Technical Appendix C
Impact and value-for-money analysis
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Summary

The CVC programme supported 60 local authorities (LAs) with the aim of incentivising vaccinations in areas and communities with the lowest vaccination rates across England.

This note aims at evaluating the CVC programme in order to determine its cost-effectiveness. The analysis focuses on 10 LAs which are selected as case studies as part of the CVC evaluation[1]. The note is structured with two main strands of analysis: a counterfactual impact evaluation (CIE) and a value-for-money analysis.

The CIE aims at estimating the additional impact which is attributable to CVC funding by analysing vaccination records in 117 'surveyed CVC-funded wards' within the 10 case study areas. The vaccination rate of these areas is tracked against three comparison groups which are selected using propensity-score-matching (PSM) to control for differences in demographics and vaccination rates at the start of the programme.

The impact analysis finds no evidence that the intervention had an impact on first and second dose vaccination rates as the vaccination rates for these types of vaccines grew faster in the comparison areas relative to the surveyed CVC-funded wards. However, this does not reflect a lack of effect of CVC funding activities in these areas but rather that the effect cannot be observed from vaccination records. This could be because the CVC programme targeted specific subpopulations within the supported areas and any impacts on these small subpopulations is unlikely to be detected from ward-level vaccination records.

The CIE finds a positive impact on booster vaccination rates. Of the total 0.217% growth in booster vaccination rate between January and November 2022 an additional 0.032% growth is unobserved in the counterfactual, according to the median model[2] (which is drawn on due to how it controls for the variance from model specification). This estimate implies that 14.7% of the booster vaccination rate growth in the surveyed CVC-funded

[1] The 10 case study areas include: Boston Borough Council, Bristol City Council, Cambridge City Council, Hammersmith and Fulham London Borough, Kensington and Chelsea Royal Borough, Lancaster City Council, Newham London Borough, Oxford City Council, Sandwell Metropolitan Borough Council, Westminster City Council, and Wolverhampton City Council. To note: Westminster City Council and Royal Borough of Kensington and Chelsea administered the programme as one body and are therefore counted as one LA for the purposes of the evaluation.
[2] The median model is the model which provides the central estimate out of the three models considered, for most findings Model I yields the central estimate.

wards is attributable to the CVC programme. However, notably, a statistically significant impact is found in only one of the three models considered.

The value-for-money analysis reviews the MI data for each of the 10 case study areas and it analyses the cost and the outputs of CVC-funded activities. The number of vaccines administered at CVC-funded events is considered as the main direct gross output of the programme. The net social value of this output is estimated by determining the number of these vaccines which would not have been administered without CVC funding and the social value of each vaccine is quantified in terms of the number of COVID-19 cases prevented and their social cost foregone.

The total cost of the CVC programme across the 10 case study areas as of October 2022 is around £4 million, while the cost across all 60 supported LAs is around £19 million. A total of 2,387 CVC-funded events were organised across the 10 case study areas, with 684 of these being face-to-face events. The type of events delivered by each of the case study areas varied substantially as some focused on face-to-face events aimed at delivering vaccines, however other LAs focused on community engagement and COVID-19 awareness events.

A total of 4,975 vaccines being administered during CVC-funded events was recorded in the MI data across the case study areas, of which 427 were first doses, 726 were second doses and 3,822 were boosters.

Taking into account vaccine effectiveness and the transmission rate of COVID-19, extracted from the literature[3], an estimated 8,008 COVID-19 cases were prevented by the vaccines delivered at CVC-funded events. it is estimated that of these cases, 979.3 are considered ‘additional’, as they were prevented by vaccines which would not have been administered without CVC funding.

Given that the estimate of the proportion of additional vaccines comes with uncertainties and is not statistically significant, the resulting estimate of cases prevented is also subject to uncertainty. Sensitivity analysis considers alternative scenarios, which estimated the number of additional cases prevented varying between 0 and 1,298.

The gross social value of this estimated number of prevented cases was estimated to be around £46.4 million, while the additional social value attributable to the programme is estimated around £5.7 million. The social value of each COVID-19 case prevented was taken from a report by the Welsh Technical Advisory Group published in May 2022[4] as £5,800. This estimate considers the social cost avoided by prevented hospital

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[3] Vaccine effectiveness was extracted from BMJ (2022) accessed from https://www.bmj.com/content/379/bmj-2022-072141 while the transmission rate was taken from the UK Health Security Agency (UKHSA) https://www.gov.uk/guidance/the-r-value-and-growth-rate both accessed on the 2nd of February 2023.

[4] https://www.gov.wales/sites/default/files/publications/2022-06/the-social-value-of-a-covid-case-january-2022.pdf accessed on the 2nd of February 2023.

admissions, ICU admissions, deaths and estimated long COVID cases. The sensitivity analysis[5] addresses the uncertainty in each of the parameters by exploring different scenarios, estimating the net social value of the programme within a range of £0 to £10.5m.

The social value attributable to CVC-funded activities for all supported LAs can be estimated to be £26.1m, though this value only refers to the impact up to July 2022[6]. This was calculated under the same assumption as the case study analysis, taking into account that the total number of vaccinations administered during CVC events up to July 2022 was 27,850, which implied that around 4,515 additional cases were prevented by the policy.

[5] The sensitivity analysis considers the changes in net social value under different estimates of the social value of a covid case, vaccine effectiveness, covid transmission rate, proportion of additional vaccines, and the number of vaccines delivered at CVC events.
[6] MI data for the period August 2022 to October 2022 was not reported by all supported LAs.

Counterfactual impact evaluation (CIE)

This section investigates the impact of the CVC programme on vaccination rates, trying to quantify the number of additional vaccines delivered which can be attributed to the intervention. The analysis uses propensity score matching and difference-in-differences (PSM-DID) methods to identify the proportion of the vaccination rate growth which can be attributed to the CVC programme. The analysis compares the growth in vaccination rates between the areas which received CVC funding and similar unsupported areas.

The key points from the analysis are the following:

- The analysis tracks the change in vaccination rates of 117 ‘surveyed CVC-funded wards’ between January and November 2022. The surveyed CVC-funded wards were selected from 10 case study areas[7] which received CVC funding and that were identified as having been targeted by the programme. The dataset for the analysis is compiled from ward-level NHS vaccine records.
- The 117 surveyed CVC-funded wards are characterised by lower vaccination rates, a larger share of young individuals as well as a lower proportion of white and affluent individuals relative to the national average. A surveyed comparison group (drawn on as part of other elements of the CVC evaluation) and two matched comparison groups are selected in order control for selection bias when evaluating the change in vaccination rate. The comparison groups control for demographics and differences in the vaccination rate at the start of the programme.
- The total number of vaccinations between January and November 2022 in the surveyed CVC-funded wards is 53,477 with around 457 vaccinations per surveyed CVC-funded ward[8]. The majority of these vaccinations are first doses (61%). However, most of the vaccines administered at CVC-funded events were booster doses, this discrepancy is likely due to young people vaccinating outside of CVC-funded events as they become eligible.
- The vaccination rate in the CVC-funded wards increases by 2.1, 1.3 and 0.1 percentage points for first dose, second dose and booster vaccinations respectively. The increase in vaccination rates in the surveyed CVC-funded wards for booster vaccinations outperforms the comparison groups as well as the national average.
- The rate of growth of vaccination rates in the surveyed CVC-funded wards is statistically significantly lower than for the comparison groups for first and second

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[7] The 10 case study areas are: Boston Borough Council, Bristol City Council, Cambridge City Council, Hammersmith and Fulham London Borough, Kensington and Chelsea Royal Borough, Lancaster City Council, Newham London Borough, Oxford City Council, Sandwell Metropolitan Borough Council, Westminster City Council, and Wolverhampton City Council.

[8] Note that these vaccinations refer only to the 117 surveyed CVC-funded wards while the CVC administered vaccines recorded in the MI data may capture vaccinations outside these areas.

dose vaccines. A positive impact is found for booster vaccination rate as there is an additional 0.032% growth which is unobserved in the counterfactual for the median model. However, this estimate is not statistically significant (p-value=0.18).

- This median estimate implies that 14.7% of the booster vaccination rate growth is attributable to the CVC programme, though this estimate is subject to variation when considering alternative estimate models. Using an alternative model, the proportion of booster doses delivered attributable to the CVC programme is found to be 21.7%, which would represent a statistically significant impact, however when using the surveyed comparison group as a counterfactual, overall no additional net impact is identified.

Data

The analysis tracks the number of vaccinations in 117 surveyed CVC-funded wards, using English ward-level vaccination data in order to extract a counterfactual. There are a total 7,219 wards in England which belong to 314 local authorities9 (LAs). Wards are identified by 2020 ward codes and names[10].

60 of the 314 LAs have received funding for the Community Vaccine Champions (CVC) programme. Further, 10 LAs are considered in this analysis as case studies, reflecting the focus of the fieldwork being conducted for the CVC programme evaluation. 117 'surveyed CVC-funded wards' are selected from these case study areas[11]. For the study, using propensity score matching, 117 further unsupported wards have been selected from non-CVC LAs for comparison, and these are the same as those used for the counterfactual surveys that form of other strands of the evaluation.

Vaccination data is available for two points in time[12]: 1 January 2022 and 25 November 2022. These two points in time should reflect a cross-section of vaccination rates before CVC-funded activities were introduced and after their introduction.

The vaccination data is collected by age categories, ethnicity, deprivation quintiles and for those clinically extremely vulnerable (CEV)[13] . Note that the data is collected at ward level and it only provides the vaccination rate for each subgroup, so testing within

[9] The analysis uses January 2022 local authority boundaries for England, these have changed since December 2022 which have reduced the number of LAs to 309.
[10] Using 2021 ward codes resulted in data linking issues, so the analysis considers 2020 wards, assuming that the data is consistent with these boundaries over time.
[11] It is worth noting that treatment is analysed only for the 117 surveyed CVC-funded wards, however impacts of CVC is likely to also have affected vaccinations in other wards of the supported LAs.
[12] Further data at other dates was also received but this did not provide a detailed breakdown which was necessary for the analysis.
[13] No data was available on religion which could be of importance since some of the target demographics were religious communities.

intersection of subgroups (eg. deprived and mixed ethnicity) is not possible. The data was collected from NHS Immunisation Management Service by DLUHC.

Data limitations

This section outlines the limitations of the datasets considered which may affect the analysis. These include potential measurement errors and inaccuracies which may affect data quality as well as coverage issues due to missing data.

The NHS IMS age bands are in multiples of 10 consistently, 0-9, 10-19, 20-29 … 80+, regardless of distinction between adult and child. The main consequence of this is an inability to split the data accurately to look at just 16+ or 18+ adults. The age groups considered in the analysis are from 10+.

Many sheets of the data contained geographic misalignments, namely local authorities displaying results vs national regions that lie outside of where they sit. This 'noisy data' is low volume and has arisen due to one or more of the following: incomplete medical records, incorrect medical records, or incorrect registration data. To identify accurate data, the data was linked to a ward region lookup for December 2020; any rows where a ward was reported in an incorrect region were removed.

This removed quite a large number of rows in some files where the proportion of observations deleted ranged from 1.2% to 76.1%, however the observations removed covered a small portion of the population of the wards considered and shouldn't affect the validity of the analysis substantially.

The dataset appears to contain some measurement errors, as in around 10% of the observations, the number of people reported to have received at least one vaccination dose is lower than the number of people reported to have received two doses. This type of error affects 19 of the selected CVC-funded wards. To correct for this error, the higher estimate for each of the doses is used, though this may cause some slight inaccuracies. Additionally, the vaccination rates for a given ward are calculated considering the number of eligible individuals in November 2022 as a population estimate.

