Liverpool Covid-SMART Pilot

Systematic **M**eaningful **A**symptomatic **R**epeated **T**esting

Addressing SARS-CoV-2 transmission
and harms from Covid-19 restrictions, as one system

10th December 2020 for SAGE Covid 72

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Department of Health & Social Care · NHS Test and Trace · ARMY · Public Health England · Liverpool City Council · UNIVERSITY OF LIVERPOOL · NHS Liverpool Clinical Commissioning Group · NHS Mersey Care NHS Foundation Trust · MERSEYSIDE RESILIENCE FORUM · Cheshire & Merseyside Health & Care Partnership

Intervention and evaluation

- Oct 31: Govt offers Liverpool mass testing with military assistance
- Nov 1: Mersey Resilience Forum accepts in principle, for resilience *and* recovery
- Nov 3: Liverpool accepts a MAST (Mass Asymptomatic Serial Testing) pilot during Tier 3, working toward targeted approach; emergency response stood up
- Nov 5: national lockdown; communications drive; Cheshire & Mersey CIPHA (Combined Intelligence for Population Health Action) dataflows; pilot activated
- Nov 6: first 6 asymptomatic testing sites (ATS) open, 16 within 24h
- Nov 11: capacity increased: 48 ATS; 15 mobile units; home PCR kits (one off); after action evaluation (biology; behaviours; systems) steering group
- Nov 20: 15 popular ATS kept; redeploy to smaller ATS in low uptake areas
- Dec 2: Liverpool into Tier 2
- Dec 3: handover from military; targeting begins as Liverpool Covid-SMART (Systematic Meaningful Asymptomatic Repeated Testing)

Summary of findings

- From 6th Nov to 9th Dec 25% of the Liverpool population took up LFT and 35% took up either LFT or PCR, where 891 positive individuals were identified by LFT and 2829 by PCR

- Planning week vital: logistics, combined data/intelligence, communications

- Key to deployment: daily command, data review, rapid adaptation

- Innova lateral flow test (LFT) detecting ~2/3 of substantially infectious people, and not detecting ~3/5 PCR positive people

- Predictors of low uptake predictors: digitally excluded, deprived, young adult males

- Some areas with higher prevalence had lower uptake, but not consistently

- High variability of uptake between neighbourhoods and over time

- Uptake varied with delivery/access site type and communications

- Uptake of PCR had larger consistent socio-demographic inequalities than LFT

- Switch from national to local follow-up system improved confirmatory PCR uptake

- Media misinformation over LFT affected public confidence

- Repeated LFT and LFT+ PCR combinations can improve accuracy but need careful explanation

- Shift from MAST (Mass Asymptomatic Serial Testing) to SMART (Systematic Meaningful Asymptomatic Testing) to reflect end-to-end, responsive solution

- SMART: test-to-protect (the vulnerable); test-to-release (from quarantine); test-to-enable (abeyance of restrictions)

- Better support for those isolating is essential to uptake out of lockdown or Tier 3

- Emergency (gold/silver/bronze) operations and intensive resources needed to deploy testing

Quality Assurance of Innova LFT (+ procedure)

		QA PCR Result		
		Negative	Positive	Void
LFT Site Result	Negative	5405	41	341
	Positive	3	28	2
	Void	18	4	0

Accuracy measures (excluding VOID results) with 95% CI:
Sensitivity (true positive rate) = 40.58% (28.91% to 53.08%)
Specificity (true negative rate) = 99.94% (99.84% to 99.99%)

Predictive value of +ve test (post-test likelihood of PCR +ve)
= 90.32% (74.25% to 97.96%)
Predictive value of -ve test (post-test likelihood of PCR -ve)
= 99.25% (98.98% to 99.46%)

Operator variance inferred from Oxford/Porton Down validation studies: -
- Swabbing quality (supervision/instruction)
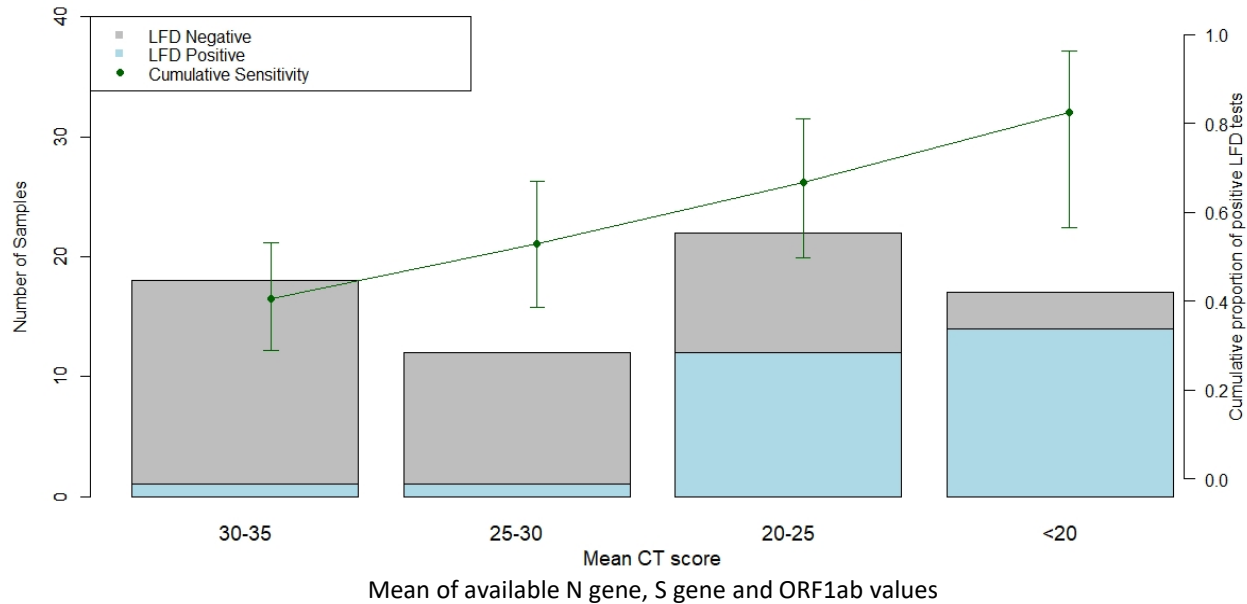- Feint blue line reading
- Mis-labelling void

~ headroom for sensitivity

Test accuracy may also vary with: -
- Manufacture / batch variation
- Storage/transport - temperature

Ability to pick up the most infectious individuals

**Proportion of Samples with positive LFD test according to viral load**

**Proportion of Samples with positive LFD test according to N gene result**

Mean of available N gene, S gene and ORF1ab values
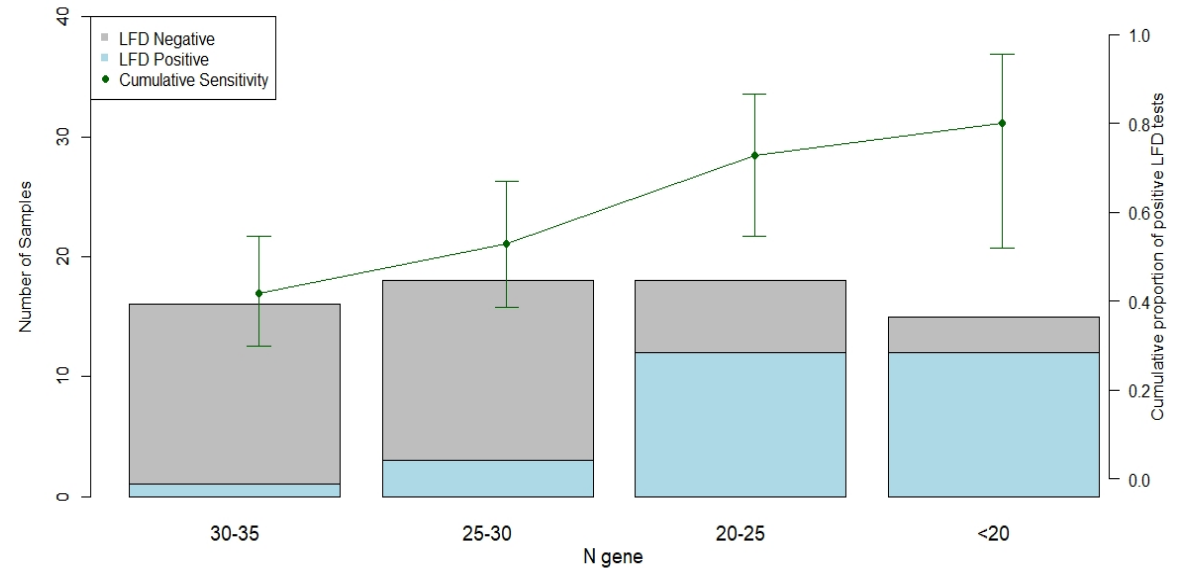
		Mean (N gene, S gene, ORF1lab) score {N gene only} from PCR								
		<20	**20-25**	**25-30**	**30-35**	+ve (n/a)	void (30-35)	void (>35)	void (n/a)	-ve
LFD Site Results	**-ve**	3 {3}	10 {6}	11 {15}	17 {15}	{2}	5 {6}	8 {4}	328 {331}	5405 {5405}
	+ve	14 {12}	12 {12}	1 {3}	1 {1}	{0}	0 {0}	0 {0}	2 {2}	3 {3}
	Void	2 {1}	2 {3}	0 {0}	0 {0}	{0}	0 {0}	0 {0}	0 {0}	18 {18}
Cumulative Sensitivity 95% CI		**82.4** (56.6, 96.2) {**80.0** (51.9, 95.7)}	**66.7** (49.8, 80.9) {**72.7** (54.5, 86.7)}	**52.9** (38.4, 67.1) {**52.9** (38.5, 67.1)}	**40.6** (28.9,53.1) {**41.8** (29.8, 54.5)}					

Working inference (viral loads/durations debated): detecting around two thirds of the substantially infectious people, and not detecting around three fifths of PCR positive individuals
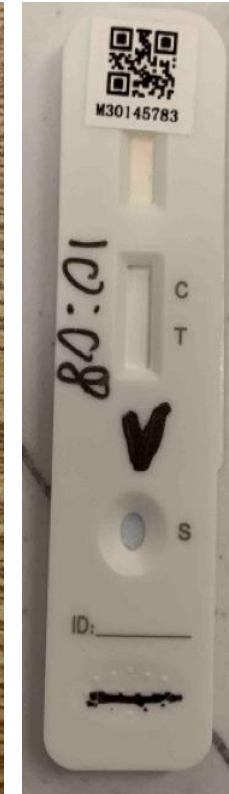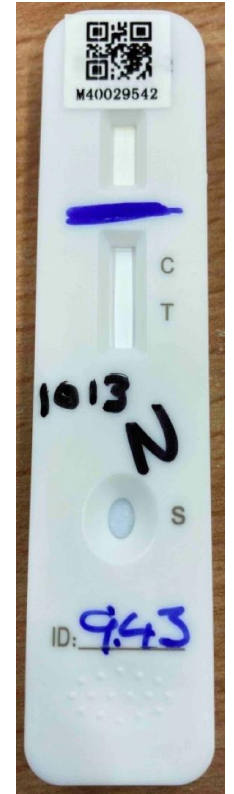
Variants of Innova device and labelling
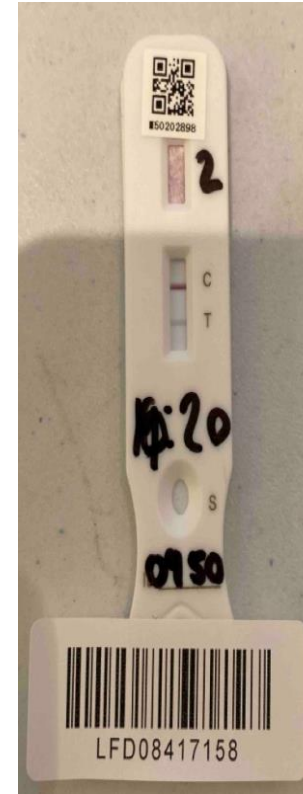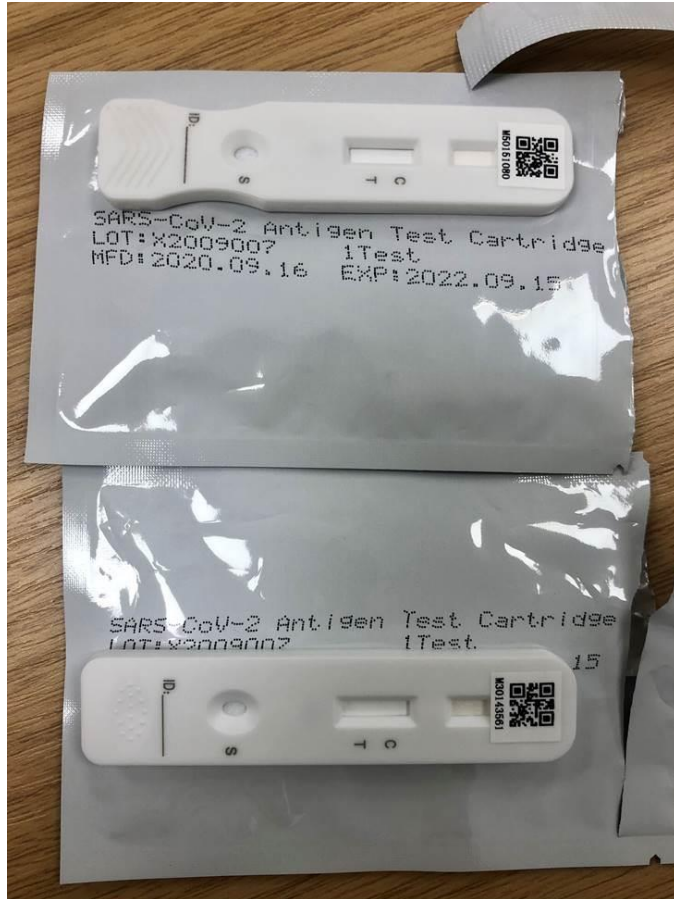
LFD08417158
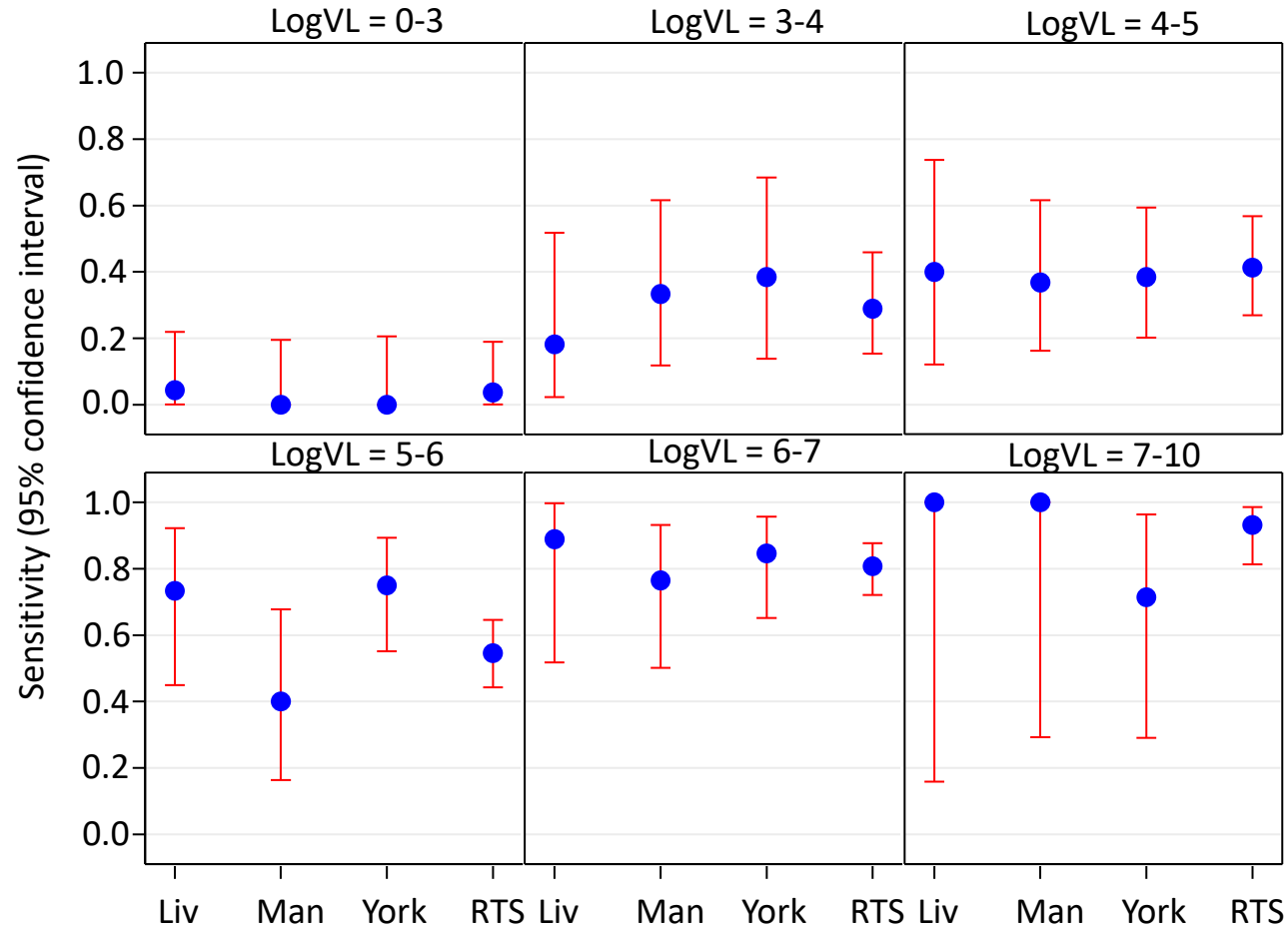CT: 19.5, MS2: 22.1
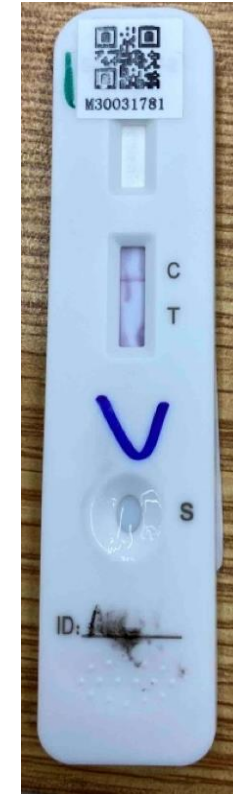
LFD08175065

