



# Assessment Task 1: Data Visualisation Foundations

26.03.2023

Vi Nguyen

13592629

Chi.Vi.Nguyen@student.uts.edu.au

32146 Data Visualisation and Visual Analytics - Autumn 2023

# Table of Contents

Introduction to the dataset and the collection process ...	3
1. Visualisation 1. Supply and demand .....	4
2. Visualisation 2. Property price.....	5
3. Visualisation 3. Finance .....	6
4. Visualisation 4. Population .....	8
5. Visualisation 5. Ownership and Household .....	9
6. Visualisation 6. Workforce .....	10
7. Visualisation 7. Dwelling .....	11
8. Visualisation 8. Family: .....	12
Summary of the advantage of the data visualisation technique used in the report.....	13
Executive summary and conclusion.....	13

## Dataset summarise and the data preparation process

The dataset provided below is for Como (NSW) collecting the information from ABS and PriceFinder from 2001, 2006, 2011, 2016 and 2021. PriceFinder provided the first two columns of data: the median house price and the unit house price. The following 48 rows are from ABS, displaying a range of census information about:

- Property prices
- Median weekly income level for different categories
- Detail rent and mortgage payment
- Brief overview of the population
- Registered marital status of the residents.
- Percentage of Australian-born citizens
- The employment status overview of the town
- Transportation method: Public transport vs car
- Family Composition
- Dwelling status and structure
- The condition of tenure and the type of household



	A	B	C	D	E	F							
1	Location	Como	Como	Como	Como	Como	27	OneParentFamily(%)	9.8%	8.8%	8.4%	9.2%	9.1%
2	Time	Y2001	Y2006	Y2011	Y2016	Y2021	28	OtherFamily(%)	0.9%	1.1%	1.2%	0.5%	0.9%
3	MedianHousePrice	\$405,000	\$550,000	\$705,780	\$1,135,000	\$1,681,000	29	OccupiedDwellings(%)	95.8%	95.7%	95.0%	94.4%	95.7%
4	MedianUnitPrice	\$362,500	\$520,000	\$512,000	\$1,172,000	\$1,180,000	30	UnoccupiedDwelling(%)	4.2%	4.3%	5.0%	5.6%	4.2%
5	MedianPersonalWeeklyIncome		\$636	\$778	\$948	\$1,149	31	SeparateHouse(dwelling%)	92.6%	94.0%	93.9%	91.9%	91.3%
6	MedianFamilyWeeklyIncome		\$1,904	\$2,505	\$2,779	\$3,452	32	SemiDetached(dwelling%)	5.4%	5.4%	5.7%	6.8%	7.6%
7	MedianHouseholdWeeklyIncome		\$1,668	\$2,254	\$2,543	\$3,152	33	FlatUnitApartment(dwelling%)	1.0%	0.2%	0.4%	0.2%	0.8%
8	MedianMortgageWeeklyPayment		\$449	\$598	\$598	\$690	34	0xBedroom(%)			0.0%	0.0%	0.0%
9	MedianWeeklyRent		\$300	\$450	\$550	\$590	35	1xBedroom(%)			1.4%	1.1%	1.5%
10	Population	3,673	3,736	3,789	3,977	4,053	36	2xBedroom(%)			12.5%	11.1%	8.4%
11	MedianAge		37	38	39	40	37	3xBedroom(%)			43.5%	39.7%	37.4%
12	Families	1,063	1,032	1,047	1,090	1,147	38	4xBedroom+(%)			41.2%	46.5%	52.2%
13	TotalPrivateDwelling	1,322	1,290	1,319	1,352	1,378	39	AverageNumberBedroomsPerDwelling			3.4	3.5	3.6
14	Married(%)	62.2%	60.9%	60.8%	62.1%	59.7%	40	AverageNumberPeoplePerHousehold		3.0	3.0	3.1	3.1
15	Separated+Divorced(%)	6.9%	6.9%	7.4%	8.0%	6.8%	41	FullyOwned(%)	50.6%	41.6%	40.6%	38.7%	40.4%
16	Widowed(%)	5.0%	4.9%	4.3%	3.7%	3.9%	42	OwnedWithMortgage(%)	35.7%	45.7%	47.5%	49.2%	48.2%
17	NeverMarried(%)	25.9%	27.4%	27.5%	26.2%	29.5%	43	Rented(%)	9.9%	10.3%	9.8%	9.7%	10.6%
18	BirthInAustralia(%)	83.2%	83.8%	83.6%	81.1%	79.7%	44	FamilyHouseHolds(%)	83.0%	81.9%	83.9%	84.8%	86.2%
19	Worked full-time(%)	63.3%	61.1%	59.7%	59.9%	58.6%	45	SinglePersonHouseHolds(%)	14.0%	15.4%	13.9%	13.5%	12.5%
20	Worked part-time(%)	32.1%	30.7%	31.6%	32.9%	29.3%	46	GroupHouseHold(%)	2.1%	1.7%	2.2%	1.7%	1.4%
21	Unemployment(%)	2.7%	2.3%	3.5%	2.9%	3.2%	47	LessThan\$650WeeklyIncome(%)			11.8%	9.1%	8.3%
22	PeopleTravelledToWorkByPublicTransport(%)			25.1%	28.1%	3.6%	48	MoreThan\$3000WeeklyIncome(%)			29.8%	40.9%	52.2%
23	PeopleTravelledToWorkByCar(%)			54.6%	55.9%	30.7%	49	HouseholdsRentPayments<30%Income(%)			96.1%	95.8%	58.7%
24	AverageMotorVehiclesPerDwelling			1.8	1.9	1.9	50	HouseholdsRentPayments>30%Income(%)			3.9%	4.2%	29.0%
25	CoupleFamilyNoChildren(%)	33.1%	28.9%	29.8%	28.1%	28.5%	51	HouseholdsMortgageRepayments<30%Income(%)			87.4%	91.7%	81.5%
26	CoupleFamilyHasChildren(%)	56.2%	61.2%	60.6%	62.3%	61.1%	52	HouseholdsMortgageRepayments>30%Income(%)			12.6%	8.3%	10.9%

### Data handling and processing

- Row 8 MedianMortgageWeeklyPayment: The ABS only provided the monthly payment. Hence, the solution is to divide the monthly payment by 4.345 to get the weekly payment
- Row 15 - Separated + Divorced(%): From 2011 onward, the separated + divorced ratio are divided into two different categories. The solution is to manually add them together so it can be consistent with the rest
- Row 30 – UnoccupiedDwellings(%): Data from 2001 and 2006 only provide the occupied dwellings. The solution is to manually subtract one from the OccupiedDwelling to obtain the portion of UnoccupiedDwellings.
- Row 22 – 23: How the data is collected in 2021 differs from the previous year. The solution is to avoid using the data if not required

The objective of this report is to give the reader a brief introduction about suburb Como using data visualisation techniques and tools. Most importantly, this report also provided a few recommendations to the buyer and investors that are intending to purchase a property in this area. The dataset is duplicated and rearranged into 8 other sub-table of excel. Each will contains a certain data that is related to the area. There are some new data added in order to explain the story easier (i.e. changes over year).

Original data	8. Family status	7. Dwelling status	6. Workforce	5. House Ownership	4. Pop and marital status	3. Finance	2. House and unit price	1. Supply and demand
---------------	------------------	--------------------	--------------	--------------------	---------------------------	------------	-------------------------	----------------------

# 1. Visualisation 1. Supply and demand

## 1.1 Dataset overview and handling data

This dataset provided a general overview of suburb Como's property supply and demand condition from 2001 - 2021.

- Supply is the total private dwelling in the area.
- Demand is calculated by dividing the total residents by the average number of people per household.

