

## Business Intelligence Project

### Power BI Project: Auto Insurance Analysis

#### Dataset Information:

United State Auto Insurance survey data is collected from Kaggle.com.

Data Source Link: <https://www.kaggle.com/code/madhushreesannigrahi/jenks-natural-breaks-and-k-means-clustering/input>

#### Summary:

In my project, I conducted an in-depth analysis of customer tenure within the auto insurance industry using 12 months of survey data sourced from Kaggle.com. My objective was to identify the primary factors influencing customer tenure over a span of one or more years.

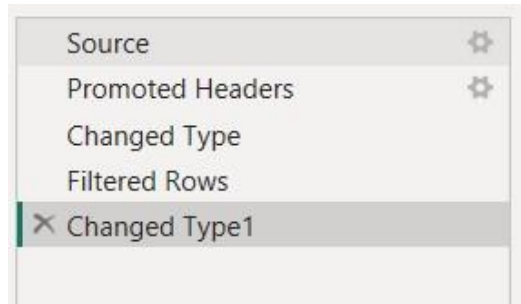
I utilized Power BI Desktop to create a comprehensive dashboard report based on the supplied dataset. My objectives included loading the datasets, performing necessary data cleaning and transformation procedures, and utilizing Power BI DAX to create required tables and metrics. I built a robust data model, establishing relationships based on key attributes to facilitate insightful analysis. Multiple report pages (dashboards) were created to visualize key performance indicators (KPIs), with varied formatting options applied for clarity and aesthetics. Upon completion, the report was published to Power BI services and configured for auto-refresh to ensure up-to-date data availability. Finally, a dashboard was created in Power BI services based on the published report, providing users with an intuitive and interactive interface for exploring insights derived from the data.

My findings provide valuable strategic insights for auto insurance companies seeking to enhance customer loyalty and optimize their business strategies.

#### Load Data to PowerBi:

The project kicked off with the crucial step of loading the dataset into Power BI Desktop. I promptly addressed any null values and standardized data types across columns, ensuring data integrity and consistency. This initial data cleaning process set the stage for my subsequent analysis and dashboard creation, enabling me to derive meaningful insights with confidence.

Customer	State	Customer Lifetime Value	Response	Coverage	Education	Effective To Date	EmploymentStatus	Gender	Income	Location Code	Marital Status
TE34064	California	2168.523464	No	Basic	High School or Below	20 June 2001	Unemployed	M	0	Suburban	Single
NI17718	California	2150.178388	No	Basic	High School or Below	20 September 2002	Unemployed	F	0	Suburban	Single
JK32620	Nevada	2224.768	No	Basic	College	20 January 2002	Unemployed	M	0	Suburban	Single
QZ42725	Washington	2310.882998	No	Basic	Bachelor	20 January 2001	Unemployed	F	0	Suburban	Single
GB33195	Washington	2275.363967	No	Basic	High School or Below	20 December 2001	Unemployed	M	0	Suburban	Single
WL65572	California	2064.458781	No	Basic	College	20 August 2001	Unemployed	M	0	Suburban	Single
GT38956	California	2441.394244	No	Basic	College	20 February 2013	Unemployed	F	0	Suburban	Married
ZO83562	Nevada	2379.741171	No	Basic	Bachelor	20 June 2002	Unemployed	F	0	Suburban	Single
OE19087	California	2243.473907	No	Basic	High School or Below	20 February 2024	Unemployed	F	0	Suburban	Single
LY97989	Oregon	2894.243869	No	Extended	Bachelor	20 February 2017	Unemployed	F	0	Suburban	Single
GG68407	Washington	2321.88367	No	Basic	High School or Below	20 February 2022	Unemployed	F	0	Suburban	Single
LE43061	California	3728.83013	No	Premium	High School or Below	20 February 2020	Unemployed	M	0	Suburban	Single
HM20544	Washington	2175.740021	No	Basic	College	20 May 2002	Unemployed	F	0	Suburban	Single
XR97812	California	2345.084479	No	Basic	College	20 February 2022	Unemployed	M	0	Suburban	Single
UW98698	California	2269.841123	No	Basic	College	20 August 2002	Unemployed	M	0	Suburban	Single
CI24326	Oregon	3591.066675	No	Extended	Bachelor	20 January 2023	Unemployed	M	0	Suburban	Married
YL72747	California	2265.318569	No	Basic	High School or Below	20 January 2025	Unemployed	M	0	Suburban	Divorced
WL06174	California	2677.279707	No	Basic	Bachelor	20 February 2024	Unemployed	F	0	Suburban	Married
HE84643	California	2175.624856	No	Basic	High School or Below	20 January 2002	Unemployed	F	0	Suburban	Single
NW41789	Oregon	2746.90319	No	Extended	Bachelor	20 January 2024	Unemployed	M	0	Suburban	Single
HZ62410	Oregon	2771.963072	No	Extended	Bachelor	20 March 2001	Unemployed	M	0	Suburban	Single



