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GEODEMOGRAPHIC ANALYSIS USING GIS SOFTWARE

Geographical Information Systems – ACCB5027

Lucy Boyt - 2308345

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1. Introduction

Geographical Information Systems (GIS) is a computer-based tool which stores, analyses, and visualises spatially referenced data. Within the context of public health and geodemographic analysis, GIS enables decision makers to identify patterns of deprivation, map health outcomes and assess the distribution of services across geographical areas [1, 2].

This report presents the findings of a geodemographic case study focused on Wales, developed using QGIS with the British National Grid coordinate reference system (EPSG:27700) [3,4]. The study investigates two research questions:

- Is lower income associated with a reduced adoption of healthier behaviours and poorer mental health outcomes?
- Are primary care and mental health services adequately distributed in areas with lower income, poorer mental health and reduced healthy behaviours?



Data was acquired from a range of open government sources, including the Office for National Statistics (ONS), DataMapsWales and StatsWales, and organised across five thematic layers joined to a Middle Layer Super Output Area (MSOA) boundary framework. The analytical chain underpinning the study follows the relationship between income deprivation, educational attainment, healthy behaviours, health outcomes, and service distribution across 410 MSOA's in Wales.

2. Methodology

2.1 Data Processing

The methodology for this study followed a structured data processing pipeline encompassing data acquisition, cleaning, and manipulation prior to the GIS build. Data was sourced collaboratively from reliable open government portals to ensure accuracy and credibility. Each dataset was evaluated for its relevance to the study objectives before being processed through the processing stages.

The processing journey followed four key stages: acquisition, where datasets were identified and downloaded; cleaning, where formatting errors, redundant fields and structural inconsistencies were resolved; manipulation and transformation, where derived fields were calculated and datasets were restructured for spatial compatibility; and finally import into QGIS, where field types were confirmed, joins were executed, and calculated fields were added within the GIS environment.

2.2 Data Acquisition

Data was identified and selected for each thematic layer to align with the case study objectives and the two research questions. The selection process prioritised datasets available at MSOA level to maintain spatial consistency with the boundary framework, except for point-based datasets, which use coordinate data instead of MSOA codes for spatial referencing.

The primary spatial framework was established using the Wales MSOA 2021 boundary dataset sourced from DataMapWales in GeoPackage(.gpkg) format. This provided the polygon base layer to which the majority of attribute data was subsequently joined using the MSOA21CD code field as the common geographic identifier. Point-based datasets specifically the GP main sites and Hospital Locations within the Therapy Wait Time set were managed differently, being projected as individual point layers using latitude and longitude coordinates.

Statistical attribute data was collected from several sources. The income deprivation, physical activity, BMI, and suicide rate datasets were provided in Microsoft Excel (.xlsx) format which were subsequently cleaned and, in some cases, transposed before being exported to Comma Separated Values (.csv) format to ensure compatibility with QGIS. The remaining datasets were available directly in .csv format [5,6,7,8,9,10,11,12,13,14,15,16].

Home > Data catalogue > Middle layer Super Output Areas (MSOAs) - Wales - 2021

Middle layer Super Output Areas (MSOAs) - Wales - 2021

Office of National Statistics



[Display in map viewer](#)

[Or display data on an existing map](#)

Type: Spatial data
Creation date: 08 August 2022
Licence: Open Government Licence for Public Sector Information (OGI) >
Point of contact: stats@gov.wales
[Read full metadata](#)

Super Output Areas were designed to improve the reporting of small area statistics and are built up from groups of output areas (OA). Statistics for lower layer super output areas (LSOA) and middle layer super output areas (MSOA) were originally released in 2004 for England and Wales. A Lower Layer Super Output Area (LSOA) is a geographic area. Lower Layer Super Output Areas are a geographic hierarchy designed to improve the reporting of small area statistics in England and Wales.

Use this data in another application

Please refer to the [licence](#) to understand the conditions of using this data.

OWS endpoints

[Copy WMS endpoint link](#)
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Find out how to use OWS (WMS and WFS) endpoints

Spatial data download

OGC Geopackage [Download](#)

Figure 1 - DataMapsWales - MSOA Boundary Data Download



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Home > Employment and labour market > People in work > Earnings and working hours

Dataset

Income estimates for small areas, England and Wales

Contact:
Admin and Modelled Income Estimates (AMIE) team

Release date:
10 December 2025

Next release:
To be announced

View all data related to earnings and working hours

Contact details for this dataset
Admin and Modelled Income Estimates (AMIE) team
AMIE@ons.gov.uk
+44 1633 988062

About this Dataset
Estimates of annual household income for the four income types for Middle layer Super Output Areas, or local areas, in England and Wales.

Edition in this dataset
Financial year ending 2023 edition of this dataset

xlsx (1.8 MB)

Figure 2 - ONS - Small Area Income Estimates



Cymraeg

StatsWales

This dataset can be found in:
[Health and social care > Hospital and other care setting activity](#)
[Health and social care > Performance and waiting times](#)

Therapy services: pathway waiting times, August 2024 onwards

View data

Download data

Dataset history

About this dataset

Variable filters

See what variables and values are shown in your table
[Change the variables shown in the table](#) | [Switch to table showing all variables](#)

Your current table can only show the data for 2 sets of variables at a time. All other variables have to be represented by a single value. You can change which variables and values are shown in your table.

Table

Copy link to this table

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Weeks waiting	Betsi Cadwaladr	Powys	Hywel Dda	Swansea Bay	Cwm Taf Morgannwg	Anaeth Betsi	Cardiff and Vale
Total Waiting	16,744	2,689	9,528	5,377	3,951	8,084	10,673
Up to 14 Weeks	13,049	2,689	7,108	5,380	3,955	8,117	10,014
Over 14 Weeks	2,695	1	2,420	17	46	467	659
Over 5 weeks and up to 1 week	2,257	389	692	525	581	1,299	1,031
Over 1 week and up to 2 weeks	1,597	389	797	741	681	1,099	1,240
Over 2 weeks and up to 3 weeks	1,470	350	721	660	512	960	1,048
Over 3 weeks and up to 4 weeks	1,244	261	613	540	383	896	965

Figure 3 - StatsWales -Therapy Services Pathway Waiting Times

2.3 Datasets

The following datasets were acquired to support the study. Each dataset contributes to the analysis, collectively enabling a multi-layered examination of the relationship between income deprivation, health outcomes, and service distribution across Wales.

