Influenza in ~~2025~~ 2026: a program at the crossroads

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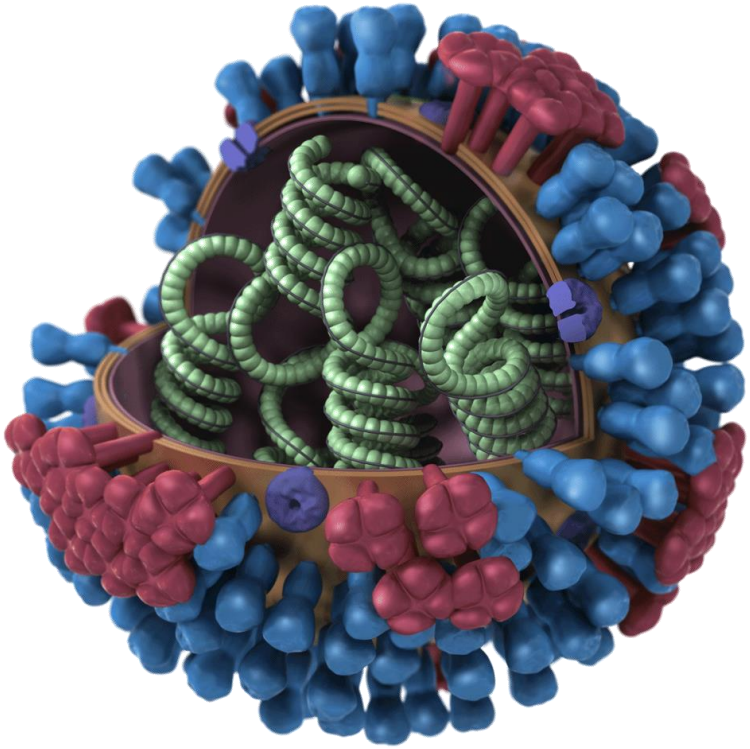
Summary

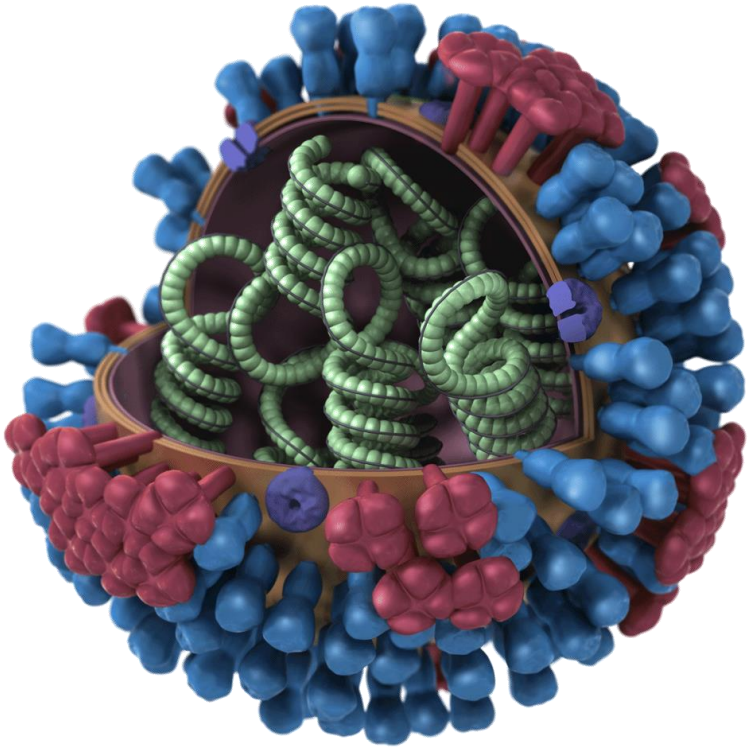
- The virus
- Fast flu facts
- Live attenuated influenza vaccine
- FAQs

The virus



- Family of enveloped RNA viruses with a segmented genome
  - Influenza A – strain shift and drift
  - Influenza B – strain drift
  - Influenza C – rarely causes disease
- Unique features
  - Haemogglutinin
  - Neuraminidase
  - Segmented genome

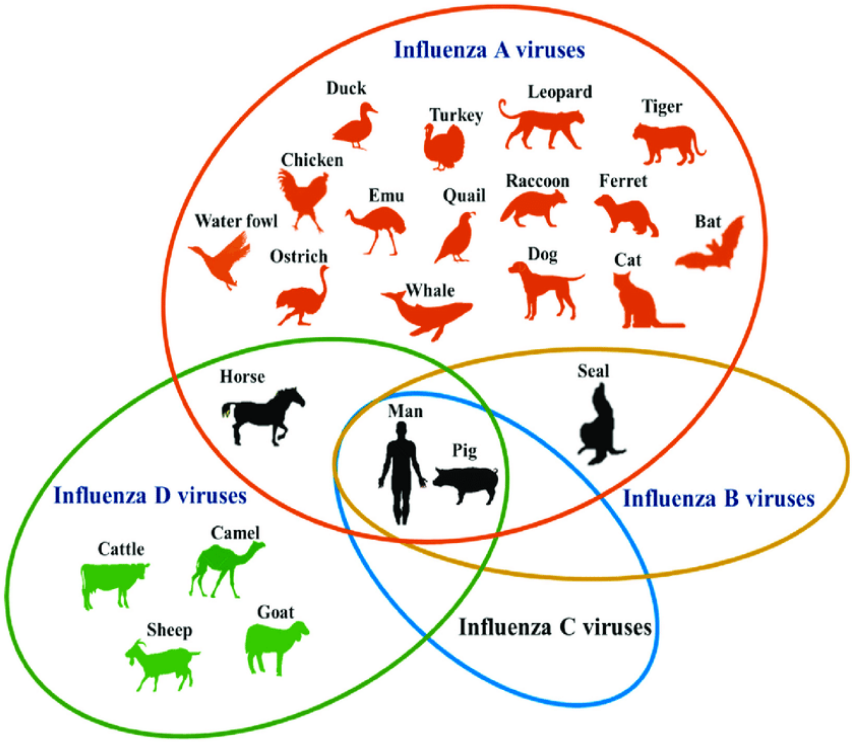
The virus



- RNA polymerases lack the ability to proof-read
  - Mutations occur more frequently with RNA viruses
- Mutations result in periodic changes in haemogglutinin: **Strain drift**
- Strain drift makes immunity short lived: **annual epidemics**

