

GIS Report BK

by Bryoni Keighley

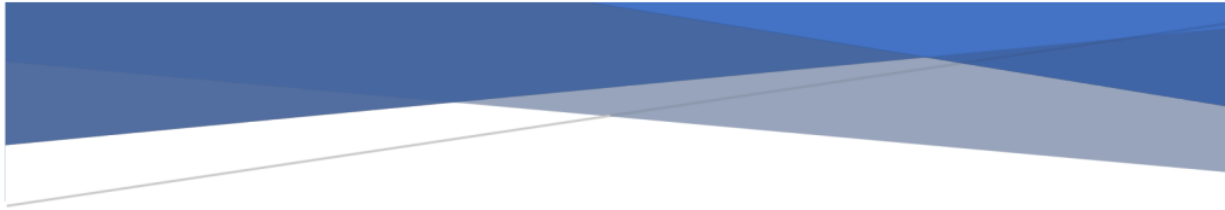
Submission date: 05-May-2022 10:18AM (UTC+0100)

Submission ID: 178540167

File name: 16687_Bryoni_Keighley_GIS_Report_BK_419142_1638960189.docx (13.8M)

Word count: 4115

Character count: 21929



GEOGRAPHICAL INFORMATION SYSTEMS

Geodemographic Analysis using GIS Software

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1908160

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Task One – Development Log

The student was tasked with building a GIS workspace using MapInfo, to highlight and provide suggestions on the trends in the Covid-19 data for Wales. Also, to visually present the uptake of the Covid-19 vaccination program showing where uptake is good and where uptake may need improving. The following development log documents how the student went about building the GIS workspace and what they used to support their investigation.

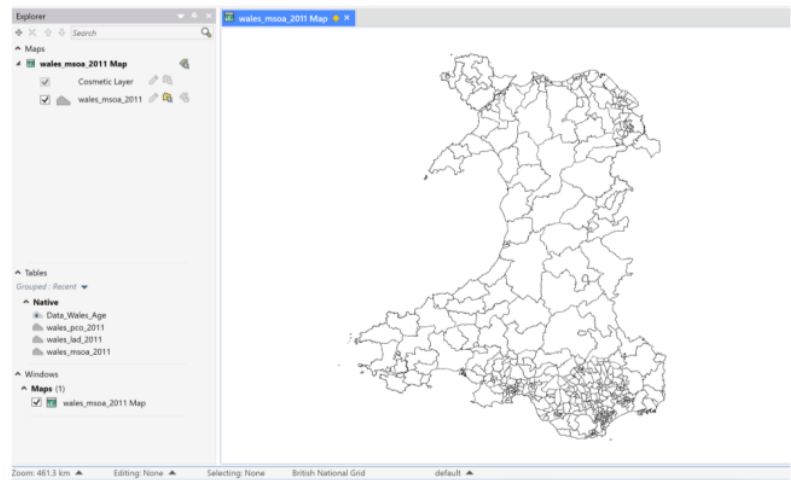
Firstly, the student downloaded maps of Wales at different boundary levels from UK Data Service [1]:



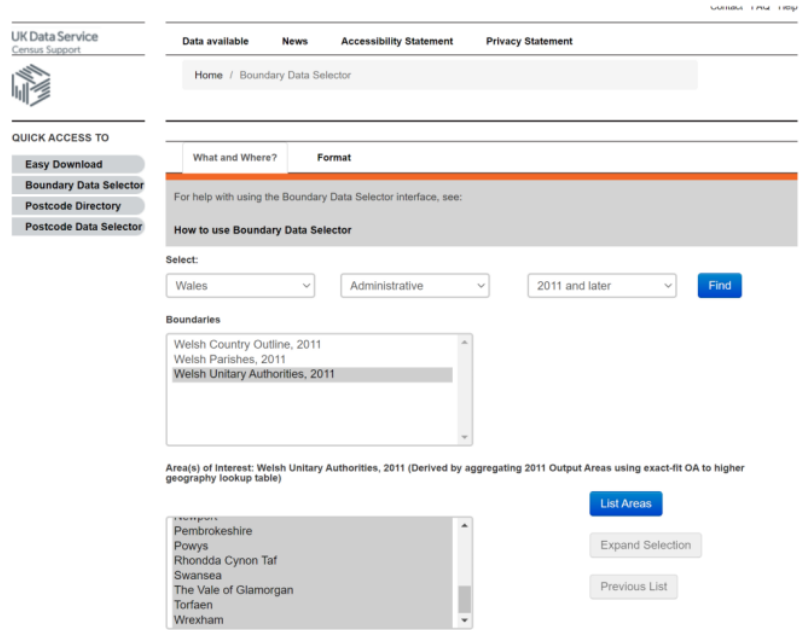
Welsh Middle Layer Super Output Area (MLSOA) provides a detailed boundary level, at a lower level than local authorities or health boards. This is the most reliable format when looking at data visualisation on the map, as it reduces generalisation of data. The boundary data selector allowed the student to easily specify the requirements and download the map:

The image shows the "Boundary Data Selector" interface on the UK Data Service website. On the left, there is a sidebar with "QUICK ACCESS TO" links: Easy Download, Boundary Data Selector (highlighted), Postcode Directory, and Postcode Data Selector. The main content area has a breadcrumb trail "Home / Boundary Data Selector". Below this, there are tabs for "What and Where?" and "Format". A help section states "For help with using the Boundary Data Selector interface, see: How to use Boundary Data Selector". The "Select:" section has three dropdown menus: "Wales", "Statistical Building Blox", and "2011 and later", followed by a "Find" button. The "Boundaries" section shows a list of options: "Welsh Census Output Areas, 2011", "Welsh Lower Layer Super Output Areas, 2011", and "Welsh Middle Layer Super Output Areas, 2011" (which is selected). Below this, a section titled "Area(s) of Interest: Welsh Unitary Authorities, 2011 (Derived by aggregating 2011 Output Areas using exact-fit OA to higher geography lookup table)" shows a list of areas: Pembrokeshire, Powys, Rhondda Cynon Taf, Swansea, The Vale of Glamorgan, Torfaen, and Wrexham. To the right of this list are buttons for "List Areas", "Expand Selection", and "Previous List".

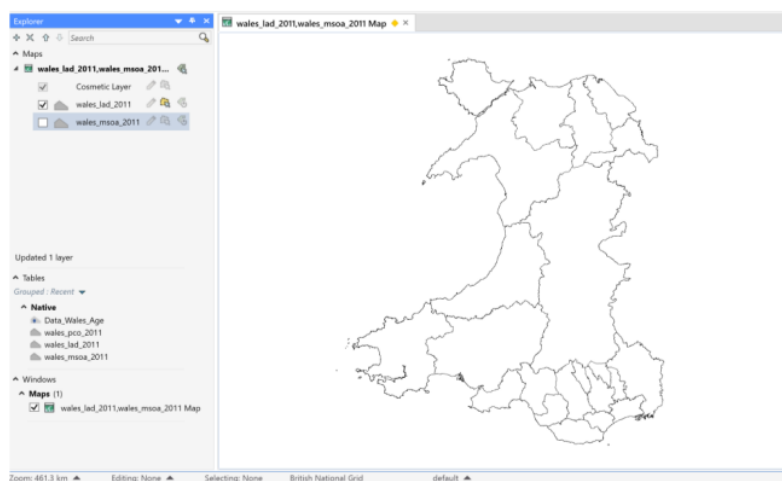
Once downloaded, the map was imported into MapInfo:



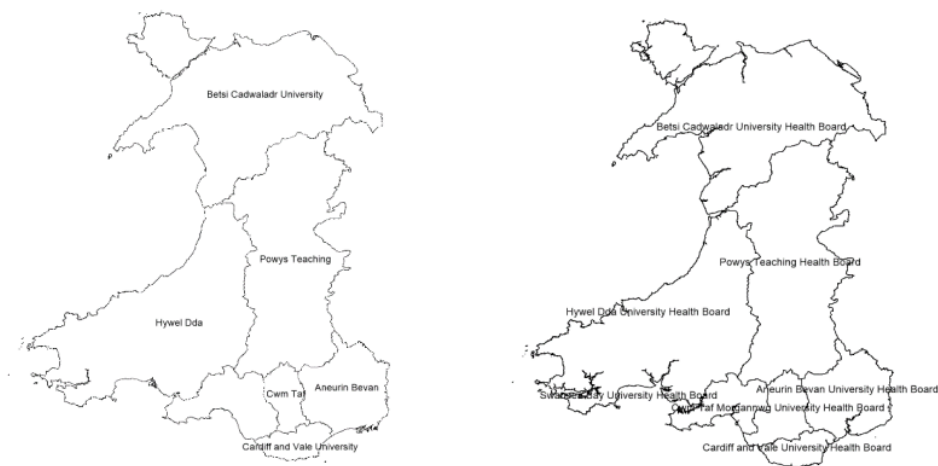
Another boundary map downloaded from Boundary Data Selector was the Welsh Unitary Authorities (LA's) map. This contains all of the local authorities in Wales, which is most widely recognised by residents. This is useful because users will easily recognise the different areas and how they are split. The LA map is slightly less detailed than the MLSOA.



