Public Health England

Health Protection Report
weekly report

This is a PDF consolidation of the news items and infection reports published in HPR numbers 5 and 6, on 7 and 14 February 2014, respectively

Volume 8 Numbers 5-6 Published on: **7 and 14 February 2014**

Current News

Infection Reports

* Published in *HPR* **8**(5) on 7/2/2014.

** Published in *HPR* **8**(6) on 14/2/2014.

News

Volume 8 Numbers 5-6 Published on: **7 and 14 February 2014**

UK measles cases in travellers returning from the Philippines

An outbreak of measles has been reported in the Philippines [1] in connection with which 10 cases have been reported in the UK (to date, since 1 December 2013) in persons returning from the country.

Public Health England's Immunisation Department has advised health protection teams that they may receive an increased number of notifications of suspected measles cases in travellers from the Philippines, or alerts of contacts of measles cases on flights from the country. Current advice is that individuals with clinical features compatible with measles illness who have recently travelled to the Philippines should be treated as *likely* measles cases, and public health actions – such as identifying vulnerable contacts – commenced ahead of laboratory confirmation of the diagnosis.

Ages of the UK cases ranged from less than one year to 45 years. Five cases were in children under two years of age, of which three were under 13 months of age and therefore not yet eligible for immunisation. The majority of the cases (eight) had travelled to the Philippines to visit family and friends and at least four cases were infectious on their flight back to the UK raising the possibility of onward transmission and further cases occurring.

All the cases presented to frontline healthcare services with a rash illness and in some instances patients were not isolated immediately, exposing healthcare workers and other vulnerable patients. Health protection teams were reminded that healthcare workers who have had a significant exposure to a measles case should be able to demonstrate satisfactory evidence of protection against measles to continue working, as per national guidance [2].

The Philippines outbreak has prompted a reminder from the PHE-commissioned National Travel Health Network and Centre (NaTHNaC) about the need for all travellers to ensure they are up to date with all vaccines (including MMR) according to the current UK schedule, as travel is a factor in international spread of the infection [3].

References

1. Philippines Health Cluster Bulletin, 31 January 2014, http://reliefweb.int/sites/reliefweb.int/files/resources/Health%20cluster%20bulletin%2013.pdf.

2. Health Protection Agency (October 2010). National measles guidelines (Local and Regional Services). Legacy HPA website: http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1274088429847.

3. National Travel Health Network and Centre (5 February 2014). *Measles and travel: reminder*. Available from: http://www.nathnac.org/pro/clinical_updates/measles_reminder_050214.htm.

Laboratory confirmed pertussis in England: data to end-December 2013

With the exception of a small expected seasonal peak in July and August 2013, pertussis activity in England has continued to fall through to December 2013 but persists at raised levels compared to recent years. Immunisation of pregnant women continues to be important in the face of these persisting raised levels of pertussis. This news report presents current pertussis activity to 31 December 2013, updating the previous report that included data to the end of September 2013 [1].

A level 3 incident was declared in April 2012 to coordinate the response to the ongoing increased pertussis activity observed in the third quarter of 2011 and extending into 2012 (figure 1) [2]. In response to this ongoing outbreak, the Department of Health announced on 28 September [3,4] that pertussis immunisation would be offered to pregnant women from 1 October 2012 to protect infants from birth whilst disease levels remain high. It has been confirmed that this programme will be continued in 2013/2014 until further notice, pending further advice from the Joint Committee on Vaccination and Immunisation [5].

All infants under 16 months are now in the cohort born to mothers who were eligible for pertussis-containing vaccine in pregnancy. In England there was a fall in confirmed cases of pertussis from July/August 2012 through to December 2012 in infants under one year (figure 2) in whom low numbers of cases have been sustained through to December 2013. In infants aged less than three months there were four confirmed cases in November and three in December 2013; these numbers are lower than the equivalent period in 2012 with 23 in November and nine cases in December. Disease incidence does, as expected, continue to be highest in this age group. There were no pertussis related infant deaths reported in November and December 2013 (provisional).

In England overall laboratory confirmed pertussis cases fell each month from November 2012 to June 2013, then increased slightly in July and August 2013 before decreasing again in September through to December 2013, in line with seasonal trends (figure 1). Provisional data show that in November and December 2013, 226 and 219 cases respectively were newly confirmed (table 1), compared with 306 cases in October. Whilst the overall number of cases has fallen, large numbers of cases continue to be confirmed in individuals aged 15 years or older with 180 cases reported in December 2013, compared to 666 in December 2012 and 126 in December 2011 (table 1). In those aged 10-14 years there were 22 cases confirmed in December 2013; 77 in December 2012; and 23 in December 2011.

Whilst cases were lower in all age groups in 2013 when compared to 2012, the impact was greatest in infants aged less than three months. This specific effect on infants covered by the maternal immunisation programme is consistent with a programme effect. Between January and December 2013 there were 116 confirmed cases in infants under one year of age compared to 508 in 2012 and 207 in 2011. The situation will continue to be monitored.

High pertussis activity has been observed across all regions in England and Wales (table 2). In Wales 12 laboratory confirmed cases were reported in November and five in December 2013 compared to 59 cases in November and 40 in December 2012.

Information on the uptake of pertussis immunisation in pregnant women has been published for women giving birth up to the end September 2013 [6]. The latest provisional data suggests that coverage fell from a peak of 59.6% in February 2013 to a low of 49.8% in June 2013 and increasing to an estimated 56.4% for women giving birth in August and September 2013.

Current high levels of reporting may, in part, be due to increased awareness amongst health professionals improving case ascertainment in older age groups. This is reflected by the increased demand for serology testing which is the predominant method of confirmation in adolescents and adults who typically present with milder features late in the course of the illness. However, it is considered that the increases that have been observed reflect a real change in pertussis activity with waning immunity following vaccination and/or natural infection likely to be important contributory factors [7]. This is supported by the high number of confirmed cases in infants under three months of age in whom ascertainment has been more consistent through time.

Figure 1. Provisional number of confirmed cases of pertussis in England, by month: Jan 2011 to Dec 2013