Generally, the quick analysis indicates that supply and demand grew slowly over the year. Surprisingly, the supply-to-demand ratio hardly changed over the 15 years and only fluctuated around 104 – 105. ABS didnot provide data on the average number of people per household in 2001. Hence, the demand and the ratio can not be computed. The solution is to ignore the missing data

## 1.2 Data visualisation technique

The combo chat allows the usage of two separate y-axes, one for thousand and one for percentages. This allows the audience to easily visualise the trend and relationship between data with different measurements over the 20 years without any misinterpretation of data.

**Layout:** Utilise the same colour to match the corresponding pair, such as blue for both population (in thousands) and the change in population (in percentage). Columns with different colours for the whole numbers parameter and line chart for percentages. Grid line was deleted for a clearer view. **Rescaling:** Right vertical axis (%) is being rescaled to 100 - 110 to show changes clearly.

**Label:** To avoid overlap, the labels of columns are placed inside the column and coloured in white. Labels of the changes are coloured correspondingly.

**Trend highlights:** Using the green arrow highlights the accumulated changes and increasing trends in population, supply and demand over 20 years.

## 1.3 Data summary and recommendation

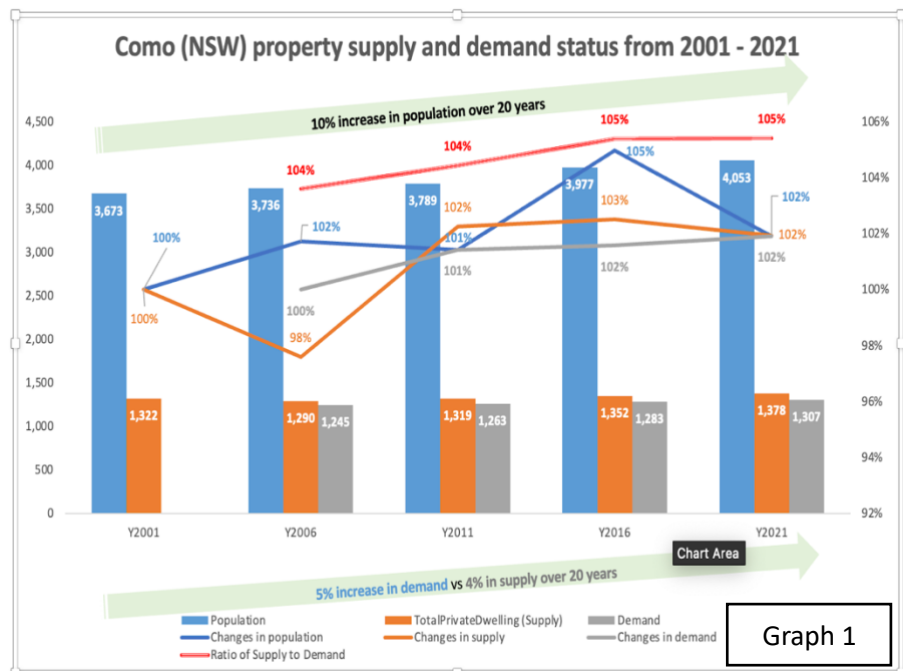
- The changes in population, demand and supply are relatively uncorrelated. The reason for this is that this suburb is tranquil. Regarding the population, Como had 3,673 residents in 2001 and reached 4,053 in 2021 or approximately 10% accumulated change. With an area of 1598 km square, the population density is only 2.54 people per sq km. This is relatively low compared to around 10 for an NSW suburb.

- In the short run, the supply ratio fluctuates a bit. It decreased by 2% in 2006 but quickly offset that decrease with a 102% increase in the following period. Population change peaked in 2016, increased by 105% but had fallen back to the constant growth rate of 102%. The rise in supply has a low and steady rate of 101%-102%.

- Furthermore, the supply-to-demand ratio of this area remained almost unchanged over 15 years, fluctuating from around 104% to 105%. This ratio signals that Como does not require any new residential property investments. Hence, this suburb would be beneficial for renting, as the cost of living could be lower. There are better options than this area for investors who want to build a house for leasing. Regardless, this dataset is collected in the last 20 years period. We have two major global crises: Global Financial Crisis (2008 - 2009) and Covid 19, starting in 2020. These two events can impact, or at least slow, the economy worldwide. Hence, investors or buyers need to consider many other factors carefully before making any decision.

Como (NSW) property supply and demand status from 2001 - 2021

Location	Como				
Time	Y2001	Y2006	Y2011	Y2016	Y2021
Population	3,673	3,736	3,789	3,977	4,053
TotalPrivateDwelling (Supply)	1,322	1,290	1,319	1,352	1,378
AverageNumberPeoplePerHousehold		3.0	3.0	3.1	3.1
Demand		1245.33	1263.00	1282.90	1307.42
Ratio of Supply to Demand		104%	104%	105%	105%
Changes in population	100%	102%	101%	105%	102%
Changes in demand		100%	101%	102%	102%
Changes in supply	100%	98%	102%	103%	102%
Accumulated changes in population	0%	2%	3%	8%	10%
Accumulated changes in demand		0%	1%	3%	5%
Accumulated changes in supply	0%	-2%	0%	2%	4%





## Visualisation 2. Property price

### 2.1 Dataset overview and data handling

The second visualisation demonstrates the median unit and house prices over 20 years. In general, the price of both types of property rises significantly. The increase in unit price over the short-term period (5 years) fluctuates more frequently than the house prices. Both hit their peak growth in 2016, where house prices increased by 61% and unit costs increased by 29%.

Como (NSW) median house and unit price from 2001 - 2021

Location	Como				
Time	Y2001	Y2006	Y2011	Y2016	Y2021
MedianHousePrice	\$405,000	\$550,000	\$705,780	\$1,135,000	\$1,681,000
MedianUnitPrice	\$362,500	\$520,000	\$512,000	\$1,172,000	\$1,180,000
Change in median house price	100%	136%	128%	161%	148%
Change in median unit price	100%	143%	98%	229%	101%
Accumulated change in median house price	100%	136%	174%	280%	415%
Accumulated change in median unit price	100%	143%	141%	323%	326%

### 2.2 Visualisation technique

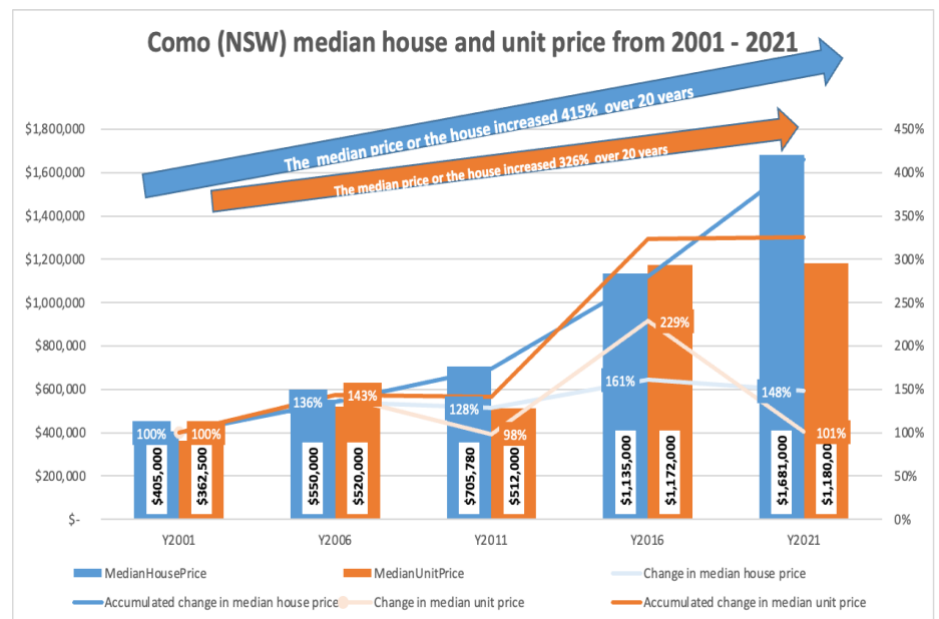
The most suitable chart for visualising data with different measure (percentage and whole number) is a combo chart.