Again, once downloaded the LA map was imported into MapInfo:

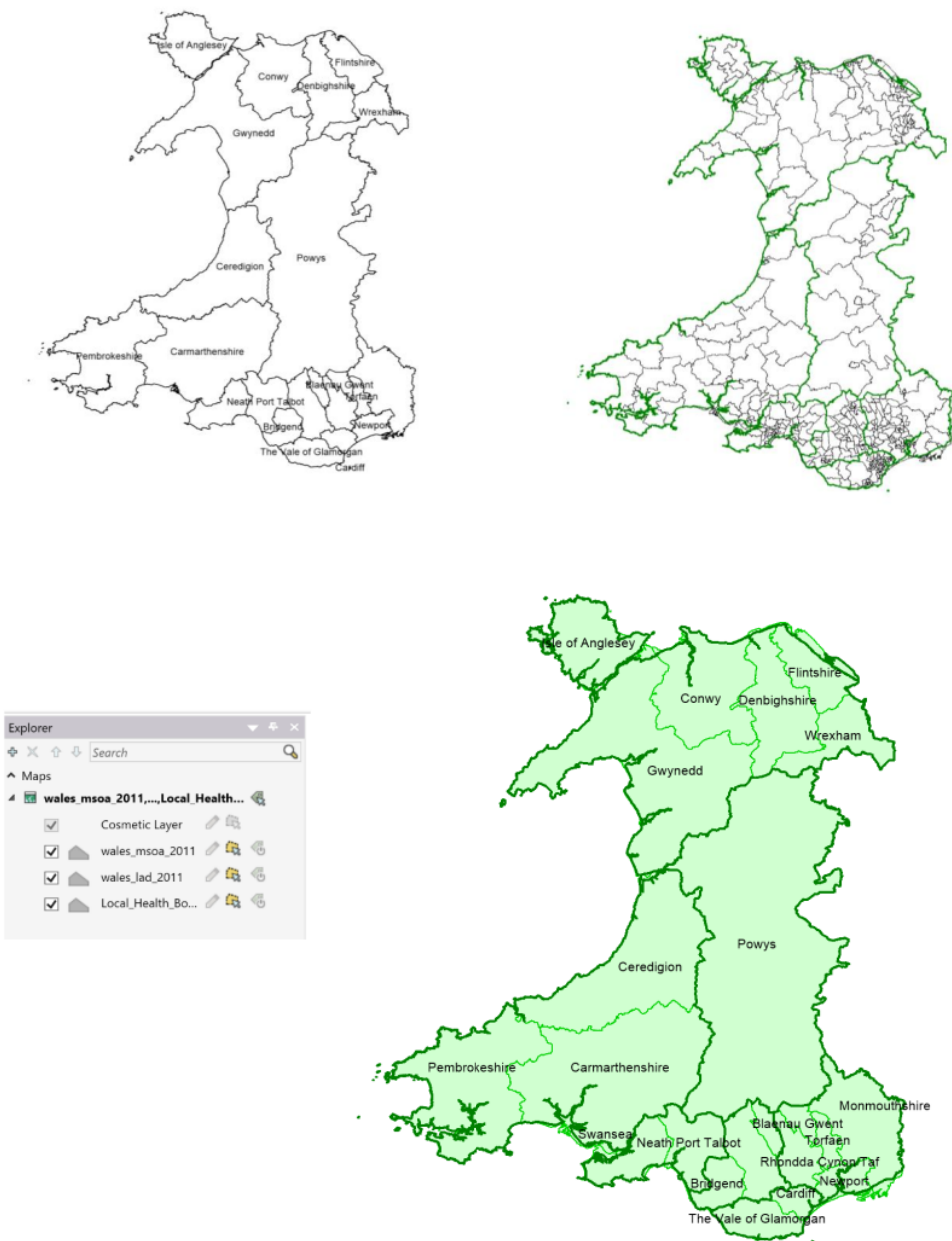


The boundary data selector also provided a map split by Welsh Primary care organisations. This splits the map into the 7 Health Boards across Wales. However, the version found on the UK Data Service was out of date as the boundaries were amended in 2019. The student decided to use an updated version of the Health Board map, provided by the Health Maps Wales team in DHCW. This map gave the updated boundaries, but the coastline was slightly misaligned. Here is the difference between the two:



The main difference can be seen in the south, where Cwm Taf Morgannwg has increased in size, taking an area from Swansea Bay.

The student imported all of the maps into MapInfo and edited the layer order, label display and overall format to create a clearly presented map of Wales:



The Covid-19 (cases, deaths, vaccination) data was provided by the lecturer via Moodle. The student analysed the data available and cleansed the data they wanted to use to show the thematic trends.

- Geographical Information Systems > Assignment > Covid Data Moodle						Search Covid Data Moodle
Name	Status	Date modified	Type	Size		
COVID_Vaccination_data_download_Wales_latest	✓	28/04/2022 13:40	Microsoft Excel Wo...	54 KB		
DeathsByLHB	✓	28/04/2022 13:44	Microsoft Excel 97-...	20 KB		
Rapid COVID-19 surveillance data	✓	28/04/2022 13:42	Microsoft Excel Wo...	971 KB		
VaccineUptake	✓	28/04/2022 13:39	Microsoft Excel 97-...	79 KB		

Deaths by LHB

	A	B	C
1	Local Health Board	Cumulative deaths	
2	Aneurin Bevan University Health Board	1193	
3	Betsi Cadwaladr University Health Board	1259	
4	Cardiff and Vale University Health Board	924	
5	Cwm Taf Morgannwg University Health Board	1871	
6	Hywel Dda University Health Board	707	
7	Powys Teaching Health Board	89	
8	Swansea Bay University Health Board	976	
9			
10			

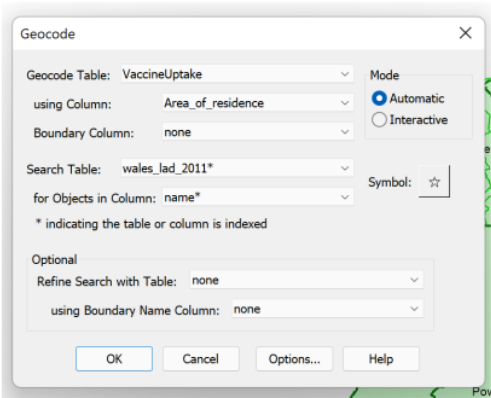
This dataset contained the cumulative number of deaths from Covid-19 per Local Health Board. This could be used to show whether there are areas in Wales with a higher death rate of Covid-19 compared to others. This may suggest that there were problems in those particular areas e.g. lack of accessibility to healthcare, high number of elderly or those with underlying health problems etc.

Vaccine Uptake

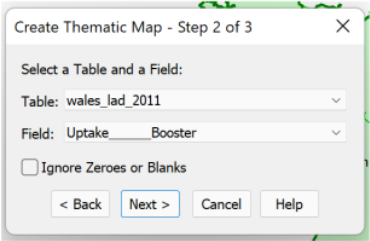
Risk group	Area of res	Denominator	Immunised	Uptake(%)	Immunised	Uptake(%)	Immunised	Uptake(%)
Wales residents aged 80 years and older	Aneurin Bevan	32281	31254	96.8	31100	96.3	30064	93.1
Wales residents aged 80 years and older	Blaenau Gwent	3494	3400	97.3	3384	96.9	3271	93.6
Wales residents aged 80 years and older	Caerphilly	9143	8834	96.6	8796	96.2	8549	93.5
Wales residents aged 80 years and older	Monmouthshire	6841	6699	97.9	6661	97.4	6445	94.2
Wales residents aged 80 years and older	Newport	7566	7223	95.5	7190	95	6904	91.3
Wales residents aged 80 years and older	Torfaen	5237	5098	97.3	5069	96.8	4895	93.5
Wales residents aged 80 years and older	Betsi Cadwaladr	43983	42652	97	42365	96.3	39844	90.6
Wales residents aged 80 years and older	Isle of Anglesey	4869	4749	97.5	4721	97	4487	92.2
Wales residents aged 80 years and older	Conwy	9200	8893	96.7	8822	95.9	8280	90
Wales residents aged 80 years and older	Denbighshire	6623	6399	96.6	6357	96	5864	88.5
Wales residents aged 80 years and older	Flintshire	8652	8402	97.1	8364	96.7	7887	91.2
Wales residents aged 80 years and older	Gwynedd	7557	7306	96.7	7250	95.9	6765	89.5
Wales residents aged 80 years and older	Wrexham	7082	6903	97.5	6851	96.7	6561	92.6
Wales residents aged 80 years and older	Cardiff and Vale	23274	22100	95	21944	94.3	20865	89.6
Wales residents aged 80 years and older	Cardiff	15168	14264	94	14154	93.3	13389	88.3
Wales residents aged 80 years and older	Vale of Glamorgan	8106	7836	96.7	7790	96.1	7476	92.2
Wales residents aged 80 years and older	Cwm Taf Morgannwg	23048	22270	96.6	22173	96.2	21416	92.9

The vaccine uptake data was copied directly from the original Moodle spreadsheet containing the percentage uptake of each dose which can be filtered by Health Board or Local Authority. This could be used to show how the percentage uptake differs across Wales, and which areas are showing a good level of immunisation compared to areas at risk. Those areas at risk may show high numbers of unemployment, religion or perhaps a high number of specific age groups which may be impacting their opinion on the vaccine.

