32146 Data Visualisation and Visual Analytics - Autumn 2024

Assessment Task 1

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Executive Summary

This report delves into comprehensive analysis of factors influencing the property market of Penrith- a Sydney Suburb. Insights offering the demographics and housing trends. With effective Visualization technique, we uncover the pattern of property investors. The report allows to focus on key findings in significant increase in demand, affordability of houses and increasing rental market. Each category is presented with the help of graphs, concise overview of challenges and description of insights to understand the suburb demographic.

Overview

This report is a comprehensive analysis of Penrith Suburb spanning the years 2011, 2016 and 2021.Throughout this period, there has been considerable changes have occurred which consist of Affordability of houses and units, Supply and demand, workforce and financial status , family pattern, Dwelling composition, ownership and status. With the help of visualization Techniques this complex data of Penrith is analysed to provide meaningful insights which are readable and convey story of Penrith Property market over the years.

Dataset

The dataset(Figure1) consists of Variable which consist of wide range of topic such as Property Value, Population status and overall Socioeconomic status for years 2011,2016 and 2021. The data collected form Australian Bureau of Statistics (ABS) and Price.

Location	Penrith	Penrith	Penrith
Time	Y2011	Y2016	Y2021
MedianHousePrice	$338,000	$680,000	$850,000
MedianUnitPrice	$258,000	$520,000	$500,000
MedianPersonalWeeklyIncome	$545	$620	$812
MedianFamilyWeeklyIncome	$1,274	$1,482	$1,850
MedianHouseholdWeeklyIncome	$949	$1,142	$1,397
MedianMortgageWeeklyPayment	$391	$399	$410
MedianWeeklyRent	$250	$330	$380
Population	11,813	13,295	17,966
MedianAge	37	37	36
Families	2,890	3,218	4,312
TotalPrivateDwelling	5,678	6,309	9,388
Married(%)	35.8%	34.2%	31.0%
Separated+Divorced(%)	16.9%	17.6%	16.7%
Widowed(%)	9.1%	8.1%	6.5%
NeverMarried(%)	38.3%	40.1%	45.9%
BirthInAustralia(%)	70.6%	68.2%	65.8%
Worked full-time(%)	63.3%	62.4%	57.1%
Worked part-time(%)	22.9%	24.2%	24.7%
Unemployment(%)	7.6%	8.5%	6.1%
PeopleTravelledToWorkByPublicTransport(%)	15.5%	17.4%	5.7%
PeopleTravelledToWorkByCar(%)	61.1%	65.9%	46.5%
AverageMotorVehiclesPerDwelling	1.2	1.4	1.3
CoupleFamilyNoChidren(%)	35.5%	34.9%	40.6%
CoupleFamilyHasChidren(%)	35.3%	35.0%	30.9%
OneParentFamily(%)	26.2%	27.2%	25.2%
OtherFamily(%)	2.9%	2.8%	3.2%
OccupiedDwellings(%)	91.9%	91.4%	89.2%
UnoccupiedDwelling(%)	8.1%	8.6%	10.9%
SeparateHouse(dwellings%)	47.3%	47.2%	36.0%
SemiDetached(dwellings%)	25.3%	28.5%	20.4%
FlatUnitApartment(dwellings%)	26.0%	23.8%	43.4%
0xBedroom(%)	1.4%	1.0%	0.8%
1xBedroom(%)	5.6%	5.1%	10.2%
2xBedroom(%)	32.6%	31.6%	43.2%
3xBedroom(%)	44.5%	41.5%	31.3%
4xBedroom+(%)	13.1%	15.7%	12.9%
AverageNumberBedroomsPerDwelling	2.7	2.7	2.5
AverageNumberPeoplePerHousehold	2.2	2.2	2.1
FullyOwned(%)	21.6%	19.5%	15.4%
OwnedWithMortgage(%)	24.3%	21.2%	20.6%
Rented(%)	49.4%	53.9%	60.2%
FamilyHouseHolds(%)	57.2%	58.2%	53.7%
SinglePersonHouseHolds(%)	38.6%	37.3%	41.2%
GroupHouseHold(%)	4.2%	4.5%	5.0%
LessThan$650WeeklyIncome(%)	32.1%	27.6%	21.5%
MoreThan$3000WeeklyIncome(%)	4.8%	8.8%	12.8%
HouseholdsRentPayments<30%Income (%)	81.9%	76.3%	55.8%
HouseholdsRentPayments>30%Income(%)	18.1%	23.7%	37.7%
HouseholdsMortgageRepayments<30%Income(%)	92.9%	95.0%	74.3%
HouseholdsMortgageRepayments>30%Income(%)	7.1%		16.9%

Figure 1 Dataset

Visualization

1. Supply and Demand

To show Supply and demand ratio in visualization Combo Graph type is used. The Total Dwelling, Demand is shown using bar graph and Ratio(supply – demand) with the help of line graph. Data labels are used in the graph to highlight the change and contrasting colour theme to avoid confusion.

