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## Short Communication

## Resistance to COVID-19 vaccination has increased in Ireland and the United Kingdom during the pandemic



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## ABSTRACT

**Objectives:** Hesitance and resistance to COVID-19 vaccination poses a serious challenge to achieving adequate vaccine uptake in the general population. Cross-sectional data from the early months of the pandemic indicates that approximately one-third of adults in multiple nations are hesitant or resistant to a vaccine for COVID-19. Using longitudinal data, we tracked changes in attitudes to COVID-19 vaccination during the pandemic.

**Study design:** This is a quantitative, longitudinal design.

**Method:** Nationally representative samples of the adult general population of the Republic of Ireland (N = 1041) and the United Kingdom (N = 2025) were assessed for their attitudes towards COVID-19 vaccination at three points from March to August 2020.

**Results:** Statistically significant increases in resistance to COVID-19 vaccination were observed in Irish (from 9.5% to 18.1%) and British (from 6.2% to 10%) adults.

**Conclusion:** Resistance to vaccination has significantly increased in two European nations as the pandemic has progressed. Growing resistance to COVID-19 vaccination will pose a challenge to public health officials responsible for ensuring sufficient vaccine coverage.

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With an excess of 65 million confirmed cases across 190 countries globally and more than 1.5 million deaths, COVID-19 remains one of the most important global health challenges of our lifetime.<sup>1</sup> Recent announcements about the development of multiple, safe and effective vaccines for COVID-19 offer a promising solution to this public health crisis. However, in addition to production and distribution challenges, a key challenge remains convincing a critical mass of the population to accept a COVID-19 vaccine.

In June 2020, 72% of people from 19 countries indicated that they would accept a COVID-19 vaccine, with rates as high as 89% in China and as low as 55% in Russia.<sup>2</sup> An ongoing Gallup Poll of the United States general population found that acceptance of a COVID-

19 vaccine fell from 66% in July to 50% in September before increasing to 58% by the end of October.<sup>3</sup> Although more longitudinal research is clearly required, early evidence suggests that people's attitudes towards a COVID-19 vaccine are fluctuating over time.

In March 2020, our research group initiated a longitudinal project that tracked nationally representative samples of adults from the Republic of Ireland and the United Kingdom (UK). Asked if they would accept a hypothetical vaccine for COVID-19, approximately two-thirds of Irish (65%) and British (69%) adults responded 'yes', about one-quarter responded 'maybe' (26% in Ireland and 25% in the UK) and the remainder responded 'no' (9% in Ireland and 6% in the UK).<sup>4</sup> Here, we report changes in COVID-19 vaccine acceptance ('yes'), hesitance ('maybe') and resistance ('no') in these samples during the first four months of the pandemic.

Identical sampling methods were used to collect data in Ireland and the UK. Participants were recruited from existing survey panels

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**Table 1**  
Proportion of Irish (n = 1030) and UK (n = 2020) samples accepting, hesitant to and resistant to a COVID-19 vaccine.

Country	Wave 1	Wave 2	Wave 3	Pairwise comparisons (Wald chi-squared)		
	% (95% CI)	% (95% CI)	% (95% CI)	Wave 1 vs wave 2	Wave 1 vs wave 3	Wave 2 vs wave 3
<b>Ireland</b>						
Acceptance	64.9 (61.9, 67.8)	64.3 (60.5, 68.1)	55.4 (51.6, 59.3)	Chi-squared = 0.09	Chi-squared = 24.67***	Chi-squared = 22.05***
Hesitance	25.6 (22.9, 28.3)	23.0 (19.5, 26.4)	26.6 (23.0, 30.2)	Chi-squared = 2.02	Chi-squared = 0.23	Chi-squared = 3.08
Resistance	9.5 (7.7, 11.3)	12.9 (10.1, 15.6)	18.1 (15.0, 21.2)	Chi-squared = 6.27*	Chi-squared = 30.24***	Chi-squared = 11.03***
<b>UK</b>						
Acceptance	68.8 (66.8, 70.9)	66.6 (64.3, 69.0)	71.8 (69.4, 74.3)	Chi-squared = 3.12	Chi-squared = 5.53*	Chi-squared = 18.97***
Hesitance	24.9 (23.1, 26.8)	23.8 (21.7, 26.0)	18.1 (16.0, 20.2)	Chi-squared = 0.88	Chi-squared = 30.29***	Chi-squared = 23.54***
Resistance	6.2 (5.2, 7.3)	9.4 (7.9, 10.9)	10.0 (8.4, 11.7)	Chi-squared = 17.68***	Chi-squared = 20.57***	Chi-squared = 0.51

95% CI = 95% confidence interval; UK, United Kingdom.