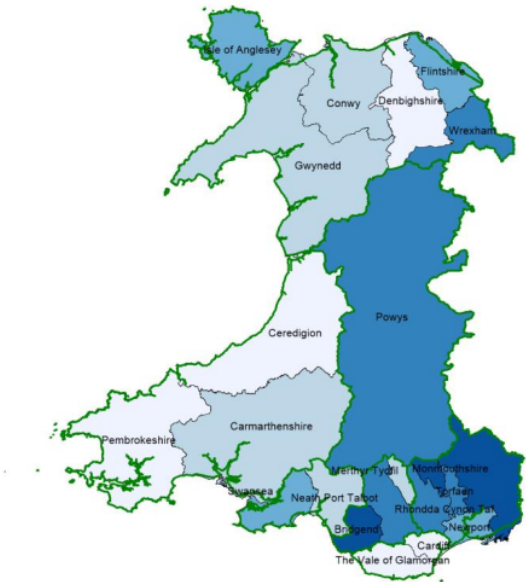
The data from Excel was imported into MapInfo and geocoded using the boundary maps:



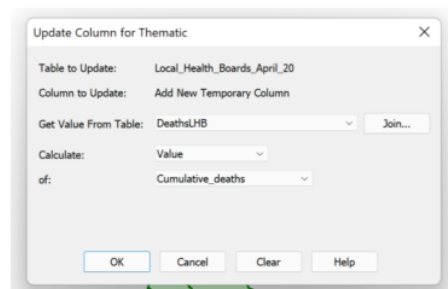
After successfully Geocoding, the data could be used to add a theme to the map:



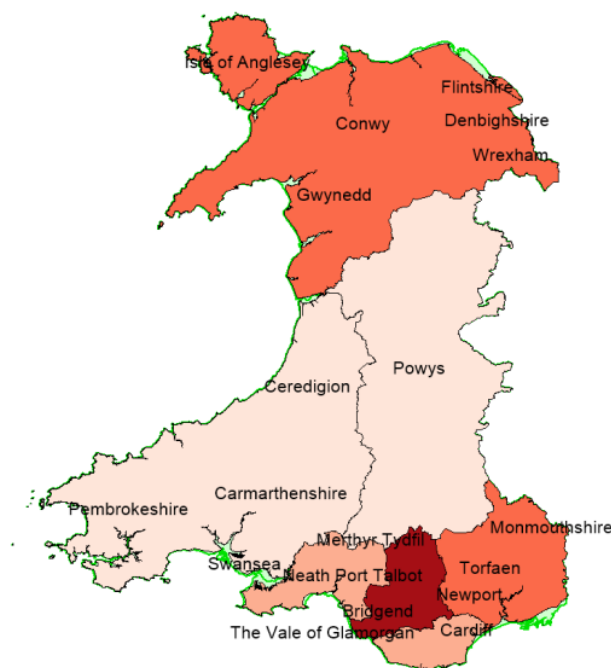
The theme creates another layer on the map, the darker the colour the higher the percentage uptake of the Covid-19 Booster:



This process was repeated for the Covid-19 deaths dataset, however this time the data was Geocoded onto the Local Health Boards map rather than Local Authorities:



This layer of the map really highlights the misalignment of the coast when using multiple maps from different sources, due to the amount of detail around the coastline on each map. However this does not affect the Health Board boundaries:



To suggest why we see the thematic results found in the Covid-19 data, the student downloaded different datasets from InFuse [2] via UK Data Service [1], deciding to look at the following topics:

- Age – Categorise the data into age groups to show the comparison in the distribution of the younger population compared to the older population in Wales. This could indicate whether age has an impact on Covid-19 deaths or vaccine uptake.

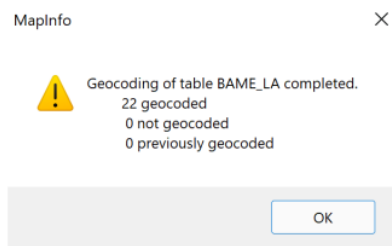
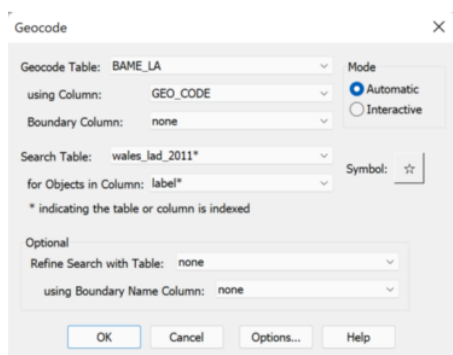
- Commute – Look at the different methods of commuting in Wales and present the amount of people who use public transport to get to work. The use of public transport should increase the spread of Covid-19; therefore these areas could see higher Covid-19 cases, and/or higher vaccine uptake.
- Economic Activity – Those who are economically active are currently in employment, this could influence the spread of Covid-19 and the vaccine uptake if it is required for employment for example.
- Ethnic Group – Studies found that some ethnic groups were more at risk from Covid-19 compared to others [3]. This data can be categorised into ethnic groups, grouped into BAME and displayed on the map to show the distribution of BAME communities across Wales for a comparison with the Covid-19 deaths data.
- Health Problems – Those with long term health problems were more at risk of dying from Covid-19, the health problem data should show a similar distribution to the Covid Deaths data, also those with long term health problems were prioritised for the vaccine so should show a higher uptake.
- Religion – At the time studies showed that religion could have an impact on whether or not individuals got the Covid vaccine. If this is the case, we may see lower levels of vaccine uptake in the most religious areas.

The topics were based on Local Authority data as an easily recognisable map layout, however MLSOA data would provide a more realistic spread of the data for in-depth analysis:

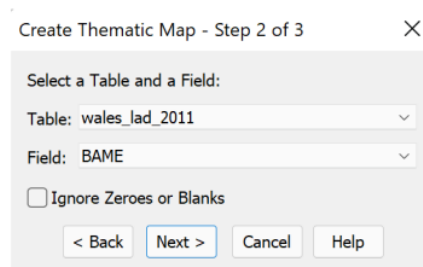
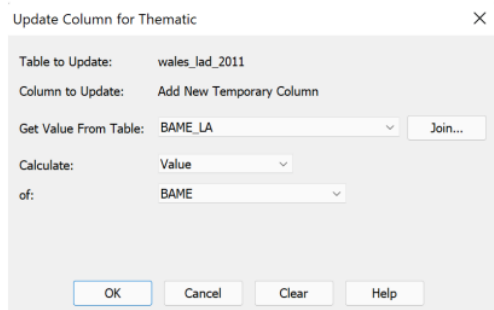
Once the files were downloaded, the data was cleansed in excel and imported into MapInfo as Excel 97-03. All of the data is stored in one location:

Geographical Information Systems > Assignment				
Name	Status	Date modified	Type	
Covid Data Moodle	✓	01/05/2022 15:50	File folder	
Digimap	⬆	03/05/2022 15:23	File folder	
LA_Age	✓	01/05/2022 16:41	File folder	
LA_Commute	✓	29/04/2022 11:47	File folder	
LA_EconomicActivity	✓	28/04/2022 16:40	File folder	
LA_EthnicGroup	✓	29/04/2022 11:27	File folder	
LA_HealthProbs	✓	29/04/2022 14:57	File folder	
LA_Religion	✓	28/04/2022 16:48	File folder	
Lie	✓	03/05/2022 16:17	File folder	
Vaccination Centres	✓	03/05/2022 13:38	File folder	
WalesMap HBs	✓	21/03/2022 13:54	File folder	
WalesMap MSOA	✓	21/03/2022 14:08	File folder	
WalesMap UnitaryAuthorities	✓	28/04/2022 15:43	File folder	

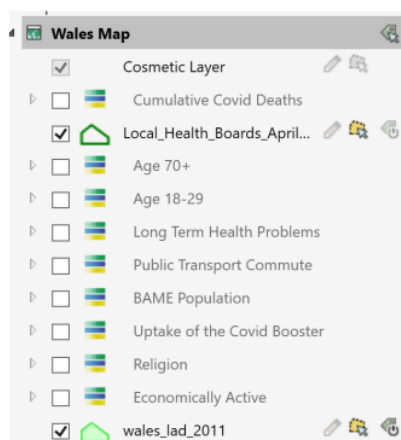
The tables were then Geocoded:



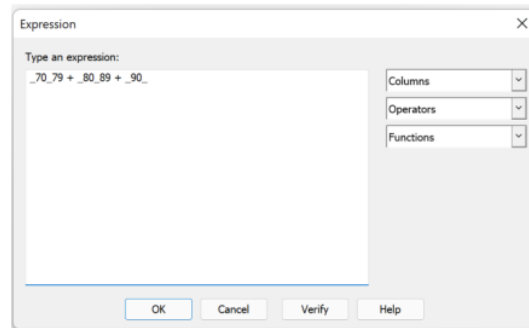
Then, the student could use the data tables to add themes to the Map:



The workspace map now contained different theme layers that can be turned on and off to present different maps:



The 'Age 70+' theme was created by calculating the total of 3 different columns in an expression:



As well as thematic mapping, topographic and spatial data can be used to give a different perspective on the data. Spatial queries can include roads, vaccine centres, hospitals etc. for specific areas. The student focused on the Betsi Cadwaladr University Health Board (BCUHB) region as this is their Health Board, to provide a more detailed view and suggest more specific reasons for the data results in that particular area. The reasons and trends found here may differ between the Health Boards.