Information about ethnicity is missing for around 8.2% of individuals, as these appear in the dataset but with no data on their ethnicity. The proportion of missing ethnicity in the surveyed CVC-funded wards increase to 11.7%. This missing data might result in a downward bias of the vaccination rate of each ethnic group.

Vaccination data on individuals classified as clinically extremely vulnerable (CEV) appears to be subject to significant measurement errors. These are suggested by vaccination rates which are substantially higher compared to other data releases. Additionally, the data shows large changes in the number of CEV vaccinations between January and November 2022 which are inconsistent with other results. This is likely due to a discontinuity in the size of the CEV population, as this seems to increase substantially between the two time periods. Thus, the findings for the CEV group are not shown as their reliability was compromised by poor data quality.

7,146 wards were linked to the vaccination data by ward codes with an additional two wards being linked by ward and LA name. 21 wards did not link to vaccinations data with all of these wards being in four LAs (Allerdale, Copeland, Eden and High Peak). However these are neither in the surveyed CVC-funded nor in the surveyed comparison group so this doesn't hinder the analysis.

The totals are for November 2022, indicating that in the English wards, a total of 56.7m individuals are eligible for vaccination, of which 42.3m have then taken the first of the two doses (the most frequent dosage in the datasets). The current 'people vaccinated' statistics for England register a total of 45.4m[14] suggesting that the data coverage is missing some observations that are in current records. This suggests a proportion of around 6.8% missing observations.

Characterising the CVC-funded wards

This section analyses the characteristics of the 117 surveyed CVC-funded wards compared to the surveyed comparison wards and other wards in England. Identifying the characteristics of the CVC-funded wards can help inform the selection model and determine what other factors may affect the outcome other than receiving the intervention.

For the CVC programme, vaccination rates at the start of the programme are a key factor to control for as the targeted areas were those which had lower than average vaccination rates. Differences in the demography of the ward are also important factors to consider for a robust counterfactual impact evaluation (CIE).

Table 1 shows descriptive statistics for the surveyed CVC-funded and comparison wards by age, ethnicity, deprivation quintile and CEV. The table provide the total and average eligible population as well as the proportion of the population by each category. This is shown for the surveyed CVC-funded wards, the surveyed comparison wards, as well as all 60 CVC-funded LAs and other LAs in England.

[14] https://coronavirus.data.gov.uk/details/vaccinations?areaType=nation&areaName=England, viewed 21 December 2022

Table 1. Descriptive statistics for CVC-funded and comparison wards

Variable	Surveyed CVC-funded wards (n=117)	Surveyed comparison wards (n=117)	All CVC-funded LAs (n= 1292)	Other LAs in England (n=5927)	Totals (n=7219)
Eligible population across all wards	*1,496,974*	*1,287,810*	*18,518,215*	*35,543,360*	*54,061,575*
Average population per ward	*12,795*	*11,007*	*14,333*	*5,997*	*7,489*
By age					
10-20 years old	*12.6%*	*14.5%*	*13.2%*	*12.9%*	*13.0%*
20-30 years old	*21.6%*	*19.9%*	*18.8%*	*12.2%*	*14.5%*
30-40 years old	*21.8%*	*19.8%*	*20.3%*	*14.7%*	*16.6%*
40-50 years old	*15.6%*	*15.5%*	*15.9%*	*14.0%*	*14.6%*
50-60 years old	*12.2%*	*12.7%*	*13.1%*	*15.8%*	*14.9%*
60-70 years old	*8.3%*	*8.9%*	*9.2%*	*13.2%*	*11.8%*
70-80 years old	*5.0%*	*5.5%*	*5.9%*	*10.9%*	*9.2%*
80+ years old	*2.9%*	*3.2%*	*3.4%*	*6.3%*	*5.3%*
By ethnicity					
White	*49.2%*	*57.6%*	*54.4%*	*83.0%*	*73.2%*
Black	*8.8%*	*6.2%*	*8.5%*	*1.5%*	*3.9%*
Asian	*21.1%*	*20.3%*	*19.4%*	*5.0%*	*10.0%*
Mixed	*3.5%*	*2.8%*	*3.3%*	*1.4%*	*2.1%*
Other	*5.6%*	*3.8%*	*5.2%*	*1.4%*	*2.7%*
Missing	*11.7%*	*9.2%*	*9.3%*	*7.7%*	*8.2%*
By IMD					
Deprived (DQ1)	*36.7%*	*44.9%*	*30.8%*	*15.4%*	*20.7%*
Moderately Deprived (DQ2)	*34.1%*	*26.5%*	*28.2%*	*17.2%*	*21.0%*
Average (DQ3)	*13.9%*	*15.9%*	*19.3%*	*20.5%*	*20.1%*
Moderately Affluent (DQ4)	*10.3%*	*7.0%*	*13.4%*	*22.4%*	*19.3%*
Affluent (DQ5)	*5.0%*	*5.6%*	*8.3%*	*24.5%*	*18.9%*
By CEV					
CEV	*6.2%*	*6.2%*	*6.3%*	*5.9%*	*6.0%*
non-CEV	*93.8%*	*93.8%*	*93.7%*	*94.1%*	*94.0%*

Note: The data refers to the eligible population in November 2022

The table shows that the surveyed CVC-funded wards are different from the national average as well as slightly different from wards in other CVC-funded LAs. In fact, they appear to have a larger population on average, a larger proportion of young individuals (under 30), and a lower proportion of white and affluent individuals. The comparable wards partially offset these discrepancies, providing a group of similar areas which help take into account demographic differences which may be driving differences in vaccination rates. For example, the ethnic distribution of the surveyed comparison wards is much closer to that of the surveyed CVC-funded wards than the national average, with the proportion of the white population at c.50% and c.58% for the CVC-funded and comparison group respectively, while the national average is c.73%.

Table 2 shows vaccination rates for different categories of wards in January and November 2022. The surveyed CVC-funded wards had a population of 1,496,974, with 62.3% vaccinated in January and 64.4% vaccinated in November. The surveyed comparison wards had a population of 1,287,811, with 63.4% vaccinated in January and 65.9% vaccinated in November. The 60 CVC-funded local areas (LAs) had a total population of 18,518,215, with 67.2% vaccinated in January and 68.3% vaccinated in November. Non-CVC LAs in England had a population of 35,543,384, with 81.8% vaccinated in January and 84.0% vaccinated in November.

Table 2. Population and vaccination rates in CVC-funded and comparison wards

Category of Ward	Eligible population	Vaccinated in Jan 2022	% Jan 2022	Vaccinated in Nov 2022	% Nov 2022
Surveyed CVC-funded wards (n=117)	1,496,974	915,710	62.3%	948,331	64.4%
Surveyed comparison wards (n=117)	1,287,811	818,113	63.4%	850,260	65.9%
All CVC-funded LAs (n= 1292)	18,518,215	12,138,890	67.2%	12,556,915	68.3%
Other LAs in England (n=5927)	35,543,384	28,626,782	81.8%	29,423,562	84.0%
Totals (n=7219)	**54,061,599**	**40,765,672**	**79.2%**	**41,980,477**	**81.4%**

Note: The vaccination rates refer to first doses, which include both 1/1 doses and 1/2 doses. Sample sizes in brackets refer to number of wards within each group

Using impact analysis to compare the two residents' survey samples initially identified no significant impacts of CVC funding on the behaviours or attitudes of residents in the CVC-funded case study area wards overall. As a result, the remaining impact analysis was focused on a smaller group of residents in the CVC-funded case study wards; those residents who were aware of the CVC-funded activities (428 of the 750 residents surveyed in CVC-funded case study areas). The hypothesis was that significant impacts would be more likely to be observed among residents in the CVC-funded areas who were aware of CVC activities.[15] The diagram overleaf (Figure 1.3) summarises the analysis approach, from the initial selection of wards in both CVC-funded and non-funded areas, through to the focus on those aware of CVC activities in the funded wards. provides an overview of the impact analysis approach.

The table shows that vaccination rates in the surveyed CVC-funded wards were substantially lower than the national average in January 2022 with only 62.3% of the eligible population having received at least one dose. This is explained by the CVC funding selection process as it targeted the local authorities with lower vaccination rates.

The surveyed comparison wards also reflect a lower vaccination rate with 63.4% of the eligible population vaccinated in January 2022 compared to the national average of 79.2%. These are wards from local authorities which, at the LA-level didn't have the lowest rates of vaccination, but which had wards within them seeing lower rates.

The surveyed CVC-funded wards have an eligible population of around 1.5 million, or around 3% of the national population. The surveyed comparison wards have a slightly lower but similar total population of 1.2 million people. The targeted LAs collectively account for around 35% of the national population. When looking for a comparable area the wards which are in targeted LAs are not considered as they may also have been affected by the intervention, this restricts the pool from which to draw a counterfactual to the 5,927 wards in non-CVC LAs.

Gross increase in vaccinations

The surveyed CVC-funded wards show an increase in vaccinations, with more first doses, second doses and boosters being delivered. This gross increase in vaccination numbers shows an increase in the uptake of vaccinations between January and November 2022. These new vaccinations are dependent on many factors, many of which are unrelated to the CVC programme, such as the increase of the eligible population. The aim of the counterfactual impact evaluation (CIE) is to assess the net

[15] These were residents who, since January 2022, had heard or seen something about people or organisations in their local community who were either encouraging people to receive the COVID-19 vaccination or sharing information in support of the COVID-19 vaccination; or who had heard or seen something about Community Vaccine Champions / Community Health Champions; or had personally had any dealings with people or organisations in their local community who were encouraging people to receive the COVID-19 vaccination or sharing information in support of the COVID-19 vaccination; or were aware of local meetings or events that talked about COVID-19 vaccines; or who'd seen or heard something else about COVID-19 vaccines since January 2022, from talking to people in your local community who were encouraging people to receive the COVID-19 vaccination or sharing information in support of the COVID-19 vaccination.

increase in vaccinations which are attributable to the intervention, and which would not have been observed without it.

The total number of new vaccinations between January and November 2022 in the surveyed CVC-funded wards is outlined in Table 3. These are divided into the type of vaccine delivered – first dose, second dose or booster – as well as by age categories.

Table 3. Gross increase in vaccinations in surveyed CVC-funded wards by type of vaccine and age category

	New vaccinations	First dose	Second dose	Booster
10-20 years old	27,208	17,141	9,762	305
20-30 years old	11,525	7,007	4,218	300
30-40 years old	7,722	4,587	2,830	305
40-50 years old	3,538	2,073	1,290	175
50-60 years old	1,940	1,094	672	174
60-70 years old	928	468	321	139
70-80 years old	417	168	138	111
80+ years old	199	83	55	61
Total	**53,477**	**32,621**	**19,286**	**1,570**

A total of 53,447 new vaccinations were delivered in the surveyed CVC-funded wards between January and November 2022, with around 457 vaccinations per ward. The majority of these vaccinations are first doses, 32,621 first doses compared to 19,286 second doses and only 1,570 booster doses. This may be due to the fact that CVC-funded wards had a large share of unvaccinated compared to other parts of the country as well as the increase in eligible population. In fact, a large part of the increase is being driven by young people vaccinating – 50.9% of all vaccinations are for under 20 years old. This observation is likely to be due to a large number of young individuals becoming eligible for vaccinations, but other factors linked to the CVC programme may be involved.