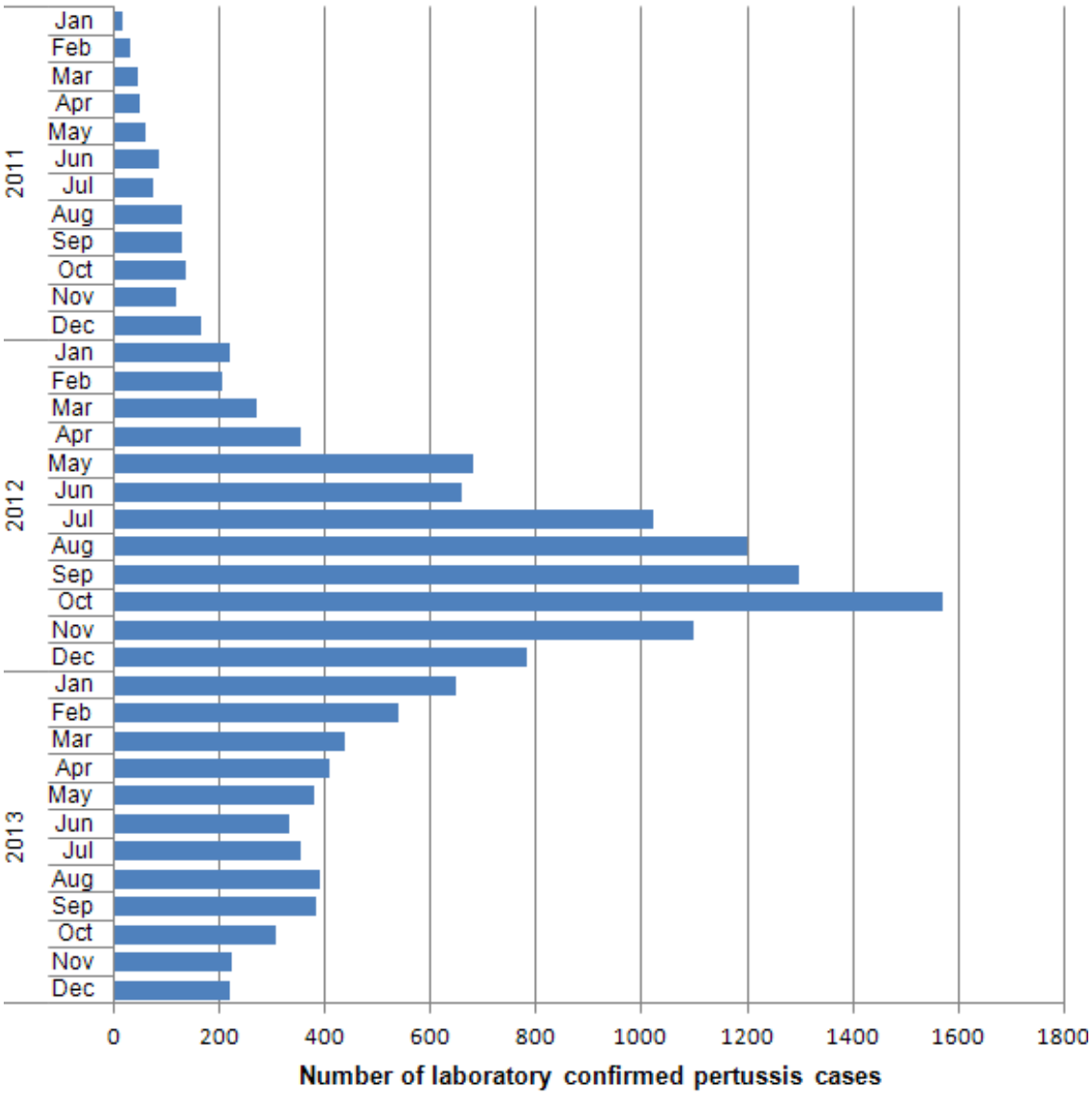


Figure 2. Monthly distribution of laboratory confirmed cases in 2012 and 2013, England, by age group based on provisional data

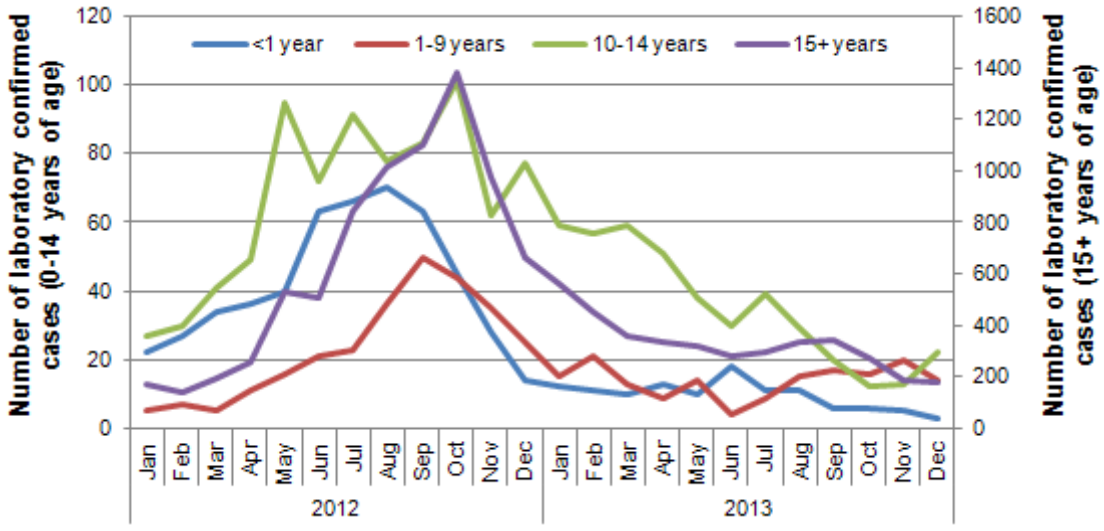


Table 1. Provisional number of confirmed cases of pertussis in England, 2008 to 2013 by age group: November and December

Age group		<3 months	3-5 months	6-11 months	1-4 years	5-9 years	10-14 years	15+ years	All ages
2008	November	6	–	–	1	6	5	44	**62**
	December	6	1	–	1	1	5	26	**40**
2009	November	3	1	–	3	2	2	28	**39**
	December	1	–	–	1	–	–	14	**16**
2010	November	6	–	–	2	–	1	27	**36**
	December	4	–	–	2	1	2	16	**25**
2011	November	19	4	1	2	1	12	79	**118**
	December	12	1	1	1	3	23	126	**167**
2012	November	23	3	2	12	23	62	974	**1099**
	December	9	3	2	8	17	77	666	**782**
2013	November	4	1	–	8	12	13	188	**226**
	December	3	–	–	8	6	22	180	**219**

Table 2. Provisional number of confirmed cases of pertussis in England and Wales: November and December 2013, 2012 and 2011, by PHE Region and Centre

PHE Region and Centre	2013		2012		2011	
	Nov.	Dec.	Nov.	Dec.	Nov.	Dec.
London	**28**	**34**	**101**	**79**	**7**	**12**
Midlands and East of England	83	77	395	239	32	47
Anglia and Essex	13	17	130	70	7	8
East Midlands	27	22	102	72	11	16
South Midlands and Hertfordshire	16	4	52	31	4	6
West Midlands	27	34	111	66	10	17
North of England	**42**	**42**	**254**	**203**	**28**	**42**
Cheshire and Merseyside	4	2	24	17	2	2
Cumbria and Lancashire	1	2	38	17	5	1
Greater Manchester	6	6	21	24	4	3
North East	8	11	53	55	5	10
Yorkshire and Humber	23	21	118	90	12	26
South of England	**73**	**66**	**349**	**261**	**51**	**66**
Avon, Gloucestershire and Wiltshire	18	8	113	75	23	27
Devon, Cornwall and Somerset	10	6	42	38	3	9
Sussex, Surrey and Kent	34	36	121	86	8	13
Thames Valley	5	7	22	13	3	2
Wessex	6	9	51	49	14	15
England Total	**226**	**219**	**1099**	**782**	**118**	**167**
Wales	**12**	**5**	**59**	**40**	**7**	**8**
England and Wales Total	**238**	**224**	**1158**	**822**	**125**	**175**

References

1. Confirmed pertussis cases in England and Wales: update to end-September 2013. *HPR* **7**(47): news, 22 November 2013.

2. A level 3 incident is the third of five levels of alert under the HPA's Incident Reporting and Information System (IERP) according to which public health threats are classified and information flow to the relevant outbreak control team is coordinated. A level 3 incident is defined as one where the public health impact is significant across regional boundaries or nationally. An IERP level 3 incident was declared in April 2012 in response to the ongoing increased pertussis activity (*HPR* **6**(15), http://www.hpa.org.uk/hpr/archives/2012/news1512.htm).

3. "Pregnant women to be offered whooping cough vaccination", 28 September 2012. Department of Health website, http://www.dh.gov.uk/health/2012/09/whooping-cough/.

4. "HPA welcomes introduction of whooping cough vaccination for pregnant women as outbreak continues", HPA press release, 28 September 2012, HPA legacy website: Home > News Centre > National Press Releases > 2012 Press Releases.

5. Department of Health, Public Health England, NHS England. "Continuation of temporary programme of pertussis (whooping cough) vaccination of pregnant women", https://www.gov.uk/government/publications/whooping-cough-vaccination-programme-for-pregnant-women-extension-to-2014

6. Pertussis Vaccination Programme for Pregnant Women: vaccine coverage estimates in England, October 2012 to September 2013: https://www.gov.uk/government/publications/pertussis-vaccine-uptake-in-pregnant-women-october-2012-to-september-2013.

7. Campbell H, Amirthalingam G, Andrews N, Fry NK, George RC, Harrison TG, Miller E. Accelerating control of pertussis in England and Wales. *Emerging Infectious Diseases* 2012; **18**(1):38-47.

Coordination of public health response to flooding in south west England and Wales

Public Health England's advice to government, to local authorities and to other partners about potential health consequences of the recent flooding in south west England has been seen as a successful demonstration of the new public health system working together in response to an emergency.

PHE's Devon, Cornwall and Somerset Centre worked alongside Somerset's Director of Public Health, to provide timely advice to the public and media, and with national PHE colleagues to keep the Department of Health fully briefed.

Consistency of advice on communicable disease risks and other health impacts was facilitated by a scientific and technical advice cell (STAC) set up at the request of the chair of Strategic Coordinating Group. Local residents in flooded areas were reminded of the importance of avoiding contact with flood water, washing hands and food preparation surfaces and not eating food that had touched flood water [1,2].

Experience from previous floods in the UK has been that no significant communicable disease risks have resulted (eg no significantly increased rates of gastrointestinal illness), whereas psychological impact and distress caused has been noted [3].