This graph includes Total Private Dwelling, Demand for dwelling, and Ratio(Supply-Demand).The Total Private Dwelling data is present in Dataset whereas Demand and ratio value were calculated as:

Demand= Population / AverageNumberPeoplePerHouseHold
Ratio(Supply-Demand)= TotalPrivateDwelling / Demand

The Graph (Figure 2) shows the decrease in Ratio of Supply- Demand from year 2011 to 2016 was 1.34% whereas in year 2016 it increased up to 5.33% to year 2021.
The surplus or Deficit of Household is positive because total Dwelling exceed the numbers of Demand of dwelling throughout the years 2011 to 2021.
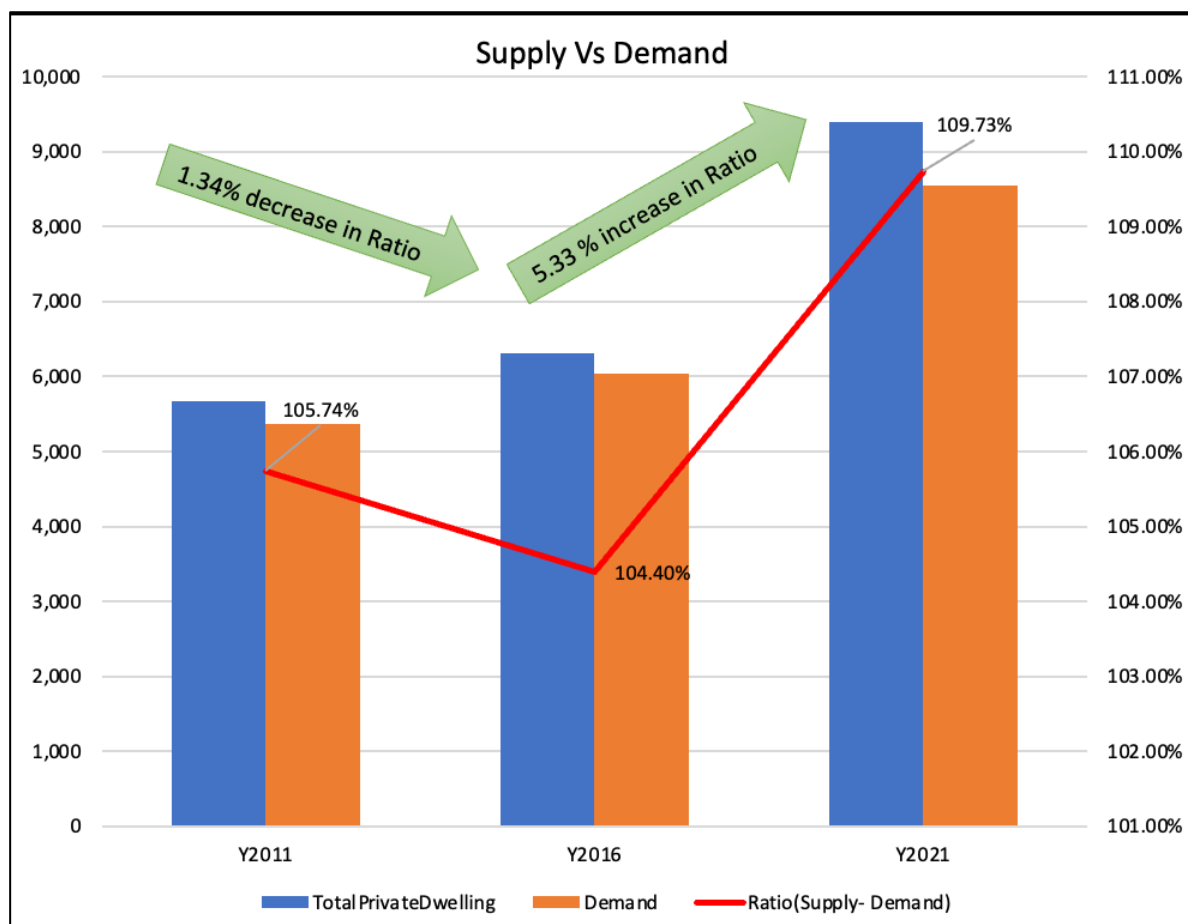

Figure 2 Supply Vs Demand ratio

2. Property Affordability

To Create Visualization for Property Affordability, Bar chart is used to plot Annual Household Income with value in currency. For Affordability, the calculated the value is numeric value , so to overcome the challenge of data points not giving meaningful visualization. I changed the chart type of Affordability of House and Unit into Line graph. The line graph needed to be compared with the trend to get a concise summary to interpret and analyse the pattern. Furthermore, adding drop lines can enhance the visualization to identify the difference between the two comparable values (affordability of Houses and Units over the years).

