

GIS Report

by Brandon Gorman

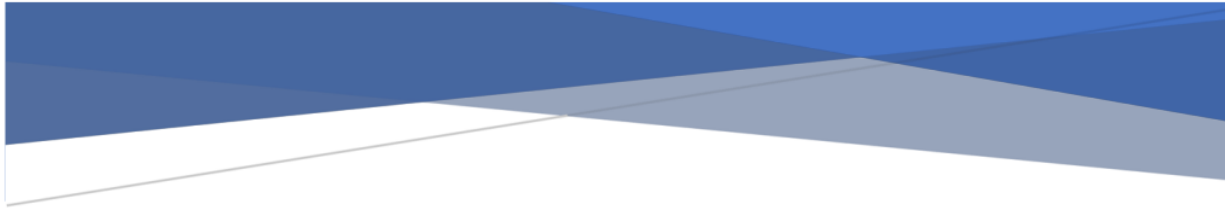
Submission date: 06-May-2022 01:46PM (UTC+0100)

Submission ID: 178800017

File name: 19441_Brandon_Gorman_GIS_Report_419142_1540162207.odt (468.17K)

Word count: 2231

Character count: 12558



GEOGRAPHICAL INFORMATION SYSTEMS

The use of GIS software to demonstrate the uptake
of the COVID-19 vaccination programme in Wales.

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Development Log

Base Map.

To build a characteristic, it is first important to obtain enough data to build a profile. The Mid Super Output Area (MSOA) provides an individual with enough information to make initial hypotheses and assumptions. The MSOA map itself provides in-depth analysis of areas within a particular region. This provides a GIS analyst the ability to pinpoint a particular demographic, if required.



Health Board Map.

Wales is broken up into seven Welsh health boards; these health boards provide health and care services to the people of Wales. The health boards ensure the correct funding makes it way to the services and GP services within its borders.

As a health informatician, data broken up into a health board level provides a more meaningful approach and more importantly, can relate to health and care professionals across Wales.



County Council Map.

The use of a county borough map is important as it's a map that map citizens are familiar with. What this map also allows analysts to do is measure rates of infection, or uptake of a vaccine within the county that is situated in a health board, providing the analyst with more of a meaningful insight.



Thematic Maps

Themes allow users to relate a map to a certain topic. Due to COVID-19 affecting all citizens there are several themes a user can use to build trends. The themes used in the following report include:

1. Economic Activity Data

- a. Economic data provides a reader with either metric or descriptive data, in this case metric data was used to measure the activity of a particular area. Economically active citizen more likely to purchase goods and services adding value to a local economy.

2. Those who practice or follow a particular religion.

- a. This data helps informaticians understand the mindsets and / or preconceived views of a particular group of people. A mindset example includes achieve the goals of salvation for oneself and others, and (if there is a God) to render due worship and obedience to God [1].

3. House Deprivation.

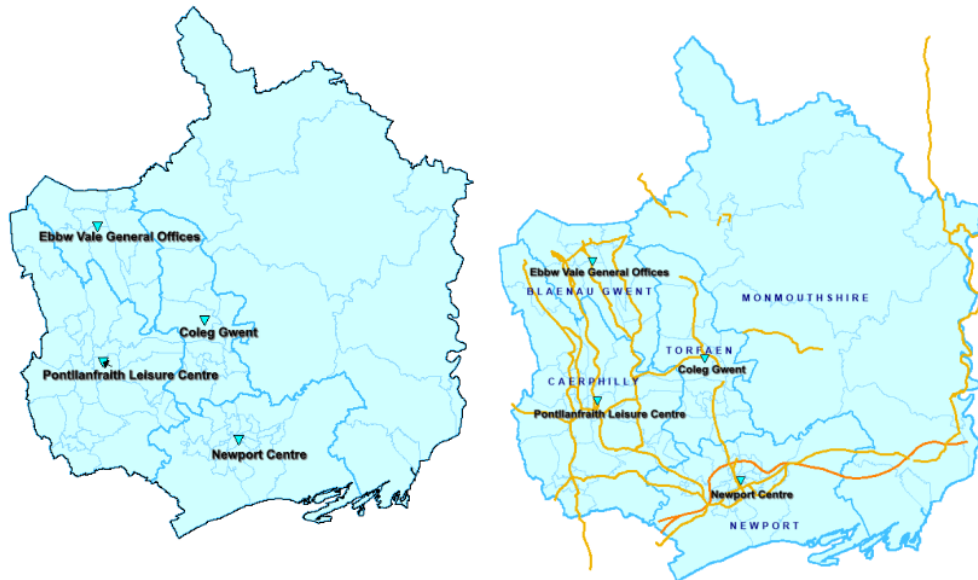
- a. Those individuals with a lack of finical resources to meet needs.

