NIPH
Norwegian Institute of Public Health

REPORT

2022

NORWAY:

Influenza Virological and Epidemiological season report prepared for the WHO Consultation on the Composition of Influenza Virus Vaccines for the Northern Hemisphere 2022/2023

February 2022

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 Northern Hemisphere 2022/2023,

February 2022

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
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

February 2022

Authors:

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

ISBN digital: 978-82-8406-280-8

Contents

The 2021-2022 influenza season, Norway

Summary

- There was no influenza outbreak in Norway during 2020-2021.
- The slight increase in influenza detections seen this autumn was paused through the holiday season and has decreased somewhat since then. The proportion of influenza-like illness (ILI) remains at baseline level and has not been above the epidemic threshold since the spring of 2020.
- The numbers of influenza hospitalisations and ICU admissions have so far been very low. No influenza outbreaks have been reported from health care institutions so far this season.
- As of week 4/2022, only 987 cases of influenza have been laboratory confirmed, out of more than 280,000 patients tested during this season. The number of persons tested for influenza is unprecedented, but testing has to a large extent been carried out together with testing for SARS-CoV-2 on specimens taken for COVID-19 screening or verification, thus often without any clinical indication for influenza.
- Among the 944 detected influenza A viruses, 252 have been subtyped as H3 and 21 as H1. Among the 43 recorded detections of influenza B, very few have been confirmed in the National Influenza Centre and none of these had sufficient virus RNA for lineage identification.
- So far only A(H3N2) viruses have been whole genome sequenced. The viruses are characterized as A/Bangladesh/4005/2020-like viruses belonging to the genetic group 3C.2a1b.2a.2
- Consistent with the very low influenza activity during the last few seasons, seroprevalence against current influenza viruses have declined and the susceptibility of the unvaccinated part of the population has increased.

Influensasesongen 2021-2022 i Norge (Norwegian)

Hovedbudskap

- Influensautbruddet i Norge uteble sesongen 2020-2021 og er så langt også uteblitt 2021-2022.
- Nivået av influensalignende sykdom har vært svært lavt så langt denne sesongen.
- Antallet sykehusinnleggelser og intensivinnleggelser med influensa har vært svært lavt så langt denne sesongen. Det har ikke vært rapportert om utbrudd av influensa i helseinstitusjoner.
- Det var høy oppslutning rundt vaksinasjonsprogrammet. Antallet distribuerte doser økte med 31 % fra sesongen 2020/21. Forbruket i programmet var omtrent 1,4 millioner doser. Vaksinasjonsdekningen blant personer over 65 år var 65 prosent på landsbasis.
- Bare 987 laboratoriebekreftede tilfeller av influensa er registrert denne sesongen til og med uke 4/2022, blant mer enn 280 000 pasienter testet for influensavirus. Det har aldri tidligere vært testet så mange mot influensa, men testingen har i stor grad vært koblet til testing for SARS-CoV-2 og i mindre grad på klinisk indikasjon for influensa.
- Blant 944 influensa A-påvisninger er 252 virus subtypet som A(H3) og 21 som A(H1). Kun få av de 43 registrerte influensa B-påvisningene er bekreftet ved det nasjonale influensasenteret og ingen av disse har inneholdt tilstrekkelig mengde virus-RNA for linjebestemmelse.
- Bare A(H3N2) virus har så langt blitt helgenomsekvensert og disse tilhører 3C.2a1b.2a.2gruppen av virus lignende A/Bangladesh/4005/2020-referanse viruset.
- I samsvar med at det har vært svært lite influensa de siste sesongene, er også forekomsten av beskyttende antistoff mot aktuelle influensavirus lavere enn før. Dette tyder på at befolkningen er mer mottakelig for fremtidige influensautbrudd.

A look back at the preceding 2020/2021 season

The 2020/21 season in Norway was characterized by a virtual absence of influenza detections. The proportion of influenza-like illness (ILI) in primary health care never exceeded the epidemic threshold; no outbreaks of influenza in health care institutions were reported, and the numbers of influenza hospitalisations and ICU admissions were very low.

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 antigenically distinct 3C.2a1b.2a.2 subgroup and most closely resembled viruses like A/Bangladesh/100009/2020.

The influenza B-viruses belonged to the B-Victoria lineage (Δ162-164) and the antigenic different group of viruses originating from West Africa.

The H1N1 viruses belonged to 6B.1A/183P-7.

The 2021/2022 season

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

Influenza-like illness (ILI) in primary health care

The heavy focus on COVID-19 together with new diagnostic codes for confirmed and suspected COVID-19 has probably altered primary health care physicians' coding practices. At present time, it is uncertain to which extent the ILI-indicator can inform on influenza activity.

The influenza activity measured through the ILI indicator has been at a very low level throughout this season as well as the 2020-21-season (Figure 1).

Outbreaks in health care institutions

No outbreaks of influenza have been reported from health care institutions so far this season through VESUV, the national web-based outbreak alert system.

