RESEARCH ARTICLE

COVID-19 vaccine hesitancy in an ethnically diverse community: descriptive findings from the Born in Bradford study [version 1; peer review: 1 approved, 1 approved with reservations]

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Abstract

Background: The roll out of coronavirus disease 2019 (COVID-19) vaccines are now underway in the UK, and ensuring good uptake in vulnerable communities will be critical to reducing hospital admissions and deaths. There is emerging evidence that vaccine hesitancy is higher in ethnic minorities and deprived areas, and that this may be caused by misinformation in the community. This study aims to understand COVID-19 vaccine hesitancy in an ethnically diverse and deprived population.

Methods: Questionnaire surveys were sent to parents in the Born in Bradford study. Cross tabulations explored variation by ethnicity and deprivation. Text from open-ended questions was analysed using thematic analysis.

Results: 535 (31%) of 1727 invited between 29th October-9th December 2020 participated in the study. 154 (29%) of respondents **do** want a vaccine, 53 (10%) **do not**. The majority had not thought about it (N=154, 29%) or were unsure (N=161, 30%). Vaccine hesitancy differed significantly by ethnicity and deprivation: 43% (95% CIs: 37-54%) of White British and 60% (35-81%) in the least deprived areas **do want** a vaccine, compared to 13% (9-19%) of Pakistani heritage and 20% (15-26%) in the most deprived areas. Those that distrusted the

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Any reports and responses or comments on the article can be found at the end of the article.		

NHS were more likely to not want a vaccine (30%, 15-50%). Reasons for not wanting a vaccine were commonly explained by confusion and distrust caused by prevalent misinformation.

Conclusions: There is a much higher level of vaccine hesitancy in ethnic minorities, those living in deprived areas and those that distrust the NHS. There is an urgent need to tackle the overwhelming misinformation about COVID-19 that is leading to this uncertainty and confusion about the vaccines. If not addressed there is a high risk of unequitable roll out of the vaccination programme in the UK.

Keywords

Covid-19, vaccine hesitancy, trust, health beliefs, poverty, health inequalities, ethnicity, social determinants of health, cohorts, Born in Bradford

This article is included in the [Born in Bradford](#) gateway.

This article is included in the [Coronavirus \(COVID-19\)](#) collection.

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Introduction

The roll out of the first approved coronavirus disease 2019 (COVID-19) vaccine began on 8th December 2020 in the UK. Ensuring good uptake will be critical to reducing hospital admissions and deaths. However, since the beginning of the COVID-19 pandemic there has been what the World Health Organisation has called an ‘infodemic’: an overwhelming amount of information about COVID-19, much of it unchecked and uncontrolled and spread through social media channels¹. Recent qualitative research has demonstrated that this overwhelming and contradictory information about COVID-19 has caused confusion, distrust and distress². Significantly, this study found that the greater these feelings of confusion and distress, the less positive people were about COVID-19 vaccination.

A number of research studies in the UK have indicated that 45–64% of the population are likely to accept the COVID-19 vaccines if offered, and that a small proportion (4–9%) say they definitely would not accept a vaccine^{2–7}. There are clear indications that a lack of trust of key organisations and exposure to misinformation increases vaccine hesitancy^{2,4,6,7}.

There are also indications that vaccine hesitancy is higher in ethnic minority and deprived communities^{5–7}; however this evidence comes from studies with a very small proportion of ethnic minority participants (6–9%). Given that ethnic minority and deprived communities have been disproportionately affected by the virus that causes COVID-19 (severe acute respiratory syndrome virus 2; SARS-CoV-2)⁸, it is critical that vaccine hesitancy and concerns in these communities are well understood so that vaccine up-take can be enhanced.

The Born in Bradford (BiB) research programme has harnessed existing strong relationships with participants in their ongoing birth cohorts to help understand the impact of COVID-19 on ethnically diverse families, many of whom live in deprived communities. This programme of research uses a mixed methods longitudinal adaptive approach to provide actionable intelligence to local decision makers about how best to minimise health inequalities and aid the City’s recovery⁹. As part of this programme, longitudinal surveys have been completed with data collection in the first COVID-19 lockdown (April–May 2020)¹⁰, and a follow-up survey in October to December 2020. The latter survey included questions about levels of trust in relation to key organisations and vaccination hesitancy.

This paper reports findings from the second survey of BiB parents, exploring vaccine hesitancy and trust of organisations, by ethnicity and deprivation and aims to provide insights into the reasons why people are uncertain or unwilling to accept the COVID-19 vaccines.

Methods

Study design

A survey of participants in the Born in Bradford cohort study.

Study population

Our sample consists of adult participants from the prospective Born in Bradford Growing Up family cohort study (parents of

children aged 9–13)¹¹ who had taken part in the first round of our COVID-19 survey in the first lockdown (April–June 2020)^{9,10}.

Mode of delivery and data collection

Surveys were sent out by post or email, dependent on participants’ preferences. Follow-up by phone was completed 1–3 weeks later and a reminder postcard/email was sent 3–4 weeks after the first contact. For participants with little or no English, surveys were completed in their main language via phone wherever possible.

Consent

Participants had previously consented to be a part of Born in Bradford and for their research and routine health and education data to be used for research. For this survey, and as approved by the HRA and Bradford/Leeds research ethics committee, verbal consent was taken for questionnaires completed over the phone and logged in the questionnaire database. Implied consent was assumed for all questionnaires completed via post or online.