`= Table.TransformColumnTypes(#"Filtered Rows",{{"Total Claim Amount", Currency.Type}, {"Coverage", type text}})`

### **Creating the required table Using Power BI DAX**

This Power BI DAX code creates a Date table spanning from January 1, 2001, to December 31, 2031, and augments it with columns for formatted dates, months, years, quarters, and days. The CALENDAR function generates the date range, while ADDCOLUMNS appends new columns to the table. These added columns use various DAX functions like FORMAT, YEAR, and DAY to extract and format date-related information such as month names, years, quarters, and days. This resulting Date table serves as a fundamental component in data modeling for time-based analysis and visualization within Power BI.

```

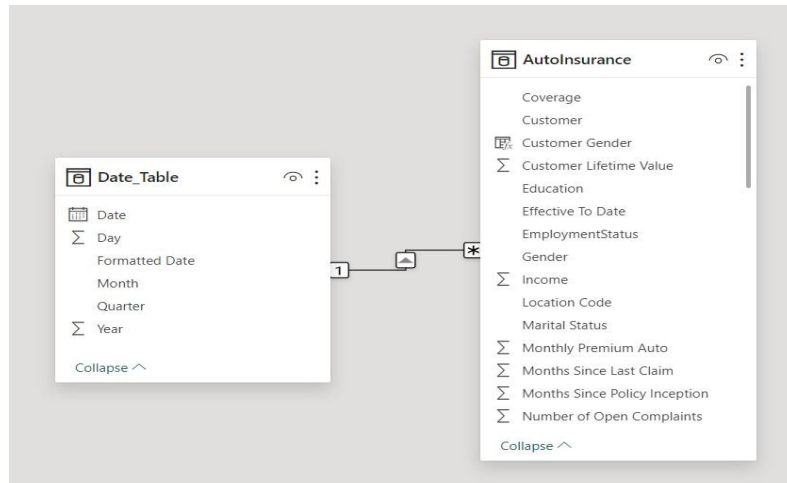
1 Date_Table =
2 ADDCOLUMNS (
3     CALENDAR (DATE (2001, 1, 1), DATE (2031, 12, 31)),
4     "Formatted Date", FORMAT ( [Date], "dd-mmm-yyyy" ),
5     "Month", FORMAT ( [Date], "mmm" ),
6     "Year", YEAR ( [Date] ),
7     "Quarter", "Q" & FORMAT ( [Date], "Q" ),
8     "Day", DAY ( [Date] )
9 )

```

Date	Formatted Date	Month	Year	Quarter	Day
01-07-2001 12:00:00 AM	01-Jul-2001	Jul	2001	Q3	1
02-07-2001 12:00:00 AM	02-Jul-2001	Jul	2001	Q3	2
03-07-2001 12:00:00 AM	03-Jul-2001	Jul	2001	Q3	3
04-07-2001 12:00:00 AM	04-Jul-2001	Jul	2001	Q3	4
05-07-2001 12:00:00 AM	05-Jul-2001	Jul	2001	Q3	5
06-07-2001 12:00:00 AM	06-Jul-2001	Jul	2001	Q3	6
07-07-2001 12:00:00 AM	07-Jul-2001	Jul	2001	Q3	7
08-07-2001 12:00:00 AM	08-Jul-2001	Jul	2001	Q3	8
09-07-2001 12:00:00 AM	09-Jul-2001	Jul	2001	Q3	9

### **Building the data model and creating the relationship based on the key attribute**

I constructed a data model by linking datasets through key attributes in Power BI. This facilitated coherent analysis across tables, ensuring data integrity and enabling insightful visualization in reports and dashboards.



