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Short communication

An outbreak of acute respiratory illnesses in primary school children with low vaccine uptake, UK, 2016

Daiga Jermacane [a,b,*], M. Gobin [b], N. Young [c], J. Yates [d], Gloria Osei Owusu [c]

[a] European Programme for Intervention Epidemiology Training (EPIET), European Centre for Disease Prevention and Control, (ECDC), Stockholm, Sweden
[b] Field Epidemiology Service, Public Health England, South West, United Kingdom
[c] Public Health England, South West, United Kingdom
[d] Screening and Immunisation, Public Health England, South West, United Kingdom

1. Introduction

Live attenuated influenza vaccine (LAIV) in 2015/16, providing protection against Influenza A(H1N1)pdm09, was available for children aged 2–4-years old, plus school years 1 and 2 (ages 5–7), as part of the national childhood vaccination programme. The 2015/16 UK influenza season started late, peaking in week 11 (14–20 March 2016), with circulation initially dominated by A/H1N1pdm09 [1,2].

We describe an outbreak of acute respiratory illness (ARI) in a primary school of 395 children, aged 4–11 years, in the South-West of England during January 2016, associated with absenteeism in just under half of the student population. Children reported symptoms consistent with ARI, with influenza A confirmed in three cases, of which two were further typed demonstrating A(H1N1)pdm09 type. We conducted an outbreak investigation, including assessment of vaccine uptake and crude effectiveness (VE) amongst age groups eligible for LAIV (n = 180).

2. Methods

The childhood influenza vaccination campaign for ages 4–7 began in September 2015 and was completed by beginning of January 2016. The first case in this outbreak reported illness on 5 January 2016. School children born between 2008 and 2011, during the influenza season 2015/16 formed our cohort for LAIV uptake and VE analysis (ages 4–7). Children attending the school but not eligible for the vaccine (those aged 8–11) were excluded. Immunisation status was obtained from the Child Health Information Systems (CHIS) and checked against the General Practitioner (GP) records.

Cases were classified based on symptoms recorded on the school absence register, reported to the school by parent/guardian and recorded through the school management system. A confirmed case was classified as influenza A detected by real-time PCR (RT-PCR) of throat swabs, with sudden onset between 5th and 28th January 2016. Children with at least one systemic (fever/feverishness, malaise, headache, myalgia) and one respiratory symptom (cough, sore throat, shortness of breath) were classified as probable cases (equivalent to influenza-like illness – ILI). A child with at least one clinical symptom, consistent with ARI was classified as possible, in the absence of any laboratory confirmed alternative diagnosis [3].

We calculated risk ratios (RR), 95% confidence intervals (95%CI) and crude VE using univariable binomial regression. We estimated VE for two end-points, (a more sensitive but less specific case definition, including confirmed, probable and possible cases; and more specific case definition, including only confirmed and probable cases. Unvaccinated children within the eligible cohort were used as the reference group for all the analyses. Children with missing/incomplete influenza immunisation histories were excluded from the analyses. Statistical analyses were performed using Stata13.1.

3. Results

198 children out of 395 were recorded absent between 5–28 January; 191 reported symptoms consistent with possible/probable or confirmed case definition. The overall clinical attack rate (AR) at the school was 48.4% (191/395); those not eligible for LAIV vaccine also reported high AR's (Table 1).

We identified 3 confirmed, 23 probable and 165 possible cases during the outbreak period (Fig. 1).

Of the school population of 395, 180 children in school year 0, 1 and 2 were eligible for vaccination. Immunisation status was available for 152 (84.4%) of these children; 57 (37.5%) had received LAIV for seasonal flu in 2015/16. The estimated crude VE for confirmed and probable cases only, was 33% (95%CI: -100% to 78%). When all case definitions were included, the estimated VE was 21% (95% CI-7% to 41%) (Table 2).

* Corresponding author at: National Infection Service, Public Health England, 2 Rivergate, Temple Quay, Bristol BS1 6EH, United Kingdom.
E-mail addresses: Daiga.Jermacane@phe.gov.uk (D. Jermacane), Maya.Gobin@phe.gov.uk (M. Gobin), Nick.Young@phe.gov.uk (N. Young), Julie.Yates@phe.gov.uk (J. Yates), Gloria.OseiOwusu@phe.gov.uk (G.O. Owusu).