**Layout:** All the data related to unit price is coloured orange, and the colour blue is for the house.

**Rescaling:** Vertical axis was not rescaled as the changes in both data types are quite substantial.

**Label:** The column labels are placed at the bottom of the bar chart to avoid data overlapping, and the background of the line chart labels are coloured similarly to the line.

**Trend highlight:** The two arrows show the long term or accumulated increase of each type with the corresponding colour.



Graph 2

### 2.3 Data summary and recommendation

- Generally, the house price in suburb Como had never experienced any drop over the years. The price consistently increases. On the other hand, the unit price is more volatile in the short-term period. The price decreased by 2% in 2011 but increased by 129% in 2016 and then back to 1% growth again in 2021. The price of a unit in the Como area can hardly be predicted based on past data.

- Based on past data, investors can consider investing in the housing market if they decide to hold it for a more extended period in suburb Como. With 100,000 dollars invested, a house investor gains \$315,000 in profit compared to only \$226,000 for investing in a unit. Relatively, the payoff of the house investor is 48% higher compared to a unit investor.

- In terms of speculating or short-term investment, the buyer of the unit price can expect a higher return on investment (ROI). In 2011, a buyer can buy a house for 512,000 and sell for 1,172,000 in 2021, which is a 130% return on investment. On the other hand, the house owner can only earn around 61%. On the other hand, their loss or opportunity cost can be pretty high. In 2011, the unit price dropped by 2% while the house prices increased by 28% compared to 2006. The opportunity cost of this speculating action is 30%. Hence, this type of short-term trading requires a lot of knowledge and high-risk tolerance.

In conclusion, the buyer with limited knowledge and skills should consider a low-risk strategy. Hence, the buyer should consider purchasing a house with a low mortgage ratio and expect a higher return over the long term. On the other hand, professional property investors can have many different choices. While keeping a large portion of the portfolio on the housing market, they can delegate a portion of their portfolio to this high-risk but high-return investment asset to gain some short-term profit.

## Visualisation 3. Finance

### 3.1 Dataset overview and handling data

This dataset on the right shows the weekly income of the residents in Como with their mortgage and rent payments. These payments usually contribute heavily toward their weekly expenses. With the current inflation situation and housing price spikes, it is crucial to examine these data. **Problem:** Missing data from 2001. **Solution:** Drop the entire column.

Como (NSW) resident income vs housing from 2001 - 2021

Location	Como			
Time	Y2006	Y2011	Y2016	Y2021
MedianPersonalWeeklyIncome	\$636	\$778	\$948	\$1,149
MedianFamilyWeeklyIncome	\$1,904	\$2,505	\$2,779	\$3,452
MedianHouseholdWeeklyIncome	\$1,668	\$2,254	\$2,543	\$3,152
MedianMortgageWeeklyPayment	\$449	\$598	\$598	\$690
MedianWeeklyRent	\$300	\$450	\$550	\$590
ChangeMedianPersonalWeeklyIncome	100%	122%	122%	121%
ChangeMedianFamilyWeeklyIncome	100%	132%	111%	124%
ChangeMedianHouseholdWeeklyIncome	100%	135%	113%	124%
ChangeMedianMortgageWeeklyPayment	100%	133%	100%	115%
ChangeMedianWeeklyRent	100%	150%	122%	107%

### 3.2 Visualisation technique

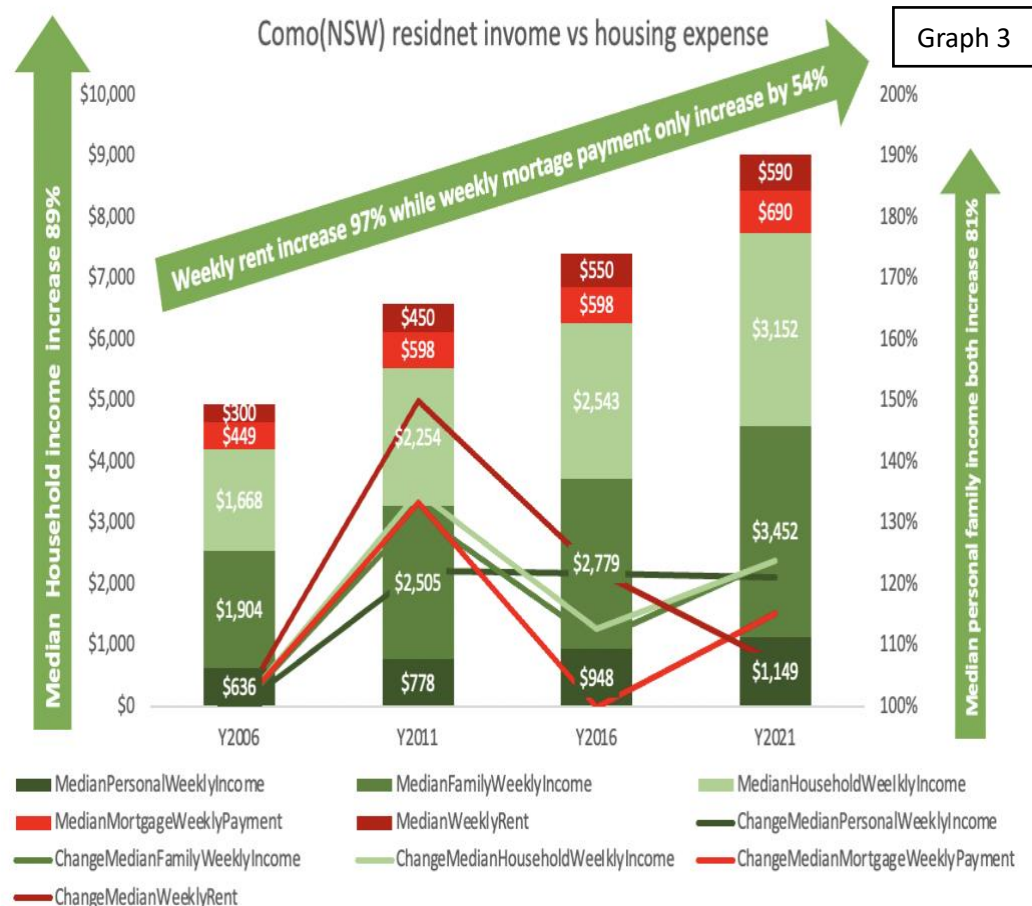
Again, a combo chart is ideal for dealing with data in different measurements. Regardless, this time we encounter ten rows of data. Hence, the stacked bar chart would allow displaying of extra data without overlapping. A stacked bar chart also allows a quick comparison between income and payment.

a) **Layout:** The three income groups are coloured in dark green, green & light green. The two payments are coloured in red (Light red & dark red). The changes in a category are displayed using line charts and coloured similarly to their corresponding data. Grid lines are deleted for a clearer view.

b) **Rescaling:** The right chart axis is rescaled to 100% to show the slope of changes more precisely

c) **Labelling:** Each of the categories is labelled with their corresponding changes. The line chart labels are not displayed to avoid data overlap but still easy to recognise the trend over the twenty years using the right y-axis.

d) **trends:** Three arrows are added to display the accumulated increases over time.



