



UK Health
Security
Agency

Yorkshire and Humber COVID-19 campaign pilot

Evaluation report



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Introduction

The self-isolation of people who have coronavirus, alongside the vaccine rollout, have been key parts of the government's response to COVID-19. The self-isolation steering group within the Department for Health and Social Care (DHSC) initiated a 'What Works' programme that funded a number of pilots of initiatives related to self-isolation in areas with high COVID-19 transmission¹. The programmes aimed to test creative ways to encourage people most at risk of catching and transmitting COVID-19 to test and to self-isolate if they test positive.

One of these pilots targeted Yorkshire and Humber (YH), and NatCen was commissioned to conduct an evaluation of this pilot. Magpie was appointed to lead the production and delivery of the communication campaign.

Description of the YH COVID-19 campaign pilot

Campaign objectives

The YH COVID-19 Campaign pilot consisted of a communications campaign, named 'COVID-19 Explained'. This was a co-created campaign with communities from 15 local authorities and translated into 12 languages. The overall goal of the campaign was to make information about COVID-19 simpler and more accessible for people that are less likely to comply with COVID-19 regulations or to be vaccinated.

The campaign implemented behavioural insights techniques to achieve 2 sets of outcomes:

Increased vaccine confidence

The pilot aimed to increase vaccine take-up, particularly among at risk groups, or among those who were less likely to get vaccinated.

Increased compliance with self-isolation

This was aimed at people with confirmed positive cases and their contacts who were asked to self-isolate.

Although it was not a direct outcome of the campaign, there was also an interest for all of the 'what works' pilots on increasing compliance with Test and Trace, such as getting tested when displaying symptoms of COVID-19, or naming contacts when asked by the Test and Trace team.

¹ The areas that received funding for these pilots were: Newham; Yorkshire and Humber; Lancashire; Blackburn with Darwen; Blackpool; Greater Manchester; Cheshire and Merseyside; Royal Borough of Kingston; Hackney; Peterborough, Fenland and South Holland, and Somerset.

Throughout the campaign, messaging was adapted to align with changes to COVID-19 restrictions, including information about new COVID-19 variants, self-isolation, travel guidelines and testing.

An initial pilot was carried out in 2 areas of Leeds and Grimsby (a set of Lower Layer Super Output Areas (LSOAs) in each), before elements of the campaign were rolled out more widely across Yorkshire and the Humber. The campaign was intended to be as neutral as possible, providing people with the information and skills necessary to follow COVID-19 restrictions, without being top-down or prescriptive.

Campaign delivery

The campaign targeted specific audiences that were less likely to be vaccinated and/or comply with COVID-19 regulations. It should be noted that this did not include staunch 'anti-vaxxers', but rather those who were hesitant around vaccine take up. The original target groups included the following: manual workers; ethnic minorities; people without employment protection; people on low incomes; men; young people between 18 and 30 years old; business and employers (SMEs); and women with fertility concerns. Pregnant women were also later added as a key target group.

The campaign planned to take a 'community-up' approach by disseminating messages through people and groups that were trusted by the target audiences, such as community leaders. Community leaders were those who had pre-existing relationships with target groups in the community. Stakeholders, such as local authorities, were also involved in the campaign and were given access to an internet-based 'Stakeholder Hub' where they could access campaign updates and download campaign materials. Campaign outputs were varied and included digital outputs (for example, adverts on Google and social media), out-of-home advertising (for example, information on billboards) and print media (for example, booklets, leaflets).

Changes to the pilot programme

Both the campaign design and timelines changed from the way they were originally conceived. The UK Health Security Agency (UKHSA) initially planned for a mass audience communications campaign. However, following the scoping phase, a more targeted approach to reaching communities in Yorkshire and the Humber was designed. The focus changed from mass audience communication to a campaign which put emphasis on 'bottom-up' communication, working with local community leaders. This change in approach meant that a number of additional suppliers were commissioned such as a stakeholder management company and a translation company (as outlined in [Table 1](#)).

The campaign was also in full implementation for a shorter time period than originally planned. The original launch date for the campaign was October 2021 but this was pushed back to the end of November while the campaign website was being built (see the section on 'Campaign implementation' for further information). The campaign was also stopped in February 2022 in

line with a reduction in COVID-19 communication nationally. These changes meant that pilot was not in full implementation for as long as originally planned.

Campaign roles and responsibilities

The key organisations involved in the development of the campaign were Magpie, Hull City Council and UKHSA², in addition to other suppliers who worked on specific aspects of the campaign (for example, media-buying and videography). These key organisations and their contributions at different stages of the campaign are outlined in Table 1.

Table 1. Main organisations involved in the campaign and their responsibilities

Organisation	Responsibilities
Hull City Council	Responsible for creating contracts and distributing funding across suppliers
Magpie	<ul style="list-style-type: none"> • commissioned to create a tailored campaign using behavioural insights and disseminate campaign materials • responsible for campaign management
Other associated suppliers	<ul style="list-style-type: none"> • a stakeholder management company which coordinated relationships with key stakeholders (for example, local authorities, community groups) • media buyers for out-of-home and digital outputs • a website development company who created digital content such as the COVID-19 Explained website and Stakeholder Hub • a translation company who translated campaign materials into 12 languages • a film company who created video content • a photographer who helped take photographs of people across the region
UKHSA	Commissioning body who managed the funding, shared regional COVID-19 data, lead viability discussions and chaired the steering group.

The steering group

A steering group was set-up to provide guidance on local areas to target and decide on the campaign approach. This group was chaired by UKHSA and included representatives from Hull City Council, UKHSA, NHS England, local NHS Trusts, the National COVID-19 Response Centre (NCRC), and DHSC. Magpie met with the steering group on a monthly basis, providing

² Public Health England (PHE) was the original commissioning organisation of the campaign. It was later replaced by UKHSA. To ensure consistency we will refer to UKHSA throughout, rather than switching between the 2 depending on timing.

updates on campaign progress and utilising feedback from the steering group to adapt campaign content.

Theory of change and overall hypothesis for the pilot

The theory of change (ToC) diagram (see Figure 15 in Appendix A) was developed by NatCen and illustrates how activities undertaken as part of the campaign were expected to lead to the intended outcomes and impacts. This ToC formed the theoretical basis guiding the evaluation and all evaluation tools were designed to align with the ToC. A workshop was held virtually by NatCen with key pilot stakeholders to develop the ToC. This included representatives from the local Test and Trace team, Magpie and DHSC.

The overall hypothesis for the pilot campaign was as follows:

By providing tangible, localised and clear facts about COVID-19 through materials that promote lived experience and have been designed with trusted local people, the campaign can build trust with people. This trust will lead to people being more likely to get vaccinated, more likely to get tested if they have COVID-19 symptoms and more likely to comply with self-isolation. This will then lead to reduced COVID-19 transmission, fewer hospitalisations and ultimately fewer COVID-19 deaths.

The activities detailed in the ToC were the initial inputs into the campaign. These included the co-design and testing of campaign materials and the sharing of campaign materials, both through trusted people (for example, community or faith leaders) and via digital and out of home media (for example, social media graphics, bus adverts). The mechanisms detailed in the ToC were the expected result of these activities. The co-design of materials and sharing of materials via trusted people was expected to build trust in the messages from the campaign. In turn, these mechanisms were expected to contribute to the outcomes for the different target groups.

The ToC lastly showed that these outcomes were expected to lead to 3 key impacts:

- reduced COVID-19 transmission
- fewer COVID-19 hospitalisations
- fewer COVID-19 deaths

There were also a number of key assumptions made in the ToC, namely that:

- the campaign runs for sufficient time
- campaign activities occur as planned
- campaign materials are produced and distributed at a scale capable of leading to change
- campaign materials are seen and used by target populations

Evaluation overview

This document outlines the design and findings of the evaluation of the Yorkshire and Humber COVID-19 campaign pilot. More information on the study design is available in the study plan. The evaluation aimed to understand the delivery of the pilot and to assess the impact of the pilot on vaccination and testing. The evaluation was based on a ToC (see Figure 15 and the overall hypothesis for the pilot). To achieve the core objectives of the study, and provide evaluation insights that inform the delivery of similar programmes, the evaluation comprised 2 stands:

1. An impact evaluation (IE), which used a synthetic control method (SCM) to quantify the impact of the pilot on desired outcomes of vaccination and testing.
2. An implementation and process evaluation (IPE), which used a small number of interviews to understand the processes by which the campaign was implemented to meet its objectives, what influenced this, lessons learned throughout, and recommendations for what could have been improved.

Evaluation questions

The IE was designed to answer the following research questions (RQs):

RQ 1.1: What is the impact of the programme on the rate of COVID-19 testing as measured by number of PCR tests per 1,000 people in the area of interest?

RQ 1.2: What is the impact of the programme on the rate of COVID-19 testing as measured by number of lateral flow tests per 1,000 people in the area of interest?

RQ 2.1: What is the impact of the programme on vaccination as measured by the proportion of adults with one dose of an approved COVID-19 vaccine in the area of interest?

RQ 2.2: What is the impact of the programme on vaccination as measured by the proportion of population with 2 doses of an approved COVID-19 vaccine in the area of interest?

The original study plan included an assessment of the impact of the programme on engagement with Test and Trace and on self-isolation compliance as measured by data sourced from NHS Test and Trace³. However, it was agreed that these aspects could not be pursued further given that data on compliance and engagement largely stopped in the end of November 2021 (see the section on '[Impact evaluation design](#)' for more information). Therefore, a decision was made to explore the feasibility of using social media data to capture programme effects on self-isolation compliance and engagement with Test and Trace, and to further explore impact on

³ RQ 6: What is the impact of the programme on engagement with Test and Trace?

RQ 7: What is the impact of the programme on self-isolation compliance?

vaccination and testing. This led to the addition of RQ8 to RQ11⁴. However, as requested by the funder these RQs were abandoned too.

The IPE was designed to answer the following RQs:

RQ 1: How were campaign activities implemented?

RQ 2: How were target audiences and communities reached?

RQ 3: How did external factors influence the campaign?

RQ 4: Was the campaign delivered as intended?

RQ 5: What could be improved about the campaign?

⁴ RQ 8: What is the impact of the programme on sentiments regarding Test and Trace as measured by Twitter posts?

RQ 9: What is the impact of the programme on sentiments regarding self-isolation compliance as measured by Twitter posts?

RQ 10: What is the impact of the programme on sentiments regarding COVID-19 testing as measured by Twitter posts?

RQ 11: What is the impact of the programme on sentiments regarding vaccination as measured by Twitter posts?

Changes to the evaluation scope and design

The evaluation was redesigned and rescopeed due to delays in programme implementation and in response to changes in government rules and regulations on COVID-19.

Several alterations to the evaluation design were made to the original and updated study plans, driven by these changes. The main changes to the timelines, scope and evaluation design are summarised below.

Timeline

- The pre-intervention start date and the post-intervention period analysed in the evaluation changed from the one described in the original plan. The programme start date was delayed (the programme started to be implemented partially on 29 November 2021 in the pilot LSOAs) and the campaign was also stopped earlier than originally planned (in February 2022) in line with a reduction in COVID-19 communication nationally.

Scope of the evaluation

- A focus on vaccination and testing outcomes, and exclusion of self-isolation compliance and engagement with Test and Trace as outcomes. The evaluation originally included an assessment of the impact of the programme on engagement with Test and Trace and on self-isolation compliance as measured by data sourced from NHS Test and Trace. However, the government changes on self-isolation affected the outcome data collection on self-isolation compliance and consequently analysis of impact on self-isolation compliance was not feasible. Similarly, data collection on compliance and engagement largely stopped by the end of November 2021.
- A decision was made to explore the feasibility of using social media data to capture programme effects on self-isolation compliance and engagement with Test and Trace, and to further explore impact on vaccination and testing. Therefore, the updated study plan outlined additional assessment of the impact of the pilot on sentiments regarding self-isolation compliance, COVID-19 testing and vaccination, as measured by Twitter data. However, it was jointly agreed by the NatCen evaluation team and the funder that this aspect of the evaluation should not be pursued.

Impact evaluation

- National Immunisation Management System (NIMS) population estimates were used in place of publicly available Office for National Statistics (ONS) population estimates. This is because ONS estimates contained some errors. For example, a substantial proportion of LSOAs had over 100% vaccination for both first and second dose. We thus obtained NIMS population estimates which are used for government estimations of vaccination.
- Adoption of 'nearest neighbour' matching to reduce the control donor pool.

Implementation and process evaluation

- Interviews were originally planned to take place with both community leaders who had been engaged with the campaign as well as those who decided not to take part, to understand a range of perspectives. Due to changes in the campaign timeline (the campaign finishing earlier than planned), engagement with community leaders was more difficult; by the time of the fieldwork period, many were no longer actively engaged with the campaign. Consequently, it was not possible to snowball recruit community leaders who decided not to take part in the campaign.

The next sections provide further details on the IE and IPE design. More information on the evaluation design is available in the updated study plan.

Scoping stage

The evaluation was designed following a scoping stage, which aimed to establish the most suitable design and to develop a ToC.

The scoping stage was extended from what was originally intended, and the evaluation design was adapted to reflect changes in the timeline and scope of the Yorkshire and Humber COVID-19 campaign pilot, as well as changes in government policy reflecting the changing context of the COVID-19 pandemic. As a result of these considerations, the scoping stage was extended to better understand programme changes, re-assess data availability and produce a revised design for the evaluation. It comprised the following steps:

Theory of change development

The ToC was developed by NatCen, Magpie and DHSC during the ToC workshop, and was further updated by NatCen and Magpie with the aim to capture programme changes (see Figure 15).

Review of available data sources

This included a review of data collected by Test and Trace, data on vaccinations from the NHS and publicly available data sources. We also considered the scope of using social media data to measure changes in sentiments on self-compliance, testing and vaccination.

