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SQL for Data Science

Year 1: Semester 2

Group Assignment 03


Analyzing Health Worker Density in Australia
Insights from Data visualization

Table of content

Task 01

1.Introduction

Distribution of health care staff is very important to ensure equitable access to medical care, especially in different geographic areas. The Health Worker Density and Distribution dataset has been used to identify the patterns and discrepancies in the distribution of medical professionals throughout various geographical regions. This analysis is primarily done to assist in policy formation and decision-making in the distribution of healthcare resources. This, therefore, involved processing this dataset through Microsoft SQL Server to better import, clean, and prepare data. The processed data will then be visually represented using dynamic, interactive, and understandable visualizations created on Power BI that provide a good overview of critical parameters in the form of geographical disparities, health worker density against the population, and workforce growth rate. The following report presents the procedures followed in data transformation, analysis, and preparation. This report covers the challenges of this process and underlines very significant results, such as workers' distribution patterns or their development areas. It gives weight to the importance of applying BI tools, like Power BI, in the transformation of raw unprocessed data into actionable insight for the creation of effective health policy.

2.Methodology

2.1Data set review

The Health Worker Density and Distribution dataset shows the distribution of health workers across the Major Cities, Inner Regional, Outer Regional, and Remote geographic regions. This dataset encompasses data from 2013 to 2019, with key measures such as headcounts, Full-Time Equivalent (FTE) counts, and FTE per 1,000 population, enabling temporal analysis of workforce changes. This dataset draws attention to differences in the workforce, which helps in observing specific locations with insufficient resources as well as growth/stagnation trends. Various dataset preprocessing issues, like problems with missing values, require normalization. This can ensure support for data-driven decisions and efficient policy development as data are structured and have the significance of relevance toward equity in healthcare, proving an excellent basis for such sensitive analysis and visualization.

FTE_2013: The full- time equivalent count of health workers in each region for 2013

FTE_2019: The full-time equivalent count of health workers in each region for 2019

FTE_per_1000_2013: The ratio of FTE health workers per 1000 population 2013

FTE_per_1000_2019: The ratio of FTE health workers per 1000 population 2019

Region: Represent different geographical areas categorized by remoteness, such as major cities, inner regions, outer regions and remote.

Headcount_2013: The total number of employed medical participants in each region for the year 2013

Headcount_2019: The total number of employed medical participants in each region for the year 2019

2.2 Data base design and implementation

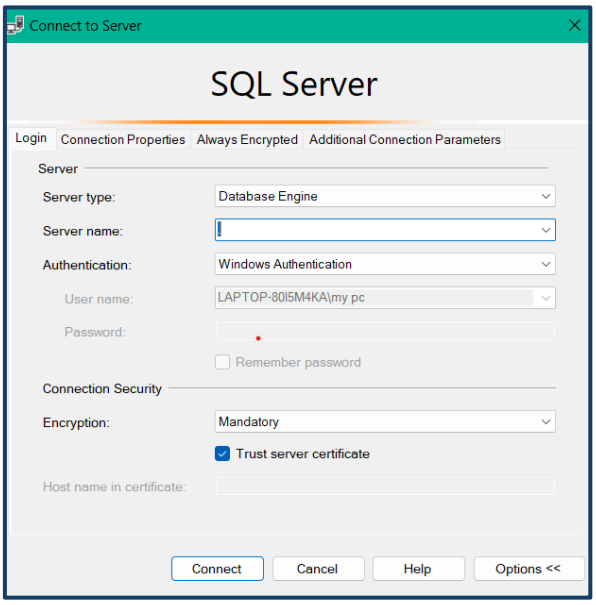
Data.gov.au-a single directory for Australian open data resources, everything from education to health and environment-provided the dataset used for this article. This allows openness and well-informed decision-making, with access to a large range of datasets. To examine the distribution of the healthcare workforce across geographical regions categorized by remoteness, for example, Health Worker Density and Distribution will be retrieved from this source. Therefore, this dataset's thorough structure across several years makes it suitable for examining the workforce trend and guiding the creation of policies meant to solve healthcare access gaps.

- Download the data set from the below link.
- (Data set: Data.gov.au,)

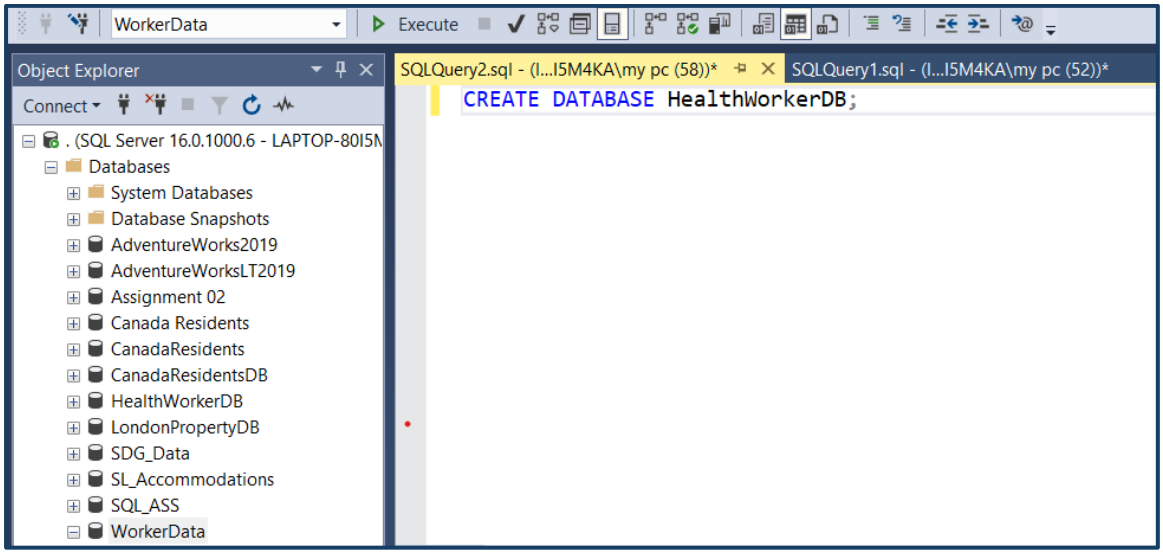
3. SQL queries for data analysing

3.1 Connect to the SQL Server

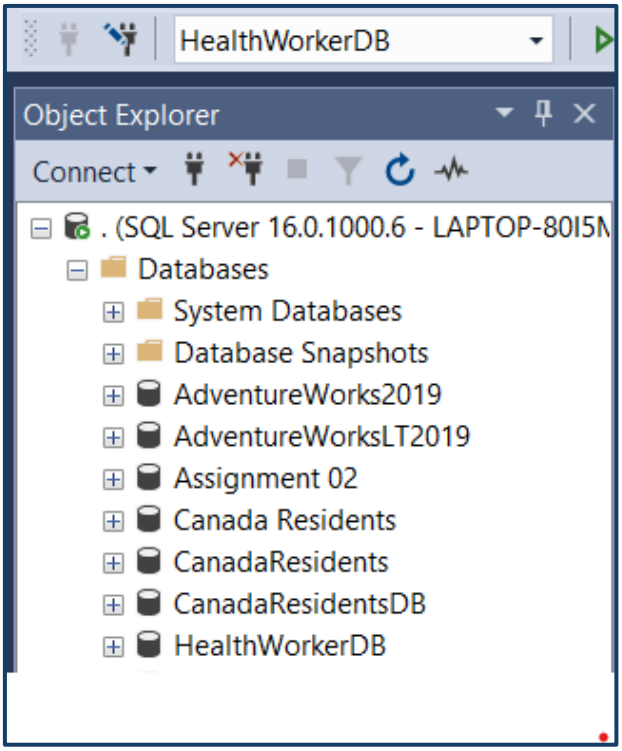
> Open SSMS and connect to SQL Server instance from giving your servers name.



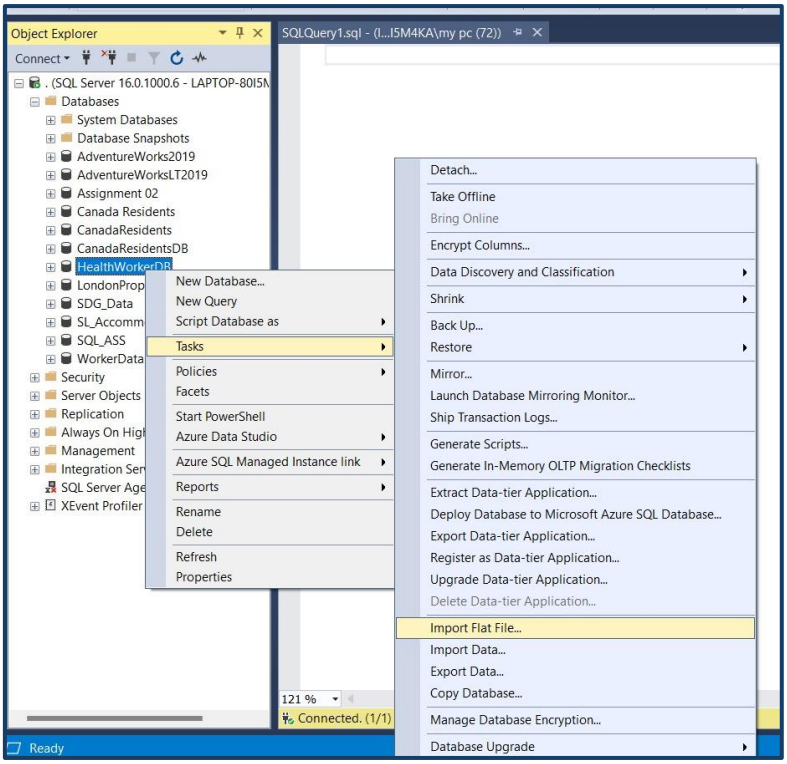
- Create a new data base called “Health Worker DB”



