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The rise and fall of pertussis: Evaluation of the Pertussis Immunisation Programme for pregnant women

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Public Health England

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What is pertussis (whooping cough)?

- *Bordetella pertussis* exclusively human pathogen
  - Transmitted through close direct contact
- Incubation period average 7-10 days
- Can infect others from 2-4 days before coughing starts to 21 days after symptom onset
- Symptoms and severity vary with age
- Vaccination is the most effective strategy to prevent transmission
- Infection / Vaccination do not confer lifelong protection

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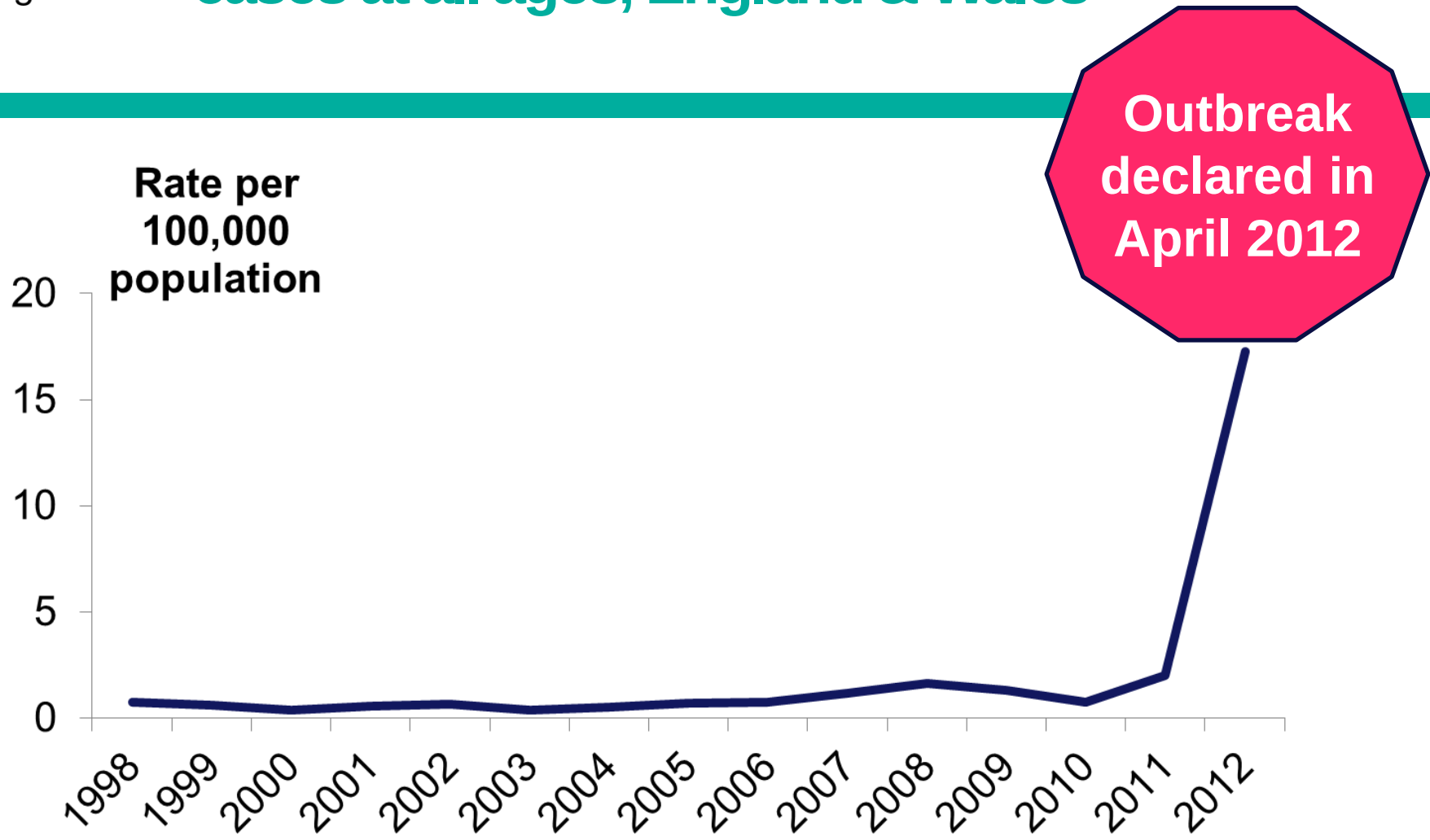
Incidence of laboratory confirmed pertussis cases at all ages, England & Wales



conciled deaths from pertussis nfants, England only

Five babies die as whooping cough hits 20-year high

By Rebecca Smith

WHOOPING cough cases are at their highest for 20 years and five babies have died so far this year, government scientists have said.

Figures from the Health Protection Agency (HPA) show that there have been 1,781 cases in the first five months of this year, compared with 137 in 2010.