4. Booster Vaccine uptake.

- a. Those who have taken the booster vaccine.

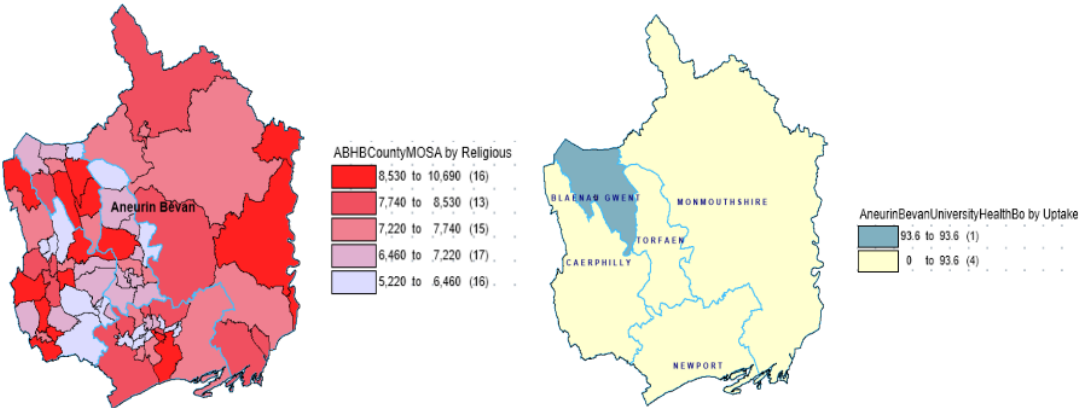
Aneurin Bevan University Health Board

To make the report more localised, this report will focus on Aneurin Bevan University Health Board, with its councils and MSOA.



To understand why the vaccination centres and situated where they are on the above maps. The infrastructure must be included to provide context, for this the M road and A road were included.

To provide the reader with additional information and to make their mind up on certain issues then its important that they have access to the national data on a local level, the below maps provide this by providing insights to religion and vaccine uptake.



Spatial Data

Due to categorising via health board the requirement to investigate further isn't necessary. In addition to this the data provided doesn't have enough demographic information to satisfy spatial data usage.

Introduction

The United Kingdom (UK) government in March 2020 took the decision in partnership with Her Majesties devolved administrations in Wales, Scotland and Northern Ireland to limit the personal and economic activities of the country, to ensure public health and stability across the UKs devolved health services [2], independent services and social care providers. Such action provided organisations the ability to adapt to an uncertain environment and to minimize delays to critical services, both clinically and technologically.

During the national lockdown imposed by HM UK Government several additional processes were put in place by the devolved administrations to ensure protection to those in most need, an example of this is the Welsh Governments decision to add extra protections for the clinically vulnerable, that included new ways of medicine collection and guidance to those supporting individuals with suppressed immune systems [3].

The UK Medicines and Healthcare Products Agency in December 2020 published and notified the four devolved governments that Pfizer/BioNTech COVID-19 vaccine was given approval [4]. During 2020 and 2021 the COVID-19 vaccination rollout began. The responsibility of the COVID-19 vaccination rollout was devolved to each constituent country within the Union of the United Kingdom and her over sea territories.

Digital Health & Care Wales (DHCW), which is the Specialist Health Authority for informatics solutions and development unveiled in just sixteen weeks the Welsh Immunisation System (WIS) [5]. The WIS system, uses patient demographics such as, personal details, occupation and agreed priority levels to schedule vaccination appointments.