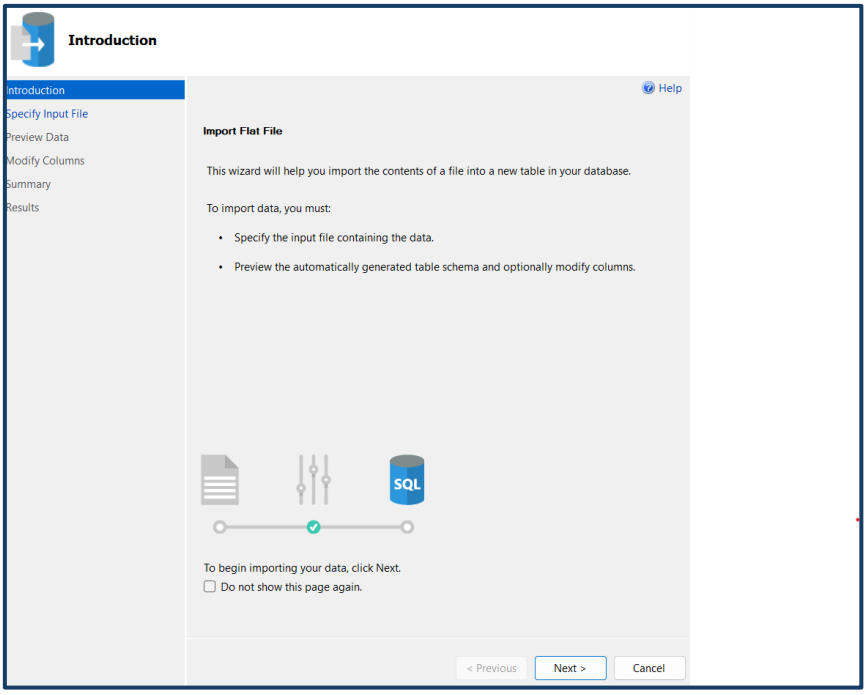
- You can see the data base created display in the object explorer



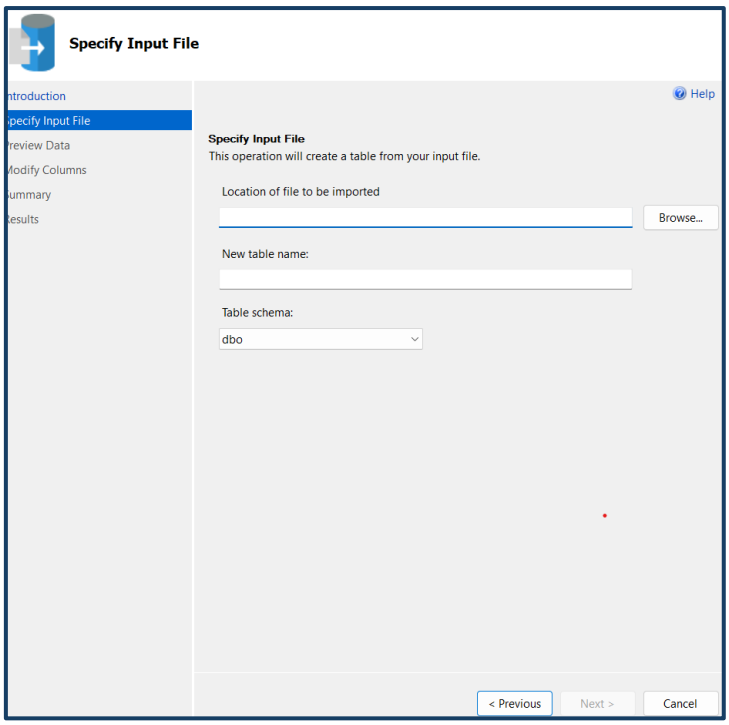
- Import the CSV file to the SQL server database “Health Worker DB”.



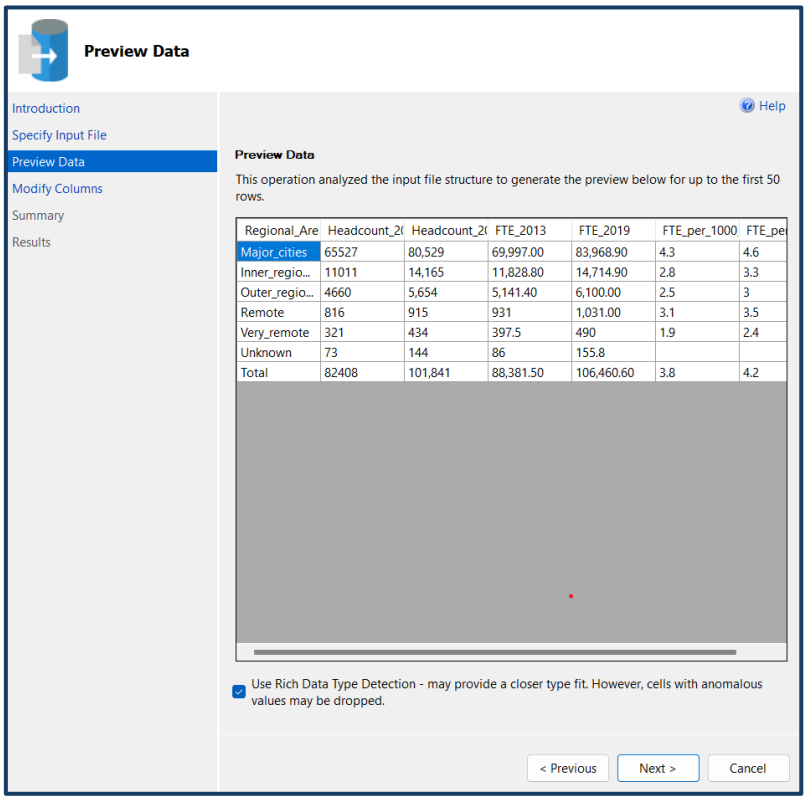
- Click next on the SQL server import and export wizard welcome page



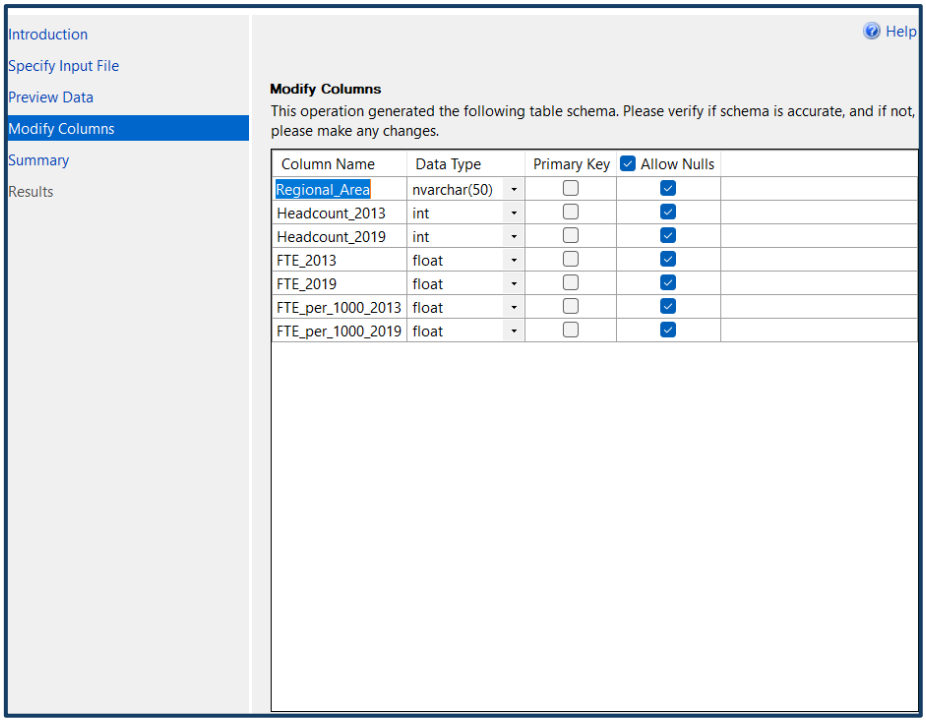
- Select flat file source as the data source and browse for the file to import.



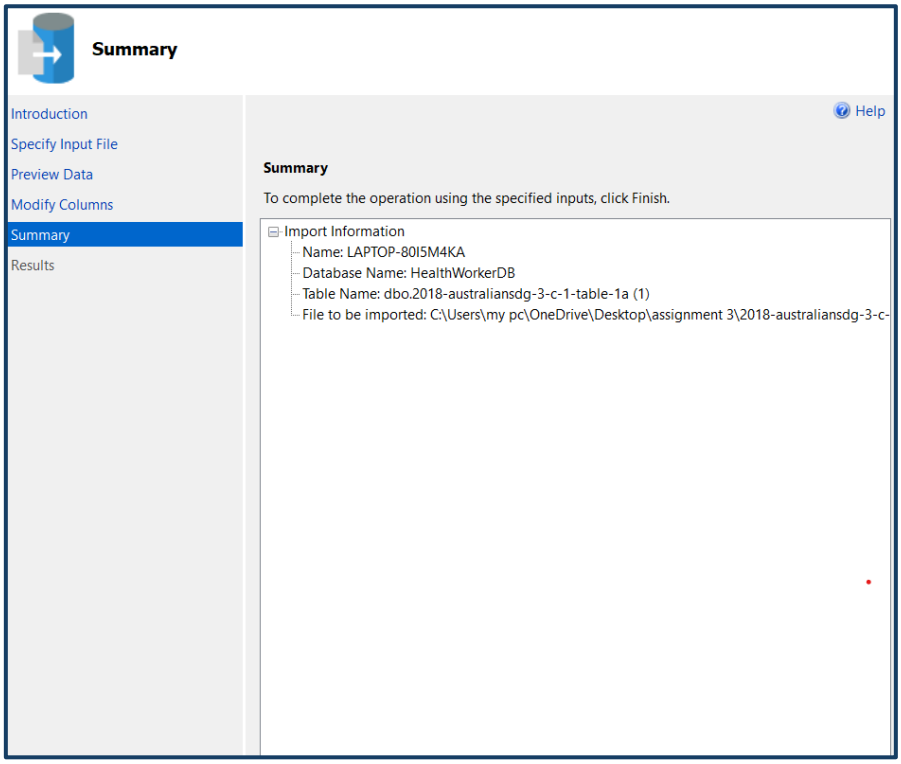
- Browse first data set you download and select next.



