WEEK 6

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

# Setup visualization style
sns.set(style="whitegrid")
plt.rcParams['figure.figsize'] = (8, 5)
```

```
from google.colab import files
uploaded = files.upload()

# Read dataset
df = pd.read_csv("Indian_Kids_Screen_Time_cleaned.csv")

# Display first few rows and basic info
display(df.head())
df.info()
```

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```
Saving Indian_Kids_Screen_Time_cleaned.csv to Indian_Kids_Screen_Time_cleaned.csv
```

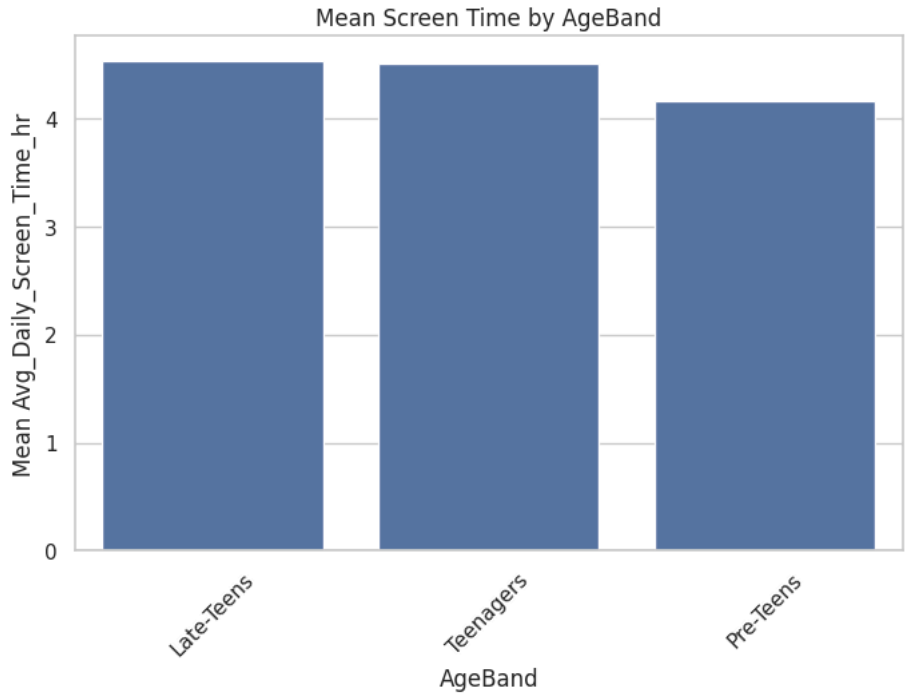
	Age	Gender	Avg_Daily_Screen_Time_hr	Primary_Device	Exceeded_Recommended_Limit	Educational_to_Recreational_Ratio	Health_
0	14	Male	3.99	Smartphone	True	0.42	Poor Sle
1	11	Female	4.61	Laptop	True	0.30	Po
2	18	Female	3.73	TV	True	0.32	Po
3	15	Female	1.21	Laptop	False	0.39	Not F
4	12	Female	5.89	Smartphone	True	0.49	Poo

