```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import plotly.express as px

# Step 1: Extract the Data
import pandas as pd
df = pd.read_csv('Heart Disease Data.csv')
df.head()
```

```
   age  sex  cp  trestbps  chol  fbs  restecg  thalach  exang  oldpeak
slope  \
0   52    1   0       125   212    0        1      168      0      1.0
2
1   53    1   0       140   203    1        0      155      1      3.1
0
2   70    1   0       145   174    0        1      125      1      2.6
0
3   61    1   0       148   203    0        1      161      0      0.0
2
4   62    0   0       138   294    1        1      106      0      1.9
1

   ca  thal  target
0   2     3       0
1   0     3       0
2   0     3       0
3   1     3       0
4   3     2       0
```

```
# Step 2: Transform the Data
# Display basic info
print(df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1025 entries, 0 to 1024
Data columns (total 14 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   age       1025 non-null   int64
 1   sex       1025 non-null   int64
 2   cp        1025 non-null   int64
 3   trestbps  1025 non-null   int64
 4   chol      1025 non-null   int64
 5   fbs       1025 non-null   int64
 6   restecg   1025 non-null   int64
 7   thalach   1025 non-null   int64
 8   exang     1025 non-null   int64
 9   oldpeak   1025 non-null   float64
 10  slope     1025 non-null   int64
```

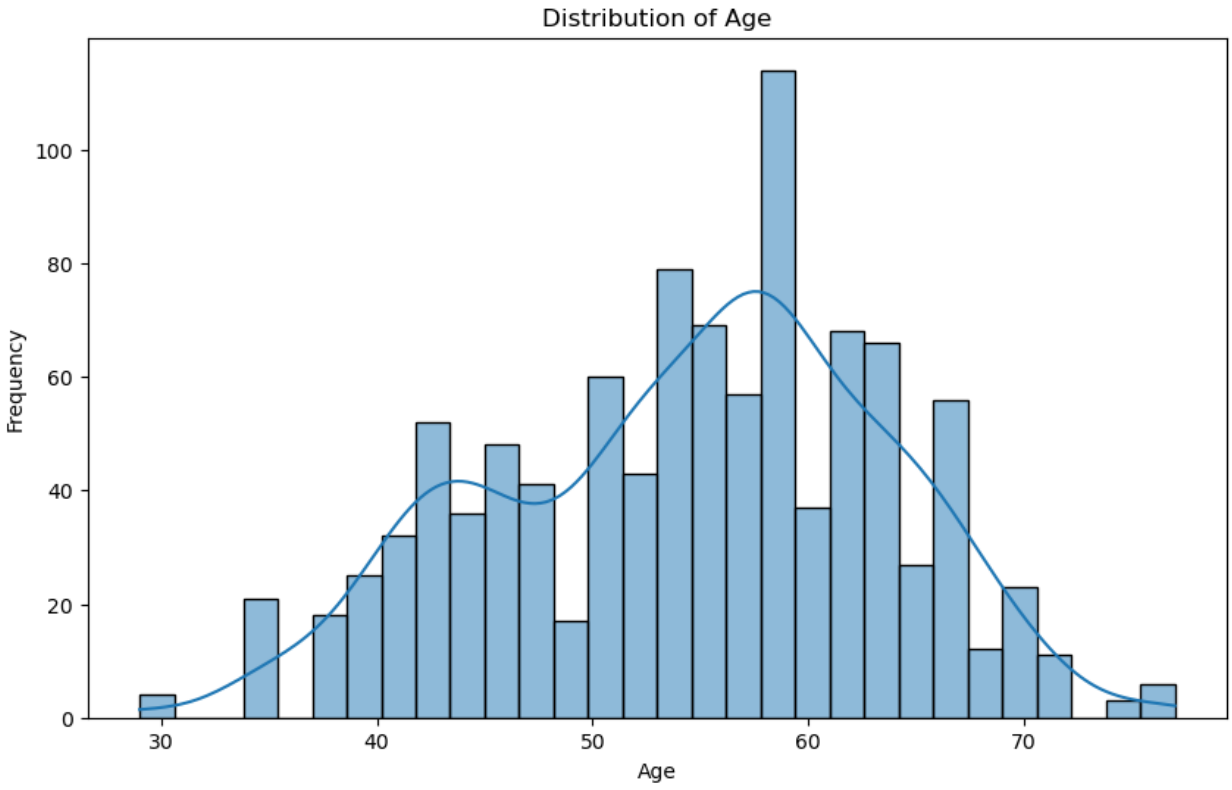
```
 11  ca        1025 non-null   int64
 12  thal      1025 non-null   int64
 13  target    1025 non-null   int64
dtypes: float64(1), int64(13)
memory usage: 112.2 KB
None
```

```
# Step 4:Handling missing values (if any)
df = df.dropna()

# Displaying summary statistics
print(df.describe())
```

```
                age          sex           cp     trestbps        chol
\
count  1025.000000  1025.000000  1025.000000  1025.000000  1025.00000

mean     54.434146     0.695610     0.942439   131.611707   246.00000

std       9.072290     0.460373     1.029641    17.516718    51.59251

min      29.000000     0.000000     0.000000    94.000000   126.00000