LFD07469554

LFD08982472

Test accuracy could vary with manufacture, swabbing, temperature, reading, labelling
The end-to-end process sensitivity may have headroom for improvement

Heterogeneity of Innova LFT real-world accuracy

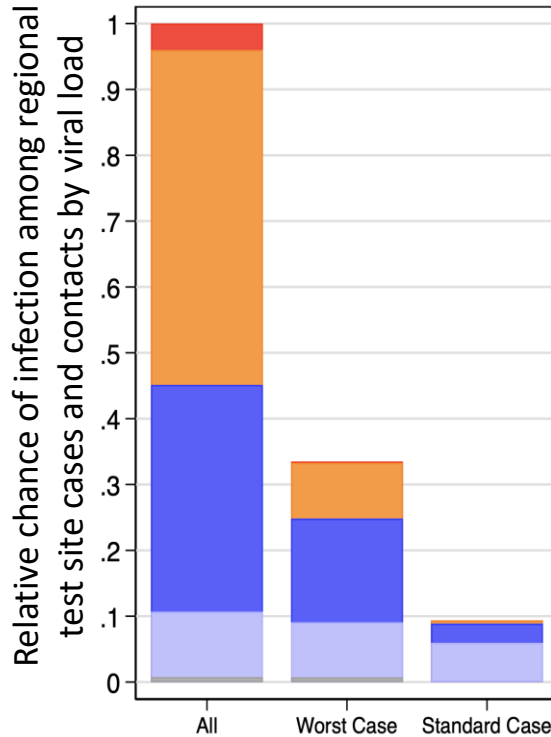Categories of $\log_{10}$ (viral load) = 12-0.328*Ct

Liv = Liverpool SMART pilot QA sample (n = 5859)
Man = Manchester drive in self-swab QA (n = 403)
York = York drive in self-swab QA (n = 599) – pending data assurance
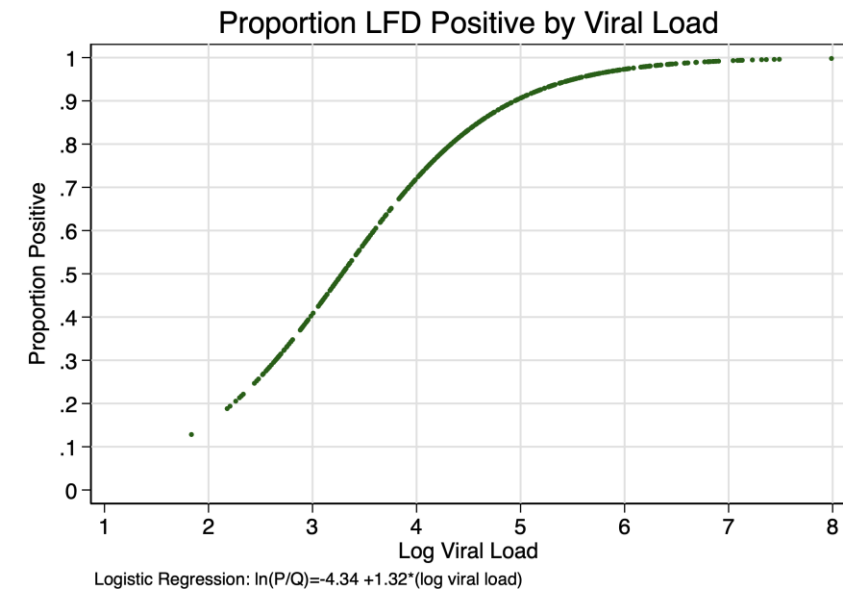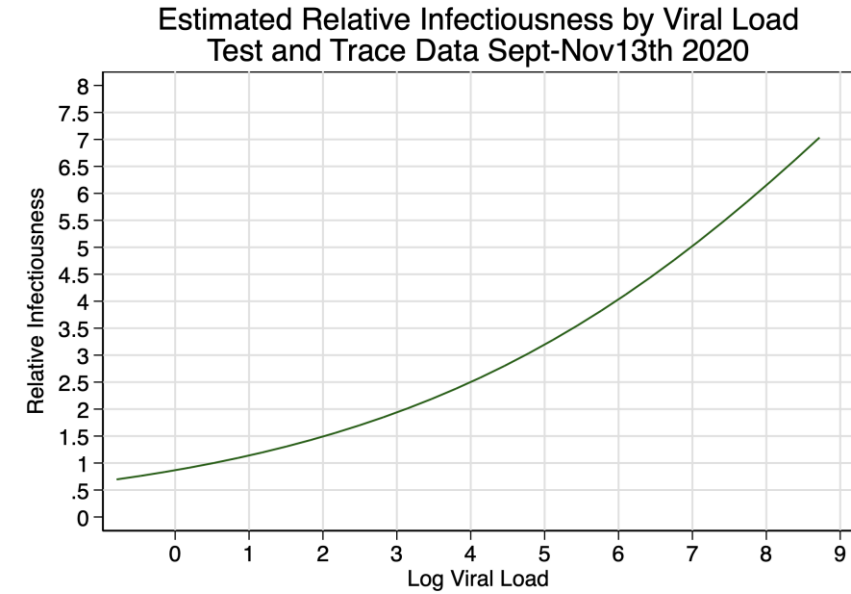RTS = DHSC Regional Test Site paired LFT + PCR reference study (n = 1704)
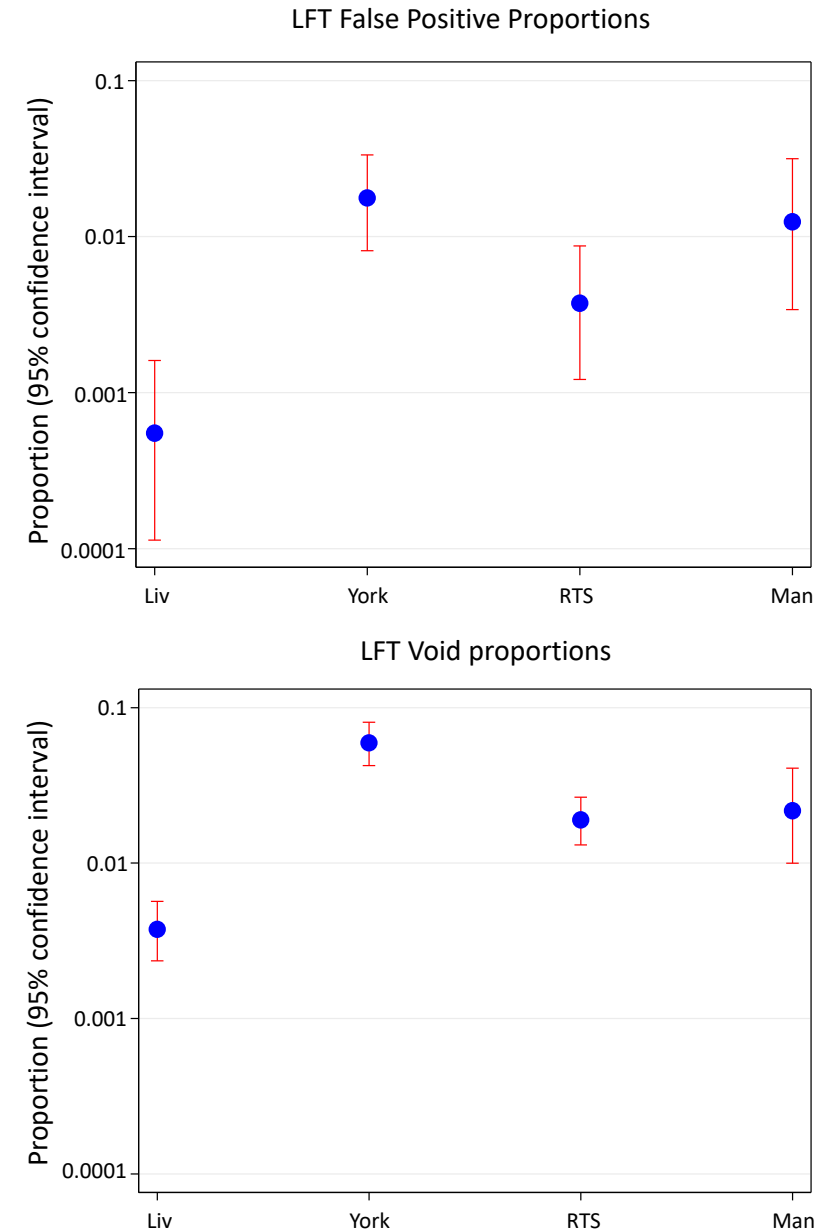
Assumption that Ct<25 picks up most infectious

Relative chance of being infected from data on contact networks and LFT + PCR pairs on those attending regional test sites and contacts (from T. Peto et al)

Data from Consecutive RTS Positive Individuals

Estimated Relative Infectiousness by Viral Load
Test and Trace Data Sept-Nov13th 2020

Viral load RNA copies/ml	Log viral load	Innova Liverpool detection %	Approximate Ct	
			Porton	Glasgow
>100M	8-10+	~100%	<14.9	<12.2
1-100M	6-8	~90%	14.9-21.5	12.2-18.3
10K-1M	4-6	~40%	21.5-28.1	18.3-24.4
100-10K	2-4	~20%	28.1-34.6	24.4-30.5
<100	0-2	~10%	>34.6	>30.5

Proportion LFD Positive by Viral Load

Logistic Regression: ln(P/Q)=-4.34 +1.32*(log viral load)
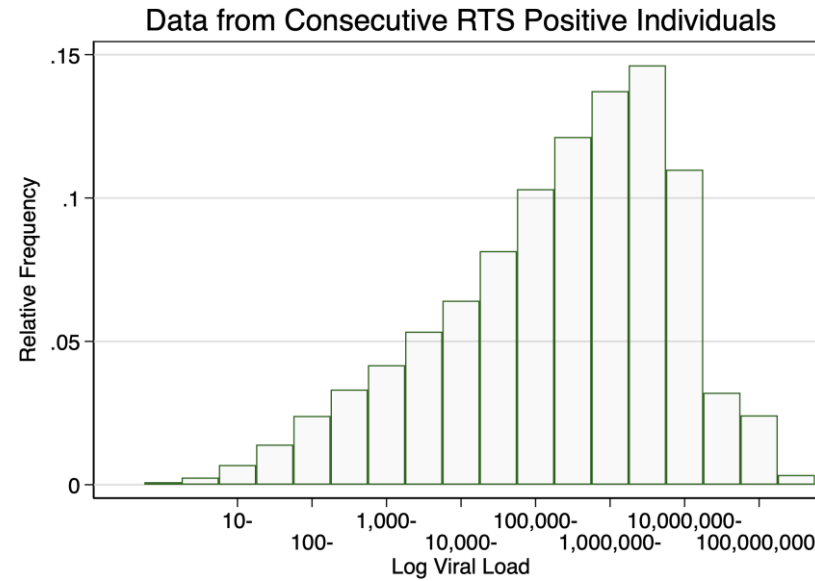
Confirmatory PCR uptake required local solution

Positive LFT result with confirmatory PCR within 5 days

Legend:
- **Positive LFT**
- **Positive LFT with PCR test within 5 days**

Y-axis: Number of tests (0 to 70)
X-axis dates: 11-06 through 12-10
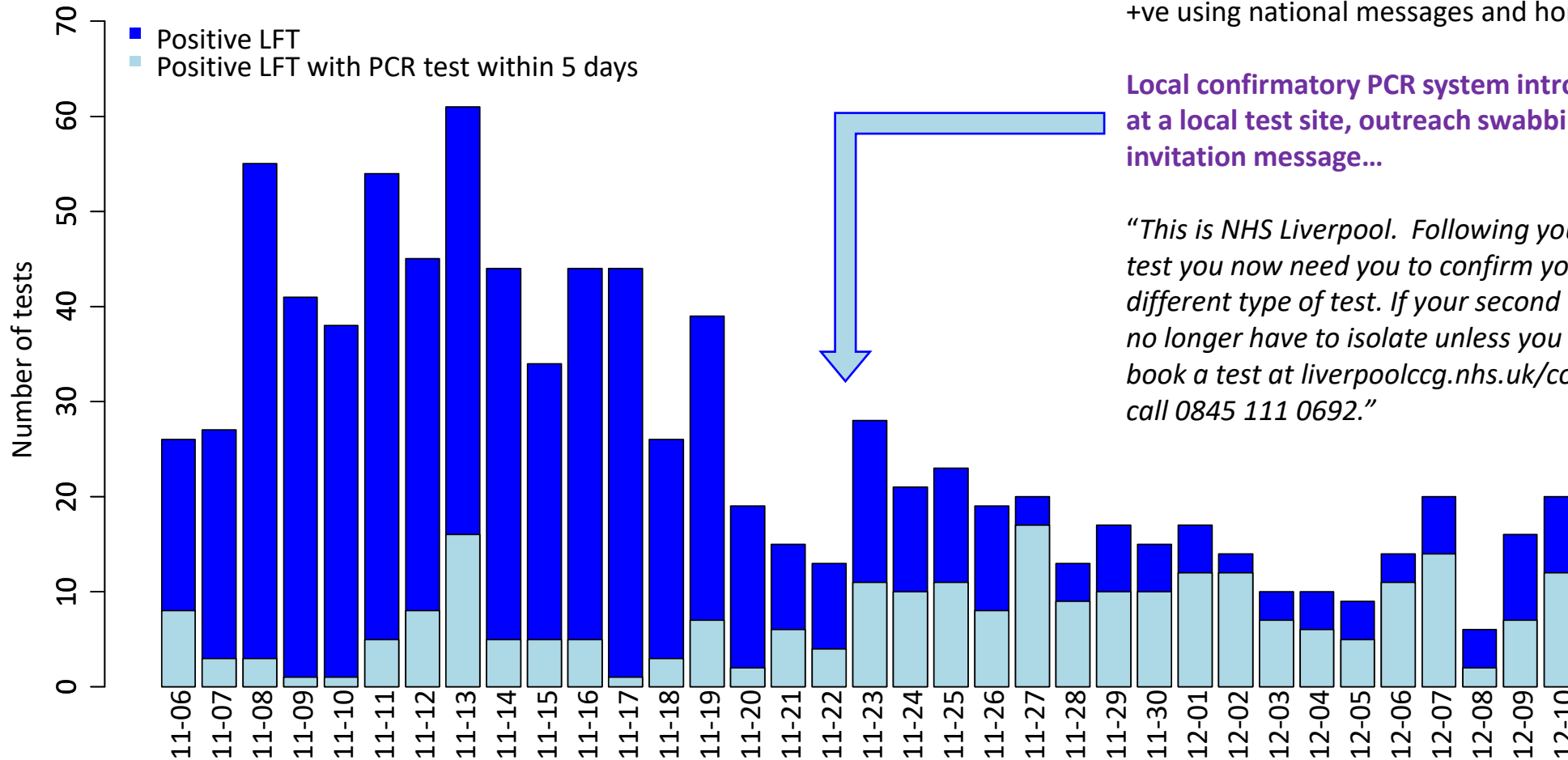
Problems with poor uptake of confirmatory PCR test for LFT +ve using national messages and home test kits

Local confirmatory PCR system introduced, with swabbing at a local test site, outreach swabbing and localised invitation message…

"This is NHS Liverpool. Following your positive COVID-19 test you now need you to confirm your result with a second, different type of test. If your second test is negative, you will no longer have to isolate unless you have symptoms. Please book a test at liverpoolccg.nhs.uk/confirmatory-pcr-test or call 0845 111 0692."

