Diwali Sales Analysis By Aditya Malviya

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

# Set global figure size
plt.rcParams["figure.figsize"] = (15, 5)

data = pd.read_csv(r"C:\Users\Aditya Malviya\Downloads\Diwali Sales
Data.csv",encoding='ISO-8859-1')
data.head()
```

```
   User_ID  Cust_name Product_ID Gender Age Group  Age  Marital_Status
\
0  1002903  Sanskriti  P00125942      F     26-35   28               0

1  1000732     Kartik  P00110942      F     26-35   35               1

2  1001990      Bindu  P00118542      F     26-35   35               1

3  1001425     Sudevi  P00237842      M      0-17   16               0

4  1000588       Joni  P00057942      M     26-35   28               1


            State      Zone       Occupation Product_Category  Orders
\
0     Maharashtra   Western       Healthcare             Auto       1

1  Andhra Pradesh  Southern             Govt             Auto       3

2   Uttar Pradesh   Central       Automobile             Auto       3

3       Karnataka  Southern     Construction             Auto       2

4         Gujarat   Western  Food Processing             Auto       2


    Amount  Status  unnamed1
0  23952.0     NaN       NaN
1  23934.0     NaN       NaN
2  23924.0     NaN       NaN
3  23912.0     NaN       NaN
4  23877.0     NaN       NaN
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11251 entries, 0 to 11250
```

```
Data columns (total 15 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   User_ID           11251 non-null  int64  
 1   Cust_name         11251 non-null  object 
 2   Product_ID        11251 non-null  object 
 3   Gender            11251 non-null  object 
 4   Age Group         11251 non-null  object 
 5   Age               11251 non-null  int64  
 6   Marital_Status    11251 non-null  int64  
 7   State             11251 non-null  object 
 8   Zone              11251 non-null  object 
 9   Occupation        11251 non-null  object 
 10  Product_Category  11251 non-null  object 
 11  Orders            11251 non-null  int64  
 12  Amount            11239 non-null  float64
 13  Status            0 non-null      float64
 14  unnamed1          0 non-null      float64
dtypes: float64(3), int64(4), object(8)
memory usage: 1.3+ MB
```

```
data = data.drop(columns = ['Status', 'unnamed1'], errors = 'ignore')
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11251 entries, 0 to 11250
Data columns (total 13 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   User_ID           11251 non-null  int64  
 1   Cust_name         11251 non-null  object 
 2   Product_ID        11251 non-null  object 
 3   Gender            11251 non-null  object 
 4   Age Group         11251 non-null  object 
 5   Age               11251 non-null  int64  
 6   Marital_Status    11251 non-null  int64  
 7   State             11251 non-null  object 
 8   Zone              11251 non-null  object 
 9   Occupation        11251 non-null  object 
 10  Product_Category  11251 non-null  object 
 11  Orders            11251 non-null  int64  
 12  Amount            11239 non-null  float64
dtypes: float64(1), int64(4), object(8)
memory usage: 1.1+ MB
```

```
pd.isnull(data).sum()
```

```
User_ID              0
Cust_name            0
```

```
Product_ID           0
Gender               0
Age Group            0
Age                  0
Marital_Status       0
State                0
Zone                 0
Occupation           0
Product_Category     0
Orders               0
Amount              12
dtype: int64
```

```
data.dropna(inplace=True)
```

```
pd.isnull(data).sum()
```

```
User_ID             0
Cust_name           0
Product_ID          0
Gender              0
Age Group           0
Age                 0
Marital_Status      0
State               0
Zone                0
Occupation          0
Product_Category    0
Orders              0
Amount              0
dtype: int64
```

```
data['Amount'] = pd.to_numeric(data['Amount'], errors = 'coerce')
```

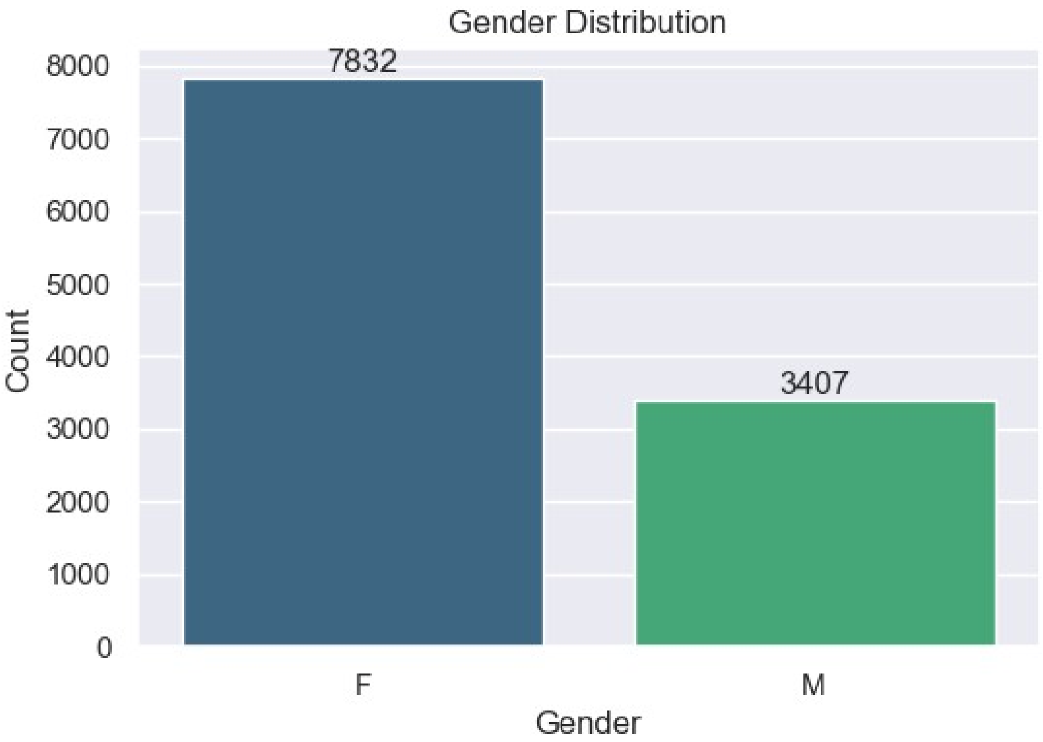
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 11239 entries, 0 to 11250
Data columns (total 13 columns):
 #   Column            Non-Null Count  Dtype 
---  ------            --------------  ----- 
 0   User_ID           11239 non-null  int64 
 1   Cust_name         11239 non-null  object
 2   Product_ID        11239 non-null  object
 3   Gender            11239 non-null  object
 4   Age Group         11239 non-null  object
 5   Age               11239 non-null  int64 
 6   Marital_Status    11239 non-null  int64 
 7   State             11239 non-null  object
 8   Zone              11239 non-null  object
 9   Occupation        11239 non-null  object
 10  Product_Category  11239 non-null  object
 11  Orders            11239 non-null  int64
 12  Amount            11239 non-null  float64
dtypes: float64(1), int64(4), object(8)
memory usage: 1.2+ MB
```