25%      48.000000     0.000000     0.000000   120.000000   211.00000

50%      56.000000     1.000000     1.000000   130.000000   240.00000

75%      61.000000     1.000000     2.000000   140.000000   275.00000

max      77.000000     1.000000     3.000000   200.000000   564.00000


                fbs      restecg      thalach        exang      oldpeak
\
count  1025.000000  1025.000000  1025.000000  1025.000000  1025.000000

mean      0.149268     0.529756   149.114146     0.336585     1.071512

std       0.356527     0.527878    23.005724     0.472772     1.175053

min       0.000000     0.000000    71.000000     0.000000     0.000000

25%       0.000000     0.000000   132.000000     0.000000     0.000000

50%       0.000000     1.000000   152.000000     0.000000     0.800000

75%       0.000000     1.000000   166.000000     1.000000     1.800000

max       1.000000     2.000000   202.000000     1.000000     6.200000


             slope           ca         thal       target
```

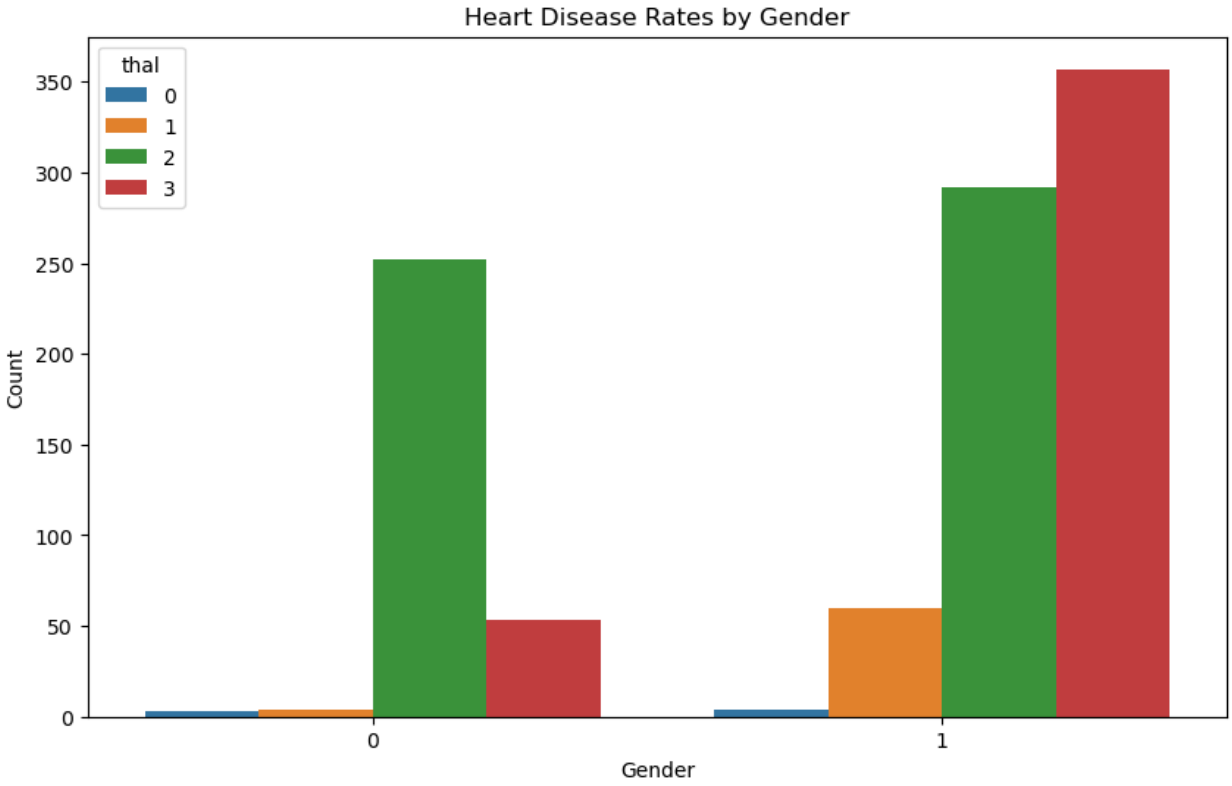
```
