

Prevalence of protective antibodies against influenza in Portugal

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1. Influenza and Respiratory viruses surveillance

Sentinel and non-sentinel networks



Sentinel

- General practitioner (GP) network
- Primary care health units
- Intensive care units network



Non-Sentinel

Portuguese Laboratory Network for the Diagnosis of Influenza and Other Respiratory Viruses (Hospitals)
Despacho nº 4843/2023 (DR, 2ª série, 21 abril)



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Sera collection



2. Portuguese serological studies



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Objectives

To assess the:

- Annual seroprevalence for seasonal influenza viruses
- Cross-protection and seroprevalence for influenza new variants
- Acquired immunity after vaccination and waning immunity

3. Study design



Repeated Cross-sectional



Annual seroprevalence for seasonal
influenza viruses

Cross-protection and seroprevalence for
influenza new variants

Longitudinal Cohort



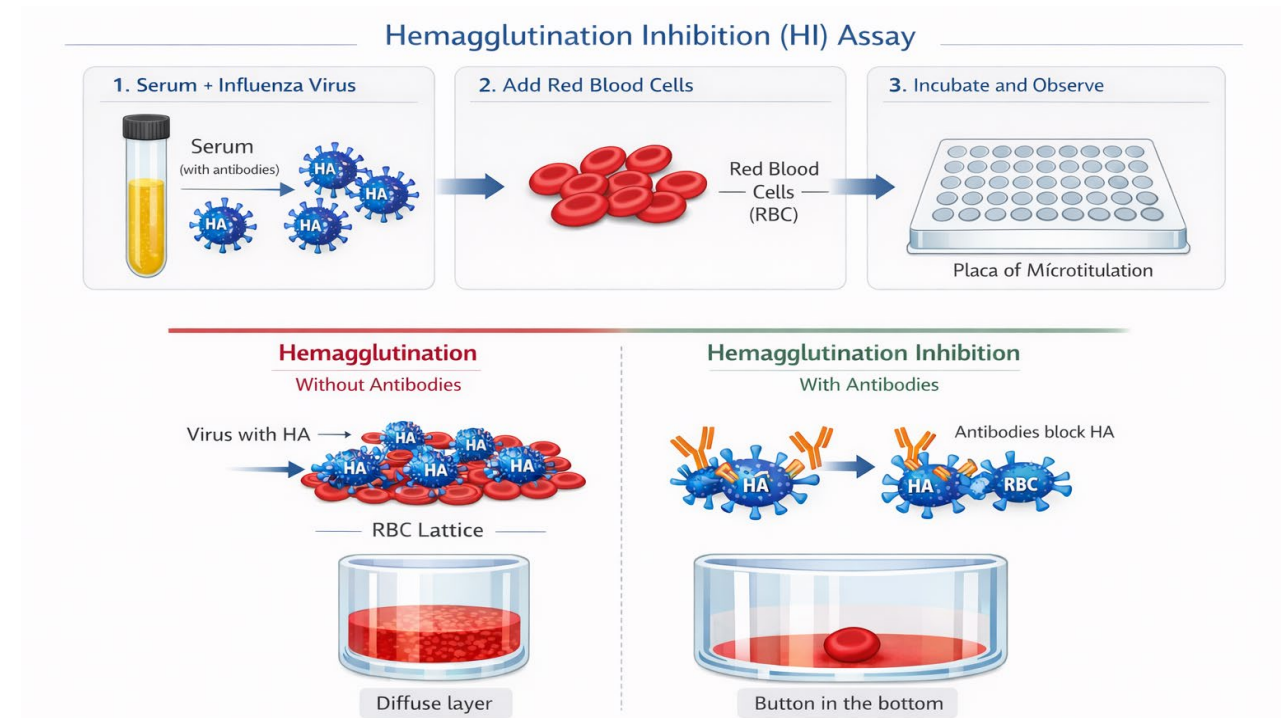
Acquired immunity **after vaccination** and
waning immunity

4. Laboratory methods



Hemagglutination inhibition assay (HAI)

- Serological test that quantifies virus-specific antibodies in serum by measuring their ability to inhibit the hemagglutination of red blood cells caused by viral hemagglutinin proteins.
- Measures the antibody titer that completely inhibits the hemagglutination of virus and RBC
- HAI titer $\geq 1:40$ is considered protective



Author-generated illustration created with AI (2026)

4. Laboratory methods

Hemagglutination inhibition assay (HAI) - Check points



- **Red blood cells** – fresh, wash, concentration
- **Antigen** – titration and dilution (4HA units), backtitration
- **Sera** – storage, RDE treatment
- **Plates** – proper handle
- **Incubation** – timing and temperature
- **Controls** – valid
- **Read** – double reading

5. Key findings



Repeated Cross-sectional studies

Repeated Cross-sectional



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Cross-protection and seroprevalence for
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Longitudinal Cohort



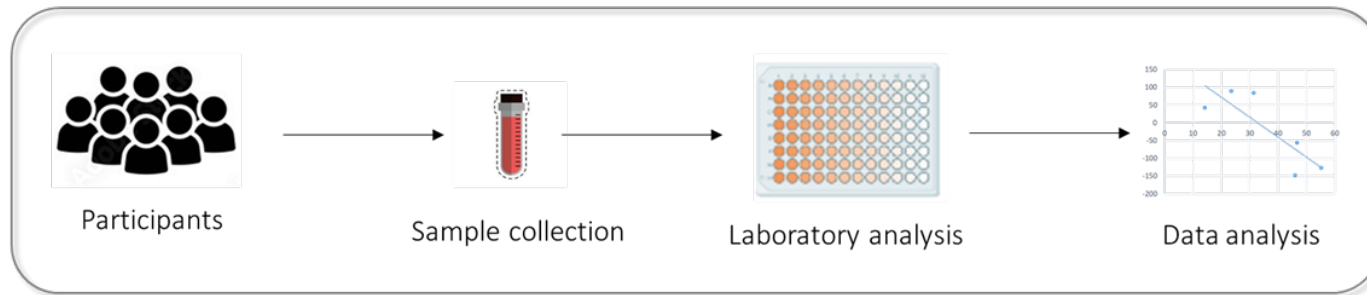
Acquired immunity **after vaccination** and
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5. Key findings



