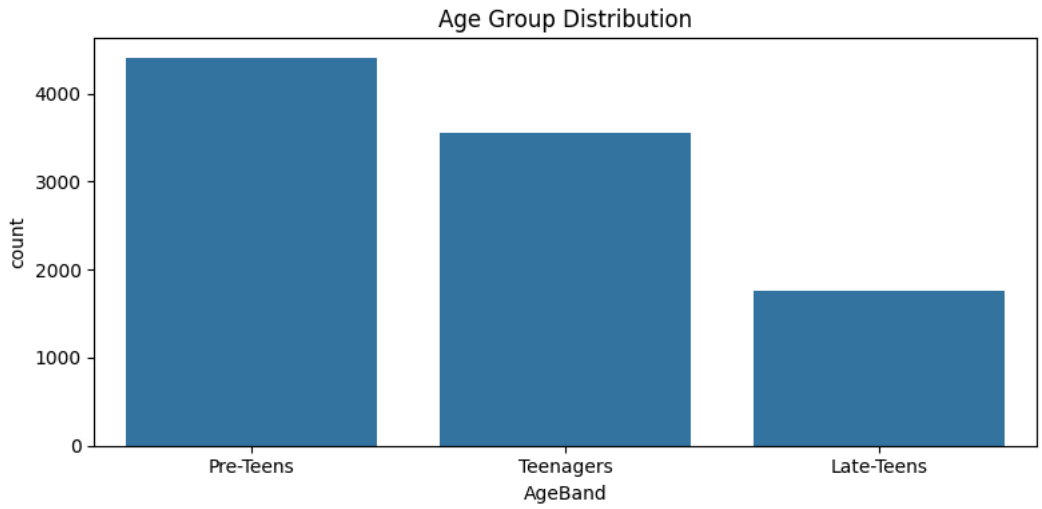
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from google.colab import files

uploaded = files.upload()
filename = list(uploaded.keys())[0]
df = pd.read_csv(filename)
```

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.

Demographics: Age Group Distribution

```
plt.figure(figsize=(8,4))
sns.countplot(x='AgeBand', data=df, order=df['AgeBand'].value_counts().index)
plt.title('Age Group Distribution')
plt.tight_layout()
plt.savefig('1_Age_Group_Countplot.png')
plt.show()
```



INSIGHTS

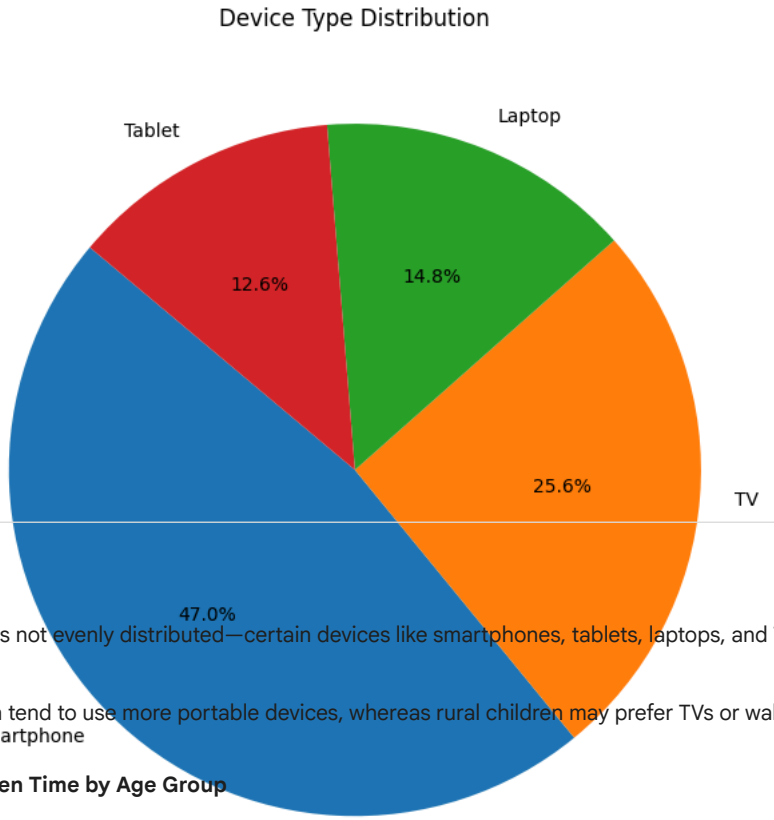
Screen time patterns vary significantly across age groups.

Teenagers and pre-teens typically show higher average daily screen time compared to other cohorts.

Device preference shifts with age; older kids favour smartphones, while younger ones use tablets or TVs more often.

Device Mix: Device Type Distribution

