UK Health Security Agency

Responding to the rise in pertussis (whooping cough). A webinar for health professionals.

18th March 2024
12:30-14:00

UK Health Security Agency

Welcome

Dr Gayatri Amirthalingam

Consultant Medical Epidemiologist, Immunisation and Vaccine Preventable Diseases Division
Deputy Director, Public Health Programmes
UK Health Security Agency

UK Health Security Agency

Clinical pertussis and why we vaccinate

Professor Adam Finn

Professor of Paediatrics
University of Bristol UK

Pertussis – Whooping Cough

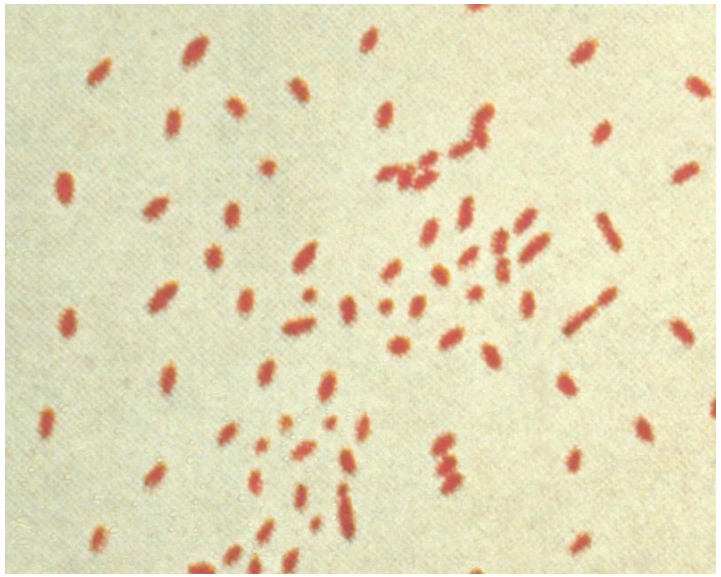
Clinical features and why we vaccinate (in 10 minutes)

…the way we do

Adam Finn

University of BRISTOL

Bordetella pertussis



- Gram-negative cocco-bacillus
- Hard to culture
- Only found in human respiratory tract
- Transmitted by coughing, respiratory secretions
- Incubation time (exposure to symptoms) usually 7-10 days (can be 6-20 days)

BRISTOL VACCINE CENTRE B · V · C

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Classical presentation – “100 day cough”

- Paroxysmal coughing bouts, inspiratory whoop and post-tussive vomiting

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Classical presentation – 100 day cough

- Paroxysmal coughing bouts, inspiratory whoop and post-tussive vomiting
- Catarrhal stage (1-2 weeks) – like a viral URTI. Low grade or no fever. Cough gradually gets worse
- Paroxysmal stage - (3-5 weeks) – coughing bouts – spontaneous or triggered, worse at night, lead to complications… Whooping – in 80% unvaccinated, less in vaccinated cases. Vomiting – especially infants
- Convalescent phase – (??weeks/months) – gradual resolution of coughing bouts
- Atypical presentations more commonly seen in very young infants and vaccinated children

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Complications – especially in young infants

- Apnoea (may occur without cough)
- Pneumonia – can be associated with pulmonary hypertension - may require IPPV or ECMO
- Extreme leukocytosis – may require leukofiltration/exchange transfusion
- Seizures and encephalopathy
- Cardiac failure, multi-organ failure
- Death (CFR in young infants 1%). Possible cause of SIDS.

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Management – largely supportive

- Hospitalisation for: pneumonia/respiratory failure, inability to feed, seizures
- Management of cough – no proven effective treatment
- Antimicrobials (macrolides) – reduce symptoms only if given in first week of symptoms, reduce duration of shedding/infectiousness
- (Early) intensive care management of complications
- Post exposure antimicrobial prophylaxis of close and high-risk contacts

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What causes the cough?

- Possibly a combination of 3 bacterial factors:
  - Pertussis toxin (PT)
  - Lipo-oligosaccharide (LOS)
  - Vag8 (C1-inhibitor-inhibitor)

Based on work in mice: Y. Hiramatsu, K. Suzuki, T. Nishida, N. Onoda, et al. (mBio 13:e01397-21, 2022, https://doi.org/10.1128/mbio.03197-21)

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All in all: a very good example of:
"**Prevention is better than Cure**"!

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Vaccination - “Whole Cell Vaccine”

- Whole cell vaccines introduced in 1950s when large epidemics were routine, approximately every 3 years
- Widespread use led to drops in pertussis incidence by 100-200x
- Problem appeared to have been largely solved until:
- Paediatrician-driven vaccine scare in late 1970s led to massive drop in coverage and 3 large epidemics in early 1980s. Other northern European countries abandoned pertussis immunization altogether
- Coverage recovery in 1980s and introduction of accelerated schedule (2,3,4 months)

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Vaccination “Acellular Pertussis Vaccines” (aP)

- 1980s-90s acellular (protein antigen) vaccines developed and evaluated in large placebo controlled or WCV controlled trials in infants
- Contain (some of) detoxified Pertussis Toxin (PT), Filamentous haemagglutinin (FHA), Pertactin, fimbriae, agglutinogens
- Encouraging results – also WCVs efficacy found to be widely variable
- Switch to acellular vaccine in UK forced by non-availability of WCV combination vaccines 2004
- Efficacy high, reactogenicity low, but duration of protection shorter
- Recognition of pertussis in adolescents and young adults
- Sudden return of infant pertussis deaths in 2012

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Maternal vaccination – passive immunization of the infant via the mother

- Prevention of neonatal tetanus in global south for many years
- Much discussion about maternal pneumococcal vaccination 2000s…
- Promotion of maternal flu vaccination in response to 2009 H1N1 flu pandemic
- 12 infant pertussis deaths in 2012 led to JCVI recommendation to offer pertussis containing vaccine (dTaP+/-polio) to all pregnant women
- Subsequent case-control studies demonstate >90% effectiveness

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But…. And….

- Pertussis continues to circulate
- Currently available vaccines and delivery strategies are incapable to achieving population immunity as indirect effects and duration of protection are both limited.
- Coverage rates are falling..
- Incidence is rising..
- Genetically detoxified PT-containing pertussis only vaccine approaching licensure – may induce longer protection
- Live attenuated intra-nasal vaccine in clinical trials

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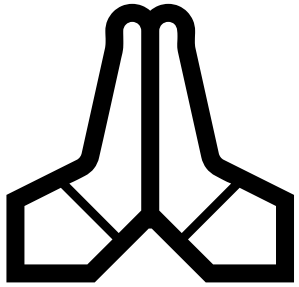
Thank you for your attention



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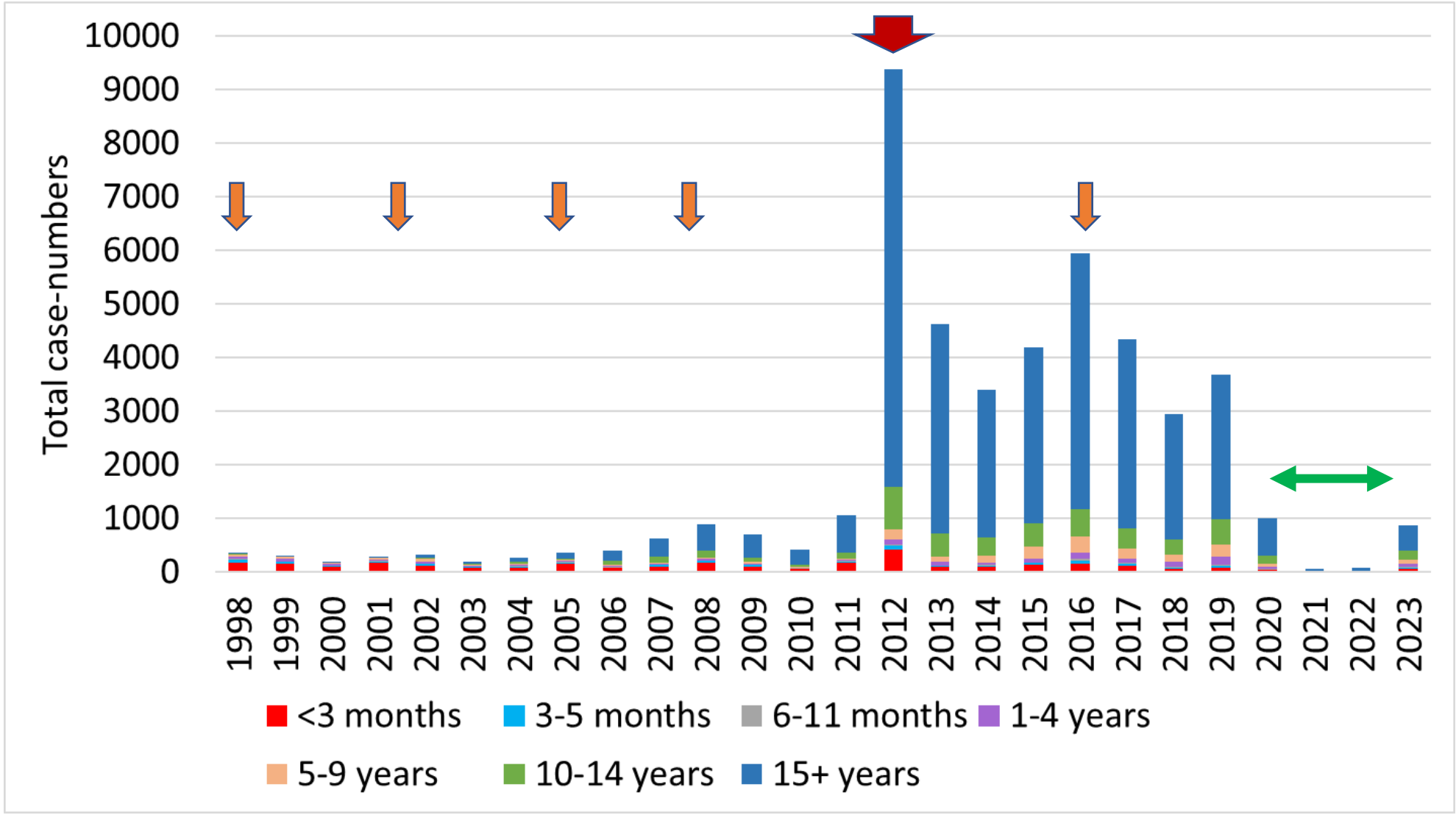
Pertussis vaccination programmes and epidemiology

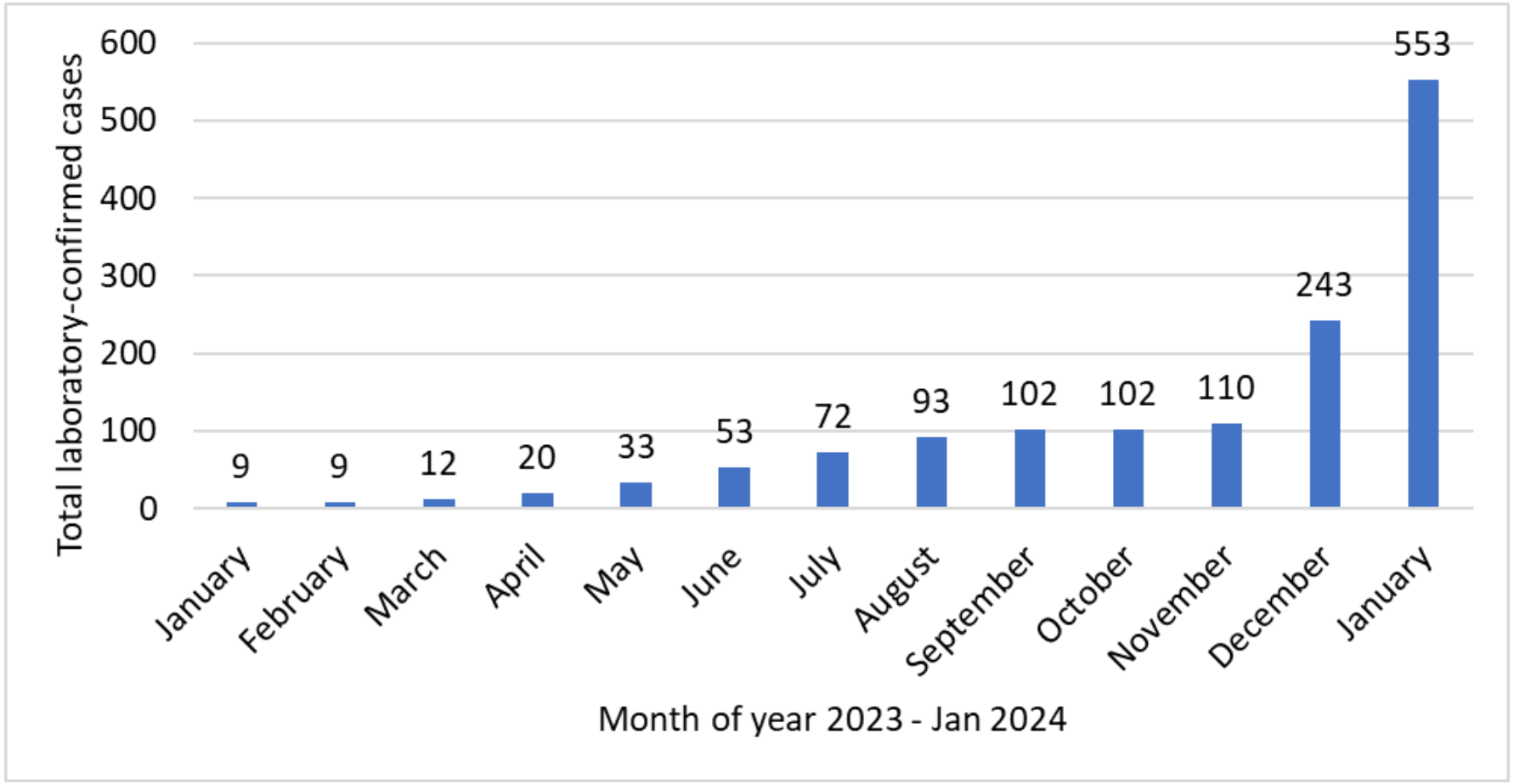
Dr Helen Campbell

Lead Clinical Scientist (CS10291), Immunisation and Vaccine Preventable Diseases Division
UK Health Security Agency