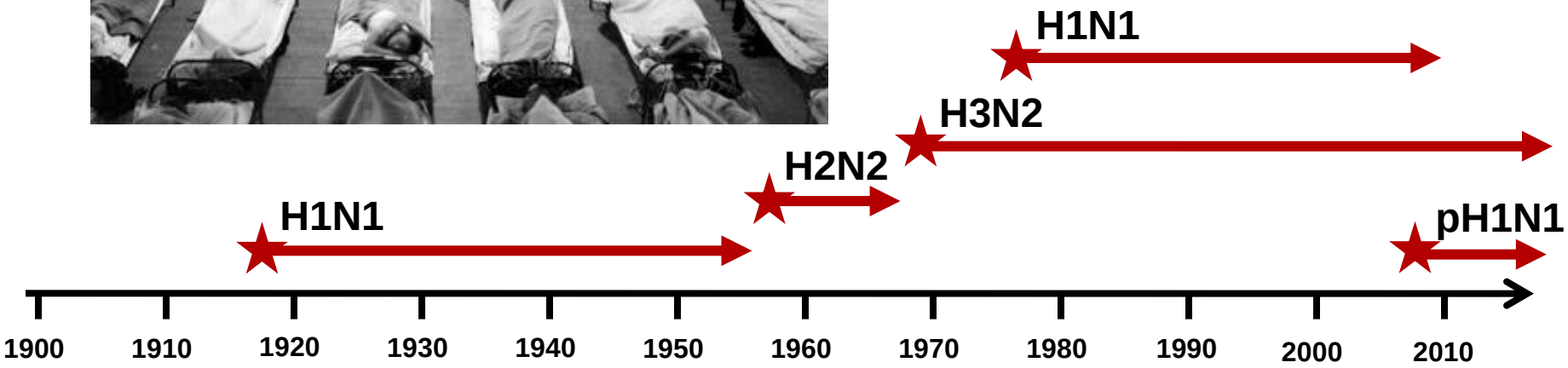
The virus

- A segmented genome allows the genetic reassortment of the influenza genome: **Strain shift**

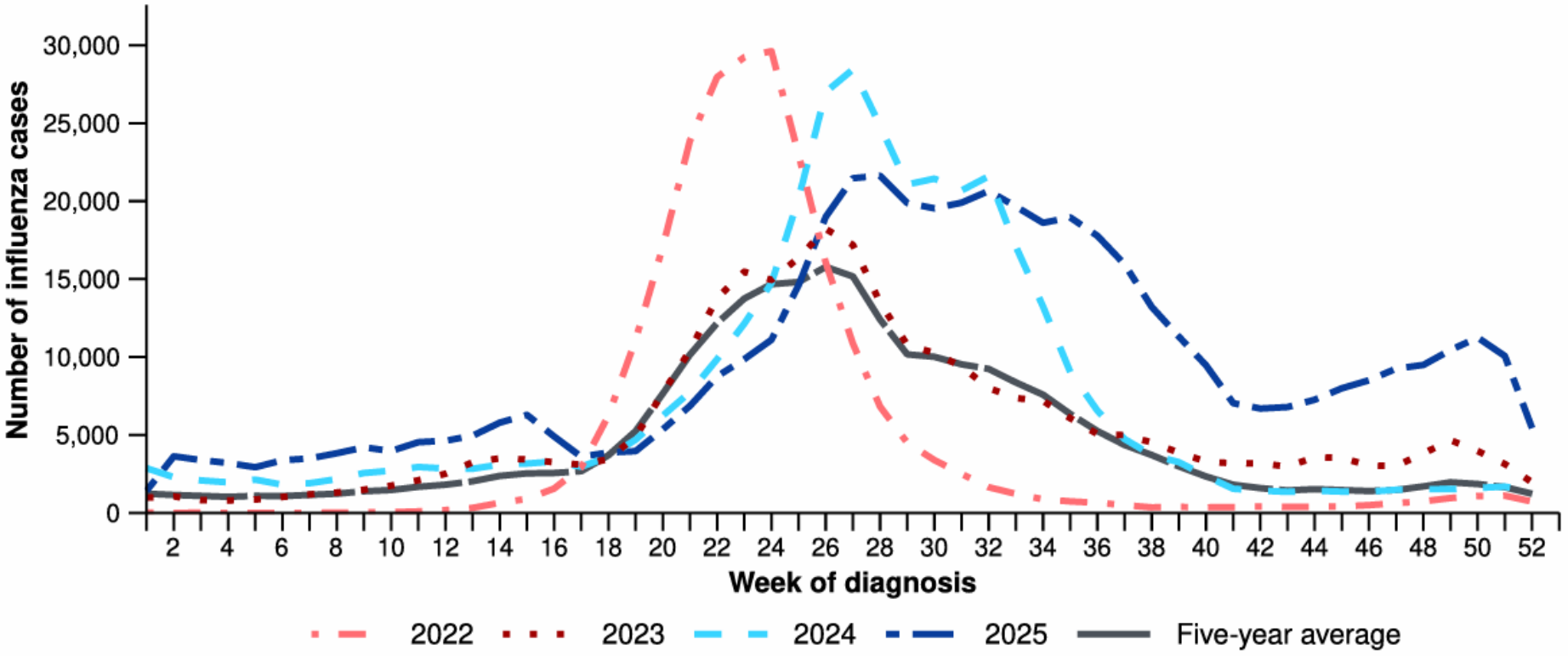


The virus

- No (little) protective immunity exists against new reassorted viruses: **episodic pandemics**



The virus



Source: National Notifiable Diseases Surveillance System (NNDSS)
* The years 2020 and 2021 are excluded when comparing the current season to historical periods when influenza virus has circulated without public health restrictions. As such, the five-year average includes the years 2018 to 2019 and 2022 to 2024. Please refer to the Technical Supplement for interpretation of the five-year average.

Fast fact #1

Our most common vaccine preventable disease

Australia

Lab-confirmed cases:
>500,000
Hospitalisations: >20,000
Deaths: >1000 each year

In Children:
Cases: >200,000
Hospitalisations: 5-10,0000
Deaths: every year

WA

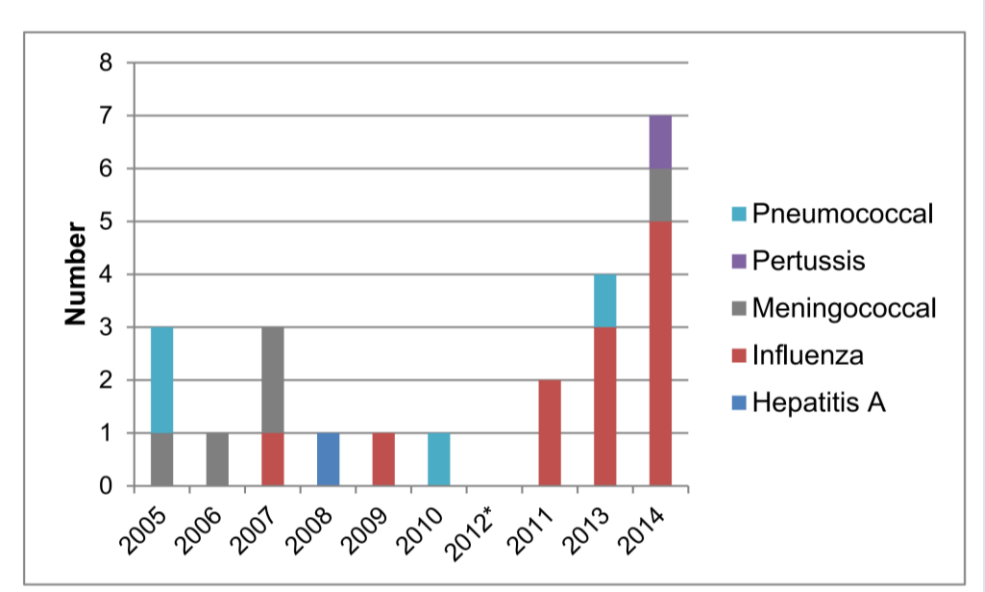
Lab-confirmed cases:
>37,000
Hospitalisations: >2,000
Deaths: >100

