Customer_analytics

June 19, 2025

[61]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

import seaborn as sns
import datetime
from datetime import datetime, timedelta
```

[62]:
```
from google.colab import files
data= files.upload()
```

```
<IPython.core.display.HTML object>
```

```
Saving QVI_transaction_data.csv to QVI_transaction_data (1).csv
```

[63]:
```
from google.colab import files
data_2= files.upload()
```

```
<IPython.core.display.HTML object>
```

```
Saving QVI_purchase_behaviour.csv to QVI_purchase_behaviour (1).csv
```

[64]:
```
df_1= pd.read_csv('QVI_transaction_data.csv')
df_2= pd.read_csv('QVI_purchase_behaviour.csv')
```

[5]:
```
df_1.head()
```

[5]:

	DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	PROD_NAME	PROD_QTY	TOT_SALES
0	43390	1	1000	1	5	Natural Chip Compny SeaSalt175g	2	6.0
1	43599	1	1307	348	66	CCs Nacho Cheese 175g	3	6.3
2	43605	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	2	2.9
3	43329	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0
4	43330	2	2426	1038	108			

```
4  Kettle Tortilla ChpsHny&Jlpno Chili 150g         3       13.8
```

[6]:
```
df_2.head()
```

[6]:
```
   LYLTY_CARD_NBR               LIFESTAGE PREMIUM_CUSTOMER
0            1000   YOUNG SINGLES/COUPLES          Premium
1            1002   YOUNG SINGLES/COUPLES       Mainstream
2            1003          YOUNG FAMILIES           Budget
3            1004   OLDER SINGLES/COUPLES       Mainstream
4            1005  MIDAGE SINGLES/COUPLES       Mainstream
```

[7]:
```
df_1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 264836 entries, 0 to 264835
Data columns (total 8 columns):
 #   Column          Non-Null Count   Dtype
---  ------          --------------   -----
 0   DATE            264836 non-null  int64
 1   STORE_NBR       264836 non-null  int64
 2   LYLTY_CARD_NBR  264836 non-null  int64
 3   TXN_ID          264836 non-null  int64
 4   PROD_NBR        264836 non-null  int64
 5   PROD_NAME       264836 non-null  object
 6   PROD_QTY        264836 non-null  int64
 7   TOT_SALES       264836 non-null  float64
dtypes: float64(1), int64(6), object(1)
memory usage: 16.2+ MB
```

[148]:
```
chips_df = df_1[df_1['PROD_NAME'].str.contains('Chips', case=False)]
chips_df['PROD_NAME'].unique()
```

[148]:
```
['Smiths Crinkle Cut  Chips Chicken 170g', 'Smiths Crinkle Chips Salt & Vinegar
330g', 'Thins Chips Light&  Tangy 175g', 'Thins Chips         Originl saltd
175g', 'Thins Chips Seasonedchicken 175g', …, 'WW Original Stacked Chips
160g', 'Thins Chips Salt &  Vinegar 175g', 'Smiths Crinkle Cut  Chips Barbecue
170g', 'WW Supreme Cheese   Corn Chips 200g', 'WW Sour Cream &OnionStacked Chips
160g']
Length: 21
Categories (114, object): ['Burger Rings 220g', 'CCs Nacho Cheese    175g', 'CCs
Original 175g',
                           'CCs Tasty Cheese    175g', …, 'WW Supreme Cheese
Corn Chips 200g',
                           'Woolworths Cheese   Rings 190g', 'Woolworths Medium
Salsa 300g',
                           'Woolworths Mild     Salsa 300g']
```

Products focusing only on chips

[66]:
```
df_1['PROD_NAME']=df_1['PROD_NAME'].astype('category')
```

[65]:
```
# Ensure the 'DATE' column is in datetime format
df_1['DATE'] = df_1['DATE'].astype(np.int64)
df_1['ORDER_DATE'] = df_1['DATE'].apply(lambda x: datetime(1899, 12, 30) +␣
 ↪timedelta(days=x))
df_1.drop('DATE',axis=1,inplace=True)
```

[67]:
```
cols = df_1.columns.tolist()

cols.insert(0, cols.pop(cols.index('ORDER_DATE')))  # Remove and insert at␣
 ↪index 1

# Apply new order
df_1 = df_1[cols]

# View updated DataFrame
df_1.head()
```

[67]:

	ORDER_DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	PROD_NAME	PROD_QTY	TOT_SALES
0	2018-10-17	1	1000	1	5	Natural Chip Compny SeaSalt175g	2	6.0
1	2019-05-14	1	1307	348	66	CCs Nacho Cheese 175g	3	6.3
2	2019-05-20	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	2	2.9
3	2018-08-17	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0
4	2018-08-18	2	2426	1038	108	Kettle Tortilla ChpsHny&Jlpno Chili 150g	3	13.8

[68]:
```
df_1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 264836 entries, 0 to 264835
Data columns (total 8 columns):
 #   Column          Non-Null Count   Dtype
---  ------          --------------   -----
 0   ORDER_DATE      264836 non-null  datetime64[ns]
 1   STORE_NBR       264836 non-null  int64
 2   LYLTY_CARD_NBR  264836 non-null  int64
 3   TXN_ID          264836 non-null  int64
 4   PROD_NBR        264836 non-null  int64
 5   PROD_NAME       264836 non-null  category
 6   PROD_QTY        264836 non-null  int64
```

```
 7   TOT_SALES        264836 non-null  float64
dtypes: category(1), datetime64[ns](1), float64(1), int64(5)
memory usage: 14.4 MB
```

[69]:
```
df_2.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 72637 entries, 0 to 72636
Data columns (total 3 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   LYLTY_CARD_NBR    72637 non-null  int64
 1   LIFESTAGE         72637 non-null  object
 2   PREMIUM_CUSTOMER  72637 non-null  object
dtypes: int64(1), object(2)
memory usage: 1.7+ MB
```

[70]:
```
cat_col=['LIFESTAGE',"PREMIUM_CUSTOMER"]
for col in cat_col:
  df_2[col]=df_2[col].astype('category')
df_2.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 72637 entries, 0 to 72636
Data columns (total 3 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   LYLTY_CARD_NBR    72637 non-null  int64
 1   LIFESTAGE         72637 non-null  category
 2   PREMIUM_CUSTOMER  72637 non-null  category
dtypes: category(2), int64(1)
memory usage: 710.0 KB
```

[71]:
```
df_1.shape
```

[71]:
```
(264836, 8)
```

[72]:
```
df_1.isna().sum()
```

[72]:
```
ORDER_DATE        0
STORE_NBR         0
LYLTY_CARD_NBR    0
TXN_ID            0
PROD_NBR          0
PROD_NAME         0
PROD_QTY          0
TOT_SALES         0
dtype: int64
```

No null values

[73]:
```
df_2.isna().sum()
```

[73]:
```
LYLTY_CARD_NBR      0
LIFESTAGE           0
PREMIUM_CUSTOMER    0
dtype: int64
```

[74]:
```
# checking unique entitites
for col in df_1.columns:
  print(col, "=", df_1[col].nunique())
```

