Public Health England

Health Protection Report
weekly report

**Volume 9 Number 30** Published on: **28 August 2015**

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**News**

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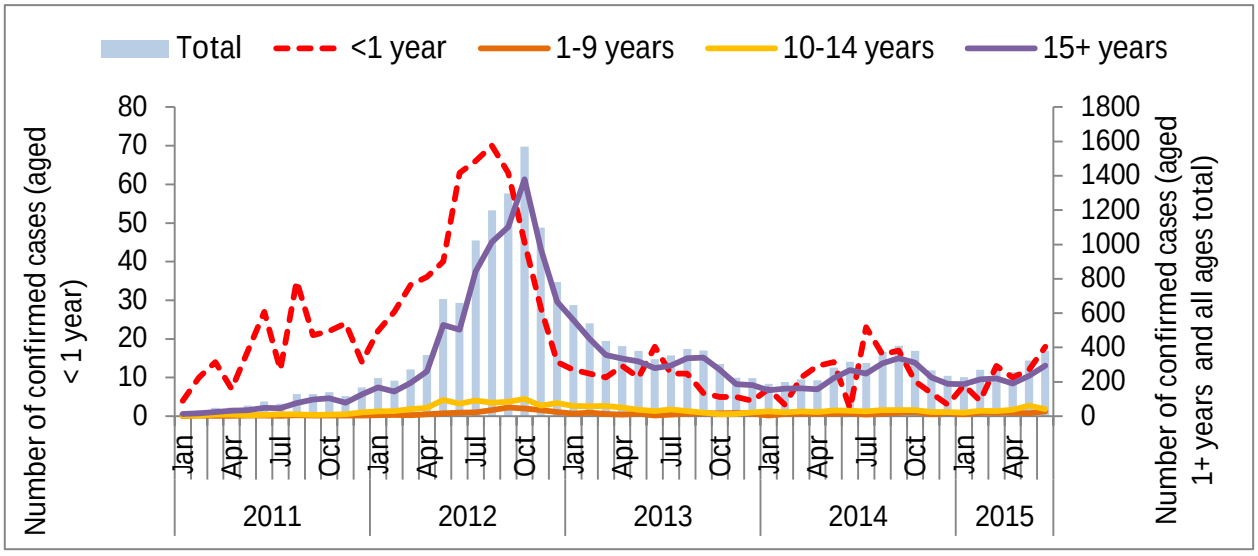
## Laboratory confirmed pertussis in England: data to end-June 2015

*This report presents current pertussis activity to 30 June 2015, updating the previous report that included data to the end of February 2015 [1].*

### Background

In England the number of laboratory confirmed cases of pertussis has fallen overall each consecutive year from a peak of 9367 cases in 2012; by 51% between 2012 and 2013 (4621 cases) and 27% between 2013 and 2014 (3388 cases). A seasonal increase is usually observed from the second and into the third quarter of the year and activity increased as expected in May and June 2015. The 1744 laboratory confirmed cases reported in 2015 to the end of June (provisional data) was lower than the same period in 2012 (2399 cases) and 2013 (2745 cases) but higher than the same period last year (1412 cases). Overall pertussis activity in England persists at raised levels compared to the years preceding the outbreak in 2012 (see figure).

**Provisional number of laboratory confirmed cases of pertussis in England by age group and month: January 2011 to June 2015**




The pertussis vaccination in pregnancy programme was introduced in October 2012 [2,3] in response to a national outbreak and is offered to women ideally between 28-32 weeks pregnancy to protect infants in their first few weeks of life. Confirmed pertussis cases in infants <6 months of age have remained low despite the continued high activity in other age groups (see table 1).

**Table 1. Provisional number of laboratory confirmed cases in England, 2008-2015 by age group: January to June**

| Year | Month | <3 months | 3-5 months | 6-11 months | 1-4 years | 5-9 years | 10-14 years | 15+ years | All ages |
|---|---|---|---|---|---|---|---|---|---|
| 2008 | Jan - June | 80 | 15 | 4 | 12 | 11 | 72 | 217 | 411 |
| 2009 | Jan - June | 59 | 15 | 1 | 10 | 9 | 46 | 192 | 332 |
| 2010 | Jan - June | 27 | 4 | 1 | 3 | 6 | 24 | 100 | 165 |
| 2011 | Jan - June | 65 | 11 | 3 | 5 | 7 | 37 | 170 | 298 |
| 2012 | Jan - June | 188 | 27 | 7 | 16 | 49 | 314 | 1798 | 2399 |
| 2013 | Jan - June | 51 | 19 | 4 | 28 | 48 | 294 | 2301 | 2745 |
| 2014 | Jan - June | 38 | 6 | 5 | 14 | 61 | 168 | 1120 | 1412 |
| 2015 | Jan - June | 47 | 11 | 7 | 31 | 87 | 220 | 1341 | 1744 |

The immunisation programme for pregnant women continues to be important, particularly in light of the ongoing raised levels of pertussis in those from one year of age and recent infant deaths. There have been recent key publications on the high effectiveness and safety of the pertussis immunisation in pregnancy programme [4,5,6]. Together with coverage and epidemiological data, these findings informed the Joint Committee on Vaccination and Immunisation's (JCVI) decision in July 2014 that the pregnancy programme should continue for at least a further five years [7].

The latest pertussis vaccine coverage estimates [8] in pregnant woman in England indicate that coverage decreased from 59.3% in January to 55.2% in May 2015. This decline followed a similar seasonal pattern to that observed in 2013 and 2014 with coverage dropping in the first quarter and starting to plateau at the end of spring, although the decline has been less pronounced in 2015, with coverage at 55.2% in May 2015 compared to 50% and 53.6% in the same month in 2013 and 2014 respectively.

## Confirmed cases in 2015

In infants under three months of age low numbers of cases have been sustained since December 2012. Pertussis activity in all infants <1 year of age was low in the first six months of 2015, with 65 cases, but higher than the equivalent period in 2014 (49 cases) (see table 2); disease incidence, as expected, continued to be highest in this age group but case reports are now in line with those seen before the 2012 peak, when there were 222 cases in the first 6 months of the year. There have been two deaths in infants with pertussis confirmed this year.

The numbers of laboratory confirmed cases in those aged one year and older, however, continued to be higher than those reported before the 2012 outbreak. Pertussis cases in those aged 10 years and older were lower in the first six months of 2015 than the totals confirmed in 2012. In those aged 1-9 years however cases to 30 June 2015 (31 aged 1-4 years and 87 aged 5-9 years) are nearly double those confirmed to the same point in 2012 (16 cases aged 1-4 years and 49 cases aged 5-9 years), although a similar number were reported in those aged 1-4 years in 2013 (28 cases) Overall confirmed pertussis cases were higher to end June 2015 than in the comparable period in 2014.

## Overall trends at end-June 2015

The greatest reduction in disease since the peak in 2012 has been in infants aged under six months. Overall pertussis activity was relatively high in the first six months of 2015 in all Regions of the country (see table 2), in particular in children aged 1-9 years. Twelve deaths have been reported in young babies with confirmed pertussis who were born after the introduction of the pregnancy programme on 1 October 2012, as at end June 2015. Eleven of these 12 babies were born to mothers who had not been vaccinated against pertussis, all of the 12 babies were too young to be fully protected by vaccination themselves and only one had received their first dose of pertussis-containing vaccine.

**Table 2. Provisional number of laboratory confirmed cases in England, 2008-2015 by PHE Region and PHE Centre: January to June**

| PHE Region and Centre | 2008 Jan-June | 2009 Jan-June | 2010 Jan-June | 2011 Jan-June | 2012 Jan-June | 2013 Jan-June | 2014 Jan-June | 2015 Jan-June |
|---|---|---|---|---|---|---|---|---|
| **London** | **46** | **46** | **16** | **33** | **188** | **295** | **227** | **281** |
| **Midlands and East of England** | **107** | **90** | **22** | **98** | **647** | **850** | **377** | **480** |
| Anglia and Essex | 31 | 30 | 9 | 24 | 151 | 230 | 98 | 94 |
| East Midlands | 33 | 31 | 5 | 37 | 263 | 320 | 109 | 139 |
| South Midlands and Herts. | 13 | 7 | 4 | 17 | 93 | 79 | 56 | 69 |
| West Midlands | 30 | 22 | 4 | 20 | 140 | 221 | 114 | 178 |
| **North of England** | **89** | **60** | **65** | **84** | **554** | **675** | **339** | **433** |
| Cheshire and Merseyside | 22 | 11 | 5 | 7 | 43 | 92 | 42 | 62 |
| Cumbria and Lancashire | 13 | 19 | 14 | 18 | 37 | 65 | 22 | 54 |
| Greater Manchester | 8 | 4 | 4 | 7 | 78 | 57 | 31 | 53 |
| North East | 22 | 6 | 21 | 28 | 112 | 161 | 39 | 76 |
| Yorkshire and Humber | 24 | 20 | 21 | 24 | 284 | 300 | 205 | 188 |
| **South of England** | **169** | **136** | **62** | **83** | **1010** | **925** | **469** | **550** |
| Avon, Glous. and Wilts. | 50 | 36 | 11 | 24 | 367 | 276 | 63 | 123 |
| Devon, Cornwall, Somerset | 21 | 14 | 20 | 12 | 110 | 142 | 58 | 81 |
| Sussex, Surrey and Kent | 34 | 36 | 11 | 27 | 280 | 339 | 191 | 208 |
| Thames Valley | 45 | 30 | 15 | 14 | 101 | 73 | 73 | 38 |
| Wessex | 19 | 20 | 5 | 6 | 152 | 95 | 84 | 100 |
| **Total** | **411** | **332** | **165** | **298** | **2399** | **2745** | **1412** | **1744** |

## References


1. Confirmed pertussis cases in England and Wales: update to end-February 2015, *HPR* **9**(17): news, 15 May 2015.

2. "Pregnant women to be offered whooping cough vaccination", 28 September 2012. Department of Health website.

