

How the UPRN saved lives: a story of vaccinating for COVID

Rob Shaw, Head of Forecasting

May 2023

Introduction

- Location data can be critical to supporting analysis and government response in times of crisis, such as the Covid-19 pandemic. For the NHS, data on the characteristics, location and movement of the population were all important factors in shaping the our response.
- When Covid-19 first struck, NHS England (NHSE) needed to understand who was at greatest risks of infection and illness – and then as vaccines became available, the uptake rate of vaccinations, and how it varied.
- NHSE had lots of previous experience with pseudonymised person-level model – they started being used as part of the allocation formula that distributes money to the local NHS in 2014/15. But factors like long term conditions that drive the need for many NHS services were less important for COVID and we needed models that gave very localised insights.

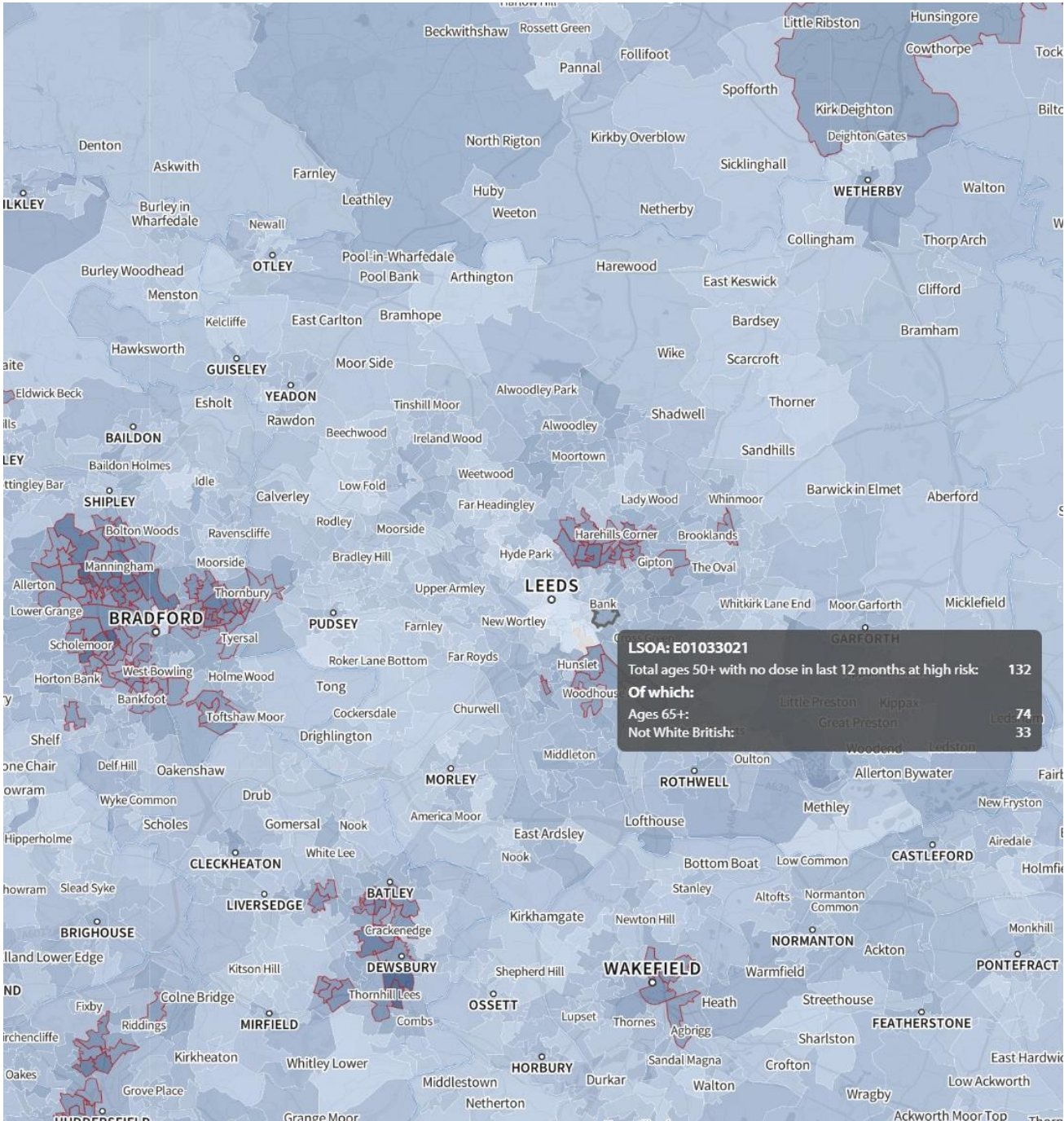
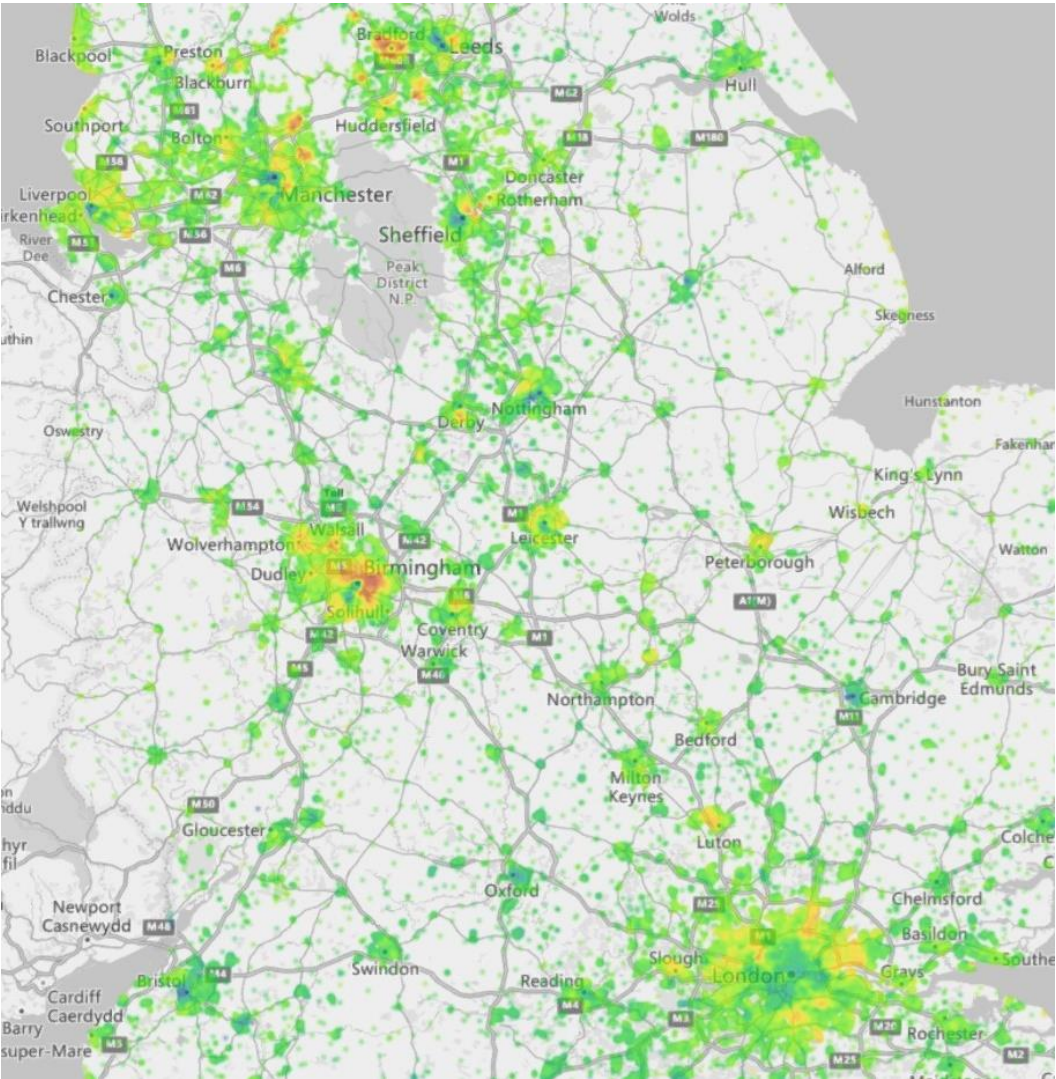
Enter the UPRN...