In order to identify the share of these vaccinations which can be attributed to the CVC programme, the analysis tracks the change in vaccination rates in the surveyed CVC-funded wards against the surveyed comparison wards and other selected comparison groups16. The impact is estimated for different categories: age, ethnicity, and index of multiple deprivation (IMD). The impact is also differentiated depending on the type of vaccine, distinguishing between first dose, second dose and booster vaccination rates.

[16] Aside from the surveyed comparison wards two comparison groups selected using PSM are analysed in the CIE.

Table 4 outlines the average first dose vaccination rates in January 2022 and their change up to November 2022. These are shown for the surveyed CVC-funded wards as well as the surveyed comparison wards and the national average.

Table 2. Population and vaccination rates in CVC-funded and comparison wards

Category	Surveyed CVC-funded wards (n=117)		Surveyed comparison wards (n=117)		Totals (n=7219)	
	Jan-22	Chang	Jan-22	Change	Jan-22	Change
Overall	62.3%	2.12%	63.4%	2.50%	79.2%	2.17%
By age						
10-20 years old	30.8%	9.26%	31.7%	9.23%	41.0%	12.61%
20-30 years old	56.6%	2.25%	56.7%	2.84%	74.2%	1.99%
30-40 years old	56.2%	1.38%	57.5%	1.86%	75.3%	1.18%
40-50 years old	65.1%	0.82%	68.5%	1.12%	82.5%	0.54%
50-60 years old	76.8%	0.56%	79.2%	0.53%	89.2%	0.27%
60-70 years old	82.4%	0.37%	86.0%	0.31%	92.4%	0.15%
70-80 years old	87.5%	0.24%	91.0%	0.21%	95.0%	0.10%
80+ years old	89.1%	0.20%	92.3%	0.21%	96.0%	0.09%
By ethnicity						
White	67.1%	1.99%	66.5%	2.18%	78.6%	2.48%
Black	52.2%	3.03%	52.3%	4.35%	61.7%	3.59%
Asian	60.8%	3.67%	59.7%	4.08%	69.3%	4.21%
Mixed	49.1%	4.39%	47.4%	3.95%	55.7%	5.69%
Other	50.7%	2.93%	45.2%	2.94%	61.0%	3.14%
By IMD						
Deprived (DQ1)	58.2%	2.65%	57.6%	2.74%	65.9%	2.72%
Moderately Deprived (DQ2)	59.9%	2.41%	62.3%	2.63%	71.8%	2.54%
Average (DQ3)	65.4%	2.29%	64.6%	2.74%	76.4%	2.49%
Moderately Affluent (DQ4)	65.2%	2.07%	70.8%	2.32%	78.9%	2.59%
Affluent (DQ5)	64.7%	2.21%	70.6%	2.56%	80.9%	2.80%

Note: This table refers to the uptake of first dose vaccinations, including both 1/1 doses and 1/2 doses. Vaccination rate calculated as a proportion of eligible population in November 2022. Change is calculated between Jan-22 and Nov-22.

The table shows that the overall first dose vaccination rate is lowest for the surveyed CVC-funded wards at 62.3% compared to 63.4% of the surveyed comparison wards and 79.2% overall. Between January and November 2022, the vaccination rate increases by 2.1% for the surveyed CVC-funded areas however this increase is still smaller than that of the surveyed comparison wards at 2.5% and the national average increase which is 2.2%.

The overall rise in the vaccination rate for the first dose is primarily attributed to the demographic of young individuals. This is due to the fact that their initial vaccination rate in January was lower in comparison to other age groups as they became eligible more recently, and as such, their vaccination rate is catching up with that of other age groups. Specifically, individuals under the age of 20 constitute the sole demographic with a vaccination rate of less than 50% in January 2022, which has subsequently seen a 12.6% increase by November 2022. This catch-up phenomenon is also evident in both surveyed CVC-funded and comparison wards, where older demographic categories have seen a greater increase in comparison to other wards. This is owing to the fact that their initial vaccination rates were below the national average.

When examining differences in vaccination rates across different ethnicities, it is noted that the white population has the highest vaccination rate. It is also observed that this demographic experiences the smallest increase in vaccination rate. In regards to surveyed CVC-funded wards, the mixed ethnic category is the only one that experiences an increase in vaccination rate that surpasses that of comparison areas. With respect to quintiles of deprivation, a positive correlation is observed between vaccination rates and the income status of an individual, with more individuals in less deprived areas being more likely to be vaccinated. The largest increase in vaccination rates is seen among individuals from more deprived areas, as they work to catch up to the rest of the population. However, it should be noted that this increase is smaller in surveyed CVC-funded wards relative to the comparison groups.

Table 5 outlines the average second dose vaccination rates in January 2022 and their change up to November 2022. These are shown for the surveyed CVC-funded wards as well as the surveyed comparison wards and the national average.

Table 5. Second dose vaccination rates changes breakdown

Category	Surveyed CVC-funded wards (n=117)		Surveyed comparison wards (n=117)		Totals (n=7219)	
	Jan-22	Change	Jan-22	Change	Jan-22	Change
Overall	60.1%	1.26%	60.7%	1.47%	77.3%	1.35%
By age						
10-20 years old	25.9%	5.42%	24.9%	5.21%	35.3%	7.91%
20-30 years old	53.9%	1.32%	53.0%	1.68%	71.3%	1.19%
30-40 years old	54.0%	0.85%	54.8%	1.08%	73.0%	0.72%
40-50 years old	63.3%	0.53%	66.4%	0.71%	81.0%	0.32%
50-60 years old	75.4%	0.35%	77.7%	0.35%	88.3%	0.17%
60-70 years old	81.5%	0.27%	85.1%	0.25%	91.8%	0.11%
70-80 years old	86.9%	0.22%	90.4%	0.22%	94.7%	0.08%
80+ years old	88.5%	0.15%	91.8%	0.19%	95.7%	0.07%
By ethnicity						
White	64.9%	1.21%	63.9%	1.25%	76.8%	1.54%
Black	49.7%	1.68%	49.4%	2.47%	59.3%	2.05%
Asian	59.3%	2.38%	57.6%	2.44%	67.9%	2.66%
Mixed	46.5%	2.62%	43.7%	2.23%	53.1%	3.56%
Other	48.4%	1.73%	42.8%	1.59%	58.9%	1.86%
By IMD						
Deprived (DQ1)	55.7%	1.49%	54.6%	1.56%	63.0%	1.48%
Moderately Deprived (DQ2)	57.8%	1.44%	59.9%	1.55%	69.6%	1.48%
Average (DQ3)	63.7%	1.41%	62.7%	1.54%	74.6%	1.52%
Moderately Affluent (DQ4)	63.9%	1.33%	68.9%	1.47%	77.4%	1.67%
Affluent (DQ5)	63.6%	1.49%	69.3%	1.84%	79.7%	1.87%

Note: This table refers to the uptake of second dose vaccinations relative to the eligible population in November 2022

The table outlines a similar pattern to that for first dose vaccinations. The second dose vaccination rates are lower than for first doses and they also experience a smaller increase. The average second dose vaccination rate is 60.1% for the surveyed CVC-funded wards and it increases by 1.26% between January and November 2022. This increase is lower than for the comparison wards and the national average. In fact, the increase in vaccination rates in the comparison wards always outperforms the surveyed CVC-funded wards apart from the 60-70 years old, and the mixed ethnic category. This shows that the surveyed CVC-funded wards are sluggish in their COVID vaccine uptake even when compared to other similar wards with low vaccination rates.

Table 6 shows the booster vaccination rate for each of the groups of wards and categories considered. The table shows the vaccination rate in January 2022 as well as its increase up to November 2022.

Table 6. Booster vaccination rates changes breakdown

Category	Surveyed CVC-funded wards (n=117)		Surveyed comparison wards (n=117)		Totals (n=7219)	
	Jan-22	Change	Jan-22	Change	Jan-22	Change
Overall	45.9%	0.10%	43.8%	0.09%	64.9%	0.08%
By age						
10-20 years old	9.0%	0.19%	7.9%	0.14%	10.6%	0.26%
20-30 years old	34.5%	0.09%	29.2%	0.07%	49.2%	0.07%
30-40 years old	37.0%	0.09%	33.5%	0.09%	55.0%	0.06%
40-50 years old	47.7%	0.08%	47.0%	0.07%	68.2%	0.04%
50-60 years old	63.4%	0.08%	64.2%	0.08%	80.6%	0.04%
60-70 years old	74.1%	0.10%	76.6%	0.09%	87.7%	0.05%
70-80 years old	83.2%	0.11%	86.3%	0.14%	92.9%	0.06%
80+ years old	85.1%	0.10%	88.5%	0.14%	94.3%	0.05%
By ethnicity						
White	52.5%	0.09%	49.9%	0.10%	65.4%	0.08%
Black	30.7%	0.08%	29.1%	0.16%	42.6%	0.14%
Asian	43.9%	0.12%	38.8%	0.13%	54.5%	0.14%
Mixed	32.0%	0.11%	27.3%	0.12%	38.4%	0.15%
Other	32.3%	0.13%	26.7%	0.09%	44.4%	0.12%
By IMD						
Deprived (DQ1)	39.8%	0.10%	37.3%	0.10%	47.6%	0.08%
Moderately Deprived (DQ2)	43.5%	0.08%	44.3%	0.07%	56.3%	0.08%
Average (DQ3)	51.2%	0.09%	49.0%	0.09%	63.0%	0.08%
Moderately Affluent (DQ4)	53.7%	0.11%	57.0%	0.08%	66.8%	0.08%
Affluent (DQ5)	54.4%	0.10%	59.0%	0.12%	70.0%	0.09%

Note: This table refers to the uptake of first booster vaccinations relative to the eligible population in November 2022

The table indicates that the number of people receiving booster vaccinations is substantially lower compared to other types of vaccines and the uptake of these vaccinations is very slow across all wards. The booster vaccination rate is only around 65% nationally, compared to c.80% of people having received one dose and 77% two doses. This is likely due to the fact that booster vaccinations are not typically included in the "complete" vaccination cycle, resulting in a small number of people receiving the booster dose. Additionally, younger individuals only recently became eligible for booster vaccinations, in fact only around 10% of under 20s have received a booster vaccine.

As of January to November 2022, only a small number of people received the booster vaccination in the 117 surveyed CVC-funded wards, with an average of 13.4 booster vaccines having been administered. It should also be noted that this data may have a higher margin of error as it is based on a small number of observations.

The booster vaccination rate in the surveyed CVC-funded wards exhibited minimal growth, with the highest increase observed among individuals under 20 years of age, those belonging to the "Other" ethnic category, and moderately affluent individuals.

Comparative analysis of booster vaccination rates in comparison areas also indicates a slow rate of growth, similar to the surveyed CVC-funded wards. The most pronounced difference in vaccination rate growth was observed among individuals under 20 years of age, however, further evidence is required to determine the extent to which this difference is attributed to the CVC programme.

Estimating the additional impact

This section conducts an econometric analysis of the additional impact of the CVC programme using quasi-experimental methods. The method used in the analysis is propensity score matching difference-in-differences (PSM-DID).

Propensity Score Matching (PSM) is a technique used to estimate the causal effect of a treatment by matching units who received the treatment with units who did not, but who have similar characteristics (propensity scores) that may affect the outcome. When combined with difference-in-difference (DID), the approach is considered robust, able to estimate the additional effects of an intervention by using the matched comparator.