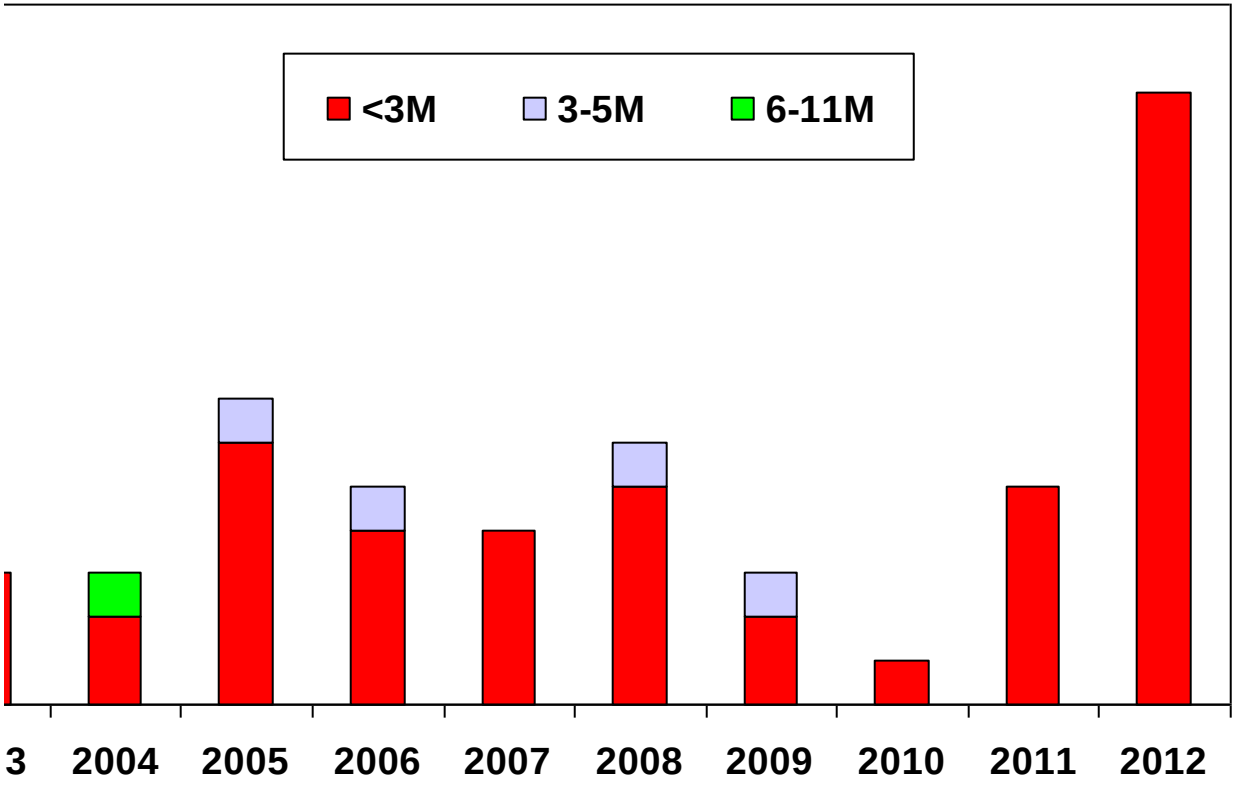
Vaccinations given in childhood lose their effectiveness over time, leading to cases in teenagers and adults. Experts are considering whether a booster jab needs to be given in adolescence.

The majority of cases this year have affected people aged over 15 but there has been a sharp rise in cases among babies aged under three months, who are too young to have had their first vaccination. There were 138 cases in babies under three months between January and May, compared with 67 during the same period in 2008, and five babies died.

A spokesman for the HPA said the increase may be due to better awareness among doctors resulting in an increased diagnosis of the disease, but that "waning immunity following vaccination and/or natural infection is also likely to be an important contributory factor".

Dr Gayatri Armithalingham, consultant epidemiologist at the HPA, said young babies were at the "highest risk of severe complications and death" from whooping cough. "Anyone showing signs and symptoms, which include severe coughing fits accompanied by the characteristic 'whoop' sound in young children, but as a prolonged cough in older children and adults, should visit their GP," he said.

"Whooping cough can spread easily to close contacts such as household members." He added that vaccination was the most effective way to prevent infection to children and babies, so parents should ensure all children were up to date with their vaccinations.



cases, certified deaths, Hospital episode statistics, GP registration

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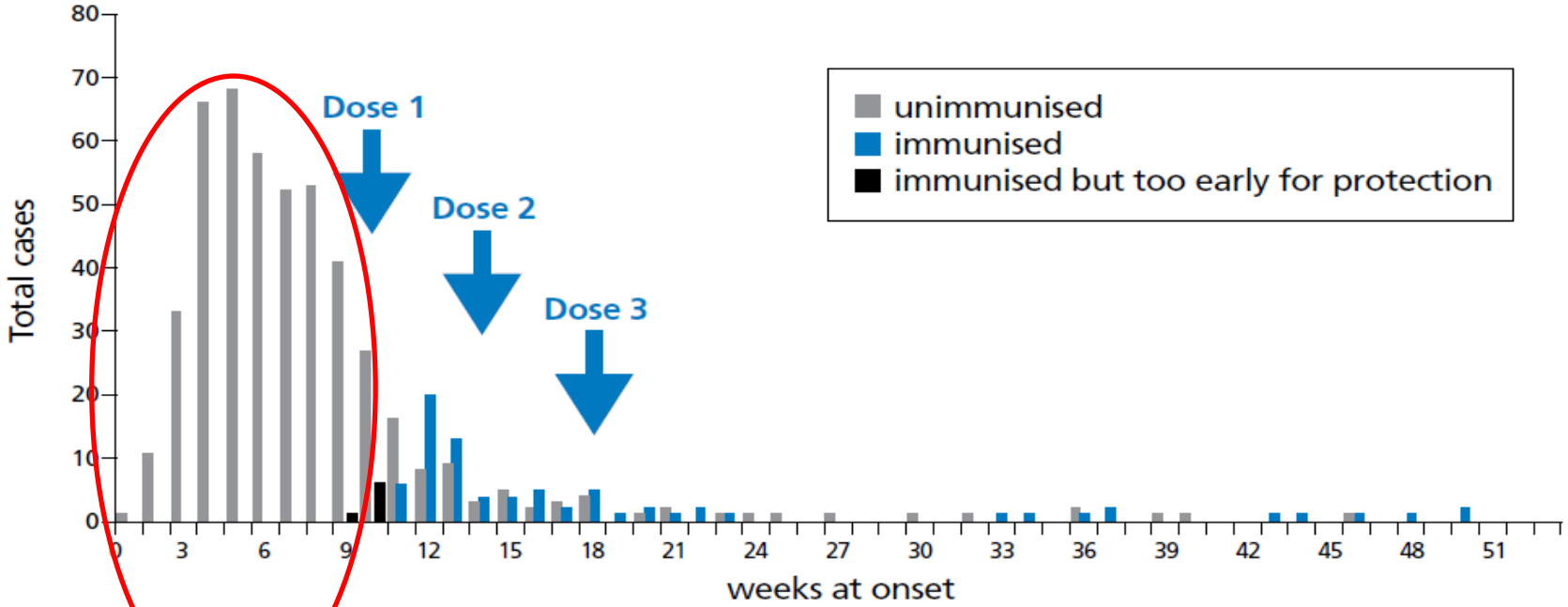
Onset age of laboratory confirmed pertussis cases in infants



