The role of religion and COVID-19 vaccine uptake in England

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ABSTRACT

Background: While many countries have successfully deployed COVID-19 vaccination programmes, there are disparities in their uptake. One factor influencing vaccine coverage is religion. Existing research has found a link between religious beliefs and vaccine hesitancy. This study looks at religion in England to examine its relationship with public health.
Methods: This analysis used data from a survey of over 12,000 respondents in England, conducted through the YouGov Online Panel. Respondents were asked whether they identified with a religion, and if so which, and the number of COVID-19 vaccinations they had received. We employed logistic regressions to analyse the data, accounting for age, gender, education, generalised trust, trust in government, and political ideology.
Results: We find that respondents who identify as part of the Church of England have had significantly more COVID-19 vaccinations. Conversely, adherents to the Pentecostal Evangelical and Islamic faiths have had significantly fewer COVID-19 vaccinations. These relationships hold even when adjusting for age, education, level of trust, and political affiliation.
Conclusion: This research indicates a potential influence of religious affiliation on vaccine uptake, highlighting the need for more carefully-tailored public health programmes. Recognizing the diverse associations of different religious affiliations on health behaviour is important for shaping future vaccination campaigns and policy interventions. Engaging with religious communities and leaders may be one method through which to deal with vaccine hesitancy and improve public health.

1. Introduction

When the COVID-19 pandemic first emerged, vaccine research quickly pivoted to developing vaccines against SARS-CoV-2, the virus which causes COVID-19. Soon after, vaccines became available through a mass vaccination effort which took place throughout the world. The United Kingdom began its COVID-19 vaccination program on 8 December 2020 when a 90-year old was given the first vaccine dose [1]. The UK vaccination program has continued since with some people receiving five or more vaccine doses, depending on the type of first vaccine and subsequent boosters. However, there continues to be a group of people who have not received a vaccination or only had one vaccine dose. There has been a general increase in hesitancy to vaccines of any kind [2,3]. Understanding what factors explain the lack of vaccination is important for policy-makers to tailor the intervention required for future vaccination waves.

Among the potential factors related to understanding vaccine uptake/hesitancy is religion, be that in terms of belief, affiliation or membership of a religious community. It is well-established that there is a link between vaccine hesitancy and religion; a notable body of research has found that people who identify as being part of a religion tend to be more sceptical towards vaccination [4–8]. The connection between religion and vaccine hesitancy is not new. Grabenstein [9] presents a detailed review of the historical connections between religious affiliation and vaccine opposition and also some of the consequences that these groups face through a lack of immunization. Trangerud's [10] research on religious vaccine scepticism effectively categorises the various forms of religious views on vaccines into an easily applicable typology. Rutjens et al [11] show the link between religiosity and vaccine scepticism and also highlight political views as a potential explanatory factor. While Viskupic and Wiltse [12] report that trust in government alongside political views also have an impact. Cross-national studies have found that Christianity is negatively associated with COVID-19 vaccines [13]. This negative association is also reported by Kohli et al [14] in their commentary on vaccine hesitancy in Africa and Asia. Van Lier et al [8] used support for a religious minority party at

elections as a proxy for religiousness and showed lower vaccine uptake in districts where the party had high electoral support.

Martens [15] found a consistent negative association between vaccination rate and religious affiliations in England. While in Europe more generally a relationship between prayer frequency and vaccine hesitancy has been reported [16]. Murphy et al. [17] found a strong relationship between religiousness and vaccine hesitancy in the United Kingdom and Ireland. Yet it is also acknowledged that some religious leaders, most notably Pope Francis, have supported the COVID-19 vaccine efforts [18], which was a reversal of previous Roman Catholic positions on vaccinations [19]. The main problem for the Catholic church was that some COVID-19 vaccines, such as those produced by Johnson & Johnson and AstraZeneca, used cell lines from foetuses which had been aborted in the 1970s and 80s [20]. Other faiths were critical about the UK government's guidance on religious services during lockdown, for instance cancelling the important Muslim festival of Eid al-Adha in Blackburn and Leicester in 2020 through local lockdowns [21]. In general, the existing literature points toward a clear association between religion and vaccine uptake. Yet, as we will argue in this article there might be a problem with treating religion as one single category.