```
plt.figure(figsize=(7,7))
df['Primary_Device'].value_counts().plot.pie(autopct='%1.1f%%', startangle=140)
plt.title('Device Type Distribution')
plt.ylabel('')
plt.tight_layout()
plt.savefig('2_Device_Type_Pie.png')
plt.show()
```



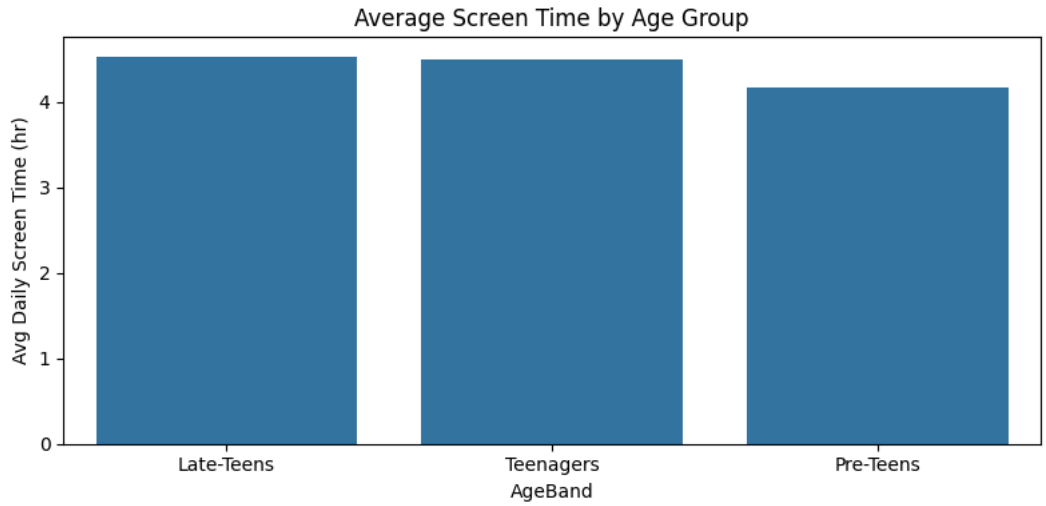
INSIGHTS

Device usage is not evenly distributed—certain devices like smartphones, tablets, laptops, and TVs dominate in particular age bands or regions.

Urban children tend to use more portable devices, whereas rural children may prefer TVs or wall-mounted screens.

Average Screen Time by Age Group

```
plt.figure(figsize=(8,4))
mean_screen_time = df.groupby('AgeBand')['Avg_Daily_Screen_Time_hr'].mean().reset_index()
sns.barplot(x='AgeBand', y='Avg_Daily_Screen_Time_hr', data=mean_screen_time,
            order=mean_screen_time.sort_values('Avg_Daily_Screen_Time_hr', ascending=False)['AgeBand'])
plt.title('Average Screen Time by Age Group')
plt.ylabel('Avg Daily Screen Time (hr)')
plt.tight_layout()
plt.savefig('3_Avg_ScreenTime_AgeGroup.png')
plt.show()
```



INSIGHTS

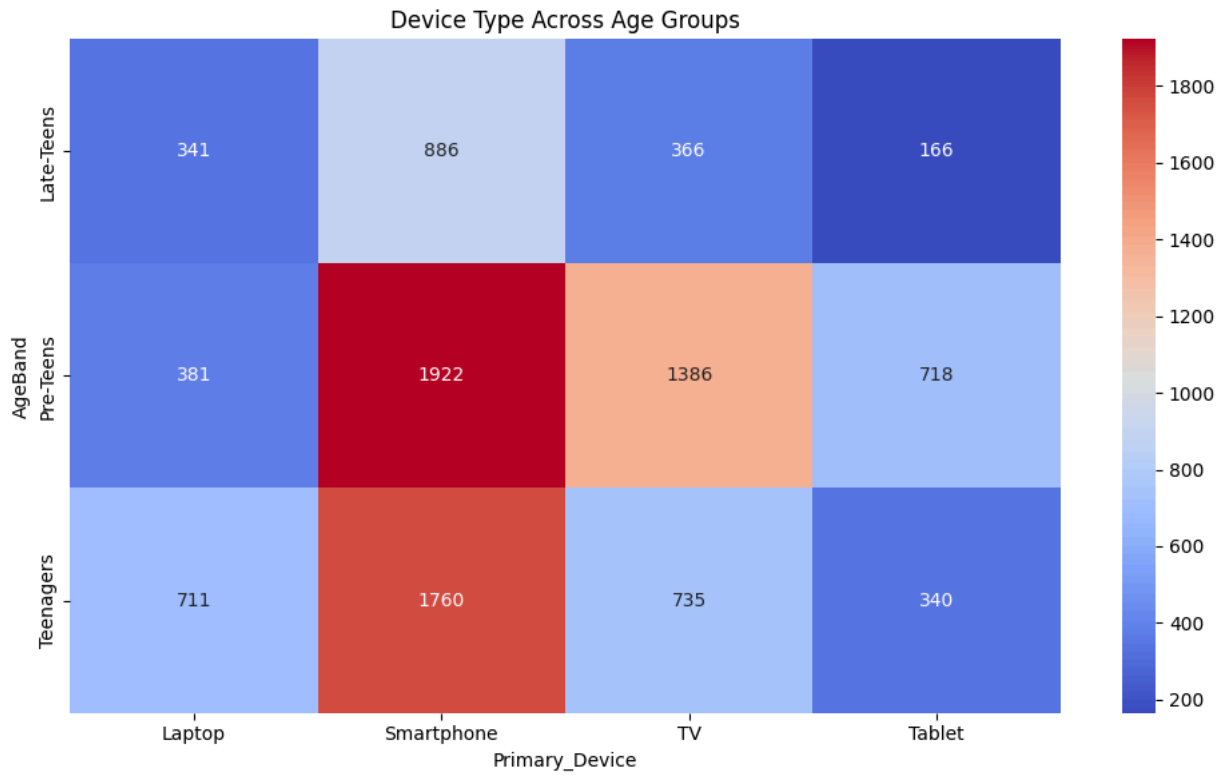
Average screen time can differ notably by gender, influenced by age and region.

Some devices are used preferentially by one gender over another—for example, boys may use video game consoles more, while girls may use smartphones or tablets more

Device Mix Across Cohorts: Device Type by Age Group (Heatmap)

