HEALTH INSURANCE CLAIM - SQL CASE STUDY

Here, Juypter Notebook is used to run SQL queries and the reason being is to use python to work on queried Data and Visualize it to look at the data in effective manner and not have to use any visualization tool like PowerBI, etc.

About Dataset : Dataset contains information about patient like his/her age, number of children, patientiD, claim, bloodpressure, bmi, etc

```
#installing mysql-connector-python

pip install mysql-connector-python
```

```
Collecting mysql-connector-python
  Obtaining dependency information for mysql-connector-python from
https://files.pythonhosted.org/packages/d9/91/007a0d60fee8db4f7385075d
c50bf62d2d359b417b374ec06b06ce6c2d64/mysql_connector_python-8.3.0-
cp311-cp311-win_amd64.whl.metadata
  Downloading mysql_connector_python-8.3.0-cp311-cp311-
win_amd64.whl.metadata (2.0 kB)
Downloading mysql_connector_python-8.3.0-cp311-cp311-win_amd64.whl
(15.4 MB)
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```

```
0:00:01
   ---------------------------------------- 15.4/15.4 MB 1.1 MB/s eta
0:00:00
Installing collected packages: mysql-connector-python
Successfully installed mysql-connector-python-8.3.0
Note: you may need to restart the kernel to use updated packages.
```

```
#importing required libraries

import mysql.connector
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# making connection between mysql database and jupyter notebook

conn = mysql.connector.connect(
        host = 'localhost',
        user = 'root',
        password = '**********',
        database = 'insurance'
)

print(conn)
```

```
<mysql.connector.connection_cext.CMySQLConnection object at
0x000001C18BA08CD0>
```

```
mycursor = conn.cursor()

mycursor.execute("SELECT * FROM insurance_data")
data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)

df.head()
```

```
   index  PatientID   age gender   bmi  bloodpressure diabetic
children  \
0      0          1  39.0   male  23.2             91      Yes
0
1      1          2  24.0   male  30.1             87       No
0
2      2          3         male  33.3             82      Yes
0
3      3          4         male  33.7             80       No
0
4      4          5         male  34.1            100       No
0
```

```
  smoker     region    claim
0     No  southeast  1121.87
1     No  southeast  1131.51
2     No  southeast  1135.94
3     No  northwest  1136.40
4     No  northwest  1137.01
```

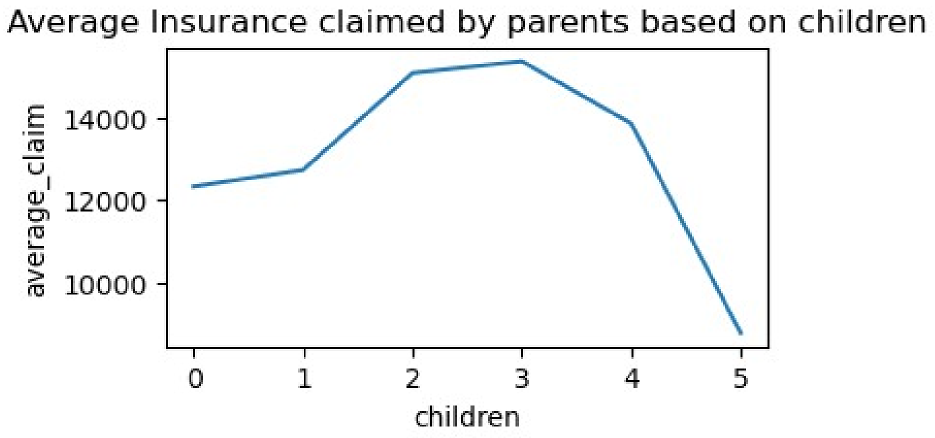
Problem 1: What are the top 5 patients who claimed the highest insurance amounts?

```
mycursor.execute("""SELECT * FROM insurance_data
                    ORDER BY claim DESC
                    Limit 5""")
data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()

   index  PatientID   age  gender   bmi  bloodpressure diabetic
children  \
0   1339       1340  30.0  female  47.4            101       No
0
1   1338       1339  37.0    male  30.4            106       No
0
2   1337       1338  30.0    male  34.5             91      Yes
3
3   1336       1337  59.0  female  38.1            120       No
1
4   1335       1336  44.0  female  35.5             88      Yes
0

  smoker     region     claim
0    Yes  southeast  63770.43
1    Yes  southeast  62592.87
2    Yes  northwest  60021.40
3    Yes  northeast  58571.07
4    Yes  northwest  55135.40
```

Problem 2: What is the average insurance claimed by patients based on the number of children they have?