Theme	Dataset	Source	Format	Key Field
Base	Wales MSOA 2021 Boundaries	DataMapWales	.gpk	MSOA21CD
Deprivation	Income Deprivation – Small Area Income Estimates	ONS	.xlsx > .csv	MSOA Code
Deprivation	Highest level of Qualification	ONS – Census 2021	.csv	MSOA Code
Healthy Living	Healthy Living – Physical Activity	Welsh Government	.xlsx > .csv	MSOA Code (A Generated)
Healthy Living	Healthy Living – BMI	Welsh Government	.xlsx > .csv	MSOA Code (A Generated)
Health Outcome	General Health	UK Data Service	.csv	GEO_CODE
Health Outcome	Disability – Long Term Health Conditions	ONS – Census 2021	.csv	MSOA Code
Mental Health	Suicide Rates by MSOA 2017-2021	ONS Ad-Hoc	.xlsx > .csv	MSOA Code
Care Provisions	GP Main Sites	DataMap Wales	.csv	Latitude/Longitude
Care Provisions	Rural Urban classifications 2021	ONS	.csv	MSOA21CD
Mental Health/Care Provisions	Therapy Services Pathway Waiting Times	StatsWales	.csv	Hospital Name (Geocoding utilised)

Table 1 - Data Acquisition Log. Physical Activity and BMI datasets were acquired and cleaned but excluded from the final map outputs due to spatial accuracy. See Section 2.5.

The table below provides a brief description of each dataset used in the final analysis, including the fields used and their role within the study.

Dataset	Key Fields Used	Role in Analysis
Wales MSOA 2021 Boundaries	MSOA21CD, MSOA21NM	Base polygon layer. Provides the spatial framework to which all attribute data is joined. 410 MSOAs covering the whole of Wales.
Income Deprivation – Small Area Income Estimates	MSOA code, Total Annual Income (£)	Primary independent variable. Used as the base choropleth layer across all three maps to represent income deprivation at MSA level.
Highest Level of Qualification (TS067)	MSOA code, Qualification level, Observation count	Used as a proxy for educational deprivation and socioeconomic context. Joined to boundary layer for thematic mapping.
General Health (INFUSE)	GEO_CODE, pct_poor_health	Measures the proportion of residents reporting bad or very bad health per MSA. Used as an overlay on Map 1 to examine the relationship between income and health outcomes.
Disability – Long Term Health Conditions (TS038)	MSOA code, pct_disabled	Measures the proportion of residents with a disability limiting day-to-day activities. Used as a transparency overlay on Map 1.
Suicide Rates by MSA 2017–2021	MSOA code, Persons_no_of_deaths	Provides a proxy measure for mental health outcomes at MSA level. Used as the base choropleth for Map 3.
GP Main Sites – Wales	Latitude, Longitude, Practice Name	Point layer showing the location of GP main sites across Wales. Used in Map 2 with urban and rural catchment buffers.
2021 Rural Urban Classification	MSOA21CD, Urban_rural_flag	Categorises each MSA as Urban or Rural. Used to apply differentiated GP catchment buffers and as a boundary outline layer across all maps.
Therapy Services Pathway Waiting Times	Hospital Name, Total_Waiting, Over_14_Weeks, pct_over_14_weeks	Hospital-level mental health therapy waiting times. Geocoded to point locations and displayed as proportional symbols on Map 3.

Table 2 - Dataset Descriptions and Field Usage



2.4 Data Cleaning

Prior to import into QGIS, each dataset underwent a data cleaning process to address formatting inconsistencies, removal of redundant fields and ensuring structural compatibility with the GIS environment. Cleaning was conducted primarily in Microsoft Excel before exporting to .csv format.

Several datasets required cleaning, the income deprivation Total Annual Income field was reformatted to numeric, general health and disability datasets had redundant columns removed, fields renamed and percentage fields calculated for analysis. Educational attainment data was transposed to MSOA row format and suicide headings were standardised.

2.5 Data Manipulation and Transformation

Beyond cleaning, several datasets required more substantive manipulation and transformation to make them spatially useable or analytically meaningful within the study framework.

The physical activity and BMI dataset presented a challenge as both were originally sourced from a Welsh Government ad-hoc statistical release at the Upper Super Output Area level rather than MSOA. In order to enable spatial joining to the MSOA boundary layer, MSOA codes were generated using Claude.AI to replicate the dataset at MSOA level. Whilst the process allowed the data to be structured and cleaned it was determined that the resulting dataset could not be considered sufficiently dependable for thematic mapping due to the uncertainty introduced by the AI-assisted code generation. Both datasets were therefore excluded from the final map outputs.

The original therapy waiting times StatsWales dataset provided waiting time figures broken down by individual named hospitals across Wales but did not include geographic coordinate information. This data needed to be rendered as a point layer within QGIS. A list of Welsh Hospitals was extracted from the dataset, and the MMQGIS plugin within QGIS was used to query the OpenStreetMap Nominatim geocoding service and return latitude and longitude coordinates for each hospital. Where the automated process failed to return results for a small number of hospitals, coordination were sourced manually using Google Maps and added directly to the dataset. The resulting geocoded hospital locations file contained 62 hospital sites with verified coordinate data.

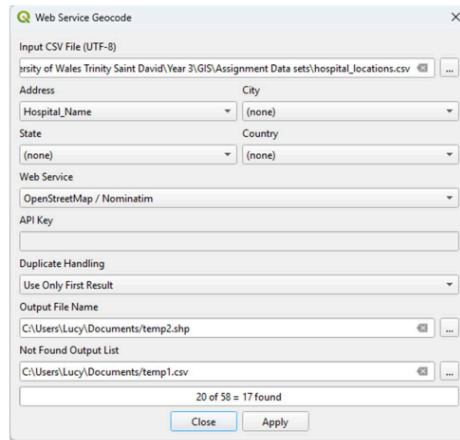


Figure 4 - QGIS MMQGIS Plugin - Geocoding dialogue showing hospital name field and Nominatim service selected.

