
Subject: Seasonal Influenza-like Illness and Vaccinations Statistics 2022-2023
Date of report: 7 September 2023

Introduction

This report summarises influenza statistics over the 2022-2023 winter period, including

- A) Influenza illness activity (number of patients with confirmed flu, and number of resident patients presenting to their GP with flu-like illness)
- B) annual uptake of the seasonal influenza vaccination

Clinicians can use the numbers presenting with 'flu-like' symptoms, alongside cases of influenza confirmed amongst patients to assess the extent of influenza on the Island.

The report also shows to what extent the previous year's flu vaccines were delivered in advance of the winter flu season.

Also presented are data regarding deaths from influenza and pneumonia for the period 2015-2022.

Summary

In 2022-2023:

- Jersey experienced a period of influenza activity that was relatively early within the typical seasonal range, this pattern was similarly observed across the UK¹
- registered flu-like illness peaked around the new year period (early January 2023), and a rise in confirmed influenza was also registered for the same period
- Jersey succeeded in delivering influenza (flu) vaccinations to over 39,000 individuals
- the proportion of patients aged 65 years and over who were vaccinated was 80%. It was the second year in a row that the World Health Organization (WHO) vaccine uptake ambition of 75% had been met in this group; but uptake was slightly lower in 2022-2023 than in the previous season (84%)
- the proportion of pre-school children aged 2-4 years who were vaccinated in Nurseries or at GP surgeries (52%) was slightly lower than in the previous season 2021-2022 (57%)
- vaccine uptake in the school-aged children programme (4-16 years) was 60%, lower when compared to the previous seasons programme (66%)
- a little under half of individuals aged 50-64 years (47%) were vaccinated

¹ [Surveillance of influenza and other seasonal respiratory viruses in the UK, winter 2022 to 2023 - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/news/surveillance-of-influenza-and-other-seasonal-respiratory-viruses-in-the-uk-winter-2022-to-2023)

Background

Flu is caused by the influenza virus, and for some groups of people can be serious (e.g., they can develop a serious complication such as pneumonia). However, there are other viruses (i.e., not the influenza virus) that can cause similar symptoms. These other 'flu-like' viruses are often mistaken for influenza and could be referred to as "the flu" but are in fact a different illness. The only way to confirm that a 'flu-like' illness is caused by the influenza virus is to conduct a laboratory test, which in many cases is not necessary.

It is important to note that interpretation of influenza surveillance data over the last few years should consider the impact of the COVID-19 pandemic; data reported from the various influenza surveillance systems was affected by changing social and behavioural factors during the pandemic, as well as in testing regimes. The data presented should only be used as a guide, especially when compared to earlier influenza seasons.

What is the data telling us?

The 2022-2023 season saw influenza activity that was more similar to typical pre-pandemic years, after two seasons of less severe influenza activity during the height of the COVID-19 pandemic period (the 2020-2021 and 2021-2022 seasons). Influenza activity in 2022-2023 saw an early autumn peak, which was unusual, before a larger mid-winter peak.

The Government of Jersey works each year to increase the number of people who receive a flu vaccine and to eliminate barriers to vaccination. The 2022-2023 season's immunisation programme saw the WHO coverage target for those aged 65 and over exceeded in Jersey, but there were slight decreases in coverage noted compared to the 2021-2022 season across all age groups.

'Flu-like' illness

The number of resident patients presenting to their GP with 'flu-like' illness is taken from the Primary Care database (EMIS). These people are not tested for influenza, so it is not known what proportion of them have actual influenza, and what proportion have a 'flu-like' illness. Also note that not everyone with 'flu-like' illness will attend their GP.

