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Prenatal pertussis immunisation programme 2014/15:
Annual vaccine coverage report for England

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Contents

Background

Background to the pertussis vaccination in pregnancy programme

In the UK the introduction of routine national immunisation against pertussis (whooping cough) in 1957 resulted in a marked reduction in pertussis notifications and deaths [1]. Despite a sustained period of high vaccine coverage since the early 1990s, pertussis has continued to display 3−4 yearly peaks in activity. In the five years prior to 2012, on average, there were nearly 800 confirmed cases of whooping cough, 270 babies admitted to hospital and four deaths in babies each year [Health Protection Agency (HPA) unpublished reconciled data]. The highest disease incidence occurs in infants under three months of age who are too young to have completed the primary vaccine course and have the greatest risk of complications and death. In 2012, pertussis activity increased beyond levels reported in the previous 20 years and extended into all age groups, including infants less than three months of age. This young infant group is considered a key indicator of pertussis activity [2], and the primary aim of the pertussis vaccination programme is to minimise disease, hospitalisation and death in young infants.

A national outbreak (level 3 incident) was declared in April 2012 by the HPA to coordinate the response to increased pertussis activity [3]. In response to this on-going outbreak, the Department of Health announced that pertussis immunisation would be offered to pregnant women from 1 October 2012 to protect infants from birth while disease levels remain high [4]. This programme aims to passively protect infants from birth, through intra-uterine transfer of maternal antibodies, until they can be actively protected by the routine infant programme with the first dose of pertussis vaccine scheduled at eight weeks of age [5].

Pertussis activity in England persists at raised levels compared with the years preceding the outbreak in 2012 [6]. The greatest reduction in disease since the peak in 2012 has been in infants under six months of age who are targeted by the maternal pertussis vaccination programme. Disease incidence has, as expected, continued to be highest in this age group but case reports are now in line with those seen before the 2012 peak. Up to 31 March 2015, 11 deaths have been reported in young babies with confirmed pertussis who were born after the introduction of the pregnancy programme on 1 October 2012. Ten of these 11 babies were born to mothers who had not been vaccinated against pertussis [6].

A UK study examining the safety of pertussis vaccination in pregnancy found no evidence of an increased risk of any of an extensive predefined list of adverse events related to pregnancy for women given pertussis vaccination in the third trimester [7]. Two studies using different methods have each shown that babies born to mothers

vaccinated at least seven days before delivery had a reduced risk of pertussis disease, of around 90%, in their first few weeks of life when compared with babies whose mothers had not been vaccinated [8, 9]. In July 2014 the Joint Committee on Vaccination and Immunisation (JCVI) considered available data relating to the coverage, effectiveness and safety of the programme, its impact on disease and current epidemiology, and advised that the programme should continue for a further five years [10]. This includes the continuation of all surveillance activities introduced to monitor the programme.

All PHE documents relating to the prenatal pertusiss vaccination programme – including training slide-sets, patient leaflets and factsheets – are accessible via the PHE Pertussis Vaccination Programme for Pregnant Women series webpages [5].

Public Health England's Immunisation Information for Health Professionals home page can be found here: http://www.gov.uk/government/organisations/public-health-england/series/immunisation

Methods

Vaccine coverage data collection

Since the introduction of the programme in October 2012, monthly vaccine coverage data for pertussis vaccination in pregnancy in England has been collected from GP records via the ImmForm website[1] and been monitored, validated and analysed by PHE. Initially this was a manual collection, but from April 2014 an automated collection was developed extracting data from participating general practice (GP) clinical systems with minimal or no burden to the NHS [11]. The automated monthly surveys capture data on the number of women who delivered in the survey month at more than 28 weeks gestational age (denominator), and the number of these women who received a dose of pertussis-containing vaccine in the preceding fourteen weeks (numerator). The monthly survey data extractions are run on the 21st of the month following the evaluation month, allowing a minimum of three weeks for a delivery date to be recorded in the mother's GP record in order for her to be included in the denominator. These data are published regularly in the Health Protection Report with the latest report presenting data up to 31 May 2015 [12].

The accuracy of the data extracted is reliant on GPs ensuring all women in their practice who have given birth have dates of delivery, dates of receipt of a pertussis-containing vaccine at or after 28 weeks of pregnancy (regardless of where vaccine was administered), and where relevant any record of a premature delivery occurring at less than 28 gestational weeks, recorded using the correct READ codes (guidance is available at http://www.nottingham.ac.uk/primis/documents/audit-docs/codingpertussisvac.pdf).

A new retrospective annual collection was undertaken for the period 1 April 2014 to 31 March 2015, with the aim of providing a more complete assessment of vaccine coverage and validation of the monthly surveys. The annual survey was also an automated sentinel collection of data from GP practices where data was extracted between 1 and 11 May 2015. Data from this collection is reported here.

