final

September 20, 2024

```
[22]: import pandas as pd
      import sqlite3
      import matplotlib.pyplot as plt
      import seaborn as sns
```

```
[23]: # Load the CSV data
      file_path = 'Regulatory Affairs of Road Accident Data 2020 India.csv'
      df = pd.read_csv(file_path)
```

```
[24]: df.head()
```

```
[24]:   Million Plus Cities   Cause category        Cause Subcategory  \
     0                Agra  Traffic Control  Flashing Signal/Blinker
     1                Agra  Traffic Control  Flashing Signal/Blinker
     2                Agra  Traffic Control  Flashing Signal/Blinker
     3                Agra  Traffic Control  Flashing Signal/Blinker
     4                Agra  Traffic Control  Flashing Signal/Blinker

              Outcome of Incident  Count
     0         Greviously Injured    0.0
     1               Minor Injury    0.0
     2             Persons Killed    0.0
     3              Total Injured    0.0
     4  Total number of Accidents    0.0
```

```
[25]: df.tail()
```

```
[25]:      Million Plus Cities Cause category Cause Subcategory  \
     9545               Vizaq        Weather       Sunny/Clear
     9546               Vizaq        Weather       Sunny/Clear
     9547               Vizaq        Weather       Sunny/Clear
     9548               Vizaq        Weather       Sunny/Clear
     9549               Vizaq        Weather       Sunny/Clear

                 Outcome of Incident   Count
     9545         Greviously Injured   561.0
     9546               Minor Injury   252.0
```

```
9547              Persons Killed   176.0
9548  Total number of Accidents  1207.0
9549               Total Injured   813.0
```

[26]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9550 entries, 0 to 9549
Data columns (total 5 columns):
 #   Column               Non-Null Count  Dtype
---  ------               --------------  -----
 0   Million Plus Cities  9550 non-null   object
 1   Cause category       9550 non-null   object
 2   Cause Subcategory    9550 non-null   object
 3   Outcome of Incident  9550 non-null   object
 4   Count                9547 non-null   float64
dtypes: float64(1), object(4)
memory usage: 373.2+ KB
```

[27]:
```
# Check for missing values
print(df.isnull().sum())
```

```
Million Plus Cities    0
Cause category         0
Cause Subcategory      0
Outcome of Incident    0
Count                  3
dtype: int64
```

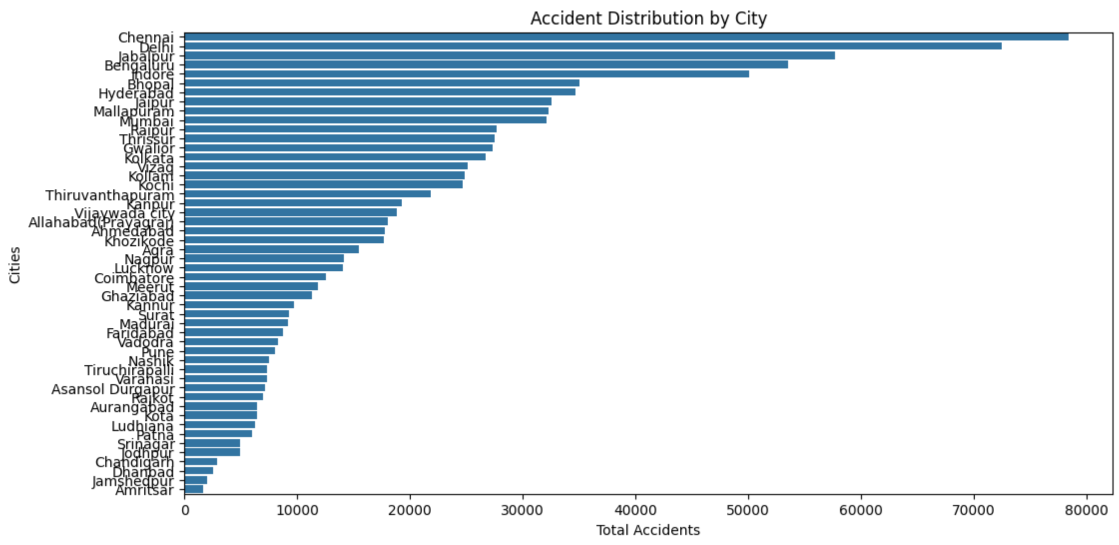
[28]:
```
# Handle missing values (e.g., filling with zero or dropping)
df.fillna(0, inplace=True)
```

[29]:
```
# Create an SQLite connection
conn = sqlite3.connect('road_accidents.db')
cursor = conn.cursor()