An assessment of appropriate evaluation methods

Before identifying SCM as the most suitable approach we considered strengths and limitations of different IE methods. The 2 main impact evaluation methods that were under consideration were matched difference-in-differences (DD) and SCM. However, as the intervention took a hyper-localised approach, the available sample size meant that DD analysis would be unlikely to detect the size of effect that might be realistic to expect given the intervention and outcomes in question. Therefore, it was established that SCM was the most suitable method, provided that the assumptions and data requirements for the method were satisfied.

Impact evaluation design

In this evaluation we applied SCM to explore the effect of the pilot campaign on the LSOAs where the campaign operated by constructing a synthetic control group that resembles the treated LSOAs. This approach was used to assess the effects on all outcomes of interest (both vaccination and testing). SCM was developed by Abadie and colleagues (2010).

At its core, this approach compares outcomes for the treated LSOAs with outcomes in other LSOAs over time. It produces a 'synthetic' cohort by weighting comparison units based on their pre-intervention time trends so that they are very similar. This method first calculates the importance of certain LSOA covariates (for example, deprivation index, age, ethnicity distribution in the LSOA) for the outcomes (testing and vaccination) and subsequently computes weights to minimise the difference between treated and untreated LSOAs. The weighting is then applied in the post-intervention period, so that the difference in outcome trends between the intervention group and the 'synthetic control' group can be assessed as the causal impact of the intervention.

In the next sections we describe our outcomes of interest, the data, the approach we undertook to construct the synthetic control group, and our analysis approach.

Outcome measures

The outcomes for this evaluation were categorised into 2 distinct groups (outcomes related to testing and vaccination). These are outlined in Table 2, along with the data sources used to create them. Due to changes in government guidelines and regulations, and subsequent changes in data availability, exploring effects on self-compliance and engagement with Test and Test trace was no longer considered feasible. At the request of funder, all outcome measures based on sentiment scores using social media data were foregone (see the section on '[Outcomes not being analysed](#)' for more information).

Table 2. Outcomes, metrics and data source

Outcome		Metric	Data source
Testing	1.1	Number of PCR tests per 1,000 people in the area of interest	Testing extract, NIMS
	1.2	Number of lateral flow tests per 1,000 people in the area of interest	Testing extract, NIMS
Vaccination	2.1	Proportion of adults with one dose of an approved COVID-19 vaccine in the area of interest	Vaccination extract, NIMS
	2.2	Proportion of population with both doses of an approved COVID-19 vaccine in the area of interest	Vaccination extract, NIMS

Testing

Outcomes 1.1 and 1.2 were used to measure whether there was an increased take-up of COVID-19 testing when displaying symptoms, as is postulated in the ToC (RQs 1.1 and 1.2).

The rationale here was that, because of the sharing of campaign materials, including by trusted community members and friends or family, individuals would develop a better understanding of when to get tested and what to do if they tested positive. They should also have an improved capability to self-isolate if necessary, increasing their willingness to get tested.

We derived these outcomes from the testing extract and NIMS population estimates. Using the testing extract, we separately calculated the daily total number of polymerase chain reaction (PCR) and lateral flow tests (LFT) conducted within each LSOA. We then divided these by the NIMS population estimates and multiplied these by 1,000. This gave the daily number of PCR and lateral flow tests administered per 1,000 people in each LSOA.

We included both PCR and lateral flow tests. Although lateral flows have become more prevalent over time, both continue to be used and were included in the testing data extract. Using both outcomes allowed us to monitor their relative use. Furthermore, LFT data only includes results which have been reported to NHS Test and Trace. Consequently, data was likely to underestimate the number of LFTs being taken.⁵ Thus, incorporating data relating to both LFT and PCR tests allowed for the most comprehensive assessment possible of available test data.

Vaccination

Outcomes 2.1 and 2.2 were used to measure the impact of the campaign on vaccination (RQs 2.1 and 2.2). The ToC postulated that material sharing as part of the campaign should lead to a greater understanding of COVID-19 and vaccination, changing their perception of the relative risks of catching COVID-19 versus getting vaccinated. This should lead to increased vaccine confidence and, subsequently, increased take-up.

The vaccines data extract included data on all the vaccine doses administered in each LSOA. It also separated data for adults only. Using this, we calculated (separately) the daily cumulative total number of first and second vaccine doses administered to adults in each LSOA, starting on 8 December 2020. We chose this date because it marks the start of the vaccine rollout in England.⁶ We then divided these cumulative totals by the NIMS adult population estimates to produce the proportion of adults in each LSOA who have received their first and second vaccine doses, respectively.

⁵ For example, because people take government provided LFTs and do not report the result, or pay for private tests.

⁶ The data only includes a few doses before this date, but this data is likely erroneous (for example, dates are from earlier years or the dose (first, second, third) is not indicated).

We did not look at the proportion of adults who received booster or third vaccine doses. This was because booster doses were not made available to all adults until December 2021, meaning that we lacked a sufficiently long pre-intervention period for constructing a synthetic control. Similarly, we focused analysis on adults. The vaccine rollout for under 18s started later than the adult rollout and been staggered based on age and vulnerability.⁷ This meant there was not sufficient lead-up data for analysis for under-18s.

Outcomes not being analysed

We had initially wished to include the following outcomes:

- engagement with Test and Trace (contact sharing):
 - proportion of cases sharing at least one contact
 - mean number of contacts shared
- self-isolation compliance:
 - proportion of isolating cases and contacts with 100% success in check-in calls (Test and Trace check-in calls on days 4, 7, and 10 were all completely successful (if made))
 - proportion of self-isolating cases that report no household contacts
- sentiment scores on all outcomes based on Twitter data

Because of changes in government guidelines and regulations, and subsequent alterations to the contents of the cases data extract, anticipated data on engagement with Test and Trace and self-isolation compliance was not available. We had planned to explore the impact of the pilot on self-isolation compliance and engagement with Test and Trace using Twitter data and sentiment analysis, although this analysis was dropped at the request of the funder. Analysis instead focused on the main testing and vaccination outcomes.

Data

The evaluation drew primarily on data provided via DHSC. DHSC collated data from multiple sources and made this available to NatCen, divided into separate extracts. Information on these data sets and data preparation follows.

Vaccination data extract

The vaccination data extract included NHS-sources data on all vaccine doses administered in England. This data was provided at the LSOA level and each observation gave the number of

⁷ Healthy individuals under 18, and under 16s, were excluded from the initial rollout. From 19th July 2021, the rollout was expanded to vulnerable adolescents aged 12+ and young people 3 or fewer months from their 18th birthday. Rollout for all 16 to 17 year olds started on 4 August 2021. The rollout of a single dose for 12 to 15 year olds started 13 September 2021, with second doses starting 29 November 2021. On 15 and 16 February 2022 plans were announced across the UK to expand the vaccine rollout to children aged 5 and over.

specific vaccine doses (first, second, other) administered within a specific LSOA on a specific date. The vaccination data extract was used to derive outcomes related to vaccine uptake.

NIMS population estimates

DHSC provided an extract of NIMS data, which provided estimates of the adult and total population for all LSOAs in England. The population estimates were used to derive outcomes calculated as a proportion of an LSOA's population.

Testing data extract

This data extract included information on test results LSOAs, sourced from NHS Test and Trace. Each observation counted the number of specific results to a test (positive, negative, unknown or void) for a specific type of test (PCR or LFD) in a specific LSOA, on a specific date. It was used to derive outcomes relating to the number/rate of individuals being tested.

Additional data

We received additional data from DHSC on the locations and timings of surge testing⁸ and other COVID-related pilots, to inform the sample and donor pool selection, as well as the timings for pre-intervention data inclusion.

In addition to this, we sourced publicly available data at the LSOA level, used for constructing the synthetic control. Typically, this data was time invariant, we only had one estimate as a baseline for the study period (as these statistics are typically produced annually). Publicly available databases that we used came from reliable sources such as the UKHSA, the DHSC Test and Trace Dashboard, and the Consumer Data Centre. Variables from these data sets include age breakdown, ethnicity, urban-rural division and household size, among others.

Data preparation

The testing, vaccination and population data sets were cleaned, reshaped, and merged to produce a single 'long' data set collating daily LSOA data. The LSOA was the unit of analysis. We prepared data in Stata 17 SE.

Time period analysed

Pre-intervention period

As pre-specified in the evaluation plan, the pre-intervention period considered for the SCM approach was 4 months long (between 21 July 2021 and 28 November 2021). The pre-

⁸ Surge testing is increased testing (including door-to-door testing in some areas) and enhanced contact tracing in specific locations in England

intervention period was chosen based on the last period of surge testing in the pilot areas and the start date of the pilot.⁹

Delivery period

Pilot delivery was delayed, and the period of pilot implementation was shorter than originally intended. The partial implementation started on 29 November 2021 in the pilot LSOAs. The pilot campaign scaled up over December 2021 and January 2022, meaning that the programme only reached full implementation on 17 January 2022. The period for the full implementation of the pilot therefore spans from 17 January to 24 February 2022.

Time unit for analysis

The data provided via DHSC were available on a daily basis. The use of daily data maximised the number of time units available for analysis but came at the potential cost of greater 'noise' based on daily fluctuations.

We compared daily, weekly, 7-day rolling average (daily), 2-weeks rolling average (daily) and one-month rolling average (daily) to identify the time unit that smoothed out the fluctuations in the testing data while maximising the number of time periods. Based on our analysis, we decided to use one-month rolling average for both the number of PCR tests per 1,000 people (outcome 1.1) and the number of lateral flow tests per 1,000 people (outcome 1.2). The use of the one-month rolling average highlighted the trends while reducing the fluctuations in the testing data.¹⁰ However, it reduced the number of time periods by 29 days compared to the vaccination data.

To minimise fluctuations measured in vaccine take-up, we used the daily cumulative rate of adults with one dose of an approved COVID-19 vaccine in the area of interest (outcome 2.1) and daily cumulative rate of adults with both COVID-19 vaccine doses (outcome 2.2).

In total, our analysis was based on 131 pre-intervention units (between 21 July and 28 November 2021) for the vaccination outcomes, while 102 pre-intervention units (between 19 August and 28 November 2021) were available for the testing outcomes. Our analysis was based on 88 post-intervention units (between 29 November 2021 and 24 February 2022) for all outcomes.

⁹ The last surge testing before the programme started took place in Leeds from 22 June 2021 to 8 July 2021 (16 days). A 2-week gap between the end of the surge testing in Leeds and the start of the pre-intervention period of the programme was given to minimise the impact of the surge testing on the testing results. However, another set of surge testing took place in Leeds after the programme started partially from 10 December 2021 to 12 December 2021 (2 days). This surge testing was shorter compared to the earlier surge testing. Therefore, we do not expect significant effect of this surge testing on the testing outcomes. No surge testing took place in Grimsby.

¹⁰ The use of longer time periods for creating moving averages could potentially risk over-smoothing trend lines and lead to losing important trends if outcomes are not measured for a substantial period of time. Given that we have large pre-intervention and post-intervention time units for our outcomes, we do not expect this would be the case in our analysis.

Treated units and synthetic control group

This section outlines the treated units, as well as the process of identifying and restricting the untreated units (often called the 'donor pool') from which the synthetic control group was constructed.

Treated units

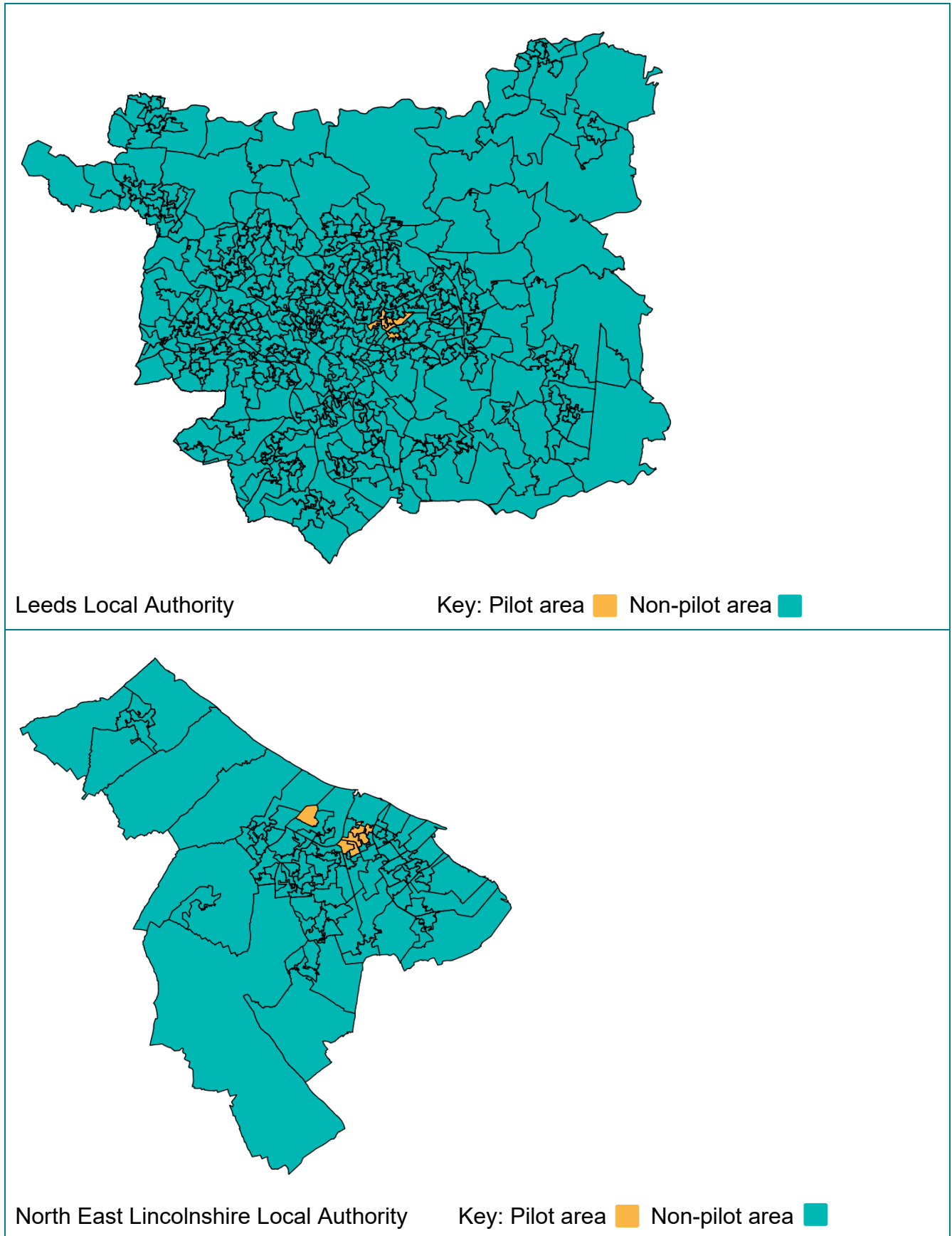
The intervention operated within all the local authorities in the Yorkshire and Humber region and the intervention sample therefore consists of 18 local authorities within the region. However, the hyper-localised campaigns of the pilot evaluation evaluated in this study only ran in 2 local authorities, Leeds and Grimsby.¹¹

Magpie identified LSOAs in Leeds and Grimsby with the lowest levels of vaccination amongst people over 20 years of age at the time of the programme design. The pilot evaluation activities took place in these selected LSOAs in Leeds and Grimsby.

