Public Health England

Protecting and improving the nation's health

Seasonal influenza vaccine uptake in children of primary school age: winter season 2016 to 2017

End of season report

Final data for 1 September 2016 to 31 January 2017

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Executive summary

In 2012, the Joint Committee on Vaccination and Immunisation recommended the roll-out of a universal childhood influenza vaccine programme with a newly licensed live attenuated influenza vaccine. This programme will ultimately target all children 2-16 years of age with the aim of not only directly protecting children themselves, but also protecting the remainder of the population (i.e. the vulnerable elderly) by reducing transmission in the population.

This document describes and reports on the cumulative uptake of influenza vaccine in children of primary school age during the 2016 to 2017 influenza vaccine season, with a focus on the results from the final end of season data submitted to Public Health England at school-level between June- July 2017. The school-level data returns presented in this report include analysis on consents, refusals, contraindications, and population level ecological predictors of low vaccine uptake.

Of the school-level data returned for the 2016 to 2017 influenza season, the overall uptake in school years 1, 2 and 3 was 54.9%, while the overall uptake in pilot areas for children in school years 1-6 was 58.4% showing pattern of decreasing uptake with increasing age. Ecological population level predictors of uptake found that lower uptake in both children of school years 1, 2 and 3 age across England and children school years 1 to 6 in pilot areas was significantly and independently associated with both increasing deprivation and black or minority ethnic (BME, defined as non-white British) .The lowest uptake was reported in the most deprived deciles of deprivation or areas with the largest proportion of black or minority ethnic groups. These findings are consistent with previous results obtained during the first three seasons of the roll-out of the childhood influenza vaccine programme.

Background

Seasonal influenza is a very common infection among infants and children. Healthy children under five years of age have the highest influenza hospital admission rates compared to other age-groups[1]. The United Kingdom (UK) has a long standing selective influenza vaccination programme targeted at all those 65 years and over, under 65 and in a clinical risk group, and pregnant women. Based on the recommendations of the Joint Committee on Vaccination and Immunisation (JCVI) in 2012, England is in the process of implementing a universal paediatric influenza vaccination programme to ultimately cover all children 2-16 years of age[2]. The programme is being introduced incrementally across a number of influenza seasons.

In 2013 to 2014 vaccination against influenza with a newly licensed live attenuated influenza vaccine (LAIV) was first offered nationally across the UK to all children aged two and three years of age through GP practices. Additionally Public Health England (PHE) commissioned a pilot vaccination programme to cover children of primary school-age (4-11 years) that ran in seven geographically distinct areas. Pilot regions offered LAIV to healthy and at-risk children in whom the vaccine was not contraindicated. The pilots achieved a final overall uptake of 52.5%, ranging from 35.8% to 71.5% between individual pilot areas[3].

In 2014 to 2015 the national programme was further extended to include vaccination of all children two to four years of age through GP practices. In addition the 2014 to 2015 season saw the extension of the school-age pilot vaccination programme to 14 areas across England targeting a) primary school age children 4-11 years of age, b) secondary school children aged 11-13 years or c) both groups. The pilot achieved a final uptake of 53.2% for children of primary and secondary school age children (4-13 years)[4].

In 2015 to 2016, besides children aged 2-4 years, all children in England of school years 1 and 2 age were offered influenza vaccine as well as children of school years 1 to 6 age in pilot areas. The overall uptake in school years 1 and 2 was 55.1% in those areas using a school delivery model, while the overall uptake in pilot areas for children in school years 1-6 was 55.6%[5].

During the 2016 to 2017 vaccine campaign, besides continuation of the offer of vaccination to all children aged 2-4 years in England, in addition all children of school years 1, 2 and 3 age were offered the influenza vaccine as well as all children in school years 1-6 in pilot areas. Cumulative school-level vaccine uptake data were manually submitted through ImmForm for all children of school age on a monthly basis. Vaccine uptake was recorded locally at school level and then reported to ImmForm by LA /Area Team and year group (Annexe A). At the end of the influenza season (June-July), final vaccination data was collected at school-level across England and submitted to PHE including additional information on consents, refusals, and contraindications. The final school-level data were used to evaluate influenza vaccine uptake and for analyses on various predictors of vaccine uptake.

Methods

End of season data for 2016 to 2017 were collected at a school-level and submitted to PHE between June-July 2017 by ATs. The majority of schools used a data collection tool created by PHE where data were entered for each child in the school. These data were aggregated into school totals which were provided to the LA. The end of season collection variables requested are outlined in Annexe B.

Key indicators

Uptake

End-of-season programme uptake was calculated based on the number of children in the target population who were reported to have received at least one dose of influenza vaccine during the campaign period (1 September 2016 until 31 January 2017). Second doses were not counted. The target population was defined as the number of primary school age children (aged 5-7, rising to 8 years) born between 1 September 2008 and 31 August 2011 eligible for vaccination across England as well as the number of primary school age children (5-11 years, but not older) born between 1 September 2005 to 31 August 2011 resident in the selected pilot areas.

Predictors of uptake

To assess how population level predictors may be associated with vaccine uptake, the postcode of each school and the urban/rural data were matched using the GeoConvert: UK Data Service Census Support tool to various predictors available at 2011 census Office for National Statistics (ONS)[6].

Data on religion, ethnicity by age, sex, and Lower Super Output Area level (LSOA) were downloaded from Nomis (provided by ONS)[7]. Religion and ethnicity predictors were calculated for those aged 0 to 15 years old.

Each LOSA had a population range of 1,000 – 3,000 and were used to assess potential ecological associations with uptake[8]. The Index of Multiple Deprivation (IMD) is an overall score assigned to each LSOA summarising its relative level of deprivation based on seven topic areas: income, employment, health, education, crime, service access and living environment[9]. The 2015 updated IMD scores were calculated and, based on the distribution, categorically grouped into deciles.

Information on ethnic constitution of each LSOA is available according to the following categories: White/Mixed/Asian/Black/Other[9]. The proportion of LSOA classified as

belonging in a black or minority ethnic (BME, defined as non-white British) categorically grouped into quartiles.
Information on the religious constitution of each LSOA is available with the categories of Christian/Buddhist/Hindu/Jewish/Muslim/Sikh/Other/None[10]. Proportions were analysed, focusing on Jewish and Muslim because of the issues reported in previous seasons around the use of porcine gelatine in the vaccine. The proportion of LSOAs identifying as Jewish were grouped into 0% and >0% (95% of schools were in an area with Jewish population less than 1%) and Muslim into 0%, 1-5% and 6%+.

Classification of the LSOA as rural (Town and fringe/Village or hamlet/Isolated dwelling) or urban (Major conurbation/Minor conurbation/City and town) was available from the ONS 2011 census[6].

Vaccine uptake was calculated by each of these population characteristics. A linear regression analysis was undertaken to assess whether any of the population characteristics were significantly related to uptake. Uptake in primary schools was linearly regressed against the same population-level variables (area, deprivation, ethnicity, religious constitution and rurality) to determine if changes in uptake could be explained. All the variables were included in a multiple linear regression model to provide adjusted estimates and the model fit was assessed. This method was previously used by Green et. al[11], as well for the previous two influenza vaccine uptake reports[4,5].

Consent, refusal, refused but previously vaccinated, and non-responders

Parental consent forms for influenza vaccination were sent to parents through schools. The return of these forms was recorded by the school/local authorities and information on consents, refusals, and no returns was submitted to PHE at the end of the season. Not all areas returned consent, refusal, and no return data and not all schools within each LA identified these groups consistently. Additionally, some areas merged consent/refusal/no return data for all vaccinating year groups.

Consent –Calculated from number of consent forms returned by all children in a year group, divided by the final denominator for that year group. Consent is defined as direct parental consent to vaccinate. In some cases consents include children who are contraindicated for vaccination with LAIV.

Refusal – Calculated from number of forms returned refusing consent by all children in a year group, divided by the final denominator for that year group. Refusal is recorded as direct refusal to vaccinate. In some cases refusals include children who are contraindicated for the vaccination with LAIV.

Refused but previously vaccinated – Calculated from the number of forms returned refusing the vaccine because the child has been previously vaccinated during the current influenza season, divided by the final denominator for that year group.

No return – Calculated from the number of forms not returned in a year group (non-responders), divided by the final denominator for that year group. Non-responders were defined as parents that did not return consent forms whose children were subsequently not vaccinated. Non-responder counts were either provided by the school level data submission or calculated from the final denominator by subtracting the count of consents and refusals. No returns may also include children contraindicated for vaccination with LAIV.

Contraindications

Children contraindicated for vaccination with LAIV (i.e. children in clinical risk groups) were based on the risk groups clinically outlined in Green Book[12]. The number of children contraindicated for vaccination were recorded and aggregated by risk group.