Care home visiting pilot from 3rd December

- Informed by paired LFT+PCR analysis, modelling in Liverpool and SPI-M, and focus group with Liverpool community stakeholders in care home living, operating and visiting

- Visiting protocol summary
  1. Visitor takes LFT and PCR at dedicated testing site within 24h of visit
  2. Proceed to care home if LFT –ve (overridden by +ve PCR if reported in time), isolate if +ve
  3. Second LFT at care home – proceed if –ve, isolate and confirmatory PCR if +ve
  4. Supervised visit with PPE and no hugging but hand holding through gloves; visitor signs agreement to observe rules, and homes apply risk assessments
  5. Visitor journey through care home documented

- Wider precautions
  - Continued emphasis of infection prevention and control / testing not fail-safe
  - Visitor household repeated testing encouragement

Summary: Liverpool and nearby (worker) residents

☰ Tests & Cases

All Cheshire & Merseyside (C&M) residents tested at any Pillar 2 test site and non-C&M residents tested at a C&M test site

NHS CIPHA Combined Intelligence for Population Health Action

593,576	**398,460**	**19,898**	**0.54 %**	**5.78 %**
Tests Completed (LFT+PCR)	Individuals Tested (LFT+PCR)	Individuals Tested Positive (LFT+PCR)	LFT Positivity Rate	PCR Positivity Rate

Dates Selected: 06/11/2020 – 09/12/2020

Note: positivity rate calculations do not follow PHE methodology

TEST COUNTS

Test Kit ▲	Tests Completed	Positivity Rate (not PHE methodology)	Positive Tests	Negative Tests	Void / Insufficient Tests
LFT	248,366	0.54 %	1,325	245,675	1,366
PCR	345,210	5.78 %	19,651	320,202	5,357
Total	**593,576**	**3.57 %**	**20,976**	**565,877**	**6,723**

INDIVIDUALS TESTED POSITIVE

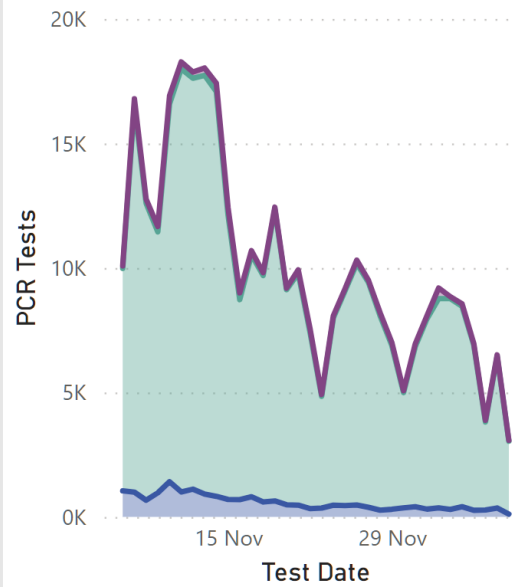| Test Kit ▲	Individuals Tested	Individuals Tested Positive	Positivity Rate (not PHE methodology)
LFT	165,785	1,308	0.54 %
PCR	257,190	18,932	5.78 %
Total	**398,460**	**19,898**	**3.57 %**

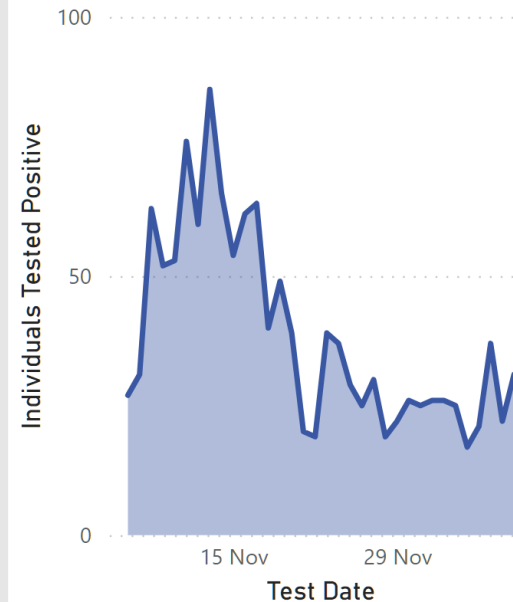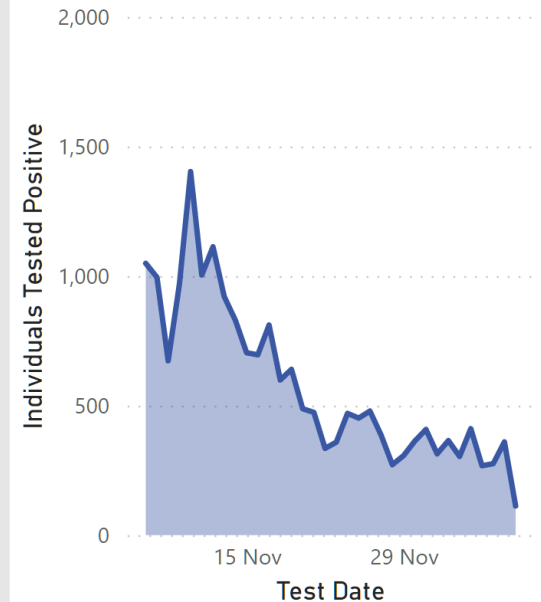TESTS OVER TIME: LFT — ●Positive ●Negative ●Void/insufficient
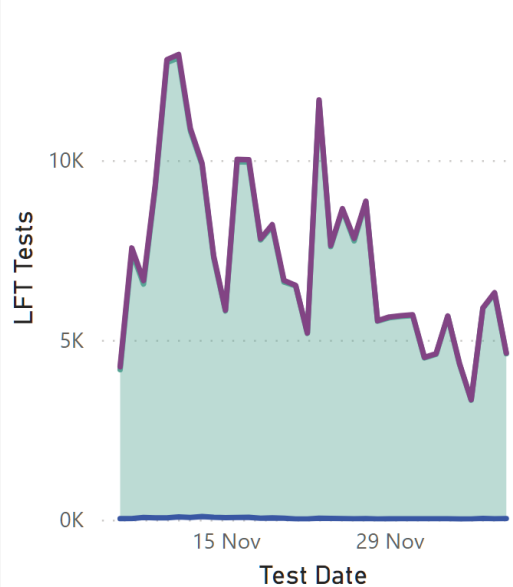
TESTS OVER TIME: PCR — ●Positive ●Negative ●Void/insufficient

INDIVIDUALS TESTED POSITIVE OVER TIME: LFT

INDIVIDUALS TESTED POSITIVE OVER TIME: PCR

Summary: Liverpool Residents

Tests & Cases

All Liverpool residents tested at any Pillar 2 test site

277,014	179,018	3,508	0.49 %	3.26 %
Tests Completed (LFT+PCR)	Individuals Tested (LFT+PCR)	Individuals Tested Positive (LFT+PCR)	LFT Positivity Rate	PCR Positivity Rate

NHS CIPHA Combined Intelligence for Population Health Action

Dates Selected: 06/11/2020 – 09/12/2020

Note: positivity rate calculations do not follow PHE methodology

TEST COUNTS

| Test Kit ▲	Tests Completed	Positivity Rate (not PHE methodology)	Positive Tests	Negative Tests	Void / Insufficient Tests
LFT	184,596	0.49 %	903	182,629	1,064
PCR	92,418	3.26 %	2,966	87,905	1,547
Total	**277,014**	**1.41 %**	**3,869**	**270,534**	**2,611**

CASES IDENTIFIED

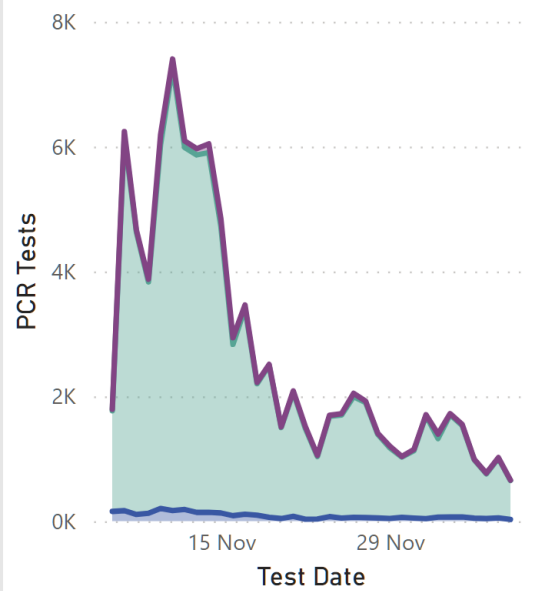| Test Kit ▲	Individuals Tested	Individuals Tested Positive	Positivity Rate (not PHE methodology)
LFT	123,247	891	0.49 %
PCR	74,267	2,829	3.26 %
Total	**179,018**	**3,508**	**1.41 %**

TESTS OVER TIME: LFT — Positive, Negative, Void/insufficient
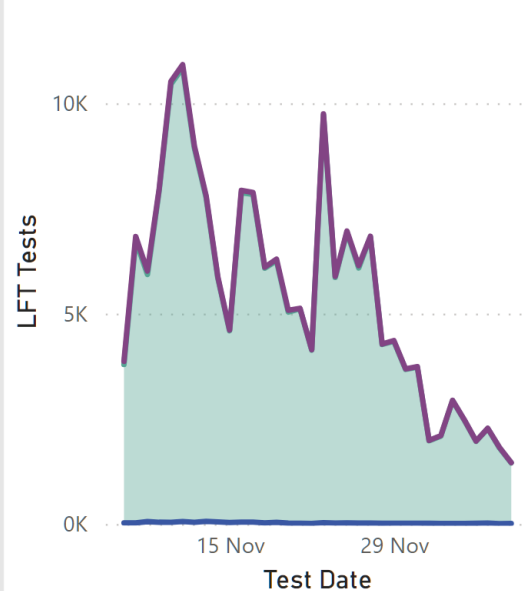
TESTS OVER TIME: PCR — Positive, Negative, Void/insufficient

CASES OVER TIME: LFT

CASES OVER TIME: PCR

Graphnet Integrating Care
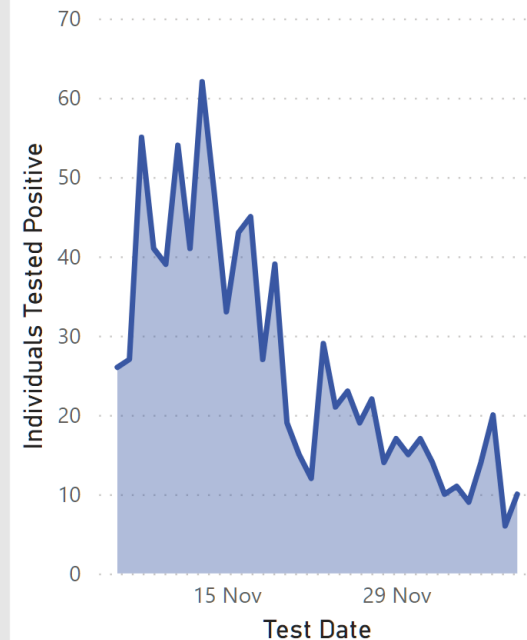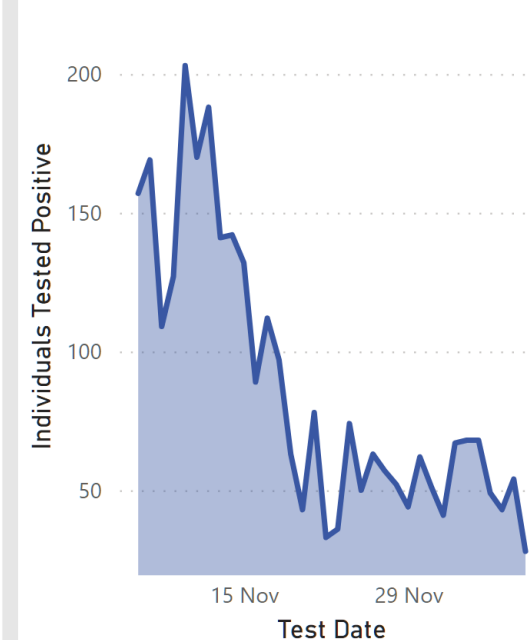
Test Demographics: LFT
All Liverpool residents tested at any Pillar 2 test site

184,596
Tests Completed (LFT)

123,247
Individuals Tested (LFT)

891
Individuals Tested Positive (LFT)

0.49 %
Positivity Rate (LFT)

NHS CIPHA
Combined Intelligence for Population Health Action

Dates Selected: 06/11/2020 – 09/12/2020

Note: positivity rate calculations do not follow PHE methodology

INDIVIDUALS TESTED BY AGE BAND: LFT
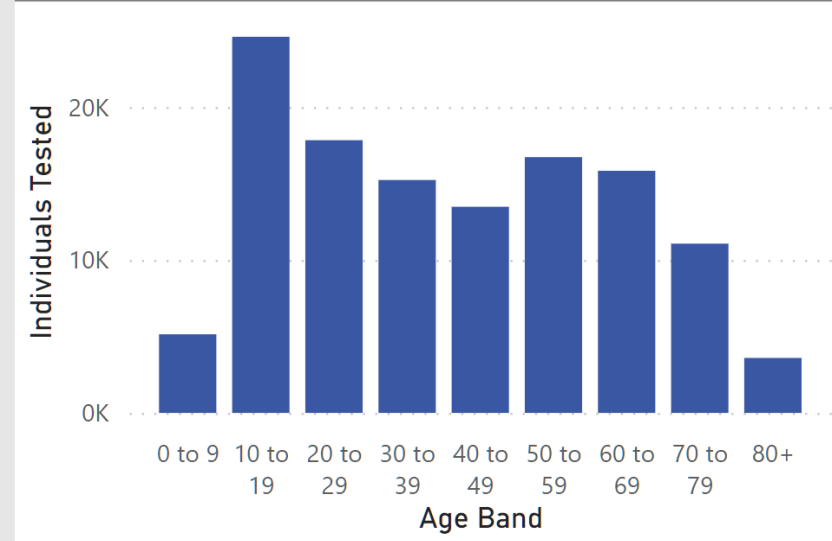
INDIVIDUALS TESTED BY IMD QUINTILE: LFT
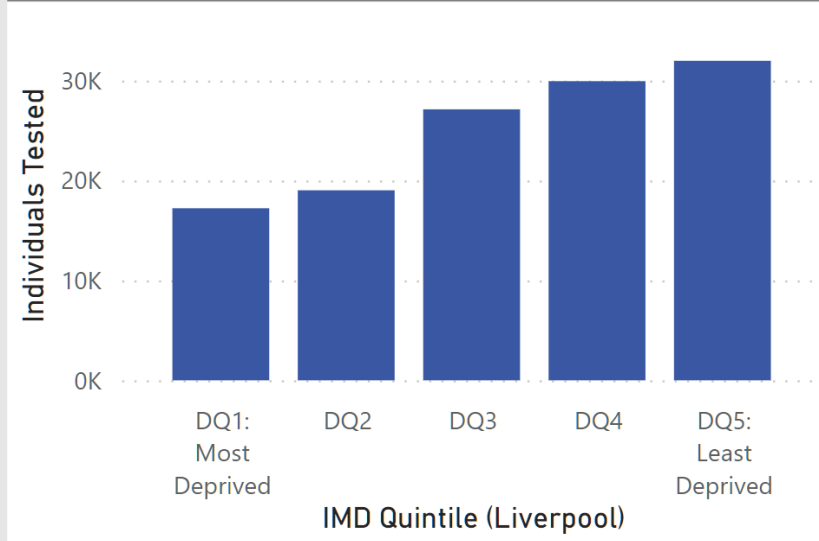
TEST RESULTS BY REASON FOR TEST: LFT

