Appendix 3: Public Health Wales Surveillance of acute respiratory infections during 2021-22

Aims

The long-term aims of Public Health Wales' respiratory infection surveillance are to provide timely, robust and meaningful information for action, locally, regionally, nationally and internationally. Specifically:

- *To monitor, describe and communicate in a timely fashion the onset and duration of respiratory epidemics and seasons,* ***providing information which can be used to prompt and guide public health action***
- *To advise Welsh Government Chief Medical Officer in a timely manner to the onset of community circulation of seasonal influenza viruses*
- *To detect, analyse and communicate changes in epidemiology and virology (including at genetic sequence level) of influenza, SARS-CoV-2, Respiratory Syncytial Virus (RSV) and other significant respiratory pathogens*
- *To assess and monitor timing and severity of seasonal epidemics in historical context; to anticipate and alert to heightened activity*
- *To assess the burden of disease caused by seasonal respiratory infections, providing information to guide and evaluate interventions, including vaccination, providing useful feedback to NHS Wales and WG*
- *To provide information to estimate population immunity or susceptibility to respiratory pathogens of epidemic potential (such as influenza, SARS-CoV-2, RSV, enteroviruses and other infections of public health significance)*
- *To contribute to UK, European and global level surveillance and understanding of the epidemiology and virology of acute respiratory infections and effectiveness of control measures including vaccinations*
- *To embed surveillance systems that are resilient in the face of future pandemics*

The COVID-19 pandemic has highlighted the importance of systematic and robust surveillance of respiratory infections. SARS-CoV-2 is now one of a number of endemic causes of respiratory infections in Wales. As respiratory infections often present in similar ways, and circulate concurrently, we propose that the existing surveillance strategy for influenza-like illnesses (ILI), acute respiratory infections (ARI) and severe acute respiratory infections (SARI), should be updated to include SARS-CoV-2 and COVID-19. This will be of greater utility and efficiency than separate surveillance streams, whilst still allowing pathogen-specific analyses.

Surveillance of influenza remains a priority, even with the advent of SARS-CoV-2, as the overall burden of morbidity and mortality is comparable, with epidemics occurring on an annual basis. Without robust influenza surveillance, decisions around triggering use of antivirals for treatment and prophylaxis of flu in the community may be delayed. Timely detection to type and clade level is important in alerting to specific influenza viruses and associated impact on different settings (e.g. the impact of drifted influenza A(H3N2) clades on residential care homes) and informing future vaccine composition.

Typing and sequencing of causes of respiratory infections underpins surveillance and is required to differing levels across many respiratory pathogens. There will be resource

implications and capacity considerations of requirements for increased typing, sequencing and genomic analysis for surveillance reasons.

Where appropriate to do so for surveillance or epidemiological analysis to inform planning of public health interventions, sero-surveillance sero-epidemiology activities will be scoped. These activities may require external support and advice.

The focus of surveillance is to provide timely information for action. Reporting frequency should be determined by the need for analyses and intelligence to support public health action. Daily (weekday) reporting will only be in place where the information is needed to support urgent decisions on public health intervention. Indefinite continuation of daily in-depth reporting on COVID-19 carries a risk of making small differences in trends appear more significant than they are and may disproportionately focus attention away from other important public health issues. Weekly reporting will be the baseline for routine reporting. For some outputs, monthly or even quarterly reports can provide more meaningful and relevant messages. During periods of higher activity, where actions depend on it, more frequent reporting will be considered (e.g. bi-weekly or week-day). However, the focus will remain to provide information essential to guide health protection response and public health actions. Surveillance is a continuous activity with important quality analysis, developments and epidemiological analysis needing to be conducted between report cycles. The surveillance team also provide key field epidemiology support around clusters and outbreaks; and lead a number of epidemiological research and development activities. Time to factor these responsibilities in, between routine reporting, is essential.

Reporting will be through a mixture of methods determined through stakeholder requirements, good surveillance and epidemiological principles of transparency of *methods*. A common set of outputs to be routinely published via the PHW website will be agreed. These will be chosen based on a balance of clarity of message, public health actions prompted, confidentiality and statistical disclosure, and transparency.

Other outputs will be circulated to stakeholders based on their needs (ascertained through stakeholder survey) using a “pull” based system, whereby recipients manage their requirements for receiving reports. Distribution of reports via multiple centrally managed distribution lists will be kept to a minimum, to help ensure good information governance.

