```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

```
# Set seed for reproducibility
np.random.seed(42)
```

```
# Define the number of samples
num_samples = 10000
```

```
# Generate synthetic data
df = pd.DataFrame({
    'patient_id': range(1, num_samples + 1),  # Unique identifier for patients
    'fever': np.random.choice([0, 1], size=num_samples, p=[0.4, 0.6]),
    'cough': np.random.choice([0, 1], size=num_samples, p=[0.5, 0.5]),
    'shortness_of_breath': np.random.choice([0, 1], size=num_samples, p=[0.3, 0.7]),
    'chest_pain': np.random.choice([0, 1], size=num_samples, p=[0.6, 0.4]),
    'headache': np.random.choice([0, 1], size=num_samples, p=[0.5, 0.5]),
    'age': np.random.randint(18, 90, size=num_samples),
    'gender': np.random.choice(['Male', 'Female'], size=num_samples),
    'smoking_history': np.random.choice([0, 1], size=num_samples, p=[0.7, 0.3]),
    'family_history_of_disease': np.random.choice([0, 1], size=num_samples, p=[0.6, 0.4]),
    'diabetes': np.random.choice([0, 1], size=num_samples, p=[0.8, 0.2]),
    'hypertension': np.random.choice([0, 1], size=num_samples, p=[0.7, 0.3]),
    'heart_disease': np.random.choice([0, 1], size=num_samples, p=[0.85, 0.15]),
    'disease': np.random.choice(['Flu', 'COVID-19', 'Pneumonia', 'None'], size=num_samples,
                                p=[0.3, 0.2, 0.2, 0.3])  # Target labels
})
```

```
df.head()
```

	patient_id	fever	cough	shortness_of_breath	chest_pain	headache	age	gender	smoking_hi
0	1	0	0	1	1	0	26	Female	
1	2	1	0	0	0	0	87	Male	
2	3	1	0	1	1	0	41	Female	
3	4	1	1	1	0	0	82	Female	
4	5	0	0	1	0	0	34	Female	

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```
df.describe()
```

	patient_id	fever	cough	shortness_of_breath	chest_pain	headache
count	10000.00000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000
mean	5000.50000	0.594200	0.506400	0.702900	0.400000	0.493700
std	2886.89568	0.491071	0.499984	0.457004	0.489922	0.499985
min	1.00000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	2500.75000	0.000000	0.000000	0.000000	0.000000	0.000000
50%	5000.50000	1.000000	1.000000	1.000000	0.000000	0.000000
75%	7500.25000	1.000000	1.000000	1.000000	1.000000	1.000000
max	10000.00000	1.000000	1.000000	1.000000	1.000000	1.000000

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 14 columns):
 #   Column                     Non-Null Count  Dtype 
---  ------                     --------------  ----- 
 0   patient_id                 10000 non-null  int64 
 1   fever                      10000 non-null  int64 
 2   cough                      10000 non-null  int64 
 3   shortness_of_breath        10000 non-null  int64 
 4   chest_pain                 10000 non-null  int64 
 5   headache                   10000 non-null  int64 
 6   age                        10000 non-null  int64 
 7   gender                     10000 non-null  object
 8   smoking_history            10000 non-null  int64 
 9   family_history_of_disease  10000 non-null  int64 
 10  diabetes                   10000 non-null  int64 
 11  hypertension               10000 non-null  int64 
 12  heart_disease              10000 non-null  int64 
 13  disease                    10000 non-null  object
dtypes: int64(12), object(2)
memory usage: 1.1+ MB
```

```
df.shape
```

```
(10000, 14)
```

```
df.columns
```

```
Index(['patient_id', 'fever', 'cough', 'shortness_of_breath', 'chest_pain',
       'headache', 'age', 'gender', 'smoking_history',
       'family_history_of_disease', 'diabetes', 'hypertension',
       'heart_disease', 'disease'],
      dtype='object')
```

```
df.dtypes
```

	0
patient_id	int64
fever	int64
cough	int64
shortness_of_breath	int64
chest_pain	int64
headache	int64
age	int64
gender	object
smoking_history	int64
family_history_of_disease	int64
diabetes	int64
hypertension	int64
heart_disease	int64
disease	object

dtype: object

```
df.isnull().sum()
```

	0
patient_id	0
fever	0
cough	0
shortness_of_breath	0
chest_pain	0
headache	0
age	0
gender	0
smoking_history	0
family_history_of_disease	0
diabetes	0
hypertension	0
heart_disease	0
disease	0

dtype: int64