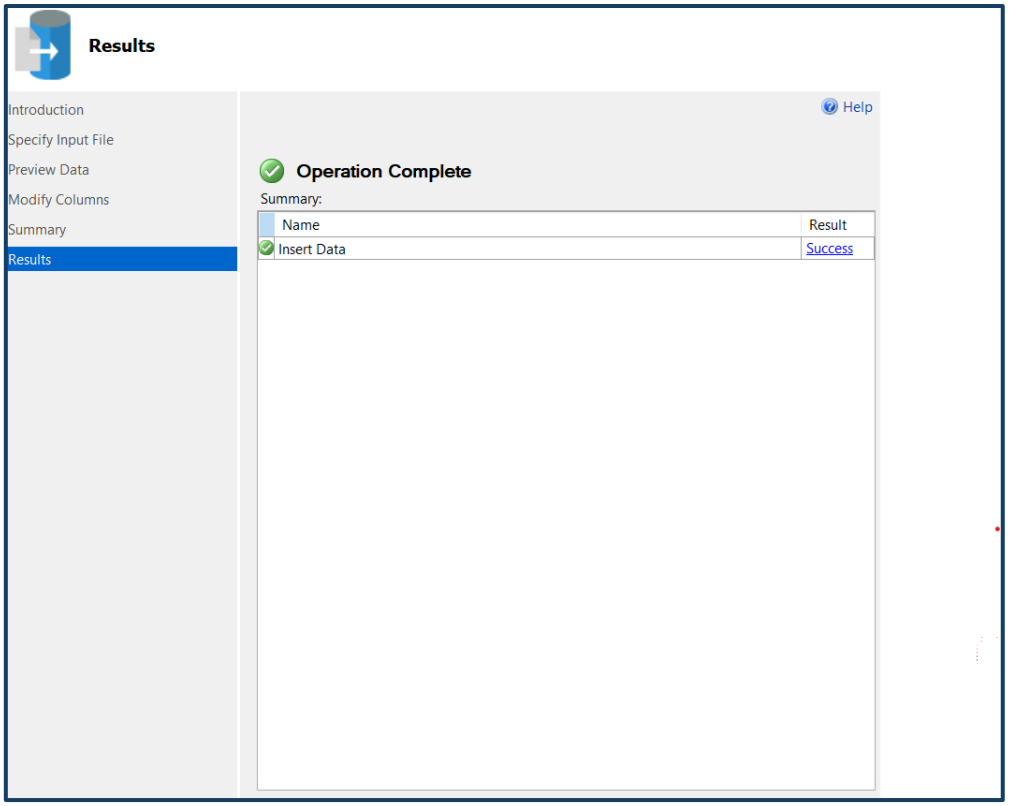
- Then this dialog box appears. Select next.



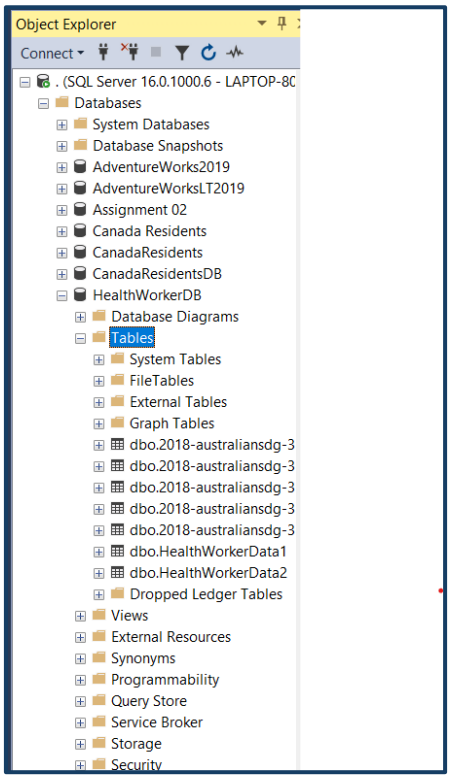
- Go to the advanced tab and change all the columns correctly and tick allow nulls.
- After changing all the columns click next.



- Click finish. The execution results dialog box appears if all went well, the data has loaded successfully.



- After you can see the new six tables in the “Health Worker DB” database.



- You must repeat the same procedure to add the other excel files to the ‘Health Worker DB’ database.

3.2 Write SQL queries

- Under a new query write and execute SQL queries to remove null values, combine and to build relationships.

- SQL will allow me efficiently to access, clean, and modify data, the analysis of the Health Worker Density and Distribution dataset required it. Queries took care of averaging and standardizing data types and substituting null entries for missing values. For example, missing values in the FTE_2013 column were filled with their average using an UPDATE query to ensure no data gaps would affect the analysis. SELECT queries were used in finding the trends of, for example, the average number of full-time employees per 1,000 people across years and regions. Key information for labour distribution was determined through aggregation processes like SUM, AVG, and MAX. At the end, these SQL processing procedures fastened the preparation of data and contributed to the creation of interactive visualizations that could easily integrate and deeply monitor the trends in the healthcare workforce and combine with power bi.

```sql
-- Combine Employed Medical Practitioners by Remoteness Area
SELECT
    'Medical Practitioners' AS Category,
    'Remoteness Area' AS [Area Type],
    [Regional_Area] AS [Area Name],
    'Headcount' AS Metric,
    2013 AS [Year],
    [Headcount_2013] AS [Value]
FROM dbo.[1 Employed medical practitioners by Remoteness Area]
WHERE [Headcount_2013] IS NOT NULL

UNION ALL

SELECT
    'Medical Practitioners' AS Category,
    'Remoteness Area' AS [Area Type],
    [Regional_Area] AS [Area Name],
    'Headcount' AS Metric,
    2019 AS [Year],
    [Headcount_2019] AS [Value]
FROM dbo.[1 Employed medical practitioners by Remoteness Area]
WHERE [Headcount_2019] IS NOT NULL

UNION ALL

SELECT
    'Medical Practitioners' AS Category,
    'MMM Area' AS [Area Type],
    [MMM_Area] AS [Area Name],
    'FTE' AS Metric,
    2013 AS [Year],
    [FTE_2013] AS [Value]
FROM dbo.[2 Employed medical practitioners by MMM]
WHERE [FTE_2013] IS NOT NULL

UNION ALL

SELECT
    'Medical Practitioners' AS Category,
    'MMM Area' AS [Area Type],
    [MMM_Area] AS [Area Name],
    'FTE' AS Metric,
    2019 AS [Year],
    [FTE_2019] AS [Value]
FROM dbo.[2 Employed medical practitioners by MMM]
WHERE [FTE_2019] IS NOT NULL
```

```sql
-- Combine Employed Nurses and Midwives by Remoteness Area
SELECT
    'Nurses and Midwives' AS Category,
    'Remoteness Area' AS [Area Type],
    [Regional_Area] AS [Area Name],
    'Headcount' AS Metric,
    2013 AS [Year],
    [Headcount_2013] AS [Value]
FROM dbo.[3 Employed nurses and midwives by Remoteness Area]
WHERE [Headcount_2013] IS NOT NULL

UNION ALL

SELECT
    'Nurses and Midwives' AS Category,
    'Remoteness Area' AS [Area Type],
    [Regional_Area] AS [Area Name],
    'Headcount' AS Metric,
    2019 AS [Year],
    [Headcount_2019] AS [Value]
FROM dbo.[3 Employed nurses and midwives by Remoteness Area]
WHERE [Headcount_2019] IS NOT NULL

UNION ALL

SELECT
    'Nurses and Midwives' AS Category,
    'Remoteness Area' AS [Area Type],
    [Regional_Area] AS [Area Name],
    'FTE per 1000' AS Metric,
    2013 AS [Year],
    [FTE_per_1000_2013] AS [Value]
FROM dbo.[3 Employed nurses and midwives by Remoteness Area]
WHERE [FTE_per_1000_2013] IS NOT NULL

UNION ALL

SELECT
    'Nurses and Midwives' AS Category,
    'Remoteness Area' AS [Area Type],
    [Regional_Area] AS [Area Name],
    'FTE per 1000' AS Metric,
    2019 AS [Year],
    [FTE_per_1000_2019] AS [Value]
FROM dbo.[3 Employed nurses and midwives by Remoteness Area]
WHERE [FTE_per_1000_2019] IS NOT NULL

UNION ALL
```

```sql
-- Combine Employed Nurses and Midwives by MMM
SELECT
    'Nurses and Midwives' AS Category,
    'MMM Area' AS [Area Type],
    [MMM_Area] AS [Area Name],
    'Headcount' AS Metric,
    2013 AS [Year],
    [Headcount_2013] AS [Value]
FROM dbo.[4 Employed nurses and midwives by MMM]
WHERE [Headcount_2013] IS NOT NULL

UNION ALL

SELECT
    'Nurses and Midwives' AS Category,
    'MMM Area' AS [Area Type],
    [MMM_Area] AS [Area Name],
    'Headcount' AS Metric,
    2019 AS [Year],
    [Headcount_2019] AS [Value]
FROM dbo.[4 Employed nurses and midwives by MMM]
WHERE [Headcount_2019] IS NOT NULL

UNION ALL

SELECT
    'Nurses and Midwives' AS Category,
    'MMM Area' AS [Area Type],
    [MMM_Area] AS [Area Name],
    'FTE per 1000' AS Metric,
    2013 AS [Year],
    [FTE_per_1000_2013] AS [Value]
FROM dbo.[4 Employed nurses and midwives by MMM]
WHERE [FTE_per_1000_2013] IS NOT NULL

UNION ALL

SELECT
    'Nurses and Midwives' AS Category,
    'MMM Area' AS [Area Type],
    [MMM_Area] AS [Area Name],
    'FTE per 1000' AS Metric,
    2019 AS [Year],
    [FTE_per_1000_2019] AS [Value]
FROM dbo.[4 Employed nurses and midwives by MMM]
WHERE [FTE_per_1000_2019] IS NOT NULL

UNION ALL
```

```sql
-- Combine Employed Allied Health Practitioners by Remoteness Area
SELECT
    'Allied Health Practitioners' AS Category,
    'Remoteness Area' AS [Area Type],
    [Regional_Area] AS [Area Name],
    'Headcount' AS Metric,
    2013 AS [Year],
    [Headcount_2013] AS [Value]
FROM dbo.[5 Employed allied health practitioners by Remoteness Area]
WHERE [Headcount_2013] IS NOT NULL

UNION ALL

SELECT
    'Allied Health Practitioners' AS Category,
    'Remoteness Area' AS [Area Type],
    [Regional_Area] AS [Area Name],
    'Headcount' AS Metric,
    2019 AS [Year],
    [Headcount_2019] AS [Value]
FROM dbo.[5 Employed allied health practitioners by Remoteness Area]
WHERE [Headcount_2019] IS NOT NULL

UNION ALL

SELECT
    'Allied Health Practitioners' AS Category,
    'Remoteness Area' AS [Area Type],
    [Regional_Area] AS [Area Name],
    'FTE per 1000' AS Metric,
    2013 AS [Year],
    [FTE_per_1000_2013] AS [Value]
FROM dbo.[5 Employed allied health practitioners by Remoteness Area]
WHERE [FTE_per_1000_2013] IS NOT NULL

UNION ALL

SELECT
    'Allied Health Practitioners' AS Category,
    'Remoteness Area' AS [Area Type],
    [Regional_Area] AS [Area Name],
    'FTE per 1000' AS Metric,
    2019 AS [Year],
    [FTE_per_1000_2019] AS [Value]
FROM dbo.[5 Employed allied health practitioners by Remoteness Area]
WHERE [FTE_per_1000_2019] IS NOT NULL

UNION ALL
```