Contraindications were split into two groups: Prior Contraindications and On-day Contraindications. The first describes pre-existing contraindications to vaccination that parents were aware of e.g. severe asthma. The second describes contraindications described on the day of vaccination e.g. a child being congested. Not all areas recorded data for all risk groups, and not all schools within each pilot site identified risk groups consistent with the end of season data return variables. Children contraindicated for vaccination with LAIV were either offered injectable quadrivalent inactivated influenza vaccine on site by providers or referred to their general practice for vaccination.

Data Limitations

It is important to note that there were differences in missing data and data returned among school children school year ages 1-3 in England and within the pilot areas in 2015 to 2016 and the 2016 to 2017 season.

Years 1, 2 and 3 across England

For this study, a total of 150 LAs were assessed. Data for Bassetlaw and Nottinghamshire were collected independently thus resulting in two separate LAs. Additionally, due to small numbers data for City of London and Hackney and Leicestershire and Rutland were merged resulting in two LAs instead of four, giving a total of 150 LAs rather than 152. A total of 126 of 150 LAs reported having a school delivery model during the 2016 to 2017 season and a total of 24 LAs were not included in the school age analysis. Of the latter, data was not returned for 22 LAs, and both

Gloucestershire and Swindon used a GP delivery model (Annex C). Data from the Isles of Scilly were also not returned for Kernow (Cornwall and Isles of Scilly) LA since the Isles of Scilly also used a GP delivery model. However, school level data from Cornwall were returned and included in the analyses. As a result the remaining 126 LAs provided vaccine uptake at a school level, however, some school entries were not accounted for due to missing information or when the numerator was greater than the denominator (Annex D). The Harrow LA in London and Rochdale LA in Greater Manchester returned data for years 1, 2 and 3 combined, therefore these schools were only assessed when combining years 1, 2 and 3 data. The Hertfordshire LA, Leicestershire and Rutland LA, and the Leicester LA provided data for special schools and did not specify the year group, therefore these schools were only assessed when combining years 1, 2 and 3 data.

Pilot areas

All 11 LAs in the pilot areas returned data. The pilot area Essex included data for the reception, which are not included in this analysis.

Uptake predictors

For the linear regression analysis of children of school years 1, 2 and 3 age, a total of 12,576 of the 15,925 (79.70%) school-level data entries were used. A total of 2,885 schools were unable to be matched to LSOA classification and could therefore not be used for analysing uptake predictors. A further 464 schools were unable to be matched due to having a zero as a denominator. Although not indicated, these schools were most likely catch-up clinics or home-educated students who were not vaccinated in during the school campaign.
For the linear regression analyses of children of school years 1-6 age in pilot areas, a total of 1,075 of 1,311 (82.0%) of schools were used for the analysis with 236 schools (18.0%) missing. A total of 225 schools were unable to be matched to LSOA classifications while 11 schools were unable to be matched due to having zero as a denominator. Although not indicated, these schools were most likely catch-up clinics or home-educated students who were not vaccinated in during the school campaign.

Results

Uptake (school years 1, 2 and 3 across England)

A total of 84.0% (126/150) LAs reported using a school delivery model as their main mode of delivery returned data. Of these 126 LAs, an estimated 944,031 of 1,720,020 children of school years 1, 2 and 3 age in England received at least one dose of influenza vaccine during the period 1 September 2016 to 31 January 2017 in schools

giving an overall uptake of 54.9% in school delivery areas with uptake ranging from 41.3% in Kent and Medway to 70.1% in Bath Gloucestershire, Swindon and Wiltshire (Table 1). Overall vaccine uptake by individual year group was 57.0, 55.0, and 52.7 for children in school years 1, 2, and 3 respectively (Annex E).

A total of 1.3% (2/150) of LAs reported using a GP delivery model as their main mode of delivery as well as the Isles of Scilly (part of the Kernow LA). An estimated 34.7% (10,181 of 29,367) of children of school years 1, 2 and 3 age in England were reported to have received at least one dose of influenza vaccine during the period of 1 September 2016 to 31 January 2017 by GP delivery models (Table 2).
The remaining 14.7% (22/150) LAs used a school delivery model, but did not provide data for the analysis in this report. An estimated 54.2% (114,373 / 211,195) of children of school years 1, 2 and 3 age in England were reported to have received at least one dose of influenza vaccine during the period of 1 September 2016 to 31 January 2017 in these 22 LAs.

Table 1. Estimated proportion of children school years 1, 2 and 3 age in England vaccinated with at least one dose of influenza vaccine through a school delivery model. England, 1 September 2016 to 31 January 2017 by Area Team

Area team[a,b]	LA Response Rate (%)	No. of children eligible for vaccination	No. of children vaccinated with at least 1 dose of influenza vaccine	Vacccine uptake (%)
Arden, Herefordshire and Worcestershire	100.0	59,005	37,483	63.5
Bath, Gloucestershire, Swindon and Wiltshire	50.0	23,214	16,279	70.1
Birmingham and the Black Country	100.0	105,322	52,157	49.5
Bristol, North Somerset, Somerset and South Gloucestershire	100.0	51,852	27,650	53.3
Cheshire, Warrington and Wirral	0.0	-	-	-
Cumbria, Northumberland, Tyne and Wear	57.1	28,463	17,665	62.1
Derbyshire and Nottinghamshire	100.0	76,185	45,004	59.1
Devon, Cornwall and Isles of Scilly*	100.0	55,121	31,044	56.3
Durham, Darlington and Tees	33.3	21,110	11,921	56.5
East Anglia	100.0	86,559	50,102	57.9
Essex	100.0	67,106	40,099	59.8
Greater Manchester	100.0	111,394	53,996	48.5
Hertfordshire and the South Midlands	100.0	113,261	62,945	55.6
Kent and Medway	100.0	69,557	28,695	41.3
Lancashire	100.0	26,121	13,458	51.5
Leicestershire and Lincolnshire	100.0	65,477	39,556	60.4
London	78.1	254,536	109,381	43.0
Merseyside	20.0	5,584	3,023	54.1
North Yorkshire and Humber	100.0	57,784	36,593	63.3
Shropshire and Staffordshire	100.0	55,628	34,331	61.7
South Yorkshire and Bassetlaw	100.0	50,363	30,614	60.8
Surrey and Sussex	100.0	74,882	41,570	55.5
Thames Valley	100.0	82,683	52,912	64.0
Wessex	100.0	92,631	60,900	65.7
West Yorkshire	100.0	86,182	46,653	54.1
Total	**82.4**	**1,720,020**	**944,031**	**54.9**

a Denominators represent the number of children of school years 1, 2 and 3 age eligible for vaccination. Denominators are based on school-roll figures obtained directly from schools unless unavailable then Department of Education January 2017 school census figures were used.
b A total of 22 LAs that provided vaccinations via a school delivery model did not provide any school level data. Gloucestershire, Swindon and Isles of Scilly provided vaccinations through a GP model and are not included.

Table 2. Estimated proportion of children school years 1, 2 and 3 age in England vaccinated in GP clinics with at least one dose of influenza vaccine. England, 1 September 2016 to 31 January 2017 by Area Team