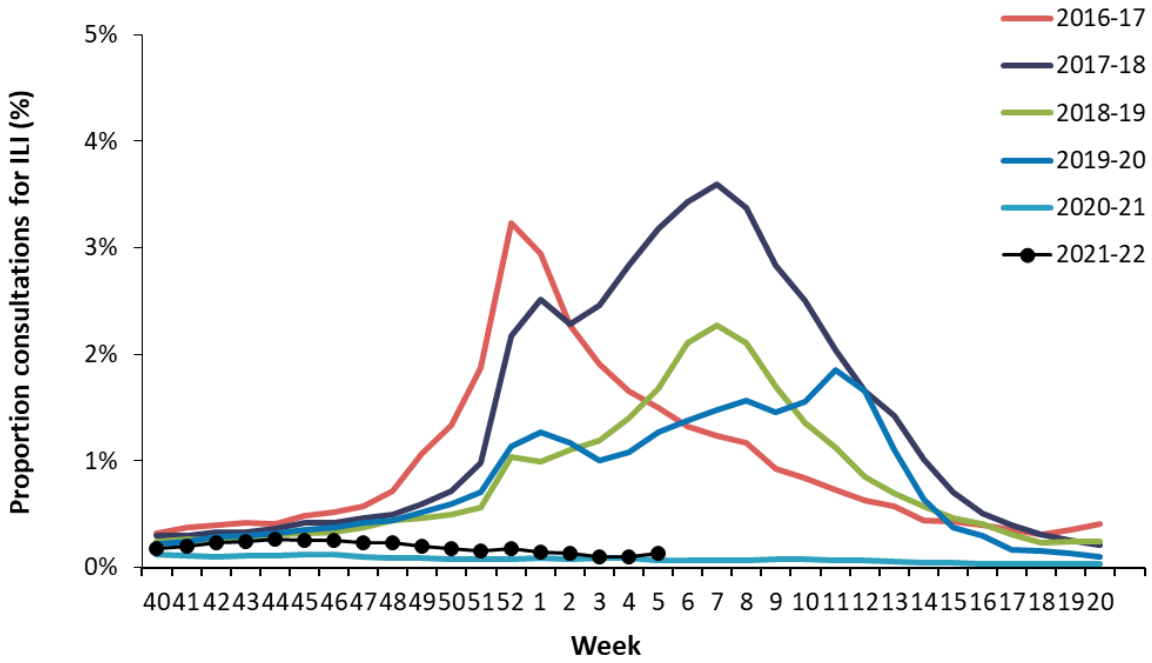

Figure 1. Weekly proportion of consultations for ILI, Norway 2021-2022 season (black dotted line). The graph shows the proportion of patients in general practice and emergency clinics diagnosed with ILI, by calendar week. The five previous seasons are also shown. Source: Sykdomspulsen with data from KUHR, NIPH.

Influenza hospitalisations based on registry data

Between week 40-2021 and 4-2022, altogether 110 (2.0 per 100,000 population) patients have been hospitalised with influenza. Apart from a small peak in week 52-2021, the weekly number of new patients hospitalised with influenza has varied between 8 and 12 since week 48-2021 (figure 2). The median age of the 110 patients was 61.5 years, and 68 (62 %) of them were female.

In comparison, in season 2020-2021 there was no circulation of influenza in Norway, and this registry-based surveillance system identified <5 patients hospitalised with influenza during the entire season. While registry data on influenza-positive PCR tests have been available only since the start of the COVID-19 pandemic, registry data based on hospital discharge codes alone suggest that prior to the COVID-19 pandemic, an average of ca. 5000 patients were hospitalised with influenza per season (1).

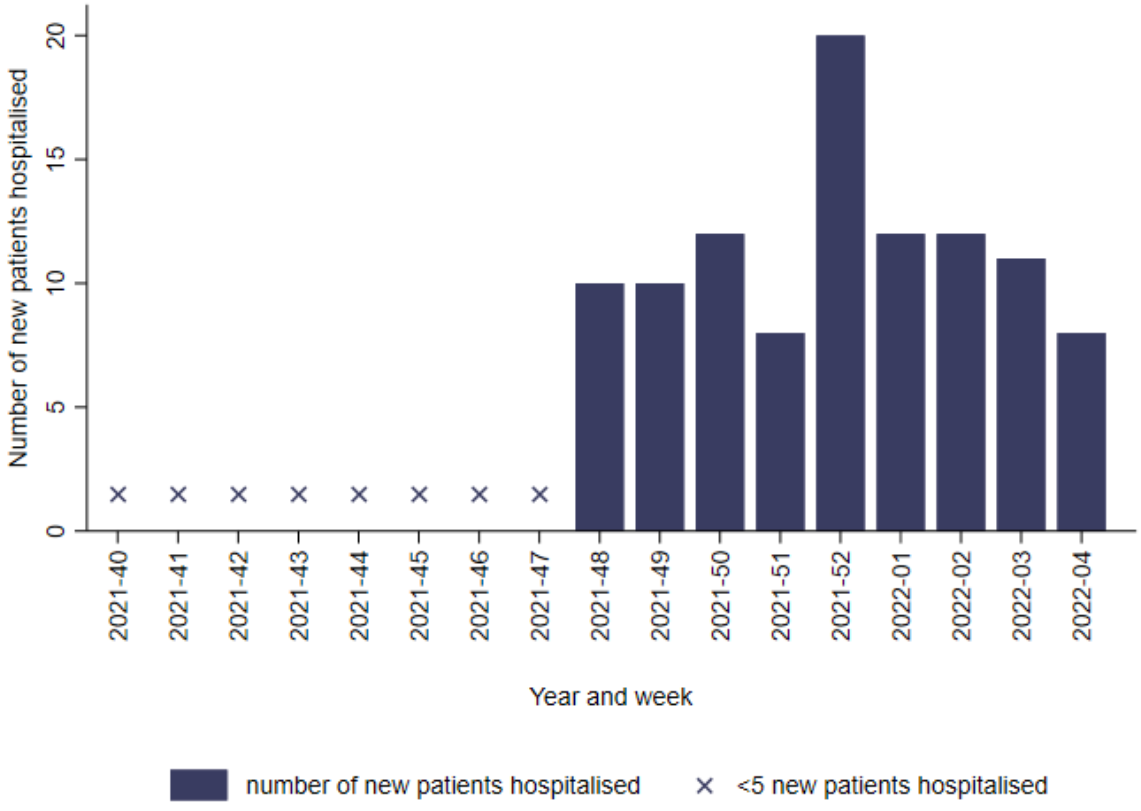

Figure 2. Weekly number of patients hospitalised with influenza diagnosis, Norway, 4 October 2021 – 30 January 2022. Source: The Norwegian Emergency Preparedness Register (Beredt C19) with data from the Norwegian Patient Register

