

Influenza disease burden in Australia

Influenza Specialist Group

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- Professor Allen Cheng
- Dr Kevin Yin
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- Members of ATAGI & Influenza Working Party
- Data provision: ABS; AIHW; FluCAN; NNDSS

Outline: Estimates of national flu burden

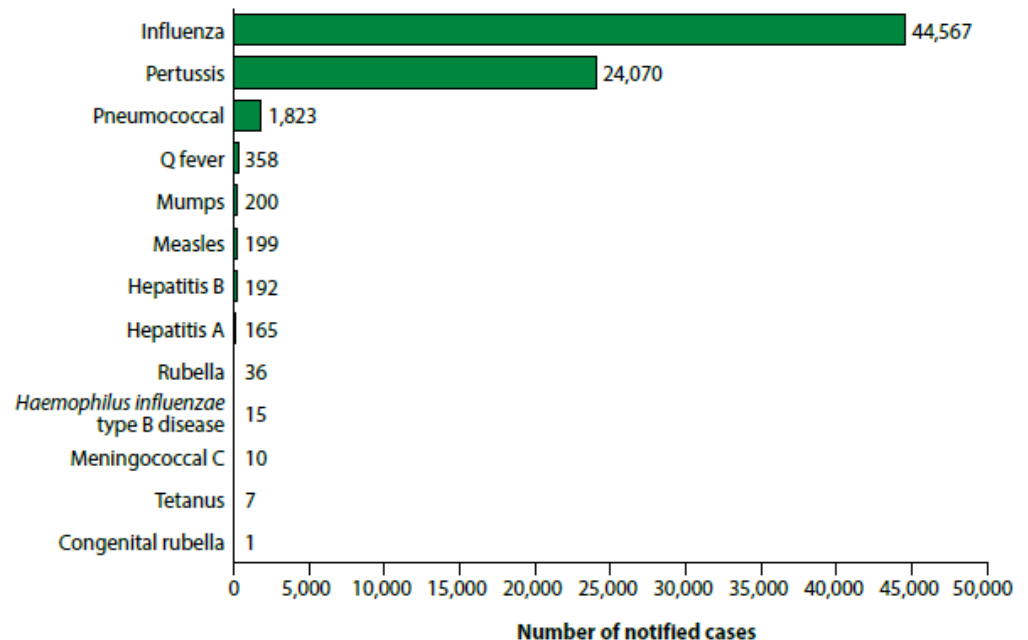
Sources:

- National administrative surveillance data
 - Influenza notifications
 - Incidence of influenza hospitalisations
 - Influenza deaths
- Indigenous vs Non-indigenous burden
- Sentinel site surveillance data
 - Hospital-based: FluCAN
 - GP (*ASPREN; SPN(WA); VicSPIN, BEACH*)
 - ED (*NSW, NT, Qld, SA, WA*)

Not outlined in
this talk

Background

- Influenza is number one notifiable vaccine preventable disease
- Attack rates estimated at 3.5% of adults each year but up to 15.2% of children.¹
- 55-78% of infected adults develop clinical disease²



Source: National Notifiable Diseases Surveillance System.

Most commonly notified vaccine preventable diseases in Australia, 2012

¹ Jayasundara et al. *BMC Infect Dis.* 2014;14:670.

² Carrat et al. *American Journal of Epidemiology* 2008;167:775-85.

- Burden of influenza in Australia remains high, despite targeted vaccination program
 - >65y
 - Medical conditions with increased risk of flu
 - Indigenous 6m-<5y, ≥15 y
- Robust burden data needed to inform evaluations of existing & potential new vaccination strategies

Methods:

Estimating flu burden from administrative data

- Latest surveillance data were used
 - Calculated rates by age groups (*stratified based on age indication of vaccine or potential program options*)
 - Trends over time including pre-pandemic, pandemic and post-pandemic time periods.
 - Assessed differences in Indigenous and non-Indigenous burden

Sources of data that inform key parameters

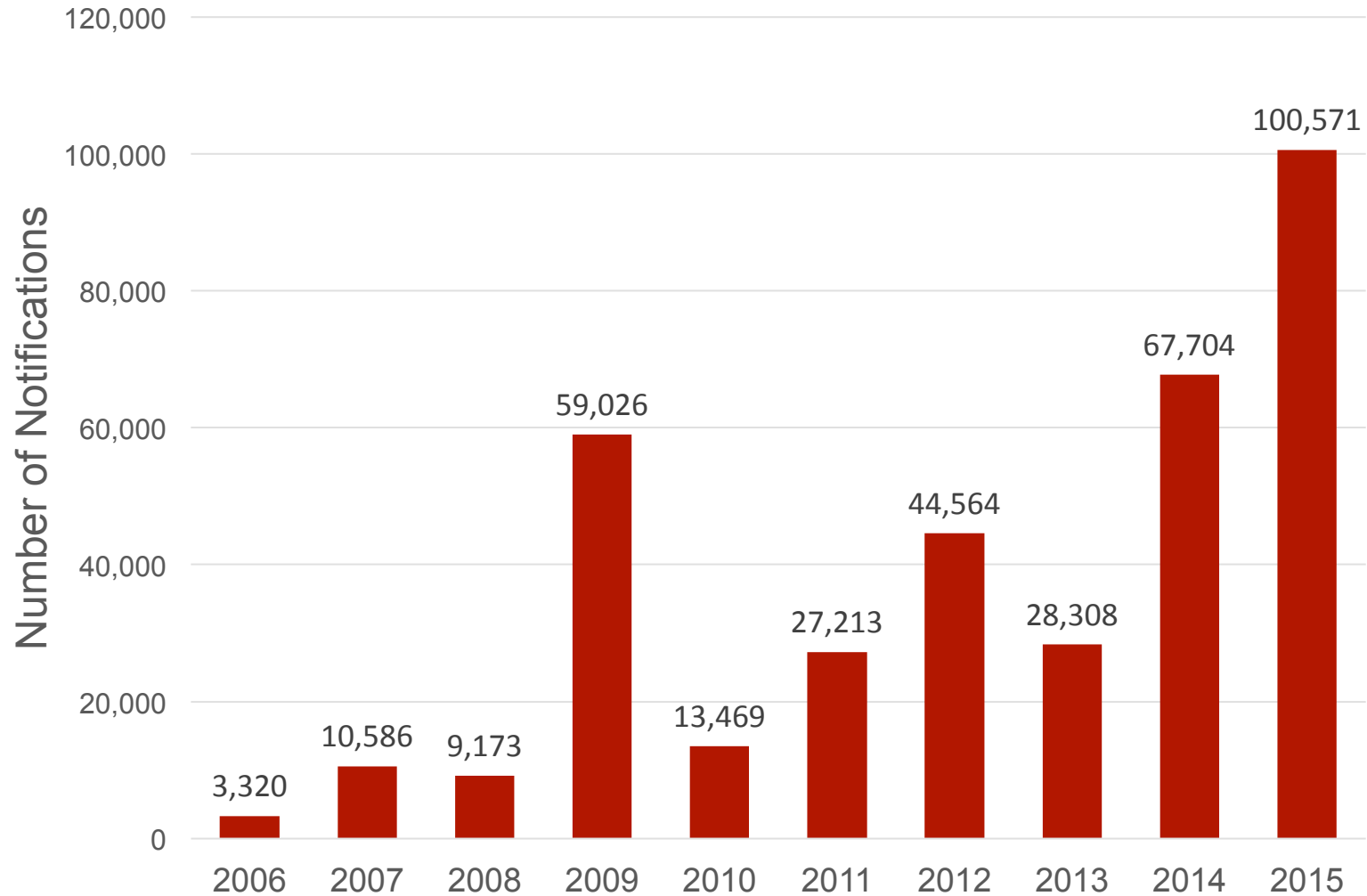
Epidemiological measurement		Data category	Data source & time period
Lab-confirmed influenza & influenza-like illness incidence		Notifications	NNDSS 2002–2014 (excluding 2009)
		Data from sentinel surveillance systems	GP sentinel surveillance
			ED sentinel surveillance
Hospitalisation incidence rate		ICD-coded hospitalisation	AIHW NHMD 2002–2013 (excluding 2009)
% ICU admission among hospitalised cases		Laboratory-confirmed influenza hospitalisation	FluCAN 2011–2015
Mortality	Years of Life Lost	Death certificates	ABS Cause of Death data 2006–2013 (excluding 2009)
	Population mortality rate		
	In-hospital case fatality ratio (CFR)	ICD-coded hospitalisation	NHMD 2002–2013 (excluding 2009)

Abbreviation: ABS=Australian Bureau of Statistics, AIHW=Australian Institute of Health & Welfare, NHMD=National Hospital Morbidity Database, ED=emergency department, FluCAN=The Influenza Complications Alert Network, GP=general practice, NNDSS=National Notifiable Diseases Surveillance System

