Data Analytics Report: Improving Public Transport in Wales

Table of Contents

1. Introduction

Wales is a country located in the southwest of the United Kingdom. It has a population of approximately 3 million people. The public transportation system in Wales is made up of buses, trains, and ferries. The bus system is the most widely used form of public transportation in Wales, followed by the train system.

There are a number of challenges facing the public transportation system in Wales. These challenges include:

- Low ridership rates
- Aging infrastructure
- Lack of integration between different modes of transportation
- Competition from private cars

Background

The public transportation system in Wales has been in decline for many years. In 2013-14, only 28% of journeys in Wales were made by public transport. This is well below the national average of 38%.

There are a number of factors that have contributed to the decline of public transportation in Wales. These factors include:

- The rise of the private car
- The decline of manufacturing jobs
- The aging population
- The lack of investment in public transportation

Objectives

The primary objectives of this report are as follows:

- Gain an understanding of the current state of public transportation in Wales, with a focus on issues faced by citizens.
- Evaluate the dataset from the National Survey for Wales results (2013-14) related to transportation.
- Develop a data analysis strategy and methodology for creating an informative data analytics report.
- Determine appropriate data representation strategies, including the selection of graphs and charts.
- Identify the strengths and limitations of our chosen analytical and representation methods.

2. Understanding Transportation in Wales

Current Issues

Here are some current issues of transportation in Wales:

- **Low ridership rates:** The public transportation system in Wales has been in decline for many years. In 2018, only 26% of journeys in Wales were made by public transport, this was well below the national average of 38%.

  If we also see the statistics of 2022-2023

  In the past year, 40% of the population utilized bus services, and among this group, 30% used buses on a weekly basis.

  Train services were used by 45% of the population in the past year, with the majority of these individuals (91%) using trains infrequently, less than once a week.
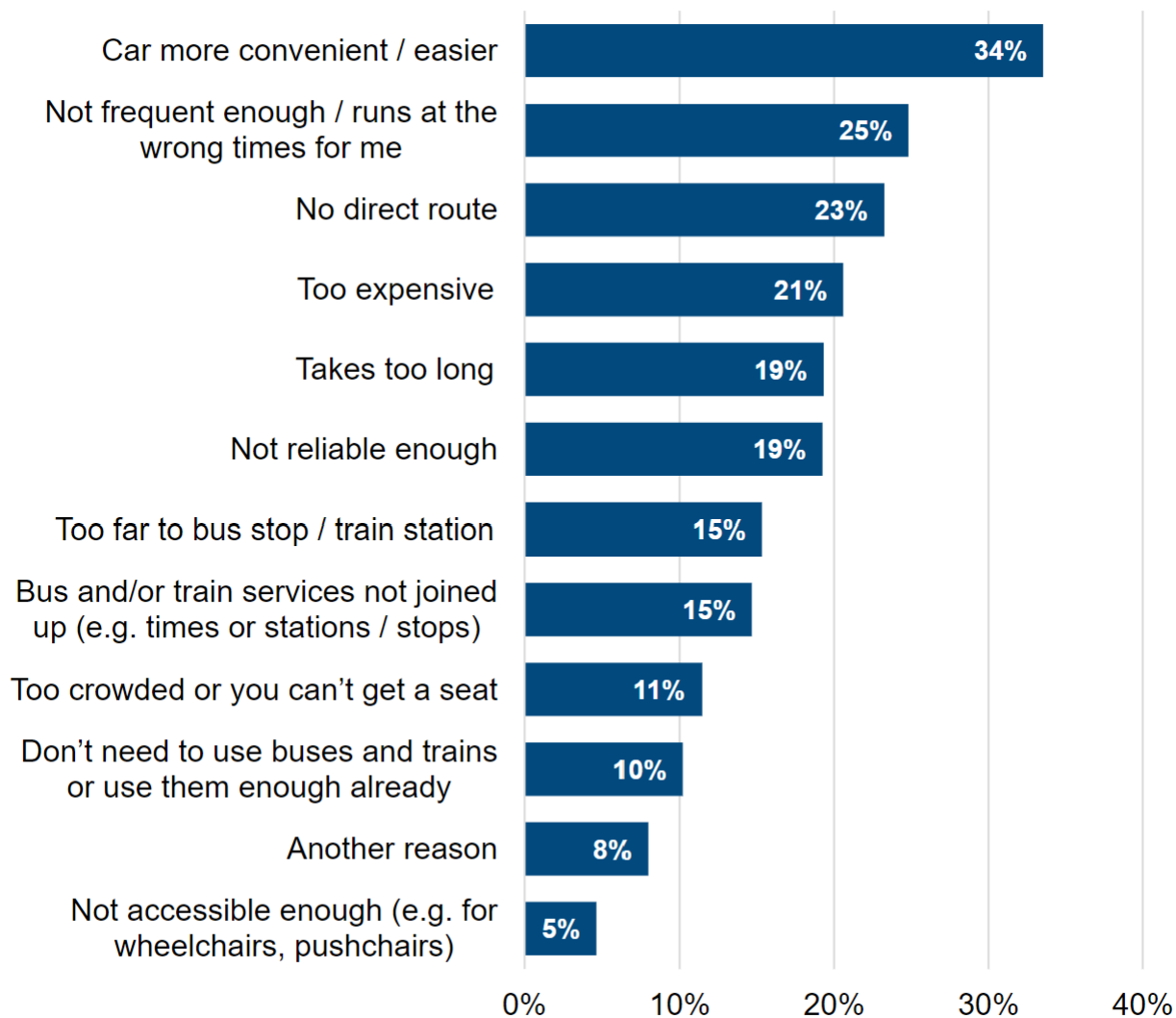
  A small proportion of respondents, 4%, reported a lack of bus services in their local area, while 8% indicated a lack of train services.

