



Infection report / Immunisation

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Laboratory confirmed cases of pertussis reported to the enhanced pertussis surveillance programme in England: annual report for 2014

In England there were 3388 laboratory confirmed cases of pertussis (culture, PCR, serology or oral fluid) reported to the Public Health England pertussis enhanced surveillance programme in 2014. Pertussis is a cyclical disease with increases occurring every 3-4 years. Typically pertussis activity peaks in quarter three within each year, however, there was an unusually high increase in cases in 2012 (figure 1). A third (32%; 1094/3388) of all confirmed cases in England in 2014 were reported in the third quarter (July to September) (table1).

Numbers of confirmed cases in England in 2014 were 27% lower than the 4621 reported in 2013 and 64% lower than the 9367 cases reported in 2012; however the number of confirmed cases in 2014 were three-fold higher than the number of cases reported in 2011 (n=1053). In all those aged four years and older confirmed pertussis cases were higher in 2014 than any year reported prior to 2012 and in the 1-4 year age group total cases were higher than they had been in the 15 years preceding 2012. In infants under a year, however, pertussis cases were slightly higher in 2014 (n=123) than in 2013 (116) but lower than the 508 reported in 2012 and 207 reported in 2011 and was overall in line with annual cases reported prior to 2012.

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]. The most recent PHE figures report that the proportion of mothers due to give birth between January 2014 and December 2014 who had been immunised with a pertussis containing vaccine in pregnancy in England ranged from 52.7% - 62.3% [4].

The national incidence for all age groups, based on laboratory confirmations in England and 2011 population estimates [5], was 2 cases of pertussis per 100,000 population in 2011, 18 per 100,000 in 2012, nine per 100,000 in 2013 and six per 100,000 in 2014 (figure 2). As was seen in 2012 and 2013, the majority (81%; 2738/3388) of laboratory confirmed cases in England in 2014 occurred in individuals aged 15 years and older. The number of confirmed cases in this

age group continued to decrease from a peak of 7775 in 2012 (incidence of 18/100,000) to 3912 in 2013 (incidence of 9/100,000) and 2738 (incidence 6/100,000) in 2014 (figure 2).

As expected, 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 58 per 100,000 in 2014, compared to 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 15% in 2014 (98 cases) compared to 2013 (85 cases), but was 76% lower than 2012 (407 cases) and 41% lower than 2011 (166). In England, 14 deaths were reported for infants with pertussis confirmed in 2012. Following the introduction of pertussis vaccination in pregnancy; three babies died following pertussis confirmed in 2013 and seven in 2014. In Wales one baby with pertussis certified as an underlying cause of death was reported in 2014. All cases were too young to be protected by infant vaccination and only one of the infants born after the introduction of the maternal programme had a mother who had been vaccinated during pregnancy.

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 older age groups and women should, therefore, continue to be encouraged to be immunised against pertussis during pregnancy in order to protect their babies from birth. The pertussis immunisation in pregnancy programme in England has shown high levels of protection against pertussis in babies born to vaccinated mothers [6,7]. The Medicines and Healthcare Products Regulatory Agency also found no safety concerns relating to pertussis vaccination in pregnancy based on a large study of nearly 18,000 vaccinated women with similar rates of normal, healthy births in vaccinated and in unvaccinated women [8].

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 2014, serology confirmed cases accounted for the greatest proportion (92%; 3110/3388) of total laboratory confirmations, and accounted for 98% (2683/2738) of all confirmed cases of pertussis in older age groups (table 2). All but three infants under one year of age with confirmed pertussis in 2014 were tested using culture and PCR methods. Oral fluid (OF) testing was introduced in 2013 for testing children aged five to <17 years and in 2014, 90 of 577 cases (16%) in this age group tested positive for a recent pertussis infection by OF testing only.

