



A jab in time...

Trevor Foster explains how new geospatial modelling techniques optimised travel routes for health workers delivering Covid-19 vaccinations to housebound patients in Somerset

We all know that vaccinations are the key to getting through the pandemic. But how do you make sure housebound patients receive their vaccines in the most efficient way? Primary Care Networks (PCNs) in Somerset pondered this question as they began to rapidly roll out their Covid-19 vaccination programme.

The approach to delivering this first round of vaccinations turned out to be quite hectic. Allison Nation, Associate Director of Digital Strategy for Somerset CCG (Clinical Commissioning Group), was soon asked by one of her PCN GPs if there was some clever technology that could help. And this was how the GIS team at the NHS South, Central and West Commissioning Support Unit became involved. The need quickly escalated, as a second PCN in Somerset also urgently needed a solution for its 200 housebound patients.

Creating routings

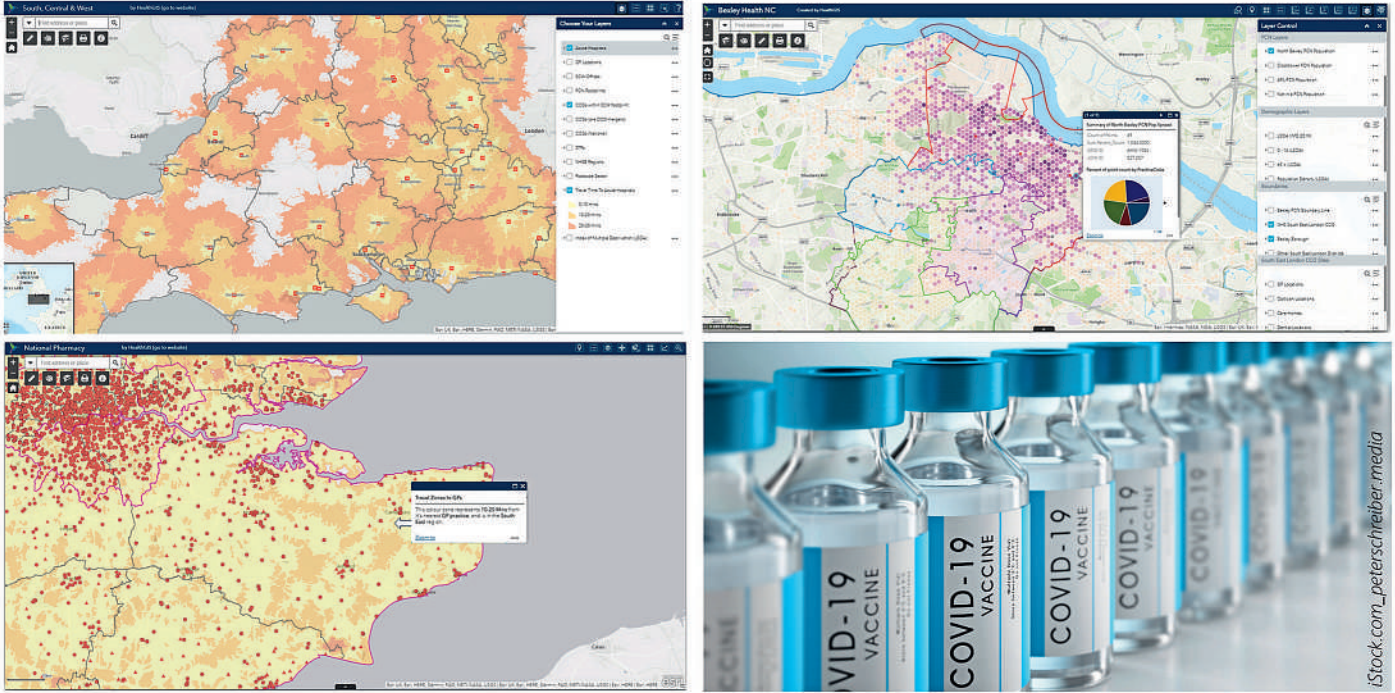
In planning how vaccinators visit patients, there were a few parameters to consider:

1. Where is the vaccine stored? Where does it need to be collected from? This is usually one central place in a PCN area
2. What time of day do vaccinators start and what time do they plan to finish?
3. The vaccine vial contains 11 doses and it is critical to use all doses and not waste any
4. Once open, the vial contents last six hours. Within this time, up to 11 jabs need to be completed