Due to the impact that COVID-19 has had, and continues to have, on the health care system and health seeking behaviours, there is a need to continue and adapt some of the temporary surveillance systems set up for SARS-CoV-2, until those that remain relevant and proportionate can be factored in to long-standing resilient surveillance systems.

Where possible surveillance activities are passive, working with NHS Wales partners to utilise routine NHS data in a timely way. A small number of surveillance activities are active in nature, requiring participating sites to collect samples and/ or provide additional data. In the longer term it may be possible to improve efficiency of active surveillance systems via electronic collection of data and rapid linkage to existing NHS Wales datasets.

Developments made over the past 18 months, particularly in the use of record linkage for surveillance of COVID-19, will benefit wider surveillance of acute respiratory infections whilst minimising the additional burden on clinicians to provide active surveillance data. Further developments in routine data linkage will help improve understanding of burden of respiratory infections in Wales. We will also explore the feasibility and usefulness of modelling approaches for acute respiratory infections, and short-term forecasting of trends during epidemics.

Use of targeted environmental surveillance of respiratory pathogens in waste-water will potentially improve sensitivity, especially in scenarios where case-based surveillance is not possible. This system, set up by academic and Welsh Government partners, it would be advantageous if this was brought into PHW surveillance for the longer term, providing opportunities for detection of other pathogens and linkage by small area geography to other datasets.

Surveillance indicators are focussed on detecting and monitoring incidence/ activity, severity and burden. We do not include data on NHS utilisation and capacity, which are collected through routine situation reports from health boards to Welsh Government.

This surveillance plan for 2021-22 include syndromic and virological surveillance indicators from a range of settings. Where possible using passive surveillance with downstream data linkage. Active approaches are also required, particularly where there is a requirement for certainty around symptoms and clinical presentation or additional 'non-diagnostic' sampling.

The following tables highlight key existing and proposed ARI surveillance indicators/ developments for the next 12 months. This list is not exhaustive, with scoping and development work continuing for new useful indicators and epidemiological analyses.

Table 4.1 Community surveillance indicators of influenza-like illness (ILI) and acute respiratory infections (ARI)

Surveillance stream	Surveillance type	Background
ONS community infection survey	Active, repeat survey	Data provided will contribute to understanding the reach of SARS-CoV-2 infections in the community, and help to assess the sensitivity and completeness of surveillance, but may not be timely enough to give early warnings.
NHS Direct/ NHS111 calls	Passive, syndromic	Traditionally the first point of contact with NHS Wales for many individuals and provides a sensitive indicator of respiratory symptom trends in the community. This surveillance is already in place.
In hours GPs consultation rates for ILI and ARI	Passive, syndromic	In 2020, GP electronic surveillance indicators established in 2009 were expanded to include influenza-like illnesses, upper respiratory tract infections, lower respiratory tract infections, exacerbations of asthma and suspected coronavirus/ COVID-19. This surveillance in already in place, although sensitivity may be reduced while those with respiratory symptoms contact TTP rather than consulting with GPs.
Sentinel GP ILI and ARI consultations	Active, syndromic and virological	Population incidence of patients diagnosed by the sentinel GP network with influenza-like illness has been an integral surveillance indicator in Wales for nearly 35 years, with linked virological sampling in place for 15 years. Symptom data, vaccination data and risk information are collected from symptomatic patients attending sentinel GPs, along with a respiratory samples provided for testing against a panel of respiratory pathogens. Information from this surveillance scheme provides the main weekly indicator of ILI in the community in Wales and important information for annual estimation of influenza VE.
Out of hours GP (OOH) electronic data	Passive, syndromic	OOH GPs provide primary care to those seeking urgent attention outside normal GP opening hours, including weekends and holidays. This surveillance is already in place, but will be updated for the 2021-22 season.
OOH GP virological surveillance	Active, syndromic and virological	Expansion of the sentinel GP surveillance scheme to include OOH GPs. Symptom data, vaccination data and risk information are collected from symptomatic patients attending participating OOH GP services, along with a respiratory sample for testing against a panel of respiratory pathogens.
TTP SARS-CoV-2 testing data, scoping testing for additional viruses and exploring symptom data from TTP	Passive, virological	Passive surveillance of SARS-CoV-2 testing data from NHS Wales labs and Lighthouse labs will continue as long as it is appropriate to do so, in line with any changes in diagnostic testing policy in the community. Scoping will be carried out to determine whether symptom data collected through TTP systems can usefully supplement existing analyses. As a short-term, temporary development the utility of testing a systematically selected sample of respiratory specimens from symptomatic patients contacting TTP against a wider panel of respiratory pathogens could also be scoped. This area of surveillance will need to be revised as policy and practice around testing of symptomatic patients in the community evolves.
Returning travellers surveillance	Passive, syndromic and virological	It is important that confirmed infections due to SARS-CoV-2 or influenza in those with a history of travel outside the UK in the 14d prior to onset of symptoms are identified and prioritised for sequencing/ genomic analysis. Currently returning traveller tests are done via a private system, but a longer-term NHS solution will be required. This area of surveillance will need to be revised if testing policy in this area changes.