The data for the Property Price includes Median Price of both Houses and Units. To get meaningful Insights such as affordability. AnnualHouseholdIncome is calculated with the Formula:

AnnualHouseholdIncome = MedianHouseholdWeeIklyIncome *52.143

For calculating Affordability, AnnualHouseholdIncome was essential, the formula used is :

Affordability(House) = MedianHousePrice / AnnualHouseholdIncome
Affordbility(Unit) = MedianUnitPrice/ / AnnualHouseholdIncome

The insights retrieved from the graph(Figure 3) shows an increase in Affordability of Houses with increasing Annual Household Income. From year 2011to 2016 there is significant increase in House and Unit affordability of 67.05% and 67.5% respectively. From 2016 to 2021 there is increase in house affordability of 21.9% and decrease by 27% for Unit Affordbility. This decrease in Unit affordability signifies over the years it became relatively less affordable to purchase units in Penrith suburb.
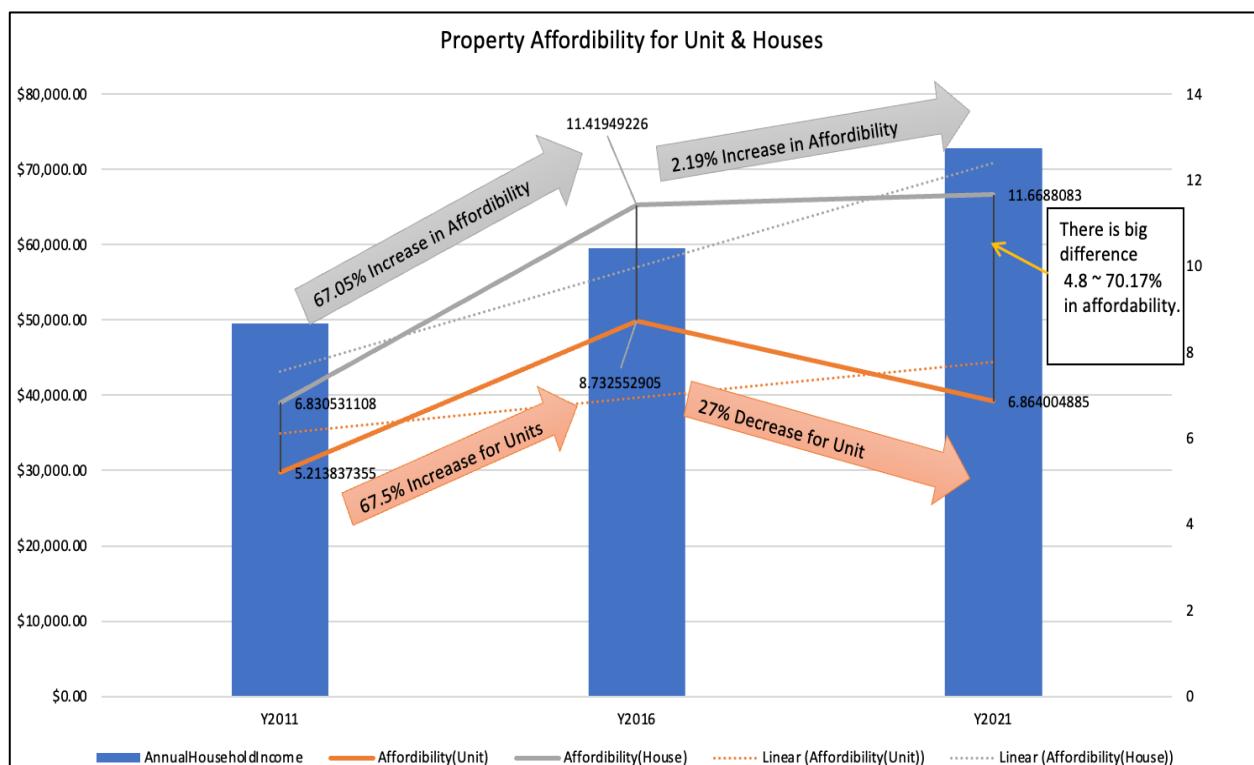

