



Public Health
England

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Laboratory confirmed cases of pertussis in England: annual report for 2020

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Laboratory confirmed cases and incidence

In England, there were 994 new laboratory confirmed cases of pertussis (culture, PCR, serology or oral fluid) reported to the Public Health England (PHE) pertussis enhanced surveillance programme in 2020. The 994 confirmed cases in England in 2020 were 73% lower than the 3,680 reported in 2019 (Figure 1). Total number of samples submitted to PHE for testing was 54% lower in 2020 (6,841) compared to 2019 (14,808) with a positivity rate of 16% (1,059/6,825) in 2020 and 26% (3,833/14,789) in 2019.

Pertussis is a cyclical disease, with increases occurring every 3 to 4 years, with pertussis activity usually peaking each year in quarter 3 (July to September). The majority (81%; 806/994) of confirmed cases in England in 2020 were reported in the first quarter (January to March) compared to 16% (604/3,680) in the first quarter of 2019 (Table 1). A seasonal peak was not observed between July and September 2020. Incidence, based on laboratory confirmed cases, decreased from 1 per 100,000 in the first quarter to 0.1 per 100,000 in quarter 3 compared to 2019 where incidence increased from 1 per 100,000 to 2 per 100,000 in the same quarters.

The coronavirus (COVID-19) pandemic and the implementation of social distancing measures and lockdown across the UK from 23 March 2020 has had a significant impact on the spread and detection of other infections including pertussis.

The national incidence for all age groups, based on laboratory confirmed cases of pertussis in England and 2019 population estimates, was 2 per 100,000 in 2020 compared to 7 per 100,000 in the previous year and 5 per 100,000 in 2018; it reached 18 per 100,000 in 2012 (epidemic peak year). Prior to the major peak in 2012, incidence ranged between 0.4 per 100,000 and 2 per 100,000 (Figure 2).

Laboratory confirmed pertussis cases in infants aged under 1 year, were 63% lower in 2020 (50 cases), than in 2019 (136 cases). This compares with 508 confirmed cases reported in 2012.

There has been a decline in pertussis incidence in infants under 3 months of age since the introduction of the maternal vaccination programme, from 234 per 100,000 in 2012 to 93 per 100,000 in 2016 and 19 per 100,000 in 2020 (Figure 2). The number of confirmed cases in infants under 3 months in 2020 was 64% lower (30 cases) than in 2019 when 83 cases were reported. The number of confirmed cases in infants under 3 months and overall for infants under 1 year of age in 2020 were the lowest reported since the introduction of enhanced surveillance in 1994. Incidence does however remain highest in infants under 3 months who are at most risk of severe disease and too young to be fully vaccinated.

Cases in older infants have also remained low since the 2012 epidemic peak when there were 74 cases (43 per 100,000) in infants aged between 3 and 5 months. There were 15 cases (10 per 100,000) in this age group in 2020 compared to 32 (21 per 100,000) in 2019. In the 2016 cyclical peak, confirmed cases aged between 6 and 11 months were higher (34 cases, 10 per 100,000) than in any year since the introduction of enhanced surveillance. In 2019 incidence in this age group was 7 per 100,000 (21 cases) and 2 per 100,000 (5 cases) in 2020. These low numbers are consistent with protection from primary vaccination offered at 2, 3 and 4 months of age.

In all children aged 1 year and older, numbers of confirmed cases were markedly lower in 2020 than in 2019 (67% lower in those aged 1 to 4 years, 77% lower in 5 to 9 year olds and 68% lower in 10 to 14 year olds). Ascertainment in those aged 5 to less than 17 years has improved with availability of oral fluid testing since 2013. From 1 May 2018, the availability of oral fluid testing was extended to all children aged from 2 up to and including 16-year-olds, which may underpin earlier increases observed in the 1 to 4 year age group where confirmation by oral fluid alone accounted for 39% of cases.