Following import into QGIS, two further transformations were made to the data. First, field type formatting was applied during the CSV import using the Add Delimited Text Layer dialogue to confirm numeric fields were correctly interpreted as integer or decimal values in place of strings. Second, derived fields were calculated using the Field Calculator within the Attributes table of the relevant dataset.

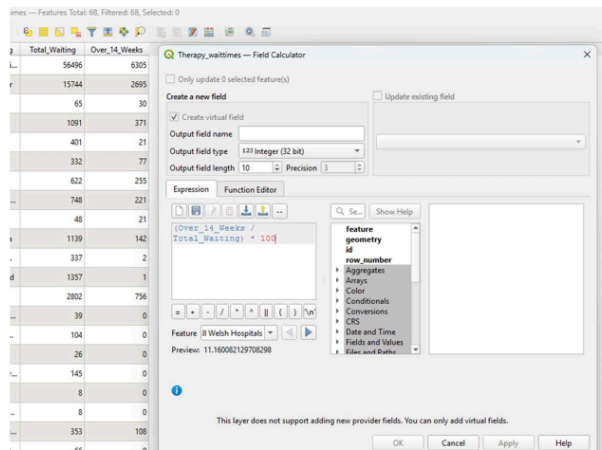


Figure 5 - QGIS - Field Calculator showing pct_over_14_weeks expression and preview value.

3. GIS Build and Thematic Mapping

3.1 Workspace Configuration

The GIS workspace was built in QGIS 4.0.1 using the British National Grid coordinate reference system. The Wales MSOA 2021 boundary GeoPackage was loaded as the base polygon layer, providing the spatial framework across which all thematic data was joined and visualised. The boundary layer confirmed 410 MSOAs covering the whole of Wales, with smaller, denser MSOAs visible in the urban south and larger MSOAs across rural mid and north Wales.

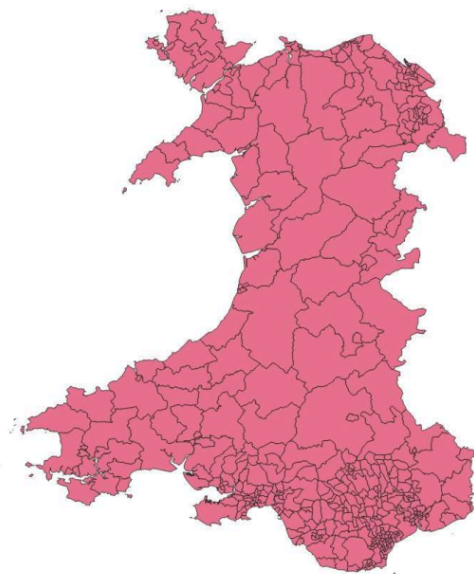


Figure 6 - Wales MSOA 2021 Boundary layer loaded into QGIS.

3.2 Layer Joins and Attribute Configuration

Attribute datasets were joined to the boundary layer using the Join function within layer properties. Each join used the MSOA21CD field in the boundary layer as the target field, matching against the corresponding MSOA code field in each .csv. Only the fields required for analysis were selected during each join to maintain a clean attribute table.

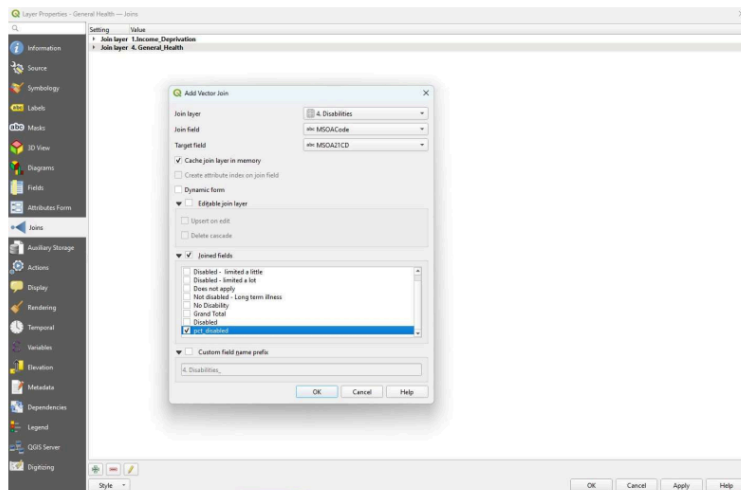


Figure 7 - Add Vector Join dialogue showing Disability layer join with pct_disabled field selected.

fid_1	FID	MSOA21CD	MSOA21NM	Income_Total annual income (£)	Health_pct_poor_health	Disabilities_pct_disabled
1	6857	W02000001	Isle of Anglesey...	43135	7.48	21.61808447
2	6858	W02000002	Isle of Anglesey...	47425	7.28	20.097423
3	6859	W02000003	Isle of Anglesey...	39366	7.2	23.45969335
4	6860	W02000004	Isle of Anglesey...	46011	6.01	20.21894851
5	6861	W02000005	Isle of Anglesey...	45901	5.77	21.39443696
6	6862	W02000006	Isle of Anglesey...	47176	6.17	19.30777976

Figure 8 - Attribute table showing income, general health and disability fields joined to MSOA boundary layer.

3.3 Thematic Mapping – Map 1: Income, Health, and Disability

In order to address the primary research question, Map 1 was designed by visualising the spatial relationship between income deprivation, general health outcomes, and disability rates across Wales. Four layers were combined using a transparency overlay technique to allow simultaneous visualisation of all variables.

The income deprivation layer was styled as a graduated choropleth using a Red-Yellow-Green colour ramp with Natural Breaks (Jenks) classification across five classes, with red representing the lowest income MSOAs. The general health layer was duplicated from the boundary layer, styled as a graduated red choropleth, and applied at a 60% opacity over the income base. The disability layer was similarly duplicated and styled as a graduated purple choropleth at 45% opacity. The Rural Urban Classification was applied as a categorised outline-only layer using transparent fill with green outlines for rural MSOAs and blue outlines for urban MSOAs.

