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# What do we know about the impact of vaccines on transmission?

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- What is transmission?
- Effects of vaccination - individual
- Evidence of vaccine effects
- Implications
- Conclusions

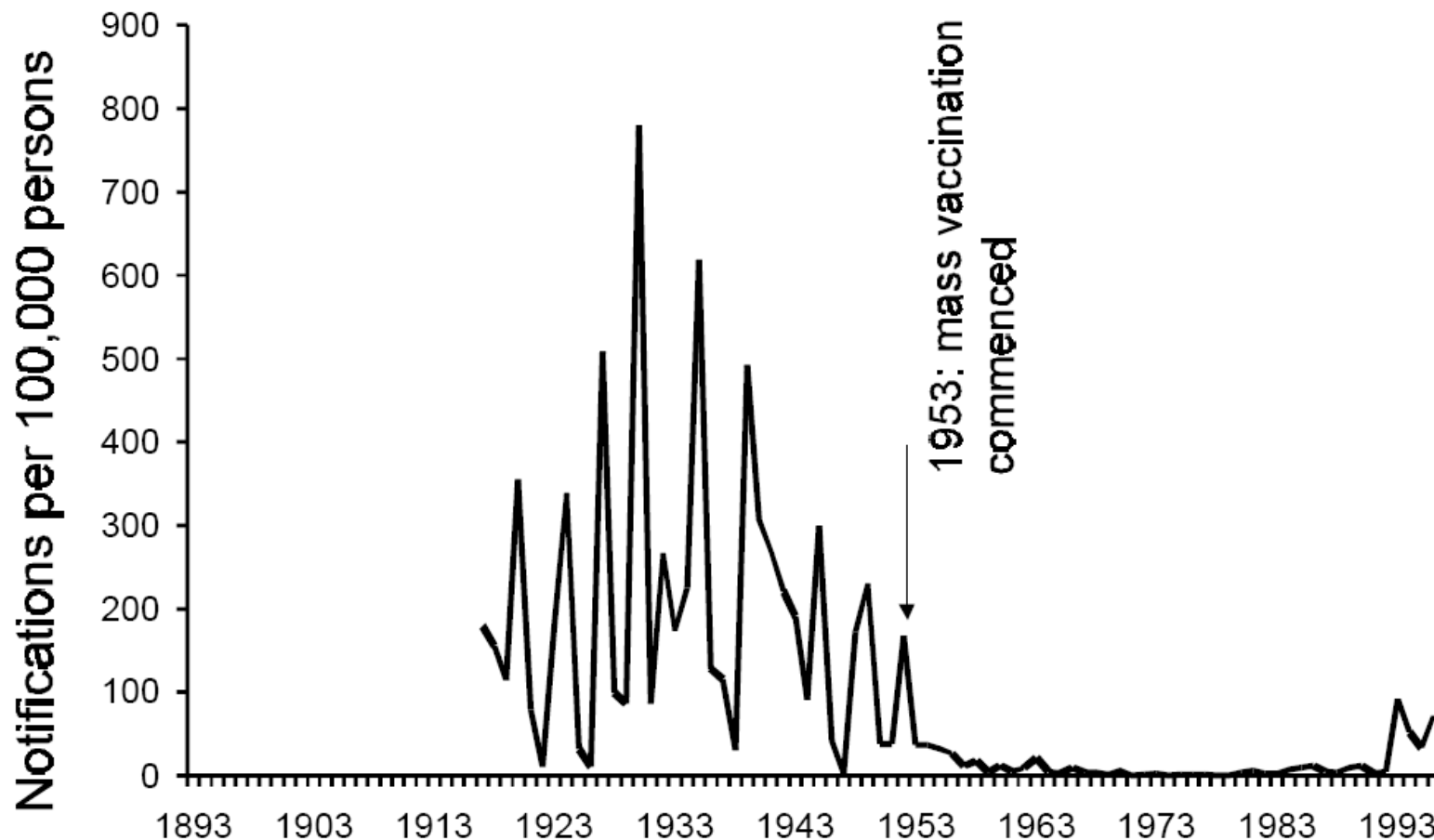
- Transfer of *Bordetella pertussis* bacterium between hosts
- Regulated by:
  - Natural immunity
  - Vaccination coverage and efficacy
  - Antibiotic use
  - Adequate contact
- Consequences may be detrimental or beneficial

- **For vaccinated person:**
  - Reduction in susceptibility to infection
  - Reduction in disease severity
  - Reduction in infectiousness
  