In Children:
Cases: >13,000
Hospitalisations: 500-1000
Deaths: every year

NNDSS and WANIDD 2025 data; Nazareno AL et al, IoRV 2022

Fast fact #2

The most common vaccine-preventable cause of death



NCIRS NSW report, 2016

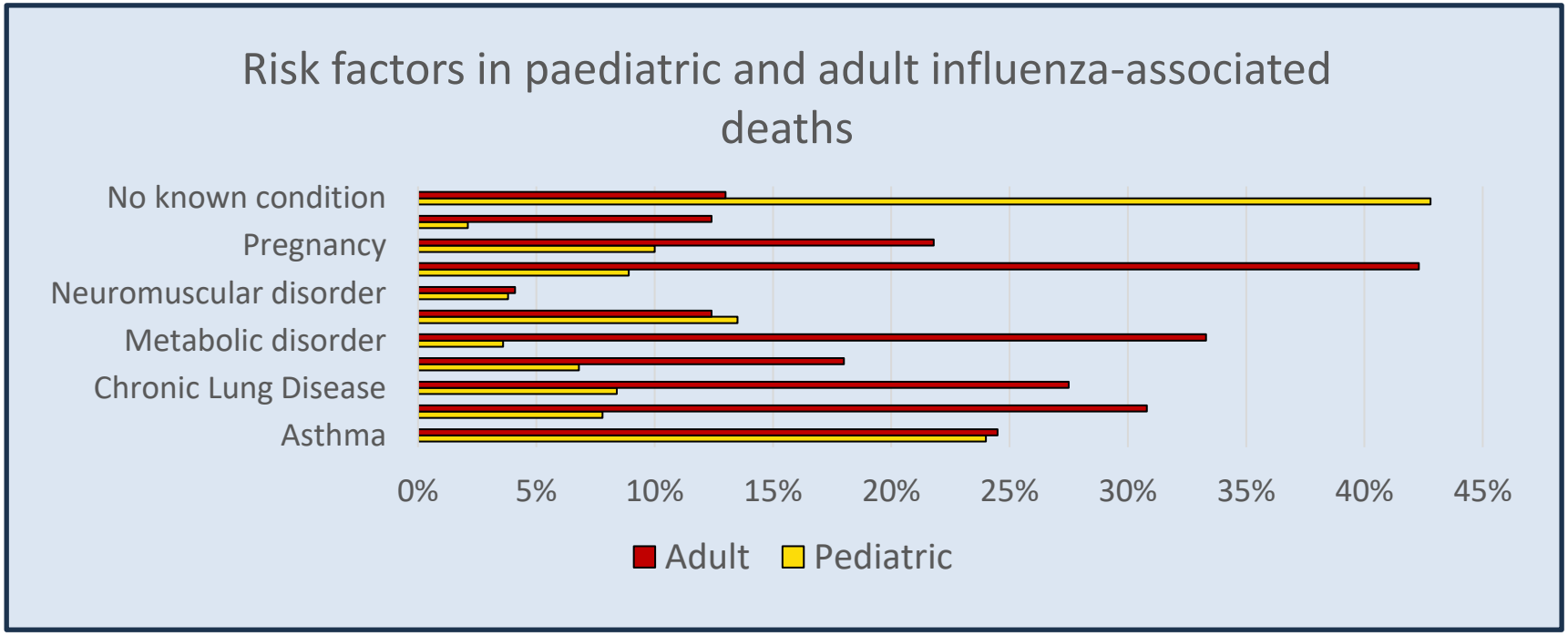
Who is at risk?

- We are all susceptible to influenza infection

- Specific populations are at greatest risk of morbidity and mortality
  - The young
  - The elderly
  - Those with underlying comorbid conditions
  - Pregnant people
  - Aboriginal people

Fast fact #3

Most severe outcomes in children occur in healthy children (as opposed to adults)



http://gis.cdc.gov/GRASP/Fluview/PedFluDeath.html

Fast fact #4

Flu vaccines keep children out of hospital

A flu vaccine prevents two in every three flu-related hospitalisation (and complications) in children

	Vaccinated cases	Unvaccinated cases	Vaccinated controls	Unvaccinated controls	Unadjusted VE (95% CI)	Adjusted VE* (95% CI)
All strains	**945**	**6,697**	**1,665**	**4,350**	**63.1% (59.7, 66.2)**	**65.6% (61.9, 69.0)**
A	728	5,039	1,665	4,350	**62.2% (58.4, 65.7)**	**64.6% (60.5, 68.3)**
H1N1	101	1,266	1,665	4,350	79.1% (74.3, 83.1)	79.3% (74.0, 83.4)
H3N2	177	904	1,665	4,350	48.8% (39.3, 56.8)	51.6% (40.8, 60.4)
B	208	1,565	1,665	4,350	**65.3% (29.7, 40.6)**	**68.6% (62.3, 73.9)**

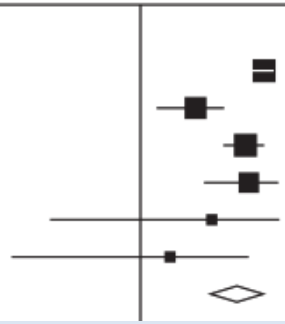
Rice E, submitted manuscript

Fast fact #4

Flu vaccines keep adults out of hospital

A flu vaccine prevents one in every two flu-related hospitalisation (and complications) in adults

	Test-positive cases		Test-negative controls		Vaccine effectiveness (95% CI)
	Vaccinated	Total	Vaccinated	Total	
Any influenza					
Australia	380	2856	541	1545	67·5% (60·8 to 73·0)
Brazil	127	509	643	2053	29·3% (8·8 to 45·1)
Chile	115	451	1313	2331	56·9% (44·8 to 66·3)
New Zealand	28	207	190	650	58·8% (34·5 to 74·1)
Thailand	7	154	36	580	38·8% (−49·1 to 74·9)
Uruguay	11	132	91	802	15·5% (−70·1 to 58·1)
Random-effects model					**51·9% (37·2 to 66·7)**