# Create a table in SQLite for the dataset
df.to_sql('accidents', conn, if_exists='replace', index=False)

# Verify the table creation
cursor.execute("SELECT * FROM accidents LIMIT 5").fetchall()
```

[29]:
```
[('Agra',
  'Traffic Control',
  'Flashing Signal/Blinker',
  'Greviously Injured',
  0.0),
 ('Agra', 'Traffic Control', 'Flashing Signal/Blinker', 'Minor Injury', 0.0),
 ('Agra', 'Traffic Control', 'Flashing Signal/Blinker', 'Persons Killed', 0.0),
 ('Agra', 'Traffic Control', 'Flashing Signal/Blinker', 'Total Injured', 0.0),
 ('Agra',
  'Traffic Control',
  'Flashing Signal/Blinker',
  'Total number of Accidents',
  0.0)]
```

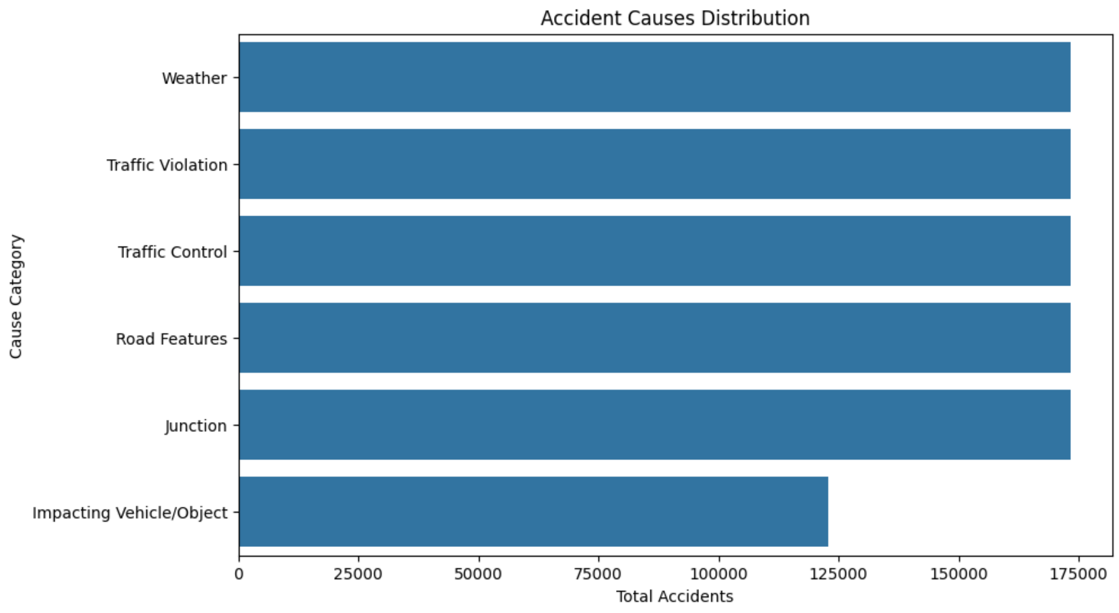
[30]:
```
print("Accident Distribution Across Cities")
# SQL Query to count accidents by city
query_city_accidents = """
SELECT "Million Plus Cities", SUM(Count) as Total_Accidents
FROM accidents
GROUP BY "Million Plus Cities"
ORDER BY Total_Accidents DESC
"""
city_accidents = pd.read_sql_query(query_city_accidents, conn)

plt.figure(figsize=(12, 6))
sns.barplot(y=city_accidents['Million Plus Cities'],␣
 ↪x=city_accidents['Total_Accidents'])
plt.title('Accident Distribution by City')
plt.xlabel('Total Accidents')
plt.ylabel('Cities')
plt.show()
```

```
Accident Distribution Across Cities
```



```
[31]: print("Accident Causes Analysis")
# SQL Query to get the count of accidents by Cause category
query_cause_accidents = """
SELECT "Cause category", SUM(Count) as Total_Accidents
FROM accidents
GROUP BY "Cause category"
ORDER BY Total_Accidents DESC
"""
cause_accidents = pd.read_sql_query(query_cause_accidents, conn)