Measures

Key questionnaire domains for the survey were co-produced with the Bradford Institute for Health Research COVID-19 Scientific Advisory Group¹², and key policy and decision makers within Bradford and communities. Questions were selected or adapted from other relevant questionnaires. The full survey is available as extended data¹³.

The survey covered key domains on health, wellbeing and economic insecurity as per the first lockdown questionnaire¹⁰. We also asked about COVID-19 vaccine hesitancy⁷, trust of organisations and flu vaccine uptake for this year (winter 2020/21), see [Figure 1](#).

Ethnicity was captured in self-reported questionnaires administered at baseline recruitment to the cohorts (March 2007 to December 2010) and categorised as ‘White British’, ‘Pakistani Heritage’ and Other (there were small numbers of non-White British, non-Pakistani Heritage parents from multiple ethnic groups). We linked residential address (as at 31st March 2019) to the 2019 Index of Multiple Deprivation (IMD) and composed quintiles of deprivation from least to most deprived¹⁴.

Statistical analysis

Descriptive statistics are presented for each of the survey domains. We used cross tabulations (proportions and 95% confidence intervals) to explore differences in trust and vaccine hesitancy by ethnicity and deprivation. We also explored vaccine hesitancy by trust of different key organisations, and by uptake of the seasonal flu vaccine. All statistical analyses were carried out using [Stata 15](#)¹⁵.

Text responses to the open questions were explored by thematic analysis¹⁶. The first 255 responses were analysed by RM and CE, employing an inductive approach where coding and theme development were driven by the content of the responses. A codebook was developed (by RM, CE and BL) while analysing these responses. This codebook focused on separating responses based on whether individuals felt positive about the vaccines or whether they were undecided/ (or felt) negative towards the

57) Which of the following best describes your thoughts about getting vaccinated against coronavirus (Covid-19), once a vaccine becomes available to you? Choose one response

- ☐ I've not yet thought about getting vaccinated against Covid-19
- ☐ I'm not yet sure about getting vaccinated against Covid-19
- ☐ I've decided I DON'T want to get vaccinated against Covid-19
- ☐ I've decided I DO want to get vaccinated against Covid-19

58) What is your main reason for this?

67) For each of the following organisations can you tell us how much you trust them to do the right thing in the Covid-19 pandemic?

	Trust it a great deal	Tend to trust it	Tend to distrust it	Distrust it greatly	Don't know
The Government	☐	☐	☐	☐	☐
The NHS	☐	☐	☐	☐	☐
Your local hospital	☐	☐	☐	☐	☐
Bradford Council	☐	☐	☐	☐	☐
Local voluntary organisations	☐	☐	☐	☐	☐
Schools	☐	☐	☐	☐	☐
Police	☐	☐	☐	☐	☐
Public Health England	☐	☐	☐	☐	☐
Faith organisations (e.g., churches or mosques)	☐	☐	☐	☐	☐

56) Have you had the flu vaccine in the last year?

- ☐ Yes
- ☐ No
- ☐ Don't know

Figure 1. Survey questions on vaccine hesitancy and trust of organisations.

vaccines. Multiple codes were used within each category to explore and effectively summarise their responses. The codebook is available as extended data¹³.

The remaining responses were coded by RM and CE alongside frequent discussion with BL to test the strength and validity of the codebook. During this process, thorough and frequent discussion between the researchers took place, allowing adjustments to be made to the original codebook to ensure it was reflective of all responses.

Ethics

This research was approved by the HRA and Bradford/Leeds research ethics committee (BiB Growing Up study 16/YH/0320).

Results

Out of a total of 1727 eligible participants, 535 (31%) participated in the study between 29th October and 9th December 2020.

The mean age of respondents was 42 years (SD 6), with 500 women and 35 men; 234 (48%) were White British, 178 (37%) Pakistani heritage and 74 (15%) from other ethnic groups; 243 (46%) were from the most deprived quintile of IMD. Participants were broadly representative of those who completed the first COVID-19 survey and of those in the entire BiB sample¹⁰, but with a drop of ~5% in participation from Pakistani heritage participants and people in the most deprived quintile of IMD (Table 1).

Trust of organisations

Table 2 shows that the most trusted organisations were the NHS (N=432, 89% (95% CIs)), the local hospital (N=415, 85%), and schools (N= 405, 84%). The least trusted were the Government (N= 136, 49%), the local council (N=335, 69%) and faith organisations (N= 326, 67%). There were patterns suggesting differences in trust of organisations by ethnicity but the variance in responses was too high to report on this with confidence. When

Table 1. Profile of sample.