```
ORDER_DATE = 364
STORE_NBR = 272
LYLTY_CARD_NBR  = 72637
TXN_ID = 263127
PROD_NBR = 114
PROD_NAME = 114
PROD_QTY = 6
TOT_SALES = 112
```

[75]:
```
for col in df_2.columns:
  print(col, "=", df_2[col].nunique())
```

```
LYLTY_CARD_NBR = 72637
LIFESTAGE = 7
PREMIUM_CUSTOMER = 3
```

[76]:
```
df_1.head()
```

[76]:

	ORDER_DATE	STORE_NBR	LYLTY_CARD_NBR	TXN_ID	PROD_NBR	PROD_NAME	PROD_QTY	TOT_SALES
0	2018-10-17	1	1000	1	5	Natural Chip Compny SeaSalt175g	2	6.0
1	2019-05-14	1	1307	348	66	CCs Nacho Cheese 175g	3	6.3
2	2019-05-20	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	2	2.9
3	2018-08-17	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0
4	2018-08-18	2	2426	1038	108	Kettle Tortilla ChpsHny&Jlpno Chili 150g	3	13.8

Statistical Summary of the data

[77]:
```
df_1.describe()
```

[77]:
```
                           ORDER_DATE     STORE_NBR  LYLTY_CARD_NBR   \
count                          264836  264836.00000     2.648360e+05
mean   2018-12-30 00:52:12.879215616     135.08011     1.355495e+05
min              2018-07-01 00:00:00       1.00000     1.000000e+03
25%              2018-09-30 00:00:00      70.00000     7.002100e+04
50%              2018-12-30 00:00:00     130.00000     1.303575e+05
75%              2019-03-31 00:00:00     203.00000     2.030942e+05
max              2019-06-30 00:00:00     272.00000     2.373711e+06
std                              NaN      76.78418     8.057998e+04

             TXN_ID       PROD_NBR       PROD_QTY      TOT_SALES
count  2.648360e+05  264836.000000  264836.000000  264836.000000
mean   1.351583e+05      56.583157       1.907309       7.304200
min    1.000000e+00       1.000000       1.000000       1.500000
25%    6.760150e+04      28.000000       2.000000       5.400000
50%    1.351375e+05      56.000000       2.000000       7.400000
75%    2.027012e+05      85.000000       2.000000       9.200000
max    2.415841e+06     114.000000     200.000000     650.000000
std    7.813303e+04      32.826638       0.643654       3.083226
```

[78]:
```
df_1.columns = df_1.columns.str.strip()
df_2.columns = df_2.columns.str.strip()
```

[79]:
```
print(df_1.columns)
print(df_2.columns)
```

```
Index(['ORDER_DATE', 'STORE_NBR', 'LYLTY_CARD_NBR', 'TXN_ID', 'PROD_NBR',
       'PROD_NAME', 'PROD_QTY', 'TOT_SALES'],
      dtype='object')
Index(['LYLTY_CARD_NBR', 'LIFESTAGE', 'PREMIUM_CUSTOMER'], dtype='object')
```

[80]:
```
df_1.rename(columns={'LYLTY_CARD_NBR': 'CARD_NBR'}, inplace=True)
# Rename the column in df_2 to match df_1
df_2.rename(columns={'LYLTY_CARD_NBR': 'CARD_NBR'}, inplace=True)

# Now merge df_1 and df_2 on the common column 'CARD_NBR'
df = pd.merge(df_1, df_2, on='CARD_NBR')
df.head(10)
```

[80]:
```
  ORDER_DATE  STORE_NBR  CARD_NBR  TXN_ID  PROD_NBR  \
0 2018-10-17          1      1000       1         5
1 2019-05-14          1      1307     348        66
2 2019-05-20          1      1343     383        61
3 2018-08-17          2      2373     974        69
4 2018-08-18          2      2426    1038       108
5 2019-05-19          4      4074    2982        57
6 2019-05-16          4      4149    3333        16
```

```
7 2019-05-16          4      4196    3539        24
8 2018-08-20          5      5026    4525        42
9 2018-08-18          7      7150    6900        52

                                  PROD_NAME  PROD_QTY  TOT_SALES  \
0    Natural Chip        Compny SeaSalt175g         2        6.0
1                  CCs Nacho Cheese    175g         3        6.3
2    Smiths Crinkle Cut  Chips Chicken 170g         2        2.9
3    Smiths Chip Thinly  S/Cream&Onion 175g         5       15.0
4  Kettle Tortilla ChpsHny&Jlpno Chili 150g         3       13.8
5  Old El Paso Salsa   Dip Tomato Mild 300g         1        5.1
6  Smiths Crinkle Chips Salt & Vinegar 330g         1        5.7
7     Grain Waves         Sweet Chilli 210g         1        3.6
8   Doritos Corn Chip Mexican Jalapeno 150g         1        3.9
9     Grain Waves Sour    Cream&Chives 210G         2        7.2

                LIFESTAGE PREMIUM_CUSTOMER
0    YOUNG SINGLES/COUPLES          Premium
1   MIDAGE SINGLES/COUPLES           Budget
2   MIDAGE SINGLES/COUPLES           Budget
3   MIDAGE SINGLES/COUPLES           Budget
4   MIDAGE SINGLES/COUPLES           Budget
5   MIDAGE SINGLES/COUPLES           Budget
6   MIDAGE SINGLES/COUPLES           Budget
7   MIDAGE SINGLES/COUPLES           Budget
8   MIDAGE SINGLES/COUPLES           Budget
9   MIDAGE SINGLES/COUPLES           Budget
```

Creating different features from date,prod_name

[81]:
```
# features from date
df['ORDER_YEAR']=df['ORDER_DATE'].dt.year
df['ORDER_MONTH']=df['ORDER_DATE'].dt.strftime('%B')
```

[82]:
```
df.head(10)
```

[82]:
```
   ORDER_DATE  STORE_NBR  CARD_NBR  TXN_ID  PROD_NBR  \
0 2018-10-17          1      1000       1         5
1 2019-05-14          1      1307     348        66
2 2019-05-20          1      1343     383        61
3 2018-08-17          2      2373     974        69
4 2018-08-18          2      2426    1038       108
5 2019-05-19          4      4074    2982        57
6 2019-05-16          4      4149    3333        16
7 2019-05-16          4      4196    3539        24
8 2018-08-20          5      5026    4525        42
9 2018-08-18          7      7150    6900        52
```