Figure 3 Property Affordability
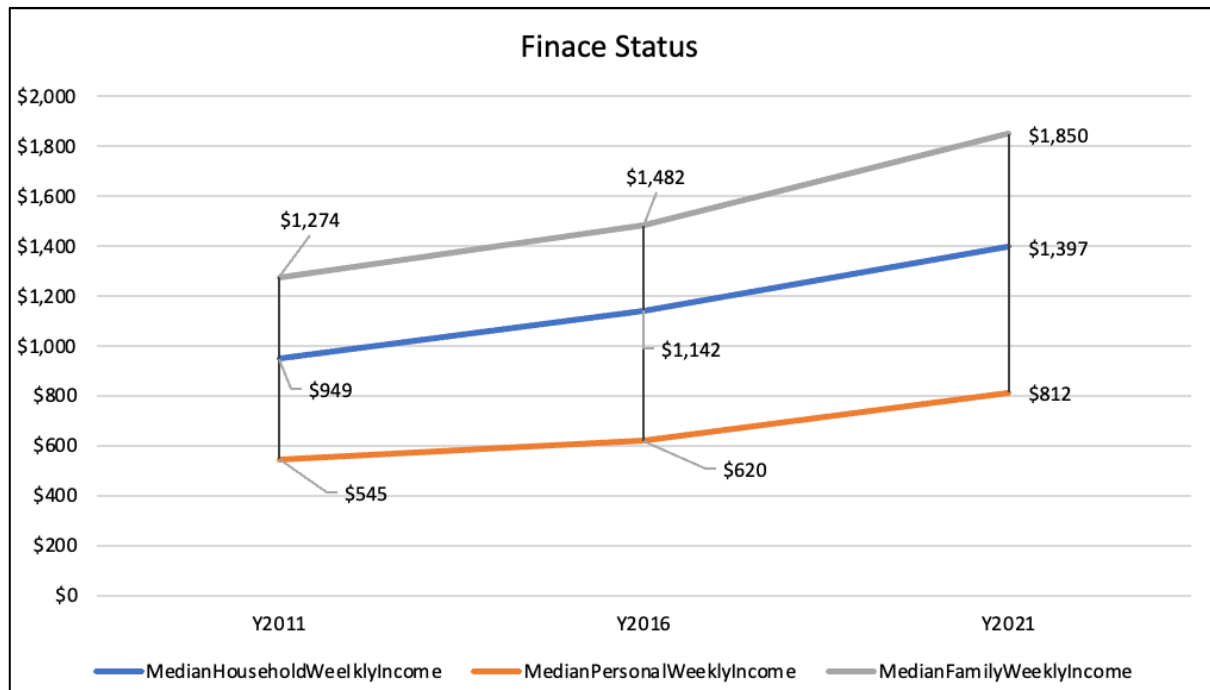
3. Finance

Figure 4 Finance Status

The Line Chart (Figure 4) includes three different category of data with same value (Currency). The Median Value of Household, Family and personal weekly income is increasing over the years.
Data points are showing the value for year 2011, 2016 and 2021 which makes the comparison easier. Over the time weekly income has increased which provides insights to improved financial conditions for personal, family and household categories

4. Population

Population change and marriage status graph requires some customization while creating graph due to different data values for population(numeric) and marriage(percentage) related datasets.
Challenges: When plotting the graph, the population graph was overlapping the marriage status category due to percentage value. When combo graph type was selected the population(numeric) with married(percentage) value was bar graph which resulted in difficulty in understanding the graph.

The Graph below (Figure5), Column Graph was used for marriage status and later through Chart Design - Select data option helped to add Population and changed the chart type to Line graph
The Chart below shows clear understanding of how population over the years has changed and data points for year 2011, 2016 and 2021 are highlighted.
Over the year 2011 to 2021 the population in Penrith has increased by 52.08%.

The Married population has decreased over the year form 35.8% in 2011 to 31.0% in 2021. There is significant increase in NeverMarried population from 38.3% in 2011, 40.1% in 2016 and 45.9% in 2021.
Separated or divorced status category had minor increase from16.9% in 2011to 17.6% in 2016 and decreased in year 2021 to 16.7%.
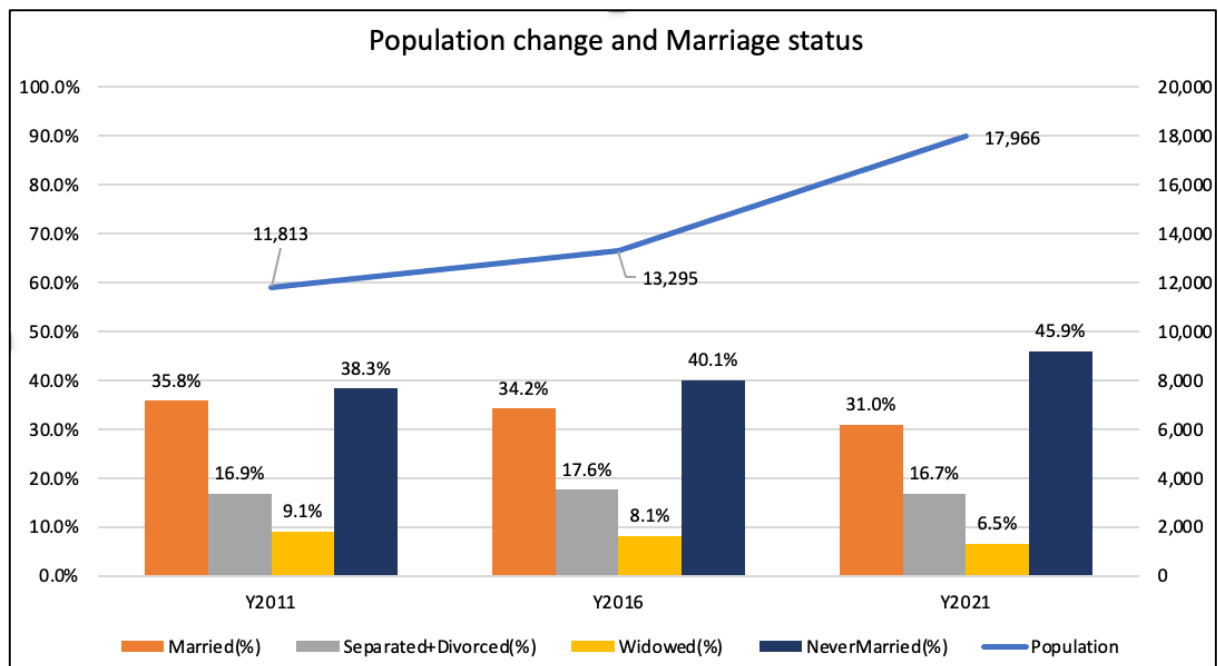Widowed category decreased over the year from 9.1% in 2011 to 6.5% in 2021.

