DATA Gathering:

Hypothesis: Is there a correlation between drinking and LDL cholesterol levels?

Null Hypothesis (H0): There is no significant correlation between drinking and LDL cholesterol levels. Alternative Hypothesis (H1): There is a significant correlation between drinking and LDL cholesterol levels.

In [1]:
```
import pandas as pd
import numpy as np
import random
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

In [2]:
```
df = pd.read_csv('smoking_driking_dataset_Ver01.csv')
```

In [3]:
```
df.head()
```

Out[3]:

	sex	age	height	weight	waistline	sight_left	sight_right	hear_left	hear_right	SBP
0	Male	35	170	75	90.0	1.0	1.0	1.0	1.0	120.0
1	Male	30	180	80	89.0	0.9	1.2	1.0	1.0	130.0
2	Male	40	165	75	91.0	1.2	1.5	1.0	1.0	120.0
3	Male	50	175	80	91.0	1.5	1.2	1.0	1.0	145.0
4	Male	50	165	60	80.0	1.0	1.2	1.0	1.0	138.0

5 rows × 24 columns

In [4]:
```
df.describe()
```

Out[4]:

	age	height	weight	waistline	sight_left	sigh
count	991346.000000	991346.000000	991346.000000	991346.000000	991346.000000	991346.
mean	47.614491	162.240625	63.284050	81.233358	0.980834	0.
std	14.181339	9.282957	12.514241	11.850323	0.605949	0.
min	20.000000	130.000000	25.000000	8.000000	0.100000	0.
25%	35.000000	155.000000	55.000000	74.100000	0.700000	0.
50%	45.000000	160.000000	60.000000	81.000000	1.000000	1.
75%	60.000000	170.000000	70.000000	87.800000	1.200000	1.
max	85.000000	190.000000	140.000000	999.000000	9.900000	9.

8 rows × 22 columns

In [5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 991346 entries, 0 to 991345
Data columns (total 24 columns):
 #   Column            Non-Null Count   Dtype  
---  ------            --------------   -----  
 0   sex               991346 non-null  object 
 1   age               991346 non-null  int64  
 2   height            991346 non-null  int64  
 3   weight            991346 non-null  int64  
 4   waistline         991346 non-null  float64
 5   sight_left        991346 non-null  float64
 6   sight_right       991346 non-null  float64
 7   hear_left         991346 non-null  float64
 8   hear_right        991346 non-null  float64
 9   SBP               991346 non-null  float64
 10  DBP               991346 non-null  float64
 11  BLDS              991346 non-null  float64
 12  tot_chole         991346 non-null  float64
 13  HDL_chole         991346 non-null  float64
 14  LDL_chole         991346 non-null  float64
 15  triglyceride      991346 non-null  float64
 16  hemoglobin        991346 non-null  float64
 17  urine_protein     991346 non-null  float64
 18  serum_creatinine  991346 non-null  float64
 19  SGOT_AST          991346 non-null  float64
 20  SGOT_ALT          991346 non-null  float64
 21  gamma_GTP         991346 non-null  float64
 22  SMK_stat_type_cd  991346 non-null  float64
 23  DRK_YN            991346 non-null  object 
dtypes: float64(19), int64(3), object(2)
memory usage: 181.5+ MB
```

DATA Cleaning:

In [6]:
```
# Check missing values

df.isna().sum()
```

Out[6]:
```
sex                 0
age                 0
height              0
weight              0
waistline           0
sight_left          0
sight_right         0
hear_left           0
hear_right          0
SBP                 0
DBP                 0
BLDS                0
tot_chole           0
HDL_chole           0
LDL_chole           0
triglyceride        0
hemoglobin          0
urine_protein       0
serum_creatinine    0
SGOT_AST            0
SGOT_ALT            0
gamma_GTP           0
SMK_stat_type_cd    0
DRK_YN              0
dtype: int64
```

We don't have any missing or NaN values

In [7]:
```
# Check duplicates

df[df.duplicated].shape
```

Out[7]:
```
(26, 24)
```

In [8]:
```
# There are 26 duplicates to drop from the dataset

df = df.drop_duplicates(keep='first')
```