count  1025.000000  1025.000000  1025.000000  1025.000000
mean      1.385366     0.754146     2.323902     0.513171
std       0.617755     1.030798     0.620660     0.500070
min       0.000000     0.000000     0.000000     0.000000
25%       1.000000     0.000000     2.000000     0.000000
50%       1.000000     0.000000     2.000000     1.000000
75%       2.000000     1.000000     3.000000     1.000000
max       2.000000     4.000000     3.000000     1.000000
```

```python
# Step 4: EDA

# Distribution of age
plt.figure(figsize=(10, 6))
sns.histplot(df['age'], bins=30, kde=True)
plt.title('Distribution of Age')
plt.xlabel('Age')
plt.ylabel('Frequency')
plt.show()
```

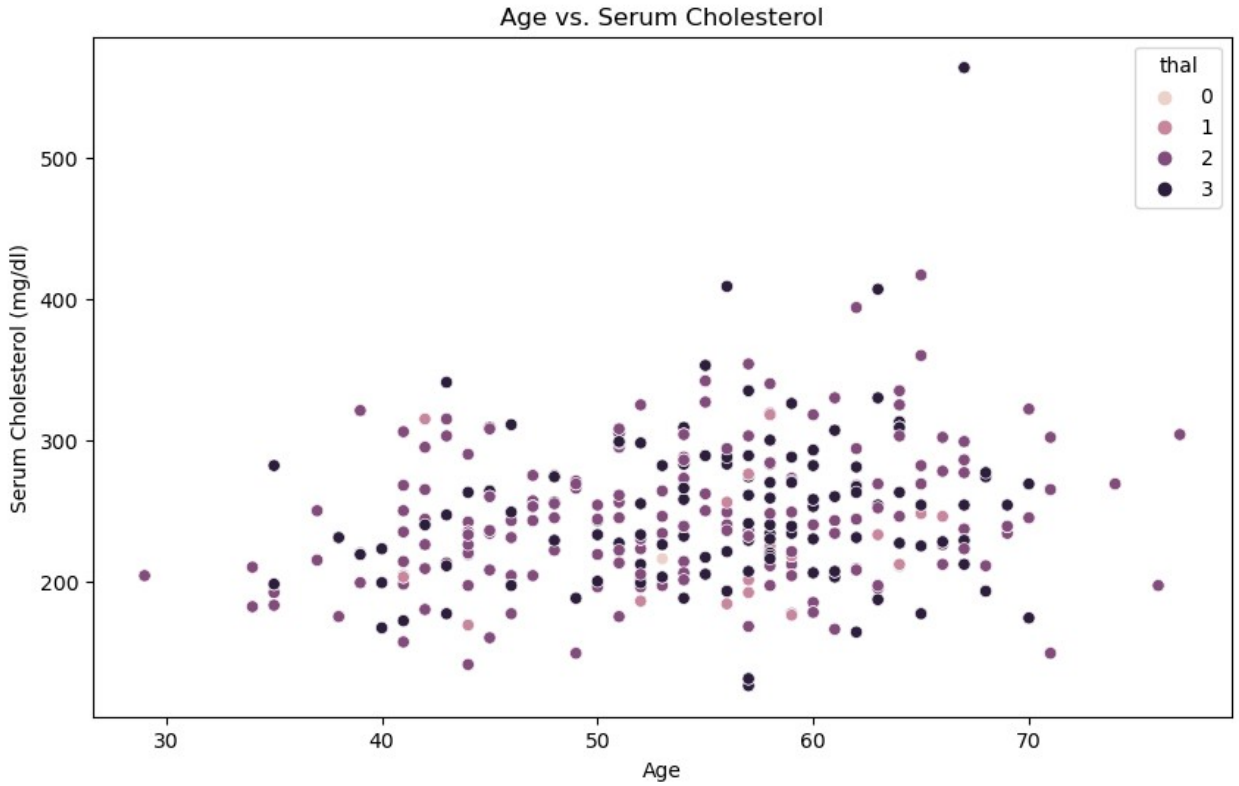



```python
# Heart disease rates by gender
plt.figure(figsize=(10, 6))
sns.countplot(data=df, x='sex', hue='thal')
plt.title('Heart Disease Rates by Gender')
plt.xlabel('Gender')
```

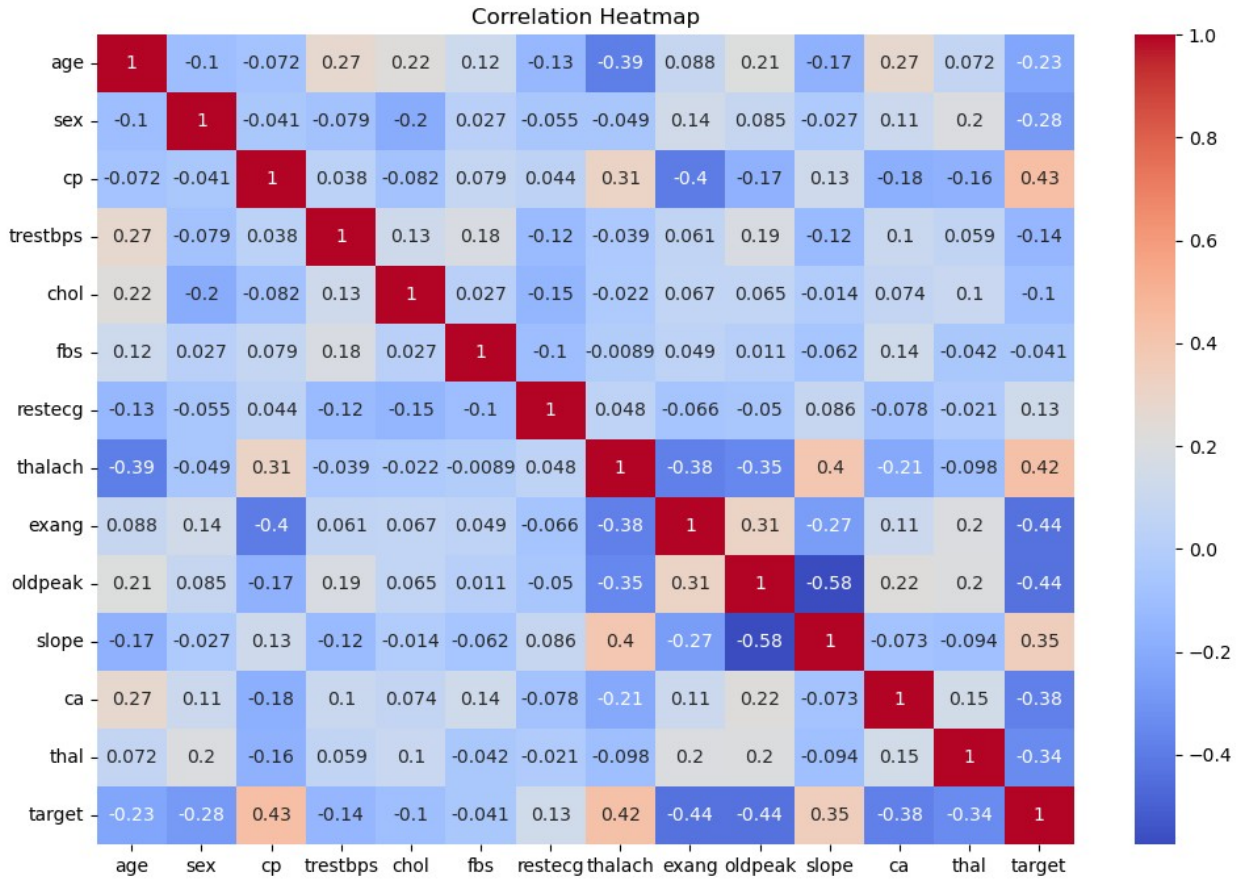
```
plt.ylabel('Count')
plt.show()
```




```
# Relationship between age and serum cholesterol
plt.figure(figsize=(10, 6))
