

REPORT

2021

NORWAY:

Influenza Virological and Epidemiological
season report prepared for the WHO
Consultation on the Composition of
Influenza Virus Vaccines for the
Southern Hemisphere 2022

September 2021

NORWAY:

Norwegian Institute of Public Health

Influenza Virological and Epidemiological season report
prepared for the WHO Consultation on the Composition of
Influenza Virus Vaccines for the Southern Hemisphere 2022,

September 2021

Division of Infection Control

Department of Virology;

Section for Influenza and other respiratory viruses

And

Department of Infection Control and Vaccines

Section for Respiratory, Blood-borne and Sexually transmitted infections

Published by Norwegian Institute of Public Health
Division of Infection Control and Environmental Health
Department of Virology | Section for Influenza and other respiratory viruses
Department of Infection Control and Vaccines | Section for Respiratory, Blood-borne and Sexually transmitted infections

October 2021

Title:

Influenza Virological and Epidemiological season report prepared for the WHO Consultation on the Composition of Influenza Virus Vaccines for the Southern Hemisphere 2022

Authors:

Karoline Bragstad
Trine Hessevik Paulsen
Ragnhild Tønnessen
Birgitte Klüwer
Kjersti Rydland
Torstein Aune
Olav Hungnes

Ordering:

The report can be downloaded as pdf at www.fhi.no/en/publ/

Graphic design template:

Per Kristian Svendsen

Graphic design cover:

Fete Typer

ISBN digital 978-82-8406-246-4

Citation: Bragstad K, Paulsen TH, Tønnessen R, Klüwer B, Rydland KM, Aune T, Hungnes O. "Norway National Influenza Centre: Influenza Virological and Epidemiological season report prepared for the WHO Consultation on the Composition of Influenza Virus Vaccines for the Southern Hemisphere 2022". [Norsk influensarapport til WHO's møte om sammensetning av influensavaksinen for sørlige halvkule 2022] Report 2021. Oslo: Norwegian Institute of Public Health, 2021.

Content

Content	2
The 2020-2021 influenza season, Norway	3
Summary	3
Influensasæsonen 2020-2021 i Norge (Norwegian)	4
Hovedbudskap	4
A look back at the preceding 2019/2020 season	5
The 2020/2021 season	6
Influenza-like illness (ILI) in primary health care	6
Laboratory-confirmed hospitalised cases	8
Influenza hospitalisations based on registry data	8
Influenza patients in intensive care units	8
Excess all-cause mortality	9
Laboratory confirmed influenza: Virological surveillance	9
Genetic characterisation of the viruses in circulation	13
Antiviral susceptibility	13
Vaccine distribution and coverage	14
References	15
Acknowledgements	16
Appendices	17
Methods	17
Influenza-like illness	17
Virological surveillance.	17
Surveillance of laboratory-confirmed influenza in hospitalised patients	17
Registry-based surveillance of influenza hospitalisations	17
Influenza patients in intensive care units	17
Mortality monitoring	18
Influenza seroepidemiology	18

The 2020-2021 influenza season, Norway

Summary

- There was no influenza outbreak in Norway during 2020-2021.
- The proportion of influenza-like illness (ILI) never exceeded the epidemic threshold.
- No outbreaks of influenza in health care institutions were reported.
- The numbers of influenza hospitalisations and ICU admissions were very low.
- All-cause mortality was within expected levels or below.
- Only 20 sporadic cases of influenza were detected out of 155,198 analyses during the season. Of these, 7 were A(H3N2), 2 A(H1N1), 8 B (not genotyped) and 3 B/Victoria. No B/Yamagata lineage viruses were detected.
- The influenza A(H3N2) viruses belonged to the 3C.2a1b/159N subgroup of viruses and were characterised to be genetically similar to the antigenic different group of viruses like A/Bangladesh/100009/2020.
- The influenza B-cases belonged to the B-Victoria lineage (Δ 162-164) and the antigenic different group of viruses originating from West Africa.
- The H1N1 viruses belonged to 6B.1A/183P-7.

Influensasesongen 2020-2021 i Norge (Norwegian)

Hovedbudskap

- Influenzautbruddet i Norge uteble sesongen 2020-2021.
- Andelen influensalignende sykdom overskred aldri utbruddsterskelen.
- Det var ingen rapporterte utbrudd av influensa i helseinstitusjoner.
- Antallet sykehusinnleggelser og intensivinnleggelser med influensa var uvanlig lavt.
- Totaldødeligheten i Norge var på forventet nivå eller lavere.
- Det var høy oppslutning rundt vaksinasjonsprogrammet. Antallet distribuerte doser økte med 33 % fra sesongen 2019/20.
- Bare 20 tilfeller av influensa ble påvist i Norge i løpet av sesongen av totalt 155.196 prøver analysert. Disse var 7 A(H3N2), 2 A(H1N1), 8 influensa B ikke varianttypet og 3 B/Victoria. Ingen B/Yamagata ble påvist.
- Influenza A(H3N2) virusene tilhørte den genetiske undergruppen 3C.2a1b/159N og ligner de antigenet forskjellige A/Bangladesh/100009/2020 virus.
- Influenza B tilhørte B-Victoria linjen med trippeldelesjonen (Δ 162-164) og er vist å ligne de antigenet forskjellige influensa B-virus fra Vest Afrika.
- Influenza A(H1N1) virusene tilhørte den genetiske gruppen 6B.1A/183P-2

A look back at the preceding 2019/2020 season

The 2019/20 influenza outbreak began in week 52. It peaked in week 8, never exceeding low intensity level. In week 11 yet another ILI-peak appeared, exceeding the peak seen in week 8, with a simultaneous and unusually steep drop in influenza detections. The latter increase in ILI most probably resulted from increased health care seeking for respiratory symptoms due to the COVID-19 pandemic. The ILI-data from the last part of the season are associated with uncertainty, and bearing this in mind, the outbreak ended in week 14 and lasted for 14 weeks, two weeks longer than average.