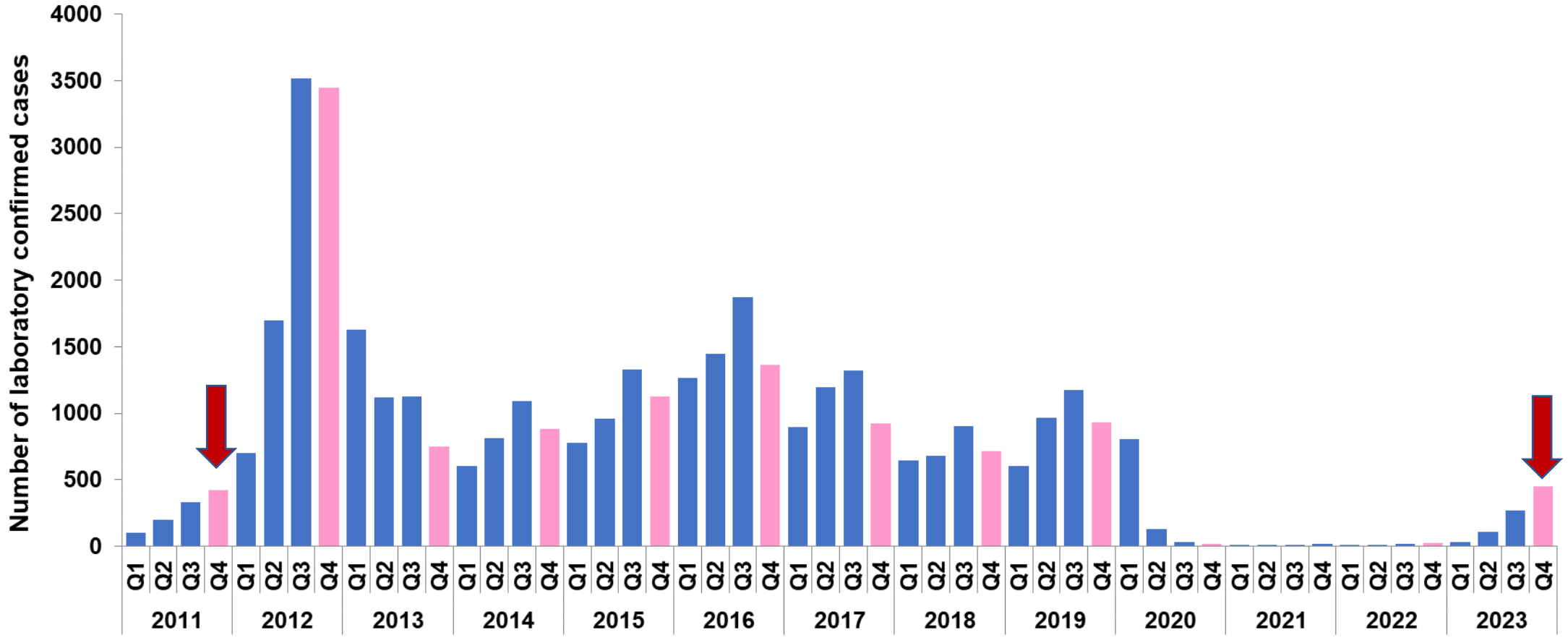
Pertussis annual laboratory-confirmed case numbers by age group



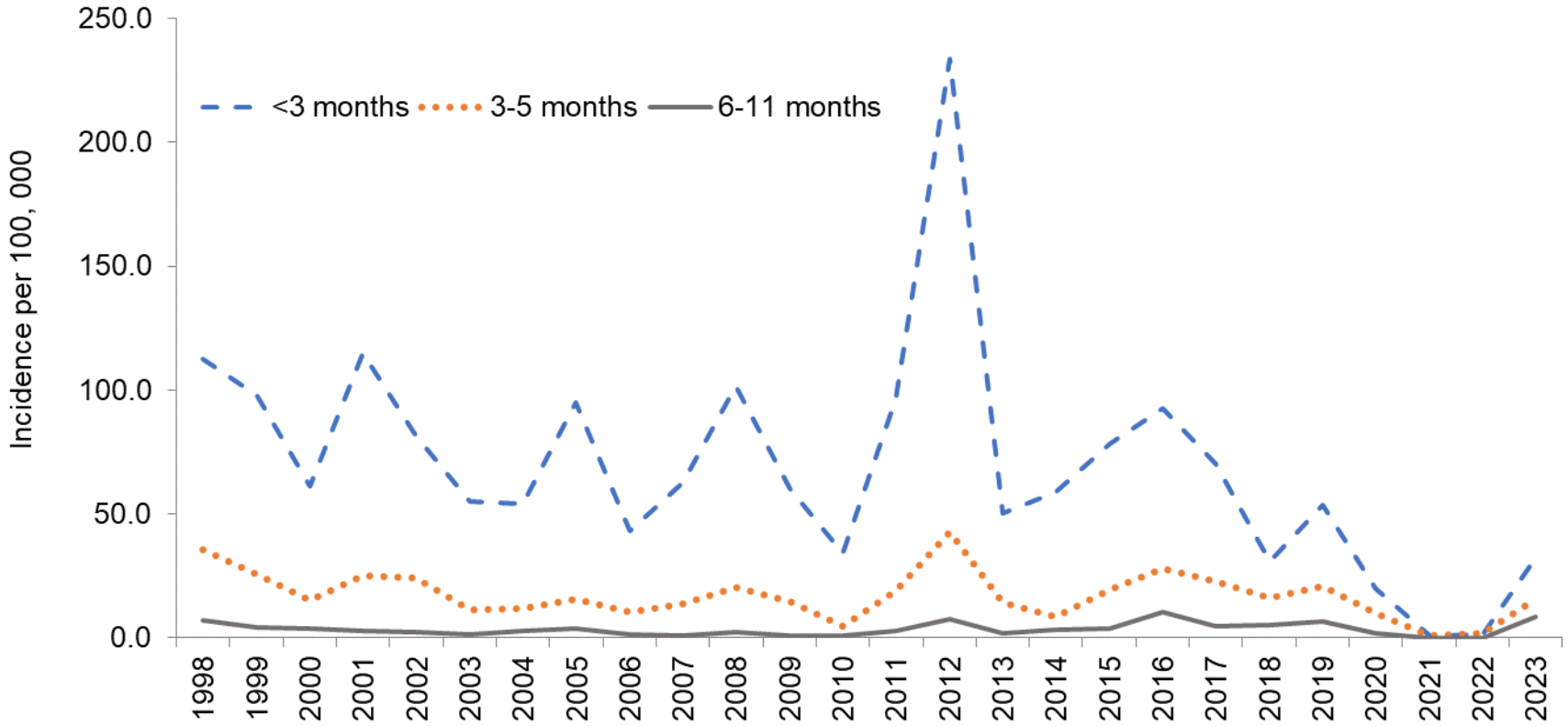
Number of laboratory confirmed cases in England by month, 2023 and January 2024 (provisional data)



Laboratory-confirmed pertussis cases in England by quarter

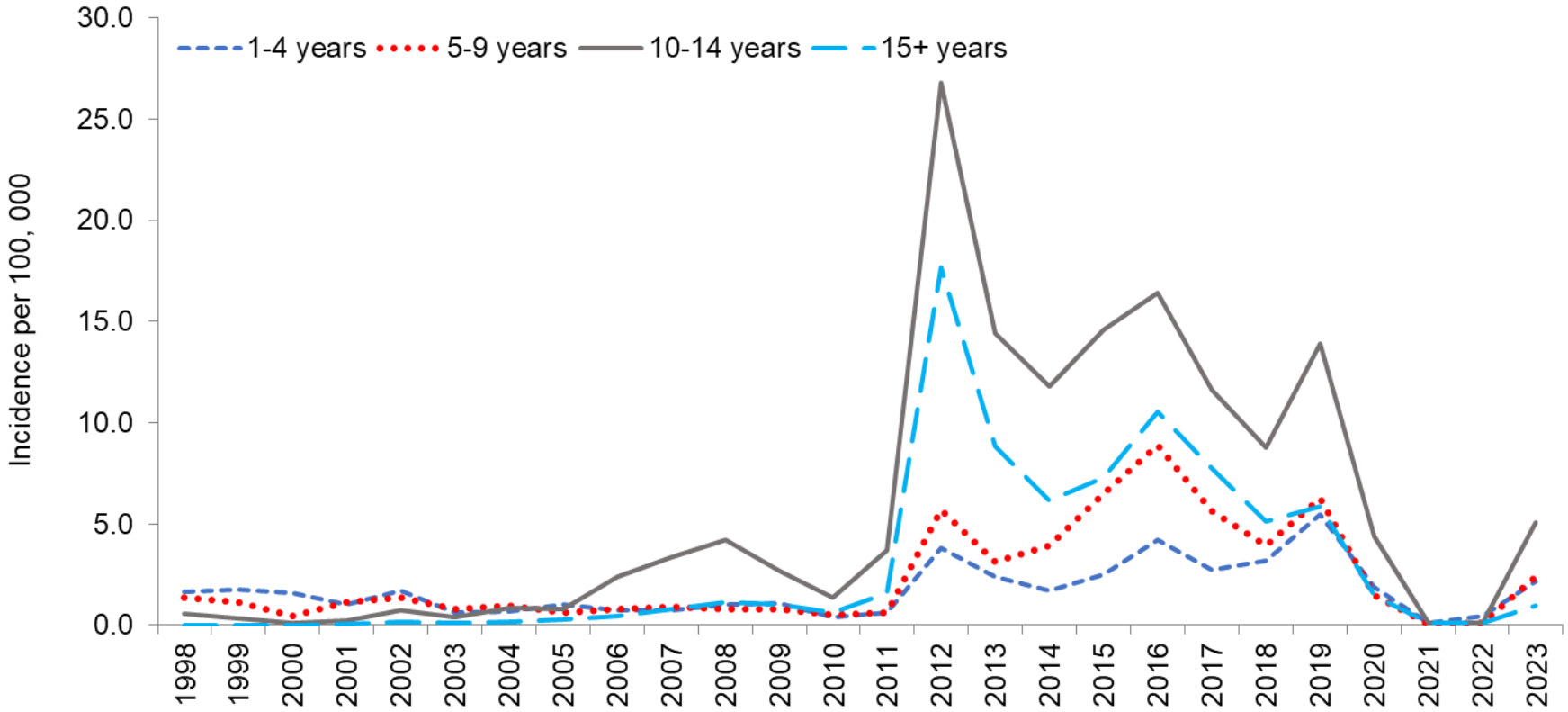


Incidence of laboratory confirmed infant pertussis cases, England: 1998 to 2023*,**



*2023 is provisional data.
**More diagnostic methods have become available over the time period presented with increasing use of serology and oral fluid testing.

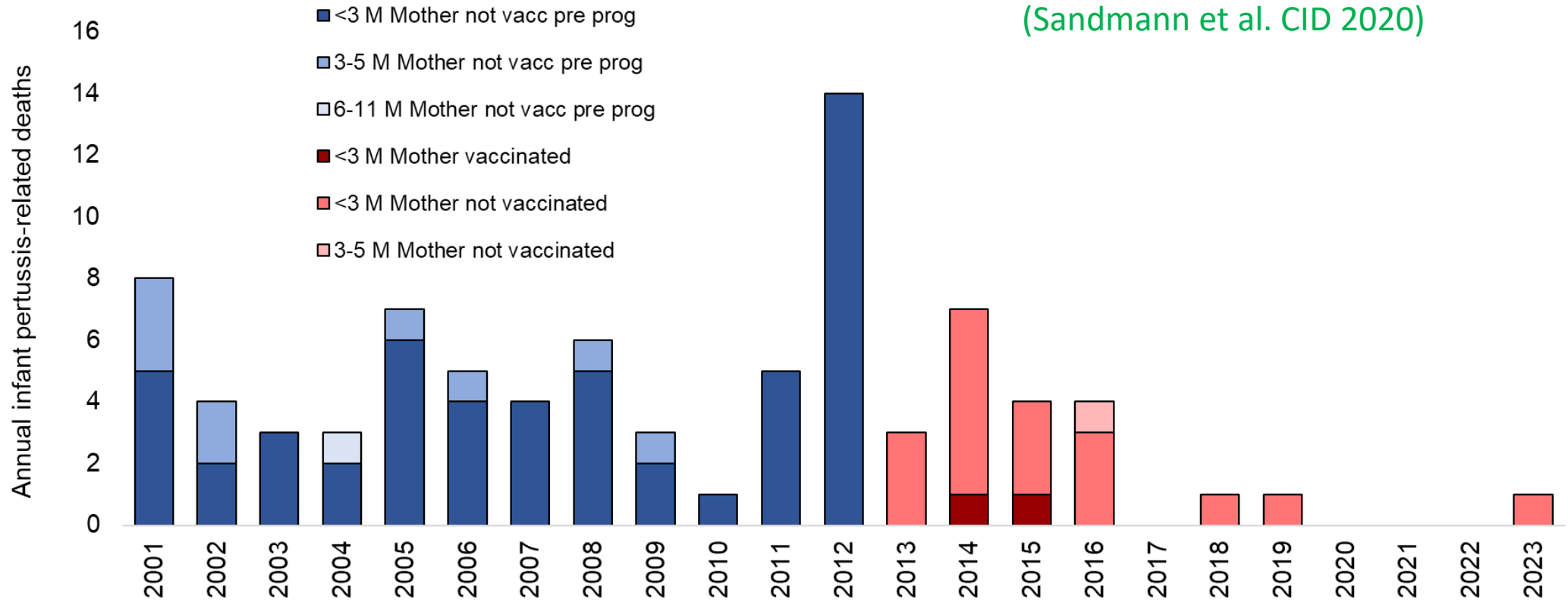
Incidence of laboratory confirmed pertussis cases aged at least 1 year, England: 1998 to 2023*,**



*2023 is provisional data.
**More diagnostic methods have become available over the time period presented with increasing use of serology and oral fluid testing.