The pilot spanned a total of 14 LSOAs, out of which 7 LSOAs are in central Leeds and 7 LSOAs are in Grimsby (see [Figure 1](#)). All 7 of the Leeds LSOAs fall within the Leeds Local Authority, while all 7 of the Grimsby LSOAs fall within the North East Lincolnshire Local Authority. The 2 pilot areas, Leeds and Grimsby, have different characteristics and pre-intervention trends. This made it difficult to construct a convincing single counterfactual for both pilot areas combined. For this reason, we analysed the 2 pilot areas separately, establishing 2 separate synthetic controls. This gave us a greater insight into the potential variation in programme effectiveness based on the local context.

¹¹ The other local authorities in Yorkshire and Humber had access to the umbrella materials from the intervention.

Figure 1. Pilot target areas



Construction of the synthetic control group (donor pool)

We created a synthetic control using data from regions that were not part of the intervention or that were not implementing similar programmes. Data aggregated at the LSOA-level was used to define the donor pool for testing and vaccination outcomes. To identify the donor pool, we followed several inclusion criteria to limit the impact of confounders. Second, we further restricted the control donor by applying a 'nearest neighbour matching' approach. We discuss the inclusion criteria and the 'nearest neighbour' matching approach below.

Inclusion criteria

First, for a LSOA to be considered in the donor pool the following inclusion criteria were applied:

Local authorities in England

Given that the different lockdown rules have been followed within the UK nations, only local authorities from England were included in the donor pool.

Not being exposed to elements of the pilot

As the intervention was scaled up to the whole of Yorkshire and Humber in late January 2022, the other local authorities in the Yorkshire and Humber region have been exposed to the intervention activities. Therefore, the other local authorities in Yorkshire and Humber region were excluded from the donor pool.

Not implementing similar pilot

At the time of writing the study plan, there were 18 'What Works' pilots being implemented in England, across 60 local authorities. One of the pilots, implemented in Bradford, is also within the Yorkshire and Humber region.¹² The Bradford pilot was in operation in April and May 2021, so it did not overlap directly with the Yorkshire and Humber pilot in time, and was included in the donor pool. The remaining local authorities from England that have had or will have a 'What Works' pilot were excluded from the donor pool.

Less than 1% of tests processed by the Wolverhampton lab

In October 2021, the processing of PCR testing at a Wolverhampton lab was suspended following an investigation by NHS Test and Trace, which raised concerns that tens of thousands of people in various areas of England and Wales may have been wrongly told their COVID-19 test was negative due to errors at the laboratory. This reduced confidence in all tests which came from this lab. While it was not possible to identify which tests came from this laboratory, DHSC provided data for all LSOAs in the UK on the number and proportion of tests processed by the Wolverhampton lab. All those LSOAs which had more than 1% of their PCR tests processed by the lab (from the start of the pandemic to 26 October 2021) were excluded from the analysis. None of the pilot LSOAs had this problem, although 3,222 LSOAs out of 32,844 English LSOAs (9.8% of English LSOAs) were excluded from the donor pool as a result.

¹² This pilot was a temporary change in the income eligibility threshold for the Test and Trace support payment (from a weekly wage of £350 to £500).

'Nearest neighbour' matching

In the study plan we did not predict the need to further restrict the donor pool. However, we believe the most appropriate and robust analysis required further restriction to the control donor pool for 2 main reasons. First, the SCM assumes that the number of control units for which we observe outcomes is modest and the areas in the donor pool have similar historical trends and context that is change in vaccination and testing is driven by similar structural process as for the treated units (see Abadie 2015; Abadie 2021). Second, when using the entire control donor pool the computation time was lengthy. Therefore, in addition to applying the inclusion criteria above we further restricted the donor pool by using a 'nearest neighbour' matching approach which allowed us to restrict the donor pool to LSOAs that resemble the treated LSOAs before intervention characteristics and trends on the outcomes. We matched LSOAs based on population, ethnicity, age and level of deprivation.¹³

Synthetic control units

We constructed 8 different synthetic control (SC) units to provide counterfactual for each of the 4 outcomes (testing as measured by the number of PCR tests per 1,000 people (RQ 1.1); testing as measured by the number of LFT per 1,000 people in the LSOA (RQ 1.2); vaccination rates as measured by the proportion of adults with one vaccine (RQ 2.1); vaccination rate as measured by the proportion of adults with both doses (RQ 2.2)) and separately for the LSOAs located in Leeds and those located in Grimsby. The method reweighted 48 LSOAs for Leeds, and 56 LSOAs for Grimsby.¹⁴

The SC units matched as accurately as possible the pre-treatment trends of the variables of outcome. We also included several time constrained and time-variant variables that potentially predict take up on vaccination and testing. The time-constraint LSOA characteristics we used for each outcome were:

- percentage of LSOA population belonging to different ethnic groups (White British; White other; Black, African, Caribbean, Black British; Asian-Asian British; mixed and other)
- percentage of LSOA population belonging to different age groups (16 to 29, 30 to 44, 45 to 64, 65 and over)
- percentage of LSOA population living in rural areas
- Index of Multiple Deprivation 2019

The time-varying covariates vary for each outcome and they are based on the respective pre-treatment outcome measured at 5 different time periods (that is the average vaccination rates and number of tests on every Friday during the pre-treatment period).

¹³ The full list of variables included the following: adult population in the LSOA; total urban or rural population of LSOA; percentage of white British-other white-mixed-Asian-black population in LSOA; percentage of people coming from other ethnic background in LSOA or percentage of population aged 16 to 29 or 30, to 44 or 45, to 64 or 65 and over in LSOA; English indices of deprivation 2019.

¹⁴ Tables B1-B8 in Appendix B displays the non-zero weights of each control LSOA for each of the 4 outcomes separately for the synthetic Leeds and Grimsby.

Summary statistics for treated units and donor pool as analysed in the pre-intervention period

In Table 3 and Table 4, we present summary statistics for the treated units and the constrained donor pool for the pre-intervention period. The first 4 rows show values for the outcome variables for the day before delivery commenced (28 November). The remaining variables are the time constrained variables for the LSOAs that predict number of tests taken and vaccination rates in the LSOAs.

Looking first at Leeds and its donor pool, we observe that the number of PCR and lateral flow tests taken were on average lower in comparison to the number of PCR and lateral flow tests in the LSOAs from the donor pool. Similar, on average, the vaccination rate was lower in the LSOAs in Leeds in comparison to the LSOAs in the donor pool. For Grimsby and the respective donor pool, the imbalance was similar, that is the vaccination rate and the number of tests taken were lower for the LSOAs in Grimsby in comparison to the donor pool.

The mean values for the outcomes and the variables presented below suggest that simple average across the other LSOAs serves as a poor counterfactual. By using the SCM to form a weighted average of the untreated LSOAs, we can obtain much better counterfactual for both Leeds and Grimsby.

Table 3. Pre-intervention summary statistics for Leeds and its donor pool

Variables	Leeds LSOAs					Donor pool LSOAs					Standardised mean diff
	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	
Number of PCR tests per 1,000 people in the area of interest	7	1.21	0.53	0.64	2.31	46	3.23	2.06	0.75	11.8	-0.99
Number of lateral flow tests per 1,000 people in the area of interest	7	0.91	0.41	0.59	1.74	46	1.62	0.64	0.6	3.04	-1.07
Proportion of adults with one dose of an approved COVID-19 vaccine in the area of interest	7	44.93	10.23	37.66	65.8	46	59.35	11.04	38.34	81.66	-1.21
Proportion of population with both doses of an approved COVID-19 vaccine in the area of interest	7	38.03	10.25	30.33	59.11	46	53.5	11.52	31.33	78.03	-1.24
% White British population (2011)	7	35.51	18.78	10.05	62.00	46	52.70	26.01	4.71	90.73	-0.67
% White Other population (2011)	7	8.21	2.11	5.99	11.95	46	7.31	4.00	1.67	19.39	0.24
% Mixed population (2011)	7	5.92	1.52	3.05	7.87	46	4.11	1.69	0.83	9.10	1.02
% Asian population (2011)	7	32.73	19.97	7.30	66.42	46	25.08	21.35	1.64	75.20	0.36
% Black population (2011)	7	15.14	3.43	10.21	20.88	46	8.67	6.05	0.41	26.56	1.05
% Other population (2011)	7	2.49	1.51	1.02	4.79	46	2.12	1.55	0.25	5.55	0.24
% urban population (2011)	7	94.27	0.00	94.27	94.27	46	97.06	7.42	60.58	100.00	-0.40
% rural population (2011)	7	5.73	0.00	5.73	5.73	46	2.94	7.42	0.00	39.42	0.40
% population aged 16 to 29 (2011)	7	23.29	1.60	20.00	25.00	46	21.57	4.42	15.00	36.00	0.41
% population aged 30 to 44 (2011)	7	22.43	1.99	19.00	25.00	46	22.59	2.70	16.00	29.00	-0.06
% population aged 45 to 64 (2011)	7	17.71	2.21	16.00	22.00	46	20.13	3.49	14.00	28.00	-0.70
% population aged 65 and over (2011)	7	4.71	1.50	3.00	7.00	46	9.13	3.10	4.00	20.00	-1.34
Index of Multiple Deprivation (2019)	7	992.71	859.04	216.00	2,828.00	46	4,424.26	4,728.46	137.00	20,047.00	-0.75

Table 4. Pre-intervention summary statistics for Grimsby and its donor pool

Variable	Grimsby LSOAs					Donor pool LSOAs					Standardised mean diff
	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	
Number of PCR tests per 1,000 people in the area of interest	7	3.97	1.52	2.18	6.04	58	5.16	1.59	1.95	9.63	-0.74
Number of lateral flow tests per 1,000 people in the area of interest	7	1.65	0.27	1.29	2.02	58	2.36	0.6	1.18	3.91	-1.16
Proportion of adults with one dose of an approved COVID-19 vaccine in the area of interest	7	65.46	0.94	63.6	66.36	58	72.01	4.9	58	80.09	-1.29
Proportion of population with both doses of an approved COVID-19 vaccine in the area of interest	7	59.95	1.27	57.39	61.03	58	67.06	5.36	52.57	77.51	-1.28
% White British population (2011)	7	91.90	1.48	89.90	93.76	58	88.37	7.00	71.16	96.60	0.53
% White Other population (2011)	7	4.82	0.74	3.76	5.79	58	5.00	3.48	1.10	17.75	-0.05
% Mixed population (2011)	7	0.97	0.29	0.74	1.49	58	1.56	0.72	0.41	3.96	-0.84
% Asian population (2011)	7	1.49	0.68	0.41	2.53	58	2.65	2.41	0.33	9.95	-0.50
% Black population (2011)	7	0.39	0.12	0.22	0.54	58	1.94	2.34	0.00	11.57	-0.69
% Other population (2011)	7	0.43	0.24	0.00	0.72	58	0.47	0.58	0.00	3.38	-0.08
% urban population (2011)	7	90.09	0.00	90.09	90.09	58	85.22	17.26	25.14	100.00	0.30
% rural population (2011)	7	9.91	0.00	9.91	9.91	58	14.78	17.26	0.00	74.86	-0.30
% population aged 16 to 29 (2011)	7	20.00	2.52	18.00	23.00	58	17.88	2.99	11.00	28.00	0.71
% population aged 30 to 44 (2011)	7	21.29	2.06	17.00	23.00	58	21.14	2.56	16.00	28.00	0.06
% population aged 45 to 64 (2011)	7	24.29	3.09	19.00	27.00	58	24.16	2.63	19.00	31.00	0.05
% population aged 65 and over (2011)	7	9.71	2.63	7.00	14.00	58	13.02	3.63	6.00	23.00	-0.90
Index of Multiple Deprivation (2019)	7	252.14	259.97	22.00	627.00	58	5,402.31	4,498.86	48.00	1,6301.00	-1.13

Pre-intervention fit

We explored the extent to which the outcomes in the treated and untreated LSOAs follow similar trends in the pre-intervention period. To assess the overlap in time trends across the treated units and the donor pool we inspected the histograms for all outcomes (see Figures 2 to 5). Given the donor pool LSOAs followed similar trends with the treated LSOAs, we should observe similarity across pre-treatment time in both the trends and the level. The figures demonstrate that there was good overlap in trends and levels for Grimsby, and to a lesser extent, for Leeds.