Another table is created to compare the mortgage and rent payments with the income. The purpose is to examine if these payments make up a large portion of income or not. This graph has a similar problem of missing data from 2001. The solution is to drop the entire columns.

Weekly mortgage and rent payment versus income

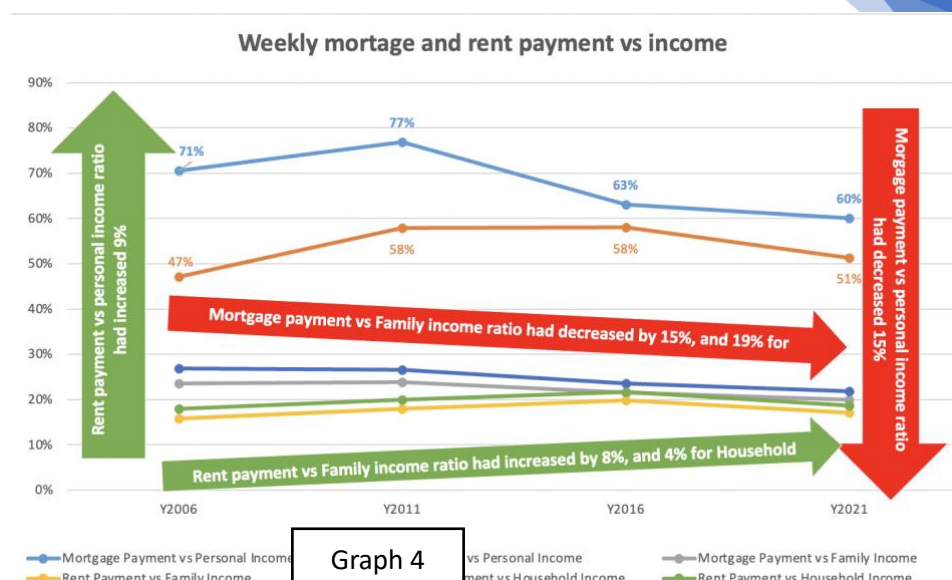
Location	Como			
Time	Y2006	Y2011	Y2016	Y2021
Mortgage Payment vs Personal Income	71%	77%	63%	60%
Rent Payment vs Personal Income	47%	58%	58%	51%
Mortgage Payment vs Family Income	24%	24%	22%	20%
Rent Payment vs Family Income	16%	18%	20%	17%
Mortgage Payment vs Household Income	27%	27%	24%	22%
Rent Payment vs Household Income	18%	20%	22%	19%

Accumulated	
-15%	
9%	
-15%	
8%	
-19%	
4%	

**Layout:** The line chart is suitable for showing the trend over the years, especially in percentages.

**Label:** Data labels of the personal income ratio are provided as it is very high. The colour of the line is labelled correspondingly to the line. The other 4 labels are removed to avoid overlap. The reader can still find the estimated value based on the gridline.

**Trend highlights:** The use of green arrows indicates the increasing trend and red for the decreasing trend.



### 3.3 Data summary and recommendation

Overall, the weekly income has a consistently increasing trend over the three categories. Both median weekly personal and family income increased by 81%. The household income had the strongest increase, with an accumulated growth of 89%. This suggested that a few individuals have a very high income, dragging the household income upward. In the short run, the median household's weekly income fluctuates the most. It peaked in 2011 with a 35% increase, down to an increase of 11% and back to the 124% rise in 2021. The personal weekly income did increase at a constant rate of 21 -22%. Family income trend is positively correlated with the rise in household income, peaking in 2011 at a 35% increase, down to an 11% increase in 2016 and rising again at a 24% increase in 2021.

- The weekly rent in this area has increased sharply over the year, reaching 590 per week by 2021. With a personal income of only 1149, it would be very challenging to afford to rent an entire house in this area. A better option could be just a room or a shared house. The weekly rent change peaked in 2011, with a 50% increase, but this increase continued to diminish the following decade. On the other hand, this area is quite suitable for family or a group of friends living together as the weekly rent accounts for only 20-25% of the weekly income.
- For the mortgage payment, this payment peaked in 2011 at a 33% increase compared to 2006 but did not fluctuate in the next five years and recently experienced some upward movement at 15% in 2021. A mortgage homebuyer can consider investing in this area as the mortgage weekly payment increase quite slowly over the year. There could be some policy to encourage individuals to take a mortgage loan in this area. The mortgage payment even declined from 2011 - 2016. However, a family or married couple would be more suitable to take out a mortgage loan as the mortgage payment only accounted for 23 - 30% of their salary. For an individual, the mortgage payment portion will nearly double, taking up to 60-70% of their salary.

For graph 3, there are a few similar insights.

- The rent payment and income ratio also increase toward all three income categories. An 8% increase in family and personal income and a 4% increase for households. The mortgage payment vs income ratio across the three categories also decreased substantially. Specifically, this ratio for personal income had reduced by 15%, 19% for households and a 15% for families. The local government probably did influence this reduction to encourage the residents to finance their property using a mortgage or loan.



## Visualisation 4. Population

### 4.1 Dataset overview and handling data

This dataset will try to examine the composition of marital status over the year. The 2001's median age is missing, but it is not essentially important so we can ignore it. Noticeably, there is a consistently increasing trend in median age and the NeverMarried ratio. Median age increases quite consistently over the year. The married components seems increasing while never married component decrease.

Como (NSW) population change and marital status from 2001 - 2021

Location	Como				
Time	Y2001	Y2006	Y2011	Y2016	Y2021
Population	↑ 3,673	↑ 3,736	↑ 3,789	↑ 3,977	↑ 4,053
MedianAge		↓ 37	↓ 38	↓ 39	↓ 40
Families	↓ 1,063	↓ 1,032	↓ 1,047	↓ 1,090	↓ 1,147
Married(%)	↓ 62.2%	↓ 60.9%	↓ 60.8%	↓ 62.1%	↓ 59.7%
Separated+Divorced(%)	↓ 6.9%	↓ 6.9%	↓ 7.4%	↓ 8.0%	↓ 6.8%
Widowed(%)	↓ 5.0%	↓ 4.9%	↓ 4.3%	↓ 3.7%	↓ 3.9%
NeverMarried(%)	↓ 25.9%	↓ 27.4%	↓ 27.5%	↓ 26.2%	↓ 29.5%

### 4.2 Visualisation technique

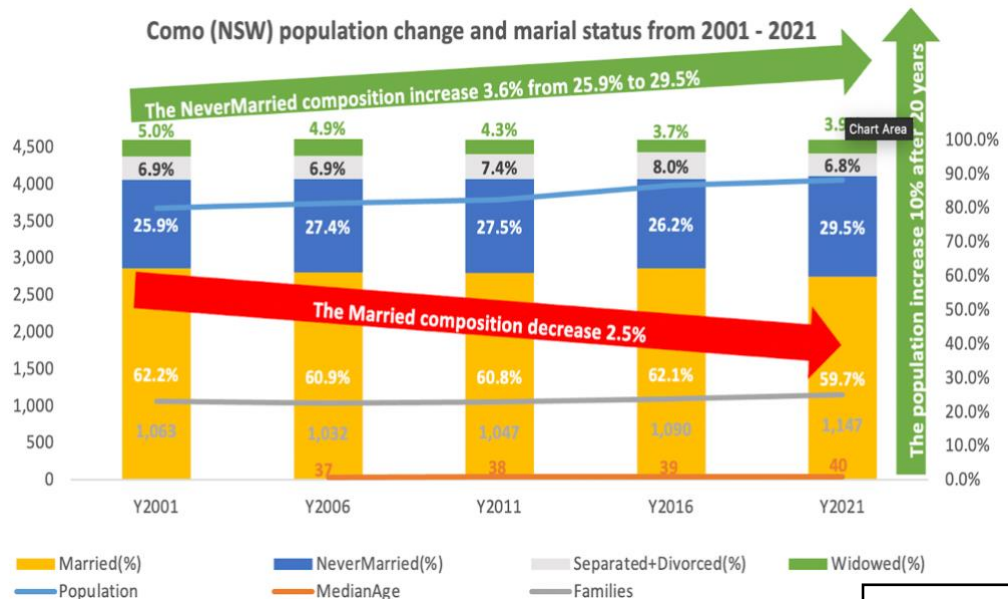
The combo graph is once again the best candidate for different measurement data. However, this dataset is demanded to examine the evolution between the four different marital status compositions. Hence, a 100% stacked bar chart would be a better solution for comparing changes over time.