3. "HPA welcomes introduction of whooping cough vaccination for pregnant women as outbreak continues", HPA press release, 28 September 2012.

4. Amirthalingam G, Andrews N, Campbell H, *et al* (2014). Effectiveness of maternal pertussis vaccination in England: an observational study, *Lancet*.

5. Donegan K, King B, Bryan P (2014). Safety of pertussis vaccination in pregnant women in the UK: observational study, *BMJ*.

6. Dabrera G, Amirthalingam G, Andrews N *et al* (2014). A case-control study to estimate the effectiveness of maternal pertussis vaccination in protecting newborn Infants in England and Wales, 2012–2013, *Clinical Infectious Diseases* (online), 19 October.

7. Joint committee of Vaccination and Immunisation minutes.

8. Pertussis Vaccination Programme for Pregnant Women: vaccine coverage estimates in England (PHE statistics).

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## Infection Reports

### Vaccine preventable infections

- **Laboratory confirmed cases of measles, mumps and rubella, England: April to June 2015**
- **Laboratory reports of hepatitis A and C (England and Wales): January to March 2015**
- **Laboratory reports of *Haemophilus influenzae* by age group and serotype (England and Wales): April to June 2015**
- **Acute hepatitis B (England): annual report for 2014**

### Vaccine coverage report

- **National rotavirus immunisation programme: preliminary data for England, February 2014 to July 2015**

## Infection reports

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### Vaccine preventable infections

# Laboratory confirmed cases of measles, mumps and rubella, England: April to June 2015

Measles, mumps and rubella are notifiable diseases and healthcare professionals suspecting a case are legally required to inform the authorities. Oral fluid testing is offered to all notified cases to confirm the diagnosis. This is part of the enhanced surveillance for these vaccine preventable diseases. Recent infection is confirmed by measuring the presence of IgM antibodies or detecting viral RNA (by PCR) in the samples.

Data presented here are for the second quarter of 2015 (ie April to June). Cases include those confirmed by oral fluid testing (IgM antibody tests and/or PCR) at the Virus Reference Department, Colindale, and national routine laboratory reports (mumps infections only) (table 1). Analyses are by date of onset and regional breakdown figures relate to Government Office Regions.

Quarterly figures from 2013 for cases confirmed by oral fluid antibody detection only and annual total numbers of confirmed cases by region and age are available from:

https://www.gov.uk/government/publications/measles-confirmed-cases

https://www.gov.uk/government/publications/mumps-confirmed-cases

https://www.gov.uk/government/publications/rubella-confirmed-cases

**Table 1. Total laboratory confirmed cases of measles, mumps and rubella, and oral fluid IgM antibody tests in notified cases: weeks 14-26/2015**

| Notified and investigated cases | | | | | | Confirmed cases | | |
|---|---|---|---|---|---|---|---|---|
| Infecting virus | Cases reported to Health Protection Teams in England* | Oral fluid testing | | | | | Other samples | **Total** |
| | | Number Tested | % of reported cases tested | *Total Positive* | *Recently Vaccinated* | Confirmed infections | | |
| **Measles** | 477 | 318 | 67% | *32* | *15* | 17 | 16 | **33** |
| **Mumps** | 1769 | 1083 | 61% | *191* | *0* | 191 | 60 | **251** |
| **Rubella** | 159 | 110 | 69% | *0* | *0* | 0 | 0 | **0** |

*This represents the number of infections reported as possible cases and investigated by individual PHE centres in England

## Measles

Thirty-three measles infections were confirmed in the National Reference Laboratory in England with onset dates between April and June 2015, compared to only 20 cases in the first quarter of 2015 [1].

The measles cases in the period were reported from four regions in England with London identifying half the new notifications. No cases so far this year have been reported from Scotland, Wales or Northern Ireland.

All of the new infections were associated with importations. Two clusters of cases in London (14 cases) and South West (nine cases) were linked to Somalia (genotype B3) and Sri Lanka (genotype B3), respectively. Six sporadic cases were imported from Afghanistan (B3), Germany (not typed), India (D8), Indonesia (not typed), Pakistan (B3) and Poland (D8). Measles virus RNA was detected and sequences genotyped from 23 of the 33 cases this quarter.

The majority (23/33, 70%) of the measles cases this quarter were in children and adolescents: six (18%) under-1s, six (18%) aged 1-4 years; six (18%) aged 5-9 years, four (12%) aged 10-14 years; and one (3%) in the 15-18 years age range. The remaining 10 cases (30%) were adults aged 20 to 38 years. Three of the remaining cases this quarter reported receiving at least one dose of a measles-containing vaccine; the remaining cases were unvaccinated.

## Mumps

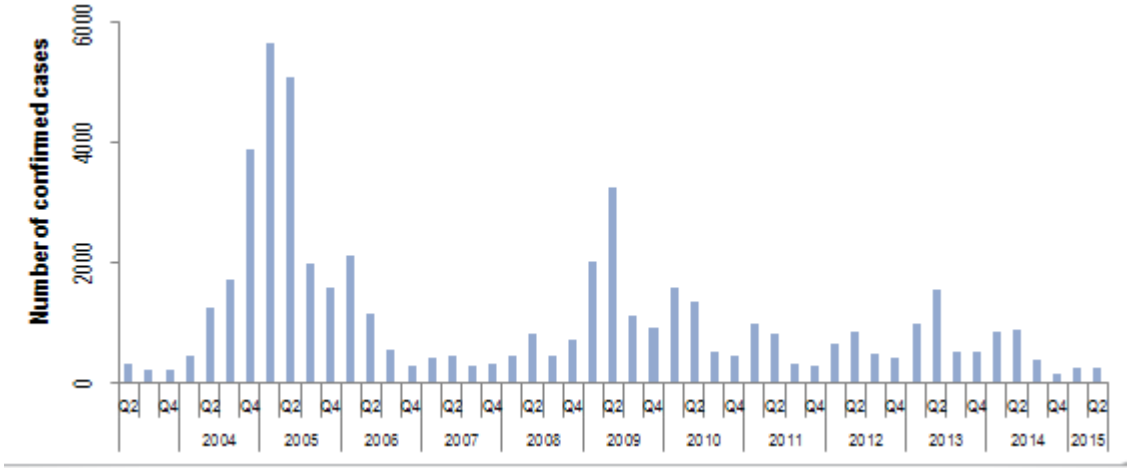
There were 251 laboratory confirmed cases of mumps in England with an onset date in the second quarter of 2015 compared to 227 in the previous quarter (see figure) [1]. Additionally, two new mumps infections were confirmed in oral fluid samples from Wales.

Cases continue to be identified predominantly in young adults between 20 and 33 years of age (133/251 57%, table 2). Over 40% of all cases this quarter have reported receiving at least one dose of MMR vaccination in childhood, suggesting that some waning immunity may be contributing to transmission. Mumps cases were reported in all regions of England although around a third of all cases were reported in the North East (table 2).

**Table 2. Laboratory confirmed cases of mumps by age group and region, England: weeks 14-26/2015**

| Region | <1 | 1-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25+ | Total |
|---|---|---|---|---|---|---|---|---|
| North East | 0 | 0 | 1 | 2 | 11 | 32 | 36 | **82** |
| North West | 0 | 1 | 0 | 5 | 5 | 6 | 13 | **30** |
| Yorkshire & Humber | 0 | 1 | 4 | 3 | 9 | 4 | 12 | **33** |
| East Midlands | 0 | 0 | 0 | 0 | 0 | 5 | 1 | **6** |
| West Midlands | 0 | 1 | 1 | 2 | 3 | 1 | 3 | **11** |
| East of England | 0 | 2 | 1 | 0 | 0 | 1 | 11 | **15** |
| London | 0 | 1 | 1 | 1 | 0 | 6 | 23 | **32** |
| South East | 0 | 2 | 0 | 0 | 3 | 5 | 15 | **25** |
| South West | 0 | 1 | 1 | 2 | 5 | 3 | 5 | **17** |
| **Total** | **0** | **9** | **9** | **15** | **36** | **63** | **119** | **251** |

**Laboratory confirmed cases of mumps by quarter, England, 2003-2015**




## Rubella

No new cases of rubella were confirmed the period April-June 2105, compared to four in the previous three months [1].