What the existing studies have in common is that they either look at levels of religiosity or at top-level religions. There are limited studies which focus on various smaller religious denominations, mostly due to a measurement issue, i.e. obtaining a large enough sample with enough variation across several denominations to estimate the association between vaccine uptake and belonging to such a denomination. In this article we overcome this problem by drawing on a survey of over 12,000 respondents to examine the association between religion and vaccine uptake in England. The case of England is useful as it is first and foremost a country in which many different religious denominations exists. While it does have a sizeable main religious group, the Church of England, which is the largest Christian denomination in the country, and a large group identifying as non-religious, it is also home to many other faiths. This allows us to examine the association between religion and vaccine uptake in comparison to non-religious respondents. In the online materials (separate from the main manuscript), we also examine the differences between particular religions and religious denominations when comparing to the dominant denomination in England, the Church of England. Using the English case follows the approach of Martens [15] who argues that it is necessary to understand the link between specific religious denominations and vaccine hesitancy to optimise policy interventions.

2. Data and methodology

All replication data and code for this article are available through the Harvard Dataverse, at https://doi.org/10.7910/DVN/VGA0BK. The survey data were gathered via monthly waves from July 2022 through March 2024. The questions were asked through the survey company YouGov's Online Panel which ensures that a nationally representative sample of respondents in England is present throughout. We pool together the waves for analysis purposes. The research was approved by the Brunel University London Research Ethics Committee (Ref 35290-LR-Jan/2022-37313-1).

Our dependent variable asks the respondent "How many times have you been vaccinated against COVID-19?" and gives the respondent a choice between "I have not been vaccinated against COVID-19", and then up to "Five and more" times.

The main independent variable included in the analysis is religion, but we also control for a number of other socio-economic factors. We present the detailed description of each independent variable in Table 1 below.

As the distribution of the number of vaccines received by respondents is non-linear, logistic regression is used for the analysis, based on a dichotomous vaccination variable, where fewer than three vaccinations is coded as 0, and 3 or more is coded as 1. The analysis was

Table 1

Description of independent variables in the analysis.

Variable	Description
Gender	Respondents were asked to indicate their gender and this was used to create a dichotomous variable: Male, Female
Age	Respondents were asked to provide their age in full years.
Education	Respondents were given 18 standard YouGov categories to choose from which were not strictly ordinal (e.g. category 11 is "GCE A level or Higher Certificate (UK High School equivalent)" while category 12 is the comparable "Scottish Higher Certificate"). These were recoded to an ordinal 7 point scale, where 1 means no formal qualifications, and 7 means higher degree or professional qualification.
Trust in government	Respondents were presented with: "Using a scale of 1 to 7 where 1 means 'not at all' and 7 means 'completely', how much do you trust each of the following: The Government in Westminster. 1: Not at all... 7: Completely."
General trust	Respondents were asked "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people? 1: You cannot be too careful... 7: Most people can be trusted."
Left right self-placement	Respondents were presented with the following statement: "In politics people sometimes talk of 'left' and 'right'. Where would you place yourself on this scale, where 0 means the left and 10 means the right?"
Religion	Respondents were given the options: "No, I do not regard myself as belonging to any particular religion; Yes - Church of England/Anglican/Episcopal; Yes - Roman Catholic; Yes – Other Christian; Yes - Methodist; Yes - Baptist; Yes - Judaism; Yes - Hinduism; Yes – Islam; Yes - Other; Yes – Orthodox Christian; Yes - Pentecostal; Yes – Evangelical."

conducted using R 4.3.2.

3. Results

In total our survey captures 12,268 respondents in England. Descriptive statistics of the respondents are presented in Table 2 below.

As can be seen, our survey covers a good spread of age groups, and has slightly greater representation of women than men. In order to compare our data to national averages, we also present data from the 2021 Census (restricted in Table 2 to focus on residents of England aged 16 or above; the Census does not record gender for the under-16s). Our survey captured religion in a different way to that of the Census. While the Census captured religion in 58 different categories (compared to the 19 in our survey), surprisingly, the Census did not subdivide the major religion (Christianity) into any of its denominations (Protestantism, Roman Catholic, etc.). Moreover, the census has 44 "other" religion categories which, while admirable in their granularity, cover less than one per cent of the population. Nevertheless, by making aggregations to both the census and our survey, some comparisons are possible. A comparison of religion as reported by the 2021 Census and our survey is presented in Table 3.

As can be seen, the survey is not nationally representative on religious affiliation. For instance, our survey has just over 1.5 % of the respondents indicating that they belong to the Islamic faith, while the English census from 2021 sets this number as almost 6.5 %. In Table 4 we present the mean number of vaccinations for each of the religious groups and the standard deviation.

Table 2

Descriptive survey gender and age statistics.

| | *Survey* | | *Census* | |
	N	(%)	N	(%)
Female	6701	54.62	25,039,047	51.56
Male	5567	45.38	23,527,304	48.44
		Survey Age		
Min	**Max**	**Median**	**Mean**	**SD**
18	98	50	49.95	17.62

Table 3

Descriptive census and survey religion statistics.