Like the monthly survey, the annual survey collected data on:

- number of women who delivered in the survey month at more than 28 weeks gestational age (denominator)
- number of women receiving pertussis vaccination in the 14 weeks prior to delivery (numerator 1)
- number of women declining pertussis vaccination in the 14 weeks prior to delivery who have not been vaccinated (numerator 2)

[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)

The annual collection captured the following new information:

- additional eligible women whose delivery dates were entered after the monthly collection deadlines
- information on the healthcare setting where the vaccination was administered: *vaccinations given by other health care providers in the 14 weeks prior to delivery* (numerator 3)
- ethnicity of the women included in the survey

In order to allow for direct comparison with the monthly survey, the annual survey data was broken down by the 12 months in the year. In addition to the denominator and numerators described above, the automated survey also extracted the number and percentage of GP practices responding each month.

Results

Data quality and caveats

GP practice participation in the annual survey was high at 94.1%, only marginally lower than that reported in the equivalent monthly surveys (96.9%), and ranged by area team (AT) from 90.6% in Kent and Medway to 99.6% in Lancashire (Appendix I).

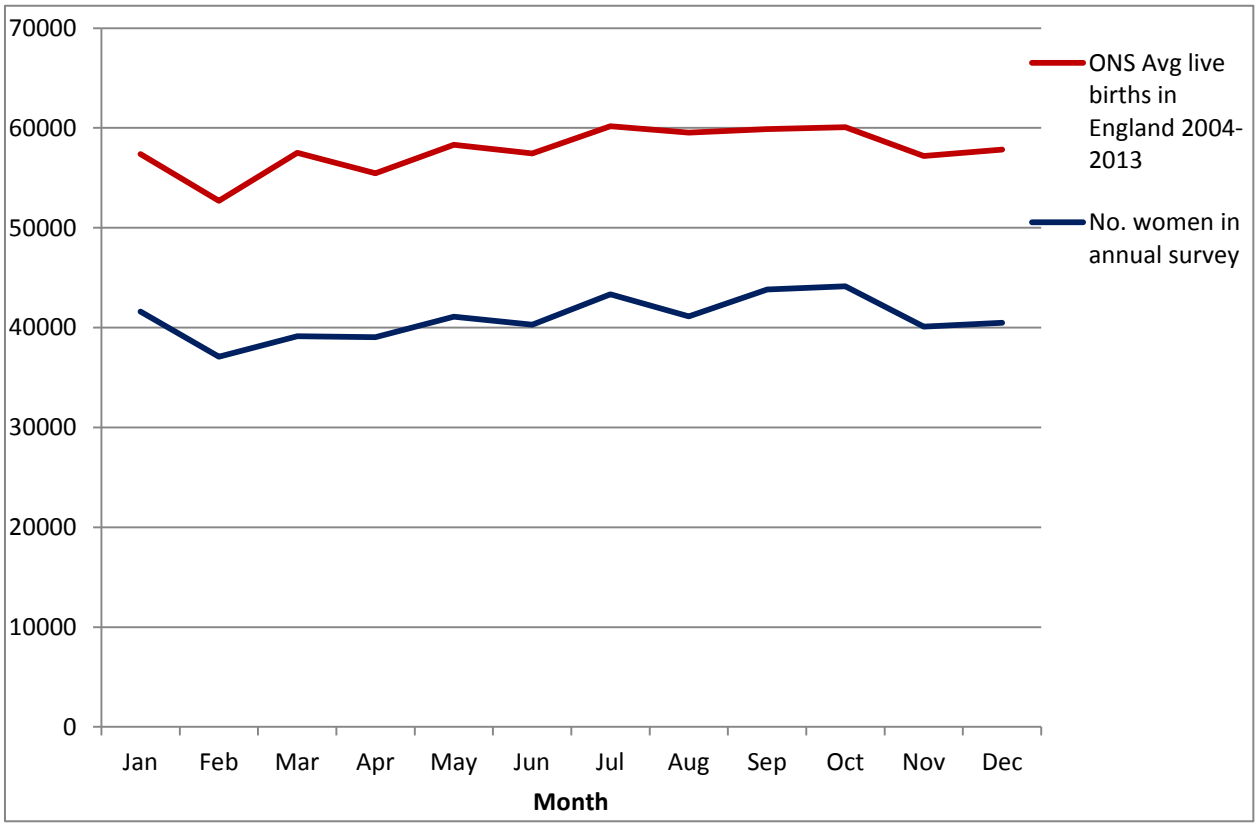
Data from one of the four GP IT suppliers, representing 1.1% of the denominator, were found to be unreliable in this collection, with the number of women captured who were vaccinated being significantly lower than that captured in the equivalent monthly surveys. We are investigating this so that it can be corrected going forward; however, these data have been excluded from subsequent figures presented in this report.

Using data from the remaining three suppliers, a total of 491,218 vaccine eligible women were captured in the annual survey denominator, which is 105,237 more than the number captured in monthly surveys. This difference increased the denominator − obtained through annual, as opposed to monthly surveys − from 55.7% to 70.1% of the ONS average number of live births in England from 2004−13 [14].