Numbers of 'flu-like' illnesses presenting to GPs in last 6 flu seasons

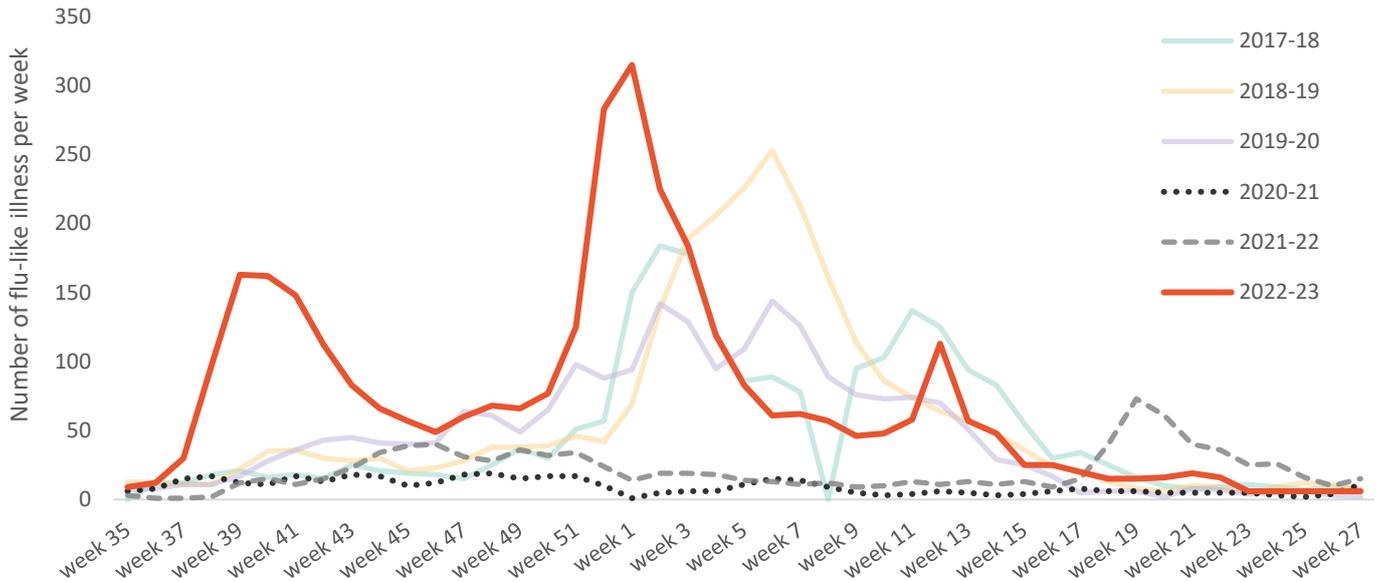
Figure 1 shows the numbers recorded per week as presenting to their GP with 'flu-like' symptoms over each flu season between the 2017-2018 winter and the 2022-2023 winter. The individual flu-season profiles vary, in terms of the peak number of cases seen, the timing of the increase and decrease in the number of cases, and shape of profile.

- the 2022-2023 season saw a resurgence of influenza virus activity, reaching levels similar to those before the COVID-19 pandemic
- Jersey experienced a period of influenza activity in the autumn; relatively early within the typical seasonal range. This pattern was similarly observed across the UK²
- notably, the 2022-2023 season had an earlier onset and reached a mid-winter peak earlier compared to preceding seasons (Figure 1); this pattern aligns with the experience in EU/EEA countries³

² [Surveillance of influenza and other seasonal respiratory viruses in the UK, winter 2022 to 2023 - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/news/surveillance-of-influenza-and-other-seasonal-respiratory-viruses-in-the-uk-winter-2022-to-2023)

³ [Seasonal influenza - Annual Epidemiological Report for 2022/2023 \(europa.eu\)](https://ecdc.europa.eu/en/seasonal-influenza-annual-epidemiological-report-for-2022-2023)

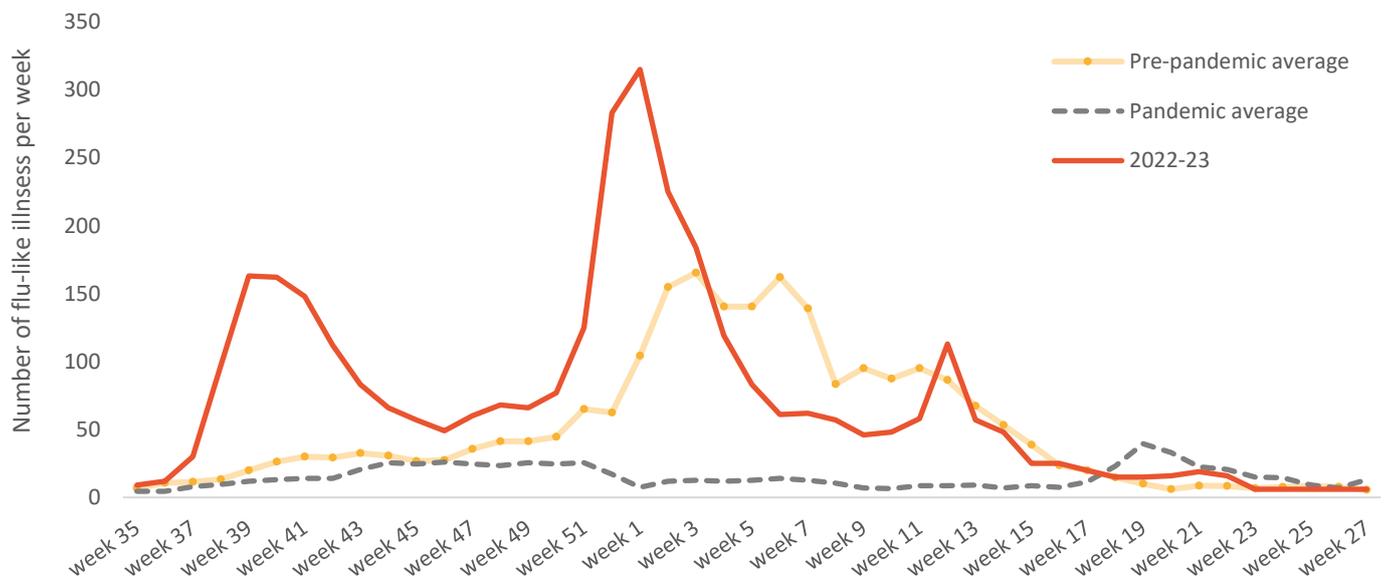
Figure 1: 'Flu-like' illness profiles from 2017-18 to 2022-23, by week



Data from these individual seasons can be combined to produce an 'average' (calculated as a mean average) profile (see Figure 2). The average profile tends to be smoothed out, with the shape reflecting the earliest increase and latest decrease from each of the individual profiles while flattening the maximum, or peak, number of cases.