Annual seroprevalence for seasonal influenza viruses

Annual cross-sectional study



- Sera selected annually
- Non-probabilistic sampling of residual sera
- Hospital/laboratories
- Both sexes, covering all age groups (0-4, 5-14, 15-44, 45-64 and 65+) and regions
- ~ 1000-1500 sera/year

5. Key findings



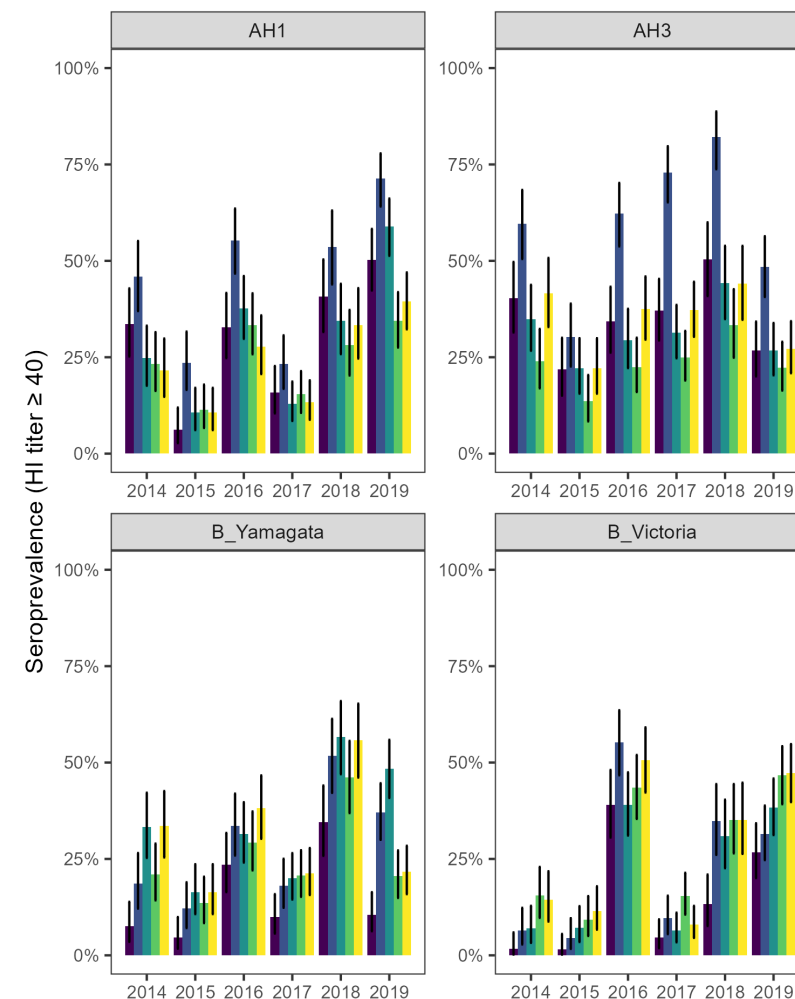
Annual seroprevalence for seasonal influenza viruses

Seroprevalence of Protective Antibodies Against Influenza and the Reduction of the Influenza Incidence Rate: An Annual Repeated Cross-Sectional Study From 2014 to 2019

Raquel Guiomar¹ | Susana Pereira da Silva² | Inês Costa¹ | Patricia Conde¹ | Paula Cristóvão¹ | Ana Paula Rodrigues² |

Influenza and Other Respiratory Viruses, 2024; 18:e13307 1 of 13
<https://doi.org/10.1111/irv.13307>

- Seroprevalence and GMT were significantly **different for each influenza virus**
- **Significant differences** in the seroprevalence of protective antibodies against influenza were observed in the population, mainly according to **age**, **vaccination status**, and **geographic region**