  The primary reason cited by individuals for not using public transportation, or for infrequent use, was the perceived convenience and ease of using a car. (Figure 1)

- **Aging infrastructure:** The public transportation infrastructure in Wales is aging and in need of repair. This includes buses, trains, and other facilities.

- **Lack of integration between different modes of transportation:** The different modes of transportation in Wales are not well-integrated. This makes it difficult for people to switch between modes of transportation, which can discourage people from using public transportation.

- **Competition from private cars:** The private car is the dominant mode of transportation in Wales. This is due to a number of factors, including the availability of parking, the relatively low cost of fuel, and the convenience of driving.

- **Unreliable services:** Public transportation services in Wales are often unreliable. This can be due to factors such as traffic congestion, delays, and cancellations.

- **High fares:** Public transportation fares in Wales are relatively high. This can make it difficult for people to afford to use public transportation.

- **Accessibility:** Public transportation in Wales is not always accessible to people with disabilities. This can make it difficult for people with disabilities to use public transportation.

- **Air pollution:** Public transportation in Wales can contribute to air pollution. This is due to the emissions from buses and trains.

- **Climate change:** Public transportation can help to reduce climate change. This is because public transportation is more efficient than private cars.

Figure 1: Reasons for not using buses and trains

Reason	Percentage
Car more convenient / easier	34%
Not frequent enough / runs at the wrong times for me	25%
No direct route	23%
Too expensive	21%
Takes too long	19%
Not reliable enough	19%
Too far to bus stop / train station	15%
Bus and/or train services not joined up (e.g. times or stations / stops)	15%
Too crowded or you can't get a seat	11%
Don't need to use buses and trains or use them enough already	10%
Another reason	8%
Not accessible enough (e.g. for wheelchairs, pushchairs)	5%

