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BAI-5A

ML-LAB-TASK-09

In [21]:
```
import pandas as pd
import numpy as np

data = pd.read_csv('./framingham.csv')
data.tail(9)
```

Out[21]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	preva
4229	0	51	3.0	1	20.0	0.0	0	
4230	0	56	1.0	1	3.0	0.0	0	
4231	1	58	3.0	0	0.0	0.0	0	
4232	1	68	1.0	0	0.0	0.0	0	
4233	1	50	1.0	1	1.0	0.0	0	
4234	1	51	3.0	1	43.0	0.0	0	
4235	0	48	2.0	1	20.0	NaN	0	
4236	0	44	1.0	1	15.0	0.0	0	
4237	0	52	2.0	0	0.0	0.0	0	

In [22]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4238 entries, 0 to 4237
Data columns (total 16 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   male             4238 non-null   int64  
 1   age              4238 non-null   int64  
 2   education        4133 non-null   float64
 3   currentSmoker    4238 non-null   int64  
 4   cigsPerDay       4209 non-null   float64
 5   BPMeds           4185 non-null   float64
 6   prevalentStroke  4238 non-null   int64  
 7   prevalentHyp     4238 non-null   int64  
 8   diabetes         4238 non-null   int64  
 9   totChol          4188 non-null   float64
 10  sysBP            4238 non-null   float64
 11  diaBP            4238 non-null   float64
 12  BMI              4219 non-null   float64
 13  heartRate        4237 non-null   float64
 14  glucose          3850 non-null   float64
 15  TenYearCHD       4238 non-null   int64  
dtypes: float64(9), int64(7)
memory usage: 529.9 KB
```

In [23]:
```
#missing values in the dataset
print("missing values in the dataset")
print(data.isnull().sum())
```

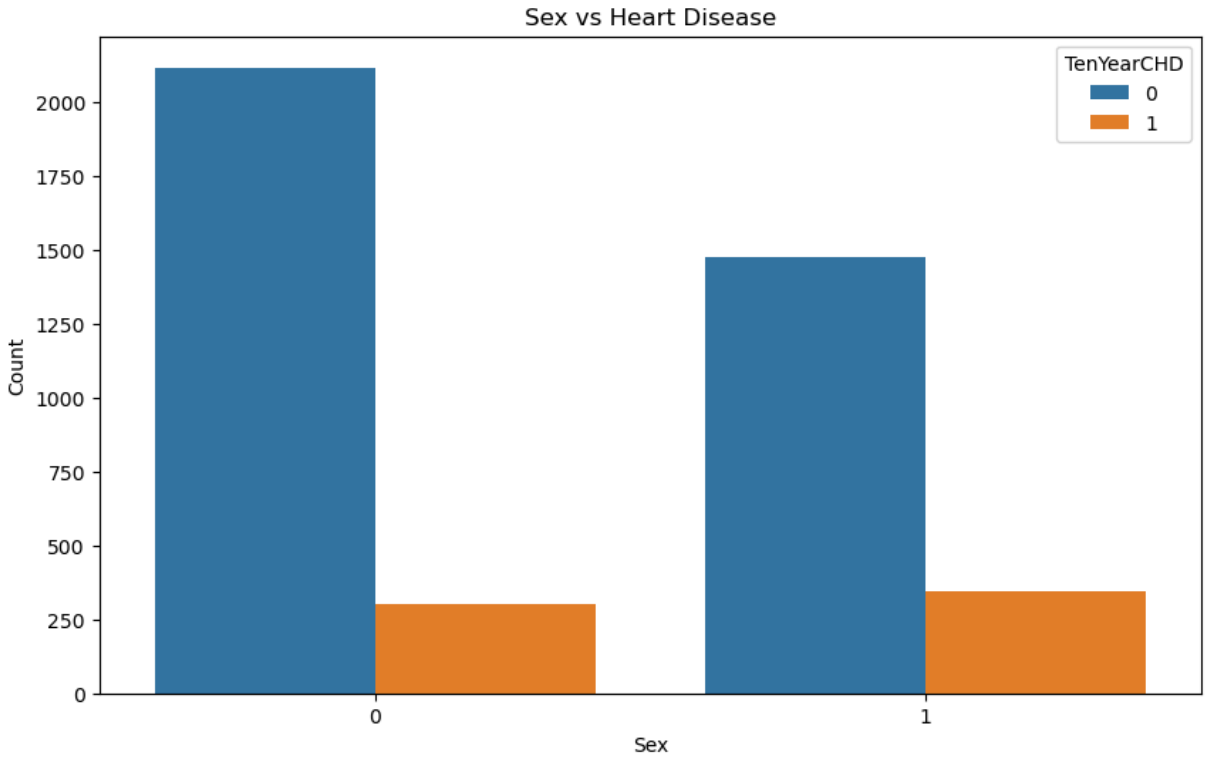
```
missing values in the dataset
male                 0
age                  0
education          105
currentSmoker        0
cigsPerDay          29
BPMeds              53
prevalentStroke      0
prevalentHyp         0
diabetes             0
totChol             50
sysBP                0
diaBP                0
BMI                 19
heartRate            1
glucose            388
TenYearCHD           0
dtype: int64
```

In [24]:
```
#handling missing values

#filling missing values with mean
data = data.fillna(data.mean())