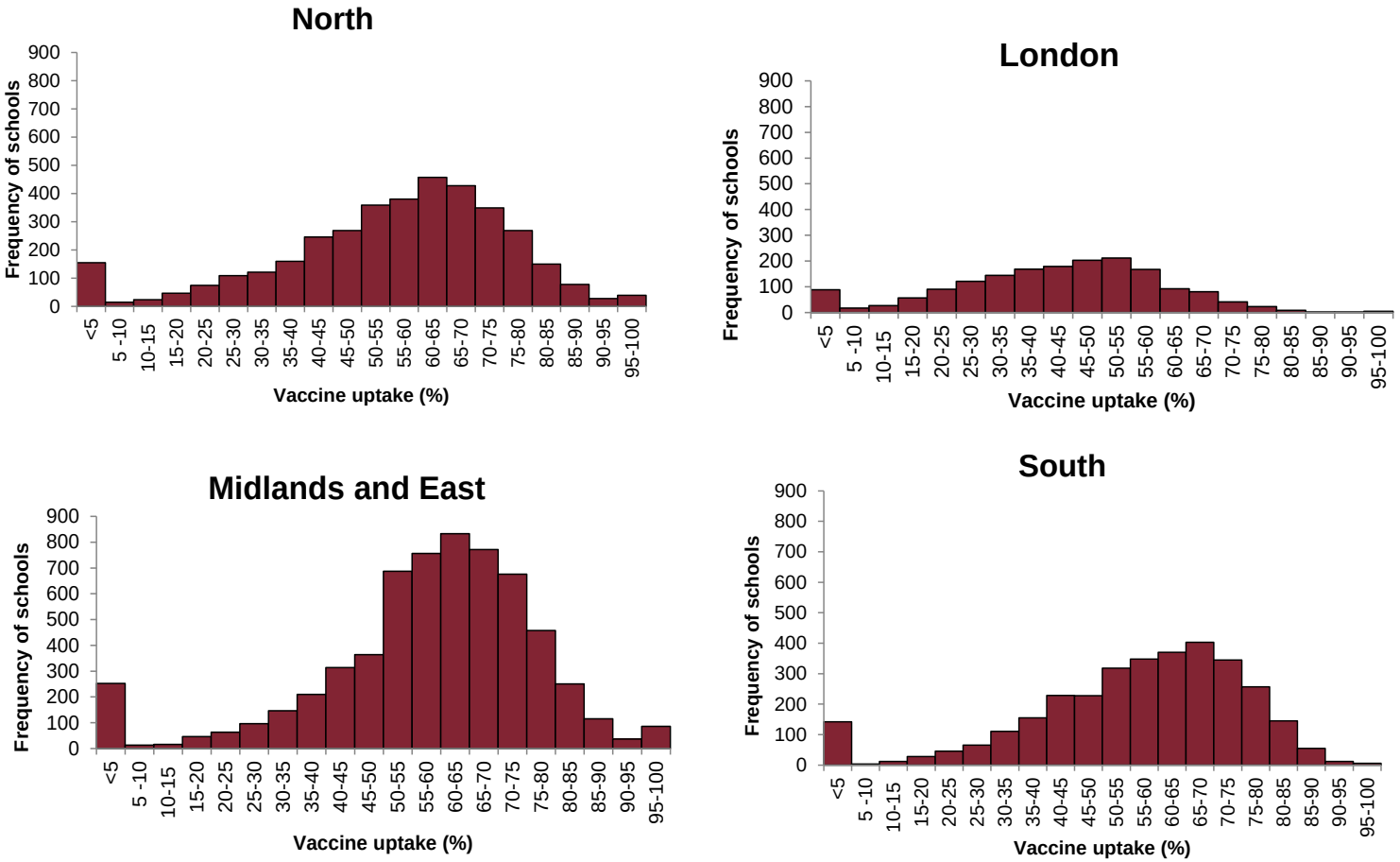
Area team[a,b]	LA Response Rate (%)	Mode of delivery	No. of children eligible for vaccination[b]	No. of children vaccinated with at least 1 dose of influenza vaccine	Vacccine uptake (%)
Bath, Gloucestershire, Swindon and Wiltshire	50.0	GP	29,308	10,132	34.6
Devon, Cornwall and Isles of Scilly	25.0	GP[a]	59	49	83.1
Total	**37.5**		**29,367**	**10,181**	**34.7**

a For the Kernow Local Authority, the Isles of Scilly provided a GP delivery model, while Cornwall provided a school delivery model.
b GP delivery model denominators were derived from GP systems and were based on the number of patients registered with a GP practice located within the LAs geographical boundary, as defined by child age on 1 September 2016.

Uptake by PHE Region

Vaccine uptake for children of school years 1, 2 and 3 age vaccinated in schools in England varied across PHE regions. Uptake at school level ranged from 0 to 100%. In the North of England, of the 3,740 primary schools reporting vaccine uptake data for years 1, 2 and 3, the median uptake was 58.8% (with an interquartile range (IQR) of 44.8% to 69.7%). In London, of the 1,720 schools reporting vaccine uptake data for schools years 1, 2 and 3, the median uptake was 44.2% (IQR of 31.1% to 54.7%). In the Midlands and East, of the 6,189 schools that reporting vaccine uptake data for school years 1, 2 and 3, the median uptake was 60.5% (IQR of 50.0% to 70.4%). Finally, in the South of England, of the 3,245 schools reporting vaccine uptake, the median uptake was 59.2% (IQR of 45.5% to 70.0%) (Figure 1).

Figure 1. School delivery influenza vaccine uptake for children of school years 1, 2 and 3 age in all four PHE regions from 1 September 2016 to 31 January 2017



Predictors of uptake (School years 1, 2 and 3 across England)

The results of the unadjusted univariate analysis for children of school years 1, 2 and 3 indicated that the largest effect was seen for ethnicity and deprivation and religious beliefs (Table 3).

Areas with an ethnic population of 34% or more had just under 22.0% lower uptake compared to areas with a minority population of <5%.The more deprived an area, the lower the uptake, with those in the least deprived decile of deprivation showing uptake 21.0% greater than those in the most deprived decile. In terms of religious beliefs, uptake was 18.7% lower when 6%+ of the LSOA population identified as Muslim relative to none, while a 3.5% lower vaccine uptake was observed if the LSOA contained Jewish residents compared to none. A lower uptake was seen in urban relative to rural areas, with a difference in uptake of 8.2% and an increase was seen in pilot areas by 4.2% than in non-pilot areas. Finally, uptake by PHE region compared to the North of England shows a significantly lower uptake in London with a difference of 17.5% and a higher uptake in the Midlands and East was observed with a difference of 1.9% (Table 4).

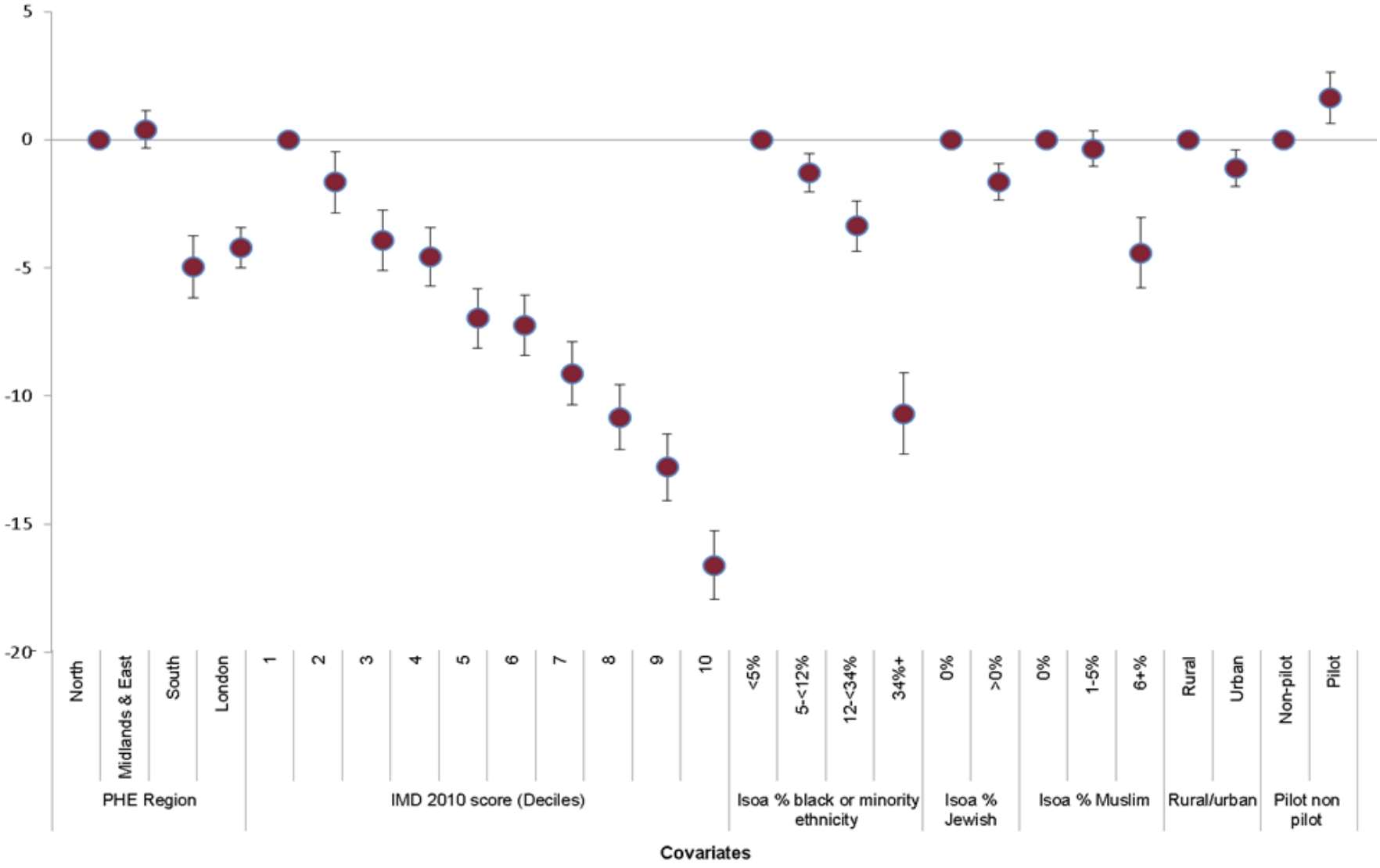
Figure 2 and Table 3 show the results of the multivariable analysis. Deprivation, ethnicity, rurality, region and religion all remained independent predictors of lower uptake. Areas in the least deprived decile of deprivation had a 16.6% higher uptake than those in the most deprived decile, those with a BME population of 34% or more had 10.7% lower uptake compared to areas with a BME population of <5%. Areas with a Muslim population of 6%+ had an uptake 4.4% lower than those with no Muslim population and in areas with a Jewish population uptake was 1.6% lower than those areas with no Jewish population. Urban areas had a 1.2% lower uptake compared to rural areas. Pilot areas had a 1.6% greater vaccine uptake than non-pilot areas. London and the South of England had significantly lower uptake compared to the North of England with 5.0% and 4.2% lower uptake respectively.