Confirmed cases in infants aged under one year, by week of age at onset (2011- August 2012). Protection is assumed to accrue within the two weeks following immunisation.

Pertussis (Whooping Cough)
How can we better control disease?
The options

- Cocooning strategy
- Neonatal immunisation
- Commencing primary infant course at 6 weeks
- Timely completion of current schedule
- Vaccination of Pregnant Women
- Vaccination of Healthcare workers
- Adolescent Pertussis Booster

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UK Maternal Programme introduced as outbreak response measure

- Only potential way to protect infants from birth
  - Boost immunity in pregnant women
  - Optimise transplacental transfer of maternal Abs
  - Passive protection in infant until first dose of vaccine at 2 months
- Additionally these women are then unlikely to be a source of infection for their babies

Pertussis vaccination in pregnancy

UK Maternal Programme introduced as outbreak response measure

Introduced in October 2012

- Offer a single dose of Repevax®(dT5aP/IPV) ideally between 28-32 weeks pregnancy
- Offer in every pregnancy

From July 2014, vaccine changed to Boostrix-IPV® (dT3aP/IPV)

From April 2016, guidance updated to advise women can be vaccinated from 16 weeks, ideally between 20-28 weeks (usually after 20 week scan)

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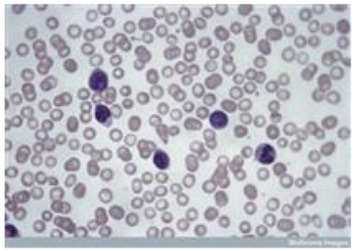
Pregnant women to be offered pertussis vaccine

Mark Gould

Add to PDP Print

Friday, 28 September 2012



From today all pregnant women will be offered the whooping cough vaccine amid concerns about a serious increase in prevalence of the disease which has resulted in nine infant deaths this year.

Both the Royal College of General Practitioners (RCGP) and the Health Protection Agency (HPA) have welcomed the move which was announced by the Chief Medical Officer for England, Dame Sally Davies, today.

The HPA says it received reports of 1,230 cases of whooping cough in August 2012, bringing the total number of cases so far this year to 4,791, according to figu today.

It says the total number of cases so far in 2012 (up to end of August) is now more than four t the annual total number of cases reported in 2011 (1,118) and in 2008 (908) – the last 'peak' current outbreak.

In August there were a further three pertussis-related deaths in infants aged three months an the total number of deaths in this age group so far this year to nine.

Dr Maureen Baker, the RCGP's Health Protection Lead said the college welcomed the move, "p light of the recent deaths of babies".

"Whooping cough is a highly infectious bacterial disease which spreads when a person with th coughs and sheds the bacteria which is then inhaled by another person.

"The vaccine will be offered to pregnant women from week 28 of their pregnancy during routi appointments with a GP, midwife or nurse.

The Telegraph

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Pregnant women to be given whooping cough vaccine to protect unborn child

Pregnant women are to be given the whooping cough vaccine for the first time following the biggest outbreak of the disease for 20 years and the deaths of ten babies.

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28 September 2012 Last updated at 02:53

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Fergus Walsh

Medical correspondent

More from Fergus

Whooping cough vaccine a 'no-brainer' during pregnancy

COMMENTS (46)

