Factors associated with vaccine hesitancy

Henry Potts, 10 March 2021

# Vaccine hesitancy

We are using the CORSAIR study (see Smith et al., 2020, 2021, for details). This involves approximately 2000 respondents per wave of polling. Questions relating to vaccination were asked from wave 36.

|  |  |  |  |
| --- | --- | --- | --- |
| Calendar week | Polling wave | Data collected | Notes |
| 50 (2020) | 36 | 7 – 9 December 2020 | UK vaccination programme began 8 Dec 2020 |
| 51 (2020) | 37 | 14 – 16 December 2020 |  |
| 52 (2020) | 38 | 21 – 23 December 2020 |  |
| 53 (2020) | 39 | 28 – 29 December 2020 |  |
| 1 (2021)/54 (2020) | 40 | 4 – 6 January 2021 |  |
| 2 (2021)/55 (2020) | 41 | 11 – 13 January 2021 |  |
| 3 (2021)/56 (2020) | no poll |  | Roll-out of vaccinations to over 70 year olds and those defined as clinically extremely vulnerable from 18 Jan 2021 |
| 4 (2021)/57 (2020) | 42 | 25 – 27 January 2021 | “Have you received a coronavirus vaccine?” recorded from here on |
| 5 (2021)/58 (2020) | 43 | 8 – 9 Feb 2021 |  |
| 6 (2021)/59 (2020) | no poll |  |  |
| 7 (2021)/60 (2020) | 44 | 22 – 23 Feb 2021 |  |

We have a question, “If you were offered a vaccine against coronavirus (Covid-19) free of charge in the next month, how likely would you be to get vaccinated?” The response options are: *Definitely would* / *Probably would* / *Probably would not* / *Definitely not* / *Not sure*. We generated a binary variable of vaccine hesitancy (*Probably would not* / *Definitely not* / *Not sure*) versus acceptance (*Definitely would* / *Probably would*).



How people respond to this question will be influenced by whether people are eligible for the vaccine and whether they have had the vaccine already. The interpretation of the question if someone has already been vaccinated is unclear. To handle this, we look at two periods. For waves 36-41, we include all respondents and presume that numbers who have been vaccinated are very low. For waves 42-44, we will only examine those who say they have not been offered the vaccine.

# JANUARY/FEBRUARY 2021: PEOPLE WHO HAVE NOT BEEN OFFERED THE VACCINATION

For waves 42-44, we have 6033 (unique) responses. Of these, 4115 say they have not been offered the vaccine. We carry out a multivariable logistic regression to predict vaccine hesitancy. There are 298 cases omitted because of missing data.

The overall model is significant: χ2(43) = 304.8, *p* < 0.001, Nagelkerke R2 = 13%.

Table 1. Associations between personal characteristics and vaccine hesitancy. Bolding indicates findings significant at a *p*<0.001.