Table 3. Vaccine uptake unadjusted/adjusted impact on uptake determined through linear regression for children of school years 1, 2 and 3 age across England, 1 September 2016 to 31 January 2017

Covariate		Number of children	Crude uptake (%)	Unadjusted		Adjusted (R2= 25.0%)[a]	
				Estimated % uptake change (95% CI)	p-value[a]	Estimated % uptake change (95% CI)	p-value
PHE Region of School	North	166,469	56.1	Baseline		Baseline	
	Midlands and East	295,312	57.4	1.91 (1.14 to 2.66)	<0.001	0.40 (-0.33 to 1.12)	0.284
	London	79,991	43.0	-14.24 (-15.37 to -13.11)	<0.001	-4.96 (-6.16 to -3.76)	<0.001
	South	198,183	57.8	-0.19 (-1.03 to 0.65)	0.656	-4.22 (-5.00 to -3.43)	<0.001
IMD 2010 Score of school (decile)	Least deprived	93,844	65.4	Baseline		Baseline	
		85,569	63.0	-1.30 (-2.56 to -0.05)	0.042	-1.66 (-2.84 to -0.48)	0.006
		77,239	61.1	-3.14 (-4.38 to -1.89)	<0.001	-3.92 (-5.10 to -2.75)	<0.001
		82,486	59.9	-3.97 (-5.19 to -2.75)	<0.001	-4.57 (-5.72 to -3.42)	<0.001
		75,791	57.6	-6.61 (-7.84 to -5.38)	<0.001	-6.96 (-8.12 to -5.80)	<0.001
		76,196	56.2	-7.70 (-8.95 to -6.46)	<0.001	-7.23 (-8.41 to -6.06)	<0.001
		64,007	52.3	-10.85 (-12.14 to -9.55)	<0.001	-9.12 (-10.35 to -7.89)	<0.001
		63,774	48.4	-14.08 (-15.40 to -12.75)	<0.001	-10.83 (-12.10 to -9.56)	<0.001
		63,056	45.5	-17.70 (-19.04 to -16.37)	<0.001	-12.77 (-14.07 to -11.46)	<0.001
	Most deprived	57,993	42.3	-21.00 (-22.34 to -19.66)	<0.001	-16.60 (-17.93 to -15.28)	<0.001
School lsoa % black or minority ethnicity	<5%	259,155	62.1	Baseline		Baseline	
	5 to <12%	209,407	59.9	-1.84 (-2.54 to -1.14)	<0.001	-1.30 (-2.05 to -0.56)	0.001
	12 to <34%	163,823	55.0	-6.97 (-7.74 to -6.19)	<0.001	-3.37 (-4.35 to -2.39)	<0.001
	34+ %	107,570	39.0	-21.92 (-22.77 to -21.06)	<0.001	-10.68 (-12.27 to -9.09)	<0.001
School lsoa % Jewish	0%	605,082	55.9	Baseline		Baseline	
	>0%	134,873	52.3	-3.54 (-4.33 to -2.75)	<0.001	-1.64 (-2.36 to -0.92)	<0.001
School lsoa % Muslim	0%	193,408	61.8	Baseline		Baseline	
	1 to 5%	401,180	59.0	-2.64 (-3.28 to -1.99)	<0.001	-0.35 (-1.05 to 0.35)	0.322
	6+%	145,367	41.9	-18.74 (-19.57 to -17.92)	<0.001	-4.41 (-5.80 to -3.03)	<0.001
Rural/Urban school	Rural	157,792	63.2	Baseline		Baseline	
	Urban	582,163	53.4	-8.24 (-8.88 to -7.61)	<0.001	-1.12 (-1.83 to -0.42)	0.002
Pilot/ Non-Pilot	Non-pilot	669,379	54.7	Baseline		Baseline	
	Pilot	70,576	60.0	4.23 (3.13 to 5.33)	<0.001	1.64 (0.64 to 2.63)	0.001

a Adjusted for PHE region, IMD score, lsoa % black or minority ethnicity, lsoa % Jewish, lsoa Muslim, Rural/Urban school, and Pilot status

Figure 2. Adjusted linear regression % uptake change values with corresponding 95% confidence intervals for population-level predictors for children of school years 1, 2 and 3 age in England, 1 September 2016 to 31 January 2017



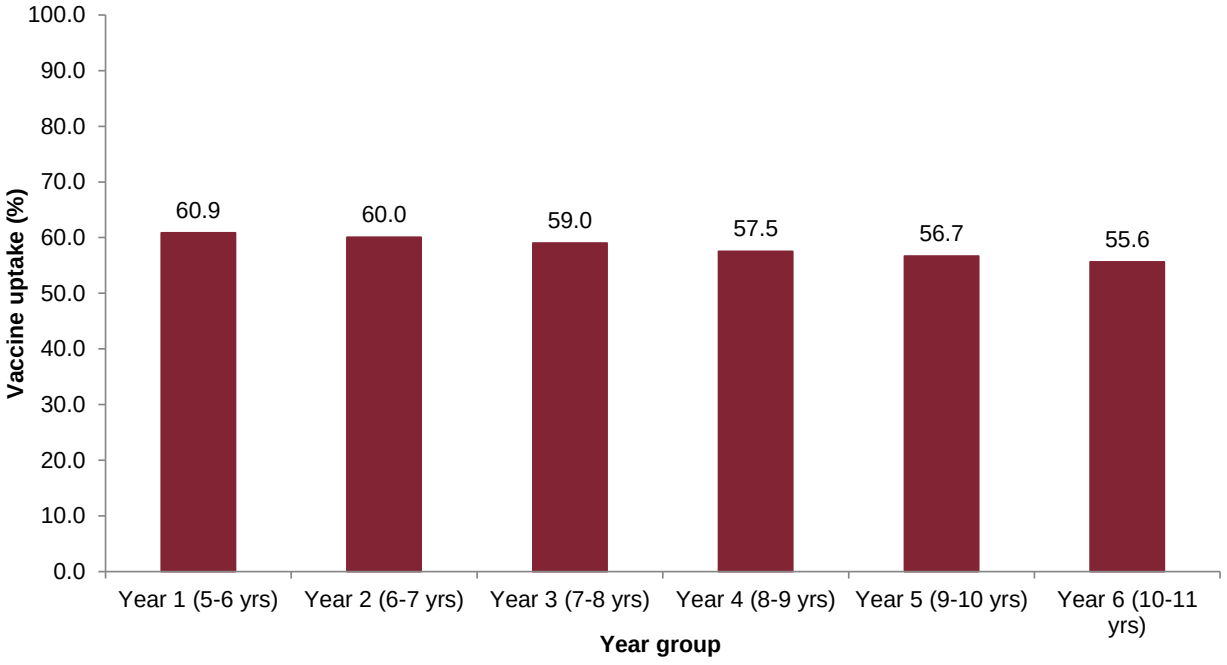
Uptake (school years 1 to 6 in pilot areas across England)

All of the pilot areas returned data for school level uptake. An estimated 166,826 children of school years 1 to 6 age in England out of 285,881 eligible received at least one dose of influenza vaccine during the period 1 September 2016 to 31 January 2017 in schools. Overall uptake for children in school year 1 to 6 vaccinated in schools was 58.4% with uptake ranging from 52.7% in London to 59.9% in Leicestershire and Lincolnshire (Table 4). Vaccine uptake in the pilot areas ranged from 60.9% in year 1 to 55.6% in year 6, with overall decreasing uptake with increasing age (Figure 3, Annex F).

Table 4. Estimated proportion of children school years 1 to 6 age by pilot area with at least one dose of influenza vaccine. England, 1 September 2016 to 31 January 2017

Area team	LAs responding (%)	No. of children eligible for vaccination	No. of children vaccinated with at least 1 dose of influenza vaccine	Vacccine uptake (%)
Cumbria, Northumberland, Tyne and Wear	100	42,482	25,107	59.1
Essex	100	131,561	76,438	58.1
Greater Manchester	100	13,989	8,053	57.6
Leicestershire and Lincolnshire	100	78,769	47,164	59.9
London	100	19,080	10,064	52.7
Total	**100**	**285,881**	**166,826**	**58.4**

Figure 3: Estimated proportion of children school years 1 to 6 age in pilot areas across England vaccinated with at least one dose of influenza vaccine by year group from 1 September 2016 to 31 January 2017[a]



[a] Not including special schools that did not provide the year group

Predictors of uptake (School years 1 to 6 in pilot areas across England)

The results of the univariate analysis (Table 5) for children school years 1- 6 ages showed there was a decreasing trend in vaccine uptake as the BME population increased and with increasing deprivation. Those in the most deprived decile of deprivation had a 17.0% lower uptake than those in the least deprived decile. Vaccine uptake decreased with an increasing proportion of the population identifying as Muslim, with uptake 16.0% lower in areas with 6% or more Muslim. Urban areas had 7.1% lower uptake compared to rural areas.