As flu was unusually low in the 2020-2021 and 2021-2022⁴ winters, an average of the three years prior to the onset of the COVID-19 pandemic ("Pre-pandemic") is shown in yellow in Figure 2, to show the typical seasonal pattern of flu. The most recent year (2022-2023 winter) is shown in red; comparing this line with the pre-pandemic average demonstrates the unusually early flu-like illness patterns in the most recent season.

Figure 2: 'Flu-like' illness profiles: Pre-pandemic average (2017-2018, 2018-2019, 2019-2020), Pandemic average (2020-2021, 2021-2022) and 2022-2023



⁴ [Surveillance of influenza and other seasonal respiratory viruses in winter 2021 to 2022 - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/statistics/surveillance-of-influenza-and-other-seasonal-respiratory-viruses-in-winter-2021-to-2022)

Patients with confirmed influenza

Circulating influenza is declared by the Hospital's Consultant Microbiologist based on the influenza situation in the UK and Europe, as well as the local laboratory tests. Hospital patients are tested for the influenza virus according to a schedule devised by the Hospital's Consultant Microbiologist. Typically in years prior to the COVID-19 pandemic, during the 'surveillance' stage of flu-season (i.e., before the declaration of circulating influenza has been made), hospital patients (whether admitted or not) are tested for influenza if they display 'flu-like' symptoms or are in another 'at risk' group. Once circulating influenza has been declared, only admitted patients are considered for testing (based on the same symptom or risk criteria).

The onset of the COVID-19 pandemic has affected influenza testing protocols, due to the need to clinically distinguish between the different respiratory illnesses, and ensure patients get treated appropriately. In the 2022-2023 season, combined testing (to distinguish between different respiratory illnesses including influenza and COVID-19) was used throughout the season. This resulted in a higher number of confirmed flu cases being detected in the 2022-2023 season, as there were patients tested for flu who may not have received a diagnostic test in previous years, as their symptoms alone would have been sufficient for diagnosis.

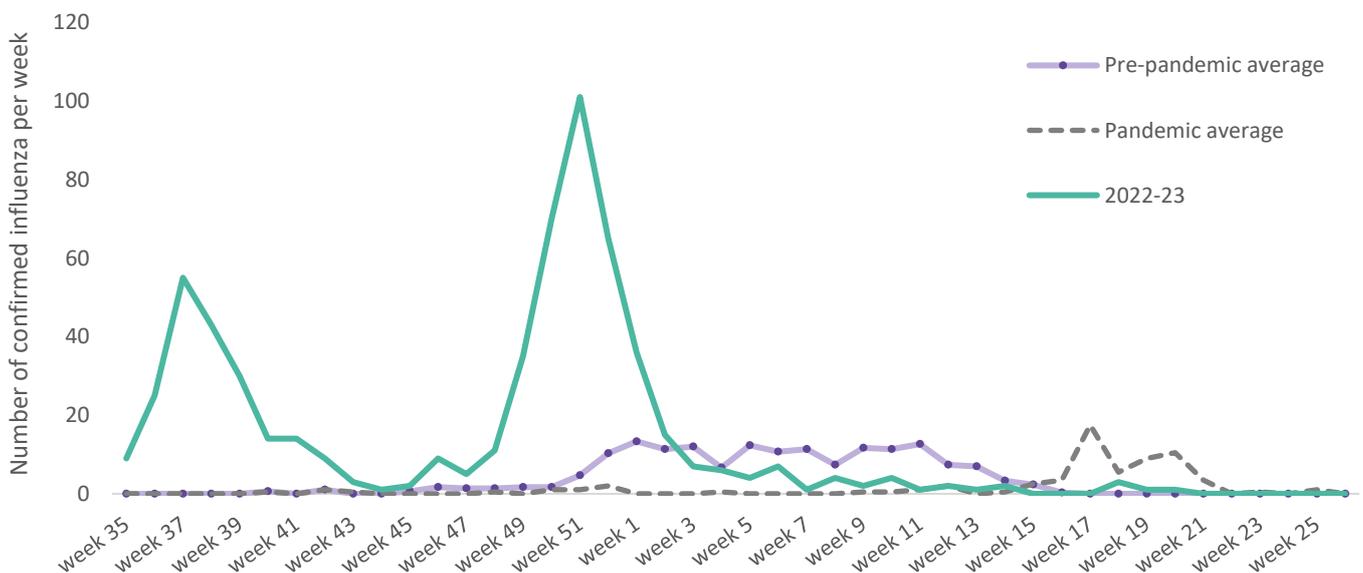
Numbers of patients with confirmed influenza over the 2022-2023 season

Similar to flu-like illness, confirmed influenza was unusually low during the COVID-19 pandemic (Figure 3), but the 2022-2023 winter saw a return of waves of confirmed flu. An average of the three years prior to the onset of the COVID-19 pandemic ("Pre-pandemic") is shown in purple in Figure 3, to show the typical seasonal pattern of confirmed influenza, whilst the peak COVID-19 pandemic years (2020-2021 and 2021-2022) are shown as a grey dotted line. The most recent season (2022-2023) is shown in green.