Reconciled deaths from pertussis in infants, 2001-2023, England only

An estimated 1,400-4,300 infant hospitalisations and 41-170 infant deaths averted between 2012-2017. (Sandmann et al. CID 2020)



Sources: laboratory confirmed cases, certified deaths, Hospital episode statistics, GPs, HPZone

Pertussis cases rise in Denmark

Denmark has experienced a substantial increase in cases of whooping cough, also known as pertussis, in the past few months. Sanjeet Bagcchi reports.

In a report updated on Sept 26, 2023, Denmark's Statens Serum Institut (SSI) revealed that pertussis cases have increased in Denmark, from usually fewer than 80–100 detected cases per month to 104 in May, 293 in June, and approximately 228 in July. Case numbers were increased in the population due to lower natural boosting resulting in an increasing proportion of susceptible individuals."

Caused by *Bordetella pertussis*, pertussis is a respiratory infection that is prevented through vaccination. Since the launch of the pertussis vaccine in 1950–60, incidence and source of transmission to unprotected newborns, particularly in cases where routine vaccination during pregnancy was not conducted."

WHO states that pertussis is endemic in all countries. Laurence Luu (School of Life Sciences, University of Technology Sydney, NSW, Australia)

This online publication has been corrected. The corrected version first appeared at thelancet.com/infection on November 23, 2023

For the **report from Statens Serum Institut** see https://essi.dk/news/epi-news/2023/27---2023

Whooping cough hits Okotoks as Alberta outbreaks drag on

CBC

Wed, 13 March 2024 at 7:35 pm GMT · 3-min read

Alberta Health Services says 39 cases of pertussis, also known as whooping cough, have been confirmed in the Calgary zone since November, including 17 in the Okotoks area. (Winnipeg Health Region - image credit)

Spike in whooping cough cases prompts warning from health officials and infectious disease expert

ABC Gold Coast / By Mark Rigby

Posted Thu 8 Feb 2024 at 3:48am

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Pertussis deaths in New Zealand without community transmission—an infant immunity gap?

Peter B. McIntyre • Emma Best • Catherine A. Byrnes • Owen Sinclair • Adrian Trenholme • Cameron C. Grant

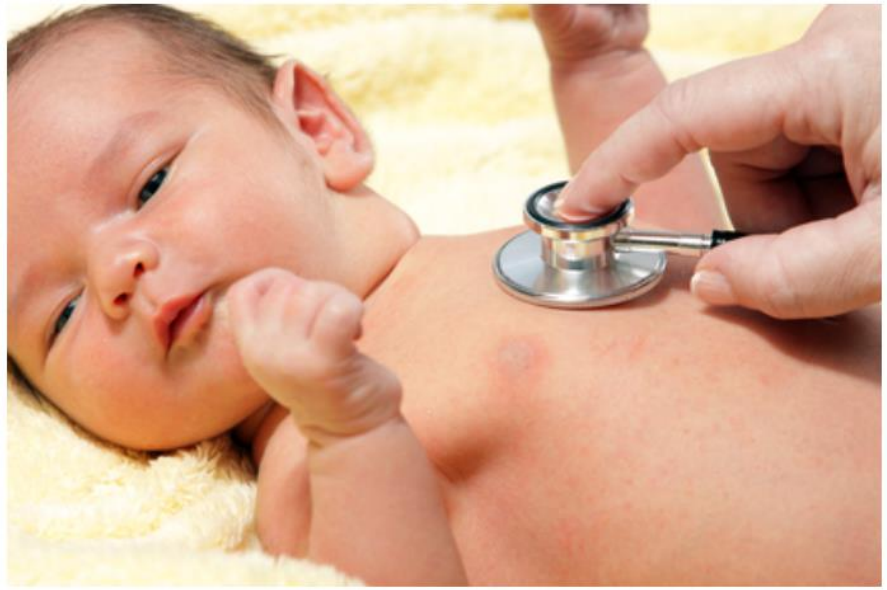
Open Access • Published: July 20, 2023 • DOI: https://doi.org/10.1016/j.lanwpc.2023.100850 • Check for updates

Attention was first drawn to development of a post-COVID "immunity debt" in children ir

DutchNews 16 MARCH 2024

Whooping cough killed four babies in last six weeks: RIVM

March 15, 2024



Four babies have died of whooping cough in the last six weeks as cases rise, national health institute RIVM has said.

Vaccination schedule & protection

In babies under 3 months of age maternal vaccination is estimated to give approximately:

- 81% protection against laboratory-confirmed pertussis
- 89% protection against hospitalisation with pertussis
- 97% protection against fatal pertussis

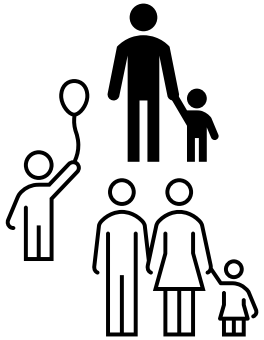
Maternal pertussis-containing vaccine, from 16 weeks, optimally at 20-32 weeks gestation

Timely infant vaccination extends the protection. In infants aged 9 weeks to <6 months there was approximately:

- 62% protection after 1 dose
- 85% protection after 2 doses
- 95% protection after 3 doses

Infant pertussis-containing vaccine at 8, 12 and 16 weeks

The pre-school booster gives an estimated additional 46% protection compared to those who received 3 doses



Pre-school pertussis-containing vaccine at about 3 years & 4 months of age

Extensive data show that Tdap and Tdap/IPV have reassuring safety profiles in maternal immunisation

16 studies from multiple countries (mostly in Europe and North America) investigated:

Safety in >150,000 vaccinated pregnancies	Tdap and Tdap/IPV vaccines with either 3- or 5- pertussis components	A range of maternal, foetal and infant outcomes

Findings generally consistent, with similar risks of safety outcomes in vaccinated and unvaccinated pregnancies

Campbell H *et al. J Med Microbiol* 2018;67:1426–1456

https://www.bmj.com/content/349/bmj.g4219

Pediatrics. 2021 May;147(5):e2020042507. doi: 10.1542/peds.2020-042507. Epub 2021 Apr 19.

Health Outcomes in Young Children Following Pertussis Vaccination During Pregnancy

Meghan Laverty [1], Natasha Crowcroft [2 3], Shelly Bolotin [3 4], Steven Hawken [1 2 5 6], Kumanan Wilson [1 2 5], Gayatri Amirthalingam [7], Anne Biringer [3 8], Jocelynn Cook [9], Vinita Dubey [3 10], Romina Fakhraei [5 6], Scott A Halperin [11], Frances Jamieson [3 8], Jeffrey C Kwong [2 3 4 12], Manish Sadarangani [13 14], Ewa Sucha [2], Mark C Walker [1 5 15], Deshayne B Fell [16 2 6]

Results: Of 625 643 live births, 12 045 (1.9%) were exposed to Tdap in utero. There were no significant increased risks of adverse childhood outcomes and prenatal Tdap exposure; however, we observed inverse associations (adjusted incidence rate ratio [95% confidence interval]) with upper respiratory infections (0.94 [0.90-0.99]), gastrointestinal infections (0.85 [0.79-0.91]), and urgent and inpatient health service use (0.93 [0.91-0.96]).

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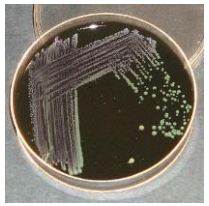
Pertussis diagnostics

Dr David Litt

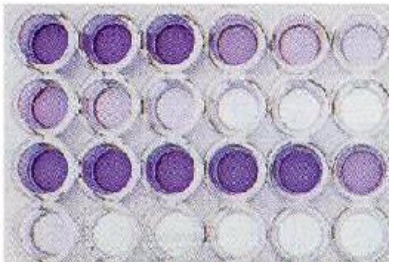
Clinical Scientist
Head, Vaccine Preventable Bacteria Section
Respiratory and Vaccine Preventable Bacteria Reference Unit
and Laboratory Surveillance Lead
Immunisation and Vaccine Preventable Diseases Division
UK Health Security Agency

Laboratory methods for detecting *Bordetella pertussis* infections



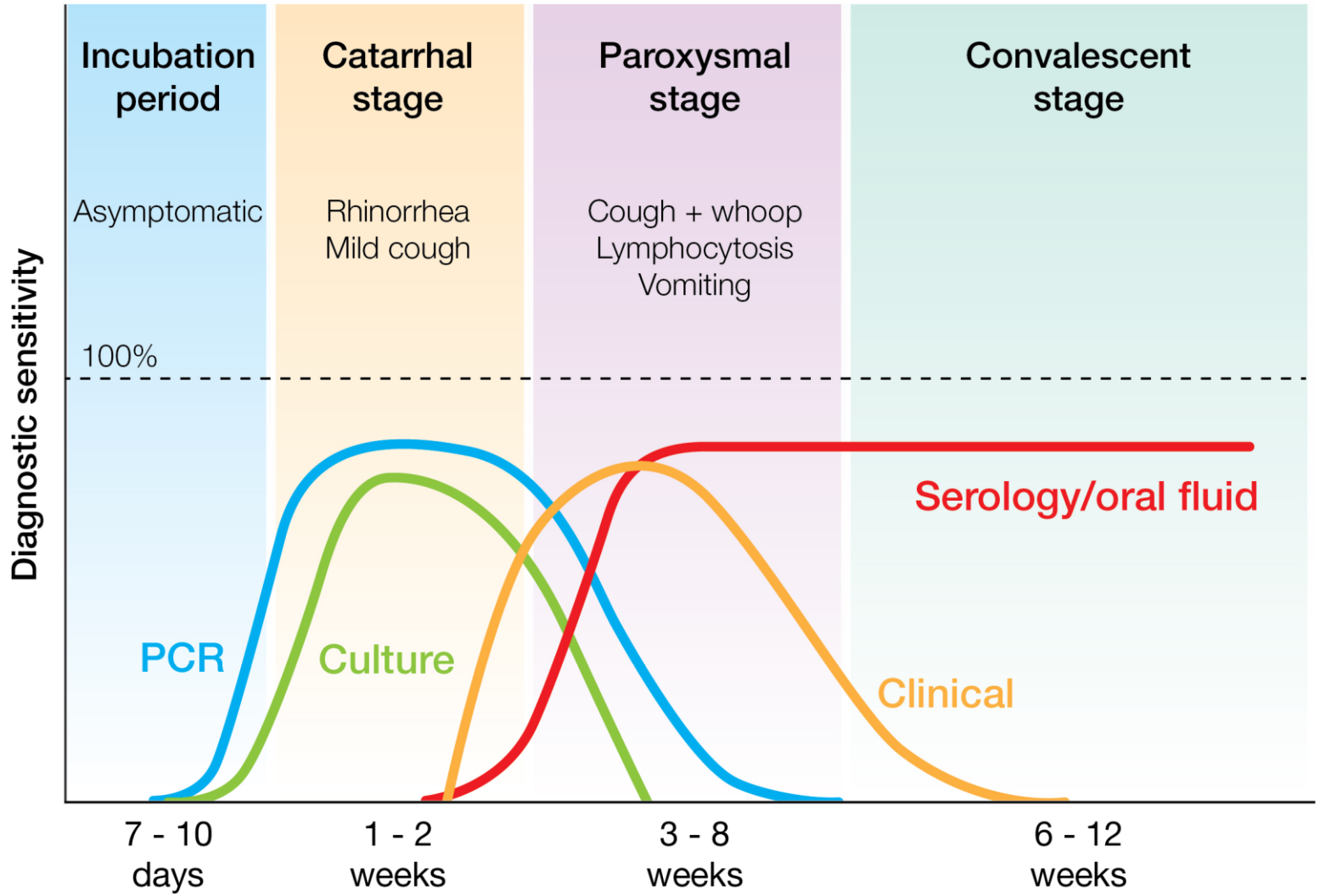
Culture of the bacterium from respiratory specimens

PCR: demonstration of the bacterium's DNA in respiratory specimens



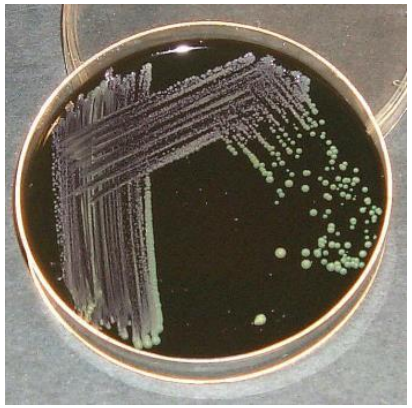
Serological tests: demonstration of significant antibody levels against the bacterium (IgG against pertussis toxin) in patients' sera and oral fluid

Overview of timing for testing for pertussis



Fry *et al*., Journal of Medical Microbiology 2021;70:001442

Detection by culture



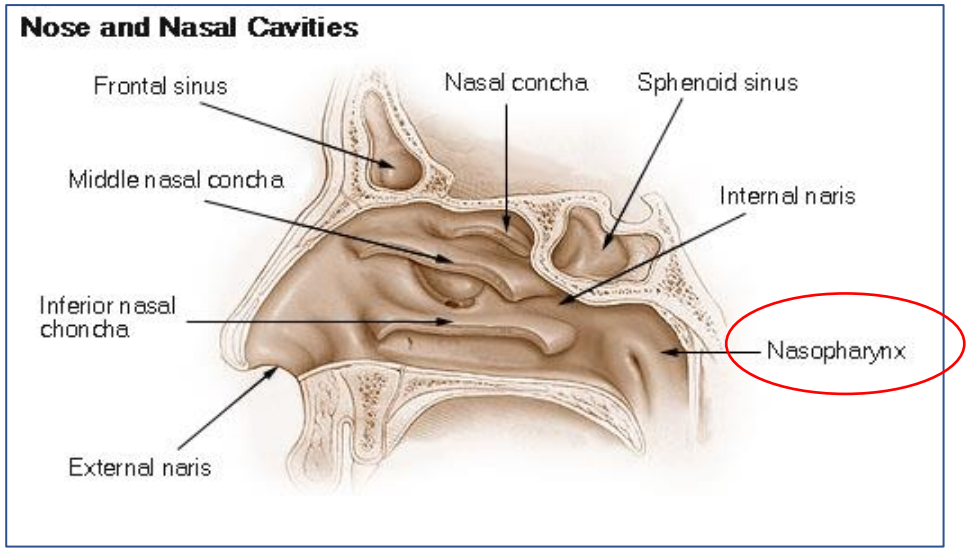
1. **As early as possible after coughing starts**
   - Within the first 3 weeks (success decreases with time)
   - Highest success = earlier you sample and the younger the person
   - Before antibiotics are given
2. **From the upper respiratory tract**
   - Nasopharynx is optimum site
   - Nasopharyngeal swab/nasopharyngeal aspirate (NPS/NPA)
   - Throat swab acceptable if NPS not available
3. ***B. pertussis* is delicate!**
   - Need charcoal agar transport medium and plate out as quickly as possible (ideally ≤24h)
   - Not viral transport medium (contains antibiotics)
4. **Send swab to local hospital**
   - They may send it to a UKHSA Regional Reference Laboratory
5. **Pros/cons of culture**
   - Can provide a result within the 21 day window for antibiotic treatment ✓
   - Culture is the “gold standard” test ✓
   - Culture can be tested for antibiotic resistance and typing ✓
   - It can take up to 7 days to get a result ✗