Test Reason	Positive	Negative	Void / Insufficient

INDIVIDUALS TESTED BY ETHNICITY: LFT

INDIVIDUALS TESTED BY GENDER: LFT

Young adults under-represented (teens boosted by schools)

Males under-represented (46% c.f. 54% female)

Slightly higher (1.14 times) positivity in females

Uptake ~34% in least deprived compared with ~17% in most deprived fifth of the population

BAME populations might be under-represented but 24% did not give ethnicity

Test Demographics: PCR
All Liverpool residents tested at any Pillar 2 test site

92,418
Tests Completed (PCR)

74,267
Individuals Tested (PCR)

2,829
Individuals Tested Positive (PCR)

3.26 %
Positivity Rate (PCR)

NHS CIPHA
Combined Intelligence for
Population Health Action

Dates Selected: 06/11/2020 - 09/12/2020

Note: positivity rate calculations do not follow PHE methodology

INDIVIDUALS TESTED BY AGE BAND: PCR
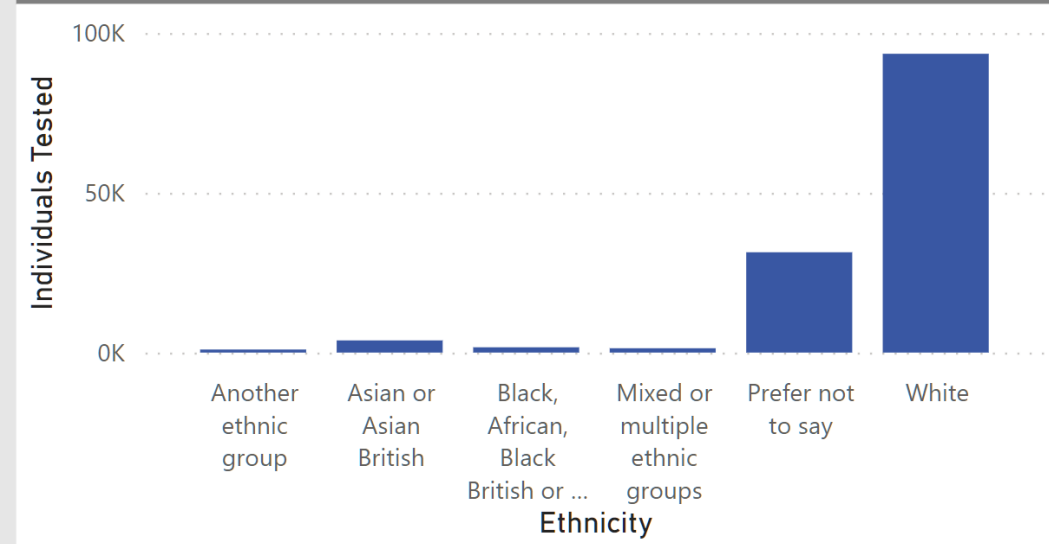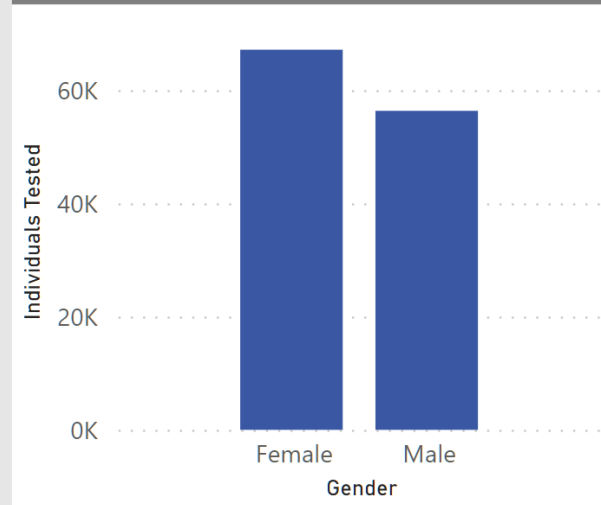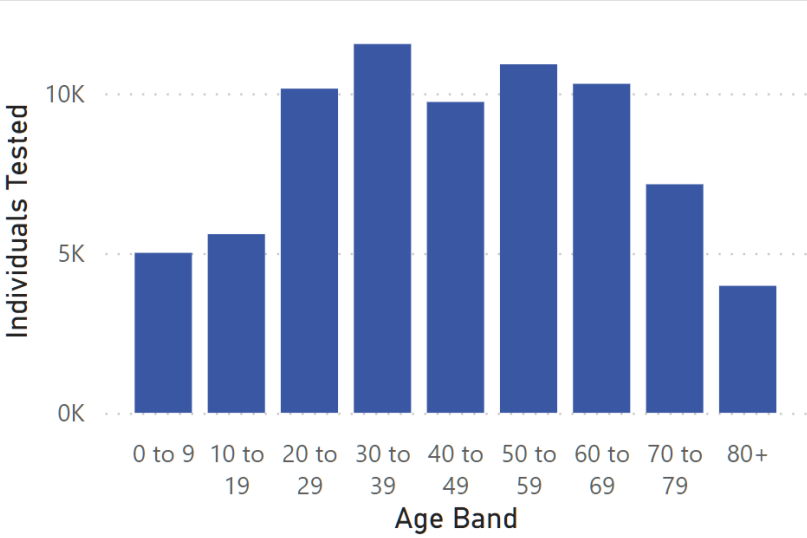

INDIVIDUALS TESTED BY IMD QUINTILE: PCR
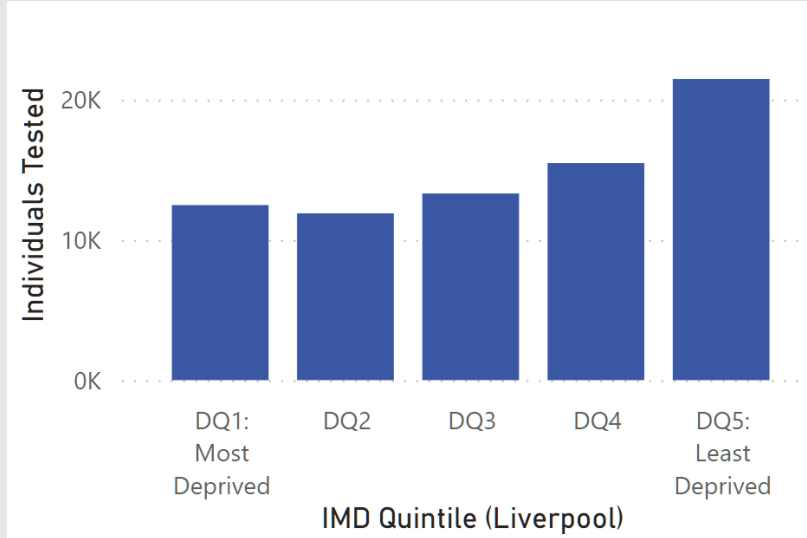
TEST RESULTS BY REASON FOR TEST: PCR

Test Reason	Positive	Negative	Void / insufficient
liverpool-testing	808	34,606	564
home test kit drop	803	39,963	786
symptomatic-citizen	594	4,736	83
symptomatic-essential-worker	302	1,727	18
told-to-order-repeat-test	184	1,625	33
liverpool-merthyr-testing	83	2,007	12
for-symptomatic-household-member	76	559	9
community-testing	48	725	9
local-council-request	35	1,652	30
zoe-symptom-study	26	176	3
ntrg-member	3	35	
I live~ work or study in a lockdown area with a coronavirus outbreak	2	8	
Im an essential worker	1	9	
Other	1		
contact-testing-study	0	24	
I have coronavirus symptoms	0	52	
Ive been in contact with a person who has tested positive for coronavirus and have since developed s	0	1	
visiting-professional-pilot	0		
Total	**2,966**	**87,905**	**1,547**

INDIVIDUALS TESTED BY ETHNICITY: PCR
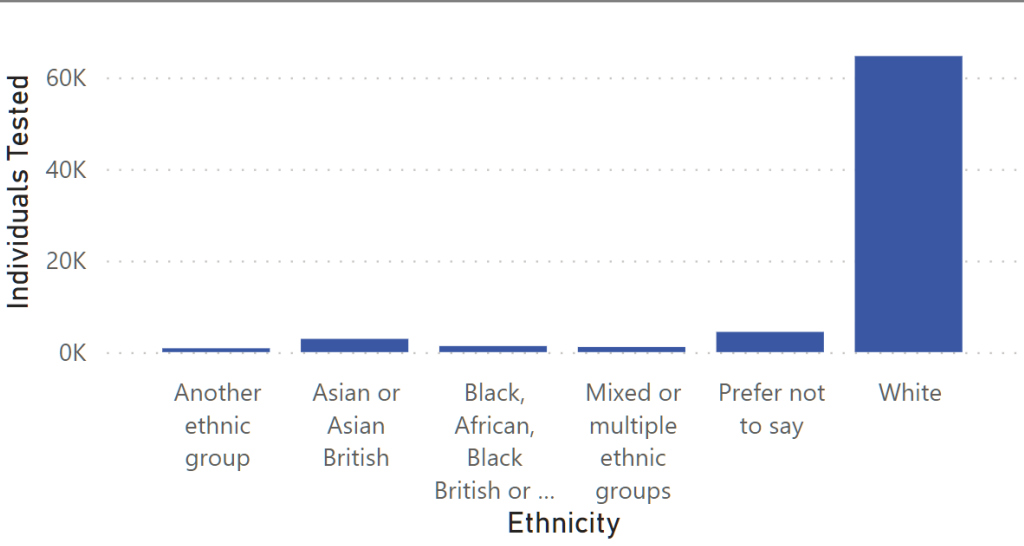
INDIVIDUALS TESTED BY GENDER: PCR

Graphnet Integrating Care
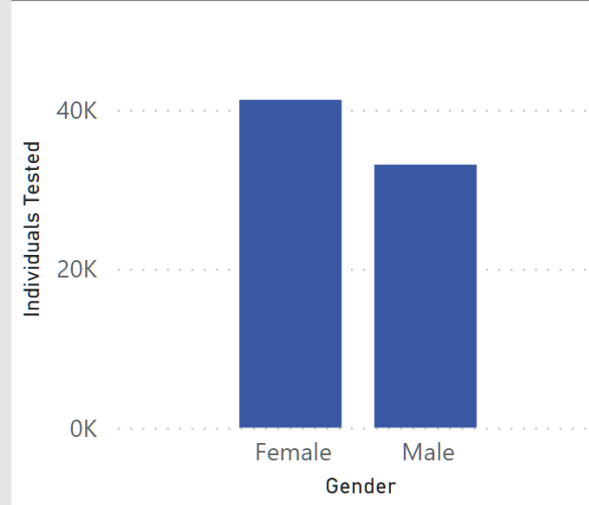
INDIVIDUALS TESTED BY AGE BAND: PCR
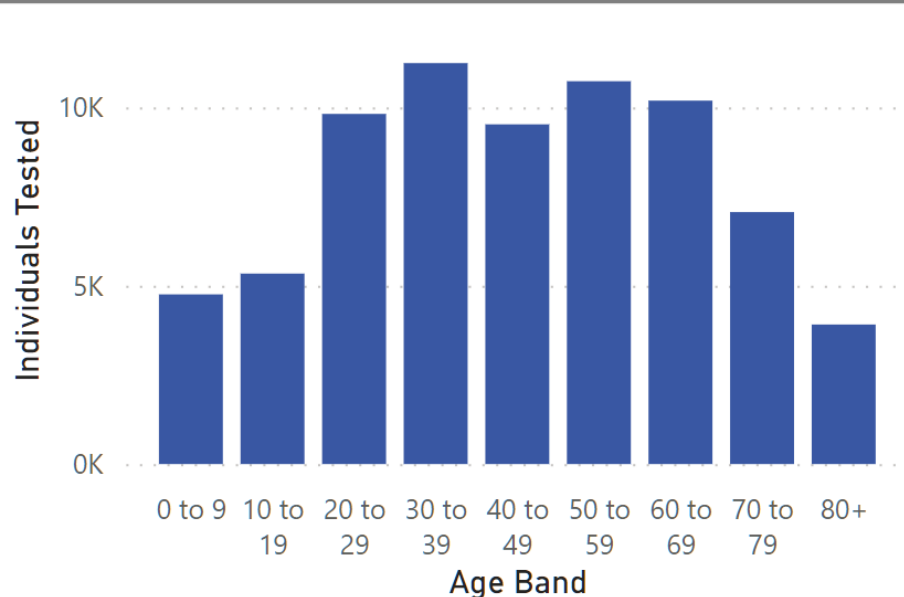
INDIVIDUALS TESTED BY IMD QUINTILE: PCR
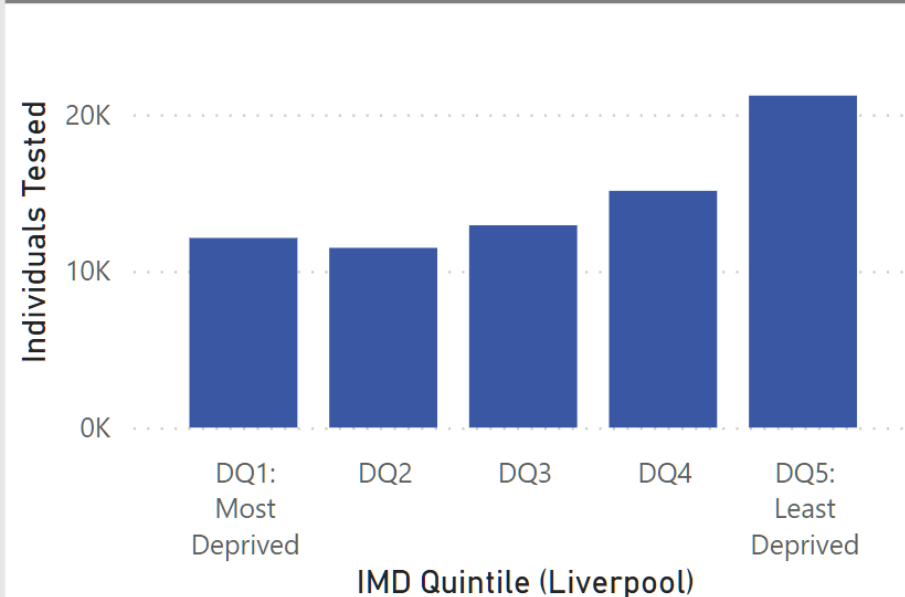
[mostly symptomatic]
PCR uptake (positivity)

12.1% (5.2%) ↑ most deprived
11.8% (4.7%)
14.1% (4.4%)
14.5% (3.4%)
22.4% (3.0%) ↓ least deprived
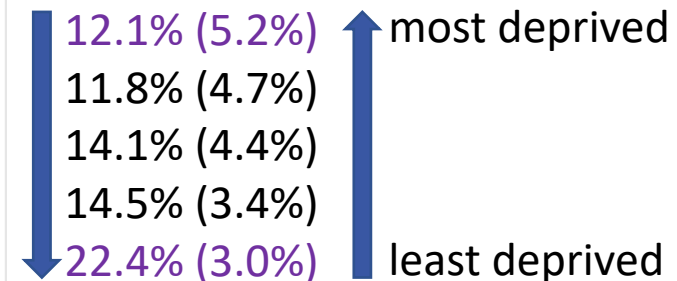
Higher uptake of PCR in least deprived fifth of areas (using Liverpool quintiles)