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Table 1
Attack rates by age groups.

Class-year	Age	Total number of students	Absent from school	Possible case	%	Probable case	%	Confirmed case	%	Overall attack rate (AR)%
Vaccinated school years 0, 1 and 2	Ages 4–7	180	103	87	48.3	13	7.2	2	1.1	56.6
Unvaccinated school years 3, 4, 5 and 6	Ages 8–11	215	95	78	36.2	10	4.6	1	0.5	41.4
Total		395	198	165	41.7	23	5.8	3	0.8	48.4

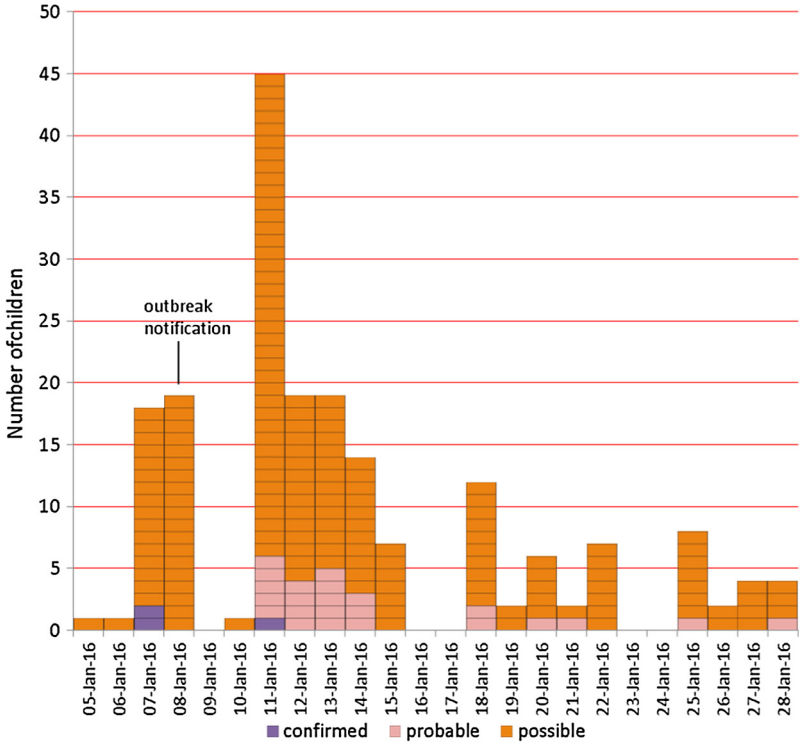

Fig. 1. Cases by date of first absence and by case status: (n = 191).

Table 2
Vaccine effectiveness: sensitivity analysis.

	Age	Total	Vaccination 2015/16 Yes	Vaccination 2015/16 No	Cases (vacc)	Cases (unvacc)	AR (vacc)	AR (unvacc)	VE (%)	95% CI (%)
Confirmed and probable cases										
	4 years	34	11	23	1	3	9	13	N/A	N/A
	5 years	54	21	33	3	3	14	9	N/A	N/A
	6 years	47	20	27	0	3	N/A	11	N/A	N/A
	7 years	17	5	12	0	1	N/A	8	N/A	N/A
Total		152	57	95	4	10	7	11	33	(-100 to 78)
Confirmed, probable and possible cases										
	4 years	34	11	23	8	17	73	74	N/A	N/A
	5 years	54	21	33	13	26	62	79	N/A	N/A
	6 years	47	20	27	8	10	40	37	N/A	N/A
	7 years	17	5	12	0	8	N/A	67	N/A	N/A
Total		152	57	95	29	61	51	64	21	(-7 to 41)

4. Discussion

This was a large primary school outbreak of ARI with particularly high rates of illness reported amongst age groups eligible for LAIV.

The estimated uptake of LAIV in 2015/16 amongst the eligible school population was below the minimum target ambition (40–60%) [2]. Nonetheless, we demonstrate that children vaccinated in 2015/16 were 33% less likely to get an ARI as compared with children who were unvaccinated.

Since 2012, the Joint Committee of Vaccination and Immunisation (JCVI) in UK has recommended the incremental introduction of LAIV for healthy children with the aim of ultimately offering the vaccine to all children (ages 2–16) [2]. The LAIV is reportedly