```
                                  PROD_NAME  PROD_QTY  TOT_SALES  \
0    Natural Chip        Compny SeaSalt175g         2        6.0
1                  CCs Nacho Cheese    175g         3        6.3
2    Smiths Crinkle Cut  Chips Chicken 170g         2        2.9
3    Smiths Chip Thinly  S/Cream&Onion 175g         5       15.0
4  Kettle Tortilla ChpsHny&Jlpno Chili 150g         3       13.8
5  Old El Paso Salsa   Dip Tomato Mild 300g         1        5.1
6  Smiths Crinkle Chips Salt & Vinegar 330g         1        5.7
7     Grain Waves         Sweet Chilli 210g         1        3.6
8   Doritos Corn Chip Mexican Jalapeno 150g         1        3.9
9     Grain Waves Sour    Cream&Chives 210G         2        7.2

                LIFESTAGE PREMIUM_CUSTOMER  ORDER_YEAR ORDER_MONTH
0   YOUNG SINGLES/COUPLES          Premium        2018     October
1  MIDAGE SINGLES/COUPLES           Budget        2019         May
2  MIDAGE SINGLES/COUPLES           Budget        2019         May
3  MIDAGE SINGLES/COUPLES           Budget        2018      August
4  MIDAGE SINGLES/COUPLES           Budget        2018      August
5  MIDAGE SINGLES/COUPLES           Budget        2019         May
6  MIDAGE SINGLES/COUPLES           Budget        2019         May
7  MIDAGE SINGLES/COUPLES           Budget        2019         May
8  MIDAGE SINGLES/COUPLES           Budget        2018      August
9  MIDAGE SINGLES/COUPLES           Budget        2018      August
```

[83]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 264836 entries, 0 to 264835
Data columns (total 12 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   ORDER_DATE        264836 non-null  datetime64[ns]
 1   STORE_NBR         264836 non-null  int64
 2   CARD_NBR          264836 non-null  int64
 3   TXN_ID            264836 non-null  int64
 4   PROD_NBR          264836 non-null  int64
 5   PROD_NAME         264836 non-null  category
 6   PROD_QTY          264836 non-null  int64
 7   TOT_SALES         264836 non-null  float64
 8   LIFESTAGE         264836 non-null  category
 9   PREMIUM_CUSTOMER  264836 non-null  category
 10  ORDER_YEAR        264836 non-null  int32
 11  ORDER_MONTH       264836 non-null  object
dtypes: category(3), datetime64[ns](1), float64(1), int32(1), int64(5),
object(1)
memory usage: 17.9+ MB
```

[84]:
```
df.describe()
```

[84]:
```
                           ORDER_DATE     STORE_NBR      CARD_NBR  \
count                          264836  264836.00000  2.648360e+05
mean   2018-12-30 00:52:12.879215616     135.08011  1.355495e+05
min              2018-07-01 00:00:00       1.00000  1.000000e+03
25%              2018-09-30 00:00:00      70.00000  7.002100e+04
50%              2018-12-30 00:00:00     130.00000  1.303575e+05
75%              2019-03-31 00:00:00     203.00000  2.030942e+05
max              2019-06-30 00:00:00     272.00000  2.373711e+06
std                              NaN      76.78418  8.057998e+04

              TXN_ID       PROD_NBR       PROD_QTY      TOT_SALES  \
count  2.648360e+05  264836.000000  264836.000000  264836.000000
mean   1.351583e+05      56.583157       1.907309       7.304200
min    1.000000e+00       1.000000       1.000000       1.500000
25%    6.760150e+04      28.000000       2.000000       5.400000
50%    1.351375e+05      56.000000       2.000000       7.400000
75%    2.027012e+05      85.000000       2.000000       9.200000
max    2.415841e+06     114.000000     200.000000     650.000000
std    7.813303e+04      32.826638       0.643654       3.083226

          ORDER_YEAR
count  264836.000000
mean     2018.495193
min      2018.000000
25%      2018.000000
50%      2018.000000
75%      2019.000000
max      2019.000000
std         0.499978
```

[85]:
```
df.nunique()
```

[85]:
```
ORDER_DATE            364
STORE_NBR             272
CARD_NBR            72637
TXN_ID             263127
PROD_NBR              114
PROD_NAME             114
PROD_QTY                6
TOT_SALES             112
LIFESTAGE               7
PREMIUM_CUSTOMER        3
ORDER_YEAR              2
ORDER_MONTH            12
dtype: int64
```

[86]:
```
df['LIFESTAGE'].value_counts()
```

[86]:
```
LIFESTAGE
OLDER SINGLES/COUPLES     54479
RETIREES                  49763
OLDER FAMILIES            48596
YOUNG FAMILIES            43592
YOUNG SINGLES/COUPLES     36377
MIDAGE SINGLES/COUPLES    25110
NEW FAMILIES               6919
Name: count, dtype: int64
```

[87]:
```
df['PROD_NAME'].value_counts()
```

[87]:
```
PROD_NAME
Kettle Mozzarella   Basil & Pesto 175g      3304
Kettle Tortilla ChpsHny&Jlpno Chili 150g    3296
Cobs Popd Swt/Chlli &Sr/Cream Chips 110g    3269
Tyrrells Crisps     Ched & Chives 165g      3268
Cobs Popd Sea Salt  Chips 110g              3265
                                            …
RRD Pc Sea Salt     165g                    1431
Woolworths Medium   Salsa 300g              1430
NCC Sour Cream &    Garden Chives 175g      1419
French Fries Potato Chips 175g              1418
WW Crinkle Cut      Original 175g           1410
Name: count, Length: 114, dtype: int64
```

[88]:
```
df['PREMIUM_CUSTOMER'].value_counts()
```

[88]:
```
PREMIUM_CUSTOMER
Mainstream    101988
Budget         93157
Premium        69691
Name: count, dtype: int64
```

[89]:
```
#Detect and optionally remove outliers in purchase amount.
#calculat Q1 & Q3 for tot_sales
Q1=df['TOT_SALES'].quantile(0.25)
Q3=df['TOT_SALES'].quantile(0.75)
IQR=Q3-Q1

lower_bound=Q1-1.5*IQR
upper_bound=Q3+1.5*IQR

print(f"Lower bound: {lower_bound}")
print(f"Upper bound: {upper_bound}")
```

```
outliers = df[(df['TOT_SALES'] < lower_bound) | (df['TOT_SALES'] > upper_bound)]

print("Outliers:")
print(outliers)
```