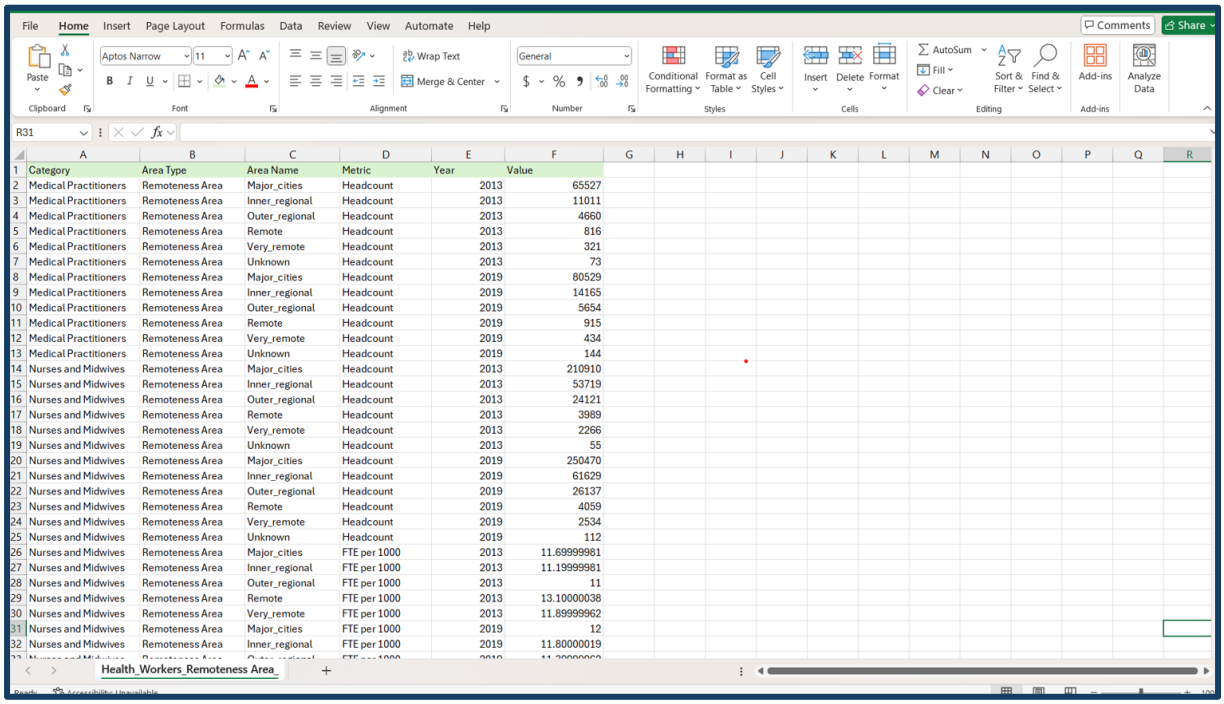
```sql
-- Combine Employed Allied Health Practitioners by MMM
SELECT
    'Allied Health Practitioners' AS Category,
    'MMM Area' AS [Area Type],
    [MMM_Area] AS [Area Name],
    'Headcount' AS Metric,
    2013 AS [Year],
    [Headcount_2013] AS [Value]
FROM dbo.[6 Employed allied health practitioners by MMM]
WHERE [Headcount_2013] IS NOT NULL

UNION ALL

SELECT
    'Allied Health Practitioners' AS Category,
    'MMM Area' AS [Area Type],
    [MMM_Area] AS [Area Name],
    'Headcount' AS Metric,
    2019 AS [Year],
    [Headcount_2019] AS [Value]
FROM dbo.[6 Employed allied health practitioners by MMM]
WHERE [Headcount_2019] IS NOT NULL

UNION ALL

SELECT
    'Allied Health Practitioners' AS Category,
    'MMM Area' AS [Area Type],
    [MMM_Area] AS [Area Name],
    'FTE' AS Metric,
    2013 AS [Year],
    [FTE_2013] AS [Value]
FROM dbo.[6 Employed allied health practitioners by MMM]
WHERE [FTE_2013] IS NOT NULL

UNION ALL

SELECT
    'Allied Health Practitioners' AS Category,
    'MMM Area' AS [Area Type],
    [MMM_Area] AS [Area Name],
    'FTE' AS Metric,
    2019 AS [Year],
    [FTE_2019] AS [Value]
FROM dbo.[6 Employed allied health practitioners by MMM]
WHERE [FTE_2019] IS NOT NULL;
```

- From SQL queries I remove all the null values, clean and combine data tables.

- From the SQL output I create another three excel sheets as follows.

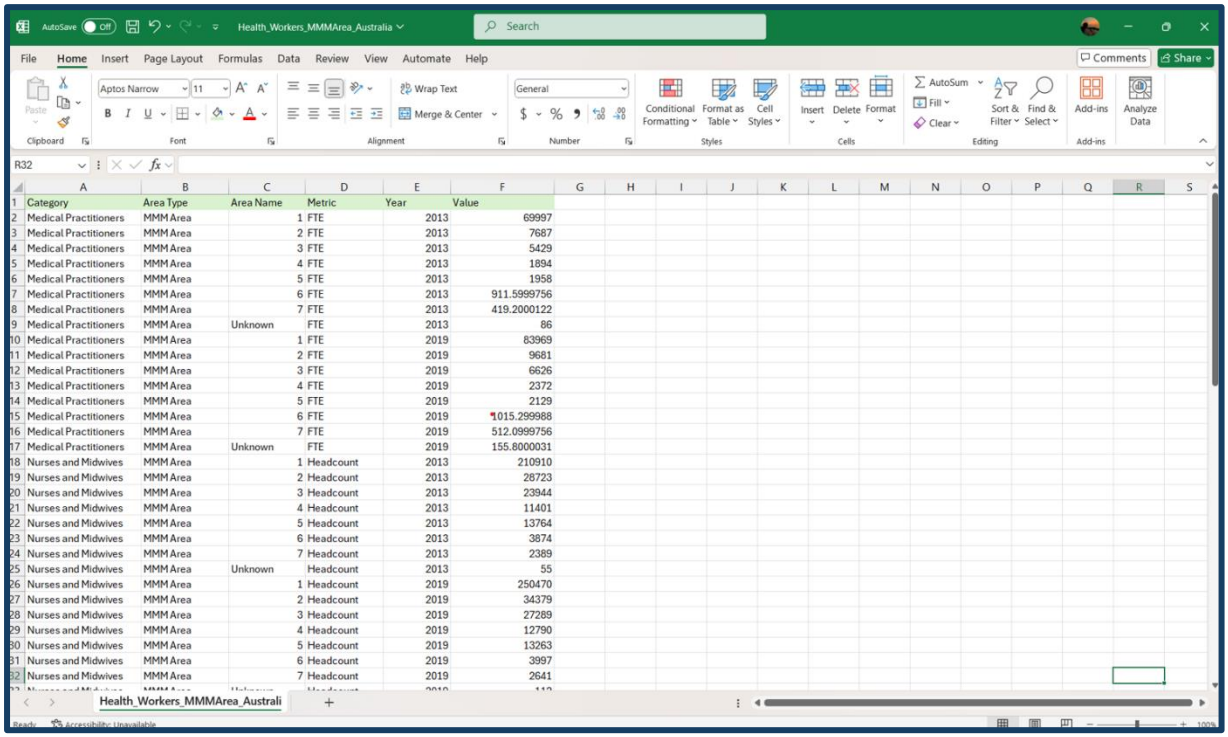
3.3 Working with Excel

- Excel sheet of remoteness of area



Category	Area Type	Area Name	Metric	Year	Value
Medical Practitioners	Remoteness Area	Major_cities	Headcount	2013	65527
Medical Practitioners	Remoteness Area	Inner_regional	Headcount	2013	11011
Medical Practitioners	Remoteness Area	Outer_regional	Headcount	2013	4660
Medical Practitioners	Remoteness Area	Remote	Headcount	2013	816
Medical Practitioners	Remoteness Area	Very_remote	Headcount	2013	321
Medical Practitioners	Remoteness Area	Unknown	Headcount	2013	73
Medical Practitioners	Remoteness Area	Major_cities	Headcount	2019	80529
Medical Practitioners	Remoteness Area	Inner_regional	Headcount	2019	14165
Medical Practitioners	Remoteness Area	Outer_regional	Headcount	2019	5654
Medical Practitioners	Remoteness Area	Remote	Headcount	2019	915
Medical Practitioners	Remoteness Area	Very_remote	Headcount	2019	434
Medical Practitioners	Remoteness Area	Unknown	Headcount	2019	144
Nurses and Midwives	Remoteness Area	Major_cities	Headcount	2013	210910
Nurses and Midwives	Remoteness Area	Inner_regional	Headcount	2013	53719
Nurses and Midwives	Remoteness Area	Outer_regional	Headcount	2013	24121
Nurses and Midwives	Remoteness Area	Remote	Headcount	2013	3989
Nurses and Midwives	Remoteness Area	Very_remote	Headcount	2013	2266
Nurses and Midwives	Remoteness Area	Unknown	Headcount	2013	55
Nurses and Midwives	Remoteness Area	Major_cities	Headcount	2019	250470
Nurses and Midwives	Remoteness Area	Inner_regional	Headcount	2019	61629
Nurses and Midwives	Remoteness Area	Outer_regional	Headcount	2019	26137
Nurses and Midwives	Remoteness Area	Remote	Headcount	2019	4059
Nurses and Midwives	Remoteness Area	Very_remote	Headcount	2019	2534
Nurses and Midwives	Remoteness Area	Unknown	Headcount	2019	112
Nurses and Midwives	Remoteness Area	Major_cities	FTE per 1000	2013	11.69999981
Nurses and Midwives	Remoteness Area	Inner_regional	FTE per 1000	2013	11.19999981
Nurses and Midwives	Remoteness Area	Outer_regional	FTE per 1000	2013	11
Nurses and Midwives	Remoteness Area	Remote	FTE per 1000	2013	13.10000038
Nurses and Midwives	Remoteness Area	Very_remote	FTE per 1000	2013	11.89999962
Nurses and Midwives	Remoteness Area	Major_cities	FTE per 1000	2019	12
Nurses and Midwives	Remoteness Area	Inner_regional	FTE per 1000	2019	11.80000019

