COVID-19 surge testing in a unitary local authority in England: an observational study

Authors & Correspondence

Norman, G. Title: Acting Deputy Director of Public Health. Dept: Public Health. Institution: Government of Jersey, 19-21 Broad Street, St Helier, Jersey. Postcode: JE2 3RR

Akomfrah, G. Title: Population Health Analyst. Dept: Public Health. Institution: Bedford Borough Council, Borough Hall, Bedford. Postcode: MK42 9AP, UK.

Mytton, O. Title: Honorary Consultant in Public Health, UCL Great Ormond Street, Institute of Child Health, 30 Guilford Street, London, WC1N 1EH.

Brown, I. Title: Consultant in Public Health. Dept: Public Health. Institution: Bedford Borough Council, Borough Hall, Bedford. Postcode: MK42 9AP, UK. [Corresponding author, Ian.Brown@bedford.gov.uk]

Abstract

Background: In May 2021, due to rising case rates and the detection of a new variant of concern, increased asymptomatic 'surge testing' for COVID-19 was implemented in Bedford Borough.

Methods: Over three weeks, surge testing in higher incidence areas utilised: 1) mobile testing units, 2) home test kit collection and drop-off, and, 3) Door-to-door outreach. Testing was voluntary and supported by a communication campaign. Test results and data provided by participants were analysed.

Results: During surge testing, 16% (n=5,018) of the target population were tested, resulting in 125 positive results (2.5%). Females, those identifying as white, and those living in the most deprived quintile (Q1) were over-represented in testing. Test positivity was relatively higher for ages 0-19 (4.0%), for minority ethnic groups (2.8%), and those not listing an ethnic group (15.1%). Test positivity was lowest for the door-to-door outreach approach (0.9%), despite collecting the most samples (2,225).

Conclusions: Surge testing in Bedford reached a large number of people, was particularly successful at reaching people living in the most deprived areas, and identified cases that might have been missed. However, the testing did not reach the majority of the population, and began after cases had begun to fall.

Introduction

As part of the 2021 strategy for managing COVID-19, the UK government advocated 'surge testing' to control the spread of the virus in areas with high case rates. Surge testing was described as, "increased testing (including door-to-door testing in some areas) and enhanced contact tracing in specific locations in England […] It involves testing of people who do not have any symptoms of COVID-19," [1] with the intention to, "monitor and supress the spread of COVID-19 [and] better understand new variants" [1].

Due to high case rates and the arrival of a new variant of concern (lineage B.1.617.2, subsequently termed 'Delta'), on 19 May 2021, Bedford Borough (a unitary authority in the East of England, population 175,000) was asked to undertake surge testing. In mid-May 2021, Bedford had the third highest rate among local authorities in England (123.6 cases per 100,000 on week-ending 16 May, compared to 17.4 cases per 100,000 in England as a whole) [2]. At that time, the dominant strain in England was the Alpha variant (lineage B.1.1.7) but in Bedford by mid-May the dominant strain had become Delta [2]. Subsequent government guidance recommended this testing should be in four areas of high incidence in Bedford [1].

In February 2021, the UK government had published a roadmap for lifting restrictions after the third national lockdown, that started on 6 January. From March to July there was a gradual easing of measures to control the spread of the disease, with consequently greater reliance on vaccination, testing and contact tracing. There were still significant measures in place, including legal limits on social contacts indoors (the 'rule of six' or two households) and strong encouragement for working from home. Vaccines were only available to those aged over 40 years [3].

During the intervention period, people in England were advised to get a test if they had one of the three classic symptoms of COVID-19, and there was widespread provision of PCR testing to enable this. Symptomatic testing continued during the period of surge testing. Lateral flow device tests had been available to the population since early April [4], and everyone in England was encouraged to use them twice a week [5].

Surge testing during this period provided an opportunity to suppress the spread of cases in four areas of highest incidence in Bedford. The testing modalities provided a way to target under-served groups who may not otherwise have come forward for testing.