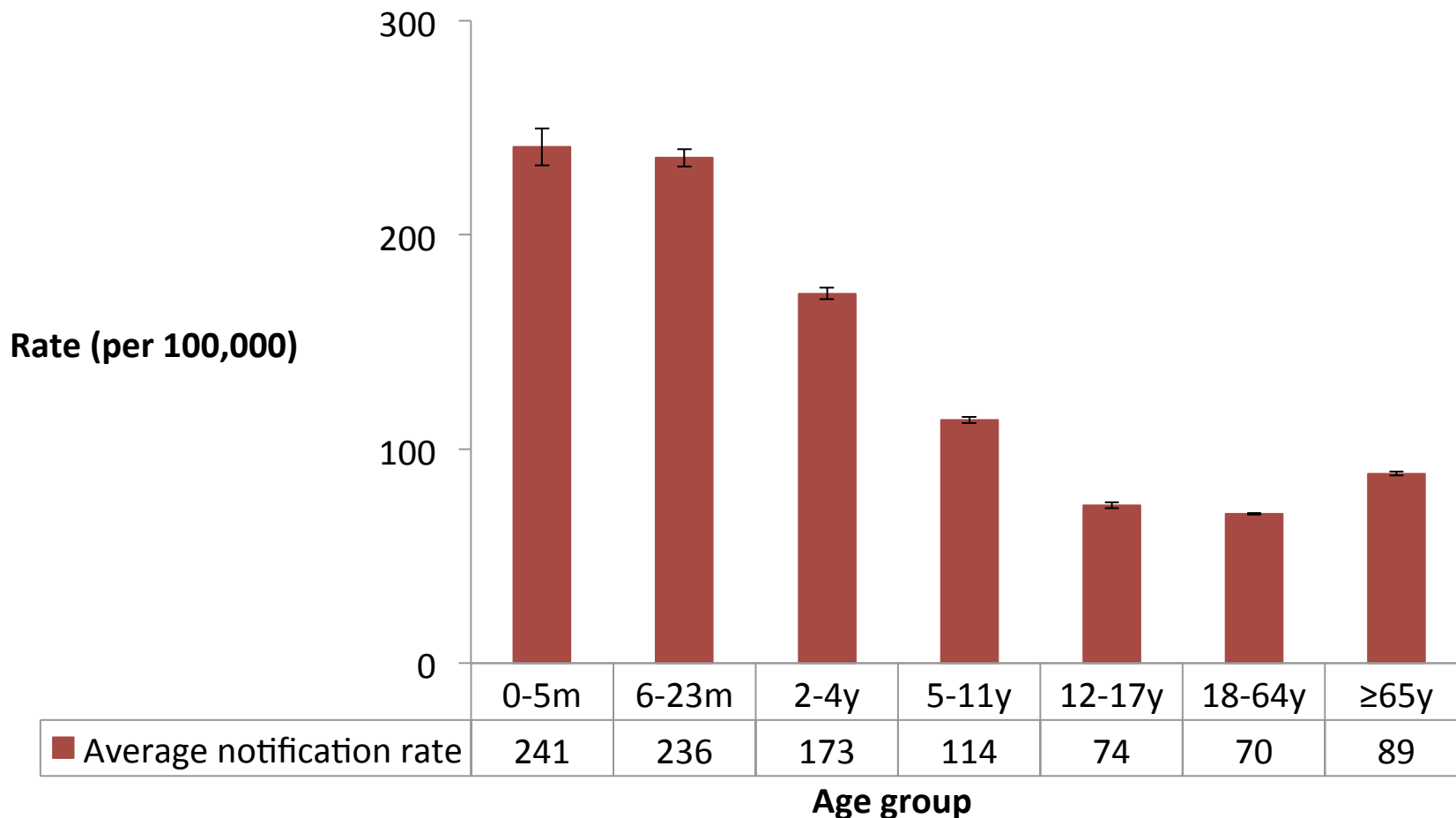
Influenza notifications

- Notification rate \neq population infection rate
 - Notifications: cases who seek medical care, with test performed which is positive, leading to notification
 - Influenced by variation in
 - Health seeking behaviour
 - Local testing practices
 - Accessibility to laboratory testing
 - Preferential testing of high-risk populations
 - Use of more sensitive tests in recent years
 - ...

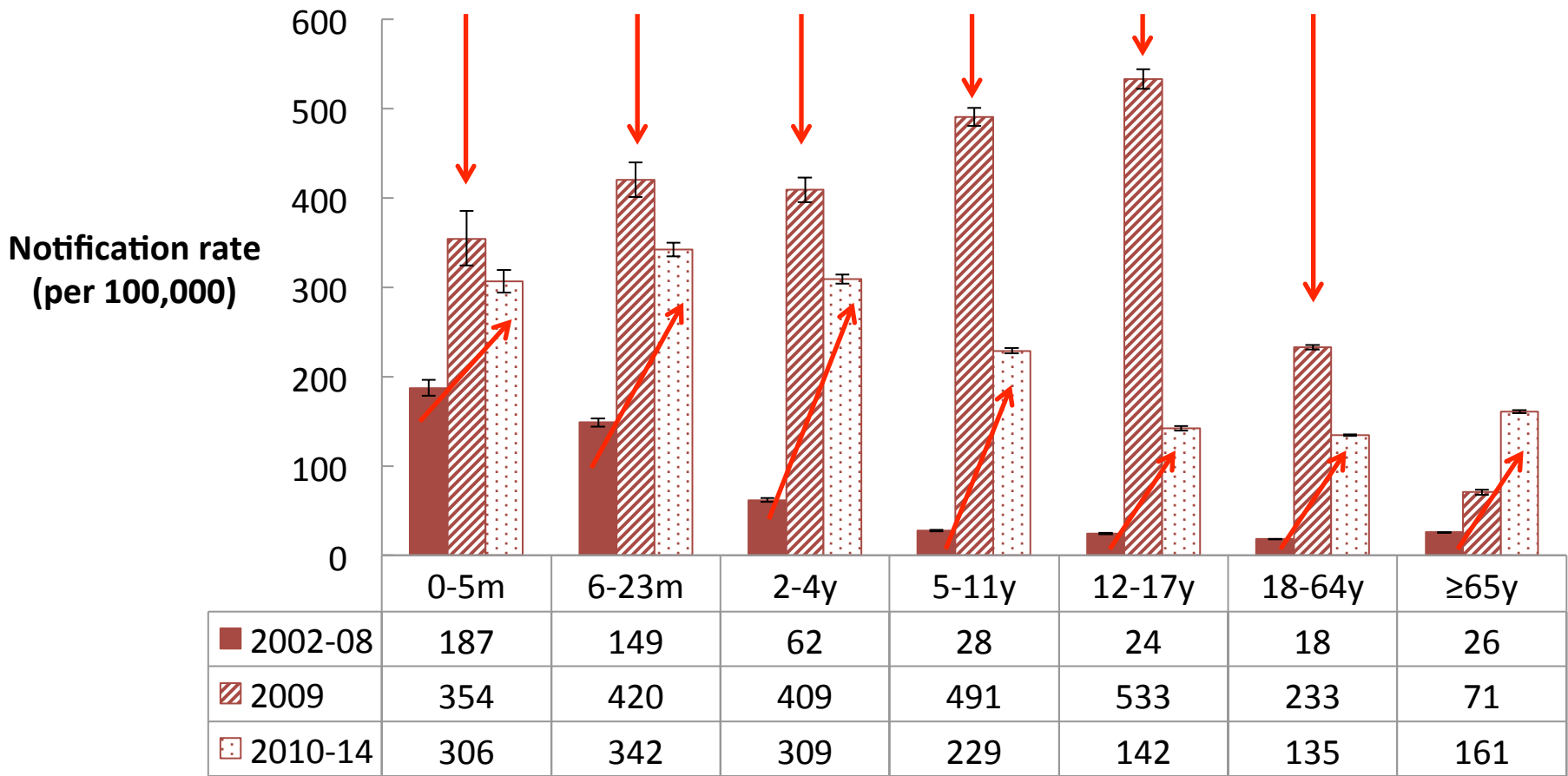
Number of influenza notifications by year 2006-2015



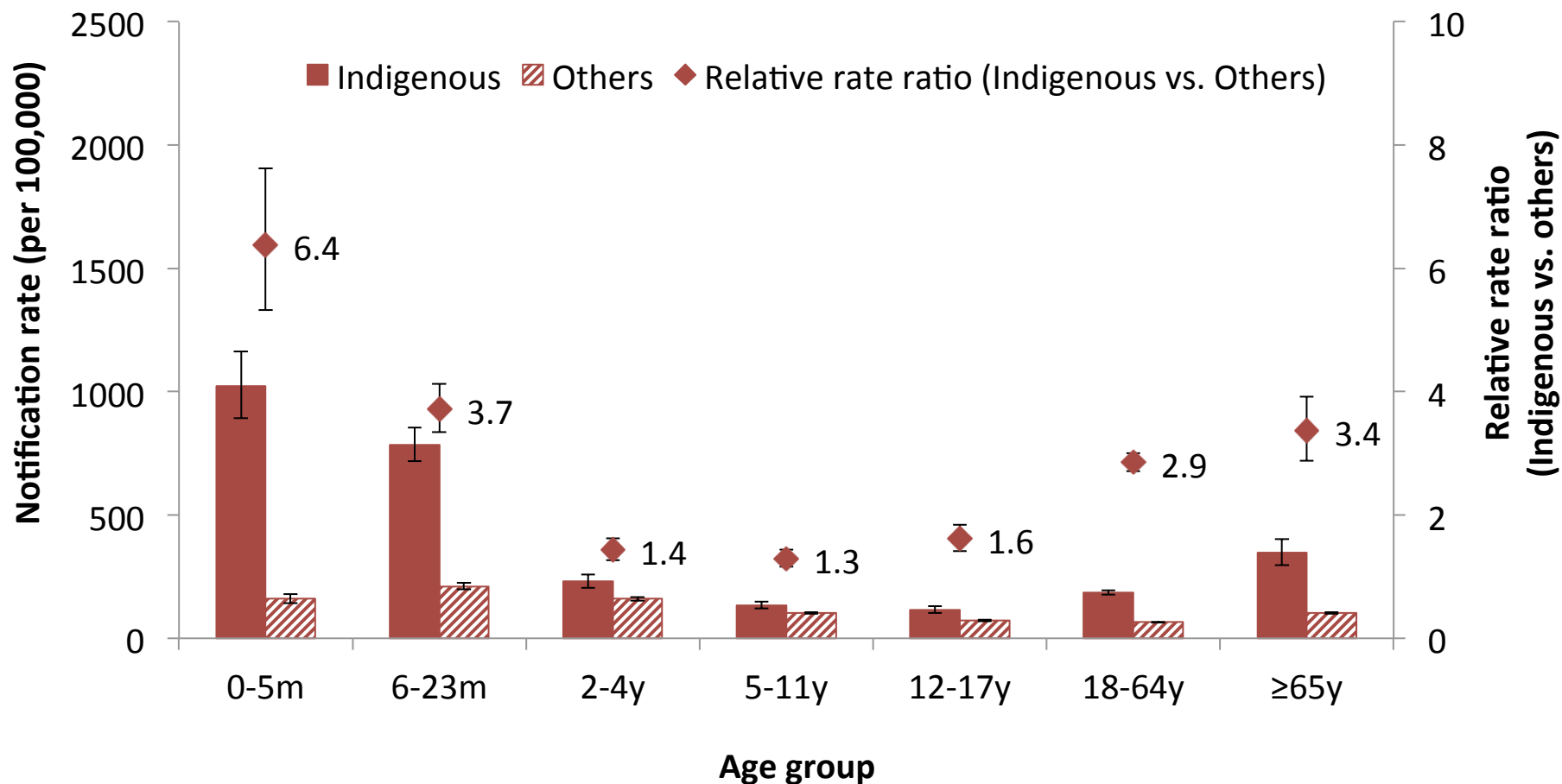
Annual incidence of influenza notification 2002–2014 excl. 2009 by age



