```
from google.colab import files

# Upload the file
uploaded = files.upload()
```

```
Choose Files No file chosen    Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.
Saving mental_health_and_technology_usage_2022.xlsx to mental_health_and_technology_usage_2022 (1).xlsx
```

```
import pandas as pd

# Assuming the uploaded file is 'mental_health_and_technology_usage_2022.xlsx'
df = pd.read_excel('mental_health_and_technology_usage_2022.xlsx')

# Check the first few rows of the dataset
df.head()
```

	User_ID	Age	Birth Year	Generation	Technology_Usage_Hours	Social_Media_Usage_Hours	Gaming_Hours	Screen_Time_Hours	Mental_Health_Status	Stress_Level	Sleep_Hours	Physical_Activity_Hours	Support_Systems_Access	Work_Environment_Impact	Online_Support_Usage
0	USER-00001	23	1999	Gen Z	6.57	6.00	0.68	12.36	Good	Low	8.01	6.71	No	Negative	Yes
1	USER-00002	21	2001	Gen Z	3.01	2.57	3.74	7.61	Poor	High	7.28	5.88	Yes	Positive	No
2	USER-00003	51	1971	Gen X	3.04	6.14	1.26	3.16	Fair	High	8.04	9.81	No	Negative	No
3	USER-00004	25	1997	Gen Z	3.84	4.48	2.59	13.08	Excellent	Medium	5.62	5.28	Yes	Negative	Yes
4	USER-00005	53	1969	Gen X	1.20	0.56	0.29	12.63	Good	Low	5.55	4.00	No	Positive	Yes