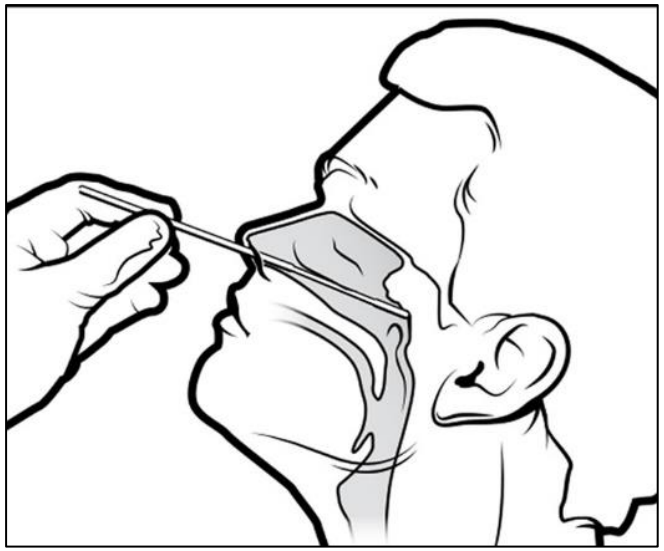
Detection by PCR

1. **As early as possible after coughing starts**
   - Within the first 3 weeks (success decreases with time)
   - Highest success = earlier you sample and the younger the person
   - Can still be positive after antibiotics have been started
2. **From the upper respiratory tract**
   - Nasopharynx is optimum site
   - Nasopharyngeal swab/nasopharyngeal aspirate (NPS/NPA)
   - Throat swab acceptable if NPS not available
3. **DNA from *B. pertussis* is less delicate!**
   - Send swab in a dry tube or in transport medium
4. **Send swab to local hospital**
   - They may send it to a UKHSA Regional Reference Laboratory
5. **Pros/Cons of PCR**
   - Can provide a result within the 21 day window for antibiotic treatment ✓
   - PCR is generally more sensitive than culture ✓
   - PCR can give a result within a day ✓
   - May be less specific than culture ✗ [low clinical impact]

Taking samples for culture and PCR

- Pernasal/nasopharyngeal swab





- Throat swab – less sensitive but acceptable

Taking samples for culture and PCR

- Pernasal/nasopharyngeal swab

1. Flexible wire or plastic

2. Small tip: rayon, nylon flock,
   NOT cotton
   (NOT calcium alginate for PCR)

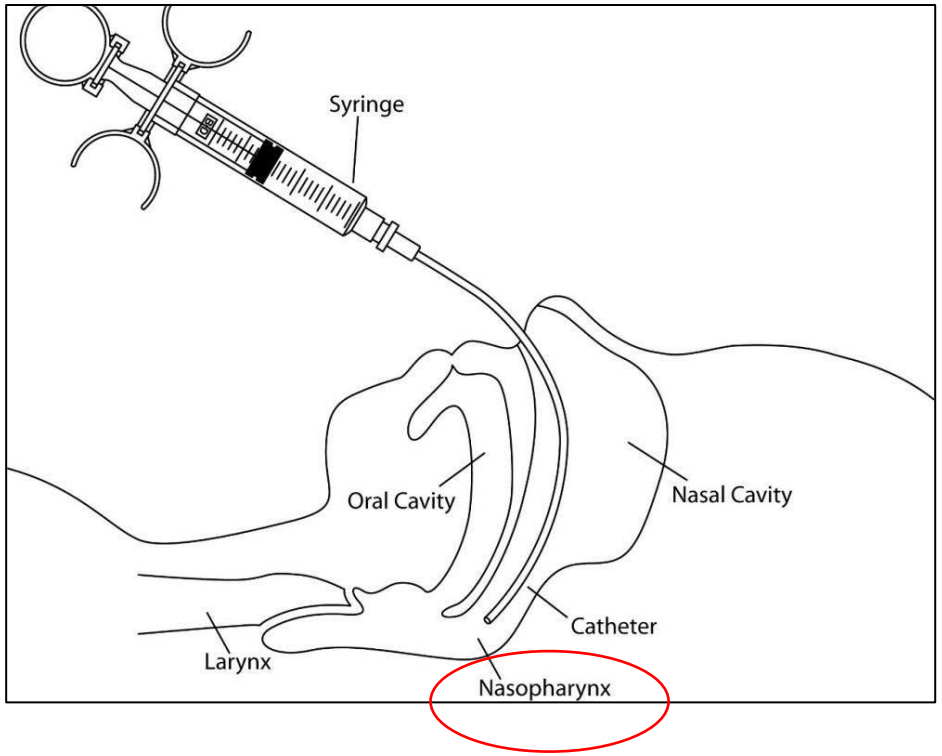
3. Culture: charcoal transport medium
   (e.g. Amies or Regan Lowe)

4. PCR: best NOT to use transport medium,
   but acceptable

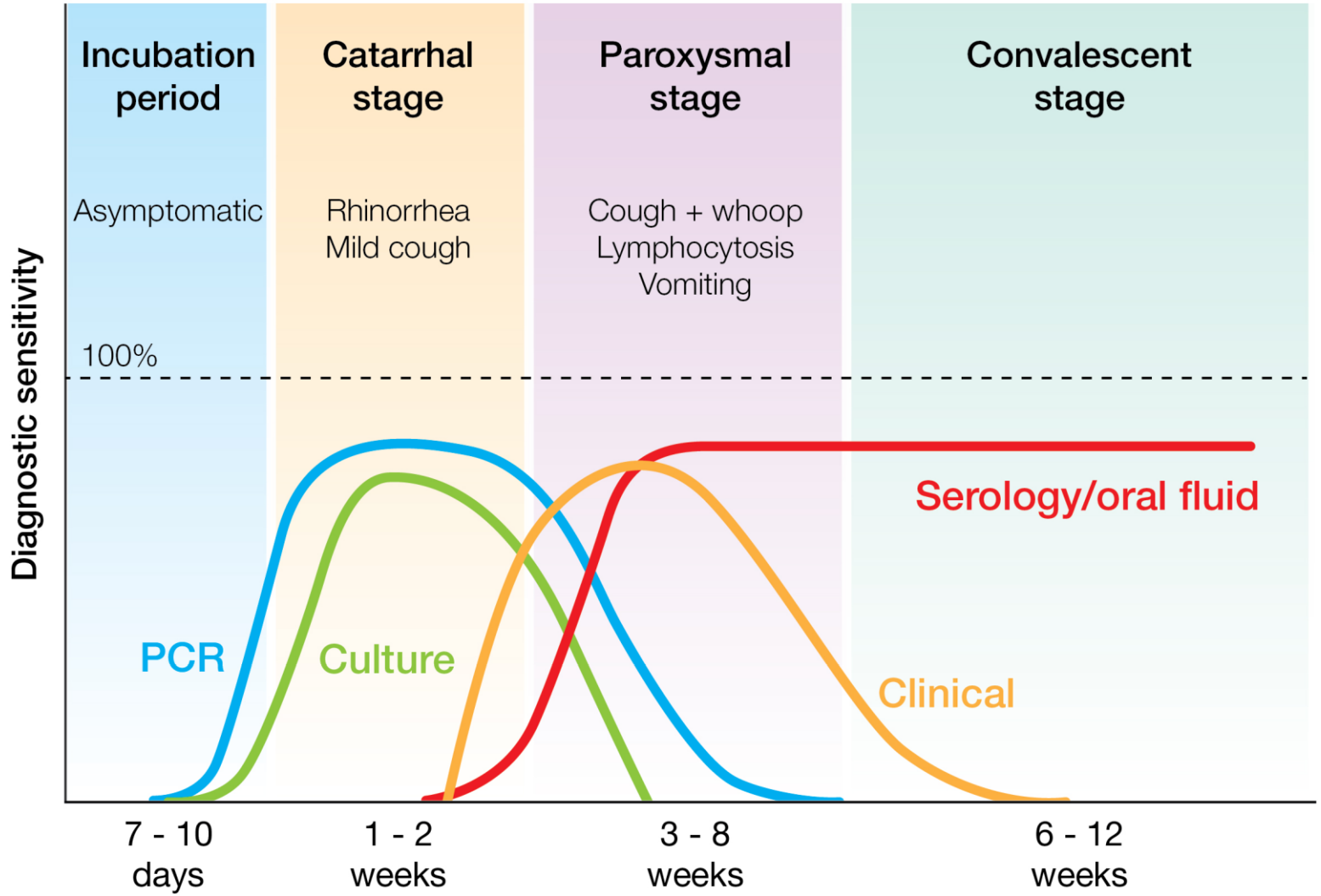
5. For culture and PCR, take 2 swabs or use
   charcoal swab for both

Taking samples for culture and PCR

- Nasopharyngeal aspirate

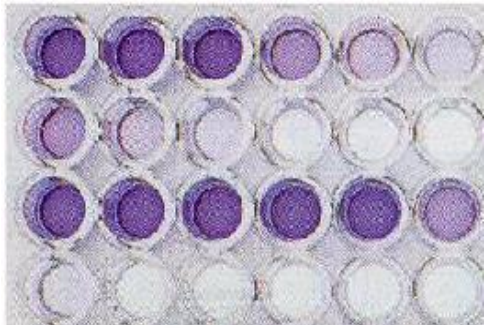


Overview of timing for testing for pertussis



Fry *et al*., Journal of Medical Microbiology 2021;70:001442

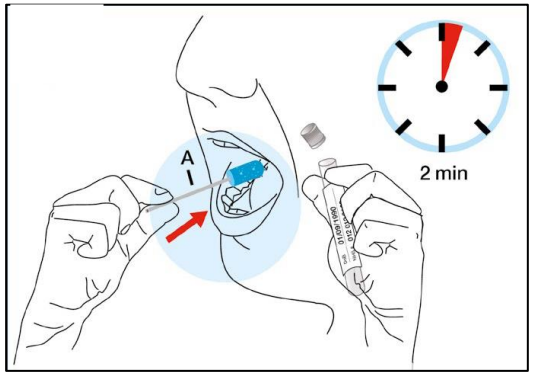
Detection by serology (serum)



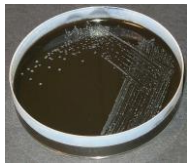
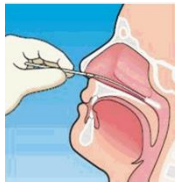
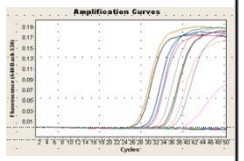
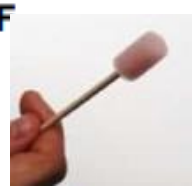
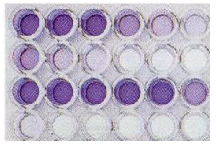
1. **Give the patient time to mount an antibody response**
   - Only take serum after patient has been coughing for at least 14 days
   - Negative results from sera taken too early could be false negatives
   - Titre can remain positive for several months (up to ~1 year)
2. **Detects IgG against pertussis toxin**
   - Anti-PT IgG is best indication of evidence of a recent pertussis infection
   - Test a single sample for a titre over diagnostic threshold (typically 50 – 100 IU/ml)
   - Recent vaccination or previous infection (<1y) can give a false positive result
3. **Send serum to local hospital**
   - Some hospitals offer pertussis serology
   - Some hospitals will refer to a UKHSA Regional Reference Laboratory or UKHSA National Reference Lab
   - UKHSA National Reference Lab offers serology testing
4. **Pros/Cons of serology**
   - Can provide a result for several months after the onset of coughing ✓
   - More sensitive than PCR and culture ✓
   - Does not usually produce a result within the 21 day window for antibiotic treatment ✗
   - Previous vaccination or infection can confound interpretation of a positive result ✗
   - Not recommended for children <1y ✗
   - Cannot use pertussis serology to measure existing immunity

Detection by oral fluid antibodies

1. **Measuring the same antibodies as serology**
   - Also measuring anti-PT IgG
   - Only take oral fluid after patient has been coughing for at least 14 days
   - Negative results from oral fluid taken too early could be false negatives
   - Titre can remain positive for several months (up to ~1 year)
   - Recent vaccination or previous infection (<1y) can give a false positive result
   - Needs ≥1 µg/ml total IgG (2 minutes of swabbing)
2. **Reserved for 2-16 (<17) year olds**
   - Aimed at children to accommodate resistance to having blood taken
   - Samples tested in UKHSA National Reference Lab
   - More laborious to process and test than serum
3. **Notify local HPT to request a test**
   - HPT arranges for a kit to go directly to the patient
   - Results sent directly to GP and HPT
4. **Pros/Cons of oral fluid antibody testing**
   - More convenient than providing serum ✓
   - Can provide a result for several months after the onset of coughing ✓
   - More sensitive than PCR and culture ✓
   - Does not usually produce a result within the 21 day window for antibiotic treatment ✗
   - Previous vaccination or infection can confound interpretation of a positive result ✗
   - Not recommended for children <1y ✗
   - Occasional test failure due to insufficient swabbing. ✗



Microbiological tests for pertussis in England (adapted from 2018 PHE Guidelines)

Test method	Patient criteria	Sample	Access	RVPBRU
Culture 	Suspected cases in all age groups with cough <21 days duration	NPS/NPA/PNS 	NHS laboratories (via local lab)	Confirmed isolates to be sent to RVPBRU
PCR 	Suspected cases in all age groups with cough <21 days cough duration	NPS/PNS preferred; throat swab acceptable for community patients	Regional PHE laboratories and some NHS labs (via local lab)	Positive samples to be referred to RVPBRU
OF 	Suspected cases aged 2 to <17 years with cough >14 days* duration	OF kit 	OF kit sent to patient upon notification to PHE HPT	Samples tested and reported by RVPBRU
Serology 	Suspected cases in older children/ adults with cough >14 days* duration	Serum 	Charged for service at RVPBRU and some UKHSA and NHS labs (via local lab)	Samples tested and reported by RVPBRU

* Recent vaccination (within ~1y) with pertussis-containing vaccine can give false positive result in serum/OF assays.
NPS, nasopharyngeal swab; PNS, pernasal swab; NPA, nasopharyngeal aspirate; HPT, Health Protection Team; RVPBRU, Respiratory and Vaccine Preventable Bacteria Reference Unit (National Reference Laboratory)

Appendix 6:Testing for Pertussis in Primary Care

Suspect pertussis in patients with a **cough illness lasting 14 days or more** without an apparent cause **plus one** of the following: (a) paroxysms of coughing; (b) inspiratory 'whoop'; (c) post-tussive vomiting.