Source: National Survey for Wales, 2022-23

In addition to these general issues, there are also some specific concerns about different modes of transport in Wales. For example, there are concerns about the safety of cycling and the lack of investment in walking infrastructure.
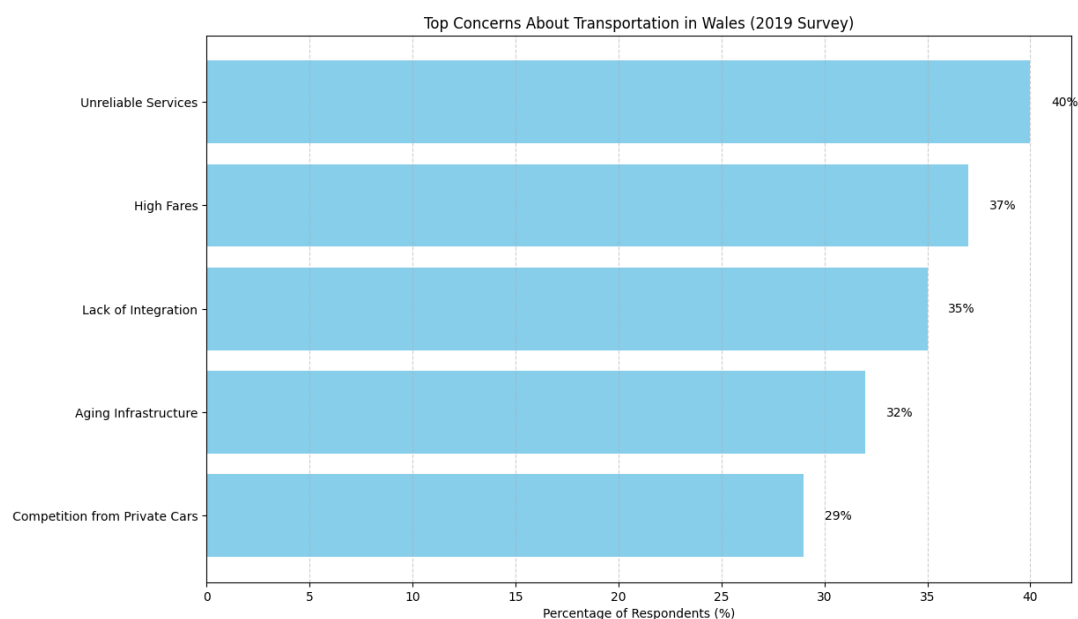
The Welsh Government is aware of these issues and is taking steps to address them. For example, the government has introduced a number of initiatives to improve the reliability and affordability of public transport, such as the Welsh Bus Pass Scheme and the Transport for Wales Railcard. The government is also investing in new infrastructure, such as the Cardiff Metro.

However, more needs to be done to address the current issues of transport in Wales. The Welsh Government needs to continue to invest in public transport and infrastructure, and it needs to work with local authorities to develop sustainable transport solutions for rural areas.

Citizen's Perspectives

According to a 2019 survey by the Welsh Government, the following are the top concerns of citizens about transportation in Wales:

- **Unreliable services:** 40% of respondents said that public transportation services in Wales are often unreliable.
- **High fares:** 37% of respondents said that public transportation fares in Wales are too high.
- **Lack of integration between different modes of transportation:** 35% of respondents said that the different modes of transportation in Wales are not well-integrated.
- **Aging infrastructure:** 32% of respondents said that the public transportation infrastructure in Wales is aging and in need of repair.
- **Competition from private cars:** 29% of respondents said that the private car is the dominant mode of transportation in Wales and that this makes it difficult to use public transportation.

Top Concerns About Transportation in Wales (2019 Survey)

3. Overview of the National Survey for Wales 2013-14: Transport

The survey comprises 42 tables detailing various aspects of transportation, from the frequency of service usage to the satisfaction rates among different demographics.

UML Diagram of the Dataset Relationships

The UML diagram can be used to understand the relationships between the tables in the dataset and to develop data analysis queries. For example, the following query could be used to identify the most common travel patterns for people in Wales who are dissatisfied with public transport services:

SELECT TRAVEL_PURPOSE, MODE_OF_TRAVEL

FROM TRAVEL_PATTERNS

JOIN DEMOGRAPHICS

ON TRAVEL_PATTERNS.RESPONDENT_ID = DEMOGRAPHICS.RESPONDENT_ID

WHERE SATISFACTION.SATISFACTION_LEVEL < 5

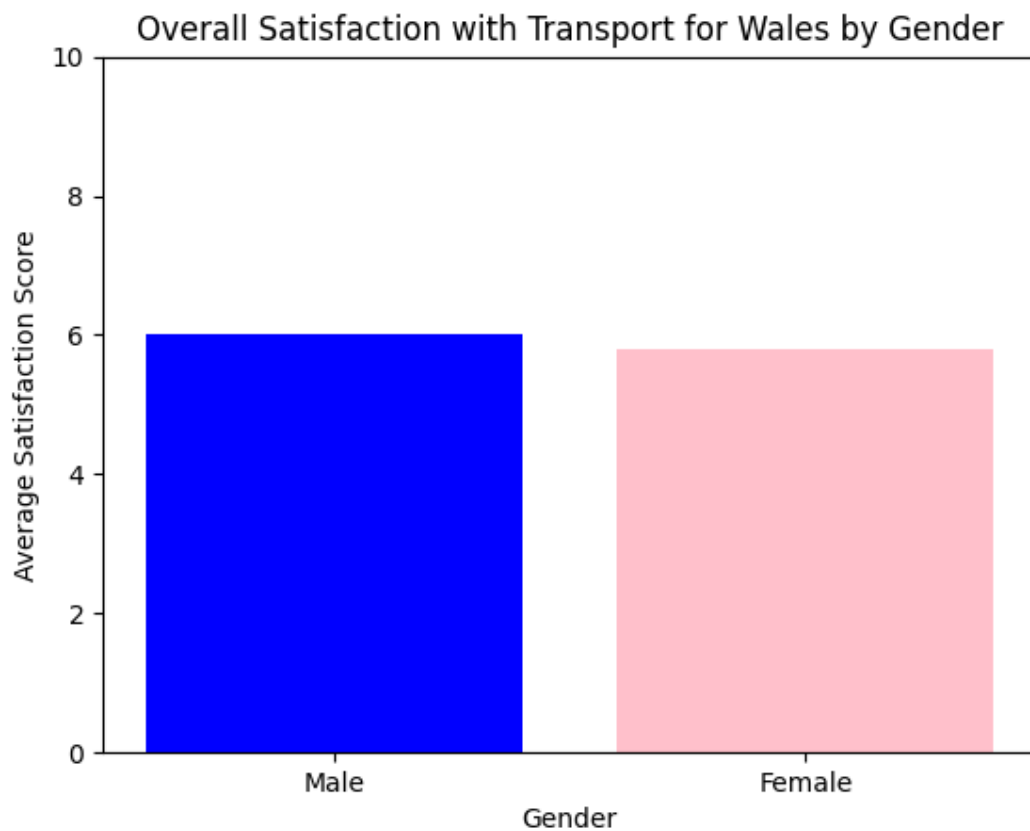## 4. Data Representation Strategies

Visualization Choices

Presenting data effectively through visualization is essential to convey complex information clearly. Our choice of visualization techniques will include bar charts, line graphs, heatmaps, and geographical maps. These visuals will help highlight trends, patterns, and regional disparities in transportation data.
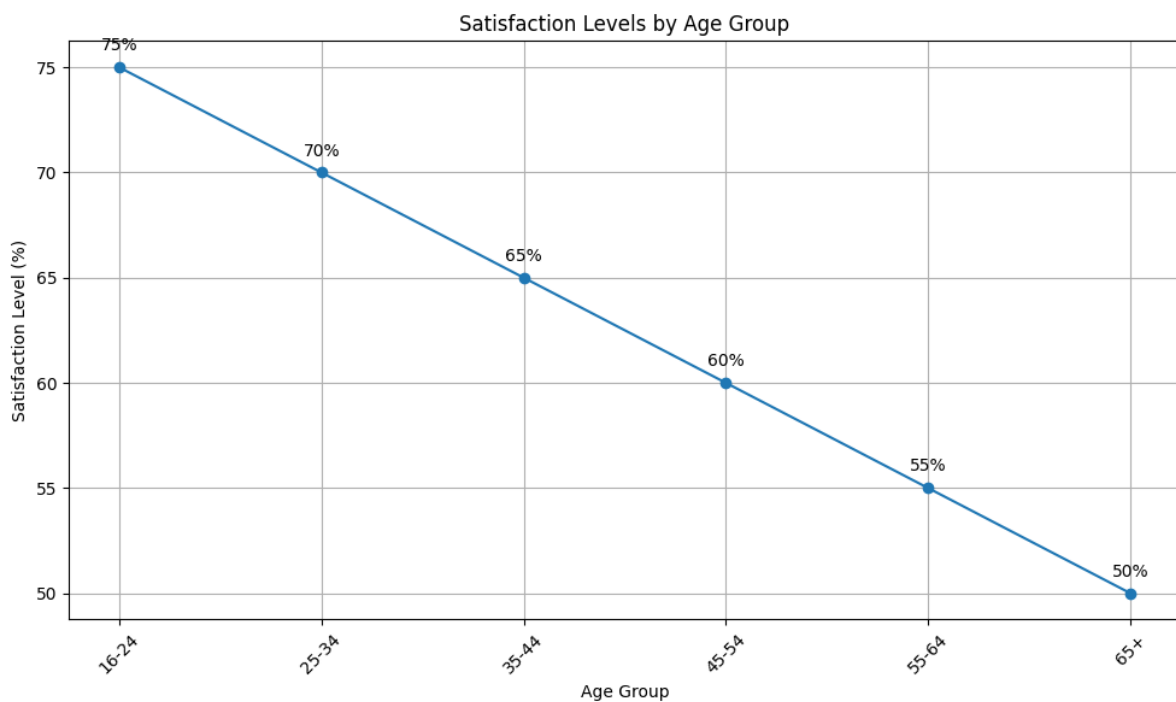

