19. Scenario:

You are a medical researcher investigating the effectiveness of a new drug in reducing blood

pressure. You conduct a clinical trial with a sample of 50 patients who were randomly assigned to

receive either the new drug or a placebo. After measuring their blood pressure levels at the end of

the trial, you obtain the data for both groups. Now, you want to determine the confidence intervals

for the mean reduction in blood pressure for both the drug and placebo groups.

Question:

"What is the 95% confidence interval for the mean reduction in blood pressure for patients who

received the new drug? Also, what is the 95% confidence interval for the mean reduction in blood

pressure for patients who received the placebo?

Code:

import pandas as pd

import numpy as np

from scipy import stats

import matplotlib.pyplot as plt

import seaborn as sns

df = pd.read\_csv(r"C:\Users\jampa\Downloads\blood\_pressure\_trial.csv")

def confidence\_interval(data):

mean = np.mean(data)

sem = stats.sem(data)

margin = sem \* stats.t.ppf((1 + 0.95) / 2, len(data) - 1)

return mean, margin

summary = df.groupby('Group')['BP\_Reduction'].apply(confidence\_interval).reset\_index()

summary[['Mean', 'Margin']] = pd.DataFrame(summary['BP\_Reduction'].tolist(), index=summary.index)

# Plot

plt.figure(figsize=(8, 5))

sns.barplot(data=summary, x='Group', y='Mean', hue='Group', legend=False,

palette="Set2", capsize=0.1, errorbar=None)

plt.errorbar(x=range(len(summary)), y=summary['Mean'],

yerr=summary['Margin'], fmt='none', c='black', capsize=5)

plt.title("95% Confidence Interval for Mean BP Reduction")

plt.ylabel("Blood Pressure Reduction (mmHg)")

plt.xlabel("Group")

plt.xticks(ticks=range(len(summary)), labels=summary['Group']) # Match bar positions

plt.tight\_layout()

plt.show()

output:

A number on a white background

AI-generated content may be incorrect.

A graph of a graph showing a number of different colored squares

AI-generated content may be incorrect.

Dataset:

|  |  |  |
| --- | --- | --- |
| Patient\_ID | Group | BP\_Reduction |
| P1 | Drug | 11.49014 |
| P2 | Drug | 9.585207 |
| P3 | Drug | 11.94307 |
| P4 | Drug | 14.56909 |
| P5 | Drug | 9.29754 |
| P6 | Drug | 9.297589 |
| P7 | Drug | 14.73764 |
| P8 | Drug | 12.3023 |
| P9 | Drug | 8.591577 |
| P10 | Drug | 11.62768 |
| P11 | Drug | 8.609747 |
| P12 | Drug | 8.602811 |
| P13 | Drug | 10.72589 |
| P14 | Drug | 4.260159 |
| P15 | Drug | 4.825247 |
| P16 | Drug | 8.313137 |
| P17 | Drug | 6.961507 |
| P18 | Drug | 10.94274 |
| P19 | Drug | 7.275928 |
| P20 | Drug | 5.763089 |
| P21 | Drug | 14.39695 |
| P22 | Drug | 9.322671 |
| P23 | Drug | 10.20258 |
| P24 | Drug | 5.725755 |
| P25 | Drug | 8.366852 |
| P26 | Placebo | 3.221845 |
| P27 | Placebo | 0.698013 |
| P28 | Placebo | 3.751396 |
| P29 | Placebo | 1.798723 |
| P30 | Placebo | 2.416613 |
| P31 | Placebo | 1.796587 |
| P32 | Placebo | 6.704556 |
| P33 | Placebo | 2.973006 |
| P34 | Placebo | 0.884578 |
| P35 | Placebo | 4.64509 |
| P36 | Placebo | 0.558313 |
| P37 | Placebo | 3.417727 |
| P38 | Placebo | -0.91934 |
| P39 | Placebo | 0.343628 |
| P40 | Placebo | 3.393722 |
| P41 | Placebo | 4.476933 |
| P42 | Placebo | 3.342737 |
| P43 | Placebo | 2.768703 |
| P44 | Placebo | 2.397793 |
| P45 | Placebo | 0.042956 |
| P46 | Placebo | 1.560312 |
| P47 | Placebo | 2.078722 |
| P48 | Placebo | 5.114244 |
| P49 | Placebo | 3.687237 |
| P50 | Placebo | -0.52608 |
|  |  |  |