|  |  |  |  |
| --- | --- | --- | --- |
| Participant characteristics | Level | Adjusted odds ratio (95% CI) for multivariable analysis (plus likelihood ratio tests for factors involving multiple variables) | *p*-value |
| Survey wave | Overall | χ2(2) = 3.2 | 0.2 |
| Region | Overall | χ2(11) = 14.4 | 0.2 |
| Gender | Male | 0.85 (0.70, 1.02) | 0.083 |
| Female | Reference category |  |
| Age (categories) | Overall | χ2(4) = 24.4 | **< 0.001** |
|  | 16-49 years old | 2.39 (1.18, 4.82) | 0.015 |
|  | 50-59 years old | 1.50 (0.74, 3.04) | 0.3 |
|  | 60-64 years old | 1.15 (0.54, 2.45) | 0.7 |
|  | 65-69 years old | 1.20 (0.55, 2.64) | 0.6 |
|  | 70+ years old | Reference category |  |
| Dependent child in household | None | Reference category | 0.034 |
| Child present | 1.25 (1.02, 1.54) |  |
| Clinically vulnerable to COVID-19 | No | Reference category | 0.044 |
| Yes | 0.74 (0.55, 0.99) |  |
| Household member has chronic illness | No | Reference category | 0.6 |
| Yes | 1.06 (0.83, 1.36) |  |
| Employment status | Not working | Reference category | 0.3 |
| Working | 0.90 (0.73, 1.09) |  |
| Socio-economic grade | ABC1 | Reference category |  |
| C2DE | 1.16 (0.96, 1.41) | 0.1 |
| Index of multiple deprivation | 1st quartile (least deprived) | Reference category |  |
| 2nd quartile | 1.33 (0.99, 1.78) | 0.060 |
| 3rd quartile | 1.44 (1.09, 1.91) | 0.012 |
| 4th quartile (most deprived) | 1.76 (1.33, 2.34) | **< 0.001** |
| Overall | χ2(3) = 15.9 | 0.001 |
| Highest educational or professional qualification | GCSE/vocational/A-level/No formal qualifications | Reference category | 0.001 |
| Degree or higher (Bachelors, Masters, PhD) | 0.69 (0.56, 0.86) |  |
| Ethnicity | White British | Reference category |  |
| White other | 2.68 (1.81, 3.96) | **< 0.001** |
| Mixed | 1.66 (1.01, 2.72) | 0.046 |
| Asian / Asian British | 0.92 (0.52, 1.61) | 0.8 |
| Black / Black British | 4.84 (2.95, 7.93) | **< 0.001** |
| Arab / other / don’t know / prefer not to say | 1.00 (0.37, 2.68) | 1.0 |
| Overall | χ2(5) = 60.1 | **< 0.001** |
| First language | English | Reference category | 0.2 |
|  | Not English | 1.27 (0.88, 1.83) |  |
| Religion | No religion | Reference category |  |
|  | Christian | 0.72 (0.59, 0.88) | 0.001 |
|  | Buddhist | 0.44 (0.12, 1.61) | 0.2 |
|  | Hindu | 0.69 (0.21, 2.27) | 0.5 |
|  | Any other | 0.62 (0.28, 1.38) | 0.2 |
|  | Muslim | 1.26 (0.71, 2.21) | 0.4 |
|  | Prefer not to say | 1.88 (0.95, 3.71) | 0.07 |
|  | Overall | χ2(6) = 19.2 | 0.004 |
| Living alone | Not living alone | Reference category |  |
| Living alone | 1.15 (0.86, 1.55) | 0.4 |
| Marital status | Single/separated/divorced/widowed | Reference category |  |
| Married/partnered | 0.82 (0.67, 1.02) | 0.07 |
| Ever had COVID-19 | Think have not had COVID-19 | Reference category | 0.5 |
| Think or had COVID-19 confirmed | 0.93 (0.73, 1.17) |  |
| COVID-19-related financial hardship | Range 3 (least hardship) to 15 (most hardship) | 1.05 (1.01, 1.08) | 0.005 |

There is an effect of age, with vaccine hesitancy higher in those under-50 year. Vaccine hesitancy is also higher in those who identify as Black/Black British or White Other, and in those living in the most deprived areas of the UK. Those with more education and those identifying as Christian are less vaccine hesitant. Those reporting greater pandemic-related financial hardship are more hesitant.

We construct a second model adding certain psychological variables, controlling for all the factors in Table 1 above: worry about coronavirus, risk of coronavirus to yourself, risk of coronavirus to friends & family, and MCS (trust in government on coronavirus). The overall model is significant: χ2(46) = 501.7, *p* < 0.001, Nagelkerke R2 = 30%.

|  |  |  |  |
| --- | --- | --- | --- |
| Participant characteristics | Level | Adjusted odds ratio (95% CI) for multivariable analysis | *p*-value |
| Worry | “Not at all worried” to “Extremely worried” (5 point scale) | 0.74 (0.64, 0.86) | **< 0.001** |
| Risk to self | “No risk at all” to “Major risk” (5 point scale) | 0.99 (0.84, 1.17) | 0.9 |
| Risk to friends & family | “No risk at all” to “Major risk” (5 point scale) | 0.64 (0.55, 0.76) | **< 0.001** |
| MCS | Greater trust in Government | 0.82 (0.78, 0.86) | **< 0.001** |

Vaccine hesitancy is closely associated with low worry, low perceived risk to others, and low trust in the government.

# DECEMBER TO JANUARY 2020: GENERAL POPULATION

For waves 36-41, we have 12217 responses from 12059 people (11901 people responding once over the period and 158 responding twice over the period). (These analyses could be re-run excluding the over-80 age group as this group was most likely to have been vaccinated in this period.)