The role of testing, particularly mass asymptomatic testing, in controlling the spread of COVID-19 remains debated. The extent to which this can be practically and equitably achieved is also uncertain. The aim of this paper is to describe the experience of surge testing interventions in one local area in England, Bedford Borough, and to describe the impact in terms of testing uptake and case identification.

Methods

Description of the interventions

During the intervention period, everyone living, working or studying in four areas of highest prevalence in Bedford Borough (Cauldwell, Kingsbrook and Queens Park wards and the new town of Wixams) was asked to participate in surge testing, in addition to the symptomatic and asymptomatic testing available nationally. The wards are part of Bedford town, which is an urban area with an ethnically diverse population, and Wixams is a new development on the outskirts of the Bedford. Relative to the other areas, Wixams has an older and less ethnically diverse population. A major communication campaign supported surge testing: leaflets were translated into the six most-

frequently spoken languages and community leaders – such as ward councillors, a local MP and prominent members of local ethnic minority communities – shared information and videos in key languages (including British Sign Language [6]) and via social media. [7]

The additional surge testing capacity provided in the areas of Bedford were as follows:

1. Mobile testing units:

Mobile testing units (MTUs) provided a drop-in service for asymptomatic individuals to receive a PCR test supervised by a trained operative. They accepted people in car or on foot, without needing an appointment. Attendees typically registered their own details on the online government testing portal using their mobile phone and had a nasal/throat swab, which was shipped that day for analysis and prioritised for whole genome sequencing.

Four MTUs were deployed, one in each area (see appendix 1). Locations were chosen based on their accessibility on foot, by public transport and private vehicle as well as their suitability for hosting MTUs and availability at short notice. MTUs operated daily between 20 May and 11 June, except Wixams, which closed on 29 May for operational reasons. Opening hours were from 08:00 until either 17:00 or 18:00, the widest possible given the operator's staffing constraints.

2. Home test kit collection & drop-off

While the mobile testing units were operational, volunteers were placed outside supermarkets and other community venues offering home testing PCR kits for collection. Volunteers gave advice on how to register and self-administer the test, return information. People were encouraged to return these directly to the venues rather than posting them due to the limited capacity of local post boxes. The Public Health team used local knowledge to identify higher-footfall locations (e.g. proximity to local amenities including supermarkets, shops and community centres), and select areas which were most likely to be accessible for those living in the most deprived parts of the target areas (appendix 1). Sites began operation on either 22 or 24 May and closed on 4 June, except Wixams, which closed on 26 May for operational reasons. Opening times were 08:00–18:00, the widest possible given volunteer availability. All sites were open daily, except for the late May bank holiday.

3. Door-to-door testing

Testing was offered by teams going door-to-door and delivering home test kits to households directly in Cauldwell, Kingsbrook and Queen's Park. Wixams was not included due to a fall in case numbers in that area. On Thursday 3 June, leaflets were distributed to all households across the areas advising them that this would be happening, along with communications from the council, shared and amplified by local leaders and community organisations.

Two teams delivered door-to-door testing: 1) a nationally funded 'Surge Rapid Response Team' and, 2) a local authority-led team, drawing from community volunteers and public sector employees. Between Friday 4 June and Tuesday 8 June, the teams went door-to-door, and knocked on doors of households they could access. The majority of those undertaking the door knocking in both teams lived or worked in the Bedford Borough area. To those that answered, the teams explained the rationale for testing and asked all household members aged over 5 to take a PCR test. The team gave advice on how to register and take the test, leaving the test kits with residents. The team collected the tests up to 2 hours later, or, where that wasn't suitable for residents, the team gave information about how to return test kits via community collection points or post.

Data collection

When taking a test, individuals had to register basic demographic data (age, gender, ethnicity, address and postcode) either on an internet portal or over the phone. Data were uploaded to a national

database. All tests completed at a mobile testing unit (MTU) had a unique serial number that made it possible to link the test to the testing modality.

