setting e.g. school)

• The ARI incidents captured on HPZone represent a subset of all ongoing clusters and outbreaks in England rather than an exhaustive listing.

• SARS-CoV2 testing policies and public health guidance for different settings changed over time. This means that any interpretation of seasonal and temporal trends since March 2020 should take this into account.

• From week 14 2022 all reported outbreaks are considered suspected, in line with changes in reporting and the implementation of the living with COVID-19 plan. (Prior to this, individual cases notes for situations associated with educational settings were reviewed by an epidemiologist and an assessment made about whether the criteria for a confirmed COVID-19 cluster or outbreak were met).

• The ARI definition includes presentations of both of influenza-like illness (ILI) and other acute viral respiratory infections (AVRI). Causal pathogens can include Influenza A and B, Respiratory Syncytial Virus (RSV), adenovirus, rhinovirus, parainfluenza, human metapneumovirus (hMPV) and SARS-CoV-2.

• For further info please contact: respscidsc@ukhsa.gov.uk
Number of acute respiratory infection outbreaks reported to UKHSA by type of educational setting, England
Number of acute respiratory infection outbreaks by type of educational setting, England

End of academic year total
Week 35 2021-34 2022

<table>
<thead>
<tr>
<th>UKHSA Centres</th>
<th>Nursery</th>
<th>Primary School</th>
<th>Secondary School</th>
<th>Combined</th>
<th>Special Educational Needs (SEN) schools</th>
<th>College University</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>540</td>
<td>1761</td>
<td>596</td>
<td>161</td>
<td>1306</td>
<td>59</td>
<td>4423</td>
</tr>
</tbody>
</table>

Week 17 2023
Main table

<table>
<thead>
<tr>
<th>UKHSA Centres</th>
<th>Nursery</th>
<th>Primary School</th>
<th>Secondary School</th>
<th>Combined</th>
<th>Special Educational Needs (SEN) schools</th>
<th>College University</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Midlands Centre</td>
<td>3 (0)</td>
<td>2 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (0)</td>
<td>0 (0)</td>
<td>6 (0)</td>
</tr>
<tr>
<td>East of England Centre</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (0)</td>
<td>0 (0)</td>
<td>1 (0)</td>
<td>0 (0)</td>
<td>2 (0)</td>
</tr>
<tr>
<td>London Centre</td>
<td>21 (0)</td>
<td>31 (0)</td>
<td>5 (0)</td>
<td>2 (0)</td>
<td>21 (0)</td>
<td>1 (0)</td>
<td>81 (0)</td>
</tr>
<tr>
<td>North East Centre</td>
<td>3 (0)</td>
<td>4 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (0)</td>
<td>0 (0)</td>
<td>8 (0)</td>
</tr>
<tr>
<td>North West Centre</td>
<td>0 (0)</td>
<td>6 (1)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>6 (0)</td>
<td>0 (0)</td>
<td>12 (1)</td>
</tr>
<tr>
<td>South East Centre</td>
<td>0 (0)</td>
<td>1 (0)</td>
<td>2 (0)</td>
<td>0 (0)</td>
<td>1 (0)</td>
<td>0 (0)</td>
<td>4 (0)</td>
</tr>
<tr>
<td>South West Centre</td>
<td>1 (0)</td>
<td>3 (0)</td>
<td>1 (0)</td>
<td>0 (0)</td>
<td>4 (0)</td>
<td>0 (0)</td>
<td>9 (0)</td>
</tr>
<tr>
<td>West Midlands Centre</td>
<td>5 (0)</td>
<td>23 (0)</td>
<td>4 (0)</td>
<td>1 (0)</td>
<td>2 (0)</td>
<td>0 (0)</td>
<td>35 (0)</td>
</tr>
<tr>
<td>Yorkshire &amp; the Humber</td>
<td>1 (0)</td>
<td>15 (1)</td>
<td>3 (0)</td>
<td>1 (0)</td>
<td>6 (0)</td>
<td>0 (0)</td>
<td>26 (1)</td>
</tr>
<tr>
<td>Total</td>
<td>34 (0)</td>
<td>85 (2)</td>
<td>16 (0)</td>
<td>4 (0)</td>
<td>43 (0)</td>
<td>1 (0)</td>
<td>183 (2)</td>
</tr>
</tbody>
</table>

* Number of acute respiratory infection for the most recent week in brackets
Secondary Care surveillance
Weekly admission rates for hospital and ICU/HDU laboratory confirmed COVID-19 cases reported through SARI Watch, week 17

Source: UKHSA 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 82 for the hospitalisation (all levels of care) indicator in week 24 April 2023 to 30 April inclusive and 75 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 30 April 2023 was 76 and 70 for ICU/HDU admissions for COVID-19.
Weekly COVID-19 hospitalisation rate per 100,000 trust catchment population by age group and region, weeks 08 to 17
Rate of hospitalisation (to all levels of care including ICU-HDU) by ethnic group, per 100,000 ethnic group specific trust catchment population, England

**Notes:**

- This is based on data from the sentinel surveillance involving a network of spotter trusts submitting enhanced data on laboratory confirmed cases admitted to any level of care including ICU-HDU.