References

1. "Flooding: advice for the public" (2014). PHE/Environment Agency leaflet [5 MB PDF].
2. "Flooding – health advice on floodwater" (1 February, 20140). PHE press release.
3. Pitt M. "Learning the lessons from the 2007 floods", UK Cabinet Office, 2008.

Syndromic algorithm for gastroenteritis and diarrhoea

This recently issued syndromic algorithm describes the infections, and the relevant associated tests, that should be considered in cases of clinical presentation of gastroenteritis and diarrhoea infection in adults and children in social and healthcare settings.

The main target organisms are:

Salmonella species
Shigella species
Campylobacter species
Escherichia coli VTEC (including O157)
Clostridium difficile
Cryptosporidium, Giardia and Entamoeba
Microsporidia
Norovirus.

Reference

1. PHE health protection website: Standards for Microbiology Investigations › SMI Syndromic algorithm (S) › S 7 - Gastroentiritis and Diarrhoea.

Public Health England

Health Protection Report
weekly report

Infection Reports

Respiratory*

Laboratory reports of respiratory infections made to CIDSC from PHE and NHS laboratories in England and Wales: weeks 2-5/2014

Enteric**

- **General outbreaks of food-borne illness, laboratory reports of common GI infections and hospital norovirus outbreaks (E&W, weeks 1-4/2014); and salmonella infections (E&W, December 2013, provisional)**
- **Enteric fever surveillance quarterly report (EWNI): Q4/2013**

Zoonoses**

Common animal associated infections quarterly report (England and Wales): fourth quarter 2013

Emerging infections/CJD**

CJD biannual update (2014/1), with briefing on novel human prion disease

* Published in *HPR* **8**(5) on 7/2/2014.

** Published in *HPR* **8**(6) on 14/2/2014.

Infection reports

Volume 8 Number 5 Published on: 7 February 2014

Respiratory

Laboratory reports of respiratory infections made to CIDSC from PHE and NHS laboratories in England and Wales: weeks 2-5/2014

Data are recorded by week of report, but include only specimens taken in the last eight weeks (ie recent specimens).

Table 1. Reports of influenza infection made to PHE Colindale, by age group

Week	Week 2	Week 3	Week 4	Week 5	Total
Week ending	**12/1/14**	**19/1/14**	**26/1/14**	**02/02/14**	
Influenza A	**52**	**77**	**65**	**102**	**296**
Isolation	8	4	6	9	**27**
DIF *	9	17	8	9	**43**
PCR	34	47	38	75	**194**
Other †	1	9	13	9	**32**
Influenza B	**3**	**4**	**11**	**–**	**18**
Isolation	–	–	1	–	**1**
DIF *	2	–	–	–	**2**
PCR	1	4	5	–	**10**
Other †	–	–	5	–	**5**

* DIF = Direct Immunofluorescence.

† Other = "Antibody detection - single high titre" or "Method not specified".

Table 2. Respiratory viral detections by any method (culture, direct immunofluorescence, PCR, four-fold rise in paired sera, single high serology titre, genomic, electron microscopy, other method, other method unknown)**, by week of report**

Week	Week 2	Week 3	Week 4	Week 5	Total
Week ending	**12/1/14**	**19/1/14**	**26/1/14**	**02/02/14**	
Adenovirus*	51	35	55	48	**189**
Coronavirus	40	28	35	38	**141**
Parainfluenza†	56	36	35	21	**148**
Rhinovirus	272	131	157	167	**727**
RSV	876	423	284	225	**1808**

* Respiratory samples only.

† Includes parainfluenza types 1, 2, 3, 4 and untyped.

Table 3. Respiratory viral detections by age group: weeks 2-5/2014

Age group (years)	<1 year	1-4 years	5-14 years	15-44 years	45-64 years	≥65 years	Un-known	Total
Adenovirus *	1	117	9	33	21	8	–	**189**
Coronavirus	4	44	7	25	33	28	–	**141**
Influenza A	1	66	12	105	57	49	1	**291**
Influenza B	1	1	2	7	4	3	–	**18**
Parainfluenza †	2	52	7	16	38	33	–	**148**
Rhinovirus	28	377	41	83	99	97	2	**727**
Respiratory syncytial virus	160	1307	27	69	114	120	11	**1808**

* Respiratory samples only.

† Includes parainfluenza types 1, 2, 3, 4 and untyped.

Table 4 Laboratory reports of infections associated with atypical pneumonia, by week of report

Week	Week 2	Week 3	Week 4	Week 5	Total
Week ending	**12/1/14**	**19/1/14**	**26/1/14**	**02/02/14**	
Coxiella burnettii	1	–	–	–	**1**
Respiratory *Chlamydia* sp.*	4	2	–	–	**6**
Mycoplasma pneumoniae	17	9	12	12	**50**
Legionella sp.	4	6	5	–	**15**

*Includes *Chlamydia psittaci*, *Chlamydia pneumoniae*, and *Chlamydia* sp detected from blood, serum, and respiratory specimens.

Table 5 Reports of Legionnaires Disease cases in England and Wales, by week of report

Week	Week 2	Week 3	Week 4	Week 5	Total
Week ending	**12/1/14**	**19/1/14**	**26/1/14**	**02/02/14**	
Nosocomial	–	–	–	–	**–**
Community	1(1*)	6(1*)	4(1*)	–	**11**
Travel Abroad	3(1*)	–	–	–	**3**
Travel UK	–	–	1	–	**1**
Total	**4**	**6**	**5**	**–**	**15**
Male	2	4	3	–	**9**
Female	2	2	2	–	**6**

(*) Non-pneumonic cases.

Fifteen cases were reported with pneumonia. Nine males aged 45-88yrs and six females aged 29-68yrs. Eleven cases had community-acquired infection. Two deaths were reported in a 40yr old male and an 88yr old male.

Four cases were reported with travel association: Germany/United Kingdom (1), Thailand (1), United Kingdom (1) and United Kingdom/United States of America (1).

Table 6. Reports of Legionnaires Disease cases in England and Wales, by PHE Centre: weeks 2-5/2014

Region/Country	Nosocomial	Community	Travel Abroad	Travel UK	Total
North of England					
North East	–	–	2(1*)	–	**2**
Cheshire & Merseyside	–	–	–	–	**–**
Greater Manchester	–	–	–	–	**–**
Cumbria & Lancashire	–	–	–	–	**–**
Yorkshire & the Humber	–	–	–	–	**–**
South of England					
Devon, Cornwall & Somerset	–	–	–	–	**–**
Avon, Gloucestershire & Wiltshire	–	4	–	–	**4**
Wessex	–	–	–	–	**–**
Thames Valley	–	–	–	–	**–**
Sussex, Surrey & Kent	–	–	–	–	**–**
Midlands & East of England					
East Midlands	–	1	–	–	**1**
South Midlands & Hertfordshire	–	–	–	–	**–**
Anglia & Essex	–	–	–	–	**–**
West Midlands	–	4(1*)	–	–	**4**
London Integrated Region					
London	–	2(2*)	1	–	**3**
Public Health Wales					
Mid & West Wales	–	–	–	–	**–**
North Wales	–	–	–	–	**–**
South East Wales	–	–	–	1	1
Miscellaneous					
Other	–	–	–	–	**–**
Not known	–	–	–	–	**–**
Total	**–**	**11**	**3**	**1**	**15**

(*) Non-pneumonic case.

Infection reports

Volume 8 Number 6 Published on: 14 February 2014

Enteric

General outbreaks of foodborne illness in humans, England and Wales: weeks 1-4/2014

Preliminary information has been received about the following outbreaks.

PHE Centre/ Health Protect'n Team	Organism	Location of food prepared or served	Month of outbreak	Number ill	Cases positive	Suspect vehicle	Evidence
Avon, Gloucester and Wilts.	Campylobacter	Restaurant	January	2	Not known	Not known	N/a
London	Norovirus	Restaurant	January	12	2	Oysters	D
North West London	Not known	Restaurant	January	41	Not known	Not known	N/a
Sussex, Surrey and Kent	Norovirus suspected	Pub	January	6	–	Roast turkey and pork	D

D = Descriptive epidemiological evidence: suspicion of a food vehicle in an outbreak based on the identification of common food exposures, from the systematic evaluation of cases and their characteristics and food histories over the likely incubation period by standardised means (such as standard questionnaires) from all, or an appropriate subset of, cases.