Schools incident and outbreak surveillance	Passive, virological	Currently schools surveillance is based on data collected through COVID-19 TTP. In the longer term, this surveillance will move towards systematic monitoring of testing and identified infections in school-aged populations. Surveillance of reported incidents, clusters and outbreaks will be conducted with utilising data from Tarian.
Care homes incident and outbreak surveillance	Passive, syndromic and virological	Utilisation of passive data from care home testing for ARI will be scoped, with planned work to guide appropriate testing and data collection in incidents and outbreaks.
Sentinel care home ARI surveillance	Active, syndromic and virological	Longer-term surveillance of different ARI in care homes, using a representative sentinel samples, with a focus on systematic collection of symptom data and ascertainment of severe outcomes. Potential for sero-surveillance from patients in participating care homes will also be explored. Setting up this new PHW sentinel surveillance network will require external support from WG, with advice from other external organisations such as CIW and health boards.
Prison incidents and outbreak surveillance	Passive, syndromic and virological	Surveillance of reported incidents, clusters and outbreaks will be conducted with utilising data from Tarian.
Cluster and outbreak detection	Passive, virological	Algorithms will be applied routinely to pathogen testing and geographical data to identify clusters and exceedances.

Table 4.2 Surveillance of community acquired severe acute respiratory infection (SARI) and hospital in-patients

Surveillance stream	Surveillance type	Background
WAST **ambulance call-outs**	Passive, syndromic	In 2020 Public Health Wales collaborated with WAST to set up a routine feed of data from ambulance call-outs for surveillance. Trends on total numbers of ambulance call-outs and the proportion that are related to breathing difficulties is included in the weekly COVID-19 epidemiological summary and will continue to provide information on burden of respiratory infection. This area of surveillance will be further developed.
Emergence Department Data System	Passive, syndromic	The national Emergency Department Dataset (EDDS) was scoped previously during the pandemic for utility in timey surveillance of severe presentations of acute respiratory infection. The completeness and level of detail around respiratory attendance reasons were not sufficient for robust and timely surveillance. Improvements in point of

		attendance timely data capture for respiratory infections, or alternative emergency department surveillance systems, would provide useful intelligence on community acquired severe respiratory infections. Scoping of the utility of this routinely collected data for surveillance of respiratory infections will be repeated.
Coded **hospital episode statistics**	Passive, syndromic	These data are not currently timely enough for surveillance during respiratory epidemics. However, retrospective analysis of data at the end of season, with potential for linkage to other datasets, will help in identifying burden of disease and planning for future epidemics.
Severe Acute Respiratory Infection (**SARI**) surveillance	Active, syndromic and virological	Public Health Wales, working with health board colleagues, is rolling out Emergency Department (ED) surveillance for Severe Acute Respiratory Infections (SARI). This surveillance provides data on symptoms in patients with ARI severe enough to require admission to hospital, linked to multiplex respiratory panel test results. Complete participation in this surveillance is essential for accurate monitoring of the impacts of respiratory infections. Developments to include data from this surveillance in estimation of vaccine effectiveness and is being rolled out in collaboration with the European SARI Surveillance Network.
Diagnostic respiratory panel **testing in ED settings**	Passive, virological	Analysis of testing data available through LIMS/ Datastore, from respiratory samples taken in ED and assessment unit settings can provide information on trends in confirmed cases. However, LIMS does not contain systematically collected data on symptoms and data will include samples taken for pre-admission screening. This surveillance is already in place, but cannot reliably provide information on severe infections. Future development of symptom status fields in the LIMS electronic test request form may usefully supplement this dataset, particularly at times of high levels of pre-admission screening in asymptomatic patients.
Hospital admissions following a positive test result for SARS-CoV-2, influenza or RSV	Passive, virological	In 2020, PHW Healthcare Associated Infection, Antimicrobial Resistance & Prescribing Programme (HARP) set in place a systematic surveillance of patients admitted to hospital following a positive SARS-CoV-2 or testing positive on admission. Developments are underway to expand this to include influenza and RSV. This surveillance utilises admission history data from ICNet. Although it cannot reliably distinguish between admission due to infection and admission in a patient with infection, it is useful in monitoring trends in confirmed case admissions.
Hospital inpatients with confirmed SARS-CoV-2, influenza or RSV	Passive, virological	By expanding developments made for surveillance of weekly numbers of inpatients in Wales with COVID-19, ICNet data can be used to provide equivalent indicators for influenza and RSV (with potential further expansion to other pathogens). Inpatient cases could be community admissions due to respiratory pathogens, coincidental confirmations in patients admitted for other reasons, or the result of nosocomial transmissions. However, this is a useful indicator of respiratory infection burden in secondary care.