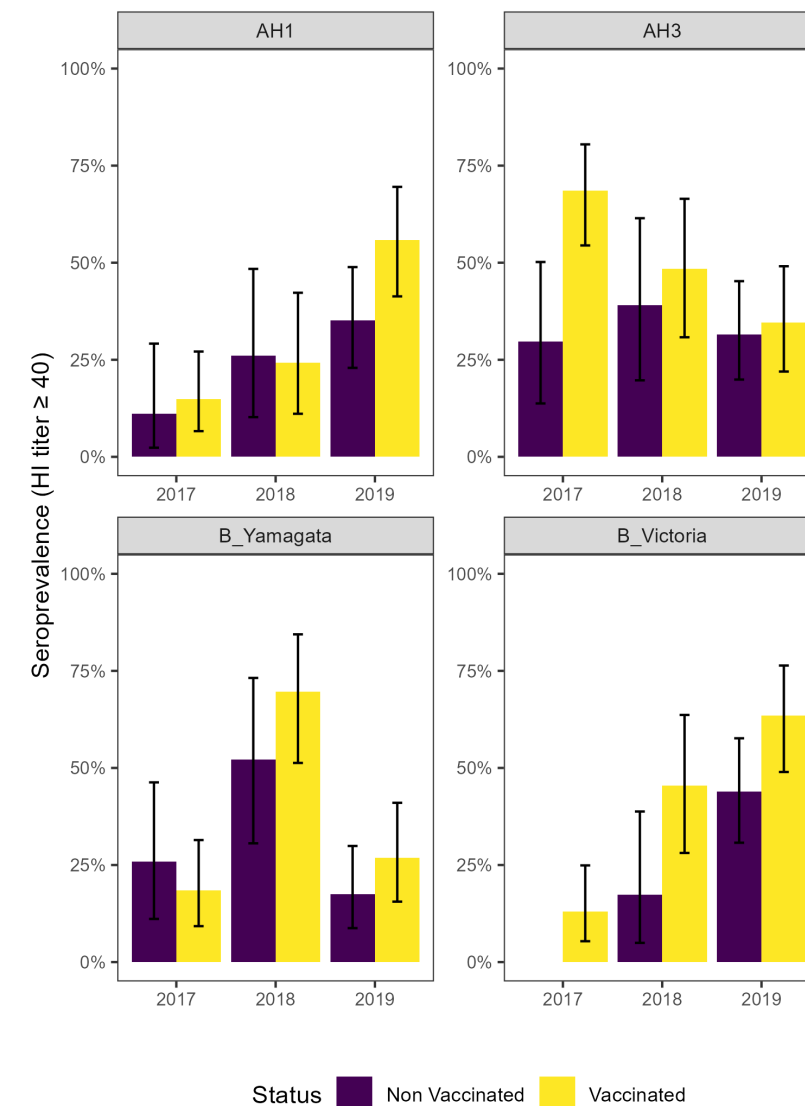


5. Key findings



Annual seroprevalence for seasonal influenza viruses

- In target group for vaccination **65+ years**, influenza vaccine provided higher antibody levels compared to unvaccinated ones
- Study provided a new insight into the relationship between the **seroprevalence of protective antibodies against influenza and the reduction of the ILI incidence** rate in the next season and the importance of acquired immunity in preventing new epidemics
- A **strong negative and significant correlation** between seroprevalence and influenza incidence rate for A(H1N1) in children between 5 and 14 yo



5. Key findings



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Longitudinal cohort study

Repeated Cross-sectional



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Acquired immunity **after vaccination** and
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Longitudinal cohort study



vaccines



Article

Immune Response Against Influenza in a Cohort of Repeatedly Vaccinated Adults During the 2017/2018 and 2018/2019 Seasons

Raquel Guiomar ^{1,2,*}, Susana Pereira da Silva ³, Ana Paula Rodrigues ³, Inês Costa ¹, Patrícia Conde ¹, Paula Cristóvão ¹, Pedro Pechirra ¹, Paulo Estragadinho ⁴, Kamal Mansinho ⁵, Olav Hungnes ⁶, António Silva Graça ⁴ and Baltazar Nunes ^{2,3}

Vaccines **2024**, *12*, 1218. <https://doi.org/10.3390/vaccines12111218>

October/2017
November/2018

November/2017
December/2018

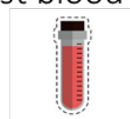
May/2018
June/2019



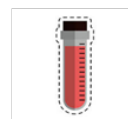
Seasonal Influenza vaccine
2017/18 and 2018/19

ILI symptoms

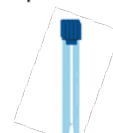
Vaccination
1st blood sample



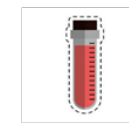
2nd blood sample



Nasopharyngeal swab



3rd blood sample



Classified as ECDC NORMAL

- Participants were vaccinated with **TIV**
- **Blood collection** in three time points per season: pre-vaccination, 1 and 6 months post-vaccine
- **Nasopharyngeal swabs** if respiratory symptoms were self-reported