Annual incidence of influenza notification 2002-2014, by age group & time period



Annual incidence of influenza notification 2002–2014 excl. 2009 in WA & NT*, by Indigenous status



Note: All rate ratios are statistically significant.

** Completeness of Indigenous status: 87% in WA; 98% in NT. Other jurisdictions had suboptimal completeness of indigenous status coding.*

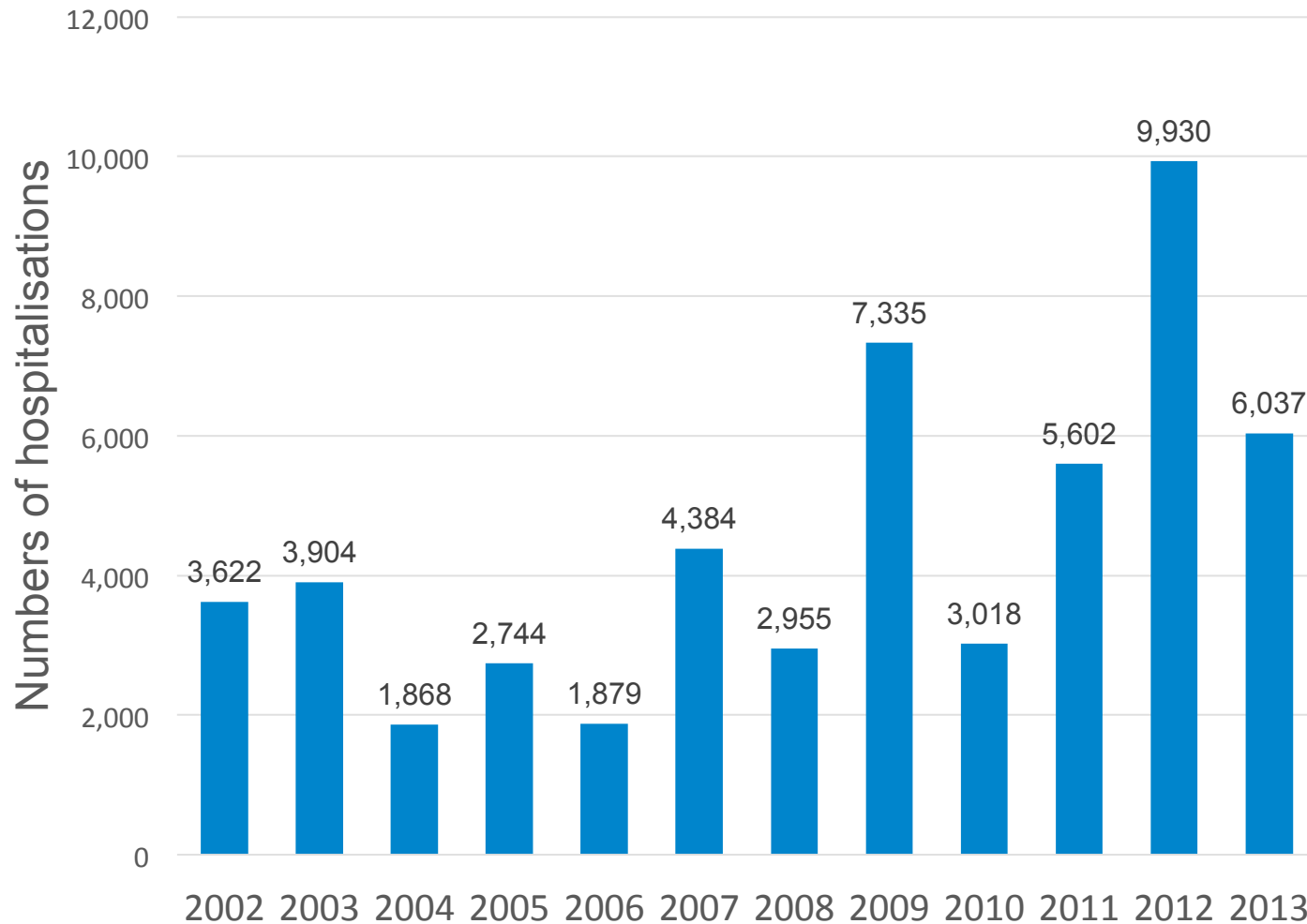
Influenza hospitalisation

- Data: ICD-coded hospitalisation (any diagnosis)
- Limitations
 - Variations in health service utilisation, admission threshold, diagnostic/coding practice
 - Cannot exclude multiple admission; transfer between hospitals

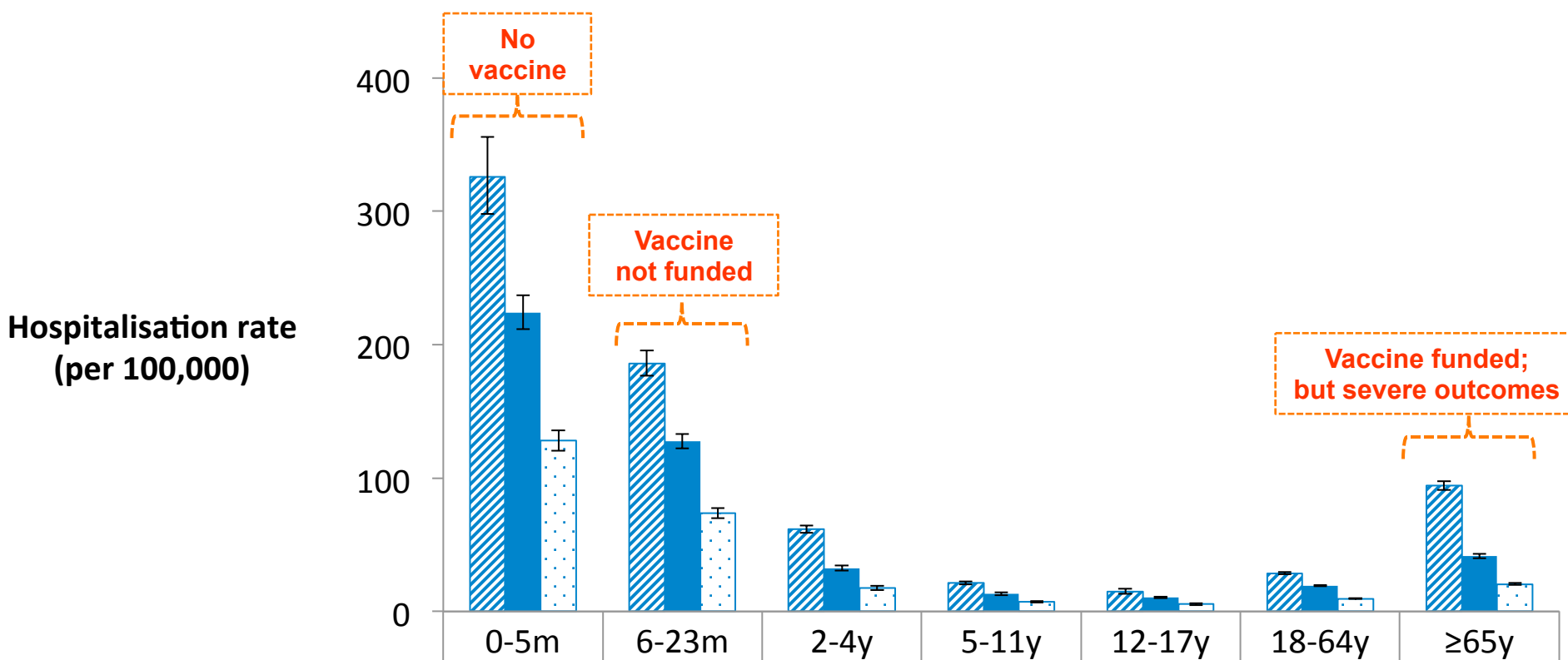
** from Australian Institute of Health & Welfare (AIHW) National Hospital Morbidity Database (NHMD)*

† (both virologically confirmed [J09 or J10] & not confirmed [J11])