Table 4.3 Surveillance of severe outcomes of acute respiratory infections

Surveillance stream	Surveillance type	Background
Diagnostic respiratory panel **tests in ICU/ CC settings**	Passive, virological	Analysis of testing data available through LIMS/ Datastore, from respiratory samples taken in ICU can provide important information on trends in severe confirmed cases. This surveillance will miss patients who test positive prior to ICU

		admission and cannot distinguish between patients admitted to ICU due to infection or patients admitted where confirmed infection is coincidental.
ICU admissions following a positive test result for SARS-CoV-2, influenza or RSV	Passive, virological	This surveillance utilises data from ICNet. Although it cannot reliably distinguish between ICU admission due to infection or ICU admission in a patient with coincidental infection, it is useful in monitoring trends in ICU cases. In the longer-term this surveillance may be enhanced by linking ICNet admission data to SARI surveillance data, to monitor ICU stays in patients admitted to hospital due to severe respiratory symptoms. Potential to supplement this surveillance with data collected through the ICNARC system will be scoped.
ICU inpatients with confirmed SARS-CoV-2, influenza or RSV	Passive, virological	Surveillance of inpatients confirmed with SARS-CoV-2 is already in place (using ICNet) and will be expanded to provide equivalent indicators for influenza and RSV (with potential further expansion to other pathogens). Inpatient cases could be community admissions due to respiratory pathogens, coincidental confirmations in patients admitted for other reasons, or the result of nosocomial transmissions. However, this is a useful indicator of respiratory infection burden in ICU.
Rapid surveillance of COVID-19 deaths in hospital settings and care home settings	Active syndromic ,	This surveillance was implemented in 2020 to provide a rapid indicator of increases in COVID-19 mortality, with hospital clinicians reporting suspected COVID-19 deaths in laboratory confirmed hospitalised cases and deaths in COVID-19 cases in care homes reported to health protection teams/ closed settings cell. Down-stream data linkage to previous diagnostic virological testing and sequencing will further supplement this surveillance.
Statutory death registrations surveillance	Passive, syndromic	Public Health Wales collaborate with Digital Health Care Wales and ONS to carry out timely epidemiological analysis of deaths registered in Wales. Although not as timely as the rapid COVID-19 surveillance of deaths in hospitalised/ care home cases, these data provide a more comprehensive picture of overall burden of mortality due to respiratory infections. Down-stream data linkage to previous diagnostic virological testing and sequencing will further supplement this surveillance. Surveillance indicators focus on: 1. Deaths with any mention of specified respiratory causes in the death certificate (with analysis of part 1 vs part 2) 2. Crude monitoring of weekly all-cause mortality against the 5-year weekly average and all-cause mortality adjusted for registration delays compared to seasonally expected weekly average (EuroMoMo) 3. Monitoring of weekly numbers of COVID-19 deaths reported in care homes, hospitals, own homes or other locations
Scoping surveillance developments around the incoming medical examiner systems		Scoping is underway to identify how changes in the role of medical examiners and medical examiner reviews may improve surveillance of mortality due to infections.

Table 4.4 Environmental surveillance of respiratory viruses in waste-water

Standardised waste-water surveillance to (a) identify transmission not detected by case-based surveillance (b) estimate sensitivity and completeness of case-based surveillance	Waste-water surveillance currently carried out by a multi-organisation group including WG and academia, with input from PHW. It would be advantageous to bring aspects of this surveillance in to PHW, with support from WG and guidance from academic partners.
waste-water surveillance combined with PCR reflex assays and genomics to detect variants and estimate their relative frequencies, again to compare with case-based surveillance	

Table 4.5 Requirements for typing, sequencing and genomic analysis for surveillance of ARI