Most (70%; 693/994) (table 2) laboratory confirmed cases in England in 2020 occurred in individuals aged 15 years and older; total numbers in 2020 were 74% lower than in 2019 (2,706 cases).

Deaths

In England, 14 deaths were reported in infants with confirmed pertussis in the 2012 epidemic peak year. Following the introduction of pertussis vaccination in pregnancy there have been 20 further deaths in babies with confirmed pertussis. There were no reported deaths in infants with confirmed pertussis in 2020. The last pertussis related death of an infant was reported in the second quarter (April to June) of 2019.

All the deaths in 2012, and those that have occurred following the introduction of the maternal programme, were too young to be fully protected by infant vaccination. Only 2 of the infants born after the introduction of the maternal programme had a mother who had been vaccinated during pregnancy. In both cases the vaccination was too close to delivery to confer optimal passive protection in the infant.

Childhood vaccination uptake

The national vaccination schedule recommends pertussis vaccination at 8, 12 and 16 weeks of age and a pre-school booster at 3 years and 4 months.

The latest vaccine coverage estimates for DTaP/IPV/Hib/HepB3 immunisation across England was 91.5% for 3 doses at 12 months of age and 85.4% for the booster dose by 5 years of age (*evaluated between October to December 2020*) which were slightly lower than the *coverage estimates for October 2019 to December 2019* when the proportion of children vaccinated at 12 months was 92.8% and 85.5% for the booster dose.

The introduction of social distancing in response to the COVID-19 pandemic from late March 2020, when some of this cohort would have been scheduled for vaccination, may have contributed to these modest decreases.

Maternal vaccination programme

The [maternal pertussis immunisation programme](#), introduced in response to the 2012 outbreak, became permanent from June 2019 [1] based on evidence of disease impact, high effectiveness and safety [2, 3, 4, 5]. The recommended gestational age for vaccination is between 20 and 32 weeks, ideally after the 20-week scan, but the vaccine can be given as early as 16 weeks [1] for pragmatic reasons to ensure vaccination.

The most recent PHE figures report that the proportion of mothers due to give birth in 2020 who had been immunised with a pertussis containing vaccine in pregnancy in England ranged from a monthly average of 66.4% (August) to 72.5% (January) compared to 2019 where monthly averages ranged from 68.4% (May) to 73.5% (December). The impact of the pandemic on healthcare services has possibly resulted in vaccine coverage being lower than any [July to December coverage estimates since April 2016](#). This could be due to a potential increase in the delivery of the vaccines through maternity units, during the pandemic, which may not have been captured completely in the survey and therefore resulted in an under-estimation of coverage.

Furthermore, the total number of women delivering in December 2020 was lower than in October and November 2020, as well as to December 2019. This decrease may be related to a number of factors related to the pandemic including the introduction of social distancing and lock down measures introduced from March 2020 when most of these women would have conceived.

The annual vaccine coverage for the financial year 2020 to 2021 was 67.8%, which was 2.7 percentage points lower compared to 2019 to 2020 financial year [6].

Surveillance data in young infants following the introduction of the pertussis immunisation in pregnancy programme demonstrated that a low incidence had been maintained in this age group, with expected seasonal increases. COVID-19 control measures appear to have had an additional impact on these observed effects. It is important that women continue to be supported during the ongoing pandemic to access immunisation against pertussis during pregnancy (ideally between 20 and 32 weeks) to optimise protection for their babies from birth.

[Supplementary data tables from 1994 to 2020](#) are available to download.