	BiB cohort		BiB GU cohort		COVID-19 Survey Phase 1		COVID-19 Survey Phase 2	
Age	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age as at April 2020	39	6	39	6	40	6	42	6
Gender	N	Percentage (95% CI)	N	Percentage (95% CI)	N	Percentage (95% CI)	N	Percentage (95% CI)
Female	12,450	79.1% (78.4%-79.7%)	4617	89.6% (88.7%-90.4%)	1,502	95.0% (93.8%-96.0%)	500	93.5% (91.0%-95.3%)
Male	3297	20.9% (20.3%-21.6%)	537	10.4% (9.6%-11.3%)	79	5.0% (4.0%-6.2%)	35	6.5% (4.7%-9.0%)
Total	15,747	100%	5154	100%	1,581	100%	535	100%
Ethnicity*	N	Percentage (95% CI)	N	Percentage (95% CI)	N	Percentage (95% CI)	N	Percentage (95% CI)
White British	4,636	38.5% (37.6%-39.3%)	1272	28.4% (27.1%-29.8%)	638	43.7% (41.2%-46.3%)	234	48.1% (43.7%-52.6%)
Pakistani heritage	5,366	44.5% (43.6%-45.4%)	2523	56.4% (54.9%-57.8%)	600	41.1% (38.6%-43.6%)	178	36.6% (32.4%-41.0%)
Other	2,055	17.0% (16.4%-17.7%)	682	15.2% (14.2%-16.3%)	222	15.2% (13.5%-17.1%)	74	15.2% (12.3%-18.7%)
Missing	393		140		42		14	
Total	12,450	100%	4617	100%	1502	100%	500	100%
IMD Quintile	N	Percentage (95% CI)	N	Percentage (95% CI)	N	Percentage (95% CI)	N	Percentage (95% CI)
1: Most deprived	9366	59.6% (58.8%-60.3%)	3351	65.1% (63.8%-66.4%)	810	51.7% (49.2%-54.1%)	243	45.8% (41.6%-50.0%)
2	3539	22.5% (21.9%-23.2%)	1202	23.3% (22.2%-24.5%)	447	28.5% (26.3%-30.8%)	155	29.2% (25.5%-33.2%)
3	1365	8.7% (8.3%-9.1%)	348	6.8% (6.1%-7.5%)	159	10.1% (8.7%-11.7%)	71	13.4% (10.7%-16.5%)
4	927	5.9% (5.5%-6.3%)	181	3.5% (3.0%-4.1%)	117	7.5% (6.3%-8.9%)	47	8.9% (6.7%-11.6%)
5: Least deprived	527	3.4% (3.1%-3.7%)	68	1.3% (1.0%-1.7%)	35	2.2% (1.6%-3.1%)	15	2.8% (1.7%-4.6%)
Missing			4		13		4	
Total	15724	100%	5154	100%	1581	100%	535	100%

Table shows Mean and Standard Deviation (SD), or Number (N) and 95% Confidence Intervals (95% CI). IMD = Index of Multiple Deprivation.

* Ethnicity is shown for women respondents (as male ethnicity was collected using different categories)

asked how confident they were that the Government was doing the right thing to stop the spread of COVID-19, 189 (39%) respondents were somewhat or extremely unconfident and 140 (29%) were confident in the Government's approach.

Vaccine hesitancy

Table 3 shows that overall, 154 (29%, 95% CIs: 26-34%) of respondents stated that they **would** want a COVID-19 vaccine,

and 53 (10%, 8-13%) said that they **would not** want a vaccine. Most stated they had not thought about it (N= 154; 29%, 26-34%) or were not sure about it yet (N=161; 32%, 27-35%).

Figure 2 shows that there were significant differences in vaccine hesitancy by ethnicity and socioeconomic status: 43% (95% CIs: 37-54%) of White British respondents said that they **do want** a vaccine compared to only 13% (9-19%) of Pakistani heritage

Table 2. Trust of organisations, and COVID-19 vaccine hesitancy by levels of trust.

	Total		I've not yet thought about it		I'm not yet sure about it		I've decided I don't want it		I've decided I do want it		Missing
How much do you trust:	N	Perc.	N	Percentage (95% CI)	N	Percentage (95% CI)	N	Percentage (95% CI)	N	Percentage (95% CI)	N
The Government											
Trust it a great deal	49	10%	10	21% (12%-35%)	17	36% (24%-51%)	4	9% (3%-21%)	16	34% (22%-49%)	2
Tend to trust it	205	39%	58	29% (23%-36%)	62	31% (25%-38%)	12	6% (3%-10%)	66	33% (27%-40%)	7
Distrust it	200	37%	46	23% (18%-30%)	62	31% (25%-38%)	30	15% (11%-21%)	60	30% (24%-37%)	2
Don't know	70	14%	36	51% (40%-63%)	19	27% (18%-39%)	5	7% (3%-16%)	10	14% (8%-25%)	0
The NHS											
Trust it a great deal	226	42%	52	24% (19%-30%)	56	26% (20%-32%)	14	6% (4%-11%)	97	44% (38%-51%)	7
Tend to trust it	239	47%	70	30% (24%-36%)	90	38% (32%-45%)	24	10% (7%-15%)	51	22% (17%-27%)	4
Distrust it	27	5%	11	41% (24%-61%)	6	22% (10%-43%)	8	30% (15%-50%)	2	7% (2%-27%)	0
Don't know	34	6%	19	56% (39%-71%)	8	24% (12%-41%)	4	12% (4%-28%)	3	9% (3%-24%)	0
The local hospital											
Trust it a great deal	212	39%	43	21% (16%-27%)	53	26% (20%-32%)	14	7% (4%-11%)	94	46% (39%-53%)	8
Tend to trust it	234	46%	75	32% (27%-39%)	82	35% (30%-42%)	24	10% (7%-15%)	50	22% (17%-27%)	3
Distrust it	33	5%	12	36% (21%-54%)	10	30% (17%-48%)	5	15% (6%-32%)	6	18% (8%-36%)	0
Don't know	47	9%	22	47% (33%-61%)	15	32% (20%-46%)	7	15% (7%-28%)	3	6% (2%-18%)	0
Bradford Council											
Trust it a great deal	76	15%	16	22% (14%-33%)	26	36% (25%-47%)	6	8% (4%-17%)	25	34% (24%-46%)	3
Tend to trust it	282	54%	77	28% (23%-33%)	82	30% (25%-35%)	25	9% (6%-13%)	93	34% (28%-39%)	5
Distrust it	89	17%	23	26% (18%-37%)	29	33% (24%-44%)	13	15% (9%-24%)	22	25% (17%-36%)	2
Don't know	75	14%	35	47% (36%-58%)	21	28% (19%-39%)	6	8% (4%-17%)	13	17% (10%-28%)	0

Table shows Number (N) and 95% Confidence Intervals (95% CI).