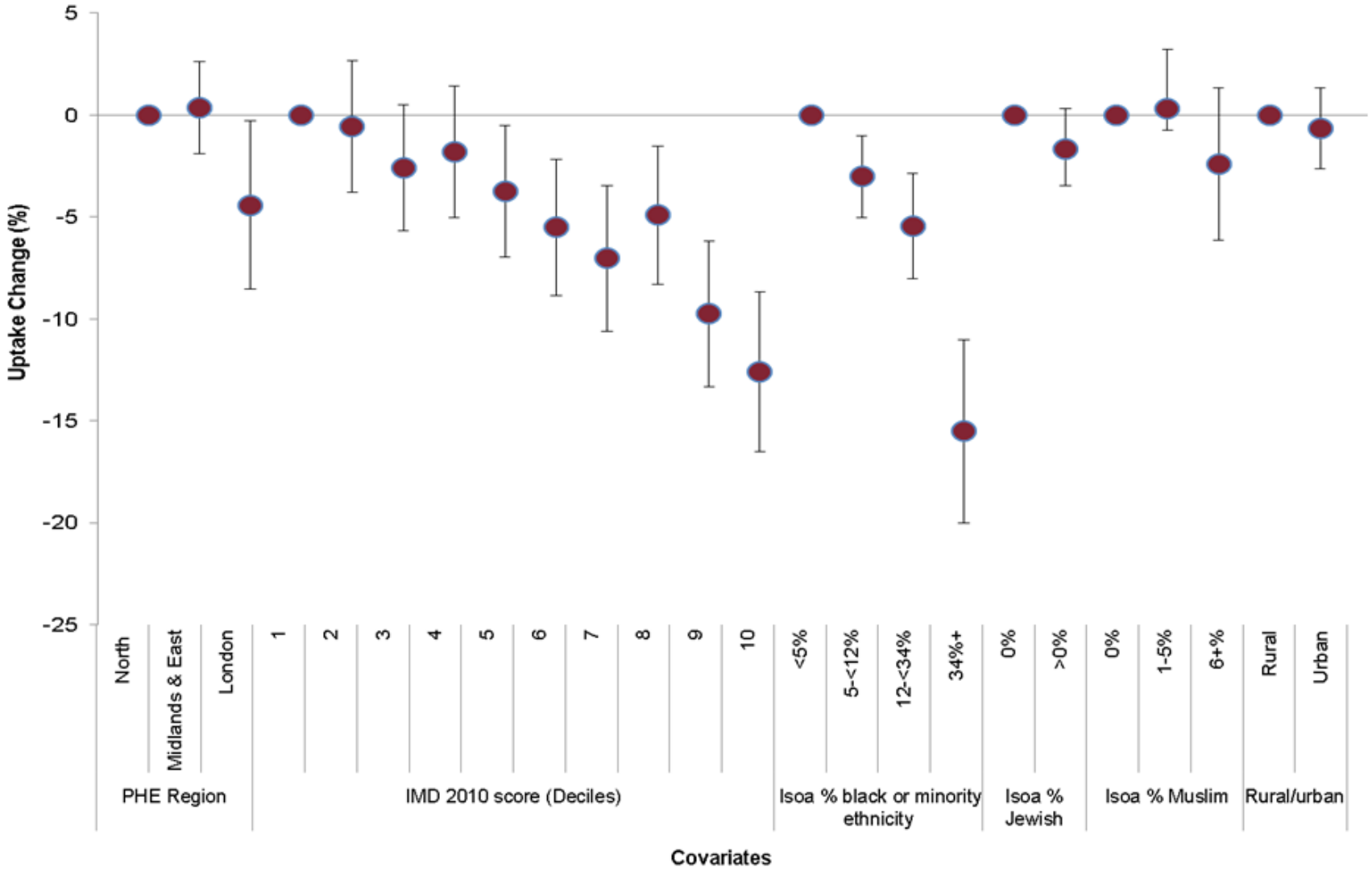
After adjusting for all area level characteristics in the multivariable regression analysis (Table 5, Figure 4) deprivation score, PHE region and BME remained significantly related to uptake. As in the single variable analysis uptake generally declined with increased deprivation with those in the least deprived decile of deprivation having uptake 12.6% greater than those in the most deprived decile and a decreasing trend in vaccine uptake as the BME population increased. London had a significantly lower uptake than all other PHE regions. Muslim and Jewish populations and urban vs rural were not significantly associated with lower uptake.

Table 5. Vaccine uptake unadjusted/adjusted impact on uptake determined through linear regression for children schools years 1 to 6 age in pilot areas across England, 1 September 2016 to 31 January 2017

Covariate		Number of children	Crude uptake (%)	Unadjusted		Adjusted (R2= 23.7%)[a]	
				Estimated % uptake change (95% CI)	p-value[a]	Estimated % uptake change (95% CI)	p-value
PHE Region of School	North	22,192	57.9	Baseline		Baseline	
	Midlands and East	105,987	58.9	2.21 (0.00 to 4.41)	0.050	0.37 (-1.88 to 2.63)	0.320
	London	7,084	53.4	-4.45 (-8.76 to -0.14)	0.043	-4.41 (-8.54 to -0.29)	0.036
IMD 2010 Score of school (decile)	Least deprived	14,938	66.2	Baseline		Baseline	
		16,415	63.6	-1.47 (-4.89 to 1.95)	0.398	-0.56 (-3.77 to 2.65)	0.733
		18,263	60.6	-3.38 (-6.68 to -0.82)	0.045	-2.60 (-5.68 to 0.49)	0.099
		14,721	61.9	-1.75 (-5.20 to 1.70)	0.320	-1.82 (-5.06 to 1.41)	0.270
		13,031	60.5	-4.54 (-8.01 to -1.06)	0.011	-3.74 (-6.98 to -0.50)	0.024
		13,291	57.6	-6.96 (-10.55 to -3.37)	<0.001	-5.50 (-8.85 to -2.14)	0.001
		10,743	55.9	-9.56 (-13.34 to -5.78)	<0.001	-7.03 (-10.60 to -3.47)	<0.001
		13,941	54.7	-8.47 (-12.05 to -4.89)	<0.001	-4.91 (-8.31 to -1.50)	<0.001
		12,122	51.3	-14.04 (-17.75 to -10.34)	<0.001	-9.74 (-13.30 to -6.17)	<0.001
	Most deprived	7,801	47.4	-16.96 (-20.92 to -12.99)	<0.001	-12.59 (-16.50 to -8.68)	<0.001
School lsoa % black or minority ethnicity	<5%	48,702	64.2	Baseline		Baseline	
	5 to <12%	43,279	60.3	-3.68 (-5.51 to -1.86)	<0.001	-3.01 (-5.02 to -0.99)	0.003
	12 to <34%	32,939	54.9	-8.70 (-10.68 to -6.71)	<0.001	-5.45 (-8.02 to -2.88)	<0.001
	34+ %	10,346	42.9	-21.29 (-24.24 to -18.35)	<0.001	-15.51 (-20.01 to -11.01)	<0.001
School lsoa % Jewish	0%	103,587	58.6	Baseline		Baseline	
	>0%	31,679	57.8	-1.81 (-3.77 to 0.15)	0.070	-1.65 (-3.64 to 0.15)	0.526
School lsoa % Muslim	0%	34,657	63.3	Baseline		Baseline	
	1 to 5%	82,154	59.5	-3.22 (-5.01 to -1.43)	<0.001	0.30 (-2.64 to 1.35)	0.526
	6+%	18,455	47.4	-15.95 (-18.52 to -13.39)	<0.001	-2.42 (-6.15 to 1.32)	0.205
Rural/Urban school	Rural	27,307	64.1	Baseline		Baseline	
	Urban	107,959	57.1	-7.05 (-8.87 to -5.24)	<0.001	-0.65 (-2.64 to 1.35)	0.526

a Adjusted for PHE region, IMD score, lsoa % black or minority ethnicity, lsoa % Jewish, lsoa Muslim, and Rural/Urban school

Figure 4. Adjusted linear regression % uptake change values with corresponding 95% confidence intervals for population-level predictors for children schools years 1 to 6 age in pilot areas across England, 1 September 2016 to 31 January 2017



Consents/refusals/non-responders and Contraindications (school years 1, 2 and 3 across England)

Data for consent, refusal and no return information was complete for 88.0% (14,188/16,188) of primary schools reporting data for schools years 1, 2 and 3 (Table 6). Some schools provided solely consent data. Incomplete data where the total number of consents, refusal and no return were not equal to the denominator were not included. The overall consent rate was 57.6% ranging from 44.0% to 76.8%; with 32.5% of non-returns and 9.7% were parental refusals.