Influenza patients in intensive care units

Between week 40-2021 and 4-2022, less than five patients have been admitted to ICU with confirmed influenza. In comparison, less than five patients with influenza were admitted to ICU in Norway during the entire preceding 2020-2021 season, which is very low.

Laboratory confirmed influenza: Virological surveillance

Altogether, 281,553 patients in Norway were tested for influenza during weeks 40/2021-4/2022, resulting in merely 944 recorded detections of influenza A virus and 43 influenza B virus (Figure 3, Table 1). With such a low prevalence of influenza in the population, the positive predictive value of the tests is expected to be poorer than usual, and in accordance with this, not all positive results could be confirmed in the National Influenza Centre (NIC). This has particularly been the case for the type B virus detections. In a few instances in the autumn, trace amounts of virus RNA representing three or four different subtypes/lineages were detected in a sample, this has been interpreted as likely contamination with tetravalent influenza vaccine. In several other instances, referred specimens testing positive for influenza B could not be verified and it is possible that a large proportion of the 43 recorded influenza B virus infections are spurious.

In contrast, only 8 out of 259 referred influenza A positive specimen could not be confirmed and/or subtyped in the NIC. Among the 944 detected influenza A viruses, 252 have been subtyped as H3 and 21 as H1, either in the primary laboratory or in the NIC.

The number of detections started to rise in late November and levelled out after a peak in week 50 when 157 out of 25,077 specimens (0.6%) tested positive for influenza. It remains to be seen if there will be a subsequent rise in cases; in most previous seasons such a secondary rise would already have started at this time (Figure 3).

The very low positivity rate partly stems from a low incidence of influenza, but it is also driven further down by extensive testing for influenza in specimens collected for SARS-CoV-2 diagnosis, with little clinical indication for influenza.