- Due to retrospective updates from trusts rates are revised accordingly. Data extracted on the 24th April 2023.

- From week (24 2021) 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.

- A caveat is that more recent data has under representations from London trusts, so trusts from that region are encouraged to participate to strength this surveillance.
Rate of admission to ICU/HDU by ethnicity, per 100,000 trust catchment population, by month, England

Note:
- From week (24 2021) 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.

- The ICU-HDU rates prior to October 2022 were based on mandatory data i.e. acute NHS trusts were required to submit enhanced data on all cases of COVID-19 admitted to ICU-HDU ward. The mandatory requirement to submit data on COVID-19 cases admitted to ICU-HDU was discontinued in October 2022.

- From October 2022, enhanced surveillance is based on sentinel data (data reported by a network of spotter trusts). Sentinel surveillance involves reporting cases of COVID-19 admitted to all levels of care. ICU-HDU cases from sentinel surveillance data maybe too small to stratify by time and ethnicity, this is due to a smaller number of reported trusts from the sentinel scheme.
COVID-19 as primary reason for admission (Yes/No) among SARS-CoV-2 positive patient by week of admission, England, All ages

Notes

1) Case-level sentinel surveillance data from SARI-Watch, from week 12 2020 (commencing 16 March 2020) to week 13 2023 (ending 16 April 2023) inclusive

2) Total 80,630 records in period of analysis, of which 42% (n=34,229) had COVID-19 as primary reason for admission ('Yes').

3) SARS-CoV-2 patients with evidence of COVID-19 treatment (antivirals or respiratory support) or COVID-19 death but have 'No' or 'Unknown' for COVID-19 as primary reason for admission (n=9,312) are reassigned to COVID-19 as primary reason of admission ('Yes').

4) Reassignment increases COVID-19 as primary reason for admission ('Yes') from 34,229 to 43,541

5) 21% (17,002/80,630) of total records in this period have missing data on the ‘Admission due to COVID-19’ indicator – these are excluded from analysis

6) Caveats: 1) London trusts under-represented since January 2021. 2) The most recent weeks are subject to retrospective updates 3) Admissions recorded as not primarily due to COVID-19 should not be interpreted as all true incidental as there will be some with non ARI presentation due to exacerbation after recent SARS-CoV-2 infection.
SARS-CoV-2 Whole Genome Sequencing (WGS) coverage, England
Coverage of sequencing with a valid result and genotyping over time (01 May 2022 to 01 May 2023)

Episodes where the individual only tested using a lateral flow device are excluded. Grey shading was applied to the previous 14 days to account for reporting delays in sequencing data.

HCAI, Fungal, AMR, AMU & Sepsis Division
Preceding/co-/secondary infections with COVID-19

Background

• Numbers of preceding/co-/secondary infection remain low across UKHSA surveillance systems.

• Free community testing ended 31 March 2022 as part of the government’s Living with COVID-19 plan, with asymptomatic testing continuing in some settings. As of 31 August 2022, asymptomatic testing in all settings, including hospitals, has been paused. Please use caution when comparing incidence of bacterial, fungal and viral preceding/co-/secondary infections with COVID-19 over time due to these differences in testing strategies.

• Published data analyses from pandemic wave 1 indicates increased mortality associated with COVID-19 and influenza, key bacterial and fungal infections and invasive pneumococcal disease (IPD) in comparison to persons without co/secondary infection.

• Data analysis from wave 1 indicates that Aspergillus and candidemia cases had increased risk of mortality in comparison to patients without co/secondary infection.

• For patients with severe respiratory failure requiring Extra Corporeal Membrane Oxygenation (ECMO), analysis of data from six adult ECMO centres in England indicates that among patients with severe respiratory failure due to COVID-19, clinically significant co/secondary infections were detected in 33% initially, rising to 40% in the 2021-22 season. In the current season (2022-23), influenza is now the predominant cause of severe respiratory failure, with almost two thirds having co/secondary infections detected. There has been two reports of COVID-19 admission requiring ECMO since the start of the current season 2022-23.
Surveillance of bacterial, fungal and respiratory viral infections in persons with COVID-19 and influenza in England