Table 6. Proportion of primary school children in years 1, 2 and 3 consenting, refusing, and not responding to vaccination in schools that provided consent, refusal and no return data within England, 1 September 2016 to 31 January 2017

Area team[a,b]	Number of children eligible for influenza vaccine (Denominator)[c]	Consented[c] (%)	Refused (%)	Refused but previously vaccinated (%)	No return (%)
Arden, Herefordshire and Worcestershire	56,713	63.8	20.1	-	16.2
Bath Gloucestershire, Swinton and Wiltshire	5,884	69.8	12.3	0.0	17.9
Birmingham and the Black Country	105,274	51.4	10.4	-	38.2
Bristol, North Somerset, Somerset and South Gloucestershire	25,785	64.0	9.9	-	26.1
Cheshire, Warrington and Wirral	-	-	-	-	-
Cumbria, Northumberland, Tyne and Wear	28,434	64.9	0.1	0.0	35.0
Derbyshire and Nottinghamshire	15,712	49.0	3.0	-	48.0
Devon, Cornwall and Isles of Scilly	22,063	60.6	12.9	1.1	25.5
Durham, Darlington and Tees	21,011	59.5	6.4	-	34.1
East Anglia	86,559	59.3	1.3	0.0	39.4
Essex	43,925	65.3	7.3	0.0	27.4
Greater Manchester	106,742	52.0	9.9	-	38.1
Hertfordshire and the South Midlands	113,219	59.2	7.8	0.4	32.6
Kent and Medway	69,174	44.0	2.8	-	53.2
Lancashire	15,164	61.0	8.0	0.0	31.0
Leicestershire and Lincolnshire	64,312	62.8	8.4	-	28.9
London	227,491	44.7	15.7	0.5	39.1
Merseyside	5,584	58.9	5.8	-	35.3
North Yorkshire and Humber	57,723	65.2	3.7	0.2	30.9
Shropshire and Staffordshire	39,295	63.7	8.1	0.7	27.5
South Yorkshire and Bassetlaw	50,325	63.1	6.6	-	30.4
Surrey and Sussex	72,258	58.6	10.5	0.5	30.4
Thames Valley	82,481	66.6	12.6	0.1	20.8
Wessex	83,558	76.8	11.3	0.0	11.9
West Yorkshire	86,092	57.0	10.4	0.6	32.0
Total	**1,484,778**	**57.6**	**9.7**	**0.2**	**32.5**

[a] Gloucestershire, Swindon and the Isles of Scilly are not included due to solely providing a GP delivery model. All 24 LAs that were excluded from the study are not presented in the table, including all 4 LAs in Cheshire, Warrington, and Wirral AT.
b Excluding schools with missing or incomplete consent form data I.e. ((school denominator) ≠ Σ (consents + refusal + no return))
c Including children contraindicated for influenza vaccine

Contraindications/ reasons for non-vaccination were reported by parents and/or guardians prior to or on the day of vaccination. A total of 1.8% (30,865 /1,720,020) of children of school years 1, 2 and 3 age who were offered vaccines through school delivery models across England from 1 September 2016 to 31 January 2017 were contraindicated to receive the influenza vaccine or provided a reason for non-vaccination. Of the contraindications noted prior to the vaccine delivery day, the most common prior contraindications were 'confirmed egg allergy' (n=496) and immunosuppression of a family member (n=465) representing 1.6% and 1.5% of all contraindications/ reasons for non-vaccination respectively. Children contraindicated prior to vaccination to receive LAIV may either have been referred to their general practice for vaccination or received the quadrivalent inactivated influenza vaccine (Fluarix Tetra) on site.

On the day contraindications resulted in 9.9% of all contraindications/ reasons for non-vaccination (Table 7). 'Child not well' on the day of the vaccination was the highest percentage (7.4%) of all medical related contraindications/reasons for non-vaccination. The total number or known reasons for influenza vaccine refusal was much lower than other or unknown reasons for the vaccine. Some areas that provided contraindication/ reasons for non-vaccination data solely provided total numbers of contraindication/reasons for non-vaccination, thus resulting in a larger proportion of other and unknowns.

Table 7. Total prior, on day, and other contraindications/ reasons for non-vaccination of the influenza vaccination for children school years 1, 2 and 3 age across England from 1 September 2016 to 31 January 2017

Contraindication / Reason for non-vaccination	Number of children contraindicated	% of total contraindications
Known contraindications		
Prior	**1,772**	**5.7**
Confirmed egg allergy	496	1.6
Immunosupression (family)	465	1.5
Previous allergy to flu vaccine	288	0.9
Severe asthma	284	0.9
Immunosupression (personal)	154	0.5
Another vaccine given/due	57	0.2
Cardiac disease/ Salicylate therapy	28	0.1
On day	**3,045**	**9.9**
On day: Child not well	2,269	7.4
On day: Asthma, wheezing	776	2.5
Known reasons for refusal: Vaccine contains porcine gelatine	**2,342**	**7.6**
Other & unknown	**23,706**	**76.8**
Total	**30,865**	**100.0**

Children that were absent or that refused the vaccination were also recorded by a subset of teams of which 1.5% (22,106/1,720,020) children of school years 1, 2 and 3 age were reported

as being absent and 0.3% (4,327/1,720,020) children of school years 1, 2 and 3 age refused vaccination on the day of the session.

Consents/refusals/non-responders and Contraindications (school years 1 to 6 in pilot areas across England)

Data were returned on 97.2% of primary schools reporting vaccine uptake for schools years 1 to 6 (1,276/1,313) in pilot areas with complete information on consents, refusals, and no returns (Table 8). The overall consent rate was 61.7% ranging from 56.3% to 62.9%. Overall there was a greater no return rate than parent refusal rate. Overall the percentage of no returns (31.2%) was greater than the percentage of parent refusals (7.1%).

Table 8. Proportion of primary school children in years 1, 2 and 3 consenting, refusing, and not responding to vaccination within England, 1 September 2016 to 31 January 2017

Area team[a,b]	Number of chidlren eligible for influenza vaccine (Denominator)	Consented[c] (%)	Refused (%)	Refused but previously vaccinated (%)	No return (%)
Cumbria, Northumberland, Tyne and Wear	42,482	61.6	0.0	0.0	38.4
Essex	88,517	62.9	7.3	0.0	29.7
Greater Manchester	13,912	58.5	9.7	-	31.8
Leicestershire and Lincolnshire	77,212	62.3	9.7	-	28.0
London	19,080	56.3	9.8	-	34.0
Total	**241,203**	**61.7**	**7.1**	**0.0**	**31.2**

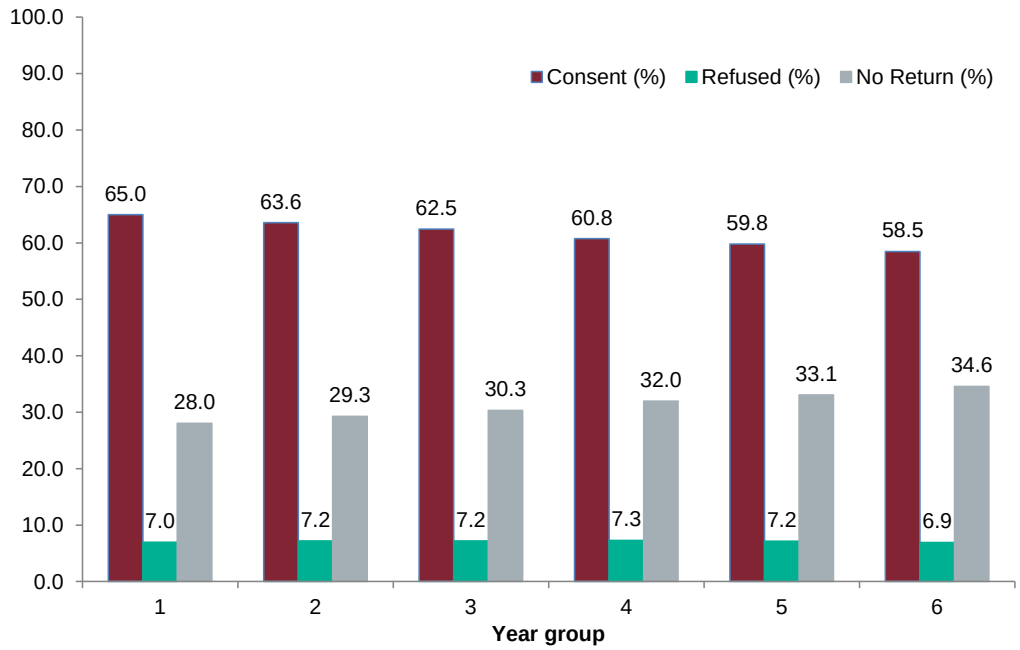
a Excluding schools with missing or incomplete consent form data I.e. ((school denominator) ≠ Σ (consents + refusal + no return))

b Excluding home educated children and children who received vaccines in a mop-up clinic

c Including children contraindicated for influenza vaccine

A slight decrease in consent and increase in no return was observed as the year groups increased. Refusal rates remained consistent as the year groups increased (Figure 5).