However quality audits of both the annual and monthly surveys have indicated that women can be counted in more than one survey month if practices erroneously record multiple delivery dates for a woman which fall in different months, thus inflating the denominator. Furthermore, this could lead to an underestimation of vaccine coverage, if the date of vaccination is more than 14 weeks before the recorded date of delivery, as these women would then be classified as unvaccinated. Ethnicity is captured only once in the dataset and can therefore be used to estimate the size of the de-duplicated denominator. Based on data from the largest of the four GP IT suppliers it is estimated that the denominator is overestimated by about 12% in the annual survey. Therefore,

the actual denominator captured by this sentinel collection is in the region of 62% of antenatal women in the national population (Figure 1). There are small seasonal fluctuations in the average number of live births recorded over the past ten years and monthly variations in the survey denominator closely mirror that seasonal variation.

Figure 1. No. of women who delivered in each survey month at more than 28 weeks gestational age in the annual April 2014 to March 2015 collection, compared with ONS average live births 2004 to 2013, England



Only one GP IT supplier was able to extract complete ethnicity data, where every woman in a practice had been assigned an ethnicity code or coded as ‘not stated’ when ethnicity was not recorded. Therefore only data from this GP IT supplier were included in the ethnicity analysis, representing 53.4% of participating GP practices, although this varied by AT (Table 1) from 17.1% in the West Yorkshire AT to 99.1% of GPs in the Lancashire AT. Overall, women from these practices equated to 48.2% of the denominator. An ethnic group was assigned for 70.4% of these women (Table 2), representing just a third of eligible women overall in the annual dataset. Due to these limitations the ethnicity data should be interpreted with caution.

Table 1. GP practice participation from the one IT supplier extracting ethnicity data for the annual prenatal pertussis vaccine coverage collection by Area Team: England, April 2014 to March 2015

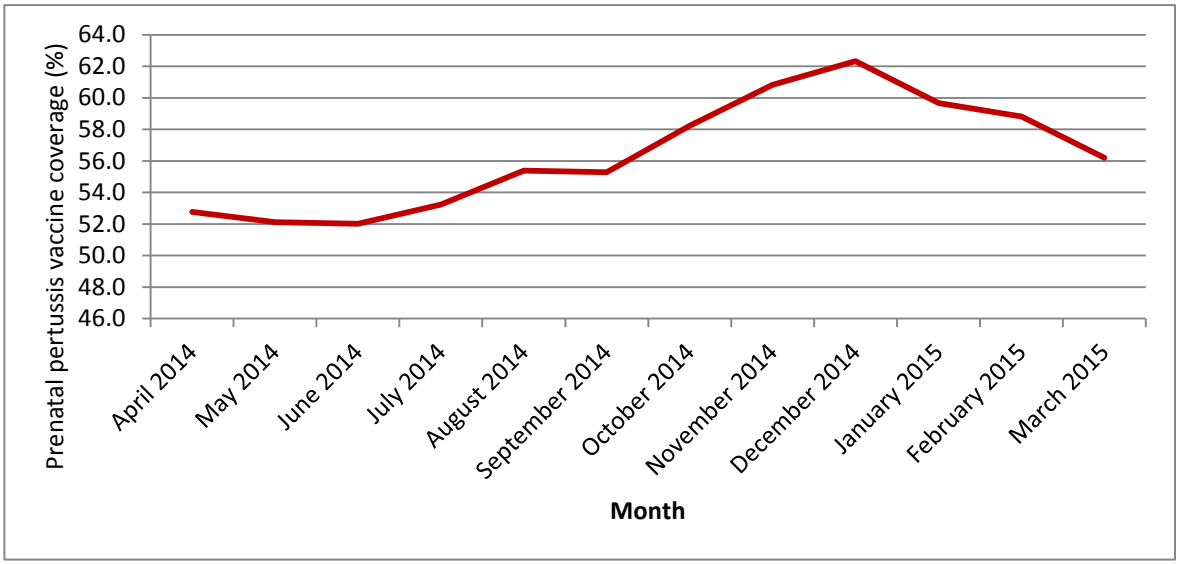
Area Team	Total no. of GP practices participating in the survey	No. of GP practices from one IT supplier with ethnicity data	% GPs participating with ethnicity data
Cheshire, Warrington & Wirral (Q44)	158	128	81.0
Durham, Darlington & Tees (Q45)	165	31	18.8
Greater Manchester (Q46)	459	272	59.3
Lancashire (Q47)	227	225	99.1
Merseyside (Q48)	216	205	94.9
Cumbria, Northumberland, Tyne & Wear (Q49)	289	228	78.9
North Yorkshire & Humber (Q50)	226	70	31.0
South Yorkshire & Bassetlaw (Q51)	215	71	33.0
West Yorkshire (Q52)	328	56	17.1
Arden, Herefordshire & Worcestershire (Q53)	214	178	83.2
Birmingham & the Black Country (Q54)	429	283	66.0
Derbyshire & Nottinghamshire (Q55)	265	65	24.5
East Anglia (Q56)	278	73	26.3
Essex (Q57)	264	47	17.8
Hertfordshire & the South Midlands (Q58)	305	89	29.2
Leicestershire & Lincolnshire (Q59)	242	70	28.9
Shropshire & Staffordshire (Q60)	225	183	81.3
Bath, Gloucestershire, Swindon & Wiltshire (Q64)	190	45	23.7
Bristol, North Somerset, Somerset & South Gloucestershire (Q65)	176	170	96.6
Devon, Cornwall &Isles of Scilly (Q66)	218	47	21.6
Kent & Medway (Q67)	232	113	48.7
Surrey & Sussex (Q68)	330	188	57.0
Thames Valley (Q69)	225	179	79.6
Wessex (Q70)	305	158	51.8
London (Q71)	1376	888	64.5
England	**7557**	**4062**	**53.8**