# Plotting Accident Causes
plt.figure(figsize=(10, 6))
sns.barplot(y=cause_accidents['Cause category'],␣
 ↪x=cause_accidents['Total_Accidents'])
plt.title('Accident Causes Distribution')
plt.xlabel('Total Accidents')
plt.ylabel('Cause Category')
plt.show()
```

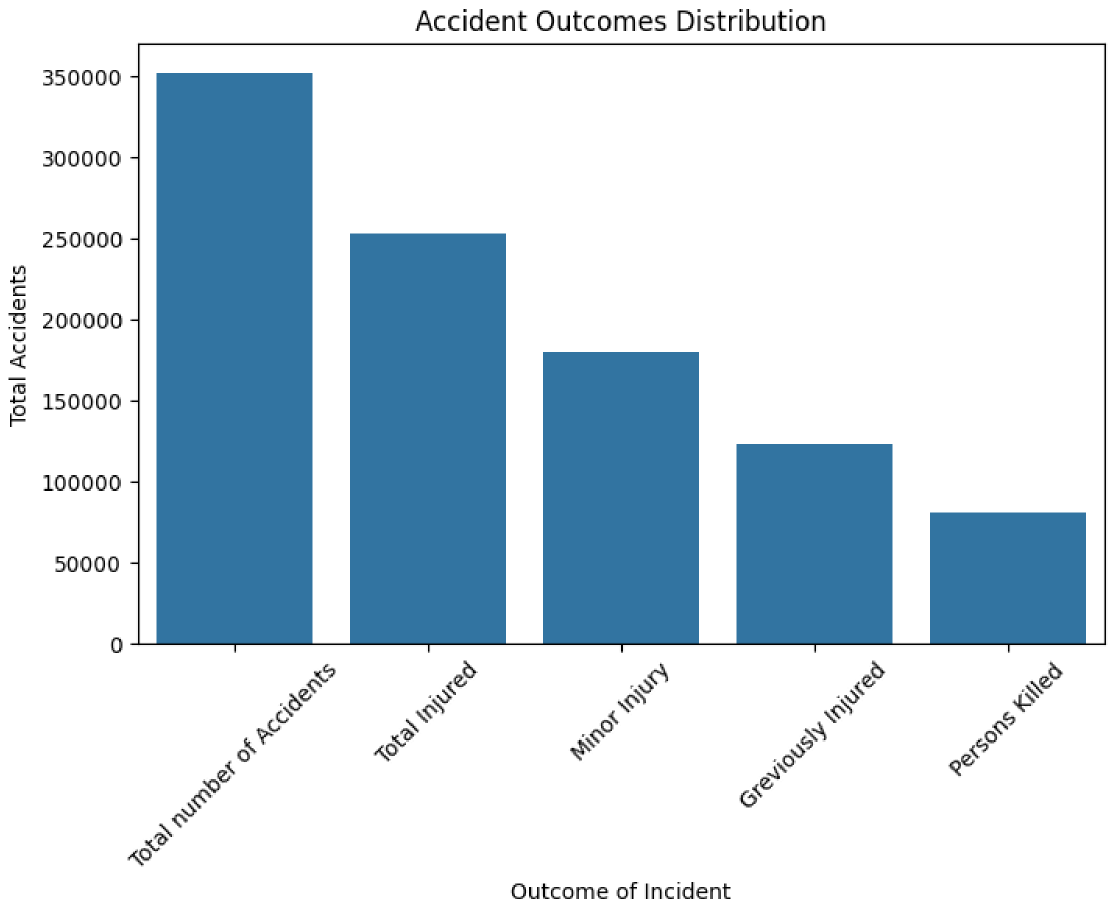
```
Accident Causes Analysis
```



```
[32]: print("Outcomes of Accidents")
# SQL Query to get the count of accidents by Outcome of Incident
query_outcome_accidents = """
SELECT "Outcome of Incident", SUM(Count) as Total_Accidents
FROM accidents
GROUP BY "Outcome of Incident"
```

```
ORDER BY Total_Accidents DESC
"""
outcome_accidents = pd.read_sql_query(query_outcome_accidents, conn)