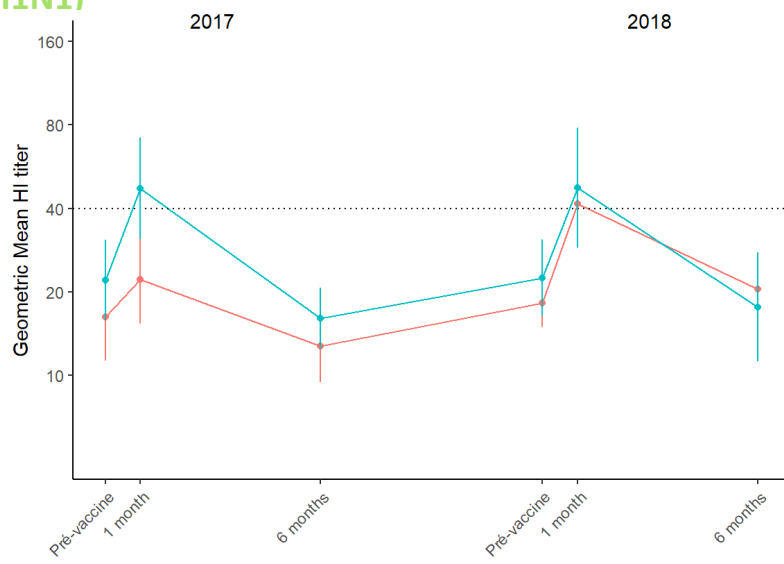
5. Key findings



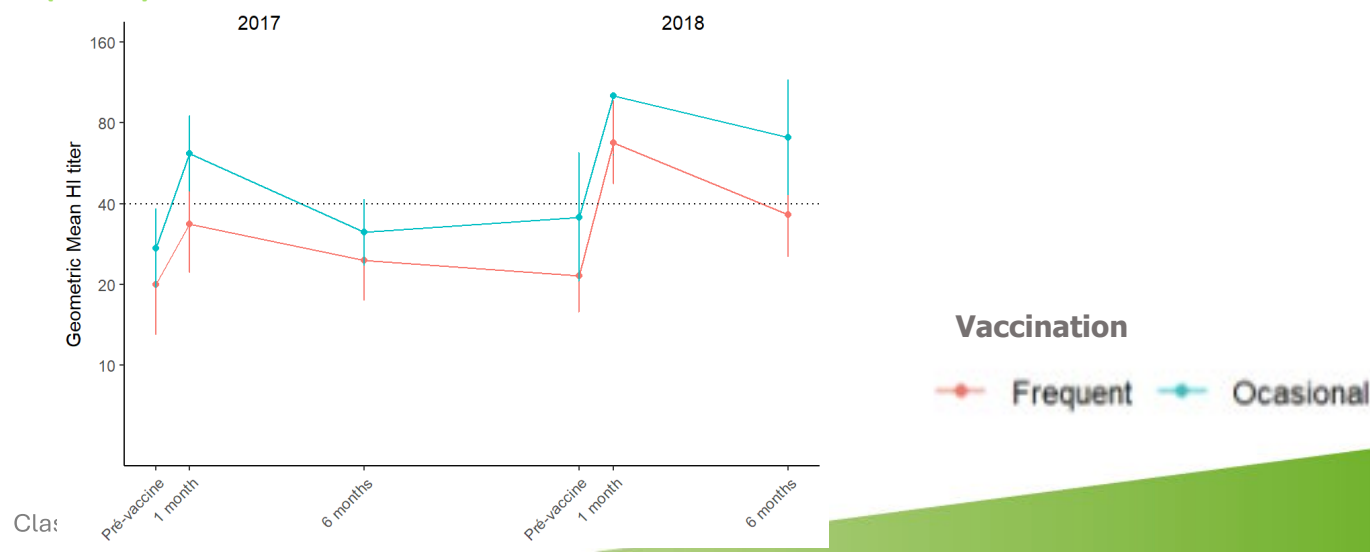
Longitudinal cohort study

- Serological response following the vaccination was influenced by vaccination history
- Annual influenza vaccination re-establish and maintain antibody titers against influenza A and B
- Repeated seasonal vaccination was associated with a reduction in the immunological response against influenza A
- Repeated vaccination resulted in higher seroprevalence and antibody titer for Influenza B

A(H1N1)



A(H3N2)



5. Key findings



Repeated Cross-sectional studies

Repeated Cross-sectional



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Cross-protection and seroprevalence for influenza new variants

RAPID COMMUNICATION

Cross-sectional study on protective antibodies against influenza A virus subtypes and cross-protection against influenza A(H3N2) subclade K, Portugal, August 2025

Raquel Guiomar¹, Camila Henriques¹, Susana Pereira da Silva², Licínia Gomes¹, Daniela Dias¹, Nuno Verdasca¹, Portuguese Laboratory Network for the Diagnosis of Influenza and Respiratory Viruses³, Baltazar Nunes⁴, Ana Paula Rodrigues²

Euro Surveill. 2026;31(6):pii=2600070. <https://doi.org/10.2807/1560-7917.ES.2026.31.6.2600070>

Aims:

- To estimate the prevalence of protective antibodies against the seasonal influenza A(H1N1)pdm09 and A(H3N2) viruses
- **To estimate the cross-protection and seroprevalence for new variant A(H3N2) subclade K**
- To estimate seroprevalence by age group and vaccination status in the previous season

5. Key findings



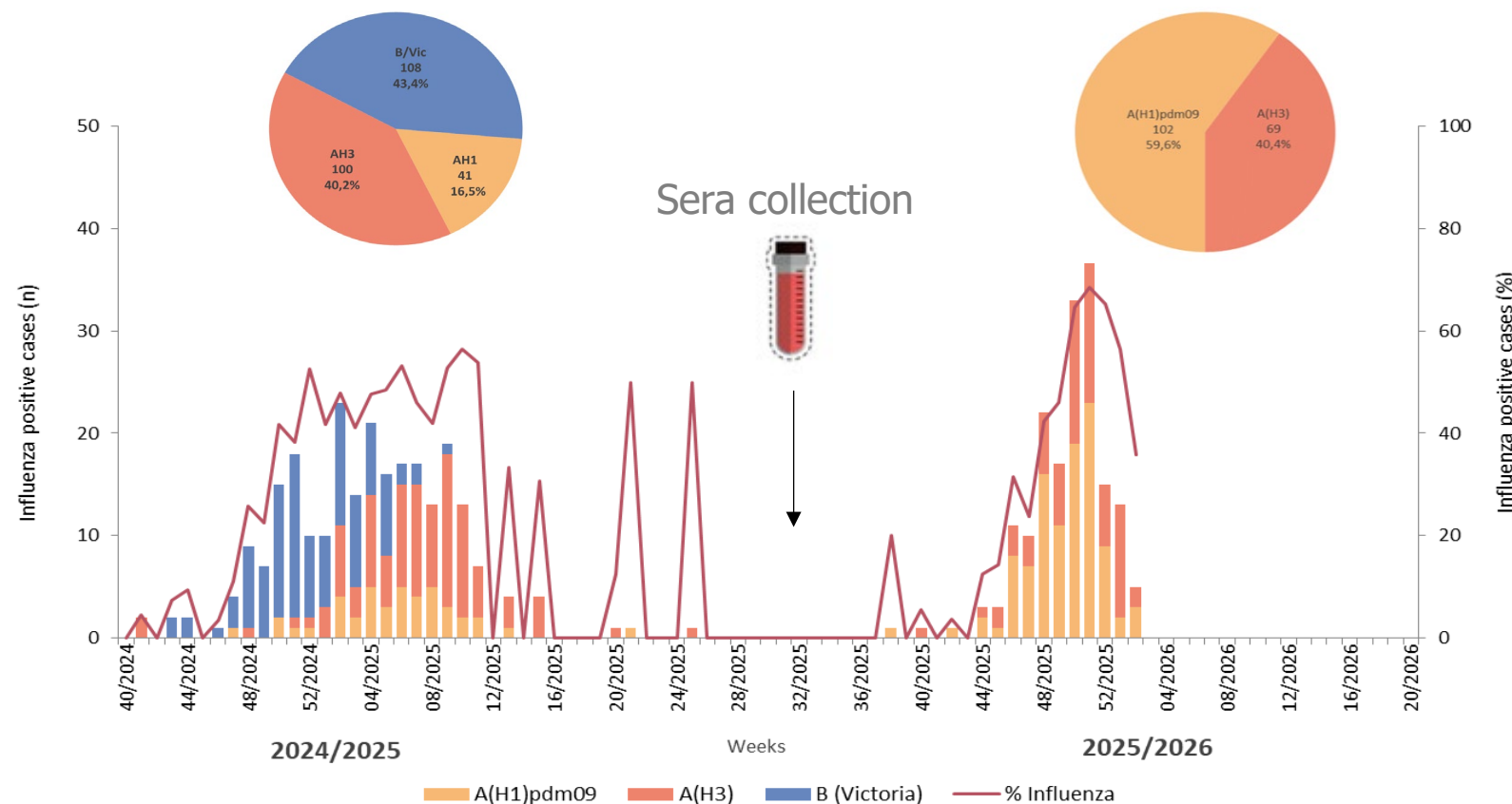
Cross-protection and seroprevalence for new variant A(H3N2) subclade K