- Excel sheet of MMM area



	A	B	C	D	E	F
1	Category	Area Type	Area Name	Metric	Year	Value
2	Medical Practitioners	MMM Area		1 FTE	2013	69997
3	Medical Practitioners	MMM Area		2 FTE	2013	7687
4	Medical Practitioners	MMM Area		3 FTE	2013	5429
5	Medical Practitioners	MMM Area		4 FTE	2013	1894
6	Medical Practitioners	MMM Area		5 FTE	2013	1958
7	Medical Practitioners	MMM Area		6 FTE	2013	911.5999756
8	Medical Practitioners	MMM Area		7 FTE	2013	419.2000122
9	Medical Practitioners	MMM Area	Unknown	FTE	2013	86
10	Medical Practitioners	MMM Area		1 FTE	2019	83969
11	Medical Practitioners	MMM Area		2 FTE	2019	9681
12	Medical Practitioners	MMM Area		3 FTE	2019	6626
13	Medical Practitioners	MMM Area		4 FTE	2019	2372
14	Medical Practitioners	MMM Area		5 FTE	2019	2129
15	Medical Practitioners	MMM Area		6 FTE	2019	1015.299988
16	Medical Practitioners	MMM Area		7 FTE	2019	512.0999756
17	Medical Practitioners	MMM Area	Unknown	FTE	2019	155.8000031
18	Nurses and Midwives	MMM Area		1 Headcount	2013	210910
19	Nurses and Midwives	MMM Area		2 Headcount	2013	28723
20	Nurses and Midwives	MMM Area		3 Headcount	2013	23944
21	Nurses and Midwives	MMM Area		4 Headcount	2013	11401
22	Nurses and Midwives	MMM Area		5 Headcount	2013	13764
23	Nurses and Midwives	MMM Area		6 Headcount	2013	3874
24	Nurses and Midwives	MMM Area		7 Headcount	2013	2389
25	Nurses and Midwives	MMM Area	Unknown	Headcount	2013	55
26	Nurses and Midwives	MMM Area		1 Headcount	2019	250470
27	Nurses and Midwives	MMM Area		2 Headcount	2019	34379
28	Nurses and Midwives	MMM Area		3 Headcount	2019	27289
29	Nurses and Midwives	MMM Area		4 Headcount	2019	12790
30	Nurses and Midwives	MMM Area		5 Headcount	2019	13263
31	Nurses and Midwives	MMM Area		6 Headcount	2019	3997
32	Nurses and Midwives	MMM Area		7 Headcount	2019	2641

- Excel sheet of total of area

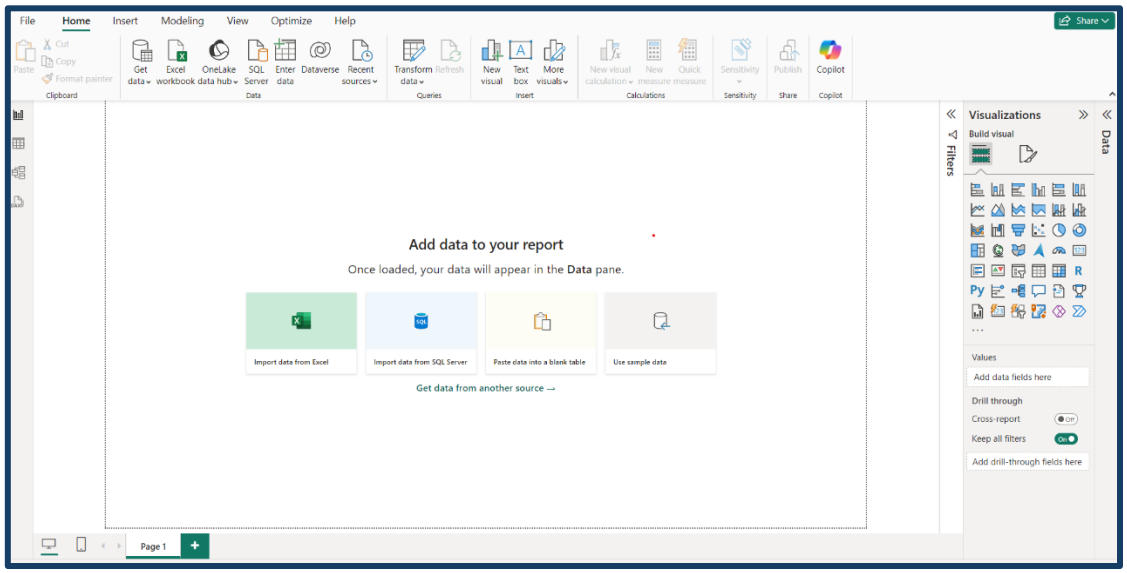
	A	B	C	D	E	F	G
1	Category	Area Type	Area Name	Year	Total Value		
2	Medical Practitioners	Remoteness Area	Headcount	2013	82408		
3	Medical Practitioners	Remoteness Area	Headcount	2019	101841		
4	Medical Practitioners	MMM Area	FTE	2013	88382		
5	Medical Practitioners	MMM Area	FTE	2019	106461		
6	Nurses and Midwives	Remoteness Area	Headcount	2013	295060		
7	Nurses and Midwives	Remoteness Area	Headcount	2019	344941		
8	Nurses and Midwives	Remoteness Area	FTE per 1000	2013	11.60000038		
9	Nurses and Midwives	Remoteness Area	FTE per 1000	2019	12		
10	Nurses and Midwives	MMM Area	Headcount	2013	295060		
11	Nurses and Midwives	MMM Area	Headcount	2019	344941		
12	Nurses and Midwives	MMM Area	FTE per 1000	2013	11.60000038		
13	Nurses and Midwives	MMM Area	FTE per 1000	2019	12		
14	Allied Health Practitioners	Remoteness Area	Headcount	2013	126527		
15	Allied Health Practitioners	Remoteness Area	Headcount	2019	178446		
16	Allied Health Practitioners	Remoteness Area	FTE per 1000	2013	5		
17	Allied Health Practitioners	Remoteness Area	FTE per 1000	2019	6.5		
18	Allied Health Practitioners	MMM Area	Headcount	2013	126527		
19	Allied Health Practitioners	MMM Area	Headcount	2019	178446		
20	Allied Health Practitioners	MMM Area	FTE	2013	115149.6016		

- Next step is, connect three excel data tables to power BI and make visualisations and insights.

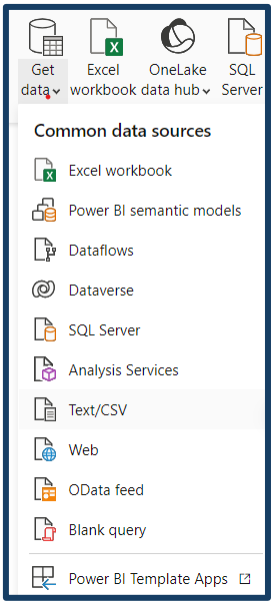
4.Dashboard design and implementation

The design and implementation of this project's dashboard had to clearly, dynamically, and with aesthetic appeal deliver insight into the Health Worker Density and Distribution dataset. Microsoft Power BI has been used for developing this dashboard, where most of the dynamic visualizations have been used to highlight major indicators of workforce trends, geographic discrepancies, and workforce growth rates.