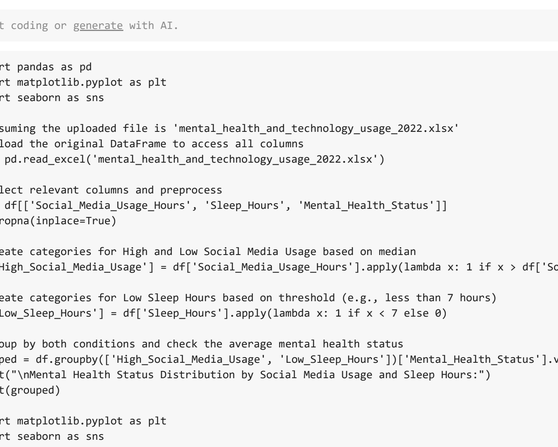
```
# Select relevant columns and preprocess the data
df = df[['Technology_Usage_Hours', 'Work_Environment_Impact', 'Stress_Level']]
df.loc[:, 'Stress_Level_Binary'] = df['Stress_Level'].apply(lambda x: 1 if x == 'High' else 0)
df.dropna(subset=['Technology_Usage_Hours', 'Work_Environment_Impact', 'Stress_Level'], inplace=True)

print("Data loaded and preprocessed. Binary encoding applied to Stress Level.")

# Diagnostic Analysis 1: Descriptive statistics for Technology Usage and Stress Level
tech_usage_stats = df.groupby('Stress_Level')['Technology_Usage_Hours'].mean()
print("\nAverage Technology Usage Hours by Stress Level:")
print(tech_usage_stats)

# Diagnostic Analysis 2: Percentage of High Stress by Work Environment Impact
work_env_stats = df.groupby('Work_Environment_Impact')['Stress_Level_Binary'].mean() * 100
print("\nPercentage of High Stress by Work Environment Impact:")
print(work_env_stats)

# Create a new variable for high technology usage based on median split
df['High_Tech_Usage'] = df['Technology_Usage_Hours'].apply(lambda x: 1 if x > df['Technology_Usage_Hours'].median() else 0)
print("\nHigh technology usage defined based on median technology usage hours.")

# Diagnostic Analysis 3: Interaction between Technology Usage and Work Environment Impact on Stress
interaction_effects = pd.crosstab(df['High_Tech_Usage'], df['Work_Environment_Impact'], df['Stress_Level_Binary'], aggfunc='mean') * 100
print("\nInteraction Effects Between Technology Usage and Work Environment on High Stress Levels:")
print(interaction_effects)

# Subgroup Analysis: Analysis by Work Environment Impact and Technology Usage
subgroup_analysis = df.groupby(['Work_Environment_Impact', 'High_Tech_Usage'])['Stress_Level_Binary'].mean() * 100
print("\nSubgroup Analysis: Percentage of High Stress by Work Environment Impact and Technology Usage:")
print(subgroup_analysis)

# Create an interaction term for correlation analysis between technology usage and work environment impact
df['Tech_Work_Interaction'] = df['Technology_Usage_Hours'] * df['Work_Environment_Impact'].apply(lambda x: 1 if x == 'Negative' else 0)
interaction_correlation = df['Tech_Work_Interaction'].corr(df['Stress_Level_Binary'])
print(f"\nCorrelation between Technology-Work Environment Interaction and High Stress Level: {interaction_correlation}")

# Conclusion summary printed
print("\nConclusion:")
print("1. The interaction between high technology usage and a negative work environment shows a trend, though correlation may vary.")
print("2. Further analysis is needed to fully understand the causes behind high stress levels in relation to these factors.")
```

```
<ipython-input-12-74f3abe48260>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df.loc[:, 'Stress_Level_Binary'] = df['Stress_Level'].apply(lambda x: 1 if x == 'High' else 0)
Data loaded and preprocessed. Binary encoding applied to Stress Level.

Average Technology Usage Hours by Stress Level:
Stress_Level
High      6.460679
Low       6.533724
Medium    6.428694
Name: Technology_Usage_Hours, dtype: float64

Percentage of High Stress by Work Environment Impact:
Work_Environment_Impact
Negative    33.333333
Neutral     33.695652
Positive    32.870091
Name: Stress_Level_Binary, dtype: float64

High technology usage defined based on median technology usage hours.

Interaction Effects Between Technology Usage and Work Environment on High Stress Levels:
Work_Environment_Impact   Negative    Neutral   Positive
High_Tech_Usage
0                       34.066587  32.200358  34.186472
1                       32.606132  35.229358  31.575794

Subgroup Analysis: Percentage of High Stress by Work Environment Impact and Technology Usage:
Work_Environment_Impact  High_Tech_Usage
Negative                 0                 34.066587
                         1                 32.606132
Neutral                  0                 32.200358
                         1                 35.229358
Positive                 0                 34.186472
                         1                 31.575794
Name: Stress_Level_Binary, dtype: float64

Correlation between Technology-Work Environment Interaction and High Stress Level: -0.0003101466768785015

Conclusion:
1. The interaction between high technology usage and a negative work environment shows a trend, though correlation may vary.
2. Further analysis is needed to fully understand the causes behind high stress levels in relation to these factors.
```

```
Start coding or generate with AI.
```

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Assuming the uploaded file is 'mental_health_and_technology_usage_2022.xlsx'
# Reload the original DataFrame to access all columns
df = pd.read_excel('mental_health_and_technology_usage_2022.xlsx')

# Select relevant columns and preprocess
df = df[['Social_Media_Usage_Hours', 'Sleep_Hours', 'Mental_Health_Status']]
df.dropna(inplace=True)

# Create categories for High and Low Social Media Usage based on median
df['High_Social_Media_Usage'] = df['Social_Media_Usage_Hours'].apply(lambda x: 1 if x > df['Social_Media_Usage_Hours'].median() else 0)

# Create categories for Low Sleep Hours based on threshold (e.g., less than 7 hours)
df['Low_Sleep_Hours'] = df['Sleep_Hours'].apply(lambda x: 1 if x < 7 else 0)