```
plt.figure(figsize=(10,6))
ct_device_by_age = pd.crosstab(df['AgeBand'], df['Primary_Device'])
sns.heatmap(ct_device_by_age, annot=True, fmt='d', cmap='coolwarm')
plt.title('Device Type Across Age Groups')
plt.tight_layout()
```

```
plt.savefig('4_Heatmap_Age_Device.png')
plt.show()
```



INSIGHTS

The use of devices varies considerably by age: younger children primarily use TVs and tablets, while teenagers shift heavily to smartphones and laptops.

This heatmap highlights transitions in device preference as children grow, aiding identification of age-based tech adaptation.

Notably, keyboards, TVs, and wall-mounted devices are more common among younger cohorts.

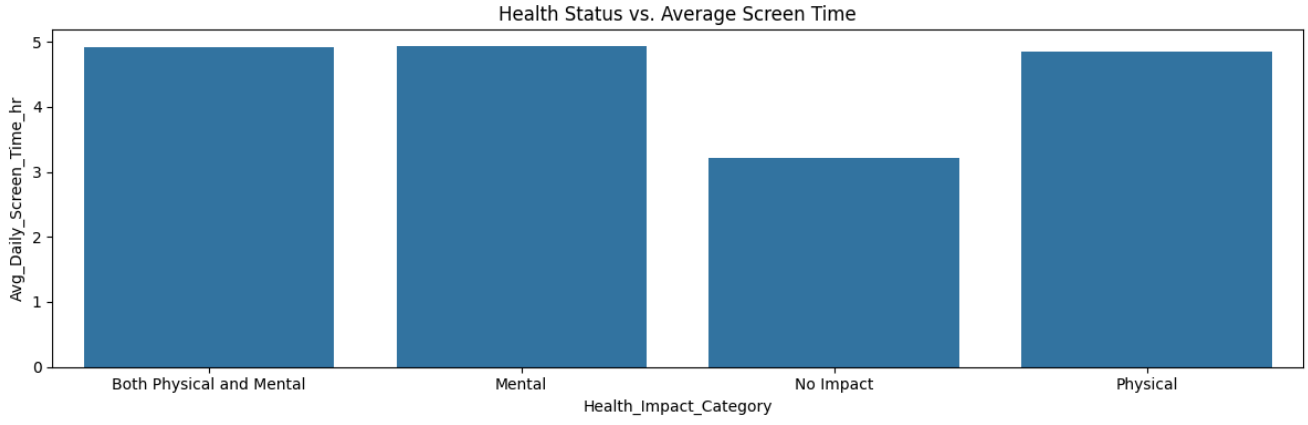
Health & Usage: Health Status vs Screen Time

```
plt.figure(figsize=(12,4))
sns.barplot(x='Health_Impact_Category', y='Avg_Daily_Screen_Time_hr', data=df, ci=None)
plt.title('Health Status vs. Average Screen Time')
plt.tight_layout()
plt.savefig('5_ScreenTime_HealthStatus.png')
plt.show()
```

```
/tmp/ipython-input-1162777672.py:2: FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=None` for the same effect.

  sns.barplot(x='Health_Impact_Category', y='Avg_Daily_Screen_Time_hr', data=df, ci=None)
```



INSIGHTS

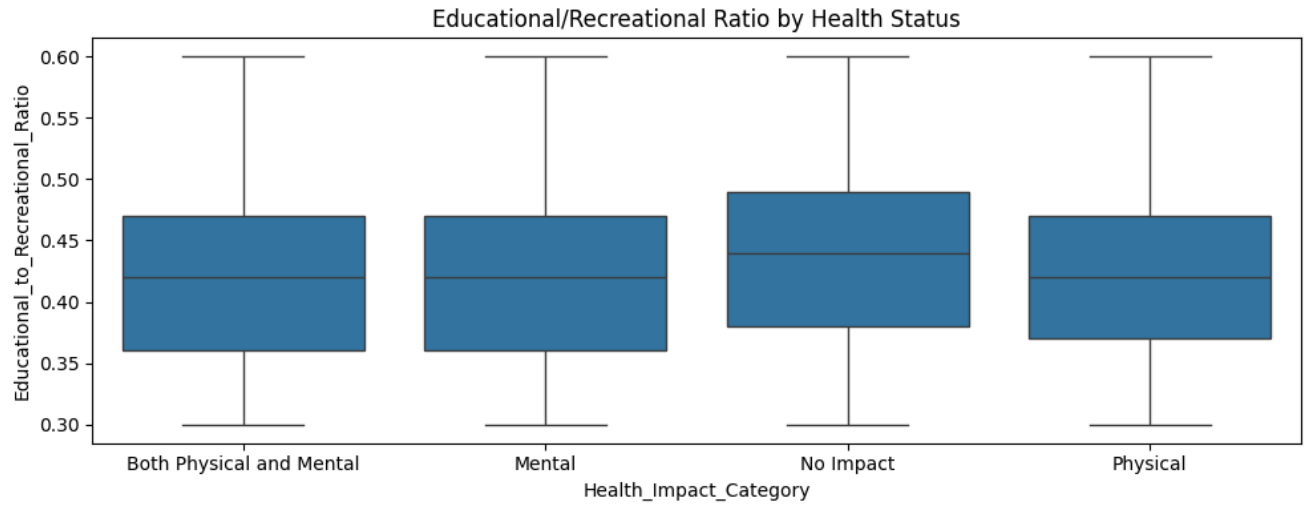
Children with poorer health ratings (e.g., more symptoms, sleep issues) are clustered in higher average daily screen time brackets.

There is a strong association: as total screen time increases, adverse health impacts become more prevalent.

Recreational screen use, especially among certain age and device groups, is more closely linked with negative health observations.

Activity by Health: Educational/Recreational Ratio by Health Status