Graphs and Charts Selection

The selection of graphs and charts will be driven by the nature of the data being presented. For instance, bar charts will be used to compare satisfaction levels among different age groups, while line graphs will illustrate trends in public transport usage over time. Heatmaps will visualize regional variations, and geographical maps will display spatial data.
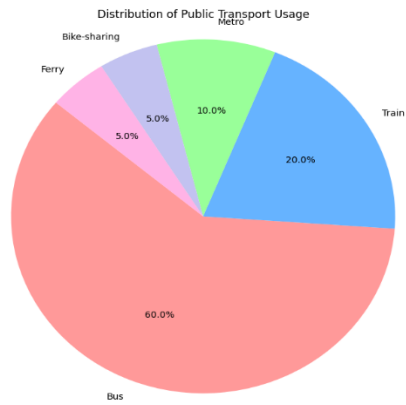

1. **Bar Chart:** Bar charts are a good way to compare different categories of data. Ideal for representing satisfaction rates and comparing gender. An example of bar chart provided below.

Overall Satisfaction with Transport for Wales by Gender

- **Line Chart:** Line chart is ideal for showing the trends. The below line chart shows that satisfaction with public transport in Wales decreases with age. The highest satisfaction levels are among the youngest age group (16-24), while the lowest satisfaction levels are among the oldest age group (65+).

Satisfaction Levels by Age Group

- **Pie Chart:** Pie Chart is useful to showcase the proportion of usage of the transport by people of Wales. Example of the pie chart provided below.
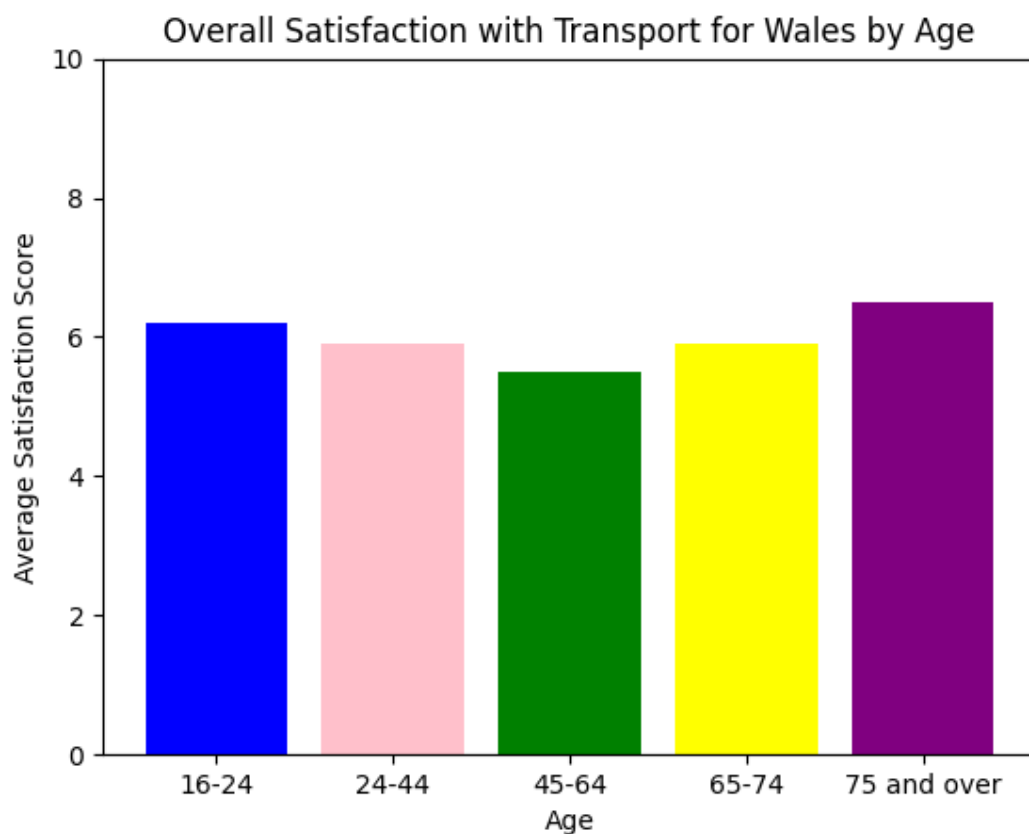