We concluded that the donor pool and treated units showed similar pre-intervention trends and were suitable for SCM analysis.

Figure 1. Histogram showing the proportion of the adult population with one dose of an approved COVID-19 vaccine across the pre-treatment period for the treated and untreated LSOAs

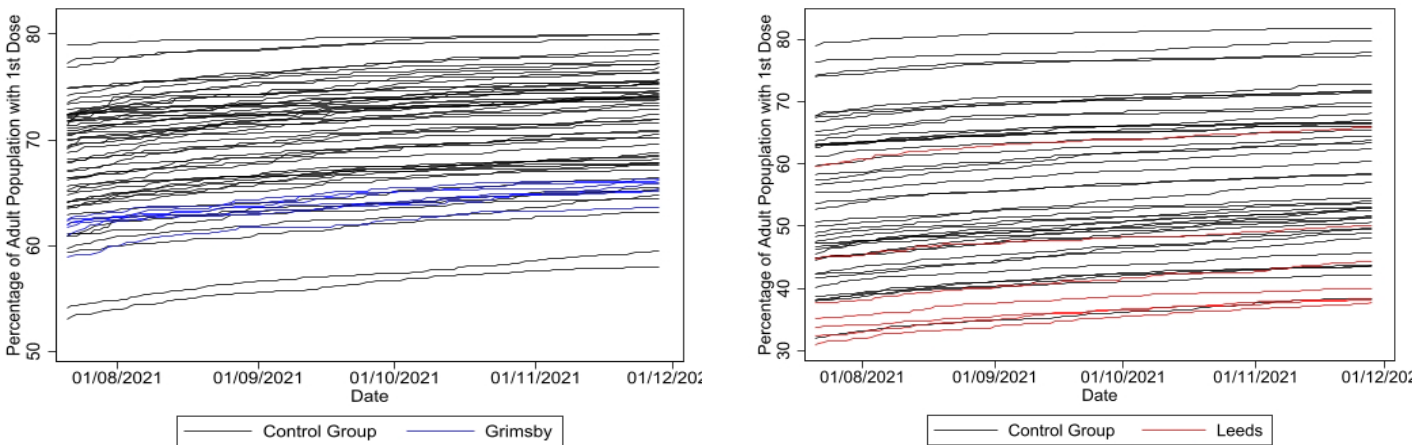


Figure 2. Histogram showing the proportion of the adult population with both doses of an approved COVID-19 vaccine across the pre-treatment period for the treated and untreated LSOAs

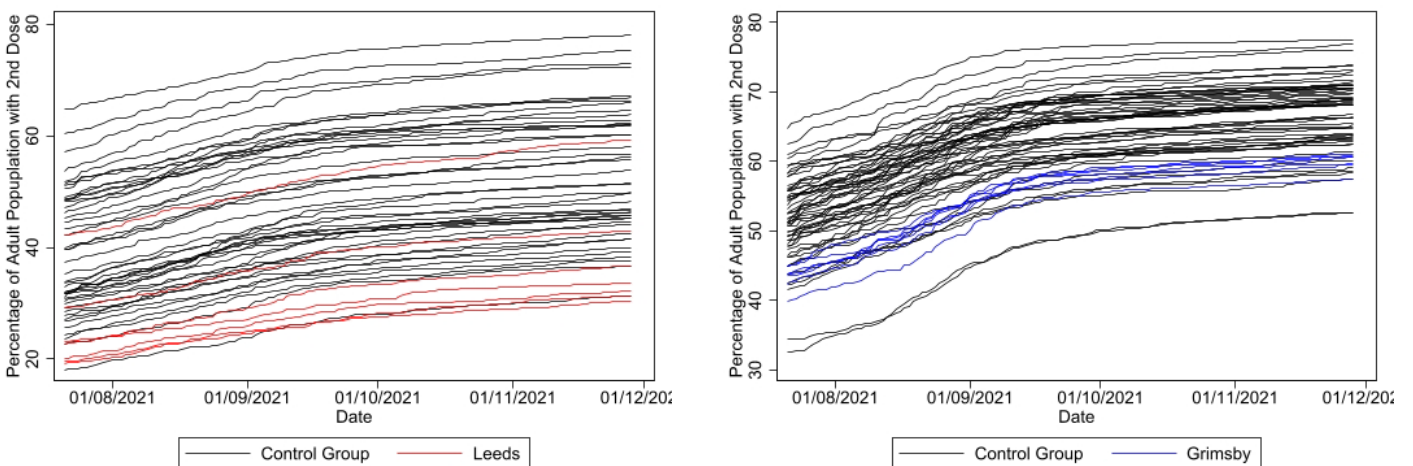


Figure 3. Histogram showing the number of PCR tests per 1,000 people across the pre-treatment period for the treated and untreated LSOAs

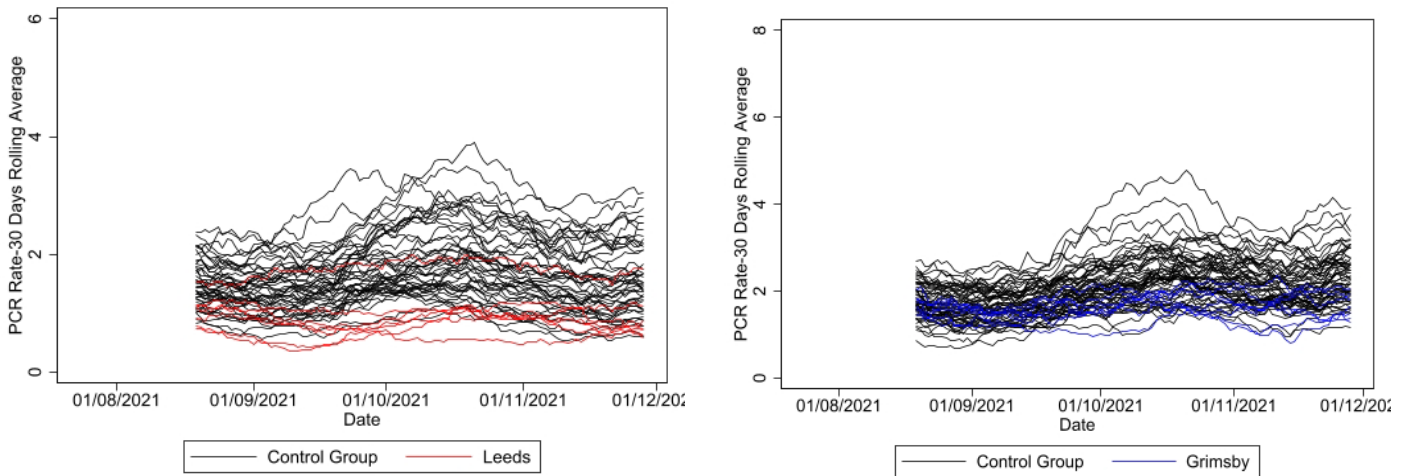
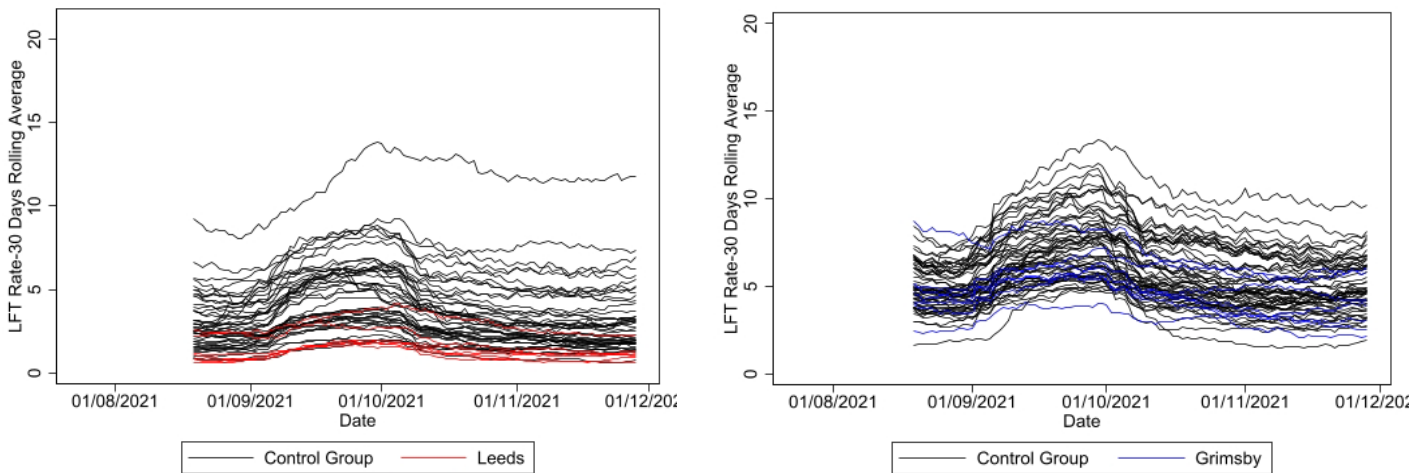


Figure 4. Histogram showing the number of lateral flow tests per 1,000 people across the pre-treatment and for the treated and untreated LSOAs



Impact evaluation analysis

Main analysis

Impact estimates were reported graphically, using the outcome trends for the treatment group and synthetic cohorts. We focused our interpretation on the Average Treatment on the Treated (ATT) group by the last day of the pilot campaign (24 February 2022).

Placebo test

For inference, we followed Abadie, Diamond and Hainmueller (2010) which suggested constructing p-values based on Fisher (1935) and Abadie and colleagues (2010). They suggest determining significance level by a placebo test which follows the following steps:

1. Apply the synthetic control method to each LSOA in the donor pool and estimate the distribution of the estimated effects of the placebo interventions.

2. Calculate the root mean squared prediction error (RMSPE) for each placebo intervention for both the pre-treatment and post-treatment period, separately.¹⁵
3. Obtain the ratios of the post/pre-intervention RMSPE for each placebo intervention and rank them in descending order.
4. Calculate the significance level for the treated unit as the ratio of the rank of the treated unit to the total number LSOAs in the donor pool.

Multiple hypothesis testing

Our study included several outcomes, and when multiple comparisons are made, the likelihood of a type-one error increase. One approach to handle multiple hypothesis testing is Bonferroni adjustment. The Bonferroni adjustment divides the type-one error rate by the number of outcomes within each 'family' of outcomes. We Bonferroni adjust our impact estimates within each outcome group outlined in Table 2. We accounted for the fact that we were making comparisons for both of the pilot areas. For example, there were 2 outcomes for vaccinations, so our impact estimation for these outcomes used a type-one error rate of 0.0125 (that is 0.05/4 as there were 2 outcomes and 2 pilot areas).

Note that because the estimation of P-values for SCM uses permutation tests (similar to Fischer's exact test), this is an approximation based on our sample size.

¹⁵ This step allowed us to obtain one constant pre-RMSPE from over all pre-intervention time periods and one constant post-RMSPE from over all post-intervention time periods for each LSOA in the donor pool.

Implementation and process evaluation design

Stakeholder and community leader interviews

Interviews with stakeholders and community leaders were conducted to gather information about how the campaign was designed and implemented, adaptations that were made to the campaign, external influences, lessons learned and recommendations for what could have been improved.

Sampling

Key stakeholders and community leaders were recruited using a purposive sampling approach. This meant that participants were selected on the basis of the main characteristics related to their involvement in the campaign (for example, strategic staff, operational staff or supplier) which were expected to affect their views, experiences and/or behaviours around the campaign. Participants were identified with the support of Magpie, who gained consent for their contact details to be shared with the evaluation team. While we understand that this approach may risk a limited selection of participants being put forward, those involved in the campaign were small and therefore our sampling needed to be purposive.

A total of 13 in-depth interviews were conducted with stakeholders (n=8) and community leaders (n=5), who were directly involved in the set-up and/or implementation of the campaign. Initially, we also planned to interview community leaders who decided not to engage with the campaign through snowball sampling. However, data collection was revised to include additional interviews with stakeholders, as this third group was hard to reach.

Data collection

All potential participants identified by Magpie were invited to take part in an interview by telephone or Microsoft Teams and sent a tailored information sheet. A screening call was arranged with those interested in taking part to confirm their eligibility, collect key sampling information example organisation or community type, and answer any questions that they may have before consenting to the interview; verbal informed consent was recorded at the start of the interview. To ensure full accessibility and inclusion for those participants with a communication, sensory or learning disability, a proxy interview was offered. Interviews were audio recorded through an encrypted computer programme (Amolto) to support analysis.

Two topic guides were designed to support interviews, one for stakeholders and one for community leaders to capture the different experiences of those involved in different stages of the campaign. The guides were developed based on a light-touch review of documents received from Magpie example campaign protocol, in collaboration with DHSC. A summary of the themes

guiding the interviews can be found in Table 5. The topic guides were semi-structured, organised around the main themes in the research questions, included prompts to encourage an in-depth discussion, and were piloted in the field before finalising.

Table 5. Summary of themes explored in the interviews

Stakeholders	Community leaders
Campaign set-up	Experiences of the pandemic
Campaign implementation	Involvement in the campaign
Barriers and facilitators	Campaign implementation
Lessons learned	Barriers and facilitators
Perceived impact of the campaign	Perceived impact of the campaign

Analysis

The Framework approach to qualitative data analysis was applied, facilitating robust qualitative data management and analysis by case and theme within an overall matrix.¹⁶ Using this Framework approach, we developed thematic matrices through familiarisation with the data and identification of emerging issues. Each thematic matrix represented one key theme (for example, barriers and facilitators to programme implementation), and the column headings in each matrix related to key sub-topics. We then summarised the data from each case (that is from one stakeholder) into the relevant cell.