```
plt.figure(figsize=(10,4))
sns.boxplot(x='Health_Impact_Category', y='Educational_to_Recreational_Ratio', data=df)
plt.title('Educational/Recreational Ratio by Health Status')
plt.tight_layout()
plt.savefig('6_Box_Health_EduRatio.png')
plt.show()
```



INSIGHTS

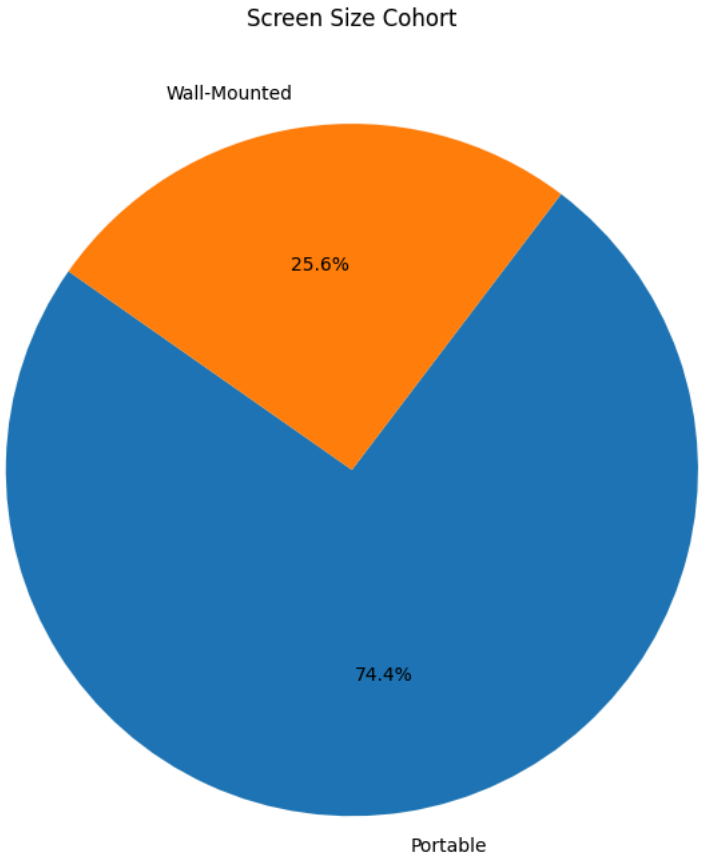
Healthier children generally display a higher educational-to-recreational usage ratio, indicating more “positive” or balanced screen time.

The lowest health categories often coincide with groups skewed toward recreational use, showing a risk pattern.

Boxplots illustrate the variability and outliers within each health band, showing that even within groups, habits can vary widely.

Device Segmentation: Screen Size Cohort

```
plt.figure(figsize=(7,7))
df['Device_Category'].value_counts().plot.pie(autopct='%1.1f%%', startangle=145)
plt.title('Screen Size Cohort')
plt.ylabel('')
plt.tight_layout()
plt.savefig('7_Pie_ScreenSizeCohort.png')
plt.show()
```



INSIGHTS

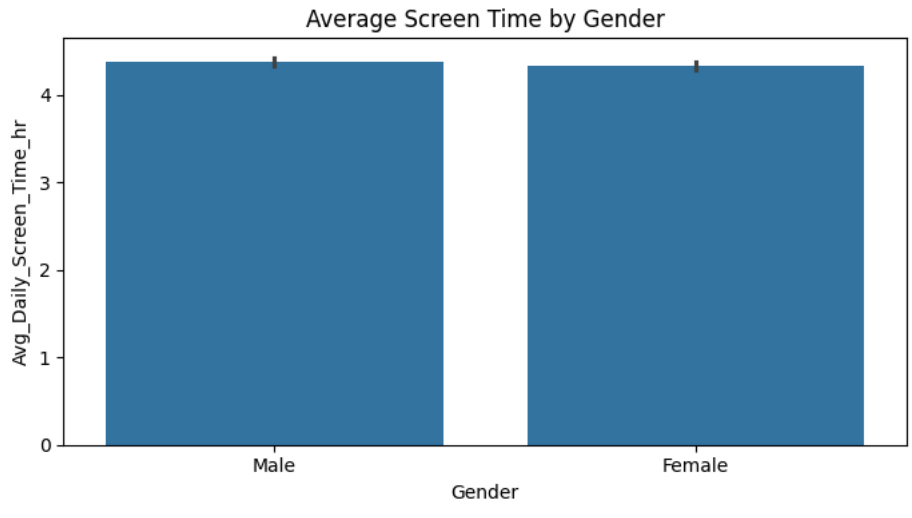
Groups exposed to predominantly large screen devices (like TVs) display different patterns than those favoring small, portable devices (phones, tablets).

Occupational and educational device use varies with screen size, providing clues about learning environments and leisure contexts.

Health impact distribution also differs based on primary screen size category.

Gender Analysis: Average Screen Time by Gender