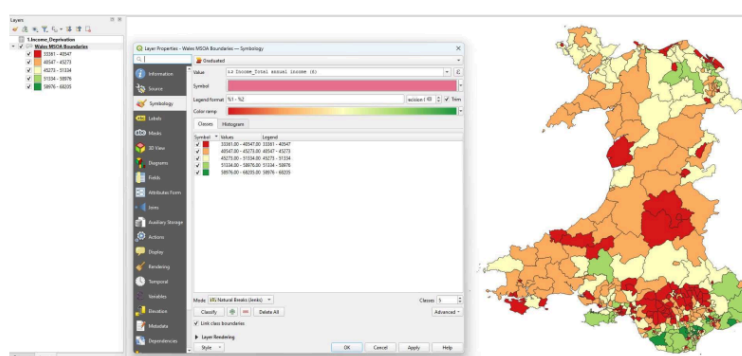


Figure 9 - Income deprivation graduated choropleth symbology dialogue and resulting map.

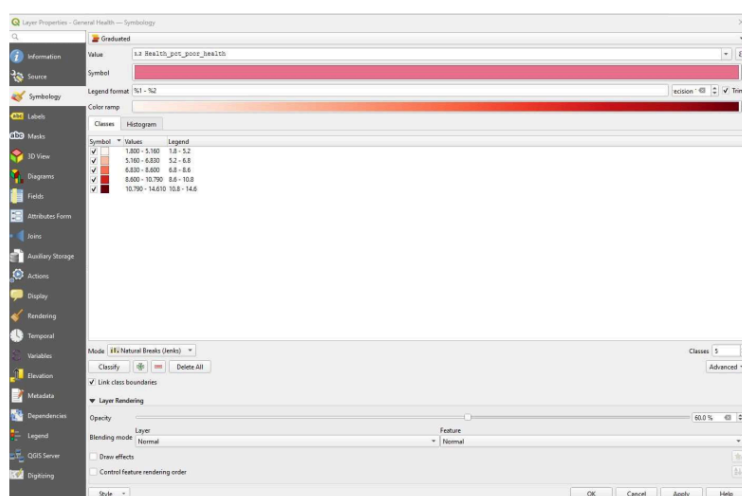


Figure 10 - General Health layer symbology showing a graduated red colour ramp at 60% opacity.

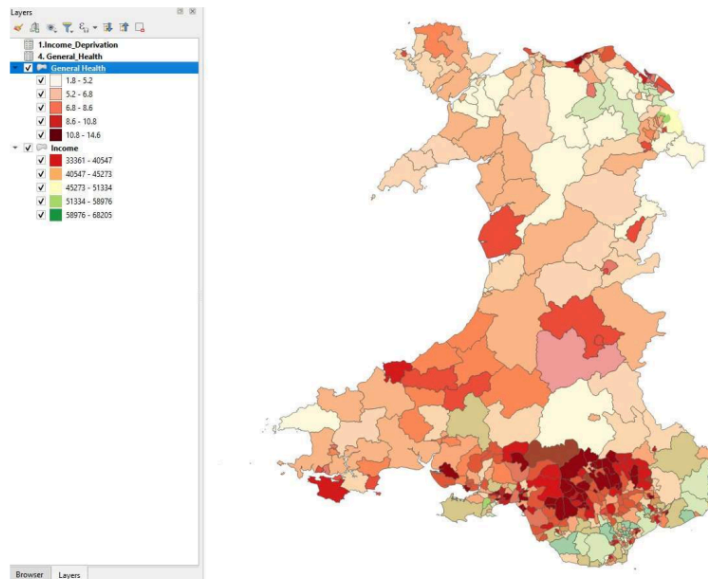


Figure 11 - Two-layer overlay: Income and General Health combined.

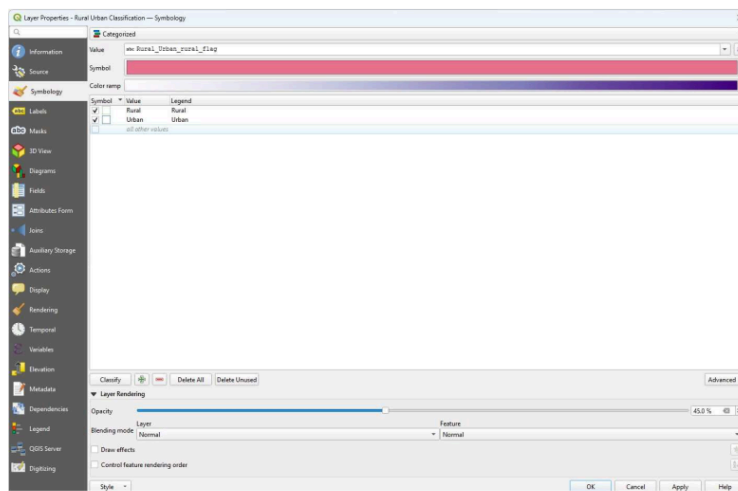


Figure 12 - Rural Urban Classification categorised symbology dialogue box showing categories.

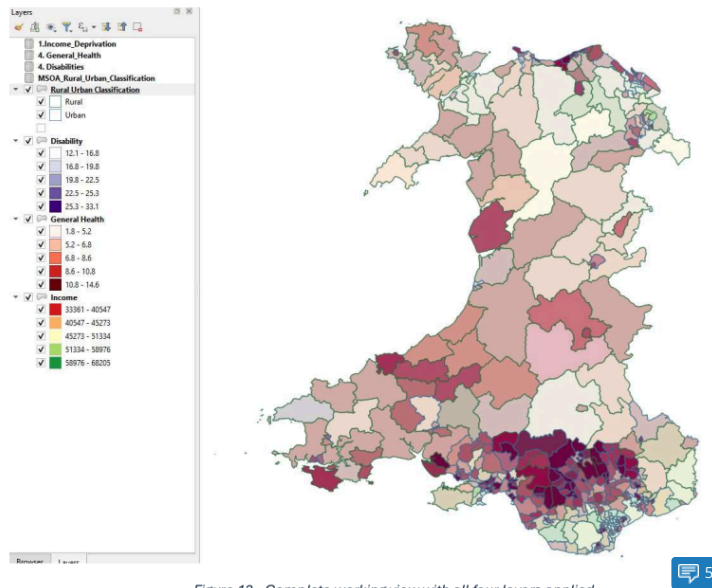


Figure 13 - Complete working view with all four layers applied.