Relationship

Table: AutoInsurance Column: Effective To Date

Cardinality: Many to one (\*:1)

Table: Date\_Table Column: Date

Make this relationship active: ☒ Yes

Cross filter direction: Single

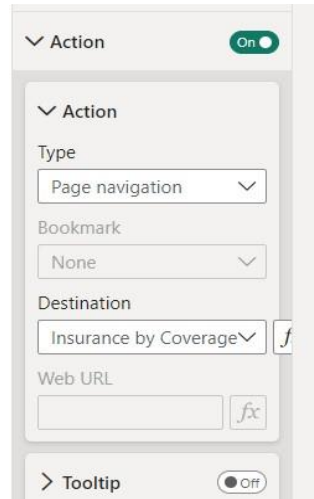
Apply security filter in both directions: ☐ No

## Landing Page:



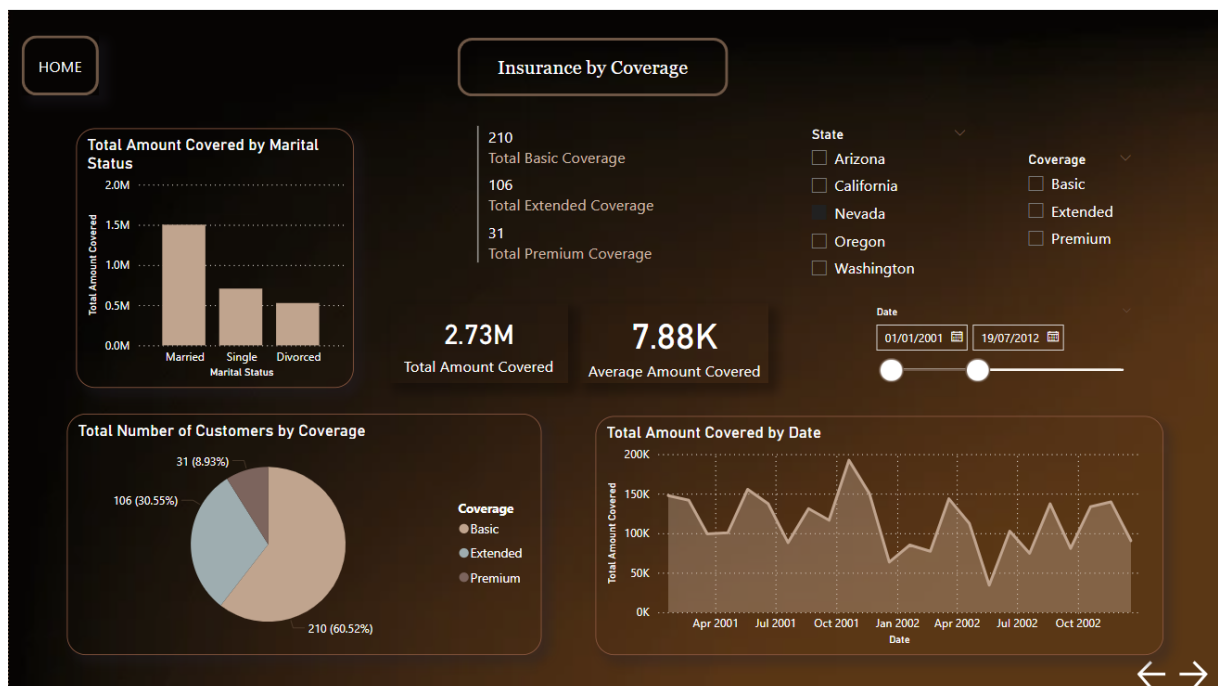
## Navigation Button:

After constructing my data model, I proceeded to enhance user experience by creating a navigation button. This button, integrated into my Power BI report, allows seamless movement between different sections or sheets. By implementing this feature, users can effortlessly explore various aspects of the data, such as transitioning from the landing page to specific sheets like "Insurance by Coverage."