The aim of qualitative research is to access the breadth and diversity of participants' experiences and views. Participants' responses are not exhaustive in that only some potential participants take part. We made sure to obtain views from a range of participants in this evaluation, and all the views expressed were reported, but may not be representative of what all potential participants would have said since the sample was purposive (as opposed to representative). We reported what participants told us, whether or not their perspectives contradict existing aims, activities, and policies of the respective organisations. Such contradictions or misunderstandings can themselves be a useful source of learning regarding how policies and practices translate into experiences of relevant stakeholders.

Ethics

Ethics permission was received from the NatCen Research Ethics Committee (REC). Our REC procedure is designed to ensure that all research undertaken by NatCen Social Research is ethically sound and meets the ethical standards of the Government and other funders. The REC reviewed our application to ensure that we obtained fully informed consent, considered diversity

¹⁶ Ritchie J, Lewis J, Nicholls CM and Ormston R editors. 'Qualitative research practice: a guide for social science students and researchers' (2013) Sage

and accessibility requirements, that our approach to recruitment was not coercive and that the requests for information were proportionate and necessary to address the evaluation objectives.

Limitations

Some limitations regarding the qualitative interviews include:

- while a range of participants involved in the campaign at different stages were interviewed, it should be noted that they may not be representative of others who were not interviewed and involved in the campaign
- the evaluation was not designed to collect data from those the campaign targeted; as such, we were unable to capture their perspectives
- the sample used was identified with the support of Magpie, who gained consent for their contact details to be shared with the evaluation team; this resulted in a limited selection of participants being put forward and impacted who could be contacted directly
- engagement with the research and content of interviews may have been affected by the campaign stopping during fieldwork

Timeline of activities undertaken as part of the IPE

Table 6. Timeline of activities undertaken as part of the IPE

Activity	Start date	End date
Development of research materials	4 October 2021	1 November 2021
Recruitment	27 December 2021	28 March 2022
Fieldwork	7 February 2022	18 April 2022
Analysis	18 April 2022	13 June 2022

Impact evaluation results

Testing (RQ 1.1 and 1.2)

Figure 6 and Figure 7 show graphic representation of testing take-up as measured by the number of PCR tests taken (RQ 1.1).

Figure 6 shows Grimsby (solid line) compared with the counterfactual outcome for Grimsby (dashed line) built from 58 LSOAs, while Figure 7 compares Leeds (solid line) with the SC unit for Leeds (dashed line) built from 46 LSOAs. The vertical axis in both figures measures the one-month rolling average of PCR tests per 1,000 people, while the horizontal axis represents calendar days starting from 19 August 2021. The period before the vertical line (28 November 2021, the day on which the campaign pilot started) indicates that our counterfactual group followed quite a similar trend to that of Grimsby and Leeds, given that the 2 lines overlap frequently. By the last day of the pilot campaign (24 February 2022), rates of PCR tests completed for both Grimsby and Leeds were similar to the SC units (see Figure 6 and Figure 7). Shortly after the campaign started, the number of tests taken in Grimsby grew less than its counterfactual, but the gap disappeared by the end of January (see Figure 6). The number of PCR tests per 1,000 people in the estimated counterfactual for Leeds grew in the first month of implementation. However, in the next month the number of tests taken grew significantly more in Leeds, however, the gap disappeared by the end of the campaign (Figure 7).

Figure 5. Number of PCR tests per 1,000 people in Grimsby and the SC unit for Grimsby

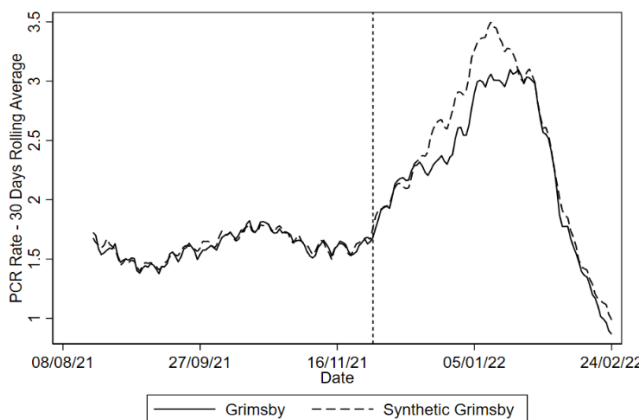


Figure 6. Number of PCR tests per 1,000 people in Leeds and the SC unit for Leeds

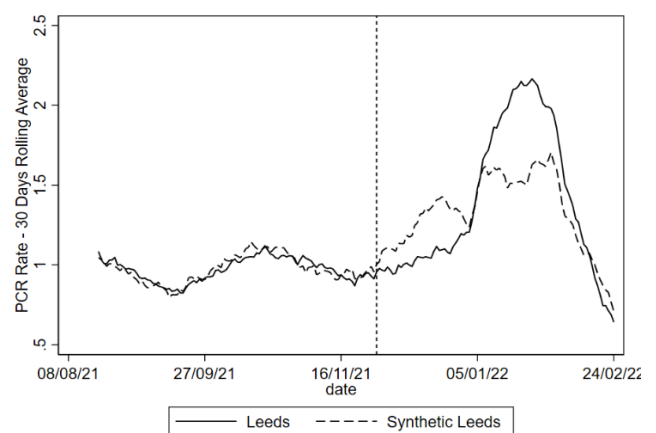


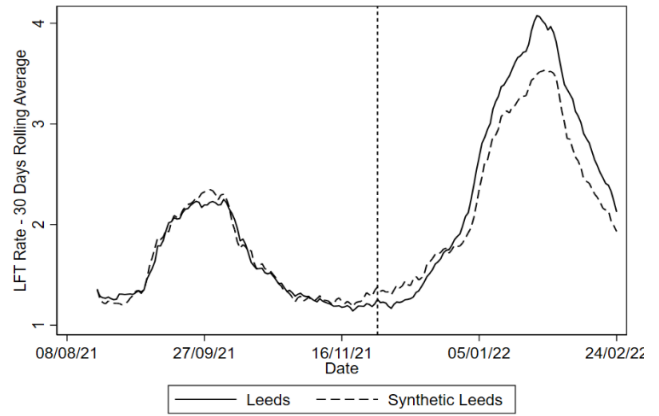
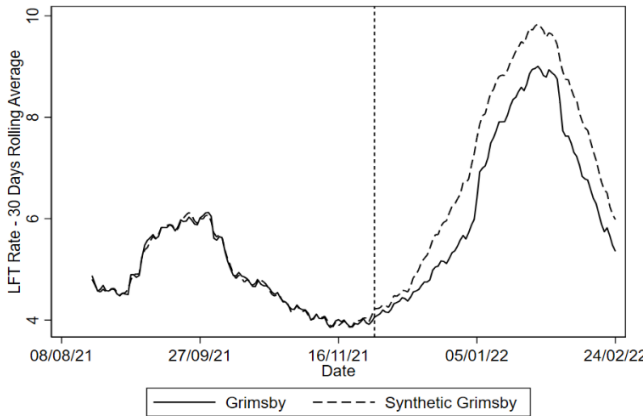
Figure 8 and Figure 9 report graphically test take-up as measured by the number of lateral flow tests taken in the treated LSOAs with the estimated SC (RQ 1.2).

Figure 8 compares Grimsby with its SC unit, while Figure 9 compares Leeds with its SC unit. The trend for the SC unit for Grimsby started to increase right after the campaign was introduced, becoming higher than in Grimsby for the duration of the programme (see Figure 8).

In contrast to Grimsby, in Leeds we observe that the number of LFT per 1,000 people started to increase in comparison to the counterfactual group one month after the start of the campaign and continued to remain higher for the duration of the campaign.

Figure 7. Number of LFT per 1,000 people in Grimsby and the SC unit for Grimsby

Figure 8. Number of LFT per 1,000 people in Leeds and the SC unit for Leeds



Vaccination (RQ 2.1 and 2.2)

Figure 10 and Figure 11 show the development over time of the estimated cumulative percentage of adult population with one dose of an approved COVID-19 vaccine for Grimsby and Leeds and the respective synthetic control group (RQ 2.1).

The vertical axis in both figures measures the cumulative vaccination rate, while the horizontal axis represents calendar days starting from 21 July 2021. As can be seen, from the period before the vertical dashed line, the counterfactual groups for Grimsby and Leeds were similar to the treated units. It shows that LSOAs in Grimsby and Leeds had similar vaccination rates compared with similar LSOAs (our SC) before the start of the campaign pilot. There was no observed difference in the cumulative percentage of the adult population with one dose of COVID-19 vaccine in Grimsby compared to the SC unit by the last day of the pilot campaign (see Figure 10). Cumulative vaccination rates for Leeds started to slightly decrease compared with the counterfactual group 30 days after the campaign was introduced, and the gap widened by the end of the campaign (see Figure 11).

Figure 9. Percentage of adult population with one dose of an approved COVID-19 vaccine in Grimsby and the SC unit for Grimsby

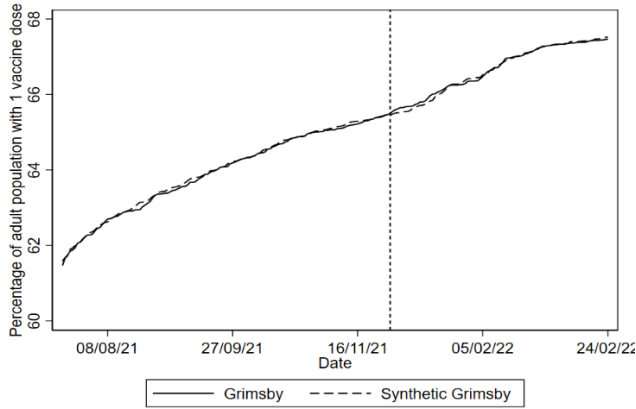
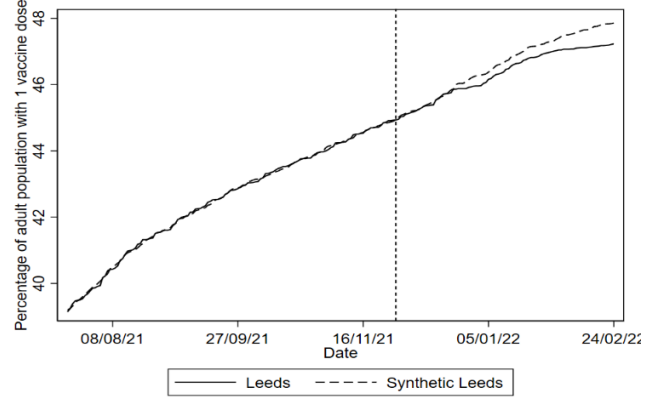


Figure 10. Percentage of adult population with one dose of an approved COVID-19 vaccine in Leeds and the SC unit for Leeds



In Figure 12 and Figure 13 we replicated the analysis using the cumulative proportion of population with both doses of an approved COVID-19 vaccine as an outcome measure (RQ 2.2).

The SCM produced a good pre-treatment fit for Grimsby and Leeds. After the pilot campaign was introduced, we did not observe any difference between Grimsby and its counterfactual group in vaccination rates as measured by the cumulative percentage of population with both doses of an approved COVID-19 vaccine (see Figure 12). As can be seen from Figure 13 the cumulative vaccination rate for the LSOAs in Leeds was slightly lower than the vaccination rate for the counterfactual LSOAs.

Figure 11. Percentage of adult population with both doses of an approved COVID-19 vaccine in Grimsby and the SC unit for Grimsby

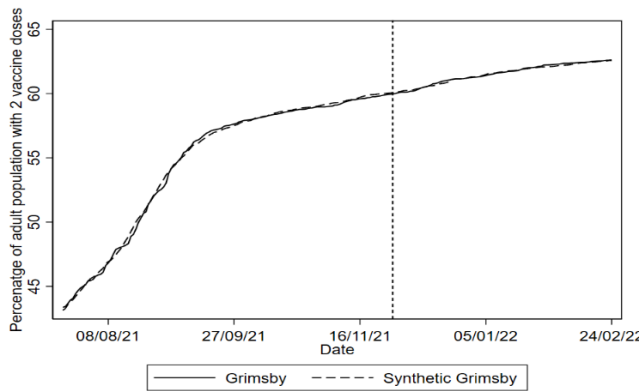
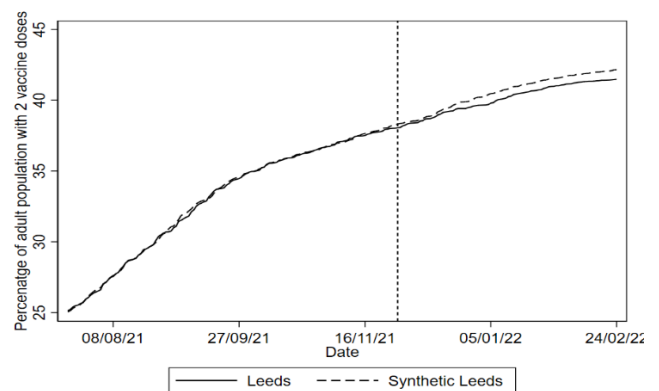


Figure 12. Percentage of adult population with both doses of an approved COVID-19 vaccine in Leeds and the SC unit for Leeds



Placebo test

Next, as outlined in the Impact evaluation analysis we determined significance level by placebo test. Table 7 reports results from the placebo analysis comparing estimated effects in the treated LSOAs in Leeds and Grimsby to placebo effect from untreated LSOAs. The data reflects the LSOAs-specific ratio between the post-intervention and pre-intervention RMSPE. The estimated p-values show that there is no statistically significant evidence of a relationship between being exposed to the campaign pilot and vaccination or testing take-up in the treated unit in comparison to the donor pool.