INDIVIDUALS TESTED BY AGE BAND: LFT
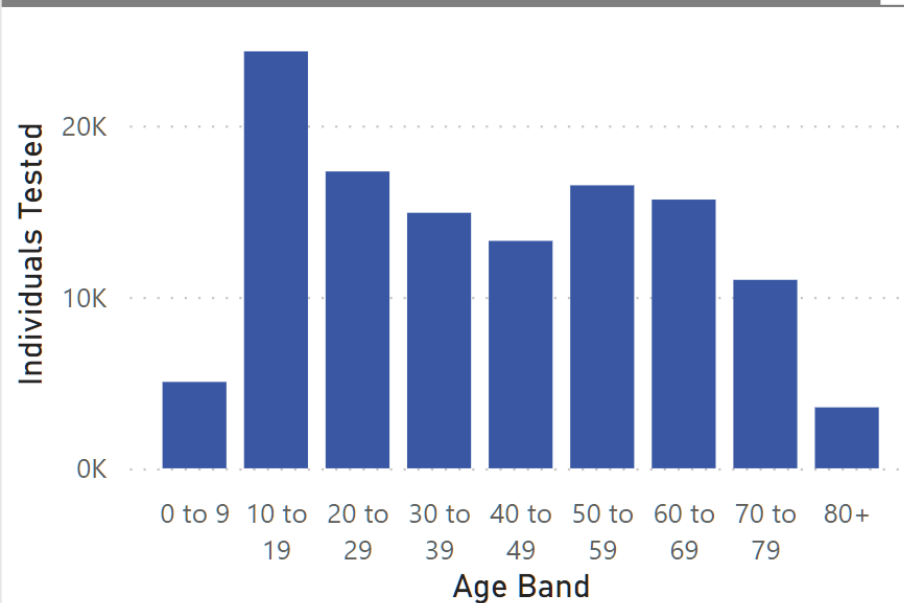
INDIVIDUALS TESTED BY IMD QUINTILE: LFT

[mostly asymptomatic]
LFT uptake (positivity)

16.8% (1.0%) ↑ most deprived
18.9% (0.9%)
28.8% (0.8%)
28.2% (0.6%)
33.4% (0.5%) ↓ least deprived

Lower uptake of LFT in most deprived two fifths of areas

Geography: LFT
All Liverpool residents tested at any Pillar 2 test site

| 184,596	123,247	891	0.49 %	NHS CIPHA
Tests Completed (LFT)	Individuals Tested (LFT)	Individuals Tested Positive (LFT)	Positivity Rate (LFT)	Combined Intelligence for Population Health Action

Dates Selected: 06/11/2020 - 09/12/2020

*Note: positivity rate calculations do not follow PHE methodology*

TESTS AND CASES BY WARD: LFT

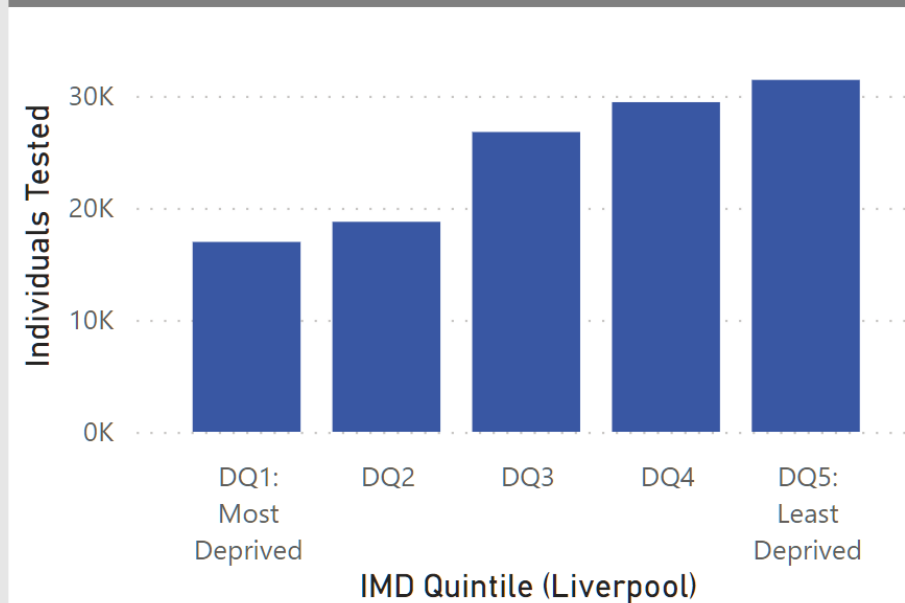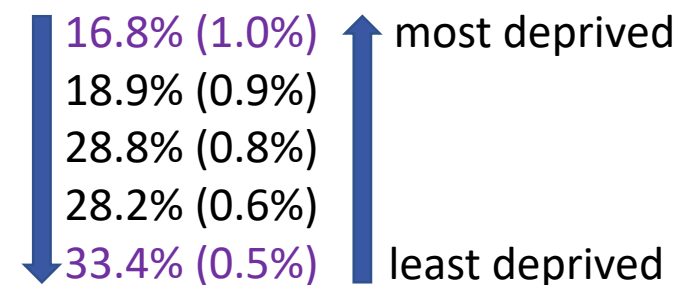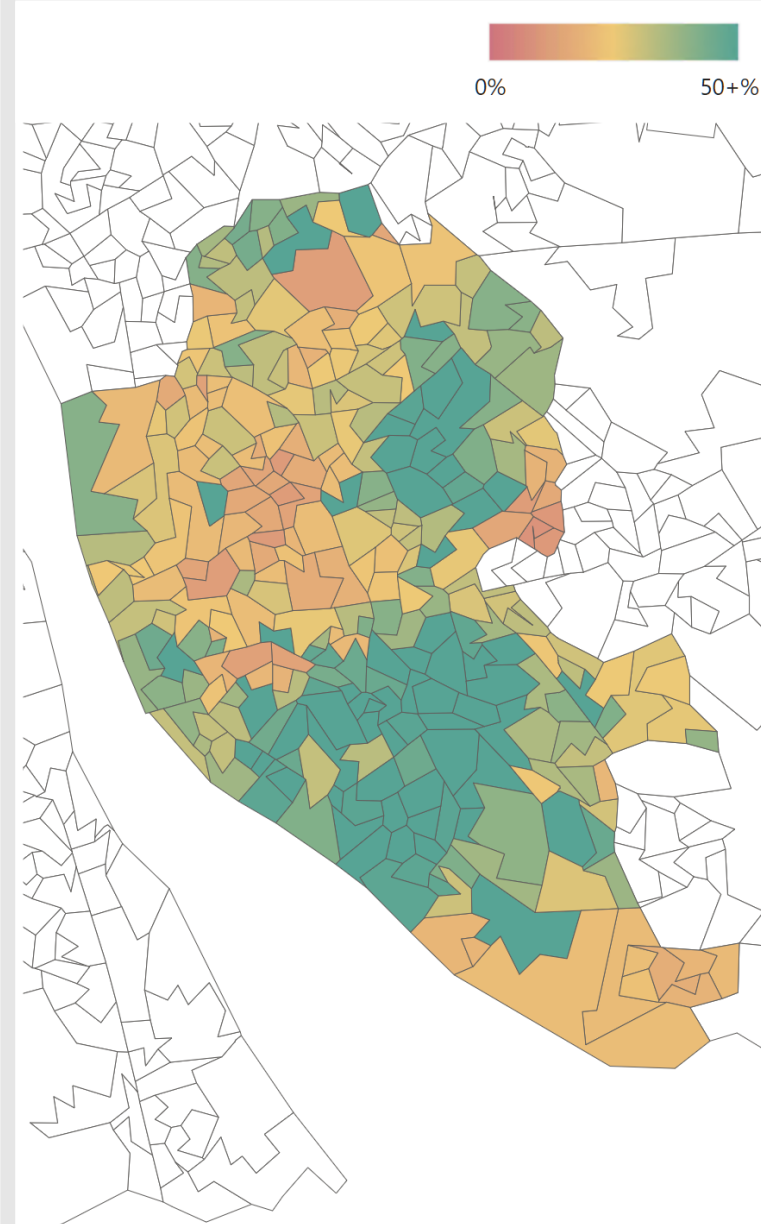| Ward Name	Tests Completed (LFT)	% of Population Tested (LFT)	Tests Completed p100k Population (LFT)	Individuals Tested (LFT)	Individuals Tested Positive (LFT)	Positivity Rate LFT (not PHE methodology)
Church	10,232	66.69 %	66,692.74	6,519	31	0.30 %
Greenbank	9,675	68.41 %	68,408.40	6,488	31	0.32 %
Cressington	8,544	51.37 %	51,367.76	5,470	23	0.28 %
Mossley Hill	8,467	60.34 %	60,344.95	5,327	13	0.15 %
West Derby	8,236	52.26 %	52,262.20	5,451	38	0.46 %
Riverside	8,106	37.41 %	37,406.55	5,657	47	0.60 %
Central	7,865	23.18 %	23,182.81	5,203	35	0.45 %
Picton	7,254	31.96 %	31,960.17	4,824	52	0.74 %
Childwall	7,175	48.76 %	48,763.08	4,786	18	0.25 %
Wavertree	7,093	56.09 %	56,093.32	4,632	34	0.50 %
St Michael's	7,046	57.91 %	57,910.74	4,597	18	0.26 %
Princes Park	6,666	32.58 %	32,575.87	4,655	57	0.86 %
Fazakerley	6,650	39.01 %	39,007.51	4,717	43	0.65 %
Yew Tree	5,803	37.63 %	37,630.50	3,969	32	0.55 %
Everton	5,676	28.84 %	28,835.60	4,070	47	0.85 %
Old Swan	5,653	34.93 %	34,929.56	3,927	27	0.48 %
Woolton	5,587	45.51 %	45,507.86	3,735	13	0.23 %
Knotty Ash	5,579	42.86 %	42,862.63	3,762	18	0.32 %
Allerton and Hunts Cross	5,450	40.19 %	40,188.78	3,770	28	0.52 %
Croxteth	5,394	42.26 %	42,256.17	3,695	31	0.60 %
Speke-Garston	5,109	24.35 %	24,354.09	3,759	29	0.61 %
Belle Vale	5,083	34.18 %	34,178.32	3,732	37	0.77 %
Norris Green	4,925	26.85 %	26,846.55	3,570	27	0.55 %
Clubmoor	4,387	26.51 %	26,512.36	3,170	26	0.62 %
Warbreck	4,380	30.46 %	30,458.97	3,008	30	0.69 %
Kirkdale	4,098	27.42 %	27,418.71	2,904	26	0.64 %
County	4,087	26.39 %	26,389.88	2,931	30	0.74 %
Tuebrook and Stoneycroft	3,782	26.78 %	26,779.01	2,615	11	0.29 %
Anfield	3,426	20.19 %	20,188.57	2,407	17	0.53 %
Kensington and Fairfield	3,168	18.37 %	18,367.35	2,252	22	0.70 %
Total	**184,596**	**37.06 %**	**37,064.34**	**123,247**	**891**	**0.49 %**

% OF POPULATION TESTED: LFT

0%   50+%

High variation in LFT uptake by small areas (LLSOA)

…hidden within larger area (ward) summaries 18%-67% uptake

…over a month of evolving delivery of community testing

☰ Geography: PCR
All Liverpool residents tested at any Pillar 2 test site

92,418	**74,267**	**2,829**	**3.26 %**
Tests Completed (PCR)	Individuals Tested (PCR)	Individuals Tested Positive (PCR)	Positivity Rate (PCR)

Dates Selected: 06/11/2020 - 09/12/2020

Note: positivity rate calculations do not follow PHE methodology

NHS CIPHA — Combined Intelligence for Population Health Action

TESTS AND CASES BY WARD: PCR

Ward Name	Tests Completed (PCR)	% of Population Tested (PCR) ▼	Tests Completed p100k Population (PCR)	Individuals Tested (PCR)	Individuals Tested Positive (PCR)	Positivity Rate PCR (not PHE methodology)
Woolton	5,644	45.97 %	45,972.14	4,556	96	1.82 %
Allerton and Hunts Cross	5,377	39.65 %	39,650.47	4,435	101	2.05 %
Church	4,684	30.53 %	30,530.57	3,768	91	1.98 %
Childwall	4,425	30.07 %	30,073.40	3,838	96	2.31 %
Knotty Ash	3,742	28.75 %	28,749.23	3,072	96	2.67 %
Belle Vale	4,244	28.54 %	28,536.85	3,428	118	2.96 %
Mossley Hill	3,388	24.15 %	24,146.53	2,747	80	2.46 %
Anfield	4,048	23.85 %	23,853.86	2,997	118	3.20 %
Yew Tree	3,429	22.24 %	22,235.91	2,747	107	3.35 %
West Derby	3,442	21.84 %	21,841.49	2,844	111	3.43 %
Croxteth	2,698	21.14 %	21,135.92	2,245	78	3.06 %
St Michael's	2,523	20.74 %	20,736.42	2,062	55	2.35 %
Cressington	3,355	20.17 %	20,170.74	2,761	89	2.75 %
Wavertree	2,508	19.83 %	19,833.93	2,044	85	3.59 %
Clubmoor	2,971	17.95 %	17,954.92	2,360	125	4.52 %
Warbreck	2,421	16.84 %	16,835.88	1,962	88	3.85 %
Speke-Garston	3,459	16.49 %	16,488.70	2,734	104	3.17 %
Tuebrook and Stoneycroft	2,305	16.32 %	16,320.89	1,883	70	3.35 %
Fazakerley	2,691	15.78 %	15,784.84	2,014	110	4.39 %
Everton	3,056	15.53 %	15,525.30	2,474	148	5.25 %
Old Swan	2,471	15.27 %	15,268.17	2,004	71	2.93 %
Kirkdale	2,223	14.87 %	14,873.54	1,785	75	3.61 %
County	2,218	14.32 %	14,321.69	1,741	81	4.04 %
Riverside	3,046	14.06 %	14,056.30	2,323	101	3.51 %
Norris Green	2,445	13.33 %	13,327.88	1,894	109	4.77 %
Greenbank	1,750	12.37 %	12,373.61	1,454	65	3.77 %
Kensington and Fairfield	1,873	10.86 %	10,859.23	1,483	93	5.56 %
Princes Park	1,989	9.72 %	9,719.98	1,642	81	4.32 %
Picton	2,105	9.27 %	9,274.35	1,697	118	5.97 %
Central	1,888	5.57 %	5,565.05	1,650	70	3.85 %
Total	**92,418**	**18.56 %**	**18,556.27**	**74,267**	**2,829**	**3.26 %**