Methodology

The use of statistical matching was the outcome of three steps. Firstly, the policy did not develop a counterfactual by design. Selection into the CVC policy did not involve any randomisation out for a sub-sample, so that a randomised control trial could not be used. Also, there was no list of rejected applicants for funding to provide a comparison group. A second step experimented with the development of comparator areas using a constructed counterfactual. Options considered included using wards in the supported local authorities but not deemed to be the focus of the policy and allowing a qualitative judgement. The nature of the delivery at local authority level suggested that the ward boundaries did not accurately delineate between CVC-funded or non-CVC areas within LAs. This led to the development of a matched sample of wards referred to as the surveyed comparison wards - which was also used for the counterfactual survey – that resembled the supported wards in terms of vaccinations rates and various demographics[17].

A third stage – using PSM – then formalised this second approach. The propensity score is estimated using a logit model which aims at reflecting the selection process into treatment. The score estimates the probability of being assigned to the treatment group based on the observable characteristics. PSM aims to balance the distribution of the confounding variables between the surveyed CVC-funded and comparison groups, thus reducing the bias in the estimate of the treatment effect. Matching statistically on variables similar to that used in the second stage built on the intuition of that approach and throughout the next sections both the PSM-derived and surveyed comparison groups are used in analysis, with the PSM one preferred because it is considered more robust.

[17] The surveyed comparison wards were identified by BPSR using manual matching based on Jan 2022 vaccination rate, region, and ethnic group profile.

Three comparison groups are considered for this analysis, one is the group of surveyed comparison wards which was selected based on their overall similarity to the surveyed CVC-funded wards in the second stage, additionally two other comparison groups are constructed using PSM based on two different matching methods. Model I estimates the propensity score using a logit model based on the size of the eligible population of the category considered and their pre-treatment vaccination rate in January 2022 as well as adding regional dummies. Model II uses the Mahalanobis distance between the CVC-funded and non-CVC wards using the vaccination rate and the log of the eligible population of the category considered.

Difference-in-Differences (DID) is a method used to estimate the causal effect of a treatment. It compares the change in the outcome variable between the CVC-funded group and the comparison group over time. In this case the outcome is denoted as the log of the vaccination rate for a given category, the logarithm is used to take into account heteroskedasticity and non-normality issues as well as mitigating outliers, thus the DID considers the difference in the growth rate of the vaccination rate between the CVC-funded sample and the comparison group.

The statistical testing is done using a Wald statistic from a linear regression of the growth in the vaccination rate on a dummy variable for being CVC-funded as well as control variables which are the same as for the selection model (as suggested in Abadie and Spiess 2022). The DID estimates shown are the estimates for the coefficient on the treatment variable in the linear regression. These estimates can be interpreted as the average difference in growth between the CVC-funded and comparison group which is not explained by differences in vaccination rates or population size.

The hypotheses which are tested by the PSM-DID can be summarised as following.

> **Null hypothesis:** The vaccination rate growth for a given type of vaccine in a given subpopulation is the same between the surveyed CVC-funded wards and the comparison group
>
> **Alternative hypothesis:** The vaccination rate growth for a given type of vaccine in a given subpopulation is significantly different in the surveyed CVC-funded wards relative to the comparison group

If the null hypothesis is rejected it implies that the vaccination rate grows significantly faster/slower in the surveyed CVC-funded wards relative to the comparison group. The comparison groups are selected to control other factors which affect vaccination rate changes, this aims to identify the effect attributable to the CVC programme by eliminating other confounding factors. These tests are carried out both for vaccination rate growth in the entire eligible population and in each of the subpopulations available. Testing at entire population level is more statistically powerful as it relies on a higher number of observations, however the treatment effect may be localised to specific subpopulations though this would be harder to detect.

Methodology limitations

The PSM-DID methodology was chosen as it is considered to be a robust technique which can be applied to the vaccination dataset without requiring unrealistic identifying assumptions. However, this statistical technique has limitations which may prevent the identification of causal effects under certain conditions, these are explored in this section.

The model specification which is used to estimate the propensity score can influence the findings. PSM-DID requires the estimation of a propensity score model, which can be sensitive to model specification and functional form. The choice of covariates, their functional form, and the specification of the propensity score model can all affect the estimated treatment effect. In this note we used three different matching techniques (manual matching, logit selection model, mahalanobis distance) to prevent bias from mis-specifying the selection model.

The PSM-DID method has to rely on a large sample in order to consistently identify treatment effects. In this case the sample of CVC-funded wards included 117 observations which is considered a small sample when treatment effects are relatively small in size. For this type of intervention, the effect could be hard to detect as the intervention often incentivised vaccinations indirectly through COVID-19 awareness activities, therefore its effect at ward level – without knowing the individuals which came into contact with the intervention - may be difficult to identify. The small sample size, however, would affect most quantitative statistical techniques, thus identifying these impacts may have to rely on qualitative evidence.

Another limitation of the PSM-DID for the evaluation of the CVC programme may be the lack of common support between CVC-funded and non-CVC areas. Matching techniques require that for every CVC-funded area, a non-CVC area that was similarly likely to be selected into the programme to be found. The CVC programme targeted LAs with the lowest vaccination rates as of January 2022 which may lead to the inability to find comparable LAs in terms of vaccine take-up[18]. However, the use of ward level data allows to use the heterogeneity in vaccination rates within an LA to find comparable wards. In fact, the wards which have low vaccination take-up rates but are located in high-vaccination take-up LAs are often selected into the comparison group.

[18] The PSM method used excludes CVC-funded wards for which the propensity score is highest/lower than the highest/lowest propensity score in the non-CVC sample which prevents matching of wards which differ excessively from any of the comparison wards.

Additional vaccines

This section outlines the findings of the PSM-DID analysis. This is conducted for each type of vaccine - first dose, second dose and booster - as well as for each sample category considered - age categories, ethnicity and deprivation.

Table 7 shows the DID estimates for the first dose vaccination rate. This is shown for the surveyed comparison group, the matched comparison groups under model I and II, as well as for the national average as a baseline.

The results of the Difference-in-Differences (DID) analysis reveal that the CVC programme had no discernible impact on first dose uptake, as evidenced by the data. In fact, the only statistically significant results are negative, indicating that the CVC-funded areas experienced significantly lower growth in vaccination rates compared to the comparison groups. However, due to the nature of the programme it is unlikely that this is attributable to a negative impact of the CVC programme, in fact vaccination rates for first and second doses still increase in the supported LAs but at a lesser rate than in comparison areas.

It is also worth noting that the growth in vaccination rates in the surveyed CVC-funded wards significantly exceeded the national average for specific demographic groups, including individuals over 20 years of age, those belonging to the Mixed and Asian ethnic categories, and moderately deprived individuals. However, further analysis using Propensity Score Matching (PSM) suggests that this effect cannot be attributed to the CVC programme as it disappears relative to matched comparison groups.

Table 7. First dose DID estimates for different comparison groups by category

	Surveyed comparison wards	Model I	Model II	National
Overall	-0.656% (-4.35***)	-0.313% (-2.2**)	-0.457% (-2.99***)	0.409% (3.25***)
By age				
10-20 years old	-1.692% (-1.66*)	-3.639% (-3.46***)	-1.538% (-1.79*)	-1.044% (-1.28)
20-30 years old	-1.278% (-4.85***)	-0.171% (-0.48)	-1.183% (-4.06***)	0.708% (3.42***)
30-40 years old	-0.711% (-4.02***)	-0.381% (-2.55**)	-0.411% (-2.1**)	0.465% (3.74***)
40-50 years old	-0.297% (-2.33**)	0.033% (0.34)	-0.013% (-0.14)	0.518% (8.72***)
50-60 years old	0.008% (0.13)	0.09% (1.27)	0.098% (1.54)	0.353% (3.92***)
60-70 years old	0.038% (0.94)	0.063% (1.15)	0.127% (2.87***)	0.253% (7.16***)
70-80 years old	0% (0.01)	0.032% (0.62)	0.031% (0.41)	0.108% (3.47***)
80+ years old	-0.023% (-0.54)	0.026% (0.53)	-0.014% (-0.27)	0.094% (2.88***)
By ethnicity				
White	-0.33% (-2.8***)	-0.394% (-3.41***)	-0.417% (-3.15***)	-0.234% (-1.57)
Black	-3.29% (-2.12**)	-2.345% (-2.68***)	-1.33% (-2.67***)	-1.674% (-5.71***)
Asian	-0.471% (-0.91)	-1.318% (-2.01**)	-1.104% (-1.54)	-0.779% (-1.86*)
Mixed	1.195% (1.75*)	-0.253% (-0.37)	-0.178% (-0.21)	1.78% (3.43***)
Other	-0.435% (-0.95)	-0.262% (-0.58)	-1.791% (-2.3**)	0.758% (2.22**)
By IMD				
Deprived (DQ1)	-0.583% (-2.76***)	-0.02% (-0.11)	-0.57% (-2.3**)	0.112% (0.76)
Moderately Deprived (DQ2)	-0.4% (-1.87*)	-0.194% (-0.91)	-0.146% (-0.78)	0.348% (2.39**)
Average (DQ3)	-0.663% (-2.54**)	-0.058% (-0.28)	-0.334% (-1.54)	0.171% (1.17)
Moderately Affluent (DQ4)	-0.515% (-1.62)	-0.529% (-0.98)	-0.594% (-1.69*)	-0.202% (-0.77)
Affluent (DQ5)	-0.409% (-0.89)	0.455% (0.79)	-1.064% (-1.33)	-0.044% (-0.16)

Table 7 shows the DID estimates for second dose vaccination rate. This table shows a similar pattern to the first dose vaccination rate with no statistically significant results indicating impact.

The findings for booster vaccination rates are shown in Table 9. The comparison groups which are determined through propensity score matching – i.e. Model I and II - estimate a positive impact effect for the overall vaccination rate growth. However, the effect is only statistically significant for Model II, which suggests that 0.047% of the vaccination rate growth is not observed in the counterfactual group. Model I - the median model - estimates a treatment effect of 0.032% but this effect is found to be statistically insignificant. The surveyed CVC-funded wards appear also to experience a higher rise in booster vaccination rates compared to the national average.

Different subcategories of the population also experience positive vaccination growth relative to the counterfactual. Notable findings include the Deprived category which has a statistically significant positive treatment effect under Model II, as well as the Other ethnic category vaccination rate significantly outperforming the national average. The categories which maintain a positive, though statistically insignificant, result across all methods are 10-20 and 30-40 years old, Asian and Mixed ethnic categories, Average and Affluent deprivation quintiles. The median estimate for each category is shown in Figure 1.

Overall, there is some evidence that booster vaccination rates may have benefitted from the CVC programme. The positive treatment effect is found when PSM is used for the selection modelling, which implies that it may be crucial to control for the vaccination rates at the start of the programme in order to identify a valid counterfactual. The magnitude of the treatment effect found is still relatively small and statistically insignificant for many subcategories of the population, however the CVC programme targeted very specific subpopulations in a large area, therefore it is difficult to identify this type of impact from statistical analysis of all vaccinations in an area.

The positive impact of the CVC programme on booster vaccinations is also supported by the survey findings and the MI data analysis which suggest that a large number of booster vaccines were administered at CVC-funded events.