- Shortly before the pandemic, UPRN linkage of NHS registered patient became available.
- This enable linkage to new datasets that may be relevant for COVID analysis:
 - Does a property have any private outdoor space? If so, how large is it?
 - How large is the property? Is it detached, terraced, a flat, etc.?
- And analysis of the grouping of individual within pseudo-UPRNs enable inference of household type:
 - Living alone
 - Two adults with or without children
 - Multigenerational households
 - etc.

Risk of hospitalisation with COVID

- NHS hospitals were under huge pressure from COVID – over 30% of all beds occupied with COVID patients at the peaks.
- We built a pseudonymised individual-level regression model to identify key drivers of COVID admission risk.
- The signs and magnitude of the coefficients were generally in line with expectations. We report results in term of marginal effects – i.e. the impact of a variable assuming others are kept unchanged. The key results were
 - Age: risk of admission increases very strongly with age.
 - Gender: males had a higher relative risk than females with the difference widening with age to around 1.5x higher at age 75+.
 - Ethnic group: all groups except Irish and Chinese had a higher relative risk compared to White British. This was around 1.6x for Black ethnic groups and those in the Asian Indian group, but over 2.0x higher for those in the Pakistani, Bangladeshi and other Asian ethnic groups.
 - Local area deprivation: relative risk was 1.3x higher for those in the most vs least deprived decile of deprivation
 - **Household type: compared to two adults of different gender, most household types had higher relative risk. In general risk increased in line with the size of the household. Of particular note were: multigenerational household where the relative risk was over 2.0x higher in those age 70+; one adults households with children (1.2-1.6x relative risk); and those age 70+ living alone (1.7-2.7x relative risk)**
 - **Property type: The impact of property type was generally small. Those recorded as living in education building had a much lower relative risk, which is probably capturing the large number of students registered at student accommodation that then returned home.**
 - Compared to being unvaccinated, those who had had only one dose had a 0.26x relative risk (i.e. 74% lower relative rate of admission).
 - For those who have had 2 doses, the relative risk was 0.05-0.07x.