Common gastrointestinal infections, England and Wales, laboratory reports: weeks 1-4/14

Laboratory reports	Number of reports received				Total reports	Cumulative total	
	01/14	02/14	03/14	04/14	1-4/14	1-4/14	1-4/13
Campylobacter	400	920	881	813	3014	3014	2979
Escherichia coli O157 *	–	10	1	2	13	13	20
Salmonella †	28	90	56	14	188	188	334
Shigella sonnei	10	18	22	18	68	68	55
Rotavirus	35	69	73	68	245	245	435
Norovirus	97	178	193	174	642	642	755
Cryptosporidium	24	43	35	24	126	126	209
Giardia	29	76	68	74	247	247	240

*Vero cytotoxin–producing isolates: data from CIDSC's Laboratory of Gastrointestinal Pathogens (LGP), PHE Colindale.
† Data from CIDSC-LGP.

Salmonella infections (faecal specimens) England and Wales, reports to Public Health England (salmonella data set): December 2013

Details of 373 serotypes of salmonella infections recorded in December are given in the table below.

In January 2014, 93 salmonella infections were recorded.

Organism	Cases: December 2013
S. Enteritidis PT4	4
S. Enteritidis (other PTs)	95
S. Typhimurium	59
S. Virchow	3
Others (typed)	212
Total salmonella (provisional data)	**373**

Suspected and laboratory-confirmed reported norovirus outbreaks in hospitals, with regional breakdown: outbreaks occurring in weeks 1-4/14

The hospital norovirus outbreak reporting scheme (HNORS) recorded 71 outbreaks occurring between weeks 1 and 4, 2014, 69 of which (97%) led to ward/bay closures or restriction to admissions. Forty-eight outbreaks (68 per cent) were recorded as laboratory confirmed due to norovirus (see table following page). For the calender year 2013 – between week 1 (January 2013) and week 52 (week beginning 23 December) – 918 outbreaks have been reported. Ninety-two per cent (843) of reported outbreaks resulted in ward/bay closures or restrictions to admissions and 68 per cent (620) were laboratory confirmed as due to norovirus (see table following page).

Seasonal comparison of laboratory reports of norovirus (England and Wales)

In the current season to date† (from week 27, 2013, to week 4, 2014), there were 2410 laboratory reports of norovirus. This is 41 per cent lower than the average number of laboratory reports for the same period in the seasons between 2007/08 and 2011/2012 (4063)* (see table following pages). The number of laboratory reports in the most recent weeks will increase as further reports are received.

† The norovirus season runs from July to June (week 27 in year one to week 26 in year two) in order to capture the winter peak in one season.

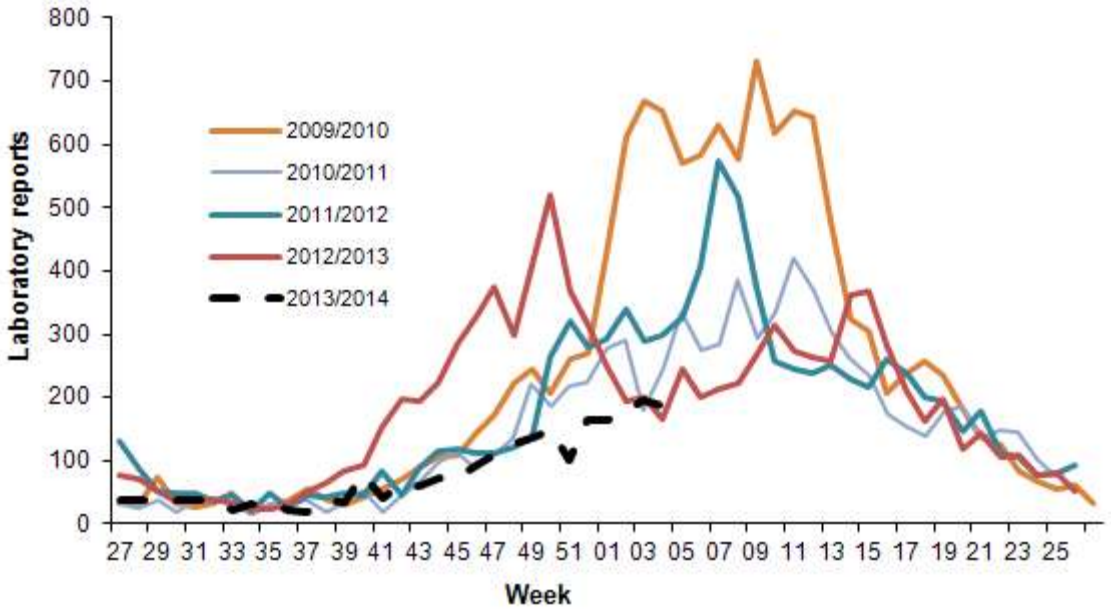
* Last season – 2012/2013 – the season began earlier than normal so comparisons between this current and last season would not be valid.

Suspected and laboratory-confirmed reported norovirus outbreaks in hospitals, with regional breakdown: outbreaks occurring in weeks 1-4/2014 (and 1-52/2013)

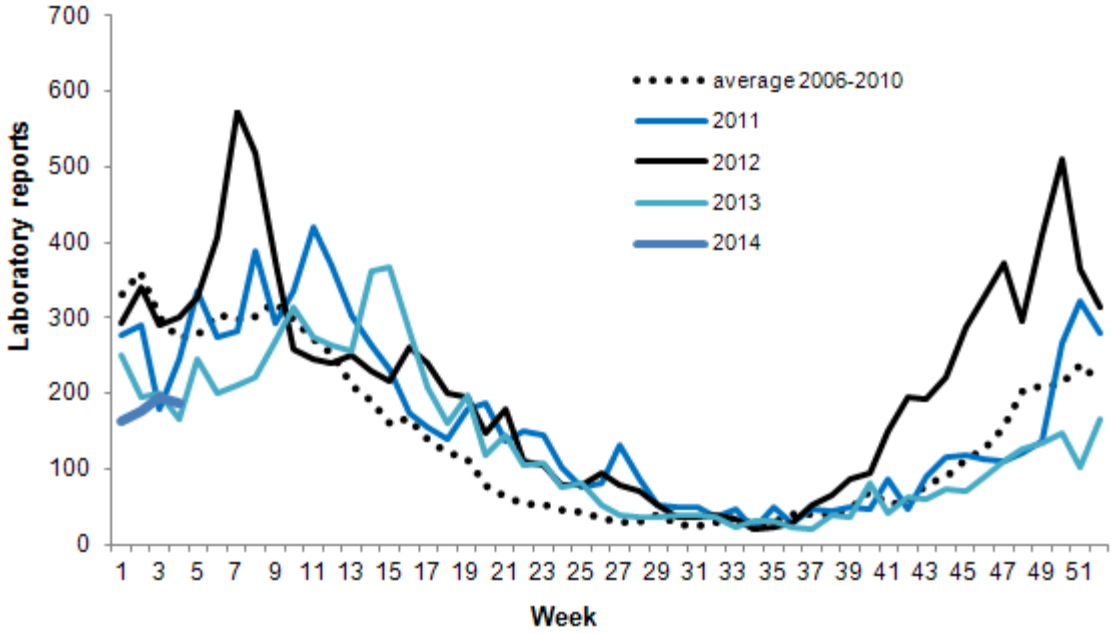
Region/ PHE Centre	Outbreaks between weeks 1-4/2014			Total outbreaks 1-52/2013		
	Outbreaks	Ward/bay closure*	Lab-confirmed	Outbreaks	Ward/bay closure*	Lab-confirmed
Avon, Gloucestershire and Wiltshire	12	12	6	91	90	74
Bedfordshire, Hertfordshire and Northamptonshire	–	–	–	11	11	10
Cheshire and Merseyside	–	–	–	17	13	12
Cumbria and Lancashire	6	6	3	69	68	27
Devon, Cornwall and Somerset	8	8	6	157	156	82
Greater Manchester	3	3	2	22	1	18
Hampshire, Isle of Wight and Dorset	5	5	4	65	64	51
Lincolnshire, Leicestershire, Nottinghamshire and Derbyshire	3	3	2	56	54	39
London	–	–	–	20	19	19
Norfolk, Suffolk, Cambridgeshire and Essex	–	–	–	–	–	–
North east	11	10	10	104	97	72
Sussex, Surrey and Kent	3	3	3	85	85	64
Thames Valley	1	1	11	45	44	27
West Midlands	18	18	1	54	47	26
Yorkshire and the Humber	1	–	–	122	94	99
Total	**71**	**69**	**48**	**918**	**843**	**620**

* Note: not all outbreaks result in whole wards closures, some closures are restricted to bays only.