There was no clearly predominant virus. Influenza A(H3N2) virus was the most numerous, constituting approximately 50% of detections. Second-most numerous was influenza B of the Victoria lineage, making up 28%, followed by influenza A(H1N1) (19%) and with only 4% of the B/Yamagata lineage. 226.512 respiratory samples were tested for influenza during that season. Results published in Eurosurveillance (<https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2021.26.22.2001160> ⁶⁾)

The majority of the A(H3N2) viruses belonged to the 3C.2a1b subgroup of viruses, carrying the T131K substitution in HA1 and more similar to the at the time vaccine candidate for the Southern hemisphere than the Northern. Most of the H3 viruses were in the Q197R+K207R 3C2a.1b group. The majority of the H1 viruses fell in the 6B.1A A/Norway/3433/2018 6B.1A5A subgroup of viruses. All the characterised influenza B-Victoria viruses were triple-deletion variants similar to B/Washington/02/2019. The B-Yamagata viruses characterised were all clade 3 viruses with very few amino acid differences.

In 2019/20, the levels of hospitalisations and influenza patients requiring intensive care unit (ICU) admission were lower than normal, with 3000 influenza-associated hospitalisations, and 123 ICU admissions. The number of hospitalisations was highest in week 8, followed by a large drop in the number of cases from week 11 to 12. Almost no influenza hospitalisations were reported after week 14. Influenza A and B was detected in 78% and 22% of the hospitalised cases, respectively. As in most other seasons, the admission rates were highest in the oldest (60 years and older) and youngest (0-4 years) age groups. Nevertheless, the number of hospitalised elderly and young children was lower than usual. In older children (5-14 years) the hospitalisation rate was relatively high. For influenza A, the admission rate was highest in the young children (0-4 years) and persons aged 60 or above. For influenza B, the rate was highest among children (age groups 0-4 years and 5-14 years).

With a few exceptions, all-cause mortality in the population was at an expected level during the season, and the influenza attributable mortality was estimated to be approximately 50 persons (From week 40/2019 to week 9/2020), which is very low.

The 2020/2021 season

The components of the surveillance system are briefly described in Appendices.

No report from Norway was generated for the WHO influenza vaccine consultation in February 2021, partly because there was very little to report at that time, but also due to a very high COVID-19-related workload.

Influenza-like illness (ILI) in primary health care

COVID-19 has resulted in changes in health care seeking in Norway which has led to uncertainties associated with the ILI data. Also, new diagnostic codes for confirmed and suspected COVID-19 were introduced in primary health care March 2020, probably affecting doctors' coding practice.

As the proportion of video- and telephone consultations became substantial from week 9 2020, these data were included in the ILI surveillance data from this season. They were also included in the historical dataset used for threshold making and comparisons between seasons (1).

During the 2020-21 influenza season, the proportion of influenza-like illness (ILI) never exceeded the epidemic threshold, as defined by national, present-season MEM-levels (Figure 1). The proportion of consultations with an influenza diagnosis did not exceed 0,1 %, which is very low compared to preceding seasons (Figure 2).

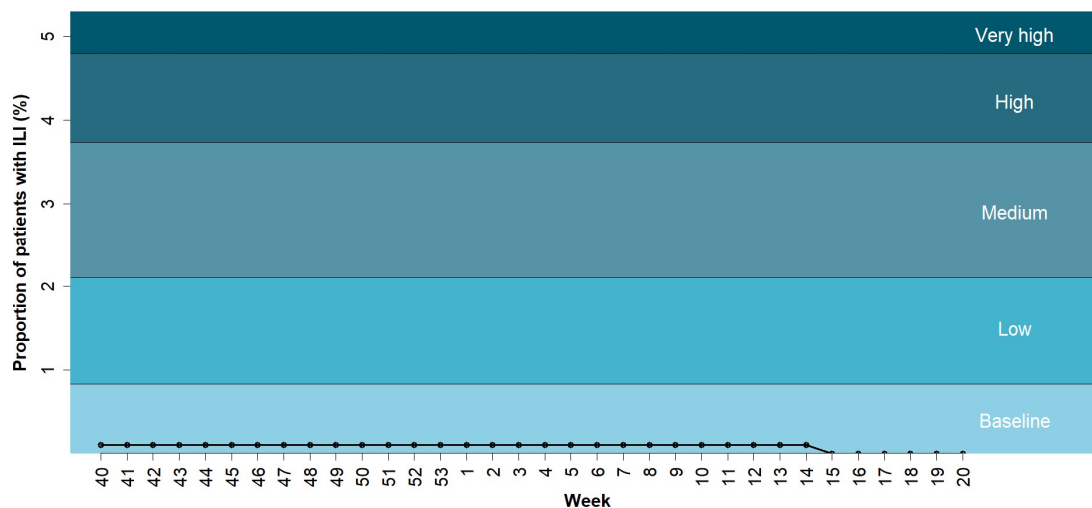


Figure 1. Level of influenza intensity by MEM-thresholds using weekly proportion of consultations in general practice and emergency clinics diagnosed with influenza, Norway 2020-2021 season. Source: Sykdomspulsen with data from SKUHR, NIPH