sns.scatterplot(data=df, x='age', y='chol', hue='thal')
plt.title('Age vs. Serum Cholesterol')
plt.xlabel('Age')
plt.ylabel('Serum Cholesterol (mg/dl)')
plt.show()
```




```
# Correlation heatmap
plt.figure(figsize=(12, 8))
sns.heatmap(df.corr(), annot=True, cmap='coolwarm')
plt.title('Correlation Heatmap')
plt.show()
```




```
# Interactive visualization using Plotly
fig = px.scatter(df, x='age', y='thalach', color='thal', title='Age
vs. Maximum Heart Rate Achieved')
fig.show()
```


```
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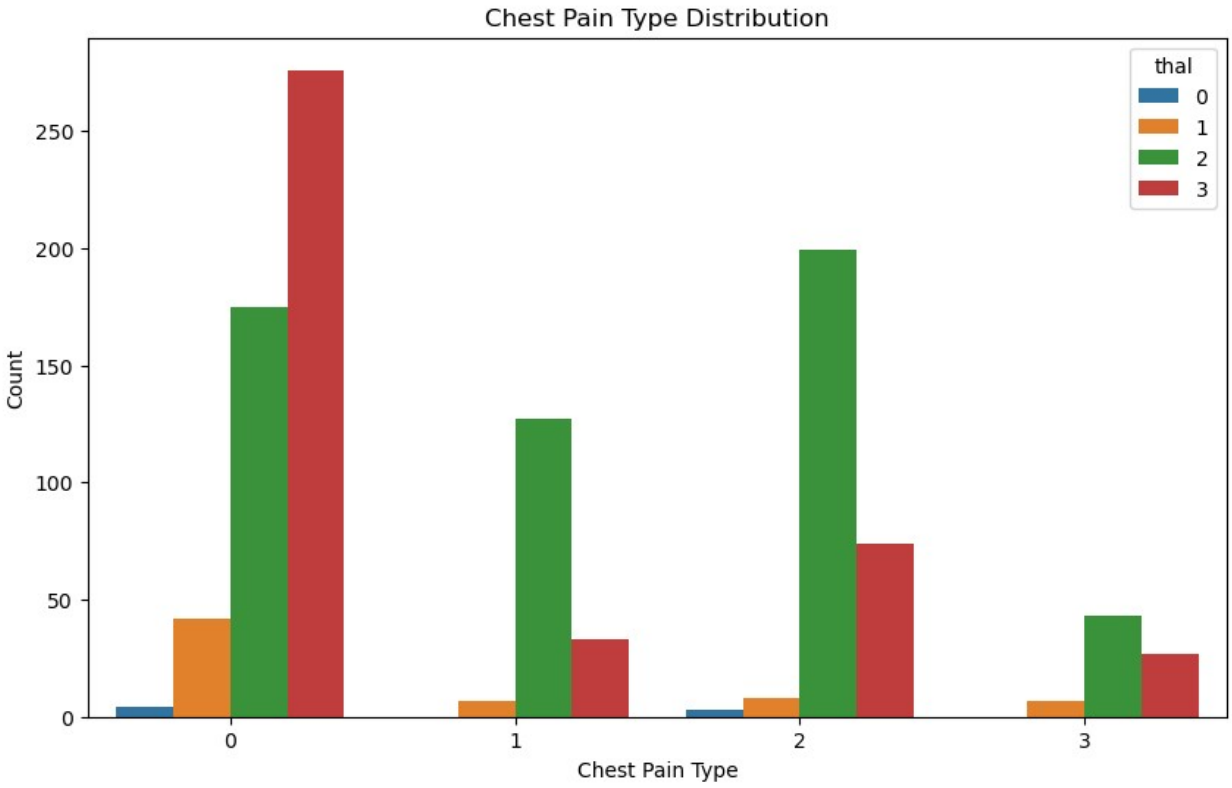
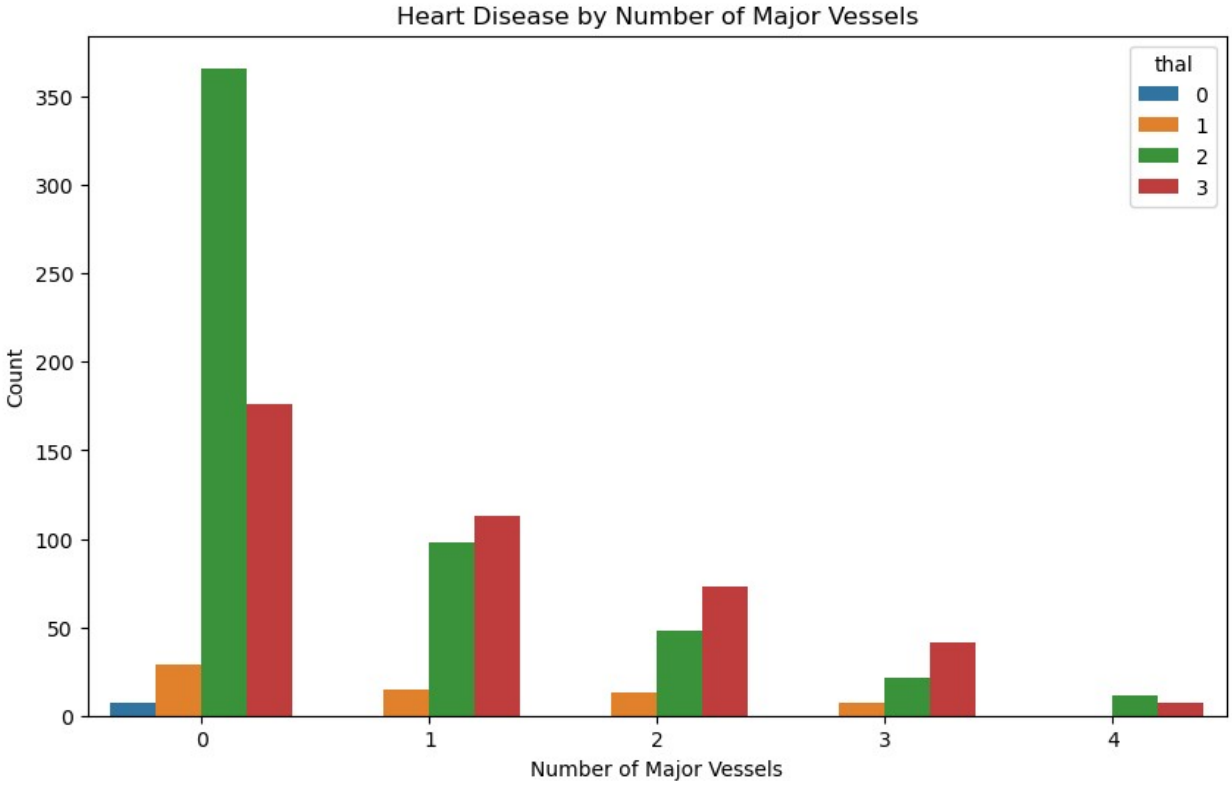
```
# More visualizations as needed for key metrics and relationships
# Distribution of chest pain types
plt.figure(figsize=(10, 6))
sns.countplot(data=df, x='cp', hue='thal')
plt.title('Chest Pain Type Distribution')
plt.xlabel('Chest Pain Type')
plt.ylabel('Count')
plt.show()
```

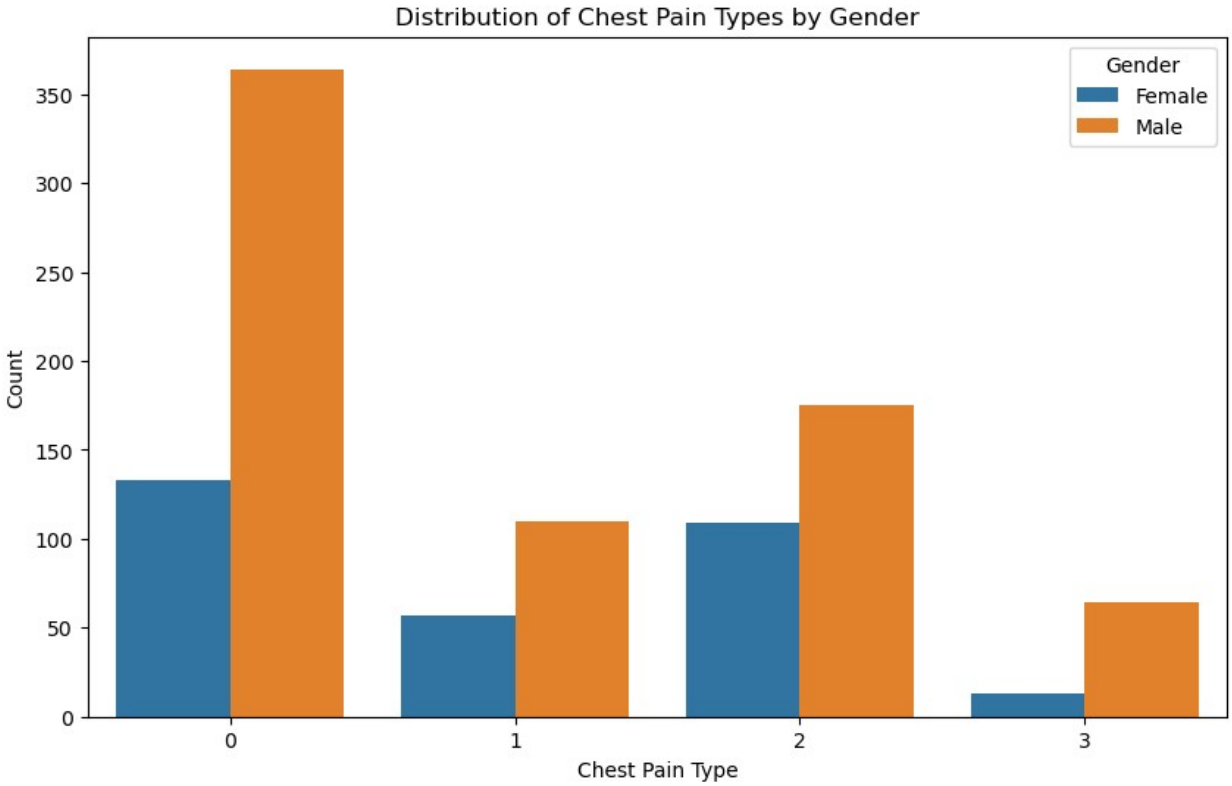



```
# Heart disease by number of major vessels
plt.figure(figsize=(10, 6))
sns.countplot(data=df, x='ca', hue='thal')