There was an average of 166 confirmed cases per season between week 35 and week 17 in pre-pandemic years (2017-2018 to 2019-2020). This compares to 593 laboratory-confirmed cases reported during a similar period in 2022-2023. The change in testing protocol necessitated by the arrival of COVID-19 accounts for the higher peaks in confirmed influenza numbers in the 2022-2023 season when compared to pre-pandemic seasons (Figure 3). It is likely that in future seasons, combined testing will continue to be used, due to the ongoing need to clinically distinguish between respiratory illnesses throughout the season.

In the 2022-2023 season, 96% of the notifications of laboratory-confirmed influenza reported were Influenza A.

Figure 3: Confirmed influenza average profiles: Pre-pandemic average (2017-18, 2018-19, 2019-20), Pandemic average (2020-21, 2021-22) and 2022-2023



Combined profiles of 'Flu-like' illness and patients with confirmed influenza

Combining the charts of average 'flu-like' illness and average number of patients with confirmed influenza (see Figure 4) shows their relationship over a flu season. Figure 4 shows the pattern of flu-like illness and confirmed influenza in the three years prior to the COVID-19 pandemic, and in the 2022-23 season.

Figure 4: Pre-pandemic average 'flu-like' illness and average patients with confirmed influenza profiles for pre-pandemic years (2017-18, 2018-19, 2019-20) and 2022-23

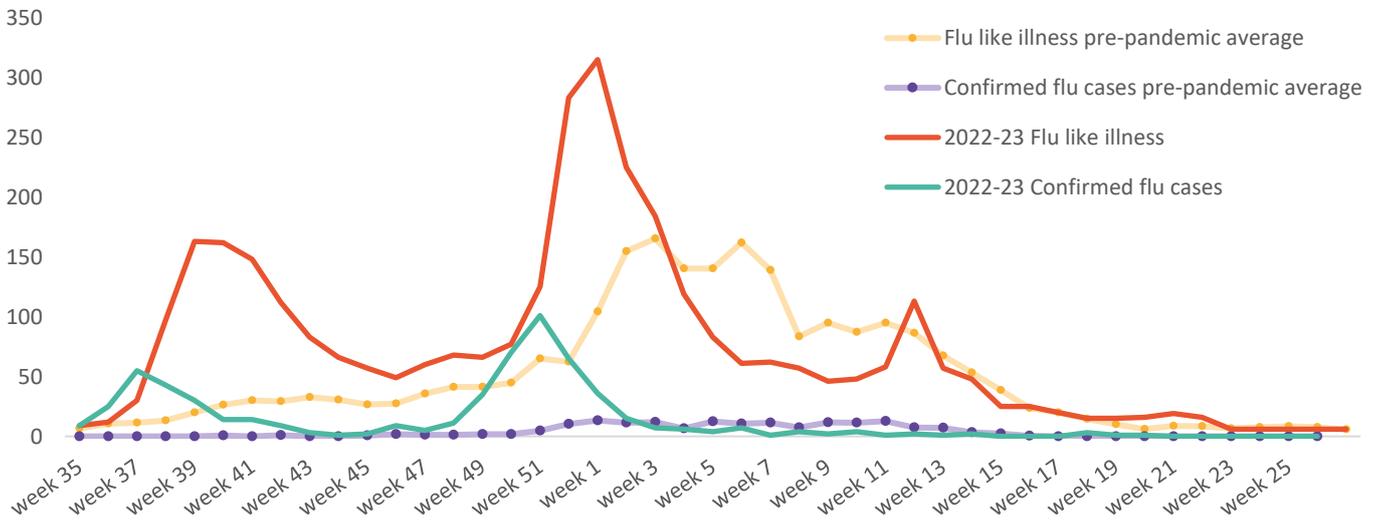


Figure 4 demonstrates that cases of influenza confirmed by the pathology lab at Jersey General Hospital started to rise as in week 35 of 2022 (end of August 2022), and that this onset is early compared to typical pre-pandemic winter seasons.

Non-pharmaceutical interventions put in place during the COVID-19 outbreak (such as wearing masks and social distancing, for example) had largely been removed by summer 2022. The removal of such measures (which were designed to inhibit the spread of respiratory viruses) may have played a contributory part in the autumn upsurge, a similar pattern was also seen in England⁵.