2024/25 season:

- co circulation influenza A(H1N1)pdm09, A(H3N2) and Influenza B

2025/26 season:

- co circulation influenza A(H1N1)pdm09 and A(H3N2)
- New subclade A(H3N2) K**



5. Key findings

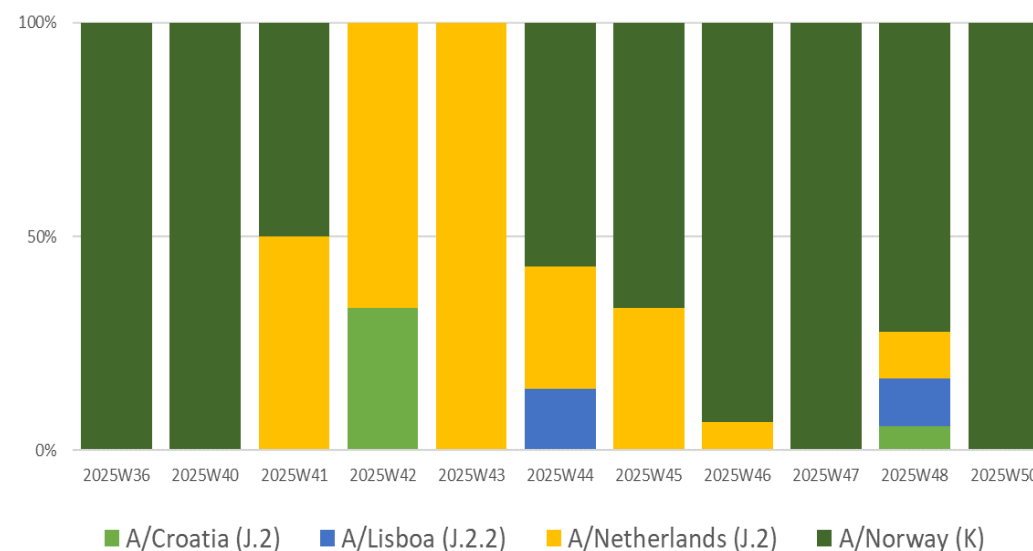
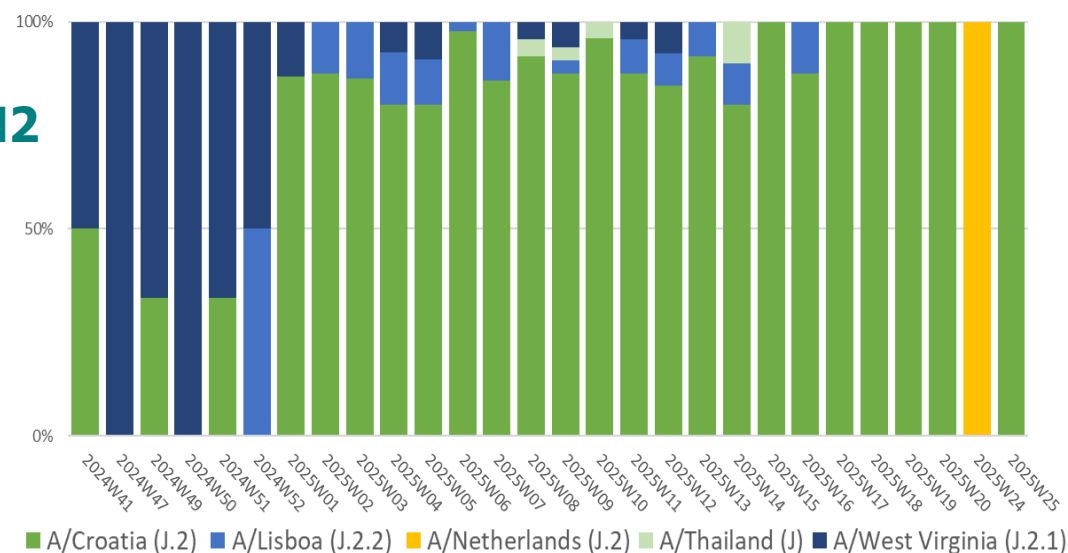


Cross-protection and seroprevalence for new variant A(H3N2) subclade K



First A(H3N2) subclade K in week 36/2025

AH3N2



5. Key findings



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Cross-protection and seroprevalence for new variant A(H3N2) subclade K

Tested viruses

A(H1N1) pdm09

- A/Victoria/4897/2022- (H1N1)pdm09-like 5a.2a.1(D)
- A/Missouri/11/2025- like (A(Lisboa/695/2025 EPI_ISL_20279799) 5a.2a.1 (D.3.1)