I enhanced my Power BI report by creating navigation buttons for key sections such as "Insurance by Customer Type," "Insurance by Policy Type," "Insurance by Sales Channel," and "Insurance by Vehicle." Each button is designed as a clickable element, seamlessly guiding users to their desired sections within the report. This intuitive navigation design fosters a user-friendly experience, facilitating efficient exploration of various data dimensions.

## Insurance By Coverage:



The Power BI sheet provides comprehensive insights into insurance coverage data, with key metrics organized for analysis: Customer coverage is depicted via a pie chart, while coverage amount over time is illustrated through an area chart, offering insights into distribution and trends respectively.

**Total Amount Covered by Marital Status:** Shows coverage sums categorized by marital status, aiding in understanding coverage patterns across different marital statuses.

**Total Number of Customers by Coverage:** Displays the count of customers by coverage type, offering insight into the distribution of customers across different plans.

**Total Amount Covered by Date:** Tracks the total coverage amount over time, enabling trend analysis and identification of fluctuations.

### Key Performance Indicators (KPIs):

- **Total Amount Covered:** Sum of all coverage amounts, indicating the overall liability assumed.

```
1 Total Amount Covered = SUM(AutoInsurance[Customer Lifetime Value])
```

- **Average Amount Covered:** Mean coverage per customer, offering insights into typical coverage levels.

```
1 Average Amount Covered = AVERAGE(AutoInsurance[Customer Lifetime Value])
```

- **Total Basic Coverage:** Sum of coverage for basic plans, representing essential protections.

```
1 Total Basic Coverage = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Coverage] = "Basic")
```

- **Total Extended Coverage:** Sum of coverage for extended plans, including additional protections.

```
1 Total Extended Coverage = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Coverage] = "Extended")
```

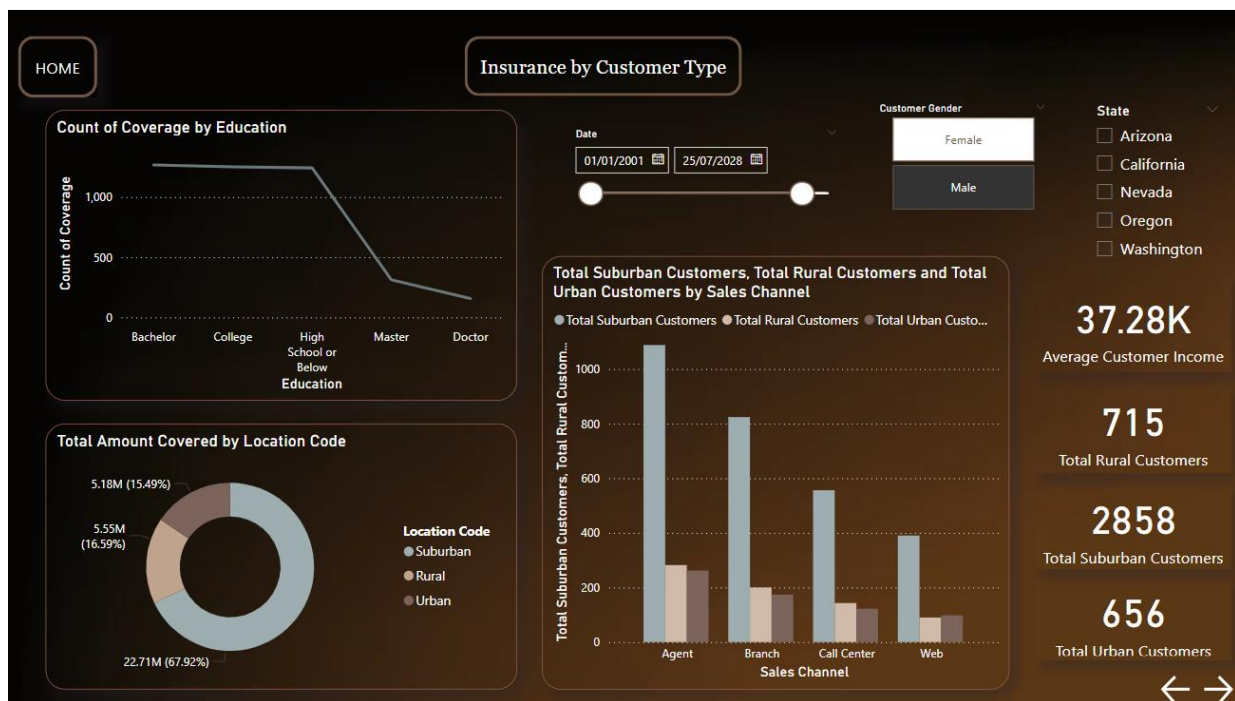
- **Total Premium Coverage:** Sum of coverage for premium plans, providing the highest level of protection.

```
1 Total Premium Coverage = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Coverage] = "Premium")
```