**Layout:** Usage of different colours. Grid line are deleted for a clearer view

**Rescaling axes:** None

**Labelling:** Data labels are adjusted to avoid overlap.

**Trends:** Green arrow for increasing trend, and red for decreasing.



Graph 5

### 4.3 Data summary and recommendation

- The median age in this area has increased steadily over the years, reaching 40 in 2021. This age group mostly had stable jobs and salaries and may demand better life quality. Investors in the area can conduct a demographic investigation to analyse this target sector of customers more carefully. Some services or potential business models include retirement service advisors, healthcare and fitness services. Entertainment centres like casino, movie theatres, ... are the available options for this age group.

- Both the local government and investors can work cooperatively to examine the marital status and decide on the best option, both in terms of financial profit and community benefits. The married rate decreased over the year, even though not very significant, suggesting that there are better ideas than building a new school or studying organisation. The percentage of never-married increased at a disturbing rate. Nevertheless, the recent generation or generation Z is comfortable living together, even having children before marriage.

Regardless, all the interested parties must consider a few other factors apart from this legal marriage contract ratio carefully before making any further investment.



## Visualisation 5. Ownership and Household

### 5.1 Dataset overview and handling data

The dataset illustrated the composition of the ownership status and household status. A suburb's ownership status can represent an area's wealth condition, while household composition can generate a lot of helpful information for future investors. For instance, there is a shift in the ownership of the property from fully-owned property to property owned with a mortgage. The trend in the family household is still increasing and takes up the largest part of the pie in household composition.

Como (NSW) ownership and household from 2001 - 2021

Location	Como				
Time	Y2001	Y2006	Y2011	Y2016	Y2021
FullyOwned(%)	50.6% ↑	41.6% ↓	40.6% ↓	38.7% ↓	40.4% ↓
OwnedWithMortgage(%)	35.7% ↓	45.7% ↑	47.5% ↑	49.2% ↑	48.2% ↑
Rented(%)	9.9% ↓	10.3% ↓	9.8% ↓	9.7% ↓	10.6% ↑
FamilyHouseHolds(%)	83.0% ↓	81.9% ↓	83.9% ↓	84.8% ↓	86.2% ↑
SinglePersonHouseHolds(%)	14.0% ↑	15.4% ↑	13.9% ↓	13.5% ↓	12.5% ↓
GroupHouseHold(%)	2.1% ↓	1.7% ↓	2.2% ↓	1.7% ↓	1.4% ↓

### 5.2 Visualisation technique

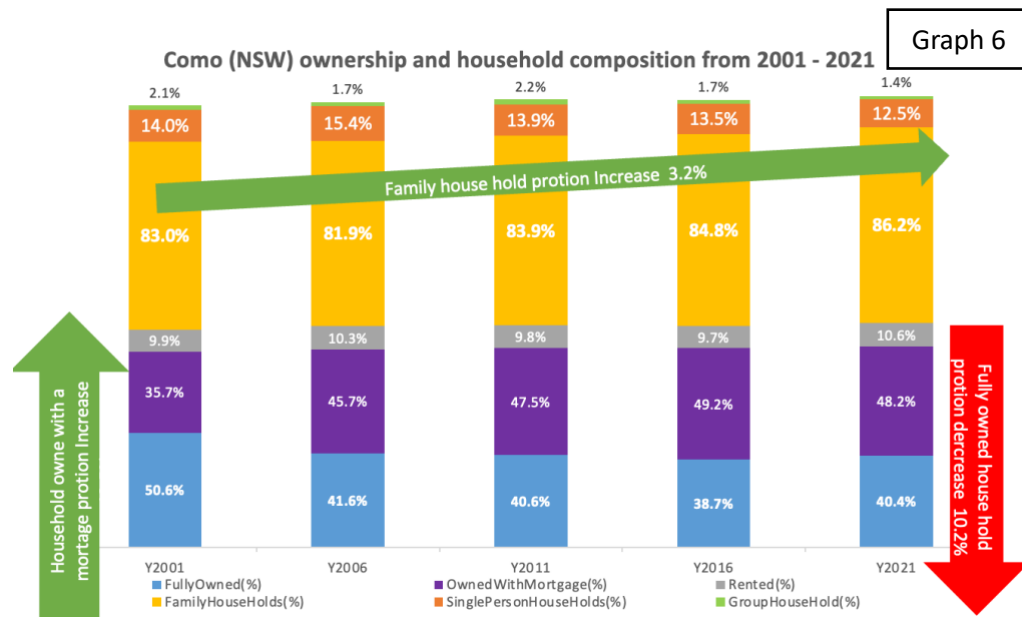
The 100% stacked bar chart is ideal for a dataset with many categories and similar measurement types.

**Layout:** Three stacks at the bottom denote ownership status, while the top three represent household compositions. Grid lines is eliminated for clear view.

**Axes:** The axis is eliminated as it is not required for this graph

**Labelling:** Each label is fitted carefully inside the bar chart

**Trends:** The green arrows are used to highlight increasing trends, while red are used for decreasing trends.



### 5.3 Data summary and recommendation

- Regarding ownership status: Initially, fully owned houses contribute 50% but slowly decrease over the 20 years period. On the other hand, the trend of buying a house with a mortgage has increased significantly over years from 35.7% to nearly 49.2% in 2016. However, the trend seems to change direction as the proportion of fully owned house start to rise again, and vice versa for fully owned houses.
- Disregarding the change in trend, nearly half of the population can take out mortgage loans, indicating that the people in this area have very easy access to some source of funds to finance their property. However, most mortgage loans are fluctuated rates. And in this high-interest rate environment and high inflation scenarios, this could lead to some individuals being unable to repay their loans due to financial problems.
- The renting status remains reasonably constant, which can be because of the high rental rate (\$590/week). Investors should only consider investing in this area if they have high competitive advantages. In other words, they must be able to reduce the housing cost or construct a better property with a unique view or location. Otherwise, it would be challenging to squeeze into the Como housing market.
- For Household status: Single-person houses contribute only around 12-14% of the household structure. Though it peaked in 2006 at 15.4%, this ratio steadily declines 0.5 – 1% yearly. Group households only contribute around 2% toward this group. The family household remains the most significant part of the pie and still ascending slowly, reaching 86.2% in 2021. Even though it decreased slightly from 83% to 81.9% in 2006, this ratio quickly climbed to 83.9% and never lowered ever since. This ratio is a perfect signal for buyers and investors as this type of property tends to increase in price over time. Families want to live in a peaceful neighbourhood. The families will have the same interest in community service and local infrastructure like a park or school. Hence, they do not have much intention to sell leading to supply decrease while demand keeps increase will drive up the house price
- Cross-checking, we can see there is a positive correlation between the mortgage house owner and family household. As discussed above, a couple or family can pay off the mortgage payment very effortlessly as it only equals 23-30% of their household income.