The beginning of January 2023 showed the highest peak in flu-like illness registrations compared to data from the previous 5 winter seasons. A rise in confirmed influenza was also registered for the same period. See page 11 for details of deaths from influenza and pneumonia for the period.

⁵ [Weekly national influenza and COVID-19 surveillance report Week 42](#)

Influenza vaccination

Annual vaccination is the best protection against the flu. The most common strains of the virus that cause influenza change every year, and the vaccine also changes every year to match these strains. A seasonal flu vaccine plan is coordinated every year in Jersey to prevent flu amongst those who are at a higher risk of flu-associated illness and mortality.

Flu vaccination programme

The programme provides direct protection to those at higher risk of flu associated morbidity and mortality, including older people, pregnant women, and those in clinical risk groups. The Jersey programme is guided by advice from the Joint Committee on Vaccination and Immunisation (JCVI)⁶.

During the 2022-2023 flu seasons, an expanded offer was continued which enabled all those aged 50 to 64 years to receive the flu vaccine as part of the funded programme (flu vaccine offered free of charge).

The below groups were eligible for a flu vaccine from September 2022:

- infants 6 months to 2 years of age in a clinical risk group⁷
- pre-school children aged 2, 3 and 4 years
- school-aged children reception up to year 11
- at-risk 16- to 49-year-olds
- people aged 50 to 64, and those over 65
- pregnant women
- households of those on the shielded patient list or of immunocompromised individuals
- home carers
- care home and domiciliary staff
- frontline health and community services staff

Additionally, there was an offer for the flu and COVID-19 autumn booster vaccines to be administered together, to those who were eligible, by Jersey's vaccination team at the vaccination centre at Fort Regent. Mobile vaccination units were also used for visits to care homes and private houses to improve the vaccination rate for older Islanders.

- during the Winter Vaccination Programme, Jersey succeeded in delivering influenza (flu) vaccinations to over 39,000 individuals.

Key to the vaccination programme being successful is having a high proportion of the targeted populations vaccinated before influenza starts circulating. The vaccine takes approximately **two weeks** to become fully effective after being administered. Therefore, to achieve the best protection for the at-risk population, most of those eligible for flu vaccination should be vaccinated at least two weeks prior to the expected onset of influenza (i.e. by week 48 as onset is typically December onwards, Figure 1).

Figure 5 shows the actual vaccination profiles over flu season 2022-2023 compared to the 2022-23 'flu-like' illness and 2022-23 confirmed influenza profiles. The unusually early onset of Flu in Autumn 2022 meant that some people had not yet been vaccinated when the virus began circulating.

⁶ [Joint Committee on Vaccination and Immunisation - GOV.UK \(www.gov.uk\)](https://www.gov.uk)

⁷ *At-risk group – includes patients with a long-term medical condition including chronic respiratory disease or asthma; chronic heart disease; chronic kidney disease; chronic liver disease; chronic neurological disease; diabetes type 1 or type 2; a suppressed immune system; asplenia or spleen dysfunction or a BMI of more than 40.*

Figure 5: Percentage of target groups vaccinated with profiles (2022-23) ‘flu-like’ illness and influenza profiles plotted for context