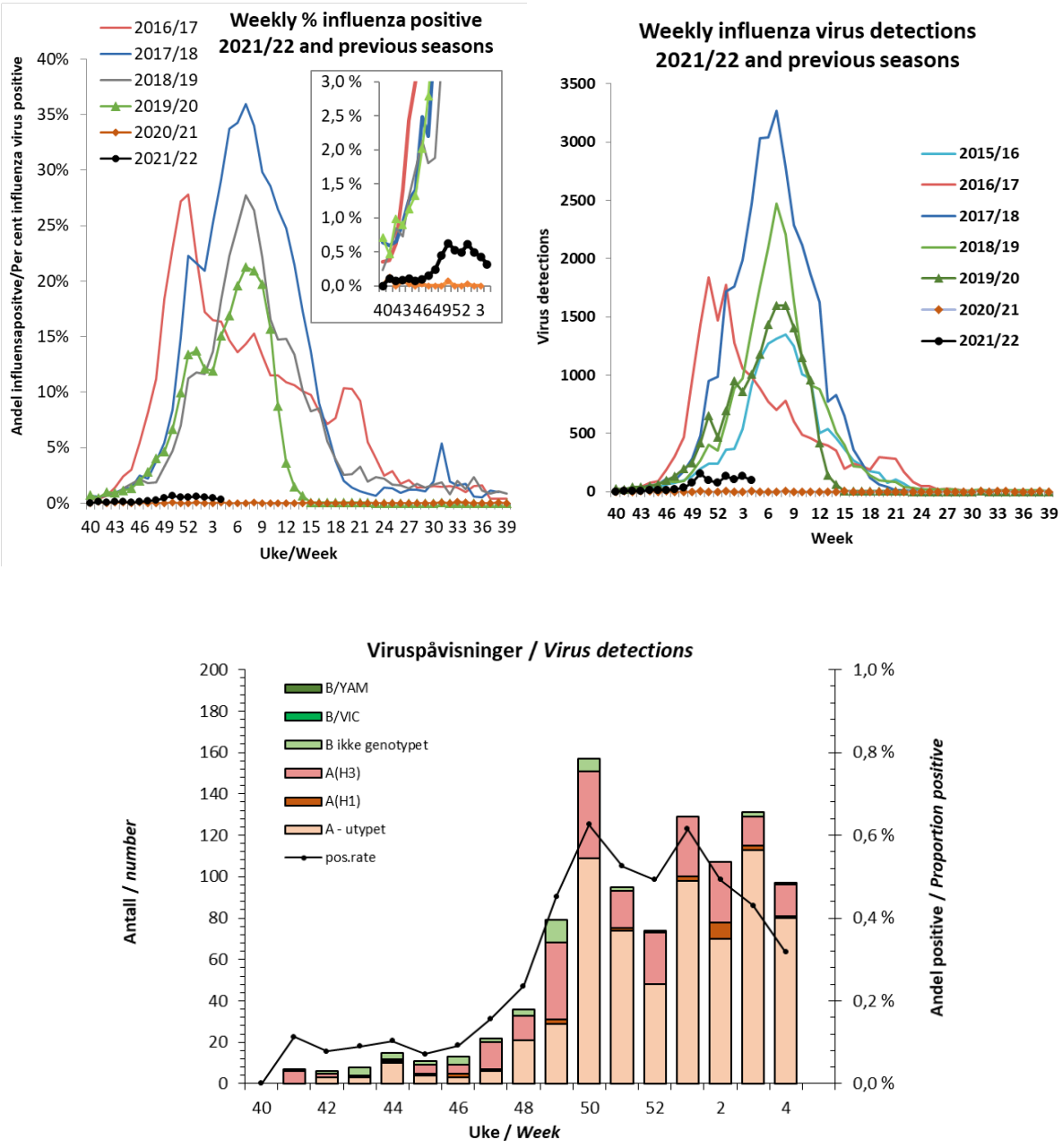

Figure 3. Laboratory detections, Norway 2021-2022. Upper left-hand panel: Weekly proportion of influenza virus positive specimens, with previous season proportions shown for comparison. Upper right-hand panel: Weekly number of influenza virus detections, with previous season numbers shown for comparison. Seasons impacted by Covid-19 are marked with symbols.
Lower panel: Weekly number of the different influenza viruses, displayed as stacked bars.

Sentinel-based surveillance

Due to the redirection since March 2020 of respiratory infection specimen collection away from general practices and emergency wards to Covid-19 testing stations, the virological sentinel system for influenza has not been operable so far this season. We are exploring ways to reactivate this surveillance.

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 (all are non-sentinel), in Norway from week 40/2021 through week 4/2022.

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	0,2 %	5990	0,00 %	0	0	0	0	0	0
41	0,2 %	6219	0,11 %	0	0	6	1	0	0
42	0,2 %	7651	0,08 %	3	0	2	1	0	0
43	0,2 %	8892	0,09 %	3	0	1	4	0	0
44	0,3 %	14467	0,10 %	10	1	1	3	0	0
45	0,3 %	15428	0,07 %	4	1	4	2	0	0
46	0,3 %	14141	0,09 %	3	2	4	4	0	0
47	0,2 %	14060	0,16 %	6	1	13	2	0	0
48	0,2 %	15304	0,24 %	21	0	12	3	0	0
49	0,2 %	17468	0,45 %	29	2	37	11	0	0
50	0,2 %	25077	0,63 %	109	0	42	6	0	0
51	0,2 %	18086	0,53 %	74	1	18	2	0	0
52	0,2 %	15042	0,49 %	48	0	25	1	0	0
1	0,1 %	20980	0,61 %	98	2	29	0	0	0
2	0,1 %	21731	0,49 %	70	8	29	0	0	0
3	0,1 %	30480	0,43 %	113	2	14	2	0	0
4	0,1 %	30537	0,32 %	80	1	15	1	0	0
Total		281553		671	21	252	43	0	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: 944		Type B: 43				

Genetic characterisation of the viruses in circulation

So far this season, the NIC at the Norwegian Institute of Public Health has received 189 influenza virus positive samples for further analysis in national monitoring. Of these, 71, all A(H3N2) have so far been of sufficient quality for further in-depth analysis with whole genome sequencing. Almost all cases are similar to the A (H3N2) virus that caused outbreaks in South Asia last summer and early autumn. Most viruses detected now in Europe this autumn appear to be this genetic variant. This virus has somewhat altered antigenic properties in relation to the influenza A(H3N2) virus we have had in circulation in Norway before. The viruses are characterized as A/Bangladesh/4005/2020-like viruses belonging to the genetic group 3C.2a1b.2a.2 with the following defining mutations in HA1: Y159N, T160I, L164Q, D190N, F193S and Y195F. The majority of H3 viruses have the E50K substitution as well.

The viruses in Norway are mainly divided into two subgroups; with and without the substitution H156S in HA (Figure 4). This is a potential key mutation for antigenic drift and has been shown in functional studies to be somewhat antigenically different from the vaccine. The subgroup with H156S is still in the minority in Norway. There are also additional mutations in some of the Norwegian viruses. Most sequences have been submitted to GISAID.

The H3 component of the Southern Hemisphere vaccine was changed in September from 3C.2a1b.2a1 to the new Bangladesh-like H3 virus 3C.2a1b.2a.2. One case from week 48 has been identified as 3C.2a1b.1a (A/Denmark/3264/2019-similar). Virus has been sent to the WHO Collaborating Centre for Influenza in London, UK for further analysis towards the work on a new vaccine provision for the northern hemisphere in February 2022.