Table 7. Significance level for the treated unit

Outcome	P-value	Test statistic ¹⁷
PCR Test (Leeds)	0.0638298	0.0125
PCR Test (Grimsby)	0.4745763	0.0125
LFT Test (Leeds)	0.0212766	0.0125
LFT Test (Grimsby)	0.3389831	0.0125
First Dose (Leeds)	0.1914894	0.0125
First Dose (Grimsby)	0.4915254	0.0125
Second Dose (Leeds)	0.7446808	0.0125
Second Dose (Grimsby)	1.0	0.0125

¹⁷ After following Bonferroni correction for multiple hypothesis testing.

Implementation and process evaluation results

Campaign set-up

Drawing on interviews with stakeholders and community leaders, this section outlines experiences of the set-up phase of the campaign, as well as giving an overview of the processes involved in moving from set-up to delivery.

Understanding of the aims of the campaign

As part of the response to the COVID-19 pandemic, the Yorkshire and the Humber COVID-19 campaign pilot was introduced to support the NHS Test and Trace programme in areas with high COVID-19 transmissions.

Stakeholders reported a detailed understanding of the campaign aims, highlighting that the aims became clearer once Magpie had developed the campaign brief at the start of the project. In particular, stakeholders noted that the campaign aimed to increase COVID-19 safe behaviours, such as encouraging vaccine uptake, testing and self-isolation.

In contrast, community leaders emphasised that the campaign aimed to inform the community about keeping safe from COVID-19. For instance, by providing information on how COVID-19 spread, where the nearest test centre was, how to use a lateral flow test and disproving vaccination side effect myths. Community leaders perceived that this information was important for the community to understand why they needed to follow the guidance and stop the spread of COVID-19. Furthermore, both groups highlighted that the campaign aimed to provide information in an accessible format, using clear and simple messaging. It was generally agreed that this would help target 'hard to reach' groups and ensure information was comprehensible. Stakeholders emphasised that it was key for the campaign to develop COVID-19 communications based on local understanding. Those involved in the design of the campaign aimed to achieve this by moving away from perceived 'top-down' government messaging, working closely with community groups and local authorities.

Overview of the campaign set-up

The set-up phase of the campaign involved the formation of the steering group, a scoping phase, a behavioural science analysis, a testing phase and campaign development. Funding from UKHSA was managed by Hull City Council, which oversaw financial and contractual arrangements. In line with the original campaign approach, UKHSA selected 2 organisations, including Magpie, to develop campaign communications intended to reach a mass audience. Following the scoping phase, stakeholders noted that this strategy changed to

target specific groups, requiring support and skills from more suppliers to create tailored content.

The scoping phase aimed to develop understanding of vaccine uptake and identify target groups for the campaign. Stakeholders described conducting a Rapid Evidence Review (RER) and analysing UKHSA vaccination uptake data, although stakeholders recalled difficulty gaining access to national data despite their positive working relationship. Another important aspect of this phase was working collaboratively with local groups across the region. Following the RER, stakeholders engaged with local authorities and local groups through meetings, workshops and interviews, to understand the barriers to COVID-19 compliance in the community. Stakeholders found this to be beneficial in understanding what was already working and what wasn't.

"It was really important the campaign was done with, and not to, all key stakeholders involved."
(Stakeholder)

Information gathered during the scoping phase was analysed using the COM-B model, highlighting key features to focus on in the development of campaign materials such as tone, clarity, language accessibility and imagery of community leaders.

In the testing phase, collaborations with local groups were identified by stakeholders as playing a crucial role in informing final output decisions and the campaign approach. Local authorities also reached out to request specific COVID-19 information in certain formats which helped to identify gaps in the communication materials. Focus groups with community leaders and members of the public provided constructive feedback and revealed the need for simple language and the removal of the NHS logo from materials, which was affiliated with a top-down approach.

"Collaboration happened from the start right until the end of the campaign."
(Stakeholder)

Throughout the co-creation process, stakeholders cited the ways in which the target groups identified were considered in the campaign approach and materials produced. For instance, stakeholders tailored the campaign to specific pilot areas by translating materials into commonly spoken languages other than English.

Furthermore, campaign materials included content that addressed the concerns of specific groups and were presented to them in clear and simple language. While feedback from community groups was used to create campaign materials, stakeholders felt that they could not incorporate all suggestions as they would not be impactful for all key target groups.

The COM-B Approach

Stakeholders were asked how the COM-B approach was applied to develop campaign materials. The COM-B model is a model of behavioural change, which proposed that there are 3 components to any behaviour (Capability, Opportunity, Motivation). The model states that one or more of these components must be targeted for an intervention to deliver behavioural change.¹⁸

Stakeholders involved in this part of the campaign reported using the COM-B model to identify how the campaign could encourage COVID-19 positive behaviours, considering the role of Capability, Opportunity and Motivation in compliance with self-isolation, vaccination and testing. Building the campaign using a COM-B model relied on bringing together various resources including public health theory, stakeholder insights, RER findings, and vaccination uptake data from UKHSA. Stakeholders found it particularly important to hold workshops with local authorities who had expertise on the needs of their local community. However, stakeholders also expressed disappointment about not being able to work directly with the local people in Grimsby, who were less willing to engage in conversation about the campaign than those in Leeds. Stakeholders discussed using the workshop findings to code responses into Capability, Opportunity, Motivation categories for vaccination, self-isolation, testing and running a separate analysis for each behaviour. The analysis was further broken down by local authority and key features to be included in the campaign were extrapolated.

“The COM-B analysis really informed everything through the campaign, from the look, the tone, the colour scheme, the illustrations, the people, the languages used.”(Stakeholder)

Stakeholders used findings from the COM-B analysis to identify how the campaign design could be developed so that it would influence positive behaviour change. One key finding was the need for the campaign messaging to be hyper-localised. For example, by distributing information booklets in shops and modelling good social behaviour on local community members.

“It [the campaign] needs to have a feel that it comes from people in the community.”(Stakeholder)

Another important finding from the COM-B analysis was the need to take a different approach to the top-down national communications at the time. The campaign considered this by avoiding language that told people what to do. Instead, it was felt that the campaign should explain why people were being asked to do something and how they could do so, such as test or get a vaccine.

¹⁸ [A guide to the COM-B model of behaviour](#)

“What this campaign needed to do was to give [information on] the why the vaccine was safe... in an easy to access way, without ever saying you must get your vaccine.”
(Stakeholder)

As a part of this ‘bottom-up’ approach, stakeholders also ensured campaign materials did not feature any logos affiliated with government or the NHS. The COM-B analysis indicated that community members did not always have positive experiences with official sources and information with logos may not be perceived as trustworthy. Furthermore, the analysis influenced the design features of the campaign as workshops with local authorities emphasised the need for clear and simple messaging. This would ensure the messaging was accessible and comprehensible for everyone in the community.

The steering group

Interviews highlighted the important role the steering group played in advising on last minute changes to the campaign. However, stakeholders felt that some steering group members were more responsive than others and that the involvement of multiple members from various organisations made it difficult to agree on key elements of the campaign, such as the campaign outcomes. Stakeholders also acknowledged that while in the early stages they did not receive much direction from the steering group, this improved later on as the campaigns’ goals and approach became clearer.

Testing the campaign

Before the pilot campaign was introduced across Yorkshire and the Humber, it underwent a test and learn phase. Stakeholders described engaging with the public in Leeds and Grimsby to test campaign materials, often standing outside shops and popular bus routes to ask members of the public what they thought of the campaign design and imaging. Many stakeholders perceived this to be beneficial as it provided instant feedback and allowed a comparison between 2 areas with different demographics. Although stakeholders involved in the campaign design recall having no budget left for further community and public engagement, they felt that this was important for their work and decided to continue on their own accord.

Community leaders involved in this phase were introduced to stakeholders by local authorities. Stakeholders spent time talking to community groups, such as baby and toddler groups, to understand their views on vaccination and tailor content to target any concerns. In interviews, community leaders highlighted their involvement in convening community members to complete a market research survey and give feedback on the booklet design. Stakeholders also mentioned working closely with established community groups that they were already familiar with to gain access to ‘hard to reach’ target groups. This was because people were less likely to engage with stakeholders who were viewed as outsiders within the community.

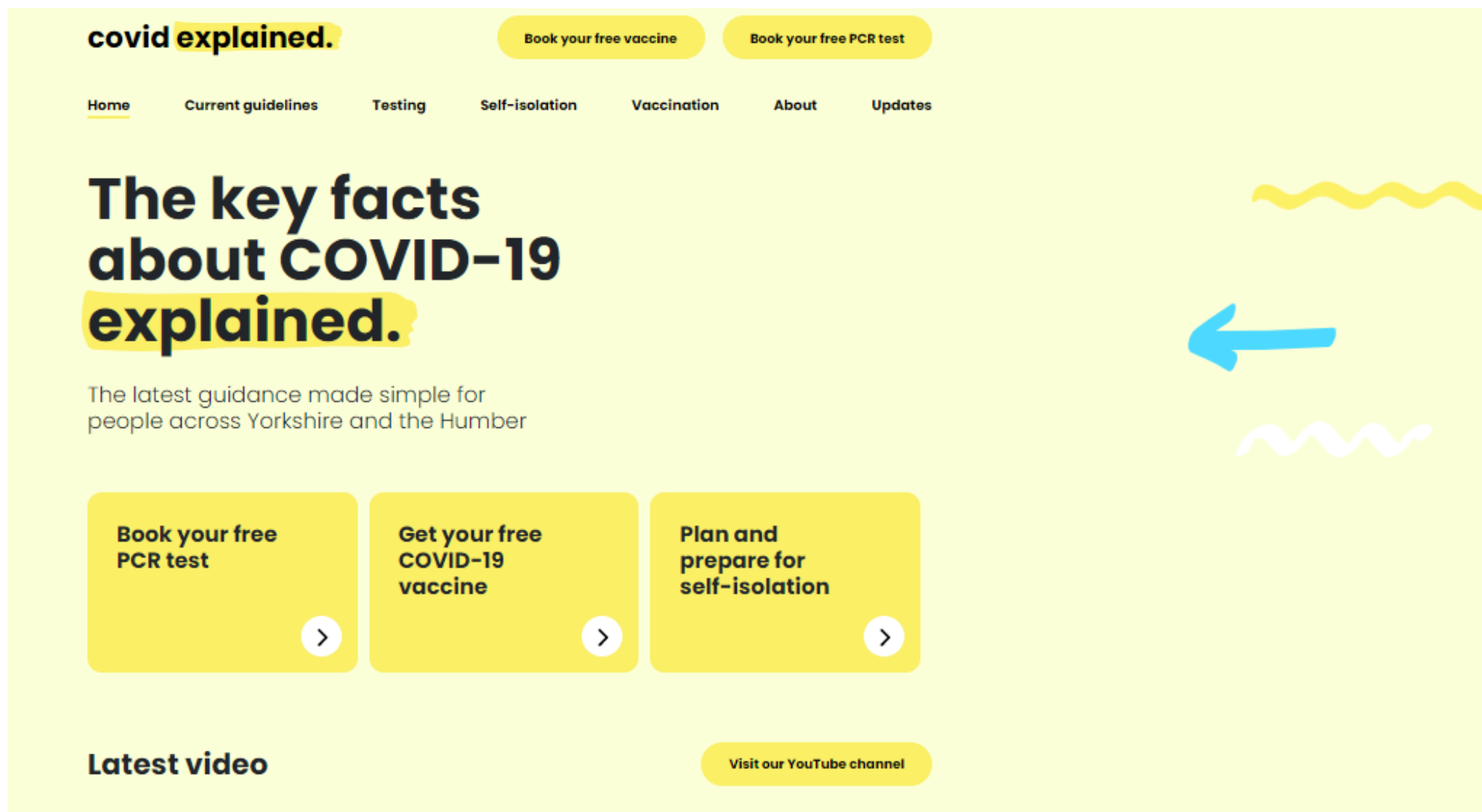
Campaign delivery

Campaign activities and outputs

The 'COVID-19 Explained' campaign was delivered through a broad range of activities and outputs. The campaign centred on the 'COVID-19 Explained' website which provided up-to-date guidance and information in 11 different languages (see Figure 14).

Stakeholders involved in the campaign (for example, local authority public health teams and community leaders) also had access to a Stakeholder Hub where they could download campaign resources, such as posters and leaflets.

Figure 13. Homepage of the 'COVID-19 Explained' web page



Stakeholders and community leaders described the outputs of the campaign as varied, ranging from digital outputs (for example, adverts on Spotify, Google, Instagram and Facebook), out-of-home advertising (for example, information on billboards) and print media (for example, booklets, leaflets). Stakeholders who were involved in designing the campaign reported that print media was primarily chosen to reach the digitally excluded. Stakeholders reported that different campaign outputs were targeted to reach different groups, for example billboards were placed in specific areas with lower vaccination rates and social media advertisements were shown to users with specific demographic characteristics.

The campaign also developed bespoke assets for specific local authorities when requested, including both new campaign materials and amended materials to highlight local services (for example, vaccination clinics and testing sites). Examples of bespoke assets included a social media campaign targeted at pregnant women in Wakefield and Calderdale and a testing centre and shopping centre which were fully branded in 'COVID-19 Explained' materials in Grimsby.

Campaign materials aimed to provide localised, relevant and clear facts and feature real-life experiences from known local people. As such, the campaign focused on important local places including supermarkets, places of worship, schools and foodbanks. The campaign outputs are summarised in Table 8.