```
df.duplicated().sum()
```

```
0
```

```
df.disease.value_counts()
```

disease	count
Flu	3066
None	2954
Pneumonia	2014
COVID-19	1966

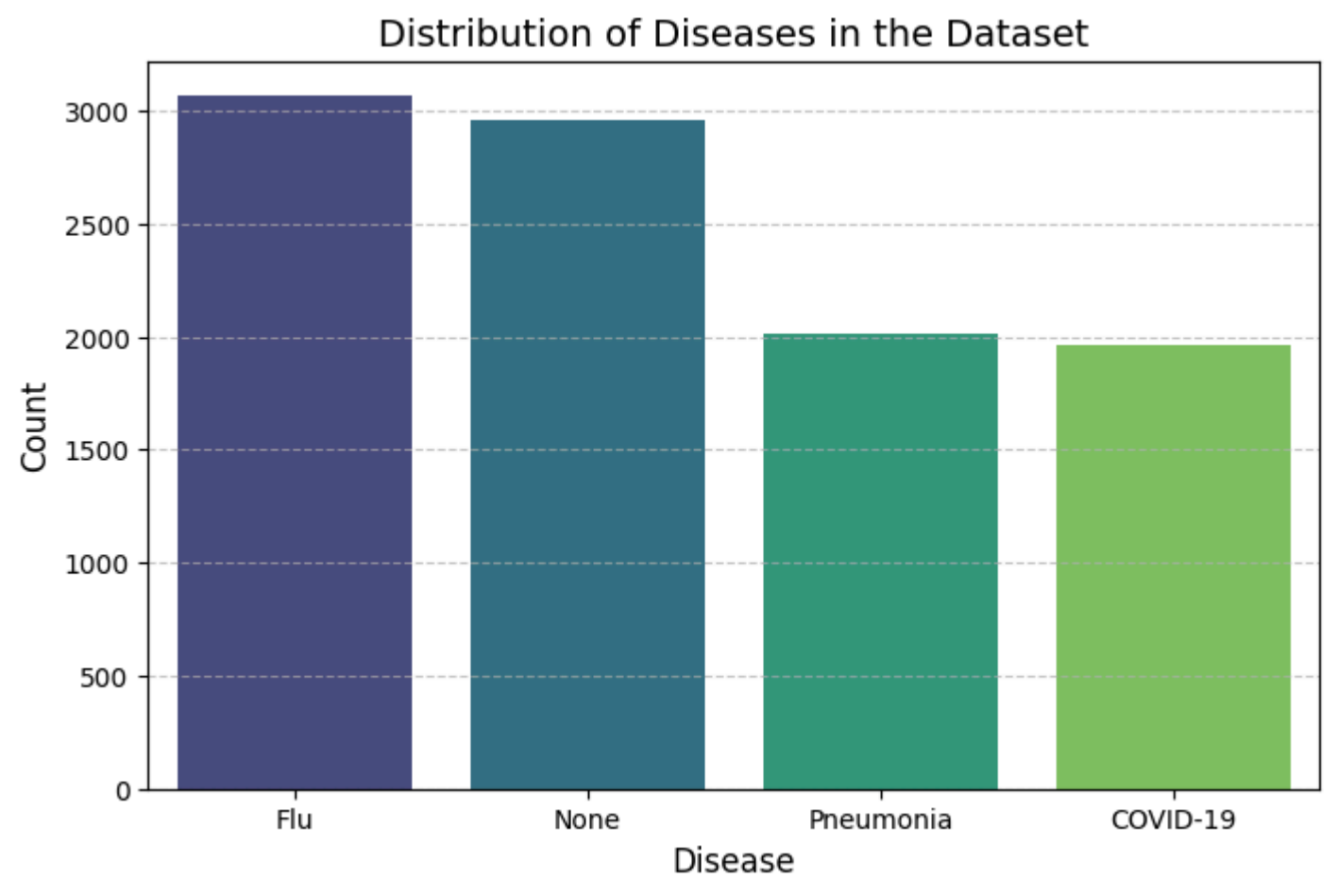
dtype: int64

```
#This command givs the minimum and maximum value of age column:

print("Patient's minimum age:",df['age'].min(),"\nPatient's maximum age:", df['age'].max())
```

```
Patient's minimum age: 18
Patient's maximum age: 89
```

```
# Create a count plot for the 'disease' column
plt.figure(figsize=(8, 5))
sns.countplot(data=df, x='disease', palette='viridis')
plt.title("Distribution of Diseases in the Dataset", fontsize=14)
plt.xlabel("Disease", fontsize=12)
plt.ylabel("Count", fontsize=12)
plt.xticks(rotation=0)
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```




```
#Import some libraries for label encoding, accurarcy and other:

from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import accuracy_score
from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import classification_report
```

```
df.head()
```

	patient_id	fever	cough	shortness_of_breath	chest_pain	headache	age	gender	smoking_hi
0	1	0	0	1	1	0	26	Female	
1	2	1	0	0	0	0	87	Male	
2	3	1	0	1	1	0	41	Female	
3	4	1	1	1	0	0	82	Female	
4	5	0	0	1	0	0	34	Female	

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```
# Convert categorical features to numeric using Label Encoding
df['gender'] = LabelEncoder().fit_transform(df['gender'])
df['disease'] = LabelEncoder().fit_transform(df['disease'])
```

```
# Separate features and target
X = df.drop('disease', axis=1)  # Features
y = df['disease']               # Target variable
```

```
df.head()
```

	patient_id	fever	cough	shortness_of_breath	chest_pain	headache	age	gender	smoking_hi
0	1	0	0	1	1	0	26	0	
1	2	1	0	0	0	0	87	1	
2	3	1	0	1	1	0	41	0	
3	4	1	1	1	0	0	82	0	
4	5	0	0	1	0	0	34	0	

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```
# Scale the feature set to standardize
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)
```

```
from sklearn.linear_model import LogisticRegression
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

```
scaler = StandardScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)
```

```
model = LogisticRegression(random_state=42, max_iter=200)
```

```
model.fit(X_train_scaled, y_train)
```

```
LogisticRegression
LogisticRegression(max_iter=200, random_state=42)
```

```
# Step 6: Make predictions on the test set
y_pred = model.predict(X_test_scaled)
```

```
# Display the classification report
print("\nClassification Report:")
print(classification_report(y_test, y_pred))
```

```
Classification Report:
              precision    recall  f1-score   support

           0       0.00      0.00      0.00       387
           1       0.32      0.62      0.42       618
           2       0.32      0.44      0.37       585
           3       0.00      0.00      0.00       410

    accuracy                           0.32      2000
   macro avg       0.16      0.26      0.20      2000
```