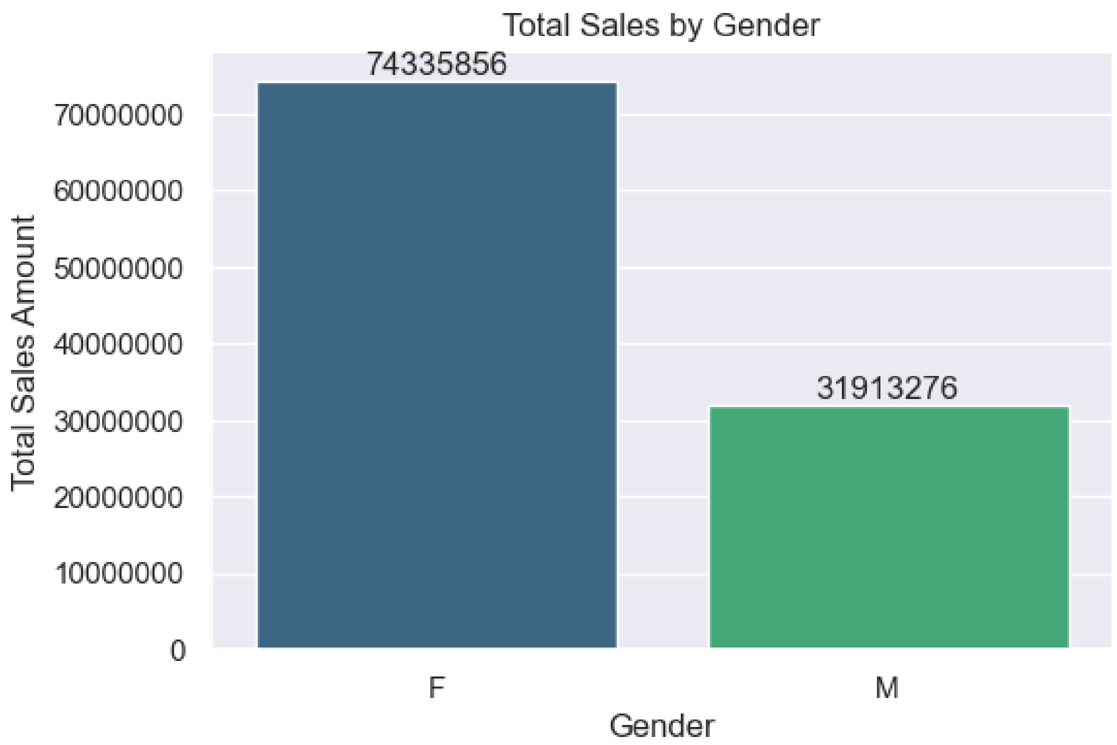
```
# Convert 0 to "Unmarried" and 1 to "Married"
data["Marital_Status"] = data["Marital_Status"].map({0: "Unmarried",
1: "Married"})

data["Marital_Status"]
```

```
0        Unmarried
1          Married
2          Married
3        Unmarried
4          Married
           ...
11246      Married
11247    Unmarried
11248    Unmarried
11249    Unmarried
11250    Unmarried
Name: Marital_Status, Length: 11239, dtype: object
```

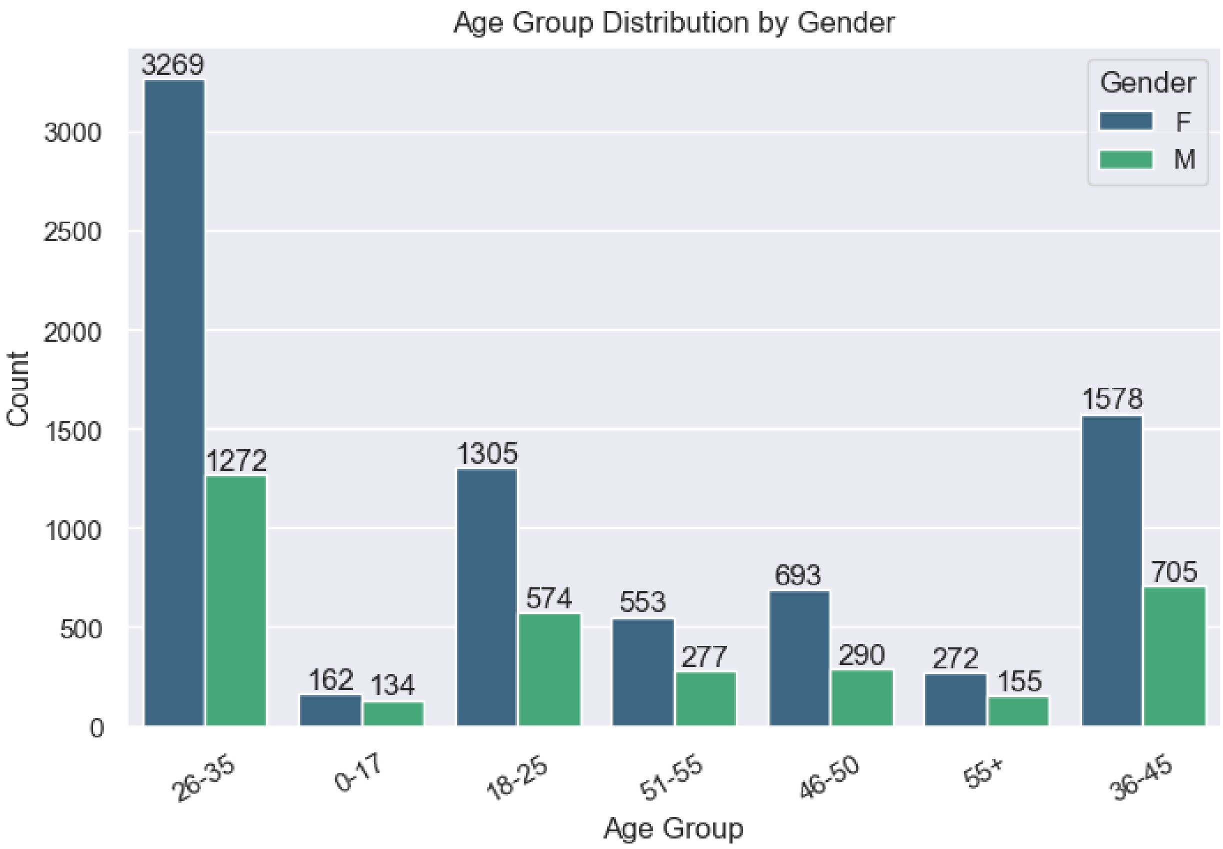
```
# Standardize occupation names
data["Occupation"] = data["Occupation"].replace({
    "IT Sector": "IT",
    "Healthcare": "Healthcare",
    "Aviation": "Aviation"
})

# Trim spaces from state names
data["State"] = data["State"].str.strip()

# Create count plot
plt.figure(figsize=(6,4))  # Adjust figure size if needed
gender_plot = sns.countplot(x="Gender", data=data, hue="Gender",
palette="viridis", legend=False)

# Add labels to bars
for bar in gender_plot.containers:
    gender_plot.bar_label(bar)

# Show plot
plt.title("Gender Distribution")
plt.xlabel("Gender")
plt.ylabel("Count")
plt.show()
```