The database was managed by Public Health England and was made available for local surveillance purposes. Population sizes by ward were obtained from the National Immunisation Management System (NIMS). PCR testing was not promoted for under 5s but testing data revealed that under 5s were tested during the intervention period, and so 0-5s were included in the denominator population accordingly.

Data analysis

Data were analysed in Excel 2016. Total tests, total positive tests and total cases were estimated for the relevant wards based on the registered postcode. Wixams was excluded from all analysis as the surge testing interventions were discontinued early.

For MTUs, tests and cases were extracted. Those that did not live in the relevant wards were excluded, so that analyses could be performed on the resident population for whom there is good demographic data. For collection, all tests coded as home tests for residents of the target wards, and with a specimen date between intervention start date and 4 June were included.

For door-to-door, all tests coded as home tests for residents of the target wards with a specimen date between 5 June and intervention end date (6 June for Queen's Park; 8 June for Cauldwell & Kingsbrook) were included.

Comparisons between groups and risk ratios were made using two-sided t-tests. The Exact method was used to calculate 95% confidence intervals.

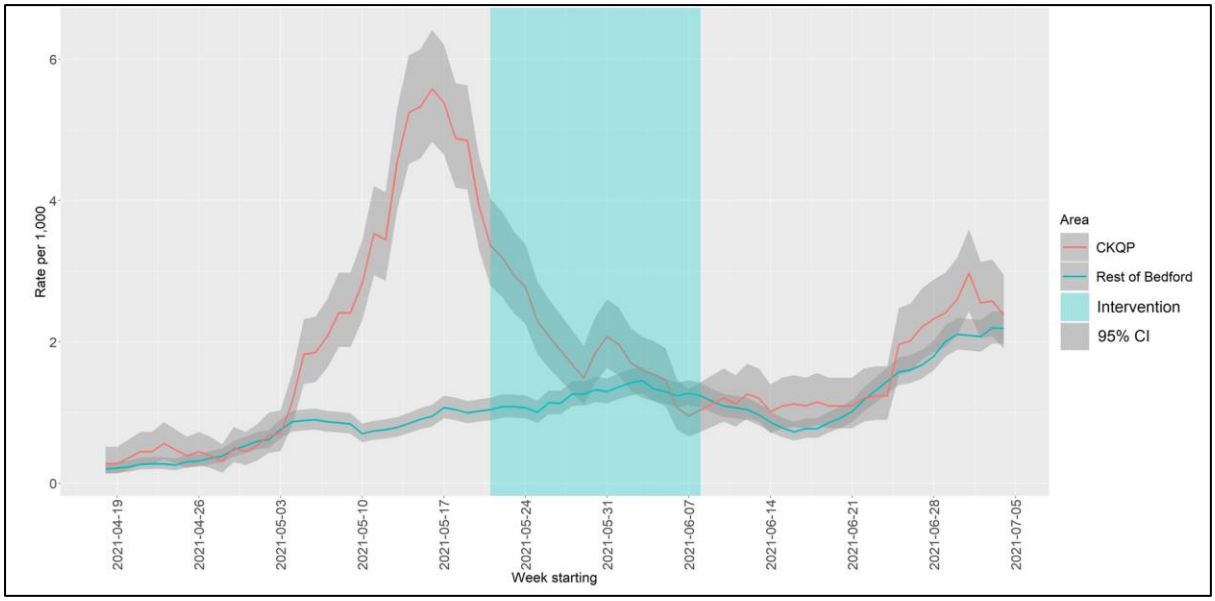
This analysis was part of enhanced public health surveillance during the pandemic, under the terms of a Data Sharing Agreement between Bedford Borough Council and Public Health England. Consequently, ethical approval was not required for the work.

Results

Overall, 5,018 tests were completed. Given the estimated eligible population (30,981), this is around 16% of the population, assuming individuals only tested once. Amongst the completed tests, 125 positive tests were reported (2.5% of tests).