Firstly the student gathered information on all of the vaccination centres in BCUHB [4] including all of the postcodes for each centre. They then converted the postcodes to get the longitude and latitude of each centre [5] and stored in an Excel spreadsheet:

Centre Name	Postcode	Latitude	Longitude
Ysbyty Enfys Bangor	LL57 2PW	53.209	-4.1598
Plas Arthur Leisure Centre	LL77 7QX	53.2562	-4.318
Caernarfon Tennis Centre	LL55 1DU	53.1477	-4.2584
Nefyn Y Ganolfan	LL53 6EA	52.9358	-4.5239
Pwllheli Leisure Centre	LL53 5PF	52.8808	-4.424
Porthmadog Leisure Centre	LL49 9HW	52.9303	-4.1354
Blaenau Ffestiniog Community Centre	LL41 3UF	52.993	-3.9376
Dolgellau Leisure Centre	LL40 1LH	52.7438	-3.8819
Bro Dysynni Leisure Centre	LL36 3AD	52.6572	-3.9882
Bala Leisure Centre	LL23 7YE	52.9078	-3.6048
Ysbyty Enfys Llandudno	LL30 1LB	53.3114	-3.8279
Denbigh Community Centre	LL16 3TS	53.1841	-3.421
Llanrwst Glasdir Centre	LL26 0DF	53.1401	-3.801
Royal Alexandra Hospital	LL18 3AS	53.3267	-3.4807
Kinmel Bay Community Centre	LL18 5BT	53.3116	-3.5158
Kings Hall	LL19 9AA	53.334	-3.4045
Ysbyty Enfys Deeside	CH5 1SA	53.2065	-3.0262
Catrin Finch Centre	LL11 2AW	53.0526	-3.0061
Plas Madoc Leisure Centre	LL14 3HL	52.9834	-3.0627
Theatre Clwyd	CH7 1YA	53.1797	-3.1374

The data was imported into MapInfo and created points using the longitude and latitude of all vaccine centres, in order to display the distribution of vaccination centres across BCUHB:



The student then added a theme to the map of BCUHB showing the vaccine uptake for dose 1 and another theme for booster, alongside the vaccination centre locations to visually analyse the distribution and potentially highlight any gaps where uptake may be limited.

Dose 1:

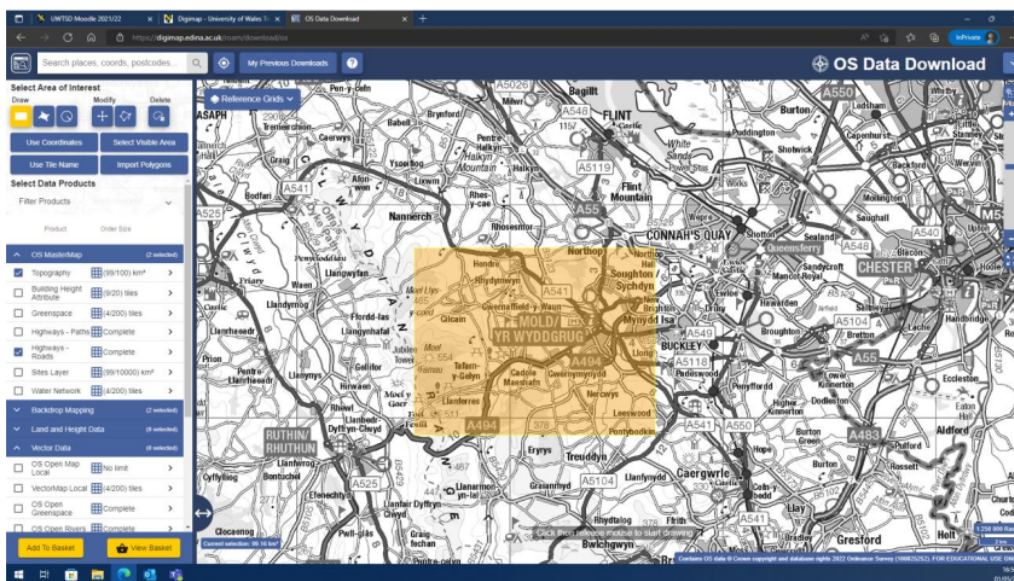


Booster

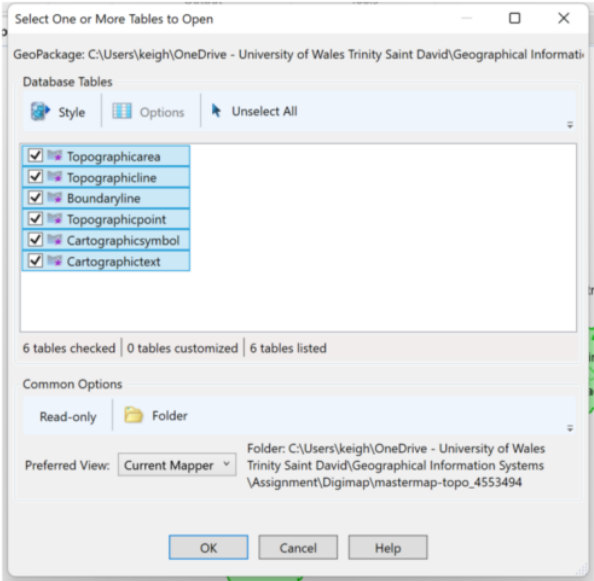


Once displaying the vaccination data on the map of BCUHB, the student wanted to add more detail and potential reasoning by adding the road network.

Digimap [6] provides ordinance survey data for your specific area of interest, allowing developers to show roads, water networks, buildings etc. The student specified the area and downloaded the data:



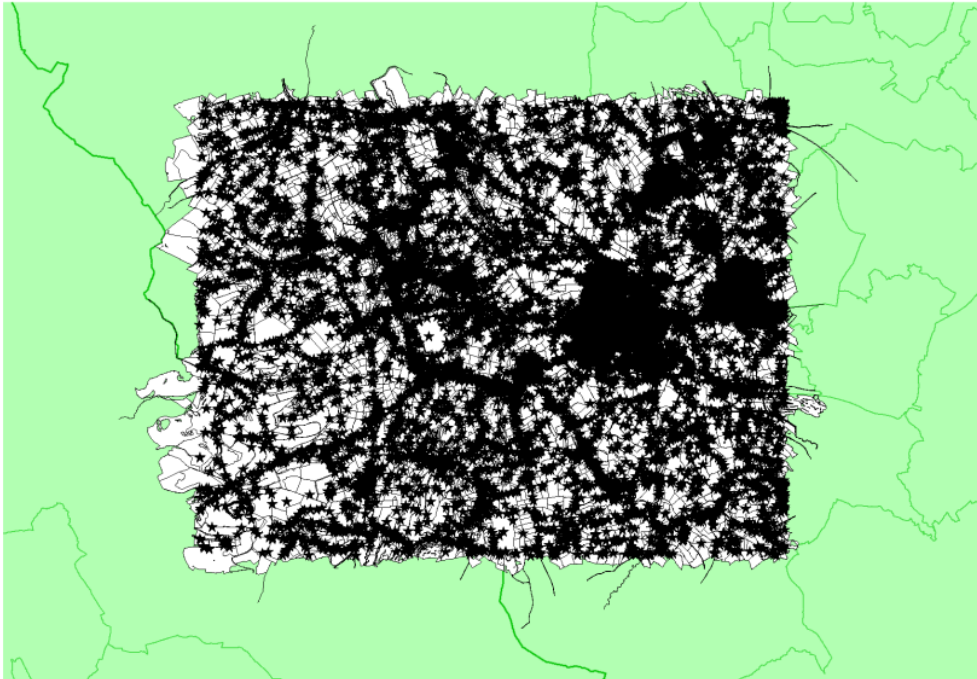
This data was downloaded and imported into MapInfo:



The area specified was relatively small compared to the focus area of BCUHB:



Zooming in gives a more detailed view but it still looks very messy:

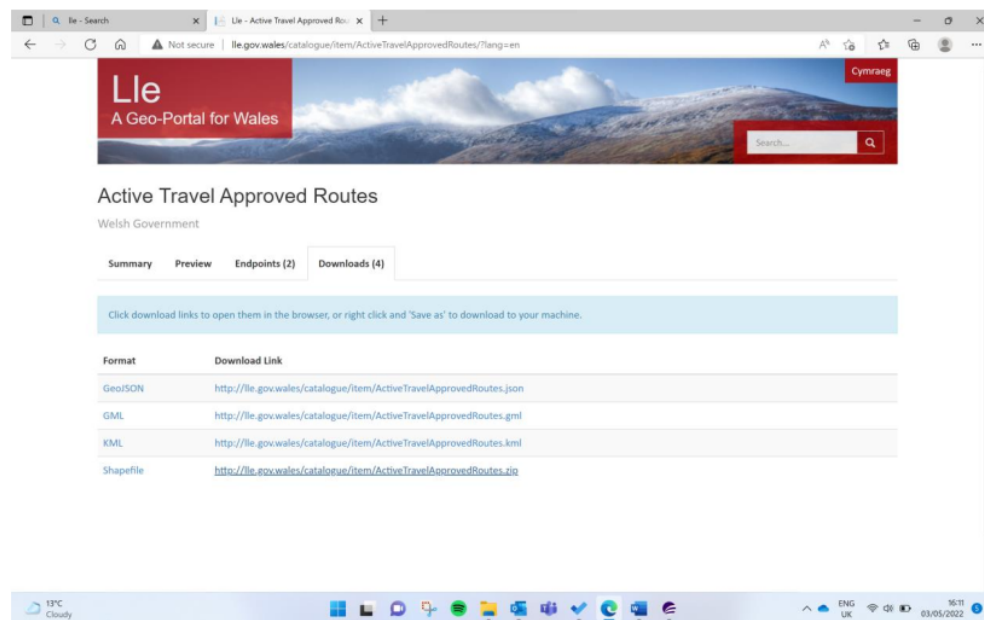


After disabling some visuals downloaded from Digimap, this was the topographic view of the student's town in BCUHB. The vector raster maps from Digimap would provide the colour for this visual:

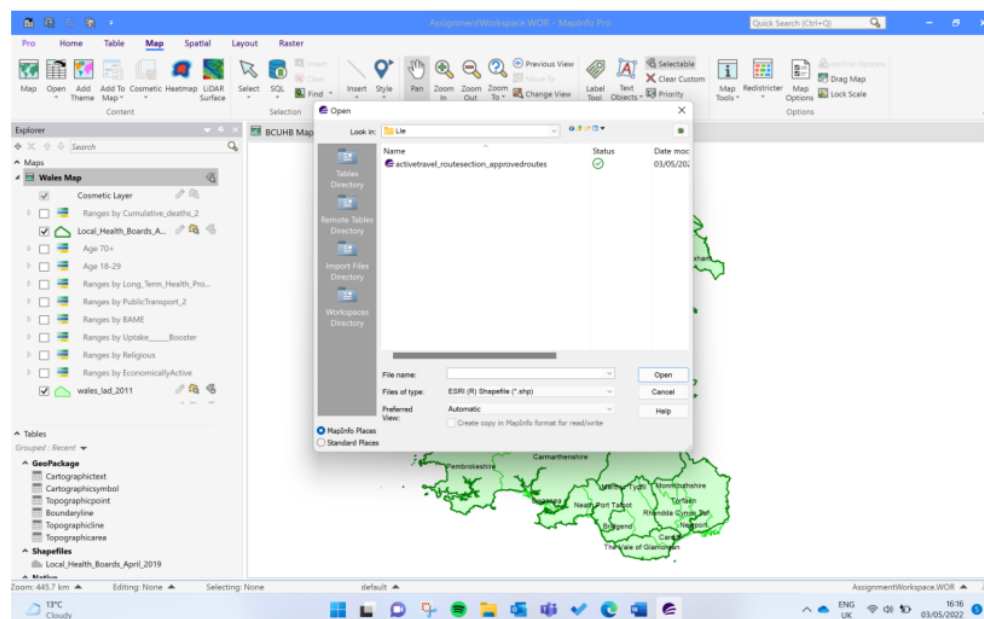


The student did not see any real value in using the topographic map for this particular area and case study as it did not explain a lot about the data. This would be useful when looking in-depth at a particular town but not for a Health Board. Instead, the student wanted to find data for all of the road networks across BCUHB. This would help to give reasons for the difference in vaccine uptake due to accessibility to a vaccination centre.

Lle [7] provides active travel routes across Wales as a Shapefile:



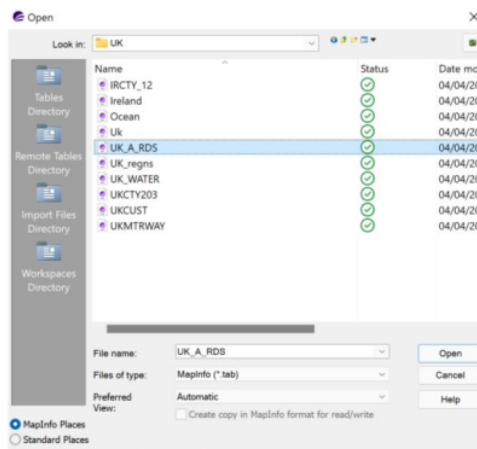
This was imported into MapInfo as a Shapefile and converted to a MapInfo Tab file:



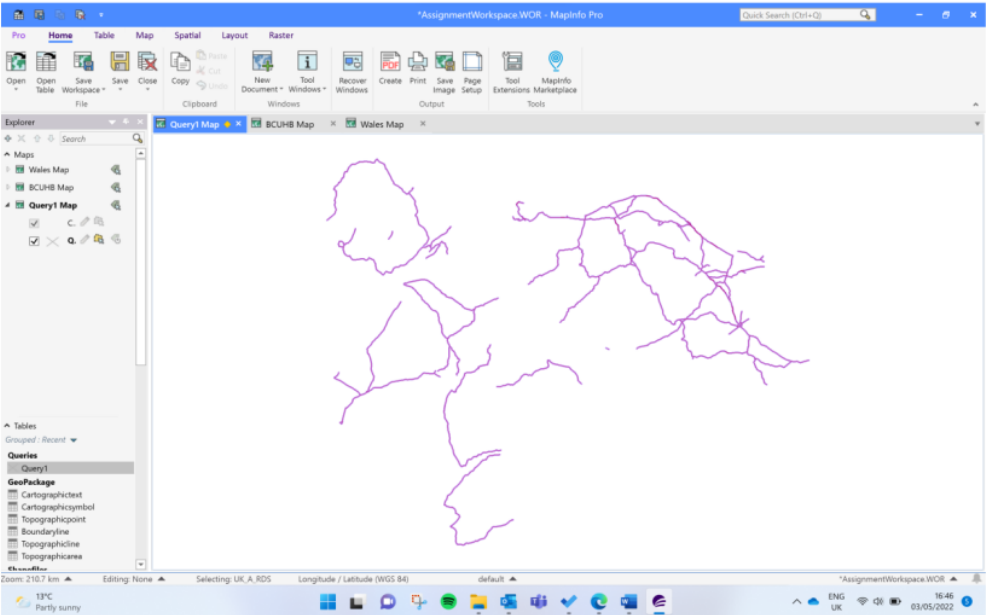
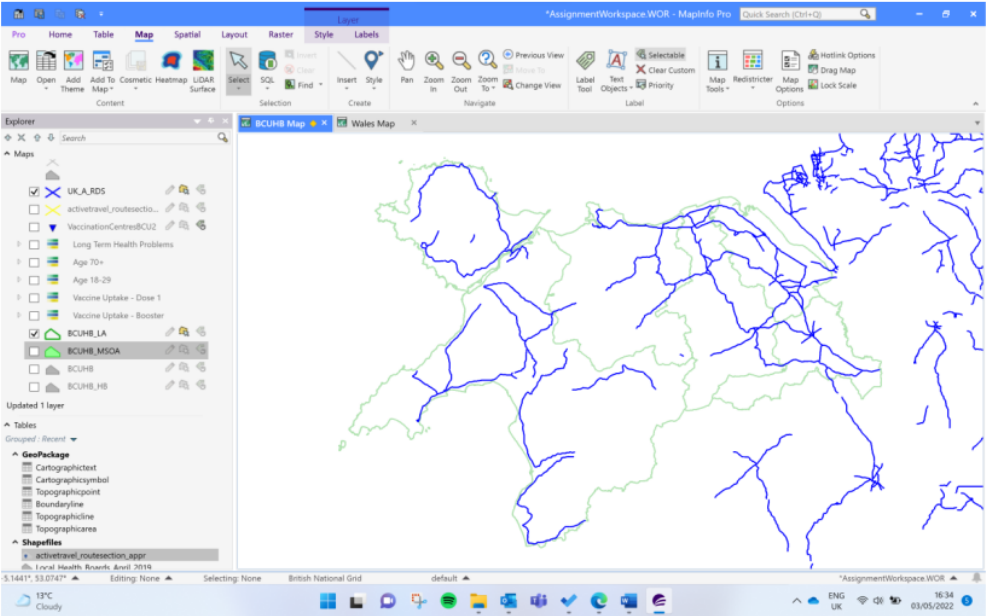
As you can see, the data displayed some active travel routes across BCUHB, mainly along the A55 coast road in the North which is accurate as this is the biggest road in BCUHB. This could potentially show a trend in resident's behaviours and where cases could be higher by highlighting the busiest areas.