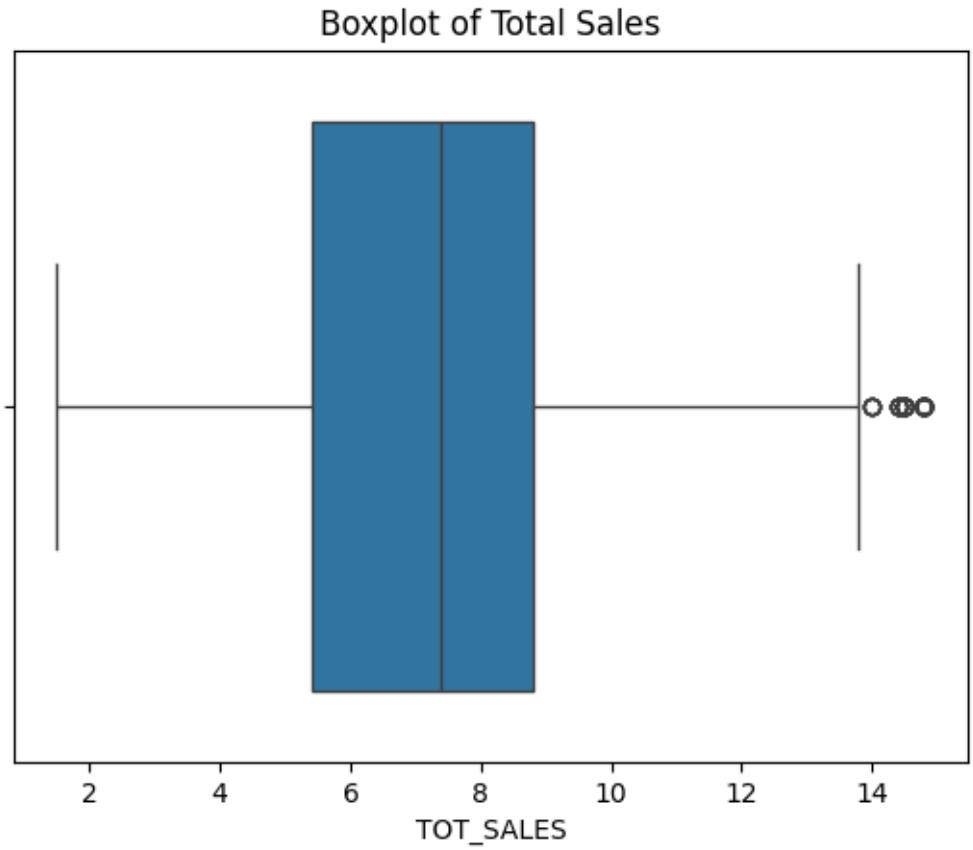
```
Lower bound: -0.29999999999999805
Upper bound: 14.899999999999999
Outliers:
       ORDER_DATE  STORE_NBR  CARD_NBR  TXN_ID  PROD_NBR  \
3      2018-08-17          2      2373     974        69
11     2018-08-20          8      8294    8221       114
56     2019-05-16         74     74336   73182        84
72     2018-08-19         96     96203   96025         7
100    2019-05-20        130    130108  134125         2
…             …          …         …       …         …
258715 2018-08-16        194    194381  194835       102
258721 2018-08-15        200    200248  199694         3
258726 2018-08-20        203    203253  203360        28
258729 2019-05-16        208    208205  207318        37
258788 2019-05-14        264    264149  262909        25

                                      PROD_NAME  PROD_QTY  TOT_SALES  \
3         Smiths Chip Thinly  S/Cream&Onion 175g         5       15.0
11         Kettle Sensations   Siracha Lime 150g         5       23.0
56         GrnWves Plus Btroot & Chilli Jam 180g         5       15.5
72             Smiths Crinkle      Original 330g         5       28.5
100       Cobs Popd Sour Crm  &Chives Chips 110g         5       19.0
…                                           …       …         …
258715    Kettle Mozzarella   Basil & Pesto 175g         4       21.6
258721  Kettle Sensations   Camembert & Fig 150g         4       18.4
258726      Thins Potato Chips  Hot & Spicy 175g         5       16.5
258729  Smiths Thinly       Swt Chli&S/Cream175G         5       15.0
258788           Pringles SourCream  Onion 134g         5       18.5

                     LIFESTAGE PREMIUM_CUSTOMER  ORDER_YEAR ORDER_MONTH
3       MIDAGE SINGLES/COUPLES           Budget        2018      August
11      MIDAGE SINGLES/COUPLES           Budget        2018      August
56      MIDAGE SINGLES/COUPLES           Budget        2019         May
72      MIDAGE SINGLES/COUPLES           Budget        2018      August
100     MIDAGE SINGLES/COUPLES           Budget        2019         May
…                          …                …           …         …
258715   YOUNG SINGLES/COUPLES          Premium        2018      August
258721   YOUNG SINGLES/COUPLES          Premium        2018      August
258726   YOUNG SINGLES/COUPLES          Premium        2018      August
258729   YOUNG SINGLES/COUPLES          Premium        2019         May
258788   YOUNG SINGLES/COUPLES          Premium        2019         May
```

```
[578 rows x 12 columns]
```

[90]:
```
# remove outliers
df_clean = df[(df['TOT_SALES'] >= lower_bound) & (df['TOT_SALES'] <=␣
 ↪upper_bound)]

print(f"Original data size: {df.shape}")
print(f"Data size after removing outliers: {df_clean.shape}")
```

```
Original data size: (264836, 12)
Data size after removing outliers: (264258, 12)
```