	Total		I've not yet thought about it		I'm not yet sure about it		I've decided I don't want it		I've decided I do want it		Missing
How much do you trust:	N	Percentage	N	Percentage (95% CI)	N	Percentage (95% CI)	N	Percentage (95% CI)	N	Percentage (95% CI)	N
Local voluntary organisations											
Trust it a great deal	95	19%	24	26% (18%-36%)	26	28% (20%-38%)	10	11% (6%-19%)	32	35% (26%-45%)	3
Tend to trust it	268	52%	71	27% (22%-33%)	85	32% (27%-38%)	26	10% (7%-14%)	81	31% (26%-37%)	5
Distrust it	27	5%	9	33% (18%-54%)	9	33% (18%-54%)	4	15% (5%-35%)	5	19% (8%-39%)	0
Don't know	124	24%	46	37% (29%-46%)	36	29% (22%-38%)	8	7% (3%-12%)	33	27% (20%-35%)	1
Schools											
Trust it a great deal	148	29%	35	24% (18%-32%)	42	29% (22%-37%)	14	10% (6%-16%)	53	37% (29%-45%)	4
Tend to trust it	291	55%	83	29% (24%-35%)	89	31% (26%-37%)	25	9% (6%-13%)	88	31% (26%-36%)	6
Distrust it	43	9%	11	26% (15%-41%)	19	44% (30%-59%)	7	16% (8%-31%)	6	14% (6%-28%)	0
Don't know	41	8%	21	51% (36%-66%)	10	24% (14%-40%)	4	10% (4%-23%)	6	15% (7%-29%)	0
Police											
Trust it a great deal	130	26%	32	25% (19%-34%)	32	25% (19%-34%)	11	9% (5%-15%)	51	40% (32%-49%)	4
Tend to trust it	268	51%	75	29% (23%-34%)	82	31% (26%-37%)	21	8% (5%-12%)	84	32% (27%-38%)	6
Distrust it	51	9%	16	31% (20%-46%)	21	41% (28%-55%)	9	18% (9%-31%)	5	10% (4%-22%)	0
Don't know	73	14%	29	40% (29%-51%)	24	33% (23%-44%)	7	10% (5%-19%)	13	18% (11%-28%)	0
Public Health England											
Trust it a great deal	141	27%	30	22% (16%-30%)	42	31% (24%-39%)	8	6% (3%-11%)	56	41% (33%-50%)	5
Tend to trust it	235	45%	64	28% (23%-34%)	73	32% (26%-38%)	21	9% (6%-14%)	71	31% (25%-37%)	6
Distrust it	58	11%	17	29% (19%-43%)	19	33% (22%-46%)	11	19% (11%-31%)	11	19% (11%-31%)	0
Don't know	88	17%	38	43% (33%-54%)	27	31% (22%-41%)	9	10% (5%-19%)	14	16% (10%-25%)	0
Faith organisations											
Trust it a great deal	101	19%	28	29% (20%-38%)	34	35% (26%-45%)	12	12% (7%-20%)	24	24% (17%-34%)	3
Tend to trust it	243	47%	74	31% (26%-37%)	73	31% (25%-37%)	17	7% (5%-11%)	73	31% (25%-37%)	6
Distrust it	42	8%	6	14% (6%-29%)	14	33% (21%-49%)	9	21% (11%-37%)	13	31% (19%-47%)	0
Don't know	134	26%	42	32% (24%-40%)	40	30% (23%-38%)	11	8% (5%-14%)	40	30% (23%-38%)	1

Table shows Number (N), percentage and 95% Confidence Intervals (95% CI).

Distrust category contains both 'distrust it a great deal' and 'tend to distrust it'.

Table 3. Covid-19 vaccination hesitancy by sociodemographics and flu uptake.

	I've not yet thought about it		I'm not yet sure about it		I've decided I don't want it		I've decided I do want it		Missing	Total
	N	Percentage. (95% CI)	N	Percentage. (95% CI)	N	Percentage. (95% CI)	N	Percentage. (95% CI)	N	N
Total										
	154	29% (26%-34%)	161	30% (27%-35%)	53	10% (8%-13%)	154	29% (26%-34%)	13	535
By ethnicity										
White British	44	19% (15%-25%)	66	29% (23%-35%)	21	9% (6%-14%)	99	43% (37%-50%)	4	234
Pakistani	71	41% (34%-49%)	63	36% (30%-44%)	17	10% (6%-15%)	22	13% (9%-19%)	5	178
Other	23	32% (23%-44%)	22	31% (21%-43%)	11	15% (9%-26%)	15	21% (13%-32%)	3	74
Total										
By IMD Quintile										
1: Most deprived	80	34% (28%-40%)	78	33% (27%-39%)	30	13% (9%-18%)	47	20% (15%-26%)	8	243
2	49	32% (25%-40%)	44	29% (22%-37%)	17	11% (7%-17%)	42	28% (21%-35%)	3	155
3	15	22% (14%-33%)	19	28% (18%-39%)	5	7% (3%-16%)	30	43% (32%-55%)	2	71
4	8	17% (9%-31%)	13	28% (17%-42%)	1	2% (0%-14%)	25	53% (39%-67%)	0	47
5: Least deprived	1	7% (1%-35%)	5	33% (15%-59%)	0	0% (0%-0%)	9	60% (35%-81%)	0	15
By flu vaccine in the last year?										
No	123	33% (28%-38%)	128	34% (30%-39%)	42	11% (8%-15%)	80	21% (18%-26%)	5	378
Yes	25	19% (13%-26%)	30	22% (16%-30%)	10	7% (4%-13%)	69	51% (43%-60%)	1	135