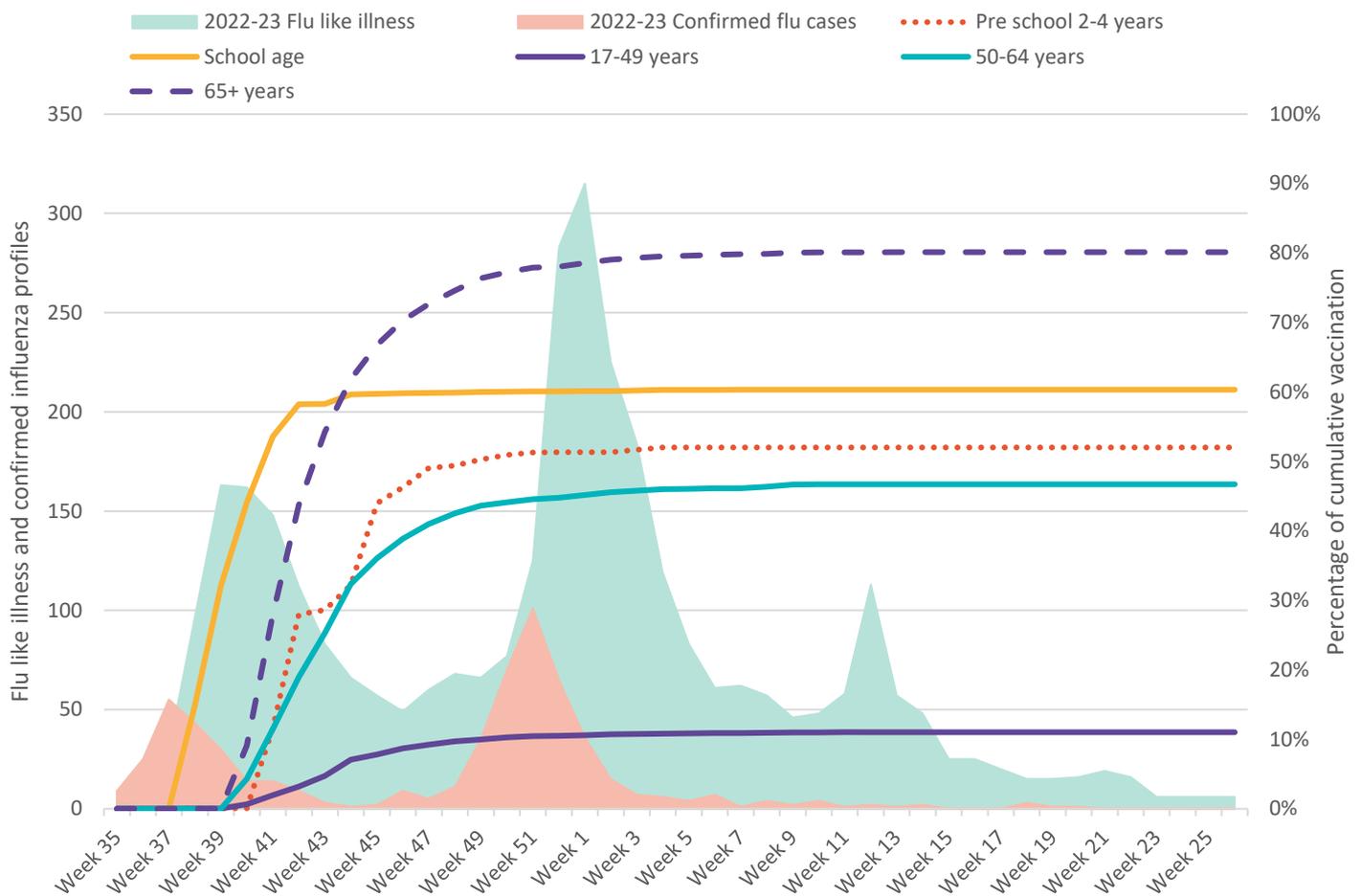


Table 1: Percentage of priority groups given the influenza vaccine by the end of the 2022-2023 flu season, by week 48, and percentage of the total number of those vaccinated that were vaccinated by week 48 (i.e. % of vaccinations that were administered at least two weeks before the expected arrival of flu season)

Age Group	% of group vaccinated by end of flu season	% of group vaccinated by week 48	Of those vaccinated by the end of flu season, % vaccinated by week 48
children aged 2, 3 and 4 years*	52	49	95
child-aged children aged 4 to 16 years*	60	60	99
people aged 17-49-years-old^	11	10	88
people aged 50-64-year-old^	47	43	91
people aged 65 and over^	80	75	93

* Denominator from 2022 Education Census

^Denominator estimated from 2021 Jersey Census

The ambition for flu vaccine coverage is to reach or exceed 75% uptake for people aged 65 years and over, as recommended by the World Health Organization (WHO). Public Health England suggested that flu vaccination coverage in the season achieve a minimum 75% uptake across all eligible groups.

Although all countries of the UK use standardised specifications to extract uptake data from IT information systems in primary care, there are some differences in extraction specifications, so comparisons between Jersey and the four constituent countries of the United Kingdom should be made cautiously.

Flu vaccine for pre-school children aged 2, 3 and 4 years⁸

Pre-school children are offered vaccination to help protect them and to reduce flu transmission in the community to other vulnerable groups. The vaccine programme for 2022-2023 was the sixth year of the nursery-based immunisation programme, where GPs and Practice Nurses went into nurseries to offer the nasal flu vaccine. The vaccine was also available to children of this age-group through GP surgeries.

- The number of vaccines given to pre-school aged children in 2022-2023 (960) was lower than the previous season (1,100)⁹
- Table 2 shows a decline in flu vaccination rates among pre-schoolers for the years 2020-2021 (69%), 2021-2022 (57%), and 2022-2023 (53%); this group's vaccination rates continue to lag behind those of school-aged children
- in England, 44% of children aged 2-3 years received a flu vaccination during the 2022-2023 winter season

Table 2. Percentage of pre-school 2-4-year-olds vaccinated in Nursery Programme or in GP surgery against influenza; over the last 7 winter periods.

	2016-17 winter %	2017-18 winter %	2018-19 winter %	2019-20 winter %	2020-21 winter %	2021-22 winter %	2022-23 winter %
% of children aged 2-4 years vaccinated in nursery	-	41	39	47	55	48	43
% of children aged 2-4 years vaccinated in GP surgery	34	16	18	17	12	10	9
% of children aged 2-4 years vaccinated in other healthcare setting	-	-	-	-	3	-	-
Total % uptake for children aged 2-4 years	34	58	58	64	69	57	52

Please note that percentages have been rounded to nearest integer.