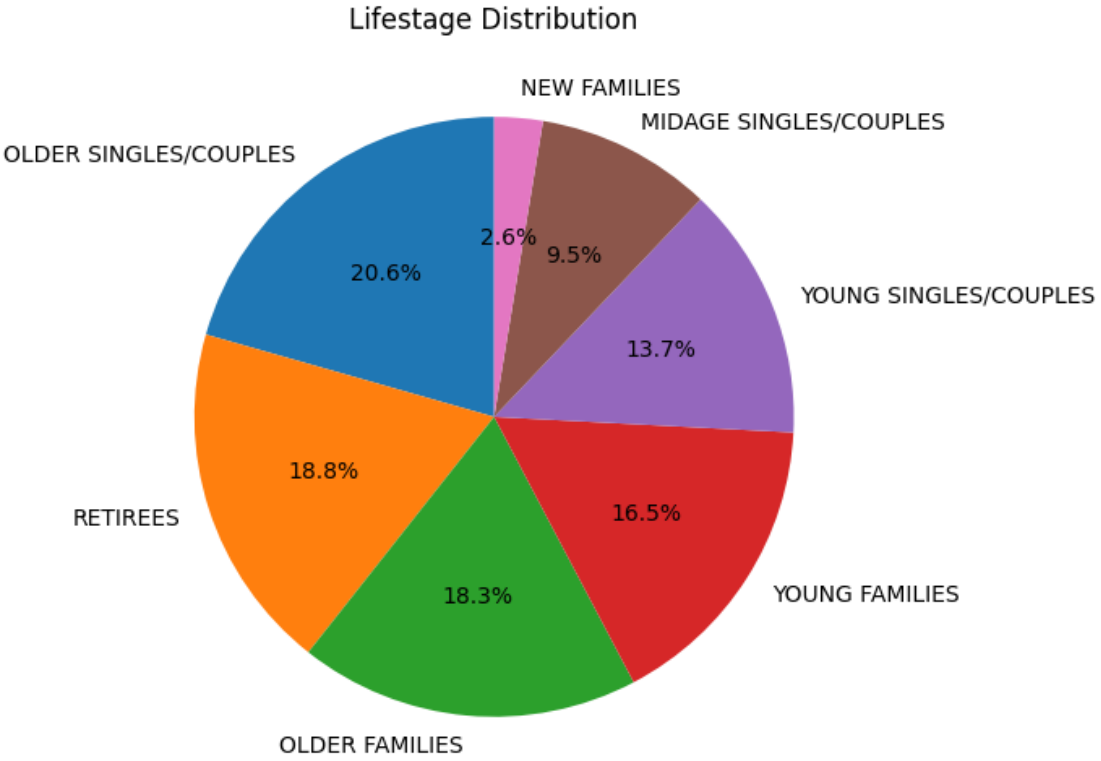
[91]:
```
sns.boxplot(x=df_clean['TOT_SALES'])
plt.title('Boxplot of Total Sales')
plt.show()
```



EXPLORATORY DATA ANALYSIS

UNIVARIATE ANALYSIS FOR CATEGORICAL VARIABLES

[92]:
```
# lifestage visualization
df['LIFESTAGE'].value_counts().plot.pie(autopct='%1.1f%%', figsize=(6,6),␣
 ↪startangle=90)
plt.title('Lifestage Distribution')
plt.ylabel('')
plt.show()
```



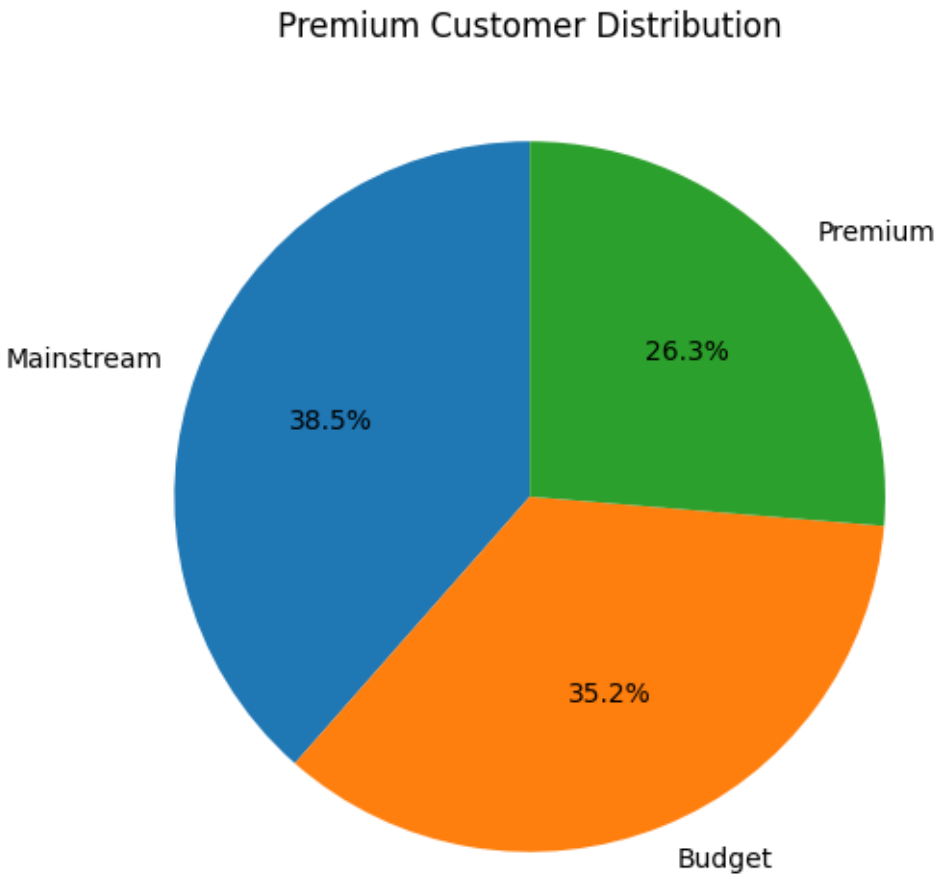
INSIGHTS:

Older Families dominate the customer base.

Other groups like Young Singles/Couples and New Families form smaller segments.

Targeting Older Families should be a key marketing focus due to their large share.

[93]:
```
#premium visualization
df['PREMIUM_CUSTOMER'].value_counts().plot.pie(autopct='%1.1f%%',␣
 ↪figsize=(6,6), startangle=90)
plt.title("Premium Customer Distribution")
plt.ylabel(' ')
plt.show()
```



INSIGHTS:

Mainstream customers make up the largest segment.

Budget and Premium segments are smaller but fairly equal in size.

Mainstream is the key target for broad marketing efforts.

Understanding Budget and Premium groups can help craft tailored strategies and grow their value.