Number of influenza ICD-coded hospitalisations by year 2002-2013



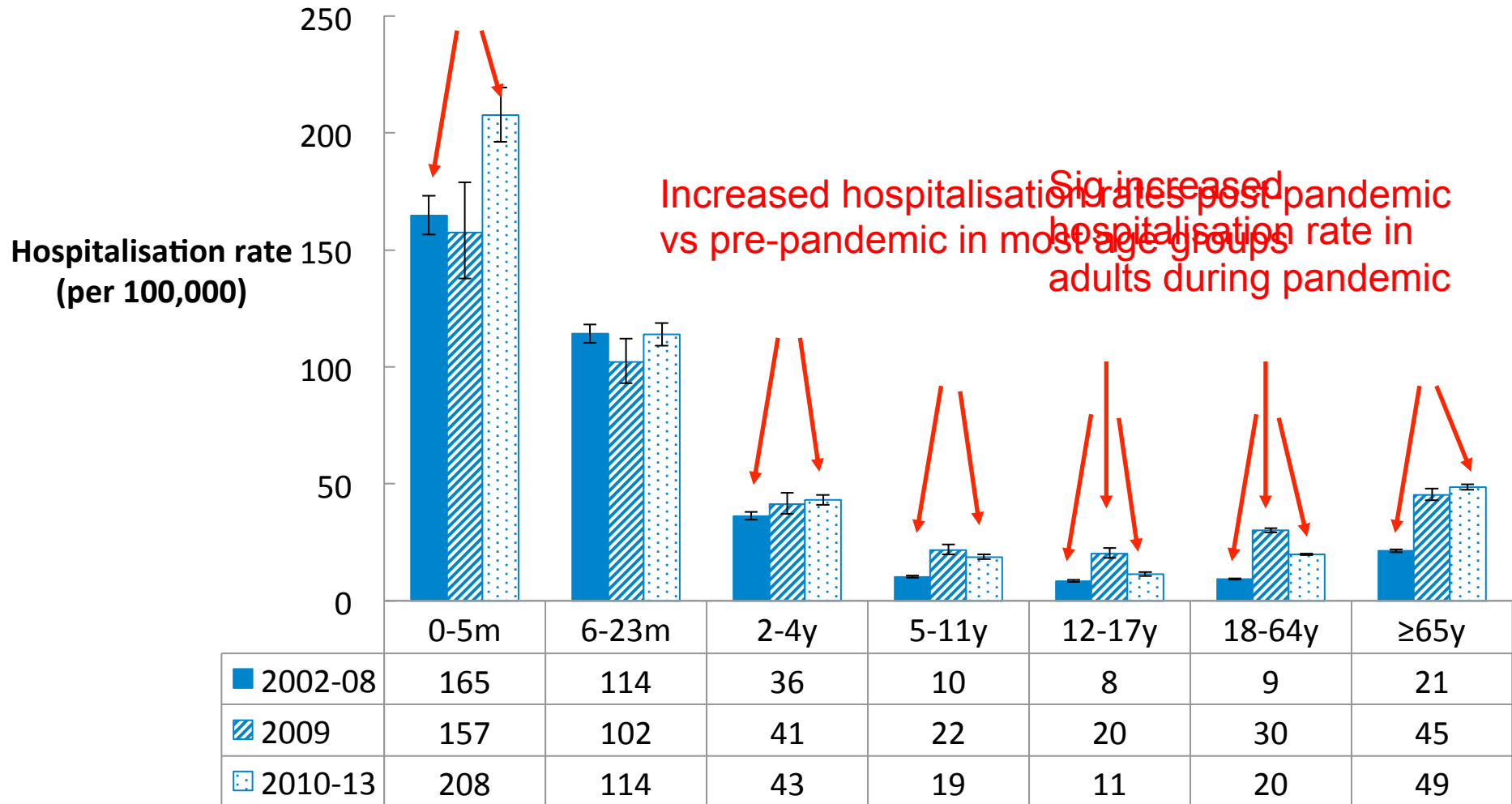
Annual incidence of ICD-coded hospitalisation for influenza (any diagnosis) 2002–2013 excl. 2009, by level of influenza activity



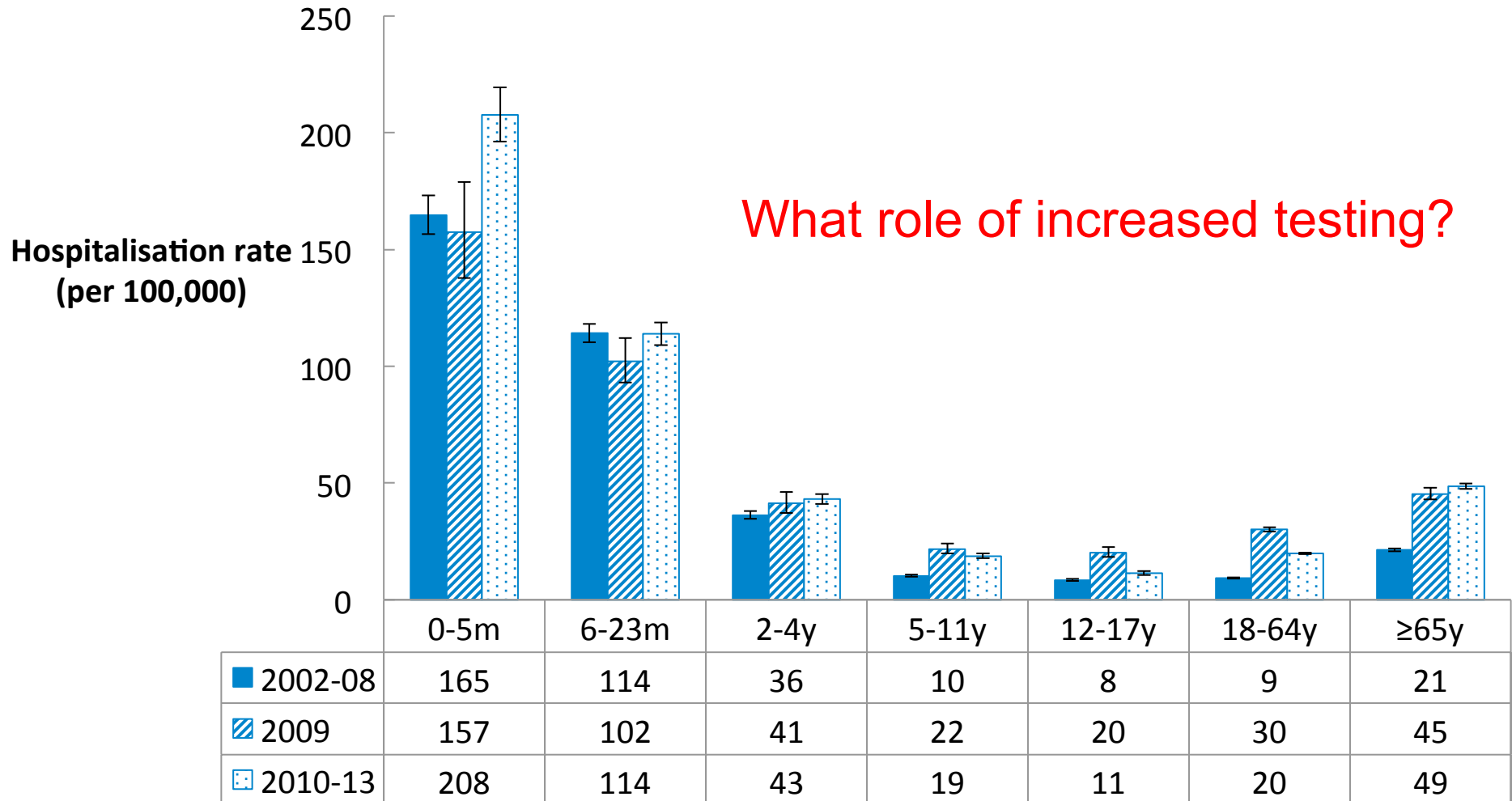
	0-5m	6-23m	2-4y	5-11y	12-17y	18-64y	≥65y
▨ High activity years*	326	186	62	21	15	29	94
■ Moderate activity years*	224	128	32	13	11	19	41
▤ Low activity years*	128	74	18	7	5	10	21

* Level of influenza activity is defined by ATAGI as: 1) Low activity: annual rate <3 times baseline rate; 2) Moderate activity: annual rate 3 to <5 times baseline rate; 3) High activity: ≥5 times baseline rate. Baseline rate is the off-season rate of hospitalisation during 2002–2013 (excluding 2009), where 'off-season' refers to the 6 months which have the lowest hospitalisation rates in each year.