Flu vaccine for compulsory school-aged children (Reception to Year 11)

The children's nasal flu vaccination programme was introduced in 2014-2015 with children in Reception classes (aged 4 to 5 years) being offered the vaccine via a compulsory school-based programme. The programme had been extended each year, and since 2018-2019 the nasal flu vaccine has been offered to all compulsory school-aged children (Reception to Year 11 inclusive). A breakdown of the children immunised at school against flu, by year group, is given in Table 3.

⁸ Pre-school children (2-, 3- and 4-year-olds) whose date of birth was between 01/09/2018 and 31/08/2020.

⁹ Numbers rounded to nearest 100.

Around 7,520 compulsory school-aged children had the flu vaccine in the 2022-2023 winter:

- 7,450 influenza vaccines were given in primary and secondary schools, whilst 70 were given at GP surgeries
- the number of vaccines given to school-aged children in 2022-2023 (7,520) was lower than the previous season (8,350)
- uptake for school-aged pupils fell in 2022-23 compared to 2021-2022; a lower proportion of those children who were eligible were vaccinated (60%) when compared to the previous year's programme (66%)
- in England 56%, of all school aged children (4-16 years) were vaccinated in 2022-2023¹⁰

Table 3. Percentage of school-aged children receiving flu vaccination in school by year group¹¹

	2015-16 winter %	2016-17 winter %	2017-18 winter %	2018-19 winter %	2019-20 winter %	2020-21 winter %	2021-22 winter %	2022-23 winter %
Reception	61	59	62	66	66	78	76	69
Year 1	58	57	60	63	66	73	75	63
Year 2	53	62	59	60	64	77	69	73
Year 3	-	54	60	61	62	71	73	60
Year 4	-	-	56	62	62	71	69	64
Year 5	-	-	56	57	61	70	71	55
Year 6	-	-	55	57	57	72	69	66
Year 7	-	-	-	55	54	63	62	58
Year 8	-	-	-	51	53	62	57	56
Year 9	-	-	-	48	50	58	59	48
Year 10	-	-	-	52	49	63	59	57
Year 11	-	-	-	57	49	56	54	48

Flu vaccine for adults

- around 1,300 influenza vaccines were given to individuals aged 16-49 years who identified that their primary reason for a flu vaccination being because they had certain chronic health conditions (e.g., a long-term heart condition, diabetes)¹²

¹⁰ [Seasonal flu vaccine uptake in children \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

¹¹ Table does not include the children immunised at GP practices, or home-schooled children.

¹² The accuracy of the data relies primarily on the reliability of the data sources. As individuals are eligible by age group etc, they may not identify the primary reason for vaccination as being due to a certain clinical condition. The numbers are therefore an underestimate.

- around 240 influenza vaccines were given to pregnant women¹³ from 1 September 2022 to 31 July 2023, this was a lower number than the previous six winter seasons (see Table 4)

Table 4. Number of patients in the pregnant women category who were immunised at Vaccination centre, GP surgeries and pharmacies against influenza; over the last 7 winter periods.

	2016-17 winter	2017-18 winter	2018-19 winter	2019-20 winter	2020-21 winter	2021-22 winter	2022-23 winter
Pregnant women	410	550	500	510	550	340	240

In 2022-2023:

- four in five (80%) of patients aged 65 and over received a seasonal flu vaccination in Jersey; the World Health Organisation (WHO) uptake recommendation was that vaccine uptake for people aged 65 years and over should reach or exceed 75%¹⁴
- the uptake ambition for Public Health England (PHE) for those aged 65 and over was 85%¹⁵; in the past season England saw a vaccine uptake of 80% in those aged 65 and over, Scotland (86%), Northern Ireland (83%) and Wales (76%)¹⁶
- uptake in Jersey for 50- to 64-year-olds was 47%, a decrease on 2021-2022 (51%) and below the Public Health England (PHE) uptake ambition of 75%¹⁷
- uptake in England¹⁸ for 50- to 64-year-olds was 41%¹⁹

Table 5. Percentage of Census population aged 50-64 years and 65 and over who were immunised at the Vaccination Centre, GP surgeries and pharmacies against flu; over the last 7 winter periods.

	2016-17 winter %	2017-18 winter %	2018-19 winter %	2019-20 winter %	2020-21 winter %	2021-22 winter %	2022-23 winter %
Adults aged 50-64 years	-	-	-	-	45	51	47
Adults aged 65 and over	55	63	60	55	78	84	80

¹³ Pregnant women are not obliged to disclose their pregnancy at time of vaccination

¹⁴ [WHO/Europe | Influenza vaccination coverage and effectiveness World Health Organisation Europe](#)

¹⁵ [National flu immunisation programme 2022 to 2023 letter - GOV.UK](#)

¹⁶ [Surveillance of influenza and other seasonal respiratory viruses in the UK, winter 2022 to 2023 - GOV.UK \(www.gov.uk\)](#)

¹⁷ [National flu immunisation programme 2022 to 2023 letter - GOV.UK](#)

¹⁸ English data not comparable between seasons as this group became eligible on 15 October 2022 compared with 1 September 2021 the previous season.