Figure 5 Population Change and Marriage Status

5. Ownership

The below Graph (Figure 6) represent the Household Ownership and Composition of people living in Penrith.
Challenge: Despite all data points are in percentage, Creating staked or bar chart was confusing. The categories were overlapping, and data labels were not readable. Colour theme used affected the visibility of data points and made the graph difficult to identify the difference.
In graph (figure 6) adding trendline and droplines was complicating the graph, to enhance the readability, only data points were added.

With the help of Stacked Bar graph, only three category of Household Compositions are plotted such as FamilyHousehold, SinglePersonHousehold and GroupHpusehold. Through data labels in stacked column value of these categories are shown which highlights that SinglePersonHousehold has increased from 38.6% to 41.2% over the years and minor increase in GroupHousehold from 4.2 % to 5.0%.
With the help of change chart type Household ownership status was changed to line chart. Household Ownership status includes FullyOwned, OwnedwithMortgage and Rented. Data points in line graphs highlights the increase in Rented ownership status

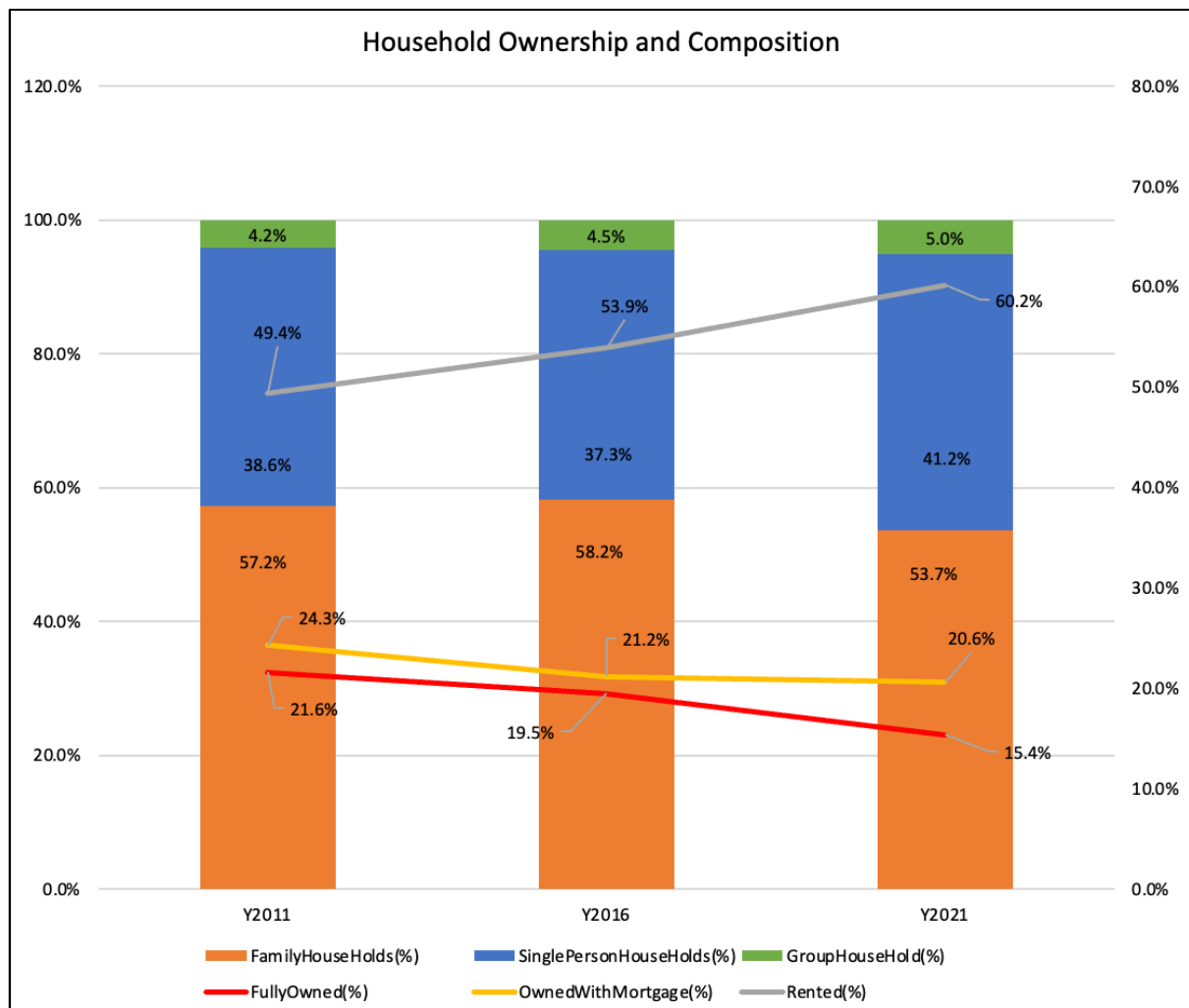from 49.4%to 60.2%over the years and FullyOwned Household has decreased from 21.6% to 15.4%.