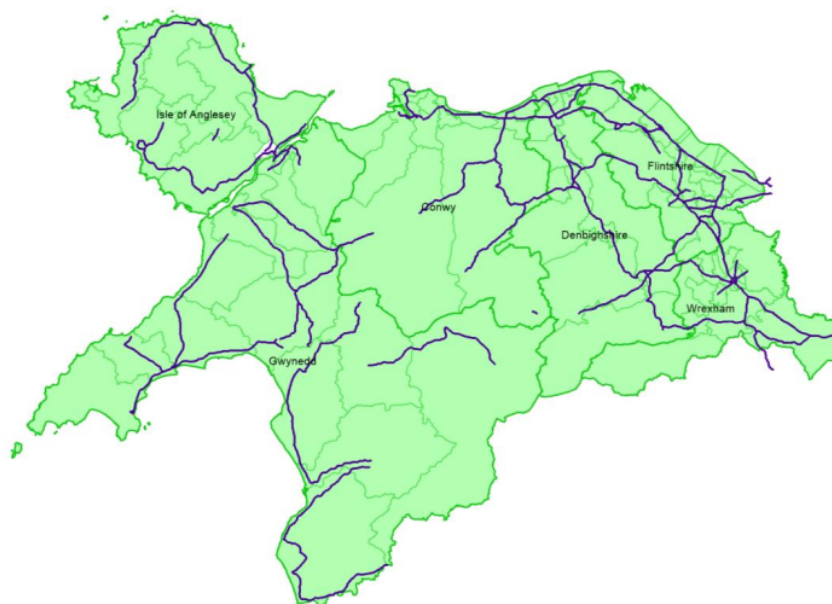
However, this still did not show all of the roads across the health board. The student navigated to the UK Data file used in a previous lecture, where UK A roads and motorway data could be found. There is no motorway in BCUHB, so this data was not required, but the A roads were imported into MapInfo and added to the BCUHB map.



As the data was for the whole of the UK, a selection needed to be made of the relevant roads in BCUHB and saved as a new data table.



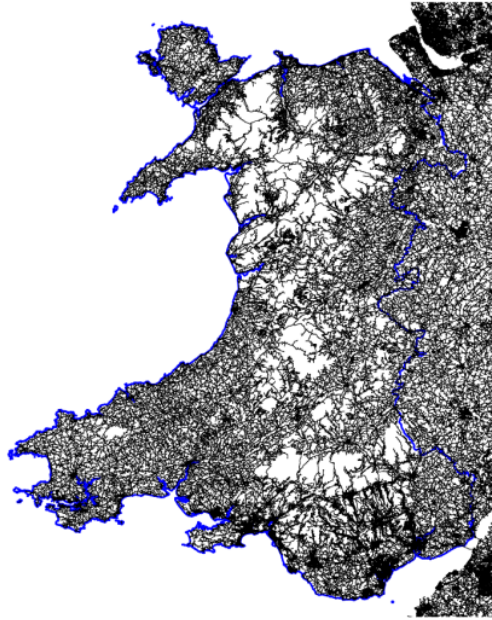
The final result was clear and showed all of the main roads used in North Wales:



After putting the vaccination centres back on the same map, it was clear to see that most of the centres were placed alongside an A road.



The overall road network in Wales looks like this:



Although this would provide much more detail, it would likely be too much for this map. However, at a glance you can see the darker the area the more travel routes, which is reflected by the positioning of the A roads in the above map.

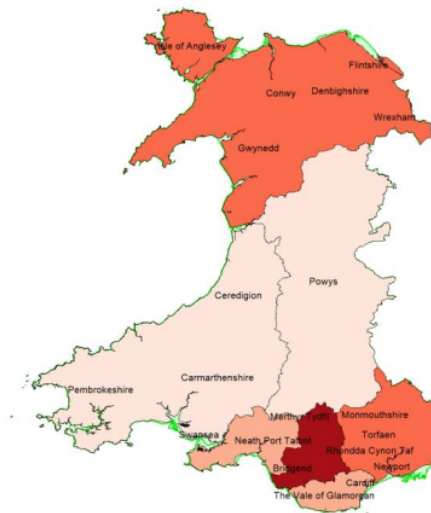
As well as vaccination centres and roads, other thematic themes were added to the map of BCUHB per local authority to support and inform any findings. This data could also be presented at MLSOA boundary level for a more accurate representation.

Another location-based services approach would be to add major hospitals and their specialties.

Task Two - Report

The student built a GIS workspace to inform healthcare professionals on the uptake of the Covid-19 vaccination programme, and the potential trends of the spread of Covid-19 across Wales. The themes added to the workspace could suggest why we see the thematic results found in the Covid data. The build presented the following results:

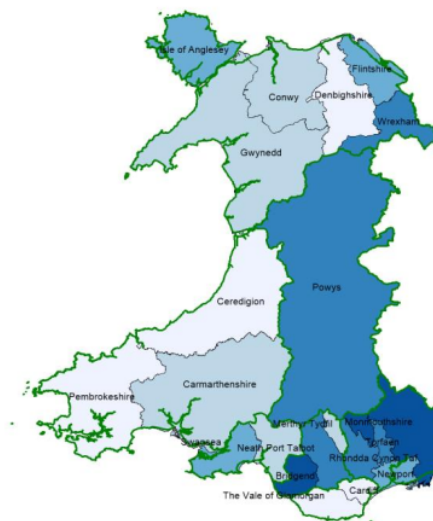
Covid-19 Cumulative Deaths



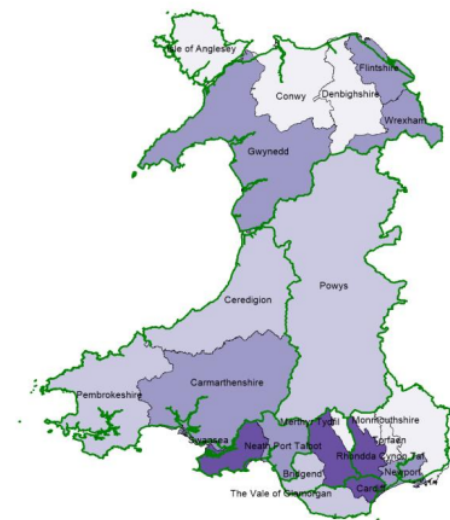
Covid-19 Vaccine Uptake – Dose 1



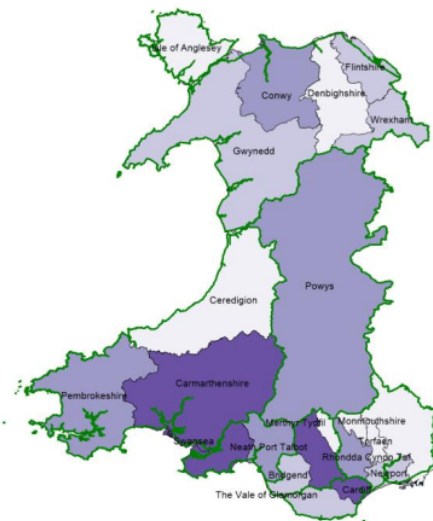
Covid-19 Vaccine Uptake – Booster



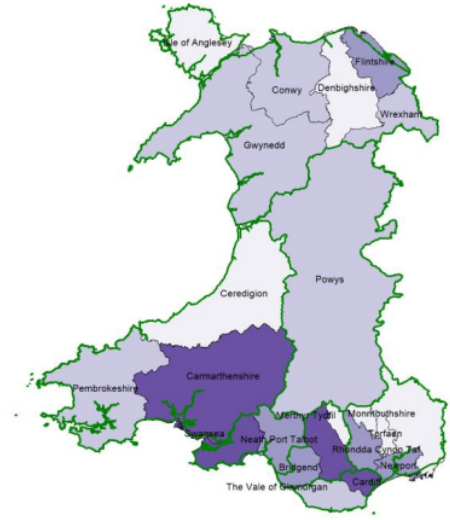
Age Distribution – 18-29



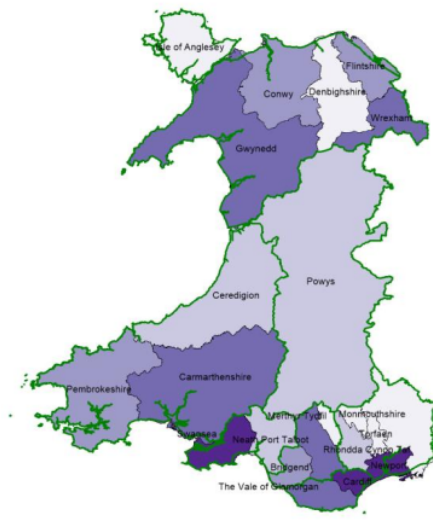
Age Distribution – 70+



Religion – Religious Population



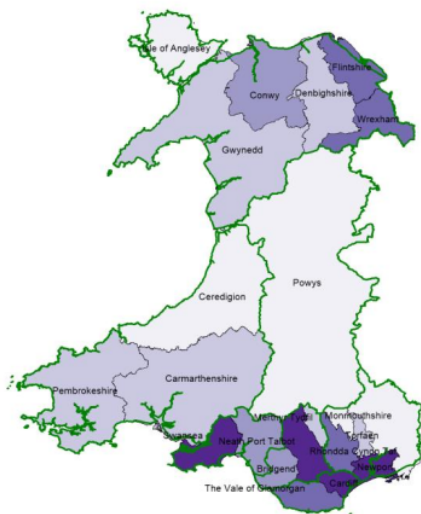
Ethnic Group – BAME Population



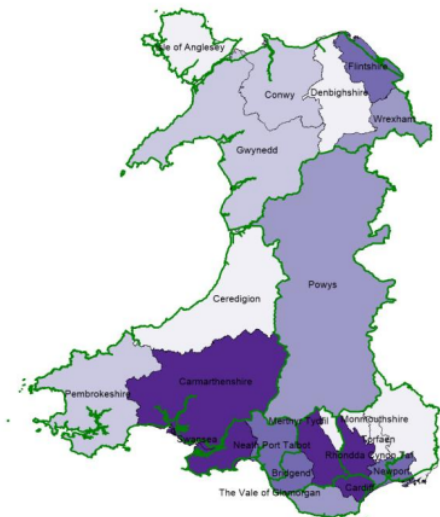
Economically Active Population



Method of Commuting – Public Transport



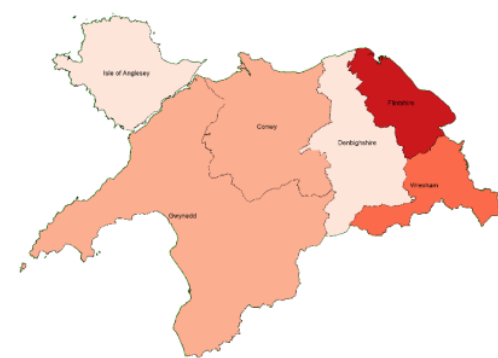
Long Term Health Problems



Map of BCUHB



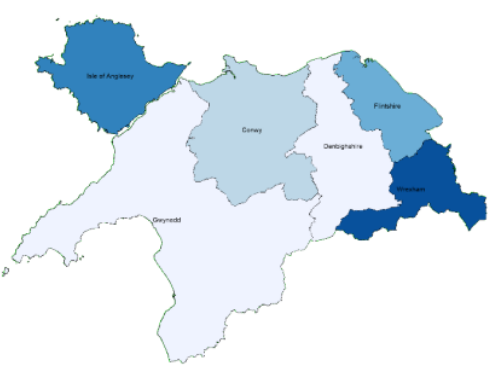
Long Term Health Problems



Vaccine Uptake – Dose 1



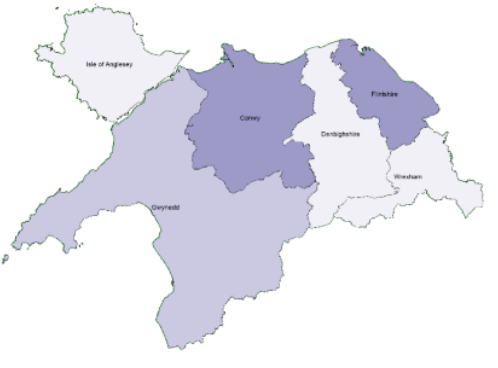
Vaccine Uptake – Dose 2



Age Distribution – 18-29



Age Distribution – 70+



Road Network and Vaccine Centres



For the whole of Wales these visuals show that Covid-19 had more of a negative impact on the population in the South – Cwm Taf Morgannwg Health Board had a particularly high Covid-19 death rate, followed by Aneurin Bevan. North Wales also had a relatively high Covid-19 death rate similar to Aneurin Bevan. Mid-Wales presented the lowest death rates in Hywel Dda and Powys. From an understanding of the population distribution of Wales, this is no surprise as it could be an influencing factor in the data. In 2020, there were reportedly '3.2m' residents in Wales [8] showing the following distribution:



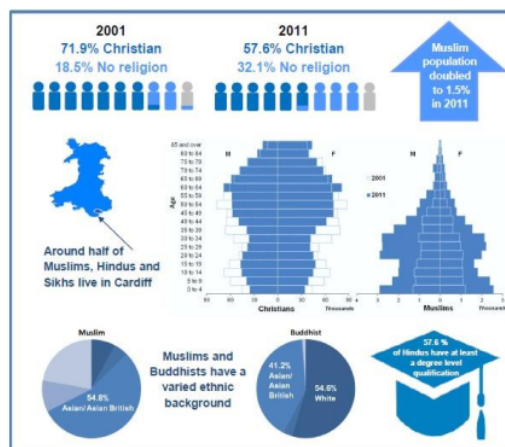
Powys has the lowest population in Wales followed by the west-coast regions.

The vaccine uptake visuals show a mixed result in general, with a slight majority in the south, however this does not include Cardiff which is surprising considering Cardiff is the capital with the biggest population. For the booster uptake, numbers seem to be higher closer to the English border in Monmouthshire, Powys and Wrexham. This could be due to the living/working arrangements on the border – perhaps more economically active residents who travel over the border for work.

From the data vaccine uptake data presented, Ceredigion, Denbighshire and Glamorgan are all at risk of not reaching herd immunity due to low levels of vaccine uptake. These areas would need further analysis to suggest reasons for the lower levels. Topographic and spatial queries may highlight accessibility problems, and thematic themes may highlight sociodemographic trends influencing uptake.

The themes added to the map from InFuse provide additional reasons for the Covid-19 results. The age distribution data gives a mixed result overall, with a higher number of 18–29-year-olds in and around Cardiff and Swansea, and a higher number of 70+ in Carmarthenshire. Cities like Cardiff and Swansea attract the younger generation as they offer universities and job opportunities, whereas Carmarthenshire is known for its rural and coastal environment which attracts the elderly generation especially when considering retirement [9]. Mid-Wales continues to present lower figures due to the lower overall population, and the North is mixed with the younger populations in the East and West, and older in the middle in Conwy. This could be explained by looking at the lifestyles in those areas, for example Wrexham and Flintshire are on the English border, close to cities and universities, whereas Conwy is another rural and coastal location potentially attracting the elderly in retirement.

The religion theme looks at where the religious population is highest in the country. Carmarthenshire, Swansea, Cardiff and Rhondda Cynon Taf have the highest figures. The infographic below supports these findings stating that Cardiff is home to ‘around half of Muslims, Hindus and Sikhs’ [10]. The student wanted to analyse the religious data as a result of the articles published during the pandemic stating that there was some ‘vaccine hesitancy’ from those who believed the vaccine went against their religious teachings [11]. However, looking at the vaccine uptake data there is no strong evidence to suggest that this was a real problem in the uptake of the vaccine, although booster uptake in Carmarthenshire did see a decline in comparison to dose 1.



The student wanted to investigate the ethnic groups across Wales as a result of the studies published during the pandemic claiming that the Black, Asian and Minority Ethnic (BAME) communities may be more at risk of the

adverse effects of Covid-19 compared to White/British communities [3]. The data shows the distribution of the BAME population throughout Wales, following the usual trend; higher figures in the South, followed by the North and low levels in Mid-Wales. The highest figures for the BAME population were shown in Swansea, Cardiff and Newport. In the North, Wrexham and Gwynedd had the highest figures. If the findings from the studies were correct, then this may be a contributing factor as to why the Covid-19 death rate is higher in those areas with a higher prevalence of BAME residents – which seems to be the case as both maps follow a similar trend.

The map showing the economically active population across Wales shows a clear majority in the South, supported by similar findings for the population and age distribution. The cities in the South may provide more job opportunities for young professionals, as well as being home to the majority of universities in Wales. The East also shows an economically active population in Wrexham, Flintshire and Powys. Wrexham and Flintshire are on the English border, within an hour of Chester, Liverpool and Manchester where lots of people may travel to for better job opportunities. Powys could offer similar opportunities towards Birmingham for example. Areas of lower economic activity were on the West coast – these are usually holiday resorts, with second homes and seasonal businesses, and also where residents may internally migrate to for retirement. These factors may influence the general population on the West coast, therefore providing lower figures for Covid-19 deaths and vaccine uptake. On the other hand, the economically active population may be more inclined to get the vaccine in order to continue working safely suggesting why vaccine uptake is higher in the East.