We carried out a GEE for a binary outcome. There are 977 cases omitted because of missing data.

Table 3. Associations between personal characteristics and vaccine hesitancy. Bolding indicates findings significant at a *p*<0.001.

|  |  |  |  |
| --- | --- | --- | --- |
| Participant characteristics | Level | Adjusted odds ratio (95% CI) for multivariable analysis (plus likelihood ratio tests for factors involving multiple variables) | *p*-value |
| Survey wave | Overall | χ2(5) = 79.5 | **< 0.001** |
|  | Wave 36 | Reference category |  |
|  | Wave 37 | 0.95 (0.82, 1.11) | 0.5 |
|  | Wave 38 | 0.83 (0.71, 0.96) | 0.016 |
|  | Wave 39 | 0.75 (0.64, 0.88) | **< 0.001** |
|  | Wave 40 | 0.62 (0.53, 0.72) | **< 0.001** |
|  | Wave 41 | 0.56 (0.48, 0.66) | **< 0.001** |
| Region | Overall | χ2(11) = 20.1 | 0.044 |
| Gender | Male | Reference category | **< 0.001** |
| Female | 1.20 (1.09, 1.33) |  |
| Age (categories) | Overall | χ2(5) = 157.7 | **< 0.001** |
|  | 16-49 years old | Reference category |  |
|  | 50-59 years old | 0.64 (0.56, 0.74) | **< 0.001** |
|  | 60-64 years old | 0.65 (0.54, 0.78) | **< 0.001** |
|  | 65-69 years old | 0.41 (0.32, 0.51) | **< 0.001** |
|  | 70-79 years old | 0.25 (0.19, 0.32) | **< 0.001** |
|  | 80+ years old | 0.21 (0.11, 0.38) | **< 0.001** |
| Dependent child in household | None | Reference category |  |
| Child present | 1.11 (0.99, 1.24) | 0.080 |
| Clinically vulnerable to COVID-19 | No | Reference category |  |
| Yes | 0.70 (0.61, 0.80) | **< 0.001** |
| Household member has chronic illness | No | Reference category | 0.005 |
| Yes | 0.82 (0.72, 0.94) |  |
| Employment status | Not working | Reference category | 0.010 |
| Working | 0.87 (0.78, 0.97) |  |
| Socio-economic grade | ABC1 | Reference category | 0.021 |
| C2DE | 1.13 (1.02, 1.26) |  |
| Index of multiple deprivation | 1st quartile (least deprived) | Reference category |  |
| 2nd quartile | 1.29 (1.11, 1.50) | 0.001 |
| 3rd quartile | 1.43 (1.24, 1.65) | **< 0.001** |
| 4th quartile (most deprived) | 1.66 (1.43, 1.92) | **< 0.001** |
| Overall | χ2(3) = 47.8 | **< 0.001** |
| Highest educational or professional qualification | GCSE/vocational/A-level/No formal qualifications | Reference category | **< 0.001** |
| Degree or higher (Bachelors, Masters, PhD) | 0.70 (0.63, 0.78) |  |
| Ethnicity | White British | Reference category |  |
| White other | 1.38 (1.12, 1.71) | 0.003 |
| Mixed | 1.64 (1.24, 2.18) | 0.001 |
| Asian / Asian British | 1.15 (0.85, 1.56) | 0.4 |
| Black / Black British | 2.28 (1.67, 3.12) | **< 0.001** |
| Arab / other | 1.53 (0.80, 2.91) | 0.2 |
| Don’t know / prefer not to say | 3.14 (1.53, 6.47) | 0.002 |
| Overall | χ2(6) = 50.2 | **< 0.001** |
| First language | English | 0.80 (0.66, 0.98) | 0.029 |
|  | Not English | Reference category |  |
| Religion | No religion | Reference category |  |
|  | Christian | 0.84 (0.75, 0.93) | 0.001 |
|  | Buddhist | 0.76 (0.45, 1.30) | 0.3 |
|  | Hindu | 0.61 (0.36, 1.03) | 0.067 |
|  | Jewish | 0.51 (0.27, 0.96) | 0.036 |
|  | Muslim | 1.00 (0.73, 1.37) | 1.0 |
|  | Sikh | 0.73 (0.33, 1.63) | 0.4 |
|  | Any other | 1.75 (1.15, 2.66) | 0.009 |
|  | Prefer not to say | 0.90 (0.60, 1.36) | 0.6 |
|  | Overall | χ2(8) = 28.1 | **< 0.001** |
| Living alone | Not living alone | 1.05 (0.90, 1.22) | 0.5 |
| Living alone | Reference category |  |
| Marital status | Single/separated/divorced/ widowed | Reference category |  |
| Married/partnered | 0.75 (0.67, 0.84) | **< 0.001** |
| Ever had COVID-19 | Think have not had COVID-19 | Reference category |  |
| Think or had COVID-19 confirmed | 0.86 (0.75, 0.99) | 0.030 |
| Covid-19-related financial hardship | Range 3 (least hardship) to 15 (most hardship) | 1.04 (1.02, 1.06) | **< 0.001** |