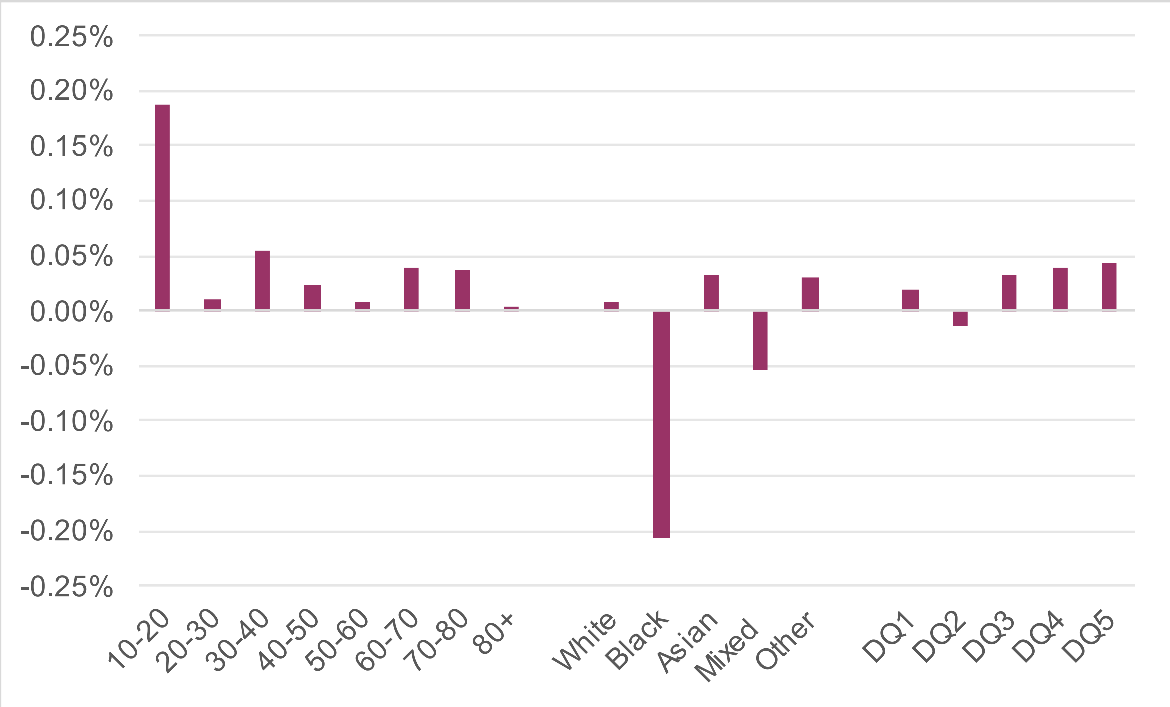
Table 8. Second dose DID estimates for different comparison groups by category

	Surveyed comparison wards	Model I	Model II	National
Overall	-0.387% (-3.73***)	-0.24% (-2.52**)	-0.2% (-2.37**)	0.186% (2.18**)
By age				
10-20 years old	-0.95% (-1.2)	-2.455% (-2.81***)	-1.494% (-1.65)	-2.327% (-2.85***)
20-30 years old	-0.878% (-4.83***)	-0.31% (-1.7*)	-0.371% (-2.15**)	0.394% (2.91***)
30-40 years old	-0.389% (-3.42***)	-0.017% (-0.16)	-0.307% (-2.38**)	0.335% (4.27***)
40-50 years old	-0.151% (-1.38)	0.011% (0.16)	0.072% (0.94)	0.367% (7.87***)
50-60 years old	-0.042% (-0.84)	0.105% (2.54**)	0.044% (0.98)	0.171% (2.01**)
60-70 years old	0.003% (0.07)	0.017% (0.35)	0.121% (2.98***)	0.156% (4.44***)
70-80 years old	-0.026% (-0.45)	0.125% (1.51)	0.064% (0.83)	0.103% (2.5**)
80+ years old	-0.048% (-1)	0.068% (1.48)	0.02% (0.36)	0.052% (1.44)
By ethnicity				
White	-0.126% (-1.54)	-0.257% (-3.41***)	-0.174% (-1.66*)	-0.249% (-2.01**)
Black	-2.44% (-1.59)	-1.072% (-1.91*)	-0.8% (-2.36**)	-0.951% (-3.65***)
Asian	0.08% (0.18)	-0.183% (-0.37)	-0.841% (-2.21**)	-0.235% (-0.59)
Mixed	0.838% (1.89*)	-0.819% (-1.42)	-0.433% (-0.7)	0.862% (2.41**)
Other	-0.068% (-0.2)	0.053% (0.13)	-0.903% (-2.26**)	0.523% (2.25**)
By IMD				
Deprived (DQ1)	-0.412% (-2.66***)	-0.128% (-0.81)	-0.268% (-1.32)	0.113% (0.98)
Moderately Deprived (DQ2)	-0.19% (-1.29)	-0.285% (-2.13**)	0.251% (2.01**)	0.209% (2.12**)
Average (DQ3)	-0.291% (-1.88*)	-0.353% (-1.6)	-0.18% (-1.02)	0.047% (0.48)
Moderately Affluent (DQ4)	-0.312% (-1.51)	-1.092% (-3.18***)	-0.494% (-1.57)	-0.226% (-1.24)
Affluent (DQ5)	-0.339% (-0.98)	-0.746% (-2.03**)	-0.754% (-1.28)	-0.007% (-0.03)

Table 9. Booster DID estimates for different comparison groups by category

	Surveyed comparison wards	Model I	Model II	National
Overall	-0.017% (-0.66)	0.032% (1.33)	0.047% (2.54**)	0.057% (3.47***)
By age				
10-20 years old	0.188% (0.55)	0.186% (0.57)	0.311% (0.91)	0.154% (0.73)
20-30 years old	-0.024% (-0.61)	-0.004% (-0.1)	0.023% (0.43)	0.074% (3***)
30-40 years old	0.002% (0.04)	0.062% (1.35)	0.047% (0.96)	0.114% (3.93***)
40-50 years old	0% (-0.01)	0.023% (0.56)	0.026% (0.73)	0.067% (2.59***)
50-60 years old	-0.01% (-0.41)	0.005% (0.19)	0.009% (0.3)	0.061% (2.91***)
60-70 years old	-0.001% (-0.04)	0.037% (0.94)	0.065% (1.73*)	0.042% (1.76*)
70-80 years old	-0.042% (-0.77)	0.058% (0.79)	0.058% (1.19)	0.015% (0.37)
80+ years old	-0.055% (-1.24)	-0.006% (-0.13)	0.052% (1.07)	0.014% (0.46)
By ethnicity				
White	-0.041% (-1.63)	0.007% (0.35)	0.044% (1.93*)	0.008% (0.54)
Black	-0.246% (-1.92*)	-0.31% (-1.27)	-0.045% (-0.59)	-0.165% (-3.28***)
Asian	0.005% (0.1)	0.039% (0.62)	0.1% (1.55)	0.025% (0.56)
Mixed	-0.038% (-0.39)	-0.165% (-1.18)	-0.069% (-0.55)	0.03% (0.46)
Other	0.002% (0.01)	0.048% (0.3)	0.013% (0.05)	0.174% (1.96**)
By IMD				
Deprived (DQ1)	-0.031% (-0.72)	-0.001% (-0.02)	0.087% (2.51**)	0.041% (1.45)
Moderately Deprived (DQ2)	-0.009% (-0.31)	-0.038% (-1.11)	-0.019% (-0.53)	0.006% (0.3)
Average (DQ3)	0.021% (0.58)	0.042% (0.99)	0.096% (2.09**)	0.014% (0.51)
Moderately Affluent (DQ4)	0.033% (0.63)	-0.007% (-0.14)	0.043% (0.75)	0.061% (1.5)
Affluent (DQ5)	0.029% (0.44)	0.006% (0.19)	0.076% (1.13)	0.058% (1.85*)

Figure 1. DID estimates for booster vaccines by category

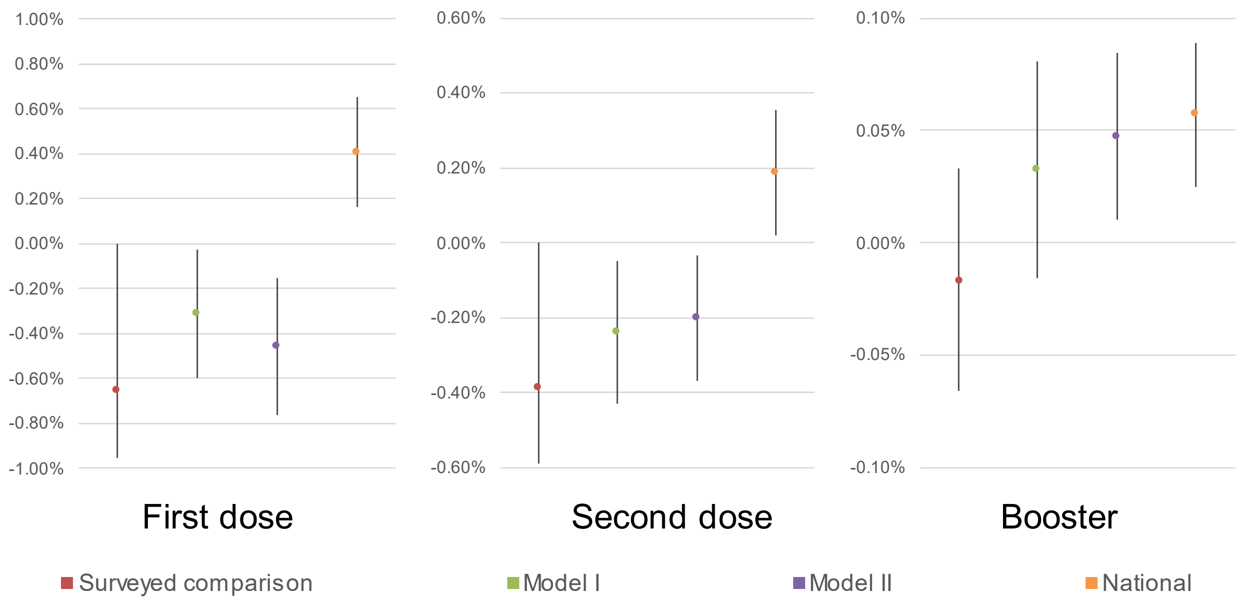


Note: The median estimate from the surveyed comparison, Model I and Model II estimates is shown

Figure 2 summarises the DID results by showing the estimates and their confidence intervals for the overall growth in vaccination rates. This is presented for all types of vaccinations and all four comparison groups used, where the comparison groups are presented in the same order as the tables. The DID represent the difference in growth relative to the comparison group, where 0% indicates no additional vaccination rate growth relative to the counterfactual.

This figure shows that the DID findings are negative for first and second doses, and mostly positive but statistically insignificant for booster doses.

Figure 2. DID estimates with confidence intervals



Note: The figure shows, for each type of vaccine, the DID estimate for each comparison group, from left to right: surveyed comparison wards, Model I, Model II, National, the DID estimates' confidence intervals are estimated including selection covariates.

Table 10 shows the additionality for each type of vaccine by taking the median model results as the treatment effect. The additionality value gives the proportion of the growth in vaccination rates that is not observed in the counterfactual group.

No additionality is found for first and second doses as there is no statistically significant evidence of the CVC programme affecting these two types of vaccinations. Additionality for booster vaccinations is estimated at around 14.7%, as the overall booster vaccination rate experiences a 0.217% growth of which 0.032% is not observed in the counterfactual group. This estimate would imply a total number of 231.5 additional booster vaccinations in the 117 surveyed CVC-funded wards, as a total of 1,570 booster vaccinations are administered. However, there is substantial uncertainty associated with this estimate as it is calculated on a statistically insignificant finding.

Table 10. Additionality for each type of vaccine

	Vaccination rate growth	DID	Additionality
First dose	3.403%	-0.457%	0%
Second dose	2.097%	-0.240%	0%
Booster	0.217%	0.032%	14.7%

Note: Figures refer to the median model. Additionality is measured as the proportion of growth not observed in the counterfactual[19].