plt.title('Heart Disease by Number of Major Vessels')
```

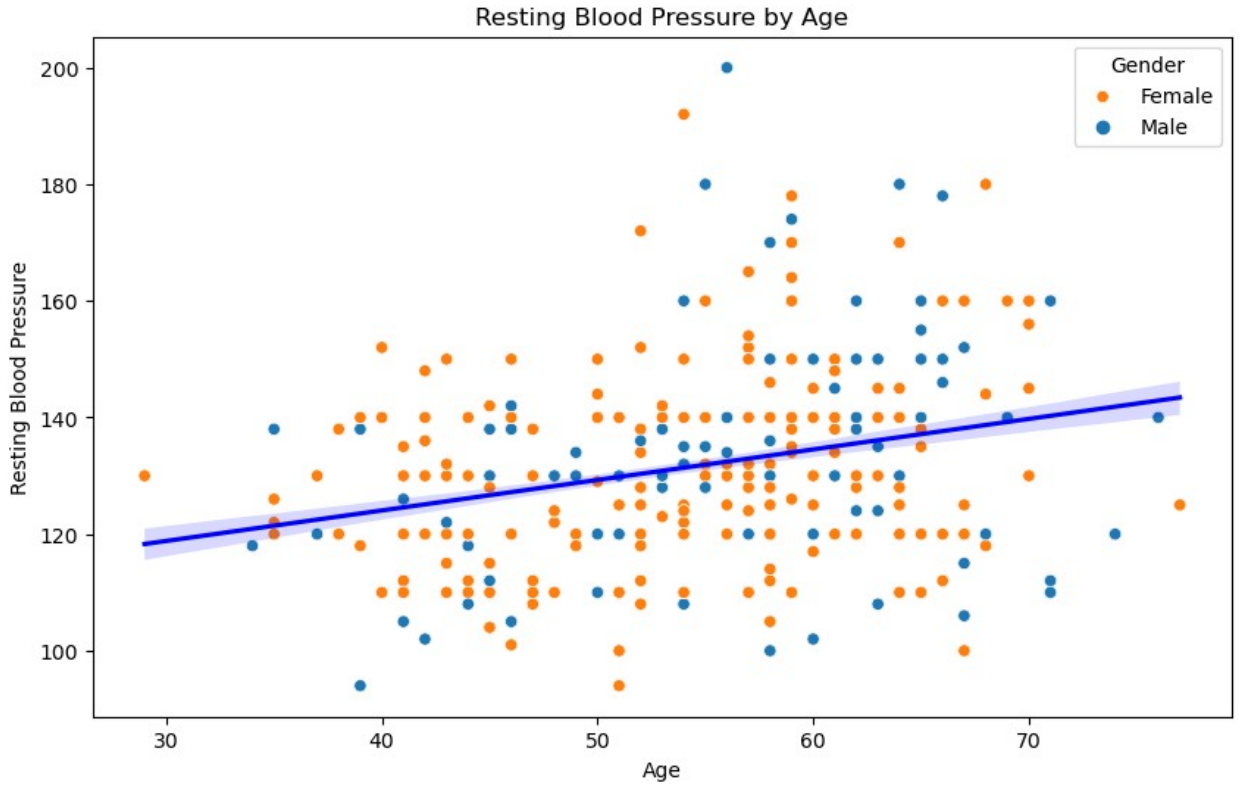
```
plt.xlabel('Number of Major Vessels')
plt.ylabel('Count')
plt.show()
```



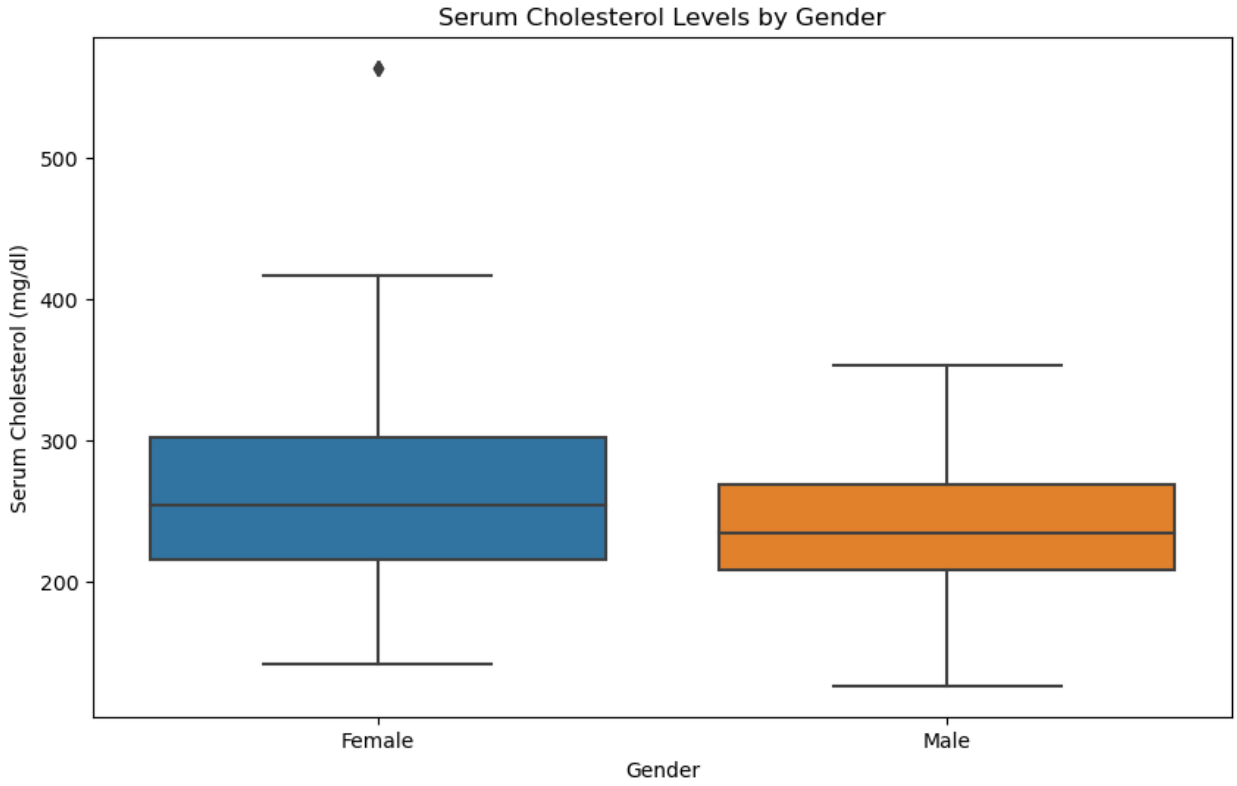

```
#Distribution of Chest Pain Types by Gender
plt.figure(figsize=(10, 6))
sns.countplot(data=df, x='cp', hue='sex')
plt.title('Distribution of Chest Pain Types by Gender')
plt.xlabel('Chest Pain Type')
plt.ylabel('Count')
plt.legend(title='Gender', labels=['Female', 'Male'])
plt.show()
```



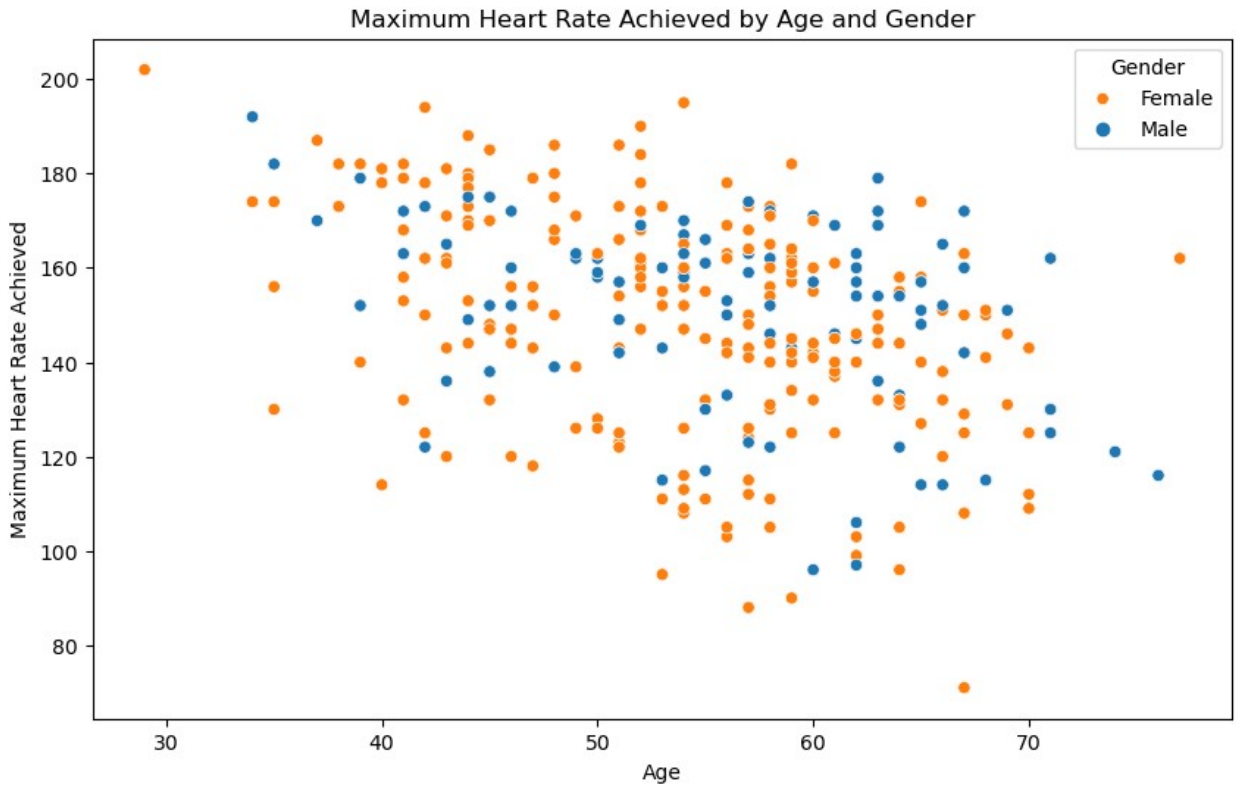

```
#Resting Blood Pressure by Age
plt.figure(figsize=(10, 6))
sns.scatterplot(data=df, x='age', y='trestbps', hue='sex')
sns.regplot(data=df, x='age', y='trestbps', scatter=False,
color='blue')
plt.title('Resting Blood Pressure by Age')
plt.xlabel('Age')
plt.ylabel('Resting Blood Pressure')
plt.legend(title='Gender', labels=['Female', 'Male'])
plt.show()
```




```
#Serum Cholesterol Levels by Gender
plt.figure(figsize=(10, 6))
sns.boxplot(data=df, x='sex', y='chol')