```
mycursor.execute("""SELECT children, AVG(claim) as average_claim
                    FROM insurance_data
                    GROUP BY children;
                  """)
data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head(6)
```

```
   children  average_claim
0         0   12327.993160
1         1   12731.171821
2         2   15073.564000
3         3   15355.318535
4         4   13850.656800
5         5    8786.035556

plt.figure(figsize = (4,2))
sns.lineplot(data = df, x = 'children', y = 'average_claim')
plt.title("Average Insurance claimed by parents based on children")
plt.show()
```

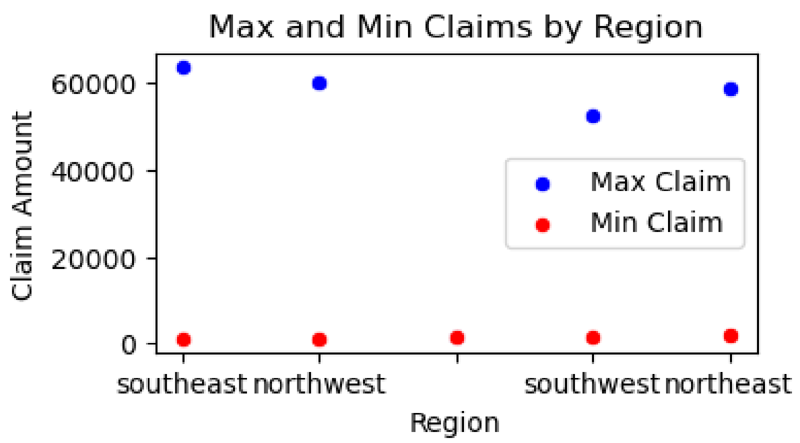


Problem 3: What is the highest and lowest claimed amount by patients in each region?

```
mycursor.execute("""SELECT region, MAX(claim), MIN(claim)
                    FROM insurance_data
                    GROUP BY region;
                  """)
data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()

      region  MAX(claim)  MIN(claim)
0  southeast    63770.43     1121.87
1  northwest    60021.40     1136.40
2                1256.30     1252.41
3  southwest    52590.83     1261.44
4  northeast    58571.07     1694.80

plt.figure(figsize = (4,2))
sns.scatterplot(x='region', y='MAX(claim)', data=df, color='blue',
label='Max Claim')
sns.scatterplot(x='region', y='MIN(claim)', data=df, color='red',
label='Min Claim')
```

```
plt.xlabel('Region')
plt.ylabel('Claim Amount')
plt.title('Max and Min Claims by Region')
plt.legend()
```

```
<matplotlib.legend.Legend at 0x1c190867e90>
```



Problem 4: What is the percentage of smokers in each age group?

```
mycursor.execute("""SELECT age,
                    COUNT(CASE WHEN smoker = 'Yes' THEN 1 END) /
COUNT(*) AS smoker_percentage
                    FROM insurance_data
                    GROUP BY age;
                  """)
data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()
```

```
    age  smoker_percentage
0  39.0             0.2692
1  24.0             0.0000
2                   0.0000
3  19.0             0.2414
4  20.0             0.3077
```

Problem 5: What is the difference between the claimed amount of each patient and the first claimed amount of that patient?

```
mycursor.execute("""SELECT patientID,
                    claim - LAG(claim) OVER() AS Difference
                    FROM insurance_data
                  """)
```

```
data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()

   patientID  Difference
0          1         NaN
1          2        9.64
2          3        4.43
3          4        0.46
4          5        0.61
```

Problem 6: For each patient, calculate the difference between their claimed amount and the average claimed amount of patients with the same number of children.

```
mycursor.execute("""
                  SELECT i1.patientId, i1.children,  MAX(i1.claim),
ROUND(i2.average_claim,2) as average_claim,
                  ROUND(MAX(i1.claim) - i2.average_claim,2) as
difference
                  FROM insurance_data as i1
                  JOIN (
                        SELECT children,
                        AVG(claim) as average_claim
                        FROM insurance_data
                        GROUP BY children
                        ) AS i2
                  ON i1.children = i2.children
                  GROUP BY i1.patientId, i1.children,
i2.average_claim;
                  """)
data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()

   patientId  children  MAX(i1.claim)  average_claim  difference
0          1         0        1121.87       12327.99   -11206.12
1          2         0        1131.51       12327.99   -11196.48
2          3         0        1135.94       12327.99   -11192.05
3          4         0        1136.40       12327.99   -11191.59
4          5         0        1137.01       12327.99   -11190.98
```

Problem 7: Show the patient with the highest BMI in each region and their respective rank.

```
mycursor.execute("""
                  SELECT region, MAX(bmi) AS maximum_bmi,
                  RANK() OVER(ORDER BY MAX(bmi) DESC) AS ranking
                  FROM insurance_data
```

```
                 GROUP BY region
                 """)
data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()

      region  maximum_bmi  ranking
0  northwest         53.1        1
1  southeast         52.6        2
2  northeast         48.1        3
3  southwest         47.6        4
4                    30.4        5
```

Problem 8: Calculate the difference between the claimed amount of each patient and the claimed amount of the patient who has the highest BMI in their region.