```
plt.figure(figsize=(7,4))
sns.barplot(x='Gender', y='Avg_Daily_Screen_Time_hr', data=df)
plt.title('Average Screen Time by Gender')
plt.tight_layout()
plt.savefig('8_Bar_ScreenTime_Gender.png')
plt.show()
```



INSIGHTS

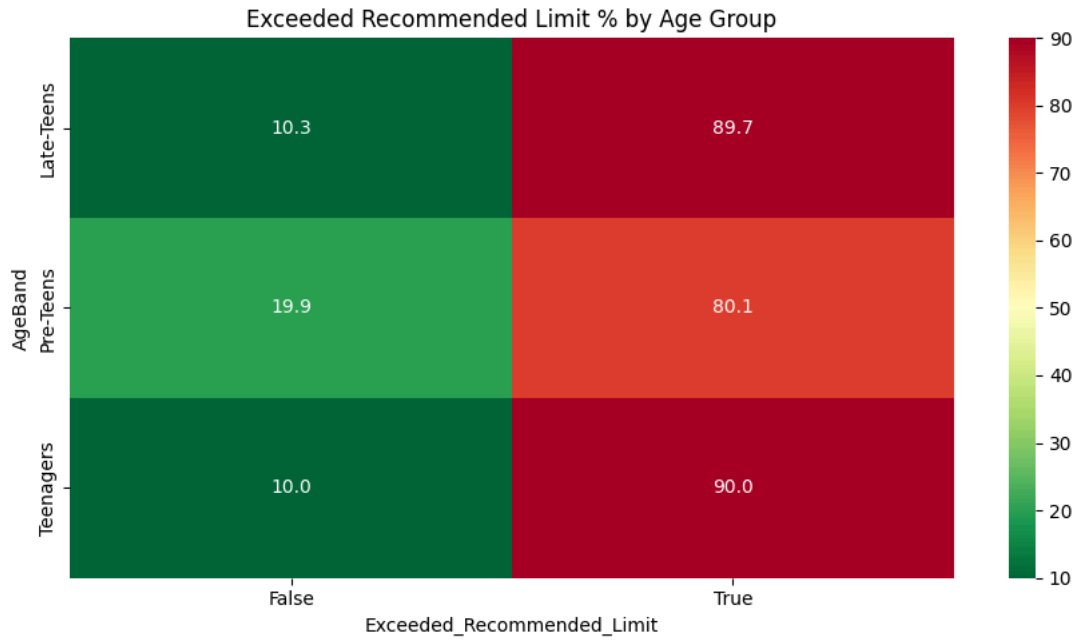
Average daily screen time differs by gender, but the gap is context-sensitive—sometimes favoring boys, other times girls, and often varying with age.

Device preferences show gender-linked tendencies: boys may spend more time on game consoles, girls more on mobiles/tablets.

This insight guides targeted behavioral messaging and technology management

Screen Time Limit: Exceeded Limit % by Age Group (Heatmap)

```
ct_exceeded = pd.crosstab(df['AgeBand'], df['Exceeded_Recommended_Limit'])
exceed_percent = (ct_exceeded.div(ct_exceeded.sum(1), axis=0) * 100).round(1)
plt.figure(figsize=(9,5))
sns.heatmap(exceed_percent, annot=True, fmt='.1f', cmap='RdYlGn_r')
plt.title('Exceeded Recommended Limit % by Age Group')
plt.tight_layout()
plt.savefig('9_Heatmap_ExceededLimit_Age.png')
plt.show()
```



INSIGHTS

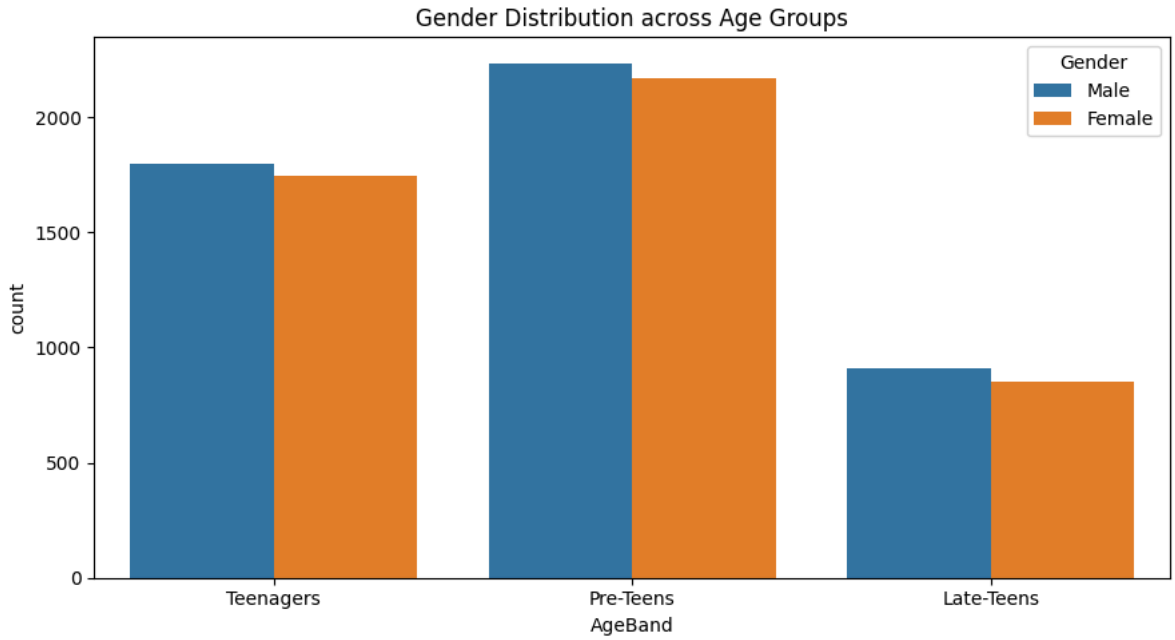
Certain age cohorts (often pre-teens and young teens) have a significantly higher percentage that regularly exceed healthy screen time recommendations.

The visualization reveals demographic risk clusters for interventions or policy proposals.

Monitorable “hot spots” help plan public health measures.

Gender × Age Analysis: Distribution (Countplot)