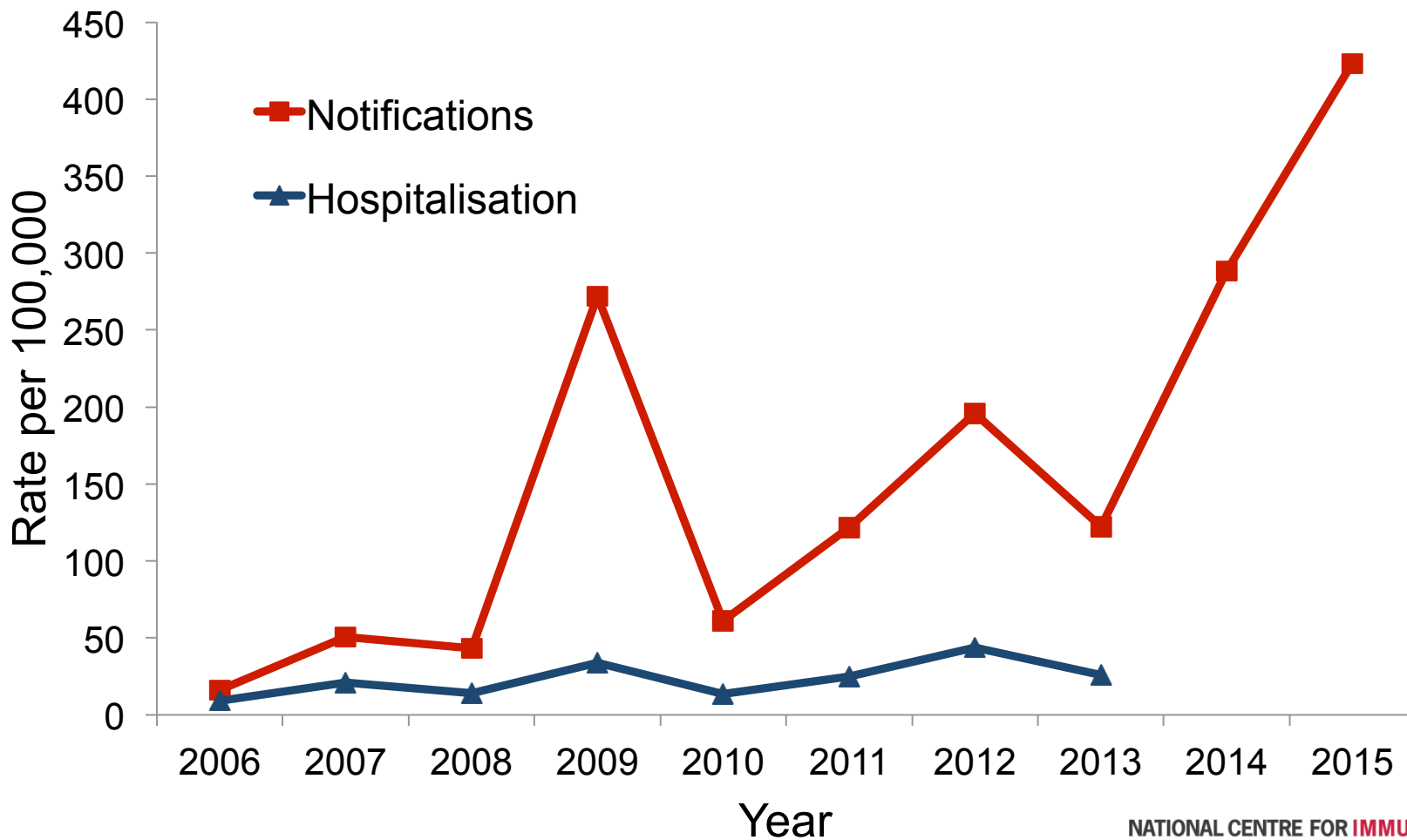
Annual incidence of ICD-coded hospitalisation for influenza (any diagnosis) 2002–2013, by age group & time period



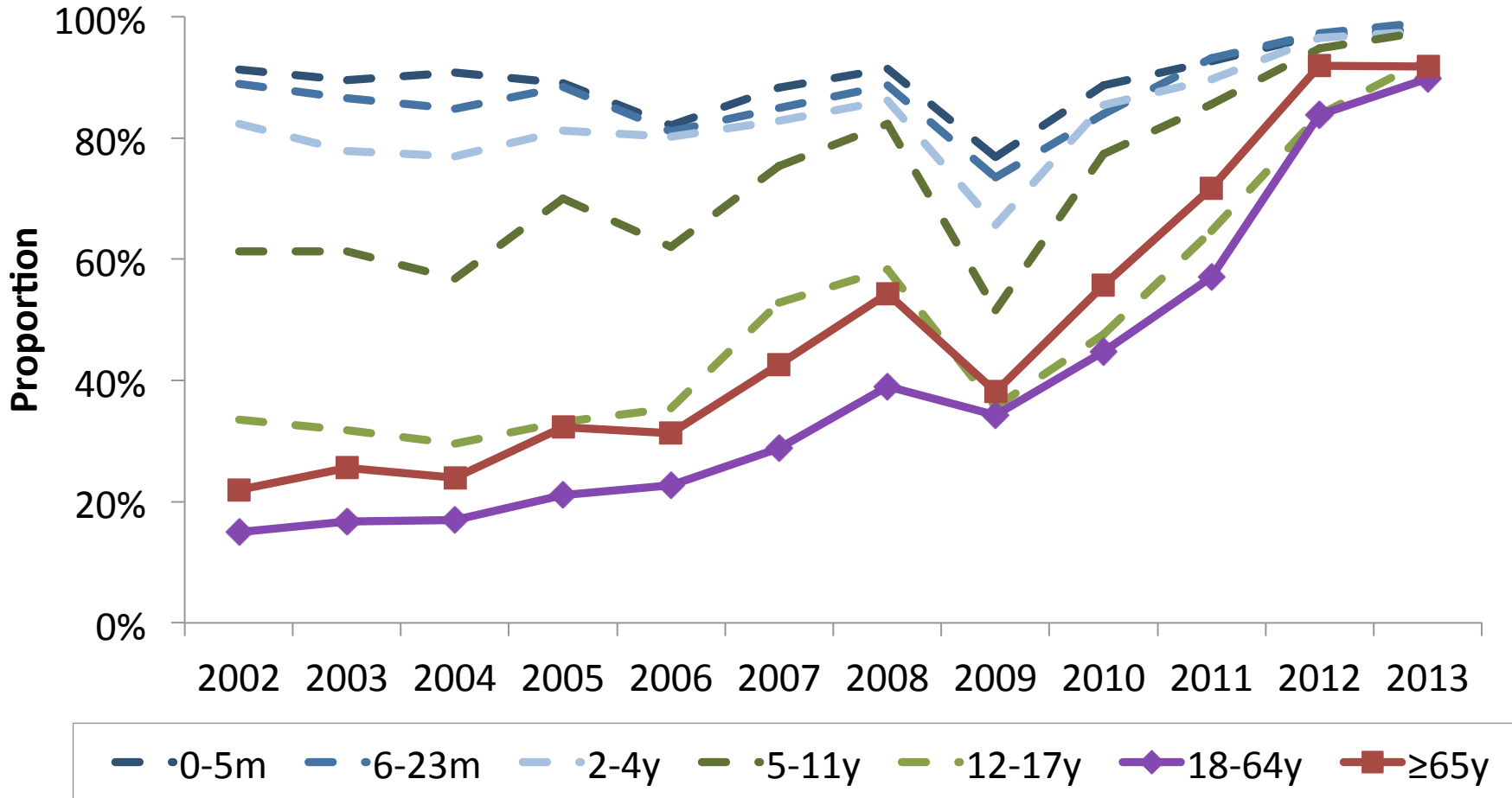
Annual incidence of ICD-coded hospitalisation for influenza (any diagnosis) 2002–2013, by age group & time period



Comparison of notification and hospitalisation rates 2006-2015

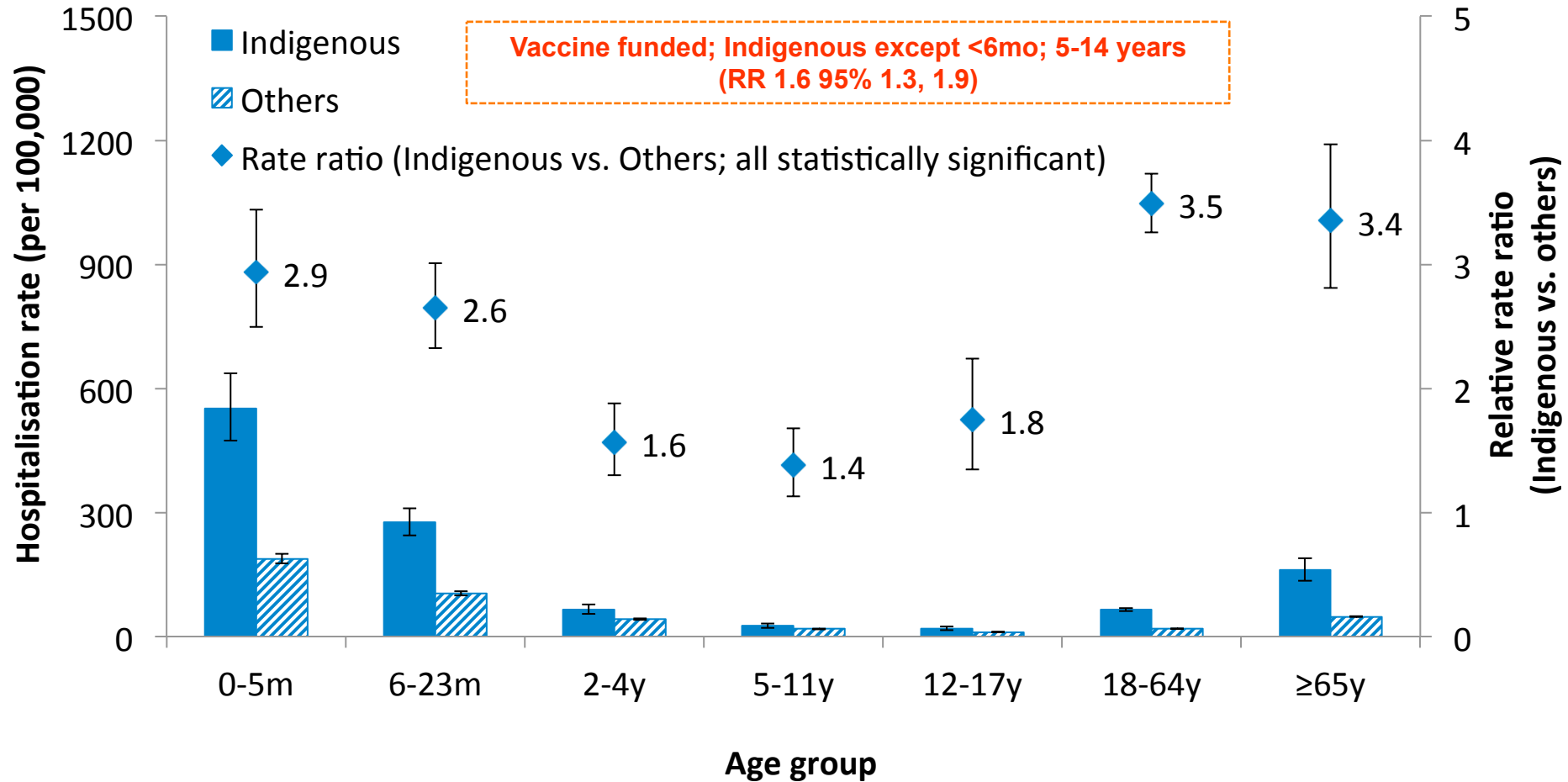


Proportion of ICD-coded hospitalisation for influenza (any diagnosis: J9-11) being virologically confirmed (J9-10), 2002-2013



