



Infection report / Immunisation

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Laboratory confirmed cases of pertussis reported to the enhanced pertussis surveillance programme in England: annual report for 2015

In England there were 4190 laboratory confirmed cases of pertussis (culture, PCR, serology or oral fluid) reported to the Public Health England pertussis enhanced surveillance programme in 2015. Pertussis is a cyclical disease with increases occurring every 3-4 years with pertussis activity usually peaking each year in quarter three. Numbers of confirmed cases in England in 2015 were 24% higher than the 3387 reported in 2014 however the number of confirmed cases reported in 2015 were 9% lower than 2013 and 55% lower than the peak observed in 2012 (4621 and 9367 respectively, see figure 1). A third (32%; 1327/4190) of all confirmed cases in England in 2015 were reported in the third quarter (July to September) (table1).

In those aged 1 to 4 years confirmed pertussis cases were higher in 2015 than in the 14 years preceding 2012 and cases aged between 5 and 9 years were higher than any year reported since the introduction of enhanced pertussis surveillance in 1994. Similarly the number of laboratory confirmed cases aged between 10 and 14 years reported in 2015 was the second highest reported after 2012. In infants under a year, however, pertussis cases were 42% higher in 2015 (n=175) than in 2014 (123) but lower than the 508 reported in 2012 and 205 reported in 2011.

A national outbreak of pertussis (level 3 incident [1]) was declared by the HPA in April 2012 and, as a response to the ongoing outbreak, the Department of Health (DH) announced the introduction of a temporary immunisation programme for pregnant women on 28 September 2012 [2]. In June 2014 the Joint Committee on Vaccination and Immunisation (JCVI) recommended that the programme should continue for a further five years [3] based on UK evidence of impact, high effectiveness and safety and continuing high levels of disease [4,5,6]. From 1 April 2016 the recommended gestational age for vaccination is between 16-32 weeks and for operational reasons vaccine should be offered from around 20 weeks on or after the foetal anomaly scan [3]. The most recent PHE figures report that the proportion of mothers due to give birth between January 2015 and December 2015 who had been immunised with a pertussis containing vaccine in pregnancy in England ranged from 55.1% to 61.6% [7].

The national incidence for all age groups, based on laboratory confirmations in England and 2014 population estimates [8], was; two cases of pertussis per 100,000 population in 2011, 18 per 100,000 in 2012, nine per 100,000 in 2013, six per 100,000 in 2014 and eight per 100,000 in 2015 (figure 2). As was seen in 2012, 2013 and 2014, the majority (79%; 3291/4190) of laboratory confirmed cases in England in 2015 (incidence 7/100,000) occurred in individuals aged 15 years and older. As expected, however, the incidence of laboratory confirmed cases continued to be highest in infants less than three months, who are at most risk of serious disease and too young to be fully vaccinated. Confirmed pertussis incidence in this age group was 78 per 100,000 in 2015 compared to 59 per 100,000 in 2014, 50 per 100,000 in 2013 and 240 per 100,000 in 2012 (figure 2). Accordingly, the number of confirmed cases in infants <3 months increased by 33% in 2015 (130 cases) compared to 2014 (98 cases), but was 68% lower than 2012 (407 cases) and 21% lower than 2011 (164).

In England, 14 deaths were reported in infants with pertussis confirmed in 2012. Following the introduction of pertussis vaccination in pregnancy; three babies died following pertussis confirmed in 2013, seven in 2014 and four in 2015. All cases were <3 months of age and therefore too young to be fully protected by infant vaccination. Only two of the infants born after the introduction of the maternal programme had a mother who had been vaccinated during pregnancy but in both cases too close to delivery to confer optimal passive protection in the infant.