These metrics collectively facilitate informed decision-making by presenting a comprehensive overview of insurance coverage performance and distribution. Power BI's visualization tools enhance data interpretation and analysis.



## Insurance By Customer type:



**Line Graph:** Displays the count of coverage by education level, offering insights into the distribution of insurance coverage across different educational backgrounds.

**Donut Chart:** Represents the total amount covered by location code, allowing for a visual comparison of coverage amounts across different geographical areas.

**Bar Graph:** Illustrates the total number of suburban, rural, and urban customers categorized by sales channels, providing a comparison of customer distribution based on location and sales channels.

**Slicer:** Enables users to select specific dates and genders for filtering the data, facilitating customized analysis based on temporal and gender-based parameters.

### **KPIs:**

- **Average Customer Income:** Provides the mean income level of insurance customers, offering insights into the financial demographics of the customer base.

```
1 Average Customer Income = AVERAGE(AutoInsurance[Income])
```

- **Total Rural Customers:** Sum of customers residing in rural areas, indicating the extent of coverage penetration in rural regions.

```
1 Total Rural Customers = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Location Code] = "Rural")
```

- **Total Suburban Customers:** Sum of customers residing in suburban areas, offering insights into coverage distribution in suburban locations.

```
1 Total Suburban Customers = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Location Code] = "Suburban")
```

- **Total Urban Customers:** Sum of customers residing in urban areas, highlighting the concentration of coverage in urban settings.

```
1 Total Urban Customers = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Location Code] = "Urban")
```

These components collectively provide a comprehensive view of insurance coverage distribution, customer demographics, and performance metrics, facilitating informed decision-making and strategic planning within the insurance domain.

### Insurance By Policy type:



**Bar Graph:** Displays the total number of policies sold categorized by policy type, providing a comparison of policy sales across different types.

**Tree map:** Represents the total number of customers by policy type, offering insights into the distribution of customers based on their policy types.

**Donut Chart:** Illustrates the total number of policies sold by vehicle class, allowing for a visual comparison of policy sales across different vehicle categories.

**Area Graph:** Depicts the total number of policies sold over time, grouped by month and sales channel, enabling analysis of sales trends across different time periods and channels.

### **KPIs:**

- **Total Personal Policies Sold:** Sum of personal policies sold, providing an overview of sales volume for policies catering to individual customers.