Data information

- Data are provisional and subject to change due to possible delayed reporting of microbiological samples
- Relative undertesting for other pathogens may result in an underestimate of preceding/co-/secondary infection cases. In addition, testing varies between pathogens therefore caution should be used in comparing preceding/co-/secondary infection rates between different pathogens
- Preceding/co-/secondary infections refers to when a person has a COVID-19 or influenza infection with one or more other pathogen (Please see Appendix 1 – Preceding/co-/secondary infection definitions.)
  - Preceding infection: SARS-CoV-2 or influenza detected after another pathogen
  - Co-infection: SARS-CoV-2 or influenza and other pathogen detected at the same time
  - Secondary infection: SARS-CoV-2 or influenza detected before another pathogen
- The following outputs included in this section have been produced via the Unified Infection Dataset (UID)
- Bacterial, fungal and respiratory viral infection data sources:
  - Fungal, bacterial and respiratory viral data (excluding *Clostridioides difficile*, Invasive pneumococcal disease & *Haemophilus influenzae*): Second Generation Surveillance System (SGSS)
  - Respiratory viral data: Respiratory Datamart
  - *Clostridioides difficile*: HCAI Data Capture System
  - Invasive pneumococcal disease: reference lab
  - *Haemophilus influenzae*: reference lab

4 May 2023
Co/secondary infections among patients with severe respiratory failure requiring Extra Corporeal Membrane Oxygenation (ECMO)

Analysis is based on cumulative data from six adult ECMO centres in England. Surveillance is all year round. Each season commences around October (ISO week 40) ending in September (ISO week 39) in the following year.

Current season 2022-23

• Data is from 3 October 2022 to 2 April 2023 inclusive (week 40 2022 to 13 2023). In this period there was a total of 92 admissions across SRFs requiring ECMO.

• Of the 92 admissions, 56 were for laboratory confirmed acute respiratory infection (ARI). The causative pathogens were n=34 influenza, n=5 S. pneumoniae, n=4 S. pyogenes (Group A streptococcus), n=3 RSV, n=2 COVID-19, the remaining n=8 due to other infection aetiologies. Influenza accounted for 62% (34/56) of confirmed ARI.

• Of 56 lab confirmed ARI, 52% (n=29) had clinically significant co/secondary infections reported:
  – Of 34 influenza cases, 62% (n=21) had co/secondary infections including n=9 GAS, n=3 S. aureus and n=3 S. pneumoniae.
  – As comparison: co/secondary infections accounted for 43% of influenza cases in 2019-20 and 49% in both 2018-19 and 2017-18 seasons
  – In total this season, 10 GAS co/secondary infections were detected among 56 lab confirmed ARI.

Prior season 2021-22

Data is from 4 October 2021 to 2 October 2022. 34% (33/96) of all laboratory confirmed ARI admitted to SRFs requiring ECMO had clinically significant co/secondary infections. 80% (77/96) of laboratory confirmed ARI were due to COVID-19. Among COVID-19 admitted cases, 40% (31/77) had clinically significant co/secondary infections reported.
Number of COVID-19 infection-episodes with bacterial, fungal or respiratory viral infections in persons with COVID-19 in England from ISO week 27 of 2022*, by infection type and timing of diagnosis

<table>
<thead>
<tr>
<th>Bacterial/ fungal/ viral infection by specimen type</th>
<th>COVID-19 infection-episodes with bacterial/fungal/viral infection</th>
<th>Timing of bacterial/fungal/viral diagnosis in relation to COVID-19 diagnosis</th>
<th>Key findings:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>% of COVID cases</td>
<td>Preceding infection</td>
</tr>
<tr>
<td>Bacterial/fungal bloodstream &amp; lower respiratory infection</td>
<td>93</td>
<td>0.01</td>
<td>24</td>
</tr>
<tr>
<td>Bacterial/fungal bloodstream infection</td>
<td>7,395</td>
<td>0.49</td>
<td>3,674</td>
</tr>
<tr>
<td>Bacterial/fungal lower respiratory infection</td>
<td>1,486</td>
<td>0.10</td>
<td>534</td>
</tr>
<tr>
<td>*SARS-CoV2 specimen dates from 4 July 2022 to 26 Mar 2023 (N=1,508,448). Last updated 21 Apr 2023.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clostridioides difficile infection</td>
<td>924</td>
<td>0.06</td>
<td>392</td>
</tr>
<tr>
<td>Other respiratory virus infection</td>
<td>6,099</td>
<td>0.40</td>
<td>1,079</td>
</tr>
<tr>
<td>Any site†</td>
<td>16,034</td>
<td>1.06</td>
<td>5,722</td>
</tr>
</tbody>
</table>

Please see appendix 1 for pre-/co-/secondary infection definitions with SARS-CoV-2

Please note persons can have multiple COVID-19 infection-episodes, numbers here do not reflect the number of persons. Numbers reflect the first episode of pre-/co-/secondary infection.