Table shows Number (N), percentage and 95% Confidence Intervals (95% CI).

IMD = Index of Multiple Deprivation

respondents. Pakistani heritage respondents were more likely to be uncertain (36%, 30-44%), or to have not thought about it (41%, 34-49%), rather than stating they would not have a vaccine (10%, 6-15%).

Figure 3 demonstrates significant differences based on levels of deprivation. Of the least deprived quintile of IMD, 60% (35-81%) said that they **do want** a vaccine, compared to 20% (15-26%) in the most deprived quintile.

Figure 4 (see also Table 2) shows that participants who trusted the NHS a great deal were most likely to have decided they want a vaccine (44%, 38-51%), and those that distrusted the NHS were most likely to not want a vaccine (30%, 15-50%).

Figure 5 demonstrates that those that had already had a flu vaccine this year were more likely to want a COVID-19 vaccine (51%, 43-60%).

Reasons for vaccine hesitancy response

Of the 535 returned surveys, 64% (n = 343) offered a reason for their response to the question about accepting a vaccine.

Those that had decided **they do not want a vaccine** often stated that there had not been enough research/evidence, it had been 'rushed through' and they were concerned about the safety of the vaccines. Their responses were generally more suspicious in tone than respondents in the other groups, implying and sometimes

Figure 2. COVID-19 vaccination hesitancy by ethnicity.

Figure 3. COVID-19 vaccination hesitancy by index of multiple deprivation quintile.

Figure 4. COVID-19 vaccination hesitancy by levels of trust in the NHS.

stating a lack of trust of those that had developed and approved the vaccines:

I don't trust the vaccine, it's been rushed through, side effects etc. just haven't been explored enough

Figure 5. COVID-19 vaccination hesitancy by flu vaccine acceptance.

Untrustworthy of ingredients

Do not trust that the vaccine safety testing will have been rigorous enough, due to being very rushed.

I don't trust them

These responses also showed participants' exposure to misinformation about the COVID-19 vaccines, and this was very explicit in some responses:

I'm very suspicious of the reasons for the world's reaction to COVID-19 and not sure I can trust what is in the vaccination.

Apparently a fix for Covid, but at what cost in the future. Most people who get Covid will survive it without a vaccine. Vaccinating everyone is a great risk, as no-one had heard of Corona at the beginning of this year. Millions of people walk round with cancer cells, it's interesting none of these companies have ever looked for a vaccine for those!!

A small number of respondents felt that they did not need a vaccine; either because they were fit and healthy or were taking other precautions, so not at risk:

I'm healthy and symptom free. Plus I don't feel comfortable having an unknown vaccine

Because I'm not in an at risk or vulnerable category.

They're not vegan and I don't agree with vaccines. A healthy diet is the best defense.

Family is in good health so we don't need it

Those who were **unsure about having a vaccine** expressed concerns about not having enough information to be able to make an informed decision, they were also anxious about not knowing the side effects, the speed with which vaccines had been developed and the safety of the vaccines:

Too much of speculations going around that the vaccine is not good so want to know more. Have more info, then will decide.

I would like to see the side effects, if any, before committing. I am not an anti-vaccinator, however because it's new and potentially rushed, would be cautious

I'm really anxious about the vaccination because of the speed in which it is being developed. I worry about possible side effects.

Similar to those who said they did not want the vaccine, these respondents also indicated that exposure to recent and prevalent misinformation had confused them:

[Lack of] confidence in fast track development. I know it is unlikely but thalidomide springs to mind for people who took a new drug. That said I do get the flu vac each year and my children are inoculated so I guess I am confused so far.

Just unsure about COVID-19 in general due to people saying it's not real etc. I'm confused.

For those respondents who indicated that **they had not yet thought about having a vaccine**, it is worth noting that the majority of the responses were returned before a vaccine was available to be administered which influenced some of the responses:

Until a vaccine has been made why ask!

Don't expect vaccines to be ready until mid-2021

There's no imminent vaccine for COVID-19, nothing to think about yet

It was also apparent from some responses that people were not aware that a number of COVID-19 vaccines were very close to being approved:

Nothing conclusive has been created.

Will be years before vaccine is found

Other participants who had not yet thought about having a vaccine stated that they were focusing on the present moment and did not have the time/space to think about a vaccine right now:

I am focused on getting through the here and now rather than spending time about what might happen in the future

Not thinking about Covid anymore fed up of it on TV news everywhere

Similar to the respondents who were uncertain, many respondents who said they hadn't thought about it yet also indicated that they were worried about efficacy, safety and potential side effects of the vaccine.