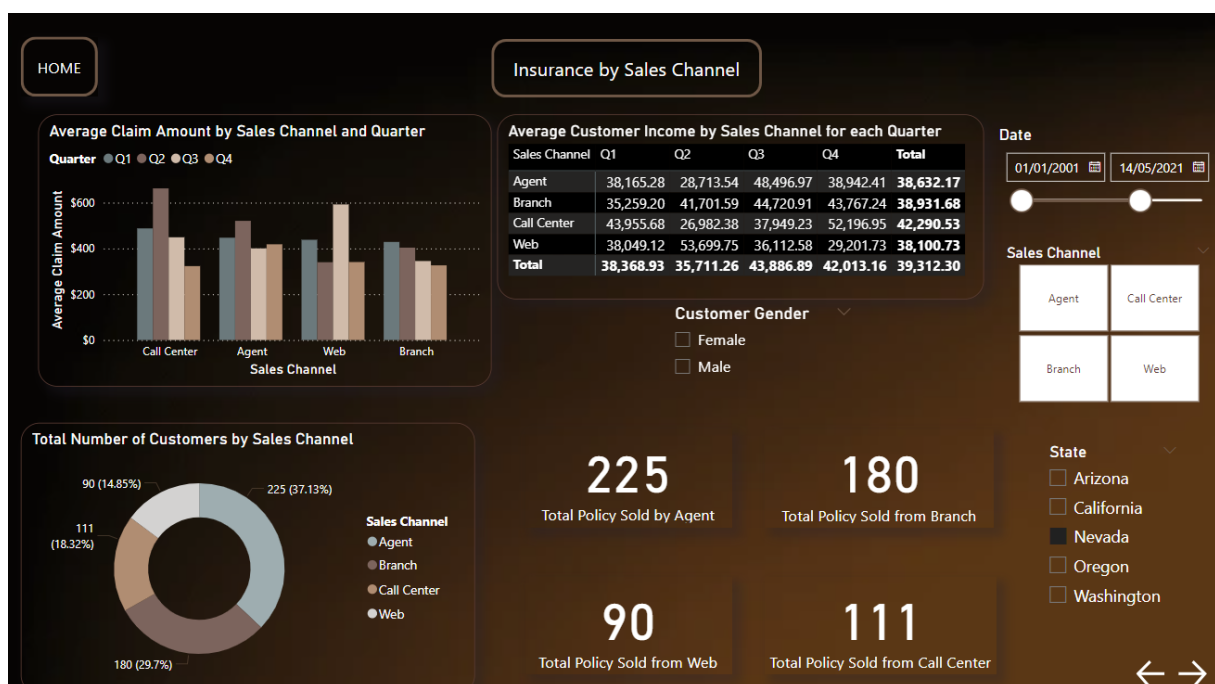
```
1 Total Personal Policy Sold = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Policy Type] = "Personal Auto")
```

- **Total Special Policies Sold:** Sum of special policies sold, indicating the sales volume for policies offering unique or specialized coverage options.

```
1 Total Special Policy Sold = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Policy Type] = "Special Auto")
```

These components collectively offer valuable insights into policy sales trends, customer preferences, and performance metrics, aiding in decision-making within the insurance industry.

### Insurance By Sales Channel:



**Bar Chart:** Displays the average claim amount by sales channel and quarter, providing insights into the average claim amounts processed through different sales channels over time.

**Donut Chart:** Illustrates the total number of customers by sales channel, offering a visual comparison of customer distribution across different sales channels.

**Metrix:** Represent average customer income by sales channel and quarter, allowing for analysis of income trends among customers acquired through different sales channels over time.



### **Key Performance Indicators (KPIs):**

- **Total Policy Sold by Agent:** Sum of policies sold by agents, indicating the sales volume attributed to agent-mediated transactions.



```
1 Total Policy Sold by Agent = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Sales Channel] = "Agent")
```

- **Total Policy Sold from Branch:** Sum of policies sold through branch offices, reflecting the sales volume generated from branch-based transactions.

```
1 Total Policy Sold from Branch = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Sales Channel] = "Branch")
```

- **Total Policy Sold from Web:** Sum of policies sold through online channels, showcasing the sales volume from web-based transactions.