The method of commuting shows the areas where the population is more likely to commute via public transport. It is no surprise that this is higher in the South between the cities of Cardiff and Swansea, which is supported by the employment data. Cardiff and Swansea are more developed in terms of transport links and infrastructure. Flintshire and Wrexham show some activity – suggesting these areas are in-fact commuter locations for the English cities close-by. The use of public transport could have increased the likelihood of catching Covid-19, and therefore increased the overall spread. This in turn would have increased the Covid-19 death rate in those commuter areas, providing another reason for the distribution of the Covid-19 data.

The use of public transport could also encourage commuters to get the vaccine. The use of vaccine passports for travel would have influenced their decision. If public transport is their only way of getting to work for example, they may feel that the vaccine is a requirement, whereas those who travel by car or walk/cycle to work would not have had the same requirement. This may be another reason why the West of Wales shows lower levels of vaccine uptake.

Long term health problems on the map of Wales are more prevalent in the South, showing a similar distribution to the ageing population. This is expected, as it is more likely for the 70+ population to also have underlying or long-term health problems. There is no clear link between the Covid-19 deaths and long-term health problems from the two maps, as the Covid-19 deaths are Health Board level instead of Local Authority. There is a slight similarity between the long-term health problems map and the vaccine uptake for dose 1, however. As part of the vaccine rollout, those with underlying health problems were prioritised and received their vaccine earlier than others. This could be a reason for the similarities in the two maps, however this is not supported by the booster uptake which shows a difference in the distribution.

The student then focused on a smaller area of Wales, where they looked at the data specifically for BCUHB in North Wales. The vaccine uptake trend is widely consistent from dose 1 to the booster. The data shows higher uptake in the East – particularly in Wrexham. Wrexham contains a large hospital and other NHS organisations, where all staff would have been prioritised for the vaccine in order to continue working safely. Anglesey also shows a high uptake, which is a slight surprise as Anglesey does not have well-developed infrastructure, or job opportunities. However this could be an issue with the data as the population is a lot smaller therefore the percentage of the population vaccinated would likely increase at a faster rate following the success of the vaccine rollout across BCUHB.

The age distribution shows that there is a higher number of 18–29-year-olds in Flintshire compared to other counties, with Wrexham and Gwynedd following. The older population (70+) is highest in Conwy, as discussed

Long-term health problems are higher in the East and lowest in Denbighshire and Anglesey. Denbighshire figures are consistently low for all themes on the map, this may be due to a smaller population in general as it is a more rural area, but more analysis is needed here.

The final map displays the A roads across BCUHB as well as all of the vaccine centres used during the pandemic. The map clearly shows that the placement of the vaccine centres did consider road access, as most vaccine centres are accessible via an A road. The vaccine centres are distributed fairly evenly across the health board, with more in the North-East due to being a more heavily populated area. A potential reason for a low vaccine uptake could be lack of accessibility, which would be highlighted on the map when looking at the following layers:

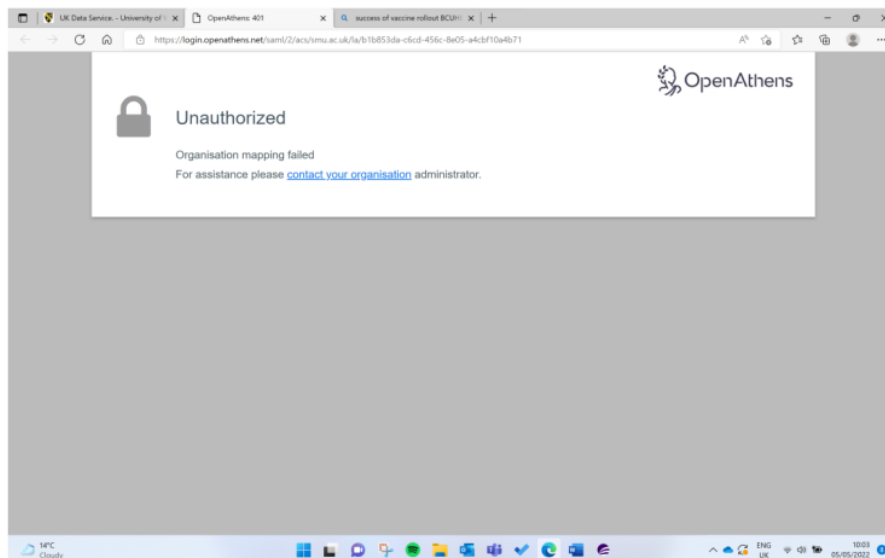


To conclude, all of the data themes used to suggest reasons for the thematic results found in the Covid-19 data give a quick visual analysis for a high-level point of view. The Covid-19 data is hugely impacted by the population density of the particular area and could potentially be impacted by the themes presented above such as age and ethnicity. The GIS workspace would be a useful tool to inform health professionals on the uptake of the vaccination and would allow health professionals to find improvements specific to the particular areas [12]. This is definitely made easier by analysing the data visually on the map. However in this case study, with the data provided, it is difficult to come up with improvements to be made to the vaccination programme in order to improve uptake, without knowing specific reasons for the lack of uptake.

Additional case study data that may enhance the case study include:

- Covid-19 deaths per local authority rather than health board – for a more accurate and detailed representation of the death rate distribution.
- Time-series analysis of Covid-19 cases – to compare the case figures throughout the pandemic to diagnostically analyse the data.
- Hospital locations in Wales to be added to the map using location-based services.
- Differentiation between first and second homes – lots of holiday homes on the West coast which could negatively impact the reliability of the data, especially working with percentage of population in the area.
- Drive time analysis – Collect the drive time for all vaccination centres for a more consistent and quantified analysis of accessibility.
- Vaccine centre opening times and wheelchair access etc. – These could be contributing to the lack of access if opening times are limited, or wheelchair access is not offered.
- MLSOA data analysis – Download the MLSOA data from InFuse for a more accurate representation of the data distribution.
- Live Covid-19 data – a live feed of Covid-19 data to offer a time-series analysis and potential to predict future trends [13].
- Testing Centres – Add the testing centres to the map and compare the number of cases around them. Accessibility to testing centres could impact the figures with a lack of access lowering the amount of people getting tested.

Ps. I would have tried to meet some of the additional points above, but I could no longer access the UK Data Service:



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GIS Report BK

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

79/100

Generic Assessment Criteria	Marks available	Marks awarded
1. Engagement with Literature Skills		
2. Knowledge and Understanding Skills		
You demonstrate a sound understanding of the principles behind geographical information system software. You've discussed the need for thematic mapping and explored the use of the software in producing said visuals.	25	21

3. Cognitive and Intellectual Skills		
you have looked at the acquisition of data for your case study in detail. Providing suitable base maps both mid super lower super and and addition of a newly digitised NH S boundary map. This new map has certainly enhanced the ability to analyse the said data. You have also used lots of different sources to gather additional layers to add to your visuals for example UK data services digimap and also Lle which has provided you with top of graphic as well as data driven spatial information.	25	20
4. Practical Application Skills		
Linking with the above you certainly explored the functionality of the GIS software in use but you've also discussed the use of other file types	40	34

excel for example and shape files which you can add to the package to enhance your queries and your spatial decision-making you've produced some excellent layers and demonstrated those in your report. You have presented a PDF document although I have to say here this was a little bit difficult to follow as you seem to have put in lots of layers individually into the PDF you could have done this as one layer which I would have been able to switch on and off but that said there were some excellent evidence of your use and build of this practical application.		
5. Transferable Skills for Life and Professional Practice		
A good clear document detailing a log of your practical undertakings you have put in lots of images and visuals of your maps one thing I would say here is to label each image with a figure legend eg Fig 1.2 map of..... this all enhances the readability of the academic document.	10	6

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Generic Assessment Criteria	Marks available	Marks awarded
1. Engagement with Literature Skills		
Some clear references have been presented throughout and you have used your reference as well when discussing your different types of data analysis for example your investigation of locations where we tend to see more elderly people and the impact of perhaps a higher population in in terms of religion but you've used this well to backup and support your visual findings from your GIS.	25	18
2. Knowledge and Understanding Skills		
You have used your officials from part one well within your report for this section and you	20	16

have provided some detailed discussions on your findings demonstrating a sound understanding of the software and its capabilities		
3. Cognitive and Intellectual Skills		
some excellent reflective narrative discussing the different layers and different climatic maps that you have presented throughout your discussion some very interesting visuals. It was particularly interesting to see the number of vaccination centres in the north of Wales looking at data available for the South of Wales it would appear that there seemed to be an more even spread within North Wales than South which may explain some of the latter data where we do see increased death rates in the South of the country.	25	20

4. Practical Application Skills		
Again here appropriate selections of your visuals have been distributed throughout your discussion we've also pulled in different data sets for example transport links and again this has added to your findings which you have discussed at length.	20	15
5. Transferable Skills for Life and Professional Practice		
Good sectioning clear layout your report and good referencing throughout stop	10	7

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