In [9]:
```
df[df.duplicated].shape
```

Out[9]:
```
(0, 24)
```

In [10]:
```
# Rename column DRK_YN to drinking_hist

df.rename(columns={'DRK_YN': 'drinking_hist'}, inplace=True)
```

In [11]:
```
# Replace Y to 1 and N to 0

df['drinking_hist'] = df['drinking_hist'].replace({'Y': 1, 'N': 0})
```

In [12]:
```
# Keep only cholesterol columns

columns_to_keep = ['tot_chole', 'HDL_chole', 'LDL_chole', 'drinking_hist']

# Create a new DataFrame with only the specified columns
df = df[columns_to_keep]
```

In [13]:
```
# Calculate the mean value of 'LDL_chole' within your specified range
mean_within_range = df[(df['LDL_chole'] >= 10) & (df['LDL_chole'] <= 250)]['LDL_cho

# Replace values outside of the range with the mean value
df['LDL_chole'] = df['LDL_chole'].apply(lambda x: mean_within_range if x < 10 or x
```

In [14]:
```
# Final Dataset

df.head()
```

Out[14]:

	tot_chole	HDL_chole	LDL_chole	drinking_hist
0	193.0	48.0	126.0	1
1	228.0	55.0	148.0	0
2	136.0	41.0	74.0	0
3	201.0	76.0	104.0	0
4	199.0	61.0	117.0	0

DATA Analysis:

In [15]:
```
# Count how many people we have in the dataset

df['drinking_hist'].count()
```