Figure 1. Total number of laboratory confirmed pertussis cases per evaluation quarter in England: 2011 to 2020

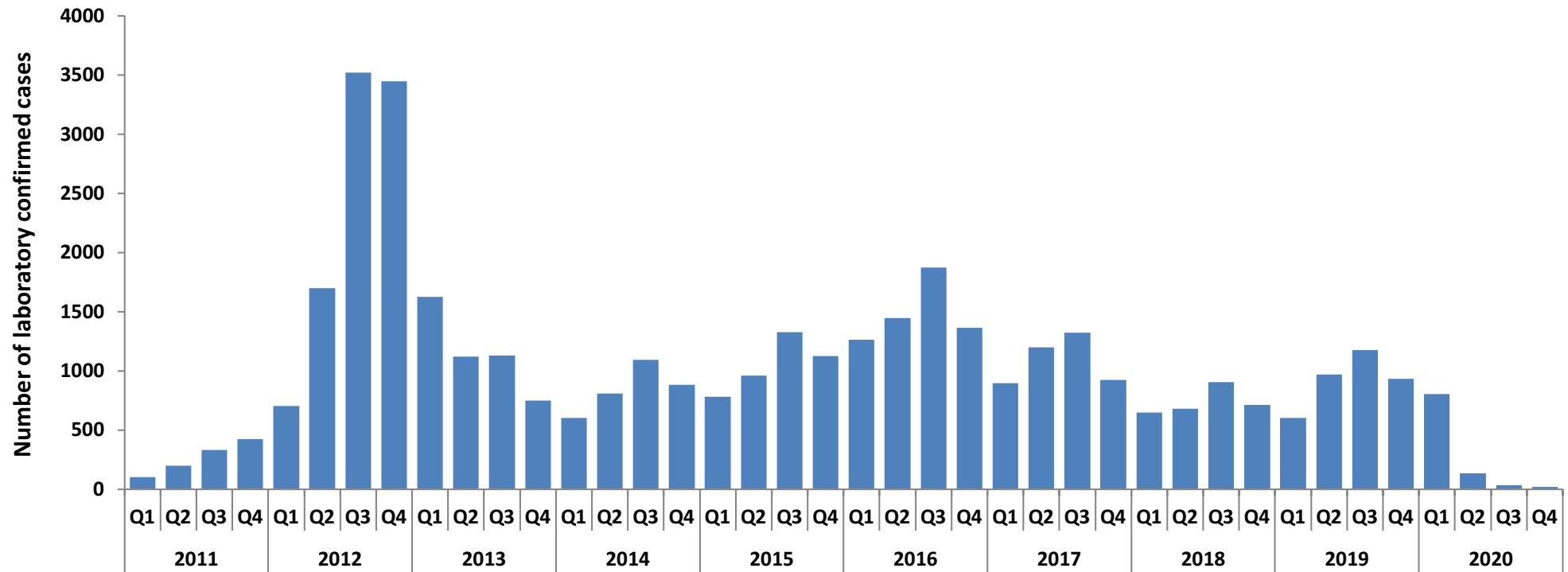


Figure 2. Incidence of laboratory confirmed pertussis cases by age group in England: 1998 to 2020