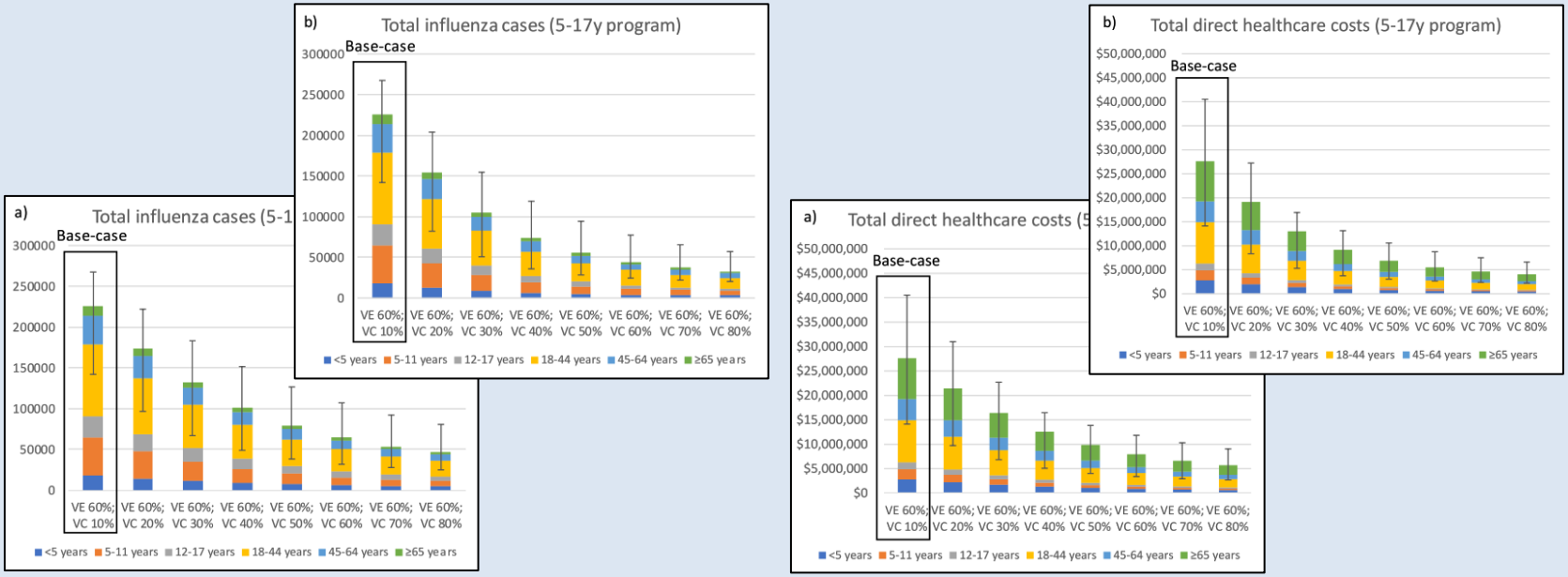


Gharpure R et al, Lancet Global Health 2025

Fast fact #5

Vaccinating children protects the community

Vaccinating children protects the family, protects grandparents, protects the community

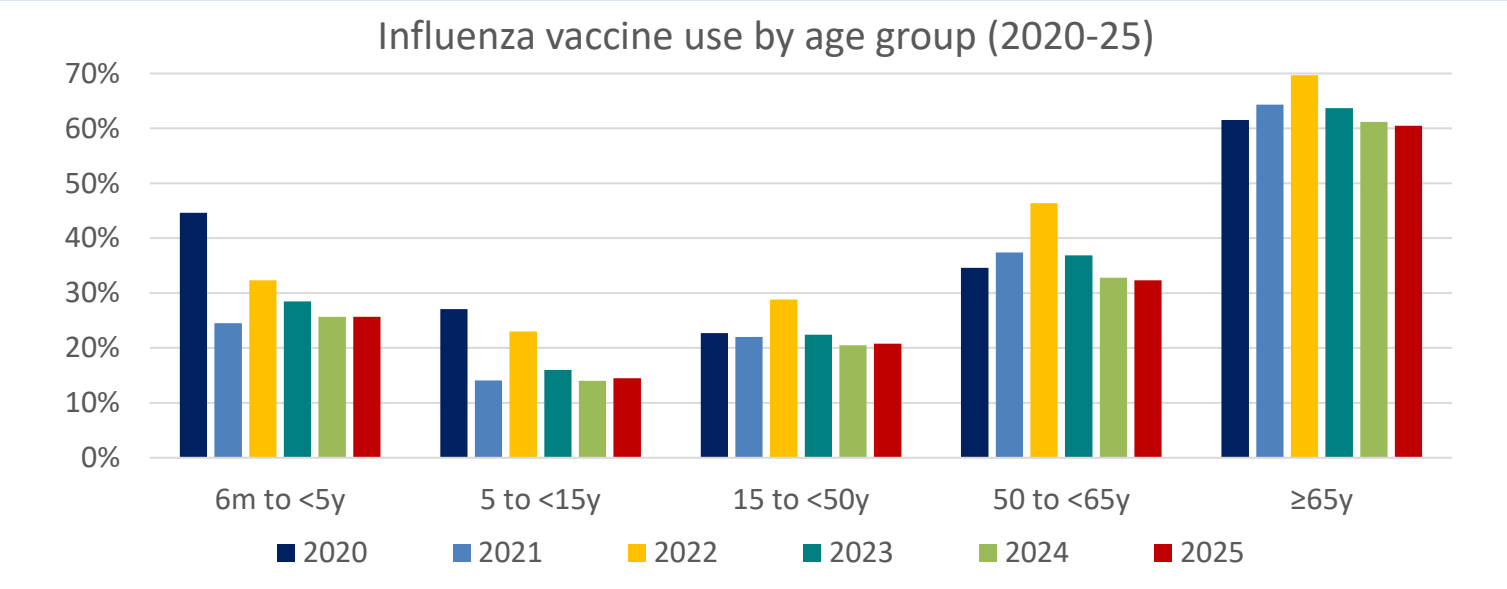


Blyth CC, Vaccine X 2023

Fast fact #6

What we are doing is not working

Despite clear evidence of burden, safety and efficacy, what we are doing is not working