This report will highlight several Welsh personas, which act as a characteristic insight of the population. This report will also highlight the effect national infrastructure (Motorways and A Roads) has had on a population's vaccination uptake. The report will also focus on the Aneurin Bevan University Health Board which encompasses the following Unitary Authorities (County Councils); Caerphilly County Brough Council, Blaenau Gwent County Brough Council, Torfaen County Brough Council, Newport City Council and Monmouthshire County Council.

Welsh Demographics

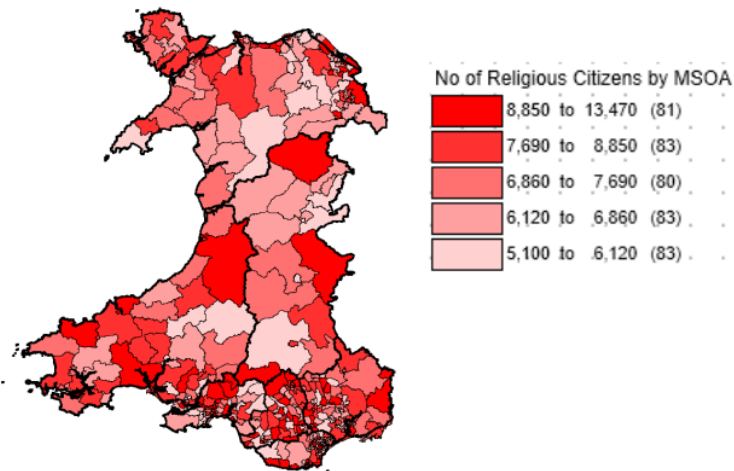
Wales is a diverse nation with personas that has made the COVID-19 vaccination rollout at times troublesome. In addition to this, there particular topics such as infrastructure that has had a significant impact on the vaccine uptake.

Geographically, more than half of the Welsh population live in Southeast Wales, according to the Statistics for Wales document by the Welsh Government, this only makes up 14% of Wales' land area [6], this report hypothesizes that those who live in the Southeast of Wales, will have a significantly higher uptake of the COVID-19 vaccine due to infrastructure and cultural norms.

All Wales Characteristics

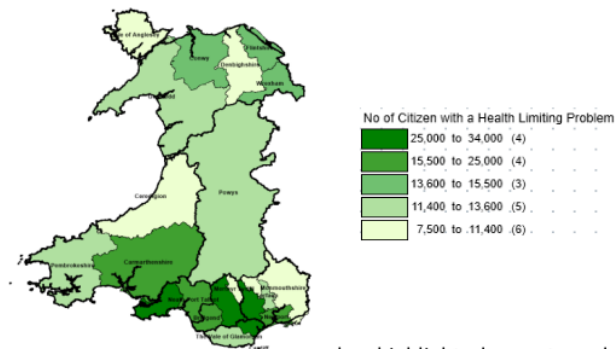
According to one report by The National Library of Medicine, certain demographics showed a trait of reluctance and internal conflict with core beliefs [7], when considering the COVID-19 vaccination. Such a characteristic, like religion has defined how many citizens across Wales live their lives and the stances they take on scientific and societal topics of discussion.

The following map depicts the number of religious citizens by Middle Super Output Area. The map shows that across Wales there are significant levels of religious influence. In early 2021, religious leaders publicly supported the use of vaccines to combat COVID-19, which supported the uptake of the vaccine.

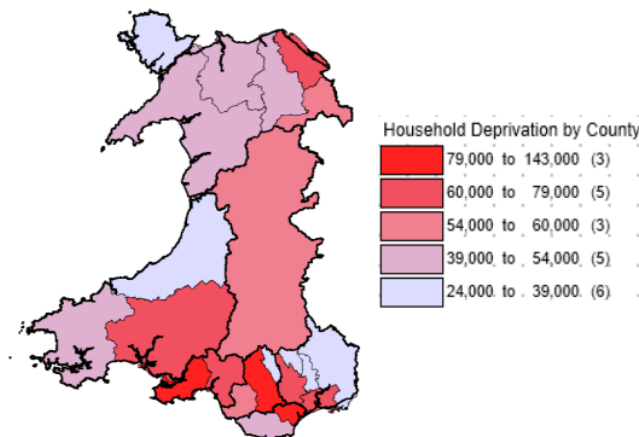


Although this worked in favor of the vaccine there are additional characteristics that have ensured a smooth vaccine rollout. Wales has a significant number of its citizens living with health limiting problems. Individuals who are clinically vulnerable were given a higher priority to get a vaccination.

