Influenza epidemiology, vaccine coverage and effectiveness in children 2017

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On behalf of:
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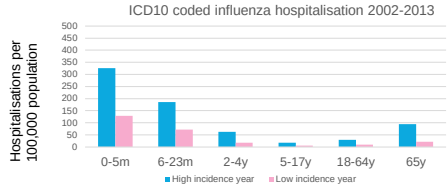
PAEDS Paediatric Active Enhanced Disease Surveillance

Why study children with influenza?

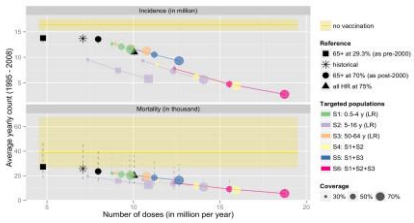
- Influenza is the most frequently diagnosed vaccine preventable disease
- Young children have the highest rate of hospitalisation



AIHW data Kevin Yin, NCIRS;

Why study children with influenza?

- School age children have been demonstrated to be central to the community spread of influenza

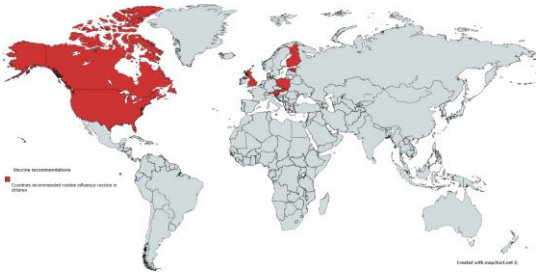


Baguelin M et al PloSOne 2013

Why study children with influenza?

- In 2017, inactivated influenza vaccine was recommended for all children from 6 months yet funded only for:
  - Children from 6 months with medical comorbidities increasing their risk of influenza hospitalisation
  - Indigenous children from 6 months to 4 years
  - All children 6 months to 4 years in Western Australia

Why study children with influenza?

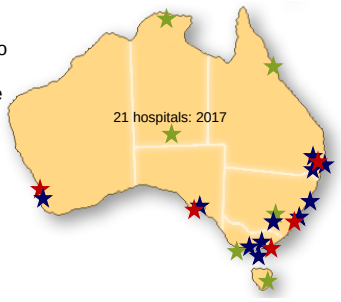


PAEDS-FluCAN

- PAEDS: Conducting paediatric hospital-based surveillance for vaccine preventable conditions, adverse events following vaccination and other conditions of public health significance since 2007
- FluCAN: Conducting hospital-based surveillance for influenza and influenza complications since 2009 enabling real time surveillance of influenza activity and mid-season and end-of-season vaccine effectiveness estimates

PAEDS-FluCAN

In 2017:
- Expanded from two to five paediatric sites
- One new general site with significant paediatric population added (RDH)



PAEDS-FluCAN: Aims

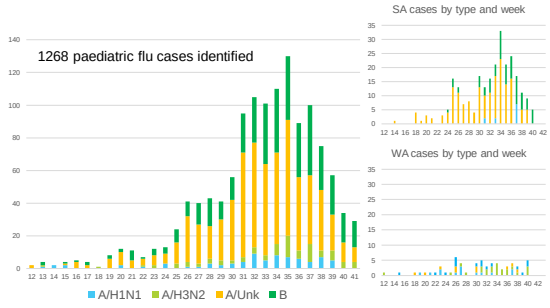
- Collect real-time sentinel surveillance for influenza requiring hospitalisation
- Collect detailed clinical and laboratory information from all patients hospitalised with a laboratory-confirmed diagnosis of influenza to determine the burden of disease requiring hospitalisation associated with 'flu.
- To estimate the effectiveness of influenza vaccine against hospitalisation by comparing influenza vaccine status in patients with influenza and test-negative controls

PAEDS-FluCAN: Methods

- Surveillance period: April to November 2017.
- Case: paediatric patient (≤16 years) admitted to hospital with acute respiratory illness and PCR+ve for flu.
- Control: flu test negative subject with acute respiratory illness tested contemporaneously with a case.

- Demographic, risk factor, treatment, outcome data and immunisation history collected.
- Factors associated with ICU admission assessed using multivariable regression.
- Vaccine effectiveness estimated using incidence density test negative design and conditional logistic regression (VE = 1-aOR).

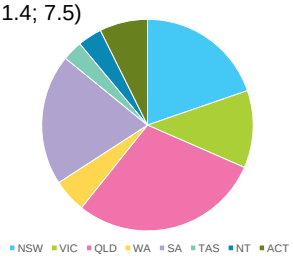
PAEDS-FluCAN: paediatric data in '17



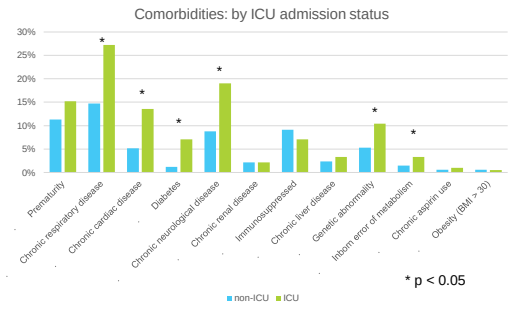
PAEDS-FluCAN: paediatric data in '17

- Median age: 3.9 (IQR 1.4; 7.5)
- Male: 52.3%
- Indigenous: 8.3%
- Comorbidities: 45.1%
- Nosocomial: 3.5%