Key findings:
• 1.06% of COVID-19 infection-episodes had a bacterial, fungal or other respiratory viral infection detected in either the 28 days prior or following their COVID-19 diagnosis.
• Most infections with key organisms were categorised as co-infections (39.19%).

† other sites not listed in table but included in total: Bacterial/fungal bloodstream & *Clostridioides difficile* infection (17 preceding, 1 coinfection & 12 secondary), and Bacterial/fungal lower respiratory & *Clostridioides difficile* infection (2 preceding & 5 secondary)
Most frequent bacterial/fungal species in blood or lower respiratory tract specimens, by timing of diagnosis, in persons with COVID-19 in England from ISO week 27 of 2022

Key findings:
From ISO week 27 of 2022, the most frequent bacterial/fungal organisms identified from blood specimens were *Escherichia coli*, *Staphylococcus aureus* and *Klebsiella pneumoniae* and from respiratory specimens were *S. aureus*, *Pseudomonas aeruginosa* and *E. coli*.
Most frequent viral specimens, by timing of diagnosis, in persons with COVID-19 in England from ISO week 27 of 2022

Key findings:
From ISO week 27 of 2022, the most frequent viral organisms identified from respiratory specimens were influenza A, RSV and rhinovirus.
Number of influenza infection-episodes with bacterial, fungal or respiratory viral infections in persons with influenza in England from ISO week 27 of 2022*, by infection type and timing of diagnosis

<table>
<thead>
<tr>
<th>Bacterial/ fungal/ viral infection by specimen type**</th>
<th>Influenza infection-episodes with bacterial/ fungal/ viral infection</th>
<th>Timing of bacterial/fungal/viral diagnosis in relation to influenza diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>% of Influenza cases</td>
</tr>
<tr>
<td>Preceding infection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>% infections by site</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary infection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacterial/fungal bloodstream infection</td>
<td>1,374 1.42</td>
<td>387 28.17 0.40</td>
</tr>
<tr>
<td>Bacterial/fungal lower respiratory infection</td>
<td>559 0.58</td>
<td>99 17.71 0.10</td>
</tr>
<tr>
<td>SARS-CoV-2 infection</td>
<td>4,098 4.24</td>
<td>717 17.50 0.74</td>
</tr>
<tr>
<td><strong>Clostridioides difficile infection</strong></td>
<td>179 0.19</td>
<td>44 24.58 0.05</td>
</tr>
<tr>
<td>Respiratory virus infection***</td>
<td>4,441 4.59</td>
<td>663 14.93 0.69</td>
</tr>
<tr>
<td>Invasive pneumococcal disease</td>
<td>218 0.23</td>
<td>22 10.09 0.02</td>
</tr>
<tr>
<td><em>Haemophilus influenzae infection</em>*</td>
<td>24 0.02</td>
<td>6 25.00 0.01</td>
</tr>
<tr>
<td>Any site</td>
<td>10,893 11.26</td>
<td>1,938 17.79 2.00</td>
</tr>
</tbody>
</table>

Key findings:
- 11.26% of influenza infection-episodes had a bacterial, fungal or other respiratory viral infection detected in either the 28 days prior or following their influenza diagnosis.
- Majority of infections with key organisms were categorised as co-infections (62.92%).
- Most influenza persons with a preceding, co- or secondary infection with key organisms were categorised as 0 to 9 years old (25.11%).

Please see appendix 1 for pre-/co-/secondary infection definitions with Influenza
Please note persons can have multiple influenza infection-episodes, numbers here do not reflect the number of persons. Numbers reflect the first episode of pre-/co-/secondary infection.

**The baseline infection is any type of influenza (influenza A or B or both) for all bacterial/fungal/respiratory viral preceding/co-/secondary infections except for influenza B where the baseline infection is influenza A
***Respiratory virus infection includes influenza B (where the baseline infection is influenza A)

4 May 2023
Most frequent bacterial/fungal/respiratory viral infections, by timing of diagnosis, in persons with influenza in England from ISO week 27 of 2022

Key findings:
From ISO week 27 of 2022, the most frequent organisms identified were COVID-19, RSV and rhinovirus.

*The baseline infection is any type of influenza (influenza A or B or both) for all bacterial/fungal/respiratory viral preceding/co-/secondary infections except for influenza B where the baseline infection is influenza A.
Appendix 1: Pre-/co-/secondary infection definitions

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.

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

Continued overleaf
Appendix 1 continued: Pre-/co-/secondary infection definitions

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

See next slides for notes
Appendix 1 continued: Pre-/co-/secondary infection definitions

Notes
† From the first specimen date of a SARS-CoV-2/influenza infection episode.
* 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 UKHSA to account for disparities in testing throughout the 28d period after SARS-CoV-2 detection.
‡ Streptococcus species includes the following groups and species:

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