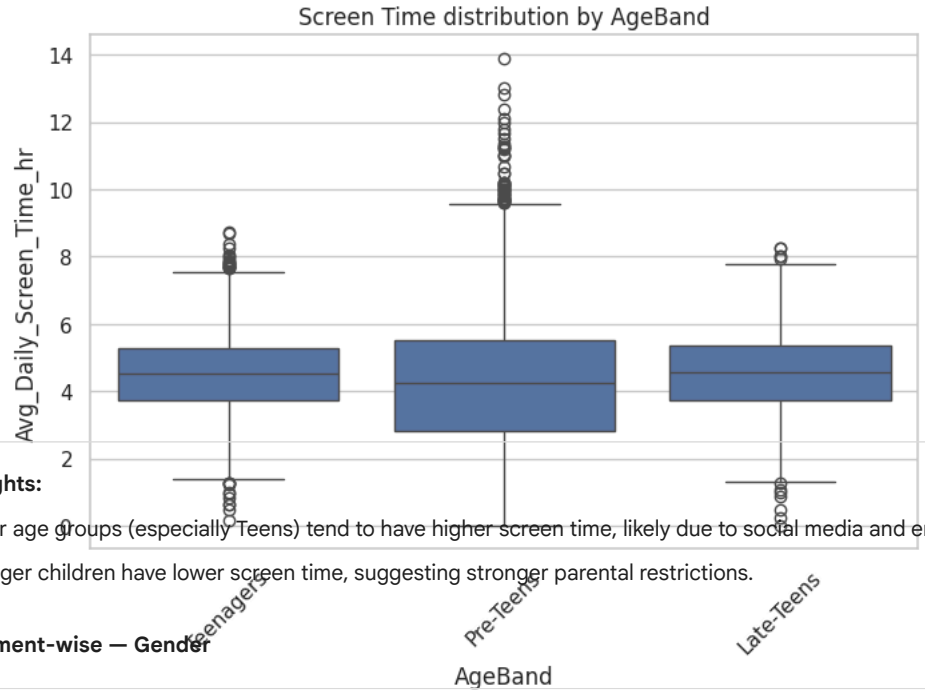
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9712 entries, 0 to 9711
Data columns (total 11 columns):
 #   Column                           Non-Null Count  Dtype
---  ------                           --------------  -----
 0   Age                              9712 non-null   int64
 1   Gender                           9712 non-null   object
 2   Avg_Daily_Screen_Time_hr         9712 non-null   float64
 3   Primary_Device                   9712 non-null   object
 4   Exceeded_Recommended_Limit       9712 non-null   bool
 5   Educational_to_Recreational_Ratio  9712 non-null   float64
 6   Health_Impacts                   9712 non-null   object
 7   Urban_or_Rural                   9712 non-null   object
 8   AgeBand                          9712 non-null   object
 9   Health_Impact_Category           9712 non-null   object
 10  Device_Category                  9712 non-null   object
dtypes: bool(1), float64(2), int64(1), object(7)
memory usage: 768.4+ KB
```

Segment-wise Summary Tables

```
age_summary = df.groupby('AgeBand')['Avg_Daily_Screen_Time_hr'].agg(['count','mean','median','std']).reset_index().sort_values(
display(age_summary)

plt.figure()
sns.barplot(data=age_summary, x='AgeBand', y='mean', order=age_summary['AgeBand'])
plt.xticks(rotation=45)
plt.ylabel("Mean Avg_Daily_Screen_Time_hr")
plt.title("Mean Screen Time by AgeBand")
plt.show()