## References


1. PHE (May 2015). "Laboratory confirmed cases of measles, mumps and rubella, England: January to March 2015", *HPR* **9**(18): immunisation.

## Infection reports

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**Vaccine preventable infections**

# Laboratory reports of hepatitis A and C (England and Wales): January to March 2015

## Laboratory reports of hepatitis A in England and Wales (January-March 2015)

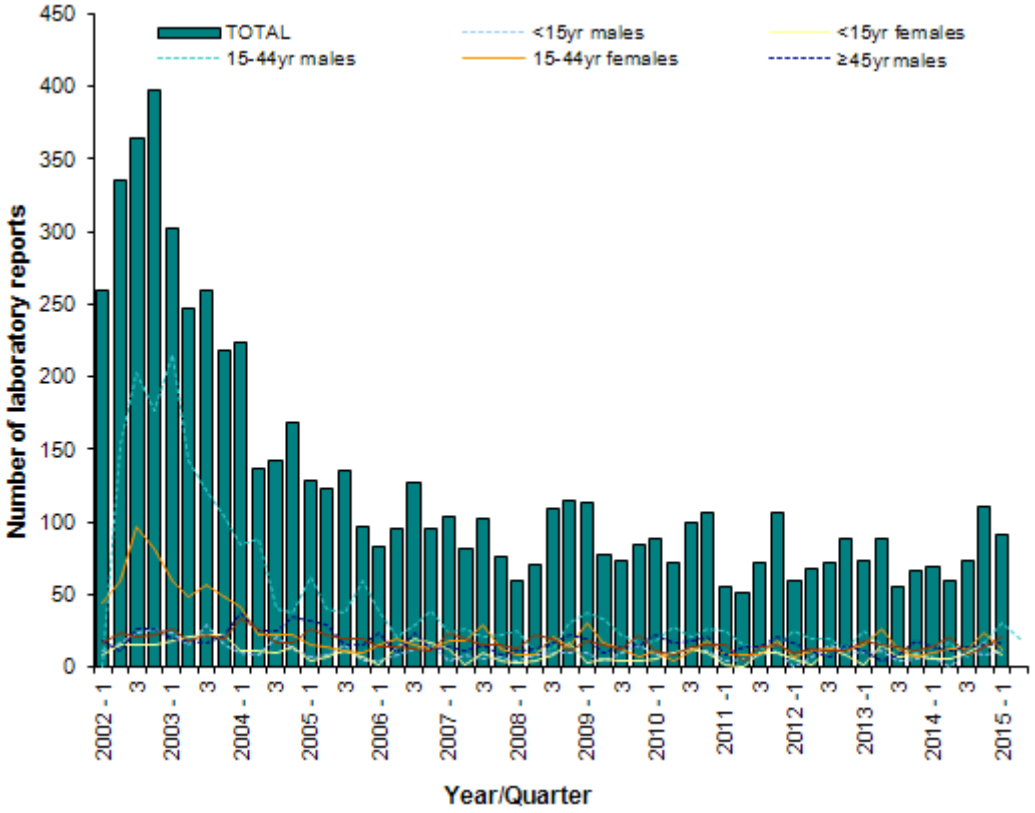
There were a total of 92 laboratory reports of hepatitis A reported to Public Health England (PHE) during the first quarter of 2015 (January-March 2015). This was a 16.4% decrease on the number of reports during the fourth quarter of 2015 (n=110) and a 33.3% increase on the same quarter in 2014 (n=69).

Age-group and sex were well reported (>98% complete). Thirty eight reports (41.8%) were among the over-44 years old age group, a further 33 reports (36.3%) were among those aged 15-44 years, and 20 reports (22.0%) were from those aged under 15 years.
Males accounted for 52.7% of all reports. A similar proportion of males and females were reported in the less-than-15-years of age group (55% males) and those aged 15-44 (60.6% males). A higher proportion of females (55.3% females) were reported in the over-45 years of age group.

**Laboratory reports of hepatitis A in England and Wales, January-March 2015**

| Age group | Male | Female | Unknown | Total |
|---|---|---|---|---|
| <1 year | 0 | 0 | 0 | **0** |
| 1-4 years | 5 | 2 | 0 | **7** |
| 5-9 years | 4 | 5 | 0 | **9** |
| 10-14 years | 2 | 2 | 0 | **4** |
| 15-24 years | 6 | 2 | 0 | **8** |
| 25-34 years | 9 | 8 | 0 | **17** |
| 35-44 years | 5 | 3 | 0 | **8** |
| 45-54 years | 7 | 10 | 0 | **17** |
| 55-64 years | 3 | 7 | 0 | **10** |
| >65 years | 7 | 4 | 0 | **11** |
| Unknown | 0 | 0 | 1 | **1** |
| **Total** | **48** | **43** | **1** | **92** |

**Figure 1. Laboratory reports of hepatitis A by age and sex (England and Wales): Jan. 2002 to March 2015**

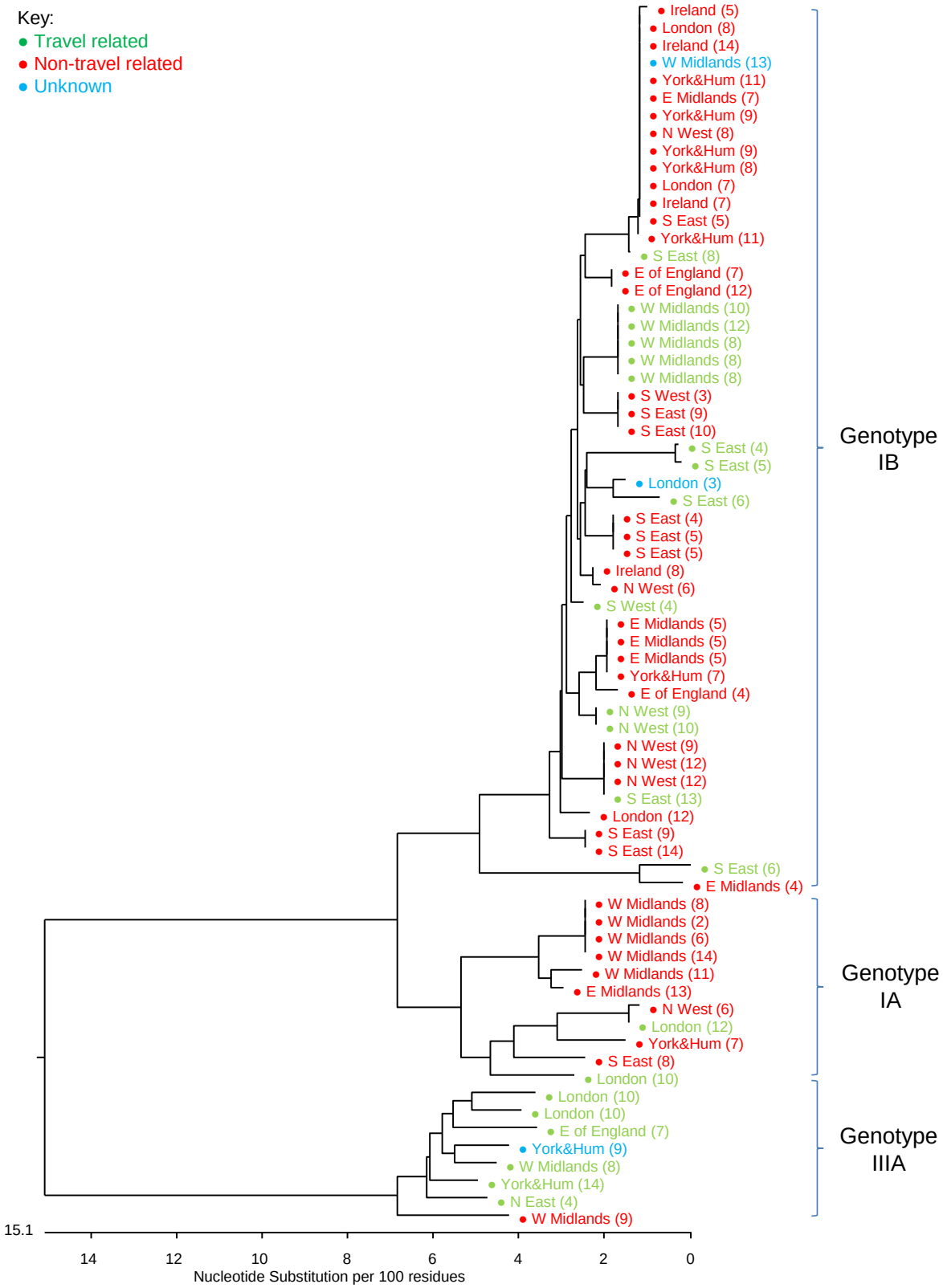



**Reference laboratory confirmation and phylogeny of hepatitis A infection**

Of the 92 patients notified as having acute HAV infection during the first quarter of 2015, 60 had samples forwarded to the Virus Reference Department for confirmation. Ten of the patients were not confirmed to have acute HAV infection. The remaining 50 patients were confirmed to have acute HAV infection. In addition 19 patients were confirmed to have acute HAV infection that had not been reported through the laboratory reporting system although they were recorded in HPzone.