Vaccine coverage

Overall annual vaccine coverage averaged 56.4%, marginally lower than that reported through the monthly surveys for the same period (56.8%), although this difference varied by delivery month and followed the same seasonal pattern as that reported in the monthly surveys [12]. Coverage was highest in the winter months with a peak of 62.3%

in December 2014 (Figure 2) which tailed off in the spring and summer months, with lowest coverage reported at 52.0% in June 2014 .

Figure 2. Prenatal pertussis vaccine coverage in England, April 2014 to March 2015



Average coverage over the 12 months varied by AT (Appendix II), from a low of 46.2% in London to a high of 65.7% in Derbyshire and Nottinghamshire. The seasonal fluctuation in coverage was also reflected at the AT level. In December 2014, 22/25 ATs achieved coverage ≥60% and five ATs (Cumbria, Northumberland, Tyne and Wear; West Yorkshire; Derbyshire and Nottinghamshire; Bath, Gloucestershire, Swindon and Wiltshire; and Cheshire, Warrington and Wirral) achieved coverage greater than 70%. Three ATs consistently reported coverage below the national average across all survey months (London; Birmingham and the Black Country; and Greater Manchester).

On average, 0.3% of eligible women offered the vaccine declined (Appendix III), ranging from 0.1% to 0.8% by AT. This figure is consistent with that noted in the monthly surveys; however, it is much lower than the 4.1% decline rate reported among pregnant women for the seasonal influenza programme [15].

Data on the subset of women vaccinated through ‘other health care providers’ was only available from one GP IT supplier, representing 34.3% of GP practices and 36.8% of women in the survey. Four ATs have no GP practices that use that IT supplier and for the other 21 ATs, this IT supplier captured between 1.9% and 82.5% of the population; therefore, geographical comparisons within England are limited (Appendix IV). Among women captured through this IT system, on average 3.7% of those eligible, ranging from 2.7% to 5.9% by AT, were immunised by other health care providers.

Ethnicity data

Vaccine coverage varied considerably by ethnic group with an uptake difference of about 25% between the ethnic group with the highest and the group with the lowest uptake (Table 2). Women of white-British ethnicity had the highest coverage at 62.4%, closely followed by women of Chinese (62.0%), Indian (59.8%) and Bangladeshi (57.1%) ethnicity. All other ethnic groups had lower coverage than the 56.4% average. Women from Black 'other' and Black Caribbean ethnicities had the lowest vaccine coverage at 37.2% and 39.1%, respectively.

Table 2. Prenatal pertussis vaccine coverage by ethnic group for pregnant women delivering at more than 28 weeks gestational age, April 2014 to March 2015 (ranked by coverage)

Ethnic group	No. of women*	No. vaccinated	% Uptake
White − British	97093	60545	62.4
Other ethnic groups − Chinese	1784	1106	62.0
Asian or Asian British − Indian	6886	4119	59.8
Asian or Asian British − Bangladeshi	4823	2753	57.1
Asian or Asian British − Any other Asian	4767	2635	55.3
White − Irish	1005	548	54.5
Mixed − White and Asian	754	404	53.6
White − Any other White background	23899	11641	48.7
Mixed − Any other mixed background	1301	628	48.3
Asian or Asian British − Pakistani	7613	3672	48.2
Mixed − White and Black Caribbean	1011	468	46.3
Black or Black British − African	6739	3011	44.7
(Mixed − White and Black African	1003	442	44.1
Other ethnic groups − Any other ethnic group	4193	1771	42.2
Black or Black British − Caribbean	1754	685	39.1
Black or Black British − Any other Black	1946	724	37.2
Ethnicity not given − patient refused	328	172	52.4
Ethnicity not recorded/stated	69747	40761	58.4
Total	**166571**	**95152**	**57.1**