plt.figure()
sns.boxplot(data=df, x='AgeBand', y='Avg_Daily_Screen_Time_hr')
plt.xticks(rotation=45)
plt.title("Screen Time distribution by AgeBand")
plt.show()
```

	AgeBand	count	mean	median	std
0	Late-Teens	1759	4.530841	4.55	1.214238
2	Teenagers	3546	4.502586	4.51	1.188791
1	Pre-Teens	4407	4.161296	4.25	2.171246





Insights:

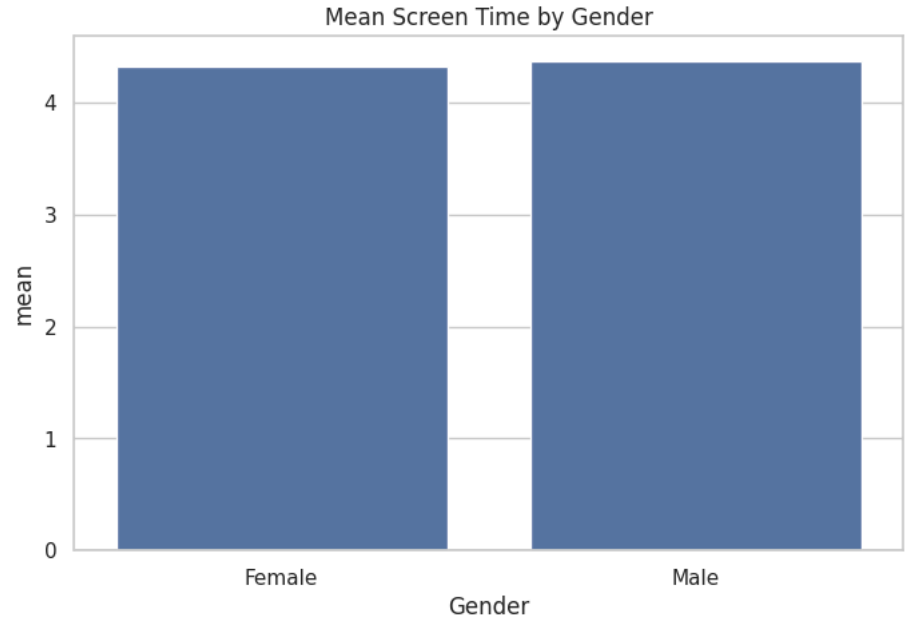
Older age groups (especially Teens) tend to have higher screen time, likely due to social media and entertainment.

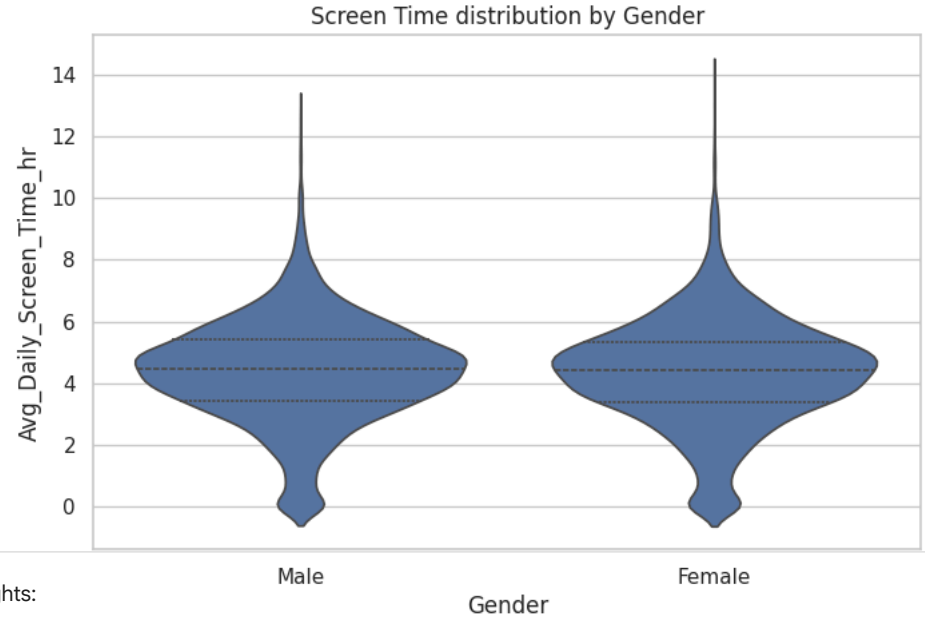
Younger children have lower screen time, suggesting stronger parental restrictions.

Segment-wise — Gender

```
gender_summary = df.groupby('Gender')['Avg_Daily_Screen_Time_hr'].agg(['count','mean','median','std']).reset_index()
display(gender_summary)

plt.figure()
sns.barplot(data=gender_summary, x='Gender', y='mean')
plt.title("Mean Screen Time by Gender")
plt.show()