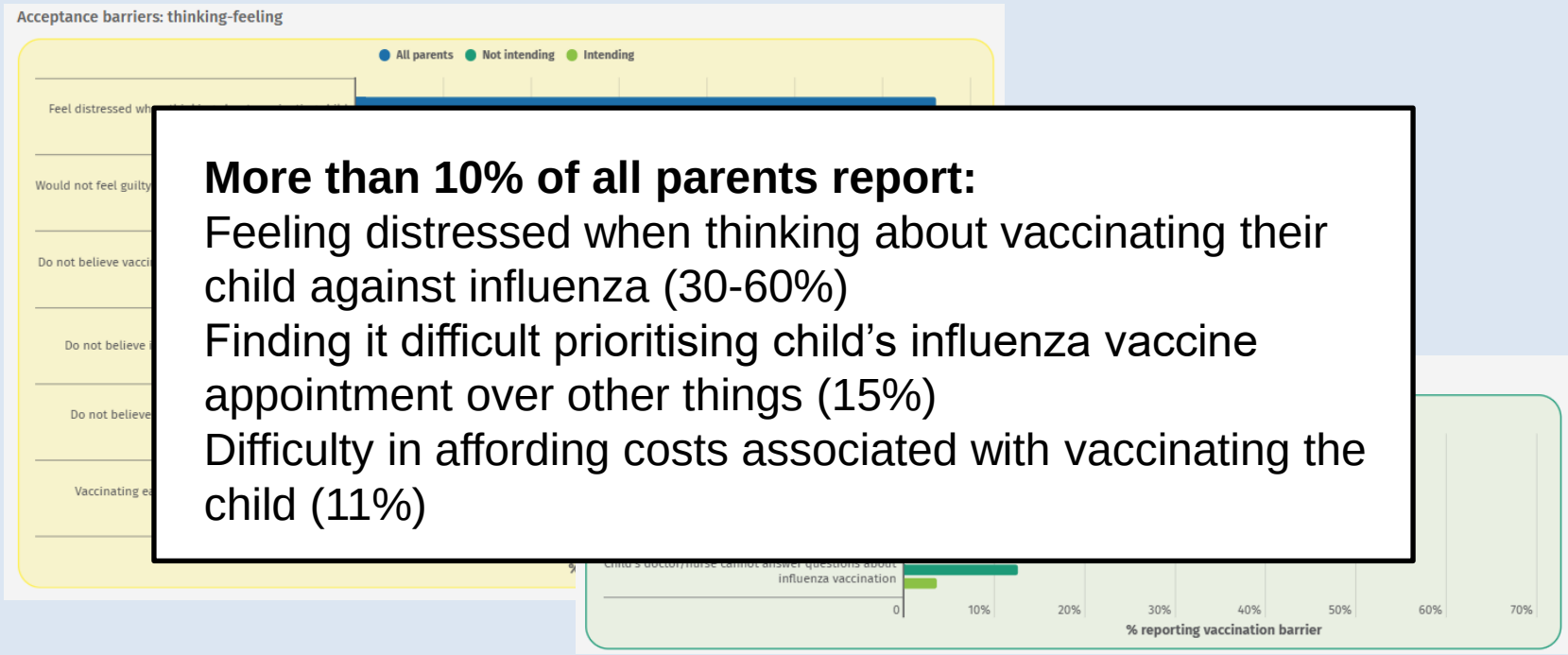


NCIRS vaccine coverage report 2025

Fast fact #6

Why children are not vaccinated is complicated

Numerous reasons why kids don't get a flu vaccine



More than 10% of all parents report:

Feeling distressed when thinking about vaccinating their child against influenza (30-60%)

Finding it difficult prioritising child's influenza vaccine appointment over other things (15%)

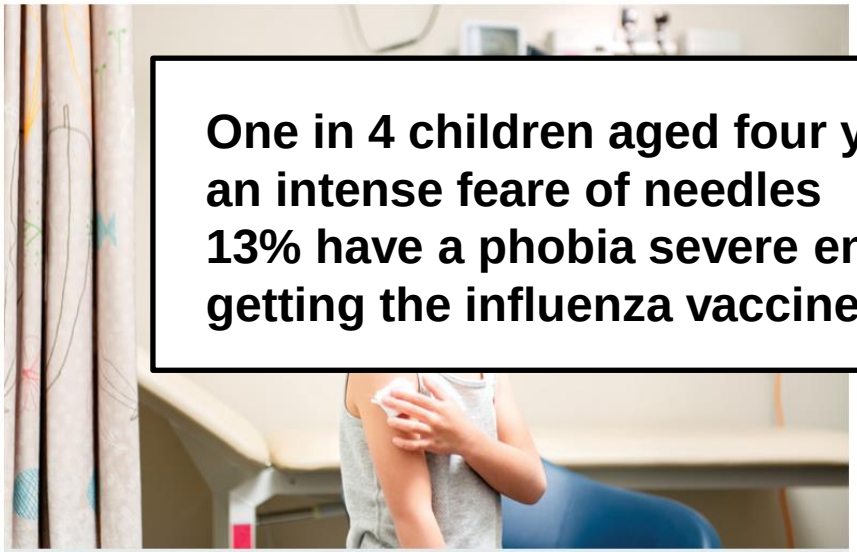
Difficulty in affording costs associated with vaccinating the child (11%)

NCIRS vaccine coverage report 2025

Fast fact #6

Why children are not vaccinated is complicated

Numerous reasons why kids don't get a flu vaccine



One in 4 children aged four year or more (27%) has an intense feare of needles
13% have a phobia severe enough to stop them getting the influenza vaccine

Flu vaccine plans: knowledge

Poll 37, May 2025

this season,

- 36% of parents don't know healthy children can get seriously unwell with the flu.
- Among parents not intending to vaccinate their child against the flu, almost three in four (71%) are not aware the flu vaccine is recommended every year.
- Most parents who plan to have their child vaccinated against flu would prefer the vaccine was available at school (84%).
- One in four children aged four years or more (27%) has an intense fear of needles and 13% have a phobia severe enough to stop them getting the flu vaccine.

https://rchpoll.org.au/wp-content/uploads/2025/05/NCHP37-Poll-report-A4_FA.pdf

Influenza vaccine recommended for

Everyone from the age of 6 months

Influenza vaccination recommended for (national)

- Children aged 6 months to 4 years
- Everyone from 6m with medical comorbidities
- All pregnant people
- All Aboriginal people
- Older Australians (aged ≥65 years)

Influenza vaccine recommended for

Primary school-aged children (5 to 11 years: state)

Healthcare workers (state)

Everyone from 6 months (state) – May and June

Fast fact #7

LAIV is safe and effective

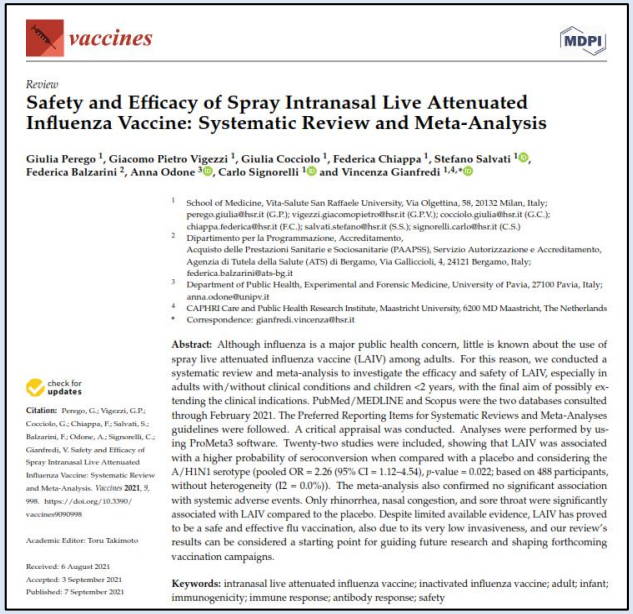
A live-attenuated intranasal vaccine (LAIV) has been used in the Northern Hemisphere for more than 20 years

- Three strains of virus – H1, H3 and B (in 2026)
- 6 of 8 genetic segments of the virus altered
- Attenuated to replicate at lower temperatures, so cannot replicate at body temperature
- Contained in a liquid sprayed in each nostril
- Licensed in Australia from age 2 to 17 years

Fast fact #7

LAIV is safe and effective

The intranasal vaccine has been shown to be both safe and effective



vaccines

MDPI

Review

Safety and Efficacy of Spray Intranasal Live Attenuated Influenza Vaccine: Systematic Review and Meta-Analysis

Giulia Perego [1], Giacomo Pietro Vigezzi [1], Giulia Cocciolo [1], Federica Chiappa [1], Stefano Salvati [1], Federica Balzarini [2], Anna Odone [3], Carlo Signorelli [1,4,*] and Vincenza Gianfredi [1,4,*]