A total of 66 patients could be genotyped over this period; 11 were genotype IA (16.7%), 47 were genotype IB (71.2%) and eight were genotype IIIA (12.1%). Of these samples 22 were associated with travel (33.3%), 41 had no travel history (62.1%) and three had no information (4.5%). This information is presented as a phylogenetic tree. Each sequence is represented by a dot with the patient region and the week of sampling in brackets.

**Figure 2. Phylogenetic tree of genotype IA, IB, and IIIA sequences January to March 2015 (n=70, including 4 sequence from Northern Ireland)**



## Laboratory reports of hepatitis C in England and Wales (January-March 2015)

There were a total of 2,689 laboratory reports of hepatitis C reported to the PHE between January and March 2015. There was an 8.0% decrease in the of number of reported cases compared to the fourth quarter of 2014 (n=2,922), and a 3.0% decrease on the same quarter in 2014 (n=2,782).

Age-group and sex were well reported (>98% complete). Where known males accounted for 70.3% of reports (1,868//2,656), which is consistent with previous quarters. Adults aged 25-44 years accounted for 51.4% of the total number of hepatitis C reports.

**Laboratory reports of hepatitis C in England and Wales, January-March 2015**

| Age group | Male | Female | Unknown | Total |
|---|---|---|---|---|
| <1 year | 5 | 5 | 0 | **10** |
| 1-4 years | 1 | 0 | 1 | **2** |
| 5-9 years | 5 | 2 | 0 | **7** |
| 10-14 years | 0 | 1 | 1 | **2** |
| 15-24 years | 70 | 39 | 5 | **114** |
| 25-34 years | 379 | 215 | 5 | **599** |
| 35-44 years | 574 | 195 | 7 | **776** |
| 45-54 years | 507 | 171 | 3 | **681** |
| 55-64 years | 246 | 91 | 2 | **339** |
| >65 years | 77 | 68 | 0 | **145** |
| Unknown | 4 | 1 | 9 | **14** |
| **Total** | **1,868** | **788** | **33** | **2,689** |

## Infection reports

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**Vaccine preventable infections**

# Laboratory reports of *Haemophilus influenzae* by age group and serotype (England and Wales): April to June 2015

In the second quarter of 2015 (April to June) there was a total of 191 laboratory confirmed cases of invasive *Haemophilus influenzae* (Hi). This represents a 10% increase in the number of cases compared to the second quarter of 2014 (n=175). There were 240 cases in the first quarter of 2015.

Of the samples which underwent serotyping 83%, n=159), 90% (n=143) were non-capsulated *Haemophilus influenzae* (ncHi), a further 8% (n=12) were serotype a, e, or f, and 3% (n=4) were serotype b (Hib). Hib cases have remained relatively stable with 6 cases in 2014 and 4 cases in Q2 2015. Total ncHi cases increased by 19% from 120 to 143 in Q2 2014 and Q2 2015 respectively, accounting for 83% and 90% of cases in each period. Cases of a, e, or f Hi fell from 18 in Q2 2014 to 12 in Q2 2015 accounting for 13% and 8% of typed cases respectively.

Age-group was well reported (see table). Of the 191 laboratory confirmed cases during the second quarter of 2015: 87% were aged 15 years and over; 7% were under one year of age, 4% were 1-4 years old, and 2% were among 5-14 year olds. Similarly, in the second quarter of 2014: 83% were aged 15 years and over; 7% were under 1 year of age, 6% were 1-4 year olds and 3% were among 5-14 year olds. There were 19 ncHi cases among children aged under 15 years old during this period compared to 22 in the second quarter of 2014. Among those aged 15 years and over there was a 27% increase in ncHi case from 98 in Q2 2014 to 124 in Q2 2015.

During the second quarter of 2015, 91% of Hi cases in children under 15 years were ncHi (n=19/21). There were no cases of Hib in this age-group during this quarter. There was one cases of Hib during the second quarter of 2014; an infant, who was too young to have received the first dose of the DTaP/IPV/Hib vaccine and who made a full recovery. The most recent death in a child aged under 16 years attributed to invasive Hib disease was in 2011.

**Age distribution of laboratory-confirmed cases of *Haemophilus influenzae* by serotype England and Wales, second quarter 2015 (*and 2014*)**

| Serotype | Age-group | | | | | Total, second quarter 2015 *(2014)* |
|---|---|---|---|---|---|---|
| | **<1y** | **1-4y** | **5-14y** | **15+** | **nk** | |
| b | *– (1)* | *– (–)* | *– (–)* | *4 (5)* | *– (–)* | *4 (6)* |
| nc | *11 (9)* | *6 (7)* | *2 (6)* | 124 *(98)* | *– (–)* | **143** *(120)* |
| a,e,f | *– (1)* | *2 (–)* | *– (–)* | 10 *(17)* | *– (–)* | **12** *(18)* |
| not typed | 2 *(1)* | *– (4)* | *2 (–)* | 27 *(26)* | *1 (–)* | **32** *(31)* |
| **Total** | ***13 (12)*** | **8** *(11)* | **4** *(6)* | **165** *(146)* | **1** *(–)* | **191** *(175)* |

## Infection reports

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**Vaccine preventable infections**

# Acute hepatitis B (England): annual report for 2014

### Introduction

Hepatitis B is a blood borne infection of the liver caused by the hepatitis B virus (HBV). The virus can provoke an acute illness characterised by nausea, malaise, abdominal pain, and jaundice but can also produce a chronic infection that is associated with an increased risk for chronic liver disease and hepatocellular carcinoma. Transmission is by parenteral exposure to infected blood and body fluids, most often through sexual contact, blood to-blood contact and perinatal transmission from mother to child. HBV infection can be prevented by vaccination and in the UK immunisation is used for individuals at high risk of exposure to the virus e.g. people who inject drugs (PWID), healthcare workers. Immediate post-exposure vaccination is used to prevent infection, especially in babies born to infected mothers or following needle-stick injuries [1].

Surveillance of acute hepatitis B is essential to target prevention and control activities such as the selective immunisation programme. Public Health England (formerly the Health Protection Agency, HPA) implemented national surveillance standards [2] for hepatitis B in 2007 which provided the framework for more consistent reporting of cases from PHE Centres. Available data on confirmed acute infections reported from laboratories can then be used to augment the epidemiological data collected from the local centres. The first report was published in 2008, and this report provides an update and presents acute hepatitis B surveillance data for 2014.

### Methods

The surveillance definition for acute hepatitis B [2] is "HBsAg positive *and* anti-HBc IgM positive *and* abnormal liver function tests with a pattern consistent with acute viral hepatitis."

As information on liver function is usually not available to PHE, for the purpose of this analysis:

- those cases classified as acute hepatitis by the local PHE Centre or the laboratory and/or with a documented positive anti-HBc IgM were classified as acute infections;
- those classified as acute infections by the PHE Centre but without anti-HBc IgM results, or not classified but with a positive anti-HBc IgM were assumed to be probable acute cases;
- those classified as acute by the PHE Centre but with contradictory evidence, e.g. positive hepatitis serology results dated before July 2012, were reclassified as chronic infections;
- cases classified as chronic infections, or those not classified where anti-HBc IgM was negative or equivocal, were assumed to be chronic infections; and
- those cases that remained unclassified and without anti-HBc IgM results were excluded from further analysis.

The PHE Centre cases with a date entered from 1 January 2014 to 31 December 2014 were extracted from HP Zone and matched to a laboratory dataset using Microsoft Access and algorithms comparing combinations of the following variables: Surname, First name, soundex, date of birth, sex, clinic number and NHS number. The laboratory database contained all confirmed hepatitis B infections reported to

PHE by laboratories in England and Wales (LabBase/SGSS).The LabBase/SGSS data was used to determine final status of any matching cases reported from the PHE Centre. A final reconciled dataset included cases classified as acute or probable acute and reported from the PHE Centre and/or from laboratories around the country to LabBase/SGSS. After follow up with the clinician and/or the patient, PHE Centre staff assigned a probable route of exposure and collected information on other possible exposure routes. For the analysis, where the probable route of exposure had not been assigned due to more than one exposure, the most likely route was assigned hierarchically (injecting drug use, followed by homosexual exposure, then heterosexual exposure, etc).

**Results**

The PHE Centres reported 4,774 hepatitis B cases from 1 January to 31 December 2014 to the PHE Immunisation, Hepatitis and Blood Safety Department. The matching and classification exercise resulted in 370 of these being confirmed as acute and 19 re-classified as probable acute cases with the remainder classified as chronic or excluded. After deduplication, nine cases reported as acute from the PHE Centres were excluded or reclassified because they had no anti-HBc IgM result, or were matched to a case classified as chronic in the LabBase/SGSS data.