Discussion

This study describes the levels of COVID-19 vaccination hesitancy, and levels of trust of key organisations, in families living in the deprived and ethnically diverse city of Bradford. The level of acceptance of vaccination was much lower than found in other studies, with just 29% of respondents being sure they would accept a vaccine, compared to 45-64% found in other studies. The majority of respondents remained uncertain, or had not yet thought about vaccination. The reasons for not wanting a vaccine included high levels of suspicion or distrust in those that had developed and approved the vaccines, as well as a belief in

misinformation about the safety and/or the speed with which the vaccine had been developed. Similarly, those who remain uncertain expressed the need for more information, and confusion from exposure to prevalent misinformation. Those that hadn't yet thought about vaccination were either focusing on the present moment and didn't want to think about COVID-19 anymore or were unaware that vaccines were imminent and also raised similar safety concerns.

These results highlight a much higher level of vaccine hesitancy in ethnic minorities, those living in deprived areas and those that distrust the NHS. These findings strengthen the key messages from recent qualitative work - that there is an urgent need to tackle the overwhelming misinformation about COVID-19 that is leading to uncertainty and confusion about the need for the vaccine, and in the worst cases, a belief that the vaccine should not be accepted².

The results of this survey have been used to inform local policy through the Bradford District Strategic Coordination Group. A communications strategy has targeted different communities with culturally appropriate messages about the vaccine led by trusted role models and faith leaders. This has included high profile vaccine champions aiming to dispel vaccine myths through multiple media channels and developing a grassroots network of COVID-19 leads to provide neighbourhood advice and support.

We suggest that a wider and carefully targeted response is also required to increase vaccine acceptability across the UK, particularly in ethnic minority groups and those living in deprived communities. Most importantly, messaging needs to reassure those who are uncertain or unwilling to think about the vaccines. This messaging needs to be culturally appropriate, provided in non-technical language, and be empathetic to the levels of confusion and distress that people are feeling.

Messaging must come from trusted sources. There was a lack of trust of the Government and local council, but strong levels of trust of the NHS, local hospitals and schools. However those least likely to take-up the vaccine also distrusted the NHS. Use of trusted organisations other than the NHS (e.g. schools), and of trusted community and faith leaders where appropriate, may help to reassure and encourage those who are currently not willing to accept the vaccine.

Strengths and limitations

These findings demonstrate varying levels of trust of key organisations and differential views on vaccine hesitancy based on ethnicity and deprivation. Our study is the first to provide views from a population with a high degree of ethnic diversity and deprivation. The response rate to this study was quite low (31%). The vast majority of responders were female with an average age of 42 years (which is to be expected as the majority of BiB participants are women recruited during their pregnancy). Non-responders, male participants and different age groups may have different views to those reported here. Nevertheless our findings do reflect those reported in other studies, with the level of vaccine hesitancy in White British parents matching that found

in other studies, as well as an increased likelihood of vaccine hesitancy in those from ethnic minorities and/or living in deprived circumstances.

The mixed methods approach, allowing open text responses to illuminate people's views on vaccination, also adds strength to this study. The reasons for uncertainty or unwillingness reflect those found in a recent report⁷.

This study was completed before any of the vaccines had been approved for roll out so there are likely to be some changes in perception now and further exploration of this would be valuable.

The longitudinal nature of the BiB cohorts will allow us to explore change over time and we will continue to follow families throughout the pandemic, adding further value to this research. In addition we have access to routine health data for all participants which will allow us to look at vaccine up-take as data become available throughout 2021.

Conclusion

Vaccination hesitancy differs based on ethnicity, level of deprivation and trust of key organisations, with those most at risk of serious impact of the virus being the least likely to accept vaccination. Confusion, distrust and distress caused by prevalent misinformation was a main cause of this high vaccine hesitancy. Effective and equitable roll out of the vaccination programme requires careful, empathetic messaging, targeting those whom it will benefit the most, and a multi-organisational approach to address issues of distrust.

Data availability

Underlying data

Scientists are encouraged and able to use BiB data, which are available through a system of managed open access. The steps below describe how to apply for access to BiB data.

- Before you contact BiB, please make sure you have read our [Guidance for Collaborators](#). Our BiB executive review proposals on a monthly basis and we will endeavor to respond to your request as soon as possible. You can find out about the different datasets which are available [here](#). If you are unsure if we have the data that you need please contact a member of the BiB team (borninbradford@bthft.nhs.uk).

- Once you have formulated your request please complete the 'Expression of Interest' form available [here](#) and send to borninbradford@bthft.nhs.uk
- If your request is approved we will ask you to sign a [collaboration agreement](#) and if your request involves biological samples we will ask you to complete a [material transfer agreement](#).

Extended data

Harvard Dataverse: Acceptability of Covid-19 vaccination in an ethnically diverse community: descriptive findings from the Born in Bradford study. <https://doi.org/10.7910/DVN/Q0SPIQ>¹³

This project contains the following extended data:

- Survey questionnaire
- COVID-19 Code book for free text responses

Data are available under the terms of the [Creative Commons Zero "No rights reserved" data waiver](#) (CC0 1.0 Public domain dedication).

Acknowledgements

Born in Bradford is only possible because of the enthusiasm and commitment of the children and parents in BiB. We are grateful to all the participants, health professionals, schools and researchers who have made Born in Bradford happen.