Zoe was just four weeks old when she got whooping cough, and had to spend

Maternal Immunisation Programmes: Country Specific Recommendations

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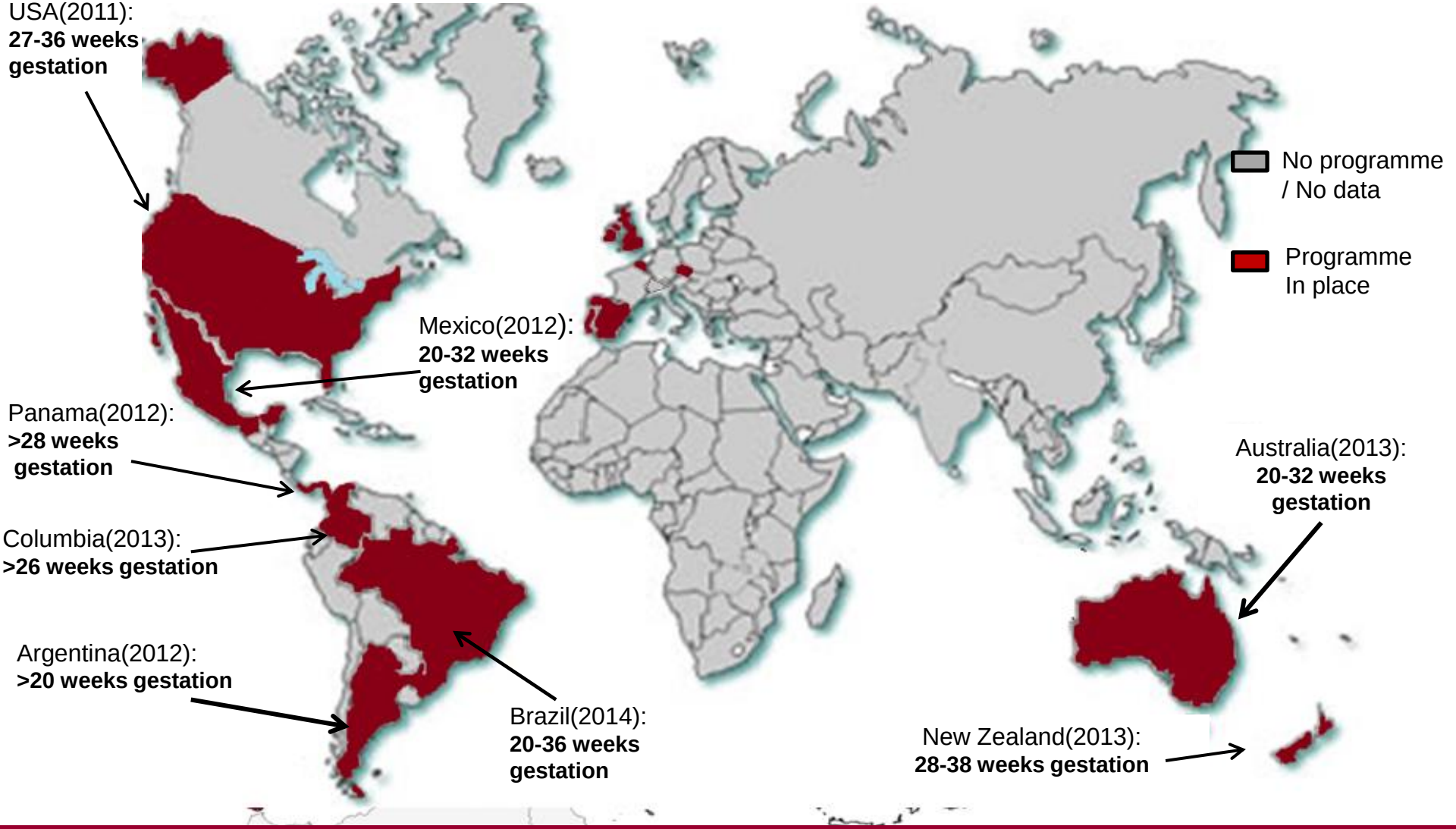

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Evaluation of the immunisation in pregnancy programme

- Attitudinal research
- Monthly vaccine coverage collection
- Programme impact on disease and death
- Vaccine effectiveness
- Impact of passive Abs on infant immune response
- Cost effectiveness
- Vaccine safety

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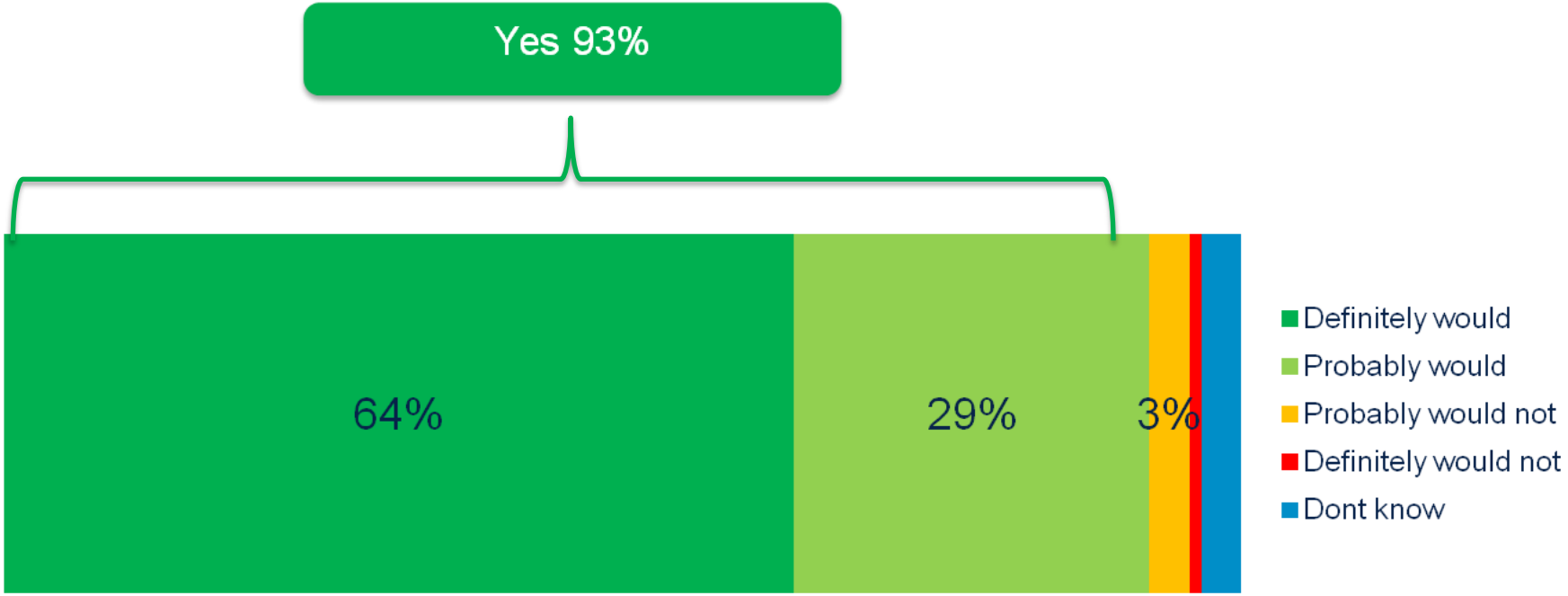
The vast majority of mums are in favour of future whooping cough immunisation