#missing values in the dataset
print("missing values in the dataset")
print(data.isnull().sum())
```

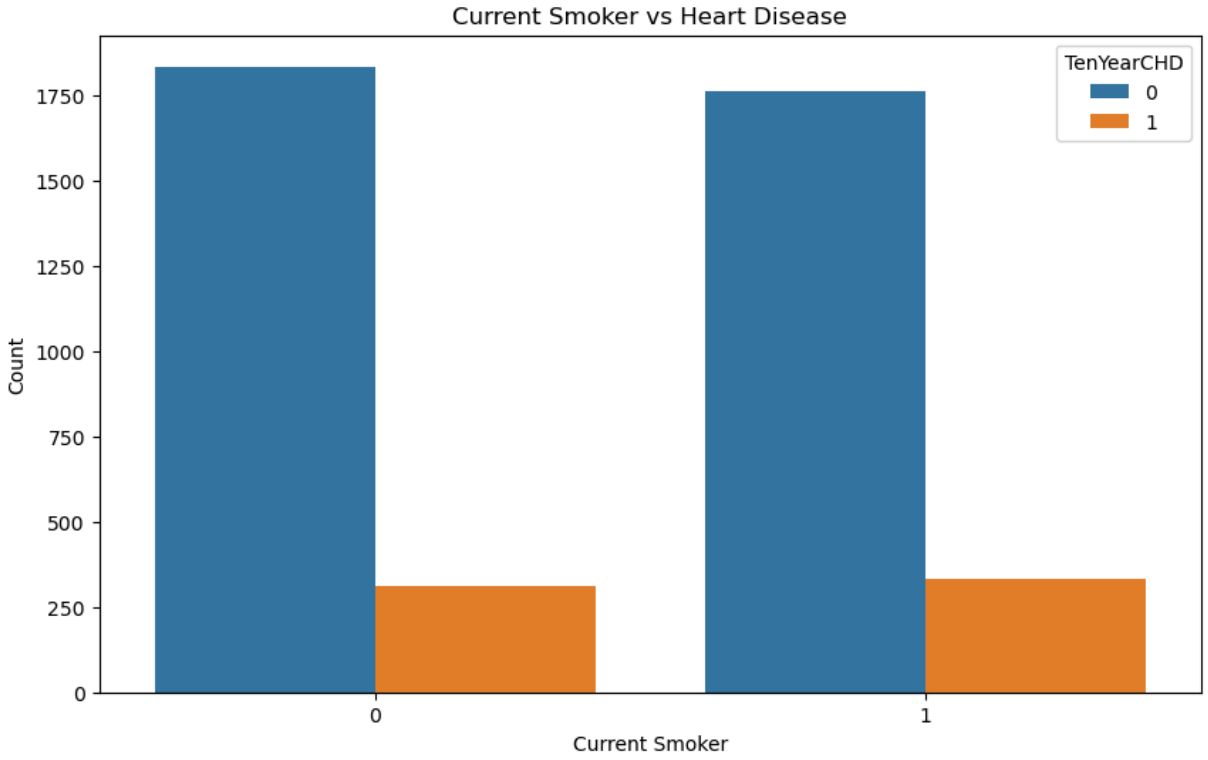
```
missing values in the dataset
male               0
age                0
education          0
currentSmoker      0
cigsPerDay         0
BPMeds             0
prevalentStroke    0
prevalentHyp       0
diabetes           0
totChol            0
sysBP              0
diaBP              0
BMI                0
heartRate          0
glucose            0
TenYearCHD         0
dtype: int64
```

In [25]:
```
# visualizing the dataset

import plotly.express as px

#correlation matrix
correlation_matrix = data.corr()
fig = px.imshow(correlation_matrix)
fig.show()
```

In [31]:
```
import seaborn as sns
import matplotlib.pyplot as plt
# Plot Crosstab
plt.figure(figsize=(10, 6))
sns.countplot(x='male', hue='TenYearCHD', data=data)
plt.title('Sex vs Heart Disease')
plt.xlabel('Sex')
plt.ylabel('Count')
plt.legend(title='TenYearCHD')
plt.show()
```



In [32]:
```
#crossplot currentSmoker vs TenYearCHD
plt.figure(figsize=(10, 6))
sns.countplot(x='currentSmoker', hue='TenYearCHD', data=data)
plt.title('Current Smoker vs Heart Disease')
plt.xlabel('Current Smoker')
plt.ylabel('Count')
plt.legend(title='TenYearCHD')
plt.show()
```



In [33]:
```
#logistic regression
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, confusion_matrix, classificatior

X = data.drop(['TenYearCHD'], axis=1)
y = data['TenYearCHD']

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, rar

logistic_model = LogisticRegression()
logistic_model.fit(X_train, y_train)

y_pred = logistic_model.predict(X_test)

print("Accuracy: ", accuracy_score(y_test, y_pred))
print("Confusion Matrix: \n", confusion_matrix(y_test, y_pred))
print("Classification Report: \n", classification_report(y_test, y_pred))
```

```
Accuracy:  0.8561320754716981
Confusion Matrix:
 [[721   3]
 [119   5]]
Classification Report:
              precision    recall  f1-score   support

           0       0.86      1.00      0.92       724
           1       0.62      0.04      0.08       124

    accuracy                           0.86       848
   macro avg       0.74      0.52      0.50       848
weighted avg       0.82      0.86      0.80       848
```

```
/home/tazmeen/anaconda3/lib/python3.12/site-packages/sklearn/linear_model/_l
ogistic.py:469: ConvergenceWarning:

lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regre
ssion
```

RESULTS

Accuracy: 0.86206896551724