% OF POPULATION TESTED: PCR

0% ——— 50+%
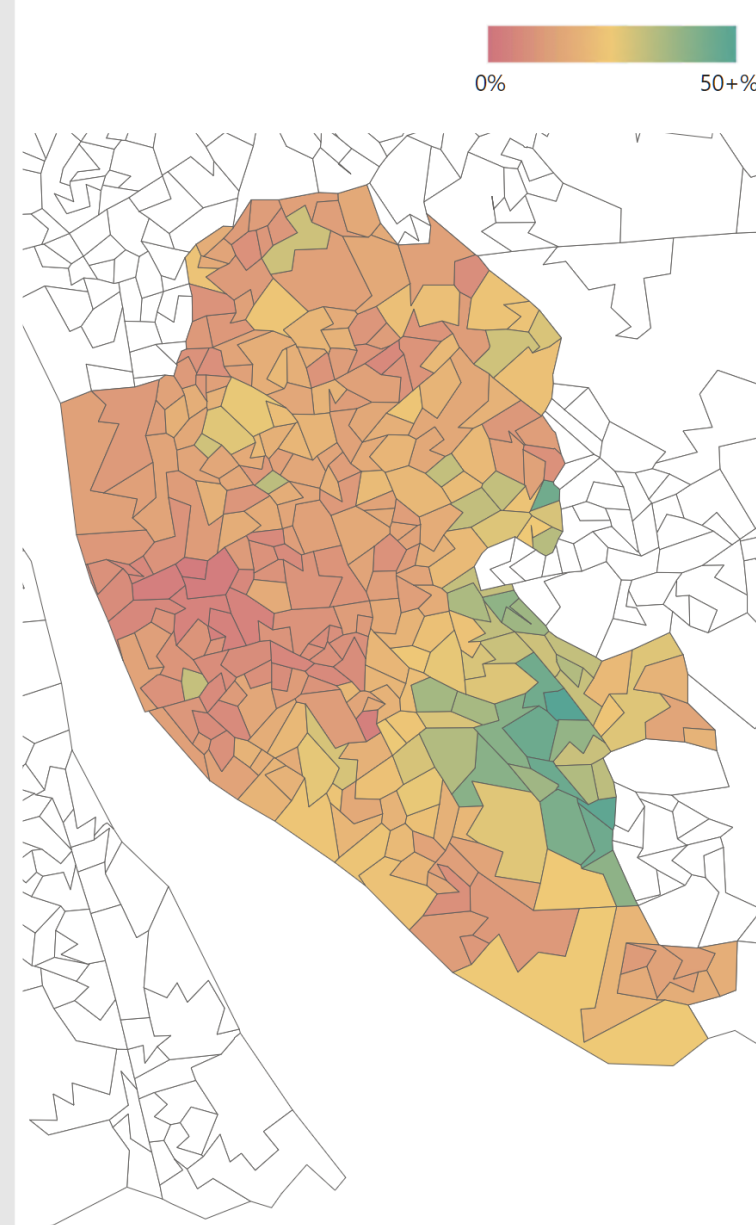
PCR pattern different to LFT; dominated by high uptake in

Concentrated in areas with older and more affluent populations

Individuals Tested Positive

All Liverpool residents tested at any Pillar 2 test site

12/3/2020 to 12/9/2020 Current week	11/26/2020 to 12/2/2020 Previous week

277,014	179,018	3,508	0.49 %	3.26 %
Tests Completed (LFT+PCR)	Individuals Tested (LFT+PCR)	Individuals Tested Positive (LFT+PCR)	LFT Positivity Rate	PCR Positivity Rate

Note: positivity rate calculations do not follow PHE methodology

Dates Selected: 06/11/2020 – 09/12/2020

NHS CIPHA Combined Intelligence for Population Health Action

INDIVIDUALS TESTED POSITIVE BY WARD

Ward Name	CURRENT WEEK Individuals Tested Positive (LFT)	CURRENT WEEK Individuals Tested Positive (PCR)	CURRENT WEEK Individuals Tested Positive (LFT+PCR)	CURRENT WEEK Individuals Tested Positive (LFT+PCR) per 100,000	PREVIOUS WEEK Individuals Tested Positive (LFT)	PREVIOUS WEEK Individuals Tested Positive (PCR)	PREVIOUS WEEK Individuals Tested Positive (LFT+PCR)	PREVIOUS WEEK Individuals Tested Positive (LFT+PCR) per 100,000	DIFFERENCE Individuals Tested Positive (LFT)	DIFFERENCE Individuals Tested Positive (PCR)	DIFFERENCE Individuals Tested Positive (LFT+PCR)	DIFFERENCE Individuals Tested Positive (LFT+PCR) per 100,000
Allerton and Hunts Cross	3	4	7	51.62		10	10	73.74	3	-6	-3	-22.12
Anfield	1	7	8	47.14	2	19	21	123.75	-1	-12	-13	-76.61
Belle Vale	3	16	19	127.76	6	10	16	107.58	-3	6	3	20.17
Central		7	7	20.63	2	7	9	26.53	-2	0	-2	-5.90
Childwall	1	4	5	33.98	2	8	10	67.96	-1	-4	-5	-33.98
Church	7	13	20	130.36	3	5	8	52.14	4	8	12	78.22
Clubmoor	2	15	17	102.74	2	12	14	84.61	0	3	3	18.13
County	4	11	15	96.86	2	16	18	116.23	2	-5	-3	-19.37
Cressington	5	17	22	132.27	3	11	14	84.17	2	6	8	48.10
Croxteth	2	8	10	78.34	4	8	12	94.01	-2	0	-2	-15.67
Everton	2	29	31	157.49	9	22	31	157.49	-7	7	0	0.00
Fazakerley	1	18	19	111.45	7	17	24	140.78	-6	1	-5	-29.33
Greenbank	4	4	8	56.57	11	4	15	106.06	-7	0	-7	-49.49
Kensington and Fairfield	2	14	16	92.76	4	14	18	104.36	-2	0	-2	-11.60
Kirkdale	3	14	17	113.74	5	13	18	120.43	-2	1	-1	-6.69
Knotty Ash	6	19	25	192.07	4	7	11	84.51	2	12	14	107.56
Mossley Hill	1	7	8	57.02	2	9	11	78.40	-1	-2	-3	-21.38
Norris Green		19	19	103.57	1	13	14	76.32	-1	6	5	27.26
Old Swan	4	7	11	67.97		6	6	37.07	4	1	5	30.89
Picton	9	16	25	110.15	7	25	32	140.99	2	-9	-7	-30.84
Princes Park		12	12	58.64	8	17	25	122.17	-8	-5	-13	-63.53
Riverside	1	13	14	64.61	4	14	18	83.06	-3	-1	-4	-18.46
Speke-Garston	3	14	17	81.04	3	15	18	85.80	0	-1	-1	-4.77
St Michael's	2	3	5	41.09		8	8	65.75	2	-5	-3	-24.66
Tuebrook and Stoneycroft		7	7	49.56	1	10	11	77.89	-1	-3	-4	-28.32
Warbreck	2	13	15	104.31	7	23	30	208.62	-5	-10	-15	-104.31
Wavertree	7	21	28	221.43	4	10	14	110.72	3	11	14	110.72
West Derby	3	15	18	114.22	5	13	18	114.22	-2	2	0	0.00
Woolton	1	10	11	89.60	3	4	7	57.02	-2	6	4	32.58
Yew Tree		15	15	97.27	7	11	18	116.72	-7	4	-3	-19.45
Total	79	372	451	90.55	118	361	479	96.18	-39	11	-28	-5.62

INDIVIDUALS TESTED POSITIVE (LFT+PCR) PER 100K - CURRENT WEEK

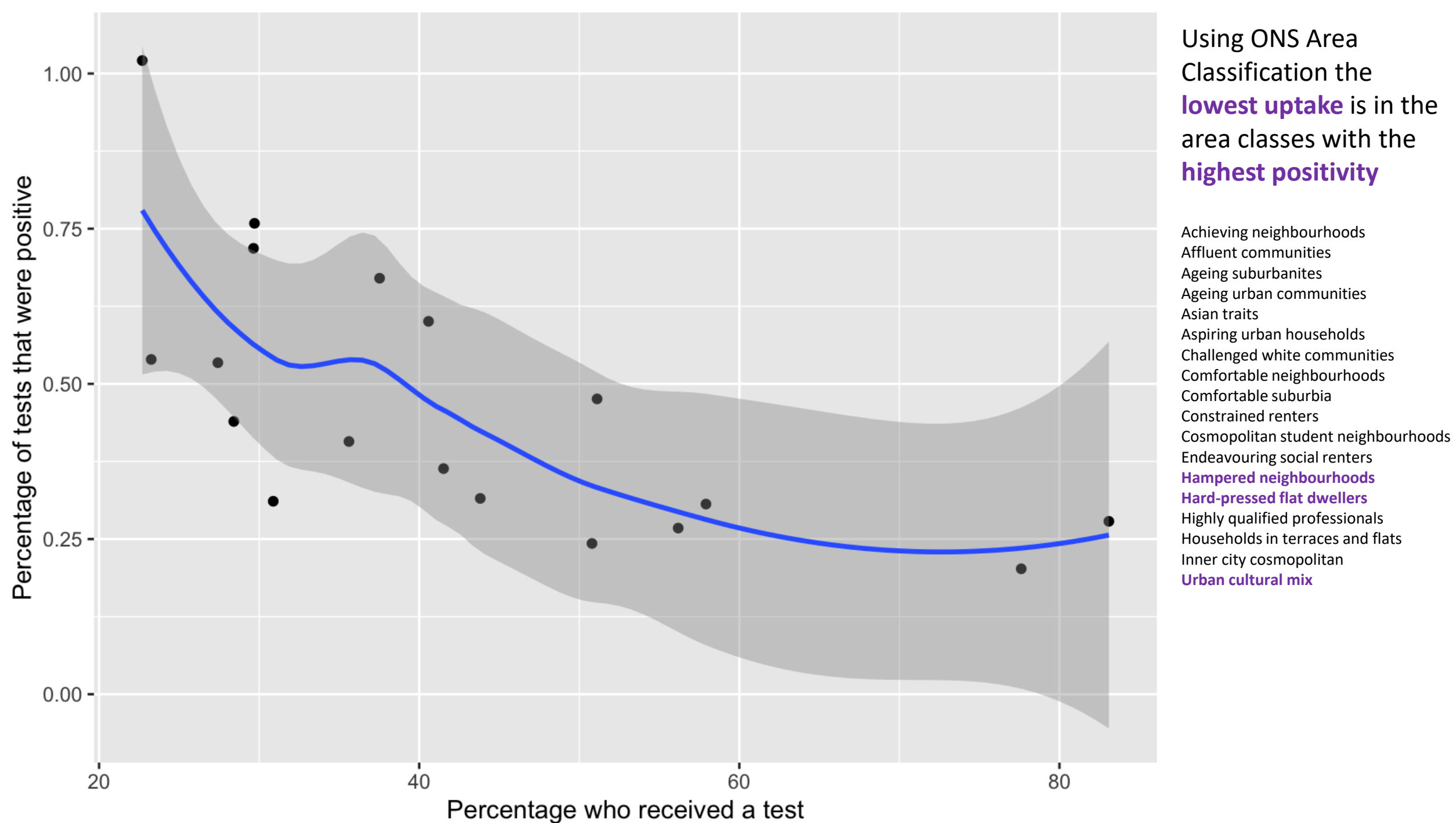MIN — MAX
White = no recorded cases in current week
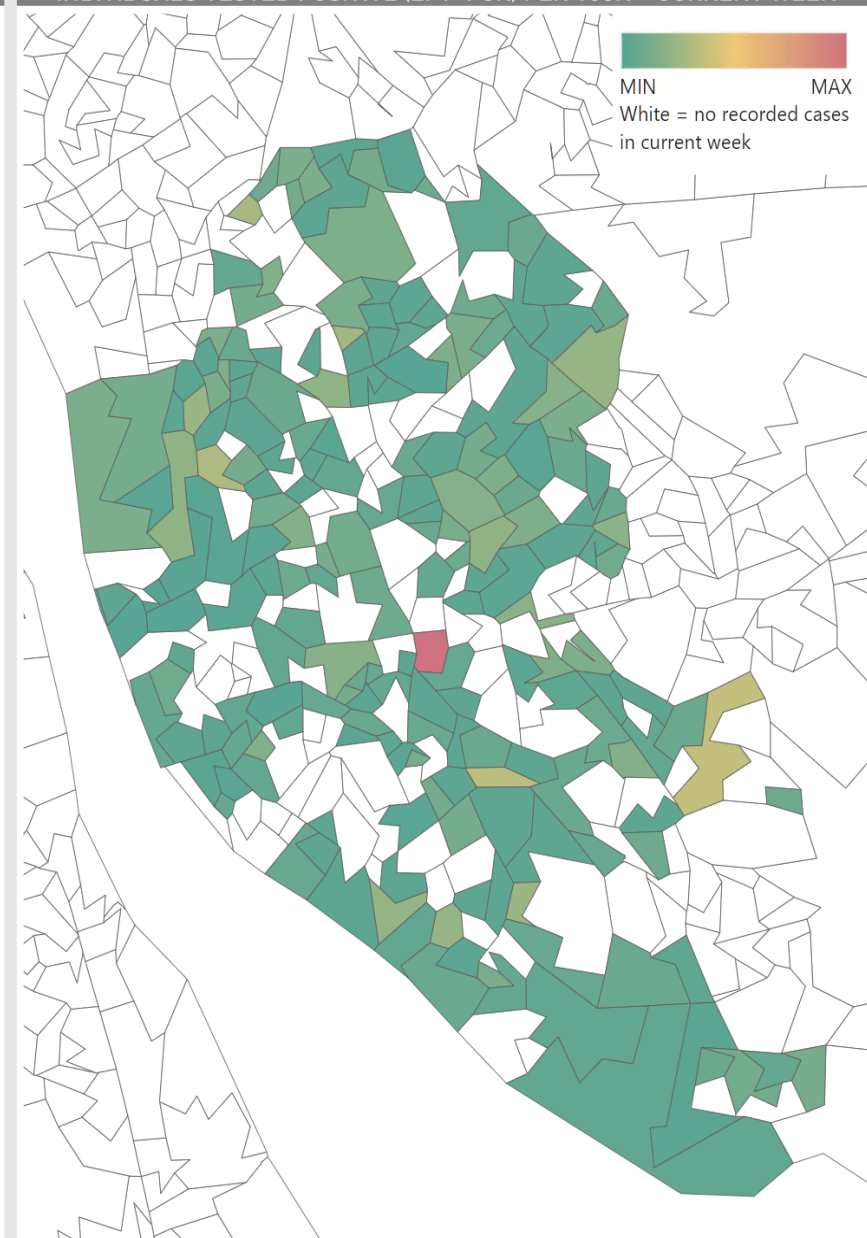
Complex wastewater SARS-CoV-2 RNA levels over time