# Group by both conditions and check the average mental health status
grouped = df.groupby(['High_Social_Media_Usage', 'Low_Sleep_Hours'])['Mental_Health_Status'].value_counts(normalize=True)
print("\nMental Health Status Distribution by Social Media Usage and Sleep Hours:")
print(grouped)

import matplotlib.pyplot as plt
import seaborn as sns

# Create a grid of histograms to show the distribution of Sleep Hours for High vs Low Social Media Usage
plt.figure(figsize=(12, 6))



# Correlation between Social Media Usage, Sleep Hours, and Mental Health
df['Poor_Mental_Health'] = df['Mental_Health_Status'].apply(lambda x: 1 if x == 'Poor' else 0)
correlation = df[['Social_Media_Usage_Hours', 'Sleep_Hours', 'Poor_Mental_Health']].corr()
print("\nCorrelation Matrix:")
print(correlation)
```

```
Mental Health Status Distribution by Social Media Usage and Sleep Hours:
High_Social_Media_Usage  Low_Sleep_Hours  Mental_Health_Status
0                        0                Poor                  0.257951
                                          Excellent             0.257446
                                          Fair                  0.243816
                                          Good                  0.240787
                         1                Good                  0.258438
                                          Excellent             0.251820
                                          Poor                  0.245533
                                          Fair                  0.244209
1                        0                Fair                  0.264289
                                          Excellent             0.251588
                                          Poor                  0.246214
                                          Good                  0.237909
                         1                Good                  0.258644
                                          Excellent             0.248136
                                          Fair                  0.246780
                                          Poor                  0.246441
Name: proportion, dtype: float64
```




```
Correlation Matrix:
                         Social_Media_Usage_Hours  Sleep_Hours  \
Social_Media_Usage_Hours                  1.000000     0.004443
Sleep_Hours                               0.004443     1.000000
Poor_Mental_Health                       -0.005561     0.006284

                         Poor_Mental_Health
Social_Media_Usage_Hours           -0.005561
Sleep_Hours                         0.006284
Poor_Mental_Health                  1.000000
```

```
Start coding or generate with AI.
```

```
import pandas as pd

# Assuming the uploaded file is 'mental_health_and_technology_usage_2022.xlsx'
df2 = pd.read_excel('mental_health_and_technology_usage_2022.xlsx')

# Check the first few rows of the dataset
df2.head()
```

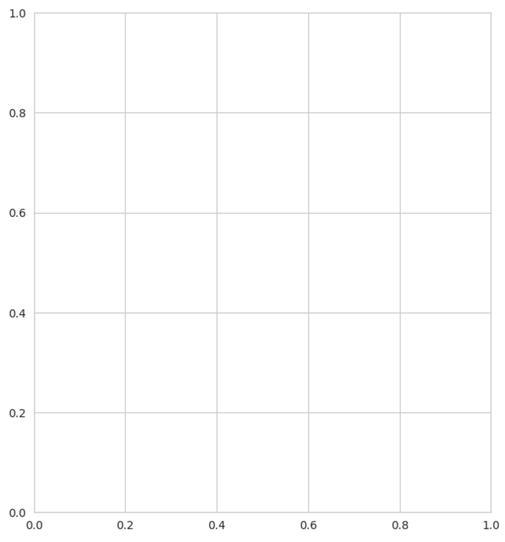
	User_ID	Age	Birth Year	Generation	Technology_Usage_Hours	Social_Media_Usage_Hours	Gaming_Hours	Screen_Time_Hours	Mental_Health_Status	Stress_Level	Sleep_Hours	Physical_Activity_Hours	Support_Systems_Access	Work_Environment_Impact	Online_Support_Usage
0	USER-00001	23	1999	Gen Z	6.57	6.00	0.68	12.36	Good	Low	8.01	6.71	No	Negative	Yes
1	USER-00002	21	2001	Gen Z	3.01	2.57	3.74	7.61	Poor	High	7.28	5.88	Yes	Positive	No
2	USER-00003	51	1971	Gen X	3.04	6.14	1.26	3.16	Fair	High	8.04	9.81	No	Negative	No
3	USER-00004	25	1997	Gen Z	3.84	4.48	2.59	13.08	Excellent	Medium	5.62	5.28	Yes	Negative	Yes
4	USER-00005	53	1969	Gen X	1.20	0.56	0.29	12.63	Good	Low	5.55	4.00	No	Positive	Yes