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Abstract: Although influenza is a major public health concern, little is known about the use of spray live attenuated influenza vaccine (LAIV) among adults. For this reason, we conducted a systematic review and meta-analysis to investigate the efficacy and safety of LAIV, especially in adults with/without clinical conditions and children <2 years, with the final aim of possibly extending the clinical indications. PubMed/MEDLINE and Scopus were the two databases consulted through February 2021. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were followed. A critical appraisal was conducted. Analyses were performed by using ProMeta3 software. Twenty-two studies were included, showing that LAIV was associated with a higher probability of seroconversion when compared with a placebo and considering the A/H1N1 serotype (pooled OR = 2.26 (95% CI = 1.12–4.54), *p*-value = 0.022; based on 488 participants, without heterogeneity ($I2 = 0.0\%$)). The meta-analysis also confirmed no significant association with systemic adverse events. Only rhinorrhea, nasal congestion, and sore throat were significantly associated with LAIV compared to the placebo. Despite limited available evidence, LAIV has proved to be a safe and effective flu vaccination, also due to its very low invasiveness, and our review's results can be considered a starting point for guiding future research and shaping forthcoming vaccination campaigns.

Keywords: intranasal live attenuated influenza vaccine; inactivated influenza vaccine; adult; infant; immunogenicity; immune response; antibody response; safety

check for updates

Citation: Perego, G.; Vigezzi, G.P.; Cocciolo, G.; Chiappa, F.; Salvati, S.; Balzarini, F.; Odone, A.; Signorelli, C.; Gianfredi, V. Safety and Efficacy of Spray Intranasal Live Attenuated Influenza Vaccine: Systematic Review and Meta-Analysis. *Vaccines* **2021**, *9*, 998. https://doi.org/10.3390/vaccines9090998

Academic Editor: Toru Takimoto

Received: 6 August 2021
Accepted: 3 September 2021
Published: 7 September 2021

EXPERT REVIEW OF VACCINES
2025, VOL. 24, NO. 1, 703–725
https://doi.org/10.1080/14760584.2025.2536087

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META-ANALYSIS

OPEN ACCESS

Real-world effectiveness of live attenuated influenza vaccines (LAIV) and inactivated influenza vaccines (IIV) in children from 2003 to 2023: a systematic literature review and network meta-analysis

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ABSTRACT

Introduction: Circulating influenza strains, vaccine effectiveness (VE), and vaccine recommendations vary over time. A systematic literature review (SLR), random effects meta-analysis (REMA), and network meta-analysis (NMA) estimated absolute VE (aVE) and relative VE (rVE) of LAIV and IIV in children/adolescents from initial LAIV approval in 2003.

Methods: Northern Hemisphere studies (2003–2023) with children ≤19 yrs were included. A modified Newcastle-Ottawa Scale assessed risk-of-bias. REMA estimated aVE and three-node NMA (LAIV-IIV-unvaccinated) estimated rVE over three periods: 2003–04 to 2008–09 (pre-2009 A(H1N1) pandemic); 2010–11 to 2016–17 (post-2009 pandemic); 2017–18 to 2022–23 (post-LAIV strain-selection optimization).

Results: One hundred and nine studies included. aVE of LAIV and IIV against any influenza was similar (~50%) in each period. Effectiveness of LAIV vs. IIV against influenza types/subtypes was comparable except (1) greater effectiveness with IIV for A(H1N1) in 2010–11 to 2016–17 (rVE −46% [95% CI: −57, −33]); (2) greater effectiveness with LAIV for influenza B in 2017–18 to 2022–23 (rVE 196% [95% CI: 73, 406]). In 2017–18 to 2022–23, effectiveness of LAIV and IIV against A(H1N1) was similar (rVE 10% [95% CI: −35, 87]).

Conclusions: LAIV and IIV have demonstrated comparable effectiveness against any influenza in children.

ARTICLE HISTORY
Received 24 April 2025
Accepted 15 July 2025

KEYWORDS
A(H1N1); inactivated influenza vaccine; influenza; live attenuated influenza vaccine; vaccine effectiveness

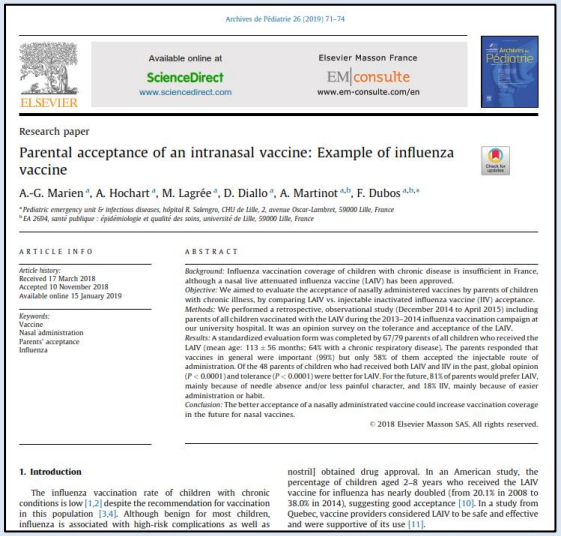
1. Introduction

Globally, approximately 20% of unvaccinated children are infected with an influenza virus each year [1]. Children and adolescents aged ≤19 years account for approximately 40% of influenza-related hospitalizations worldwide [2]; in the 2022–23 influenza season in the United States (US), almost 50% of hospitalized children and adolescents had no underlying med-

intranasally delivered influenza vaccine available, offering an alternative to IIV, which is delivered by intramuscular injection [9]. LAIV was first approved in 2003 in the US as a trivalent formulation comprising two influenza A subtype viruses and one B lineage virus [14–16]. It was approved in the EU in 2011 [17], with initial uptake in the United Kingdom (UK) during the 2013–14 influenza season [18]. Quadrivalent LAIV became

Fast fact #8

Most parents/providers prefer LAIV



Archives de Pédiatrie 26 (2019) 71–74

Available online at ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com/en

Research paper

Parental acceptance of an intranasal vaccine: Example of influenza vaccine

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ARTICLE INFO

Article history:
Received 17 March 2018
Accepted 10 November 2018
Available online 15 January 2019

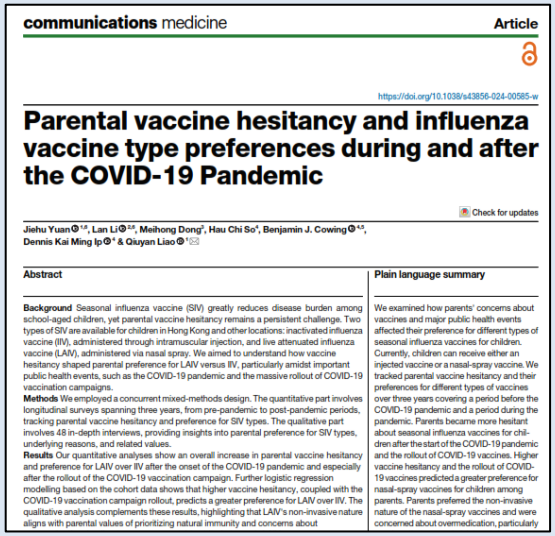
Keywords:
Vaccine
Nasal administration
Parents' acceptance
Influenza