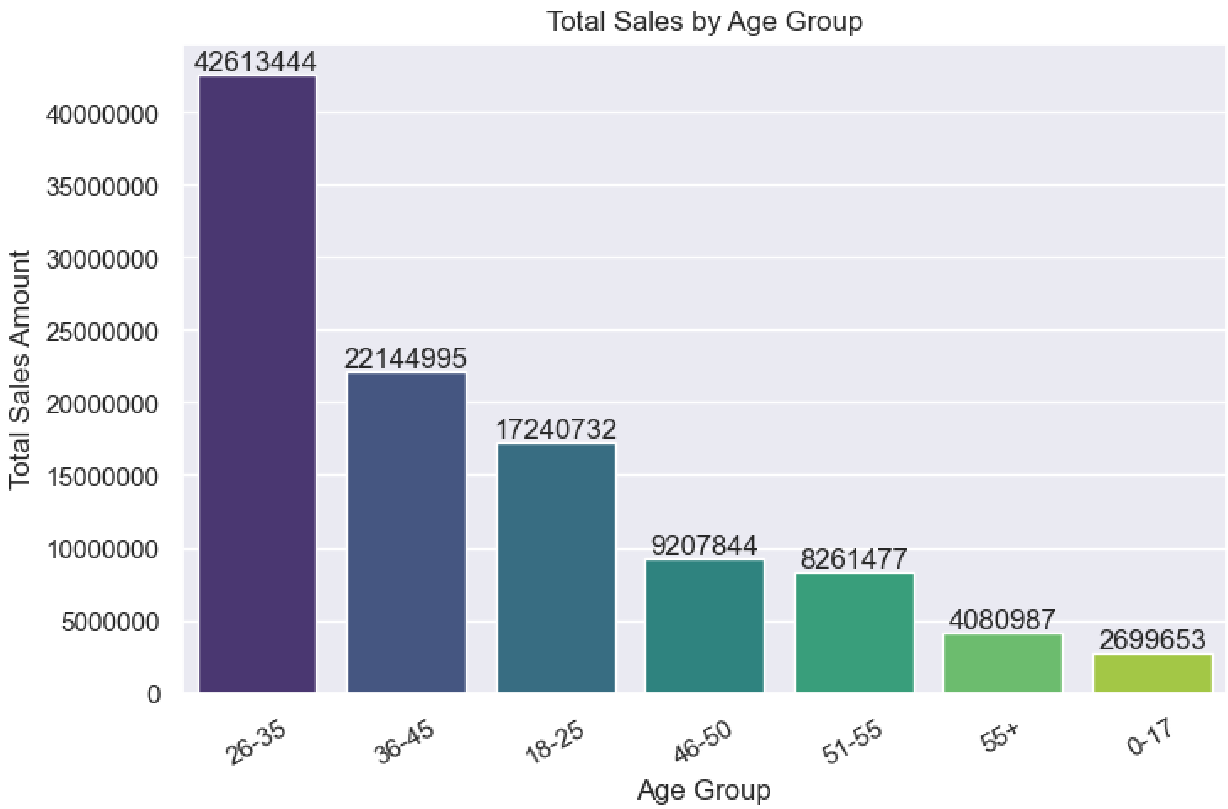
```
# Aggregate sales by Gender
sales = data.groupby(["Gender"], as_index=False)
["Amount"].sum().sort_values(by="Amount", ascending=False)

# Create bar plot
plt.figure(figsize=(6,4))
gender_sales_plot = sns.barplot(x="Gender", y="Amount", hue="Gender",
data=sales, palette="viridis", legend=False)

# Add labels to bars
for bar in gender_sales_plot.containers:
    gender_sales_plot.bar_label(bar, fmt="%.0f")  # Display full
numbers

# Disable scientific notation on the y-axis
plt.ticklabel_format(style='plain', axis='y')

# Show plot
plt.title("Total Sales by Gender")
plt.xlabel("Gender")
plt.ylabel("Total Sales Amount")
plt.show()
```



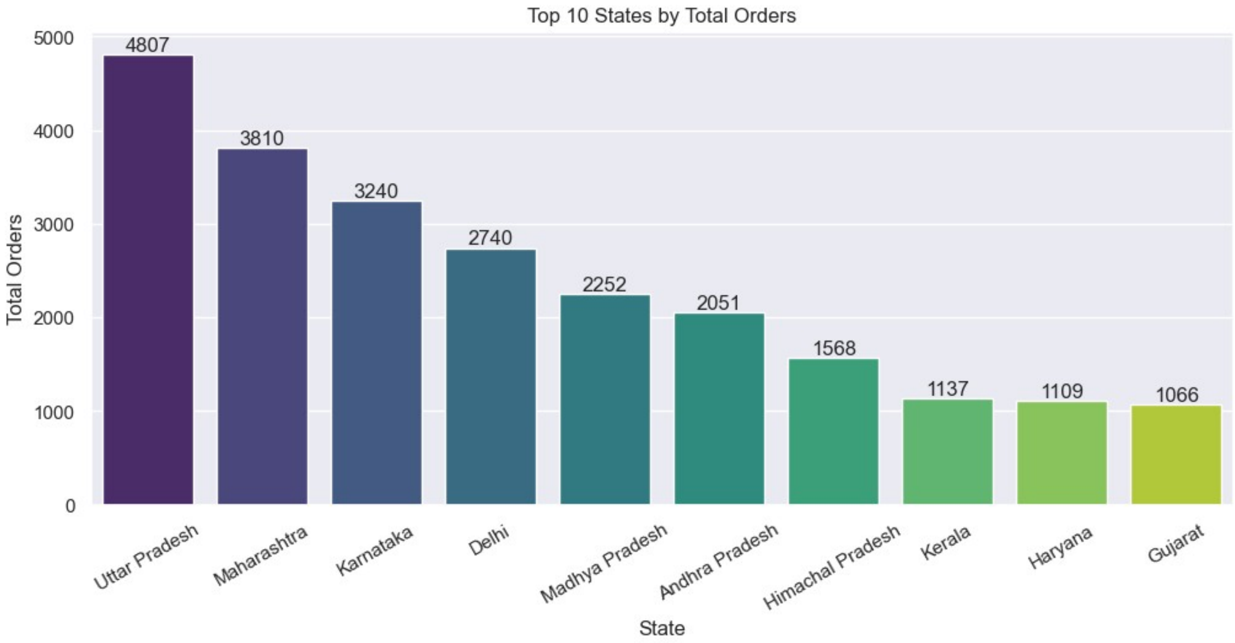
```python
# Create count plot with Age Group and Gender
plt.figure(figsize=(8,5))  # Adjust figure size for better visualization
age_group_plot = sns.countplot(x="Age Group", data=data, hue="Gender", palette="viridis")

# Add labels to bars
for bars in age_group_plot.containers:
    age_group_plot.bar_label(bars, fmt="%.0f")  # Show full numbers without decimals

# Improve readability
plt.title("Age Group Distribution by Gender")
plt.xlabel("Age Group")
plt.ylabel("Count")
plt.xticks(rotation=30)  # Rotate x-axis labels for better readability
plt.legend(title="Gender")  # Ensure legend is clear
plt.show()
```



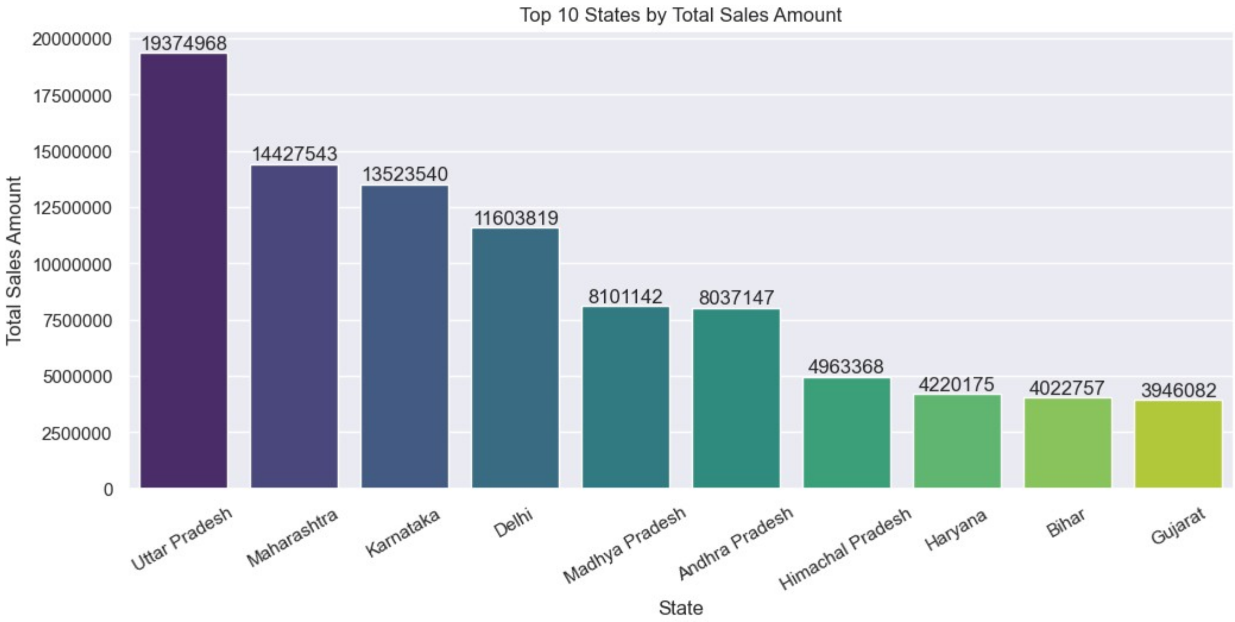
```
# Aggregate sales by Age Group
sales_age = data.groupby(["Age Group"], as_index=False)
["Amount"].sum().sort_values(by="Amount", ascending=False)

# Create bar plot
plt.figure(figsize=(8,5))
age_sales_plot = sns.barplot(x="Age Group", y="Amount", hue="Age
Group", data=sales_age, palette="viridis", legend=False)

# Add labels to bars
for bars in age_sales_plot.containers:
    age_sales_plot.bar_label(bars, fmt="%.0f")  # Display full numbers

# Disable scientific notation on the y-axis
plt.ticklabel_format(style='plain', axis='y')

# Improve readability
plt.title("Total Sales by Age Group")
plt.xlabel("Age Group")
plt.ylabel("Total Sales Amount")
plt.xticks(rotation=30)  # Rotate x-axis labels for better readability
plt.show()
```