Table 8. Campaign outputs

Digital	Out of home	Community packs
<ul style="list-style-type: none"> • Stakeholder Hub website • covidexplained.com website • YouTube channel • Facebook page • Instagram page • 3 social media graphics to encourage local community members to join the campaign • 2 campaign animations • 4 videos • 123 social media graphics • 29 Google display advert graphics • booklet BSL translation • 12 booklet language translation 	<ul style="list-style-type: none"> • 3 poster designs • 3 leaflet designs • 3 booklet designs • 6 poster designs (one poster design in 12 languages) • 31 digital van graphics (Ivan graphics which can analyse who has seen the advert) • 23 digital van graphics (Advan graphics) • 1 GP surgery screen • 2 spotify adverts • 2 graphics for 22 bus shelters • 2 large format graphics for 2 supermarkets • 2 graphics for 90 Kiosks • 2 graphics for 7 live bus shelters • 3 graphics for 242 bus rears 	<p>Local highstreets x 2,000:</p> <ul style="list-style-type: none"> • 'Wear a mask' window stickers • leaflets • posters • booklets <p>Community groups x 53:</p> <ul style="list-style-type: none"> • 'Wear a mask' window stickers • leaflets • posters • booklets

Role of community leaders

The campaign reached out to individuals and organisations in the region who were working closely with local communities (for example, local health charities) to invite them to take part in the campaign. Some local authorities also approached community organisations to invite them to take part. This was particularly the case when local authorities and community organisations had an existing working relationship. Many community leaders who became involved with the campaign reported that they were already working on COVID-19 communication as part of their role.

Community leaders perceived that their key role in the campaign was to distribute information via their networks and community groups. This information was mainly in print form, including booklets and leaflets. One community leader who worked for a local charity described distributing campaign leaflets at activity groups, on pop-up stalls and making leaflets available at the community building their charity is based in. Community leaders described integrating campaign activities into existing community groups and events. For example, a 'COVID-19 Explained' representative was invited to join an existing woman's health and wellbeing group to answer questions and concerns from group members about COVID-19.

Community leaders had mixed experiences with and awareness of the Stakeholder Hub. One view expressed was that the Hub was useful for printing out posters or additional resources if needed. In contrast, other community leaders were not aware of the Stakeholder Hub or had only used it once or twice. These community leaders were given printed 'COVID-19 Explained' materials (for example, leaflets, posters, booklets) by the campaign and instead used these for community engagement.

Community leaders felt that it was important to be involved in the campaign. They expressed concern about COVID-19 misinformation and wanted to make sure that their local community had access to up-to-date and accurate information.

Perceived impact of the campaign

Stakeholders and community leaders were asked about their views on the impact of the campaign, including vaccine hesitancy, COVID-19 testing and social isolation compliance. Both groups found it difficult to clearly state the impact of the campaign, with stakeholders highlighting that the internal and external evaluations were ongoing. However, both groups felt that the campaign had contributed to reduced vaccine hesitancy and increased vaccination rates. Community leaders also reported that the campaign helped to explain to communities the importance of following COVID-19 restrictions (for example, staying at home when positive for COVID-19).

"The campaign did explain to the community more clearly why they needed to stay at home and definitely had an impact."
(Community leader)

Community leaders felt that the campaign had a particular impact on people who did not speak or read English, as they were able to access resources in their first language.

Stakeholders emphasised that the campaign had additional impacts outside of vaccination, testing and isolation outcomes. These included building trust in communities who were wary of messaging from official sources and providing clear information to groups who had not been reached by previous COVID-19 messaging. Stakeholders also described positive outcomes for local authorities, including joining up local authority teams working on similar issues related to COVID-19 and providing campaign assets for public health teams to use in the future.

Adaptations to the campaign

Stakeholders and community leaders were asked whether they felt that the campaign was delivered as intended. Stakeholders highlighted that the strategy for the campaign changed following the scoping phase. UKHSA initially planned for a mass audience communications campaign. However, following the scoping phase a more targeted approach to reaching communities was designed. This focussed less on mass audience communication and put emphasis on 'bottom-up' communication, for example, through community leaders.

Stakeholders felt that the campaign (following the initial strategy change) was largely delivered as intended in the initial plan produced by Magpie, for example the simple style of messaging stayed the same throughout the whole campaign. However, it was also emphasised that the campaign needed to be flexible and adaptive as part of the co-creation approach.

A key adaptation described by stakeholders and community leaders related to the changing COVID-19 restrictions (for example, changes to testing, isolation and social distancing guidance). For example, as COVID-19 restrictions changed, the campaign evolved to focus on influencing the behaviours that would reduce community transmission rather than only making people aware of the provisions available to them. Stakeholders involved in the campaign set-up highlighted that resources were designed with expected changes in mind. However, the 'COVID-19 Explained' website and many campaign outputs had to be adjusted at short notice when COVID-19 restrictions changed. Stakeholders and community leaders highlighted that it was easier for digital resources to be updated, whereas some print resources had to be discarded once COVID-19 restrictions changed as they were out of date.

Another adaptation highlighted by stakeholders was changes to the timeline of the campaign. The original launch date for the campaign was October 2021, but this was pushed back to the end of November while the 'COVID-19 Explained' website was being built. As well as delays to the campaign launch, the campaign was also stopped in February 2022 in line with a reduction in COVID-19 communication nationally. Stakeholders involved in the campaign's implementation reported that this change was unexpected and felt that the campaign finished just as it was reaching full implementation.

Barriers and facilitators to campaign set-up and implementation

Stakeholders and community leaders were asked to describe the barriers and facilitators encountered during the set-up and implementation phases of the campaign.

Barriers to set-up and implementation

One key barrier highlighted by stakeholders was procurement. A number of suppliers were used by Magpie for various aspects of the campaign, including video production, printing resources, and media buying. Hull City Council had a number of agreed suppliers in place, but any additional suppliers had to be approved through the council's procurement process. This was unexpected and, in part, due to the change from a mass media to targeted campaign.

Stakeholders described this process as difficult to navigate and resulted in delays to suppliers receiving their purchase order numbers. Many suppliers could not deliver work for the campaign until their purchase order numbers were in place (due to company policy), which caused delays. Stakeholders felt that these delays could have been avoided if Magpie had managed the overall budget and procurement processes.

"If Magpie had just been given all the money and could procure those people, there wouldn't have been the same level of delay."

(Stakeholder)

Another key barrier during the set-up phase related to the challenges in co-producing different aspects of the campaign. For example, some stakeholders felt that the steering group included too many participants with differing views and agendas. This resulted in disagreement about the aims of the campaign. At the same time, some steering group members were less responsive than others and therefore not all views were likely to have been reflected. Stakeholders also felt that there were too many individuals involved in the sign-off process for campaign decisions, which was perceived to have caused avoidable delays.

Stakeholders also discussed challenges engaging with external stakeholders and community leaders. Those involved in the campaign set-up reported that the initial approach was to reach local community groups through local authorities. However, some local authorities were less engaged than others or did not have any contacts for community groups. This meant additional work was needed to identify and contact additional community groups. Stakeholders found that in these circumstances, it was challenging to engage groups as they were viewed as an outsider to the community.

“Sometimes it took a few phone calls to speak to someone who could advise them on local needs”
(Stakeholder)

Stakeholders also cited a lack of existing data infrastructure as a barrier to delivering the campaign. There were no existing lists of community organisations or stakeholders working on COVID-19 messaging in the region, which the campaign had to build from scratch. During the background research phase, it was also difficult to share data between stakeholder organisations, resulting in Magpie spending a lot of time sourcing the data from other places as it was not certain that the data would be shared with them.

Stakeholders and community leaders discussed the impact of changing COVID-19 restrictions. Changes to COVID-19 restrictions were unpredictable and often happened with little warning; despite the wide range of stakeholders in the steering group, they were informed of changes at the same time as the public. Campaign materials had to be updated quickly to ensure that incorrect guidance was not being shared with the public.

“You'd be scrambling to check that stuff you'd put out previously was still accurate or whether it was suddenly dangerous in terms of confusing people.”
(Stakeholder)

Further barriers were linked to digital advertising about COVID-19. Websites including Google and Facebook had advertising blocks in place for adverts related to COVID-19, which aimed to reduce the spread of misinformation. Despite adding additional work, the campaign was able to overcome this through verifying the adverts through each platform.

Facilitators to set-up and implementation

One of the key facilitators highlighted by stakeholders was the ability to work collaboratively with external stakeholders and community leaders. Stakeholders acknowledged the benefit of utilising pre-existing relationships between local authorities and community organisations when available. This enabled quick access to feedback for the behavioural analysis and the progression of the campaign. In addition, stakeholders highlighted effective communication between Magpie and UKHSA, with regular updates and email communications.

“Some people just knew their community inside out and they had someone whose role it was at the local authority to really engage with community groups”
(Stakeholder)

Working with the local community both directly and indirectly, and including community members in campaign materials such as videos and posters, was perceived to have built public trust in the campaign.

An additional facilitator mentioned by stakeholders was Magpie's ability to successfully manage numerous suppliers. Suppliers reported that they had a clear brief and they felt the campaign was managed well.

"They were clear on what they wanted to achieve and allowed us free reign to do what we're best at doing."
(Stakeholder)

Community leaders also cited clear communication from the *Covid Explained* campaign team as a facilitator to delivery. They felt they were updated about the campaign's progress, any changes, and could ask questions if needed.

Campaign materials and the 'COVID-19 Explained' website were designed to be quickly updated if COVID-19 restrictions changed. The online Stakeholder Hub model also allowed resources to be quickly updated and community leaders felt confident that the information they were accessing was up to date.

"When there were changes (to COVID-19 restrictions) we always got what we needed to go back out and do things a different way."
(Community leader)

Community leaders appreciated that the campaign supplied print resources. One community leader described using printed 'COVID-19 Explained' leaflets as a prompt when speaking to members of the public and felt that the leaflets helped people engage with the information.

Barriers and facilitators to impact

Stakeholders and community leaders were asked to describe the barriers and facilitators to the campaign having impact on vaccination, testing and isolation outcomes.

Barriers to impact

Among the barriers to impact, stakeholders described external factors which were outside of the control of the campaign but influenced vaccination, testing and isolation outcomes. These included the role of social media in spreading misinformation, which contrasted with the information being shared by the campaign.

"Misinformation spread by word of mouth has overshadowed the information given through leaflets in the campaign."
(Community leader)

Community leaders also highlighted the issue of being able to afford to isolate when COVID-19 positive; some people were unable to isolate due to the financial consequences of missing work, despite understanding the reasons for isolation due to the campaign. They also discussed that some residents had tried to get vaccinated but had been offered appointments far from where they live. Some had not taken these appointments because they were concerned about contracting COVID-19 on public transport while travelling to get vaccinated. Community leaders also discussed the impact of changing COVID-19 restrictions throughout the pandemic. They felt this made the public more distrustful of the campaign information as they had seen contrasting campaign information previously.

Another external factor highlighted by stakeholders was that separate COVID-19 campaigns, both local and national, were being run concurrently. It was felt that this diluted the targeted messaging of 'COVID-19 Explained' and increased messaging fatigue for the target groups. Other barriers reported related to timing. For example, stakeholders and community leaders felt that the campaign could have had greater impact if it started earlier during the COVID-19 pandemic, although it was unclear if this was meant to be when the campaign had been originally intended to start (October 2021) or before. It was also noted that the campaign was stopped before becoming fully embedded, which was perceived to affect its impact potential.¹⁹

"It's a shame we had to stop just as things were kind of just kicking off and getting going."
(Stakeholder)

Facilitators to impact

Facilitators highlighted by stakeholders and community leaders fell into 2 categories: the design of the campaign and community engagement. Stakeholders and community leaders felt that the campaign reached a wider range of people because it had a variety of outputs (print, digital, and out of home). The campaign being translated into 12 languages was also suggested as a key facilitator to impact, allowing a greater number of people to access information.

"Using the 12 different languages had a lot of impact because it meant that people could connect with the guidelines. It helped connect with different audiences."
(Stakeholder)

Community engagement was also reported as a key facilitator to the impact of the campaign. Stakeholders and community leaders emphasised that it was important for local community figures to be featured in the campaign. It was felt this helped people to identify with the campaign and trust the information.

¹⁹ The campaign was stopped in February 2022 due to a reduction on spending on COVID-19 communication.

“Using local people in the leaflets helped the group identify with the people in the images and trust the information more.”
(Community leader)

Simple messaging and the use of plain English was also perceived to increase the campaign’s impact. Community leaders felt that the campaign resources were understandable to people and this meant they trusted them more.

Main lessons

The main lessons learned and recommendations for how the campaign could be improved, cited by participants, included:

There was a need for a clearer brief, assignment of roles and governance structure set out at the beginning of the campaign from commissioners. The steering group membership was diverse, which benefitted shared learning; however this could lead to conflicting agendas and a paucity of guidance for the campaign. A clear assignment of roles and sign off procedures would have enabled decisions to be expedited.

There was an assumption at the start of the campaign around the delivery methods of information or materials and who would do so. This meant that the need for a broader set of skills brought by new suppliers was unforeseen. Furthermore, the original administrative set up of the campaign was unprepared and uncondusive for new suppliers being onboarded. The campaign would have benefitted if Magpie were responsible for managing suppliers’ contracts, as this would have avoided procurement challenges and reduced subsequent delays.

The campaign would have benefited from existing regional data infrastructure detailing local authority and community group involvement in the COVID-19 response. In its absence, the campaign had to develop this knowledge before engaging with the local community, which led to delays.

COVID-19 restrictions were changed at multiple points during the campaign and stakeholders would have benefitted from some advanced notice. Despite the diverse steering group, chaired by UKHSA, the campaign had no prior warning of when or what restrictions were going to change. They found out at the same time as the public. This led to a rush to change campaign materials at short notice, which was also labour-intensive and could not be planned for.

Conclusion

This evaluation aimed to test the effectiveness of the 'COVID-19 Explained' campaign in the Yorkshire and the Humber area. The campaign originally aimed to address vaccine hesitancy, increase testing of COVID-19 and self-isolation, and promote other COVID-19 safe behaviours. However, there were big changes to programme design and delivery timelines from that originally envisaged driven by changes in government advice for COVID-19. These occurred shortly before and during implementation and resulted in late start and early termination of the programme. Due to these changes and data availability the IE and IPE components of this evaluation were rescoped and redesigned. The amended IE was designed to assess programme effectiveness on vaccination and testing take-up.