ABSTRACT

Background: Influenza vaccination coverage of children with chronic disease is insufficient in France, although a nasal live attenuated influenza vaccine (LAIV) has been approved.
Objective: We aimed to evaluate the acceptance of nasally administered vaccines by parents of children with chronic illness, by comparing LAIV vs. injectable inactivated influenza vaccine (IIV) acceptance.
Methods: We performed a retrospective, observational study (December 2014 to April 2015) including parents of all children vaccinated with the LAIV during the 2013–2014 influenza vaccination campaign at our university hospital. It was an opinion survey on the tolerance and acceptance of the LAIV.
Results: A standardized evaluation form was completed by 67/79 parents of all children who received the LAIV (mean age: 113 ± 56 months; 64% with a chronic respiratory disease). The parents responded that vaccines in general were important (99%) but only 58% of them accepted the injectable route of administration. Of the 48 parents of children who had received both LAIV and IIV in the past, global opinion ($P < 0.0001$) and tolerance ($P < 0.0001$) were better for LAIV. For the future, 81% of parents would prefer LAIV, mainly because of needle absence and/or less painful character, and 18% IIV, mainly because of easier administration or habit.
Conclusion: The better acceptance of a nasally administrated vaccine could increase vaccination coverage in the future for nasal vaccines.

1. Introduction

The influenza vaccination rate of children with chronic conditions is low [1,2] despite the recommendation for vaccination in this population [3,4]. Although benign for most children, influenza is associated with high-risk complications as well as nostril] obtained drug approval. In an American study, the percentage of children aged 2–8 years who received the LAIV vaccine for influenza has nearly doubled (from 20.1% in 2008 to 38.0% in 2014), suggesting good acceptance [10]. In a study from Quebec, vaccine providers considered LAIV to be safe and effective and were supportive of its use [11].



communications medicine

Article

https://doi.org/10.1038/s43856-024-00585-w

Parental vaccine hesitancy and influenza vaccine type preferences during and after the COVID-19 Pandemic

Check for updates

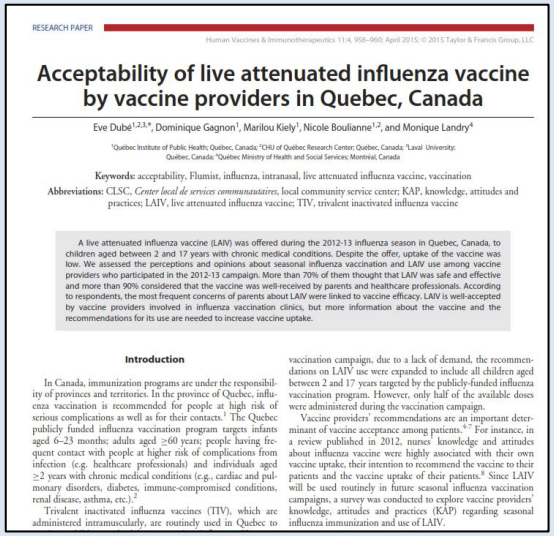
Jiehu Yuan [1,6], Lan Li [2,6], Meihong Dong [3], Hau Chi So [4], Benjamin J. Cowling [4,5], Dennis Kai Ming Ip [4] ✉ & Qiuyan Liao [1] ✉

Abstract

Background Seasonal influenza vaccine (SIV) greatly reduces disease burden among school-aged children, yet parental vaccine hesitancy remains a persistent challenge. Two types of SIV are available for children in Hong Kong and other locations: inactivated influenza vaccine (IIV), administered through intramuscular injection, and live attenuated influenza vaccine (LAIV), administered via nasal spray. We aimed to understand how vaccine hesitancy shaped parental preference for LAIV versus IIV, particularly amidst important public health events, such as the COVID-19 pandemic and the massive rollout of COVID-19 vaccination campaigns.
Methods We employed a concurrent mixed-methods design. The quantitative part involves longitudinal surveys spanning three years, from pre-pandemic to post-pandemic periods, tracking parental vaccine hesitancy and preference for SIV types. The qualitative part involves 48 in-depth interviews, providing insights into parental preference for SIV types, underlying reasons, and related values.
Results Our quantitative analyses show an overall increase in parental vaccine hesitancy and preference for LAIV over IIV after the onset of the COVID-19 pandemic and especially after the rollout of the COVID-19 vaccination campaign. Further logistic regression modelling based on the cohort data shows that higher vaccine hesitancy, coupled with the COVID-19 vaccination campaign rollout, predicts a greater preference for LAIV over IIV. The qualitative analysis complements these results, highlighting that LAIV's non-invasive nature aligns with parental values of prioritizing natural immunity and concerns about

Plain language summary

We examined how parents' concerns about vaccines and major public health events affected their preference for different types of seasonal influenza vaccines for children. Currently, children can receive either an injected vaccine or a nasal-spray vaccine. We tracked parental vaccine hesitancy and their preferences for different types of vaccines over three years covering a period before the COVID-19 pandemic and a period during the pandemic. Parents became more hesitant about seasonal influenza vaccines for children after the start of the COVID-19 pandemic and the rollout of COVID-19 vaccines. Higher vaccine hesitancy and the rollout of COVID-19 vaccines predicted a greater preference for nasal-spray vaccines for children among parents. Parents preferred the non-invasive nature of the nasal-spray vaccines and were concerned about overmedication, particularly



RESEARCH PAPER

Human Vaccines & Immunotherapeutics 11:4, 956–960; April 2015; © 2015 Taylor & Francis Group, LLC

Acceptability of live attenuated influenza vaccine by vaccine providers in Quebec, Canada

Eve Dubé[1,2,3,*], Dominique Gagnon[1], Marilou Kiely[1], Nicole Boulianne[1,2], and Monique Landry[4]

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Keywords: acceptability, Flumist, influenza, intranasal, live attenuated influenza vaccine, vaccination

Abbreviations: CLSC, *Center local de services communautaires*, local community service center; KAP, knowledge, attitudes and practices; LAIV, live attenuated influenza vaccine; TIV, trivalent inactivated influenza vaccine

A live attenuated influenza vaccine (LAIV) was offered during the 2012-13 influenza season in Quebec, Canada, to children aged between 2 and 17 years with chronic medical conditions. Despite the offer, uptake of the vaccine was low. We assessed the perceptions and opinions about seasonal influenza vaccination and LAIV use among vaccine providers who participated in the 2012-13 campaign. More than 70% of them thought that LAIV was safe and effective and more than 90% considered that the vaccine was well-received by parents and healthcare professionals. According to respondents, the most frequent concerns of parents about LAIV were linked to vaccine efficacy. LAIV is well-accepted by vaccine providers involved in influenza vaccination clinics, but more information about the vaccine and the recommendations for its use are needed to increase vaccine uptake.