Seasonal comparison of laboratory reports of norovirus (England and Wales)



Current weekly norovirus laboratory reports compared to weekly average 2006/2010



Infection reports

Volume 8 Number 6 Published on: 14 February 2014

Enteric

Enteric fever surveillance quarterly report (EWNI): Q4/2013

This quarterly report summarises the epidemiology of laboratory confirmed cases of typhoid and paratyphoid reported in England, Wales and Northern Ireland between October and December 2013. It includes both reference laboratory and enhanced enteric fever surveillance data. All data are provisional; final and more detailed reports will be produced on an annual basis. More information about enteric fever surveillance, including previous reports, is available on the enhanced enteric fever surveillance page of the PHE health protection website [1].

National summary

In the fourth quarter of 2013, 69 laboratory confirmed cases of enteric fever were reported in England, Wales and Northern Ireland (table 1), just one case less than the fourth quarter of 2012 and 27% below the rolling mean (94) for Q4 2007 to 2013 (figure 1). A 32% increase in case numbers was seen for *S*. Typhi (50 in Q4 2013 compared to 38 in Q4 2012) (table 1).

Figure 1. Laboratory confirmed cases of enteric fever by organism, England, Wales and Northern Ireland: fourth quarter 2007-2013

Table 1. Laboratory confirmed cases of enteric fever, England, Wales and Northern Ireland: fourth quarter 2007-2013

Organism	Laboratory confirmed cases						
	Q4 2013	Q4 2012	Q4 2011	Q4 2010	Q4 2009	Q4 2008	Q4 2007
Salmonella Typhi	50	38	47	61	64	62	45
Salmonella Paratyphi A	18	29	58	37	42	51	36
Salmonella Paratyphi B	1	3	1	3	5	3	1
Enteric fever total	69	70	106	101	111	116	82

Table 2. Laboratory confirmed cases of enteric fever by organism and phage type, England, Wales and Northern Ireland fourth quarter 2013

Phage type	*S.* Typhi
PT E1	15
PT E9 Var.	12
Untyp.VI	9
PT A	3
Untyp.VI 2	2
Degr.VI	2
PT 28	1
Untyp.VI 7	1
Untyp.VI 6	1
PT C1	1
VI Neg.	1
PT D2	1
PT O	1
Total	50

Phage type	*S.* Paratyphi A
PT 1	6
PT 2	3
PT 13	3
PT 1a	3
RDNC	2
PT 4	1
Total	18

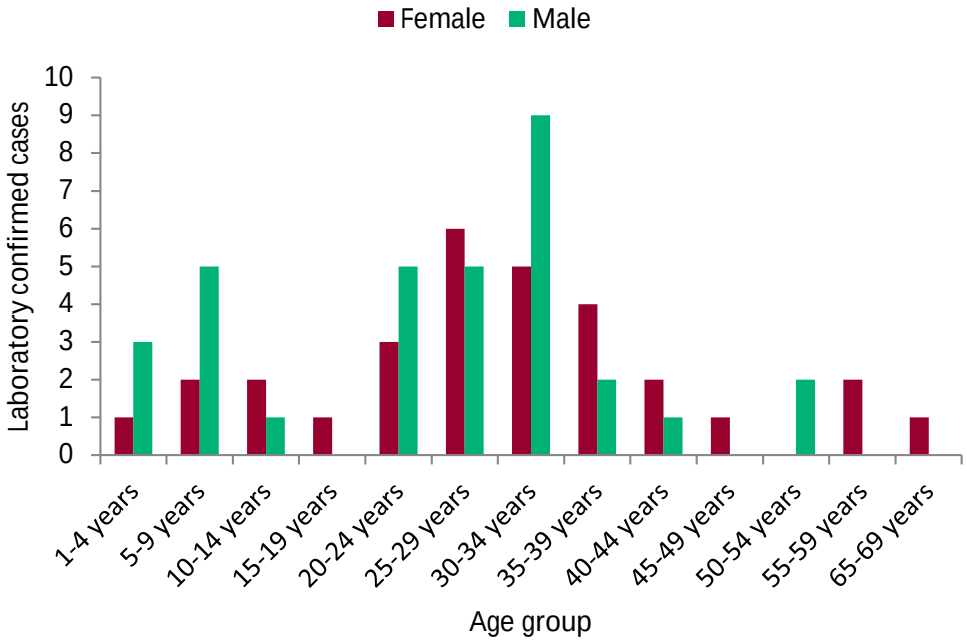
Phage type	*S.* Paratyphi B
Dundee	1
Total	1

In Q4 2013, *S.* Typhi phage types E1, E9 var and Untyp.VI and *S.* Paratyphi A phage type 1 were the most frequently reported [2].

Age/sex distribution

In the fourth quarter of 2013, the median age of cases was 28 years and 22% (17% for females and 27% for males) were aged 16 years and under. Females represented 52% of the total number of cases (figure 2).

Figure 2 Laboratory confirmed cases of enteric fever by age and sex (N=63): fourth quarter 2013



Geographical distribution

London PHE Centre (PHEC) reported 38% of the total cases during the fourth quarter of 2013, followed by Sussex, Surrey and Kent and South Midlands and Hertfordshire (10% each) (table 3).

Table 3 Laboratory confirmed cases of enteric fever by region: fourth quarter 2013

Geographical area	Q4 2013	Q4 2012	% change
London PHEC	24	28	-14.3%
Sussex, Surrey and Kent PHEC	6	-	-
South Midlands and Hertfordshire PHEC	6	4	50.0%
Thames Valley PHEC	4	5	-20.0%
Cumbria and Lancashire PHEC	4	1	300.0%
East Midlands PHEC	4	2	100.0%
West Midlands PHEC	3	7	-57.1%
Yorkshire and the Humber PHEC	2	6	-66.7%
Greater Manchester PHEC	2	7	-71.4%
Avon, Gloucestershire and Wiltshire PHEC	2	5	-60.0%
Anglia and Essex PHEC	2	-	-
Wessex PHEC	1	1	0.0%
Northern Ireland	1	-	-
Devon, Cornwall and Somerset PHEC	1	1	0.0%
Wales	1	3	-66.7%
Total	**63**	**70**	-10.0%

PHEC: PHE Centre

Carriers/asymptomatic cases

Of the 69 laboratory confirmed infections of enteric fever, one was identified as a carrier and is excluded from further analysis in this report.

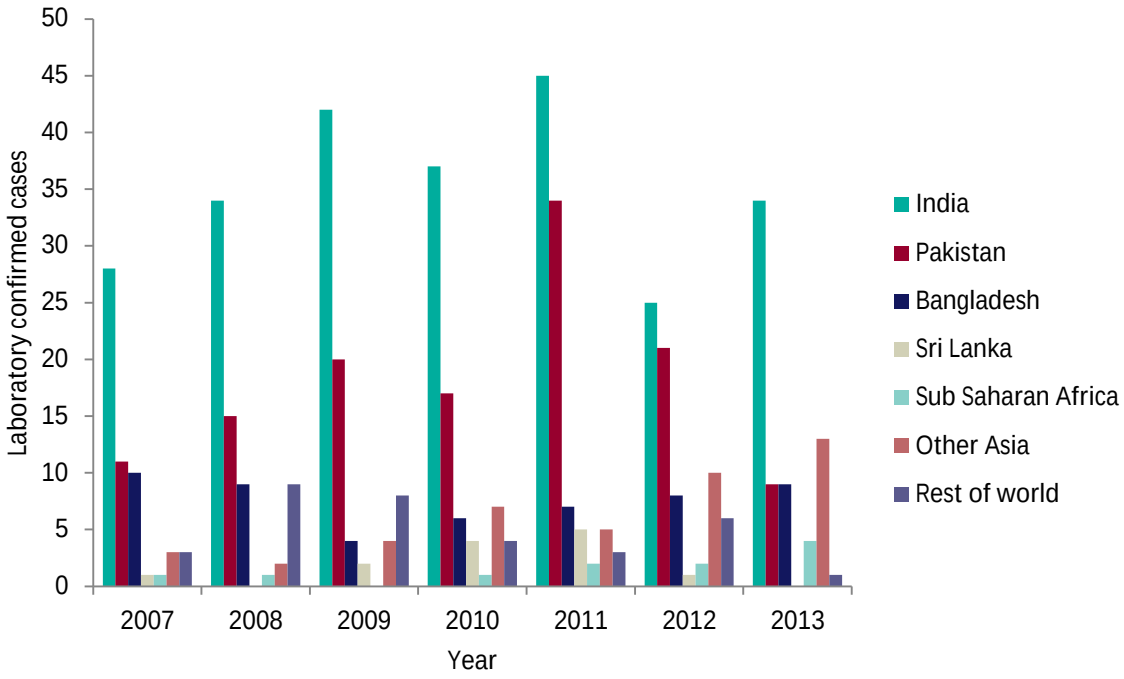
Travel history

In the fourth quarter, travel history was known for 68 cases (67 from enhanced surveillance forms and one from laboratory data); 63 (93%) cases had travelled abroad.