```
df2.columns
```

```
Index(['User_ID', 'Age', 'Birth Year', 'Generation', 'Technology_Usage_Hours',
       'Social_Media_Usage_Hours', 'Gaming_Hours', 'Screen_Time_Hours',
       'Mental_Health_Status', 'Stress_Level', 'Sleep_Hours',
       'Physical_Activity_Hours', 'Support_Systems_Access',
       'Work_Environment_Impact', 'Online_Support_Usage'],
      dtype='object')
```

```
import matplotlib.pyplot as plt
import seaborn as sns

# Set an enhanced style for better aesthetics
sns.set_style("whitegrid")

# Custom vibrant colors for Mental Health Status
colors = ["#FF6B6B", "#4ECDC4", "#F7B801", "#247BA0"]

# Create a grid of histograms to show the distribution of Sleep Hours for High vs Low Social Media Usage
plt.figure(figsize=(16, 8))

# Plot histogram for Low Social Media Usage
plt.subplot(1, 2, 1)
sns.histplot(df[df['High_Social_Media_Usage'] == 0], x='Sleep_Hours', hue='Mental_Health_Status',
             multiple='stack', kde=True, palette=colors, edgecolor='black', binwidth=0.5, alpha=0.85)

plt.title('Low Social Media Usage', fontsize=18, fontweight='bold', color='#FF6B6B')
plt.xlabel('Sleep Hours', fontsize=14, fontweight='bold', color='#247BA0')
plt.ylabel('Count', fontsize=14, fontweight='bold', color='#247BA0')
plt.legend(title='Mental Health Status', fontsize=12, title_fontsize=14, loc='upper right')
plt.xticks(fontsize=12, color='#4ECDC4')
plt.yticks(fontsize=12, color='#4ECDC4')

# Adding Annotations for Low Social Media Usage
plt.text(5, 23, "Adequate Sleep = Better Mental Health", fontsize=12, color='#FF6B6B', weight='bold')

# Plot histogram for High Social Media Usage
plt.subplot(1, 2, 2)
sns.histplot(df[df['High_Social_Media_Usage'] == 1], x='Sleep_Hours', hue='Mental_Health_Status',
             multiple='stack', kde=True, palette=colors, edgecolor='black', binwidth=0.5, alpha=0.85)

plt.title('High Social Media Usage', fontsize=18, fontweight='bold', color='#FF6B6B')
plt.xlabel('Sleep Hours', fontsize=14, fontweight='bold', color='black')
plt.ylabel('Count', fontsize=14, fontweight='bold', color='#247BA0')
plt.legend(title='Mental Health Status', fontsize=12, title_fontsize=14, loc='upper right')
plt.xticks(fontsize=10, color='#4ECDC4')
plt.yticks(fontsize=10, color='#4ECDC4')

# Adding Annotations for High Social Media Usage
plt.text(5.5, 30, "High Social Media Usage May Reduce Sleep Quality", fontsize=12, color='#FF6B6B', weight='bold')

# Apply tight layout
plt.tight_layout()

# Show the plot
plt.show()
```

```
---------------------------------------------------------------------------
KeyError                                  Traceback (most recent call last)
/usr/local/lib/python3.10/dist-packages/pandas/core/indexes/base.py in get_loc(self, key)
   3804         try:
-> 3805             return self._engine.get_loc(casted_key)
   3806         except KeyError as err:

index.pyx in pandas._libs.index.IndexEngine.get_loc()

index.pyx in pandas._libs.index.IndexEngine.get_loc()

pandas/_libs/hashtable_class_helper.pxi in pandas._libs.hashtable.PyObjectHashTable.get_item()

pandas/_libs/hashtable_class_helper.pxi in pandas._libs.hashtable.PyObjectHashTable.get_item()