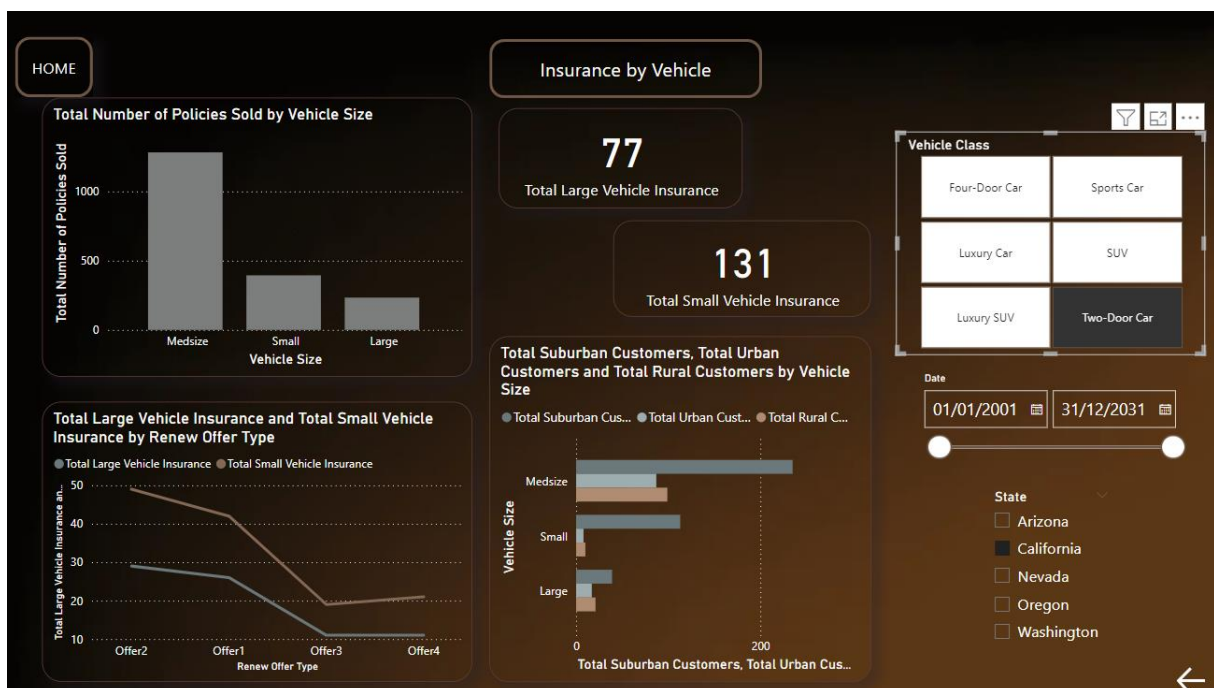
```
1 Total Policy Sold from Web = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Sales Channel] = "Web")
```

- **Total Policy Sold from Call Centers:** Sum of policies sold through call center operations, highlighting the sales volume from call center-mediated transactions.

```
1 Total Policy Sold from Call Center = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Sales Channel] = "Call Center")
```

These components collectively provide insights into sales performance, customer demographics, claim amounts, and income trends across different sales channels and quarters, aiding in decision making and strategic planning within the insurance domain.

### Insurance By Vehicles:



**Stacked Column Chart:** Illustrates the total number of policies sold, categorized by vehicle size. This chart offers a visual comparison of policy sales across different vehicle sizes.

**Line Graph:** Represents the total large vehicle insurance and total small vehicle insurance, segmented by renew offer type. This graph helps analyse the distribution of insurance policies for large and small vehicles based on different renewal offer types.

**Clustered Bar Chart:** Displays the total number of suburban, urban, and rural customers categorized by vehicle size. This chart provides insights into customer distribution across different geographic areas based on vehicle size.

### Key Performance Indicators (KPIs):

- **Total Large Vehicle Insurance:** Sum of insurance policies for large vehicles, indicating the overall sales volume for this vehicle category.

```
1 Total Large Vehicle Insurance = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Vehicle Size] = "Large")
```

- **Total Small Vehicle Insurance:** Sum of insurance policies for small vehicles, indicating the overall sales volume for this vehicle category.

```
1 Total Small Vehicle Insurance = CALCULATE(COUNTROWS(AutoInsurance), AutoInsurance[Vehicle Size] = "Small")
```

**Matrix:** Represents vehicle class, offering a structured view of vehicle categories for analysis and comparison purposes.

Vehicle Class	
Four-Door Car	Sports Car
Luxury Car	SUV
Luxury SUV	Two-Door Car

These components collectively provide insights into policy sales, customer demographics, and insurance coverage distribution across different vehicle sizes and geographic areas, aiding in decision-making within the insurance industry.

### Project Link

<https://app.powerbi.com/groups/me/reports/b9eeca9300424c55b020731b8a4c9427/ReportSection?experience=power-bi>

### Conclusion

Through this project, I have learned how to effectively use Power BI to load and clean data, create complex DAX formulas, build data models, and design interactive dashboards. These skills are essential for conducting comprehensive data analysis and presenting actionable insights in a clear and accessible manner.