A total of 12,297 confirmed hepatitis B infections were reported from laboratories to LabBase/SGSS in the same period, 298 (2.4%) of which were classified as acute cases, 41 (0.3%) as probable acute cases, 9,468 (77%) were classified as chronic and 2,490 (20.2%) remained unclassified.

After the two databases were linked and reconciled, a total of 488 acute or probable acute cases of hepatitis B were reported for England in 2014. This gives an annual incidence of 0.91 per 100,000 population, higher than the incidence of 0.77 per 100,000 reported for 2013.

London is still the region with the highest incidence (1.52 per 100,000) and this has increased by almost a quarter from the previous year (1.22 per 100,000). A similar increase was reported from North East region (from 0.65 to 0.84 per 100,000 in 2013 and 2014 respectively). The East Midlands region now has the lowest incidence (0.41 per 100,000, an increase from 0.35 in 2013). The highest increase in incidence accounted for South West, from 0.63 per 100,000 in 2013 to 1.08 in 2014. In the remaining regions incidence was similar or declined from last year (table 1). There continues to be regional variation in the contribution of the different sources to the overall total, although the overlap between sources has continued to improve suggesting that completeness of reporting by laboratories and local clinicians has also improved.

As in previous years, where known the majority of cases were in men (71.7%) who had an overall incidence of 1.26 per 100,000 – an increase from 1.12 per 100,000 in 2013 compared to a continuing decline from the previous year [3]. The corresponding incidence in women in 2014 was 0.48 per 100,000 - also a slight increase from 0.42 per 100,000 in the previous year. Men aged 45-54 years had the highest incidence of acute hepatitis B at 2.46 per 100,000 but all age groups except males aged less than 15 and 15-24 had a slightly higher incidence than in 2013 .The incidence in children remains very low (table 2).

Only 108 (22%) of the total acute or probable acute hepatitis B cases had their ethnicity recorded, a higher proportion than the previous year. Sixty seven percent of the cases were white, followed by Black or Black British (19%) and Asian or Asian British (14%), the latter lower than in 2013.

Of the total 488 acute and probable acute cases of hepatitis B, 245 (50.2%) had associated exposure information recorded (with the most probable route of acquisition assigned by the PHE Centre.
A lower proportion (47.3%, 196/414) had exposure information available in 2013.

As in previous years where known the commonest reported risk attributed was heterosexual exposure, implicated as the probable route of exposure in 134 (54.7%), compared to 57% in this category in 2013 (n=141). Cases attributed to sex between men were reported in 43 (17.6%); a similar proportion to the 40 (16%) reported in 2013.

Twelve cases (4.9%) with known exposure were attributed to PWID (an increase from 4.4% in the previous year), where one had been also assigned to homosexual and one to heterosexual exposure as the most likely risk by the PHE centre.

Where known, 14 (5.7%) cases had health care related exposures (four of which reported recent travel abroad), including surgery, dental treatment dialysis and other hospital exposure – a decrease from the 18 cases assigned to medical risk factors last year. Skin piercing, tattooing and acupuncture combined were listed as probable exposures for five cases (2%, 5/245). Eleven cases (4.5%, 11/245) had other unspecified risk related to travel abroad. A range of other risks were reported for the remaining 26 cases. Of all cases with a risk exposure reported, 68 (27.8%, 68/245) also had information stating recent travel abroad.

**Discussion**

In 2014, reporting of acute cases of hepatitis B from PHE Centres has continued to exceed the number reported from laboratories but the proportion of cases reported by both PHE Centres and laboratory systems is high at 61% (296/489), compared to 71% (294/414) of cases reported in 2013. This decrease in overlap may be due to the introduction of SGSS a new laboratory reporting system to replace LabBase that could on its initial stages of implementation compromise the quality of identifiers used for matching the data from both sources.

There was nonetheless an overall improved matching over the years that could be explained given the introduction of statutory laboratory reporting in October 2010 and the continued decline in the proportion of cases of unknown status reported from laboratories. Combining data from both sources does minimise under ascertainment and improve the completeness of associated data for analysis. Interpretation of trends should be made with caution, but based on this combined data, the incidence of acute hepatitis B is low. Given the improved quality and completeness of data provided in 2013/2014, it is likely that there has been a continued gradual decline in incidence since 2008 which has become more apparent in the more recent years.

It is known that anti-HBc IgM, normally a marker of acute infection, may be detected during flares in chronic infections. To minimise misclassification, matching to historical laboratory reports can identify those chronic infections detected previously. However, there is still likely to be some misclassification of

chronic cases as acute infections in both datasets. Given the large number of chronic cases diagnosed each year, even a small proportion of cases misclassified as acute can substantially increase the estimated incidence of acute hepatitis B, and confuse the attribution of exposures. Further testing using anti-HBc avidity is now being offered at PHE Colindale, to enable better distinction between acute and chronic infection. Local laboratories can send samples from IgM positive cases to the national reference laboratory where both genotyping and avidity testing will be undertaken free of charge [5].

Risk factor data were available in 50.2% of cases. The interpretation of these data is difficult because in many instances, more than one possible exposure is listed and a probable exposure had not been assigned by the local unit. Despite this, the data suggest that the number of cases in PWID has remained low in 2014. The overall low incidence in this group is supported by the 2012 unlinked anonymous survey among PWID in contact with drug services which showed that anti-HBc prevalence has remained low and self-reported uptake of hepatitis B vaccine has remained high since 2009, particularly in recent initiates [6].

The incidence of acute hepatitis B continues to remain higher in males than females. This excess of male cases is partly explained by cases in men who have sex with men (MSM); the number of cases with this exposure reported has remained high again this year, following a large increase in 2010. Such cases are more likely to be diagnosed in GUM clinics, reinforcing the important role of GUM clinics in providing opportunistic hepatitis B immunisation to MSM and individuals with multiple sexual partners. In 2010 the HPA worked with the British Association of Sexual Health and HIV (BASHH) to introduce a standard form for GUM clinics to report acute hepatitis to their local health protection team [7]. This may have helped to increase the reporting of cases diagnosed in this group. This year, a small proportion of cases (5.7%) were attributed to medical exposure. It is still likely that many of these attributions are incorrect, as further investigation may have been undertaken – for example by NHS Blood and Transplant and excluded transmission by this route. It is therefore recommended that cases with these exposures assigned are checked prior to reporting.

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**Table 1. Acute or probable acute hepatitis B cases by region and source of report, 2014 (incidence 2008-2014 – mid 2013 population ONS [4])**

| REGION | HPU | Lab/y | BOTH | TOTAL | **Incidence of reported acute hepatitis B per 100,000 in 2014** | Incidence of reported acute hepatitis B per 100,000 in 2013 | Incidence of reported acute hepatitis B per 100,000 in 2012 | Incidence of reported acute hepatitis B per 100,000 in 2011 | Incidence of reported acute hepatitis B per 100,000 in 2010 | Incidence of reported acute hepatitis B per 100,000 in 2009 | Incidence of reported acute hepatitis B per 100,000 in 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EAST MIDL'DS | 3 | 1 | 15 | 19 | **0.41** | **0.35** | 0.77 | 0.76 | 0.74 | 0.85 | 1.3 |
| EAST OF ENGLAND | 22 | 6 | 25 | 53 | **0.89** | **0.81** | 0.89 | 1.08 | 0.78 | 0.85 | 0.97 |
| LONDON | 23 | 16 | 89 | 128 | **1.52** | **1.22** | 2.02 | 2.06 | 1.82 | 1.8 | 1.83 |
| NORTH EAST | 4 | 6 | 12 | 22 | **0.84** | **0.65** | 0.46 | 0.54 | 0.54 | 1.28 | 0.7 |
| NORTH WEST | 8 | 23 | 27 | 58 | **0.82** | **0.87** | 0.61 | 0.99 | 0.96 | 1.64 | 1.79 |
| SOUTH EAST | 12 | 12 | 38 | 62 | **0.71** | **0.67** | 0.84 | 0.96 | 0.84 | 1.03 | 1 |
| SOUTH WEST | 11 | 24 | 23 | 58 | **1.08** | **0.63** | 1.40 | 1.16 | 1.05 | 0.78 | 0.85 |
| WEST MIDL'DS | 18 | 7 | 19 | 44 | **0.78** | **0.55** | 0.98 | 0.90 | 0.66 | 0.74 | 0.76 |
| YORKS and HUMBER | 2 | 4 | 38 | 44 | **0.82** | **0.82** | 0.83 | 1.06 | 0.97 | 1.05 | 1.18 |
| **National** | **103** | **99** | **286** | **488** | **0.91** | **0.77** | **1.04** | **1.13** | **0.99** | **1.15** | **1.21** |