Introduction

In Canada, immunization programs are under the responsibility of provinces and territories. In the province of Quebec, influenza vaccination is recommended for people at high risk of serious complications as well as for their contacts.[1] The Quebec publicly funded influenza vaccination program targets infants aged 6–23 months; adults aged ≥60 years; people having frequent contact with people at higher risk of complications from infection (e.g. healthcare professionals) and individuals aged ≥2 years with chronic medical conditions (e.g., cardiac and pulmonary disorders, diabetes, immune-compromised conditions, renal disease, asthma, etc.).[2]

Trivalent inactivated influenza vaccines (TIV), which are administered intramuscularly, are routinely used in Quebec to vaccination campaign, due to a lack of demand, the recommendations on LAIV use were expanded to include all children aged between 2 and 17 years targeted by the publicly-funded influenza vaccination program. However, only half of the available doses were administered during the vaccination campaign.

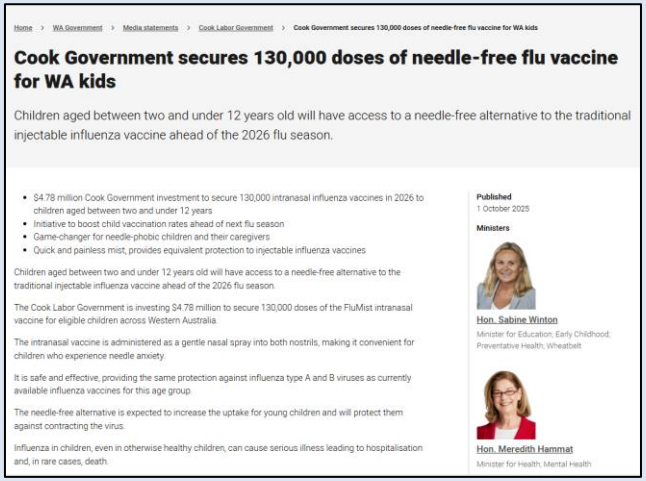
Vaccine providers' recommendations are an important determinant of vaccine acceptance among patients.[4-7] For instance, in a review published in 2012, nurses' knowledge and attitudes about influenza vaccine were highly associated with their own vaccine uptake, their intention to recommend the vaccine to their patients and the vaccine uptake of their patients.[8] Since LAIV will be used routinely in future seasonal influenza vaccination campaigns, a survey was conducted to explore vaccine providers' knowledge, attitudes and practices (KAP) regarding seasonal influenza immunization and use of LAIV.

WA FluMist Program

Four states will have LAIV programs in 2026

WA Health has funded LAIV for children 2 to 11y

- Distributed through GPs, pharmacies, community clinics and AMSs
- Expected to commence in early April
- 15 week shelf life



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Cook Government secures 130,000 doses of needle-free flu vaccine for WA kids

Children aged between two and under 12 years old will have access to a needle-free alternative to the traditional injectable influenza vaccine ahead of the 2026 flu season.

- $4.78 million Cook Government investment to secure 130,000 intranasal influenza vaccines in 2026 to children aged between two and under 12 years
- Initiative to boost child vaccination rates ahead of next flu season
- Game-changer for needle-phobic children and their caregivers
- Quick and painless mist, provides equivalent protection to injectable influenza vaccines

Children aged between two and under 12 years old will have access to a needle-free alternative to the traditional injectable influenza vaccine ahead of the 2026 flu season.

The Cook Labor Government is investing $4.78 million to secure 130,000 doses of the FluMist intranasal vaccine for eligible children across Western Australia.

The intranasal vaccine is administered as a gentle nasal spray into both nostrils, making it convenient for children who experience needle anxiety.

It is safe and effective, providing the same protection against influenza type A and B viruses as currently available influenza vaccines for this age group.

The needle-free alternative is expected to increase the uptake for young children and will protect them against contracting the virus.

Influenza in children, even in otherwise healthy children, can cause serious illness leading to hospitalisation and, in rare cases, death.

Published
1 October 2025

Ministers

Hon. Sabine Winton
Minister for Education; Early Childhood; Preventative Health; Wheatbelt

Hon. Meredith Hammat
Minister for Health; Mental Health

Funded programs also occurring in NSW and SA (2 to 4y) and Queensland (2 to 5y)

WA FluMist Program

Don’t forget injectable vaccine for others

Influenza vaccination recommended for everyone over the page of 6 months

- Inactivated injectable vaccine (IIV) funded for those 6m to <2y (NIP)
- LAIV funded for those 2y to <12y and available on the private market for children 12 to 17 years
- LAIV contraindicated for those with moderate / severe immunosuppressed
- IIV also funded for those with comorbid conditions and all Aboriginal individuals aged ≥6m.
- IIV also funded for pregnant women and elderly

FluMist - FAQs

How many doses are required?

Previous recommendation for two doses in the first year for those <9 years of age has now has been modified to:
i) those aged <2 years
ii) those aged <9 years with medical risk factors for severe influenza

So for most children, one dose is all that is required

FluMist - FAQs

What side effects may occur?

More respiratory side effects – blocked or runny nose, headache, some fever

Less systematic side effects

FluMist - FAQs

In whom is LAIV contraindicated?

LAIV is contraindicated in those with:

1) Anaphylaxis after receiving a dose of <u>any</u> flu vaccine
2) Moderate to severe immunosuppression
    a) Primary immunodeficiencies including B cell, T cell, combined defects, phagocytes/neutrophils defects
    b) High-dose immunosuppressive therapies including steroids (>20mg/day or 2mg/kg for 14d) or high dose DMARDs
    c) Leukaemia or solid tumours currently/recently receiving chemoRx
    d) BMT or solid organ transplantation
    e) Moderate to severe HIV infection
3) Taking oral aspirin

FluMist - FAQs

In whom is LAIV NOT contraindicated?

LAIV is NOT contraindicated in mild immunosuppression

LAIV is NOT contraindicated in those with asthma or wheeze (AIH) – it should not be given at the same time as an active exacerbation or history of severe asthma

LAIV is NOT contraindicated in those using nasal steroids

LAIV is NOT contraindicated in egg allergy

LAIV is NOT contraindicated in setting of mild intercurrent illness (but delay if severely blocked nose)

FluMist - FAQs

Does shedding occur and should I worry?

Shedding of the modified virus occurs for a few days following LAIV.

This can cause false positive influenza PCR tests

Transmission of LAIV to unvaccinated individuals has not been observed

Given the theoretical risk, IIV is preferred over LAIV in those living or working with the severely immunocompromised individuals (if contact cannot be avoided for 1-2 weeks post immunisation)

FluMist - FAQs

Can LAIV be coadminstered?

Yes – it can be given at the same time as live and non-live vaccines

FluMist - FAQs

What if the child sneezes straight afterwards or only half a dose is able to be administered?

Don’t worry – the effective dose is many times higher than required, and so repeat dosing is not required

FluMist - FAQs

Are any special precautions required?

Apart from hand hygiene before and after administration, no additional precautions are required.

No cases of live virus transmission to healthcare workers have been observed – as such, healthcare workers who are mild-moderately immunocompromised or pregnant can safety given LAIV

Very severely immunocompromised staff should not administered LAIV

FluMist - FAQs

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