- **For unvaccinated person:**
  - Reduced proportion of contacts infected
  - Infected contacts less infectious
  - Herd immunity

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- Number of cases overall

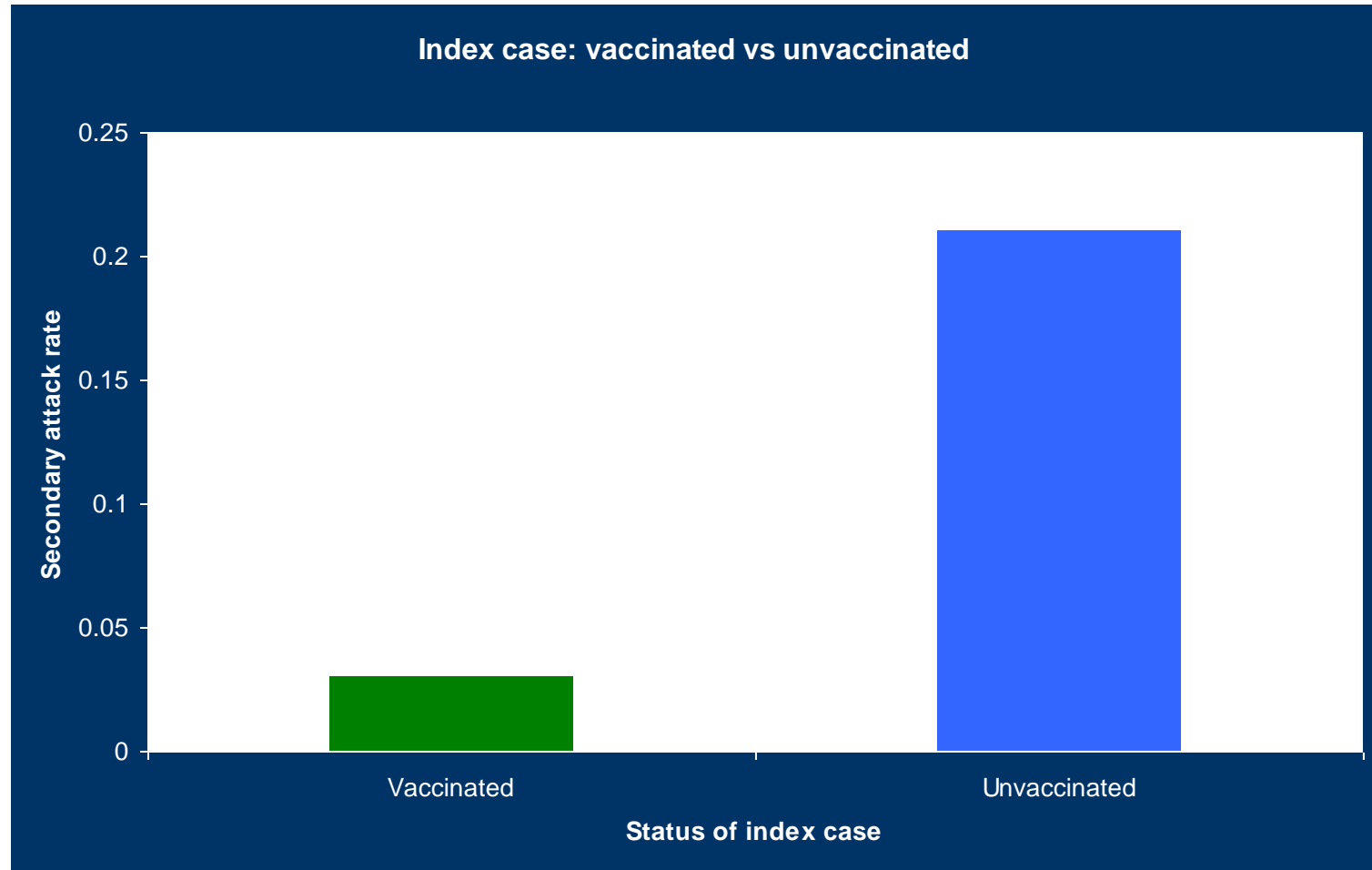
Notification rate for pertussis in South Australia, 1893 to 1996



Scheil W, Cameron S, Roberts C, Hall R. Pertussis in South Australia 1893 to 1996. *Commun. Dis. Intell.* 1998;22(5):76-80.

