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Using GIS to Provide Information for Aiding Knowledge Based Decision Making for Local Health Services

GIG CYMRU NHS WALES
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1. Introduction

The NHS is always striving to improve services, to ensure the best services are available to its patients in a safe environment, but as locally as possible.

HDUHB is no different, and is currently going through a significant reconfiguration in terms of looking at a new hospital site to provide services to patients in Pembrokeshire, West Carmarthenshire and South Ceredigion.

The aim of this research was to investigate the use of GIS and its ability to use data to aid the decision making of the reconfiguration, particularly around Maternity services.

This was achieved by gaining an understanding of the maternity dataset and going on to design develop and implement a working GIS visual for modelling the various site locations.

2. Methods and Resources

The project was a quantitative case study, with an RAD cycle to ensure input from all relevant users were considered and implemented.

Data Sources

Activity – HDUHB Data Warehouse
Sites – HDUHB Executive Board
Postcode Information - ONS
Drive Time – R package "osrm"

Software

R RStudio

3. Sample `R` Code

Calling the function into an R code chunk

```{r - combined mapping consultant}
get_map_current_drive(ccls_iso_fixed$time, ccls_iso_fixed, ccls_points)
```

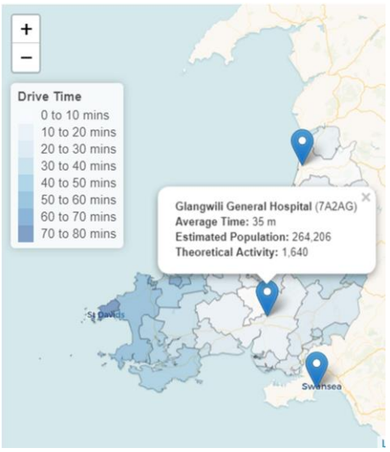
The function that has been called

```
### Building the drive time map
get_map_current_drive <- function(df1_and_column, df1, df2){
  table_temp1 <- levels(df1_and_column)
  table_temp2 <- colorFactor("Blues", table_temp1)

  leaflet(df1) %>%
    addProviderTiles(providers$CartoDB.Voyager) %>%
    addPolygons(fillColor = ~table_temp2(time),
                color = "#000000",
                weight = .5,
                fillOpacity = 0.5,
                popup = ~glue::glue("<b>{name}</b>",
                                    "<br><strong> Intervals in Mins: </strong> {time}",
                                    "<br><strong> Theoretical Activity: </strong> {Observations}")) %>%
    addMarkers(data = df2,
               popup = ~glue::glue("<b>{name}</b> ({org_id})",
                                   "<br/><strong> Average Time: </strong> {round(mean_time, 0)} m",
                                   "<br/><strong> Estimated Population: </strong> {scales::comma(pop)}",
                                   "<br/><strong> Theoretical Activity: </strong> {scales::comma(Observations)}")) %>%
    addLegend("topleft",
              pal = table_temp2,
              values = ~time,
              title = "Drive Time",
              labFormat = labelFormat(),
              opacity = 0.5) %>%
    setView(-4.750000, 52.050000, zoom = 8)
}
```

4. Results – showing the current and proposed site maps with drive time isochrones.

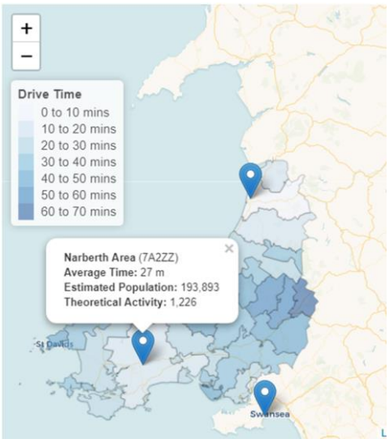
Current:



Hospital Site	Hospital Site ID	Average Time (mins)	Estimated Population	Theoretical Activity	Actual Activity
Bronglais General Hospital	7A2AJ	13.92	47,769	281	381
Singleton Hospital	7A3C4	25.92	72,087	344	
Glangwili General Hospital	7A2AG	35.43	264,206	1,640	2,056
Withybush General Hospital					1

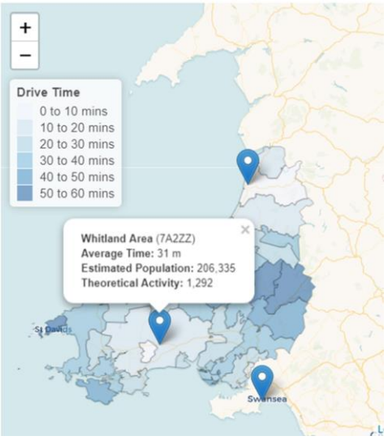
Proposed:

Site 1



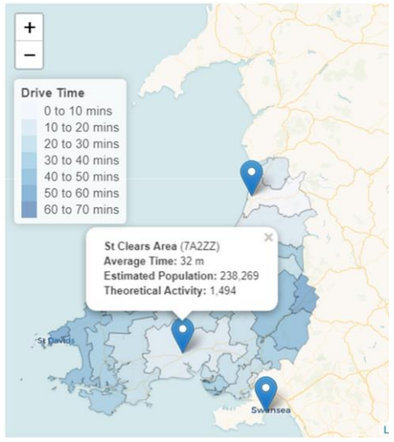
Hospital Site	Hospital Site ID	Average Time (mins)	Estimated Population	Theoretical Activity
Bronglais General Hospital	7A2AJ	21.72	63,399	371
Singleton Hospital	7A3C4	30.74	126,770	668
Narberth Area	7A2ZZ	27.15	193,893	1,226

Site 2



Hospital Site	Hospital Site ID	Average Time (mins)	Estimated Population	Theoretical Activity
Bronglais General Hospital	7A2AJ	20.74	60,829	352
Singleton Hospital	7A3C4	29.54	116,898	621
Whitland Area	7A2ZZ	30.51	206,335	1,292

Site 3



Hospital Site	Hospital Site ID	Average Time (mins)	Estimated Population	Theoretical Activity
Bronglais General Hospital	7A2AJ	17.35	54,388	314
Singleton Hospital	7A3C4	27.27	91,405	457
St Clears Area	7A2ZZ	31.87	238,269	1,494

5. Findings

- The aims of the report were met in terms of understanding the maternity dataset with a view to designing and developing a GIS visual for modelling the various site locations.
- The proposed sites, show that as it moves from west to east that the patient flow has the potential to increase. This is due to the site further east having a faster accessibility time to the proposed site for those living east of Carmarthen. It also demonstrates that those furthest west would have a longer drive to the site, if situated to the east of the preferred zone.
- It was noted that there were some discrepancies with timings and so further investigation is needed to understand what were the under lying causes and to correct them.

6. Feedback and Future Thoughts

Comments made about the work included:

- *"Being able to visually see the impact on travel time (therefore treatment time too) had more impact than trying to understand the differentiation between values in a column;"*
- *"The only improvement would be to show the effect of the three different sites, side by side. This doesn't detract from produced work but would be more a display tweak for comparison."*

Improvements that can be looked at going forward:

- Adding different features such as GP surgeries;
- Using forecasted data to determine future demands and therefore potential pinch points

References

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Acknowledgements

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