Mapping the results



Uptake of COVID vaccine



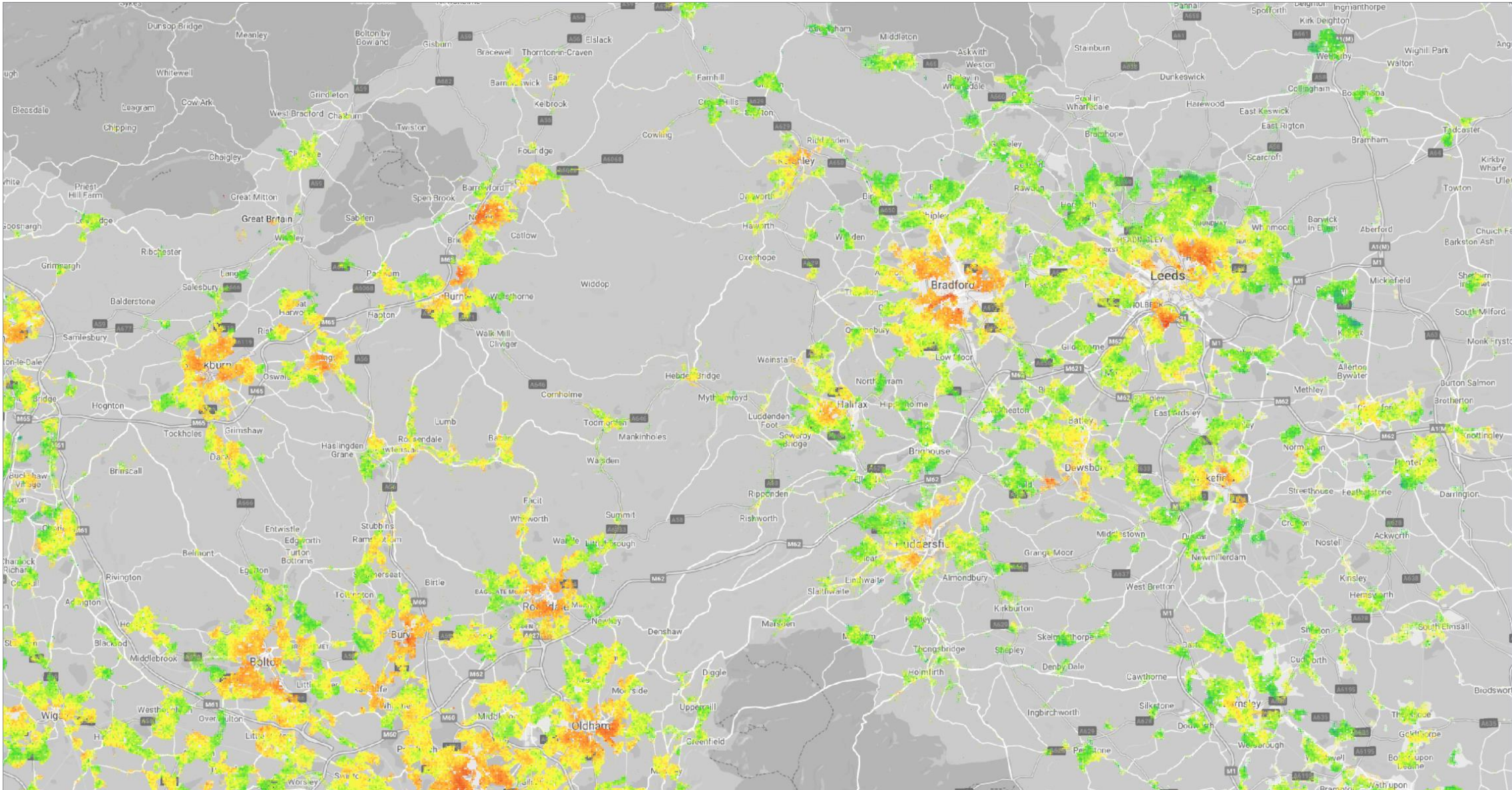
- After the COVID vaccination programme began, it was clear that some groups in the population were much less likely to come forward.
- We adapted our model to identify key factors that were associated with low vaccine uptake
- The key results were:
 - There was huge variation by ethnicity
 - Household type was very significant
 - The highest uptake was amongst households with two adults of different gender.
 - Uptake was >10% lower in multi-adult and multi-generational households
 - The effect was particularly large for some ethnic group who lived in a multi-generational household – a further 3-15% lower on top of the independent effects.
 - Property type generally showed higher uptake for those that tend to be associated with affluence e.g. detached vs flat.
 - Hotels, hostels, HMOs and other ‘irregular’ properties were associated with significant lower uptake (5-10%).
 - Uptake was 6.4% points lower in the most deprived decile of IMD compare to the least deprived.
 - Some disabilities and LTCs were associated with lower uptake:
 - Serious mental illness: -4.9%
 - Learning disability: -0.7%
 - Alcohol dependence: -4.7%
 - Level 3 Frailty: -1.5%

vs White British:

White Irish	-4%
White Any other White background	-23%
Asian Indian	-2%
Asian Pakistani	-13%
Asian Bangladeshi	3%
Asian Any other Asian background	-6%
Black African	-22%
Black Caribbean	-33%
Black Any other Black background	-31%
Mixed White and Asian	-11%
Mixed White and Black African	-21%
Mixed White and Black Caribbean	-31%
Mixed Any other mixed background	-19%
Chinese	-14%
Any other ethnic group	-18%
Not Known	-54%

Mapping

We used the fitted values from the regression to indicate the 'challenge' that a local area may have in achieving high uptake, and may need the most support.



Conclusion

- Coding NHS data with the UPRN opens up significant opportunities to link in other datasets. In the last few months this has included council tax bands, Energy Performance Certificate data, and tenure.
- These data can lead to the significant improvement in models and therefore leading to better decisions, patient outcomes and/or value for money.
- Even with pseudonymisation, the theoretical risk of accidental or malicious disclosure is increased. Therefore secure access, training and monitoring become more important.