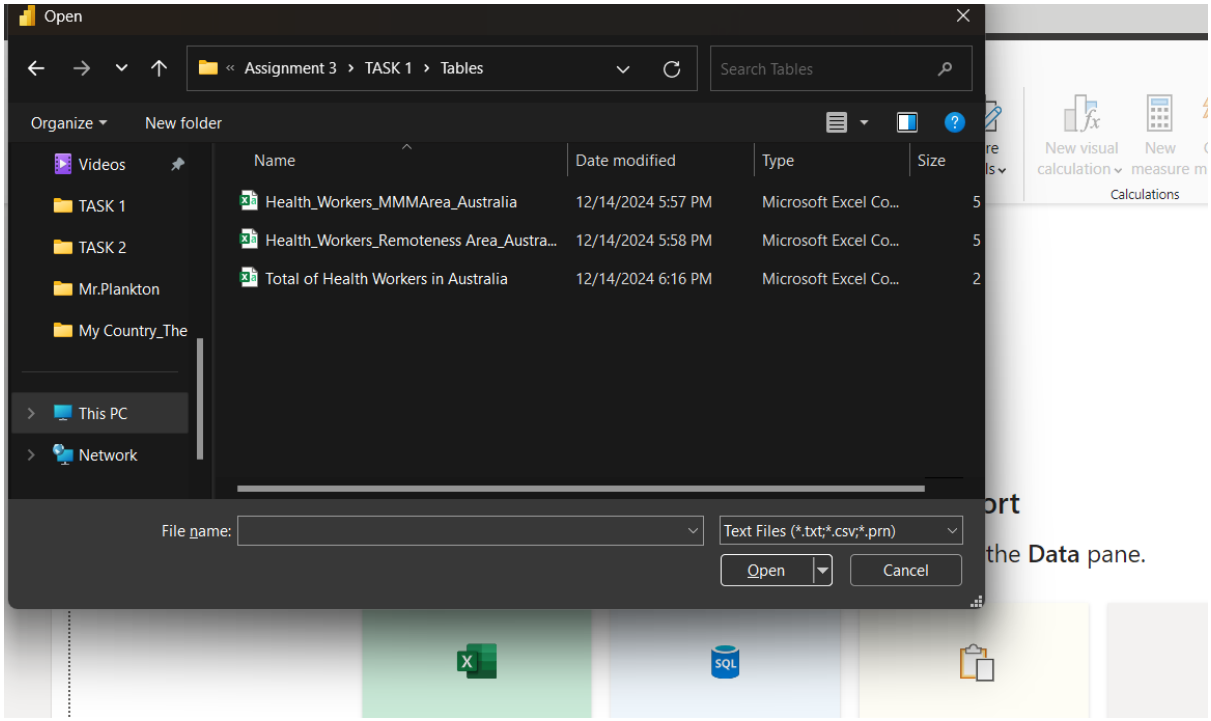
- **Open Power BI desktop**

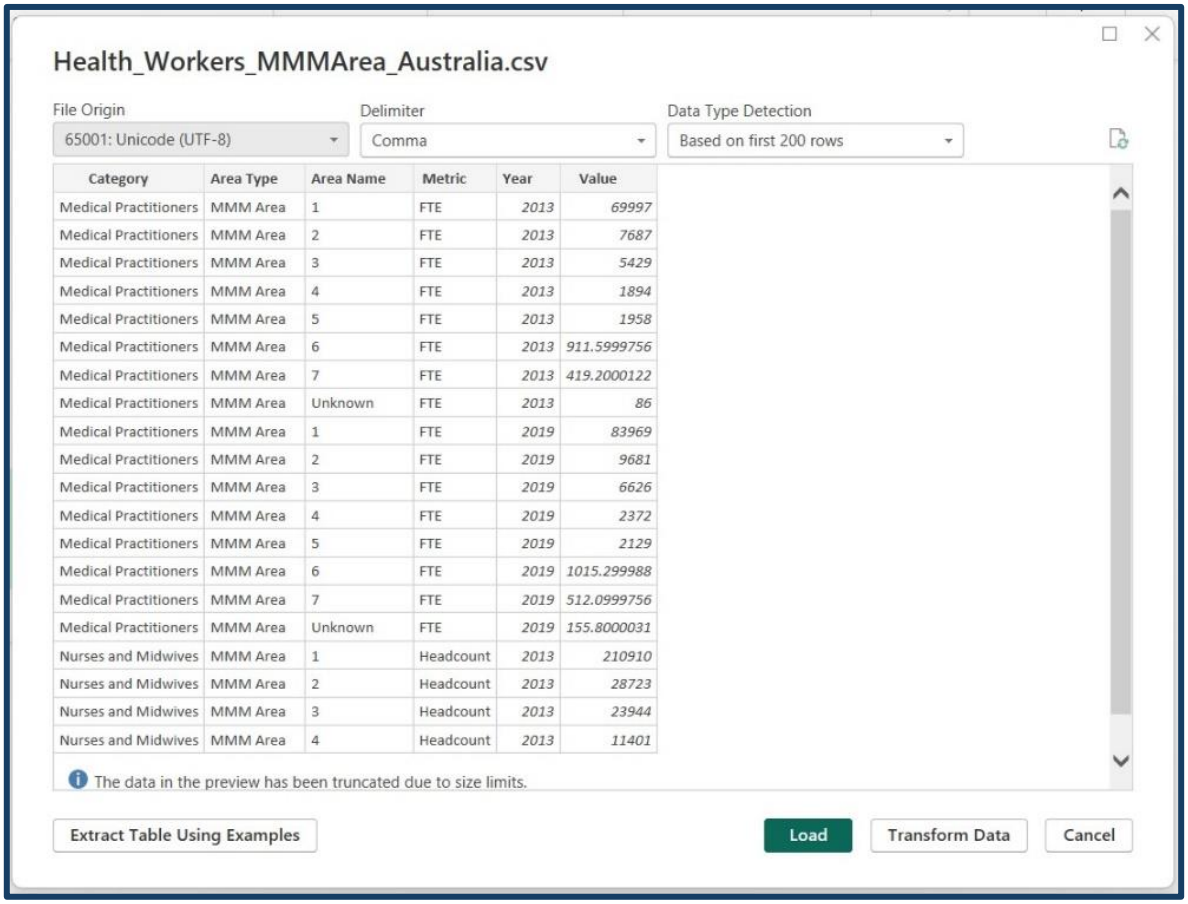


- **Select get data ——— Text/CSV**



- **From text/csv option select three excel data tables and load.**


Open
Assignment 3 › TASK 1 › Tables
Search Tables
Organize
New folder
Videos
TASK 1
TASK 2
Mr.Plankton
My Country_The
This PC
Network
Name
Date modified
Type
Size
Health_Workers_MMMArea_Australia
12/14/2024 5:57 PM
Microsoft Excel Co...
5
Health_Workers_Remoteness Area_Austra...
12/14/2024 5:58 PM
Microsoft Excel Co...
5
Total of Health Workers in Australia
12/14/2024 6:16 PM
Microsoft Excel Co...
2
File name:
Text Files (*.txt;*.csv;*.prn)
Open
Cancel
New visual calculation
New measure
Calculations
the Data pane.


Health_Workers_MMMArea_Australia.csv
File Origin
65001: Unicode (UTF-8)
Delimiter
Comma
Data Type Detection
Based on first 200 rows
Category | Area Type | Area Name | Metric | Year | Value
Medical Practitioners | MMM Area | 1 | FTE | 2013 | 69997
Medical Practitioners | MMM Area | 2 | FTE | 2013 | 7687
Medical Practitioners | MMM Area | 3 | FTE | 2013 | 5429
Medical Practitioners | MMM Area | 4 | FTE | 2013 | 1894
Medical Practitioners | MMM Area | 5 | FTE | 2013 | 1958
Medical Practitioners | MMM Area | 6 | FTE | 2013 | 911.5999756
Medical Practitioners | MMM Area | 7 | FTE | 2013 | 419.2000122
Medical Practitioners | MMM Area | Unknown | FTE | 2013 | 86
Medical Practitioners | MMM Area | 1 | FTE | 2019 | 83969
Medical Practitioners | MMM Area | 2 | FTE | 2019 | 9681
Medical Practitioners | MMM Area | 3 | FTE | 2019 | 6626
Medical Practitioners | MMM Area | 4 | FTE | 2019 | 2372
Medical Practitioners | MMM Area | 5 | FTE | 2019 | 2129
Medical Practitioners | MMM Area | 6 | FTE | 2019 | 1015.299988
Medical Practitioners | MMM Area | 7 | FTE | 2019 | 512.0999756
Medical Practitioners | MMM Area | Unknown | FTE | 2019 | 155.8000031
Nurses and Midwives | MMM Area | 1 | Headcount | 2013 | 210910
Nurses and Midwives | MMM Area | 2 | Headcount | 2013 | 28723
Nurses and Midwives | MMM Area | 3 | Headcount | 2013 | 23944
Nurses and Midwives | MMM Area | 4 | Headcount | 2013 | 11401
The data in the preview has been truncated due to size limits.
Extract Table Using Examples
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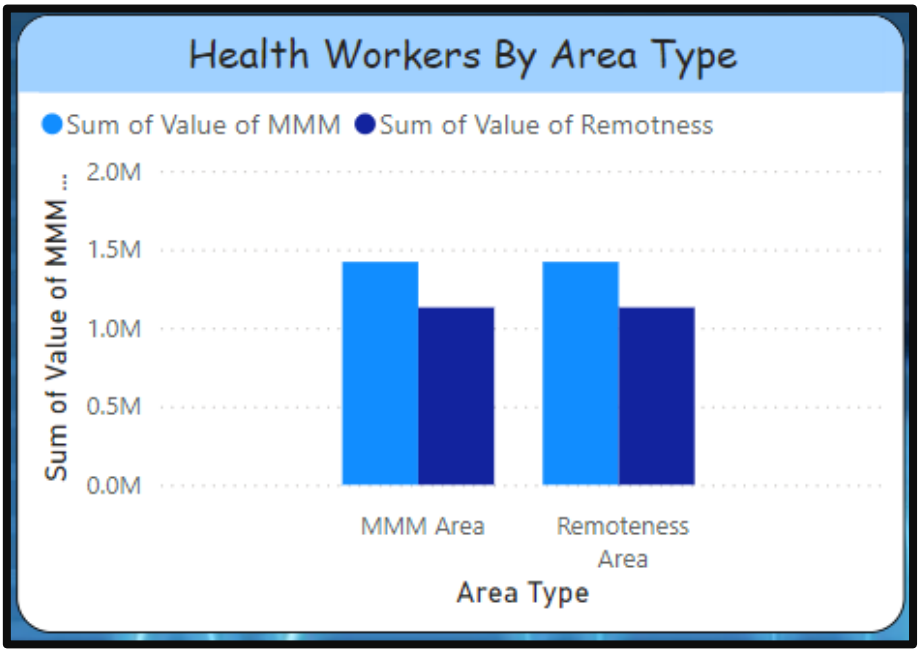
5. Visualizations and insights

5.1 Health workers by area

> Go to visualizations and select bar chart. Go to values and add columns.

X axis- Sum of value of MMM

Y axis – Area type



The graph indeed shows that the distribution of health workers differs across the two distributions of areas: "Health Workers by Area Type". These were simply divided into two: MMM Area-probably speaking to big cities or a metropolitan area-and Remoteness Area. Certainly, there is a trend that one may follow from the chart: the figures in the areas of MMM are always higher compared to the Remoteness Areas. Indeed, there is a cause for concern about unequal distribution in health personnel for access and service delivery in these remote areas, and hence it becomes more important to strategize plans to mitigate the scarcity of medical experts in these deprived areas.

5.2 category

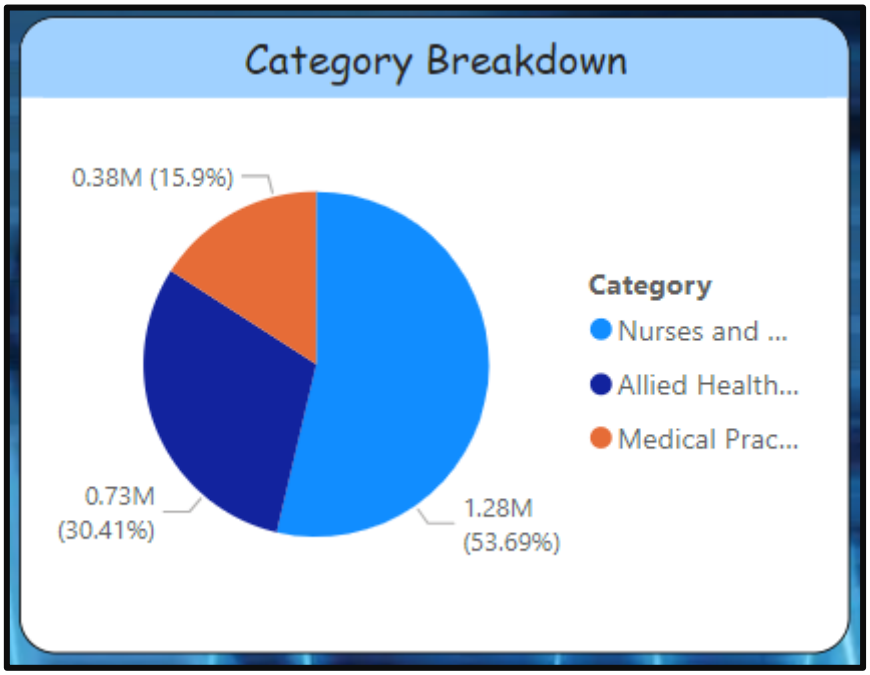
> Go to visualizations and select pie chart.