Out[15]:
```
991320
```

In [16]:
```
df['LDL_chole'].count()
```

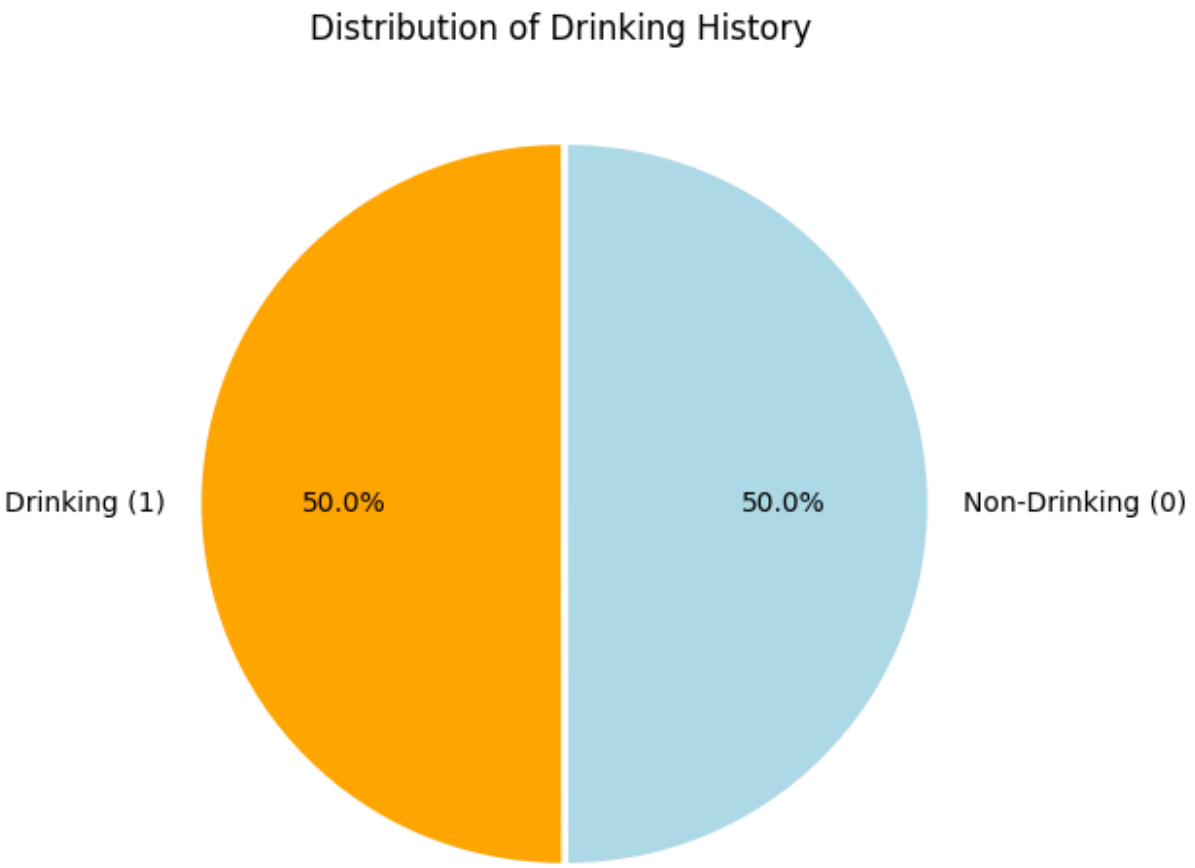
Out[16]:
```
991320
```

In [17]:
```
# Count how many drinking and not drinking

drk_counts = df['drinking_hist'].value_counts()
drk_counts
```

Out[17]:
```
0    495844
1    495476
Name: drinking_hist, dtype: int64
```

The proportions of people who drink (1) and those who don't (0) are very close, indicating a roughly equal distribution of drinking history in the dataset.

In [18]:
```
# Create a pie chart

explode=[0, 0.02]
custom_palette = ['orange', 'lightblue']

# Create a pie chart with the custom color palette
plt.figure(figsize=(6, 6))
plt.pie(drk_counts, labels=['Drinking (1)', 'Non-Drinking (0)'], autopct='%1.1f%%',
plt.title('Distribution of Drinking History')
plt.show()
```



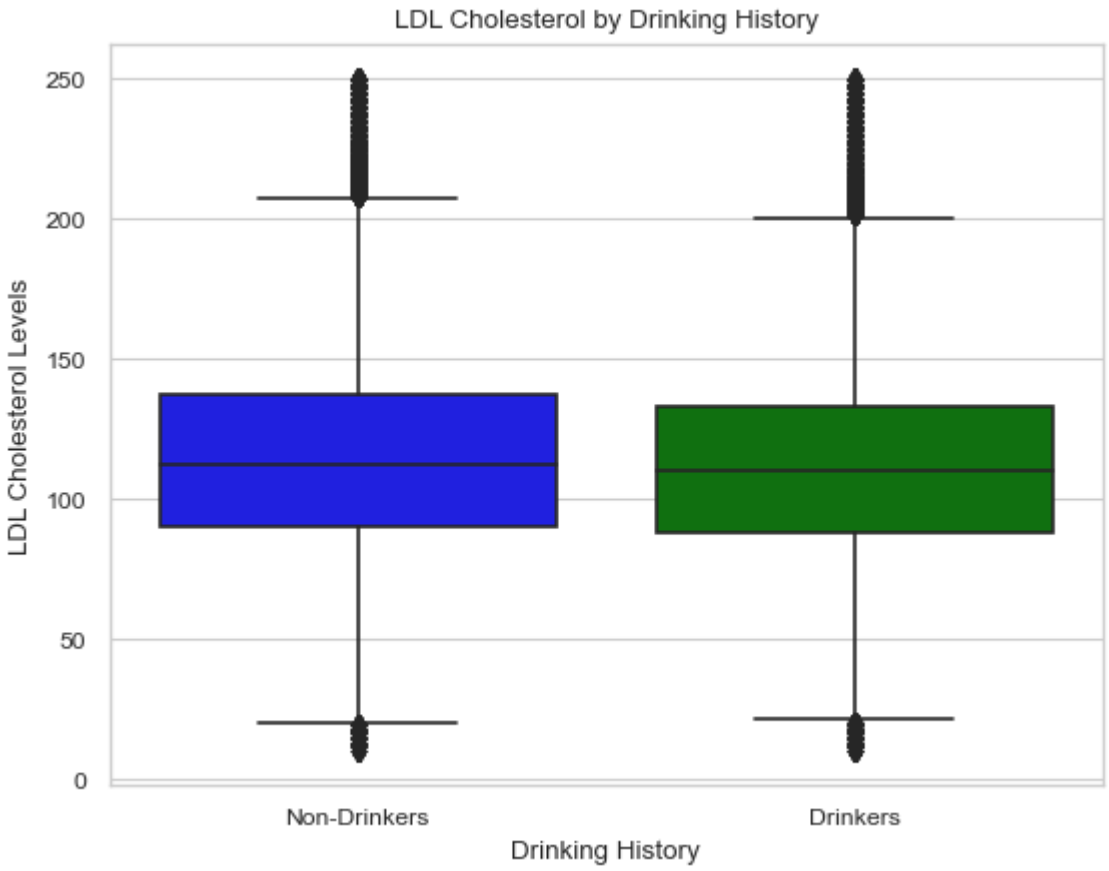
In [19]:
```
# Calculate the mean and standard deviation for drinkers (1)
mean_LDL_drinkers = df[df['drinking_hist'] == 1]['LDL_chole'].mean()
std_LDL_drinkers = df[df['drinking_hist'] == 1]['LDL_chole'].std()

# Calculate the proportion of drinkers (1) in the dataset
proportion_drinkers = len(df[df['drinking_hist'] == 1]) / len(df)

# Calculate the mean and standard deviation for non-drinkers (0)
mean_LDL_nondrinkers = df[df['drinking_hist'] == 0]['LDL_chole'].mean()
std_LDL_nondrinkers = df[df['drinking_hist'] == 0]['LDL_chole'].std()
```

```
# Calculate the proportion of non-drinkers (0) in the dataset
proportion_nondrinkers = len(df[df['drinking_hist'] == 0]) / len(df)

# Print the results
print("Drinkers (1):")
print(f"Mean LDL Cholesterol: {mean_LDL_drinkers:.2f}")
print(f"Standard Deviation: {std_LDL_drinkers:.2f}")
print(f"Proportion of Drinkers: {proportion_drinkers:.2%}\n")

print("Non-Drinkers (0):")
print(f"Mean LDL Cholesterol: {mean_LDL_nondrinkers:.2f}")
print(f"Standard Deviation: {std_LDL_nondrinkers:.2f}")
print(f"Proportion of Non-Drinkers: {proportion_nondrinkers:.2%}")
```