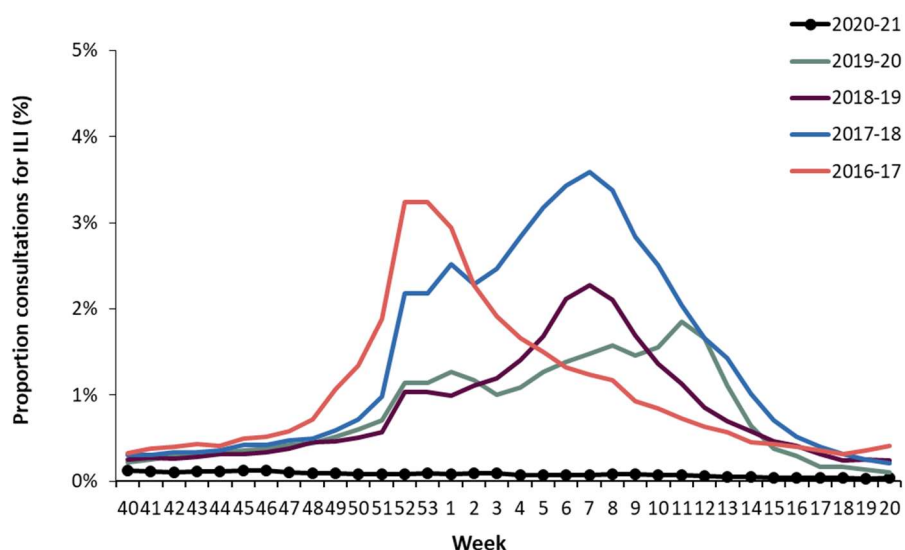


Figure 2. Weekly incidence of ILI, Norway 2020-2021 season (black dotted line). The graph shows the proportion of patients in general practice and emergency clinics diagnosed with ILI, by calendar week. The four previous seasons are also shown. Source: Sykdomspulsen with data from sKUHR, NIPH

For the 2020-21 season, 11 397 contacts and consultations for influenza-like illness were recorded (data extracted 09.08.2021). This constitutes only 9 % of the average number of contacts and consultations for influenza during an influenza season (120 515) (the average is calculated from seasons 2006-07 through 2018-19 with the pandemic season 2009-10 excluded). A large proportion (42%) of the consultations in 2020-21 were e-consultations (Figure 3).

No outbreaks of influenza in health care institutions were reported.

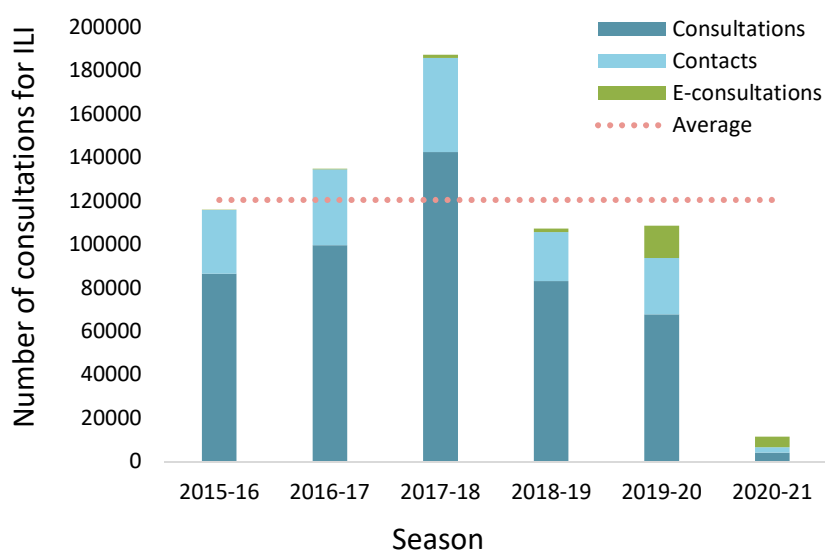


Figure 3. Number of consultations distributed for type of contact, influenza seasons 2015-16 to 2020-21, Norway. The average is calculated from seasons 2006-07 through 2018-19 with the pandemic season 2009-10 excluded. Source: Sykdomspulsen with data from sKUHR, NIPH.

Laboratory-confirmed hospitalised cases

Only three laboratory-confirmed influenza cases among hospitalised patients were reported the entire season from the nine medical microbiological laboratories that participate in the surveillance. In total, these laboratories tested 42 459 samples, of which 67% (n=28 581) were from inpatients. The total number of influenza-associated hospitalisations for the 2020/21 season in Norway was estimated to be around 4, which is extremely low, compared to an average of about 5000 hospitalisations per season in Norway estimated for seasons 2014-15 to 2018-19. The cumulative number of hospitalised patients per 100 000 population was at an unusually low level compared to the six previous seasons (Figure 4). One influenza A virus and two influenza B viruses were detected. All three viruses were detected early in the season between week 44 and 47. The influenza B virus was detected in the age group 0-4 years, whereas the remaining two viruses were detected in the age group 25-59 years.

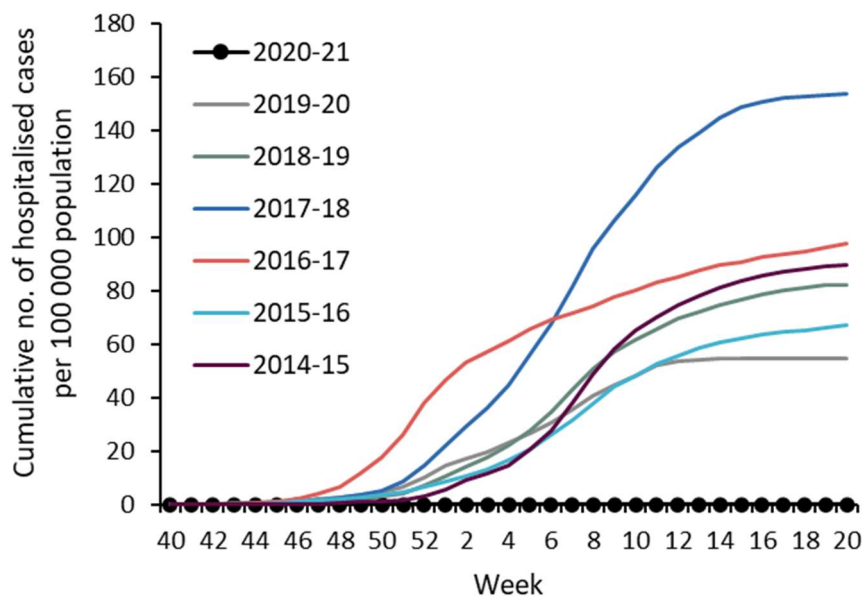


Figure 4. Estimated cumulative incidence of hospitalised patients with confirmed influenza per week season 2020-21 in Norway compared to the previous six influenza seasons (from 2014-15 to 2019-20).