Value-for-money analysis

This section reviews management information (MI) data for 10 case study areas, selected as part of the wider CVC evaluation, in order to extract the cost and social value created from CVC-funded activities between January and October 2022. The analysis focuses on the number of cases prevented due to the vaccines administered as the main driver of social value of the programme, however there may be benefits which are not possible to measure and quantify using the MI data. The findings are subject to parameter estimates which are subject to uncertainty, a sensitivity analysis presents alternative scenarios when considering different assumptions.

The key points from the analysis are the following:

- The total cost of the CVC programme across the 10 case study areas as of October 2022 is around £4 million while the cost across all 60 supported LAs is around £19 million.
- A total of 2,387 CVC-funded events were organised across the 10 LAs, with 684 of these being face-to-face events.
- A total of 4,975 vaccines being administered during CVC-funded events were recorded in the MI data, of which 427 are first doses, 726 are second doses, and 3,822 are boosters.
- Taking into account vaccine effectiveness and the transmission rate of COVID-19 as derived from related literature, an estimated 8,008 cases were prevented by the vaccines delivered at CVC-funded events. Of these cases 979 are considered additional as they were prevented by vaccines which would not have been

[19] Note that the proportion of additional vaccinations is bounded at 0%, as additionality refers to the proportion of additional vaccines delivered as part of the CVC programme.

administered without CVC funding. However, this figure is subject to uncertainty as it is based on a statistically insignificant value from the impact analysis.

- Drawing on the estimate above, the gross social value of the prevented cases is estimated to be around £46.4 million, while the additional social value created is estimated around £5.7 million. These estimates consider the social cost prevented by hospital admissions, ICU admissions, deaths and estimated long COVID cases[20].

- The estimated social value created is sensitive to changes in the social cost of a COVID-19 case and the proportion of vaccines which are attributable to the CVC programme, i.e. additionality. Alternative assumptions yield a more conservative valuation of the social value of a COVID-19 case at £2,400, resulting in the estimated net social value created decreasing to £2.4m. Relying on alternative estimates of additionality yields a net social value within the range £0 - £10.5m, the lower figure resulting from a model which finds no additional impact of the CVC programme.

- Across the 10 case study areas, there are substantial heterogeneities in the type of events undertaken and the number of vaccines delivered. A large proportion of the vaccines delivered at CVC-funded events are from Kensington and Chelsea and Westminster as these LAs focused on administering vaccines through vaccine buses, however other LAs delivered very few vaccines as they focused on community engagement and COVID-19 awareness events. This implies that there may not have been the same social value delivered across all LAs part of the programme. However, this study only considers the impact from vaccinations administered, other type of impacts haven't been considered due to their non-quantifiable/monetizable nature.

Management Information Data

Management information (MI) data for the CVC programme was collected from each of the 60 CVC-funded local authorities. This dataset tracked the progress of the delivery and cost of the CVC programme alongside other information such as the organisations involved, staffing and recruitment, events, and activities delivered.

The data was collected monthly for all 60 supported LAs from January/February until July 2022. A further MI data review was submitted by 32 LAs in October 2022. The 10

[20] This estimate relies on the assumption of the social value of a COVID-19 case prevented being £5,800 which is taken from "The social value of a COVID case January 2022" published by the Technical Advisory Group to the Welsh Government. This study was selected as it provided an up-to-date estimate of the social value of a covid case taking into account both economic and health impacts of covid cases.

case study areas are all part of this latter group of LAs21, so that the cost and delivery progress can be tracked up to October 2022.

Cost of the programme

The total cost of the programme for the 10 case study areas and the overall programme is estimated using the MI data available. Table 11 shows the total committed spend for all the supported LAs and the case study areas since the start of the project. The value for all supported LAs refers to the total spend as of July 2022, the last month for which MI data was collected for all LAs. The figures reported for the case study areas refer to the MI data as of October 2022, however it is to be noted that as of October 2022, 8 of the 10 case study areas reported that they were still delivering the CVC programme, suggesting that some of the cost is yet to be observed.

The total allocated spend amounted to around £19 million for all 60 LAs and £4 million for the 10 case study areas[22], with the average spend per LA being around £320,000 and the maximum spend at £485,000.

Table 11. Descriptive statistics on total committed spend since start of the project

	All supported LAs (n=60)	Case study areas (n=10)
Total spend	£18,919,891	£3,955,674.00
Average	£315,331	£359,606
Min - Max	£112,000 - £485,000	£112,000 - £485,000

Note: Figures refer to the total committed spend as of July 2022 for all supported LAs while up to October 2022 for case study areas.

There were two differing amounts that LAs could receive as part of the programme: LAs that had previously been funded through CVC got offered up to £185,000, and LAs newly invited to the programme could receive up to £485,000. Some LAs ended up requesting less than the maximum they could receive. Differences in funding allocations and spending across LAs implies heterogeneity in the CVC activities and outputs. The case study areas also reflect differences in allocation and spending levels. This shows that impact may also be heterogeneously distributed, with some LAs benefitting more from the project than others.23

[21] Newham was the only LA which submitted the last MI data review in December 2022 rather than October.

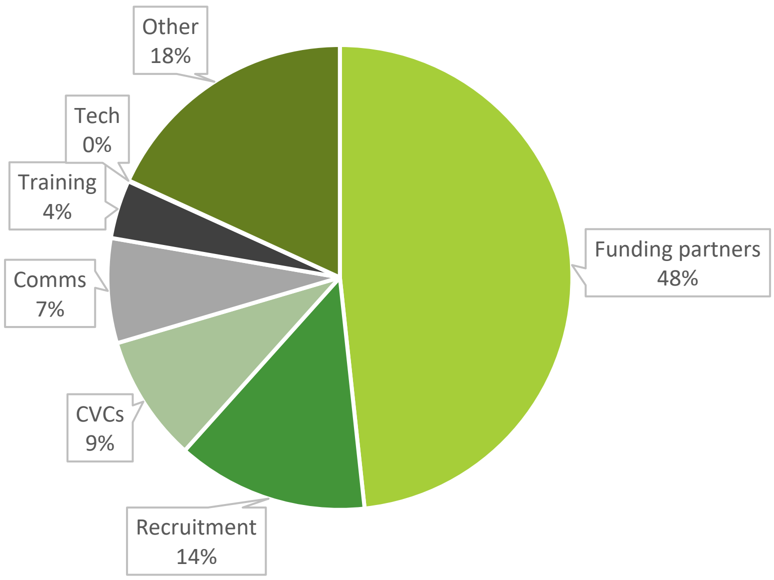
[22] The 60 supported LAs were awarded a total of £22.5m, the total spend figure of £19m refers to the total committed spend as of July 2022, the difference relates to resource allocated but not yet spent or committed by LAs at the time the last MI data was reported. For the case study areas the latest available MI was reported in October 2022 while for all supported LAs the latest data refers to July 2022.

[23] More recent MI data, updated in October 2022, is available and shows increased level of spending, however this only covers 32 of the 60 supported LAs.

Figure 3 shows the breakdown of total spend for the case study areas, allowing the main areas of spending for the programme to be identified. The figure refers to spending as of July 2022, when total spending amounted to £3.6m, thus it may not accurately reflect the breakdown at the end of the programme.

Around half of the total spending of the CVC programme was directed towards funding partners, with recruitment taking up 13% of total spending, Community Vaccination Champions 9%, and communications and training 11%.

Figure 3. Breakdown of total spend



Note: The data refer to the 10 case study areas as of July 2022[24]

Events and vaccine administration

The CVC programme was aimed at incentivising vaccinations through various means and different LAs focused on diverse types of outreach depending on the type of community they were trying to engage with. This meant that the kind of events each LA organised were very different, with certain communities deemed to benefit from face-to-face events while others, more from other types of activities. The events organised as part of the CVC programme included: face-to-face engagement sessions, pop-up vaccination clinics, health and wellbeing hubs, online engagement and networking, social media posts, and flyer distribution.

Table 12 summarises the number of events organised by the 10 case study areas across different points in time. A total of 2,387 events were recorded in the MI data, with 684 face-to-face events and 226 online events. The largest number of events were

[24] MI data for October 2022 did not report this classification of costs.

organised in July 2022, with an average of 53 events organised per supported LA. There is substantial variability in the number of events organised by each LA. Events included in the Other category varied.

As of October 2022, 8 of the 10 case study areas reported that they were still delivering the CVC programme, suggesting that some of the impact may yet to be observed.

Table 12. Number of CVC events in the 10 case study areas

Case study areas (n=10)	All	Online	Face-to-face	Other
Jan22 - Feb22	292	33	239	20
Mar22	161	21	96	44
Apr22	216	27	62	127
May22	332	33	69	230
June22	352	20	49	283
July22	583	19	74	490
Oct22	451	73	95	283
Total	2,387	226	684	1,477

Many of the events organised as part of the CVC programme included the direct administration of vaccines on site. These were usually delivered by pop-up vaccination clinics and vaccination buses. Table 13 shows the number of vaccinations at these events as recorded by the MI data for different points in time. Since MI data is missing for August and September 2022, an estimated total number of vaccines is also calculated replacing the number of vaccines in these two months for the average across the available monthly data.

The total number of vaccines recorded by the MI data is 4,975 with the majority of these being booster doses – 3,822 (77%) booster doses were administered – with fewer first doses (427) and second doses (726). The number of vaccines delivered by each LA varied substantially as some programmes focused on more face-to-face events with the aim of directly delivering vaccines, while others focused on the spreading of COVID-19 information to incentivise minority communities to get vaccinated through pre-existing channels. Additionally, the self-reporting nature of the MI data collected implies that these estimates are subject to large uncertainty as this type of data is prone to measurement errors.

Table 13. Number of vaccines delivered at CVC events across the 10 case study areas

Case study areas (n=10)	All	First dose	Second dose	Booster
Jan22-Feb22	1051	119	191	741
Mar22	739	66	199	474
Apr22	809	33	53	723
May22	536	43	62	431
June22	399	61	73	265
July22	515	71	118	326
Aug22-Oct22	926	34	30	862
Total	4975	427	726	3822

Note: The number of vaccines delivered at CVC events was recorded in the MI data for the period Jan22 – Oct22 across the 10 case study areas. The MI data reports were collected monthly, apart from the start of the programme, where they covered both Jan and Feb, and the end of the programme, where it covered Aug22 to Oct22.

The extent to which the vaccines delivered at CVC-funded events is additional is uncertain, as some of the administered vaccines may have been delivered regardless of whether CVC funding was received. For example, an individual that received a booster dose in a pop-up vaccination clinic may have been just as likely to have received a vaccine through regular vaccination channels.

The counterfactual impact analysis findings seem to suggest that part of the increase in booster vaccination rates may be attributable to the CVC programme. This result is consistent with the finding that the CVC programme events tended to deliver a much larger proportion of booster doses compared to first and second doses. This finding also stands out from the overall national vaccination pattern of more first and second doses compared to boosters, providing further evidence that without the CVC programme events these booster vaccinations may not have occurred.

Using the additionality proportion of 14.7% as found by the CIE analysis in the previous section, we can estimate the number of additional vaccinations administered at CVC-funded events. The number of total additional booster vaccinations ranges between 562 and 702 depending on whether actual or estimated vaccinations are used.

Number of cases prevented and their social value

Estimating the social value of a COVID-19 vaccine needs to take into consideration several factors and there are different approaches which take into account different economic benefits from vaccinations. The approach used in this note is to estimate the number of cases prevented by the CVC programme, and then determining the economic benefits using estimates from the literature which will be detailed below.

