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1 **Evidence of decreased HPV vaccine acceptance in Polish communities within Scotland**

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11 **Keywords:** Acceptance; HPV; vaccine; Immunisation; Polish

12

13 **Abstract**

14 Human papillomavirus (HPV) vaccines are currently utilised globally in national  
15 immunisation programmes. Many new European migrants have settled in the United  
16 Kingdom (UK) since the 2004 European Union expansion with approximately 91,000 Polish  
17 people resident in Scotland. Following anecdotal reports from several NHS Boards within  
18 Scotland of lower HPV vaccine uptake in Polish communities compared with other ethnic  
19 minorities, an extract containing both forename and surname, was taken from the Scottish  
20 Immunisation Recall System (SIRS) for all girls in S2 and S3 in school years 2014/15 to  
21 2016/17. We then used the OnoMap algorithm software to derive ethnicity. OnoMap  
22 identified between 289 and 321 age-eligible girls as Polish with significant disparity noted for  
23 completed HPV vaccine uptake between UK (87.2-89.8%) and Polish ethnicities (69.7-  
24 77.2%) ( $P < 0.01$ ). Preliminary discussions with Polish families suggest that vaccine  
25 programme differences, trust in medical/healthcare practitioners, and cultural influences may  
26 be important drivers of acceptance.

## 27 **Introduction**

28 In Scotland, since 2008, school-based uptake of both the bivalent and quadrivalent HPV  
29 vaccines in girls aged 12–13 has been impressive, with vaccine uptake sustained at levels  
30 exceeding 90% (Sinka *et al.* 2014). Implementation of the programme began as soon as the  
31 school session started in August 2008 following an extensive communication campaign with  
32 eye-catching, age-appropriate TV, radio and news coverage over the summer holidays.  
33 Nearly all HPV vaccines for this age cohort in Scotland are offered in the school setting.

34 Despite recent communications to head teachers and school nurses from anti-HPV vaccine  
35 groups in the UK, those involved in the programme remain committed to ensuring high  
36 uptake of the vaccine continues. Although the vaccine programme has been successful within  
37 the UK, the Republic of Ireland has observed considerable disparities in school uptake  
38 associated with socioeconomic disadvantage (Migone *et al.*, 2017). Furthermore, while  
39 parental intent and knowledge of the HPV vaccines has increased over time, lack of  
40 perceived importance of HPV vaccination and parental concerns about vaccine safety remain  
41 barriers to both HPV vaccination series initiation and completion, especially in the USA  
42 (Hanson *et al.* 2018).

43 Many new European migrants have settled in the United Kingdom since the 2004 European  
44 Union expansion with approximately 91,000 Polish people now resident in Scotland  
45 (National Records of Scotland, 2017). Following anecdotal reports from several of Scotland's  
46 14 regional NHS Boards of lower HPV vaccine uptake in Polish communities, we aimed to  
47 formally assess uptake of HPV vaccine in Polish girls through ethnicity analysis at the  
48 national level.

## 49 **Methods**

50 An extract, containing both forename and surname, was taken from SIRS, for all girls in S3  
51 in the school years 2014/15 to 2016/17. S3 is the third year of secondary school in Scotland  
52 (year 10 in England) and girls are aged 13-14. These extracts were then fed through OnoMap  
53 Name Classification software to derive ethnicity (Onomap; Publicprofiler Ltd, UK). Onomap  
54 offers an effective methodology for identifying population groups in both health-related and  
55 educational datasets, categorizing populations into a variety of ethnic groups. Previous  
56 evaluations have suggested that it can successfully assist health researchers, planners and  
57 policy makers in identifying and addressing health inequalities (Lakha et al. 2011). The  
58 surname and forename recorded in the SIRS database for each person were matched to an  
59 Onomap subgroup, which is the lowest level in the Onomap classification system.  
60 Furthermore, as a sense check, one of the Polish speaking authors assessed forename/surname  
61 composition in the SIRS extract, confirming that Onomap was an appropriate tool for  
62 estimation of ethnicity. Ethnicity was categorised into UK, Eastern European, and Polish.

63 The cohort data was based on girls registered in S3 in Scotland on Child Health Schools  
64 Programme-School (CHSP-S) as at mid-May of the relevant school year. The vaccination  
65 data by ethnicity was based on the SIRS extract as at mid-August following the end of each  
66 school year. The published Scotland totals refer to uptake rates reported for the S3 cohort at  
67 the time the data for each school year were first published as national statistics. A completed  
68 course of HPV in 2014/15 was three doses of HPV, while in 2015/16 and 2016/17 it was two  
69 doses (Chief Medical Officer for Scotland, 2014). Ethical approval was obtained from the  
70 Public Health Intelligence Information Governance committee and approved by the relevant  
71 Caldicott Guardian.

72 **Results**

73 The majority of girls in S3 in each of the three annual cohorts were classed as British Isles,  
74 ranging from 90.2% to 91.8%. The percentage of S3 girls who were identified as Eastern  
75 Europe ranged from 1.4% to 1.6%. Approximately 75% of those identified as Eastern  
76 European were identified as Polish (Table 1).