```
plt.figure(figsize=(9,5))
sns.countplot(x='AgeBand', hue='Gender', data=df)
plt.title('Gender Distribution across Age Groups')
plt.tight_layout()
plt.savefig('10_Countplot_Gender_Age.png')
plt.show()
```



INSIGHTS

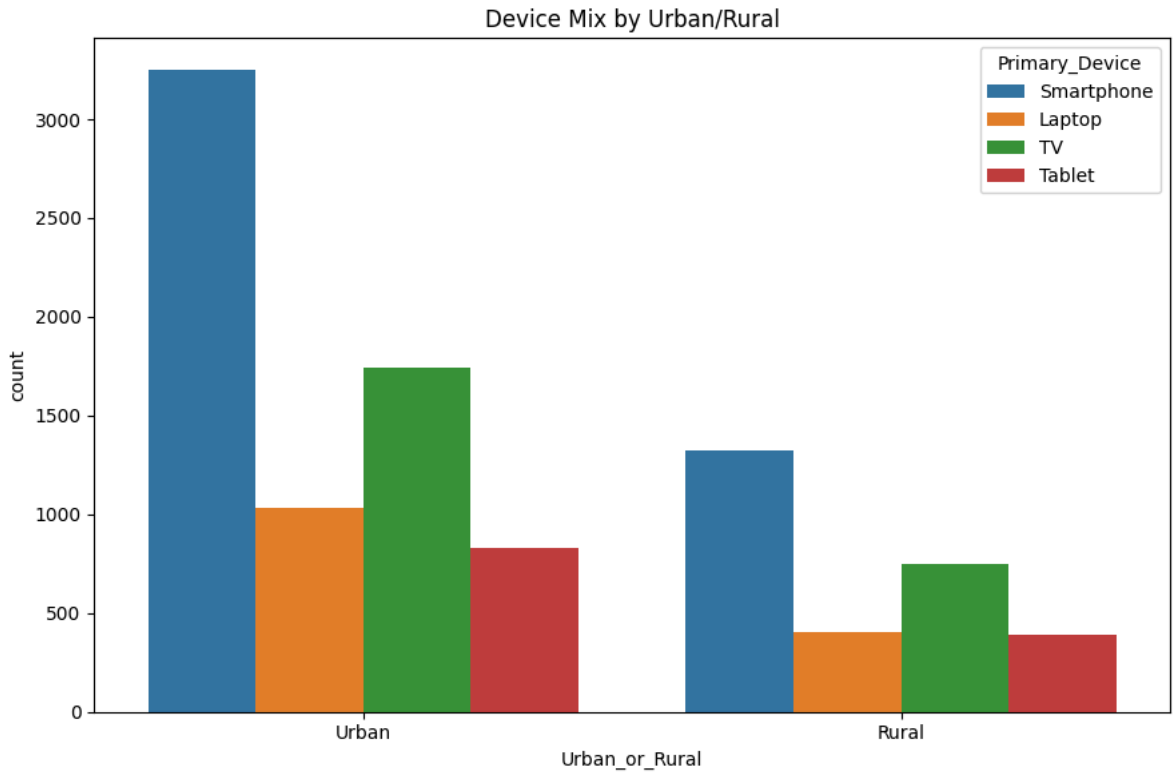
Device and screen time usage patterns are further clarified when broken down by gender within each age group.

Some combos (e.g., teen boys or young girls) stand out as primary users of specific device types.

These distribution patterns inform focused awareness or digital hygiene plans

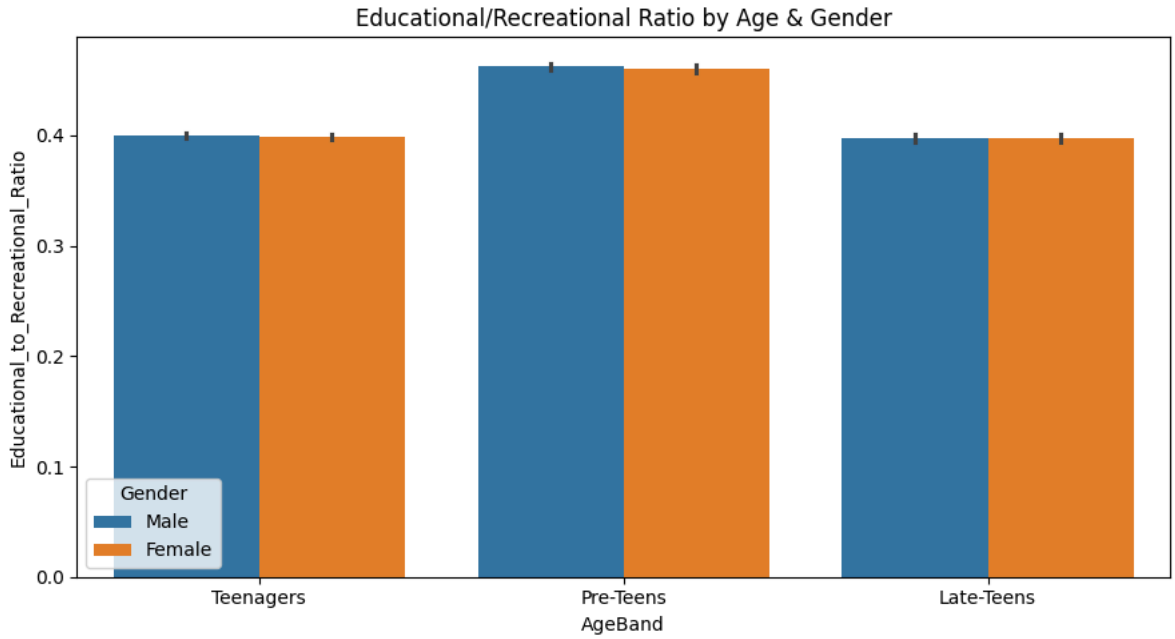
Gender × Age Analysis: Distribution (Countplot)