## Visualisation 6: Workforce

### 6.1 Dataset overview and handling data

The workforce is essential for any city and suburb. It is the backbone of any economy, providing the local government's tax income and directly influencing the city's development. This dataset examines and evaluates the composition of the workforce from Como. The proportion of working full-time and part-time are both slowly reduced.

Location	Time	Y2001	Y2006	Y2011	Y2016	Y2021
Worked full-time(%)		63.3%	61.1%	59.7%	59.9%	58.6%
Worked part-time(%)		32.1%	30.7%	31.6%	32.9%	29.3%
Unemployment(%)		2.7%	2.3%	3.5%	2.9%	3.2%
Change in worked full-time		100.0%	96.5%	97.7%	100.3%	97.8%
Change in worked part-time		100.0%	95.6%	102.9%	104.1%	89.1%
Change in unemployment		100.0%	85.2%	152.2%	82.9%	110.3%

### 6.2 Visualisation technique

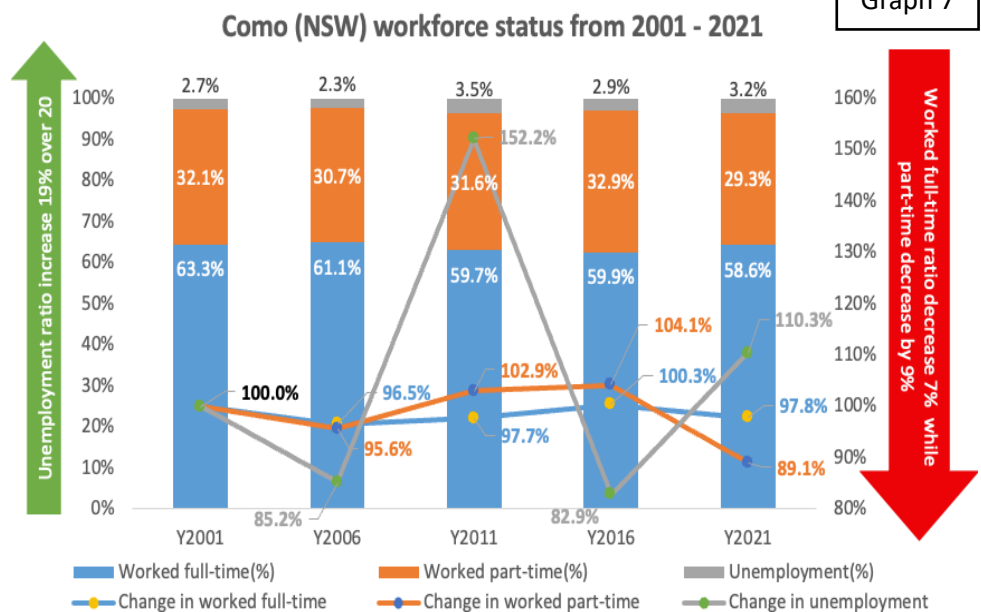
Even though the measures are all in percentages, the combo graph mixed with a 100% stacked bar chart is still valuable for representing & comparing any complicated data set.

**Layout:** The colour of the employment status is matched correspondingly to the changes over time. Grid lines are cleared

**Rescaling axes:** Right y-axis are rescaled to above 80% to show the more aggressive changes over time.

**Labelling:** To avoid overlap and clear identification, the label of the columns is being placed inside the bar. Also, the label of the line chart are coloured similarly to the line to allow easier recognition of numbers.

**Trends:** The red arrow and green arrowed are added to both side indicating significant trends over 20 years- Downwarding red arrow for decreasing and upward green arrow for increasing



Graph 7

### 6.3 Data summary and recommendation

- In the long run, the full-time and part-time ratios decreased at an alarming rate, each by 7-9%. The unemployment rate is very volatile over the year, peaking in 2011 at 3.5% and 3.2% in 2021. The most reasonable explanation for this is the impact of GFC and Covid 19. There was a Global Financial Crisis, which was a Mortgage-Backed Securities (MBS) crisis in 2008 - 2009, impacting many industries across the globe. The domino effect leads many companies to shorten all unessential aspects of their business, including labour costs, to survive this crisis. In 2021, the outspread of Covid 19 have a similar impact on the workforce for many companies across the globe.
- Disregarding 2021 impacted by covid 19, there is a shift from full-time to part-time workers. This transformation could be due to the variety of job opportunities nowadays. With a laptop and internet connection, anyone can start working at home while keeping their part-time job at the local business.
- The workforce composition of Como, judged solely on the number, are quite acceptable. The employment rate, though fluctuated a lot was still sufficient for a relatively quiet and peaceful area. The 3.2% unemployment of the population can be a good resource for new investors to invest in this area.

## Visualisation 7: Dwelling

### 7.1 Dataset overview and handling data

A good understanding of dwelling status allows interested parties to identify potential investment opportunities, renting options, house availabilities, and property varieties. Most of Como's dwellings are consistently occupied; this rate never drops under 94%. Separated houses, though going through up and down slightly over the years, still contribute the largest portion toward the dwelling structure of suburb Como.

Como (NSW) dwelling status from 2001 - 2021

Location	Como				
Time	Y2001	Y2006	Y2011	Y2016	Y2021
OccupiedDwellings(%)	95.8%	95.7%	95.0%	94.4%	95.7%
UnoccupiedDwelling(%)	4.2%	4.3%	5.0%	5.6%	4.2%
SeparateHouse(dwelling%)	92.6%	94.0%	93.9%	91.9%	91.3%
SemiDetached(dwelling%)	5.4%	5.4%	5.7%	6.8%	7.6%
FlatUnitApartment(dwelling%)	1.0%	0.2%	0.4%	0.2%	0.8%

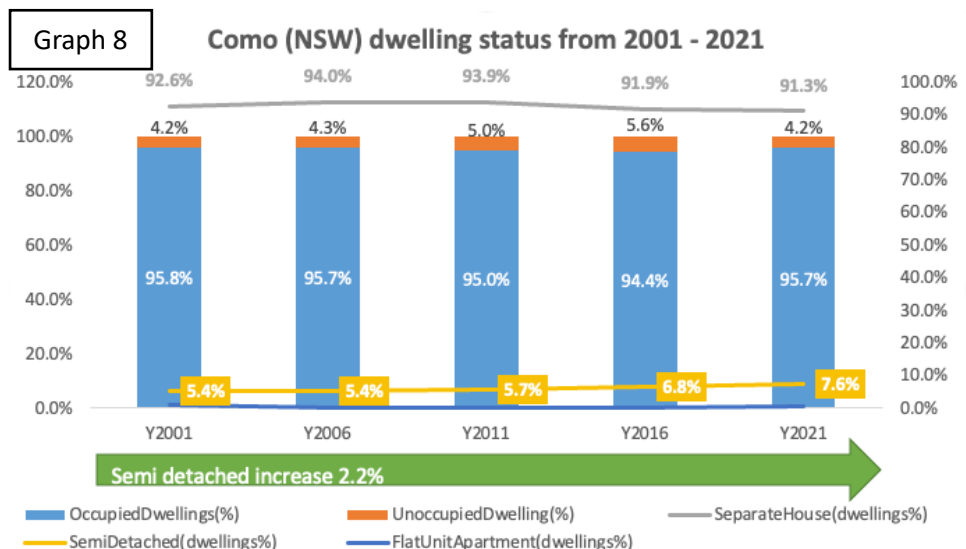
### 7.2 Visualisation technique

A combo chart mixing of 100% stack bar charts and line charts is used to describe this data set to enhance the comparison and visualisation in a complex datasets.