We acknowledge the input of the wider [Bradford Institute for Health Research COVID-19 Scientific Advisory Group](#)¹¹ in the preparation of this protocol which includes (in addition to the named authors: Chris Cartwright, Bo Hou, Tom Lawton, Dan Mason, Michael McCooe, Mark Mon-Williams, Gill Santorelli, Laura Sheard, Najma Sidiqqi, Kuldeep Sohal, Jane West.

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Umair Majid

Institute of Health Policy, Management and Evaluation, University of Toronto, Toronto, Ontario, ON M5S, Canada

General Comments

Thank you for the opportunity to review your research study on this very important topic. I have taken the chance to review your paper critically and offer helpful suggestions with the purpose of making it a more useful, clear, and relevant read.

Abstract

- I believe that the abstract needs to be a standalone section of the manuscript that provides all essential details on the research study. Some information is missing that should be included in the abstract for clarity:
 - What was the population? Where were they from? How were they selected? This does not need to be long, but the information I see in the abstract is “ethnically diverse and deprived population,” which seems wholly inadequate, and possibly minimizing the uniqueness of the population you chose to target. It also seems that your definition of deprivation and ethnically diverse are intimately tied; White British (ethnicity 1) are “least deprived” while Pakistani (ethnicity 2) are “most deprived.” I think there is a strong need to clarify this in the abstract to avoid any conflation between characteristics.
 - In the same vein, I would also suggest clarifying the first part of the first sentence in the results: 535 of 1727 of X.

Introduction

- While you are correct that there is a relationship between greater confusion/distress, and lower views of vaccination, the relationship isn't as simple as you are portraying. I think it might be okay to keep this as-is, but you must acknowledge that the relationship is complex, and in some cases, the reverse relationship has been found, emphasizing the need to investigate the relationship fully. I discuss this in a recently published paper, but there are hundreds of papers that emphasize complexity of this relationship:
 - Majid, U., Wasim, A., Bakshi, S., & Truong, J. (2020). Knowledge,(mis-) conceptions, risk

perception, and behavior change during pandemics: A scoping review of 149 studies. *Public Understanding of Science*, 29(8), 777-799.¹

Methods

- In your introduction, you mention that you used a mixed-methods longitudinal design, but in the methods section, you mention that your study design was a survey. Perhaps this paper describes the survey portion that is one of many components of your broader design? In any case, the “study design” section should be used to clarify the relationship between this paper, other papers, and your broader research program.
- Given that some readers may not know about the Born in Bradford Growing Up family cohort, I think it might be beneficial to discuss its characteristics in this paper. I recognize that you probably have another paper that goes into depth about those characteristics but having a brief summary here is essential to make this paper standalone. I also feel that as someone who is not from the UK or the community, I want to know more about Bradford, to help me to understand the surrounding context of the findings. This might include the total population of Bradford, and how the 1727 was determined.
- Since I see that you analyzed “open responses” using thematic analysis, you should describe the content of those open responses in the measures section in a brief sentence, and why this part was included in the survey.
- The qualitative analysis is missing the approach or process you used to compare between different “types” of responses. So, you analyzed positive, negative, and undecided responses separately. How did you compare them?
- This also seems like an analysis of both quantitative and qualitative data. In this case, it is a mixed-methods survey, and there is an opportunity to explain how you have integrated quantitative and qualitative data from the survey.
 - Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs—principles and practices. *Health services research*, 48(6pt2), 2134-2156.²
 - Clark, V. L. P. (2019). Meaningful integration within mixed methods studies: Identifying why, what, when, and how. *Contemporary Educational Psychology*, 57, 106-111.³

Results

- Demographics:
 - I certainly appreciate the description of participants at the beginning of the results section. I am wondering if you can offer a bit more clarity on how (if at all) ethnicity and deprivation overlap. The current table does not explore this overlap at all, but if there is an overlap in your population, then it needs to be recognized in your analysis. In other words, are White British mostly in “least deprived” areas and Pakistani and other ethnicities in “most deprived” areas?
- Quantitative Findings
 - Can you perhaps elaborate on trust in organizations part across ethnicity, socioeconomic status/deprivation? This is similar to how you have done for the

following sections.

- Qualitative Findings:
 - The fifth quote talks about mistrust and distrust, but it follows your sentence on misinformation. I am not sure that you allow for a strong connection between misinformation and mistrust/distrust. The presentation of qualitative research findings requires that you have a good presentation of findings where each quote and your interpretations are intimately linked.
 - Each quote might also benefit if you identified the ethnicity of each person and if they were from a more or less deprived area.
 - You discuss misinformation in two places. I would suggest that you integrate into one area for coherence and conciseness.
 - “These responses also showed participants’ exposure to misinformation...”
 - “Similar to those who said they did not want a vaccine, these respondents also indicate that exposure to recent and prevalent misinformation...”

Discussion

- You compare the proportion of participants who are sure why they accept vaccines between your current study and other studies. Can you cite those other studies in this sentence?
- While your discussion is a good start, I think it is somewhat inadequate and superficial for your findings. Discussions are an opportunity for authors to expand, elaborate, and extrapolate their findings. I don’t think you have done that at all. One reason why I think this is because you have only cited a single study in this section. While the implications section is good, it is also superficial since much of this information is not novel and has already been implemented in jurisdictions worldwide. For example, saying that you need a carefully targeted response, from trusted sources, and in non-technical language are the foundations of knowledge translation and public health education with decades of literature. This leads to the following question: what novel implications do you have? Perhaps the novel implications exist in the minutiae details rather than broad concepts that are somewhat intuitive and obvious to researchers in this area. For this reason, I suggest that you take a deeper dive into some of these concepts, really drawing out the novelty and practical implications that make readers or practitioners take as much out as possible from your wonderful work.