```
mycursor.execute("""
                 SELECT i1.patientId,  i1.region, MAX(i1.claim) as
patient_claim,
                 ROUND(i2.claim,2) as region_max_claim,
                 ROUND(MAX(i1.claim) - i2.claim,2) as difference
                 FROM insurance_data as i1
                 JOIN (
                        SELECT region, MAX(claim) as claim,
                        MAX(bmi) AS maximum_bmi
                        FROM insurance_data
                        GROUP BY region
                      ) AS i2
                 ON i1.region = i2.region
                 GROUP BY i1.patientId, i1.region, i2.claim;
               """)

data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()

   patientId     region  patient_claim  region_max_claim  difference
0       1340  southeast       63770.43          63770.43        0.00
1       1339  southeast       62592.87          63770.43    -1177.56
2       1333  southeast       49577.66          63770.43   -14192.77
3       1332  southeast       48970.25          63770.43   -14800.18
4       1331  southeast       48885.14          63770.43   -14885.29
```

Problem 9: For each patient, calculate the difference in claim amount between the patient and the patient with the highest claim amount among patients with the same bmi and smoker status, within the same region. Return the result in descending order difference.

```
mycursor.execute("""
                  SELECT i1.patientId,
                  i1.region, MAX(i1.claim) as patient_claim,
                  ROUND(i2.claim,2) as region_max_claim,
                  ROUND(MAX(i1.claim) - i2.claim,2) as difference
                  FROM insurance_data as i1
                  JOIN (
                         SELECT region, MAX(claim) as claim,
                         MAX(bmi) AS maximum_bmi,
                         smoker
                         FROM insurance_data
                         GROUP BY region, bmi, smoker
                       ) AS i2
                  ON i1.region = i2.region
                  AND i1.bmi =  maximum_bmi
                  AND i1.smoker = i2.smoker
                  GROUP BY i1.patientId, i1.region, i2.claim
                  ORDER BY difference DESC;
                """)

data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()
```

```
   patientId     region  patient_claim  region_max_claim  difference
0          8  northwest        1146.80           1146.80         0.0
1          9  northwest        1149.40           1149.40         0.0
2         10  northwest        1163.46           1163.46         0.0
3         11  northwest        1241.57           1241.57         0.0
4         12  northwest        1242.26           1242.26         0.0
```

Problem 10: For each patient, find the maximum BMI value among their next three records (ordered by age).

```
mycursor.execute("""
                  SELECT patientiD, age,
                  MAX(bmi) OVER(rows between 3 preceding and current
row) as bmi
                  FROM insurance_data
                  ORDER BY age

                """)

data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()
```

```
   patientiD age   bmi
0          3      33.3
1          4      33.7
2          5      34.1
3          6      34.4
4          7      37.3
```

Problem 11: For each patient, find the rolling average of the last 2 claims.

```
mycursor.execute("""
                  SELECT patientiD,
                  AVG(SUM(claim)) OVER(ROWS Between 2 preceding and
current Row) as rolling_avg
                  FROM insurance_data
                  GROUP BY patientiD;
                """)

data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()
```

```
   patientiD  rolling_avg
0          1  1121.870000
1          2  1126.690000
2          3  1129.773333
3          4  1134.616667
4          5  1136.450000
```

Problem 12: Find the first claimed insurance value for male and female patients, within each region order the data by patient age in ascending order, and only include patients who are non-diabetic and have a bmi value between 25 and 30.

```
mycursor.execute("""
                  SELECT * FROM ( SELECT patientiD,gender, age,
region, claim,
                                  ROW_NUMBER() OVER(partition by
gender order by age) AS ranking
                                  FROM insurance_data
                                  WHERE diabetic = 'No' AND bmi >= 25
AND bmi <= 30) as t
                  WHERE t.ranking = 1
                  ORDER BY age
                """)