**These data are from only one of four GP IT suppliers and represent 48% of women captured in this survey.*

The ethnicity data are experimental and should be interpreted with caution. In particular the representativeness of ethnic groups in the denominator is questionable. There are

no ONS datasets on ethnicity of pregnant women to which this data can be compared. Live births data indicate that in 2014, 27% of births were by mothers born outside of the UK; however, this data cannot be used as a proxy for ethnic group. Overall, practices in the London AT comprised a quarter of the denominator used to examine ethnicity, but because of the high ethnic diversity in London this data represented 52% of women of ethnicity other than white-British in the sample overall. This ranged by ethnic group from 29.6% (Pakistani) to 72.4% (Bangladeshi) of women of these ethnicities in the sample overall. As vaccine coverage is lowest in London, the overall coverage in these over-represented groups may be artificially under-estimated due to this geographical bias. However, when coverage is examined by ethnicity collectively for all areas outside London AT, Black ‘other’ and Black Caribbean ethnicities remain the groups with the lowest coverage, albeit at higher rates of 41.5% and 46.1%, respectively.

Discussion

Completeness and accuracy of prenatal pertussis vaccine coverage data is reliant on the timely and correct recording of delivery dates in mothers' medical records. The annual survey captured 105,000 (10%) more women than the monthly survey, which demonstrates that there is a delay in GP practices updating medical records with the delivery date. Comparison of the annual survey data with national live births indicates however that despite 94% of GP practices participating in the survey the denominator still comprises only about 60% of all pregnant women eligibile for the prenatal pertusis vaccine. Furthermore recording of incorrect delivery dates, for example by using the date that the delivery was notified to the GP practice, can also lead to an underestimation of vaccine coverage. If coverage, and ultimately the impact of the programme itself, is to be accurately monitored, it is essential that GPs and practice nurses ensure that vaccination and date of delivery are accurately recorded in the patient's GP record in a timely manner.

The increase in coverage between September and December coincides with the delivery of the seasonal influenza vaccination programme, which also targets pregnant women [15]. During the flu campaign GP practices may actively call and recall eligible patients, which should include pregnant women, and this may be having aknock-on effect on pregnant women at the appropriate stage of pregnancy being offered pertussis vaccine at the same time. The fact that some ATs achieve more than 70% coverage in the peak uptake month of December 2014, demonstrates that it is possible to achieve uptake significantly higher than the national average.

The availability of data on women vaccinated by other health care professionals was limited to just one of four IT suppliers in this survey. The data indicated that 3.3% of vaccinations were delivered to pregnant women by other providers, likely midwifery services, which is higher than the 2.2% recorded for the flu programme [15]. It is important that vaccinations given elsewhere are recorded in the individual's electronic GP record otherwise this may lead to underestimation of vaccine coverage.

Vaccine coverage varied significantly between ethnic groups with up to a 25 percentage point difference between those with highest coverage and those with the lowest coverage. Women of white-British ethnicity had the highest coverage, with those of Chinese, Indian and Bangladeshi ethnic origin exceeding average coverage.

All other ethnic groups had lower than average coverage with the lowest coverage seen in women from 'Black other' and Black Caribbean ethnicities.

These preliminary findings highlight the importance of collecting this data to describe health inequalities and help target communication and interventions to improve uptake among ethnic minorities. This data is experimental and should be interpreted with caution for the reasons outlined above. It had been reported that, following the incentivisation of ethnicity recording within primary care under the Quality and Outcomes Framework (QOF) in 2004, dramatically increased levels of ethnicity recording (over 90%) for all newly registered patients were reported [18-21]. Ethnicity was removed as an indicator from the QOF in 2010, and since then ethnicity recording may have declined, which may in part explain the low levels of ethnicity reporting in this survey. Additionally, we are aware that ethnicity is recorded using different READ codes in primary care and that some GP practices may not yet have moved to the 2001 ONS ethnicity READ Codes used in the specification.

We are working with GP IT suppliers, ImmForm and PRIMIS[1] colleagues to ensure that we can use ethnicity data extracts from all suppliers in future.

Continued support in the delivery of this important programme is being sought from service providers (GP practices and maternity units), screening and immunisation teams and health protection teams. Screening and immunisation teams should continue to update service providers on the current epidemiology of the disease, the effectiveness of the vaccination programme, and the need to maintain and improve coverage achieved. Further information on the pertussis vaccination programme for pregnant women is available here: https://www.gov.uk/government/collections/pertussis-guidance-data-and-analysis.