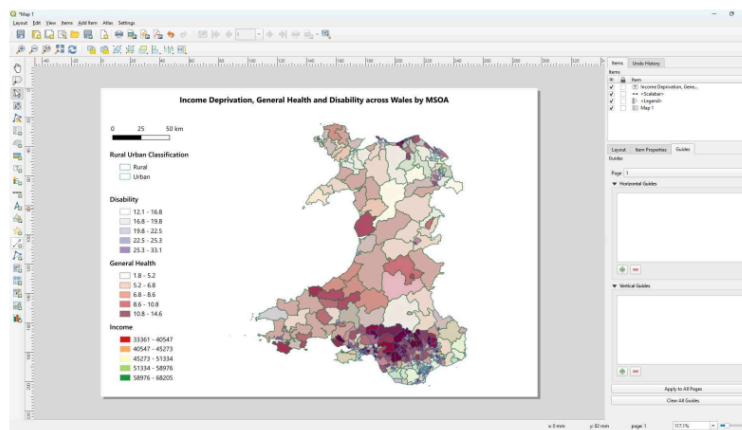


Figure 14 - Print Layout showing Title, Legend, and Scale bar.

3.4 Thematic Mapping – Map 2: Primary Care Coverage

This map was designed to address the secondary question by visualising the distribution of GP services and hospital locations relative to income deprivation. The income choropleth was retained as the base layer with GP main sites and hospital layers being imported as point layers using latitude and longitude coordinates in EPSG:4326, then reprojected to EPSG:27700 for spatial consistency.

A variable catchment buffer was added to reflect differences in access between urban and rural areas. GP sites were filtered by Rural Urban Classification flag, and two separate buffer zones were created: a 2km catchment for urban GP sites and a 5km catchment for rural GP sites. Urban buffers were stylised in purple at 20% opacity and rural buffers in teal. Hospital sites were displayed as red cross symbols and GP sites as navy-blue circles.

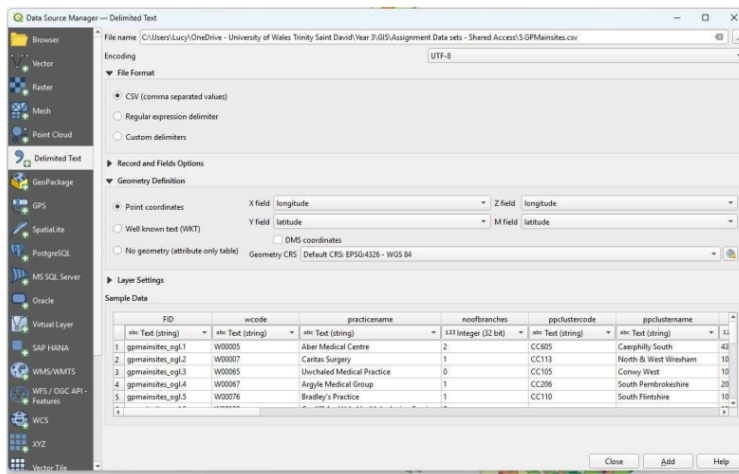


Figure 15 - GP main sites .csv import showing point coordinate configuration.

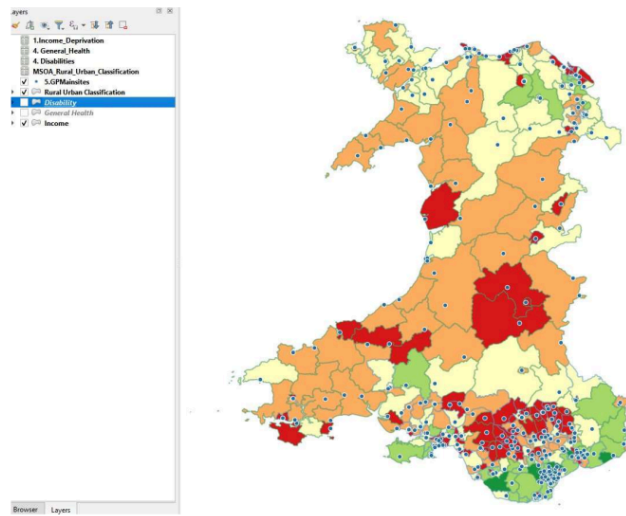


Figure 16 - GP Main sites point layer plotted over the Income base layer.

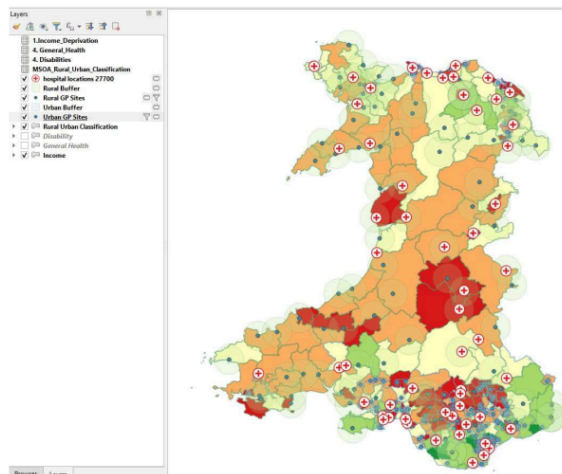


Figure 17 - Reprojected Layer with GP sites and Hospital Locations to EPSG:27700

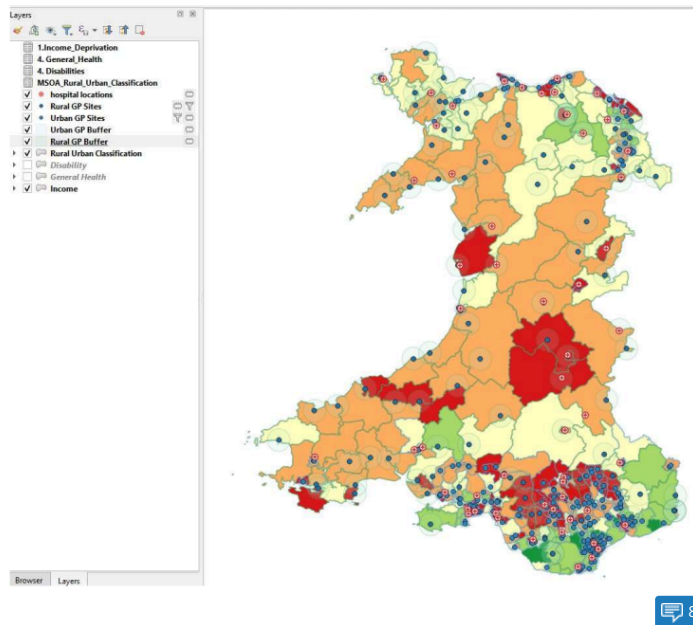


Figure 18 - Working view showing GP sites, hospital locations, variable catchment buffers, and income base.