The below map highlights areas where citizens are categorized as having a health limiting problem. As the map depicts those areas that were significantly reliant on heavy industry suffer from health limiting problems, several of these problems relating to a patient's cardiovascular system. The End of Coal Mining in South Wales report highlighted that "In 2013 10.7 per cent of the South Wales population were recorded as claiming DLA (Gore et al., 2014). The reason for this is the residual prevalence of heart disease, respiratory illness, mental ill health, back pain and arthritis within the coal mining community. However, poor health now extends beyond former miners to subsequent generations, and here the connection must be made with the poverty and deprivation that persist in the Valleys." [8]

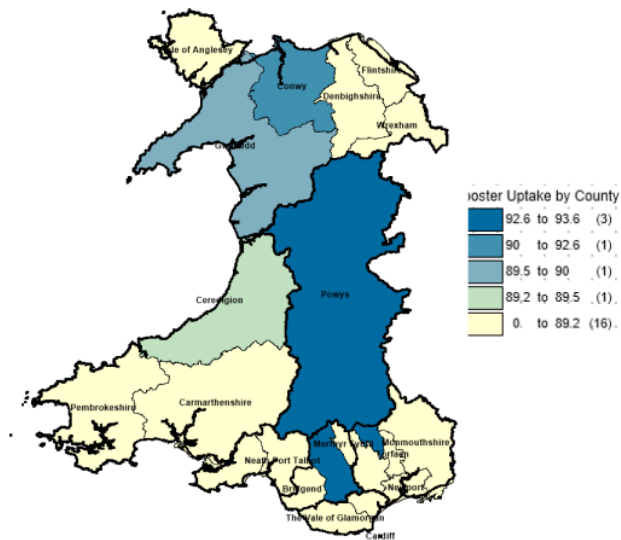
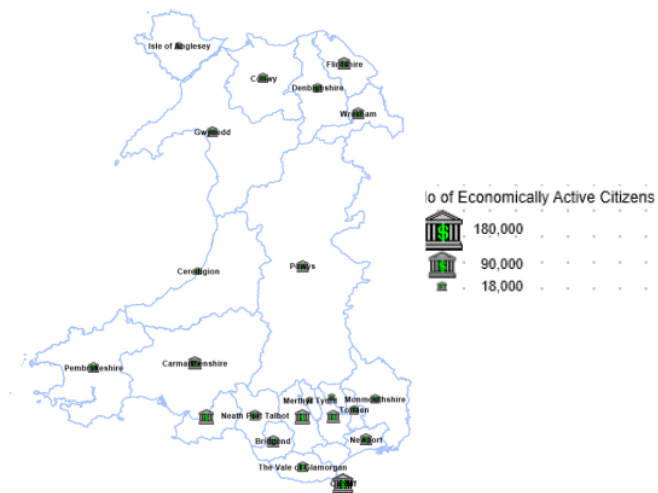


As the extract of significant concern in the valleys. To provide further evidence supporting that claim, the below map indicates the significant deprivation in the Southeast of Wales, and how the counties are suffering.



Such areas of deprivation would alas suggest significant levels of poverty, health issues and a hindering local economy. These factors have a significant impact in the ability for a vaccination uptake, however, as previously highlighted, as high levels of the Welsh populous reside in Southeast Wales, national infrastructure is significantly more developed than in North Wales and throughout Betsi Cadwaladr University Health Board for example.

Although, studies have found significant evidence that economic inactivity is a core causation of an individual being impoverished or living in deprived areas, data collected via the 2011 census suggests areas in Southeast Wales have a higher level of economic activity, however, have a higher level of deprived citizens. The below graphic presents this data via county.