These surveillance data in young infants following the introduction of a programme to immunise pregnant women are encouraging as a relatively low incidence has been maintained, with expected seasonal increases. It is important to be aware, however, that raised levels of pertussis persist in all age groups other than infants and are currently increasing. Women should, therefore, continue to be encouraged to be immunised against pertussis during pregnancy in order to protect their babies from birth. The advice to offer vaccination earlier in pregnancy should lead to more opportunities for pregnant women to be vaccinated and to have their vaccine status checked. It is anticipated that this will help improve coverage which is particularly important in view of the current increases in pertussis.

Background to laboratory testing

Since mid-2006 there has been greater use of serology testing compared to previous years due to increasing clinical awareness of pertussis in older children and adults [9] and increased awareness of the availability of this diagnostic method [10]. In 2015, serology confirmed cases accounted for the greatest proportion (90%; 3786/4190) of total laboratory confirmations, and accounted for 98% (3240/3786) of all confirmed cases of pertussis in older age groups (table 2). The majority (94%; 164/175) of infants under one year of age with confirmed pertussis in 2015 were tested using culture and PCR methods. Oral fluid (OF) testing was introduced in 2013 for testing children aged five to 16 years (<17 years) and in 2015, 161 of 795 cases (20%) in this age group tested positive for a recent pertussis infection by OF testing only. Thirty non-infant cases were confirmed by PCR.

The choice of laboratory testing method is dependent on the age of the patient and the stage of the illness; this is reflected in the distribution of testing methods summarised in table 2. Culture is the gold standard for diagnosis but loses sensitivity with increasing time from the onset of illness and is unlikely to be positive after two weeks from the onset of symptoms. The Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU) at PHE's Microbiology Services Division Colindale encourages submission of all *Bordetella pertussis* isolates for confirmation and national surveillance purposes.

Bordetella pertussis PCR testing for hospitalised cases <1 year [10] old has been offered by the RVPBRU since 2002 and from July 2014, PCR testing for all ages has been deployed via lead PHE laboratories in a phased approach [11]. This form of testing is particularly encouraged in all children aged 1-4 years, who present within three weeks of onset, for whom recent vaccination may confound serology results.

In contrast, serology investigation by estimation of anti-pertussis toxin (PT) IgG antibody levels for older children and adults is routinely offered for older children/adults who have been unwell with a cough for at least two weeks. The RVPBRU is also offering an OF testing service for clinically suspected cases, reported to local Health Protection Teams, who are aged five to 16 years (<17yrs) and have been coughing for at least two weeks and have not been immunised against pertussis in the previous year. However, as recent pertussis vaccination (primary and pre-school booster vaccination) can confound the serology and OF results, these investigations

are not usually recommended for infants or children within one year of receiving the pertussis vaccine (primary or pre-school booster).

Further information is available in the PHE Microbiology Services Colindale Bacteriology Reference Department User Manual at: <https://www.gov.uk/government/publications/bacteriology-reference-department-brd-user-manual>.

Figure 1. Total number of laboratory-confirmed pertussis cases per evaluation quarter in England: 2006 -2015

