PenCHORD

NHS National Institute for Health Research

The Peninsula Collaboration for Health Operational Research & Development

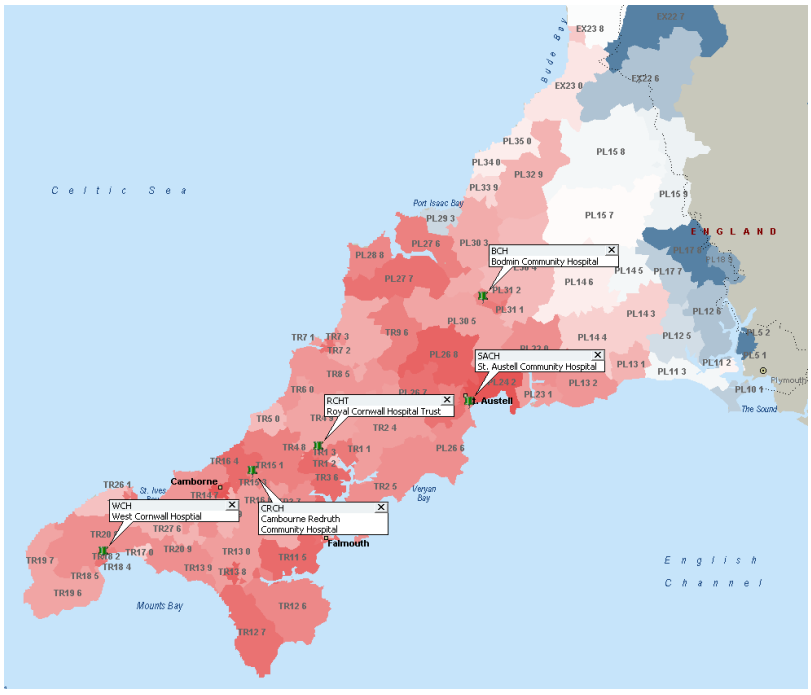
Planning outpatient clinic service provision for TIA patients using location analysis

Background:

We developed a facility location model to evaluate the consequences of different transient ischemic attack (TIA) clinic configurations to help inform the decision making process for the redesign of the service in Cornwall. Location analysis is a specialised branch of combinatorial optimisation. It involves solving for the optimal placement of a set of facilities in a region in order to minimise a measure of performance such as transportation costs or travel time. Facility location modelling has been conducted frequently in healthcare in areas emergency response vehicles and is ideally suited to aid equitable planning of services for patients with urgent care needs such as in stroke.

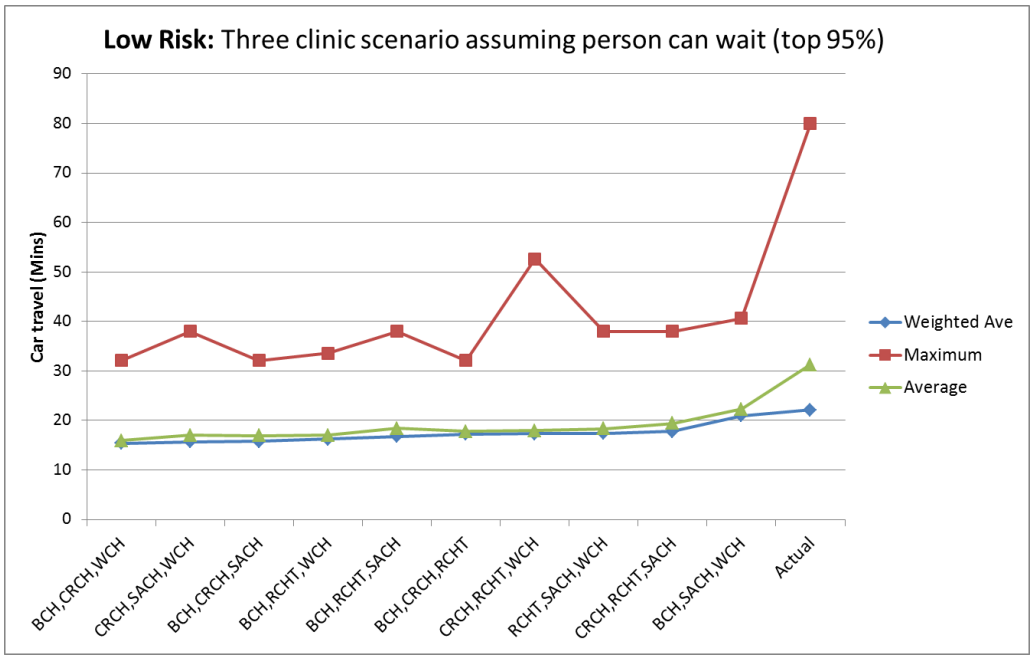
Context:

The risk of suffering a major stroke soon after a TIA or minor stroke is substantial. Prognosis studies indicate that the risk of early stroke within one week, one month and three months is 8.0%, 11.5% and 17.3%, respectively, while 15-20% of acute strokes are reported to have a preceding TIA. As such, provision of a rapid assessment and treatment service for suspected TIA, by admission to hospital or by outpatient clinic, is essential to manage this risk. Rural areas provide a particular challenge to effective TIA management, as planners must provide equitable patient access whilst balancing cost and consistency of care. PenCHORD collaborated with commissioners and clinicians in Cornwall to evaluate the impact on equity of patient access with different locations for TIA outpatient clinics.



Method:

We developed a discrete-choice facility location model to assess the impact of different clinic configurations on patient travel time. We used three car travel time measures from home postcode sectors to TIA clinics; (i) average travel time, (ii) average travel time weighted by demand, and (iii) maximum travel time. The weighted average measure allows for postcode sectors with the highest level of demand to have the greatest impact on results; diminishing the impact of outlying points.



Outputs:

The model groups patients by postcode sector and stores the clinic that the patient attended. This allows us to compare observed behaviour by different groups, such as risk types and dates, against changes in the configuration of service i.e. the number of locations in which TIA clinics operate. The choice of locations for the clinics was discrete (n = 5) and potential sites were known and fixed, therefore, we enumerated all solutions under a two ($C_2^5 = 10$ combinations) and three site ($C_3^5 = 10$ combinations) scenarios.

Results and conclusions:

- When planning service provision, Cornwall should consider a three TIA clinic solution incorporating a clinic located in the centre of Cornwall.
- To improve access for patients classified as high risk of stroke, centralised clinics should be scheduled most frequently. A consequence of this is that some patients at low risk of stroke will have to travel further than before.
- Results do not consider seasonality of travel times or access to clinics via public transport. The use of public transport in rural areas such as Cornwall again emphasises the importance of regular clinic scheduling at the central locations suggested by the analysis. These will have better and possibly more direct public transport links to the outlying areas.

Contact and more information:

PenCHORD collaborated with Selective Analytics, an industry partner specialising in location analysis, for this research. For more information, please contact Professor Martin Pitt (Director of PenCHORD): m.pitt@exeter.ac.uk