**Table 2. Age and sex breakdown of acute or probable acute hepatitis B reports, 2014 (mid-2013 population ONS) [4].**

| | **Female** | | **Male** | | **NK** | | **TOTAL** | |
|---|---|---|---|---|---|---|---|---|
| Age group | Number of cases | Incidence of reported acute hepatitis B per 100,000 population | Number of cases | **Incidence of reported acute hepatitis B per 100,000 population** | Number of cases | Incidence of reported acute hepatitis B per 100,000 population | Number of cases | Incidence of reported acute hepatitis B per 100,000 population |
| Less than15 | 7 | 0.15 | 0 | - | 2 | - | 9 | 0.09 |
| 15-24 | 42 | 1.25 | 34 | 0.97 | 3 | - | 79 | 1.15 |
| 25-34 | 27 | 0.73 | 71 | 1.93 | 3 | - | 101 | 1.37 |
| 35-44 | 25 | 0.69 | 61 | 1.71 | 1 | - | 87 | 1.22 |
| 45-54 | 13 | 0.34 | 92 | 2.46 | 5 | - | 110 | 1.46 |
| 55-64 | 10 | 0.33 | 39 | 1.31 | 4 | - | 53 | 0.88 |
| GE65 | 6 | 0.12 | 35 | 0.84 | 0 | - | 41 | 0.44 |
| NK | 2 | 0.01 | 2 | 0.01 | 4 | - | 8 | 0.01 |
| **Total** | **132** | **0.48** | **334** | **1.26** | **22** | **-** | **488** | **0.91** |

## Infection reports

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**Vaccine coverage report**

# National rotavirus immunisation programme: preliminary data for England, February 2014 to July 2015

*This report provides an update on (i) monthly vaccine coverage data for children routinely offered rotavirus vaccine and (ii) recent numbers of laboratory reports of rotavirus infection in England. The high vaccine coverage levels rapidly achieved for the first cohorts of children routinely offered this vaccine in England continue to be maintained; on average, 93.0% of the children evaluated at 25 weeks of age between February 2014 and July 2015 had received the first dose and 88.1% had completed the two dose course.*

*For the second consecutive season since introduction of the vaccine there was a substantial reduction in laboratory reports of rotavirus, with a 63% reduction compared to the average in the preceding ten seasons. The continued high coverage and rapid reduction in reported rotavirus infections suggests that the continued reduction in the burden of rotavirus is achievable.*

## Background

The national rotavirus vaccination programme started in July 2013 following the advice and recommendation by the Joint Committee on Vaccination and Immunisation (JCVI) [1]. Rotavirus is a very common and potentially serious infection of the large bowel, mainly affecting young babies. Nearly every child will have at least one episode of rotavirus gastroenteritis by five years of age. People of any age can be affected but the illness is more severe in young infants. Symptoms of gastroenteritis include vomiting, diarrhoea, stomach cramps and mild fever, which usually last for three to eight days. Some children, however, may develop severe gastroenteritis and become dehydrated, and require hospitalisation for rehydration.

The rotavirus immunisation programme is expected to prevent a significant number of young infants from developing this infection. It may also provide some additional protection to the wider population through herd immunity. The aim of the rotavirus immunisation programme is to provide two doses of Rotarix® vaccine to infants from six weeks of age and before 24 weeks of age. The first dose of Rotarix® vaccine is offered at two months (approximately eight weeks) of age and the second dose at least four weeks after the first dose. The Rotavirus Green Book chapter summarises the history and epidemiology of the disease and provides detailed recommendations on supply, storage and use of the vaccine, as well as guidance on contraindications, precautions and adverse reactions [2].

An annual evaluation of rotavirus coverage for the period February 2014 to March 2015 was published in July 2015 [3] and indicated that high coverage was rapidly achieved and maintained in the first year and that a significant concurrent reduction in the burden of rotavirus infection occurred. This report provides an update on that evaluation with additional data included from April to July 2015.

## Data collection methods

In order to rapidly assess rotavirus vaccine coverage a temporary sentinel surveillance programme was set up to extract monthly coverage data directly from GP systems for children who had just reached the upper age for receiving the vaccine (25 weeks). This early evaluation of vaccine coverage has provided assurance that the vaccine has been well accepted alongside the other childhood immunisations. This temporary surveillance programme for rotavirus coverage will eventually be replaced by data from the routine quarterly COVER (Cover of vaccination evaluated rapidly) reporting scheme which will assess vaccine coverage for all children in England aged 12 months using data extracted from Child Health Information Systems (CHIS).

Vaccine coverage data for the rotavirus immunisation programme are submitted through the ImmForm* website and are monitored, validated and analysed by PHE. Monthly automatic data uploads from sentinel GP practices with the appropriate extraction facilities allows collection with minimal or no burden to the NHS whilst providing quick and timely coverage figures.

Monthly data are collected on the following:

- *Denominator*: the number of infants in a GP practice who, in the survey month, reach 25 weeks of age;
- *Numerators*: number of infants in the denominator who received a) a first dose and b) a second dose of Rotarix® from six weeks of age up to 24 weeks of age, including vaccinations given by other healthcare providers.

## Vaccine coverage data

Figure 1 shows coverage between February 2014 and July 2015. Although the vaccine programme was introduced in July 2013 the first cohort of children aged 25 weeks to be routinely scheduled rotavirus vaccine alongside other primary vaccines at two and three months of age were evaluated from January 2014. However, data are presented from the February evaluation due to data quality issues prior to this.

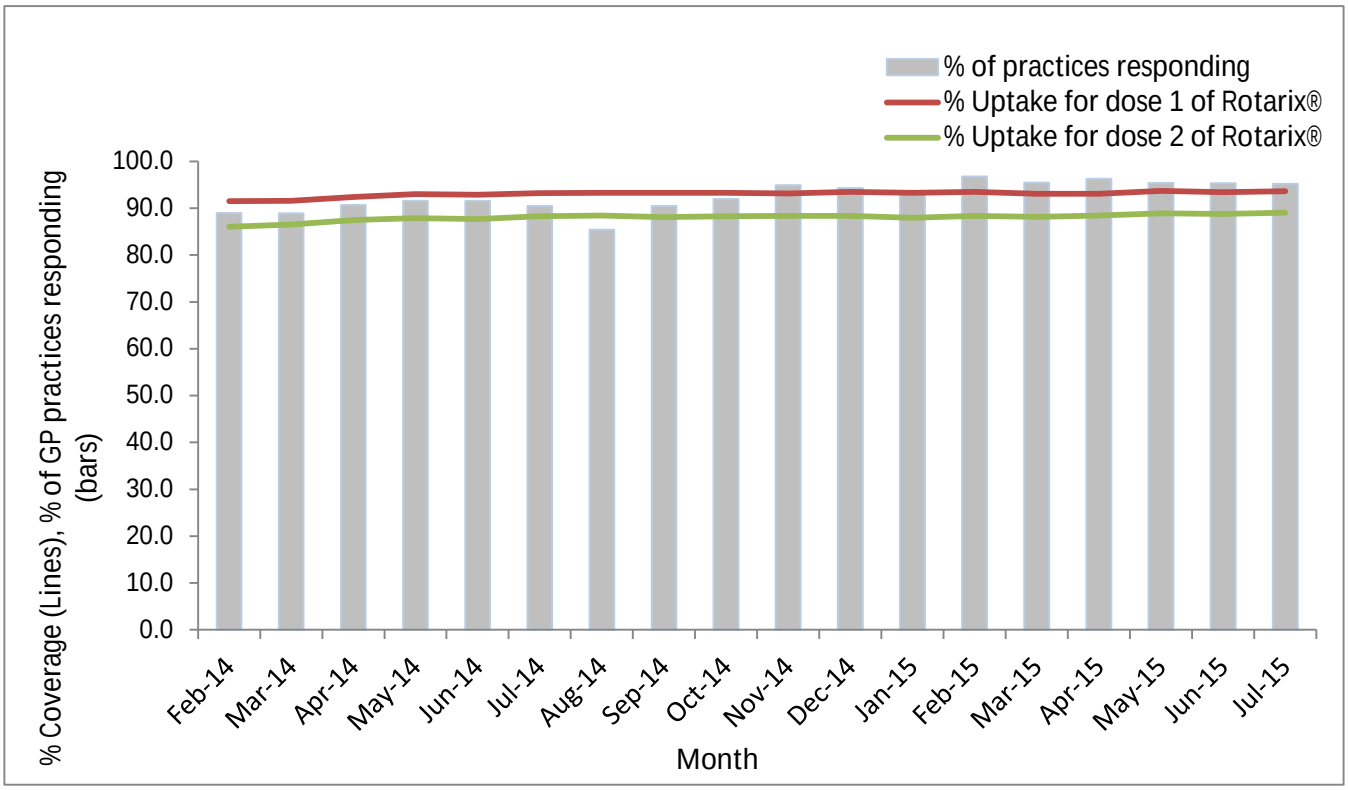
1. ImmForm is the system used by Public Health England to record vaccine coverage data for some immunisation programmes and to provide vaccine ordering facilities for the NHS. https://www.immform.dh.gov.uk/SignIn.aspx?ReturnUrl=%2f.