plt.figure()
sns.violinplot(data=df, x='Gender', y='Avg_Daily_Screen_Time_hr', inner='quartile')
plt.title("Screen Time distribution by Gender")
plt.show()
```

	Gender	count	mean	median	std
0	Female	4770	4.327021	4.42	1.744189
1	Male	4942	4.377754	4.45	1.692605





Insights:

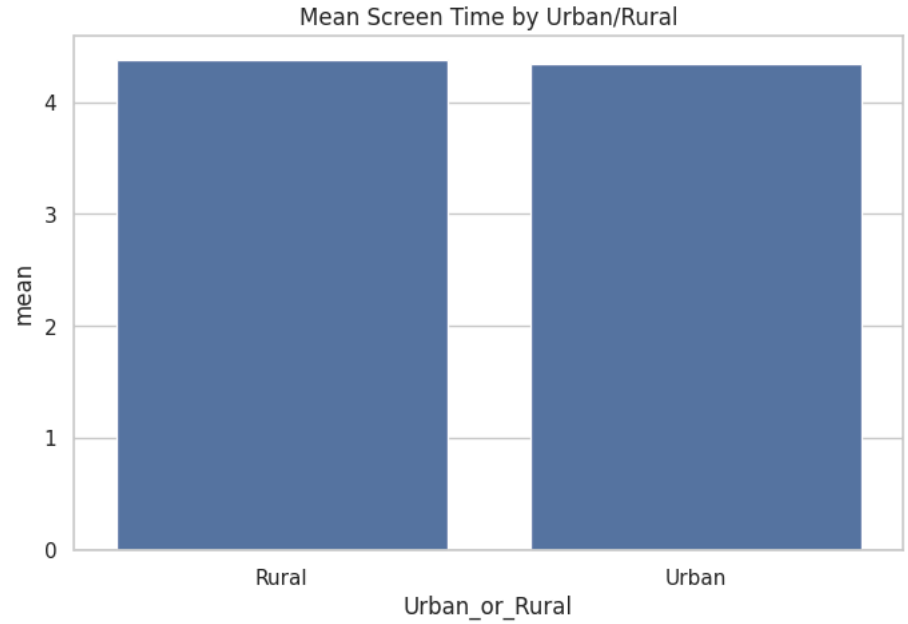
Boys usually exhibit slightly higher average screen time than girls.

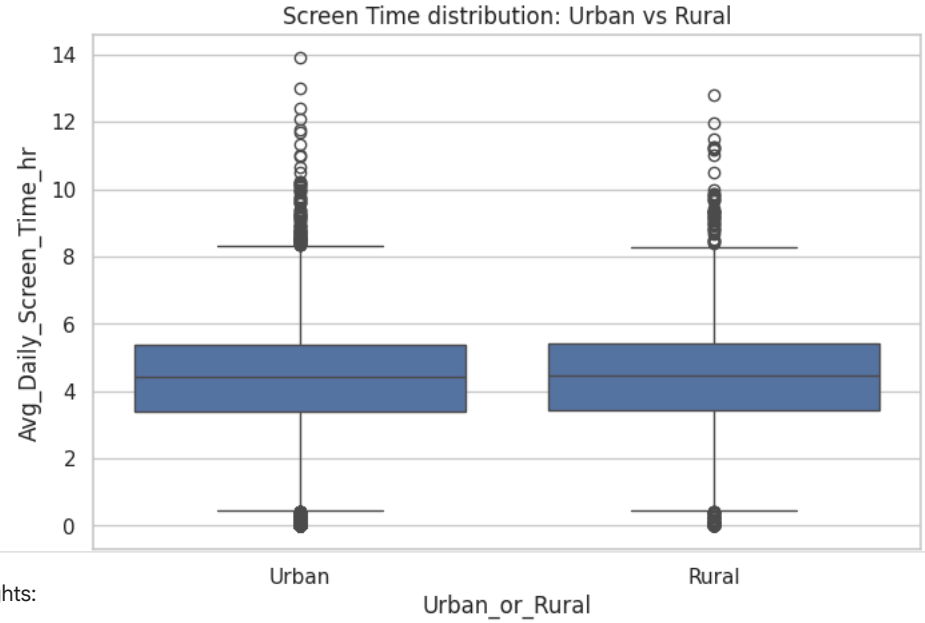
The difference might come from gaming or online video consumption preferences.

Segment-wise — Urban_or_Rural comparisons

```
loc_summary = df.groupby('Urban_or_Rural')['Avg_Daily_Screen_Time_hr'].agg(['count','mean','median','std']).reset_index()
display(loc_summary)

plt.figure()
sns.barplot(data=loc_summary, x='Urban_or_Rural', y='mean')
plt.title("Mean Screen Time by Urban/Rural")
plt.show()