- Number of cases overall
- **Infectiousness of vaccinated cases**

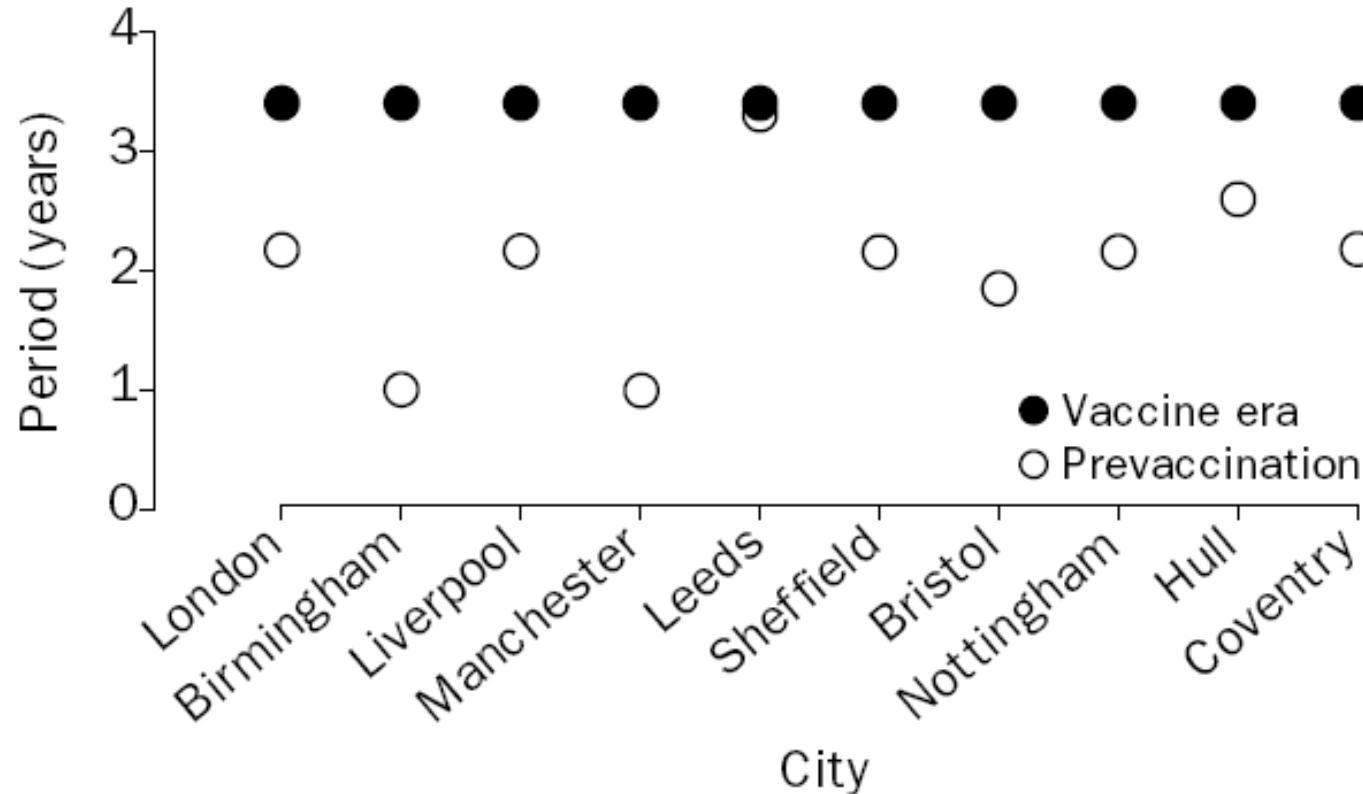
## Senegal household study



Halloran ME, Préziosi MP, Chu H. Estimating vaccine efficacy from secondary attack rates. *Journal of the American Statistical Association*. 2003;98(461):38–46.

- Number of cases overall
- Infectiousness of vaccinated cases
- **Changes in the inter-epidemic period**