Current data shows that the COVID-19 vaccination uptake has been highly successful across the whole of Wales, the above map highlights where there are either significant deprivation, or less of a population the COVID-19 vaccination uptake is significantly higher than those who are less deprived with a higher population.

This thematic map suggests the initial hypothesis of those in southeast Wales where infrastructure is significantly more developed a higher increase appears to be found untrue, however, high population, can play a significant role in this where regions in North Wales have a significantly lower population.

Current data provided from the thematic maps shows that those with a health limiting condition, where household deprivation is high are more likely to take the COVID-19 vaccination, irrespective of religion. The data also shows those in a less religious area of Wales of whom are younger are less likely to take up the second and booster regardless of socioeconomic background.

Aneurin Bevan University Health Board Characteristics

The Aneurin Bevan University Health Board (ABHB) provides health and care services to just under 650,000 citizens [9]. Due to the size and responsibility of the health board, the challenges of the vaccine uptake are different to those in other health boards across Wales. ABHB covers a wide area in Southeast Wales where poverty is significant, those living with a health limiting condition are high and where those who practice a religious faith is high.

ABHB has access to a significant infrastructure, both the M4, A470 and A469. Due to the infrastructure in place, the erection of vaccination centres was not as difficult as other areas in Wales. Due to the highlighted infrastructure, industry has naturally developed producing wealth creation as well as job opportunities. Erecting the said services with the relevant infrastructure in place has meant patients have had an ease of access to the vaccine.

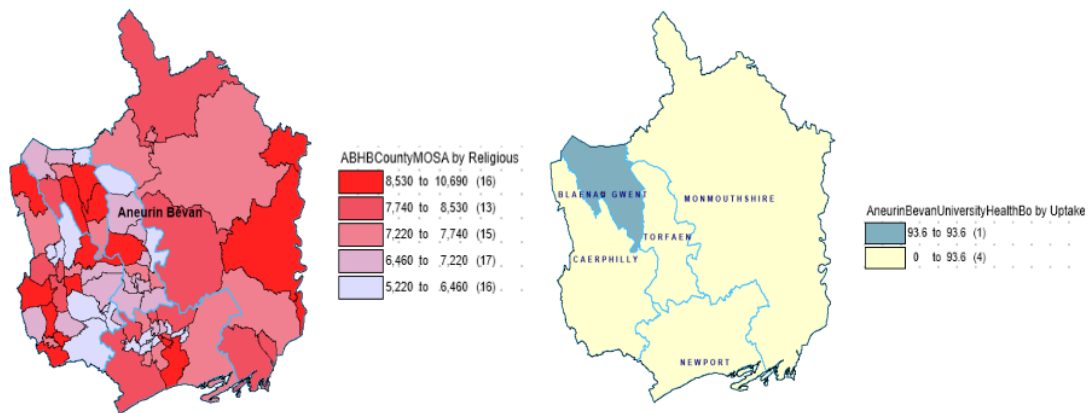


The following map emphasises the extent of ABHBs infrastructure; in dark orange the M4 is highlighted and in light orange the A Roads. The map also highlights the vaccinations centres within the health board all situated where national infrastructure is sound and can support high influxes of patients.

It must be noted that those citizens in Monmouthshire must travel significantly to access COVID services, this is down to the local agricultural communities where towns aren't as developed as Caerphilly for example. Patient health is at higher risk, additionally, the booster uptake in

Monmouthshire is lower than places such as Blaenau Gwent County Brough Council. There can be many causations, however, infrastructure is the main contender. Poverty and deprivation are extremely low in Monmouthshire as well as individuals with health limiting conditions. This provides an environment for a citizen to thrive and has an impact on over all health outcomes.

Aneurin Bevan University Health Board has a significant religious population. Where vaccination uptake has been low those same areas have a significant religious population. The below maps compare this data showing ABHBs religious population against the vaccination uptake.



Despite this, as previously highlighted a high percentage of the Welsh population live in Southeast Wales meaning there is a larger list of patients to see as opposed to other health boards in Wales. Age is another factor, as Southeast Wales is significantly populated there is naturally a higher number of younger people per 100,000 in the population.