KeyError: 'High_Social_Media_Usage'

The above exception was the direct cause of the following exception:

KeyError                                  Traceback (most recent call last)
                                          2 frames
/usr/local/lib/python3.10/dist-packages/pandas/core/indexes/base.py in get_loc(self, key)
   3810             ):
   3811                 raise InvalidIndexError(key)
-> 3812             raise KeyError(key) from err
   3813         except TypeError:
   3814             # If we have a listlike key, _check_indexing_error will raise

KeyError: 'High_Social_Media_Usage'
```




```
Start coding or generate with AI.
```

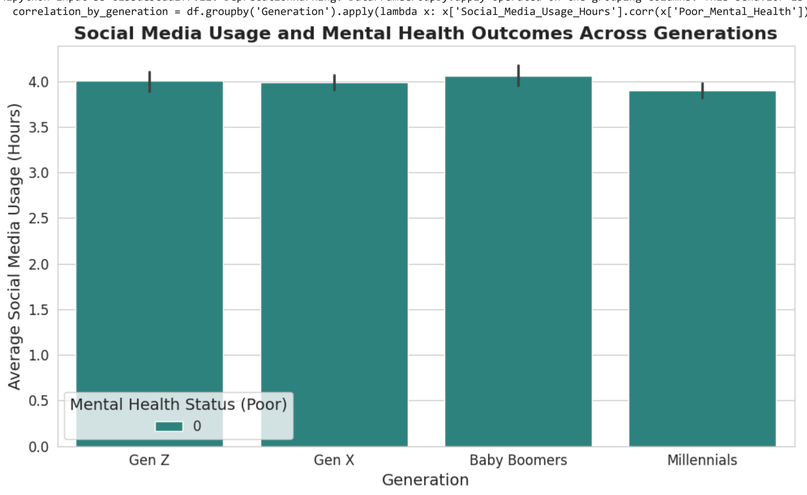
```
Start coding or generate with AI.
```

	Social_Media_Usage_Hours	Sleep_Hours	Mental_Health_Status	High_Social_Media_Usage	Low_Sleep_Hours	Poor_Mental_Health
0	6.00	8.01	Good	1	0	0
1	2.57	7.28	Poor	0	0	1
2	6.14	8.04	Fair	1	0	0
3	4.48	5.62	Excellent	1	1	0
4	0.56	5.55	Good	0	1	0
...	...	...	...	...	...	...
9995	0.41	7.37	Good	0	0	0
9996	6.79	8.92	Fair	1	0	0
9997	3.98	7.59	Poor	1	0	1
9998	1.48	7.26	Poor	0	0	1
9999	4.80	4.62	Fair	1	1	0

10000 rows × 6 columns

```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

# Load the dataset
file_path = 'mental_health_and_technology_usage_2022.xlsx'
df = pd.read_excel(file_path)

# Preprocessing: Selecting relevant columns and dropping missing values
df = df[['Social_Media_Usage_Hours', 'Mental_Health_Status', 'Generation']]
df.dropna(inplace=True)

# Encode Mental Health Status (for example: 'Anxiety' or 'Depression' as 1 and 'Good' as 0)
df['Poor_Mental_Health'] = df['Mental_Health_Status'].apply(lambda x: 1 if x in ['Anxiety', 'Depression'] else 0)

# Calculate average social media usage for each generation and mental health condition
generation_stats = df.groupby('Generation')[['Social_Media_Usage_Hours', 'Poor_Mental_Health']].mean()
print("\nAverage Social Media Usage and Mental Health Status by Generation:")
print(generation_stats)