3.5 Thematic Mapping – Map 3: Mental Health Service Access and Needs.

The last map was designed to examine mental health needs and service provisions by combining suicide rates as a proxy for mental health outcomes with hospital-level therapy waiting time data specifically for mental health therapies. Suicide rates were visualised as a graduated choropleth using a Blues colour ramp with Natural Breaks classification across five classes. The income layer was retained below this at a 35% opacity as a contextual reference layer.

Hospital waiting time data was visualised using a rule-based proportional symbol renderer combining two dimensions simultaneously. Circle size was scaled proportionally to the total wait time using the scale linear expression, ranging from size 3 to size 12, to represent the overall volume of demand at each hospital. Circle colour was distinguished where over 50% of patients were breaching the NHS Wales 14-week therapy waiting time target (dark red outline) from those where the majority were within target (blue). This proportional symbol approach allowed both the scale of demand and the quality-of-service provision to be communicated within a single layer.

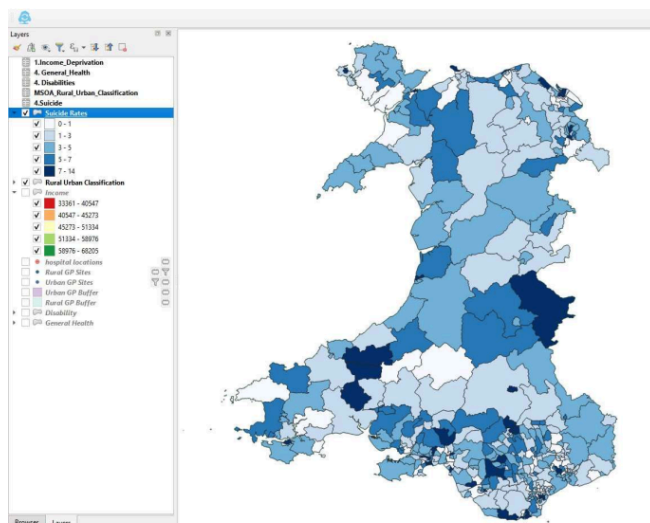


Figure 1920 - Suicide Rates choropleth at 100% opacity showing spatial distribution.

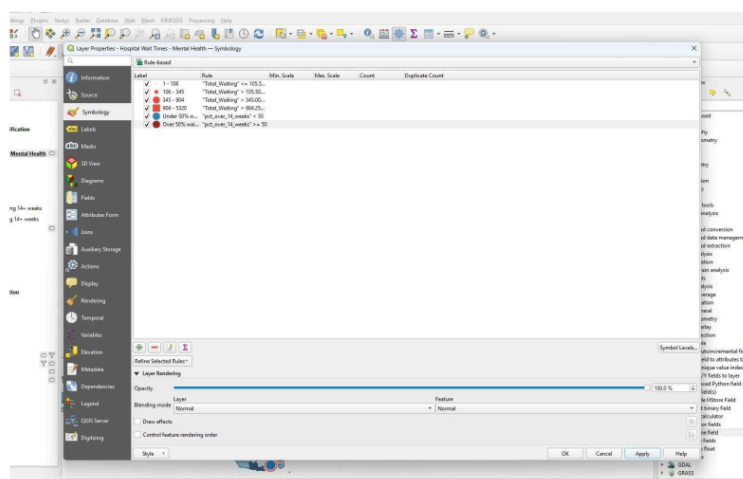


Figure 19 - Rule-Based symbology dialogue interface showing proportional circle rules for Total Waiting and pct over 14 weeks.

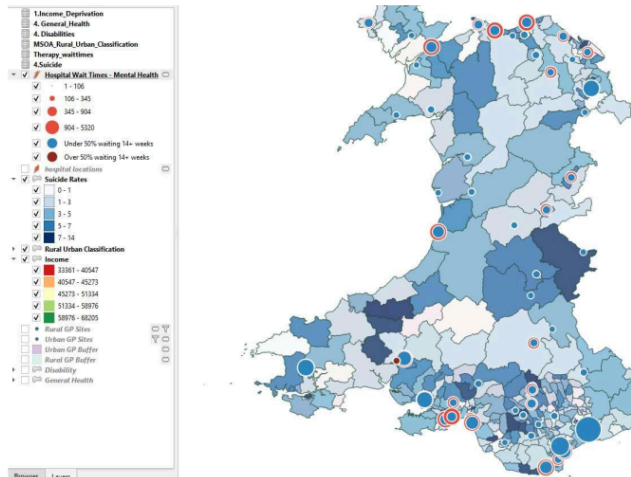


Figure 21 - Working view of Map 3 showing proportional circle symbols applied with rule-based rendering - circle size represents Total waiting, red outline indicates over 50% breaching 14-week-target.

4. Outcomes

4.1 Findings from the thematic maps

Analysis of the three thematic maps revealed spatial patterns and relationships across Wales in relation to income deprivation, health outcomes, and service distribution.