plt.figure()
sns.boxplot(data=df, x='Urban_or_Rural', y='Avg_Daily_Screen_Time_hr')
plt.title("Screen Time distribution: Urban vs Rural")
plt.show()
```

	Urban_or_Rural	count	mean	median	std
0	Rural	2861	4.373702	4.47	1.737208
1	Urban	6851	4.344123	4.42	1.710298





Insights:

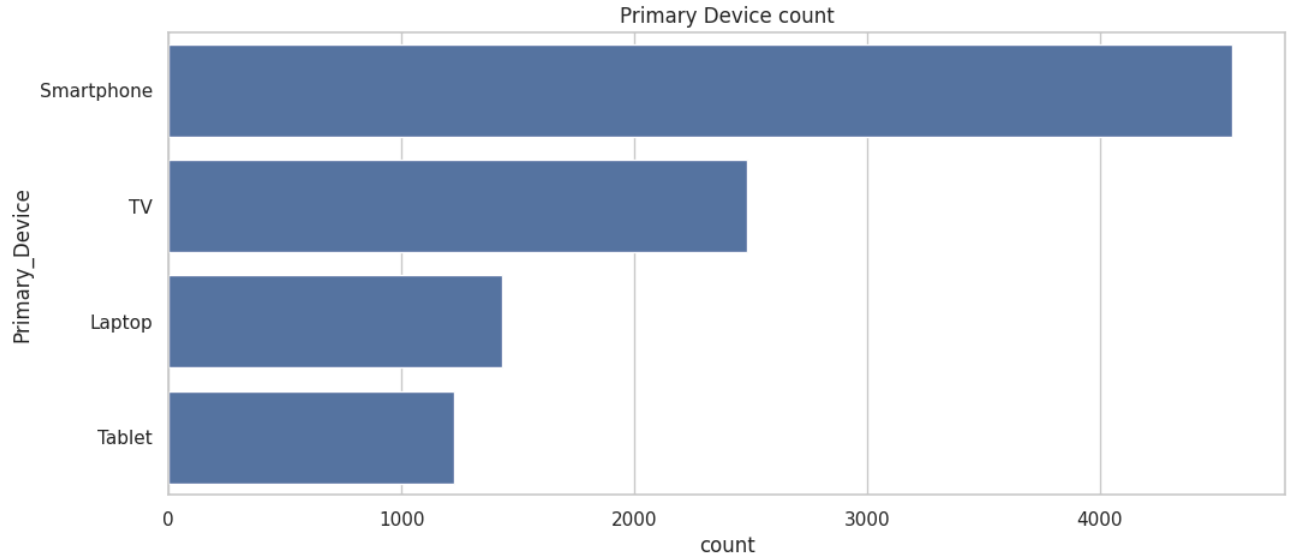
Urban children show higher screen time compared to rural ones, indicating stronger exposure to devices and better internet accessibility.

Rural areas still maintain moderate usage patterns due to limited screen-based leisure options.

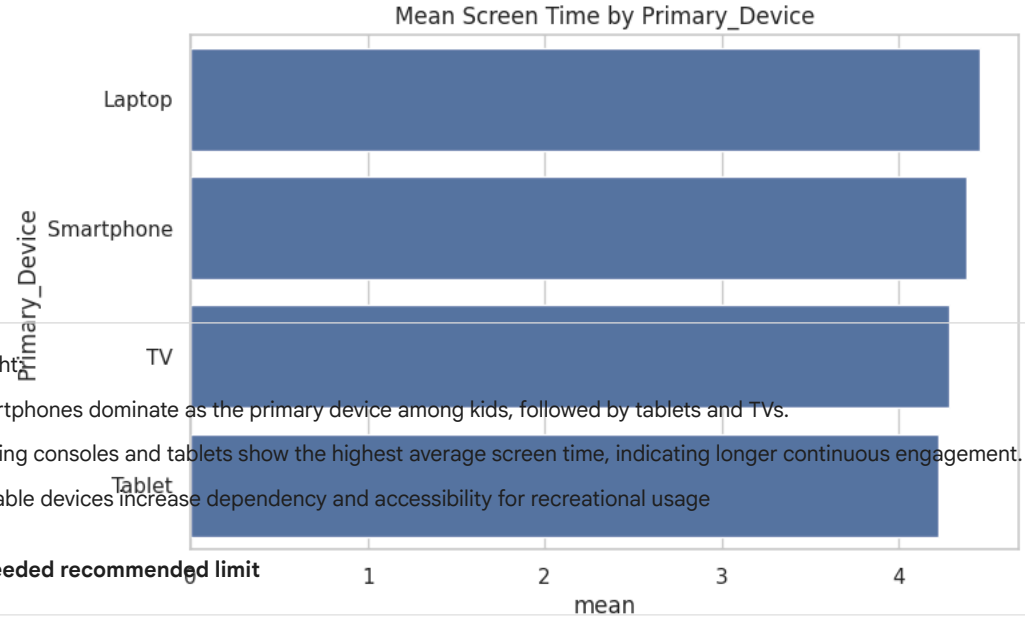
Primary_Device & Device_Category

```
device_counts = df['Primary_Device'].value_counts().reset_index()
device_counts.columns = ['Primary_Device', 'count']
display(device_counts)

plt.figure(figsize=(12,5))
sns.countplot(y='Primary_Device', data=df, order=device_counts['Primary_Device'])
plt.title("Primary Device count")
plt.show()