The number of COVID-19 cases a vaccine can prevent depends on several factors, including the vaccine's efficacy rate, the prevalence of the virus in the population, and the level of vaccination coverage (Bartsch et al. 2020).

For example, a vaccine with an efficacy rate of 95% would prevent 95 out of 100 people who receive the vaccine from getting sick with COVID-19, assuming that they would have otherwise been exposed to the virus. However, in real-world scenarios, the efficacy rate of a vaccine can be lower due to various factors, such as the emergence of new variants of the virus and individual immune response.

The actual number of cases prevented by a COVID-19 vaccine also depends on the level of vaccination coverage in the population. The more people who are vaccinated, the fewer cases of COVID-19 there will be, as the virus has fewer opportunities to spread from person to person. The R-value of a virus indicates the average number of individuals an infected person is likely to infect. As of January 2023, the R-value estimated for COVID-19 is estimated between 1 and 1.2[25].

According to BMJ (2022)[26] the efficacy of the current vaccines (Pfizer-BioNtech and Moderna) in the Omicron period, after December 2021, varies according to the number of doses received and the number of months since the vaccination. The vaccine effectiveness against hospital admission for those receiving their first dose was found to be around 43%, around 63% for second doses, and around 83% for booster doses.

Table 14 shows the estimated average number of cases prevented by vaccines delivered at CVC-funded events. The assumptions behind the estimated number of cases prevented are the following. A person exposed to COVID-19 will be infected with certainty if they are not vaccinated, while the probability of being infected when vaccinated is equal to one minus the vaccine effectiveness. Thus, the average number of infections resulting from an unvaccinated individual being exposed to COVID-19 is

[25] https://www.gov.uk/guidance/the-r-value-and-growth-rate accessed on the 2nd February 2023
[26] https://www.bmj.com/content/379/bmj-2022-072141 accessed on the 2nd February 2023.

between 2 and 2.2 (i.e. one plus the R-value as the individual is being infected), while this value is multiplied by the vaccine effectiveness in order to get the number of total infections from a vaccinated person being exposed to COVID-19. The difference between these two values gives an estimate of the average number of cases prevented per vaccine[27].

The total estimated gross number of cases prevented by vaccines administered at CVC-funded events is 8,007.8.

The largest proportion of the cases prevented is provided by booster vaccines administered at the CVC-funded events. This is due both to the fact that a higher number of boosters was delivered at the events compared to first and second doses, and that booster vaccines appear to have higher effectiveness compared to first and second doses (BMJ 2022).

The net number of cases prevented by the CVC-funded activities represent additional cases prevented that can be attributed to the programme and wouldn't have been observed without intervention. Using the estimates of additionality from the CIE analysis in the previous section, 14.7% of booster vaccines are additional, while the first and second doses would have been administered anyway. Thus, this implies that 979.3 additional cases were prevented by CVC-funded activities in the 10 case study areas.

Table 14. Estimated average number of cases prevented by type of vaccine

	Vaccine effectiveness	Average number of cases prevented per vaccine	Gross number of cases prevented from CVC vaccines	Net number of cases prevented from CVC vaccines
First dose	43%	0.903	385.6	0
Second dose	63%	1.323	960.5	0
Booster	83%	1.743	6661.7	979.3

Note: Vaccine effectiveness values are taken from BMJ (2022). The average number of cases prevented is calculated using an R-value of 1-1.2 with the highest and lowest estimate indicated in brackets. The gross number of cases prevented is based on the estimated total number of vaccinations administered at CVC-funded events.

The social value of preventing a COVID-19 case is determined by various factors and it is likely to evolve over time. The estimate used in this note is taken from the report by

[27] An underlying assumption of this model is that across the period considered an individual will be exposed to covid-19 with almost certainty, this can be justified by a relatively high rate of mixing between the infected and uninfected population. Additionally, vaccine effectiveness is assumed to be constant.

Technical Advisory Group to the Welsh Government[28], which updates the figure of the social cost of a COVID-19 case using parameters relevant in January 2022. This study was the most up-to-date estimate of the social cost of a COVID-19 case as of October 2022 and it used parameters which were relevant for the timing and location of the CVC programme. The cost estimates are based on the ratio of cases to other outcomes – hospital admissions, ICU admissions, deaths and estimated long COVID cases. The social cost of a COVID-19 case is estimated at around £5,800 per case[29]. Thus, the social value of a booster vaccine is estimated at around £10,000, while that of a first and second dose are circa £5,200 and £7,500 respectively. The difference in the estimate of social value for each type of vaccine is due to the varying vaccine efficacy by type of vaccine, as booster doses are more likely to prevent infection, this difference is amplified by the R-value as it results in fewer cases from further infections.

The social benefit derived from the cases prevented by CVC-funded event is estimated using the social value of each vaccine administered at CVC-funded events, with the gross social benefit not taking into account additionality, while the net social benefit takes into account that some of the vaccines would have been delivered regardless of CVC funding.

Table 15 shows the estimates for the gross and net social value of the vaccines administered at CVC-funded events in the 10 case study areas. The total gross social value is estimated around £46.4m while the additional social value attributable to the CVC programme is estimated around £5.7m for the 10 case study areas. This implies a cost-benefit ratio of the CVC programme at around 1.44. However, this estimate is subject to significant uncertainty. as it relies on parameters which depend on specific assumptions. To address this, the sensitivity analysis considers alternative scenarios and assumptions.

[28] https://www.gov.wales/sites/default/files/publications/2022-06/the-social-value-of-a-covid-case-january-2022.pdf accessed on the 2nd February 2023. This study was selected as it provided an up-to-date estimate of the social value of a COVID-19 case taking into account both economic and health impacts of Covid cases. Previous estimates from Drakesmith et al. (2022) suggest a social cost of one COVID-confirmed PCR case around £21,100 in December 2020, falling to around £8,300 in January 2022. This indicated that the timing of the estimate was crucial in determining its relevance.

[29] The social value is estimated for January 2022, that estimate had been falling from a starting point of £21k in Dec 2020 thus could be lower for the period considered.

Table 15. Estimated gross and net social value of the CVC programme across the 10 case study areas

Vaccines delivered	Gross number of cases prevented	Gross social value	Net number of cases prevented	Net social value	Cost-benefit ratio
4,975	8,007.8	£46.4m	979.3	£5.7m	1.44

Note: The social value is calculated assuming £5,800 as the value of a COVID-19 case prevented and 14.7% of additional booster vaccines.

The number of vaccines recorded in the MI data for all 60 supported LAs is 27,850, of which 4,283 first doses, 5,945 second doses and 17,622 booster doses. This covers only vaccines up to July 2022 for which MI data was submitted by all supported LAs. The gross number of cases prevented by these vaccines, under the same assumptions as the analysis above, is estimated to be 42,447.2. This implies a gross social value of £246.2m.

Assuming the same additionality proportion as the case study areas implies that 2,590 booster vaccines would not have been delivered without CVC funding. This results in 4,515.1 cases prevented and £26.1 of net social value created. As the total allocated spend of the CVC programme is £18.9m, this implies a cost-benefit ratio of 1.38.

Table 16. Estimated gross and net social value across all 60 CVC-funded LAs up to July 2022

Vaccines delivered	Gross number of cases prevented	Gross social value	Net number of cases prevented	Net social value	Cost-benefit ratio
27,850	42,447.9	£246.2m	4,515.1	£26.1m	1.38

Note: The social value is calculated assuming £5,800 as the value of a COVID-19 case prevented and 14.7% of additional booster vaccines. The number of vaccines reported only considers those administered up to July 2022, as MI data is not available for all CVC-funded LAs for Aug22-Oct22

Sensitivity analysis

The final estimate of the net social value created by the CVC programme relies on several parameters, each associated with a degree of uncertainty. This section considers the sensitivity of the social value estimate to changes in the underlying parameters.

The uncertain parameters which affect the estimate of the net social value created are: the social cost of a COVID-19 case, the number of vaccines delivered at CVC events, additionality estimates for each type of vaccine, the R-value for COVID-19, and the vaccine effectiveness for each type of vaccine.

The social cost of a COVID-19 case was taken from the central estimate of the WTAG (2022) report for the healthcare costs as well as the QALYs loss from the average COVID-19 case. This estimate relies on several assumptions which are outlined in Table 16. An alternative estimate was also provided in the report which considered a more moderate valuation of a QALY loss and alternative parameters. This results in an alternative social value of a COVID-19 case prevented as £2,400, compared to the £5,800 value used in the previous section.

Table 17. Underlying assumptions for social cost of COVID-19 case

Parameter	Preferred	Alternative
QALY losses for cases	0.00167	0.0000889
QALY losses for hospitalization	0.031	0.0112603
NHS costs for hospitalization	£6,531	£7,085
QALY losses for ICU	0.03457	0.03457
NHS costs for ICU	£40,687	£22,198
QALY losses for deaths (discounted)	6.78	3.72
NHS costs for deaths	£232	£232
QALY losses from long COVID	0.3	0.3
NHS costs for long COVID	£100	£100
Value of QALYs lost	£70,000	£30,000
Social cost of COVID-19 case	**£5,800**	**£2,400**

Source: Welsh Technical Advisory Group (2022) "The social value of a COVID case January 2022"

There is a risk that vaccinations have been misreported in the Aug-Oct figure. The MI data collection form was changed from being monthly to being delivered once after three months, covering a three-month period. There is a risk that LAs have interpreted the reporting differently. Given the use of the total reported figure in the main analysis, sensitivity analysis wants to include an estimated higher figure, which employs the average monthly reported dose for August, September. The estimated total number of vaccines delivered at CVC-funded activities under this assumption is 6,219, of which 534 first doses, 907 second doses and 4,778 booster doses. These figures are used in the sensitivity analysis as an alternative assumption to consider the potential underreporting.

The proportion of vaccines delivered which can be considered additional is a key parameter which determines the net social value created by the CVC programme. The CIE, in the previous section, considered three possible comparison groups as the counterfactual. The median model was taken as the central estimate, however the other two estimates can be considered as alternative parametrisations for the sensitivity analysis. The surveyed comparison group implied no additionality in any of the vaccine types as vaccination growth was higher in the counterfactual for all types of vaccines, this is taken as the 'pessimistic' estimate. The comparison group derived from Model II instead implied an additionality estimate of 21.7% in booster doses, as 0.047% of the total 0.217% increase was unobserved in the counterfactual, this estimate gives an 'optimistic' scenario.

The R-value was taken from UK government estimates as of February 2023[30]. The estimate was found to be between 1.0 and 1.2, therefore for the central estimate a value of 1.1 was assumed but the two extremes can be used for sensitivity analysis.

The value for the effectiveness of each type of vaccine was taken from BMJ (2022)[31] as the vaccine effectiveness within 2 months of receiving the vaccine. The paper provides 95% confidence intervals for each of the estimates, for the sensitivity analysis we use each of the extremes of the confidence intervals as a 'pessimistic' and 'optimistic' scenario.

Table 18 considers the effect of changing a single parameter on the gross and net number of cases prevented as well as the estimate of social value created and the cost-benefit ratio. The parameters that have the highest impact on the latter are the additionality estimate and the social cost of a COVID-19 case as these affect the net social value created through the net number of cases prevented and their social valuation respectively.

Assuming no further vaccines are delivered, apart from those reported in the MI data, leads to a decrease in the gross number of cases prevented to 8,008 which leads to a gross and net social value of £46.4m and £5.7m respectively.