Travel-associated cases

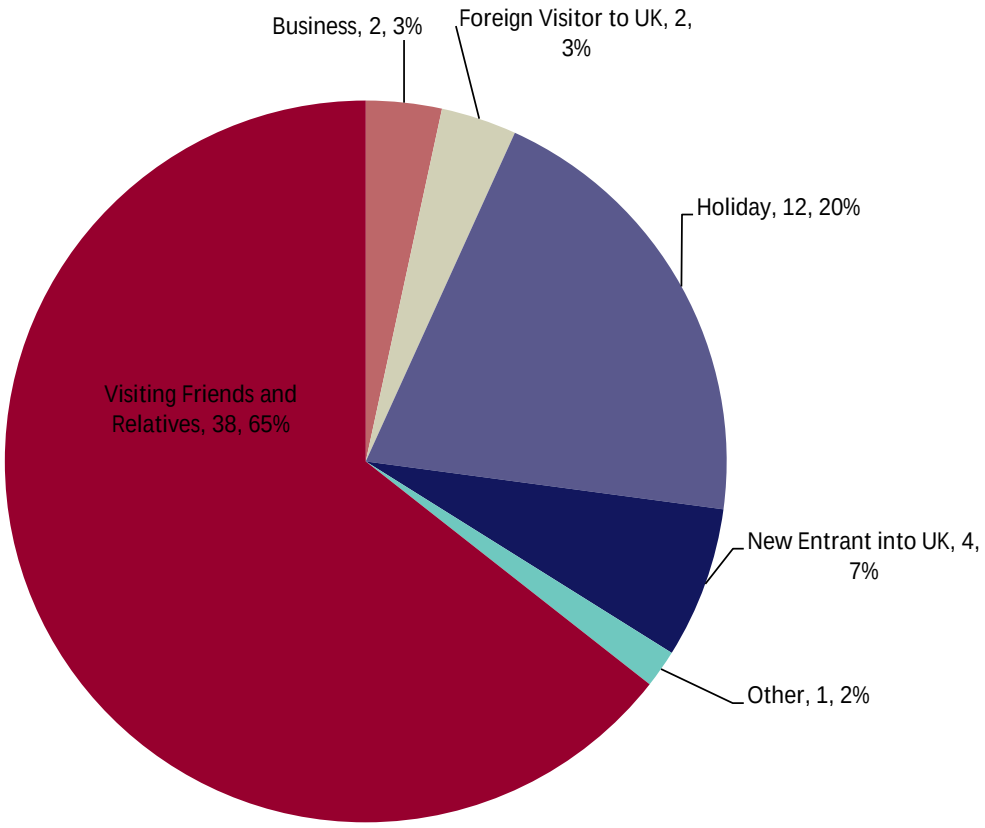
Travel-associated cases were likely to have acquired their infection in: India (34), Pakistan (nine), Bangladesh (nine), Nepal (four), Thailand (two), Malaysia (two), Cambodia (two), and Morocco, Ghana, Myanmar, Somalia, Laos, Viet Nam, Cape Verde and Nigeria (one each). Some cases travelled to more than one country so totals above will not equal the number of total cases that travelled. Where multiple countries of travel have been stated by the case, only risk countries, as identified by the National Travel Health Network and Centre [3], were included for analysis. If a case has travelled to multiple risk countries each country is counted individually. India and Pakistan continue to be the most frequently reported countries of travel throughout the year (figure 3).

Figure 3. Laboratory-confirmed cases of enteric fever, England, Wales and Northern Ireland by country of travel: fourth quarter 2007-2013



Reason for travel

Figure 4. Laboratory-confirmed cases of enteric fever that have travelled abroad (N=59) by reason for travel: fourth quarter 2013



Of the 63 cases that had travelled abroad, reason for travel was known for 59; 65% of cases travelled to visit friends and relatives mainly in the Indian sub-continent, 20% travelled abroad for a holiday and 7% were new entrants to the UK (figure 4).

Non-travel-associated cases

Five cases in the fourth quarter had not travelled abroad within 28 days of developing symptoms. Two of these cases had travelled to an endemic country but not in the previous 28 days before onset. One case had a household visitor from an endemic country and one case lived in the same household as a confirmed case. The remaining case had no possible sources of infection that were identified.

Data sources and acknowledgements

Data were collated and analysed by the Travel and Migrant Health Section, Centre for Infectious Disease Surveillance and Control, Colindale. Laboratory data were provided by the PHE Salmonella Reference Service, Colindale. Other surveillance data were provided by Environmental Health Officers and local health protection colleagues in the PHE through enteric fever enhanced surveillance.

References

1. Enhanced surveillance of enteric fever. PHE health protection website: Infections A-Z › Travel health › General Information › Enhanced surveillance of enteric fever

2. Enteric fever surveillance quarterly report (England, Wales and Northern Ireland): third quarter 2013. *HPR* **7**(46), 8 November 2013. Archived enteric routine data reports: http://www.hpa.org.uk/hpr/archives/Infections/2013/enteric13.htm.

3. National Travel Health Network and Centre (NaTHNaC) website: http://www.nathnac.org/.

Infection reports

Volume 8 Number 6 Published on: 14 February 2014

Zoonoses

Common animal associated infections quarterly report (England and Wales): fourth quarter 2013

This quarterly report, produced by the Emerging Infections and Zoonoses Section at Public Health England Centre for Infectious Disease Surveillance and Control, and the Health Protection Division of Public Health Wales, summarises confirmed cases of zoonoses reported in England and Wales between October and December 2013 (fourth quarter; weeks 40-52).

Animal associated infections in England and Wales: laboratory reports to LabBase (unless otherwise specified) by specimen date, weeks 40-52/13

Disease (Organism)	Reports for weeks 01-13		Reports for weeks 14-26		Reports for weeks 27-39		Reports for weeks 40-52	
	2013*	2012	2013*	2012	2013*	2012	2013*	2012
Anthrax *(Bacillus anthracis)*	1	–	–	–	–	3	–	2
Brucellosis ** *(Brucella spp.)*	1	1	6	1	6	4	–	2
Hepatitis E **	147	120	155	164	181	138	193	157
Hydatid ** (*Echinococcus granulosus*)	3	2	4	1	3	2	1	2
Leptospirosis ** *(Leptospira spp.)*	14	5	5	10	18	31	10	25
Lyme borreliosis ** (*Borrelia burgdorferi*)	106	99	202	254	401	437	221	250
Pasteurellosis *(Pasteurella spp)*	136	123	168	140	149	150	125	122
Psittacosis (*Chlamydophila psittaci)*	7	10	5	6	7	5	10	6
Q-fever *(Coxiella burnetii)*	8	28	12	34	11	38	13	14
Toxoplasmosis**# *(Toxoplasma spp.)*	70	76	86	83	72	66	83	86

* Provisional data; ** Enhanced surveillance system; # Based on date specimen received.

Anthrax

There were no cases reported in the fourth quarter of 2013.

Brucellosis (data from the Brucella Reference Laboratories)

There were no reports of Brucella confirmations during the fourth quarter of 2013, compared with two during the fourth quarter of 2012. This brings the total number of cases in 2013 to 13.

Hepatitis E (data from Public Health Laboratory Birmingham, and Blood Borne Virus Unit Colindale)

There were 193 cases of Hepatitis E in the fourth quarter of 2013 compared to 157 in the same quarter of 2012. This gives a total of 676 cases for 2013, which is consistent with the on-going increase in cases observed since 2010 [1].

One hundred and seventeen cases (61%) were male (aged 22-91 years, median 61) and 76 were female (aged 20-93 years, median 63). Older men predominate and this is a persisting observation, although the excess remains unexplained. Cases were reported from all regions. The majority of cases (72%, n=138) had no apparent travel history.

Hepatatis E (England and Wales, weeks 40-52/13)

Age group	Male	Female	Total
0-14	–	–	–
15-24	2	4	6
25-44	19	14	33
45-64	50	26	76
≥65	46	32	78
Total	**117**	**76**	**193**

Hydatid disease (data from the Parasitology Reference Laboratory)

There was one case of cystic echinococcosis reported during the fourth quarter of 2013, compared to two reported in the fourth quarter of 2012. This brings the total number of cases reported in 2013 to 11.