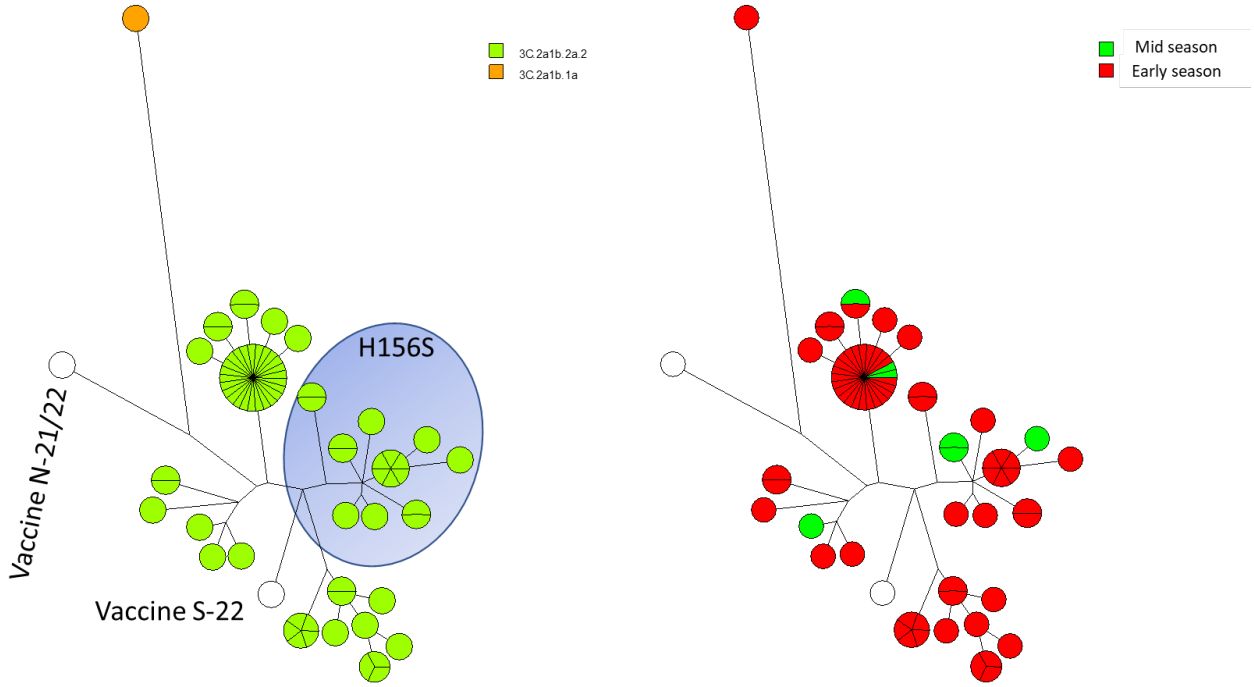

Figure 4: Genetic relationship of Norwegian A(H3N2) virus together with the H3N2 vaccine component fror the Northern hemisphere 2021/22 and Southern hemisphere 2022, HA-gene. Each circle or sector represents one virus and the clusters show genetic relationship. Left: Norwegian samples colour coded on genetic clade. Right: colour coded on time for sampling, early season before week 51, and mid-season from week 51.

Antiviral susceptibility

No genetic markers for resistance against neuraminidase inhibitors like oseltamivir and zanamivir has so far been detected in the 71 A(H3N2) samples investigated so far.

Population immunity against recent influenza viruses, August 2021

In August each year, the National Influenza Seroepidemiology Programme solicits approximately 2000 anonymised residual sera from clinical/microbiological laboratories across Norway. The sera, aimed to be representative of the Norwegian population geographically and by age composition, are tested by the haemagglutination-inhibition (HI) test to determine the antibody immunity against relevant circulating influenza viruses. Due to COVID-19 workload, the analysis of sera was not carried out in 2020, and from the August 2021 collection only a subset of ca. 660 sera was analysed. The main findings are shown in figure 5, table 2, and summarised as follows:

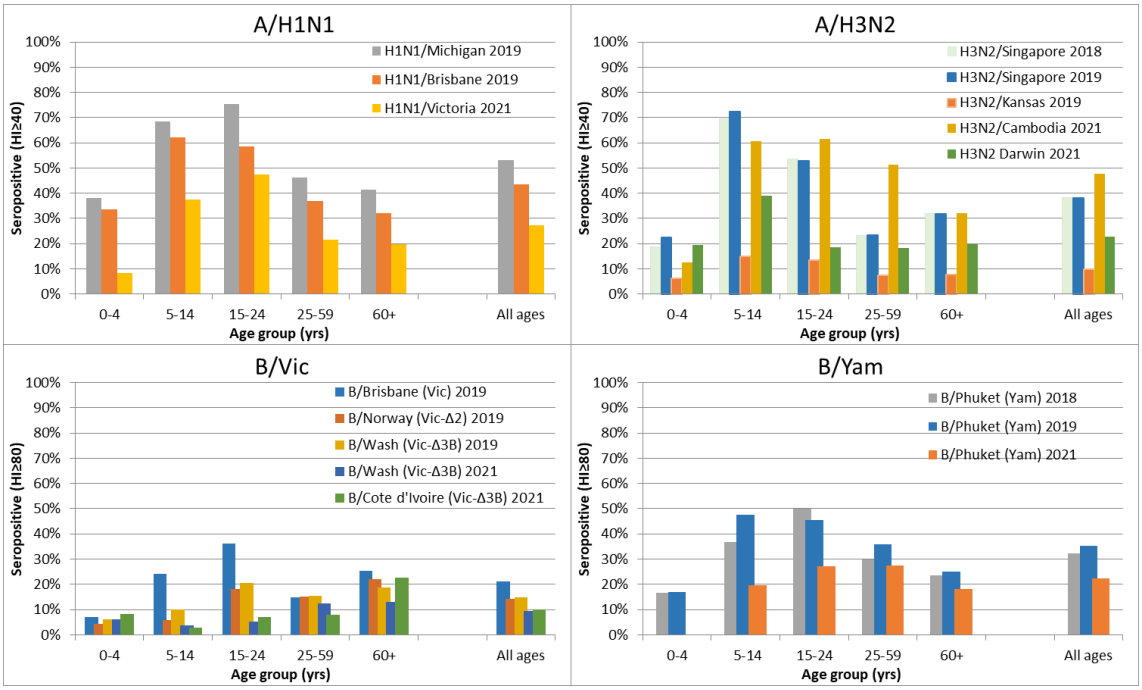

Fig 5. Seroprevalence in August 2021 to current influenza A and B reference and vaccine strains for 'All ages' and in various age groups. For comparison, seroprevalences to some virus strains in August 2019 are also shown.
H1N1/Michigan= A/Michigan/45/2015 (H1N1)pdm09 clade 6B.1; H1N1/Brisbane= A/Brisbane/02/2018 (H1N1)pdm09 clade 6B.1A1; H1N1/Victoria= A/Victoria/2570/2019(H1N1); H3N2/Singapore= A/Singapore/INFIMH-16-0019/2016 (H3N2) clade 3C.2a1 ; Kansas= A/Kansas/14/2017 (H3N2) clade 3C.3a.1; H3N2/Cambodia= A/Cambodia/e0826360/2020(H3N2), 3C.2a1b.2a.1; H3N2/Darwin= A/Darwin/9/2021(H3N2), 3C.2a1b.2a.2; B/Brisbane= B/Brisbane/60/2008 (Victoria lineage, V1.A); B/Norway= B/Norway/2409/2017 (Victoria lineage, V1A.1); B/Wash=B/Washington/02/2019 (Victoria lineage, V1A.3); B/Cote d'Ivoire= B/Cote d'Ivoire/948/2020 (Victoria lineage, V1A.3a.1); B/Phuket= B/Phuket/3073/2013 (Yamagata lineage).

For A(H1N1) viruses, there has been a drop in seroprevalence in all the age groups, leading to less than 30 % prevalence in all ages and, notably, less than 10% prevalence in children less than five years old.

For A(H3N2) viruses, the seroprevalence against the 3C.2a1b.2a.1 ("Cambodia-like") was substantial in 5-59 years age group and in all ages. The seroprevalence against the recently predominant 3C.2a1b.2a.2 ("Bangladesh-like") subgroup was much lower.

The seroprevalence against contemporary B/Victoria-lineage viruses was low in 2019 and had declined further in August 2021, with overall seroprevalence of only 10 % against recent B/Victoria variants represented by B/Washington/02/2019 (V1A.3) and B/Cote d'Ivoire/948/2020 (V1A.3a.1).

For the B/Yamagata-lineage viruses, represented by the vaccine virus for tetravalent vaccines, B/Phuket/3070/2013, the seroprevalence had declined since 2019, with overall seroprevalence at 22%, and similar proportions in all age groups except 0-4 year olds for whom the seroprevalence was zero.

Table 2. Influenza seroepidemiology results in August 2019 – Seroprevalence* in age groups.
For comparison data from studies performed for the preceding years 2016-2019 are also included.

Influenza strains (Year[$])	Age groups						
	0-4	5-14	15-24	0-24	25-59	60+	All ages
H1 X-179A/A(H1N1)pdm09 (2016)	30	66	62	56	38	36	46
H1 Slovenia/2903/15 (2016)	34	66	68	60	38	33	47
H1 X-179A/A(H1N1)pdm09 (2017)	25	79	77	67	52	46	57
H1 Michigan/45/15 (2017)	26	79	79	68	50	42	56
H1 Michigan/45/15 (2018)	17	67	71	58	48	41	51
H1 Michigan/45/15 (2019)	38	68	75	64	46	41	53
H1 Brisbane/02/18 (2019)	34	62	58	54	37	32	44
H1 Victoria/2570/19 (2021)*	***8***	***37***	***47***	***36***	***22***	***20***	***27***
H3 Switzerland/9715293/13 (2016)	18	60	29	39	21	33	31
H3 Hong Kong/5738/14 (2016)	14	53	26	34	14	22	24
H3 Hong Kong/5738/14 (2017)	28	78	59	60	30	43	45
H3 Norway/3806/16 (2017)	28	77	68	63	36	45	49
H3 Hong Kong/5738/14 (2018)	25	78	72	63	36	43	50
H3 Sing/INFIMH-16-19/2016 (2018)	19	70	54	52	23	32	38
H3 Switzerland/8060/17(2018)	25	71	47	51	29	34	40
H3 Sing/INFIMH-16-19/2016 (2019)	22	72	53	53	27	34	40
H3 Kansas/14/17 (2019)	6	15	13	12	7	8	10
H3 Cambodia/e0826360/20 (2021)*	***13***	***61***	***61***	***52***	***51***	***32***	***48***
H3 Darwin/9/21 (2021)**	***20***	***39***	***18***	***28***	***18***	***20***	***23***
B/Vic Brisbane/60/08 (2016)	9	28	15	19	9	15	15
B/Vic Brisbane/60/08 (2017)	11	27	27	23	13	26	20
B/Vic Brisbane/60/08 (2018)	3	23	31	22	15	21	19
B/VicΔ2 Norway/2409/17 (2018)	1	4	15	7	18	23	14
B/Vic Brisbane/60/08 (2019)	7	24	36	24	15	25	21
B/VicΔ2 Norway/2409/17 (2019)	4	6	18	10	15	22	14
B/VicΔ3B Wash/02/19 (2019)**	6	10	20	13	15	19	15
B/Wash/02/19 (Vic-Δ3B) (2021)*	***6***	***4***	***5***	***5***	***12***	***13***	***10***
B/Cote d'Ivoire/948/20 (Vic-Δ3B) (2021)	***8***	***3***	***7***	***6***	***8***	***23***	***10***
B/Yam Phuket/3073/13 (2016)	5	23	39	25	26	20	24
B/Yam Phuket/3073/13 (2017)	4	28	33	25	23	19	23
B/Yam Phuket/3073/13 (2018)**	17	37	50	38	30	24	32
B/Yam Phuket/3073/13 (2019)**	17	48	46	39	36	25	35
B/Yam Phuket/3073/13 (2021)*	***0***	***20***	***27***	***19***	***28***	***18***	***22***
Sera analysed (n): 2016 Aug	188	351	333	874	745	411	2028
Sera analysed (n): 2017 Aug	189	318	353	860	797	436	2093
Sera analysed (n): 2018 Aug	155	251	236	642	501	275	1418
Sera analysed (n): 2019 Aug	113	187	171	471	375	208	1054
Sera analysed (n): 2019 Aug	***48***	***107***	***114***	***269***	***250***	***137***	***656***