Figure 5. Estimated number of consent, no return, and refusal rates for children school years 1-6 age in pilot areas within England, 1 September 2016 to 31 January 2017



Contraindications/reasons for non-vaccination were reported by parents and/or guardians prior to or on the day of vaccination. A total of 0.4% (1,268/285,881) of children of school years 1 to 6 age who were offered vaccines through school delivery models across England from 1 September 2016 to 31 January 2017 were contraindicated to receive the influenza vaccine or provided a reason for non-vaccination. Of the contraindications noted prior to the vaccine delivery day, the most common prior contraindications were 'immunosuppression of a family member' (n=78) and 'confirmed egg allergy' (n=52), representing 6.2% and 4.1% of all contraindications/ reasons for non-vaccination respectively. Children contraindicated prior to vaccination to receive LAIV may either have been referred to their general practice for vaccination or received the quadrivalent inactivated influenza vaccine (Fluarix Tetra) on site.

On the day contraindications resulted in 34.1% of all contraindications/reasons for non-vaccination (Table 7). 'Child not well' on the day of the vaccination was the highest percentage (7.4%) of all medical related contraindications.

The total number or known reasons for influenza vaccine refusal was much lower than other or unknown reasons for the vaccine. Some areas that provided contraindication/ reasons for non-vaccination data solely provided total numbers of contraindication/reasons for non-vaccination, thus resulting in a larger proportion of other and unknowns.

Table 9. Total prior, on day, and other contraindications/ reasons for non-vaccination of the influenza vaccination for children school years 1- to 6 age across England from 1 September 2016 to 31 January 2017

Contraindication / Reason for non-vaccination		Number of children contraindicated	% of total contraindications
Known contraindications			
Prior		**207**	**16.3**
	Immunosupression (family)	78	6.2
	Confirmed egg allergy	52	4.1
	Immunosupression (personal)	29	2.3
	Severe asthma	29	2.3
	Previous allergy to flu vaccine	12	0.9
	Cardiac disease/ Salicylate therapy	7	0.6
	Another vaccine given/due	0	0.0
On day		**432**	**34.1**
	On day: Child not well	382	30.1
	On day: Asthma, wheezing	50	3.9
Known reasons for refusal: Vaccine contains porcine gelatine		**105**	**8.3**
Other & unknown		**524**	**41.3**
Total		**1,268**	**100.0**

Children that were absent or that refused the vaccination were also recorded by a subset of the pilot teams of which 1.1% (3,239/285,881) children of school years 1-6 age were reported as being absent and 0.2% (581/285,881) children of school years 1-6 age refused vaccination on the day of the session.

Discussion

The 2016 to 2017 influenza season saw the successful extension of the national childhood influenza vaccination programme to children of years 1, 2 and 3 age across England. An overall influenza vaccine uptake of 54.9% was achieved in children of school years 1, 2 and 3 age, demonstrating the feasibility of rolling out the programme to further year groups nationally.

For children years 1, 2 and 3 age, vaccine uptake at the Area Team level was found to be the lowest in Kent and Medway and highest in Bath Gloucestershire, Swindon and Wiltshire. Of the latter AT, Swindon and Gloucestershire were not included in this study as they used a GP delivery model.

For the Pilot areas, vaccine uptake varied by year group, which was also observed during the past two influenza seasons[4, 5]. Vaccine uptake decreased as the year groups increased in age. Among all pilot areas the lowest vaccine uptake was in London (Havering LA) with an uptake of 52.7% and the highest vaccine uptake was in Leicestershire and Lincolnshire, (Leicester, Rutland, and Leicester LAs) with an uptake of 59.9%.

Analysis on the ecological predictors of uptake suggest that low uptake of children of school years 1, 2 and 3 age is strongly and independently associated with deprivation and ethnicity, with the lowest uptake being reported in the most deprived decile of deprivation or areas with a larger BME population. Areas with 6+% or more identifying with the Muslim faith reported significantly lower (4.4%) uptake in children school year 1, 2 and 3 age. These results are similar, with some suggestion of improvement over time, to those found in the first year of the pilot vaccination programme in 2013 to 2014[11] where areas with 5+% Muslim population had 7.6% lower vaccine uptake and in 2014 to 2015[4] where areas with 6+% Muslim population had 5.8% lower vaccine uptake for children ages 4-11 years in pilot areas across England. Additionally, in 2015 to 2016[5] areas with 6+% Muslim populations had 3.7% lower vaccine uptake for children of school years 1 and 2 age across England.

Ecological analysis of children school years 1 to 6 age in pilot areas indicate that lower uptake is significantly and independently associated with deprivation, ethnicity and PHE region, with the lowest uptake in areas in the most deprived decile of deprivation or in areas with larger BME population. Geographically, the lowest uptake was reported in London. The level of association between vaccine uptake and deprivation and ethnicity are similar to those found in the first year of the pilot vaccination programme in 2013 to 2014[11], and in the subsequent two seasons[4,5]. Similarly to the 2015 to 2016 season, areas identifying with Muslim or Jewish faith and urban vs rural schools were not significantly associated with lower uptake in children school years 1-6 in pilot areas[5].

The size of effect this season was greater than the 2015 to 2016 season for Jewish populations and populations for 5%/6% or more Muslim populations, however the size of effect suggests a decreasing trend over time since the introduction of the programme in 2013. It should be noted that there have been differences in the geographical location of the pilot areas and the response rates over time.

Consent, refusal and non-response rates for children school years 1, 2 and 3 age indicate that consent rates, refusal rates and no return rates varied among the different AT. The overall no return rate was 32.5 which is 2.5% greater than during the 2015 to 2016 influenza season[5]. Among the pilot areas, consent, refusal, and non-response rates indicate that decreasing uptake appears to be linked mainly to an increase in no return rates and a decrease in consent forms as school year group age increases. These differences in response and refusal rates may be a reflection of parental perceptions of the importance of influenza vaccination for older children. Younger children are typically more likely to suffer complications from influenza than older children, and are therefore a higher risk group[13, 14]. Further work is required to understand and address these differences. A reduction in the percentage of no returns would increase the overall consent and vaccine uptake.

Data on contraindications/ reasons for non-vaccination were variable in children schools year 1, 2 and 3 age and in children ages 1-6 in pilot areas. The most common contraindication/ reason for non-vaccination was ‘vaccine contains porcine gelatine’ for both children of school years 1, 2, and 3 age across England and children of school years 1-6 age in pilot areas. The most common contraindication reported on the day of the campaign was ‘child not well’ in both children of school years 1, 2, and 3 age across England and children of school years 1-6 age in pilot areas.

The childhood influenza vaccination programme continues to show promising uptake levels with population level impact of the programme in terms of prevention of influenza as the roll out of the campaign progresses[14]. The programme is being continually strengthened through the further roll out of the programme, which is seeing a further extension in the 2017 to 2018 season. From October 2017 all children of reception and school years 1, 2, 3 and 4 age in England will be offered LAIV vaccination mainly through a school-based programme. Children aged two and three years on 31 August 2017 will be offered influenza vaccination through GPs. Four year-olds will now be offered the vaccine through school delivery models. Additionally, the five pilot areas that have been piloting the primary school vaccination programme over the past three seasons will continue to offer LAIV to all primary school-age children reception to year 6. The evaluation of the season will continue to inform the best strategy to roll out influenza vaccination to all target ages in seasons to come.

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Annexes

Annexe A: Year Group Cohort Definitions

Academic Year Group	Age range 1st Sept. 2016	Birth Date Range	
		Born From	Born To
1	Age 5-6	01/09/2010	31/08/2011
2	Age 6-7	01/09/2009	31/08/2010
3	Age 7-8	01/09/2008	31/08/2009
4	Age 8-9	01/09/2007	31/08/2008
5	Age 9-10	01/09/2006	31/08/2007
6	Age 10-11	01/09/2005	31/08/2006