The case in the fourth quarter of 2013 was a 34 year old female. She is understood to have been born overseas and to have had exposures unrelated to her residence in the UK.

Leptospirosis (data from the Leptospira Reference Unit)

There were 10 cases of leptospirosis reported in the fourth quarter of 2013, compared with 25 in the fourth quarter of 2012. This brings the total number of cases reported in 2013 to 47.

Of the 10 cases reported in the fourth quarter, five were acquired in the UK and five were acquired overseas. Four of the autochthonous cases occurred in males aged 44 to 64 years, one of whom died, and one case occurred in a female aged 42 years (median age of the five cases was 56 years). *Leptospira* Icterohaemorrhagiae was identified in one case, while the infecting serovar was not determined for the others. One case lived on a canal boat and contracted leptospirosis following immersion, one was exposed to a stream at the bottom of his garden and one case followed exposure at a rubbish re-cycling site; exposures for the other two cases were not recorded. Two of the cases were confirmed by PCR in addition to serological diagnosis.

The five cases acquired overseas all occurred in males (aged 21-49 years, median 37). Three reported exposures in South East Asian countries: one after swimming in a freshwater lake and caving and hiking in Borneo, one after visiting an elephant sanctuary in Cambodia, and one in a case who visited Thailand although no specific exposure was recorded. The remaining two patients were exposed in Europe: one reported walking barefoot through marshes in Spain, the

other developed his illness after fishing for eels in a Polish lake. One patient was confirmed to be infected with *L.* Icterohaemorrhagiae, whilst the serovar was not determined for the remaining four. One infection was confirmed by PCR.

Confirmations by PCR (undertaken by the Leptospira Reference Unit (LRU) and the Rare and Imported Pathogens Laboratory, Porton) remain a developmental test with limited technical validation. Clinicians are asked to submit a second specimen from the patient to the LRU, together with exposure and clinical histories, as this increases the likelihood that the infecting serovar can be identified.

Lyme disease (data from the Lyme Borreliosis Unit)

Two hundred and twenty one confirmed cases of Lyme borreliosis were reported during the fourth quarter of 2013, compared with 250 in the fourth quarter of 2012. This brings the provisional total number of cases in 2013 to 930.

The cases in the fourth quarter came from patients in all age groups; 100 were female and 111 were male (the sex was not given for 10 cases). One hundred and forty five cases were identified as being recent infections, and 76 as being previous or treated infections. Twenty four (11%) cases reported travel histories to northern European countries: France (5), Poland (4), the Czech Republic (3), Germany (2), Sweden (2) and the USA (2). Reports were received from patients in all regions of England and Wales, especially from the South of England (75) and London (38).

Pasteurellosis

One hundred and twenty five cases of pasteurellosis were reported in the fourth quarter of 2013, compared with 122 in the fourth quarter of 2014: *Pasteurella multocida* (84 cases, 67.2%), *Pasteurella pneumotropica* (7 cases, 5.6%), *Pasteurella canis* (two cases, 1.6%) and *Pasteurella* sp. (32 cases, 25.6%). This brings the total number of cases in 2013 to 578.

In the fourth quarter, 61 of the cases were male (0-90 years, median 55) and 63 were female (0-94 years, median 54). No deaths were reported. The South of England reported the most cases (38), and Wales reported the fewest (6). Of the 21 cases giving an animal exposure, thirteen reported cat bites and eight reported dog bites.

Pateurellosis, England and Wales: weeks 40-52/13

Age group	Male	Female	Total
0-14	4	4	1
15-29	6	3	–
13-39	7	7	–
40-49	7	13	–
50-59	13	9	–
60-69	13	12	–
70-79	7	8	–
≥80	4	7	–
Total	**61**	**63**	1

Psittacosis

Ten cases of psittacosis were diagnosed in the fourth quarter of 2013, compared with six during the fourth quarter of 2012. This brings the total number of cases in 2013 to 29. Seven of the cases from the fourth quarter of 2013 were male (aged 37-84, median 53) and three were female (aged 35-56 years, median 42). Seven of the cases were from the South of England, two from the Midlands and East of England, and one from Wales.

Note: Serological tests for respiratory chlamydophila infections cannot consistently distinguish psittacosis. The cases reported above have been identified by reporting laboratories as infection with *Chlamydia psittaci*.

Q fever (data from the Rare and Imported Pathogens Laboratory, Porton, and Bristol Reference Laboratory)

Thirteen cases were reported in the fourth quarter of 2013, compared with 14 in the fourth quarter of 2012. This brings the total number of cases in 2013 to 44, a substantial decrease from the 114 cases reported during 2012.

Five cases were female (aged 3-70 years, median 64) and eight were male (aged 23-76, median 65.5). Five cases were reported by the North of England, three each by the South of England and London, and one each by Wales and the Midlands and East of England regions.

Toxoplasma (data from the Toxoplasma Reference Unit)

There were 83 cases of toxoplasmosis infection reported in the fourth quarter of 2013, compared with 86 in the fourth quarter of 2012. This brings the total number of cases for 2013 to 311 (see table below.

Nine of the cases in the fourth quarter of 2013 reported ocular symptoms. Twelve cases occurred in pregnant women and one congenital case was reported (forming a mother-child pair with one of the pregnant cases) (see table below, following page).

***Toxoplasma gondii* diagnoses by age group: weeks 40-52/2013**

Age group	Male	Female	Unknown	Total
Foetus	–	–	–	**–**
0	1	–	–	**1**
1-9	–	–	–	**–**
10-14	1	–	–	**1**
15-24	4	3	–	**7**
25-44	20	20	2	**42**
45-64	8	15	3	**26**
≥65	2	2	–	**4**
Unknown	–	–	2	**2**
Total	**36**	**40**	**7**	**83**

***Toxoplasma gondii* diagnoses by status: weeks 40-52/2013**

Age group	Status								Total: wks 40-52/13
	Con-genital	Preg-nant	HIV	Organ donor	Organ recipient	Other (Immuno-competent)	Other (Immuno-suppressed)	Un-known*	
Foetus	–	–	–	–	–	–	–	–	–
0	1	–	–	–	–	–	–	–	**1**
1-9	–	–	–	–	–	–	–	–	–
10-14	–	–	–	–	–	–	–	1	**1**
15-24	–	1	2	–	–	2	1	1	**7**
25-44	–	11	4	–	1	16	–	10	**42**
45-64	–	–	4	–	4	16	–	2	**26**
≥65	–	–	–	–	1	2	–	1	**4**
Unknown	–	–	2	–	–	–	–	–	**2**
Total	**1**	**12**	**12**	**–**	**6**	**36**	**1**	**15**	**83**

* No clinical details or information given.

Other zoonotic organisms

Other zoonotic infections of interest diagnosed in the fourth quarter of 2013 were as follows:

- Six cases of *Capnocytophaga* infection, of which one was speciated as *C. ochracea.* Two infections were in females aged 52 and 71 years, and four were in males aged 48 – 68 years (median 59). All the infections were bacteraemias;
- Two cases of *Erysipelothrix rhusiopathiae*, one in a male aged 47 and one in a female aged 78 years. Both had tissue infections;
- Three cases of *Mycobacterium marinum,* one in a female aged 58 and two in males aged 24 and 42 years. All had tissue infections;
- One case of *Streptobacillius moniliformis* in a 29 year old male with a bacteraemia who had exposure to pet and potentially wild rats;
- One case of *Streptococcus zooepidemicus* in a 71 year old male with an unspecified joint infection.

Reference

1. PHE health protection website: http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/HepatitisE/Surveillance/.

Infection reports

Volume 8 Number 6 Published on: 14 February 2014

Emerging infections/CJD

CJD biannual update (2014/1), with briefing on novel human prion disease

This six-monthly report provides an update on the enhanced surveillance of potential iatrogenic (healthcare-acquired) exposures to Creutzfeldt-Jakob Disease (CJD). The data is correct as at 31 December 2013. For numbers of CJD case reports, readers should consult data provided by the National CJD Research and Surveillance Unit (NCJDRSU, http://www.cjd.ed.ac.uk/data.html). A briefing on a recently-identified human prion disease – Variably Protease-Sensitive Prionopathy – is also presented below.

Monitoring of patients 'at increased risk' of CJD

Individuals who have been identified as at increased risk of CJD as a consequence of their medical care are informed of their exposure and asked to follow public health precautions to avoid potentially transmitting the infection to others. They are also followed-up to help determine the risks of CJD transmission to patients through different routes and to ascertain whether any people who may have been exposed to increased CJD risks go on to develop CJD.