plt.title('Serum Cholesterol Levels by Gender')
plt.xlabel('Gender')
plt.ylabel('Serum Cholesterol (mg/dl)')
plt.xticks([0, 1], ['Female', 'Male'])
plt.show()
```




```
#Maximum Heart Rate Achieved by Age and Gender
plt.figure(figsize=(10, 6))
sns.scatterplot(data=df, x='age', y='thalach', hue='sex')
plt.title('Maximum Heart Rate Achieved by Age and Gender')
plt.xlabel('Age')
plt.ylabel('Maximum Heart Rate Achieved')
plt.legend(title='Gender', labels=['Female', 'Male'])
plt.show()
```




```
print(df.info())
```

```
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RangeIndex: 1025 entries, 0 to 1024
Data columns (total 14 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
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 1   sex       1025 non-null   int64  
 2   cp        1025 non-null   int64  
 3   trestbps  1025 non-null   int64  
 4   chol      1025 non-null   int64  
 5   fbs       1025 non-null   int64  
 6   restecg   1025 non-null   int64  
 7   thalach   1025 non-null   int64  
 8   exang     1025 non-null   int64  
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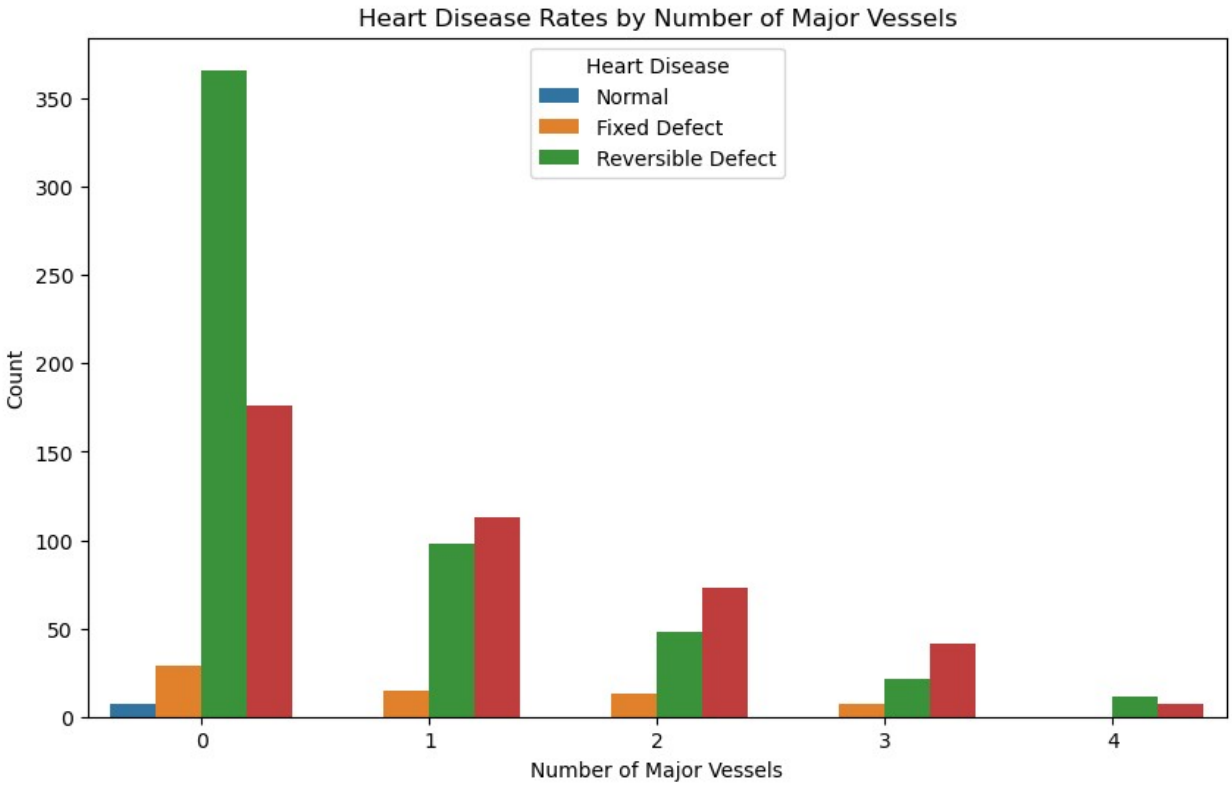
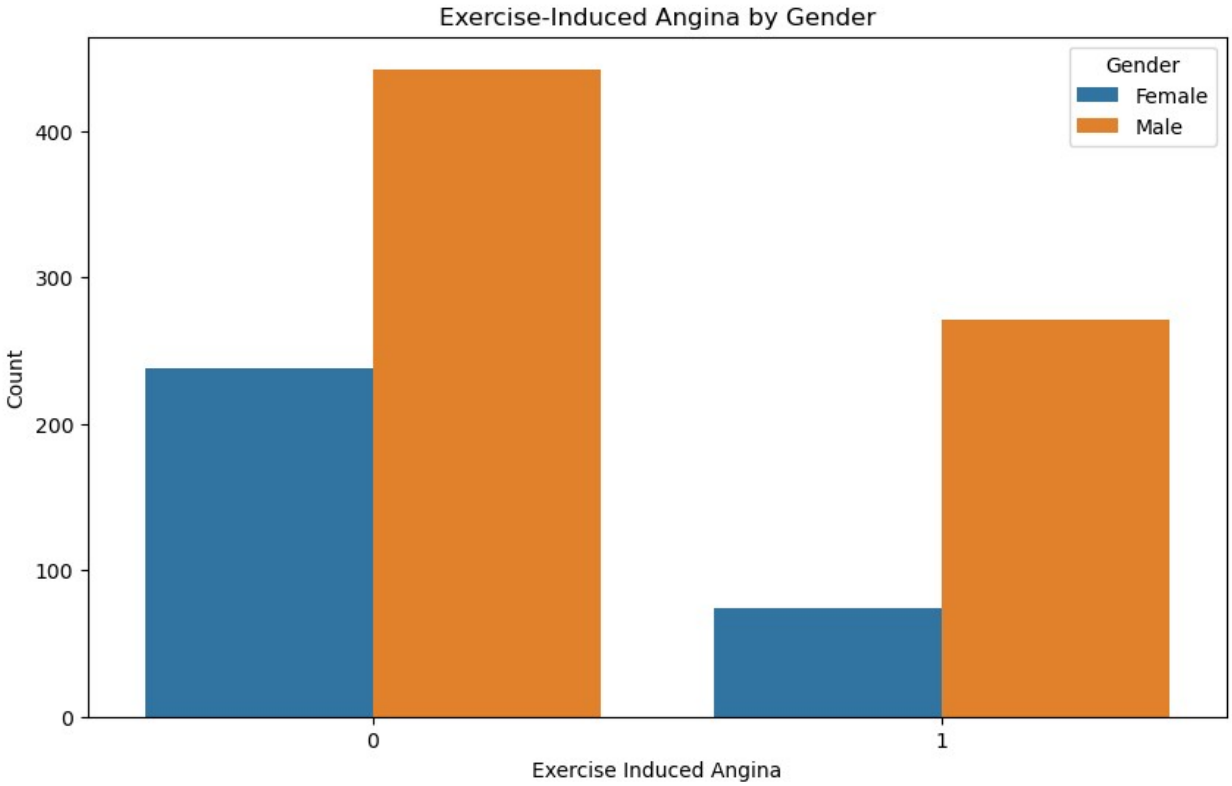
 12  thal      1025 non-null   int64  
 13  target    1025 non-null   int64  
dtypes: float64(1), int64(13)
memory usage: 112.2 KB
None
```

```
#Heart Disease Rates by Number of Major Vessels
plt.figure(figsize=(10, 6))
sns.countplot(data=df, x='ca', hue='thal')
plt.title('Heart Disease Rates by Number of Major Vessels')
plt.xlabel('Number of Major Vessels')
plt.ylabel('Count')
plt.legend(title='Heart Disease', labels=['Normal', 'Fixed Defect',
'Reversible Defect'])
plt.show()
```




```
#Exercise-Induced Angina by Gender
plt.figure(figsize=(10, 6))
sns.countplot(data=df, x='exang', hue='sex')
plt.title('Exercise-Induced Angina by Gender')
plt.xlabel('Exercise Induced Angina')
plt.ylabel('Count')
plt.legend(title='Gender', labels=['Female', 'Male'])
plt.show()
```


Exercise-Induced Angina by Gender
Gender
Female
Male
Count
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300
200
100
0
0
1
Exercise Induced Angina