data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()
```

```
   patientiD  gender   age     region    claim  ranking
0         42    male  18.0  northwest  1635.73        1
1        285  female  25.0  northwest  4189.11        1
```

Problem 13: Find the distribution of claimed insurance value for male and female patients, within each region order the data by patient age in ascending order, and only include patients who are non-diabetic and have a bmi value between 25 and 30.

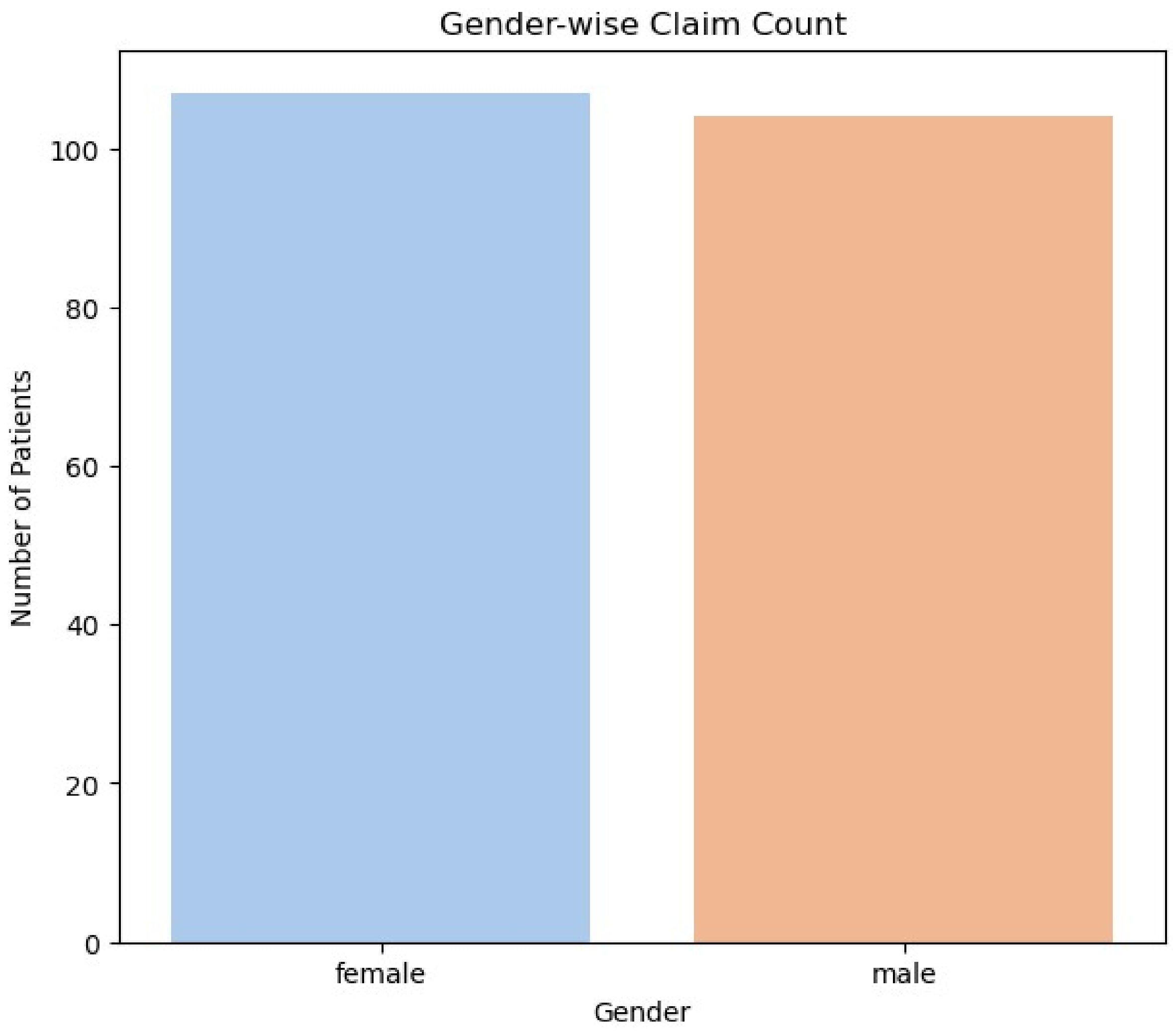
```
mycursor.execute("""
                  SELECT * FROM ( SELECT patientiD,gender, age,
region, claim,
                                  ROW_NUMBER() OVER(partition by
gender order by age) AS ranking
                                  FROM insurance_data
                                  WHERE diabetic = 'No' AND bmi >= 25
AND bmi <= 30) as t
                  ORDER BY ranking
                """)

data = mycursor.fetchall()

df = pd.DataFrame(data, columns=mycursor.column_names)
df.head()
```

```
   patientiD  gender   age     region    claim  ranking
0        285  female  25.0  northwest  4189.11        1
1         42    male  18.0  northwest  1635.73        1
2        703  female  26.0  southwest  9861.03        2
3        565    male  18.0  southeast  7742.11        2
4        508  female  26.0  southwest  7050.64        3
```

```
plt.figure(figsize = (4,2))
gender_counts = df.groupby('gender')['patientiD'].nunique()
plt.figure(figsize=(7, 6))
ax = sns.barplot(x=gender_counts.index, y=gender_counts.values,
palette='pastel')
ax.set_title("Gender-wise Claim Count", y=1)
ax.set_xlabel('Gender')
ax.set_ylabel('Number of Patients')
```

```
Text(0, 0.5, 'Number of Patients')
```

```
<Figure size 400x200 with 0 Axes>
```


Gender-wise Claim Count
Number of Patients
0
20
40
60
80
100
female
male
Gender