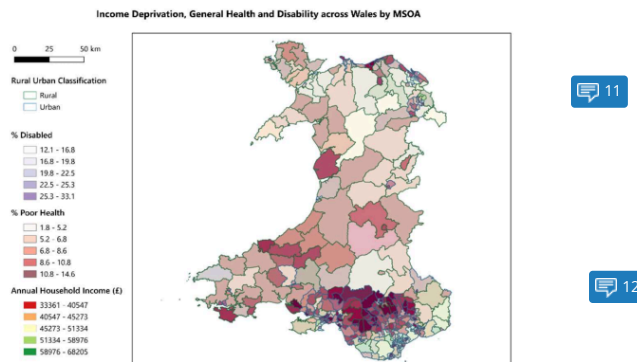


Figure 22 – Map 1: Income Deprivation, General Health, and Disability across Wales by MSAO

Map 1 reveals a strong spatial concentration of multiple disadvantages is visible in South Wales, particularly across the Valleys, parts of Swansea, Cardiff, and Newport. MSOAs with the lowest annual household incomes consistently overlap with the highest proportions of poor health and disability. Rural mid and north Wales display notably lighter tones across all three variables, suggesting better outcomes despite lower absolute incomes in some areas.[17]

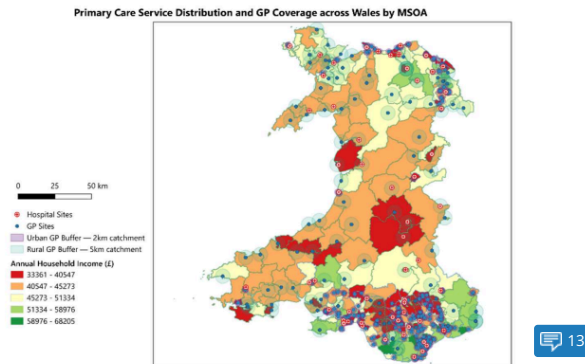


Figure 23 – Map 2: Primary Care Service Distribution and GP Coverage across Wales by MSA

Map 2 shows the primary care distribution across Wales; it reveals a large concentration of GP Provision in South Wales where urban 2km buffer zones overlap densely in the highest deprivation areas. In contrast, rural mid Wales presents a clear access gap 5km rural buffer zones are widely spaced with significant areas of orange and red income MSOAs falling outside any GP catchment areas. Hospital provision shows a similar pattern with few sites visible across the rural interior.

Map 3 highlights the darkest blue MSOAs indicating 7-14 recorded suicide deaths between 2017 – 2021, are concentrated in southeast Wales and along the north Wales coast corridor. The proportional symbol overlay reveals that several high-need areas are served by hospitals carrying the largest total waiting populations, with red-outlined circles indicating over 50% of patients breaching the NHS Wales 14-week therapy target. Rural mid Wales MSOAs show lower recorded rates but have almost no visible hospital provision suggesting potential underreporting rather than genuinely lower need [18, 19].

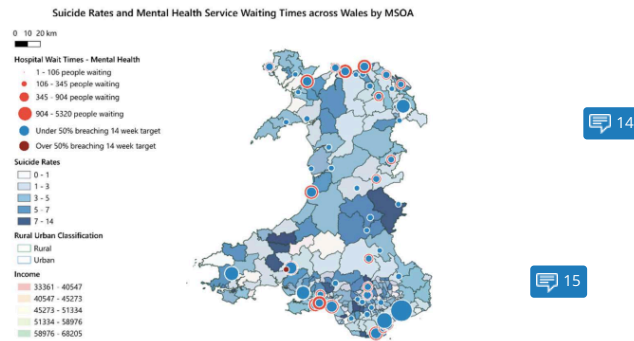


Figure 24 - Map 3: Suicide Rates and Mental Health Service Waiting Times across Wales by MSOA

5. Analysis

5.1 - Findings

The GIS build and thematic maps demonstrate several key principles of thematic mapping and data visualisation central to effective spatial communication.

Each map was designed to present data accessibly using intuitive colour ramps with clearly labelled legend entries. Natural Breaks (Jenks) classification ensured class boundaries reflected genuine clustering in the data instead of arbitrary intervals.

A deliberate decision was made to exclude physical activity and BMI datasets on the grounds of data reliability and to reserve occupation and industry data for future enrichment. This selective approach ensured each map communicated a focused analytical narrative.

Combining choropleth base layers with graduated overlays, point layers and outline classifications enable each map to communicate relationships between multiple variables impossible to convey through individual maps or tabular data alone.

The three maps provide a spatially evidenced responses to both research questions. Map 1 confirms a strong association between lower income and poorer health outcomes in urban south Wales. Maps 2 and 3 reveal that whilst primary care and mental health services are present in high deprivation areas, adequacy of provision is questionable. GP coverage gaps exist in rural deprived MSOAs and mental health therapy services in the highest need areas are significantly over capacity and underperforming against national waiting time targets.

5.2 Challenges

A number of practical challenges were encountered during the GIS build that required problem solving and, in some cases, influenced the scope of the final analysis.

A primary challenge through the data acquisition process was the availability of datasets at the correct geographical level. The MSOA boundary framework used in this study required all attribute data to be joinable at MSOA level. Several datasets of potential analytical value, most notably the physical activity and BMI data sourced from the Welsh Government Ad-hoc statistical release, were only available at Upper Super Output Area (USOA) level. Attempts were made to bridge this gap by generating MSOA Codes using Claude.AI however the resulting dataset could not be considered sufficiently dependable for thematic mapping and therefore was excluded. This challenge highlighted the importance of confirming geographic compatibility of datasets before committing to their inclusion in a GIS study.

The geocoding of hospital locations using the MMQGIS Nominatim plugin presented a technical challenge. The service-imposed rate limiting restrictions, returning an HTTP 429 error this was resolved by introducing delays between requests, a small number of names were not successfully matched by the automated service and required manual coordinate lookup via Google Maps. While the final geocoded dataset was verified and complete, this process underlined the limitations of relying on free geocoding services for non-English place names.

5.3 Limitations

In addition to the challenges encountered, a number of limitations should be considered when interpreting the study.

The datasets in this study span a range of years. Combining datasets from different time periods introduces a degree of temporal inconsistency as conditions in any given MSOA may have changed between collection dates. Ideally all datasets would relate to the same reference period to ensure comparability.

Analysis at MSOA level masks variation within individual areas. MSOA contains on average 7,200 residents and can encompass a wide range of socioeconomic conditions within its boundary. Areas that appear moderate at MSOA level may contain pockets of extreme deprivation or remarkably high service need that are not visible at this scale. A more granular analysis at LSOA level could provide greater spatial precision.