Q How likely would you be to choose to have whooping cough vaccine in this or a future pregnancy

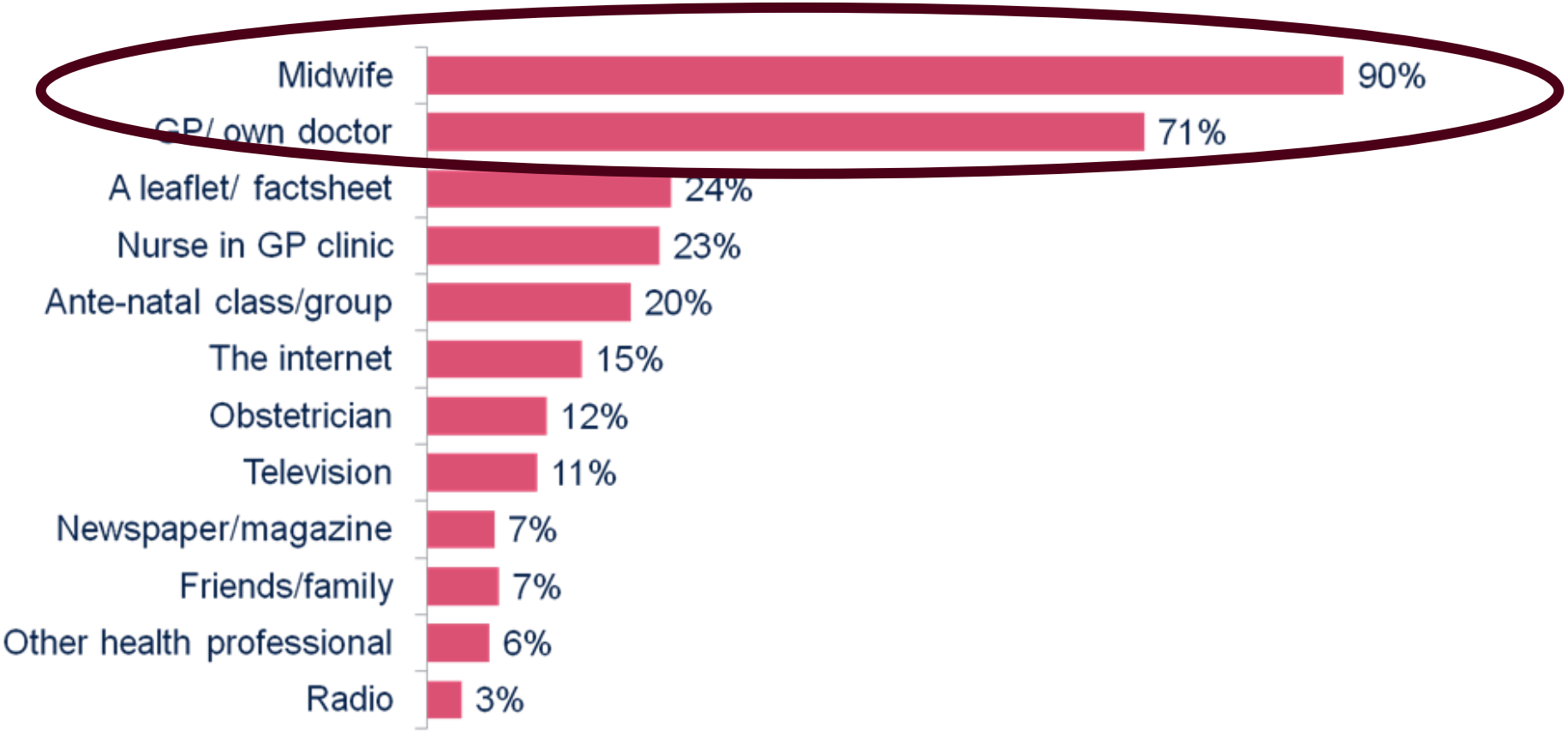


Campbell, et al British Journal of Midwifery 2015 23:8, 566-573.
ttp://www.magonlinelibrary.com/doi/10.12968/bjom.2015.23.8.566

Base: All respondents (1,892)

