



Determining the vaccination coverage required for indirect protection against invasive pneumococcal disease, Australia

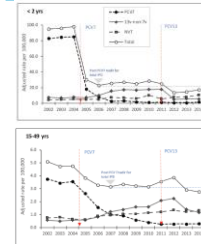
Chan J, Gidding HF, Blyth C, Fathima P, Jayasinghe S, McIntyre P, Moore H, Mulholland K, Nguyen C, Andrews R, Russell FM on behalf of the ACIR Linkage Investigator Team

April 2018

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Pneumococcal conjugate vaccines and indirect effects (PCV)



- Protects against invasive pneumococcal disease (IPD) through direct and indirect effects
- Indirect effects:
 - Result of decreased transmission
 - Comprise a substantial component of overall effect

Jayasinghe et al. 2017 CID 15:64(2):175-183.

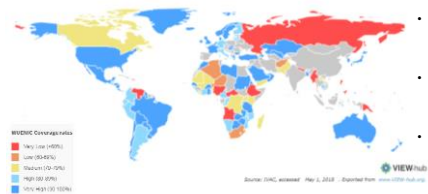
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Indirect effects of PCV in low- and middle-income countries (LMIC)

- IPD surveillance not feasible in LMIC → not able to monitor indirect effects
- Global research priority - reduced dose schedules to minimise costs
 - 1+1 - one infant dose and one toddler dose
 - Rely on maintenance of indirect effects

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PCV introduction worldwide - vaccine coverage



- Key determinant of indirect effects is vaccine coverage
- Vaccine coverage required for indirect effects unknown
- Many countries have low PCV coverage

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Sub-national vaccine coverage



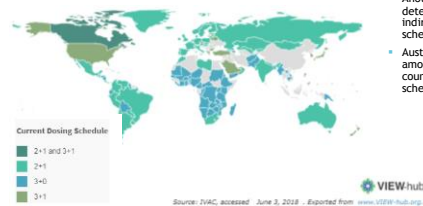
- National estimates can heterogeneity at sub-national level

← DTP3 by household economic status, 2010

SAGE - Global Vaccine Action Plan

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PCV schedules used worldwide



- Another key determinant of indirect effects - schedule
- Australia was unique among high income countries to use 3+0 schedule

Source: [VACC, accessed June 3, 2018]. Reported from: www.VIEW-hub.org

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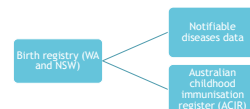
Aim

- To examine the relationship between PCV coverage and vaccine-type invasive pneumococcal disease (IPD) among under-vaccinated children under 5 years of age

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Methods - linked dataset

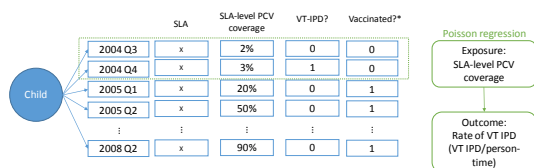
- NSW and WA births 1996-2012, with complete follow-up to December 2013
- 1.3 million children
- Probabilistically linked using demographic details



Gidding et al. 2017. IJPD5; Moore et al. 2016 ANZJPH

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Analysis



*Under-vaccinated: defined as <2 doses at <12 months old and no doses at ≥ 12 months old

- Adjusted by time since vaccine introduction, age, Indigenous status, rurality (ARIA score), socioeconomic status (SEIFA score)

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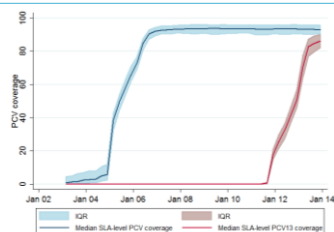
Incidence of vaccine-type IPD among under-vaccinated children <5 years old, NSW and WA, 2002-2013

	PCV7-type IPD		PCV13, nonPCV7-type IPD	
	No. IPD cases	Annual incidence per 100 000 person years	No. IPD cases	Annual incidence per 100 000 person years
Pre-universal PCV (2002-2004)	452	59.5 (54.3-65.3)	29	3.7 (2.6-5.3)
Post-PCV7 (2005-2010)	105	10.0 (8.2-12.1)	341	8.3 (7.5-9.3)
Post-PCV13 (2011-2013)	1	1.1 (0.2-7.9)	25	4.0 (2.7-6.0)

*Under-vaccinated against PCV7; *Under-vaccinated against PCV13

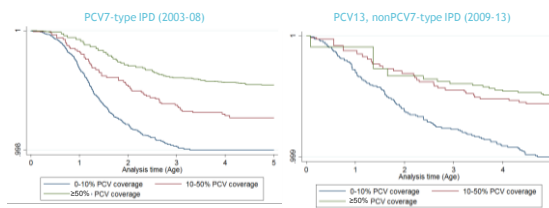
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SLA-level PCV coverage (median and IQR) among children 12-23 months of age, NSW and WA, 2003-2013



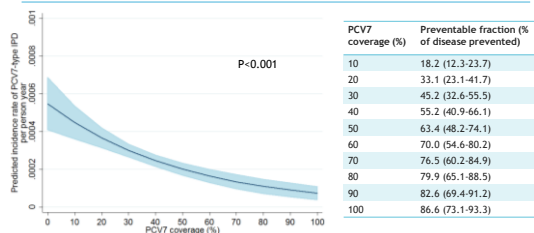
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Kaplan-meier plots - vaccine-type IPD among under-vaccinated children <5 years old, by SLA-level PCV coverage group, NSW and WA



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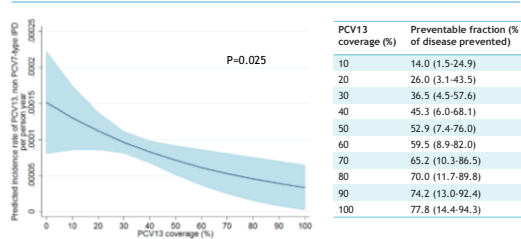
Predicted risk of PCV7-IPD in under-vaccinated children <5 years old by SLA-level PCV coverage*, 2003-08



*PCV coverage calculated among children 12-23 months of age

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Predicted risk of PCV13, nonPCV7-type IPD in under-vaccinated children <5 years old, by SLA-level PCV coverage*, 2009-13



*PCV coverage calculated among children 12-23 months of age

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Discussion

- Results indicate a strong relationship between PCV coverage (at SLA-level) and indirect effects
- Next step - PCV coverage determined among children <5 years
 - Critical age group for herd immunity
 - Identify herd immunity threshold
- Results help understand how to achieve and maximise indirect effects
- Need for similar analyses in other settings - relationship between vaccine coverage and herd immunity affected by other factors e.g. social contact patterns and vaccine schedules

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Acknowledgements

Data linkage units

Australian Institute of Health and Welfare
Western Australian Data Linkage Branch
Centre for Health Record Linkage (ChReL)

Data custodians and Department of Human Services

NSW, WA, and Commonwealth Health Departments, AIHW

The study reference groups

Aboriginal Immunisation Reference Group (AIRG)
Infectious Diseases Community Reference Group (WA)

The Population Health Research Network (PHRN)

A capability of the Australian Government National Collaborative Research Infrastructure
Strategy and Education Investment Fund Super Science Initiative

NHMRC funding

HCM, HFG and FR are supported by NHMRC Fellowships
Project grant APP1082342 (2015-2018)
CRE in Immunisation (2012-2016), especially the Aboriginal stream members

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