# Plotting Accident Outcomes
plt.figure(figsize=(8, 5))
sns.barplot(x=outcome_accidents['Outcome of Incident'],␣
 ↪y=outcome_accidents['Total_Accidents'])
plt.title('Accident Outcomes Distribution')
plt.xlabel('Outcome of Incident')
plt.ylabel('Total Accidents')
plt.xticks(rotation=45)
plt.show()
```

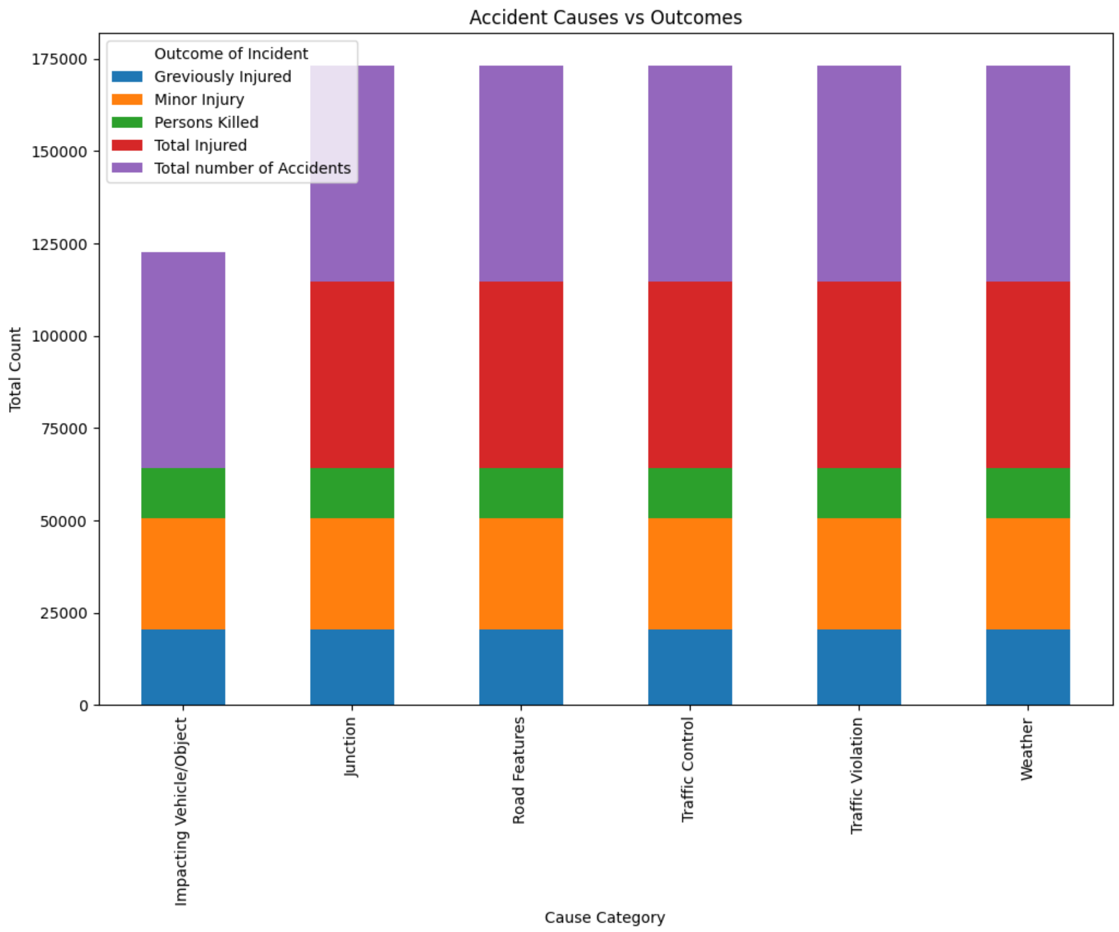
```
Outcomes of Accidents
```



[33]:
```
print("Accident Causes vs Outcomes")
# SQL Query to analyze Cause category vs Outcome
```

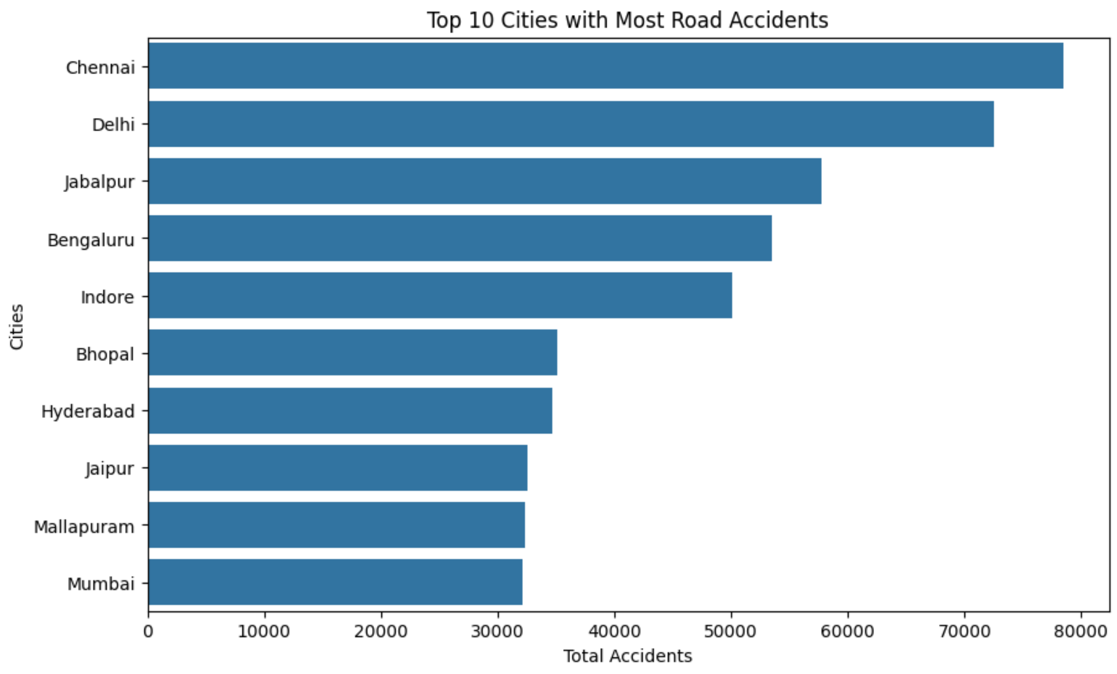
```
query_cause_vs_outcome = """
SELECT "Cause category", "Outcome of Incident", SUM(Count) as Total_Count
FROM accidents
GROUP BY "Cause category", "Outcome of Incident"
"""
cause_vs_outcome = pd.read_sql_query(query_cause_vs_outcome, conn)