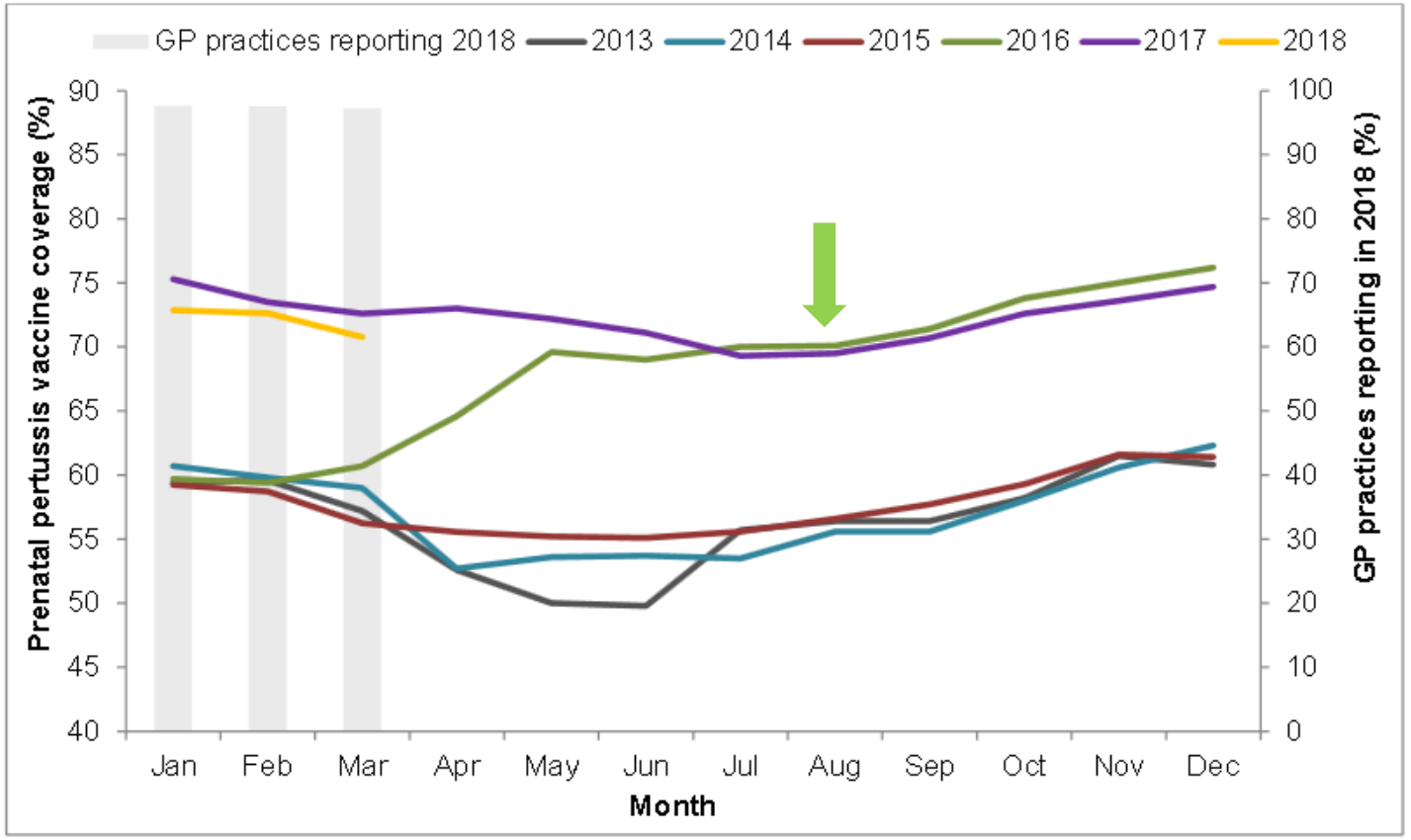
Midwives and GPs are mums' preferred channels for communication

Q Ideally, where would you like to get information from if you are being offered a vaccine in pregnancy?



Base: All respondents (1,892)