1. OVERALL SALES

[94]:
```
total_sales=df['TOT_SALES'].sum()
total_transactions = df['TXN_ID'].nunique()
total_customers = df['CARD_NBR'].nunique()
print(f"Total Sales:{total_sales}")
print(f"Total Transactions: {total_transactions}")
print(f"Total Unique Customers: {total_customers}")
```

```
Total Sales:1934415.0000000002
Total Transactions: 263127
```

```
Total Unique Customers: 72637
```

2. Total Sales Over Year

[43]:
```
Yearly_sales = df.groupby('ORDER_YEAR')['TOT_SALES'].sum().reset_index()
Yearly_sales
```

[43]:

	ORDER_YEAR	TOT_SALES
0	2018	977091.15
1	2019	957323.85

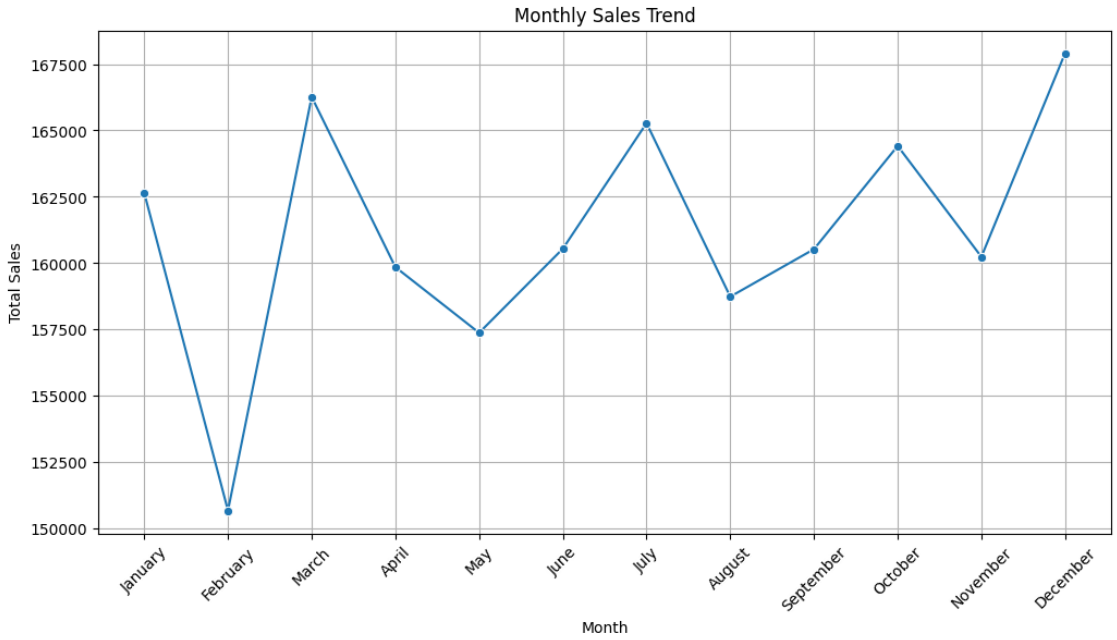
3. Total Sales Over Month

[141]:
```
Monthly_sales = df.groupby('ORDER_MONTH')['TOT_SALES'].sum().reset_index()
Monthly_sales
```

[141]:

	ORDER_MONTH	TOT_SALES
0	April	159845.10
1	August	158731.05
2	December	167913.40
3	February	150665.00
4	January	162642.30
5	July	165275.30
6	June	160538.60
7	March	166265.20
8	May	157367.65
9	November	160233.70
10	October	164415.70
11	September	160522.00

[143]:
```
month_order = ['January', 'February', 'March', 'April', 'May', 'June',
               'July', 'August', 'September', 'October', 'November', 'December']
Monthly_sales['ORDER_MONTH'] = pd.Categorical(Monthly_sales['ORDER_MONTH'],␣
 ↪categories=month_order, ordered=True)
Monthly_sales = Monthly_sales.sort_values('ORDER_MONTH')

plt.figure(figsize=(12, 6))
sns.lineplot(x='ORDER_MONTH', y='TOT_SALES', data=Monthly_sales, marker='o')
plt.title('Monthly Sales Trend')
plt.xlabel('Month')
plt.ylabel('Total Sales')
plt.xticks(rotation=45)
plt.grid(True)
plt.show()
```



Insights

The line plot shows the trend of total sales throughout the year.

Key observations:

- Sales are highest in December.
- Sales are lowest in February.
- There seems to be a peak around the holiday season (November/December).

5. Sales contribution by chips products

[151]:
```
df['PACK_SIZE'] = df_1['PROD_NAME'].str.extract(r'(\d+)[gG]')
df['PACK_SIZE'] = df_1['PACK_SIZE'].astype(float)
df.head(5)
```

[151]:

	ORDER_DATE	STORE_NBR	CARD_NBR	TXN_ID	PROD_NBR	PROD_NAME	PROD_QTY	TOT_SALES
0	2018-10-17	1	1000	1	5	Natural Chip Compny SeaSalt175g	2	6.0
1	2019-05-14	1	1307	348	66	CCs Nacho Cheese 175g	3	6.3
2	2019-05-20	1	1343	383	61	Smiths Crinkle Cut Chips Chicken 170g	2	2.9
3	2018-08-17	2	2373	974	69	Smiths Chip Thinly S/Cream&Onion 175g	5	15.0
4	2018-08-18	2	2426	1038	108			

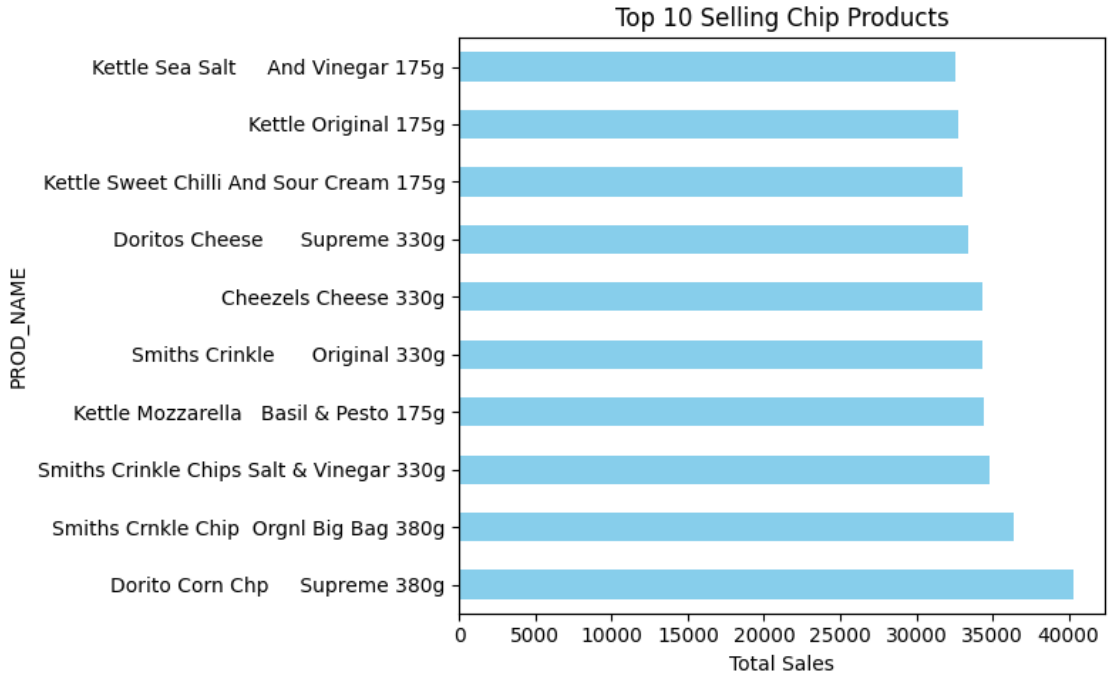
```
4  Kettle Tortilla ChpsHny&Jlpno Chili 150g         3       13.8

                LIFESTAGE PREMIUM_CUSTOMER  ORDER_YEAR ORDER_MONTH  DayOfWeek  \
0    YOUNG SINGLES/COUPLES          Premium        2018     October  Wednesday
1  MIDAGE SINGLES/COUPLES           Budget        2019         May    Tuesday
2  MIDAGE SINGLES/COUPLES           Budget        2019         May     Monday
3  MIDAGE SINGLES/COUPLES           Budget        2018      August     Friday
4  MIDAGE SINGLES/COUPLES           Budget        2018      August   Saturday

   PACK_SIZE  Week  Year YearWeek
0      175.0    42  2018  2018-42
1      175.0    20  2019  2019-20
2      170.0    21  2019  2019-21
3      175.0    33  2018  2018-33
4      150.0    33  2018  2018-33
```