# Pivoting the data for stacked bar plot
cause_outcome_pivot = cause_vs_outcome.pivot(index='Cause category',␣
 ↪columns='Outcome of Incident', values='Total_Count')

# Plotting stacked bar plot
cause_outcome_pivot.plot(kind='bar', stacked=True, figsize=(12, 8))
plt.title('Accident Causes vs Outcomes')
plt.xlabel('Cause Category')
plt.ylabel('Total Count')
plt.show()
```

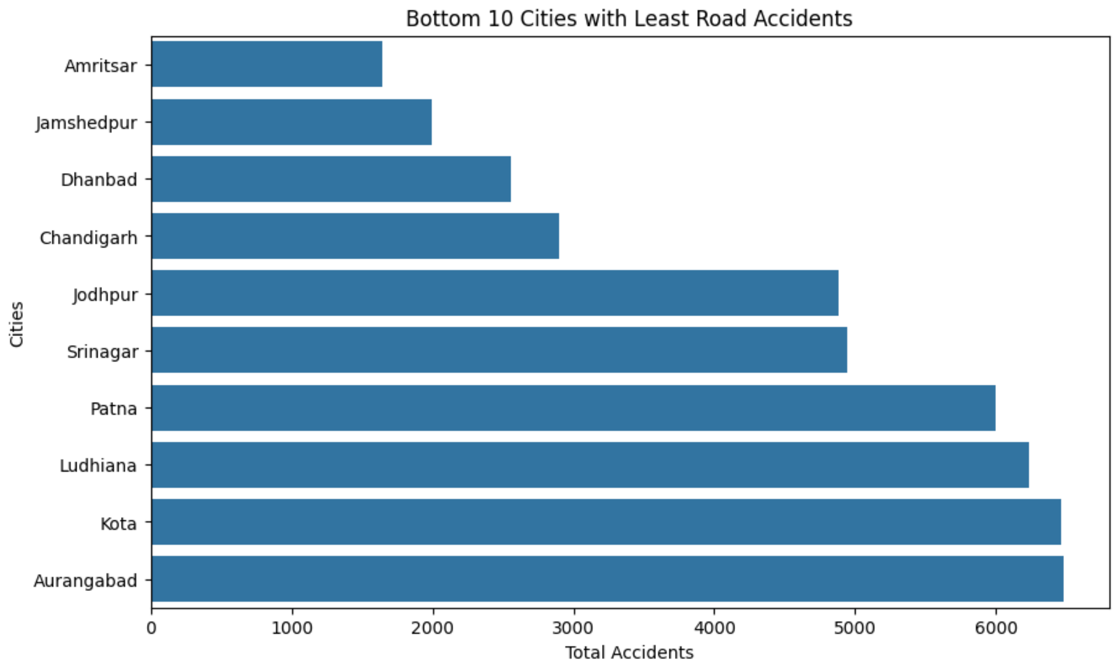
```
Accident Causes vs Outcomes
```



```
[34]: print("Top 10 Cities with the Most and Least Accidents")
      # SQL Query to get top 10 cities with the most accidents
      query_top_cities = """
      SELECT "Million Plus Cities", SUM(Count) as Total_Accidents
      FROM accidents
      GROUP BY "Million Plus Cities"
      ORDER BY Total_Accidents DESC
      LIMIT 10
      """
      top_cities = pd.read_sql_query(query_top_cities, conn)

      # Plot top 10 cities
      plt.figure(figsize=(10, 6))
      sns.barplot(y=top_cities['Million Plus Cities'],␣
       ↪x=top_cities['Total_Accidents'])
      plt.title('Top 10 Cities with Most Road Accidents')
      plt.xlabel('Total Accidents')
      plt.ylabel('Cities')
      plt.show()

      # SQL Query to get bottom 10 cities with the least accidents
      query_least_cities = """
      SELECT "Million Plus Cities", SUM(Count) as Total_Accidents
      FROM accidents
      GROUP BY "Million Plus Cities"
      ORDER BY Total_Accidents ASC
      LIMIT 10
      """
      least_cities = pd.read_sql_query(query_least_cities, conn)