6. Dwelling

Challenge: The category of Dwelling status and Dwelling occupancy even though has same data value(percentage). The visualization with the help of combination of bar and line was difficult to interpretate and was not providing any insights and link to other data points. Two separate graph helps to understand the market pattern of dwelling status and Dwelling occupancy over the years.

The graph (Figure7) is a Staked bar chart where the overall occupancy status is 100% in value, there is Minor increase over the years in Occupied Dwelling over the years which shows that housing market in Penrith Suburb is booming.
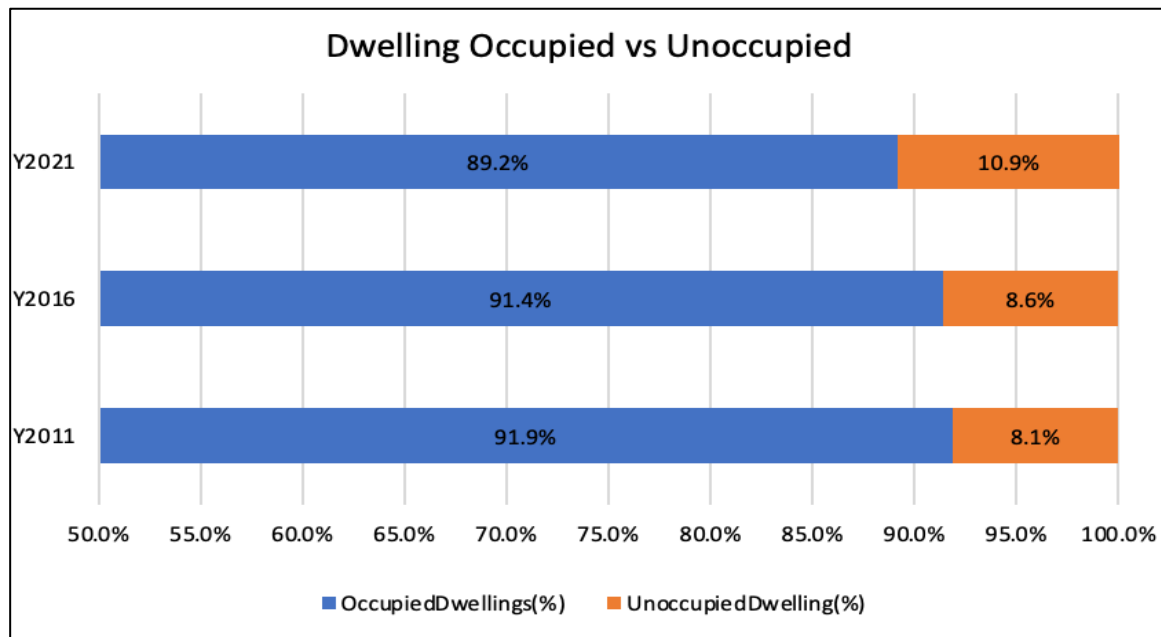
Figure 7 Dwelling Occupied and Unoccupied

