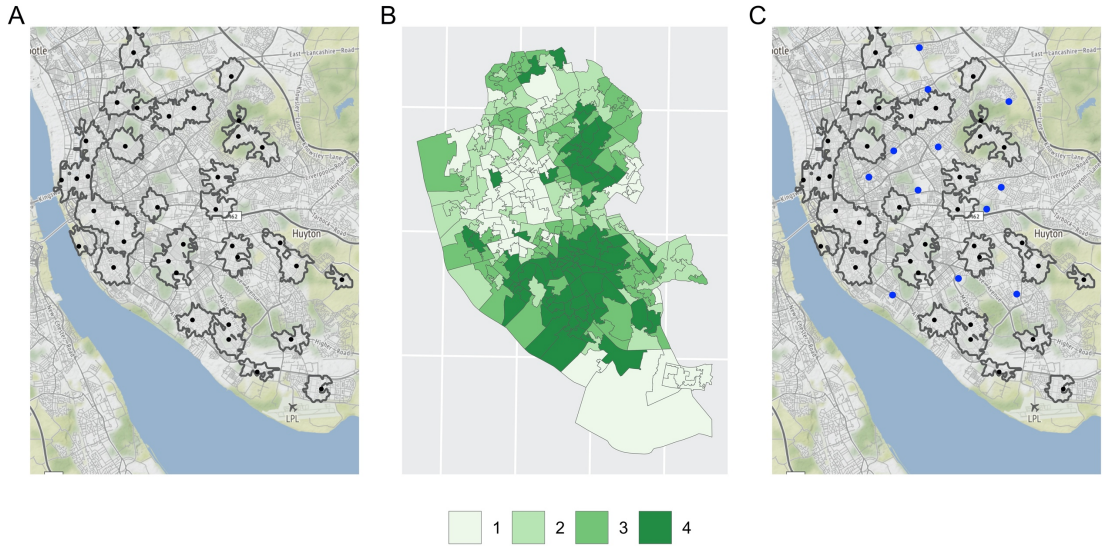
Thinking spatially to communicate and evaluate the roll-out of ‘mass’ testing in Liverpool, 2020

Keywords: COVID-19; asymptomatic; testing; Geography.

Assessing asymptomatic test site coverage in Liverpool (November 2020)

Summary: Areas with poor accessibility to test sites had lower uptake.

A: 15 min walking distance around each test site (black). B: Test uptake (quartiles with 1 = low, 4 = high).
C: Proposed new sites to maximise geographic coverage (blue) compared to existing coverage (black).



Data source: Liverpool City Council

Part of the difficulty in containing Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) has been the significance of asymptomatic cases. Individuals may be infectious without any or few symptoms, limiting our ability to prevent transmission. In response, the UK Government and Liverpool City Council (LCC) trialled providing free asymptomatic testing to all residents in Liverpool (6 November 2020 to 2 December 2021). Liverpool was selected to test the pilot since it had the highest prevalence of COVID-19 in England during planning. The aim was to identify cases and break chains of transmission earlier than before individuals displayed symptoms.

Geography is the lens at which we view the World and thinking spatially can help us to communicate complex ideas or processes. Geography often gives us a clue or signal to what is happening, given the inherent social and spatial patterning of humans and their behaviours. Key to the Geographer’s toolkit is the humble map, a means for visualising spatial processes. Mapping data ended up becoming a key part for telling the narrative and supporting LCC’s delivery of ‘mass testing’. Here, I focus on the case study of how mapping and data visualisation was key for understanding accessibility to test sites.

The featured graphic presents the story for how we mapped and visualised inequalities in accessibility to asymptomatic test sites in Liverpool. Insert A presents the estimated 15 minute walking distance around each test site as a crude measure of how accessible each were. The map was presented as simple as possible, just plotting access around each site alongside a reference map to help individuals situate themselves and interpret patterns. The geographical inequalities in accessibility were striking, particularly the lack of test sites in the densely populated deprived

communities in North Liverpool. Sharing the map with LCC, embedded within an interactive R notebook that allowed people to click, zoom in and actively engage with the map, helped spark a conversation over accessibility issues.

The map by itself was useful, however when visualised alongside other data helped to contextualise the patterns observed. Insert B plots data on overall uptake up to the point when the accessibility map was created (data on numbers of people who received a test shared by LCC). The map itself remains simple, plotting quartile of overall uptake alone, allowing the reader to focus on the spatial pattern it displays.

Eye-balling the two maps (A and B) together isn't the most rigorous form of analysis (despite what my students often tell me), however it is hard to not draw parallels between the areas without a test site within 15 minutes walking distance and lower uptake. Later analyses investigating inequalities in testing uptake demonstrated the importance of accessibility even after accounting for age, sex, ethnicity, deprivation and other possible explanatory factors (Green et al., 2021). Areas with poor accessibility to test sites had lower uptake. Distance can be significant barrier to engagement, especially for communities with no access to private transport or unable to walk long distances. The map here was the precursor that led to the more rigorous investigation of what was influencing uptake – Geography had given us the signal to what might be happening.

The data visualisation workflow isn't just reactive; Geography can and should be proactive in the design of interventions. LCC requested evidence of where they should locate 12 new sites for the final push in encouraging testing, advertised as 'Super Weekend'. Location-Allocation modelling was used to select the sites available to LCC that would maximise geographic coverage. Proposed new sites are plotted in blue on insert C, alongside the accessibility of current sites (same as in A). It boils down the complex modelling into simpler outputs and their main message, allowing the reader to focus on making comparisons between existing and proposed sites. Sometimes less is more, and tailoring outputs to their audience is key.

The visualisation was created using R. The aim was to create a fully open pipeline that LCC could utilise and replicate in any future work. Code to create the maps and analyses can be found here.

Having access to real-time data is imperative in responding to the COVID-19 pandemic. However, data are only data, and without effective and engaging means for visualising their information their story and insights can be lost.

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References

Green, M.A., García-Fiñana, M., Barr, B., *et al.* (2021) Evaluating social and spatial inequalities of large scale rapid lateral flow SARS-CoV-2 antigen testing in COVID-19 management: An observational study of Liverpool, UK (November 2020 to January 2021). MedRxiv. DOI: https://doi.org/10.1101/2021.02.10.21251256.