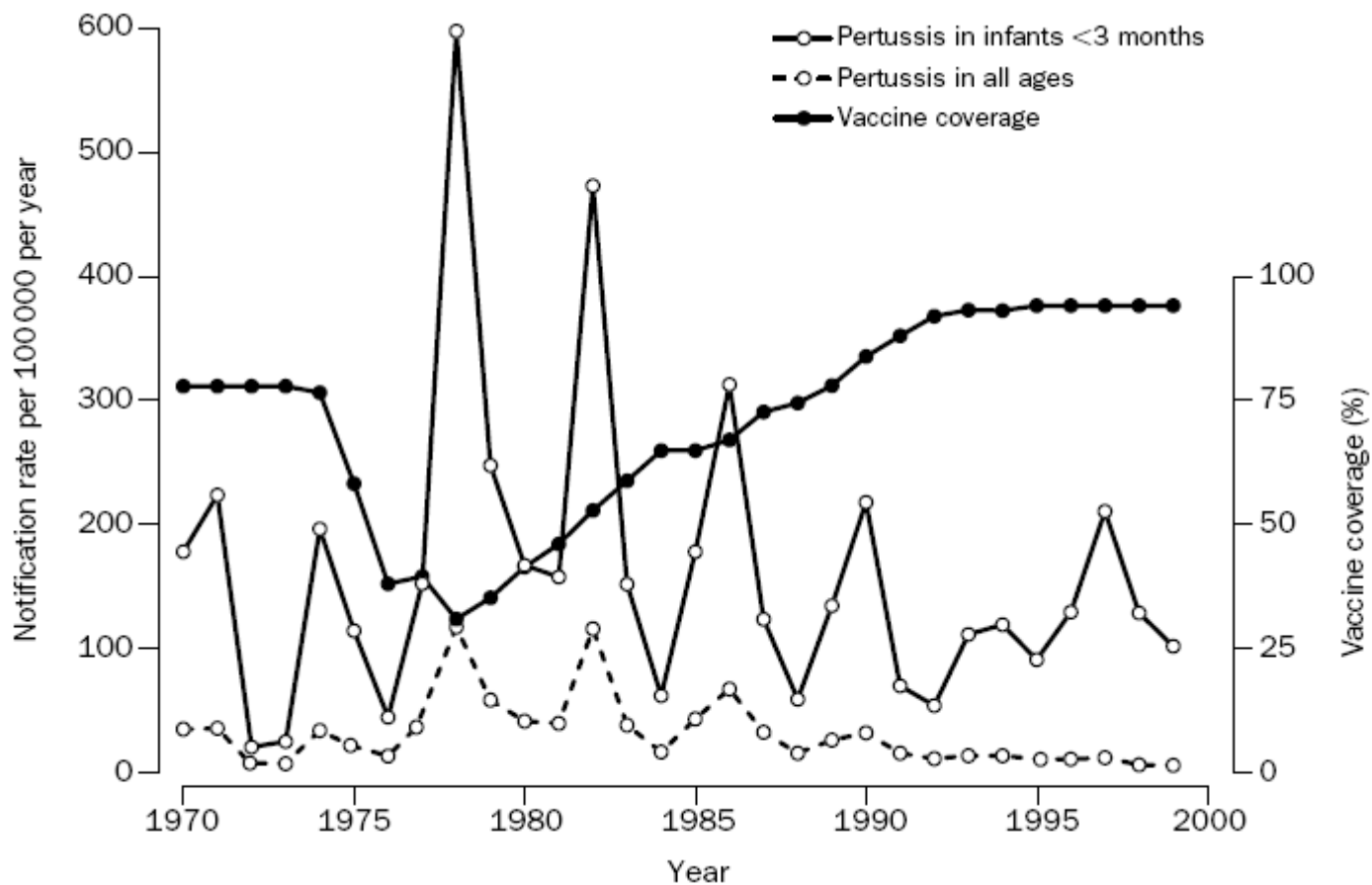
## Change in periodicity in top ten cities in England and Wales



Rohani P, Earn DJD, Grenfell BT. Impact of immunisation on pertussis transmission in England and Wales. *The Lancet*. 2000;355:285-286.