Figure 1 shows the rolling 7-day case rate in the intervention areas compared to the rest of Bedford Borough. The rate of cases in the intervention area was significantly higher than in the rest of Bedford prior to the start of surge testing when testing was being planned. The case rate had already started to fall before the intervention began and continued to fall during the intervention period, although this was not known to the Public Health department at the time.

Figure 1: Rolling 7-day case rate in CKQP (Cauldwell, Kingsbrook & Queens Park) and the rest of Bedford Borough



The demographic characteristics of those who were tested are shown in Table 1. Tests were completed by people from across the demographic spectrum.

The probability of completing a test by demographic, location and testing modality is shown in

Table 2. Compared to females, males were 18% less likely to be tested (RR 0.82, 95% CI 0.77, 0.86). Compared to people of white ethnicity, those who did not record an ethnicity were 78% less likely to be tested (RR 0.22, 95% CI 0.19, 0.25) and minority ethnic groups were 37% less likely to be tested (RR 0.63, 95% CI 0.60, 0.66). Compared to those in the most deprived quintile, those in quintiles 2 and 3 were, respectively, 24% (RR 0.76, 95% CI 0.72, 0.80) and 32% (RR 0.68, 95% CI 0.59, 0.77) less likely to complete a test.

By testing modality, the probability of being tested through the door-to-door campaign was 55% higher (RR 1.55, 95% CI 1.46,1.66) than through the MTUs. There was no significant difference between MTUs and collection.

The demographic characteristics of those that tested positive are shown in Table 1. Positive results were identified in people from across the demographic spectrum. Positivity was higher among those aged 0-19 years (4.0%) than all older age groups, and among those that did not report an ethnicity (15.1%) and from a minority ethnic group (2.8%) compared to white ethnicity (1.3%). Positivity was higher for those living in Queen's Park (4.1%) compared to the other areas, and those living in the most deprived quintile (2.8%) compared to quintile 2 (2.4%) and quintile 3 (0.5%).

The probability of receiving a positive result by demographic, location and testing modality is shown in

Table 3. Compared to those aged 0-19, those aged 60+ were 76% less likely to receive a positive test (RR 0.24, 95% CI 0.12, 0.50). Compared to those living in quintile 1 (most deprived), those living in quintile 3 were 82% less likely to receive a positive result (RR 0.18, 95%CI 0.02, 1.26). The differences for other age groups, genders, ethnicities and areas were not statistically significant.

Table 1:Descriptive analysis of tests completed and positive tests by population demographics, location and testing modality

Demographic characteristic	Population total	Tests completed		Positive tests	
		n	%	n	%
All	**30,981**	**5,018**	**16.2%**	125	2.5%
Age (years)					
0-19	**9,232**	**1,532**	**16.6%**	61	4.0%
20-39	9,172	1,309	14.3%	28	2.1%
40-59	7,969	1,337	16.8%	28	2.1%
60+	4,608	840	18.2%	8	1.0%
Gender					
Female	15,569	2,771	17.8%	59	2.1%
Male	15,412	2,236	14.5%	65	2.9%
Unknown	-	11		<5	-
Ethnicity					
White	13,455	2,996	22.3%	40	1.3%
Not known	4,768	232	4.9%	35	15.1%
Minority ethnic group	12,758	1,790	14.0%	50	2.8%
Area					
Kingsbrook	10,290	2,036	19.8%	35	1.7%
Cauldwell	11,189	1,615	14.4%	34	2.1%
Queens Park	9,502	1,367	14.4%	56	4.1%
Deprivation quintiles					
Q1 (most deprived)	12,660	2,406	19.0%	67	2.8%
Q2	16,729	2,407	14.4%	57	2.4%
Q3	1,592	205	12.9%	<5	-
Testing modality					
Mobile testing units	30,981	1,433	4.6%	53	3.7%
Collection	30,981	1,360	4.4%	52	3.8%
Door-to-door	30,981	2,225	7.2%	20	0.9%