ALL CASES should be notified to your local HPT (*insert phone number/email address*)
When notifying, it is helpful to let the HPT know if the case has had contact with pregnant individuals or children aged under 1 year, including through occupational exposure (e.g. healthcare or nursery settings).

Recommended tests for pertussis testing vary according to the length of time since symptom onset.

- Less than 2 weeks from symptom onset: PCR and culture
- Between 2 and 3 weeks from symptom onset: PCR **and** culture **and either** oral fluid kit (if aged 2 to < 17 yrs) **or** serology
- More than 3 weeks from symptom onset: **Either** oral fluid kit (if aged 2 - <17 yrs) **or** serology

Sending a pertussis PCR test – FREE SERVICE

Insert local info:
Please submit samples to your local laboratory as per normal protocol. Samples will then be referred for Pertussis PCR detection your local Public Health Laboratory (PHL). Pertussis PCR testing is not chargeable, when performed at a PHL. Please label clearly 'for **Bordetella pertussis PCR testing'**

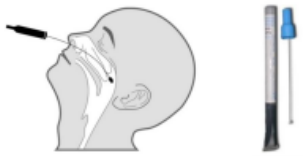
PCR testing can be performed on the following specimens:

- Throat swabs

Collected using a virology swab or dry swab in a sterile container

- Pernasal swabs

Use a dry swab with a flexible wire shaft and a rayon / Dacron / nylon bud. A rigid shaft is not suitable. Push the swab along the floor of the nasal cavity, as far towards the posterior wall of the nasopharynx as possible.



- Nasopharyngeal swabs

Use a dry or Copan style nasopharyngeal swab. See the following link for further guidance:
CDC video how to take a nasopharyngeal swab.

- Nasopharyngeal aspirate

Provide not less than 400microlitres in a sterile container. See the following link for further guidance:
CDC video how to take a nasopharyngeal aspirate.

Sending a pertussis culture

A nasopharyngeal swab or pernasal swab may be taken for culture. The swab should be placed in a culture medium (ideally charcoal) and submitted to your local microbiology lab. **Please clearly label as 'for pertussis culture'.**

Requesting an oral fluid kit – FREE SERVICE

For cases aged 2 years to less than 17 years, notify the case to your local HPT and they will post an oral fluid kit (OFK) directly to the case.

Note that oral fluid testing is not recommended if the case has been immunised against pertussis in the previous year as a positive result cannot be interpreted.

Sending a pertussis serology test

For cases not aged 2 years to less than 17 years, a charged-for serology test using serum can be arranged via your local laboratory and then sent on to the Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU). Form B3 can be used.

Note that serology is not recommended if the case has been immunised against pertussis in the previous year as the result cannot be interpreted.

Managing cases

If three weeks or less from symptom onset, treat with appropriate antibiotics once PCR and culture tests have been taken. Exclude the case from school/work until they have completed two days of the antibiotic course. Work with the local HPT to identify and manage vulnerable close contacts. There is no need to prescribe a second course of antibiotics *even if* symptoms are not resolving.

If more than three weeks from symptom onset, antibiotics are not required to manage pertussis *even if* the case still has symptoms. No exclusion of the case is necessary.

Further information on the testing for and management of pertussis is available at:
https://www.gov.uk/government/publications/pertussis-guidelines-for-public-health-management
Or please call your local HPT for further advice (*insert relevant contact details*)

UK Health Security Agency

Microbiology Services request form

Bordetella pertussis (whooping cough) antibodies in oral fluid for notified cases aged 2 to <17 years of age

Respiratory and Vaccine Preventable Bacteria Reference Unit
61 Colindale Avenue, London NW9 5HT
Web page: RVPBRU: reference and diagnostic services

* R A P P 7 *

GP information

Surgery name: Click or tap here to enter text.
GP address: Click or tap here to enter text.
Click or tap here to enter text.
Click or tap here to enter text.
GP postcode: Click or tap here to enter text.
GP telephone: Click or tap here to enter text.

Health Protection Team:
Click or tap here to enter text.
HPZone number:
Click or tap here to enter text.

Patient information

NHS number: Click or tap here to enter text.
(please use format xxx xxx xxxx)
Surname: Click or tap here to enter text.
Forename: Click or tap here to enter text.
Date of birth (dd/mm/yyyy): Click or tap here to enter text.

Sex: Male ☐ Female ☐
Age: Click or tap here to enter text.
Patient's postcode: Click or tap here to enter text.

Sample information

Date sample taken (dd/mm/yyyy): _____

Clinical information

Date of onset of coughing (dd/mm/yyyy): Click or tap here to enter text.

What was the date of the above patient's last whooping cough vaccine*? _____

*also known as the 5-in-1, 6-in-1, DTP, DTaP, pertussis, ~~Boostrix~~, ~~Infanrix-tetra~~, Infanrix-IPV, Vaxelis or Repevax

Whooping cough oral fluid sample to be taken 14 days or more after onset of cough.

UK Health Security Agency

Guidance on public health management of pertussis

Dr Gayatri Amirthalingam

Consultant Medical Epidemiologist, Immunisation and Vaccine Preventable Diseases Division
Deputy Director, Public Health Programmes
UK Health Security Agency

Session Outline

- Rationale for public health action
- Priority groups and key recommendations in national guidance
- Guidance for management during 2024 re-emergence of pertussis

Rationale for public health action

- Vaccination remains most effective intervention in preventing pertussis
- Outbreaks can occur in households, schools, healthcare settings and community
- If outbreaks are detected at an early stage, prompt action including chemoprophylaxis and vaccination can limit the spread
- Household contacts important source of transmission to unprotected infants where vaccine coverage is high[1-4]
  - Up to 75% of infants are infected from a household contact
  - 50% infected from an adult family member
  - 30% from the mother, higher in youngest infants
- Healthcare workers important source of transmission

Use of antibiotics in treatment & prevention of pertussis

- Aim: To eradicate *B. pertussis* carriage and prevent secondary transmission
- Limited effect in improving clinical course of illness
- Little effect of erythromycin in preventing secondary transmission, limited to close, prolonged household contact[1,2]
- Further supported through 2007 Cochrane review of antibiotics for pertussis[3]

- Chemoprophylaxis limited to households with vulnerable contacts where risk of severe complications and/or ongoing transmission is high

- Choice of Antibiotics
  - Erythromycin poorly tolerated, not preferred in infants <1 month
  - Newer macrolides e.g. Azithromycin & clarithromycin - longer half life & shorter duration of therapy, improved side effect prof
  - Co-trimoxazole if contra-indicated

1. Dodhia *et al. Epidemiol.Infect.* 1998;**120**:143-9
2. Dodhia *et al. Journal of Public Health Medicine* 2002;Vol 24:No 3:pp 200-206
3. Altunaiji S. *Cochrane.Database.Syst.Rev.* 2007;CD004404

Recommendations for Chemoprophylaxis

- Given the limited benefit of chemoprophylaxis, antibiotic prophylaxis should only be offered to close contacts when both of the following conditions apply:

- onset of disease in the index case is within the preceding 21 days

AND

- there is a close contact in one of the priority groups

Priority Groups for Public Health Action: Group 1

Definition of contacts considered as priority groups for public health action
These include individuals who are themselves at increased risk of complications following pertussis (Group 1) as well as those at risk of transmitting the infection to others at risk of severe disease (Group 2).

Group 1

Individuals at increased risk of severe complications ('vulnerable'):

- unimmunised infants (born after 32 weeks) less than 2 months of age whose mothers did not receive pertussis vaccine after 16 weeks of pregnancy and at least 2 weeks prior to delivery
- unimmunised infants (born ≤ 32 weeks) less than 2 months of age regardless of maternal vaccine status
- unimmunised and partially immunised infants (less than 3 doses of vaccine) aged 2 months and above regardless of maternal vaccine status

Priority Groups for Public Health Action: Group 2

Group 2

Individuals at increased risk of transmitting to 'vulnerable' individuals in 'group 1' who have not received a pertussis containing vaccine more than 1 week and less than 5 years ago:

a) pregnant women (>32 weeks gestation)
b) healthcare workers working with infants and pregnant women
c) people whose work involves regular, close or prolonged contact with infants too young to be fully vaccinated
d) people who share a household with an infant too young to be fully vaccinated

Role of Post-exposure Vaccination

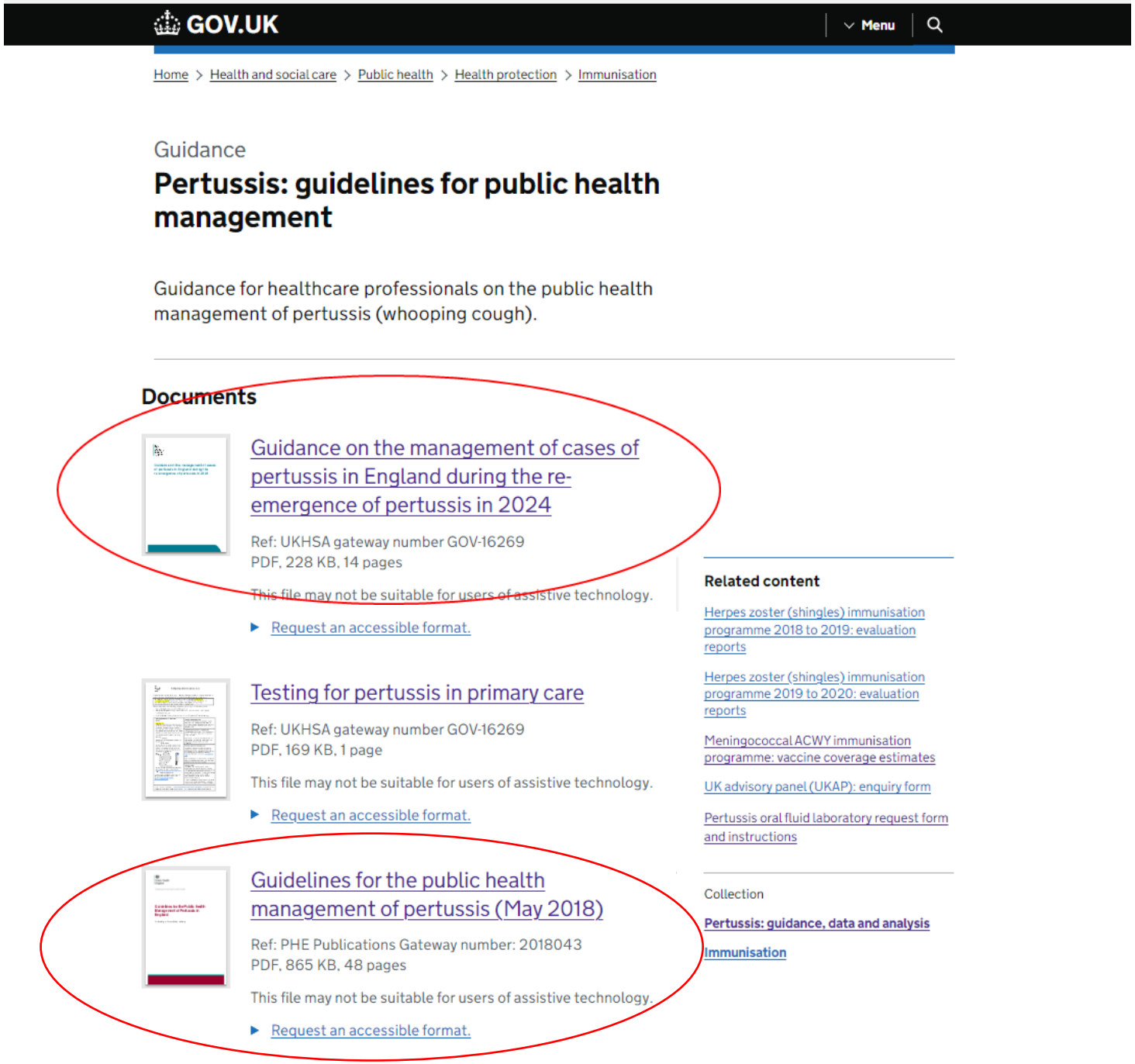
- Use of pertussis containing vaccine at time of exposure primarily been used to provide for long term protection
- Studies have demonstrated role of vaccine in outbreak control
- Immediate response to vaccine amongst 106 US HCWs[1]
  - 50% developed Abs by 1 week
  - 88-94% developed Abs by 2 weeks
  - VE not measured
  - Population susceptibility reduced within 1-2 weeks
- Extend offer of post exposure vaccination to those for whom chemoprophylaxis is indicated.
  - Unimmunised /partially immunised contacts under 10 years of age
  - Aged 10 years and older who have not received a pertussis vaccine in preceding 5 years and no Td-IPV booster in previous month

1. Kirkland et al. *Clin.Infect.Dis.* 2009;**49**:584-7

Pertussis: guidelines for public health management - GOV.UK (www.gov.uk)