[1] PRIMIS are a business unit of the University of Nottingham and were commissioned by Public Health England to provide READ codes for this collection

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Appendices

Appendix I: GP practice participation in the annual prenatal pertussis vaccine coverage collection Area Team: England, April 2014 to March 2015

Area team	No of GP practices	No of GP practices	% GP's participating
Cheshire, Warrington & Wirral (Q44)	170	158	92.9
Durham, Darlington & Tees (Q45)	170	165	97.1
Greater Manchester (Q46)	493	459	93.1
Lancashire (Q47)	228	227	99.6
Merseyside (Q48)	233	216	92.7
Cumbria, Northumberland, Tyne & Wear (Q49)	301	289	96.0
North Yorkshire & Humber (Q50)	230	226	98.3
South Yorkshire & Bassetlaw (Q51)	217	215	99.1
West Yorkshire (Q52)	330	328	99.4
Arden, Herefordshire & Worcestershire (Q53)	228	214	93.9
Birmingham & the Black Country (Q54)	449	429	95.5
Derbyshire & Nottinghamshire (Q55)	268	265	98.9
East Anglia (Q56)	286	278	97.2
Essex (Q57)	268	264	98.5
Hertfordshire & the South Midlands (Q58)	313	305	97.4
Leicestershire & Lincolnshire (Q59)	251	242	96.4
Shropshire & Staffordshire (Q60)	241	225	93.4
Bath, Gloucestershire, Swindon & Wiltshire (Q64)	191	190	99.5
Bristol, North Somerset, Somerset & South	181	176	97.2
Devon, Cornwall &Isles of Scilly (Q66)	228	218	95.6
Kent & Medway (Q67)	256	232	90.6
Surrey & Sussex (Q68)	333	330	99.1
Thames Valley (Q69)	238	225	94.5
Wessex (Q70)	316	305	96.5
London (Q71)	1411	1376	97.5
England	**7830**	**7557**	**96.5**

Appendix II: Monthly prenatal pertussis vaccine coverage among women delivering at more than 28 weeks' gestational age by area team: England, April 2014 to March 2015

Area team	April 2014	May 2014	June 2014	July 2014	August 2014	September 2014	October 2014	November 2014	December 2014	January 2015	February 2015	March 2015	All Months
Cheshire, Warrington & Wirral (Q44)	59.1	58.1	57.2	61.1	59.2	62.2	66.0	70.4	72.4	70.0	66.5	65.8	64.0
Durham, Darlington & Tees (Q45)	51.8	55.1	54.7	57.6	59.0	60.1	63.7	64.1	68.2	64.2	63.3	57.5	59.9
Greater Manchester (Q46)	51.0	47.9	49.3	52.4	52.6	51.3	55.7	60.7	59.8	56.3	57.7	55.5	54.1
Lancashire (Q47)	49.8	51.9	51.0	50.2	52.4	52.3	56.3	61.5	61.2	59.3	60.0	54.0	54.9
Merseyside (Q48)	50.9	54.2	55.8	53.4	54.2	58.5	56.5	56.6	61.0	58.1	54.4	52.7	55.6
Cumbria, Northumberland, Tyne & Wear (Q49)	55.0	58.0	58.0	58.4	61.7	62.8	66.2	68.7	70.1	66.1	64.6	65.4	62.9
North Yorkshire & Humber (Q50)	56.8	54.5	60.3	61.3	62.9	64.8	66.5	67.2	69.0	68.4	65.9	63.8	63.5
South Yorkshire & Bassetlaw (Q51)	55.6	57.8	59.6	59.2	63.7	65.0	64.9	68.8	68.2	64.2	66.0	63.0	62.8
West Yorkshire (Q52)	59.5	56.5	58.1	59.7	61.9	61.7	64.8	66.9	70.3	65.9	63.7	60.6	62.5
Arden, Herefordshire & Worcestershire (Q53)	53.8	52.2	52.4	50.2	51.5	54.2	55.7	61.7	62.7	59.6	58.4	54.9	55.5
Birmingham & the Black Country (Q54)	48.1	49.2	47.4	48.6	49.9	48.5	54.2	54.3	56.1	54.6	52.6	50.3	51.1
Derbyshire & Nottinghamshire (Q55)	62.6	61.5	61.5	63.3	63.4	64.5	67.4	71.4	70.7	69.4	66.7	65.9	65.7
East Anglia (Q56)	54.3	56.6	53.6	55.7	56.4	58.3	61.2	61.2	66.1	61.4	60.9	57.9	58.6
Essex (Q57)	49.0	54.7	50.7	49.3	56.0	53.2	58.3	60.8	64.1	61.3	58.5	51.2	55.5
Hertfordshire & the South Midlands (Q58)	54.7	53.6	54.2	54.7	57.4	57.4	62.2	62.0	63.1	62.0	60.6	57.1	58.2
Leicestershire & Lincolnshire (Q59)	55.1	54.9	53.9	53.7	58.6	56.4	57.1	62.6	64.0	59.5	59.2	55.9	57.5
Shropshire & Staffordshire (Q60)	57.9	54.3	57.6	56.2	57.5	57.9	63.9	67.1	66.4	64.4	61.8	59.5	60.4
Bath, Gloucestershire, Swindon & Wiltshire (Q64)	61.6	60.7	58.3	61.3	63.1	62.5	65.7	66.1	71.0	66.3	65.7	63.9	63.7
Bristol, North Somerset, Somerset & South Gloucestershire (Q65)	52.6	54.9	54.4	54.8	53.3	54.4	59.3	62.5	65.5	61.1	61.7	56.6	57.5
Devon, Cornwall &Isles of Scilly (Q66)	58.7	53.0	56.0	51.6	57.3	57.3	56.9	62.6	63.7	60.5	56.9	57.7	57.6
Kent & Medway (Q67)	54.3	50.3	46.3	50.0	53.3	52.9	59.7	63.6	65.1	60.6	62.9	57.8	56.3
Surrey & Sussex (Q68)	56.5	55.1	51.6	55.4	57.0	54.2	58.2	58.8	62.1	60.5	63.0	59.9	57.6
Thames Valley (Q69)	55.2	52.7	53.3	52.3	58.5	58.7	58.4	63.8	63.3	59.9	60.0	57.9	57.8
Wessex (Q70)	56.8	54.2	54.1	58.3	60.3	61.8	64.2	65.3	67.8	66.0	65.4	60.5	61.2
London (Q71)	42.8	41.5	41.8	44.2	46.4	45.0	46.8	50.1	51.0	49.2	48.0	46.7	46.2
England	**52.8**	**52.1**	**52.0**	**53.2**	**55.4**	**55.3**	**58.2**	**60.8**	**62.3**	**59.7**	**58.8**	**56.2**	**56.4**