77 Uptake in Eastern European and Polish S3 girls (range 68.1-75.5%; 69.7-79.2%) was  
78 significantly lower than in girls categorised as UK (87.2-89.6%) ( $P < 0.01$ ). The trend in  
79 uptake across the three years was similar for the three different, with uptake falling in  
80 2015/16 then increasing in 2016/17. The decrease in uptake in 2015/16 was larger among  
81 girls classed as Eastern European and the Polish sub-group, compared with UK girls.  
82 Although uptake rates rebounded in 2016/17 among all three groups, it was only the uptake  
83 among UK girls that recovered to the level observed in 2014/15 (Table 1).

84

85 **Table 1. Uptake of completed course of HPV by S3 by Ethnic Groups and Academic**  
 86 **Year.**

School Year	Ethnicity	S3 Cohort	Completed HPV		95% CI
			n	%	
2014/15	UK	24,377	21,840	89.6	(89.2-90.0)
	Eastern Europe	376	284	75.5	(70.9-79.6)
	<i>Polish</i>	289	223	77.2	(72.0-81.6)
	<b>Published Scotland Total</b>	<b>26,554</b>	<b>23,588</b>	<b>88.8</b>	
2015/16	UK	23,816	20,775	87.2	(86.8-87.6)
	Eastern Europe	382	260	68.1	(63.2-72.5)
	<i>Polish</i>	300	209	69.7	(64.2-74.6)
	<b>Published Scotland Total</b>	<b>26,104</b>	<b>22,570</b>	<b>86.5</b>	
2016/17	UK	23,389	20,998	89.8	(89.4-90.2)
	Eastern Europe	418	304	72.7	(68.3-76.8)
	<i>Polish</i>	321	231	72.0	(66.8-76.6)
	<b>Published Scotland Total</b>	<b>25,932</b>	<b>23,040</b>	<b>88.8</b>	

87

88

## 89 Discussion

90 In this study, we confirmed a significant disparity in HPV vaccine uptake amongst Eastern  
91 European and Polish communities within Scotland, a country with high uptake since  
92 programme inception. This phenomenon appears to be uniquely associated with Polish and  
93 Eastern European communities, since uptake of the HPV vaccine in girls from the Indian sub-  
94 continent was comparable (86% for two doses) to those identified as being UK born. Within  
95 the EU, Poland is one of eight countries where HPV vaccination is yet to have been made  
96 part of a free-of-charge mandatory form of immunisation programme (Ganczak *et al.* 2018).  
97 Consequently, HPV vaccination coverage in adolescent Polish girls is estimated at 1.5–10%.  
98 This is much lower than those reported in countries where the cost of vaccinations is covered  
99 from the national budget. Poland has recognised issues with vaccine hesitancy and an active  
100 anti-vaccination movement (Braczkowska *et al.*, 2017; Jaroszewska *et al.*, 2014).

101 However, notwithstanding that, the recent study by Ganczak and colleagues demonstrated  
102 that attitudes regarding their child being vaccinated against HPV were generally positive  
103 among Polish parents, even though awareness and knowledge of HPV in this group were low.  
104 If a girl wants vaccination the vaccine must be purchased by the parents and administered  
105 through primary health care or outpatient clinic. Most of the significant factors that  
106 influenced their willingness were modifiable, such as being informed about HPV and having  
107 positive attitudes toward vaccines.

108 These findings have important implications for the trans-national study of vaccine uptake and  
109 the drivers of these, especially in countries that experience significant immigration. The main  
110 aim of characterizing the nature and scale of vaccine acceptance issues is to appropriately  
111 inform the development of strategies and policies to address the concerns expressed, while  
112 sustaining confidence in vaccination (Larson *et al.* 2015). Reducing inequalities is also a key



113 aim of generating and maintaining equitable uptake of vaccines, and where cervical cancer  
114 disproportionately affects the most deprived, it is even more important to ensure uptake of the  
115 HPV vaccine is evenly distributed across national populations.

116 One of the main limitations of our study was the reliance on the Onomap naming algorithm to  
117 accurately identify ethnicity. The utility of Onomap has been validated in several studies  
118 (Smith *et al.* 2017). Combining ethnicity from multiple sources results in a more complete  
119 estimate of ethnicity than the use of one single source but we believe that this does not  
120 significantly affect the main findings of this study. The phenomenon of decreased vaccine  
121 uptake is prevalent in the Polish communities within Scotland, as is demonstrated in another  
122 study that was performed simultaneously for childhood influenza vaccine (Bielecki *et al.*  
123 2018 – manuscript submitted to Vaccine). This study only involved administrative uptake  
124 data and not parent interviews. Consequently, this study was unable to discern the actual  
125 reasons behind the lower HPV uptake among Polish girls and was not able to identify  
126 whether, and to what extent, parents were reluctant or concerned about HPV vaccination.

127 Despite higher rates of HPV vaccine uptake compared to those residents in Poland, this study  
128 demonstrates significantly lower rates of HPV vaccine uptake in girls of Polish and Eastern  
129 European ethnicity compared to others in Scotland. We have conducted an explorative  
130 qualitative study with Polish families, which suggest that vaccine programme differences  
131 between Poland and the UK, trust in medical/healthcare practitioners, and cultural influences  
132 may be important drivers of acceptance. Furthermore, this qualitative study has revealed that  
133 Polish women expressed fears in relation to the side-effects of the HPV vaccine, an  
134 independent predictor of parental willingness to have their child vaccinated (Ganczak *et al.*  
135 2018). Strategies to promote uptake of HPV vaccines amongst Polish and Eastern European  
136 communities should be promoted, especially given poor uptake of cervical screening in these  
137 communities (Mazdziarz et al., 2017).

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