Dwelling Status Graph(Figure8) is a Column bar graph with data labels in percentage which provides ease of understanding of Dwelling Category which includes SeparateHouse, SemiDetachedHouse and FlatUnitApartment. There is significant increase in FlatUnitApartment over the years from 26.0% to 43.4% from 2011 to 2021. The steady Graph of SeparateHouse from year 2011 to 2021 decreased significantly to 36.0% with decrease of 11.3%.
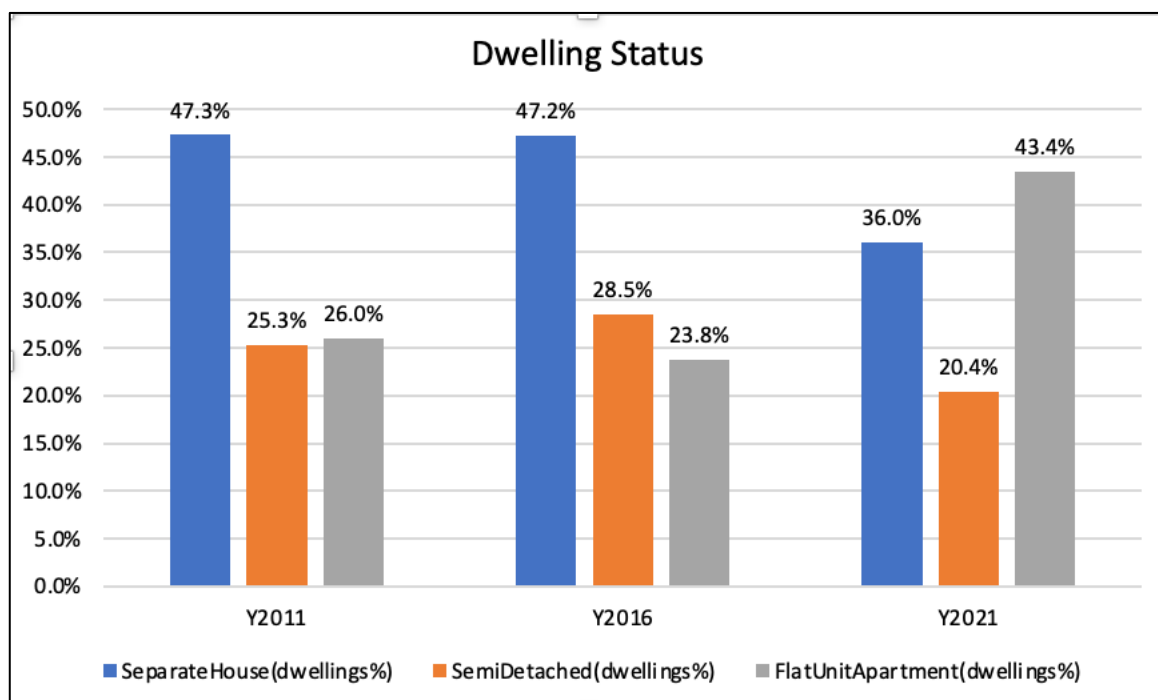

Figure 8 Dwelling Status

7. Workforce

Workforce Graph (Figure 9) shows three category of Workforce status in Penrith which includes percent value of Working full-time, Part-time and Unemployed.
Creating the Column Bar graph was easy due to same data value for three category and with the help of X-axis consisting of years, visualisation becomes easy for comparative analysis.
With the help of data Labels, we can identify there is decrease in full-time working category in Penrith, though the decrease over the years is minor but when overviewed from year 2011 to 2021 the decrease is of 4.3%.
From the graph, Unemployment was increased in year 2016 compared to year 2011 and 2021. Over the years, 2021 has lowest Unemployment rate at 5.5%, where 2011 has 5.9% and 2016 has 7.4%.
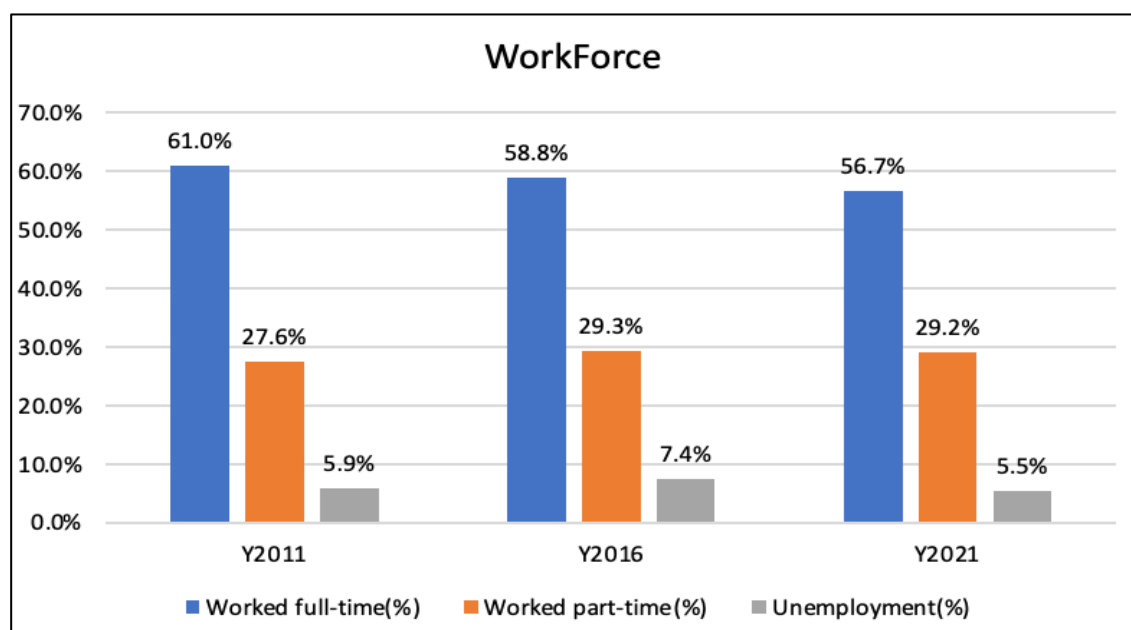
Figure 9 Workforce