> Go to values and add,

- Nurses and midwives

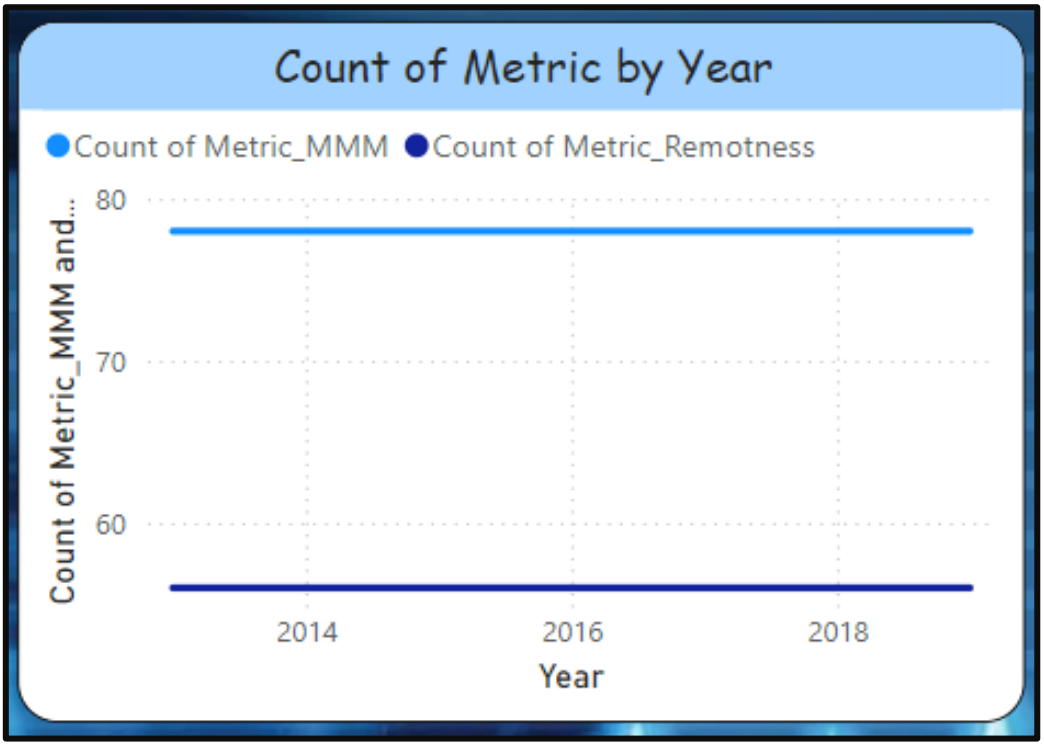
-Allied health professionals

-Medical practitioners



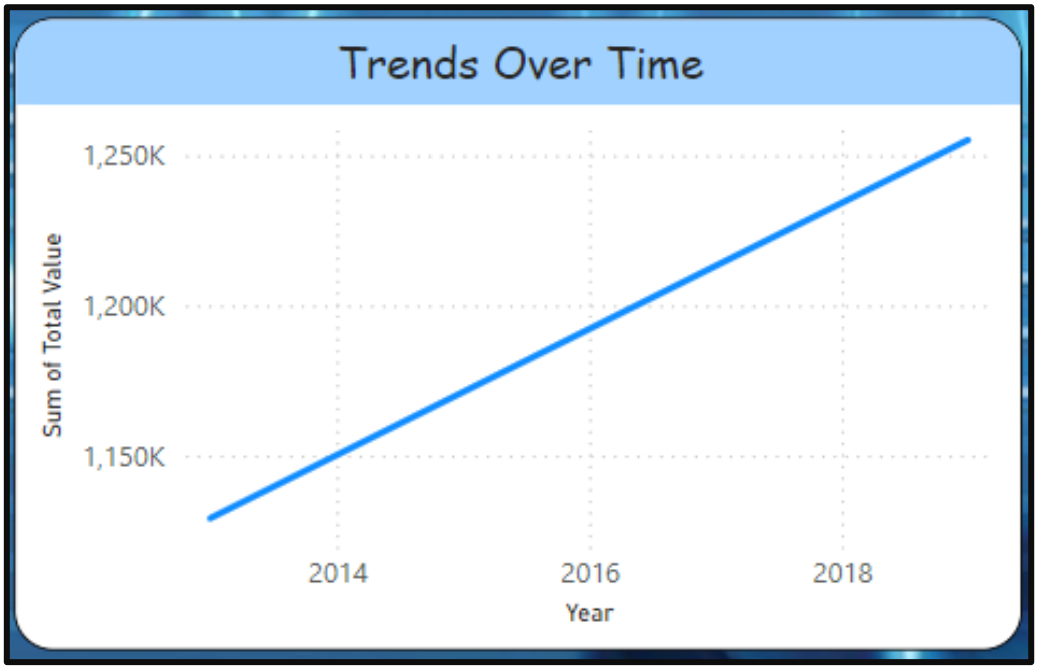
In the Category Breakdown pie chart, health workers have been dispersed into three categories; the largest of them all is taken by 53.69% Nurses and Midwives, followed by Medical Practitioners with 15.9%, while Allied Health Professionals take 30.41%. It is, therefore, from this data that Nurses and Midwives would be the most frequent and Medical Practitioners the least. The imbalance therefore raises concerns of a possible shortage of specialist medical experts; hence, there is a need for proper distribution of health workers in relative numbers across the categories to enhance comprehensive healthcare services.

5.3 Count of metric



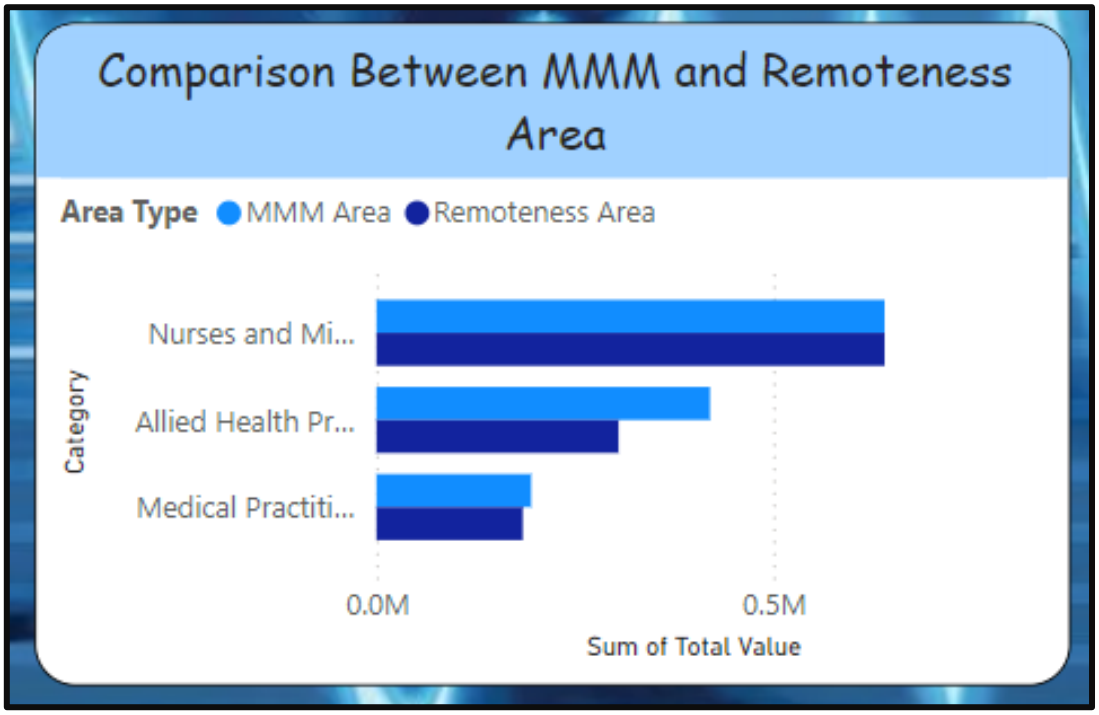
This is a line chart. A line graph entitled "Count of Metric by Year" depicts the trend in the count of health professionals in MMM and remoteness areas from 2014 to 2018. The dark blue line represents "Count of metric remoteness, " while the blue line represents "Count of Metric MMM." From this graph, it is observed that, within the period under study, there have been minimal changes in the number of health personnel in both the MMM and Remoteness regions. This indicates, at this period, either an increase or decrease in the number of health workers within these circles did not change notably.

5.4 Trends



The line chart Trends Over Time shows a consistent increase in the total value of health workers from 2014 to 2018. An increasing trend is indicative of an overall increase in either the number or presence of health personnel over this period. That upward trend would mean an increase in workforce availability, or resources, which could be related to increased spending on healthcare. On the other hand, this consistent growth also calls for further research to ensure that the growth is equitably distributed across all regions and groups so that any disparities in healthcare access can be addressed.

5.5 Comparison between two areas



The Comparison Between MMM and Remoteness Area bar chart graphically contrasts the sum of total values for several health worker categories for both MMM Areas and Remoteness Areas. From the chart, nurses and midwives are most of the health workforce in both regions, with MMM Areas having greater overall values than Remoteness Areas. Similarly, in medical practitioners and allied health professionals, the number continually comes out greater in MMM Areas. Such trends point to the inequality in the distribution of medical professionals, therefore requiring specific policies for improvement in the access to health care in the remote areas and for guaranteeing a more equal distribution of medical professionals.