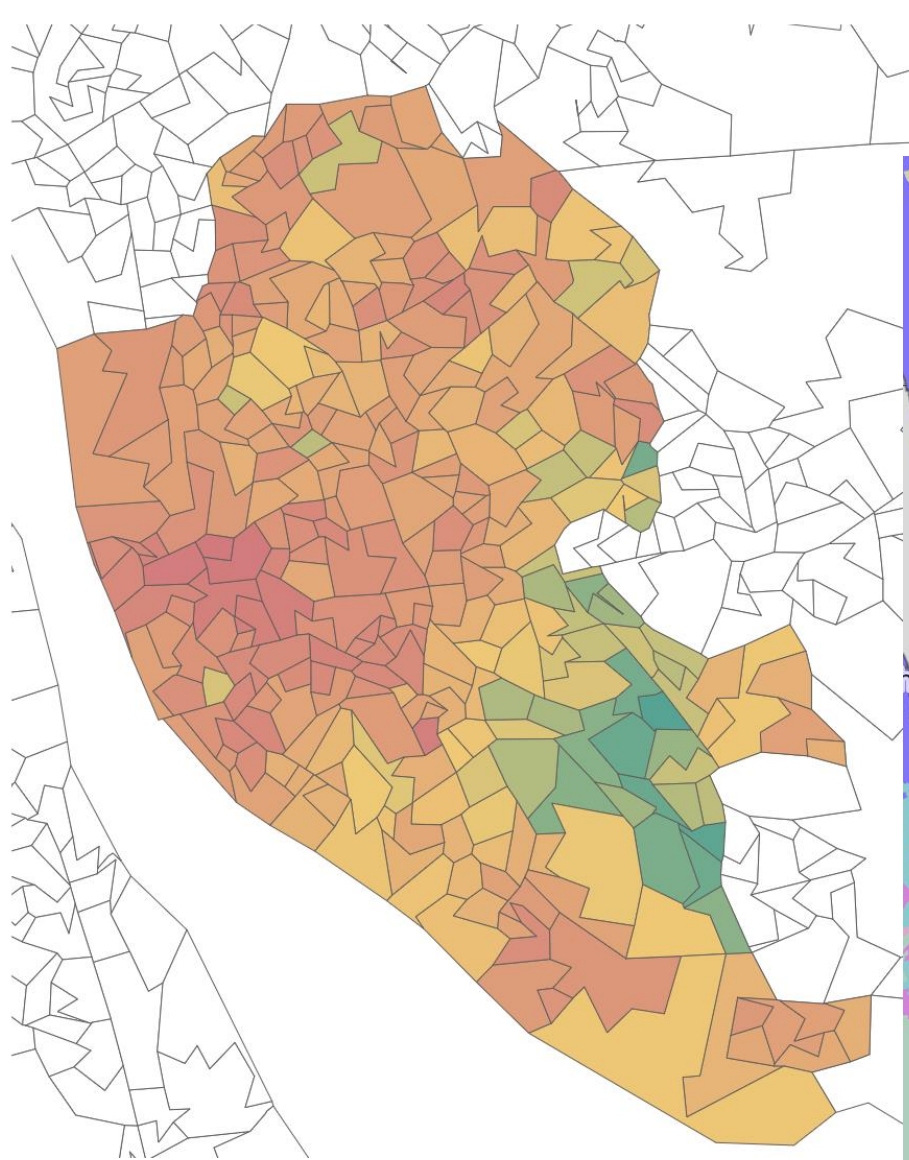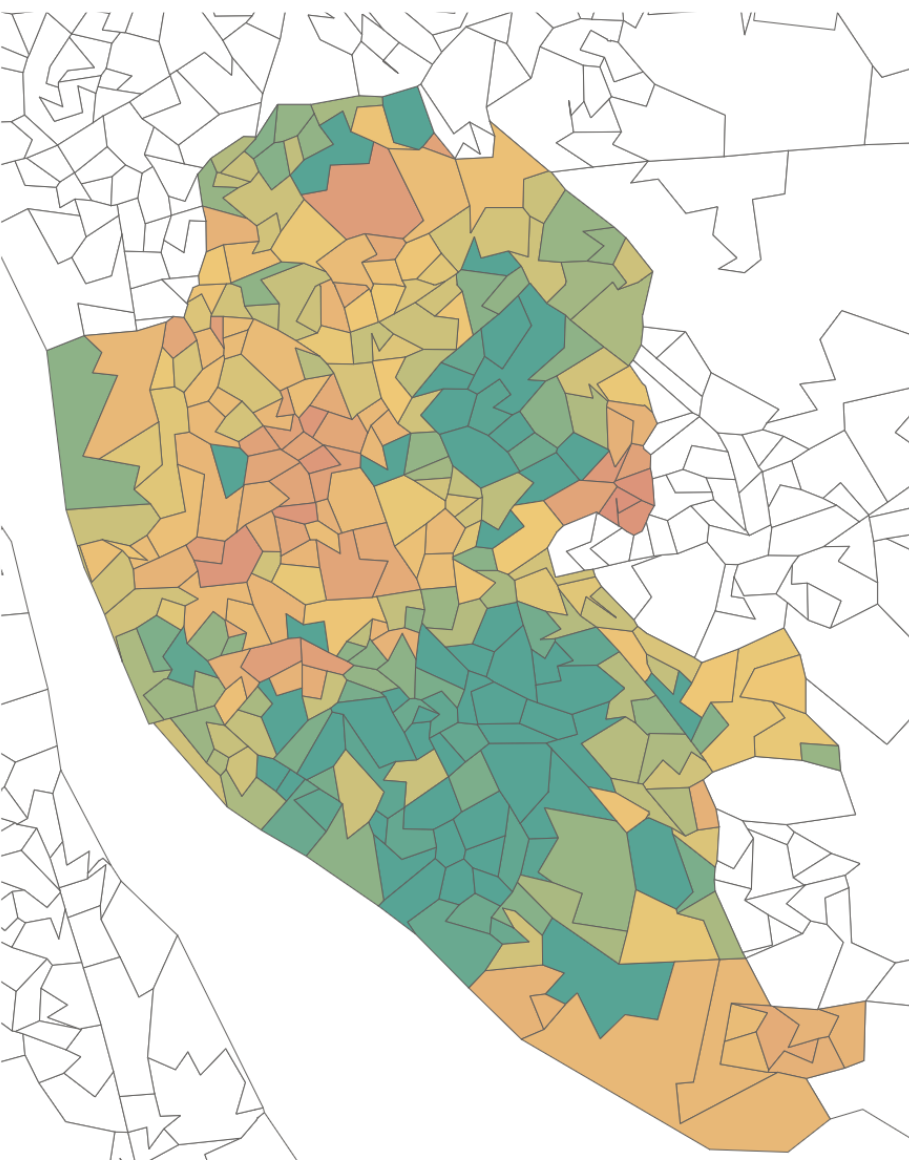7-days Rol AVG of Liverpool WW time series per subcatchment
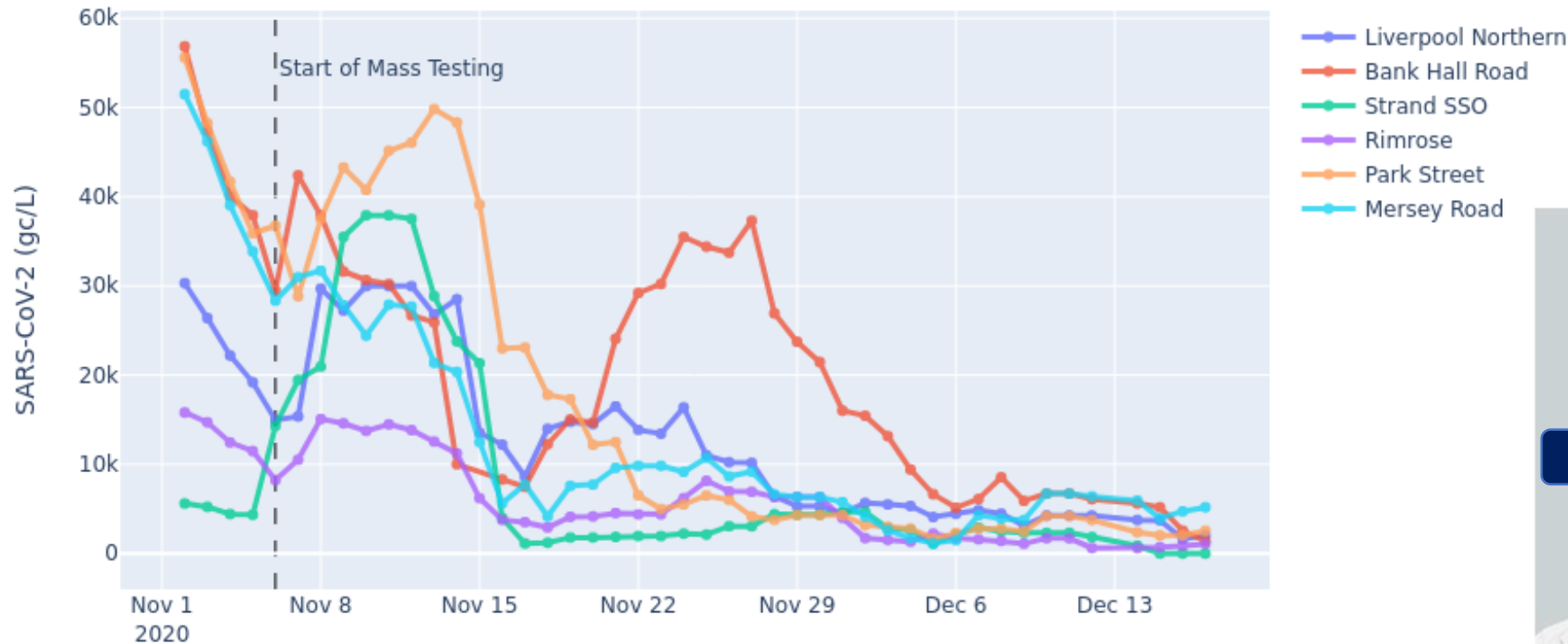
Seven day moving average SARS-CoV-2 levels in sub-sewer catchment areas sampled. After lockdown and pilot testing started 6th November there was a resurge between the 9th and 12th of November before levels declined across areas.

Using ONS Area Classification the **lowest uptake** is in the area classes with the **highest positivity**

Achieving neighbourhoods
Affluent communities
Ageing suburbanites
Ageing urban communities
Asian traits
Aspiring urban households
Challenged white communities
Comfortable neighbourhoods
Comfortable suburbia
Constrained renters
Cosmopolitan student neighbourhoods
Endeavouring social renters
Hampered neighbourhoods
Hard-pressed flat dwellers
Highly qualified professionals
Households in terraces and flats
Inner city cosmopolitan
Urban cultural mix

% OF POPULATION TESTED: LFT

0%   50+%

% OF POPULATION TESTED: PCR

0%   50+%

e-Cultural Creators
e-Professionals
e-Veterans
Youthful Urban Fringe
e-Rational Utilitarians
e-Mainstream
Passive and Uncommitted Users
Digital Seniors
Settled Offline Communities
e-Withdrawn

Bootle

Liverpool

KNOWSLEY

LIVERPOOL

head
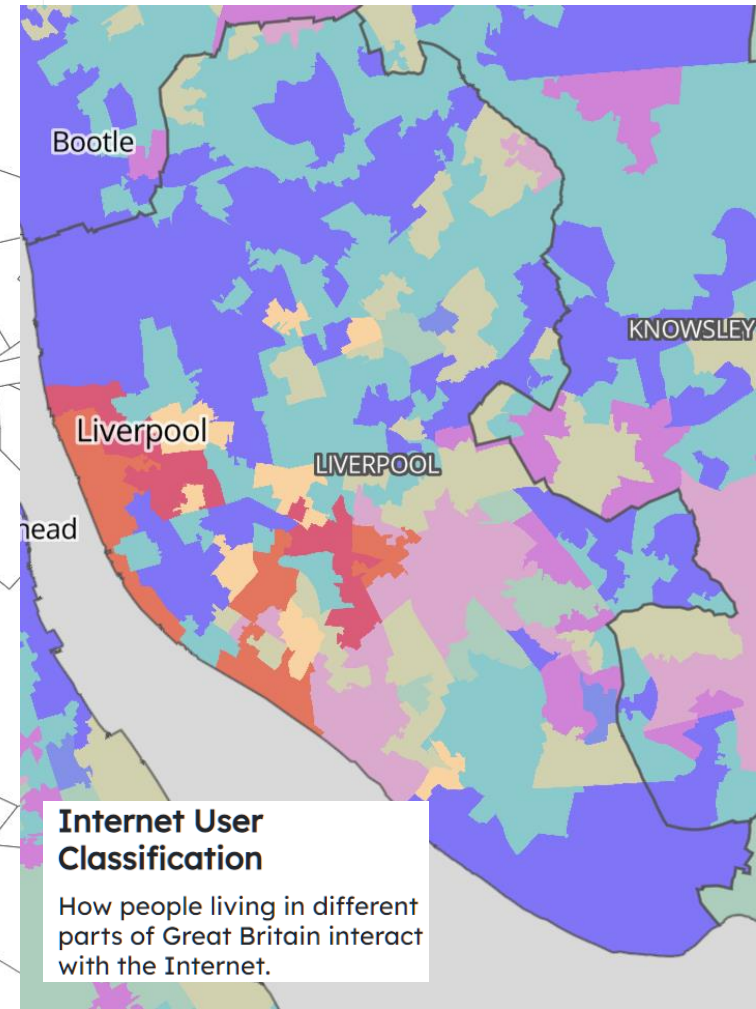
Internet User Classification

How people living in different parts of Great Britain interact with the Internet.

# Strong effect of digital exclusion – but not inclusion

Internet User Class	Population	Tested	Tests	Positive	%Tested	%Positive
e-Cultural Creators	36,317	7,783	10,893	42	21%	0.39%
e-Professionals	28,908	7,825	11,418	46	27%	0.40%
e-Veterans	37,305	15,843	24,616	58	42%	0.24%
Youthful Urban Fringe	28,591	5,378	7,730	43	19%	0.56%
e-Rational Utilitarians	8,716	3,114	4,747	11	36%	0.23%
e-Mainstream	56,822	16,790	24,978	99	30%	0.40%
Passive and Uncommitted Users	127,834	30,793	43,116	235	24%	0.55%
Digital Seniors	8,436	2,179	3,235	16	26%	0.49%
Settled Offline Communities	2,734	814	1,245	4	30%	0.32%
e-Withdrawn	162,379	29,297	39,748	277	18%	0.70%

Highest uptake and 2nd lowest positivity: 'e-Veterans' (affluent groups who confidently use the web for shopping and information seeking).

Low uptake and high positivity despite digital access in 'Youthful Urban Fringe' (inner city dwellers with high use of internet especially social media, includes young populations including students and ethnically diverse areas).
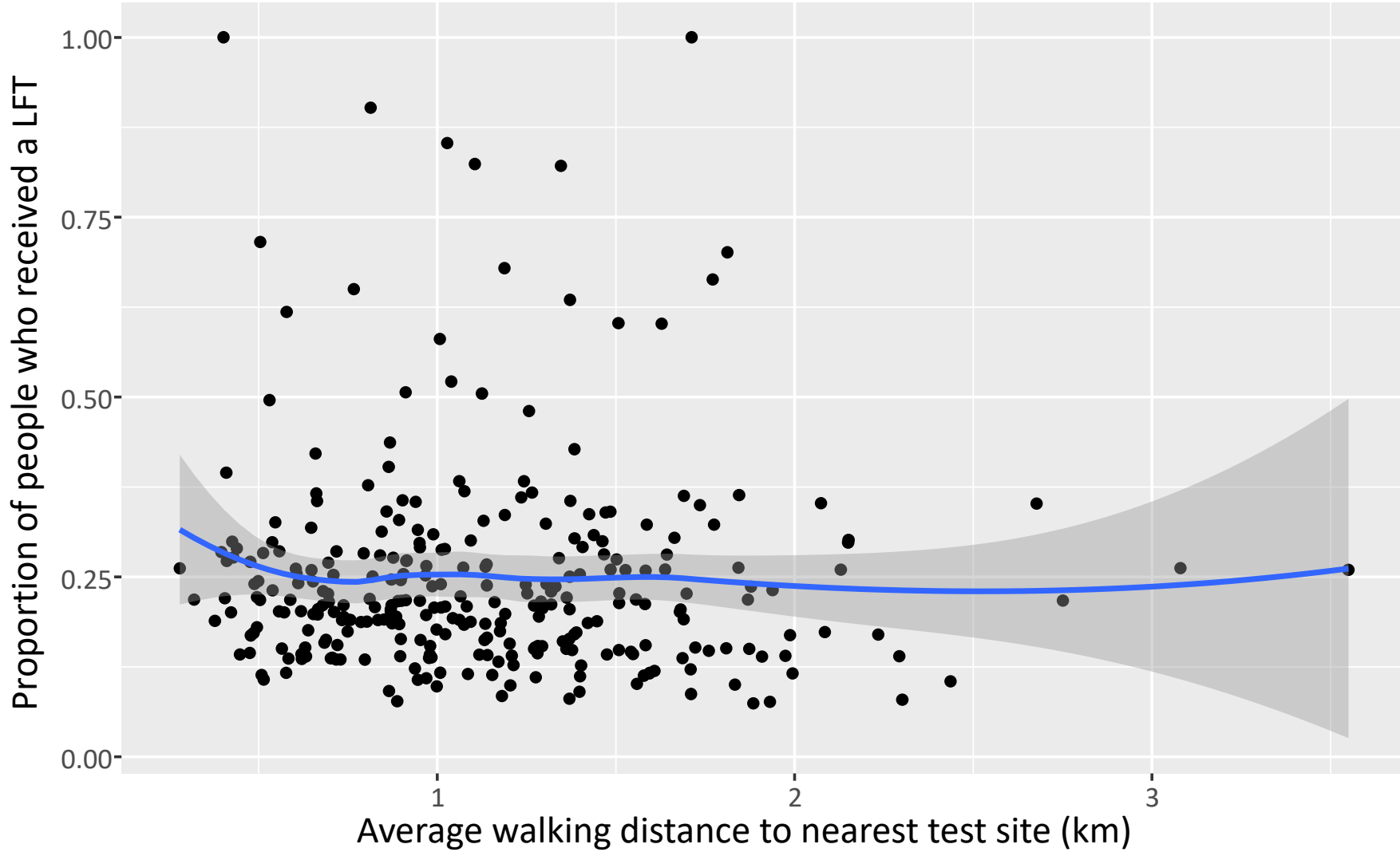
Lowest uptake and highest positivity: 'e-Withdrawn' (deprived neighbourhoods with little engagement with the internet including poor access to internet technologies or smart mobile phones)