SARS-CoV-2	**Currently in discussion**
Influenza	Where possible routine testing should identify influenza viruses to type (e.g. A vs B) and sub-type level (e.g. A(H3) vs A(H1)). The ability to detect which virus types are circulating is essential to inform which settings will likely be most severely affected during the influenza season and how likely issues of vaccine mismatch are. Additional sequencing of hemagglutinin gene/ genomic analysis is required to identify viruses to clade and sub-clade level. This is important in estimating how similar circulating viruses are to those in the seasonal influenza vaccine. These data are also provided to the WHO and the international surveillance community to monitor genetic drift in influenza viruses and inform discussions for the composition of the following season's influenza vaccines. A sample selection strategy for influenza virus sequencing is in place. Priority viruses for sequence/ genomic analysis include those detected from: GP sentinel cases, SARI cases, ICU cases, fatal cases, vaccine failure cases and likely imported cases. Out of season, during the early season and at the end of the season, 100% of adequately taken samples should be eligible for sequencing. During the main part of the flu season, sample choice for sequencing should be aimed at severe cases, with a proportion of all other cases.
RSV	It is preferred for surveillance purposes that routine testing should identify viruses at type A or type B level. Routine sequencing/ genomic analysis is not carried out, but may be required to support future RSV vaccination programmes in the UK.
Enterovirus	It is preferred for surveillance purposes that routine testing should be able to differential enteroviruses from rhinoviruses where possible.

	Sequencing is carried out at routine intervals on a proportion of confirmed enteroviruses cases (mainly hospitalised cases). Targeted sequencing of enteroviruses and collation of symptom data is important in order to monitor the changing epidemiology of these viruses and to be able to detect onset of enterovirus D68 epidemics.
Seasonal Coronaviruses	It is preferred for surveillance purposes that routine testing should identify viruses at type level. For surveillance purposes, the following types are tested for: HCoV-OC43, HCoV-NL63, HCoV-229E, HCoV-HKU1
Parainfluenza	It is preferred for surveillance purposes that routine testing should identify viruses at type level (types 1 to 4)
Other causes of acute respiratory infection	There are additional typing requirements for a number of bacterial respiratory infections, and differentiation of vaccine or non-vaccine serotypes. Arrangements are in place to encourage clinicians to provide relevant specimens and culture to the appropriate UK reference facilities. Monitoring of strain types for invasive pneumococcal disease and a selection of other invasive bacterial respiratory infections is currently undertaken by PHE/UKHSA. In the longer-term and Wales should develop the capacity for enhanced surveillance, at strain level for respiratory bacterial infections of public health significance.

Table 4.6 Surveillance of COVID-19 and influenza vaccinations

Routine surveillance of the COVID-19 vaccination and booster programme	Routine surveillance of the COVID-19 vaccination and booster vaccination programme will be maintained. However continuation of daily reporting risks making small, daily fluctuations appear more significant than they are. Surveillance indicators should focus on trends in coverage in the population at risk updated on a weekly basis, rather than daily numbers of vaccinations given. Important data required by WG for vaccination stock can be provided to WG stakeholders on a week-day basis.
Enhanced surveillance of the COVID-19 vaccination and booster programme	Enhanced surveillances in place on COVID-19 vaccination coverage equality will be maintained and updated to factor in the booster dose (monthly publication). Surveillance of COVID-19 vaccination effectiveness via the population data-linkage cohort developed in partnership with SAIL will continue and be updated to include analysis of booster dose effectiveness (mid/ end season publication). Enhanced surveillance of COVID-19 in vaccinated individuals will continue (weekly/ fortnightly update to stakeholders). Addition, more frequent estimation of VE through SARI surveillance data will be scoped.
Routine surveillance of the 2021-22 influenza vaccination programme	Routine surveillance of influenza vaccination will function as in previous years with weekly updates of coverage in eligible groups throughout the season.
Enhanced surveillance of the 2021-22 influenza vaccination programme	Scoping work will be carried out on potential transfer of methods developed to monitor COVID-19 vaccine equality/ effectiveness to influenza vaccination analysis. Routine surveillance of influenza vaccination effectiveness via primary care/ SARI test-negative case control method will continue as it has done in previous season (mid/ end of season outputs)
Further detail to be added	

Table 4.8 Surveillance of population susceptibility

Serosurveillance of SARS-CoV-2 antibodies in blood donors	Information tbc
Sero survey of SARS-CoV-2 antibodies in residual blood samples from pregnant women	Information tbc
Collaborative sero surveys with WHO Worldwide Influenza Centre	Information tbc