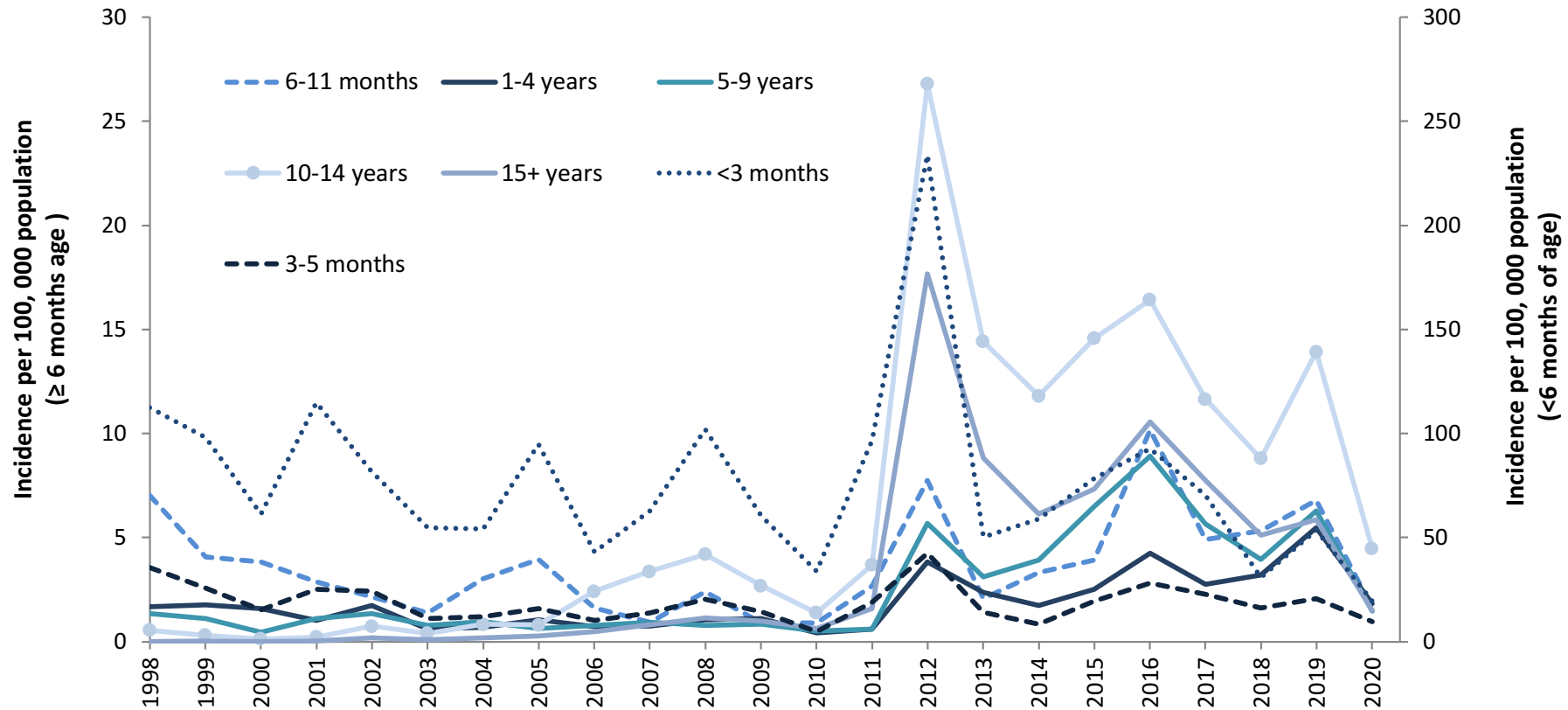


Table 1. Laboratory confirmed cases of pertussis by quarter and test method* in England: 2020

Quarter	Culture	PCR	Serology	Oral fluid only	Total
Jan - Mar	17	48	646	95	806
Apr - Jun	10	21	84	18	133
Jul - Sep	1	0	32	2	35
Oct - Dec	0	2	13	5	20
Total	28	71	775	120	994

* Culture confirmed cases may additionally have tested positive by any other method, PCR confirmed cases may have additionally tested positive by serology or OF and serology confirmed cases may also have been confirmed by OF. Cases are only represented once in the table. Submission of all presumptive B. pertussis isolates is encouraged for confirmation of identity and to allow further characterisation for epidemiological purposes.

Table 2. Age distribution of laboratory confirmed cases of pertussis by test method* in England: 2020

Age group	Culture	PCR	Serology	Oral fluid only	Total
<3 months	7	22	1	0	30
3-5 months	5	7	2	1	15
6-11 months	1	2	2	0	5
1-4 years	9	13	8	19	49
5-9 years	1	4	22	25	52
10-14 years	1	9	75	65	150
15+ years	4	14	665	10	693
Total	28	71	775	120	994

* Culture confirmed cases may additionally have tested positive by any other method, PCR confirmed cases may have additionally tested positive by serology or OF and serology confirmed cases may also have been confirmed by OF. Cases are only represented once in the table. 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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