Monthly pertussis vaccination coverage (%) in pregnant women: England, 2013-2018

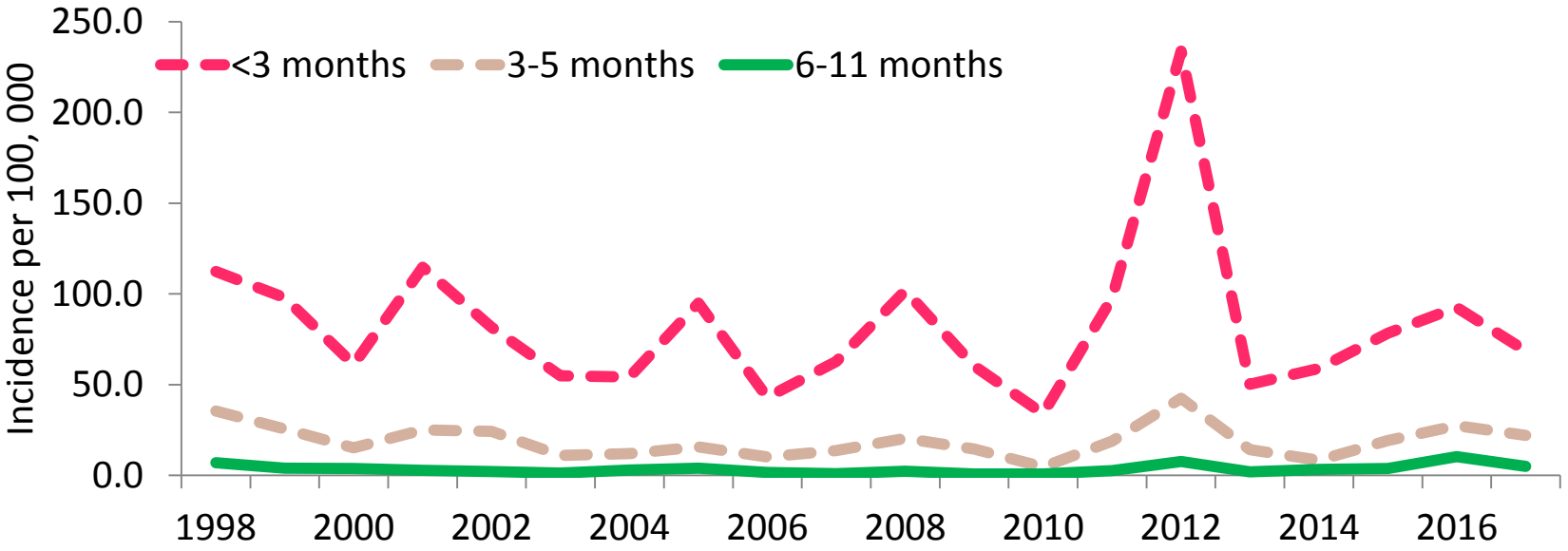


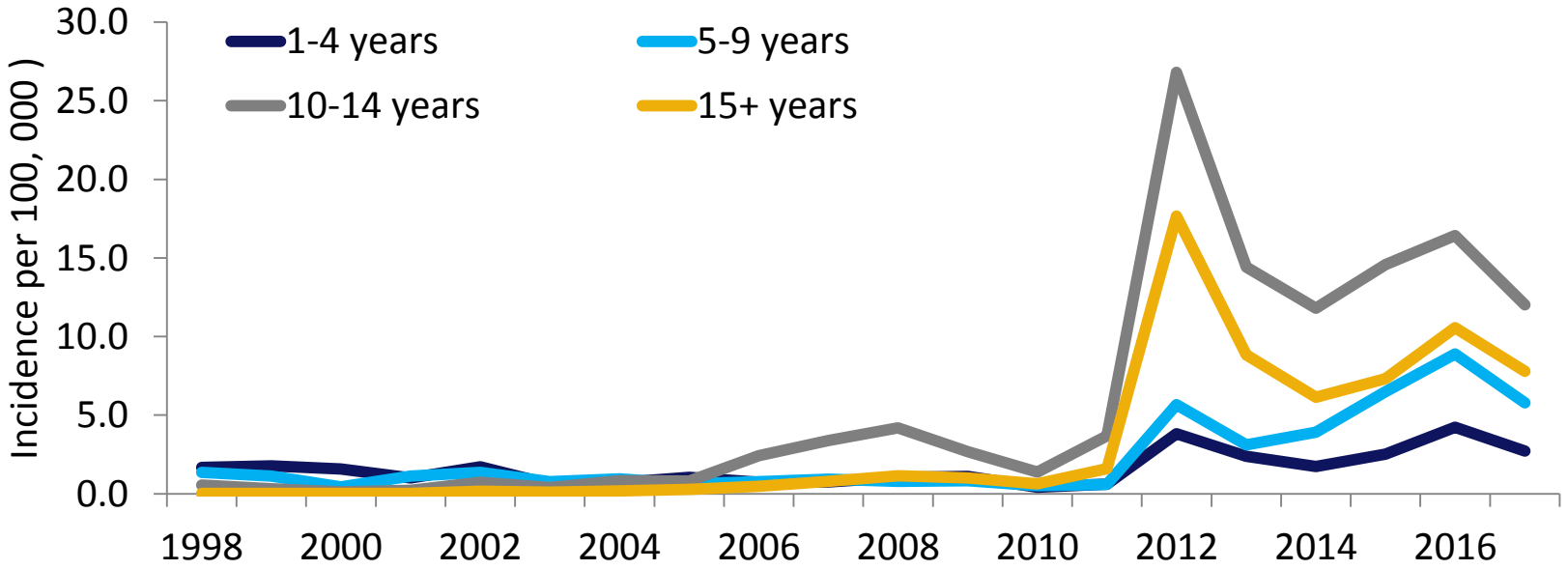
1. New IT specification implemented in March/April 2016; coverage reported prior to this date is likely to be underestimated.

2. Women first offered pertussis vaccine from 20 weeks gestational age in April 2016 would have been expected to deliver in August 2016.