Annexe B: End of season data collection variables

Category	Data Type	Description
School URN	Count (interger)	Department of Education's register of educational establishments in England and Wales school specific URN code (Edubase)
School name	Categorical (School Name)	LA Registered School Name
Year group	Categorical (1-6)	Year group cohorts as defined in Annexe A.
Denominator (provisional pre-filled LEA figures)	Count (interger)	The PROVISIONAL denominator is based on the January 2016 Department of Education school census figures and is therefore only a PROVISIONAL estimate of the total no. of children eligible for influenza vaccination in the LA geography. This denominator should be updated with the Actual denominator.
Denominator (actual if different)	Count (interger)	The ACTUAL denominator will replace the PROVISIONAL denominator and should reflect the total no. of children eligible for influenza vaccination in the LA geography based on school roll figures as reported directly by schools (including home school students in the LA.)
Difference if amended	Count (interger)	Difference between the actual and provisional denominators
Parental consent total	Count (interger)	Consent forms/parental attendance on the day
Parental refusal	Count (interger)	Consent forms returned indicating refusal for consent
No. Form Returned total	Count (interger)	The number of non-responders through no form returned/non-attendance
No. Vaccinated with one dose of LAIV since 1 September 2016	Count (interger)	Total doses of nasal LAIV vaccine given to children on the day(s) of the vaccine campaign
%	Calculated field =No. vaccinated with one dose LAIV since 1	Percentge uptake
No. vaccinated with one dose of TIV since 1 September 2016	Count (interger)	Total doses of TIV vaccines given to children on the day(s) of the vaccine campaign
%	Calculated field =No. vaccinated with one dose TIV since 1 September 2016 / Denominator (acutal if different)	Percentge uptake
No. that have received flu vaccine since 1 september 2016	Count (interger)	Total doses of all vaccines given to children on the day(s) of the vaccine campaign
%	Calculated field =No. that have received flu vaccine since 1 September 2016 / Denominator (acutal if different)	Percentge uptake
Cosented but not given	Count (interger)	Total number of children that consent but did not receive the vaccine
Total GP referrals	Count (interger)	Total number of children who were referred to the GP for vaccination
No. Yellow Cards Issued	Count (interger)	Total number of children who were issued a yellow card

Annexe B: End of season data collection variables

Contraindications	Data Type	Description
Total No. of contraindications	Count (interger)	Total number of children with contraindications
Previous allergy to flu vaccine	Count (interger)	Total number of children who have an allergy to flu vaccine
Egg Allergy	Count (interger)	Total number of children who have an egg allergy
Severe asthma	Count (interger)	Total number of children who have severe asthma
Another live vaccine given/due	Count (interger)	Total number of children who have/had another live vaccine due/given
Immunosupression (personal)	Count (interger)	Total number of children with an immunosupression
Immunosupression (family)	Count (interger)	Total number of children who have a family member with an immunosupression
Cardiac disease/ salicylate therapy	Count (interger)	Total number of children with a cardiac disease/ salicylate therapy
On day: child unwell	Count (interger)	Total number of children who were unwell on the day of the vaccination campaign
On day: child absent	Count (interger)	Total number of children who were absent on the day of the vaccination campaign
On day: child refused	Count (interger)	Total number of children who refused the vaccine on the day of the vaccination campaign
On day: allergies	Count (interger)	Total number of children who had allergies on the dat of the vaccination campaign
Other	Count (interger)	Other contraindications not previously stated
Comments	Text	Comments

Annexe C: Table of Local Authorities that were not included in the study due to missing data, or having a GP or Pharmacy mode of delivery.

Area Team	Local Authority
Non-responders	
Cheshire, Warrington and Wirral	Cheshire East
	Cheshire West and Chester
	Warrington
	Wirral
Cumbria Northumberland, Tyne and Wear	Cumbria
	Newcastle Upon Tyne
	Northumberland
Durham, Darlington and Tees	Hartlepool
	Middlesbrough
	Redcar and Cleveland
	Stockton-On-Tees
London	Brent
	Ealing
	Haringey
	Hillingdon
	Islington
Merseyside	Merton
	Sutton
	Halton
	Liverpool
	Sefton
	St. Helens
GP mode of delivery	
Bath, Gloucestershire, Swindon and Wiltshire	Gloucestershire
	Swindon
Devon, Cornwall and Isles of Scilly	Kernow (Cornwall and Isles of Scilly)*

*School level data were submitted for Cornwall LA

Annexe D: Number of schools that did not submit any data or had submitted data where the numerator was greater than the denominator.

Area Team	Local Authority	No. schools with blank data	No. of schools where numerator was greater than denomiator
Bath, Gloucestershire, Swindon and Wiltshire	Bath And North East Somerset	33	2
	Somerset	3	-
	Wiltshire	-	2
Birmingham and the Black Country	Birmingham	8	-
	Dudley	6	-
	Solihull	31	-
	Walsall	2	-
	Wolverhampton	9	-
Bristol, North Somerset, Somerset and South Gloucestershire	Bristol, City Of	-	44
	South Gloucestershire	-	14
Derbyshire and Nottinghamshire	Derbyshire	22	-
	Nottingham	-	2
	Nottinghamshire	-	3
Devon, Cornwall And Isles Of Scilly	Plymouth	-	15
East Anglia	Norfolk	2	4
	Peterborough	1	2
Essex	Essex	-	1
Greater Manchester	Bolton	3	-
	Oldham	1	-
	Tameside	-	2
Hertfordshire and the South Midlands	Bedford	-	1
	Northamptonshire	-	1
Kent and Medway	Kent	113	-
Lancashire	Blackburn With Darwen	-	1
Leicestershire and Lincolnshire	Leicester	-	6
	Leicestershire and Rutland	-	37
London	Barnet	68	-
	City and Hackney	-	2
	Croydon	1	-
	Greenwich	-	3
	Kingston Upon Thames	-	54
	Lewisham	-	12
North Yorkshire and Humber	East Riding of Yorkshire	-	1
Shropshire and Staffordshire	Shropshire	9	9
	Telford And Wrekin	2	1
South Yorkshire and Bassetlaw	Sheffield	2	1
Surrey and Sussex	Brighton and Hove	19	-
	East Sussex	68	-
	Surrey	24	6
	West Sussex	62	1
Total		**489**	**227**

Annexe E: Vaccine uptake (%) for children school ages 1, 2 and 3 by Area Team across England from 1 September 2016 to 31 January 2017.

Area team[a,b,c]	Year 1 uptake (%)	Year 2 uptake (%)	Year 3 uptake (%)
Arden, Herefordshire and Worcestershire	63.8	63.6	63.2
Bath, Gloucestershire, Swindon and Wiltshire	72.6	69.7	68.0
Birmingham and the Black Country	51.7	49.4	47.4
Bristol, North Somerset, Somerset and South Gloucestershire	58.6	53.0	48.1
Cheshire, Warrington and Wirral	-	-	-
Cumbria, Northumberland, Tyne and Wear	62.8	63.0	60.4
Derbyshire and Nottinghamshire	60.8	59.3	57.1
Devon, Cornwall and Isles of Scilly*	59.9	55.7	53.3
Durham, Darlington and Tees	57.6	56.3	55.4
East Anglia	61.0	58.3	54.3
Essex	61.0	59.8	58.4
Greater Manchester	46.9	49.7	47.3
Hertfordshire and the South Midlands	57.8	55.8	53.0
Kent and Medway	44.3	39.9	39.6
Lancashire	53.9	52.4	48.2
Leicestershire and Lincolnshire	61.7	60.3	59.2
London	45.3	42.5	40.6
Merseyside	56.1	55.6	50.6
North Yorkshire and Humber	64.6	64.0	61.5
Shropshire and Staffordshire	62.0	62.3	60.8
South Yorkshire and Bassetlaw	62.2	61.4	58.7
Surrey and Sussex	58.8	55.6	52.1
Thames Valley	66.6	63.6	61.7
Wessex	68.4	65.8	62.9
West Yorkshire	55.7	54.6	52.0
Total	**57.0**	**55.0**	**52.7**

[a] Denominators represent the number of children of school years 1, 2 and 3 age eligible for vaccination. Denominators are based on school-roll figures obtained directly from schools unless unavailable then Department of Education January 2017 school census figures were used.

[b] A total of 22 LAs that provided vaccinations via a school delivery model did not provide any school level data. Gloucestershire, Swindon and Isles of Scilly provided vaccinations through a GP model and are not included.

[C] Schools that provided merged data for school years 1, 2 and 3 were not included.

Annexe F: Vaccine uptake (%) for children school ages 1-6 in pilot areas from 1 September 2016 to 31 January 2017.

Area team[a,b]	Year 1 uptake (%)	Year 2 uptake (%)	Year 3 uptake (%)	Year 4 uptake (%)	Year 5 uptake (%)	Year 6 uptake (%)
Cumbria, Northumberland, Tyne and Wear	61.1	61.5	59.0	58.8	58.5	55.5
Essex	61.0	59.8	58.4	57.0	56.3	55.8
Greater Manchester	58.2	61.1	58.1	57.2	54.4	56.3
Leicestershire and Lincolnshire	62.2	60.7	61.7	59.0	58.2	57.1
London	56	55	53	52.5	51.2	47.7
Total	**60.9**	**60.0**	**59.0**	**57.5**	**56.7**	**55.6**

[a] Denominators represent the number of children of school years 1-6 age in pilot areas eligible for vaccination. Denominators are based on school-roll figures obtained directly from schools unless unavailable then Department of Education January 2017 school census figures were used.

[b] A total of 22 LAs that provided vaccinations via a school delivery model did not provide any school level data. Gloucestershire, Swindon and Isles of Scilly provided vaccinations through a GP model and are not included.

[C] Special schools that provided merged data for school years 1 - 6 were not included.