Public health follow-up activities include clinical monitoring, general practitioner (GP) updates, and post mortem investigations to determine whether asymptomatic individuals in these groups have been infected with the CJD agent. Some individuals also provide blood or tissue specimens for research purposes. A number of different organisations are involved in these activities: Public Health England (formerly the Health Protection Agency), Health Protection Scotland (HPS), UCL Institute of Child Health/Great Ormond Street Hospital (ICH), NHS Blood and Transplant (NHSBT), National CJD Research and Surveillance Unit (NCJDRSU), National Prion Clinic (NPC), and the UK Haemophilia Centre Doctors' Organisation (UKHCDO).

The PHE CJD Section coordinates the collation of data on individuals identified as at increased risk of CJD, and who have been informed of this. These individuals are followed up through public health monitoring and research activities by different organisations (table 1).

The PHE CJD Section currently holds data on the following groups of ‘at risk' patients:

- recipients of blood components from donors who subsequently developed vCJD
- blood donors to individuals who later developed vCJD
- other recipients of blood components from these blood donors
- recipients of certain plasma products between 1990 and 2001 (non-bleeding disorder patients)
- certain surgical contacts of patients diagnosed with CJD
- highly transfused recipients.

Data on the following risk groups are not held by PHE, but are held by other organisations:

- bleeding disorder patients who received plasma products between 1990 and 2001 (UKHCDO)
- recipients of human derived growth hormone before 1985 (ICH)
- patients who could have received a dura mater graft before August 1992 (data not currently collected)
- people who have been treated with gonadotrophin sourced from humans before 1973 (data not currently collected)
- family risk of genetic prion disease (NPC).

The data from the UKHCDO are likely to be an underestimate of the true number of ‘at risk' patients with bleeding disorders who received UK-sourced clotting factors, as there was incomplete reporting of identified ‘at risk' patients by haemophilia centres to the UKHCDO database. Notified ‘at risk' patients are given the option of removing their details from the UKHCDO database, and are then removed from the ‘at risk' totals.

The data on ‘at risk' patients who received human-derived human growth hormone held by the ICH is a slight underestimate of the total as a small number of these patients are not included in the ICH follow-up.

Table 1. Summary of all ‘at risk’ groups on which data are collected (as at 31 December 2013)

'At risk' Group	Identified as 'at risk'	Number notified as being 'at risk'		Cases	Asymptomatic infections [b]
		All	Alive		
Recipients of blood from who later developed vCJD	67	27	15	3	1
Blood donors to who later developed vCJD	112	107	104	–	–
Other recipients of blood components from these donors	34	32 [c]	19 [c]	–	–
Plasma product recipients (non-bleeding disorders) who received UK sourced plasmsa products 1980-2001	11	10	4	–	–
Certain surgical contacts of patients diagnosed witih CJD	154	129 [d]	113 [e]	–	–
Highly transfused patients	11	10	6	–	–
Total for 'at risk' groups where PHE holds data	**389**	**315** [f]	**261** [f]	**3**	**1**
Patients with bleeding disorders who received UK-sourced plasma products 1980-2001 [a]	3,875	National information incomplete	National information incomplete	–	1
Recipients of human-derived growth hormone [a]	1,883	1,883	1,504	75	–
Total for all 'at risk' groups [a]	**6147**	**At least 2198**	**At least 1765**	**78**	**2**

a. These are minimum figures. Central reporting for bleeding disorder patients is incomplete, and seven patients have opted out of the central UK Haemophilia Centre Doctors' Organisation database. A small number of ‘at risk’ growth hormone recipients are not included in the Institute of Child Health study. Not all of ‘at risk’ growth hormone recipients have been notified. There is no central record of who has been informed.
b. An unsymptomatic infection is when an individual does not exhibit any of the signs and symptoms of CJD in life but abnormal prion protein indicative of CJD infection has been found in tissue obtained from them. In these cases the abnormal prion protein was identified during post mortem after the individuals had died of other causes.
c. One patient notified by proxy. d. Four of these notified by proxy. e. Two of these notified by proxy. f. Includes patients notified by proxy.

Variably Protease-Sensitive Prionopathy

Professor James W Ironside and Dr Mark W Head,

The National CJD Research and Surveillance Unit, University of Edinburgh.

Variably protease-sensitive prionopathy (VPSPr) is the most recently identified human prion disease, first described in the USA by Gambetti *et al*. in 2008 as “a novel human disease with abnormal prion protein sensitive to protease” [1]. Since then, similar cases have been identified in other countries; the National CJD Research and Surveillance Unit has identified nine cases in the UK, three of which have been identified retrospectively and the others prospectively from samples and data collected since 1991 [2-6]. Other candidate cases are currently under investigation.

Patients with VPSPr have no identified risk factors for acquired human prion disease and no associated mutations in the prion protein gene (PRNP) coding sequence have been found. In the original description a proportion of the patients had family histories of ill-defined dementia, but this has not been a feature in more recently identified cases [1,2,6]. VPSPr affects patients in the same age range as sporadic Creutzfeldt-Jakob disease (sCJD), occurring mostly in patients over the age of 60. The clinical features are more varied than in sCJD and include movement abnormalities, cognitive decline and unsteadiness while walking. The clinical illness is longer than for sCJD; most patients survive for over a year before succumbing to the illness. Diagnostic clinical criteria are therefore difficult to establish, and further work is required on this topic since this disease is likely to be under-ascertained [2,6].

Like sCJD, VPSPr occurs in all genetic groups defined by the polymorphism at codon 129 in the PRNP gene, ie MM, MV and MV. Unlike sCJD, there is a preponderance of the codon 129-V haplotype. VPSPr has distinctive neuropathological features, the most typical of which are microplaques that occur in a target-like arrangement and are particularly common in the cerebellum. These microplaques show differential staining with a panel of different anti-PrP antibodies, allowing a distinction from both the common sCJD VV2 and the rare sCJD VV1 subtypes [1,2,5,6]. The most distinctive and defining feature of VPSPr is the biochemistry of the abnormal prion protein in the brain, which is only poorly resistant to proteolytic digestion, yielding a low abundance, truncated 8kDa (approx) band in Western blot assays [1]. This fragment is often accompanied by a faint ladder of bands extending into the 18-30kDa range [1,2]. Some cases of VPSPr also show a sCJD-like pattern on Western blot analysis for abnormal prion protein, often in the cerebellum, suggesting molecular overlaps between VPSPr and sCJD [6,7].

Further work is required to fully establish the epidemiology, clinical and pathological diagnostic criteria and transmission characteristics of VPSPr. The Advisory Committee on Dangerous Pathogens Transmissible Spongiform Encephalopathy (ACDP TSE) Subgroup concluded that until further research can demonstrate how transmissible VPSPr may be, it would be advisable to add this novel form of human prion disease to the infection control guidance for CJD and other related disorders.

References

1. Gambetti P, Dong, Yuan J, *et al*. A novel human disease with abnormal prion protein sensitive to protease. *Ann Neurol* 2008; **63**: 697-708.
2. Zou WQ, Puoti G, Xiao X, *et al*. Variably protease-sensitive prionopathy: A new sporadic disease of the prion protein. *Ann Neurol* 2010; **68**: 162-72.
3. Head MW, Knight R, Zeidler M, *et al*. A case of protease sensitive prionopathy in a patient in the United Kingdom. *Neuropathol Appl Neurobiol* 2009; **35**: 628-32.
4. Jansen C, Head MW, van Gool WA, *et al*. The first case of protease-sensitive prionopathy (PSPr) in The Netherlands: a patient with an unusual GSS-like clinical phenotype. *J Neurol Neurosurg Psychiatry* 2010; **81**: 1052-5.
5. Head MW, Lowrie S, Chohan G, *et al*. Variably protease-sensitive prionopathy in a PRNP codon 129 heterozygous UK patient with co-existing tau, a synclein and Aß pathology. *Acta Neuropathol* 2010: **120**: 821-3.
6. Head MW, Yull HM, Ritchie DL, *et al*. Variably protease-sensitive prionopathy in the UK: a retrospective review 1991-2008. *Brain* 2013; **136**: 1102-15.
7. Rodriguez-Martinez AB, de Munain AL, Ferrer I, *et al*. Coexistence of protease sensitive and resistant prion protein in 129 VV homozygous sporadic Creutzfeldt-Jakob disease. *J Med Case Rep* 2012; **6**: 348.