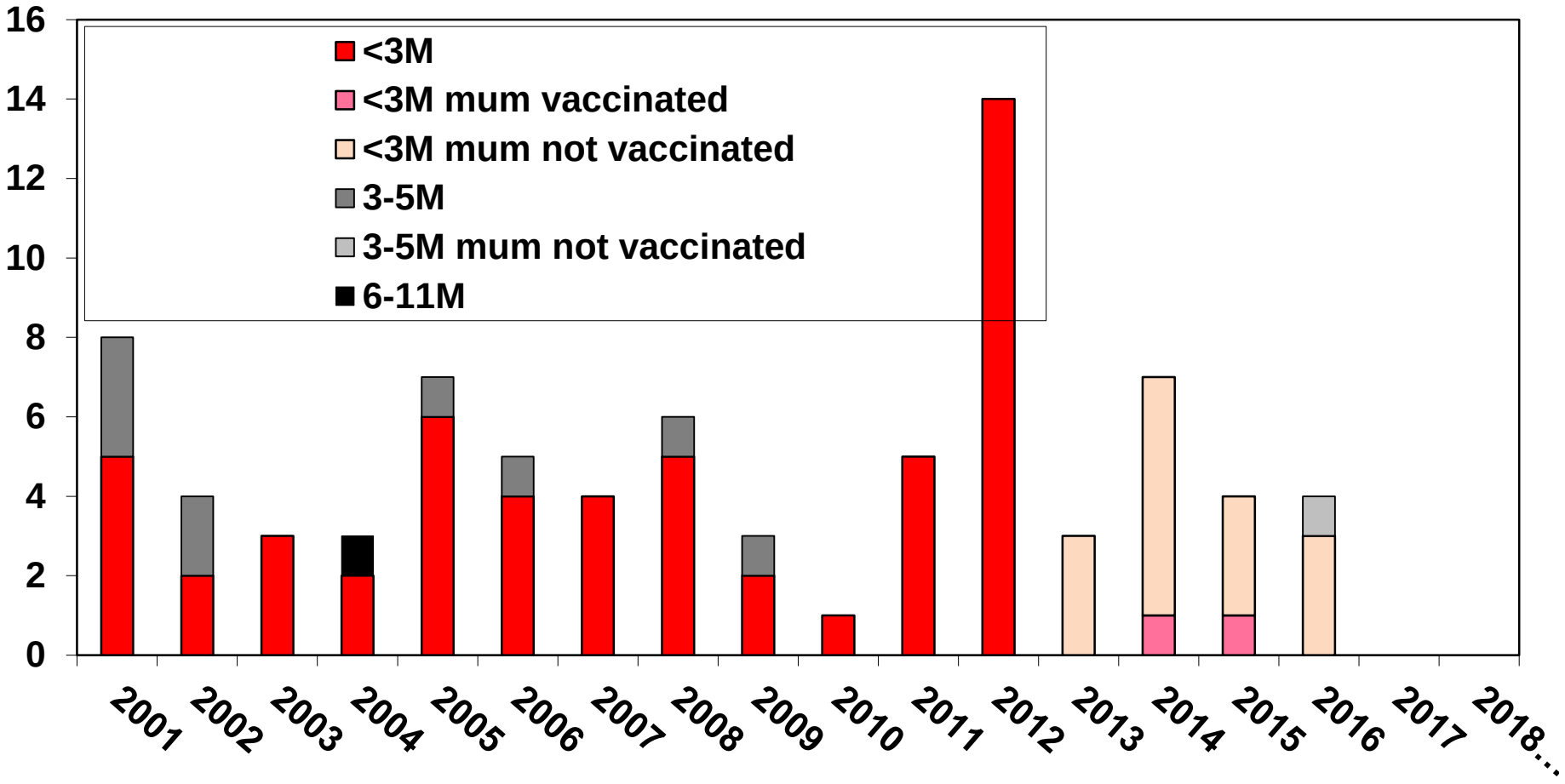
https://www.gov.uk/government/publications/pertussis-immunisation-in-pregnancy-vaccine-coverage-estimates-in-england-october-2013-to-march-2014

Laboratory confirmations, England





Reconciled deaths from pertussis in infants, England 2001-2018 (to date)



Sources: lab confirmed cases, certified deaths, Hospital episode statistics, GP registration details, HPZone

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Pertussis maternal vaccine effectiveness in prevention of infant disease: England

(1)Amirthalingam G et al. Lancet 2014 (2) Dabrera G et al. CID 2014
(3) Amirthalingam G et al CID 2016 (4) Unpublished PHE data to Sept 2017

Analysis <2M age	Cases vaccinated / total	Matched / control coverage	Adjusted VE (95% CI)
Screening method (1)	11/81 (15%)	61%	90% (82% to 95%)
Case-control study (2)	10/58 (17%)	39/55 (71%)	93% (81% to 97%)
Screening Method (3)	35/243 (14.4%)	64.8%	91% (88% to 94%)

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Growing evidence of effectiveness of maternal immunisation programmes[1,2]

- Infants born to vaccinated mothers had lower risk of hospitalisation, ICU admission and shorter hospital stays. Adjusted VE for preventing hospitalisation was 58% (95% CI: 15-80%)[3]

1. Winter *et al.* CID 2017 64(1): 3-8 2. Baxter *et al.* Pediatrics 2017 3. Winter *et al.* CID 2017 64(1):9-14 4. Unpublished PHE data to September 2017

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Investigating impact on infant immune response - Blunting

- Consistent reporting of interference in the infant's primary pertussis response following maternal immunisation – serological markers.
- The clinical significance of these findings remains unclear as no agreed correlate of protection for pertussis
- Specific pertussis antigens affected differs between studies.
- Some evidence to indicate an enhancement of the response to tetanus and tetanus conjugated vaccines and a decline in diphtheria and CRM-conjugated vaccines.

From Campbell et al JMM 2018 - Hardy-Fairbanks 2013; Hoang 2016; Ladhani 2015; Maertens 2016; Munoz 2014

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Changing model of delivery and training for health professionals are key challenges

- Antenatal care in England shared between maternity services (midwives) and general practice and care pathways vary across the country. Timely vaccination relies on good communication.
- Increasingly model of delivery in England moving to maternity settings
- In the UK, programme introduced rapidly as outbreak response measure with limited opportunity for health professional training

Amirthalingam *et al. Human Vaccine Immunother Nov 2016*

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Conclusions

- Despite success of childhood immunisation programmes, pertussis remains a global public health concern
- Additional strategies required to optimise control and protect infants at highest risk of severe disease
- Immunising pregnant women has been shown to be a highly effective strategy in protecting young infants in the first months of life, in high income settings
- Challenges remain in achieving high coverage in target group
- And there are outstanding questions

  (1) optimal timing as demonstrated by clinical protection

  (2) longer term impact of approach – including blunting

  (3) optimal infant/ booster schedule

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Acknowledgements

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Norman Fry, David Litt

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