Category	Census Total	Census %	Survey Total	Survey %
Buddhist	272,513	0.46	64	0.52
Christian	27,522,668	46.18	4886	39.83
Hindu	1,032,779	1.73	96	0.78
Jewish	271,347	0.46	84	0.68
Muslim	3,868,128	6.49	187	1.52
Other religion	348,361	0.58	261	2.13
Sikh	524,143	0.88	30	0.24
No religion	22,162,009	37.19	6289	51.26
Not answered	3,595,598	6.03	371	3.02

Table 4

Religious denominations and vaccination.

Religion	Count	Mean # vaccines	Standard deviation
Baptist	77	3.05	1.28
Church of England	2479	3.35	1.09
Evangelical	96	2.97	1.16
Hinduism	85	2.91	0.93
Islam	167	2.08	1.14
Judaism	77	3.21	1.29
Methodist	184	3.48	1.08
No Religion	5612	2.9	1.14
Orthodox Christian	80	2.4	1.3
Other	320	2.8	1.3
Other Christian	90	3.43	1.17
Pentecostal	100	1.88	1.49
Roman Catholic	768	2.89	1.22

While the mean number of vaccinations give us an indication of the differences, we need to move a level further down in the analysis. We start by conducting a regression analysis including all respondents as presented in Table 5.

We find no difference for Judaism, Baptist, Hinduism, or the Other Christian denominations compared with the non-religious group. These results are present even after our control variables are introduced. Age, education, trust in government and general trust all have an increased odds ratio for being associated with more than three vaccines, while there is a negative association between self-reported left–right position and number of vaccines in the adjusted model: respondents further to the political right tend to have had fewer than three vaccine doses. We

Table 5

Regression model of vaccination and religion, with "no religion" as the reference category.

Variable	Unadjusted		Adjusted	
	OR	2.5 % to 97.5 %	OR	2.5 % to 97.5 %
(Intercept)	2.85	2.74 to 2.97	0.13	0.10 to 0.16
Religion				
Baptist	1.23	0.76 to 2.08	0.99	0.57 to 1.82
Buddhism	1.18	0.68 to 2.19	1.2	0.62 to 2.47
Church of England	1.96	1.74 to 2.20	1.2	1.05 to 1.37
Evangelical	0.61	0.52 to 0.73	0.78	0.65 to 0.95
Hinduism	0.84	0.54 to 1.32	1.03	0.64 to 1.68
Islam	0.23	0.17 to 0.31	0.4	0.28 to 0.56
Judaism	1.67	0.98 to 3.03	1.63	0.87 to 3.26
Methodist	2.62	1.74 to 4.14	1.48	0.95 to 2.39
Other	0.68	0.52 to 0.89	0.58	0.44 to 0.79
Other Christian	0.86	0.62 to 1.19	0.73	0.50 to 1.06
Pentecostal	0.26	0.18 to 0.38	0.32	0.21 to 0.49
Roman Catholic	0.86	0.74 to 1.01	0.76	0.64 to 0.91
Sikhism	0.54	0.26 to 1.16	0.7	0.32 to 1.60
Unknown	0.63	0.51 to 0.79	0.74	0.57 to 0.98
Age	1.05	1.05 to 1.05	1.05	1.05 to 1.05
Women	1.04	0.96 to 1.13	1.09	0.99 to 1.20
Education	1.09	1.07 to 1.12	1.16	1.13 to 1.19
Trust – General	1.2	1.17 to 1.23	1.12	1.08 to 1.15
Trust – Government	1.1	1.07 to 1.13	1.11	1.07 to 1.15
Left – Right	0.99	0.97 to 1.01	0.89	0.87 to 0.91

find no relationship between gender and vaccine uptake.

These results clearly show variation between religious denominations and number of vaccines taken. However, with the reference category being non-religious groups the interpretation has to be in relation to that. In the online replication code, we also include another regression where we only include those who say they belong to a religious group, with the Church of England category, which is by far the most numerous, as the reference category. This finds a similar relationship to that presented in the main model which included all respondents.

4. Discussion

We find a strong association between belonging to particular religious denominations and vaccine uptake. On the one hand our findings corroborate existing studies in that there is a relationship between religion and vaccine hesitancy [5,22], but we also on the other hand find that one denomination (the Church of England) has a higher uptake than the reference group (no religion). Muslim, Evangelical, Pentecostal and Other (non-Christian) respondents, as well as those for whom the religion is unknown, have a lower rate of vaccination. Roman Catholic respondents also have a lower rate of vaccination in the adjusted (but not the unadjusted) model. Thus, while religion is important, there are differences within and between religious groups.