The therapy waiting times dataset is available at hospital location in place of MSOA level. These figures represent catchment-wide demand not MSOA specific need which limits the precision with which service adequacy can be assessed at the local level. Suicide data at MSOA level is subject to small number suppression in some areas and

represent only the most extreme outcome of poor mental health rather than the broader spectrum of mental health conditions.

6. Conclusions

This study investigated two research questions using GIS-based thematic mapping across 410 Welsh MSOAs. The three map outputs provide spatially evidenced responses to both.

Map 1 confirms a strong spatial relationship between lower income and poorer health outcomes, concentrated in the south Wales valleys, Swansea and the Newport/Cardiff corridor, where low income, poor health and high disability occur.

Map 2 reveals a significant urban-rural divide. Whilst GP provision exists in deprived urban areas, rural mid Wales shows clear geographic coverage gaps with several high-deprivation MSOAs falling outside any catchment zones.

Map 3 demonstrates that therapy services are under greatest pressure in the highest-need areas, with over 50% of patients at several hospitals breaching the 14-week target in areas already characterised by elevated suicide rates and low income.

Future enrichment could include population weighting, occupation and industry-based data, robust physical activities and BMI datasets, additional mental health indicators such as antidepressant prescribing rates, and green space or leisure facility coverage to explore the relationship between physical infrastructure and health outcomes.



References

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Appendix

OneDrive Access to QGIS:

The complete QGIS project file (Assignment_QGIS_Project.qgz) has been stored and made accessible via the University OneDrive. This file contains all map layers, attribute joins, symbology settings, and spatial configurations produced throughout this assignment. The .qgz format is QGIS's native compressed project file, which packages the project settings and layer references into a single portable file. The project can be accessed at the following link: <https://uowtsd->

my.sharepoint.com/:u:/g/personal/2308345_student_uwtsd_ac_uk/!QC8sE4TSckzR5RWAB-3UVMbAYl6M5ravN5_hAc5qBQersw?e=ny5ugV



AI Usage Paragraph

I acknowledge the use of Claude (<https://claude.ai>), developed by Anthropic, as a supplementary academic support tool during the preparation of this assignment.

Claude was used to:

Manipulate and analyse data relating to BMI and Physical Activities, using the following prompt:

"I am working on my GIS assignment, my lecturer has confirmed we can create a dummy data set from an existing set due to the lack of LSOA and MSOA codes. Can you replicate the existing data at USOA level but create an MSOA field for a primary key. Please create two data sets combining the relevant tabs at MSOA Level: 1) healthy_weight, overweight_or_obese, obese 2) physically_inactive with physically_active — both need to be .csv files."

Please note that this data and any associated outputs were subsequently not used within the final submission.

All core analysis, interpretation and written content were completed independently. Academic references were sourced, reviewed, and verified independently to ensure accuracy and relevance.

FINAL GRADE

86

/100

GENERAL COMMENTS

Dear Lucy,

I am highlighting some overall points here:

key strengths:

- quality and range of QGIS practical techniques demonstrated,
- transparency and rigour of the data processing pipeline,
- principled exclusion of unreliable data,
- exemplary AI usage declaration, and a well-structured, clearly written report throughout.

Main areas for improvement :

- depth of theoretical literature engagement around maps,
- quality of final cartographic outputs which could be more polished with properly configured Print Layouts, north arrows, and consistent legend design,

A more detailed feedback can be found inside the document

Best Wishes

PAGE 1

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PAGE 3



Comment 1 | Literature (25)

demonstrates an understanding of how maps communicate spatial information

PAGE 4



Comment 2 | Literature (25)

literature engagement is largely confined to supporting the empirical findings however

discussion on the role of cartographic design in communicating spatial patterns to non-specialist audiences to be added

PAGE 5

PAGE 6

PAGE 7



Comment 3 | Literature (25)

Broaden the health geography literature engagement — reference studies that have used GIS in a Welsh or UK public health context to contextualise the study within existing research.

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Comment 4 | Knowledge&Understanding(20)

QGIS screenshots added extensively and appropriately to demonstrate the GIS build process

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Comment 5 | Knowledge&Understanding(20)

colour ramps, number of classes, classification method, and opacity values are all specified



Comment 6 | Knowledge&Understanding(20)

visually the map in Print Layout is noticeably smaller and less legible than the working view in Figure 13.

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PAGE 16



Comment 7 | Knowledge&Understanding(20)

The explicit note of GP and hospital point layers in EPSG:4326 and then reprojected to EPSG:27700 for spatial consistency shows strong knowledge of CRS management

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Comment 8 | Cognitive and Intellectual(25)

each thematic maps has distinct design approach, addressing different aspects of the research questions. well done



Comment 9 | Cognitive and Intellectual(25)

no assessment of which limitations are serious vs minor

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Comment 10 | Knowledge&Understanding(20)

Adding a second attribute table screenshot for the therapy waiting times dataset to demonstrate the derived field used in Map 3

PAGE 19



Comment 11 | Practical Application (20)

A brief explanatory note in the legend about the transparency technique would aid readability.



Comment 12 | Practical Application (20)

identification of orange/red income MSOAs falling outside any GP catchment zone is concrete

PAGE 20



Comment 13 | Cognitive and Intellectual(25)

proportional symbols overlap heavily in high-density areas-needs more discussion

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Comment 14 | Cognitive and Intellectual(25)

No north arrows on any final map. this is a fundamental cartographic convention missing from all three outputs



Comment 15 | Practical Application (20)

three maps cover the same geographic area, there is an opportunity to include a small inset map showing Wales's location within the UK context.



Comment 16 | Transferable Skills(10)

coherent narrative from data acquisition through cleaning and transformation to GIS build and thematic mapping.

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Comment 17 | Transferable Skills(10)

detailed closing statement needed tying findings back to the original research questions.

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Comment 18 | Literature (25)

peer-reviewed journal articles used to support the map findings

PAGE 26



Comment 19 | Transferable Skills(10)

AI Usage section in the Appendix is exceptionally transparent

LUCY BOYT

86

LITERATURE (25)



20

KNOWLEDGE&UNDERSTANDING(20)



18

COGNITIVE AND INTELLECTUAL(25)



22

PRACTICAL APPLICATION (20)



18

TRANSFERABLE SKILLS(10)



8