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Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Qualitative and mixed methods research, implementation science, patient engagement, vaccine hesitancy, risk perceptions and behavior change

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 07 June 2021

<https://doi.org/10.21956/wellcomeopenres.18268.r44280>

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Richard Shaw

Liverpool Head & Neck Centre, Aintree University Hospital, Liverpool, UK

This is a simple questionnaire that addresses a particularly important and current issue i.e. the wide variation of vaccine hesitancy with ethnicity and deprivation.

In many ways, this data seems urgent to publish as it reflects the current UK disparities in COVID-19 and hospitalisations.

The qualitative treatment of justification for vaccine hesitancy data seems reasonable.

A few concerns:

- Validity - as return rate was only 31% - accepting no inappropriate stats used and a semi-quantitative analysis but is this return rate valid?

- The survey was carried out in October-December 2020 so precedes the real data and questions about vaccine uptake by a few months. Why is there such a delay between collecting the data and publishing for such a simple MS? Would these answers still be the same, were they reflected in vaccine take up and to what extent?
- By a similar argument, the mean age was 42 years so not an age group selected as a vulnerable group on the whole, or offered vaccine early on the whole. This may reflect the commonest comment "not sure about it yet" and therefore more recent data would firm up these suggestions.

Having stated that, the headline data on strong association with deprivation and that only 13% of Pakistan heritage actively want the vaccine is very important.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Cancer surgery; COVID19 and healthcare, head and neck cancer

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Comments on this article

Version 1

Author Response 23 Jul 2021

Josie Dickerson, Bradford Teaching Hospitals NHS Foundation Trust, Bradford, UK

Response to Reviewers

Reviewer 1:

We thank the reviewer for their kind comments on the importance of this work. In response to the reviewers concerns we would like to note:

1. Validity based on the response rate: we have noted this as a weakness in the study, but also note that respondents were on the whole representative of the entire cohort.
2. Timing of publication: We did first submit this to the Wellcome Gateway in January 2021 (published on 4th Feb 2021). Our experience is that the overwhelming number of important Covid-19 articles being submitted to publishers means that reviewers are hard to come by, hence the delay with this paper. We note in the discussion that we plan to use routinely collected health data on all our participants to look to see the extent that this data does relate to actual uptake.

Response to Reviewer 2:

Thank you for your review and helpful comments to improve this paper. We have made amendments based upon your suggestions as follows:

Abstract:

We have amended the abstract to include more information on the population, the study selection and final response rate. We have looked more carefully at our interaction between ethnicity and deprivation and there is a clear overlap, but it is not a simple case that our White British families are the least deprived and our ethnic minority families the least deprived. There are a much larger proportion of ethnic minority participants living in the lowest quintile of deprivation, although 1 in 4 of our White British participants also live in this lowest quintile. We have added this as an additional Table 2, made note of it in our results section and in our discussion (as a limitation of the study).

Introduction

We have added a sentence to in the introduction that acknowledge that the relationship between misinformation and behaviour is complex, and have added the useful reference that was shared.

Methods:

We have added clarity to our methods section as follows:

- Whilst the larger programme of Covid-19 research that we refer to in the introduction is mixed-methods, this piece of work is not:
- We used a survey for this paper from which: a) closed questions were analysed using quantitative methods and; b) a free text question that asked for the main reason for vaccine acceptability response was analysed using qualitative methods.
- We did not endeavour to formally compare the quantitative and qualitative responses, or to integrate the data together as per mixed-methods. We used the free text responses to illuminate the vaccine hesitancy responses, and this has been clarified.
- We have added the content of the free text question
- We have also added a settings section into the methods to tell the readers more about

Bradford and BiB.

Results:

We have added in an additional Table (Table 3) which separates out trust of organisations by ethnicity as per our other findings. We have added a discussion of these findings into the results section on 'Trust in organisations'.

We have clarified the sentence around the 5th quote which talks about distrust and misinformation. We did find a key theme in these respondents that distrust in the vaccines was related to exposure to Covid-19 misinformation (e.g that Covid doesn't exist etc.) We hope we have clarified what we meant here now.

Whilst we agree that it would be useful to add the ethnicity / level of IMD to the quotes, however we are unable to do so due to our ethical and confidentiality protocols.

As per our clarification in the methods about how we analysed the free text data: we aimed to use these responses to illuminate the vaccine hesitancy question responses. As such we have presented the key themes for the response options (Negative / undecided / not thought about it). Some themes are similar between the three responses but we believe it is important to keep these results separate to achieve our aim.

Discussion

We have amended the discussion to highlight what we believe to be our unique findings here: the fact that we have responses from a very diverse community, and this is in stark contrast to other studies completed up to that point that sometimes claimed to have found ethnic differences with a sample of <10% ethnic minorities.

We agree that our implications were quite generic and well founded in existing knowledge translation, so we have tried to tie this more explicitly to the context of the time which was that:

- this is what minority and deprived groups need and
- this is not what the UK government were doing at the time.

We have also added in the appropriate citations which were missing.

We hope the reviewer will be sympathetic to the point that this paper was completed to inform practice, and includes a relatively small sample size, and as such, we are reluctant to delve any further into these findings for fear of misleading any current/future practice.

Competing Interests: none