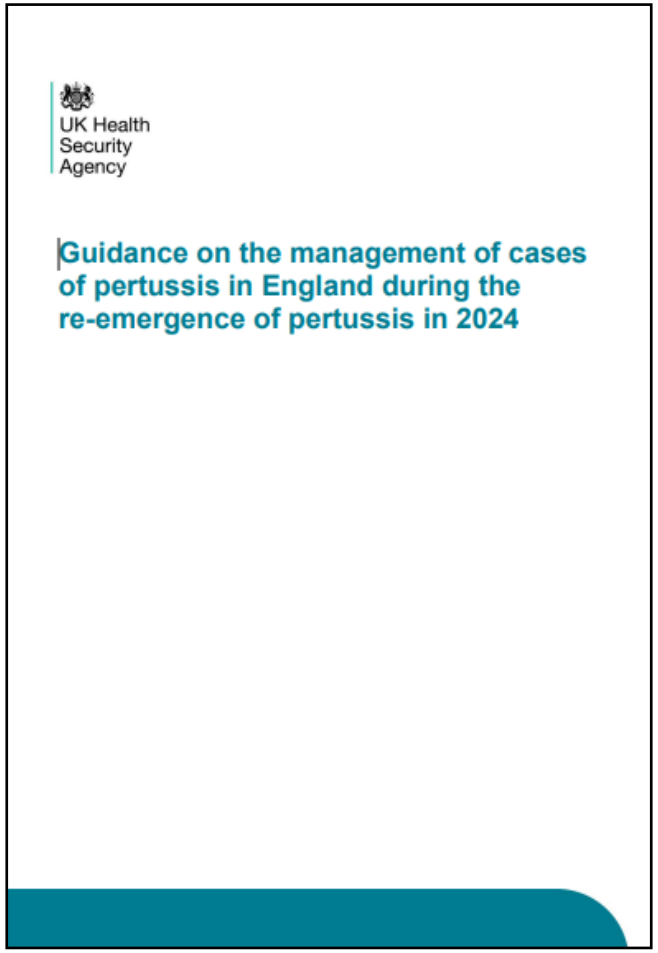
Pertussis: guidelines for public health management in a healthcare setting - GOV.UK (www.gov.uk)

Pertussis outbreaks in nurseries and educational settings - GOV.UK (www.gov.uk)



Management of pertussis cases during 2024 re-emergence

- Benefit of prophylaxis limited to households where onset of disease in index case within 21 days
- Serology and OF samples should be taken at least 14 days post onset of cough
- Unlikely results from serology /OF will be available within 21 days
- Where onset not provided, reasonable to assume too late for immediate public health action for serology /OF confirmed cases



[Pertussis: guidelines for public health management - GOV.UK (www.gov.uk)]

4.2.2 Communication

It is advised that UKHSA HPTs send a link to all patients with a suspected or confirmed diagnosis to access the UKHSA information page using the URL below:

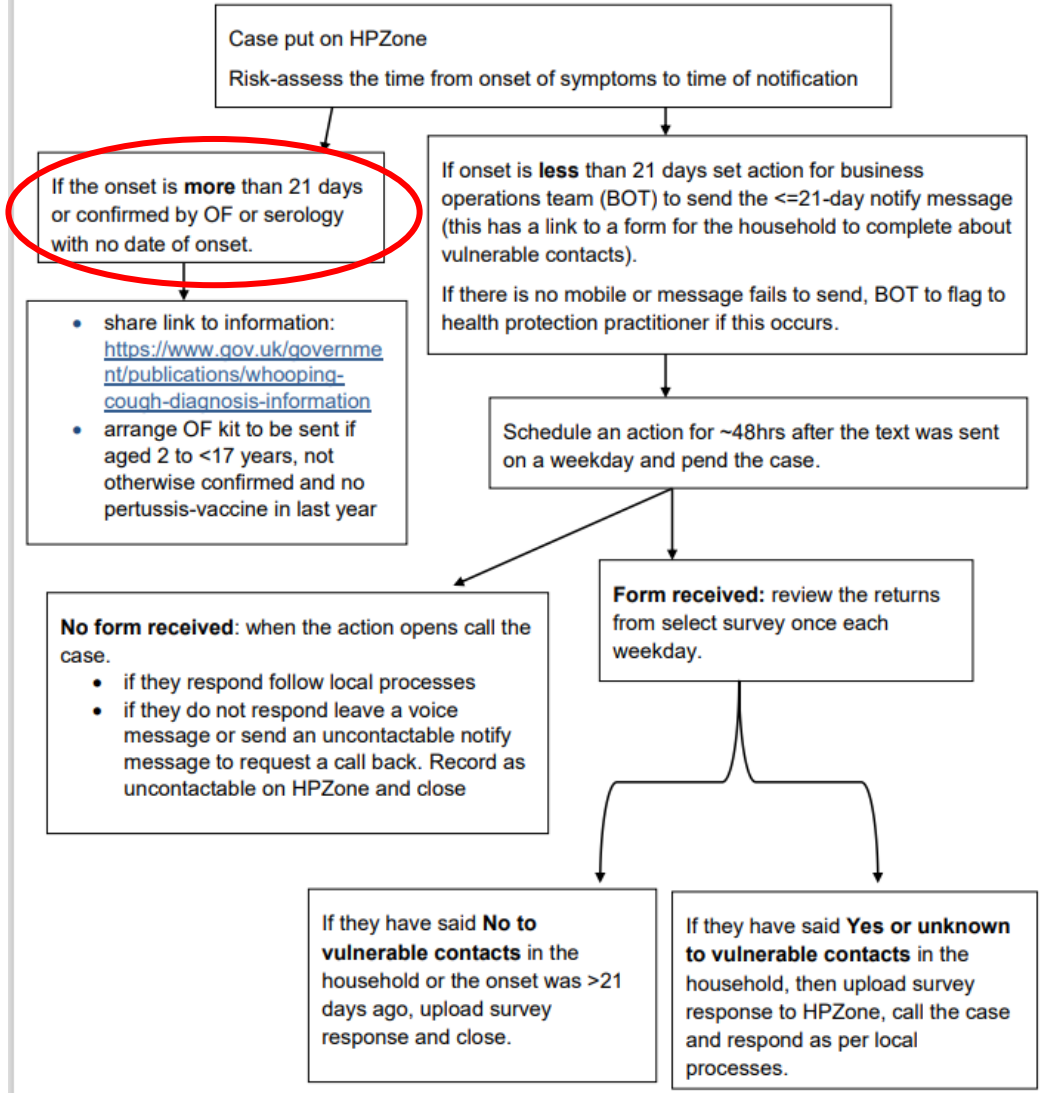
https://www.gov.uk/government/publications/whooping-cough-diagnosis-information

or share the QR code below so that those with a smart phone can access the information. See Appendix 1 for example text to accompany the link.

This information page highlights the potential risk of spread to others, safety-netting and the importance of vaccination. It sets out:

- the priority groups for public health actions especially those at high risk of severe infection, that is unimmunised or partially immunised infants
- where a member of the household is a healthcare worker working with infants or pregnant women, it requests that they inform their occupational health department and seek early medical advice if they develop symptoms
- general advice about ensuring children (up to 10 years) and pregnant women are fully immunised according to national recommendations

Appendix 1. Process for follow up of pertussis cases in periods of high activity



9

Key Messages

- Vaccination remains most effective intervention in preventing pertussis

- Post exposure prophylaxis of limited benefit and therefore restricted to where there is a close contact in a priority group
  - Group 1: those at increased risk of severe complications
  - Group 2: those at increased risk of transmitting to ‘vulnerable’ individuals in Group 1

- Range of resources on gov.uk to support public health response
  - National public health guidance (household settings)
  - Guidance for incidents in healthcare and educational settings
  - 2024 Guidance to prioritise follow up during periods of increased activity

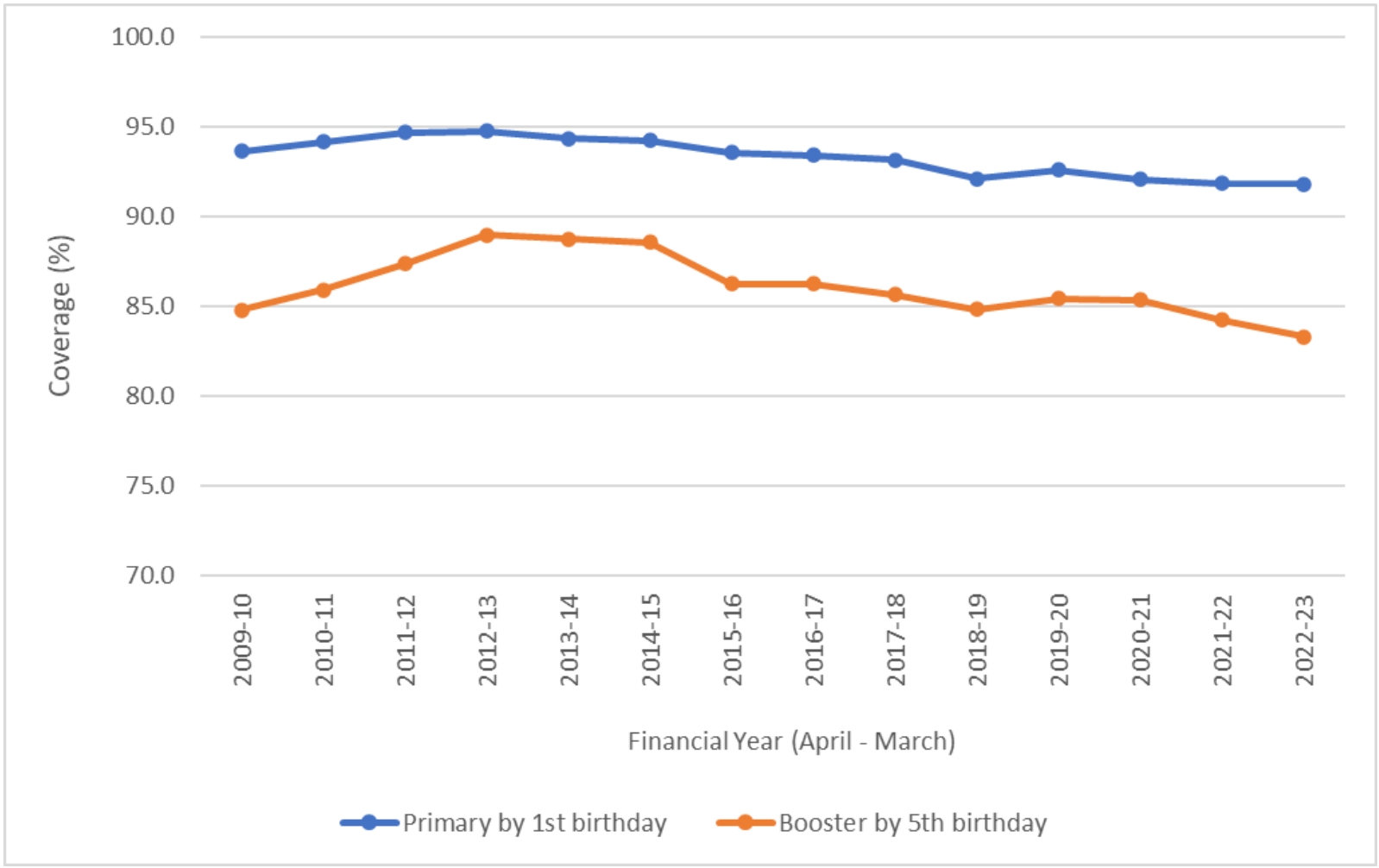
UK Health Security Agency

Vaccine coverage and data challenges

Dr Colin Campbell

Consultant Medical Epidemiologist, Immunisation and Vaccine Preventable Diseases Division
UK Health Security Agency

Childhood vaccination coverage at age 1 and 5



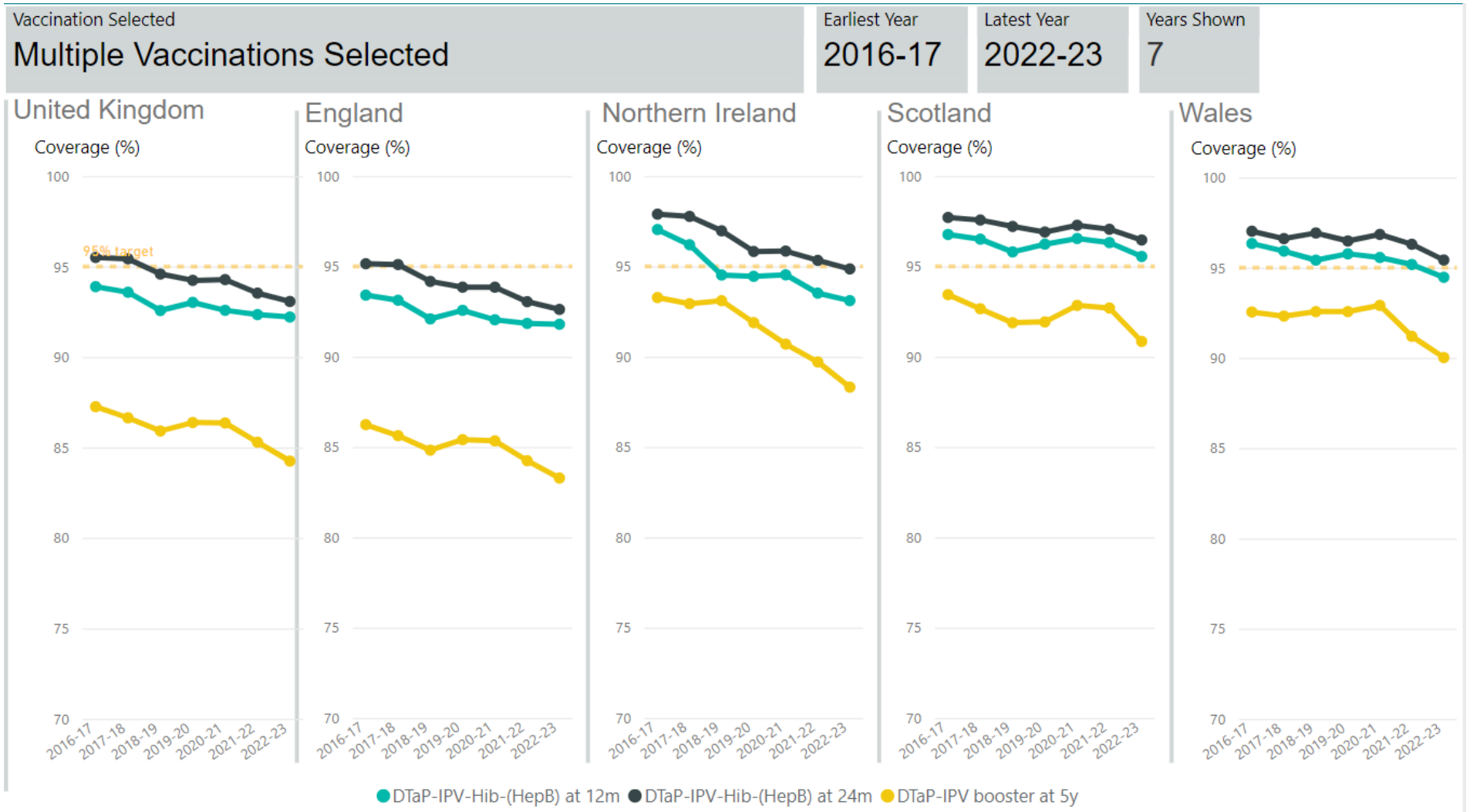
2.9% points lower than in 2012-13 = 17,400 infants in one annual cohort

5.6% points lower than in 2012-13 = 33,600 children in one annual cohort

In 2022-23, coverage was 83.3%. This represents a decrease from 2021-22, when coverage was 84.2% Coverage was highest in 2012-13, at 88.9%.