Influenza hospitalisations based on registry data

In addition to the surveillance of laboratory-confirmed hospitalisations mentioned above, a new registry-based surveillance system for influenza hospitalisation, based on the ICD-10 codes for influenza (J09-J11), was implemented and run in parallel. A total of 25 hospitalised patients were diagnosed with influenza during the season, which is also very low. In comparison, an average of 2500 influenza hospitalisations (J09-J11) per season has previously been found in Norway (2). The median age of the cases was 48 years and 64% (n=16) were male.

Influenza patients in intensive care units

Less than five patients with influenza were admitted to ICU in Norway during the 2020/21 season, which is very low.

Excess all-cause mortality

From week 40 2020 to week 20 2021, the all-cause mortality in Norway was within expected or lower than expected levels (Figure 5).

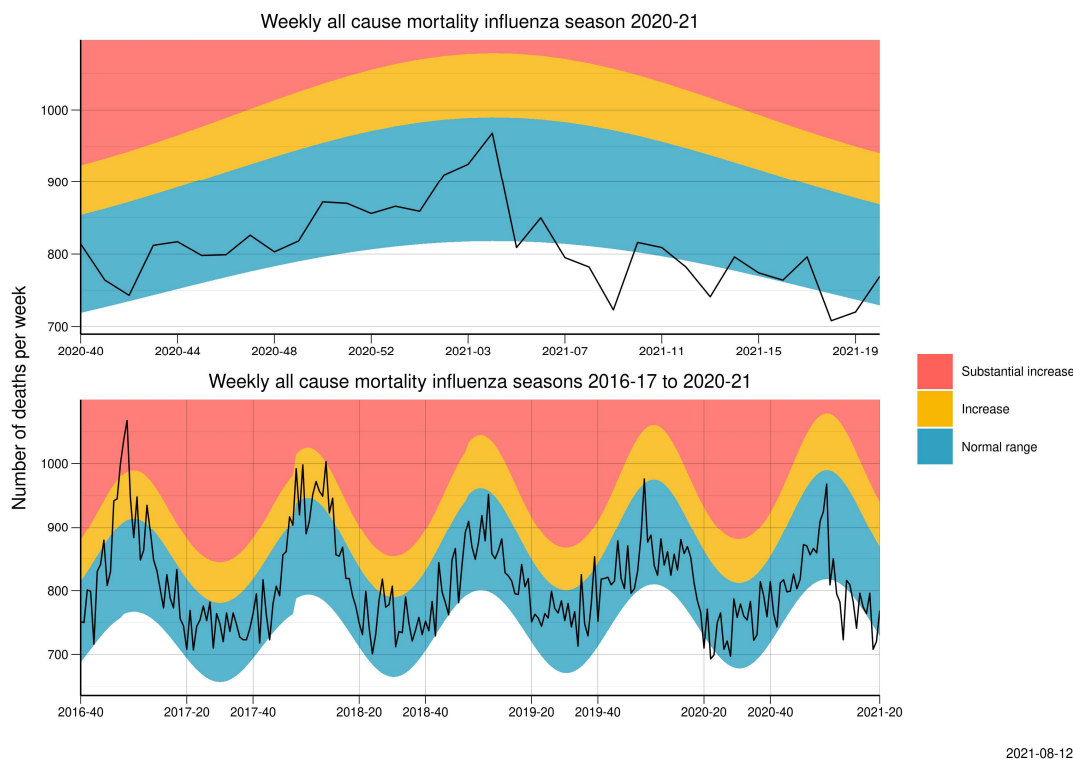


Figure 5. Weekly all-cause mortality, Norway influenza season 2020-21 (upper) and seasons 2016-17 to 2020-21 (lower). Source: NorMOMO through Sykdomspulsen, NIPH, with numbers from The National Population Register.

Influenza-attributable mortality

Influenza-attributable mortality has been calculated end-of-season since the 2016-17-season using the FluMOMO-model (3). Influenza-attributable mortality for the 2020-21 season could not be estimated using FluMOMO, due to challenges with the model under the COVID-19 pandemic. The proportion of ILI has previously been used as indicator for influenza activity in the model, but it is currently considered less reliable. However, the number of influenza deaths in 2020-21 was probably very few, if any, since there was almost no influenza virus detections or severe influenza cases. New methods for estimating and monitoring influenza mortality need to be implemented in Norway the coming season.

Laboratory confirmed influenza: Virological surveillance

Altogether, 155,198 patients in Norway were tested for influenza during weeks 40/2020-35/2021, resulting in only 9 recorded detections of influenza A and 11 recorded detections of

influenza B (Figure 6, Table 1). With such a low prevalence of influenza in the population, the positive predictive value of the tests is expected to be poor, and in accordance with this, not all positive results could be confirmed in our laboratory. Interestingly, all 9 influenza A detections were confirmed (2 A(H1N1) and 7 A(H3N2)), whereas only 4 out of the 11 influenza B positive results were confirmed (3 B/Victoria and 1 B not lineage typeable due to low viral load). These sporadic detections were spread over the season, but 6 of them (All H3s) have occurred in the previous few weeks (figure 6).