[152]:
```
top_products = df.groupby('PROD_NAME')['TOT_SALES'].sum().
↪sort_values(ascending=False).head(10)
top_products
```

```
/tmp/ipython-input-152-1044949763.py:1: FutureWarning: The default of
observed=False is deprecated and will be changed to True in a future version of
pandas. Pass observed=False to retain current behavior or observed=True to adopt
the future default and silence this warning.
  top_products =
df.groupby('PROD_NAME')['TOT_SALES'].sum().sort_values(ascending=False).head(10)
```

[152]:
```
PROD_NAME
Dorito Corn Chp     Supreme 380g            40352.0
Smiths Crnkle Chip  Orgnl Big Bag 380g      36367.6
Smiths Crinkle Chips Salt & Vinegar 330g    34804.2
Kettle Mozzarella   Basil & Pesto 175g      34457.4
Smiths Crinkle      Original 330g           34302.6
Cheezels Cheese 330g                        34296.9
Doritos Cheese      Supreme 330g            33390.6
Kettle Sweet Chilli And Sour Cream 175g     33031.8
Kettle Original 175g                        32740.2
Kettle Sea Salt     And Vinegar 175g        32589.0
Name: TOT_SALES, dtype: float64
```

[59]:
```
top_products.plot(kind='barh', figsize=(8,5), title='Top 10 Selling Chip␣
↪Products', color='skyblue')
plt.xlabel('Total Sales')
plt.tight_layout()
plt.savefig('top_chips.png')
plt.show()
```



Insights

Kettle dominates the top 10 list, with multiple flavors among the highest-selling — indicating strong brand preference.

Smiths also performs well, especially with crinkle cut and larger pack sizes (330g–380g).

Doritos appears twice, showing it's also a consistent performer.

Flavors like Original, Cheese Supreme, and Salt & Vinegar are recurring favorites, suggesting classic flavors have broad appeal.

Most top-selling products are 330g–380g packs, implying larger pack sizes drive sales.

Recommendations

Prioritize Kettle and Smiths brands in shelf placement and promotions.

Focus marketing on classic flavors like Original, Cheese, and Salt & Vinegar.

Ensure ample stock of larger pack sizes (330g–380g) — they dominate sales.

Consider bundling top flavors or running multi-buy offers to boost volume.

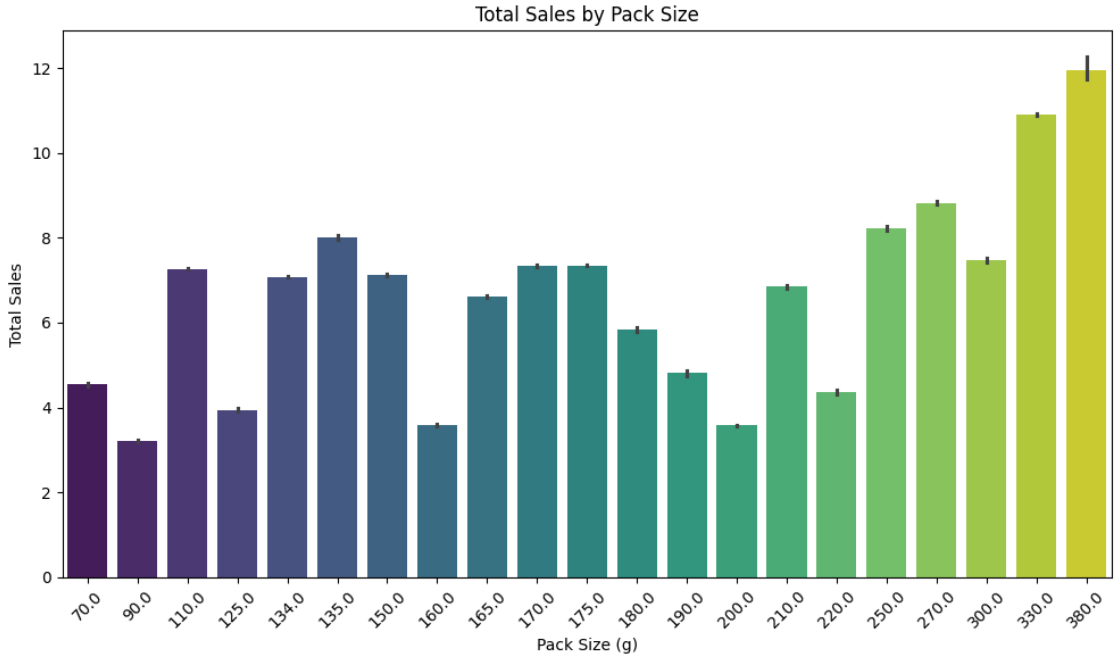
6. Pack size analysis

[156]:
```
df['PACK_SIZE'] = df['PROD_NAME'].str.extract(r'(\d+)g').astype(float)
df.groupby('PACK_SIZE')['TOT_SALES'].sum()
```