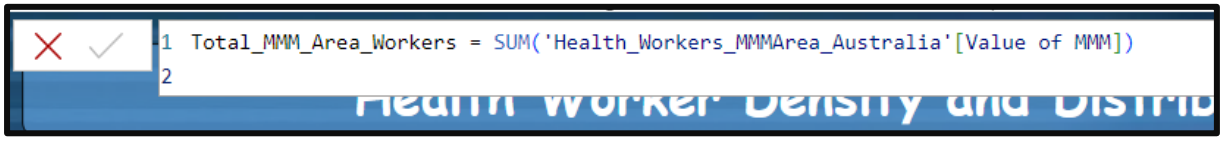
5.6 Key performance indicators

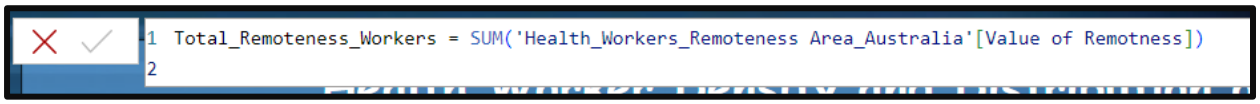
- Select KPI from visualizations.
- Create Three KPI as follows,

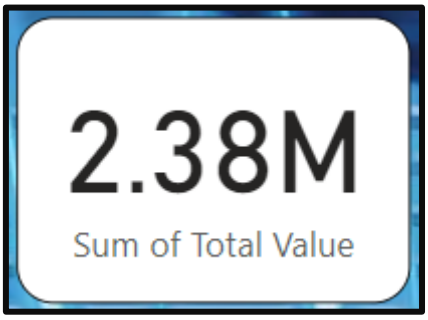
1. Sum of total values
2. Average by category
3. Sum of difference MMM remoteness

5.6.1 Sum of total values

> By writing DAX codes we can make key performance indicators.



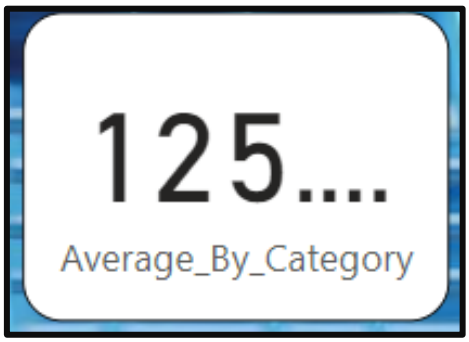




The text box in the chart displays "Sum of Total Value" as 2.38M. This most likely represents the total number of health professionals across all categories and all geographical areas in the dataset. The number 2.38M shows approximately 2.38 million health workers in total.

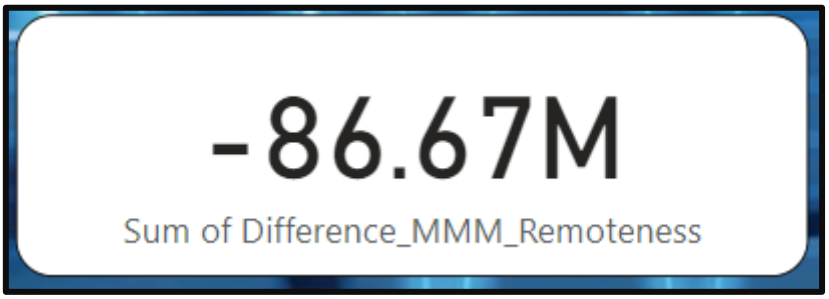
5.6.2 Average by category

```
1 Average_By_Category =
2     AVERAGE('Total of Health Workers in Australia'[Total Value])
3
```

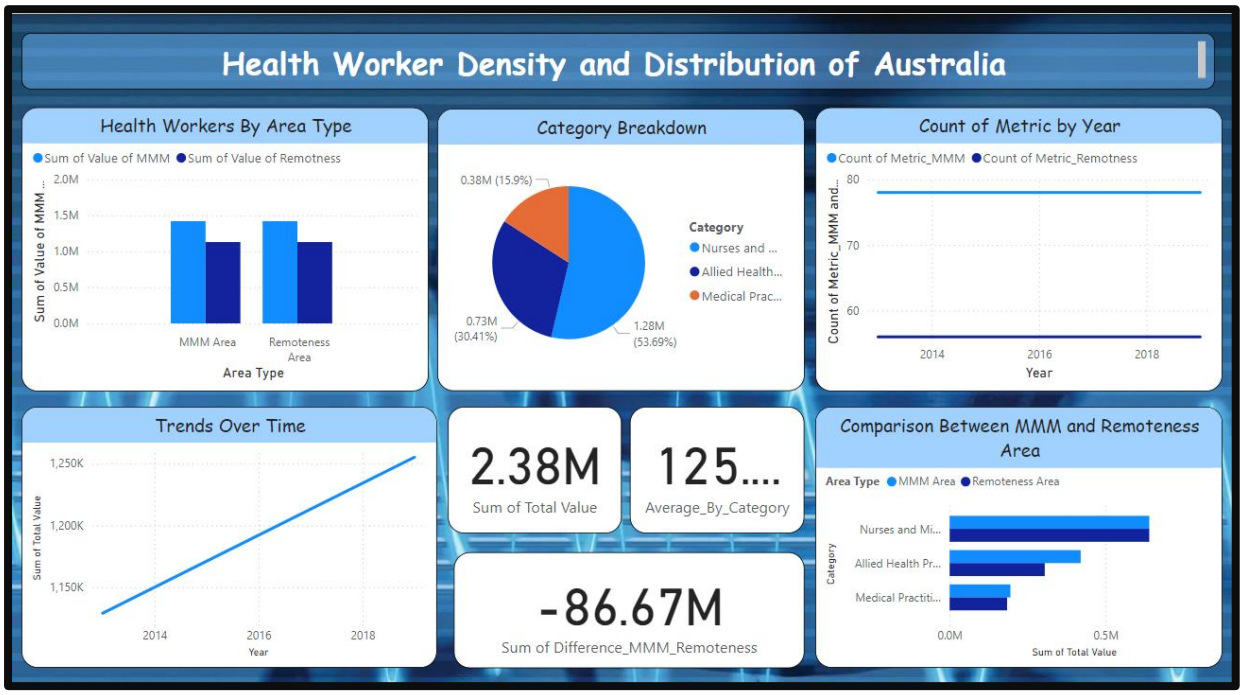


5.6.3 Sum of difference MMM remoteness

```
1 Difference_MMM_Remoteness =
2     [Total_MMM_Area_Workers] - [Total_Remoteness_Workers]
3
```



5.6.4 The final dashboard view



6. Key findings

- The distribution of health professionals according to profession consists of 53.69% for nurses and midwives, followed by 30.41% for allied health professionals and the lowest percentage, 15.9%, for medical practitioners. In contrast to Remoteness Areas, MMM Areas, which are presumably urban or metropolitan districts, always had a higher concentration of health professionals, which clearly shows significant imbalance in the distribution of health workers.

- A consistent, increasing trend in the mean value of health professionals over the period 2014 to 2018 reflects growth in general availability or resources from the workforce, most probably due to increased investment in healthcare. Even with this progress, the emerging trend demands further research to ensure the increase is equitably distributed across different regions and categories of healthcare services to iron out any potential inequalities in access.

- The unequal distribution of health workers between MMM and Remoteness Areas makes access to healthcare a challenge in more remote areas. Tailored initiatives are needed to increase healthcare access and workforce distribution in underrepresented areas, as there is a significant concentration of health professionals in urban areas. This places an urgent need for health strategies and policy changes supportive of a more equitable distribution of the workforce in areas of neglect and in rural areas to ensure even access to healthcare across the country.

7. Limitations

Possible limitations include information gaps or inconsistencies within the data, which may not reflect even current information about health worker distribution; emphasis on MMM and areas of remoteness that, by themselves, may totally dismiss communities or sub-regions within Australia with healthcare needs, while general classification of health professionals does not fully represent their comprehensive range of positions in service. Another criticism could be that the study did not consider exogenous factors, like government policy or global events such as the COVID-19 epidemic, that might influence health worker availability. More research, especially using more updated data, would give a deeper understanding, as the data analysed runs from 2014 to 2018 and might not represent current trends or needs.

8. Recommendations

All the findings pointed out that it is necessary to implement some policies to correct the maldistribution of health human resources, especially in far-flung and disadvantaged areas. This can be promoted by luring health professionals in the said areas through various incentives, such as increased salary or relocation benefits. This would further help in retaining health workers in rural and remote areas through the development of infrastructure in health and enhancing education and training programs in line with needs. Stronger links between urban and rural health systems can also be of crucial importance in ensuring a more equitable distribution of the workforce. These workforce data and health trends must be analysed regularly in order to make necessary policy changes, so that the country retains its equity in access to health services.

9. Challengers

Some of the main challenges are involved the complexity of data preparation and cleaning, particularly those with inconsistent or missing values such as null entries and duplicates. This involved being very careful with SQL queries to remove the duplicates and null values, so that the dataset would be as valid as possible for analysis. Another challenge was the unequal distribution of medical personnel between MMM and Remoteness Areas, making data interpretation difficult. I did this by focusing on the identification of significant patterns and emphasizing the inequalities in the access to healthcare, informing on the need for better distribution tactics. Secondly, this was coupled with the visualization of data, as clean charts required careful variable selection coupled with the technique of visualization to enhance this. This I did with a comprehensive but attractive chart from Power BI to ensure the findings are communicated. Lastly, the interpretation of the results considering regional healthcare disparities called for subtle understanding of the healthcare system, which I overcame through a focus on specific policy recommendations that could be used to improve access to healthcare in deprived regions.

10. Conclusion

This summary in essence, therefore, implies that there is inequality between the geographical distribution of health workers in Australia, bearing in mind that the health workforce in urban settings or areas which are MMM areas is greater compared to rural areas. The workforce composition comprises majorly nurses and midwives; however, this unequal distribution of health professionals' questions access to care in areas that have been rendered disadvantaged. Results showed a steady increase in the number of health workers from 2014 to 2018. However, specific policies and programs in the form of financial incentives, improved infrastructure, and specialized training were needed to attract and retain medical personnel in far-lying areas. To achieve equity in access to healthcare throughout the country and in the development of a multidisciplinary, effective team that can meet a broad array of regional needs, a solution for these issues shall be warranted.

11. References

- Datasets- Data.gov.au,

- Ref: https://www.theiet.org/media/5182/technical-report-writing.pdf

Thank You