% lab-confirmed, coded hospitalisations in adults & adolescents progressively increased after pandemic

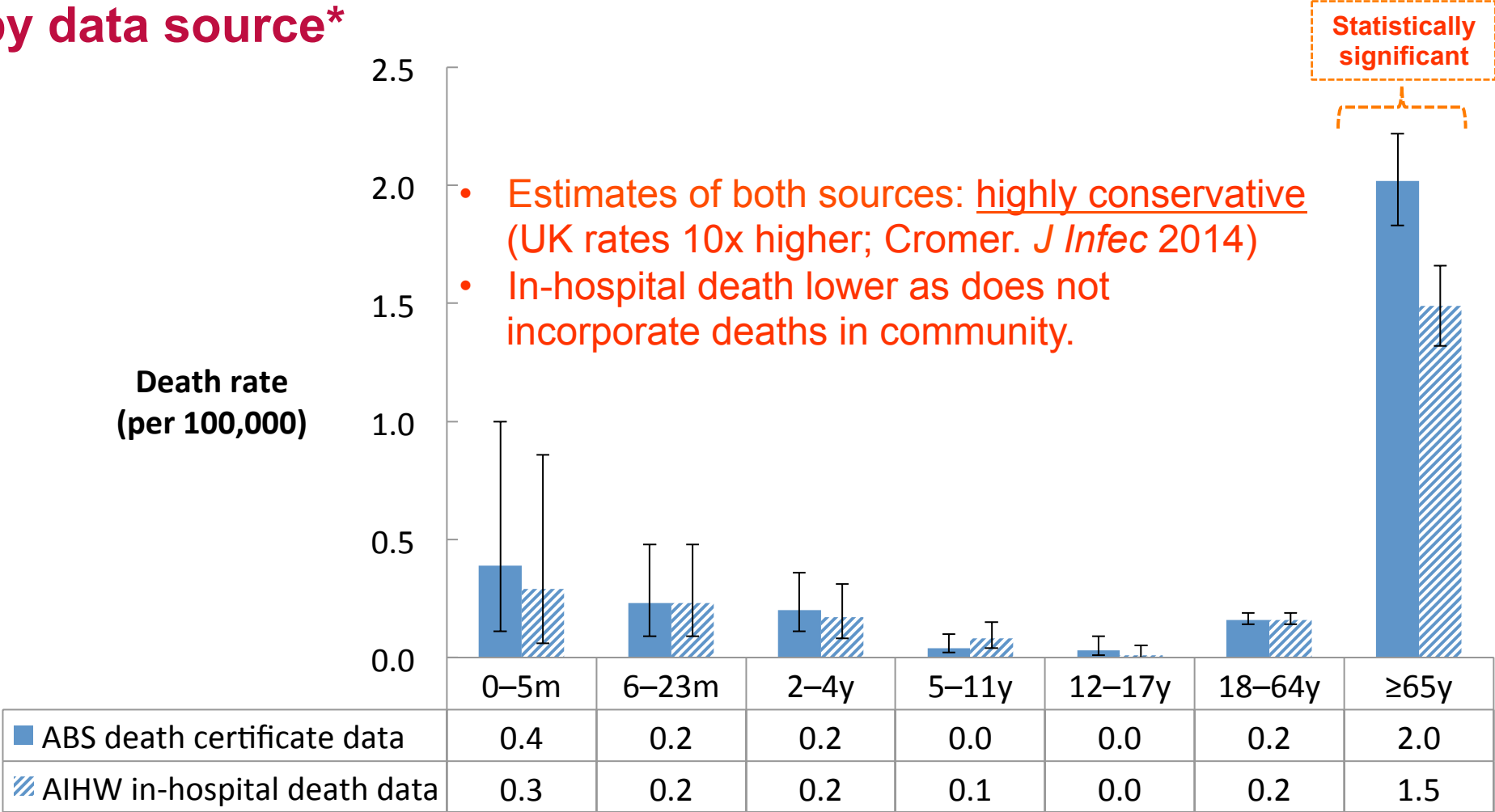
Annual incidence of ICD-coded hospitalisation for influenza (any diagnosis) 2010–2013* by Indigenous status



* AIHW suggests that Indigenous identification data from 2010 are acceptable.

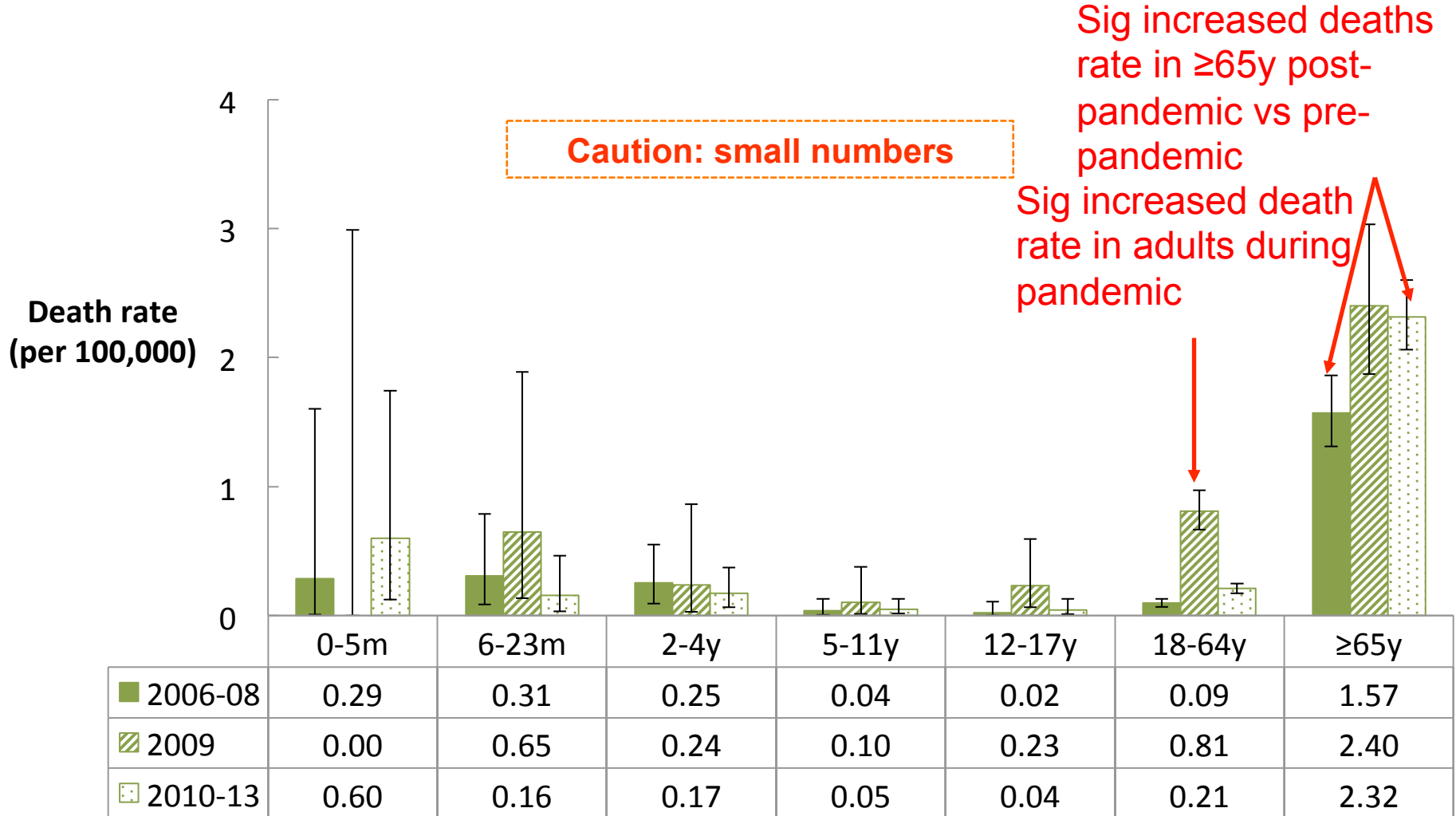
Influenza deaths

Mortality rate attributable to influenza during 2006-13 excl. 2009, by data source*