Vaccine hesitancy reduced considerably over time. There is also a strong effect of age, with younger people being more hesitant. Women, single people and those living in more deprived areas of the UK are more hesitant. Those who are clinically vulnerable to COVID-19 and with higher educational attainment are less hesitant. Vaccine hesitancy is also higher in those who identify as Black/Black British, Mixed or White Other and among those who decline to answer the ethnicity question. Vaccine hesitancy is lower among those identifying as Christian, but higher among those identifying as Any other religion.[[1]](#footnote-1)

We construct a second model adding certain psychological variables, controlling for all the variables in Table 3 above: worry about coronavirus, risk of coronavirus to yourself, risk of coronavirus to friends & family, and MCS (trust in government on coronavirus).

|  |  |  |  |
| --- | --- | --- | --- |
| Participant characteristics | Level | Adjusted odds ratio (95% CI) for multivariable analysis | *p*-value |
| Worry | “Not at all worried” to “Extremely worried” (5 point scale) | 0.74 (0.69, 0.79) | **< 0.001** |
| Risk to self | “No risk at all” to “Major risk” (5 point scale) | 0.98 (0.92, 1.06) | 0.7 |
| Risk to friends & family | “No risk at all” to “Major risk” (5 point scale) | 0.80 (0.75, 0.86) | **< 0.001** |
| MCS | Greater trust in Government | 0.85 (0.83, 0.87) | **< 0.001** |

Vaccine hesitancy is associated with low worry, low perceived risk to others, and low trust in the Government.

# References

Smith LE, Potts HWW, Amlôt R, Fear NT, Michie S, Rubin GJ (2020). Adherence to the test, trace and isolate system: Results from a time series of 21 nationally representative surveys in the UK, 3 September 2020. Scientific Advisory Group for Emergencies, 23 Oct 2020. https://www.gov.uk/government/publications/adherence-to-the-test-trace-and-isolate-system-results-from-a-time-series-of-21-nationally-representative-surveys-in-the-uk-3-september-2020 (Also available on medRxiv: 2020.09.15.20191957.)

Smith LE, Potts HW, Amlôt R, Fear NT, Michie S, Rubin GJ (in press). Adherence to the test, trace and isolate system: Results from a series of 37 nationally representative surveys in the UK (the COVID-19 Rapid Survey of Adherence to Interventions and Responses [CORSAIR] study). *BMJ*.

Dataset used:

* Department of Health and Social Care tracker
	+ Tracking DHSC marketing, coronavirus attitudes, beliefs, knowledge, reported behaviour, satisfaction with Government response, credibility of Government.
	+ Data collected weekly (Monday to Wednesday) since late January 2020.
	+ N~2000 per wave.
	+ Market research company commissioned: BMG Research.

*Please note that this work has been conducted rapidly, and has not been peer reviewed or subject to normal quality control measures.*

Professor Henry W.W. Potts (UCL), Dr Louise E. Smith (KCL), Professor Nicola T. Fear (KCL), Professor Susan Michie (UCL), Professor Richard Amlȏt (PHE), Professor G James Rubin (KCL)

Contact details: h.potts@ucl.ac.uk, louise.e.smith@kcl.ac.uk, richard.amlot@phe.gov.uk, gideon.rubin@kcl.ac.uk

1. This is a very mixed group, but the largest groups are those who identify as Pagan, Spiritualist, Wiccan, agnostic or Jehovah’s Witnesses. [↑](#footnote-ref-1)