# Correlation between Social Media Usage and Mental Health Outcomes by Generation
correlation_by_generation = df.groupby('Generation').apply(lambda x: x['Social_Media_Usage_Hours'].corr(x['Poor_Mental_Health']))
print("\nCorrelation between Social Media Usage and Poor Mental Health by Generation:")
print(correlation_by_generation)

# Visualizing the relationship between Social Media Usage and Poor Mental Health across generations
plt.figure(figsize=(10, 6))
sns.barplot(x='Generation', y='Social_Media_Usage_Hours', hue='Poor_Mental_Health', data=df, palette='viridis')
plt.title('Social Media Usage and Mental Health Outcomes Across Generations', fontsize=16, fontweight='bold')
plt.xlabel('Generation', fontsize=14)
plt.ylabel('Average Social Media Usage (Hours)', fontsize=14)
plt.legend(title='Mental Health Status (Poor)', fontsize=12, title_fontsize=14)
plt.xticks(fontsize=12)
plt.yticks(fontsize=12)
plt.tight_layout()

# Show the plot
plt.show()

# Additional diagnostic: Identifying potential factors explaining differences
# E.g., calculating the percentage of poor mental health per generation
generation_mental_health_distribution = df.groupby('Generation')['Poor_Mental_Health'].mean() * 100
print("\nPercentage of Poor Mental Health by Generation:")
print(generation_mental_health_distribution)
```

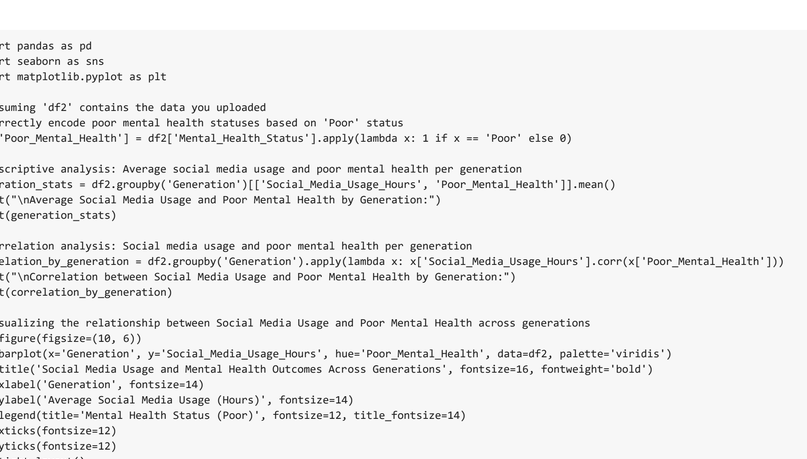
```
Average Social Media Usage and Mental Health Status by Generation:
              Social_Media_Usage_Hours  Poor_Mental_Health
Generation
Baby Boomers                  4.060466                 0.0
Gen X                         3.982845                 0.0
Gen Z                         4.008223                 0.0
Millennials                   3.898209                 0.0

Correlation between Social Media Usage and Poor Mental Health by Generation:
Generation
Baby Boomers   NaN
Gen X          NaN
Gen Z          NaN
Millennials    NaN
dtype: float64
/usr/local/lib/python3.10/dist-packages/numpy/lib/function_base.py:2897: RuntimeWarning: invalid value encountered in divide
  c /= stddev[:, None]
/usr/local/lib/python3.10/dist-packages/numpy/lib/function_base.py:2898: RuntimeWarning: invalid value encountered in divide
  c /= stddev[None, :]
<ipython-input-33-6233de58aa1f>:22: DeprecationWarning: DataFrameGroupBy.apply operated on the grouping columns. This behavior is deprecated, and in a future version of pandas the grouping columns will be excluded from the operation. Either pass `include_groups=False` to exclude the groupings or explicitly select the grouping columns after groupby to silence this warning.
  correlation_by_generation = df.groupby('Generation').apply(lambda x: x['Social_Media_Usage_Hours'].corr(x['Poor_Mental_Health']))
```