# 23rd Nov: Test Sites vs. 15 min walk
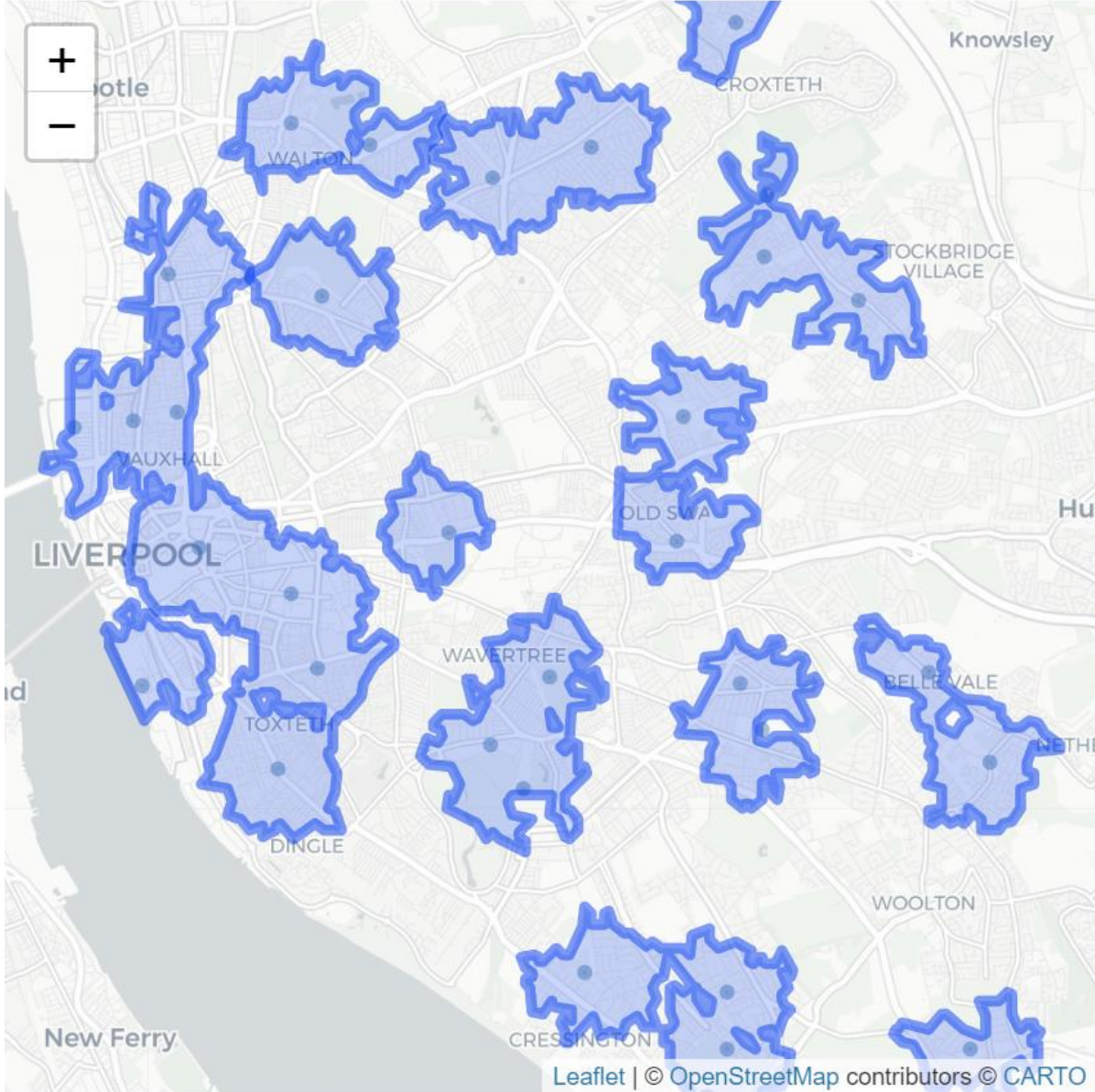
Target Location-Allocation Model (+12 sites): 80% 15 min walk
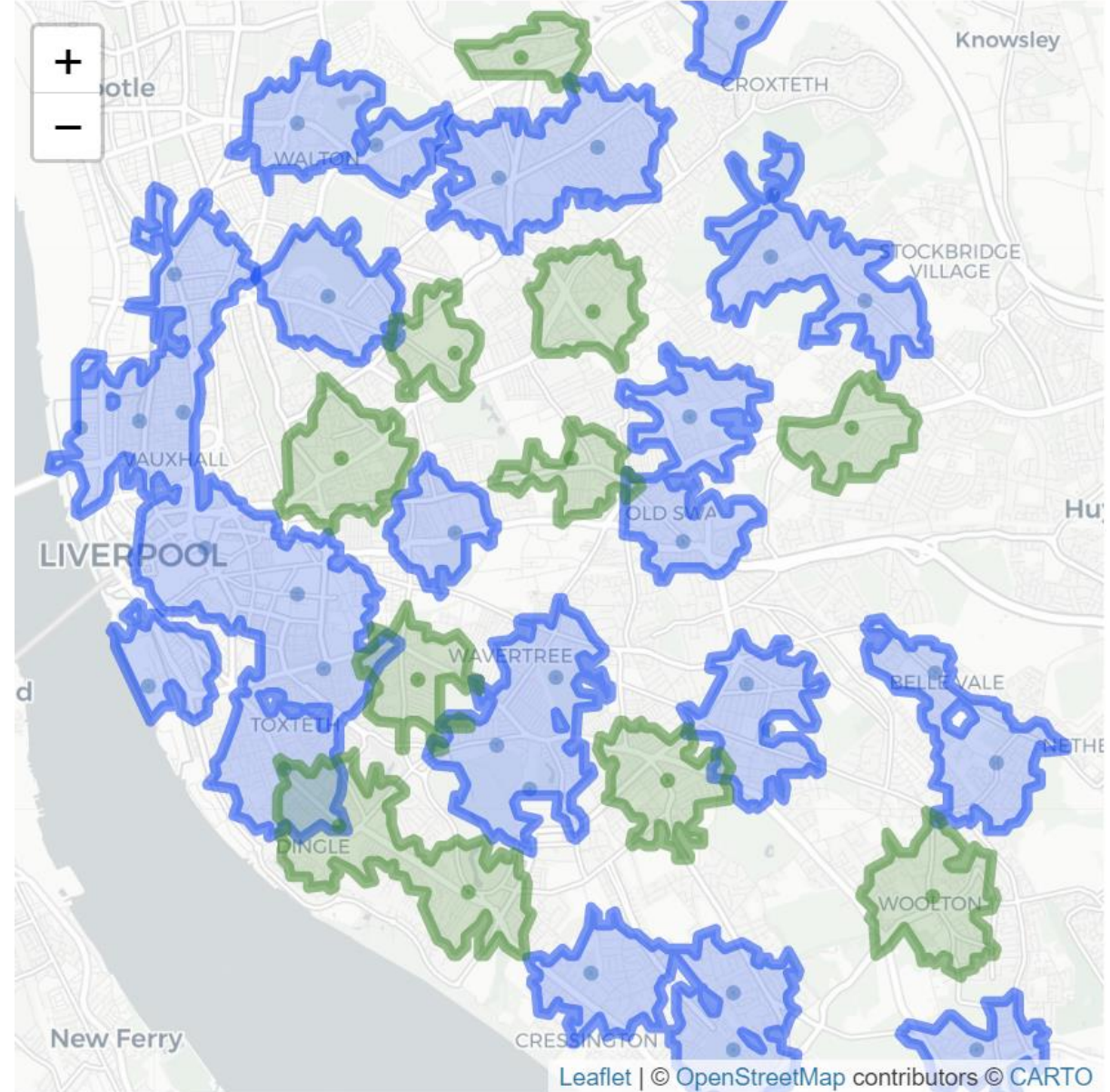
Average distance was negatively associated with test uptake: LSOAs located further from test sites had lower testing rates.

But the effect is only clear after controlling for age, deprivation and digital exclusion – when for every **1km further** walk distance to nearest test site, test **uptake fell** by **27%** (95%CI: 14% to 37%).
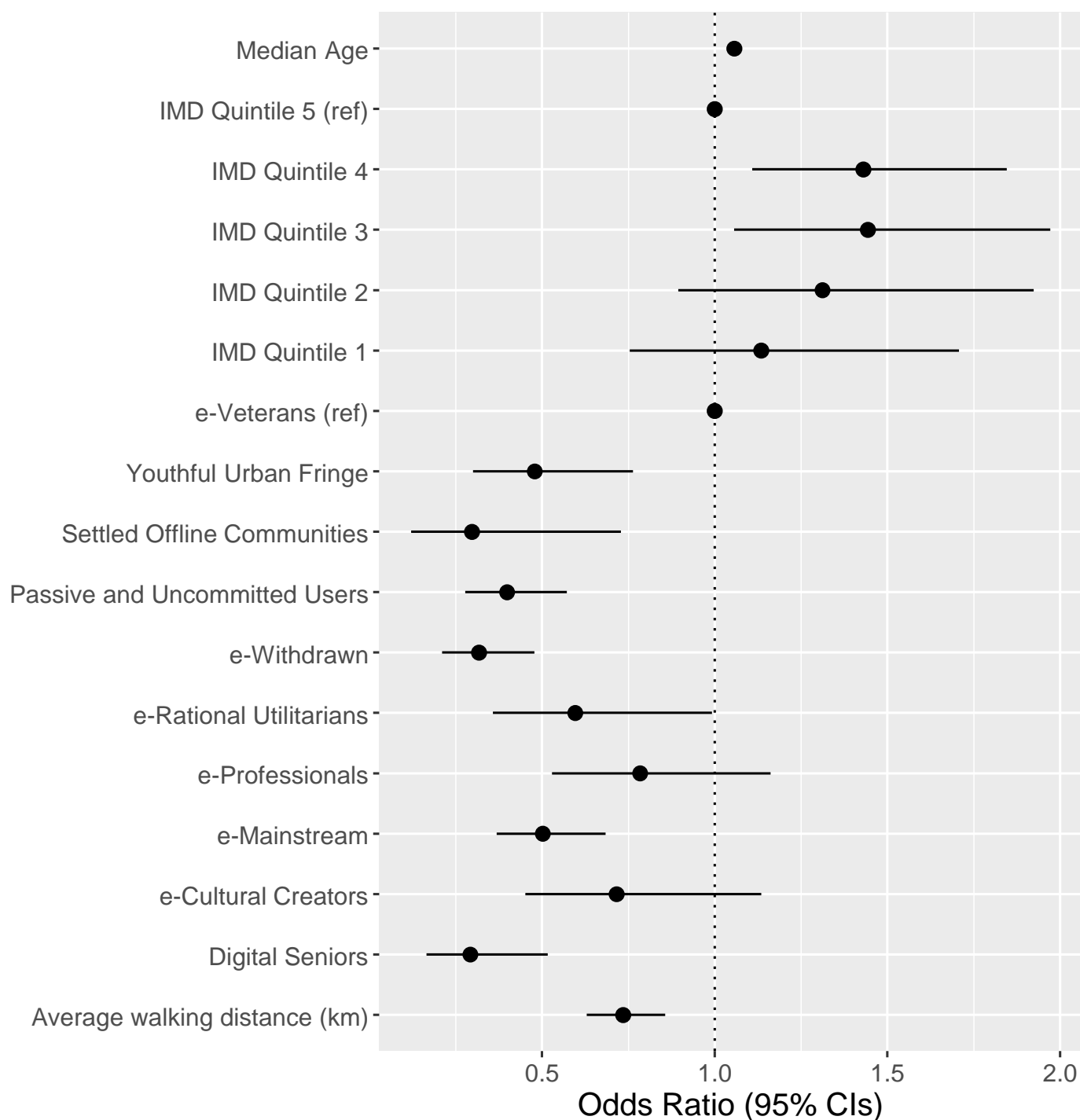
Internet user classification of area **explained more variability** in lateral flow test uptake than did deprivation by LLSOA.

Residents of areas less confident in using Internet technologies were less likely to have received a test.

Dose-response effect: test uptake in **'Digital Seniors' lower compared to 'e-Veterans'**

Behavioural insights: ONS survey

From ~5k on-line responses out of ~6k responses from 60k households: -

- Participated (75%); intend to (14%); don't intend to (10%); undecided (1%)

- Strong awareness of and positive attitude toward pilot (participating or not)

- Quarter distrust Govt (participating); third distrust Govt (not participating)

- Need to isolate understood by 98% (participating); 89% (not participating)

- Need for Covid-safe behaviours acknowledged by 91% (participating); 83% (not participating)

- Negative test intention: 62% say unlikely to affect behaviour; 23% more exercise; 17% visit shops; 9% visit friends and family; 7% go to work

- Intention to get a regular test: 53%

- Compliance with isolation – a little more leaving of household – no difference in non-household contacts compared with isolation after other testing routes

Behavioural insights: Social media and focus groups

- Social media analytics (PHE)
  - 11 local newspaper articles; 16 Facebook posts; 3 Twitter sources
  - ~1000 comments (41% neutral; 38% negative; 21% positive)
  - Facilitators: protect community – collective, cohesive action to help each other; return to normality – access to ; positive experiences of testing; social identity – civic pride in Liverpool taking the initiative
  - Barriers: accessibility of the site; risk of transmission; uncertainty; trust in test; concerns over DNA capture; concerns over Government interference; confusion with vaccine and distrust in it

- Focus groups
  - Good intention of testing programme understood
  - Areas for improving booking and test centre experience identified
  - Trust in test dropping with media debates on test accuracy – disincentive
  - General misunderstanding of test accuracy e.g., thinking PCR detects all cases
  - Test resulting in children off school is a major barrier
  - Low trust in vaccine

Attendance survey: motivations and barriers

- 242 on-line responses 30th Nov to 5th Dec

- Why did you decide to come?
    - Preventing spread, controlling the outbreak, getting out of Tier 3/lockdown, protect others, or reassurance of being safe (37%)
    - Support or help the community (31%)
    - Requirement or condition for employment (17%)
    - Protect family and friends (15%)
    - Worried about not having symptoms but still being a carrier of the virus (14%)

- Did anything put you off going for a test?
    - No (68%)
    - Yes
        - Inconvenient or unsupported (13%): transport, track and trace, isolation (support)
        - Fear of infection (8%)
        - Pain or intrusion of test (2%)

Attendance survey: intentions after test result

- Would you come back: 99% yes

- After positive test result
  - Self-isolate and stay at home (85%)
  - Go for another test to confirm the result (11%)
  - Follow the latest guidance (19%)
  - Notify recent contacts (10%)
  - Work from home (4%)
  - Notify employer (4%)
  - Inform NHS Track and Trace (4%)
  - Ask household to isolate (3%)
  - Negative emotional response (2%)

- After a negative test result
  - Continue to follow guidance (49%)
  - No change: carry on as normal (25%)
  - Get tested again (19%)
  - More confident: feel safer (4%)
  - Remain cautious/safe (4%)
  - No response (5%)

Conclusions

1. Despite lower-than-expected test sensitivity the time and scale gained from a low-cost, rapid, no-lab test is useful

2. Mass testing is not feasible

3. Targeted, agile, intelligence-led SMART framework has been adopted
   a. Test-to-protect (vulnerable settings)
   b. Test-to-release (from quarantine)
   c. Test-to-enable (abeyance of restrictions affecting health, social fabric and economy)

4. Digitally excluded, deprived, (young adult) males are hard to reach

5. Adequate support in isolation is a barrier that is rising as restrictions lift

6. Locally-driven communications, social marketing and tackling misinformation are key enablers

7. Complex public health (not just testing) intervention, which, if executed well, can help coordinate testing and vaccination as a system

Further information

- These are draft, interim findings subject to change and confirmation

- Evaluation framework available [here](#)

- Enquiries to buchan@liverpool.ac.uk