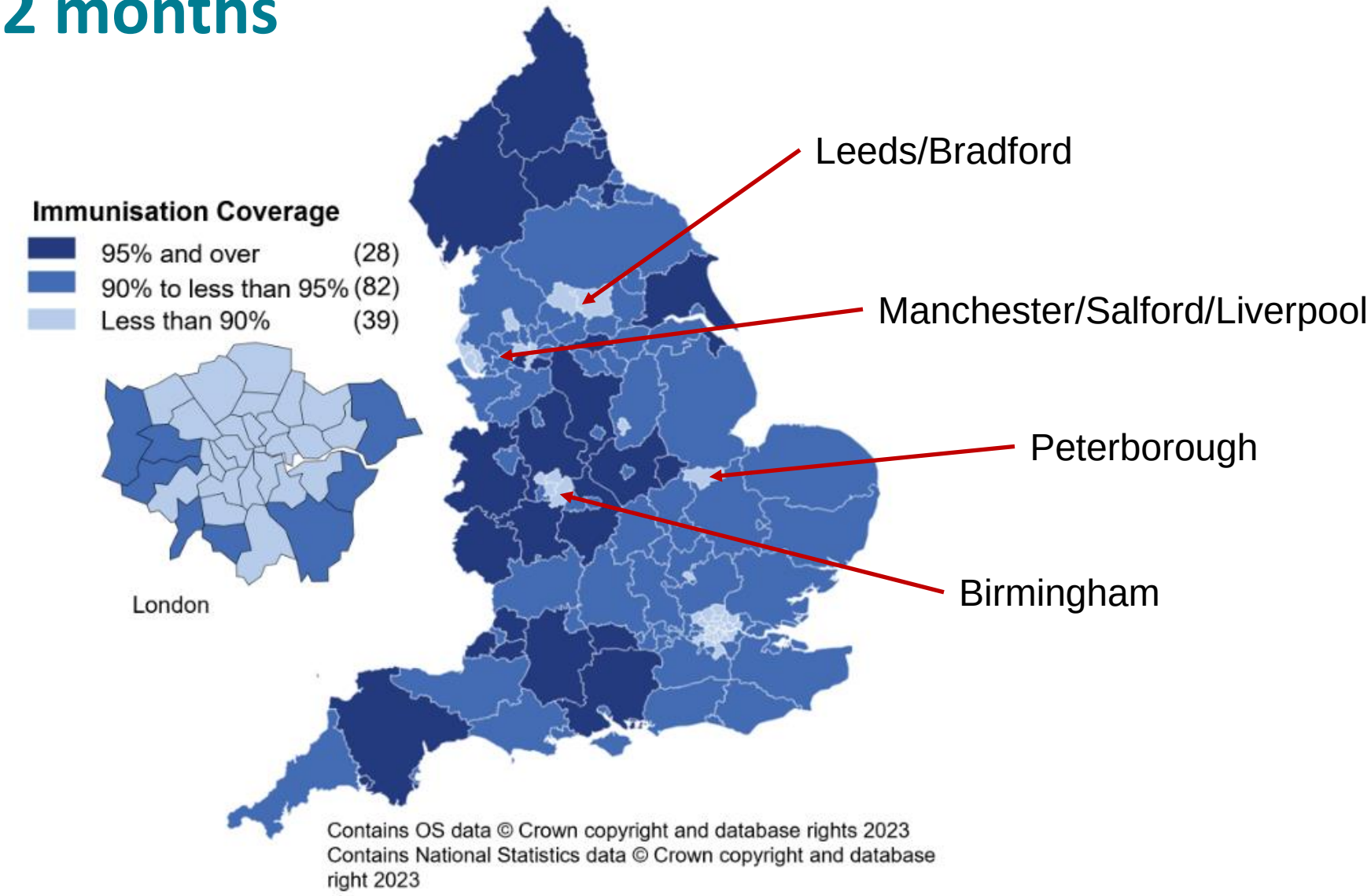
Source: NHS Digital Childhood Vaccination Coverage Statistics, England, 2022-23

Trends in coverage of pertussis containing vaccines at age 1,2,5 in the UK Devolved administrations



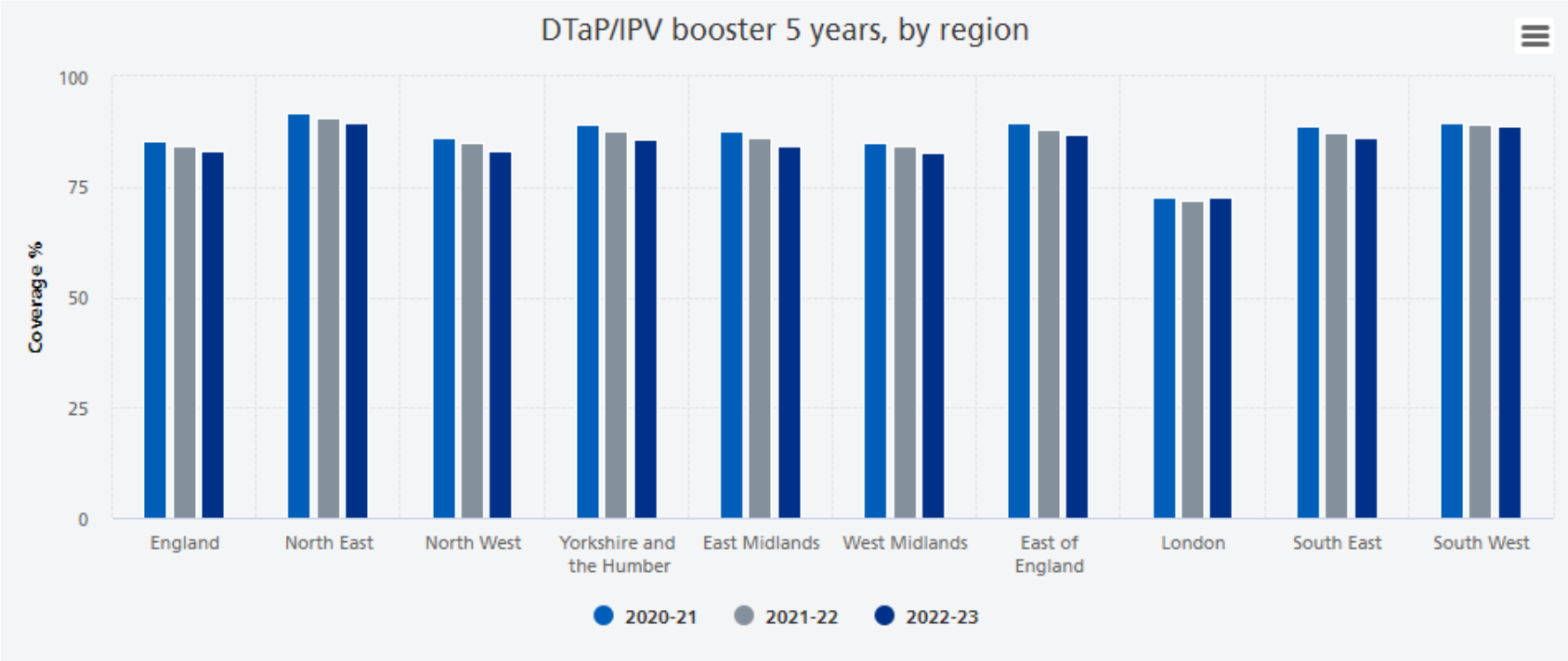
https://digital.nhs.uk/data-and-information/publications/statistical/nhs-immunisation-statistics

Upper tier local authority (LA) ‘6-in-1’ vaccine coverage at 12 months



https://app.powerbi.com/view?r=eyJrIjoiZTI3NWZhNzItMTIyZS00OWM2LTg0MzMtOGY5YTJjMGY0MjI1IiwidCI6IjUwZjYwNzFmLWJiZmUtNDAxYS04ODAzLTY3Mzc0OGU2MjllMiIsImMiOjh9

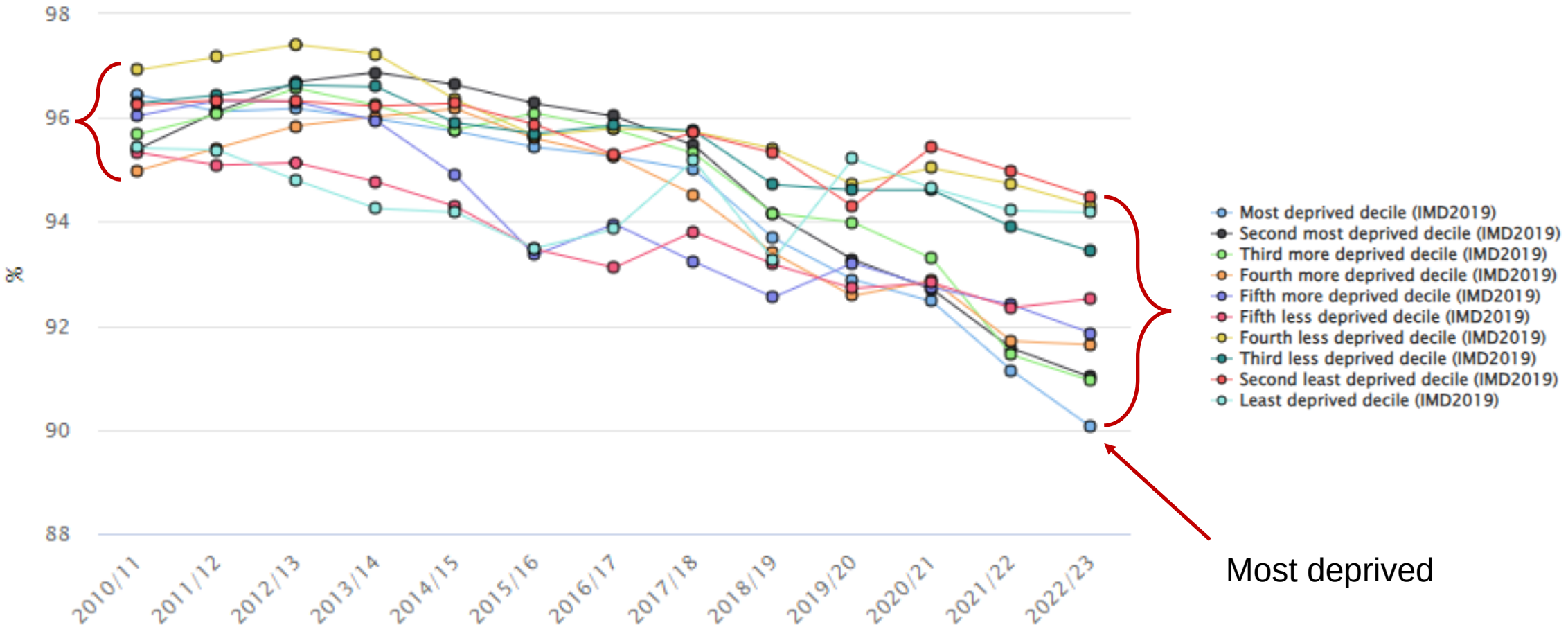
Pre-school booster - DTaP/IPV annual data 2022-23



- In 2022-23, no region achieved coverage above 90%.
- Coverage was 16.7 percentage points lower in London (the region with lowest coverage at 72.7%) compared to the Northeast, the region with the highest coverage at 89.4%.
- In London, 4 of 32 LAs reported coverage at or above 80% and 14 LAs reported coverage below 70%