```
Percentage of Poor Mental Health by Generation:
Generation
Baby Boomers    0.0
Gen X           0.0
Gen Z           0.0
Millennials     0.0
Name: Poor_Mental_Health, dtype: float64
```

```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

# Assuming 'df2' contains the data you uploaded
# Correctly encode poor mental health statuses based on 'Poor' status
df2['Poor_Mental_Health'] = df2['Mental_Health_Status'].apply(lambda x: 1 if x == 'Poor' else 0)

# Descriptive analysis: Average social media usage and poor mental health per generation
generation_stats = df2.groupby('Generation')[['Social_Media_Usage_Hours', 'Poor_Mental_Health']].mean()
print("\nAverage Social Media Usage and Poor Mental Health by Generation:")
print(generation_stats)

# Correlation analysis: Social media usage and poor mental health per generation
correlation_by_generation = df2.groupby('Generation').apply(lambda x: x['Social_Media_Usage_Hours'].corr(x['Poor_Mental_Health']))
print("\nCorrelation between Social Media Usage and Poor Mental Health by Generation:")
print(correlation_by_generation)

# Visualizing the relationship between Social Media Usage and Poor Mental Health across generations
plt.figure(figsize=(10, 6))
sns.barplot(x='Generation', y='Social_Media_Usage_Hours', hue='Poor_Mental_Health', data=df2, palette='viridis')
plt.title('Social Media Usage and Mental Health Outcomes Across Generations', fontsize=16, fontweight='bold')
plt.xlabel('Generation', fontsize=14)
plt.ylabel('Average Social Media Usage (Hours)', fontsize=14)
plt.legend(title='Mental Health Status (Poor)', fontsize=12, title_fontsize=14)
plt.xticks(fontsize=12)
plt.yticks(fontsize=12)
plt.tight_layout()

# Show the plot
plt.show()

# Investigating additional factors: Stress, sleep, and work environment impact
additional_factors = df2[['Stress_Level_Numeric', 'Sleep_Hours', 'Work_Environment_Impact_Numeric', 'Generation', 'Poor_Mental_Health']]
factor_stats = additional_factors.groupby('Generation').mean()
print("\nAdditional Factors by Generation (Average Stress Level, Sleep Hours, Work Environment Impact):")
print(factor_stats)
```

```
Average Social Media Usage and Poor Mental Health by Generation:
              Social_Media_Usage_Hours  Poor_Mental_Health
Generation
Baby Boomers                  4.060466            0.244392
Gen X                         3.982845            0.238585
Gen Z                         4.008223            0.252066
Millennials                   3.898209            0.258396

Correlation between Social Media Usage and Poor Mental Health by Generation:
Generation
Baby Boomers    0.038350
Gen X          -0.018768
Gen Z           0.011728
Millennials    -0.022716
dtype: float64
<ipython-input-36-f54a09f80bc4>:15: DeprecationWarning: DataFrameGroupBy.apply operated on the grouping columns. This behavior is deprecated, and in a future version of pandas the grouping columns will be excluded from the operation. Either pass `include_groups=False` to exclude the groupings or explicitly select the grouping columns after groupby to silence this warning.
  correlation_by_generation = df2.groupby('Generation').apply(lambda x: x['Social_Media_Usage_Hours'].corr(x['Poor_Mental_Health']))
```




```
Additional Factors by Generation (Average Stress Level, Sleep Hours, Work Environment Impact):
              Stress_Level_Numeric  Sleep_Hours  \
Generation
Baby Boomers              1.976387     6.530171
Gen X                     2.013003     6.481814
Gen Z                     2.024793     6.499427
Millennials               1.985779     6.505216

              Work_Environment_Impact_Numeric  Poor_Mental_Health
Generation
```