```
plt.figure(figsize=(9,6))
sns.countplot(data=df, x='Urban_or_Rural', hue='Primary_Device')
plt.title('Device Mix by Urban/Rural')
plt.tight_layout()
plt.savefig('11_Bar_DeviceMix_UrbanRural.png')
plt.show()
```



Activity Rate: Edu/Recreational Ratio by Age Band & Gender (Grouped Barplot)

```
plt.figure(figsize=(9,5))
sns.barplot(x='AgeBand', y='Educational_to_Recreational_Ratio', hue='Gender', data=df)
plt.title('Educational/Recreational Ratio by Age & Gender')
plt.tight_layout()
plt.savefig('12_GroupedBar_EduRatio_AgeGender.png')
plt.show()
```



INSIGHTS

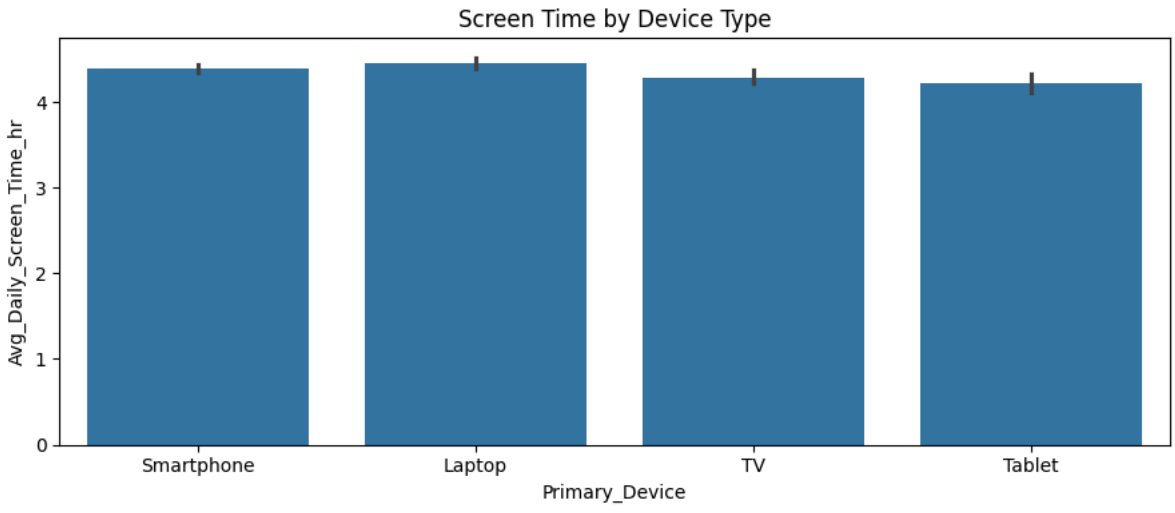
Educational/recreational screen usage ratios show sharp jumps at specific age transitions, and these patterns are different across genders.

Some periods (e.g., early teens) see a drop in educational use for both genders, indicating vulnerable phases for recreational overuse.

These trends inform both educators and parents on critical periods for digital well-being advice

Screen Time by Device Type (Barplot)

```
plt.figure(figsize=(9,4))
sns.barplot(x='Primary_Device', y='Avg_Daily_Screen_Time_hr', data=df)
plt.title('Screen Time by Device Type')
plt.tight_layout()
plt.savefig('13_Bar_DeviceType_ScreenTime.png')
plt.show()
```



INSIGHTS

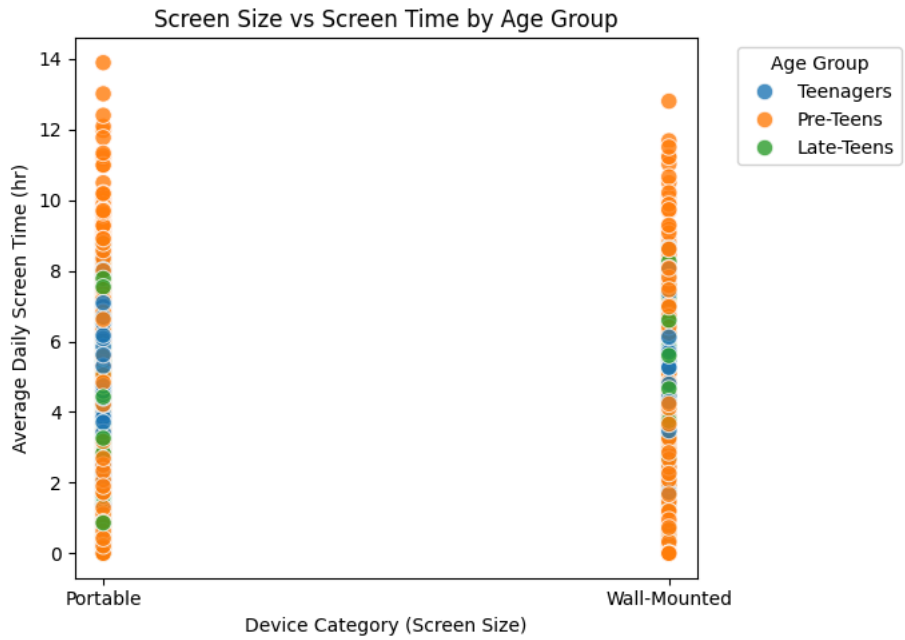
Barplots confirm that certain device types (e.g., smartphones, laptops) are responsible for most cumulative screen exposure.

The relative contribution of each device type highlights which platforms might warrant the most parental monitoring or rule-setting.

These distributions also guide where to prioritize device safety and ergonomic interventions

Scatterplot: Screen Size vs Screen Time