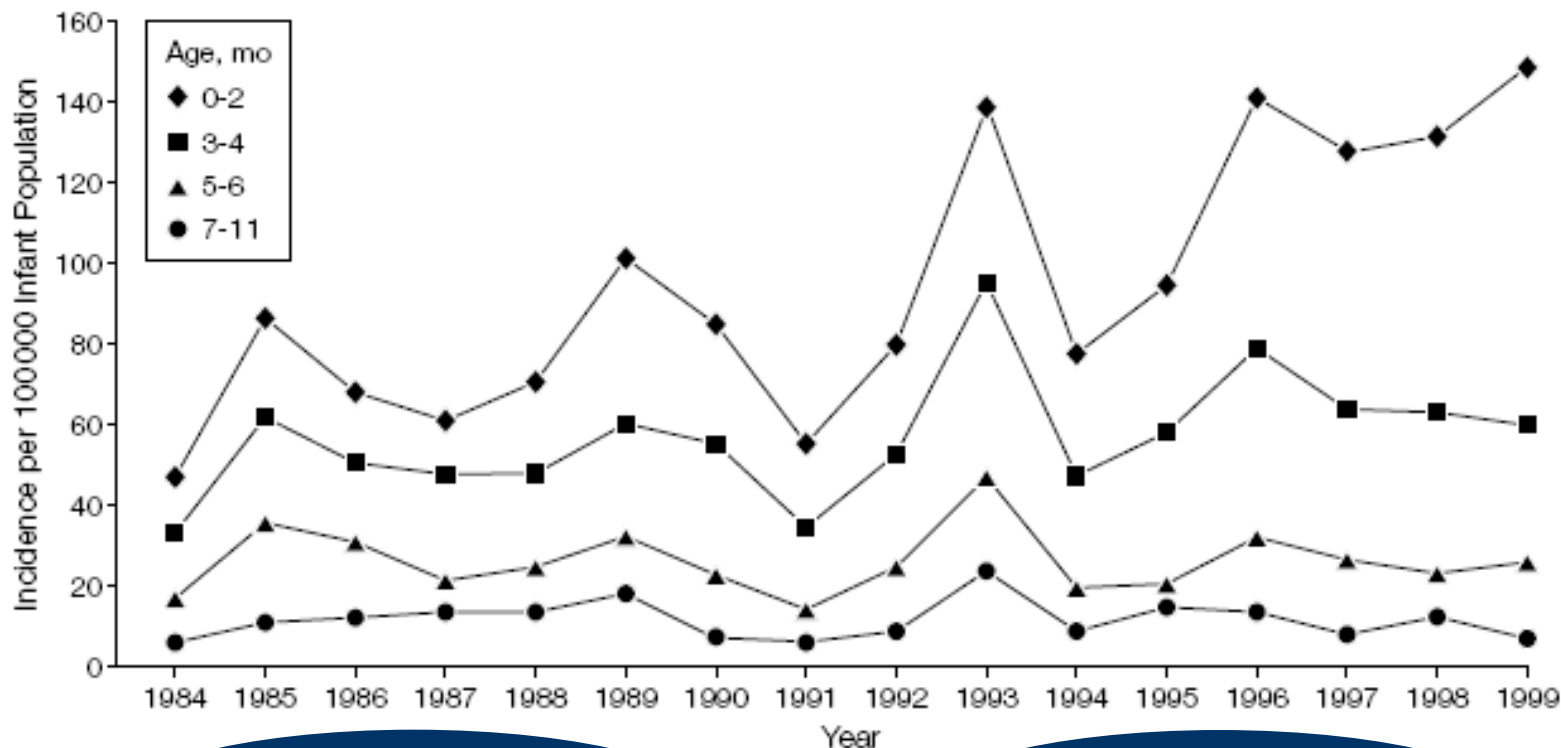
- Number of cases overall
- Infectiousness of vaccinated cases
- Changes in the inter-epidemic period
- **Changes in rates in unvaccinated population**

## Reduction in incidence in unvaccinated population - UK



Gay NJ, Miller E. Pertussis transmission in England and Wales. *Lancet*. 2000;355(9214):1553-4.

## Increase in incidence in unvaccinated population - US



Vaccine coverage about 68%

Vaccine coverage about 86%

Tanaka M, Vitek CR, Pascual FB, et al. Trends in pertussis among infants in the United States, 1980-1999. *JAMA*. 2003;290(22):2968-75.

- South Australian reduction in cases
  - vaccination at least reduces typical disease
- Senegal study
  - vaccination reduces infectiousness
  - effect may reduce over time
- Changes in inter-epidemic period
  - uncertain
- Rates in unvaccinated infants
  - uncertain

- Disease severity versus infectiousness
- Duration of protection against infectiousness
- Measuring subclinical cases
- Problems caused by reducing transmission
- Short term versus long term effects
- Whole cell versus acellular

- The impact of pertussis vaccination on transmission is uncertain
- Targeted vaccination strategies rely on vaccination interrupting transmission
- Long term impact of vaccination on transmission requires integration of all factors

## University of Melbourne

- Jodie McVernon
- James McCaw
- Terry Nolan
- John Mathews

## NCIRS

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- Helen Quinn
- Rob Menzies
- Lyn Gilbert

## UNSW

- James Wood

# Questions