Table 2: Probability of completing a test by demographic, location and testing modality

Demographic characteristic	Population total (n)	Tests completed (n)	Probability of completing a test (Risk)	Risk Ratio (95% CI)	P value
All	**30,981**	**5,018**	**0.162**		
Age					
0-19	**9,232**	**1,532**	**0.166**	**Ref**	
20-39	9,172	1,309	0.143	**0.86 (0.80,0.92)**	**<0.001**
40-59	7,969	1,337	0.168	**1.01 (0.95,1.08)**	**0.771**
60+	4,608	840	0.182	**1.10 (1.02,1.19)**	**0.014**
Gender					
Female	15,569	2,771	0.178	Ref	
Male	15,412	2,236	0.145	0.82 (0.77,0.86)	<0.001
Unknown	-	11			
Ethnicity					
White	13,455	2,996	0.223	Ref	
Not known	4,768	232	0.049	0.22 (0.19,0.25)	<0.001
Minority ethnic group	12,758	1,790	0.140	0.63 (0.60,0.66)	<0.001
Area					
Kingsbrook	10,290	2,036	0.198	Ref	
Cauldwell	11,189	1,615	0.144	0.73 (0.69,0.77)	<0.001
Queens Park	9,502	1,367	0.144	0.73 (0.68,0.77)	<0.001
Deprivation quintiles					
Q1 (most deprived)	12,660	2,406	0.190	Ref	
Q2	16,729	2,407	0.144	0.76 (0.72,0.80)	<0.001
Q3	1,592	205	0.129	0.68 (0.59,0.77)	<0.001
Testing modality					
Mobile testing units	30,981	1,433	0.046	Ref	
Collection	30,981	1,360	0.044	0.95 (0.88,1.02)	0.166
Door-to-door	30,981	2,225	0.072	1.55 (1.46,1.66)	<0.001

Table 3: Probability of receiving a positive test result (i.e. test positivity) by demographic, location & testing modality

Demographic characteristic	Tests completed	Positive tests	Probability of having a positive test result (Risk)	Risk Ratio (95% CI)	P value
All	5,018	125	0.025	-	-
Age					
0-19	1,532	61	0.040	Ref	
20-39	1,309	28	0.021	0.54 (0.35,0.84)	0.006
40-59	1,337	28	0.021	0.53 (0.34,0.82)	0.004
60+	840	8	0.010	0.24 (0.12,0.50)	<0.001
Gender					
Female	2,771	59	0.021	Ref	
Male	2,236	65	0.029	1.37 (0.96,1.93)	0.079
Unknown	11	<5	-	-	-
Ethnicity					
White	2,996	40	0.013	Ref	
Not known	232	35	0.151	11.3 (7.32,17.43)	<0.001
Minority ethnic group	1,790	50	0.028	2.09 (1.39,3.16)	<0.001
Area					
Kingsbrook	2,036	35	0.017	Ref	
Cauldwell	1,615	34	0.021	1.22 (0.77,1.95)	0.395
Queens Park	1,367	56	0.041	2.38 (1.57,3.62)	<0.001
Deprivation quintiles					
Q1 (most deprived)	2,406	67	0.028	Ref	
Q2	2,407	57	0.024	0.85 (0.60,1.21)	0.362
Q3	205	<5	-	-	-
Testing modality					
Mobile testing units	1,433	53	0.037	Ref	
Collection	1,360	52	0.038	1.03 (0.71,1.50)	0.862
Door-to-door	2,225	20	0.009	0.24 (0.15,0.40)	<0.001

Discussion

Main findings of this study

In our study, surge testing for COVID-19 reached about 1 in 6 of the target population. By the time high case rates were detected and surge testing was mobilised, cases rates were already falling. In the weeks leading up to the intervention period in Bedford Borough, around 5,500 individuals were being PCR tested every week. This rate increased to around 10,000 during the surge testing intervention.