Appendix III: Monthly prenatal pertussis vaccine declined amongst women delivering at more than 28 weeks gestational age by Area Team: England, April 2014 to March 2015

Area team	April	May	June	July	August	September	October	November	December	January	February	March	All
Cheshire, Warrington & Wirral (Q44)	0.3	0.9	0.3	0.5	0.5	0.2	0.1	0.4	0.5	0.1	0.4	0.3	0.4
Durham, Darlington & Tees (Q45)	0.1	0.1	0.0	0.1	0.0	0.2	0.1	0.1	0.0	0.2	0.0	0.4	0.1
Greater Manchester (Q46)	0.2	0.2	0.5	0.4	0.5	0.4	0.2	0.2	0.4	0.3	0.3	0.1	0.3
Lancashire (Q47)	0.7	0.5	0.9	0.6	0.7	0.9	0.2	0.4	1.1	0.3	0.3	0.4	0.6
Merseyside (Q48)	0.3	0.1	0.4	0.1	0.4	0.2	0.1	0.0	0.5	0.1	0.1	0.4	0.2
Cumbria, Northumberland, Tyne & Wear (Q49)	0.4	0.7	0.4	0.7	0.2	0.3	0.1	0.2	0.4	0.5	0.4	0.5	0.4
North Yorkshire & Humber (Q50)	0.1	0.3	0.4	0.2	0.2	0.1	0.5	0.3	0.7	0.4	0.9	0.7	0.4
South Yorkshire & Bassetlaw (Q51)	0.1	0.1	0.2	0.0	0.0	0.2	0.2	0.3	0.2	0.2	0.1	0.3	0.1
West Yorkshire (Q52)	0.1	0.2	0.1	0.1	0.2	0.0	0.2	0.3	0.1	0.2	0.2	0.2	0.2
Arden, Herefordshire & Worcestershire (Q53)	0.5	0.3	0.6	0.9	0.6	0.7	0.2	0.0	0.3	0.2	0.5	0.8	0.5
Birmingham & the Black Country (Q54)	0.2	0.3	0.1	0.2	0.2	0.1	0.2	0.3	0.6	0.3	0.4	0.5	0.3
Derbyshire & Nottinghamshire (Q55)	0.4	0.1	0.5	0.1	0.6	0.3	0.2	0.1	0.1	0.4	0.2	0.2	0.3
East Anglia (Q56)	0.0	0.4	0.4	0.3	0.6	0.4	0.5	0.4	0.3	0.3	0.4	0.4	0.4
Essex (Q57)	0.0	0.1	0.2	0.1	0.1	0.2	0.1	0.0	0.1	0.2	0.3	0.2	0.1
Hertfordshire & the South Midlands (Q58)	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.3	0.3	0.3	0.2	0.2	0.2
Leicestershire & Lincolnshire (Q59)	0.2	0.3	0.1	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.3	0.3
Shropshire & Staffordshire (Q60)	1.1	1.3	0.7	0.7	0.5	0.6	0.3	0.6	1.0	1.3	1.0	0.8	0.8
Bath, Gloucestershire, Swindon & Wiltshire	0.5	0.0	0.6	0.4	0.5	0.5	0.5	0.1	0.2	0.5	0.0	0.1	0.3
Bristol, North Somerset, Somerset & South	0.0	0.2	0.3	0.3	0.3	0.5	0.2	0.3	0.3	0.3	0.7	0.4	0.3
Devon, Cornwall &Isles of Scilly (Q66)	0.1	0.1	0.1	0.3	0.4	0.5	0.5	0.6	0.3	0.4	0.5	0.3	0.4
Kent & Medway (Q67)	0.3	0.5	0.4	0.2	0.2	0.8	0.2	0.2	0.4	0.5	0.5	0.1	0.4
Surrey & Sussex (Q68)	0.2	0.2	0.2	0.1	0.2	0.2	0.3	0.4	0.7	0.8	0.3	0.1	0.3
Thames Valley (Q69)	0.4	0.2	0.6	0.4	0.2	0.3	0.3	0.4	0.3	0.4	0.1	0.4	0.3
Wessex (Q70)	0.3	0.3	0.5	1.1	0.8	0.7	0.6	0.3	0.8	0.9	0.8	0.8	0.6
London (Q71)	0.3	0.3	0.4	0.3	0.3	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3
England	**0.3**	**0.3**	**0.4**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.4**	**0.4**	**0.4**	**0.4**	**0.3**