      # Plot bottom 10 cities
      plt.figure(figsize=(10, 6))
      sns.barplot(y=least_cities['Million Plus Cities'],␣
       ↪x=least_cities['Total_Accidents'])
      plt.title('Bottom 10 Cities with Least Road Accidents')
      plt.xlabel('Total Accidents')
      plt.ylabel('Cities')
      plt.show()
```

```
Top 10 Cities with the Most and Least Accidents
```

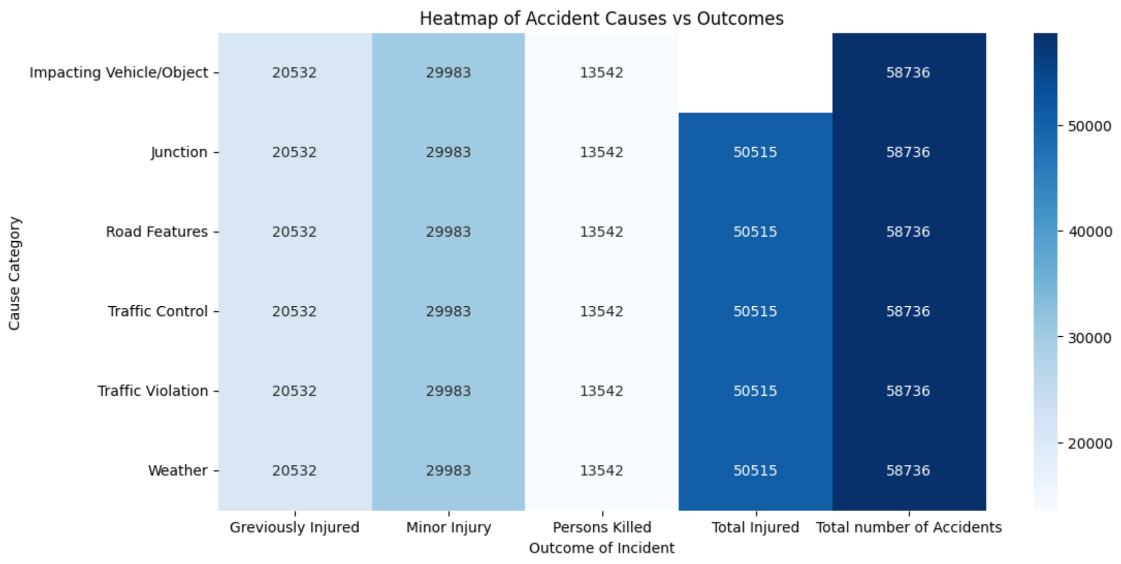




[35]:
```
print("Correlation Between Accident Causes and Outcomes")
# SQL Query to group accidents by cause and outcome
query_cause_outcome_corr = """
```

```
SELECT "Cause category", "Outcome of Incident", SUM(Count) as Total_Count
FROM accidents
GROUP BY "Cause category", "Outcome of Incident"
"""
cause_outcome_corr = pd.read_sql_query(query_cause_outcome_corr, conn)

# Correlation matrix between Cause Category and Outcome
cause_outcome_pivot_corr = cause_outcome_corr.pivot(index='Cause category',␣
↪columns='Outcome of Incident', values='Total_Count')

# Plot heatmap of correlation
plt.figure(figsize=(12, 6))
sns.heatmap(cause_outcome_pivot_corr, annot=True, fmt="g", cmap="Blues")
plt.title('Heatmap of Accident Causes vs Outcomes')
plt.xlabel('Outcome of Incident')
plt.ylabel('Cause Category')
plt.show()
```