The interventions did disproportionately reach those most who lived in the most deprived neighbourhoods. For other demographic factors (ethnicity and age), testing was accessed most by those least likely to test positive. For example, those in a minority ethnic group or who did not register their ethnicity were significantly less likely to be tested, but more likely to test positive than white people.

Considering test modality, more people were tested through door-to-door outreach than either mobile testing units (MTUs) or test collection. This is the inverse of the resource requirements; door-to-door was most resource intensive, and collection and drop-off was least intensive. People tested through door-to-door testing were less likely to be positive than those tested through MTUs or collection.

What is already known on this topic

This is the first observational study of surge testing using PCRs within the UK of which we are aware. An evaluation of a pilot of mass lateral flow device testing in Liverpool that reached 45% of the Liverpool population (n=500,000) over 8-months, similarly found that a greater percentage of females accepted tests than males, and that test positivity was higher in minority ethnic groups and lower among older people [8].

Some of the pilot study's findings differed from ours. The Liverpool study found lowest uptake among those living in the most deprived areas. The intentional placement of venues in most deprived quintile in our study may explain the difference. The Liverpool study also found that minority ethnic populations had a greater uptake than white people in contrast to our study [8]. We are unclear why this difference emerged and it warrants further exploration.

What this study adds

Our findings demonstrate the importance of involving organisations with local knowledge and community links in developing and implementing surge testing. Understanding the geography, population demographics and scoping locations is time consuming without prior knowledge, and so involving organisations with local knowledge is critical to rapid deployment of surge testing. Additionally, uptake was highest in some groups who were least likely to test positive (e.g. older age groups, white people) suggesting that even despite best efforts in this study, inequalities in access persist, and highlights the importance of engagement with different parts of the community and community leaders.

The fact that cases were already falling in the areas before the intervention was live is significant because it highlights the challenges inherent in surge testing in small areas. In small areas, a small number of additional cases could be interpreted as a concerning rise, but regression to the mean may occur before interventions can be launched. If surge testing is to be deployed again for COVID-19 or another infectious agent, having locally agreed and tested plans could reduce the time between identification of an adverse trend and implementation of testing.

Future work should seek to understand the opportunities and barriers to ensuring equitable access to mass screening interventions to consider how messages might be best targeted at those who have the most to gain. Future publications of similar surge testing initiatives would be welcomed to enable sharing of the impact of interventions and lessons learnt, shedding further light on whether surge testing is effective outbreak management tool in small areas.

Limitations of this study

The main study limitation is that it is not possible to separate out the home testing kits issued as part of the collection and door-to-door modalities from the background rate of symptomatic home test use. Normal (symptomatic) testing continued in the background – either as postal tests or by attending symptomatic in-person testing stations. With the exception of people attending a dedicated symptomatic in-person testing station it has not been possible to remove symptomatic testing, which would have happened anyway, from the analysis. It is likely that we have over-estimated the number of tests undertaken through collection and door-to-door approaches.

Secondly, completed tests and positive tests were the primary metrics used but some people could have had more than one completed test. This may mean the intervention reached a lower proportion of the population than estimated. The number of unique cases was lower than positive tests by around 20%, suggesting some people may have been tested multiple times; it is not possible to repeat that analysis for negative tests. Finally, the denominator used for the population (NIMS) is based on GP registered rather than resident population. These estimates may have inflated the population size in some groups more than others; for example, NIMS estimates are thought to over-estimate younger age groups [9]. This means that the testing rates in the younger age groups may be under-estimated relative to other age groups.

In conclusion, the surge testing implemented in Bedford was able to reach a large number of people, was particularly successful at reaching people living in the most deprived areas, and helped identify cases that may not otherwise have been identified. However, the testing did not reach the majority of the population and by the time surge testing had been mobilised cases had already started to fall.

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Appendix

Appendix 1: Map of Bedford Borough, the intervention areas and locations of home test collection and drop-off and mobile testing units