The question that emerges from these results is why some groups have lower vaccination rates. There has been discussion among Islamic law scholars about whether the COVID-19 vaccines were in compliance with Islamic law [23], although in the particular case here, England, it might also be due to the fact that respondents of the Islamic religion, as well as those who report belonging to other non-Christian denominations, are often ethnic minorities, and we know that ethnic minorities have large degrees of vaccine hesitancy [24]. We also know that ethnic minorities have a significantly lower level of trust in the NHS than white respondents in the UK [25]. A similar relationship might be present with regards to the Pentecostal denomination given its strong link with ethnic minorities in the UK [26]. It is possible that a stronger association with Pentecostal affiliation reflects a different set of beliefs related to the need to obtain vaccination [27], although we were unable to assess this from the data available. That there is variation in Christian groups also fits the comparative literature. For instance, Van Lier et al [8] find lower vaccine uptake in general in areas with stronger support for reformed Christian denominations.

Our research has limitations. First, we must acknowledge that we do not have full national representative levels of all religious denominations. This means that, for instance, Hindu, Muslim and Sikh respondents are notably under-represented. This is a result of the available panel with our survey company. This is not an issue that is unique to this study; there is a general problem with representativeness of ethnic and religious minorities in surveys [22]. Thus, we should be careful when interpreting the results, although there is no evidence to suggest that those in our sample would be significantly different to those not being included at the representative level. Another limitation is that we do not know the level of engagement with their chosen religious affiliation, merely whether the respondent indicates that they identify with a particular religious denomination. Put another way, our survey did not explicitly ask respondents to react to statements such as "I did not need to get vaccinated because I trusted God to protect me." Some existing studies focus on levels of religiosity and find a similar strong finding that the more religious a person is the more vaccine hesitant they are [28]. We cannot say that any particular denomination is more or less religious, although we can say that even identifying as a particular group does present as a significant association which we might only see increasing if we had data available on levels of religiosity. Unfortunately, with the data we have, we cannot directly test this.

Ethnicity is another factor which has the potential for residual or unmeasured confounding. Future research should, therefore, consider

ethnicity. We should also note that we rely on respondents self-reporting the number of vaccines they have had. This might be problematic if there is a social desirability effect in being seen to have had several doses of the vaccine, and if that social desirability effect is mediated by the effect of belonging to a particular religious group, which could exacerbate our findings.

The association between trust and political ideology is also present in England. In general people who trust the Government and are in general trusting have a higher number of vaccinations. While the more right wing the respondent, the fewer vaccinations they have had, although the level of association is substantively very small. These findings are noteworthy, especially with regards to trust, as it has been shown in other settings that trust can be a factor which can overcome some of the issues of vaccine hesitancy [29]. Finding an association between ideology and vaccine uptake is consistent with findings from other countries [3,12,30], but at a much lower level in England than elsewhere. Given that our findings on religious group belonging is consistent when controlling for these factors, it is clear that religion cannot be ignored when considering vaccine uptake and when policy interventions are discussed to increase vaccine uptake, be it COVID-19 or other vaccines. The factor of religion must be acknowledged and one view is that engagement with faith leaders is necessary to overcome this factor [18], while Hicken et al [31] find that faith leaders are not likely to reduce vaccine hesitancy much. There is also the possibility as noted by Kasstan [32] that focusing too much on religious minorities might represent bias towards these groups that are not conducive to increase trust in vaccinations.

5. Conclusion

In this article we analysed the association between belonging to a religious denomination and vaccine uptake using a survey of over 12,000 English residents. We found a positive association between belonging to the Church of England and the number of vaccines, compared to the non-religious. However, we also found a negative association between vaccination and belonging to Islamic, Evangelical, Pentecostal and Other (non-Christian) denominations, as well as those whose religion is unknown. The findings of this study highlight the importance of understanding religion as a potential explanatory factor for vaccine hesitancy and thus informs public health policies, indicating that specific interventions for these groups might be required in other vaccination regimes than COVID-19. The policy implications of this research are clear. First, public health bodies, such as the NHS, need to engage with religious leaders. We have found clear evidence that religion is related to vaccine uptake, so the engagement of religious communities is vital. Second, the communication strategies may need to be tailored to religious groups specifically if there is a history of low vaccine uptake. Third, an analysis needs to be performed to see whether vaccination centres were less accessible or convenient for various religious groups. Fourth, as trust was a key factor in our analysis, policymakers need to ensure that religious minority groups are in a position to trust institutions to the same degree as the non-religious.

Dataverse, at: https://doi.org/10.7910/DVN/VGA0BK.

CRediT authorship contribution statement

Martin Ejnar Hansen: Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Steven David Pickering:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Full replication data and code are available through the Harvard Dataverse, at https://doi.org/10.7910/DVN/VGA0BK

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