GP practice participation has been high and ranged from 85.4% (August 2014) to 96.8% (February 2015) of all GP practices in England and has been sustained above 95% since January 2015 (each monthly survey represents between 46,039 and 55,004 children).

Rotavirus vaccine coverage data for children in the routine vaccination cohort (i.e. evaluated between February 2014 and July 2015) averaged 93.0% for one dose, and has been maintained consistently at 93% since May 2014. All but one of 25 Area Teams (ATs) have consistently reported coverage of the first dose above 90% since February 2014. In the last 12 months of the survey, three ATs consistently achieved coverage >95% each month (Durham, Darlington and Tees; Cumbria, Northumberland, Tyne and Wear and South Yorkshire and Bassetlaw), and this increased to 11 ATs in the latest quarter (table 1).

Coverage for the two dose course averaged 88.1% between February 2014 and July 2015, and has been maintained consistently above 88% since July 2014, reaching its highest at 89.0% in July 2015 (table 2). For all but two ATs, coverage of the second dose has consistently been >85% since February 2014. Four ATs have consistently achieved coverage of >90.0% since February 2014, and more ATs have achieved higher coverage since then, with 11 AT's consistently achieving coverage >90.0% in the last 12 months and increased to17 AT's in the last quarter.

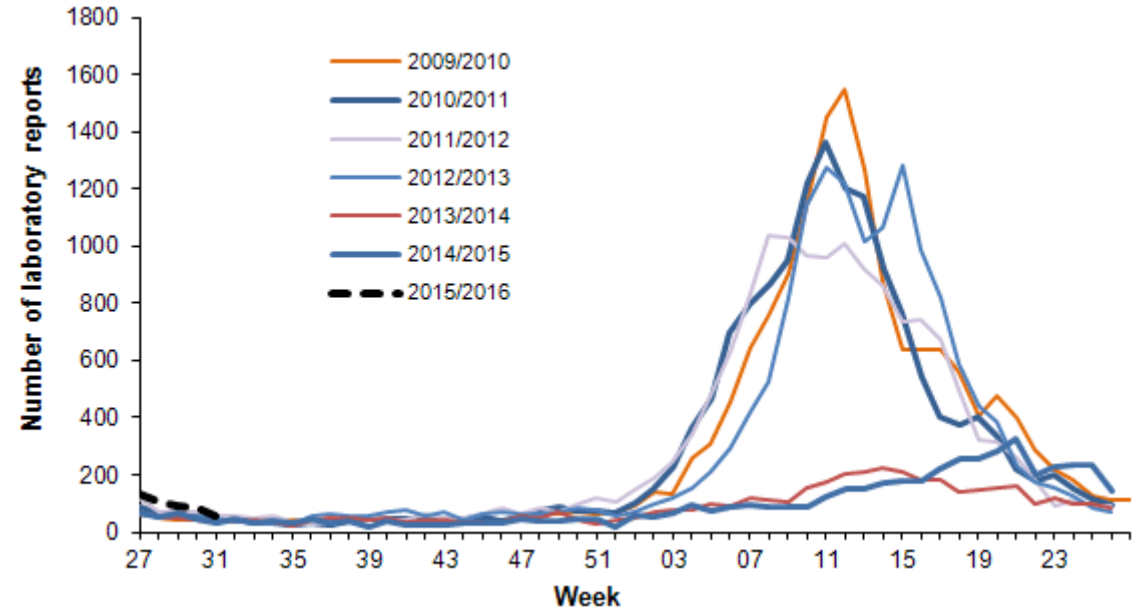
**Figure 1. Monthly rotavirus vaccine coverage at 25 weeks of age for 1st and 2nd dose, and the percentage of GP practices reporting: England, February 2014 to July 2015**



## Laboratory reports of rotavirus infection

Rotavirus infection in the UK is seasonal occurring mostly in winter and early spring (January to March). Data on the number of laboratory reports of rotavirus in England have been collated for many years by PHE Gastrointestinal Infections Department. For the second consecutive year, the number of rotavirus laboratory reports in England were substantially lower (63%) in the 2014/15 season than the average for the same period in the preceding ten seasons (figure 2). The observed decrease in rotavirus activity 2013/2014 season is likely to be associated with the introduction of the oral vaccine in July 2013.

**Figure 2. Seasonal comparison of laboratory reports of rotavirus 2009/2010 to 2014/15: England and Wales**




*Source*: PHE Monthly National Norovirus and Rotavirus Report prepared by the Gastrointestinal Infection Department, available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/453954/Norovirus_update_2015_week_31.pdf
*Note*: In order to capture the winter peak of norovirus activity in one season, for reporting purposes, the rotavirus season runs from week 27 in year 1 to week 26 in year 2, i.e. week 27 2009 to week 26 2010, July to June

**Table 1. Monthly rotavirus vaccine coverage for one dose (%) at 25 weeks of age by Area Team: England for the 12 months, August 2014 to July 2015***

| Area Team | Aug 2014 | Sept 2014 | Oct 2014 | Nov 2014 | Dec 2014 | Jan 2015 | Feb 2015 | Mar 2015 | Apr 2015 | May 2015 | June 2015 | July 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cheshire, Warrington & Wirral (Q44) | 92.9 | 94.4 | 91.7 | 93.9 | 94.0 | 94.7 | 94.3 | 93.2 | 92.7 | 94.0 | 93.5 | 92.8 |
| Durham, Darlington & Tees (Q45) | 95.9 | 96.4 | 96.9 | 96.5 | 96.1 | 96.5 | 95.0 | 96.2 | 96.5 | 95.7 | 96.5 | 95.7 |
| Greater Manchester (Q46) | 92.1 | 92.5 | 91.9 | 92.3 | 92.2 | 91.8 | 92.3 | 91.3 | 90.1 | 92.1 | 91.0 | 91.8 |
| Lancashire (Q47) | 95.2 | 96.1 | 94.7 | 95.3 | 95.2 | 93.8 | 94.6 | 94.4 | 94.4 | 95.6 | 94.8 | 95.3 |
| Merseyside (Q48) | 90.2 | 90.5 | 92.5 | 92.5 | 91.0 | 92.0 | 91.1 | 90.6 | 90.6 | 90.6 | 93.7 | 91.4 |
| Cumbria, Northumberland, Tyne & Wear (Q49) | 96.2 | 96.5 | 96.2 | 95.8 | 96.4 | 95.6 | 95.2 | 96.6 | 95.9 | 95.4 | 95.5 | 95.1 |
| North Yorkshire & Humber (Q50) | 96.2 | 96.1 | 94.3 | 95.8 | 96.4 | 95.0 | 95.3 | 94.7 | 96.0 | 95.8 | 95.6 | 96.3 |
| South Yorkshire & Bassetlaw (Q51) | 95.0 | 96.6 | 95.1 | 95.6 | 95.3 | 95.6 | 96.1 | 95 | 94.7 | 95.7 | 96.2 | 95.8 |
| West Yorkshire (Q52) | 94.9 | 95.3 | 95.1 | 95.2 | 95.1 | 95.3 | 95.6 | 94.4 | 94.6 | 95.3 | 95.0 | 95.1 |
| Arden, Herefordshire & Worcestershire (Q53) | 94.5 | 94.6 | 93.9 | 95.3 | 96.6 | 95.6 | 93.3 | 94.5 | 94.8 | 95.4 | 95.1 | 95.7 |
| Birmingham & the Black Country (Q54) | 93.3 | 93.6 | 92.2 | 92.0 | 93.0 | 93.0 | 91.7 | 91.2 | 92.5 | 92.5 | 92.7 | 92.9 |
| Derbyshire & Nottinghamshire (Q55) | 95.1 | 94.7 | 94.8 | 94.5 | 95.6 | 95.1 | 95.4 | 95.4 | 94.8 | 96.1 | 95.9 | 95.7 |
| East Anglia (Q56) | 95.6 | 95.5 | 95.5 | 94.1 | 95.2 | 95.1 | 94.3 | 94.8 | 94.3 | 95.4 | 94.7 | 94.7 |
| Essex (Q57) | 95.7 | 95.3 | 95.3 | 96.1 | 94.5 | 93.8 | 95.1 | 94.4 | 95.0 | 95.5 | 94.6 | 96.4 |
| Hertfordshire & the South Midlands (Q58) | 94.4 | 94.6 | 95.2 | 94.5 | 95.8 | 94.5 | 95.2 | 94.4 | 95.1 | 95.1 | 94.8 | 94.9 |
| Leicestershire & Lincolnshire (Q59) | 94.6 | 94.6 | 94.7 | 93.9 | 93.8 | 94.0 | 94.8 | 92.8 | 93.0 | 94.1 | 93.1 | 94.7 |
| Shropshire & Staffordshire (Q60) | 93.8 | 94.3 | 94.5 | 93.4 | 94.9 | 94.5 | 94.7 | 95.7 | 95.6 | 94.8 | 95.1 | 95.4 |
| Bath, Gloucestershire, Swindon & Wiltshire (Q64) | 94.4 | 94.7 | 93.7 | 94.0 | 94.4 | 94.2 | 94.0 | 95.2 | 96.0 | 94.4 | 94.0 | 94.9 |
| Bristol, North Somerset, Somerset & South Gloucestershire (Q65) | 92.4 | 92.3 | 93.3 | 92.4 | 92.6 | 91.3 | 93.1 | 92.9 | 92.2 | 92.6 | 92.0 | 93.1 |
| Devon, Cornwall &Isles of Scilly (Q66) | 89.5 | 86.9 | 89.7 | 90.1 | 90.6 | 91.5 | 90.3 | 91.4 | 88.1 | 89.7 | 91.9 | 89.7 |
| Kent & Medway (Q67) | 94.2 | 92.5 | 93.9 | 93.8 | 94.0 | 94.6 | 94.6 | 92.7 | 93.9 | 94.3 | 93.3 | 94.7 |
| Surrey & Sussex (Q68) | 92.4 | 92.8 | 92.9 | 93.2 | 93.0 | 92.8 | 92.4 | 93 | 92.1 | 94.2 | 93.2 | 93.5 |
| Thames Valley (Q69) | 92.9 | 93.6 | 94.0 | 93.7 | 93.4 | 94.2 | 94.7 | 94.7 | 94.3 | 95.4 | 95.2 | 93.9 |
| Wessex (Q70) | 95.6 | 93.5 | 94.4 | 94.8 | 94.5 | 94.3 | 95.3 | 94.4 | 93.9 | 95.0 | 94.9 | 95.6 |
| London (Q71) | 89.9 | 90.4 | 90.4 | 89.7 | 90.3 | 89.9 | 91.1 | 90 | 90.5 | 91.1 | 90.6 | 90.7 |
| **England** | **93.3** | **93.3** | **93.3** | **93.2** | **93.5** | **93.3** | **93.5** | **93.1** | **93.1** | **93.7** | **93.4** | **93.6** |
| **Monthly reported denominator** | **46039** | **47134** | **49247** | **50748** | **51862** | **51527** | **50042** | **55004** | **52317** | **50586** | **48489** | **51202** |