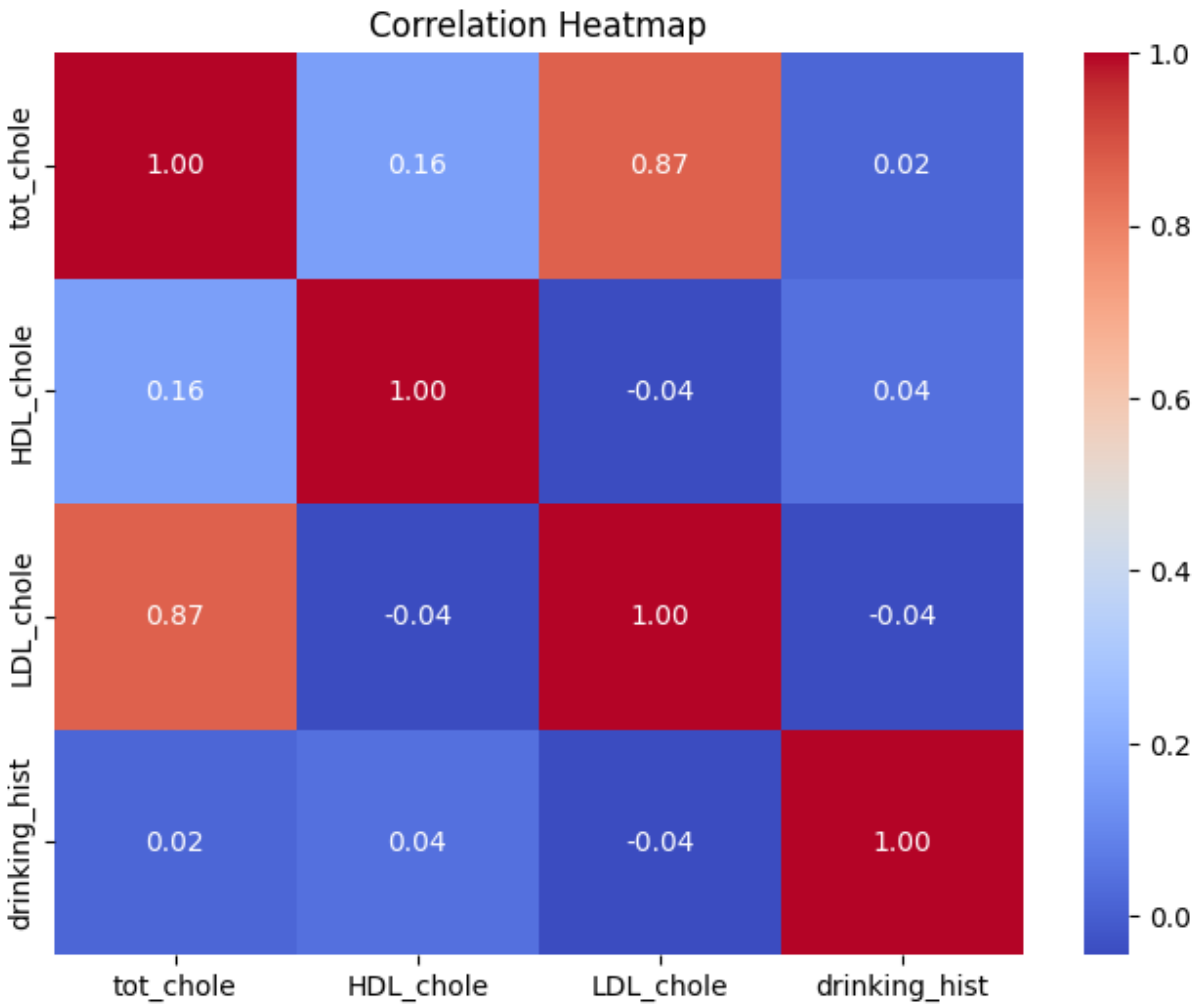
```
Drinkers (1):
Mean LDL Cholesterol: 111.33
Standard Deviation: 33.55
Proportion of Drinkers: 49.98%

Non-Drinkers (0):
Mean LDL Cholesterol: 114.38
Standard Deviation: 34.59
Proportion of Non-Drinkers: 50.02%
```