For several of the laboratory confirmed influenza cases, there was a history of travel abroad, and we do not think there is any evidence of sustained circulation of influenza viruses in Norway during the 2020-2021 season.

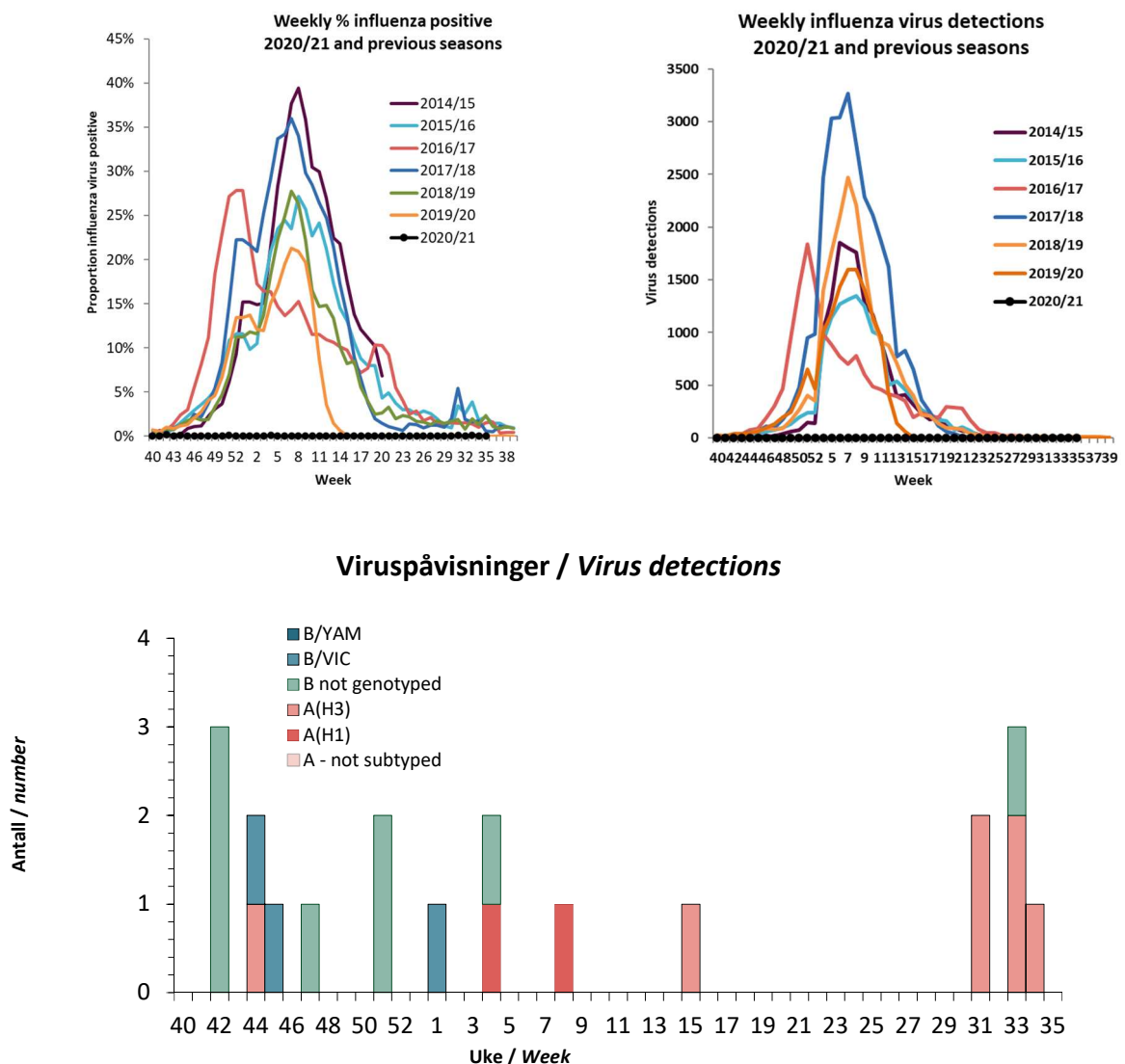


Figure 6. Laboratory detections, Norway 2020-2021. Upper left-hand panel: Weekly proportion of influenza virus positive specimens, with previous season proportions shown for comparison. Upper right-hand panel: Weekly number of influenza virus detections, with previous season numbers shown for comparison. Lower panel: Weekly number of the different influenza viruses is displayed as stacked bars.

Sentinel-based surveillance

Due to the redirection of respiratory infection specimen collection away from general practices and emergency wards to Covid-19 testing stations, the virological sentinel system for influenza has suffered a near-total collapse this season. The only remnant that was carried out was that one emergency ward sent sentinel specimens to the local hospital lab for rapid-turnaround SARS-CoV-2 and influenza testing, with outcomes and sentinel-type metadata provided to the NIC. But even this makeshift procedure broke down when Covid-19 intensified in late winter, and only 40 specimens had been processed by this point. Of these, none had influenza, two had SARS-CoV-2, and one had rhinovirus detected.