```
Correlation Between Accident Causes and Outcomes
```

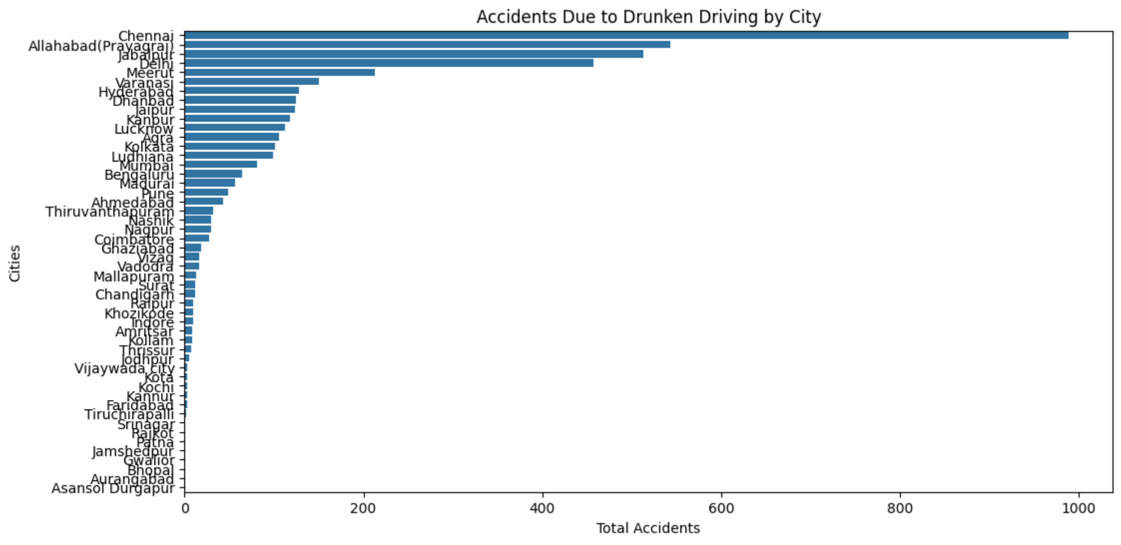


Cause Category	Greviously Injured	Minor Injury	Persons Killed	Total Injured	Total number of Accidents
Impacting Vehicle/Object	20532	29983	13542		58736
Junction	20532	29983	13542	50515	58736
Road Features	20532	29983	13542	50515	58736
Traffic Control	20532	29983	13542	50515	58736
Traffic Violation	20532	29983	13542	50515	58736
Weather	20532	29983	13542	50515	58736

[36]:
```
print("Analysis of Specific Accident Types ")
# SQL Query to analyze accidents caused by Drunken Driving
query_drunken_driving = """
SELECT "Million Plus Cities", "Cause Subcategory", SUM(Count) as Total_Accidents
FROM accidents
WHERE "Cause Subcategory" = 'Drunken Driving/ Consumption of alcohol and drug'
GROUP BY "Million Plus Cities"
ORDER BY Total_Accidents DESC
```

```
"""
drunken_driving = pd.read_sql_query(query_drunken_driving, conn)

# Plot accidents caused by drunken driving
plt.figure(figsize=(12, 6))
sns.barplot(y=drunken_driving['Million Plus Cities'],␣
 ↪x=drunken_driving['Total_Accidents'])
plt.title('Accidents Due to Drunken Driving by City')
plt.xlabel('Total Accidents')
plt.ylabel('Cities')
plt.show()
```

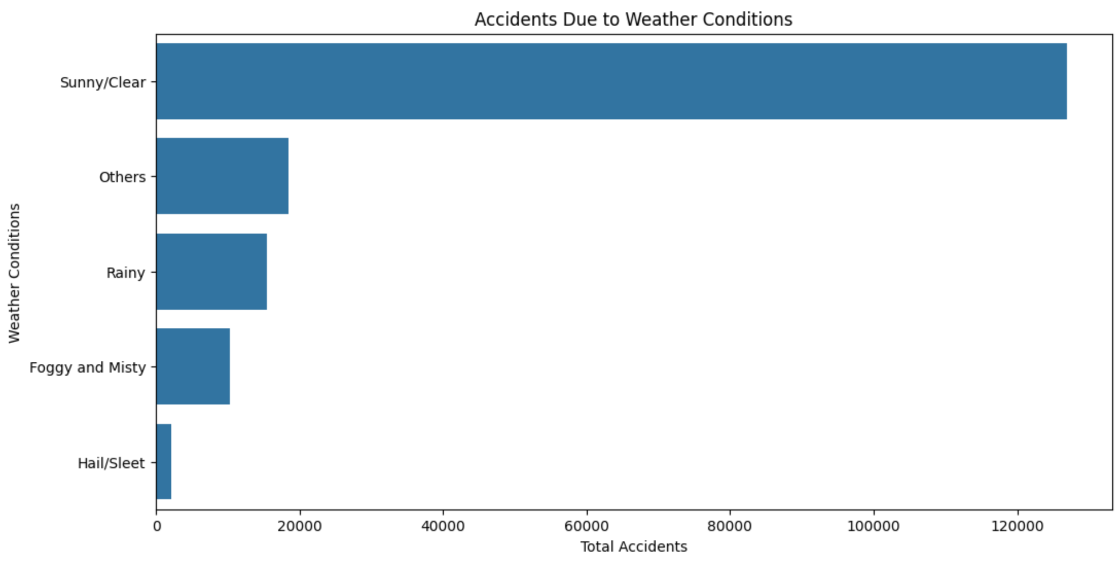
```
Analysis of Specific Accident Types
```



[37]:
```
print("Impact of Weather Conditions on Accidents")
# SQL Query to analyze accidents by weather condition
query_weather_conditions = """
SELECT "Cause Subcategory", SUM(Count) as Total_Accidents
FROM accidents
WHERE "Cause category" = 'Weather'
GROUP BY "Cause Subcategory"
ORDER BY Total_Accidents DESC
"""
weather_accidents = pd.read_sql_query(query_weather_conditions, conn)