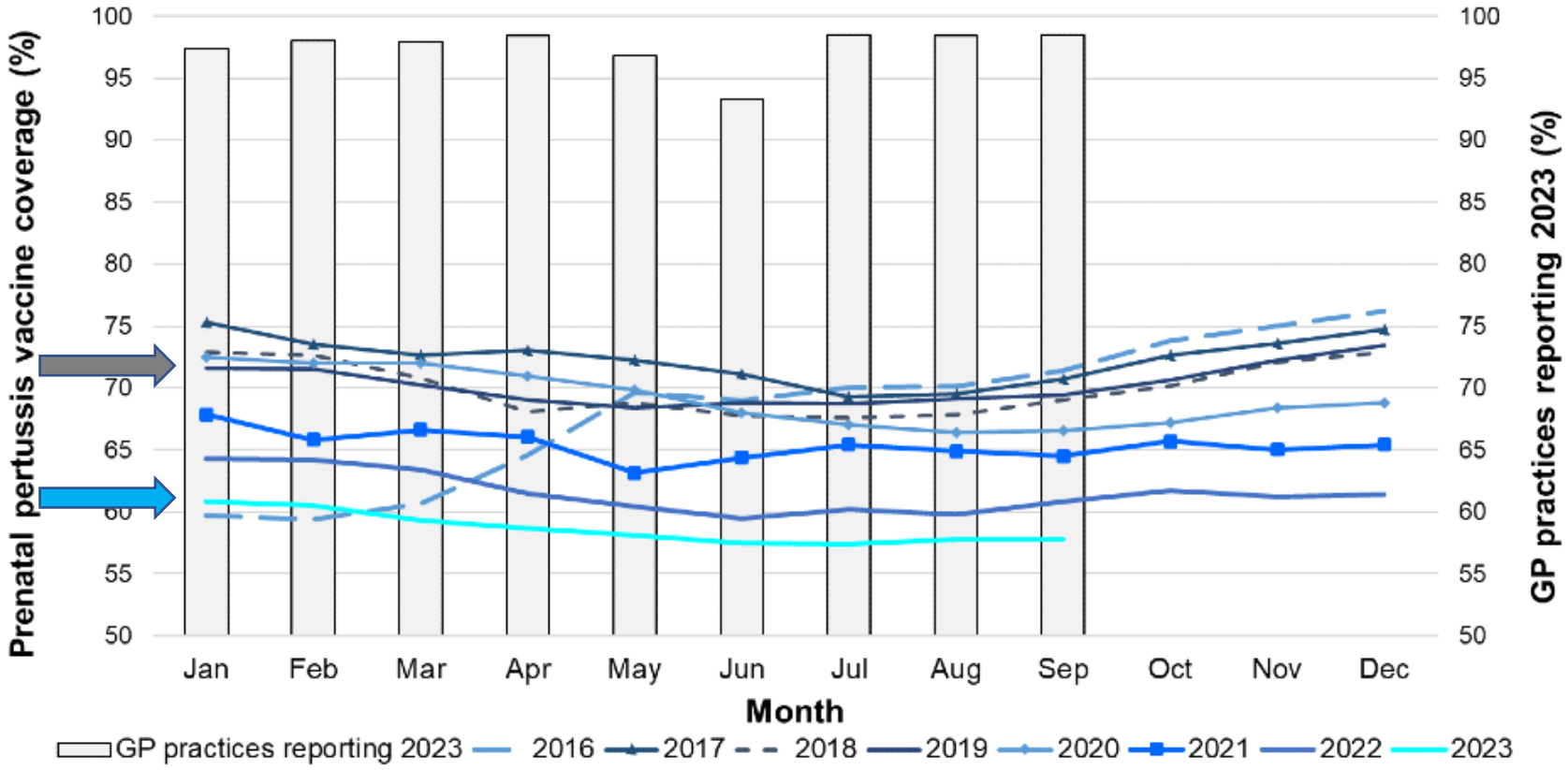
https://digital.nhs.uk/data-and-information/publications/statistical/nhs-immunisation-statistics/england-2022-23/6in-1-vaccine#pre-school-booster-dtap-ipv

Population vaccine coverage Dtap IPV Hib Age 2



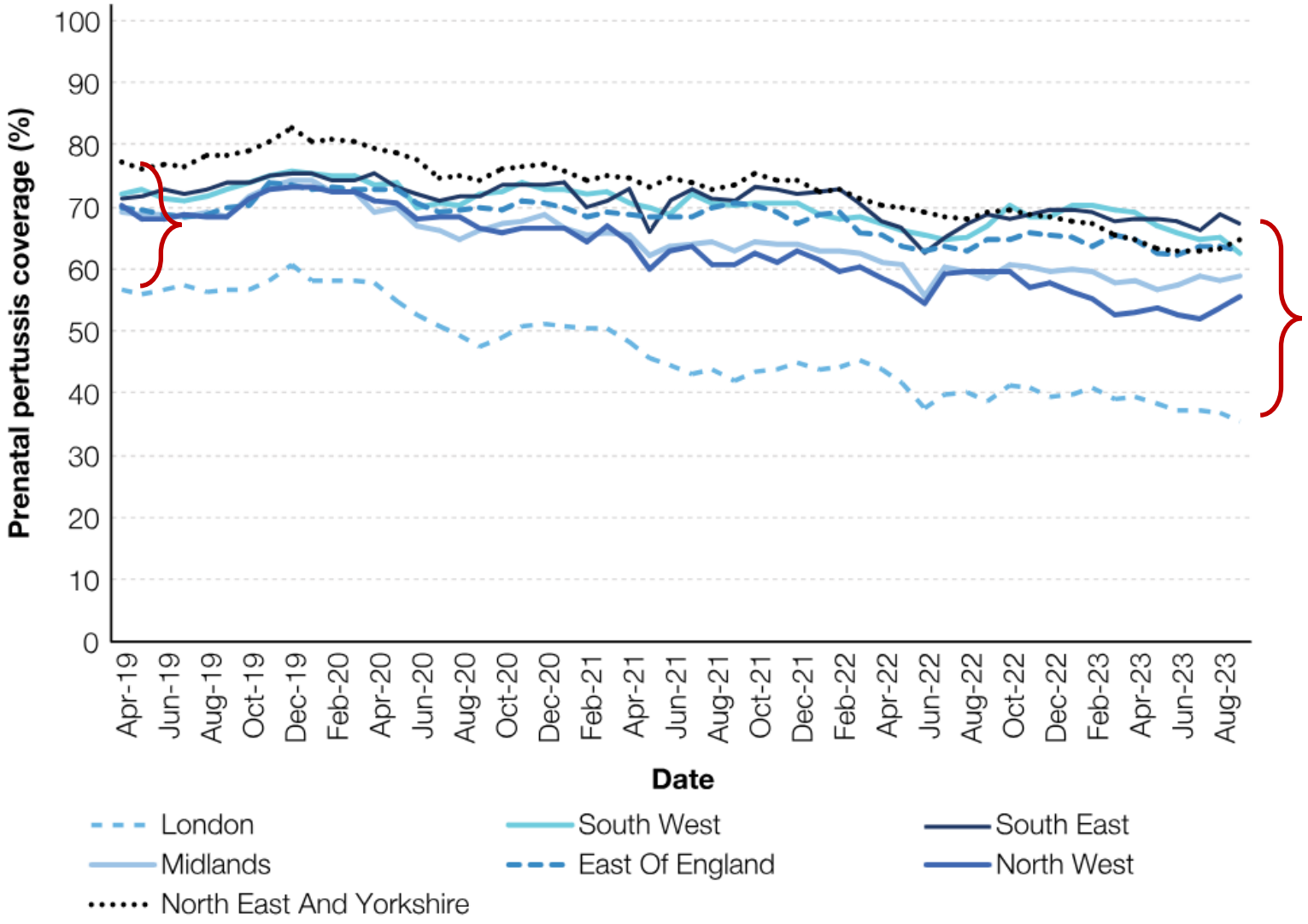
[Health Protection - Data - OHID (phe.org.uk)]

Monthly pertussis vaccination coverage (%), pregnant women (England), 2016 to 2023

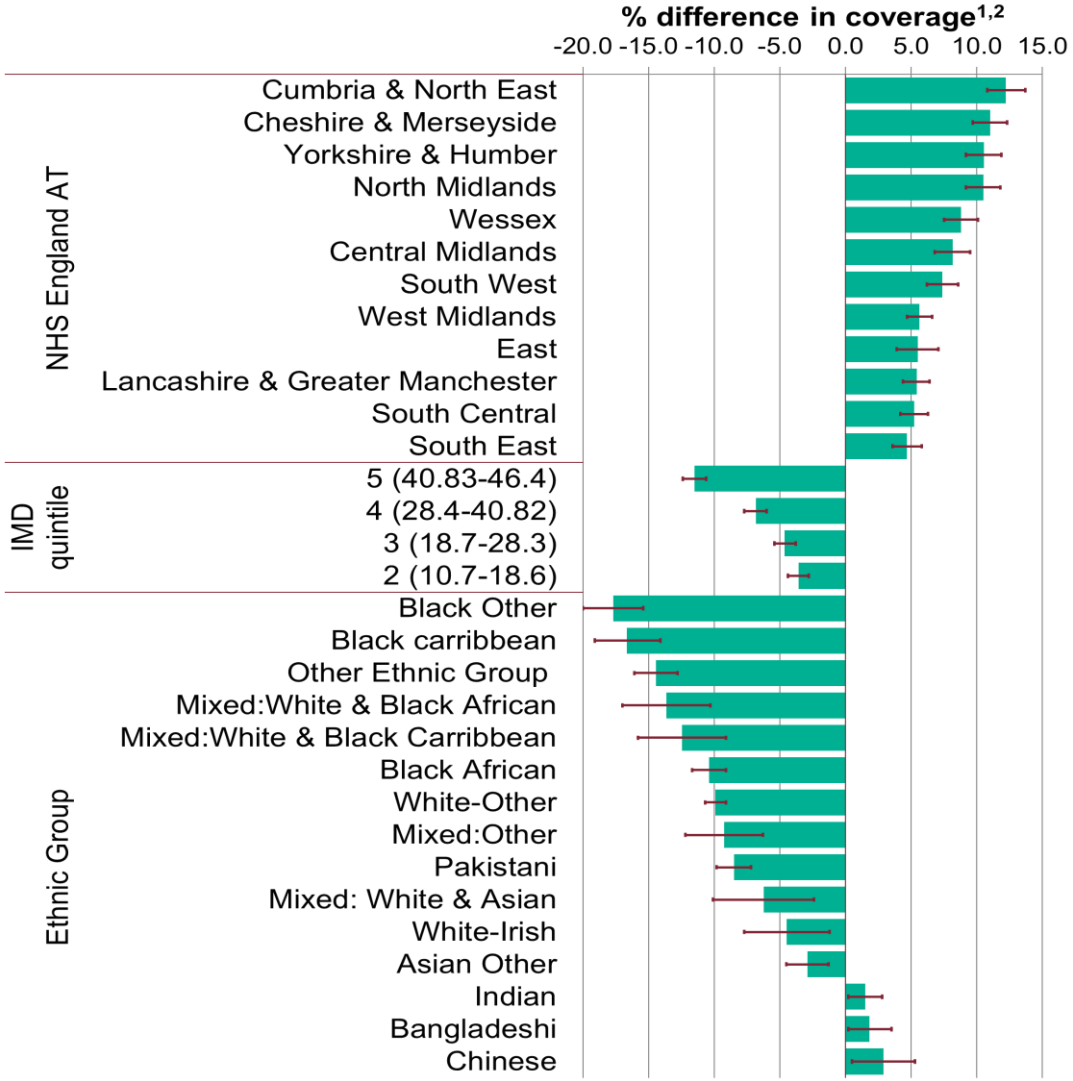


https://www.gov.uk/government/publications/pertussis-immunisation-in-pregnancy-vaccine-coverage-estimates-in-england-october-2013-to-march-2014/prenatal-pertussis-vaccination-coverage-in-england-from-july-to-september-2023

Monthly pertussis vaccination coverage (%) in pregnant women by NHS commissioning region, April 2019 to September 2023



Sociodemographic predictors of variation in coverage of the national prenatal pertussis vaccination in England, 2014/15



- Coverage decreased with increasing deprivation.
- After taking geography and deprivation into account, coverage of prenatal pertussis vaccination varied by ethnicity.
- White British and Asian (except Pakistani) ethnicities had the highest coverages, whereas Black other and Black Caribbean had the lowest.
- Conversely, patients' ethnicity and deprivation are predictors of coverage which contribute to, but do not wholly account for, geographical variation in coverage.

[Predictors of coverage of the national maternal pertussis and infant rotavirus vaccination programmes in England | Epidemiology & Infection | Cambridge Core]

Public health

Original research

Social determinants of pertussis and influenza vaccine uptake in pregnancy: a national cohort study in England using electronic health records

Jemma L Walker [1, 2, 3], Christopher T Rentsch [1, 3], Helen I McDonald [1, 3], JeongEun Bak [1, 3], Caroline Minassian [1], Gayatri Amirthalingam [3, 4], Michael Edelstein [1, 3, 4], Sara Thomas [1, 3]

Correspondence to Dr Helen I McDonald; helen.mcdonald@lshtm.ac.uk

- Lower vaccine uptake associated with greater deprivation: almost 20% lower for pertussis (57.7% vs 76.0%)
- Uptake varies by ethnicity (lowest among women of black ethnicity), maternal age under 20 years and a greater number of children in the household. Among women vaccinated against pertussis in their first eligible pregnancy and pregnant again, (40%) were not vaccinated in their second eligible pregnancy.
- The associations between all social factors and vaccine uptake were broadly unchanged in fully adjusted models, suggesting the social determinants of uptake were largely independent of one another.

Social determinants of pertussis and influenza vaccine uptake in pregnancy: a national cohort study in England using electronic health records | BMJ Open

Potential data problems

Vaccine 38 (2020) 5332–5336

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Delivering prenatal pertussis vaccine through maternity services in England: What is the impact on vaccine coverage?

Ana Llamas [a,b,c,*], Gayatri Amirthalingam [d], Nick Andrews [d], Michael Edelstein [a,d]

[a] London School of Hygiene and Tropical Medicine, London School of Hygiene & Tropical Medicine, Keppel Street, London WC1E 7HT, UK
[b] Imperial College Healthcare NHS Trust, The Bays, South Wharf Road, St Mary's Hospital, London W2 1NY, UK
[c] Public Health England, Wellington House, 133 – 155 Waterloo Road, London SE1 8UG, UK
[d] Immunisation Division, National Infection Service, Public Health England, 61 Colindale Avenue, London NW9 5EQ, UK

- Limitations to the data may explain some of the observed variability in coverage at the local level and over time.
- Possibility of shifting responsibilities in provision of antenatal care and pertussis vaccine may contribute to delivery or capture of vaccination
- Completeness of data is reliant on the recording of delivery dates in the mother's medical records and a recent study in England suggests that maternity notes regarding pregnancy and delivery are often scanned or archived, rather than coded in an extractable format (13).
- Furthermore, a comparison of this denominator data with national data on live births (14) indicates that, in 2021, this data represented about 73% of the population of pregnant women.
- Future changes in recording may help e.g. use of POC app in maternity assuming data flows https://linkinghub.elsevier.com/retrieve/pii/S0264-410X(20)30723-4

UK Health Security Agency

Q&A and panel discussion

chaired by Dr Amirthalingam

with Adam Finn, Helen Campbell, David Litt, Colin Campbell

and

Dr Jennifer Jardine

Academic Clinical Lecturer in Obstetrics and Gynaecology
Women's Health Research Unit
Centre for Public Health and Policy, Wolfson Institute of Population Health
Queen Mary University of London

Greta Hayward

Consultant Midwife, UKHSA
Immunisation & Vaccine Preventable Diseases Division