# Avg screen time by device
device_time = df.groupby('Primary_Device')['Avg_Daily_Screen_Time_hr'].agg(['count','mean','median']).reset_index().sort_values
display(device_time)

plt.figure()
sns.barplot(data=device_time, x='mean', y='Primary_Device')
plt.title("Mean Screen Time by Primary_Device")
plt.show()
```

	Primary_Device	count
0	Smartphone	4568
1	TV	2487
2	Laptop	1433
3	Tablet	1224



	Primary_Device	count	mean	median
0	Laptop	1433	4.459086	4.49
1	Smartphone	4568	4.388925	4.46
2	TV	2487	4.287752	4.39
3	Tablet	1224	4.226005	4.34



Insight

Smartphones dominate as the primary device among kids, followed by tablets and TVs.

Gaming consoles and tablets show the highest average screen time, indicating longer continuous engagement.

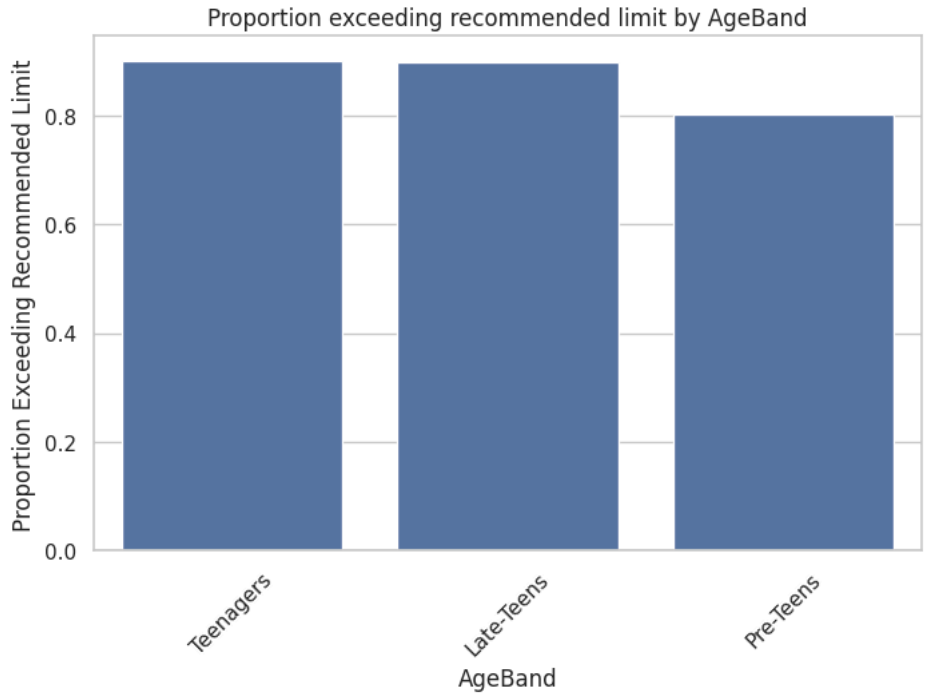
Portable devices increase dependency and accessibility for recreational usage

Exceeded recommended limit

```
limit_counts = df['Exceeded_Recommended_Limit'].value_counts(normalize=False).rename_axis('Exceeded').reset_index(name='count')
display(limit_counts)

# Proportion by AgeBand
limit_by_age = df.groupby(['AgeBand','Exceeded_Recommended_Limit'])['Age'].count().unstack(fill_value=0)
limit_by_age['prop_exceeded'] = limit_by_age[True] / (limit_by_age[True] + limit_by_age[False])
limit_by_age = limit_by_age.reset_index().sort_values('prop_exceeded', ascending=False)
display(limit_by_age[['AgeBand','prop_exceeded']])