Table 1. Weekly incidence of influenza-like illness (ILI), total number of specimens tested for influenza, proportion of specimens positive for influenza virus, and influenza virus detections per type/subtype/lineage (sentinel plus non-sentinel), in Norway from week 40/2020 through week 35/2021.

week	Clinical surveillance % ILI	Virus detections									
		Specimens	% positive	A not subtyped	A(H1) pdm09	A(H3)	B not lineage typed	B/Victoria lineage	B/Yamagata lineage		
40	0,1 %	795	0,0 %	0	0	0	0	0	0		
41	0,1 %	2038	0,0 %	0	0	0	0	0	0		
42	0,1 %	2235	0,13 %	0	0	0	3	0	0		
43	0,1 %	2478	0,0 %	0	0	0	0	0	0		
44	0,1 %	2846	0,07 %	0	0	1	0	1	0		
45	0,1 %	3266	0,03 %	0	0	0	0	1	0		
46	0,1 %	3508	0,0 %	0	0	0	0	0	0		
47	0,1 %	3804	0,0 %	0	0	0	1	0	0		
48	0,1 %	2941	0,0 %	0	0	0	0	0	0		
49	0,1 %	3114	0,0 %	0	0	0	0	0	0		
50	0,1 %	2884	0,0 %	0	0	0	0	0	0		
51	0,1 %	2895	0,07 %	0	0	0	2	0	0		
52	0,1 %	2645	0,0 %	0	0	0	0	0	0		
53	0,1 %	2870	0,0 %	0	0	0	0	0	0		
1	0,1 %	3752	0,03 %	0	0	0	0	1	0		
2	0,1 %	3361	0,0 %	0	0	0	0	0	0		
3	0,1 %	3446	0,0 %	0	0	0	0	0	0		
4	0,1 %	3425	0,06 %	0	1	0	1	0	0		
5	0,1 %	3392	0,0 %	0	0	0	0	0	0		
6	0,1 %	3357	0,0 %	0	0	0	0	0	0		
7	0,1 %	3371	0,0 %	0	0	0	0	0	0		
8	0,1 %	3763	0,03 %	0	1	0	0	0	0		
9	0,1 %	3789	0,0 %	0	0	0	0	0	0		
10	0,1 %	4060	0,0 %	0	0	0	0	0	0		
11	0,1 %	4170	0,0 %	0	0	0	0	0	0		
12	0,1 %	3714	0,0 %	0	0	0	0	0	0		
13	0,1 %	2551	0,0 %	0	0	0	0	0	0		
14	0,1 %	3782	0,0 %	0	0	0	0	0	0		
15	0,0 %	3777	0,03 %	0	0	1	0	0	0		
16	0,0 %	3886	0,0 %	0	0	0	0	0	0		
17	0,0 %	3998	0,0 %	0	0	0	0	0	0		
18	0,0 %	3725	0,0 %	0	0	0	0	0	0		
19	0,0 %	3065	0,0 %	0	0	0	0	0	0		
20	0,0 %	3105	0,0 %	0	0	0	0	0	0		
21	0,0 %	2974	0,0 %	0	0	0	0	0	0		
22	0,0 %	3141	0,0 %	0	0	0	0	0	0		
23	0,0 %	2999	0,0 %	0	0	0	0	0	0		
24	0,0 %	3120	0,0 %	0	0	0	0	0	0		
25	0,0 %	2828	0,0 %	0	0	0	0	0	0		
26	0,0 %	2902	0,0 %	0	0	0	0	0	0		
27	0,0 %	2652	0,0 %	0	0	0	0	0	0		
28	0,0 %	2613	0,0 %	0	0	0	0	0	0		
29	0,1 %	2508	0,0 %	0	0	0	0	0	0		
30	0,1 %	2808	0,0 %	0	0	0	0	0	0		
31	0,1 %	2986	0,1 %	0	0	2	0	0	0		
32	0,1 %	3127	0,0 %	0	0	0	0	0	0		
33	0,1 %	3178	0,1 %	0	0	2	1	0	0		
34	0,1 %	3624	0,0 %	0	0	1	0	0	0		
35	0,1 %	3890	0,0 %	0	0	0	0	0	0		
Total		155198		0	2	7	8	3	0		
week	% ILI	Specimens	% positive	A not subtyped	A(H1) pdm09	A(H3)	B not lineage typed	B/Victoria lineage	B/Yamagata lineage		
			Type A:	9						Type B:	11

Genetic characterisation of the viruses in circulation

Six out of 11 influenza virus samples shipped to NIC Norway this season were genetically characterised. The viral load was too low for the remaining cases. Out of the characterised viruses four cases were influenza A(H3N2) and belonged to the 3C.2a1b/159N subgroup and had highest similarity to the A/Bangladesh/10006/2020 viruses possessing several substitutions in the HA1 protein that could indicate antigenic drift:

K83E;Y94N;T131K;H156S;Y159N;T160I;L164Q;G186D;D190N;F193S;Y195F;F209S;(M347V)

Two cases of H1N1 were characterised as belonging to A/Slovenia/1489/2019 6B.1A/183P-7, but possessing the HA substitution A141T in addition, and one also with P183A in addition

All genotyped influenza B-cases belonged to the B-Victoria lineage, with Δ 162-164. One of the influenza B cases were characterised by WHO CC. The HA gene of B/Norway/435/2020 fell into a new group of viruses seen in West Africa and elsewhere. These are deemed to be antigenically different from the vaccine virus B/Washington/02/2019. Their HA genes have a series of substitutions: A127T, P144L, N50K, G184E, N197D (losing the glycosylation site usually lost on adaptation to eggs), K293R and R279K in HA1.

Antiviral susceptibility

No resistance against neuraminidase inhibitors like oseltamivir and zanamivir has so far been detected in the seven samples investigated (Two A(H1N1) and 5 A(H3N2)).

Vaccine distribution and coverage

A total of 1,37 million influenza vaccine doses have been distributed in the 2020/21 season; 1,144 million of these were distributed from NIPH specifically intended for persons in medical risk groups and health care personnel involved in direct patient care. The number of distributed doses has increased by 33 % compared to the 2019/20 season and has doubled in five years (Figure 7).