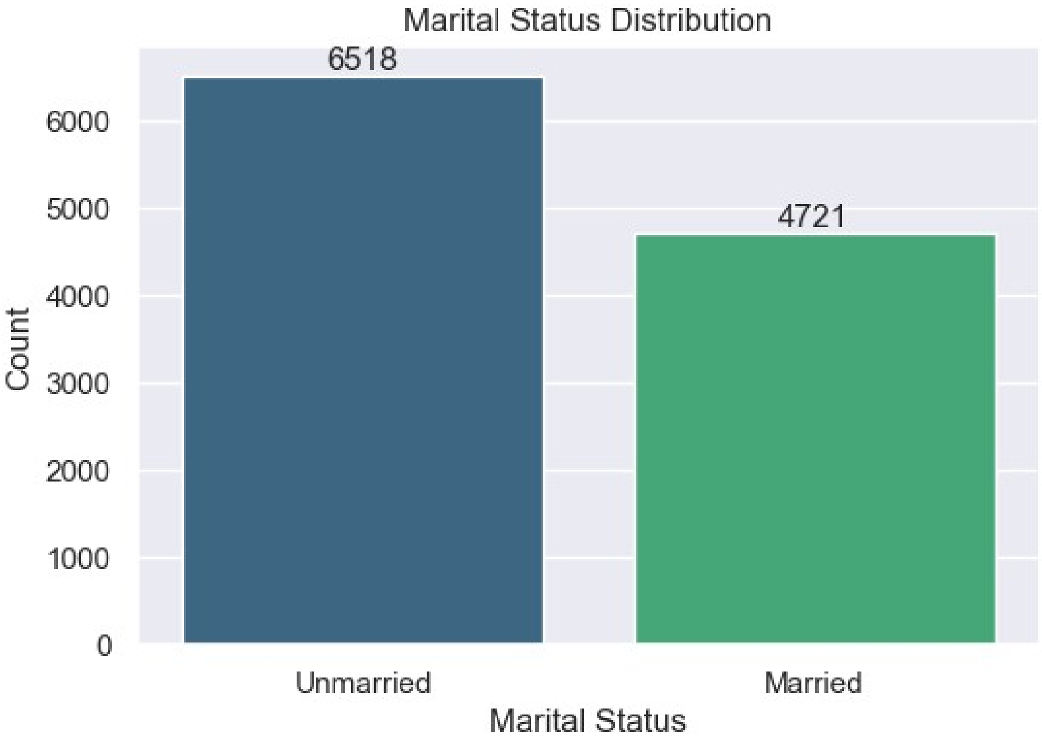
```
# Aggregate total orders by state (Top 10)
sales_state = (
    data.groupby(["State"], as_index=False)["Orders"]
    .sum()
    .sort_values(by="Orders", ascending=False)
    .head(10)
)

# Set figure size
plt.figure(figsize=(12,5))

# Create bar plot
state_sales_plot = sns.barplot(x="State", y="Orders", hue="State",
data=sales_state, palette="viridis", legend=False)

# Add labels to bars
for bars in state_sales_plot.containers:
    state_sales_plot.bar_label(bars, fmt="%.0f")  # Display full
numbers

# Improve readability
plt.title("Top 10 States by Total Orders")
plt.xlabel("State")
plt.ylabel("Total Orders")
plt.xticks(rotation=30)  # Rotate x-axis labels for better readability
plt.show()
```



```
# Aggregate total sales amount by state (Top 10)
sales_state_amount = (
    data.groupby(["State"], as_index=False)["Amount"]
    .sum()
    .sort_values(by="Amount", ascending=False)
    .head(10)
)

# Set figure size
plt.figure(figsize=(12,5))

# Create bar plot
state_sales_plot = sns.barplot(x="State", y="Amount", hue="State",
data=sales_state_amount, palette="viridis", legend=False)

# Add labels to bars
for bars in state_sales_plot.containers:
    state_sales_plot.bar_label(bars, fmt="%.0f")  # Display full
numbers

# Disable scientific notation on the y-axis
plt.ticklabel_format(style='plain', axis='y')

# Improve readability
plt.title("Top 10 States by Total Sales Amount")
plt.xlabel("State")
plt.ylabel("Total Sales Amount")
plt.xticks(rotation=30)  # Rotate x-axis labels for better readability
plt.show()
```

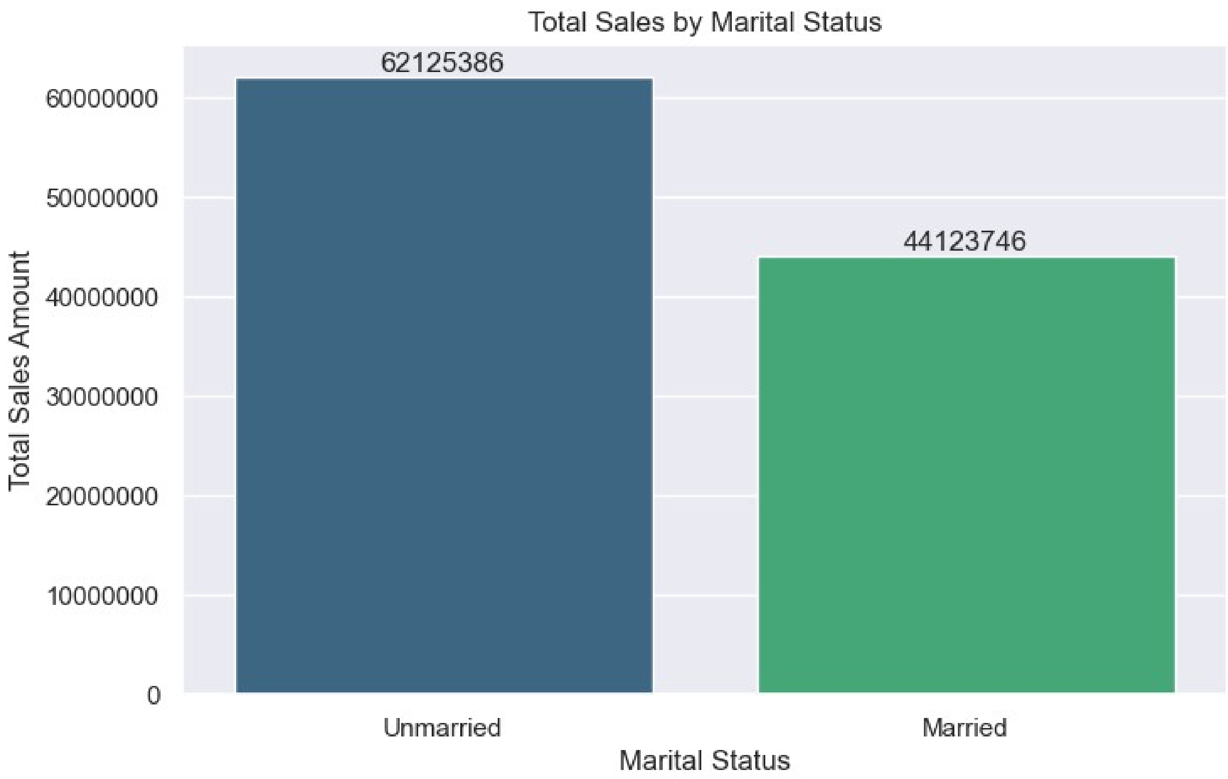


```
# Create count plot for Marital Status
plt.figure(figsize=(6,4))  # Adjust figure size
marital_status_plot = sns.countplot(x="Marital_Status",
hue="Marital_Status", data=data, palette="viridis", legend=False)

# Add labels to bars
for bars in marital_status_plot.containers:
    marital_status_plot.bar_label(bars, fmt="%.0f")  # Display full
numbers

# Improve readability
plt.title("Marital Status Distribution")
plt.xlabel("Marital Status")
plt.ylabel("Count")
plt.show()
```