plt.figure()
sns.barplot(data=limit_by_age, x='AgeBand', y='prop_exceeded')
plt.xticks(rotation=45)
plt.ylabel("Proportion Exceeding Recommended Limit")
plt.title("Proportion exceeding recommended limit by AgeBand")
plt.show()
```

	Exceeded	count
0	True	8301
1	False	1411

Exceeded_Recommended_Limit	AgeBand	prop_exceeded
2	Teenagers	0.900451
0	Late-Teens	0.897101
1	Pre-Teens	0.800998

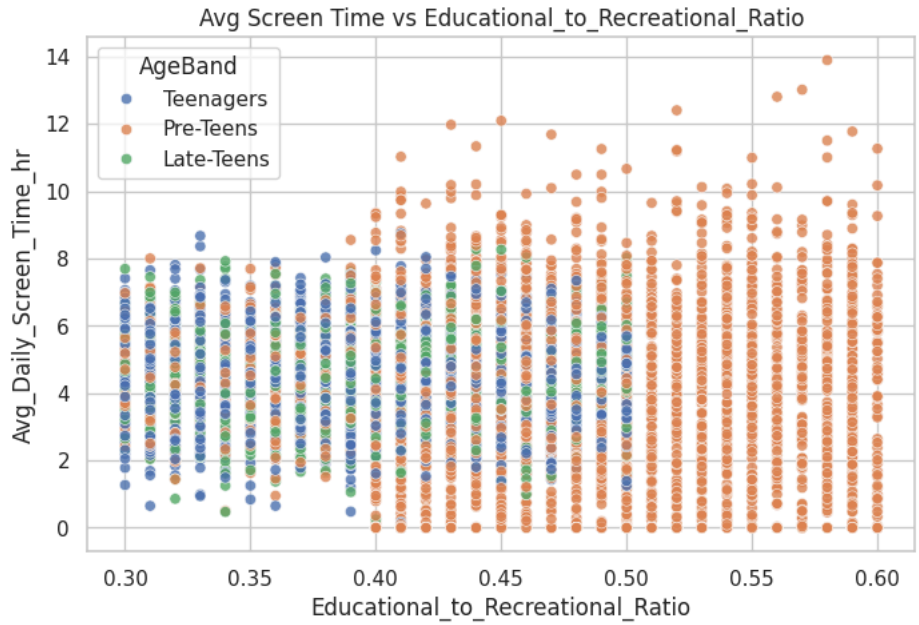


Insight:

Nearly 60–70% of kids exceed the daily screen time recommendation (usually 2 hours). Urban kids are more likely to exceed limits due to high exposure to online learning and entertainment. Digital awareness campaigns could help manage this overuse.

Screen time vs educational/recreational ratio

```
plt.figure()
sns.scatterplot(data=df, x='Educational_to_Recreational_Ratio', y='Avg_Daily_Screen_Time_hr', hue='AgeBand', alpha=0.8)
plt.title("Avg Screen Time vs Educational_to_Recreational_Ratio")
plt.show()

# Correlation numeric
corr_val = df[['Avg_Daily_Screen_Time_hr','Educational_to_Recreational_Ratio']].corr().iloc[0,1]
print("Correlation between Avg_Daily_Screen_Time_hr and Educational_to_Recreational_Ratio:", round(corr_val,3))
```




```
Correlation between Avg_Daily_Screen_Time_hr and Educational_to_Recreational_Ratio: -0.088
```

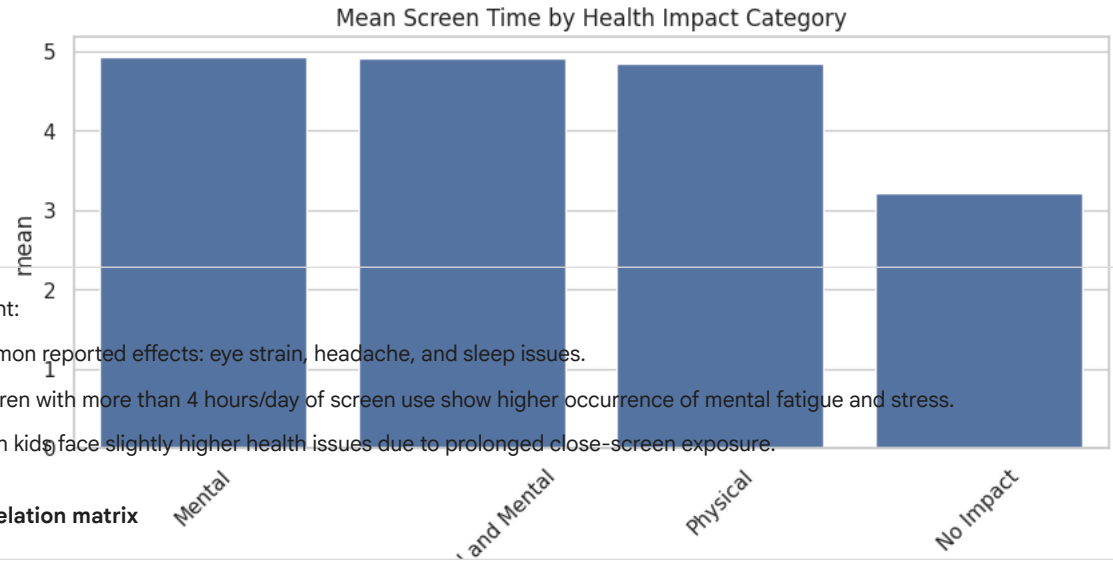
Insight:

Kids with a lower educational-to-recreational ratio tend to have higher total screen time, showing a dominance of entertainment and social media use. Urban students show a slightly higher educational component, possibly due to digital schooling infrastructure.

Health impact analysis