All degrees of freedom = 1

\*  $P < .05$ .

\*\*  $P < .01$ .

\*\*\*  $P < .001$ .

by Qualtrics using quota sampling to ensure the samples were representative of their populations by sex, age, regional and income distributions.<sup>4,5</sup> In Ireland, wave 1 (N = 1041) longitudinal data were collected from March 30 to April 5, wave 2 (n = 506, recontact rate = 49%) data were collected from April 30 to May 19 and wave 3 (n = 534, recontact rate = 51%) data were collected from July 16 to August 8. In the UK, wave 1 (N = 2025) longitudinal data were collected from March 23 to 28, wave 2 (n = 1,406, recontact rate = 69%) data were collected from April 22 to May 1 and wave 3 (n = 1,166, recontact rate = 58%) data were collected from July 9 to August 9.

At each assessment, participants were asked ‘If a new vaccine were to be developed that could prevent COVID-19, would you accept it for yourself?’ Response options were ‘yes’, ‘maybe’ and ‘no’. Changes in COVID-19 vaccine acceptance (‘yes’), hesitance (‘maybe’) and resistance (‘no’) were assessed using a structural equation modelling framework, and missing data were handled using robust maximum likelihood estimation.<sup>6,7</sup> A ‘null’ model was initially specified wherein the proportions (e.g., in vaccine resistance) were constrained to be equal over time. Next, an ‘alternative’ model was specified wherein the proportions were freely estimated over time. These models differ by one degree of freedom, so improvement in model fit can be tested using a log-likelihood ratio test that is distributed as a chi-squared distribution. Finally, pairwise comparisons were tested using a Wald chi-squared test. All analyses were performed in Mplus, version 8.2.<sup>8</sup>

There were statistically significant changes over time in attitudes towards COVID-19 vaccination in the Irish (chi-squared (2, 1030) = 33.37,  $P < .001$ ) and British (chi-squared (2, 2020) = 19.22,  $P < .001$ ) samples. Table 1 reports all figures including the pairwise comparisons. In Ireland, between March and August 2020, there was a significant decrease in vaccine acceptance (from 64.9% to 55.4%), no change in vaccine hesitance (25.6–26.6%) and a significant increase in vaccine resistance (9.5–18.1%). During the same period in the UK, there was a significant increase in vaccine acceptance (68.8–71.8%), a significant decrease in vaccine hesitance (24.9–18.1%) and a significant increase in vaccine resistance (6.2–10.0%).

Substantial changes in attitudes towards a vaccine for COVID-19 were evident in Irish and British adults during the first four months of the pandemic. Resistance to COVID-19 vaccination rose in Ireland by 91% and in the UK by 61%. It was notable that the changes in attitudes towards COVID-19 vaccination changed in distinct ways in the two countries. The rise in vaccine resistance in Ireland was

associated with a concomitant fall in vaccine acceptance, whereas in the UK, the rise in vaccine acceptance and resistance was associated with a parallel fall in vaccine hesitance.

The levels of vaccine acceptance identified in Ireland and the UK during the earliest phase of the pandemic were similar to the average level of vaccine acceptance across 19 nations reported by Lazarus et al.<sup>2</sup> in June 2020. However, the increased rate of vaccine resistance observed in both countries by August 2020 mirrors similar trends observed in the United States at a similar period of time.<sup>3</sup> It appears that the rise in vaccine resistance coincided with the loosening of public health restrictions in these countries during the summer months as the spread of the virus began to come under control and normal daily functioning for many people resumed. The emergence of the ‘second wave’ of COVID-19 appears to have led to an increase in vaccine acceptance in the United States,<sup>3</sup> and it will be important to understand if similar trends are observed in other nations.

Moreover, the emergence and public distribution of actual vaccines for COVID-19 may shift public attitudes further, which presents an opportunity to assess how COVID-19 vaccine acceptance, hesitance and resistance change in the context of an available vaccine; what predicts change in attitudes towards vaccination and how well attitudes towards a hypothetical vaccine predict actual vaccine uptake. Timely, evidence-based answers to these questions will provide valuable public health information to health officials and policymakers to better inform social behaviour and communications strategies to increase the uptake of a COVID-19 vaccine.

**Author statements**

*Ethical approval*

Collection of the data presented in this study was approved by the Research Ethics Committees at The University of Sheffield and Ulster University.

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*Competing interests*

All authors have no conflict of interest to declare.

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