[$]Year of serum collection and HI analysis.

*All entries are per cent of sera having HI titres ≥ 40 for the A strains and ≥ 80 for the ether-treated B strains.

**(Corresponding to) components of the Northern hemisphere influenza vaccine (trivalent/quadrivalent) for the season 2021-2022.

***(Corresponding to) components of the Southern hemisphere influenza vaccine (trivalent/quadrivalent) for the season 2022.

B/Yam: B/Yamagata/16/1988 lineage; **B/Vic**: B/Victoria/2/1987 lineage

Vaccine distribution and coverage

A total of 1,79 million influenza vaccine doses have been distributed in the 2021/22 season; 1,4 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 31 % compared to the 2020/21 season and has doubled in four years (Figure 7).

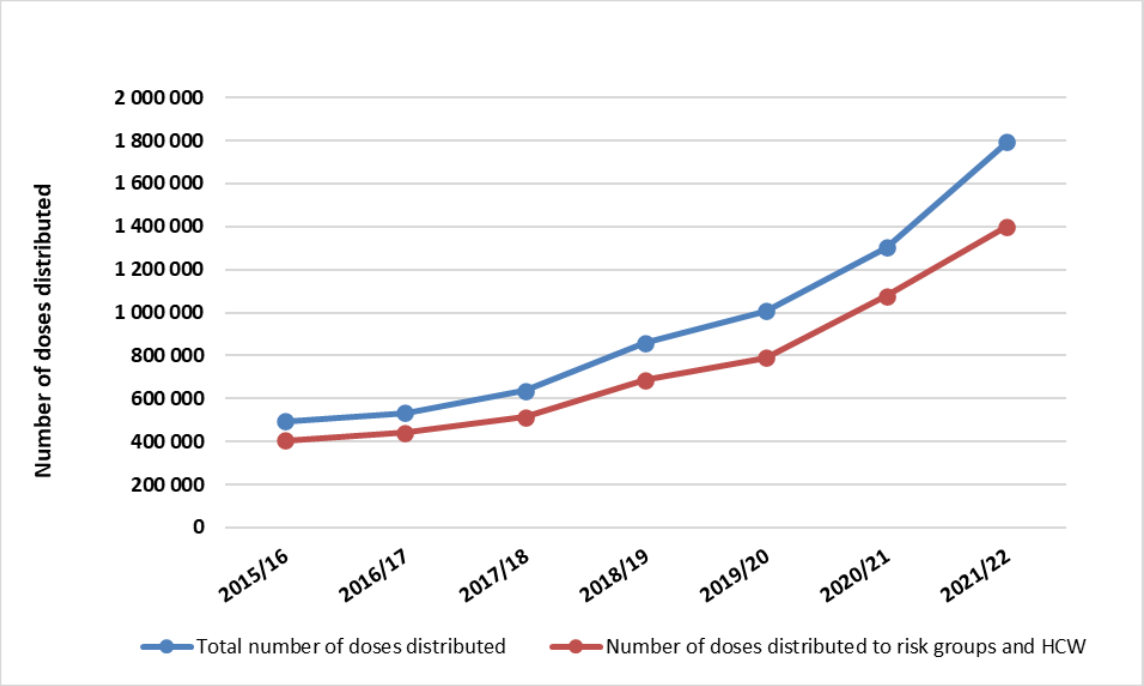

Figure 7. Influenza vaccine doses distributed in Norway, September 2015 through January 2022. HCW = Health Care Workers.

According to the Norwegian Immunization Registry SYSVAK (SYSVAK), at least 65 % of the population above 65 years of age received an influenza vaccine this season.

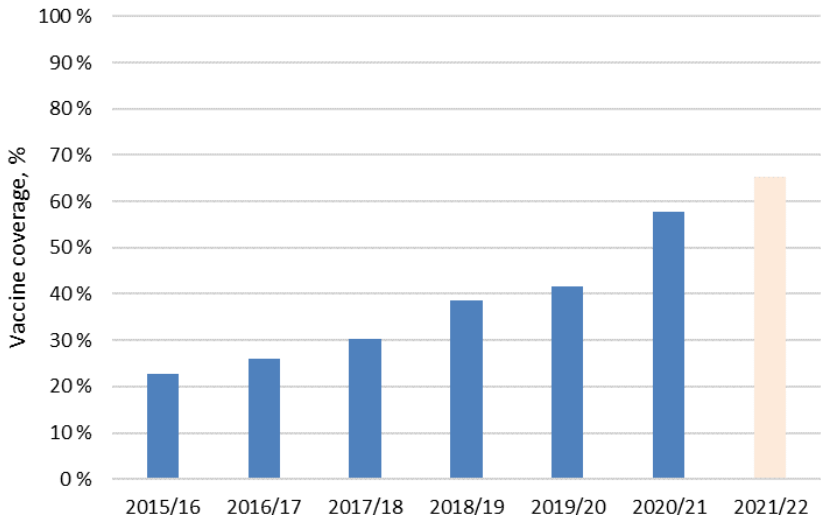

Figure 8. Vaccine coverage among residents above 65 years in Norway, 2015/16 season through to 2021/22 season as of January 2022.