8. Family

Family Status Graph is combination of Column Bar graph and with the help of select data, additional dataset numeric value (Families) is added. The line graph is highlighted with Red colour to show the increased number of families in Penrith suburb. The families over the years have increased by 49.2%. There is Increase in Couple with No children category from 35.5% in year 2011 to 40.6% in 2021. There is Minor increase in Other Family category and minor decrease in One parent Family.
The analysis shows that some category such as One Parent family has decreased based on High and Low data Points with minor increase in year 2016.
Couple family with Children category in year 2011 was 35.3% which decreased to 35.0% in year 2016 and took a dip to 30.9% in year 2021 with a decrease rate of 4.6% over the years(2011-2021). This Decreasing trend is only observed in Couple Family with Children category.
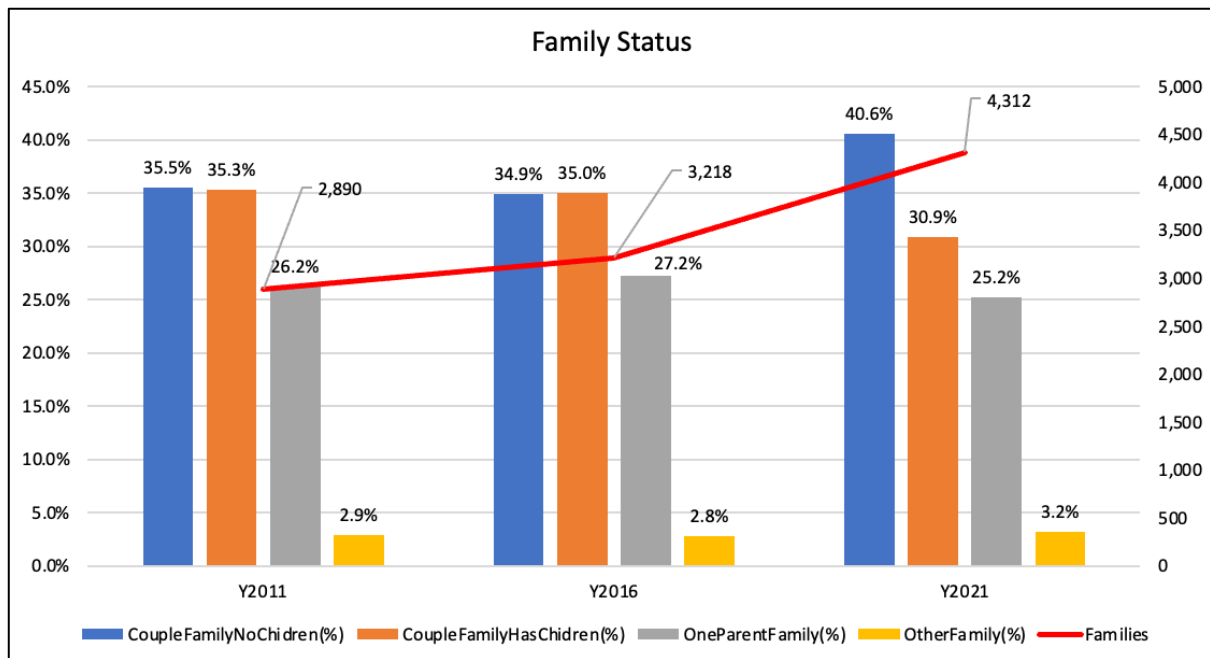
Figure 10 Family Status

Techniques Implemented in Graphs

- Data Labels
- Trendline
- Drop Line to show the difference in data points
- Modifying axis (Primary& Secondary)
- Rescaling axis for clear visualization and data points
- Changing chart type
- Combo Chart Type

Conclusion

In Conclusion, Property analysis report for Penrith suburb includes numerous type of data which represent the property demographic. The insights highlight the growing demand for property in this suburb, specifically in rental market. The data suggests that Penrith suburb dwelling is booming for Families, attracting property investors due to increased affordability of houses . With the positive value of Surplus household people are moving from CBD to Penrith due to its affordability, good rental market and improving Ratio of Supply and Demand of Household. Overall, Penrith provides a promising opportunity for Rentals, buyers and Investors.