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 the Public Health England (PHE) 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 [11] 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 [12]. 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 between 5-16 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/uploads/system/uploads/attachment_data/file/340615/BRDW0078.01_Bacteriology_Reference_Dept_User_Manual_.pdf

Figure 1. Total laboratory-confirmed pertussis cases per evaluation quarter in England: 2005-2014

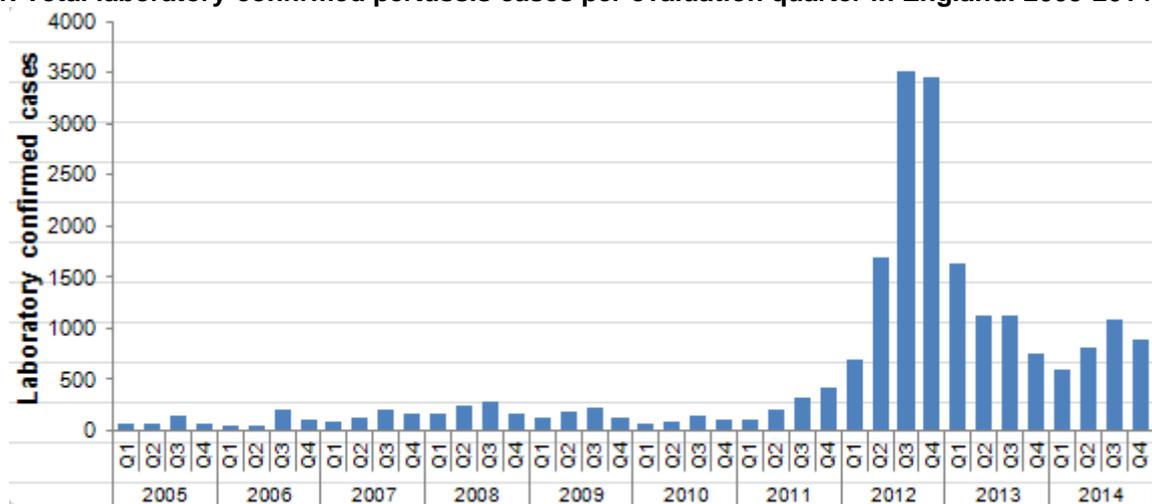


Table 1. Laboratory-confirmed cases of pertussis by quarter and test method in England: 2014

Quarter	Culture*	PCR	Serology	OF only	Total
Jan - Mar	15	13	552	22	602
Apr - Jun	21	25	743	21	810
Jul - Sep	32	39	991	32	1094
Oct - Dec	17	9	824	32	882
Total	85	86	3110	107	3388

* 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: 1998-2014

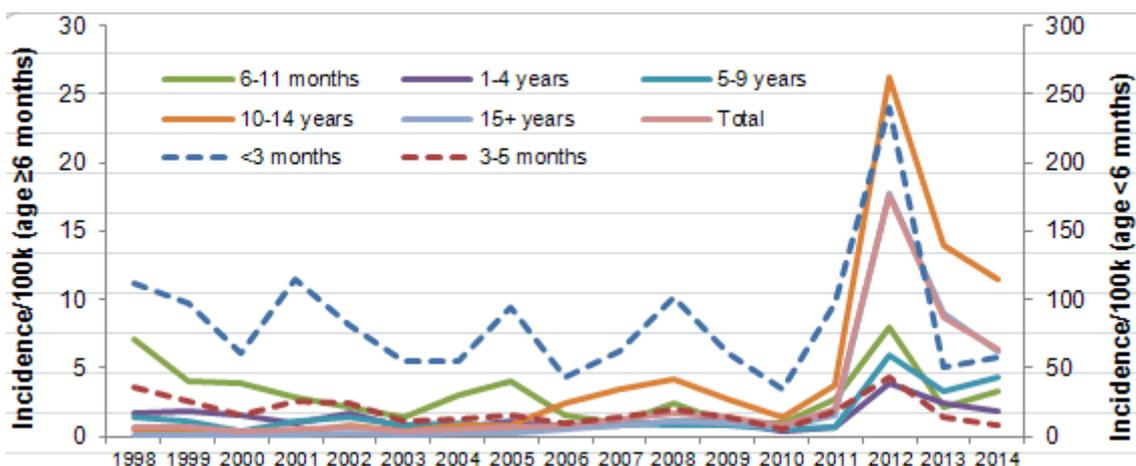


Table 2. Age distribution of laboratory-confirmed cases of pertussis in England: 2014

Age group	Culture*	PCR	Serology	OF only	Total
<3 months	48	49	1	-	98
3-5 months	3	10	1	-	14
6-11 months	7	3	1	-	11
1-4 years	6	5	34	3	48
5-9 years	3	2	96	27	128
10-14 years	2	2	294	53	351
15+ years	16	15	2683	24	2738
Total	85	86	3110	107	3388

* 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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