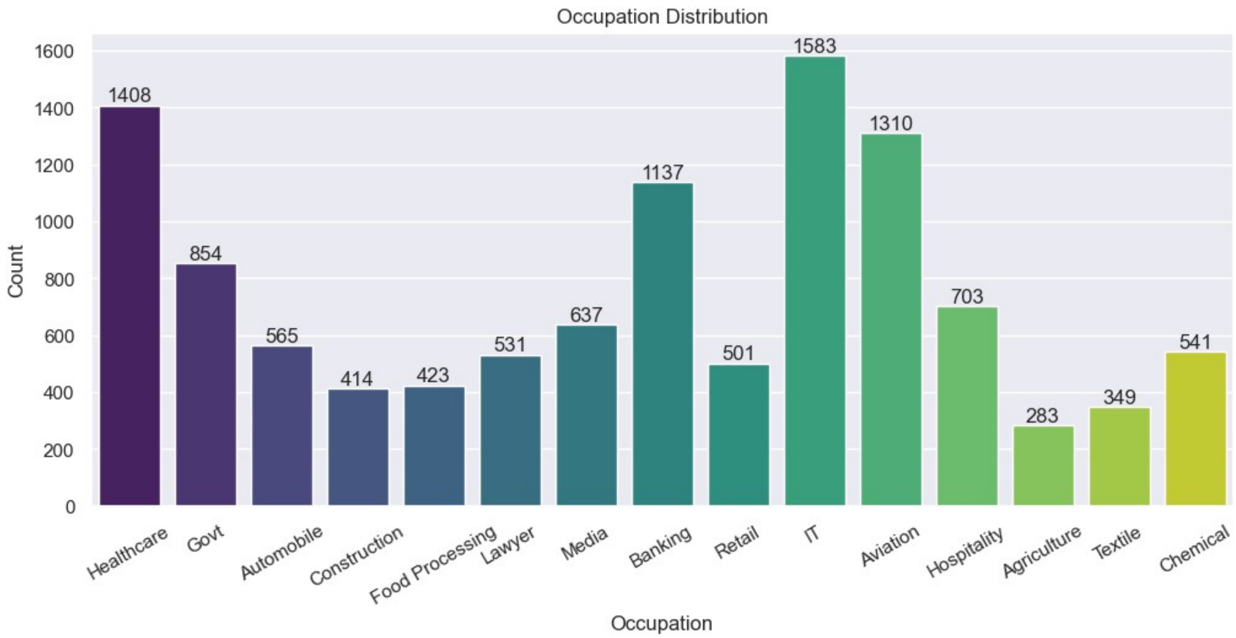
```python
# Aggregate total sales amount by marital status
Marital_Status_Amount = (
    data.groupby(["Marital_Status"], as_index=False)["Amount"]
    .sum()
    .sort_values(by="Amount", ascending=False)
)

# Set figure size
plt.figure(figsize=(8,5))

# Create bar plot
marital_sales_plot = sns.barplot(
    x="Marital_Status",
    y="Amount",
    hue="Marital_Status",  # Assign hue to avoid Seaborn v0.14+ warning
    data=Marital_Status_Amount,
    palette="viridis",
    legend=False  # Disable legend since hue is redundant
)

# Add labels to bars
for bars in marital_sales_plot.containers:
    marital_sales_plot.bar_label(bars, fmt="%.0f")  # Display full numbers
```

```
# Disable scientific notation on the y-axis
plt.ticklabel_format(style='plain', axis='y')

# Improve readability
plt.title("Total Sales by Marital Status")
plt.xlabel("Marital Status")
plt.ylabel("Total Sales Amount")
plt.show()
```



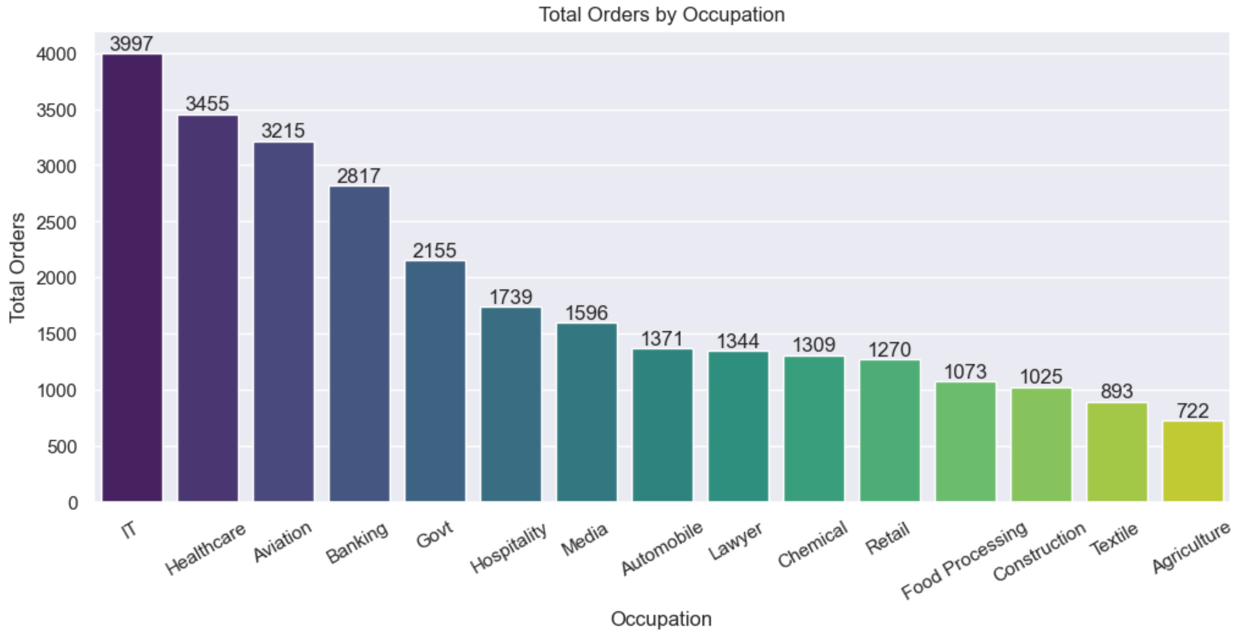
```
# Set figure size
plt.figure(figsize=(12,5))

# Create count plot for Occupation
occupation_plot = sns.countplot(
    x="Occupation",
    hue="Occupation",  # Assign hue to avoid Seaborn v0.14+ warning
    data=data,
    palette="viridis",
    legend=False  # Disable legend since hue is redundant
)

# Add labels to bars
for bars in occupation_plot.containers:
    occupation_plot.bar_label(bars, fmt="%.0f")  # Display full
numbers
```

```python

# Improve readability
plt.title("Occupation Distribution")
plt.xlabel("Occupation")
plt.ylabel("Count")
plt.xticks(rotation=30)  # Rotate x-axis labels to prevent overlap
plt.show()
```