**Layout:** Grid line are removed to enhance visualisation. The use of different colour allow the reader to visualise easily.

**Labelling:** Columns labels are placed inside the bar to avoid overlap. Labels are coloured correspondingly to their chart.

**Trends:** Use of green arrow to identify increasing trend



### 7.3 Data summary and recommendation

- Most of the dwellings in Como have been occupied. This rate is moderately stable over the year. The population density is only 2.5 people/ km<sup>2</sup>) suggesting that the community life here may be quiet and friendly. The current community services and infrastructures are pretty acceptable, that the existing homeowner decided to live here over many years. This neighbourhood should be an acceptable place to live peacefully regarding residency.

- From the investors' point of view however, this area might not have a lot of development potential. There could be a need for more new infrastructure or any other competitive advantage that discourage new homebuyer from moving into this area. The current high and consistently occupied dwellings status could be because the current owners inherited this property from their parents.

- Most of the current houses are in the form of separated house, fluctuating around 92 - 94%. However, there is a transition in living preferences of suburb Como. There is an increasing trend in semi-detached dwellings and decreasing trend in a separate houses. Specifically, the semi-detached dwellings reached 7.6% in 2021, a 40% cumulative increase compared to 20 years ago, while separated house contributions decreased slightly by 1.3%. Semi-detached houses are more affordable and suitable for new couples. As mentioned above, the number of people per km<sup>2</sup> is very low. Hence, this could not be because of lack of land to build new houses. There could be some discouragement in the local government for the new supply of new houses.

## Visualisation 8: Family

### 8.1 Dataset overview and handling data

Comprehending an area's family status can give investors useful insights about their target market. For instance, a family with children typically has around 3 to 4 people and might require a bigger house. On the left, the couple has no children composition is decreasing quite a lot from 33.1% to 28.5%. Recognising the decreasing trend of couple family has no children, along with careful area inspection of supply and demand, can give the investor many advantages.

Como (NSW) population change and family status from 2001 - 2021

Location	Como				
Time	Y2001	Y2006	Y2011	Y2016	Y2021
Families	1,063	1,032	1,047	1,090	1,147
CoupleFamilyNoChidren(%)	33.1%	28.9%	29.8%	28.1%	28.5%
CoupleFamilyHasChidren(%)	56.2%	61.2%	60.6%	62.3%	61.1%
OneParentFamily(%)	9.8%	8.8%	8.4%	9.2%	9.1%
OtherFamily(%)	0.9%	1.1%	1.2%	0.5%	0.9%

Graph 9

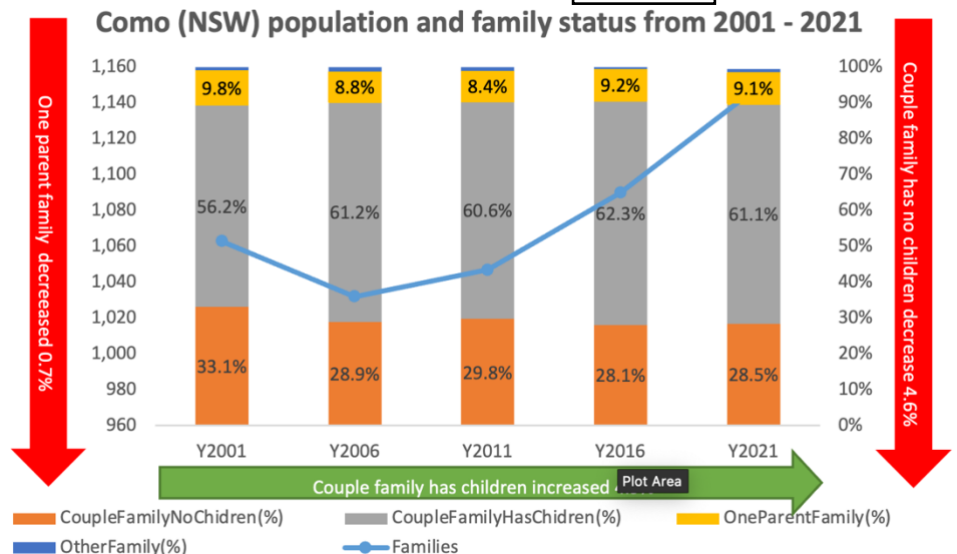
### 8.2 Visualisation technique

This data set uses a combo graph with two different kinds of data. The left y-axis is for population, and the right is for the composition of the population

**Rescaling axes:** Left y-axis is rescaled to show a clearer trend

**Labelling:** The column labels are placed inside of each bar. A few unnecessary labels are removed

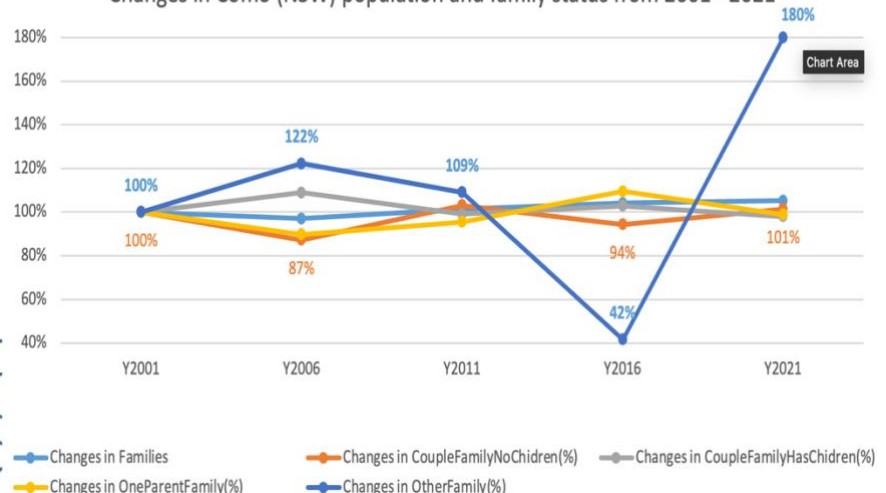
**Trends:** The graph used the green arrow to identify the increasing trend and the red decreasing



This line graph on the right illustrates the changes in the family composition in Como. The axis is rescaled to show the trend more clearly. Some data labels are removed to avoid overlap. Axis is rescaled to include the range of data only from 40 – 180%.

Location	Como				
Time	Y2001	Y2006	Y2011	Y2016	Y2021
Changes in Families	100%	97%	101%	104%	105%
Changes in CoupleFamilyNoChidren(%)	100%	87%	103%	94%	101%
Changes in CoupleFamilyHasChidren(%)	100%	109%	99%	103%	98%
Changes in OneParentFamily(%)	100%	90%	95%	110%	99%
Changes in OtherFamily(%)	100%	122%	109%	42%	180%