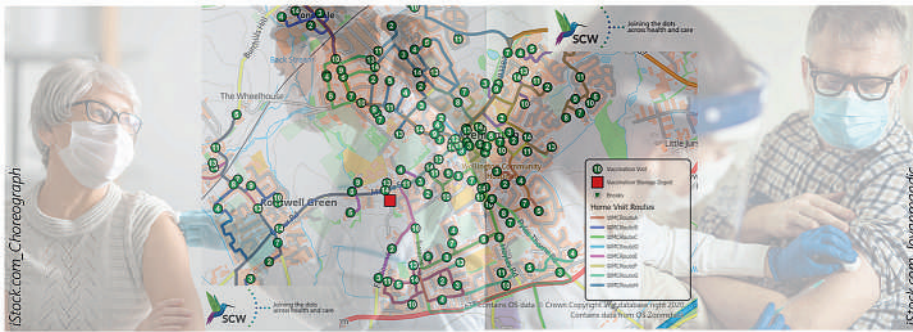
The approach adopted by the GIS team involved taking all the patient addresses and planning the optimal routing to cover as many patients as possible, in as few journeys, so they could fit within the time window for each vial.

This was achieved by modelling a structured data set that contains a unique patient identifier, such as NHS or EMIS system number and the full address, to pinpoint specific house locations. Using this data, the geospatial analysis creates the fewest number of trips needed over the time period. Each route is sequenced from start to finish, with the mapping tool recommending the order in which visits are made. The sophisticated modelling also builds in other relevant factors, including staff breaks, households with more than one patient, the time taken to ring the doorbell, chat with the patient, give the jab, and sit with each patient for 15 minutes recovery.

Using Esri GIS software, it was possible to react extremely quickly to the request and build the original model and procedures in less than two weeks, from the initial contact on 22 January, to launching a full solution to the PCN on 4



Top left: Esri ArcGIS Online web map showing NHS Clinical Commissioning Group (CCG) boundaries, main hospitals and travel access isochrones in 10-minute intervals. Provides a visualisation of accessibility to main hospitals. Top right: Esri web map showing GP registered population density using hexbin geographical areas. Darker shading represents higher density of registered patients. Pie chart shows the distribution of patients across GP practices. Lower left: Esri web map showing NHS Clinical Commissioning Group (CCG) boundaries, GP surgeries and travel access isochrones (drive times) in 10-minute intervals. Provides a visualisation of accessibility to GP surgeries



Example map of optimised vaccination routes

“The SCW GIS team engaged to understand the need and context, and were quick to identify the key questions, dataset, work through relevant information governance and technical details. A great outcome in a high-paced programme!” - Allison Nation, Associate Director, Digital Strategy, Somerset CCG

February. Esri GIS Network Analyst routing tools are very configurable and were ideal for solving the vaccination logistical challenges presented. The team was able to quickly model the specified requirements and provide clients with optimised routes in a relatively short timeframe.

Journey data is supplied in a spreadsheet, with a map providing a visualisation of the routes for the vaccinators, each location being shown as a dot on the map. These are then clustered into groupings to match the dosage and time requirement. Routes can include patients from multiple practices within the PCN, with GPs vaccinating each other’s patients to increase efficiency even further.

Improving efficiency

Critically, the solution minimises wastage of the vaccine, and PCNs can plan thoroughly and communicate better with patients in advance. Patients in each cluster will know when to expect their visits and vaccinators can call patients to confirm an accurate time. The model also builds in contingency time for unexplained delays, which maximises the vaccination programme success rate.

The routing solution is saving the PCNs time and money, as previously, their planning was rarely optimised and journeys were quite chaotic. This resulted in increased journey times, with fewer doses being given each day. This increased the number of days needed for vaccinations and, consequently, the cost of delivering the programme.

Using its expertise to model the data and interpret requirements into logical solutions, the GIS team was able to deliver the initial development in under two weeks. With development of all the procedures complete and any problems resolved, the solution is now ready to be set-up for new PCNs within a day or two - provided that good patient data is supplied (templates are provided).

Patient confidentiality is protected as no patient-identifiable data is transferred from practices. Patient name and contact details are matched only within the practice when they follow-up to make appointments. The solution has been developed using proprietary Esri commercial software owned by SCW CSU, so the system is secure. The data used is also the most accurate available. As an Ordnance Survey (OS) partner, SCW has

access to specific OS products to deliver this accuracy. As an approved data processor for NHS England national patient data sets, the Unit ensure the most up-to-date details are used, further increasing accuracy.

Overall, the new mapping solution can be used to improve vaccination planning for the remaining first job patients that are housebound, and also to plan the second round of jobs, enabling it to be managed more efficiently.

More on the SCW GIS team at:
<https://www.healthgis.nhs.uk/>
More on NHS South, Central and West CSU at
<https://www.scwcsu.nhs.uk/about-us/>
More on Esri UK at
<https://www.esriuk.com/en-gb/industries/health/overview>

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