On average, individuals with a drinking history (1) tend to have a slightly lower mean LDL cholesterol level (111.47) compared to those without a drinking history (0) who have a slightly higher mean LDL cholesterol level (114.60), with nearly equal proportions of drinkers and non-drinkers in the dataset.

In [26]:
```
# Calculate the mean LDL cholesterol for drinkers (1) and non-drinkers (0)

sns.boxplot(x='drinking_hist', y='LDL_chole', data=df, palette=['blue', 'green'])
plt.xlabel('Drinking History')
plt.ylabel('LDL Cholesterol Levels')
plt.title('LDL Cholesterol by Drinking History')
plt.xticks([0, 1], ['Non-Drinkers', 'Drinkers'])
plt.show()
```



In [21]:
```
# Calculate the correlation matrix with other cholesterol results

correlation_matrix = df[['tot_chole', 'HDL_chole', 'LDL_chole', 'drinking_hist']].c

# Create a heatmap of the correlation matrix
plt.figure(figsize=(8, 6))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', fmt=".2f")
plt.title('Correlation Heatmap')
plt.show()
```



The correlation coefficient for LDL Cholesterol is -0.04. This indicates a very weak linear relationship between LDL cholesterol levels and drinking history.

In [22]:
```
from scipy.stats import ttest_ind

# Separate the data into two groups: drinkers and non-drinkers
drinkers = df[df['drinking_hist'] == 1]['LDL_chole']
non_drinkers = df[df['drinking_hist'] == 0]['LDL_chole']

# Perform an independent t-test
t_statistic, p_value = ttest_ind(drinkers, non_drinkers, equal_var=False)

# Print the results
print('T-Statistic:', t_statistic)
print('P-Value:', p_value)
```

```
T-Statistic: -44.550079625743514
P-Value: 0.0
```

This independent two-sample t-test, the negative t-statistic (-44.55) suggests that individuals with a drinking history (1) have a lower mean LDL cholesterol levels compared to those without a drinking history (0). The low p-value (0.0) indicates strong evidence to reject the

null hypothesis, supporting the hypothesis that drinking has a significant correlation with LDL cholesterol levels.

Drinking is associated with lower LDL cholesterol levels.