¹⁹ [Seasonal influenza vaccine uptake in GP patients: winter season 2022 to 2023 \(publishing.service.gov.uk\)](#)

Influenza and pneumonia deaths

It is possible to provide an estimate of deaths due to influenza by reporting on the underlying cause of death (see Notes section for details). The underlying cause of death is defined by the WHO as "the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury"²⁰.

The number of deaths for Jersey with an underlying cause of Influenza and Pneumonia (ICD-10 code J09-J18) which is used as a proxy for flu deaths, for the most recent calendar years (2015-2022) where data is available are shown in Table 6.

In 2022, there were around 30 deaths due to Influenza and Pneumonia, similar to the numbers seen in some previous years such as 2015, 2016 and 2017.

Table 6: Annual Influenza and Pneumonia deaths *(ICD-10 code J09-J18, 2015-2022)

<i>Year</i>	<i>Number, rounded to nearest 5</i>
2015	30
2016	30
2017	30
2018	20
2019	20
2020	15
2021	25
2022	30

* Counts are rounded to the nearest multiple of 5

Please note that it still may not be possible to know exactly how many people die from seasonal flu each year, as Influenza may not always be listed on death certificates of people who die from flu-related complications. There are several reasons for this:

- serious complications can be triggered by flu; flu can make chronic medical problems worse
- many flu-related deaths can also occur one or two weeks after a person's initial infection, either because the person may develop a secondary bacterial co-infection or because influenza can aggravate an existing chronic illness
- most people who die from flu-related complications are not tested for flu or may not have sought medical care until later in their illness when influenza can no longer be detected from respiratory samples

²⁰ WHO Medical Certification Cause of Death - [Medical certification of cause of death: instructions for physicians on use of international form of medical certificate of cause of death \(who.int\)](https://www.who.int/publications/m/item/medical-certification-of-cause-of-death-instructions-for-physicians-on-use-of-international-form-of-medical-certificate-of-cause-of-death)

Notes

Flu Vaccination Programme

Data Sources

- The vaccination data for this report are derived from GP Central Server (EMIS) and the Community Pharmacy server (PharmOutcomes)
- uptake in each of the priority groups were calculated using denominators (total in group) from the following sources:
 - percentage uptake in pre-school aged children, and compulsory school aged children: Data from Health and Community Services, Child Health system (CarePlus), and Children, Young People, Education and Skills (CYPES) School audit 2022
 - percentage uptake in adults aged 17 and over: Data from Statistics Jersey census results²¹

Data quality and completeness

The data quality and completeness of data extracted from the GP central server cannot be assured, however where variation between GP practices is identified, this is fed back to individual surgeries for further checks. Figures pulled are also compared to previous year figures to see where large changes have occurred, these can then be further investigated.

There are limitations to the data reported for vaccinations of pregnant women in this report. The completeness of the data depends on the recording of pregnancy as the main reason for vaccination, which may not necessarily happen for all pregnant women receiving a vaccine.

This report has important limitations related to vaccine data for individuals at clinical risk (see list below). The completeness of the data depends on the recording of the risk situation that vaccinators consider as the main reason for vaccination, for example, some of those who may be eligible due to certain health conditions may also be eligible as they are an employee (e.g., health worker) or if aged between 50 and 64 years of age. Therefore, coverage of the clinically at risk group is an estimate only.

The following provides a summary of the groups eligible for flu vaccination in 2022-2023 including individuals (children and adults) with a long-term health condition:

- Chronic respiratory disease such as asthma requiring regular inhaled steroids, or chronic obstructive pulmonary disease (COPD)
- Chronic heart disease
- Chronic kidney disease at stage 3, 4 or 5
- Chronic liver disease
- Chronic neurological disease such as Parkinson's disease, motor neurone disease
- Learning disability
- Severe mental illness
- Diabetes
- Epilepsy
- Immunosuppression due to disease such as HIV/AIDS or treatment such as cancer treatment (and household contacts of at-risk individuals)
- Asplenia or dysfunction of the spleen

²¹ [2021 census results \(gov.je\)](https://www.gov.je/2021-census-results)

- Morbidly obese (class III obesity). This is defined as those with a Body Mass Index (BMI) of 40 or above, aged 16 or over.

Influenza and Pneumonia deaths

- the registration of deaths occurring in Jersey is carried out by the office of the Superintendent Registrar
- Information collected at death registration is recorded on the Registration Online (RON) system by registrars
- cause of death data comes from the information collected at death registration. All the conditions mentioned on the death certificate are coded using the International Classification of Diseases, Tenth Revision (ICD-10). From all of these causes an underlying cause of death is selected using ICD-10 coding rules. The underlying cause of death is defined by WHO as:
 - a) the disease or injury that initiated the train of events directly leading to death, or
 - b) the circumstances of the accident or violence that produced the fatal injury
- in the ICD-10 revision, Influenza is coded J09-J11; Pneumonia is coded J12-J18