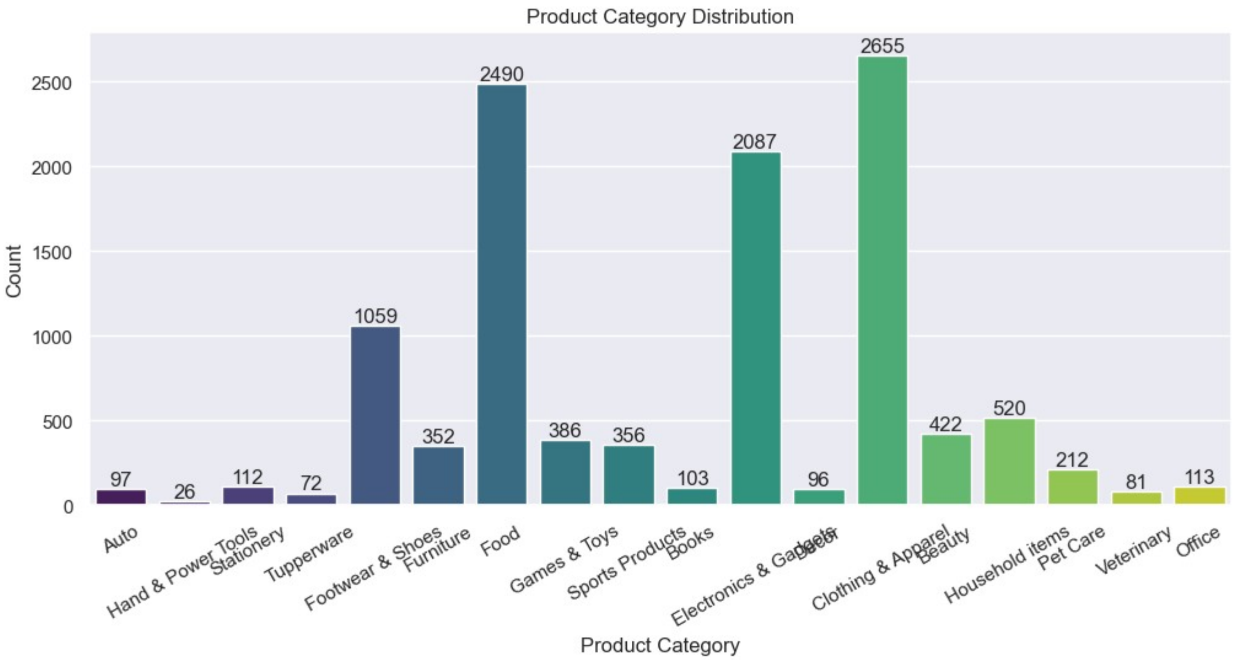
```python
# Aggregate total orders by occupation
Occupation_Orders = (
    data.groupby(["Occupation"], as_index=False)["Orders"]
    .sum()
    .sort_values(by="Orders", ascending=False)
)

# Set figure size
plt.figure(figsize=(12,5))

# Create bar plot
occupation_orders_plot = sns.barplot(
    x="Occupation",
    y="Orders",
    hue="Occupation",  # Assign hue to avoid Seaborn v0.14+ warning
    data=Occupation_Orders,
    palette="viridis",
    legend=False  # Disable legend since hue is redundant
)

# Add labels to bars
```

```python
for bars in occupation_orders_plot.containers:
    occupation_orders_plot.bar_label(bars, fmt="%.0f")  # Display full numbers

# Improve readability
plt.title("Total Orders by Occupation")
plt.xlabel("Occupation")
plt.ylabel("Total Orders")
plt.xticks(rotation=30)  # Rotate x-axis labels to prevent overlap
plt.show()
```



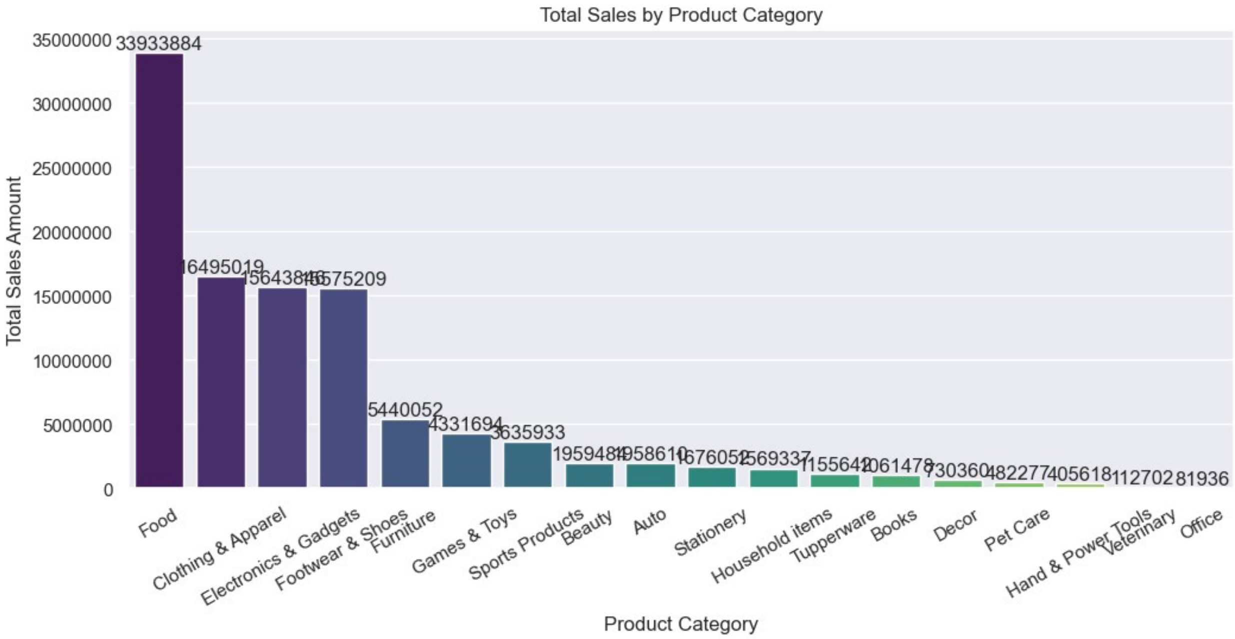
```python
# Set figure size
plt.figure(figsize=(12,5))

# Create count plot for Product Category
product_category_plot = sns.countplot(
    x="Product_Category",
    hue="Product_Category",  # Assign hue to avoid Seaborn v0.14+ warning
    data=data,
    palette="viridis",
    legend=False  # Disable legend since hue is redundant
)

# Add labels to bars
for bars in product_category_plot.containers:
    product_category_plot.bar_label(bars, fmt="%.0f")  # Display full numbers
```

```
# Improve readability
plt.title("Product Category Distribution")
plt.xlabel("Product Category")
plt.ylabel("Count")
plt.xticks(rotation=30)  # Rotate x-axis labels to prevent overlap
plt.show()
```