# Plot accidents by weather conditions
plt.figure(figsize=(12, 6))
sns.barplot(y=weather_accidents['Cause Subcategory'],␣
 ↪x=weather_accidents['Total_Accidents'])
```

```
plt.title('Accidents Due to Weather Conditions')
plt.xlabel('Total Accidents')
plt.ylabel('Weather Conditions')
plt.show()
```

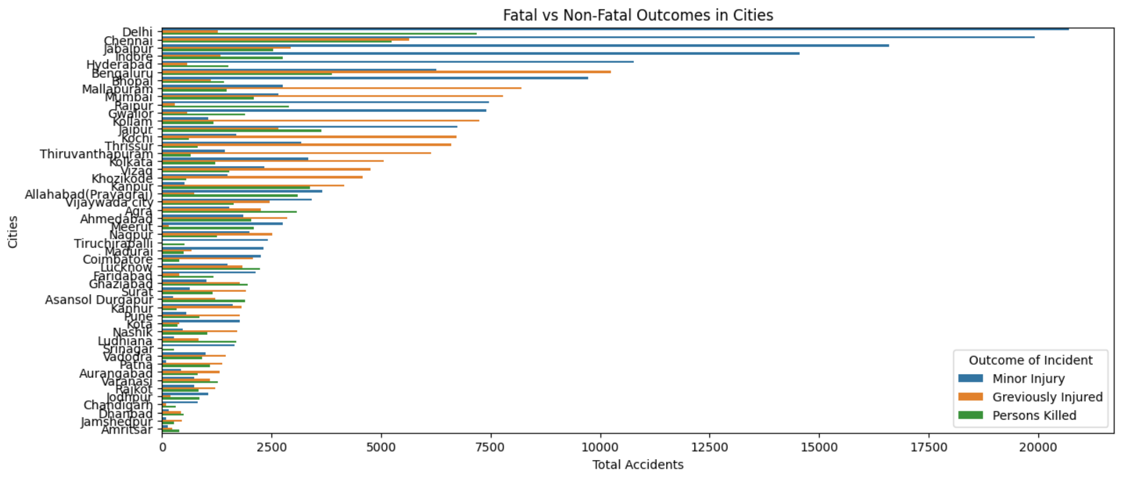
```
Impact of Weather Conditions on Accidents
```



[38]:
```
print("Fatal vs Non-Fatal Outcomes in Cities")
# SQL Query to analyze fatal and non-fatal outcomes
query_fatal_nonfatal = """
SELECT "Million Plus Cities", "Outcome of Incident", SUM(Count) as␣
↪Total_Accidents
FROM accidents
WHERE "Outcome of Incident" IN ('Persons Killed', 'Minor Injury', 'Greviously␣
↪Injured')
GROUP BY "Million Plus Cities", "Outcome of Incident"
ORDER BY Total_Accidents DESC
"""
fatal_nonfatal_accidents = pd.read_sql_query(query_fatal_nonfatal, conn)

# Plot fatal vs non-fatal outcomes by city
plt.figure(figsize=(14, 6))
sns.barplot(y=fatal_nonfatal_accidents['Million Plus Cities'],␣
↪x=fatal_nonfatal_accidents['Total_Accidents'],␣
↪hue=fatal_nonfatal_accidents['Outcome of Incident'])
plt.title('Fatal vs Non-Fatal Outcomes in Cities')
plt.xlabel('Total Accidents')
plt.ylabel('Cities')
```

```python
plt.legend(title='Outcome of Incident')
plt.show()
```

```
Fatal vs Non-Fatal Outcomes in Cities
```


Fatal vs Non-Fatal Outcomes in Cities
Cities
Total Accidents
Delhi
Chennai
Jabalpur
Indore
Hyderabad
Bengaluru
Bhopal
Mallapuram
Mumbai
Raipur
Gwalior
Kollam
Jaipur
Kochi
Thrissur
Thiruvanthapuram
Kolkata
Vizag
Khozikode
Kanpur
Allahabad(Prayagraj)
Vijaywada city
Agra
Ahmedabad
Meerut
Nagpur
Tiruchirapalli
Madurai
Coimbatore
Lucknow
Faridabad
Ghaziabad
Surat
Asansol Durgapur
Kannur
Pune
Kota
Nashik
Ludhiana
Srinagar
Vadodra
Patna
Aurangabad
Varanasi
Rajkot
Jodhpur
Chandigarh
Dhanbad
Jamshedpur
Amritsar
Outcome of Incident
Minor Injury
Greviously Injured
Persons Killed