With this data in consideration, the initial hypothesis that Welsh patients have received the vaccination in higher numbers, being based in ABHB, isn't necessarily true due to the high population numbers.

Conclusion

To conclude, Wales is a diverse nation with personas that has made the COVID-19 vaccination rollout at times troublesome. Despite these issues the uptake of the vaccine has been considerably high in Wales. Details described in the report has indicated ABHB has a higher population density and due

to this the vaccine rollout took longer in other areas, leaving younger demographics un-vaccinated or awaiting a vaccination.

The demographics to look out for or provide additional community care resources to younger demographics between the age of 11-30. These individuals are also at higher risk of community transmission.

References

- [1] R. Swinburne, *Faith and Reason*, Oxford , 2005.
- [2] H. Government, *Coronavirus Act 2020*, Westminster: Her Most Excellent Majesty, 2020.
- [3] W. Government, *The Coronavirus Act 2020 (Commencement No. 1) (Wales) Regulations 2020*, Cardiff: Welsh Government, 2020.
- [4] UK Government, "Regulatory approval of Pfizer/BioNTech vaccine for COVID-19," 2 December 2020. [Online]. Available: <https://www.gov.uk/government/publications/regulatory-approval-of-pfizer-biontech-vaccine-for-covid-19>. [Accessed 06 May 2022].
- [5] Digital Health and Care Wales, "Welsh Immunisation System," 2020. [Online]. Available: <https://dhcw.nhs.wales/coronavirus/digital-support-updates-for-healthcare-professionals/primary-care/welsh-immunisation-system/>. [Accessed 06 May 2022].
- [6] Welsh Government, "Summary statistics for Wales, by region: 2020," 20 May 2020. [Online]. Available: <https://gov.wales/sites/default/files/statistics-and-research/2020-05/summary-statistics-regions-wales-2020-629.pdf>. [Accessed 6 May 2022].
- [7] C. M. J., "Religious exception for vaccination or religious excuses for avoiding vaccination," *Croat Med Journal*, p. 516, 2016.
- [8] "The End of Coal Mining in South Wales: Lessons learned from industrial transformation.," International Institute for Sustainable Development, 2017.
- [9] A. B. U. H. Board, "Aneurin Bevan University Health Board Annual Report and Annual Accounts 2020/21," Aneurin Bevan University Health Board, 2021.

GIS Report

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		
Some suitable data sets have been used to build your thematic maps and other visuals within the GIS package. Maybe explore some of the other options available for example a little bit more detail on the road infrastructure may have helped towards your discussion. also I'm not sure why you only had two colours in your COVID uptake maybe you could have changed the ranges	25	18

on that we just had zero to 95% of 95% and over showing one area Open difference.		
3. Cognitive and Intellectual Skills		
Again you've used the data provided well and provided a subset of your chosen area which gives a little bit of insight into the Bevan health board.	25	21
4. Practical Application Skills		
good practical skills demonstrated throughout you have certainly explored the available functionality within mapinfo and use this to build some very clear visuals which have subsequently used below in your report.	40	34

5. Transferable Skills for Life and Professional Practice		
Well written throughout one thing I would add is try to give your images a figure legend for example fig 1.2 map of.... this will enhance the overall readability when you present such reports	10	6

Generic Assessment Criteria	Marks available	Marks awarded
1. Engagement with Literature Skills		
good references throughout you have used this well to reflect on your data findings and to discuss points with reference to correlations between deprivation religion and COVID vaccine uptake. You've reflected on similarities between other illnesses and ailments suffered	25	19

within Wales due to previous industries such as mining this enhances the overall read.		
2. Knowledge and Understanding Skills		
Good analysis of your data sets we've picked out salient points to compare and discuss within your report.	20	16
3. Cognitive and Intellectual Skills		
Looking at this case study have drawn down at the suitable data sets to enhance and reflect on the data provided with the cover data you've worked through this well and come to some suitable conclusions.	25	20

4. Practical Application Skills		
Again I stated above he demonstrated good practical skills and you've selected suitable visuals to support your points in fact.	20	16
5. Transferable Skills for Life and Professional Practice		
Well written throughout with suitable referencing.	10	6

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