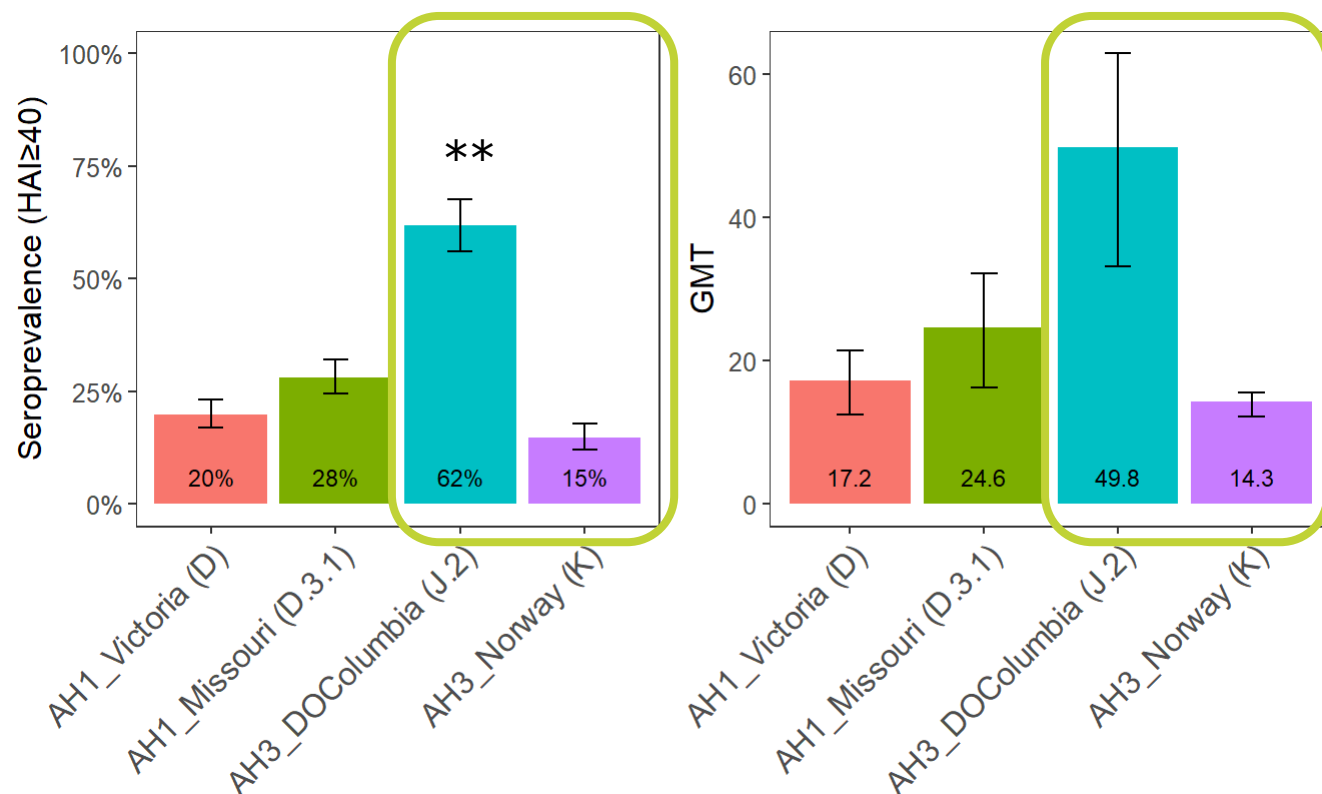
A(H3N2) pdm09

- A/District of Columbia/27/2023 (H3N2)-like virus 2a.3a.1(J.2)
- A/Norway/8765/2025- like (A/Lisboa/711/2025, EPI_ISL_20279659) 2a.3a.1(K)

5. Key findings



Cross-protection and seroprevalence for new variant A(H3N2) subclade K



- Highest seroprevalence and GMT against A(H3N2), A/District of Columbia/27/2023 (J.2)
- Lowest seroprevalence was observed against A/Norway/8765/2025, subclade K

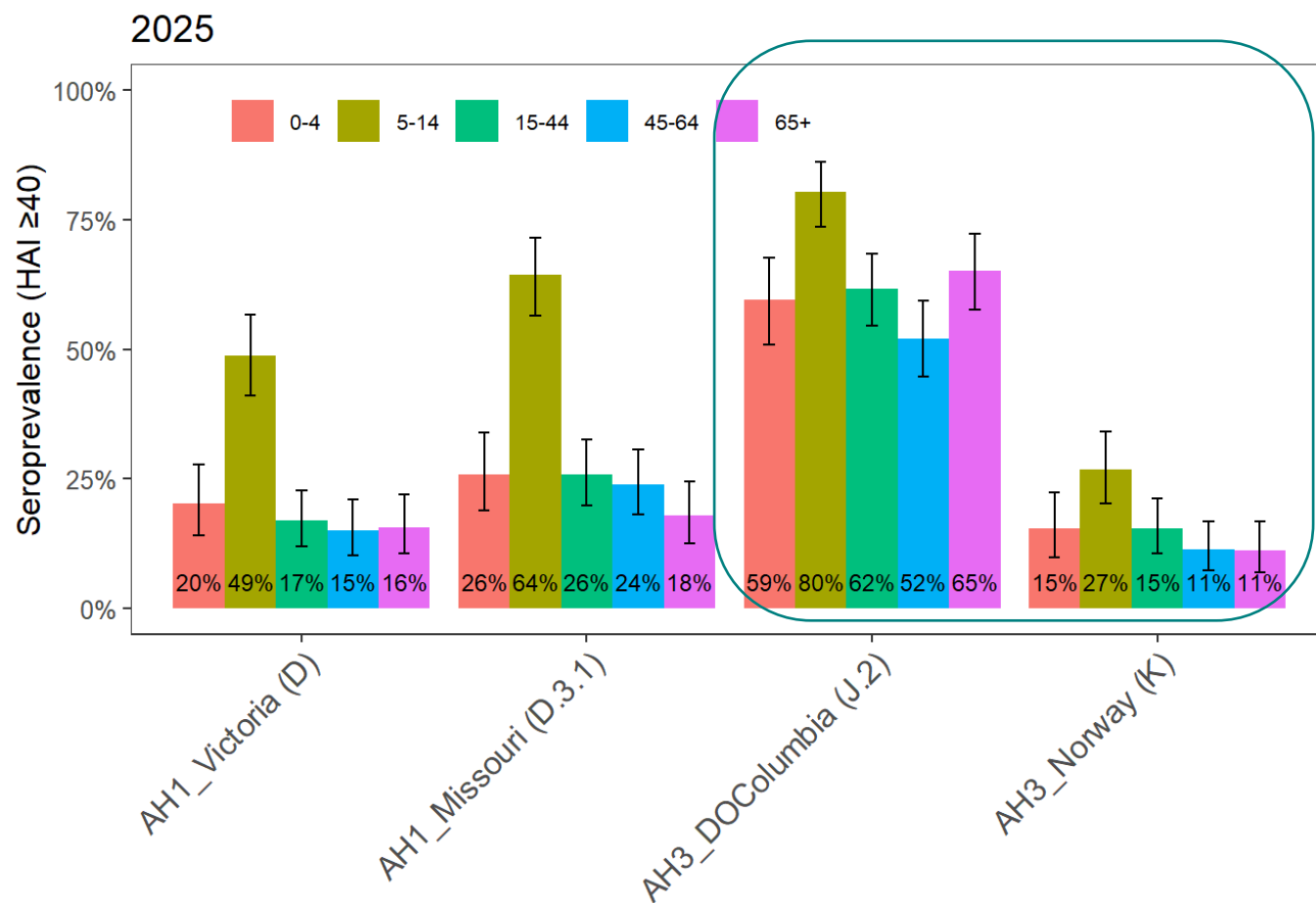
HAI≥40:

** AH3_A/District of Columbia/27/2023
22% had antibodies against
A/Norway/8765/2025, subclade K

5. Key findings



Cross-protection and seroprevalence for new variant A(H3N2) subclade K



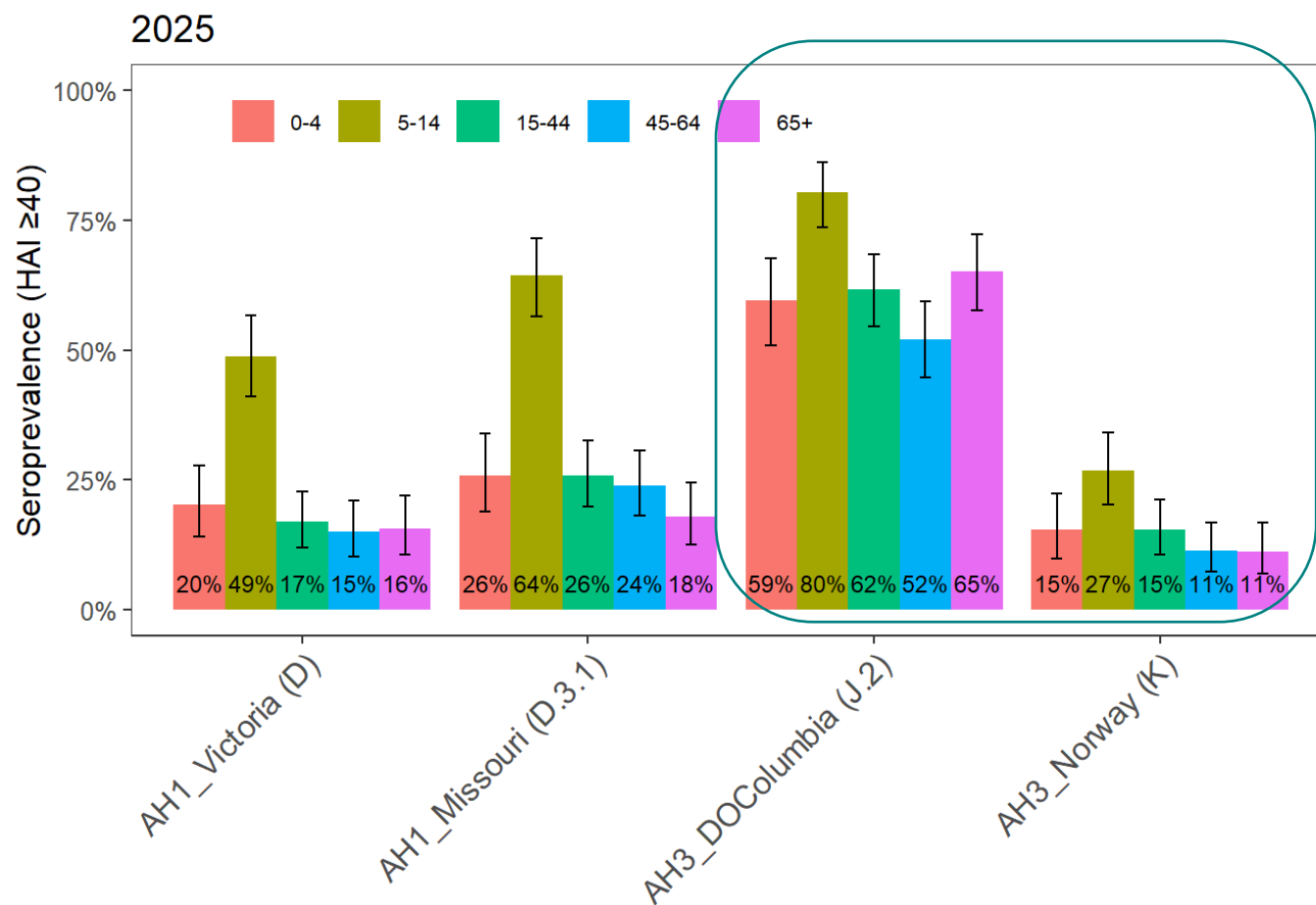
A(H3N2), A/District of Columbia/27/2023 (J.2)

- Seroprevalence was higher than 50% in all age groups.
- Highest seroprevalence was found in 5-14 age group