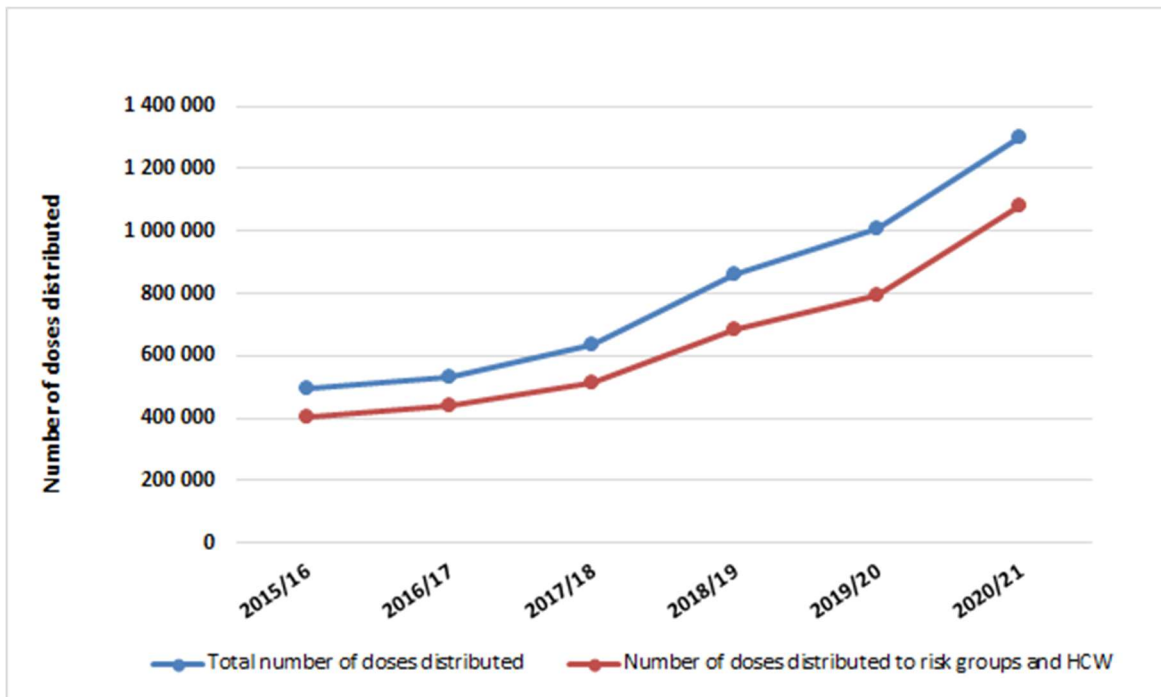


Figure 7. Influenza vaccine doses distributed in Norway, September 2015 through June 2021. HCW = Health Care Workers.

According to the Norwegian Immunization Registry SYSVAK, at least 57 % of the population above 65 years of age received an influenza vaccine this season. Only about 75 % of the doses used is registered in SYSVAK, due to underreporting and technical issues. Vaccine coverage is therefore estimated for the various risk groups based on survey data from Statistics Norway. However, these estimates will not be available until October 2021.

Zoonotic influenza

A large epizootic of highly pathogenic avian influenza A(H5N8) virus clade 2.3.4.4.b occurred in birds in several European countries during the 2020-2021 season. In November 2020, HPAIV A(H5N8) was detected in a wild bird in Southern-Norway by the Norwegian Veterinary Institute (4). This was the first time ever HPAIV has been detected in birds in Norway. No cases have been detected in humans in Norway. The Norwegian Institute of Public Health has assessed the risk for human infection as very low (5), but increased awareness and precautionary infection control measures are recommended to prevent zoonotic infection.

References

- 1 Report 2020: «Influenza season in Norway 2019-20» Oslo: Norwegian Institute of Public Health, 2020. Accessed 07.09.2021. Available from: <https://www.fhi.no/publ/2020/influensasesongen-i-norge-2019-2020/>
- 2 Hauge SH, Bakken IJ, de Blasio BF, Håberg SE. Burden of medically attended influenza in Norway 2008-2017. *Influenza Other Respir Viruses*. 2019;13(3):240-247. doi:10.1111/irv.12627
- 3 Nielsen J, Krause TG, Mølbak K. Influenza-associated mortality determined from all-cause mortality, Denmark 2010/11-2016/17: The FluMOMO model. *Influenza Other Respir Viruses*. 2018;12(5):591-604. doi:10.1111/irv.12564
- 4 Madslie K, Moldal T, Gjerset B, et al. First detection of highly pathogenic avian influenza virus in Norway. *BMC Vet Res*. 2021;17(1):218. Published 2021 Jun 12. doi:10.1186/s12917-021-02928-4
- 5 Folkehelseinstituttet. Vurdering av risiko for smitte til mennesker med høypatogen fugleinfluenza A(H5N8) i Norge. Available from: <https://www.fhi.no/publ/2021/vurdering-av-risiko-for-smitte-til-mennesker-med-hoypatogen-fugleinfluenza-/>
- 6 Abrupt termination of the 2019/20 influenza season following preventive measures against COVID-19 in Denmark, Norway and Sweden. Emborg, Hanne-Dorthe and Carnahan, AnnaSara and Bragstad, Karoline and Trebbien, Ramona and Brytting, Mia and Hungnes, Olav and Byström, Emma and Vestergaard, Lasse S, *Eurosurveillance*, 26, 2001160 (2021), <https://doi.org/10.2807/1560-7917.ES.2021.26.22.2001160>

Previous **Norwegian reports prepared for the WHO vaccine consultation meeting:**

[WHO-rapporter - FHI](https://www.fhi.no/sv/influenza/influensaovervaking/who-rapporter/) (<https://www.fhi.no/sv/influenza/influensaovervaking/who-rapporter/>)