* Coverage estimates for the entire period (February 2014 through to July 2014) can be found at: https://www.gov.uk/government/publications/rotavirus-immunisation-programme-vaccine-coverage-estimates.

**Table 2. Monthly rotavirus vaccine coverage for two doses (%) at 25 weeks of age by Area Team: England for the 12 months, August 2014 to July 2015***

| Area Team | Aug 2014 | Sept 2014 | Oct 2014 | Nov 2014 | Dec 2014 | Jan 2015 | Feb 2015 | Mar 2015 | Apr 2015 | May 2015 | June 2015 | July 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cheshire, Warrington & Wirral (Q44) | 88.9 | 91.4 | 88 | 89.2 | 90.9 | 90.7 | 89.7 | 89.7 | 88.7 | 90.2 | 90.5 | 89.8 |
| Durham, Darlington & Tees (Q45) | 92.7 | 94.6 | 93.8 | 92.8 | 92.6 | 92.2 | 91.9 | 93.4 | 93.5 | 92.8 | 92.8 | 92.6 |
| Greater Manchester (Q46) | 86 | 86.8 | 86.5 | 86.4 | 86.6 | 85.1 | 85.3 | 84.7 | 84.6 | 86.3 | 85.4 | 86.1 |
| Lancashire (Q47) | 89.3 | 91.7 | 90.3 | 90.4 | 90.4 | 88.7 | 89.8 | 90.6 | 90.6 | 91.2 | 91.4 | 90.8 |
| Merseyside (Q48) | 83.1 | 82.8 | 82.8 | 84.3 | 83.6 | 85.6 | 82.6 | 85.5 | 83.6 | 83.9 | 88.0 | 87.2 |
| Cumbria, Northumberland, Tyne & Wear (Q49) | 92.6 | 92.1 | 92.2 | 92.4 | 93.5 | 91.3 | 91.2 | 93.2 | 92.1 | 91.5 | 91.2 | 90.7 |
| North Yorkshire & Humber (Q50) | 93 | 90.8 | 91 | 92.2 | 92.4 | 91.2 | 91.1 | 90.7 | 92.5 | 92.1 | 91.9 | 92.6 |
| South Yorkshire & Bassetlaw (Q51) | 90.6 | 91.4 | 91.1 | 90.8 | 90 | 89.1 | 91.4 | 89.7 | 90.6 | 91.9 | 92.6 | 92.2 |
| West Yorkshire (Q52) | 91.8 | 91.1 | 91.7 | 91.7 | 91.4 | 91.1 | 91.9 | 91.1 | 91.1 | 91.8 | 91.8 | 92.0 |
| Arden, Herefordshire & Worcestershire (Q53) | 88.7 | 89.8 | 89.9 | 89.9 | 91.6 | 90.4 | 88 | 91.0 | 89.7 | 91.0 | 90.3 | 91.5 |
| Birmingham & the Black Country (Q54) | 87 | 86.4 | 85.6 | 86.3 | 85.7 | 86.9 | 86 | 85.3 | 87.4 | 86.4 | 86.8 | 87.4 |
| Derbyshire &Nottinghamshire (Q55) | 91.3 | 89.5 | 89.9 | 90.4 | 91.1 | 89.7 | 90.9 | 90.4 | 91.0 | 91.1 | 91.6 | 92.2 |
| East Anglia (Q56) | 91.9 | 92.5 | 91.7 | 90.9 | 90.6 | 91 | 91.3 | 91.5 | 90.4 | 92.2 | 91.7 | 91.6 |
| Essex (Q57) | 92.8 | 91.5 | 91.8 | 93.7 | 91.3 | 89.8 | 91.2 | 90.8 | 91.6 | 91.8 | 91.7 | 93.3 |
| Hertfordshire & the South Midlands (Q58) | 91 | 91.9 | 92.7 | 91.3 | 92.2 | 90.6 | 92.1 | 91.0 | 92.1 | 92.3 | 92.2 | 91.8 |
| Leicestershire & Lincolnshire (Q59) | 90.8 | 91.7 | 92 | 90.6 | 90.3 | 90.6 | 89.8 | 89.4 | 89.6 | 90.7 | 90.7 | 92.3 |
| Shropshire & Staffordshire (Q60) | 90.9 | 89.9 | 90.4 | 89.6 | 91.8 | 90.5 | 90.8 | 91.1 | 93.0 | 91.6 | 91.0 | 90.8 |
| Bath, Gloucestershire, Swindon & Wiltshire (Q64) | 90.5 | 90.4 | 89.6 | 91 | 90.3 | 90.4 | 90.1 | 91.8 | 92.6 | 90.8 | 90.7 | 92.5 |
| Bristol, North Somerset, Somerset & South Gloucestershire (Q65) | 87.1 | 87.8 | 88.6 | 87.9 | 87.8 | 86.3 | 88 | 88.1 | 86.6 | 88.3 | 87.7 | 89.7 |
| Devon, Cornwall & Isles of Scilly (Q66) | 84.5 | 81.8 | 83.3 | 85.1 | 85 | 87.1 | 84.4 | 86.6 | 82.2 | 84.5 | 87.0 | 85.4 |
| Kent & Medway (Q67) | 88.9 | 87.1 | 88.8 | 89.5 | 88.9 | 88.2 | 88.5 | 86.9 | 89.9 | 89.7 | 88.9 | 89.8 |
| Surrey & Sussex (Q68) | 88.4 | 87.9 | 88.6 | 88.6 | 88.5 | 87.9 | 87.9 | 88.3 | 87.8 | 89.7 | 89.6 | 90.1 |
| Thames Valley (Q69) | 88.8 | 88.8 | 88.5 | 88.1 | 89.1 | 89.5 | 89.7 | 88.6 | 88.8 | 91.4 | 90.2 | 88.6 |
| Wessex (Q70) | 91.6 | 89.4 | 89.9 | 91.6 | 90.4 | 90.4 | 91.2 | 90.3 | 90.4 | 90.9 | 92.1 | 92.4 |
| London (Q71) | 82.6 | 82.8 | 83.1 | 83 | 82.8 | 82.4 | 84.2 | 83.2 | 83.9 | 84.1 | 83.2 | 83.2 |
| **England** | **88.4** | **88.2** | **88.3** | **88.4** | **88.4** | **87.9** | **88.4** | **88.2** | **88.4** | **88.9** | **88.8** | **89.0** |
| **Monthly reported denominator** | **46039** | **47134** | **49247** | **50748** | **51862** | **51527** | **50042** | **55004** | **52317** | **50586** | **48489** | **51202** |

* Coverage estimates for the entire period (February 2014 through to July 2014) can be found at: https://www.gov.uk/government/publications/rotavirus-immunisation-programme-vaccine-coverage-estimates.

## References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