5. Key findings



Cross-protection and seroprevalence for new variant A(H3N2) subclade K



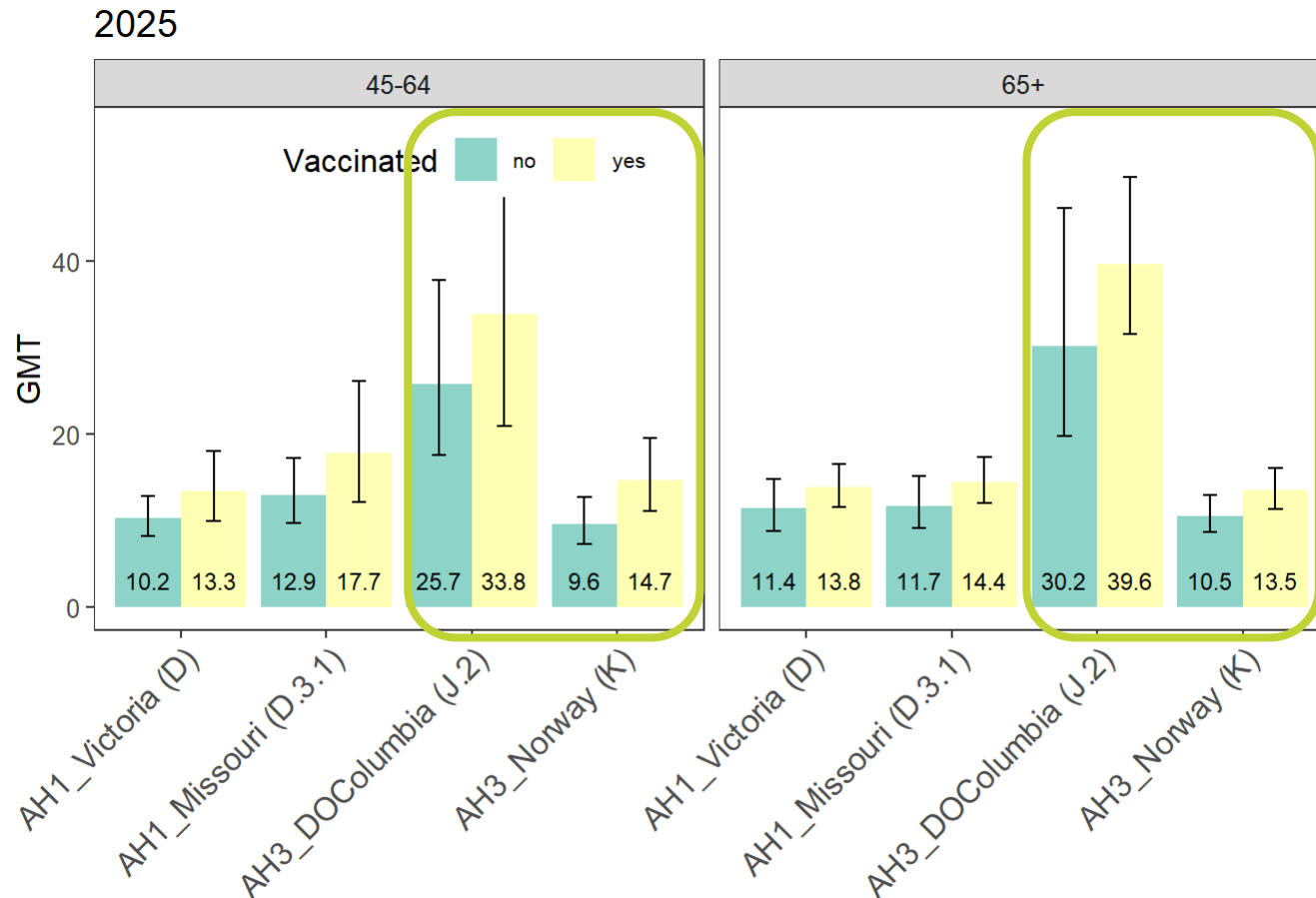
A(H3N2), A/Norway/8765/2025 subclade K

- Highest seroprevalence was found in 5-14 age group, 1.7 times higher than 0-4 age group
- Lowest seroprevalence was observed in the adults older than 45 years

5. Key findings



Cross-protection and seroprevalence for new variant A(H3N2) subclade K



Seroprevalence by vaccination status in previous season

- Seroprevalence against the new influenza A(H3N2) subclade K was 2.8 and 4.0 times higher than in vaccinated than in the non-vaccinated
- Higher GMT in vaccinated than in non-vaccinated

5. Key findings



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Cross-protection and seroprevalence for new variant A(H3N2) subclade K

Conclusions

- Detection of **cross-reactive antibodies** against the newly emerged **A(H3N2) subclade K viruses**, as well as protective antibodies against circulating influenza A viruses
- Highest seroprevalence and GMT against A(H1N1)pdm09 and A(H3N2) viruses was observed in **children aged 5-14 years**
- **Higher seroprevalence** and titer of protective antibodies against influenza A(H1N1)pdm09 and A(H3N2) were observed in previous season **vaccinated individuals 45-64 and 65 and over**, compared to non-vaccinated
- **Vaccination** seemed to be an advantage in the extent of detectable antibodies against circulating and cross-reactive antibodies against the new influenza strains



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Acknowledgements

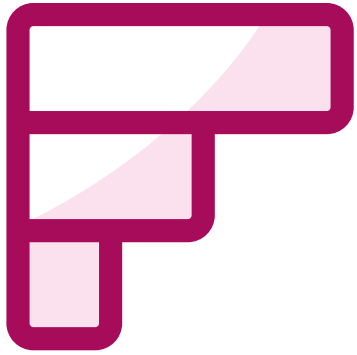
National Reference Laboratory for Influenza and Other Respiratory Viruses Team (INSA)
Department of Epidemiology
Portuguese Laboratory Network for Influenza and Respiratory Virus Diagnosis



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Slido questions



**In your opinion, which
serological studies should be
prioritised?**