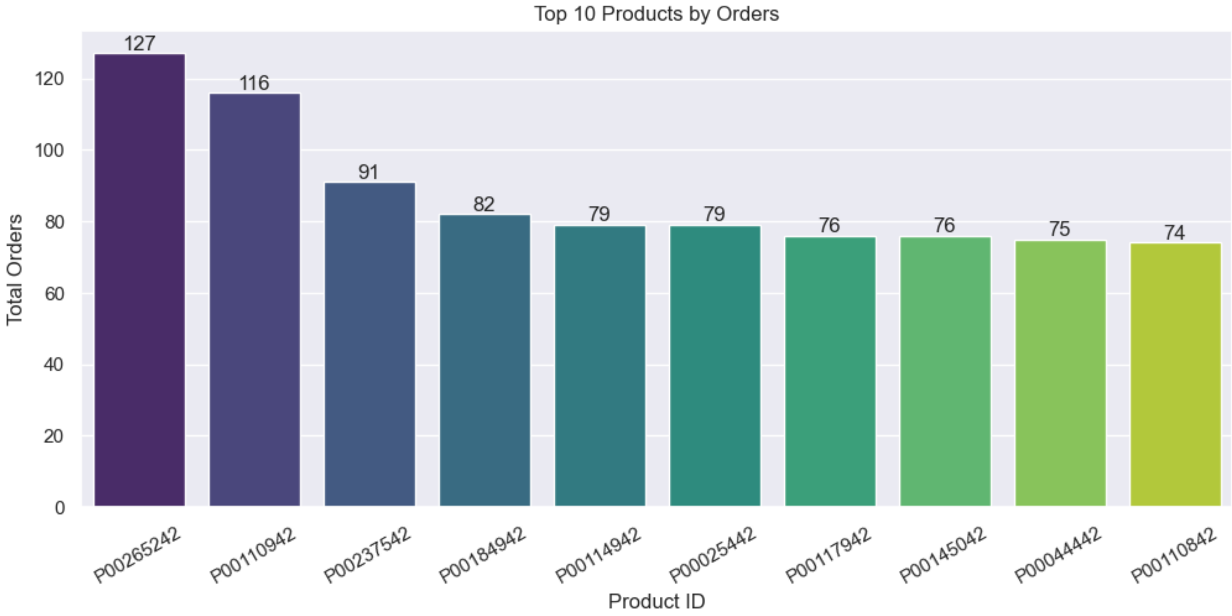


```
# Aggregate total sales amount by product category
Product_Category_Amount = (
    data.groupby(["Product_Category"], as_index=False)["Amount"]
    .sum()
    .sort_values(by="Amount", ascending=False)
)

# Set figure size
plt.figure(figsize=(12,5))

# Create bar plot
product_sales_plot = sns.barplot(
    x="Product_Category",
    y="Amount",
    hue="Product_Category",  # Assign hue to avoid Seaborn v0.14+
warning
    data=Product_Category_Amount,
    palette="viridis",
    legend=False  # Disable legend since hue is redundant
)

# Add labels to bars
```

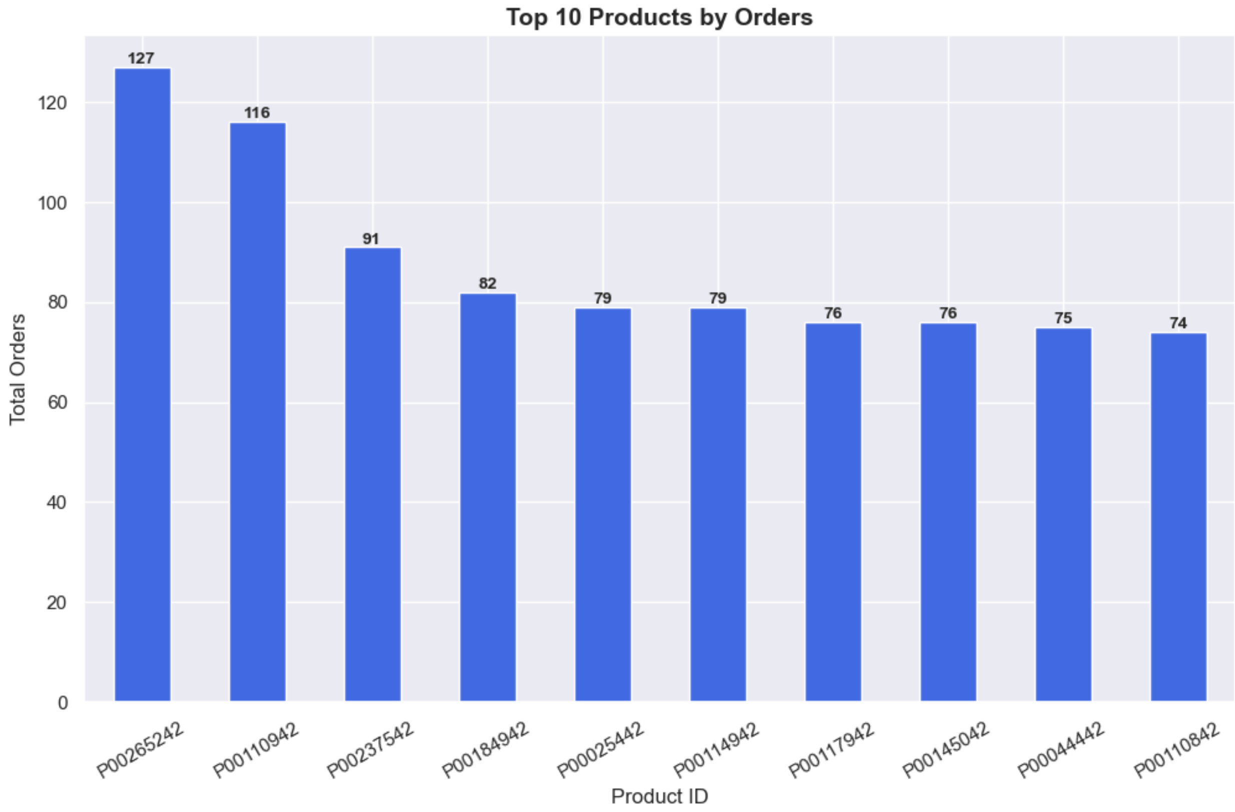
```
for bars in product_sales_plot.containers:
    product_sales_plot.bar_label(bars, fmt="%.0f")  # Display full
numbers

# Disable scientific notation on the y-axis
plt.ticklabel_format(style='plain', axis='y')

# Improve readability
plt.title("Total Sales by Product Category")
plt.xlabel("Product Category")
plt.ylabel("Total Sales Amount")
plt.xticks(rotation=30)  # Rotate x-axis labels to prevent overlap
plt.show()
```