Changing the social cost of a COVID-19 case doesn't change the impact of the CVC programme in terms of estimated number of cases prevented, however it changes the valuation of this social benefit. The net social benefit decreases substantially under the alternative assumption to £2.4m, which leads to a cost-benefit ratio of less than one.

The alternative assumptions for additionality strongly affect the net social value created which varies from £5.7m to either £0 as no additional impact is observed under the surveyed comparison group, or £8.4m when additionality increases to 21.7% under the Model II estimate.

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[30] https://www.gov.uk/guidance/the-r-value-and-growth-rate accessed on the 2nd of February 2023.
[31] https://www.bmj.com/content/379/bmj-2022-072141 accessed on the 2nd February 2023.

Changing the R-value and vaccine effectiveness only changes the estimate of how many cases are prevented from the vaccines which were delivered, the alternative assumptions for these parameters don't have a large impact on the social value created.

Table 18. Sensitivity of social value estimate to single parameter changes

Parameter	Assumption	Gross number of cases prevented	Gross social value	Net number of cases prevented	Net social value	Cost-benefit ratio
Vaccines delivered at CVC events	4,975	8,008	£46,445,385	979.3	£5,679,805	1.44
	6,219	10,010	£58,059,259	1,224.2	£7,100,499	1.80
Social cost of a COVID-19 case	£5,800	8,008	£46,445,385	979.3	£5,679,805	1.44
	£2,400	8,008	£19,218,780	979.3	£2,350,264	0.59
Booster Vaccines Additionality	14.70%	8,008	£46,445,385	979.3	£5,679,805	1.44
	0%	8,008	£46,445,385	0.0	£0	0.00
	21.70%	8,008	£46,445,385	1,445.6	£8,384,474	2.12
R-value	1.1	8,008	£46,445,385	979.3	£5,679,805	1.44
	1	7,627	£44,233,700	932.6	£5,409,338	1.37
	1.2	8,389	£48,657,070	1,025.9	£5,950,272	1.50
First dose vaccine effectiveness	43%	8,008	£46,445,385	979.3	£5,679,805	1.44
	39%	7,972	£46,237,351	979.3	£5,679,805	1.44
	46%	8,035	£46,601,411	979.3	£5,679,805	1.44
Second dose vaccine effectiveness	63%	8,008	£46,445,385	979.3	£5,679,805	1.44
	57%	7,916	£45,914,824	979.3	£5,679,805	1.44
	68%	8,084	£46,887,519	979.3	£5,679,805	1.44
Booster vaccine effectiveness	83%	8,008	£46,445,385	979.3	£5,679,805	1.44
	82%	7,928	£45,979,865	967.5	£5,611,373	1.42
	84%	8,088	£46,910,905	991.1	£5,748,236	1.45

Table 19 outlines the values of the parameters for five scenarios considered. Scenario A provides the central estimate which is used in the previous section. Scenario B and C provide the pessimistic and optimistic parameter calibration for all the parameters excluding additionality. Scenario D and E are similar but also vary the estimate of additionality for booster vaccines.

Table 19. Alternative assumptions for each parameter scenario

Parameter	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
Vaccines delivered at CVC events	4,975	4,975	6,219	4,975	6,219
Social cost of a COVID-19 case	£5,800	£2,400	£5,800	£2,400	£5,800
Booster Vaccines Additionality	14.7%	14.7%	14.7%	0%	21.7%
R-value	1.1	1	1.2	1	1.2
First dose vaccine effectiveness	43%	39%	46%	43%	43%
Second dose vaccine effectiveness	63%	57%	68%	63%	63%
Booster vaccine effectiveness	83%	82%	84%	83%	83%

Table 20 shows the key outcomes for each of the five scenarios considered. The gross number of cases prevented is shown to vary under each parametrisation as the number of vaccines is varied and the number of cases prevented by each vaccine is dependent on its effectiveness and the R-value. This implies a variation in the gross number of cases prevented between 7,428 and 10,727.

The gross social value created also varies in each scenario as the social value of a COVID-19 case is estimated differently. This implies a minimum estimate of £17.8m and a maximum of £62.2m.

The net number of cases prevented and its implied social value prevented is dependent on both the number of vaccines delivered, the valuation of the social value of a COVID-19 case and, crucially, the additionality estimate. In fact, under the 'pessimistic' additionality estimate, none of the vaccines delivered are considered additional and the net social value estimate also becomes null. On the other hand, under the estimate provided by Model II the net social value increases to £10.5m as the net number of cases prevented is estimated at 1807.2.

Overall, there is substantial variation in the cost-benefit ratio under each of the five scenarios. It varies between 0.56 and 1.90 when additionality is held at 14.7%, while it varies between 0 and 2.65 when alternative estimates of additionality are considered.

Table 20. Sensitivity analysis of Value-for-money estimates

Assumptions	Gross number of cases prevented	Gross social value	Net number of cases prevented	Net social value	Cost-benefit ratio
Scenario A	8007.8	£46,445,385	979.3	£5,679,805	1.44
Scenario B	7428.8	£17,829,072	921.4	£2,211,379	0.56
Scenario C	10727.0	£62,216,739	1,298.0	£7,528,240	1.90
Scenario D	8007.8	£19,218,780	0.0	£0	0.00
Scenario E	10010.2	£58,059,259	1,807.2	£10,481,689	2.65

Differences in impact by local authority

This section analyses the differences in cost and impact of the CVC programme across the 10 case study areas.

The data in this section is taken from the MI data collected for the programme. Each of the 10 case study areas recorded and reported their activities in different ways, additionally, the type of activities that each LA decided to engage in varied substantially, therefore direct comparability is not always possible.

Table 21 shows the cost, events and vaccinations reported by each of the LAs in the MI data. As discussed previously, there is variation in terms of the funding allocated to LAs for the CVC-funded activities, with two main ranges of overall spend with a maximum spend of around £185,000 (for those previously part of Community Champions) and £485,000 for LAs newly partaking in the programme. These different types of spending have resulted in different types of activities. In fact, the type and number of events varies across LAs, for example, Newham focused on face-to-face events while Oxford delivered a higher number of online events.

There is substantial heterogeneity in the number of vaccines administered at CVC events. This is mainly because each LA focused on different types of activities. The LAs which delivered the highest number of vaccines are Westminster and Kensington and Chelsea, with 1,389 and 1,929 vaccines delivered respectively, as they mainly focused funding towards a vaccine bus. Other LAs such as Cambridge and Hammersmith and Fulham did not directly administer any vaccinations as they instead focused on community events, advice sessions, and online awareness events.

The comparison of social value created by the CVC programme in each of these LAs cannot take into account only the value created from vaccines at CVC-funded events as there are other unobserved effects such as the value of community engagement and vaccine awareness which may be difficult to quantify.

Table 21. Cost, events and vaccinations by local authority

Local authority	Cost	Events				Vaccinations			
	Overall	Total	Face-to-face	Online	Other	Total	First dose	Second dose	Booster
Boston Borough Council	£185,000	78	19	43	16	10	1	2	7
Bristol City Council	£485,000	248	211	1	36	404	56	97	251
Cambridge City Council	£341,274	304	27	99	178	0	0	0	0
Hammersmith and Fulham Borough	£485,000	7	7	0	0	6	0	0	6
Kensington and Chelsea Borough	£485,000	835	84	18	733	1929	175	294	1460
Lancaster City Council	£222,400	6	6	0	0	59	25	14	20
Newham London Borough	£485,000	238	143	4	91	572	67	80	425
Oxford City Council	£485,000	59	21	32	6	72	18	31	23
Sandwell Borough Council	£112,000	72	53	15	4	534	0	0	534
Westminster City Council	£485,000	503	82	8	413	1389	85	208	1096
Wolverhampton City Council	£185,000	37	31	6	0	0	0	0	0

Source: MI data submitted to DLUHC as part of CVC programme monitoring

Table 22 shows the type of face-to-face events organised by each of the LAs and the targeted communities which were identified.

The main observation from the MI data is that some of the LAs focused on vaccine administration as their main output with a focus on pop-up clinics and vaccine buses. These LAs, such as Westminster and Kensington and Chelsea, mainly focused their funding on vaccine buses which resulted in a high number of vaccinations recorded. However, it is to be noted that these LAs had the highest level of funding[1], so that for LAs with lower funding there may have been considerations of whether community engagement activities would have been more beneficial.

The lack of vaccine administration by some of the LAs does not represent a lack of impact of the CVC programme. In fact, the CVC-funded community engagement may have been necessary to inform individuals of the benefit of vaccines and tackle vaccine hesitancy, as a precursor to seeking to improve vaccine uptake at a later date. For example, by tackling misconceptions and concerns about vaccines making individuals seriously ill and long-term effects, natural remedies being ‘better’, not being at enough risk to warrant a vaccine, and impacts on fertility. Additionally, these types of events have other community-wide benefits in terms of outreach and social value[2], for example the Live Well events organised by Hammersmith and Fulham Borough, and the Bangladeshi Health Fair organised by Cambridge, informed participants on a wide range of health topics, not solely related to COVID-19.

Thus, two types of activities are identified: one aimed at delivering vaccines while the other at informing hard-to-reach communities. Both create social value and they complement each other; one by directly increasing vaccination rates, the other by increasing the pool of people who are willing to receive vaccines. In fact, most LAs chose a balance between these two approaches to maximise impact.

[1] To note that LAs with prior CC1 funding were allocated £185,000, and LAs with no prior CC1 funding £485,000.

[2] Quantifying these impacts in monetary terms falls outside of the scope of this note, thus impact is quantified only in terms of vaccinations administered.

Table 22. Type of events and target population for each case study local authority

Local authority	Type of events	Target population	Total vaccs.
Boston Borough Council	Pop-up clinics, Community engagement, Information sessions with translator	Eastern European group, Under 25s, Homeless people	10
Bristol City Council	Vaccine bus, Pop-up clinics, Information sessions with refugee and Muslim communities	Ethnic minorities, Young people, Job seekers, Faith communities, Refugees and asylum seekers	404
Cambridge City Council	Information sessions with targeted communities	Ethnic minorities, Under 25s, People with disabilities, Those with a pre-existing health condition	0
Hammersmith and Fulham Borough	Community events with activities and information sessions	Low income households, Black communities, Asian communities	6
Kensington and Chelsea Borough	Vaccine bus	Ethnic minorities, Pregnant women, Under 25s, Individuals with learning difficulties	1929
Lancaster City Council	Pop-up clinic	Under 25s, Refugees and asylum seekers, Ethnic minorities, Traveller communities, Parents of young children, Homeless people	59
Newham London Borough	Pop-up clinics, Information sessions with homeless and sex workers	Ethnic minorities, Homeless people, Sex workers, Undocumented residents	572
Oxford City Council	Pop-up clinics, Information sessions with refugees and asylum seekers	Under 25s, ethnic minorities, Traveller communities, Pregnant women, areas of high deprivation, Homeless people, Refugees and asylum seekers	72
Sandwell Borough Council	Pop-up clinics, Information session with African Caribbean community	Black African and Caribbean communities, Asian communities with (focus on Pakistani and Bangladeshi)	534
Westminster City Council	Vaccine bus	Ethnic minorities, Pregnant women, Under 25s, Individuals with learning difficulties	1389
Wolverhampton City Council	Community events, Information sessions, Pop-up clinics	Ethnic minorities, Faith communities, Low socioeconomic status individuals, Under 25s	0

Source: MI data submitted to DLUHC as part of CVC programme monitoring
Note: The type of events only regards face-to-face events and it is not a comprehensive list of the events organised