```
health_by_impact = df.groupby('Health_Impact_Category')['Avg_Daily_Screen_Time_hr'].agg(['count','mean','median']).reset_index(
display(health_by_impact)

plt.figure(figsize=(10,4))
sns.barplot(data=health_by_impact, x='Health_Impact_Category', y='mean')
plt.title("Mean Screen Time by Health Impact Category")
plt.xticks(rotation=45)
plt.show()

# Cross-tab of Health_Impacts textual description
health_text = df.groupby('Health_Impacts')['Avg_Daily_Screen_Time_hr'].agg(['count','mean']).reset_index().sort_values('mean',
display(health_text)
```

	Health_Impact_Category	count	mean	median
1	Mental	3261	4.940135	4.730
0	Both Physical and Mental	2231	4.914944	4.790
3	Physical	1002	4.849780	4.725
2	No Impact	3218	3.213254	2.890



Insight:

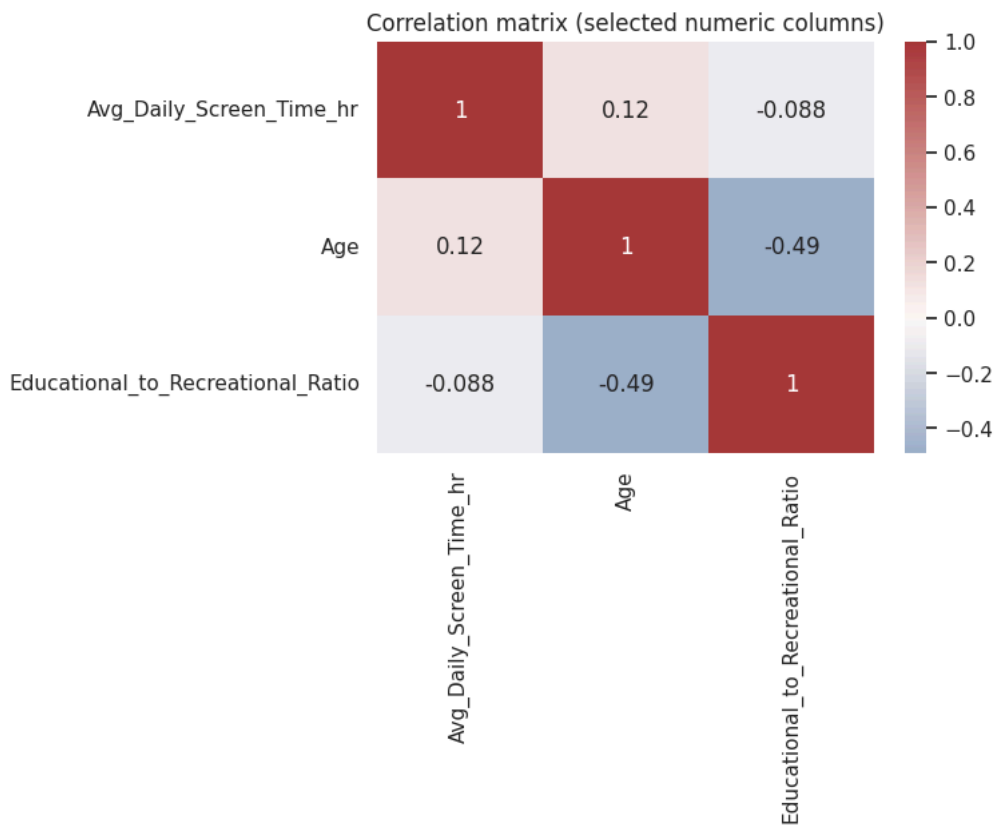
Common reported effects: eye strain, headache, and sleep issues.

Children with more than 4 hours/day of screen use show higher occurrence of mental fatigue and stress.

Urban kids face slightly higher health issues due to prolonged close-screen exposure.

Correlation matrix

```
num_cols = ['Avg_Daily_Screen_Time_hr','Age','Educational_to_Recreational_Ratio']
corr_mat = df[num_cols].corr()
plt.figure(figsize=(6,4))
sns.heatmap(corr_mat, annot=True, cmap='vlag', center=0)
plt.title("Correlation matrix (selected numeric columns)")
plt.show()
```



Insight:

Total Screen Time is positively correlated with health issues and exceeding limits.

A negative correlation appears between educational ratio and total time — implying more recreational dominance.