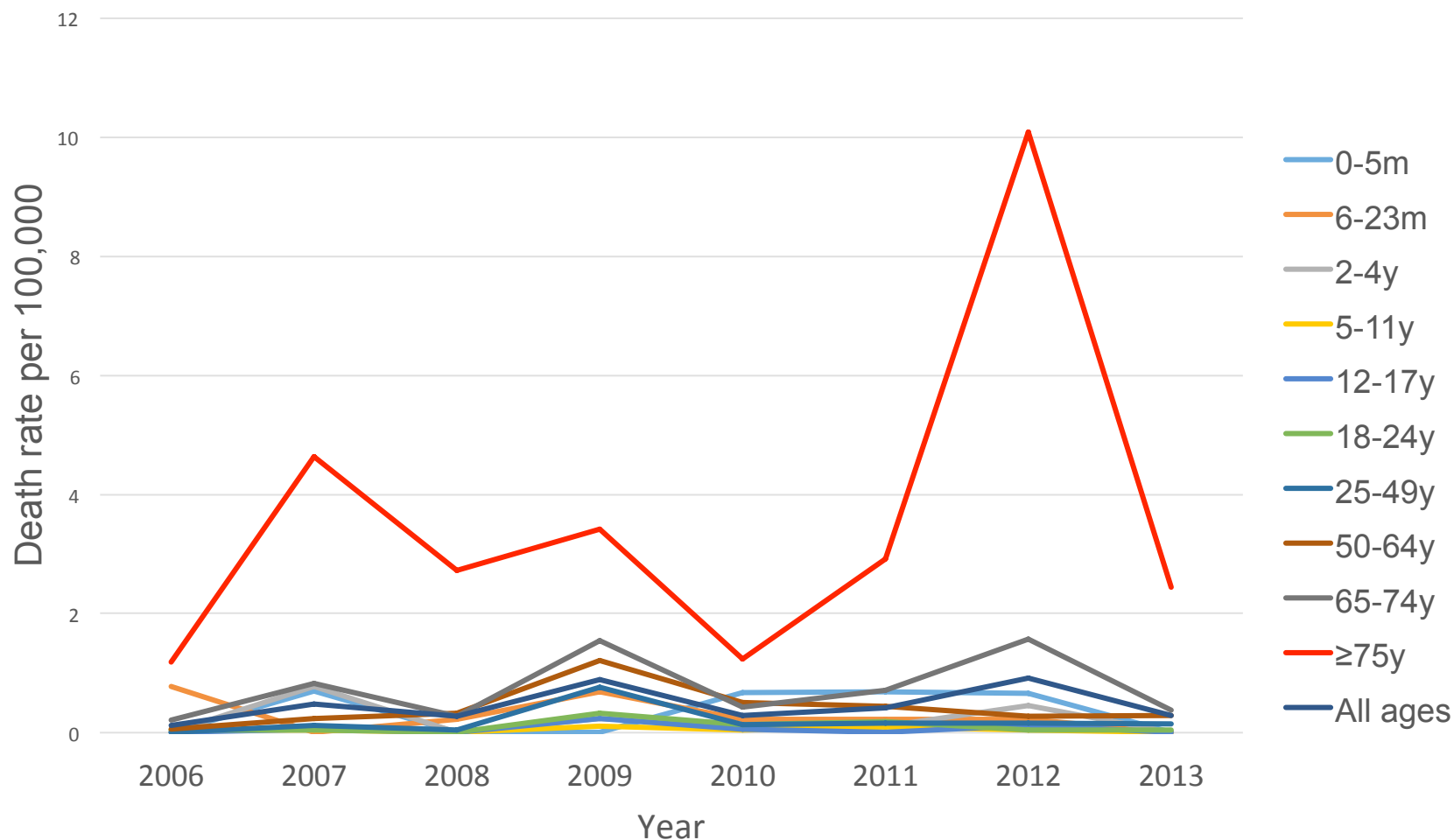
* Death certificate data from ABS (any cause of death) vs. in-hospital death from AIHW National Hospital Morbidity Database ICD-coded hospitalisation data (any diagnosis)

Annual mortality rate for influenza (any cause of death, 2006–2013), by age group & time period



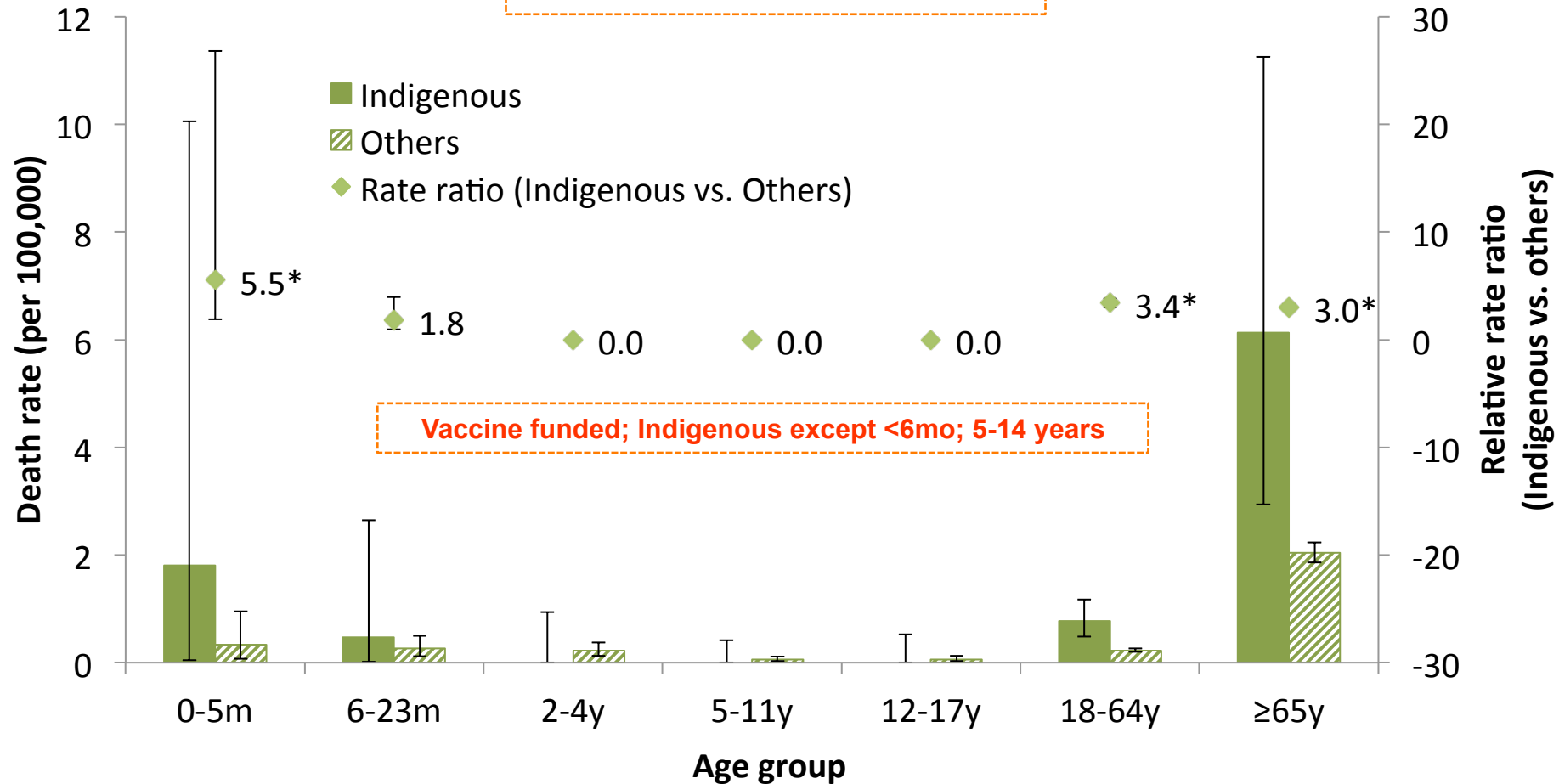
In-hospital death from AIHW National Hospital Morbidity Database ICD-coded hospitalisation data (any diagnosis position)

Annual mortality rate for influenza (any cause of death, 2006–2013), by age group & year



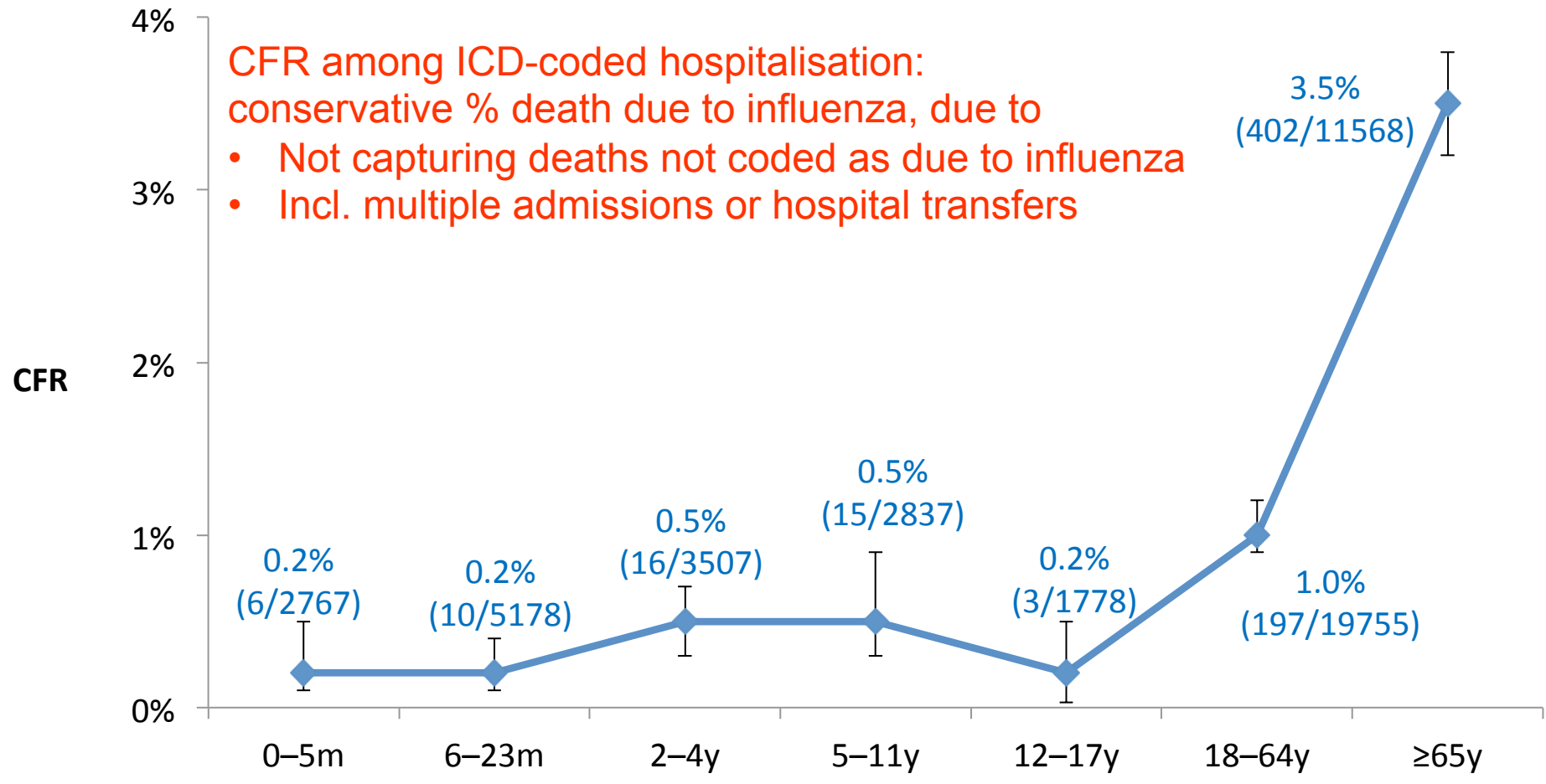
Annual mortality rate for influenza coded any cause of death, 2006–2013 excl. 2009, by age group & Indigenous status