```
plt.figure(figsize=(7,5))
sns.scatterplot(
    x='Device_Category',
    y='Avg_Daily_Screen_Time_hr',
    hue='AgeBand',
    data=df,
    palette='tab10',
    alpha=0.8,
    s=80,
    edgecolor='w'
)
plt.title('Screen Size vs Screen Time by Age Group')
plt.xlabel('Device Category (Screen Size)')
plt.ylabel('Average Daily Screen Time (hr)')
plt.legend(title='Age Group', bbox_to_anchor=(1.05, 1), loc='upper left')
plt.tight_layout()
plt.show()
```



INSIGHTS

The scatterplot reveals the relationship between the physical size of screens used most often and the average daily screen time for children.

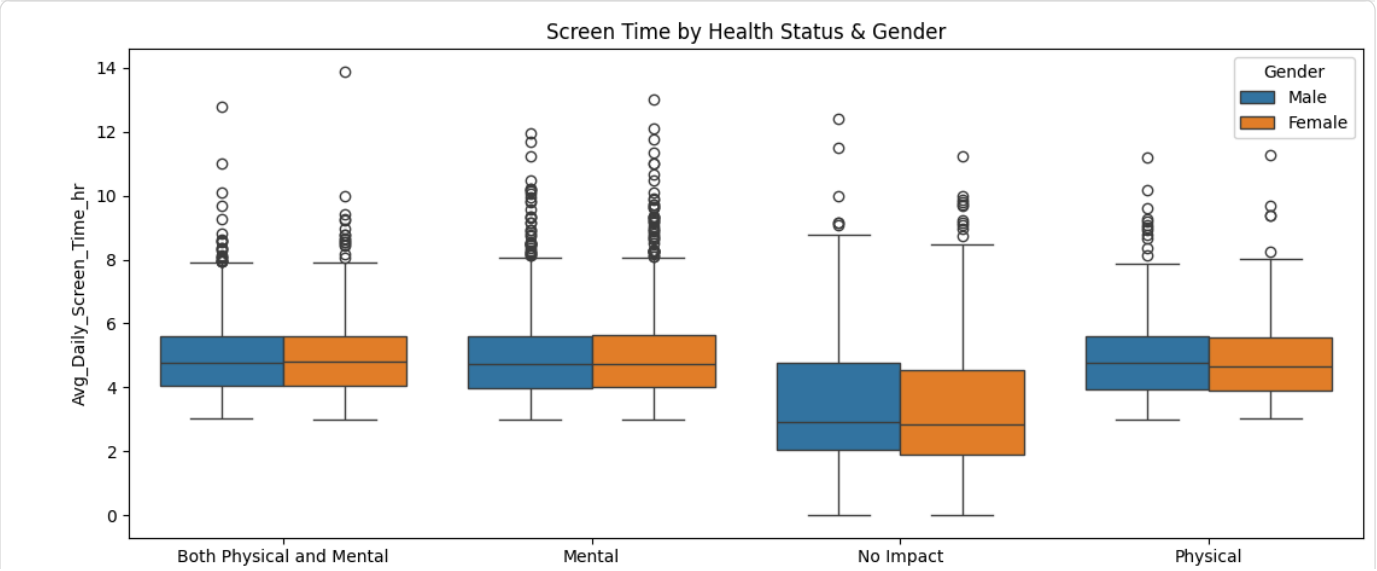
No strong positive or negative linear trend is evident, indicating that higher screen time is not exclusive to either large (TV, desktop) or small (smartphone, tablet) screens.

However, noticeable clusters show that maximum daily screen time is frequently observed in users of mid-sized portable devices (tablets and large phones), rather than exclusively the smallest or largest categories.

There are clear “zones” where outliers exist, meaning some users of compact screens still reach very high screen hours, emphasizing that risk is driven not only by screen size but by usage habits and personal context

Gender & Health: Screen Time by Health Status (Boxplot, Hue=Gender)

```
plt.figure(figsize=(11,5))
sns.boxplot(x='Health_Impact_Category', y='Avg_Daily_Screen_Time_hr', hue='Gender', data=df)
plt.title('Screen Time by Health Status & Gender')
plt.tight_layout()
plt.savefig('15_Box_Health_ScreenTime_Gender.png')
plt.show()
```


Screen Time by Health Status & Gender
Avg_Daily_Screen_Time_hr
0
2
4
6
8
10
12
14
Gender
Male
Female
Both Physical and Mental
Mental
No Impact
Physical