IE and IPE integration

We used a synthetic control method impact assessment to estimate the effect of the pilot campaign on vaccination and testing. Due to difficulties encountered – including changes in the implementation timelines and data availability on some outcome measures – the IE element of this evaluation had to be redesigned and rescoped. Impact on self-isolation compliance and engagement with Test and Trace was not measured as part of this evaluation.

We followed the aggregation approach to construct SCM, the intervention group trends were averaged for LSOAs before identifying the synthetic control group. We averaged 7 LSOAs in Leeds and 7 LSOAs in Grimsby to construct 2 treated units. Data aggregated at the LSOA level was used to define the donor pool for each treated unit. To restrict the donor pool, we followed several inclusion criteria and we applied a 'nearest neighbour matching' approach. Following restrictions, there were in total 46 LSOAs in the donor pool for Leeds and 58 LSOAs in the donor pool for Grimsby.

The SCM results found no conclusive evidence of any positive or negative impact of the campaign on testing as measured by the number of PCR tests per 1,000 people or the number of LTF tests per 1,000 people (RQ 1.1 and 1.2). No conclusive positive or negative effect of the campaign was found on vaccination take-up as measured by the cumulative rate of adults with one dose of an approved COVID-19 vaccine and the cumulative rate of adults with both doses (RQ 2.1 and 2.2).

There are several potential interpretations of the inconclusive findings around the impact of the campaign on testing and vaccination take up. Taking into consideration the evidence from the IPE, one possibility is that key elements of the campaign were delayed coupled with the fact that key elements lasted too short a time or were modified. This is a critical barrier, mentioned by many interviewees. The programme was introduced with delay (on 29 November) and full implementation of the programme started after 48 days (on 17 January). The programme ended prematurely on 24 February suggesting that the programme was fully implemented for 39 days.

Considering the delayed and shortened implementation period we can conclude that the programme may not have been given the strongest chance of success.

It should also be noted that while evidence from the IPE suggested that most of the activities set out in the ToC were generally realised there were many changes made to the campaign that may have meant that the campaign was not strong enough to produce change.

Another element that could impact on the success, particularly in terms of measuring effectiveness on testing, is the fact that the measures used to detect change in testing uptake are very volatile. Therefore, when we assessed the pre-intervention fit for the testing outcomes, we observed small differences in outcomes for the treated LSOAs versus the outcomes in the synthetic control. This suggests that the testing outcome measures used in this evaluation are not best indicators on change.

A final consideration for interpretation is that the measures used to detect impact on vaccination and testing aren't especially well-aligned to the short-term outcomes that 'COVID-19 Explained' targets that is outcomes on vaccination and testing are distant and not very sensitive to detect changes as result of the 'COVID-19 Explained' campaign. Indeed, as specified in the ToC, the programme activities should first build trust in the messages from the campaign, and produce understanding on the importance and safety of COVID-19 vaccines and understanding of COVID-19, which is intended to result in improved vaccine confidence and vaccination take up. In addition, the activities from the campaign should first increase knowledge about when to get tested and what to do when positive, and consequently increase testing take-up. So, while individuals in the LSOAs exposed to the campaign may have improved their understanding of COVID-19 and understanding of the importance of vaccination and testing, the IE was not designed to detect these programme effects in a robust way.

IPE evidence

Based on the data collected from stakeholder and community leader interviews, we found evidence that the activities set out in the ToC were generally realised. It should be noted that Magpie's management of stakeholders, including suppliers and community leaders, was viewed positively by participants who cited clear communication as one key facilitator to implementation. The campaign identified a gap in bottom-up COVID-19 communication campaigns in the Yorkshire and Humber region. The steering group was set up to provide direction; however, it was difficult to agree the campaign's aims at its inception. Although the steering group was constituted by a diverse range of stakeholders, direction could be hindered by differing agendas. Pertinently, the co-production of materials sometimes meant that local 'bottom-up' needs conflicted with the 'top-down' messages from local authority and NHS sources, compounded by the many stakeholders required to sign off elements of the campaign.

To address this, we found that the campaign worked with community leaders to co-create and test campaign materials, based on local needs and understanding, to raise awareness and

educate the population about COVID-19. We found that these materials promoted the lived experiences of local people, alongside work with community leaders, to build trust within the community. Separation from national campaigning was sought to build trust, which could be considered an additional activity. Participants reported revising and updating campaign materials throughout the campaign in response to changing COVID-19 restrictions, an additional activity; however, possibly due to the short time that the campaign was implemented, we did not find that the materials were updated for 'future phases'.

The level of engagement of 'trusted people' to share campaign materials was difficult to ascertain. While community leaders reported sharing materials, they did so in various ways and degrees, usually as part of their wider work. This could, in part, be due to one limitation of the evaluation: that the community leader sample was small and purposive; that community leaders were recruited just as they had been notified that the campaign had been stopped. The campaign was also found to have shared materials via digital and out of home media, which is easier to quantify. The ToC also outlined that evaluation of the campaign's "management, effectiveness and impact" would influence further content creation. However, based on the data collected, it is not clear to what extent early evaluative insights were used in later stages of the campaign. The IPE did not have sufficient data to assess the subsequent mechanisms, outcomes, and impact of the campaign.

The evidence from the IPE suggests that a number of adaptations were made to the original programme. Stakeholders discussed several deviations, starting with the change from a mass media campaign to one that was local and targeted. This had implications for procurement as a different, broader set of skills were required. Although Magpie had worked with and could therefore recommend suppliers to fill this gap, they were not on Hull City Council's list of approved contractors. This procurement of multiple new suppliers was not envisioned at the time Hull City Council were decided to be responsible for financial and contractual oversight. Consequently, the development of key parts of the campaign were delayed, as suppliers could not (understandably) start work without a purchase order number, which impacted on the launch date.

Another adaptation to the campaign was the external influence of changing COVID-19 restrictions. This required the redrafting of materials to ensure that they contained up to date information and did not conflict with communication from official sources. Community leaders noted that such changes created mistrust among the public of COVID-19 response communication campaigns more generally. The spread of not only misinformation, but other concurrent local and national campaigns that diluted 'COVID-19 Explained', compounded this.

Limitations

While this evaluation could suggest that there was no direct link between the campaign and vaccination and testing uptake, evidence on impact is limited by the rescoped design. Limitations of the IE include not having access to self-isolation compliance data for the analysed

period nor the ability to examine engagement with Test and Trace as outcomes. Evidence on impact was further limited with the abandonment of the assessment on impact based on sentiment analysis using Twitter data at the request of DCMS (see Overall design of the study for more information on the rescope design).

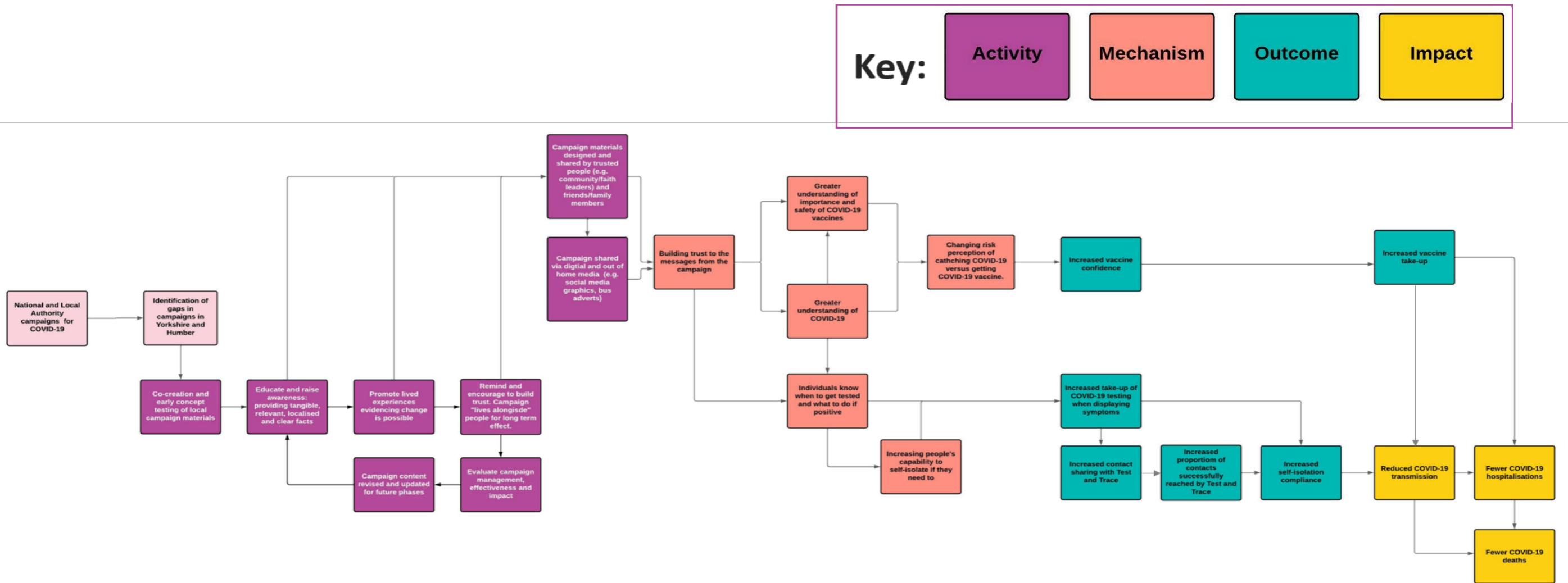
Similarly, the evaluation was not designed to test all elements of the ToC, that is the IPE did not have sufficient data to assess the subsequent mechanisms, outcomes, and impact of the campaign. Data on these key elements would have allowed for more definitive conclusions.

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Appendix A. Theory of change

Figure 14. Theory of change



Appendix B. LSOA weights in synthetic Leeds and Grimsby

Table B1. LSOA weights in the synthetic Grimsby for number of PCR tests per 1,000 people

LSOA ID	Name of local authority	Weight
E01007121	Wirral	0.112
E01016153	Medway	0.001
E01021846	Harlow	0.054
E01024590	Swale	0.094
E01024609	Swale	0.104
E01024615	Swale	0.089
E01024900	Burnley	0.005
E01025049	Hyndburn	0.034
E01026126	Lincoln	0.406
E01028066	Bassetlaw	0.102

Table B2. LSOA weights in the synthetic Leeds for number of PCR tests per 1,000 people

LSOA ID	Name of local authority	Weight
E01009361	Birmingham	0.603
E01009513	Birmingham	0.035
E01012040	Middlesbrough	0.29
E01016069	Medway	0.072

Table B3. LSOA weights in the synthetic Grimsby for number of LFT per 1,000 people

LSOA ID	Name of local authority	Weight
E01012466	Warrington	0.034
E01012534	Warrington	0.174
E01019453	Amber Valley	0.001
E01024900	Burnley	0.054
E01024906	Burnley	0.013
E01025049	Hyndburn	0.026
E01025205	Pendle	0.013
E01026028	Boston	0.054

LSOA ID	Name of local authority	Weight
E01026126	Lincoln	0.158
E01027978	Ashfield	0.074
E01028066	Bassetlaw	0.115
E01028275	Mansfield	0.135
E01028333	Newark and Sherwood	0.11
E01031008	North Warwickshire	0.139

Table B4. LSOA weights in the synthetic Leeds for number of LFT per 1,000 people

LSOA ID	Name of local authority	Weight
E01008332	Newcastle Upon Tyne	0.538
E01009269	Birmingham	0.115
E01009486	Birmingham	0.199
E01009567	Coventry	0.014
E01012038	Middlesbrough	0.029
E01012040	Middlesbrough	0.106

Table B5. LSOA weights in the synthetic Grimsby for percentage of adult population with one dose of an approved COVID-19 vaccine

LSOA ID	Name of local authority	Weight
E01007121	Wirral	0.044
E01012526	Warrington	0.152
E01012533	Warrington	0.09
E01023974	Ashford	0.108
E01024906	Burnley	0.152
E01026124	Lincoln	0.052
E01026126	Lincoln	0.005
E01028066	Bassetlaw	0.234

Table B6. LSOA weights in the synthetic Leeds for percentage of adult population with one dose of an approved COVID-19 vaccine

LSOA ID	Name of local authority	Weight
E01008332	Newcastle Upon Tyne	0.116
E01009361	Birmingham	0.175
E01009479	Birmingham	0.073

LSOA ID	Name of local authority	Weight
E01009567	Coventry	0.108
E01009659	Coventry	0.096
E01012040	Middlesbrough	0.284
E01013487	Derby	0.09
E01013567	Derby	0.137

Table B7. LSOA weights in the synthetic Grimsby for percentage of adult population with both doses of an approved COVID-19 vaccine

LSOA ID	Name of local authority	Weight
E01008429	Newcastle Upon Tyne	0.046
E01016153	Medway	0.007
E01021834	Harlow	0.092
E01024906	Burnley	0.173
E01026124	Lincoln	0.136
E01026126	Lincoln	0.302
E01026704	King's Lynn and West Norfolk	0.124
E01028275	Mansfield	0.121

Table B8. LSOA weights in the synthetic Leeds for percentage of adult population with both doses of an approved COVID-19 vaccine

LSOA ID	Name of local authority	Weight
E01008332	Newcastle Upon Tyne	0.047
E01009092	Birmingham	0.06
E01009486	Birmingham	0.289
E01012038	Middlesbrough	0.243
E01012040	Middlesbrough	0.359
E01012262	Stockton-on-Tees	0.013

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UKHSA is responsible for protecting every member of every community from the impact of infectious diseases, chemical, biological, radiological and nuclear incidents and other health threats. We provide intellectual, scientific and operational leadership at national and local level, as well as on the global stage, to make the nation health secure.

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