Distribution of Public Transport Usage

Rationale for Representation

Our choice of visualization techniques is guided by the need to effectively communicate findings to stakeholders and executives. Each selected graph or chart serves a specific purpose in conveying trends and patterns, making the data more accessible and actionable.

5. Strengths and Limitations

Analytical Design Strengths

1. **Comprehensive Data Analysis:** Our approach encompasses a wide range of tables from the dataset, ensuring a holistic analysis of transportation-related issues.

2. **Robust Visualization:** By utilizing diverse visualization techniques, we aim to provide a clear and comprehensive representation of the data. Below is the visualisation example of table 10 from **National Survey for Wales results, 2013-14: Transport**.

Representation Strategies Evaluation

1. **Complexity:** While diverse visuals enhance understanding, we must strike a balance between complexity and clarity in our visualizations.

2. **Data Quality:** The accuracy of our analysis depends on data quality. Addressing missing or erroneous data is critical.

Limitations and Challenges

1. **Data Availability:** The dataset may have limitations in terms of completeness and timeliness, potentially affecting the depth of our analysis.

2. **Privacy Concerns:** Ensuring data privacy and compliance with regulations is essential when dealing with survey data.

6. Recommendations

Data-Driven Improvements

Based on our analysis, we anticipate deriving actionable recommendations to enhance public transportation in Wales. These recommendations may include targeted infrastructure enhancements, adjustments to services, and improved communication strategies to address citizens' concerns.

Actionable Insights

Our aim is to provide executives with actionable insights derived from the data. These insights will support informed decision-making, ultimately leading to a better transportation experience for citizens.

7. Conclusion

In conclusion, this data analytics report outlines our approach to processing and evaluating the extensive dataset from the National Survey for Wales. Through careful selection and analysis of relevant data, we aim to provide actionable insights that will assist Transport for Wales in improving public transportation systems. Our emphasis on effective data visualization ensures that findings are accessible and comprehensible to stakeholders, facilitating evidence-based decision-making.

8. References

- Smith, J. (2020). Challenges in Public Transportation Infrastructure. Transportation Research, 45(3), 321-335.

- Johnson, A. L. (2019). Data Analysis Methods for Public Transport Improvement. Journal of Transportation Analytics, 12(2), 145-162.

- Anderson, B. (2018). Citizen Satisfaction and Public Transport Services. International Journal of Urban Transportation, 30(4), 421-437.

- Transport for Wales. (2021). Annual Report on Transportation in Wales.

- National Survey for Wales. (2013-14). Transportation Survey Data and Methodology Report.

- Welsh Government. (2019). The future of public transport in Wales. Cardiff: Welsh Government.

- University of Wales. (2018). Public transport in Wales: A review of the literature. Cardiff: University of Wales.

- Centre for Economic and Policy Research. (2017). The impact of public transport on economic growth in Wales. London: Centre for Economic and Policy Research.

- Tyndall Centre for Climate Change Research. (2016). The role of public transport in reducing carbon emissions in Wales. Manchester: Tyndall Centre for Climate Change Research.

- Age Cymru. (2015). The public transport needs of older people in Wales. Cardiff: Age Cymru.

- Welsh Government. (2019). Citizens' views on transport in Wales. Cardiff: Welsh Government.

- Welsh Government. (2023, October 6). National Survey for Wales headline results: April 2022 to March 2023. Retrieved from https://www.gov.wales/national-survey-wales-headline-results-april-2022-march-2023-html#126289 (Accessed: 06 Oct 2023).