- Median duration of symptoms prior to presentation was 3d



PAEDS-FluCAN: paediatric data in '17



PAEDS-FluCAN: paediatric data in '17

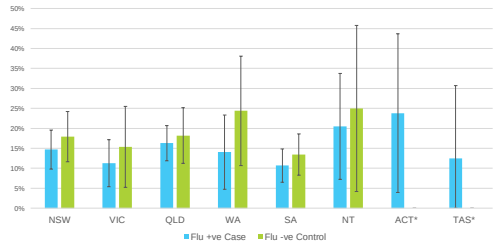
- In hospital mortality: 0.4%
- ICU admission: 14.5%

ICU admission	Crude odds ratio (95% CI)	P value	Adjusted* odds ratio (95% CI)	P value
Infant <6 months	1.71 (1.10, 2.68)	0.018	1.95 (1.24, 3.08)	0.004
Children ≥6 months	1 (referent)		1 (referent)	
Medical comorbidities	2.17 (1.57, 2.99)	<0.001	2.24 (1.62, 3.10)	<0.001
Indigenous Australian	1.06 (0.61, 1.86)	0.825	NI	
Influenza type				
• **Influenza A**	1.18 (0.84, 1.65)	0.339	NI	
• **Influenza B**	1 (referent)	0.166	1 (referent)	

*Adjusted by age, risk factors, indigenous status, state

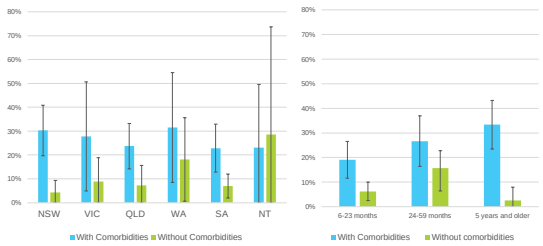
PAEDS-FluCAN: paediatric data in '17

- Vaccine coverage



PAEDS-FluCAN: paediatric data in '17

- Coverage by risk factor and age (test -ve controls)



PAEDS-FluCAN: paediatric data in '17

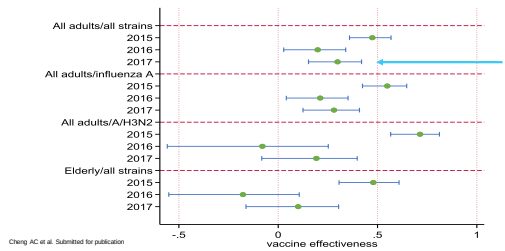
- Vaccine effectiveness

Strains	Number of cases and controls				Unadjusted VE (95% CI)	Adjusted VE* (95% CI)
	Vaccinated cases	Unvaccinated cases	Vaccinated controls	Unvaccinated controls		
Overall						
All strains†	133	804	94	457	19.6% (-7.3%; 39.7%)	30.3% (2.6%; 50.2%)
A	87	522	94	457	19.0% (-11.3%; 41.0%)	28.7% (-3.0%; 50.6%)
B	46	282	94	457	20.7% (-16.3%; 45.9%)	32.3% (-11.2; 58.8%)
In children with comorbidities						
All strains†	105	343	75	215	12.2% (-23.5%:37.7%)	23.3% (-12.7%; 47.8%)

adjusted by age group, medical risk factors and indigenous status
† Inclusive of patients with untyped influenza A infection, H1N1, H3N2 and influenza B.

PAEDS-FluCAN: paediatric data in '17

- Vaccine effectiveness (VE: 30.3%; 2.6; 50.2)



PAEDS-FluCAN: paediatric data in '17

- 2017 was a big year for paediatric influenza.
- Although the burden was high, the rate of severe influenza outcomes appeared similar to previous years

	2009[2]	2014[1]	2017
ICU admission	10%	11%	14%
In-hospital death	0.9%	0.3%	0.4%

- Majority of Australian children requiring admission to hospital with influenza are aged < 5 years (57.8%) and have no comorbidities (54.9%).
- Moderate-poor vaccine effectiveness was observed

[1]Blyth et al Eurosurveillance 2016; [2]Khandaker G et al, IoRV 2014

Influenza prevention in 2018

- Universal preschool vaccination is expected to reduce the burden of paediatric (and community) influenza but given moderate VE, severe influenza seasons will continue to occur

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Additional investigators of the FluCAN Influenza Complications Alert Network include: Mark Holmes, Dominic E Dwyer, Sanjaya Senenayake, Louise Cooley, Louis Irving, Graham Simpson, Tony Korman, Deborah Friedman, Peter Wark, Anna Holwell, Simon Bowler, John Upham, Grant Waterer

Additional investigators from the PAEDS Group include: Elizabeth Elliott, Peter McIntyre, Robert Booy, Nicholas Wood, Phillip Britton, Alison Kesson, Peter Richmond, Tom Snelling, Nigel Crawford, Mike Gold, Anne Kynaston,

FluCAN receives support from the Australian Government Department of Health.

PAEDS receives support from the National Health and Medical Research Council (NHMRC), Australian Government Departments of Health and Departments of Health in NSW, Victoria, Queensland, South Australia, Western Australia and the Northern Territory.