Changes in Como (NSW) population and family status from 2001 - 2021



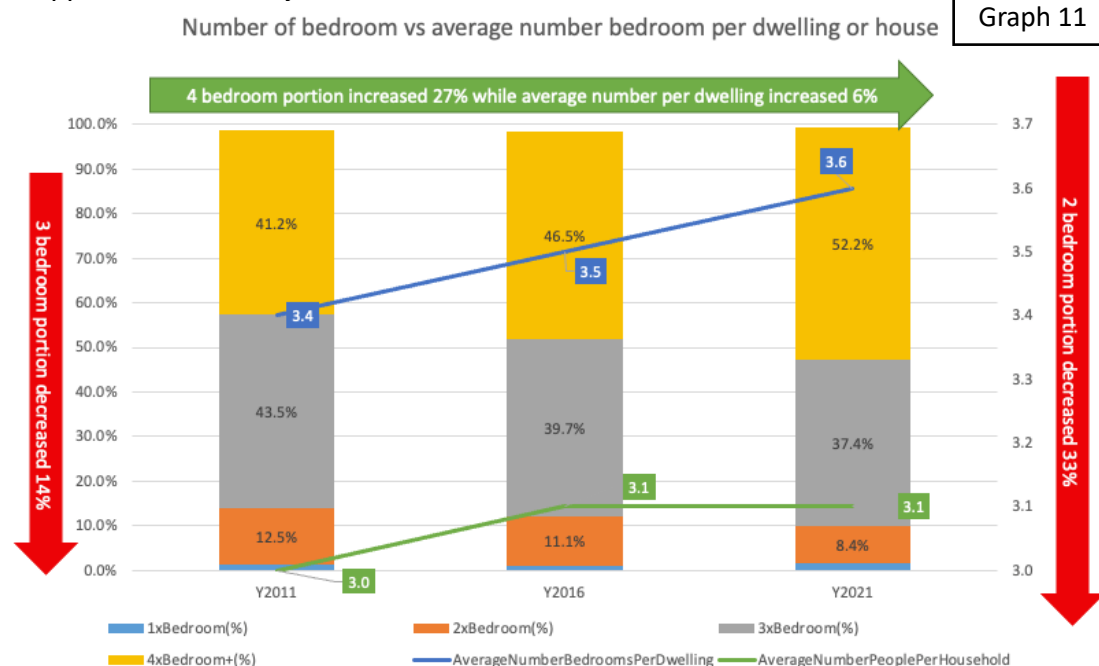


The number of bedrooms in a house versus the average number in a household or dwelling used the combo graph visualise data from two different measurements, right for whole number and left for percentage. The 2001 and 2006 columns are dropped because these type of data was not recorded back then. 0% Bedroom row also dropped because they are all 0.

**Axis:** The left axis is rescaled from 3 to 3.7 to show the trend more clearly

**Label:** To avoid data overlap, each stack label is placed inside the stack and the line graph labels' backgrounds are coloured correspondingly. Also, some low value data labels are removed.

**Trend highlights:** The red arrows are used to indicate the decreasing trends, and the green arrow for increasing ones.



### 8.3 Data summary and recommendation

- Predominantly, the couple family has children take up the most considerable portion and continue to increase over the long run. The trend of the couple family with no children, making up the second largest, decreased significantly over the year from 33.1% to 28.5% in 2021.
- The one-parent families fluctuated slightly over the year, decreasing from 9.8% (2001) to 8.4% (2011), but changed direction and increased to above 9% again in the following ten years. Though fluctuating quite a lot, other families only took a small portion of around 0.5% - 1% so it can be disregarded.
- There is a weak positive correlation between the average people per dwelling and the 4-bedroom dwelling. As the population grows but the new generation can not afford a new house, they might have to live together to reduce costs. Hence, the demand for 4-bedroom dwellings while decreasing 3-bedroom and 2-bedroom dwellings. Over the last decade, the 2-bedrooms dwellings significantly declined from 12.5% to 8.4%, or a 33% accumulative decrease. The 3-bedroom dwellings decrease at a slower rate, from 12.5% to 8.4%, or a 14% accumulative decrease.
- The average number per household increases at a constant pace. Investors can consider investing in a larger house with 4 - 6 bedrooms because this should meet the market's demand. On the other hand, they should restrict investments in 2-bedrooms or 3-bedroom dwellings only if they have any competitive advantage. The average number of people per dwelling increases by 3.3% compared to 6% for the household. This ratio even stood still in the 2016 to 2021 period. Moreover, the increasing and still predominant proportion of the family structure is coupled family has children, hence require a much bigger house (3,4,5 bedrooms). Regardless, the four bedrooms dwelling percentage had already increased by 27% over 20 years. Investors or buyers should conduct more careful inspections before making further investments.

## Summarise of the advantage of data visualisation technique used in the report

This report dominant graph is combo chart mixing between bar chart, % stacked bar, 100% stacked bar chart with line graph. This chart work perfectly when dealing with a complex data set. One of the advantages is that this graph have two separated vertical axis, and it allows fast comparison between different measurement data, such as whole number and percentage. Mixing between bar chart and line chart allow trend identification in a simple data set (graph 1 and 2) . A more complex data set could required stacked bar chart to display many categories in one graph (graph 3). Similar measurement in percentages can also used combo chart mixing with 100% stacked bar chart to show the trend over time. The layout of the graph are very spacious. Almost of gridline are removed to show a clearer view. The grid line are displayed only when some of the data labels are removed to avoid overlap, allowing user to estimate the value easily (graph 4).

The layout of the graphs is very spacious. Almost of the gridline are removed to show a clearer view. The grid line is displayed only when some data labels are removed to avoid overlap, allowing users to estimate the value easily (graph 4). Data labels are highlighted and coloured correspondingly to the chart they represent. Sometimes, for the line chart, the background of the data label is coloured similarly to the graph they represent to avoid overlap. Data labels of the columns chart are typically placed inside the bar to prevent data overlap and make easier recognition. Most of the small-value data labels are dropped as they are insignificant. The purpose of recalling the vertical axis in the charts was to show the changes more clearly and identify trends easier. Also, rescaling allows more space in the chart to display other useful information. Occasionally, the rescaling of the axis helps to avoid data overlap (graph 3) and enhance the readability of other data labels. To further highlight the trend, two types of arrows are added. The red arrow indicates a decreasing trend, labelled with text to display the accumulation change over a certain period. On the other hand, green arrows are utilised to show significant accumulation increases.



## Executive summary and conclusion

First, Como had a relatively low population of around 4000 and a low population density. The house price in this area outperforms the unit price in the last 20 years in accumulated increase. However, the unit price fluctuates more intensively and can be suitable for short-term investors with a lot of experience and knowledge. The financial situation in Como is quite stable, with rent to income ratio for households and families fluctuating around 20%. This ratio continues to decrease over the years, even though the rent experience some slight increases. On the other hand, the mortgage payment increase rate is slowing down a lot, and the mortgage payment to income ratio decreased consistently by 1-2% over the year since 2011. The ownership status of Como is currently leaning toward mortgage-back securities taking up to nearly 50% of the market share. At the same time, fully-owned property lost its leading position in 2006 yet still decreasing. Investors should consider Como because the dominant household structure is the family household of nearly, known for its stable long-term increase in value. This ratio is consistently increasing since 2006, reaching 86.2% in 2021. Regarding the workforce, the investor can be confident as Como has a stable economy when its unemployment rate constantly fluctuates around 3% despite the global crisis, like Covid-19 (2020) and GFC (2008). If the buyers are interested in a separated house neighbourhood, Como is a perfect option where the separated house is a dominant structure taking up to 94%. Larger houses in the community, ranging from above 4 bedrooms, is become a current trend in the area. Hence, the big family home buyer can consider inspecting this area for living.

Nevertheless, there are a few disadvantages that investors must consider. The supply-to-demand ratio is consistently sitting at 1.04 to 1.05, which means there is a supply excess compared to the property demand of around 4-5%. The median age is steadily growing to 40, which means this area is not very appropriate for the young and active generation that wishes to live here, not to mention the population density is also moderately low. The trend in mortgage-back properties shows some slowing down signal, and it might be more challenging to find a loan for a property in this area now compared to a few years ago. There could be a lack of food and cultural diversity where the Australian-born ratio in the Como was always above 80%. The consistently low unemployment rate can be a bad idea to find a new job in this area, particularly if the new home buyers are trying to find a job to finance a loan. Finding an available dwelling to rent or buy could be challenging as the unoccupied dwelling ratio hardly exceeds 5%.