Appendix IV: Monthly prenatal pertussis vaccine coverage by other health care providers[1] among women delivering at more than 28 weeks gestational age by Area Team: England, April 2014 to March 2015

Area team	April	May	June	July	August	September	October	November	December	January	February	March	All
Cheshire, Warrington & Wirral (Q44)	-	-	-	-	-	-	-	-	-	-	-	-	-
Durham, Darlington & Tees (Q45)	3.5	4.3	3.5	3.7	2.8	4.7	4.4	2.1	2.1	2.2	2.9	1.5	3.2
Greater Manchester (Q46)	0.5	0.5	0.6	0.3	0.9	0.5	0.3	0.3	0.6	0.4	0.6	0.6	0.5
Lancashire (Q47)	-	-	-	-	-	-	-	-	-	-	-	-	-
Merseyside (Q48)	-	-	-	-	-	-	-	-	-	-	-	-	-
Cumbria, Northumberland, Tyne & Wear (Q49)	0.6	0.9	0.8	0.9	0.6	1.0	0.7	0.5	0.4	0.5	0.4	0.6	0.7
North Yorkshire & Humber (Q50)	5.6	4.3	3.9	3.6	4.4	3.8	3.7	2.9	4.1	3.4	2.4	2.5	3.7
South Yorkshire & Bassetlaw (Q51)	4.9	3.8	3.7	2.2	2.8	2.8	4.2	2.8	3.6	2.8	2.5	2.1	3.2
West Yorkshire (Q52)	5.6	5.2	5.0	5.0	5.2	4.4	5.3	4.4	5.1	4.0	3.0	2.6	4.6
Arden, Herefordshire & Worcestershire (Q53)	-	-	-	-	-	-	-	-	-	-	-	-	-
Birmingham & the Black Country (Q54)	1.2	1.0	0.8	0.9	1.0	0.7	0.7	0.7	1.1	0.7	0.3	0.4	0.8
Derbyshire & Nottinghamshire (Q55)	5.2	4.2	4.4	5.2	4.3	4.8	4.6	3.9	4.8	4.1	2.7	2.4	4.2
East Anglia (Q56)	5.4	6.0	4.6	5.5	4.6	4.9	4.8	4.2	4.1	3.7	2.8	2.4	4.5
Essex (Q57)	5.0	5.4	4.5	4.8	4.6	5.3	3.9	4.0	4.3	3.7	3.1	2.6	4.3
Hertfordshire & the South Midlands (Q58)	4.6	3.5	3.9	3.1	3.6	3.6	3.3	3.1	3.6	3.0	2.4	1.9	3.3
Leicestershire & Lincolnshire (Q59)	4.4	4.8	4.0	5.2	5.2	3.6	3.4	3.3	3.3	3.1	3.0	2.2	3.8
Shropshire & Staffordshire (Q60)	0.4	0.5	0.2	0.5	0.3	0.3	0.1	0.4	0.6	0.5	0.2	0.3	0.4
Bath, Gloucestershire, Swindon & Wiltshire	4.0	4.6	3.3	2.9	3.7	3.8	2.4	3.4	3.0	2.8	2.4	1.6	3.2
Bristol, North Somerset, Somerset & South	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Devon, Cornwall &Isles of Scilly (Q66)	3.4	3.5	2.7	1.9	2.2	2.1	2.4	2.4	2.9	2.1	1.4	2.3	2.4
Kent & Medway (Q67)	0.1	0.1	0.0	0.0	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.4	0.1
Surrey & Sussex (Q68)	1.9	2.3	2.0	1.8	1.8	1.7	1.5	1.5	1.6	1.2	1.7	0.9	1.7
Thames Valley (Q69)	0.2	0.1	0.1	0.0	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.0	0.1
Wessex (Q70)	1.7	1.8	1.7	1.8	1.8	2.1	1.6	1.8	2.3	1.6	1.5	1.6	1.8
London (Q71)	0.6	0.5	0.4	0.6	0.7	0.6	0.7	0.7	0.6	0.5	0.7	0.4	0.6
England	**2.3**	**2.2**	**2.0**	**2.0**	**2.0**	**1.9**	**1.9**	**1.7**	**1.9**	**1.6**	**1.4**	**1.2**	**1.8**

1.Data were only available for one of four IT suppliers representing 36.8% of women in the survey and 21 of 25 ATS