According to Emergency preparedness register for COVID-19 (Beredt C19), the vaccine coverage in risk groups 18-64 years and 0-17 years per 8th of February 2022 are 39 % and 8 %, respectively. Vaccine coverage among health care workers was 59 % in specialist health care services (mainly hospitals) and 38 % in primary healthcare. Only about 75 % of the doses used is registered in SYSVAK, due to underreporting and technical issues. Vaccine coverage is therefore also estimated for the various risk groups based on survey data from Statistics Norway. However, these estimates will not be available until October 2022.

Zoonotic influenza

A large epizootic of highly pathogenic avian influenza A(H5N1) virus clade 2.3.4.4.b is ongoing in Europe. In November 2021, there were outbreaks of HPAIV A(H5N1) in two holdings of laying hens in Southern-Norway. This was the first ever outbreak of highly pathogenic avian influenza in commercial poultry holdings 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 (2), but increased awareness and precautionary infection control measures are recommended to prevent zoonotic infection.

References

1 Tønnessen R, Grøsland M, Telle K, Dahl J, Aune T, Whittaker RN, Paulsen TH. Low number of influenza hospitalisations in Norway 2020-2021. The Eighth ESWI Influenza Conference 2021; Online. Salzburg, Austria: European Scientific Working group on Influenza (ESWI).

2 Folkehelseinstituttet. Vurdering av risiko for smitte til mennesker med høypatogen fugleinfluensa A(H5N1) i Norge. Available from: https://www.fhi.no/publ/2021/vurdering-av-risiko-for-smitte-til-mennesker-med-hoypatogen-fugleinfluensa--/

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

WHO-rapporter - FHI (https://www.fhi.no/sv/influensa/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 is provided by the Department of Infectious Disease Epidemiology and Modelling, Norwegian Institute of Public Health. We would also like to thank our colleagues at NIPH working with the MSIS laboratory database for providing valuable data on laboratory results for influenza and also the National Immunisation Registry (SYSVAK) for data about influenza vaccination uptake. The Emergency preparedness register for COVID-19 is of great value in the epidemiological surveillance of influenza disease and vaccination coverage, where data from the Norwegian Patient Registry (NPR) and the Norwegian Information System for the Nursing and Care Sector (IPLOS) provided by the Norwegian Directorate of Health is of great value.

We furthermore gratefully acknowledge the excellent technical work performed by Marie Paulsen Madsen, Anne Maria Lund, Elisabeth Vikse, Rasmus Riis Kopperud, Malene Strøm Dieseth, Johanna Tonstad, Magnhild Sekse Erdal and Marianne Morken.

With best regards,

Karoline Bragstad, Trine Hessevik Paulsen, Elina Marjukka Seppälä, 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

11 February 2022

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, and, during the COVID-19 pandemic, SARS-CoV-2 testing stations.

Registry-based surveillance of influenza hospitalisations

Prior to 2020-2021, there was concern that influenza and COVID-19 epidemics could coincide. In the 2020-2021 season, a temporary registry-based system for daily surveillance of influenza hospitalisations was established and run in parallel to the laboratory-based system used in previous seasons in order to strengthen the surveillance. In this registry-based system, individual-level data originating from the Norwegian Patient Registry (NPR) was used. Influenza hospitalisations were defined as inpatient hospital admissions combined with ICD-10 codes for influenza (J09-J11). For the 2021-2022 season, the previously used laboratory-based surveillance was discontinued. To enhance the specificity of the registry-based surveillance, the data on hospital discharge codes from NPR is now linked to data on PCR tests positive for influenza, which is obtained from the Norwegian Surveillance System for Communicable Diseases (MSIS) laboratory database. Case-based data on PCR-positive influenza tests is available from season 2020-2021 onward. A patient hospitalised with influenza is defined as a person who has an influenza-related diagnosis code registered in NPR, who has been hospitalised overnight, and who has tested positive for influenza with a PCR test within 14 days before or up to 2 days after hospital admission. 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. Up to the 2020-2021 season, only anonymised data were reported from NICR to the NIPH. In the season 2021-2022 the NIPH has begun to receive case-based data on a weekly basis.

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, and only a subset of the 2021 were tested against influenza.

Vaccine distribution and coverage

Distribution data is gathered from Department of Infection Control and Vaccine at NIPH and from IQVIA Solutions (distribution from other wholesalers). Vaccine coverage data is gathered from the Norwegian immunisation registry SYSVAK. SYSVAK is a national, electronic immunisation registry that records an individual's vaccination status and vaccination coverage in Norway. It is mandatory to register all influenza vaccination. However, the last years the rate of registration has been around 75 % of the doses distributed (adjusted for the number of discarded doses). Coverage rates from SYSVAK is therefore minimum rates.

Coverage rate for people in risk groups under 65 years is captured from the emergency preparedness register for COVID-19 (Beredt C19). Beredt C19 includes information that has already been collected in the healthcare service, national health registries and medical quality registers, as well as other administrative registers with information about the Norwegian population.

Published by the Norwegian Institute of Public Health
February 2022
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/