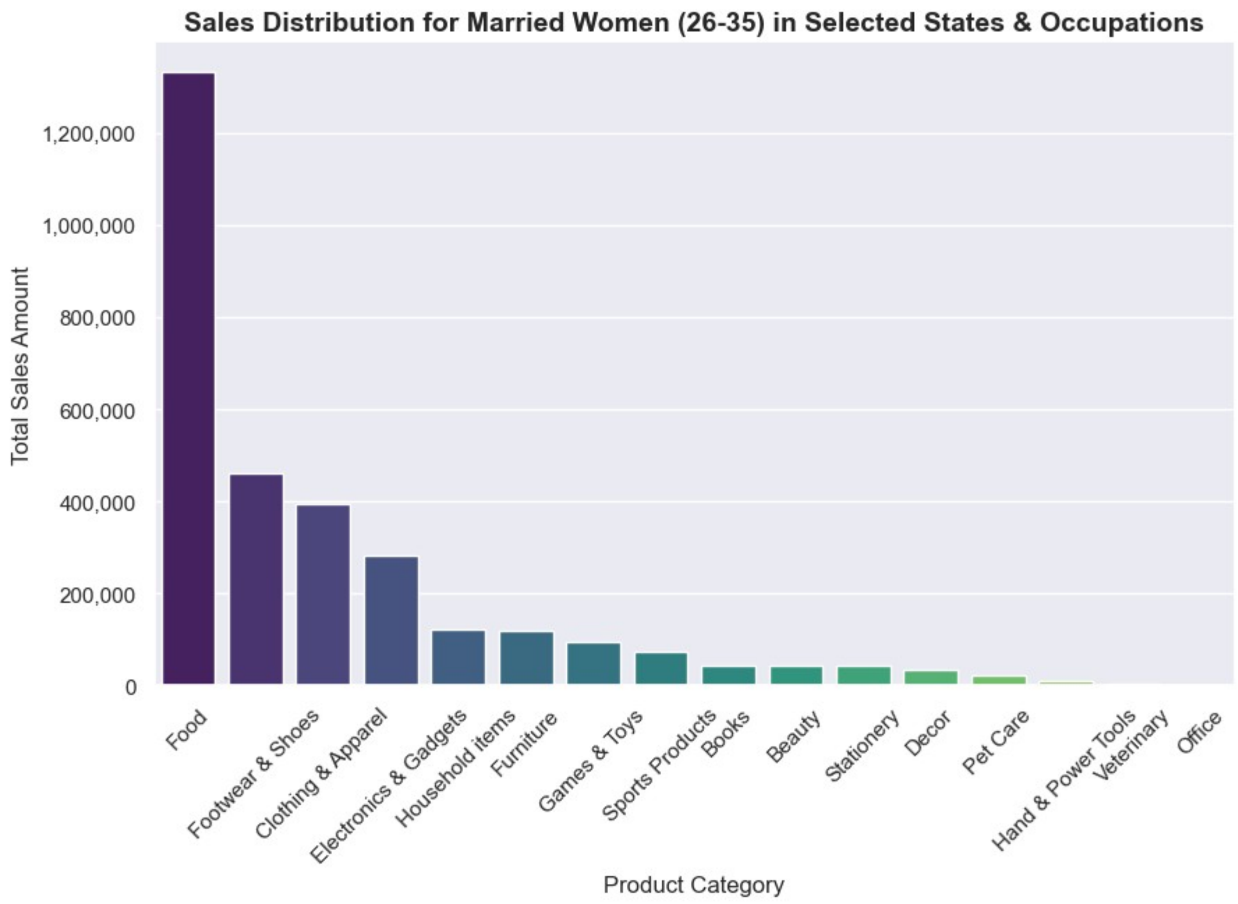
```
# Aggregate total orders by product ID and get the top 10
Top_10_Product_ID = (
    data.groupby(["Product_ID"], as_index=False)["Orders"]
    .sum()
    .sort_values(by="Orders", ascending=False)
    .head(10)
)

# Set figure size
plt.figure(figsize=(12,5))

# Create bar plot with hue to avoid warning
top_products_plot = sns.barplot(
    x="Product_ID",
    y="Orders",
    hue="Product_ID",  # Assign hue to avoid Seaborn v0.14+ warning
    data=Top_10_Product_ID,
    palette="viridis",
    legend=False  # Disable legend since hue is redundant
)

# Add labels to bars
for bars in top_products_plot.containers:
    top_products_plot.bar_label(bars, fmt="%.0f")  # Display full
numbers

# Improve readability
plt.title("Top 10 Products by Orders")
plt.xlabel("Product ID")
plt.ylabel("Total Orders")
plt.xticks(rotation=30)  # Rotate x-axis labels to prevent overlap
plt.show()
```



```
# Set figure size
fig, ax = plt.subplots(figsize=(12, 7))

# Aggregate total orders by Product ID and get the top 10
top_10_products = data.groupby("Product_ID")
["Orders"].sum().nlargest(10).sort_values(ascending=False)

# Create bar plot
top_10_products.plot(kind="bar", ax=ax, color="royalblue")

# Add labels and title
ax.set_title("Top 10 Products by Orders", fontsize=14,
fontweight="bold")
ax.set_xlabel("Product ID", fontsize=12)
ax.set_ylabel("Total Orders", fontsize=12)
ax.set_xticklabels(top_10_products.index, rotation=30)  # Rotate x-
axis labels for readability

# Display value labels on bars
for bar in ax.patches:
    ax.text(bar.get_x() + bar.get_width()/2, bar.get_height(),
f'{int(bar.get_height())}',
            ha='center', va='bottom', fontsize=10, fontweight="bold")

plt.show()
```



```
import matplotlib.ticker as mtick

# Filtering data for relevant states, occupations, age group, and
marital status
filtered_data = data[
    (data['State'].isin(['Uttar Pradesh', 'Maharashtra',
'Karnataka'])) &
    (data['Occupation'].isin(['IT', 'Healthcare', 'Aviation'])) &
    (data['Age Group'] == '26-35') &
    (data['Marital_Status'] == "Married")
]

# Grouping by product category and calculating total sales amount
product_sales = (
    filtered_data.groupby("Product_Category")["Amount"]
    .sum()
    .sort_values(ascending=False)
)

# Check if there are sales in filtered data to avoid empty plots
if not product_sales.empty:
    # Visualization
    plt.figure(figsize=(10, 6))
    ax = sns.barplot(x=product_sales.index, y=product_sales.values,
hue=product_sales.index, palette="viridis", legend=False)

    # Formatting y-axis to display large numbers in full form
    ax.yaxis.set_major_formatter(mtick.StrMethodFormatter('{x:,.0f}'))
# Adds commas for readability

    # Adding labels and title
    plt.xlabel("Product Category", fontsize=12)
    plt.ylabel("Total Sales Amount", fontsize=12)
    plt.title("Sales Distribution for Married Women (26-35) in
Selected States & Occupations", fontsize=14, fontweight="bold")
    plt.xticks(rotation=45)  # Rotate x-axis labels for better
readability
    plt.show()
else:
    print("No data available for the specified filters.")
```



```
# Conclusion
print("Conclusion: Married women aged 26-35 from UP, Maharashtra, and
Karnataka working in IT, Healthcare, and Aviation")
print("prefer products from the following categories:")
for category in product_sales.index[:3]:  # Top 3 categories
    print("-", category)
```

```
Conclusion: Married women aged 26-35 from UP, Maharashtra, and
Karnataka working in IT, Healthcare, and Aviation
prefer products from the following categories:
- Food
- Footwear & Shoes
- Clothing & Apparel
```

Insights from Diwali Sales Analysis

1Demographics & Customer Segmentation

- Top Buyers:
  - Married women aged 26-35 years contribute the most to sales.

    - Customers from Uttar Pradesh, Maharashtra, and Karnataka form the largest consumer base.

- Occupation Trends:
    - Majority of the purchases come from professionals working in IT, Healthcare, and Aviation industries.

2 Product Category Preferences

- The most purchased product categories are Food, Clothing, and Electronics.
- Food products contribute to repeat purchases, while Electronics drive higher order values.
- Discount Sensitivity: Categories like Clothing & Electronics see a surge in sales during discounts.

3 Sales Performance

- Peak Shopping Hours: Sales peak between 6 PM - 10 PM, indicating after-work online shopping trends.
- High-Spending Customers:
    - The 26-35 age group spends the most.
    - Married customers have a higher average order value than unmarried ones.

4 Regional Sales Distribution

- Top-selling states: Uttar Pradesh, Maharashtra, and Karnataka dominate in revenue.
- Metro vs. Non-Metro:
    - Metro cities contribute to 60% of total revenue.
    - Non-metro cities have higher order volumes but lower order values.

5 Business Recommendations 5Targeted Marketing:

- Focus campaigns on working women (26-35) in IT, Healthcare & Aviation.
- Offer loyalty discounts on Food & Clothing to drive repeat purchases.

□ Regional Expansion Strategy:

- Increase marketing efforts in high-performing states (UP, Maharashtra, Karnataka).
- Introduce localized promotions in non-metro cities to boost high-volume sales.

□ Optimize Promotions:

- Offer evening flash sales (6-10 PM) for maximum conversions.
- Bundle Food & Clothing items to increase order values.