Acknowledgements

The work presented relies heavily on the essential contributions by the Norwegian medical microbiology laboratories, the Norwegian Intensive Care Registry and intensive care units, other participants in Norwegian influenza surveillance, as well as the WHO Collaborating Centre for Influenza Reference and Research at the Francis Crick Institute, London, UK and other partners in the WHO Global Influenza Surveillance and Response System and the European Influenza Surveillance Network. Data on the incidence of influenza-like illness are provided by the Department of Infectious Disease Epidemiology and Modelling, Norwegian Institute of Public Health, which also provides data from the Norwegian mortality monitoring system (NorMOMO). We would also like to thank our colleagues at the Emergency preparedness register for COVID-19 at NIPH for excellent help setting up the registry-based enhanced surveillance of influenza hospitalisations. We are also grateful to the Norwegian Health Directorate and the MSIS laboratory database, NIPH for providing data from the Norwegian Patient Registry and from the laboratories, respectively.

We furthermore gratefully acknowledge the excellent technical work performed by Marie Paulsen Madsen, Anne Maria Lund, Elisabeth Vikse, Rasmus Riis Kopperud, Malene Strøm Dieseth and Marianne Morken. We would also like to thank Jesper Dahl for participating in the surveillance of influenza hospitalisations.

With best regards,

Karoline Bragstad, Trine Hessevik Paulsen, Ragnhild Tønnessen, Birgitte Klüwer, Kjersti Rydland, Torstein Aune, and Olav Hungnes

National Influenza Centre/Section of Influenza and other respiratory viruses

Section for Respiratory, Blood-borne and Sexually transmitted infections

Division for Infection Control

Norwegian Institute of Public Health,

Oslo, Norway

10 September 2021

Appendices

Methods

Influenza-like illness

Norwegian ILI surveillance data is provided by Sykdomspulsen (sKUHR data). Sykdomspulsen receives data from the KUHR-system (hosted by the Norwegian Directorate of Health), which daily provides anonymised data on influenza diagnosed in primary health care consultations. The information is admitted to KUHR through doctors' reimbursement claims to the health authorities. Sykdomspulsen has been receiving KUHR data since 2014 and is supported by retrospective data from the 2006-07 season and onwards.

Virological surveillance.

Usually, a network of volunteer sentinel physicians throughout the country collects specimens from patients with ILI for analysis at the National Influenza Centre. This sentinel network has not been operational during the COVID-19 pandemic, because community respiratory illness testing has been redirected to the SARS-CoV-2 testing infrastructures.

In addition, medical microbiology laboratories that perform influenza diagnostics report all testing outcomes in real-time to the newly established national MSIS laboratory database. Surveillance statistics for laboratory confirmed influenza has been harvested from this database. These laboratories also contribute influenza positive specimens to the NIC for further characterisation. Even though most of these laboratories are affiliated to hospitals, a large proportion of specimens tested for influenza virus are from outpatients visiting general practitioners.

Surveillance of laboratory-confirmed influenza in hospitalised patients

As an extension of the basic weekly reporting of influenza diagnostic testing outcomes, nine medical microbiology laboratories stratify their report into hospitalised patients and outpatients. Together, these laboratories cover approximately 67% of the Norwegian population, and report each week the number of influenza virus detections in hospitalised patients (all wards) as well as outpatients according to influenza type (A, B) and age group. This extended reporting constitutes the basis of the surveillance of laboratory confirmed influenza in hospitalised patients. This is the seventh season this surveillance system is in operation.

Registry-based surveillance of influenza hospitalisations

Prior to 2020-2021, there was concern that influenza and COVID-19 epidemics could coincide. To strengthen the surveillance, a temporary registry-based system for daily surveillance of influenza hospitalisations was established and run in parallel to the already existing laboratory-based system. Individual-level data originating from The Norwegian Patient Registry was used. Influenza hospitalisations were defined as inpatient hospital admissions combined with ICD-10 codes for influenza (J09-J11). Only the first admission per season is included (readmissions excluded).

Influenza patients in intensive care units

In the 2016-17 and 2017-18 seasons, the Norwegian Intensive Care Registry (NICR) and NIPH carried out a pilot study to see whether national surveillance of influenza patients in intensive

care units is feasible. As part of the pilot, NICR asked all ICUs from week 46/2017 to report weekly numbers of patients in ICUs with laboratory-confirmed influenza, the number of patients in ICUs with clinically suspected influenza and the number of deaths among patients with confirmed or suspected influenza admitted to ICUs. Almost all ICUs in Norway reported data to NICR. Since the 2018-19 season, an electronic form has been used. Currently, only anonymised data are reported from NICR to the NIPH.

Mortality monitoring

The Norwegian Mortality Monitoring system (NorMOMO) is used for weekly monitoring of all-cause mortality. The system has been in operation since 2015 and it is based on the algorithm developed by the EuroMOMO network. For influenza-attributable mortality, end-of-season estimates have been made in Norway since the 2016/17, using the FluMOMO model (3).

Influenza seroepidemiology

The National Influenza Seroepidemiology Programme annually in August solicits about 2000 serum samples collected during the weeks 31-35 from clinical/microbiological laboratories covering the 19 counties of Norway. These anonymised convenience sera are aimed to be representative of the Norwegian population geographically and by age composition. In normal times these sera are tested by the haemagglutination-inhibition (HI) test to determine the antibody immunity to relevant circulating influenza viruses. However, due to capacity limitations imposed by the response to COVID-19, the sera collected in 2020 were only tested for antibody against SARS-CoV-2 and not against influenza.

Published by the Norwegian Institute of Public Health

October 2021

P.O.Box 222- Skøyen

NO-0213 Oslo

Norway

Tel: + 47-21 07 70 00

The report can be downloaded as pdf
at www.fhi.no/en/publ/