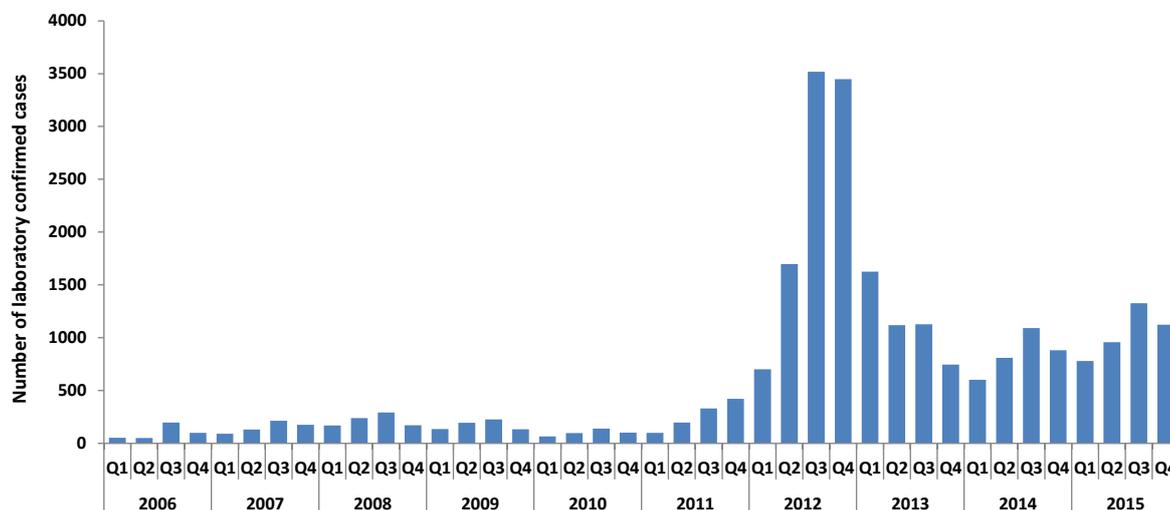


Table 1. Laboratory-confirmed cases of pertussis by quarter and test method in England: 2015

Quarter	Culture*	PCR	Serology	OF only	Total
Jan - Mar	11	22	723	25	781
Apr - Jun	28	30	845	55	958
Jul - Sep	48	49	1174	56	1327
Oct - Dec	22	27	1044	31	1124
Total	109	128	3786	167	4190

* Culture confirmed cases may additionally have tested positive using other methods. Submission of all presumptive B. pertussis isolates is encouraged for confirmation of identity and to allow further characterisation for epidemiological purposes.

Figure 2. Incidence of laboratory-confirmed pertussis cases by age group in England: 1998-2015

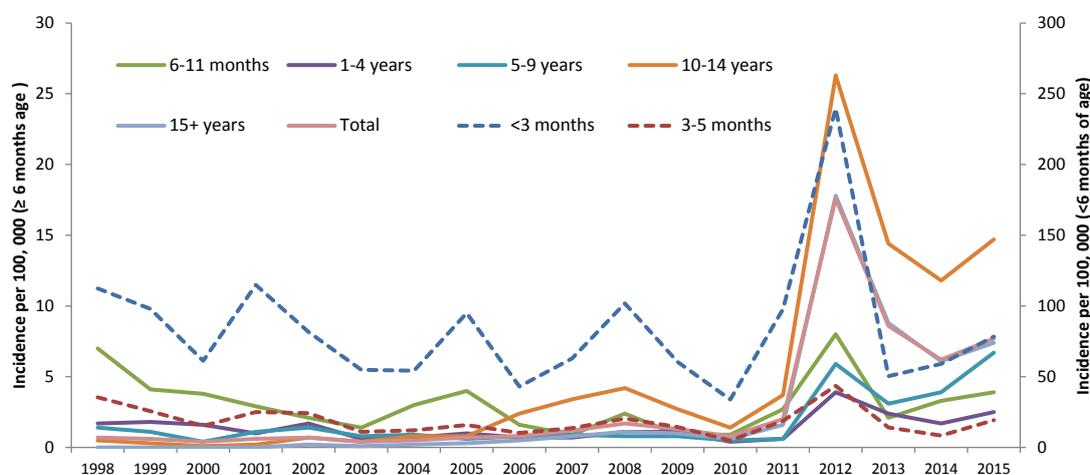


Table 2. Age distribution of laboratory-confirmed cases of pertussis in England: 2015

Age group	Culture*	PCR	Serology	OF only	Total
<3 months	46	75	9	-	130
3-5 months	15	15	2	-	32
6-11 months	5	8	-	-	13
1-4 years	11	9	47	2	69
5-9 years	9	1	144	64	218
10-14 years	5	4	344	84	437
15+ years	18	16	3240	17	3291
Total	109	128	3786	167	4190

* Culture confirmed cases may additionally have tested positive using other methods. Submission of all presumptive *B. pertussis* isolates is encouraged for confirmation of identity and to allow further characterisation for epidemiological purposes.

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