Caution: small numbers



* Statistically significant (based on binominal exact method).

In-hospital case-fatality ratio (CFR) among ICD-coded hospitalisation for influenza (any diagnosis) during 2002–2013 excl. 2009, by age group



Data from sentinel surveillance systems

- **FluCAN: Flu Complications Alert Network**
- Network of 17 hospitals across Australia
- 12% of national bed capacity
- Adult and paediatric hospitalisations.
Standardised definitions
- Review of all PCR confirmed influenza hospitalisations during influenza season
 - Annual prospective analysis of each season
 - Control group allows VE estimation

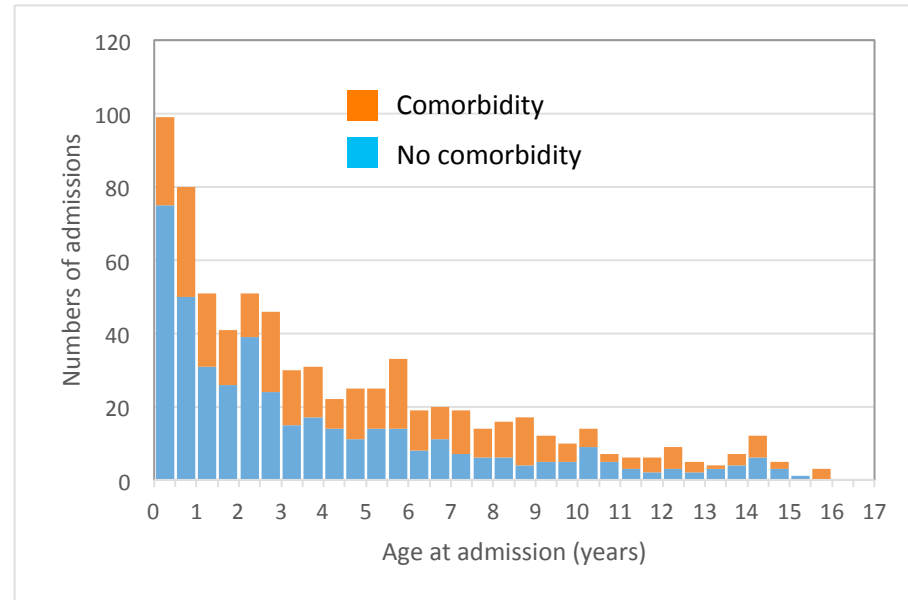
FluCAN 2015 season: Highlights

- 2070 influenza-related hospitalisations
- Overall 2.1% died. Case fatality 3.3% in ≥ 65 y.o
- 7.5% admitted to ICU.
- Vaccine coverage in hospitalised:
 - 80.2% in ≥ 65 y.o.
 - 57.9% in non-elderly adults with medical comorbidities
 - 26.9% in children with medical comorbidities
- Vaccine effectiveness in those targeted of 45% (95%CI: 34-55%)

FluCAN 2011-2014: Paediatric highlights

■ Paediatric hospitalisations 2011-2013¹

- Confirms high proportion of admissions <5y.o.
- ~60% prev healthy
- 8–11% required ICU admission



■ Children with comorbidities

- Twice more likely to be admitted to ICU

■ 2014: Full or partial vaccine coverage in test-negative²

- 12% in all children,
- 18% in those considered at risk.
- VE 55.5%

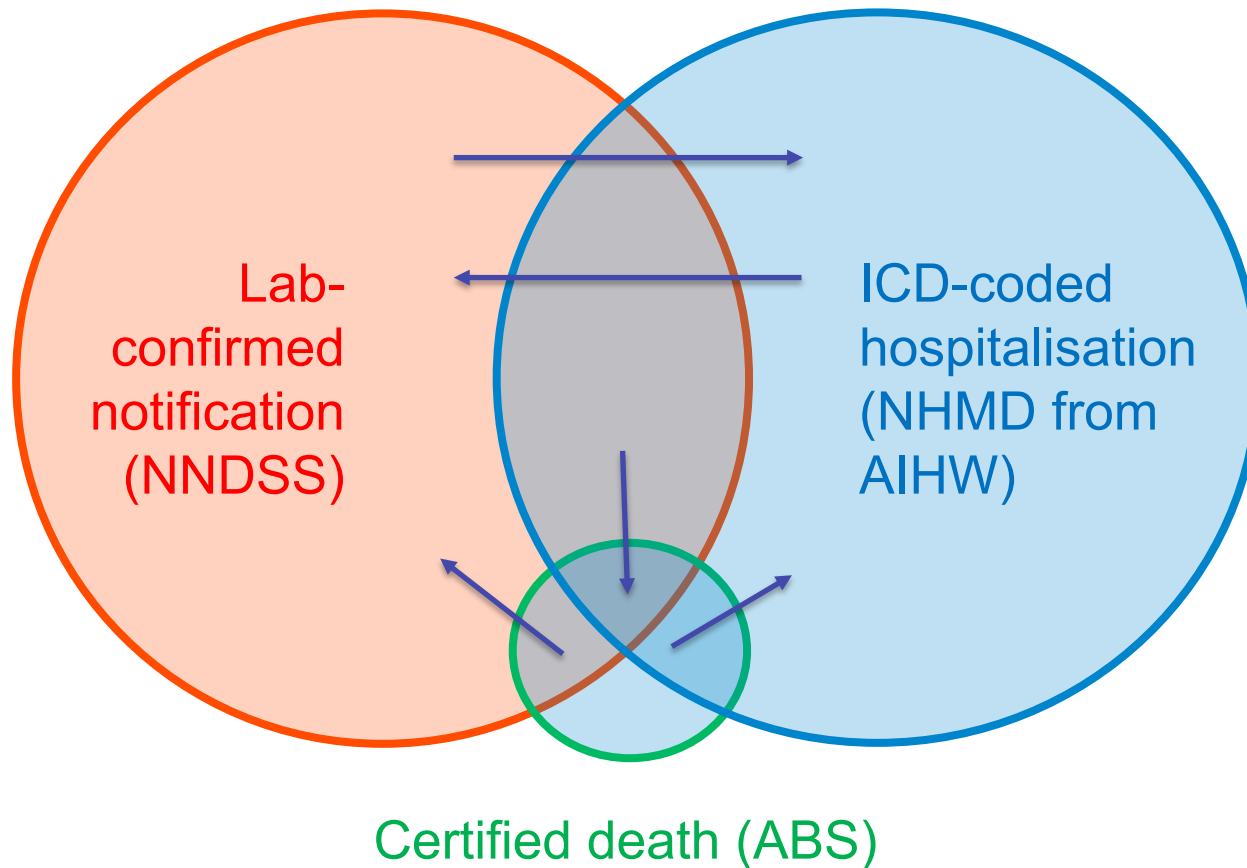
1. Li-Kim-Moy et al. Epidemiology and Infection. 2017 In press.

2. Blyth et al. Eurosurveillance. 2016;21(30):pii=30301.

Limitations

- Underascertainment
 - Not every patient is tested.
 - Local testing practices
 - Availability and ease of laboratory testing
 - Caution in interpretation of ↑notifications
 - Hospitalisation and deaths data relies on accurate coding
 - Actual hospitalisation rates up to 2x higher and deaths 4x higher during 2005-2008 (Muscatello).

Linked national datasets



*ABS=Australian Bureau of Statistics,
AIHW=Australian Institute of Health & Welfare
NHMD=National Hospital Morbidity Database,
NNDSS=National Notifiable Diseases Surveillance System*

Conclusions

- Burden of season influenza in Australia remains substantial
 - Existing vaccination program targets those aged ≥ 65 years & younger individuals with specific risk factors
- Disproportionate burden (hospitalisations; death)
 - ≥ 65 y.o.
 - Young children, especially those $< 2y$
 - Indigenous persons
- Despite limitations, these data are valuable for assessing current vaccination strategies and will help to inform future immunisation strategies

What role?

- Childhood vaccination
- Vaccination of all indigenous