[156]:
```
PACK_SIZE
70.0       6852.0
90.0       9676.4
110.0    162765.4
125.0      5733.0
134.0    177655.5
135.0     26090.4
150.0    296609.7
160.0     10647.6
165.0    101360.6
170.0    146673.0
175.0    477112.4
180.0      8568.4
190.0     14412.9
200.0     16007.5
210.0     21700.8
220.0      6831.0
250.0     26096.7
270.0     55425.4
300.0    113330.6
330.0    136794.3
380.0     76719.6
Name: TOT_SALES, dtype: float64
```

[158]:
```
plt.figure(figsize=(10, 6))
sns.barplot(x='PACK_SIZE', y='TOT_SALES', data=df, palette='viridis')
plt.title('Total Sales by Pack Size')
plt.xlabel('Pack Size (g)')
plt.ylabel('Total Sales')
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```

```
/tmp/ipython-input-158-953015961.py:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same
effect.

  sns.barplot(x='PACK_SIZE', y='TOT_SALES', data=df, palette='viridis')
```



Insights

Top-Selling Pack Sizes: Certain sizes (e.g., 330g and 380g) dominate sales — these reflect strong customer preference.

Price per Gram Variance: Smaller packs tend to have a higher price per gram, suggesting they are less value-for-money compared to larger packs.

Potential Segment Preference: Larger packs might appeal to families, while smaller ones could suit singles/couples

Product Mix Implications: Focus on expanding popular pack sizes, and re-evaluate underperforming ones.

Promotional Opportunities: Promote larger pack sizes to increase basket size or trial-size packs to attract new buyers.

Recommendations

Focus inventory and promotions on top-selling sizes (like 380g).

Consider price adjustments for smaller packs if per gram cost is too high.

Explore segment-based pack preferences to tailor offerings.

Use value messaging for larger packs in campaigns.

7. Average Spend and Frequency by Segment

[137]:
```
lifestage_avg=df.groupby('LIFESTAGE')['TOT_SALES'].agg(['count', 'sum',␣
↪'mean']).sort_values('sum', ascending=False)
```

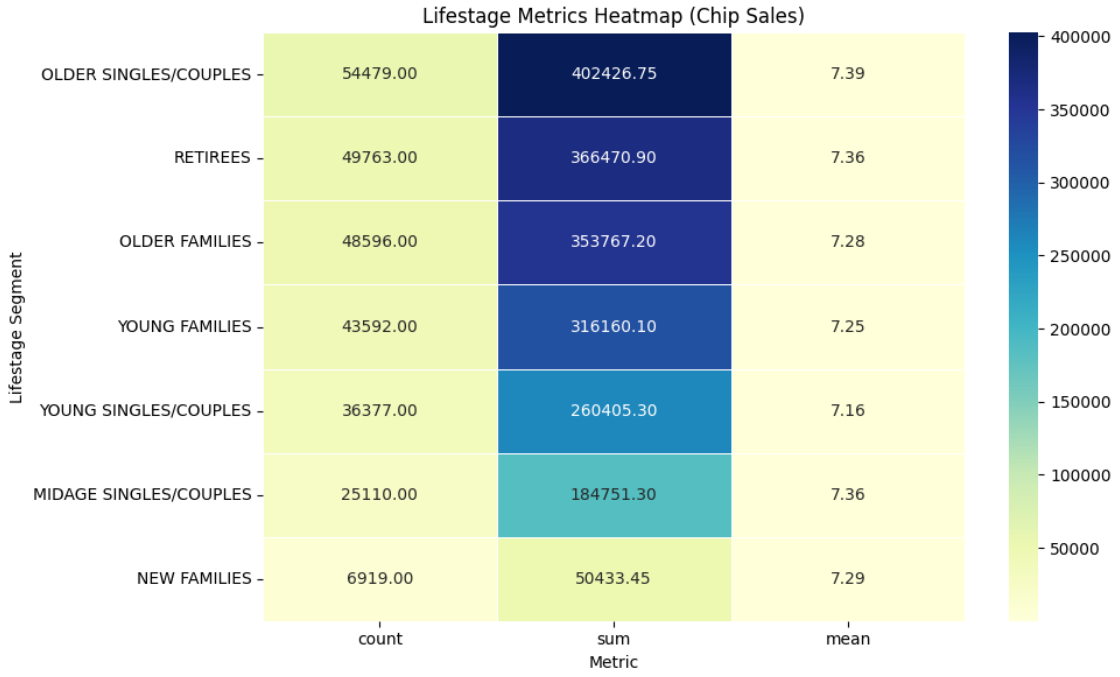
```
lifestage_avg
```

```
/tmp/ipython-input-137-520219428.py:1: FutureWarning: The default of
observed=False is deprecated and will be changed to True in a future version of
pandas. Pass observed=False to retain current behavior or observed=True to adopt
the future default and silence this warning.
  lifestage_avg=df.groupby('LIFESTAGE')['TOT_SALES'].agg(['count', 'sum',
'mean']).sort_values('sum', ascending=False)
```

[137]:

LIFESTAGE	count	sum	mean
OLDER SINGLES/COUPLES	54479	402426.75	7.386823
RETIREES	49763	366470.90	7.364325
OLDER FAMILIES	48596	353767.20	7.279760
YOUNG FAMILIES	43592	316160.10	7.252709
YOUNG SINGLES/COUPLES	36377	260405.30	7.158515
MIDAGE SINGLES/COUPLES	25110	184751.30	7.357678
NEW FAMILIES	6919	50433.45	7.289124

[138]:
```
plt.figure(figsize=(10, 6))
sns.heatmap(lifestage_avg, annot=True, cmap='YlGnBu', fmt=".2f", linewidths=0.5)
plt.title('Lifestage Metrics Heatmap (Chip Sales)')
plt.ylabel('Lifestage Segment')
plt.xlabel('Metric')
plt.xticks(rotation=0)
plt.tight_layout()
plt.show()
```



Insights

Top Contributors:

Older Singles/Couples and Retirees lead in both total sales and transaction count, making them the most valuable customer groups for chip sales.

Older Families also show strong engagement, closely following the top two groups.

Average Spend:

Older Singles/Couples, Retirees, and Midage Singles/Couples have the highest average sales per transaction (~$7.36–$7.39).

Young Singles/Couples have the lowest average spend ($7.16), despite a moderate number of purchases.

Under-engaged Segment:

New Families have the lowest transaction count and total sales, suggesting this group is currently under-targeted or less interested

Recommendation: Focus on Older Demographics: Target Older Singles/Couples, Retirees, and Older Families with loyalty rewards, value packs, and personalized offers.

Grow New Families: Introduce campaigns tailored to New Families — e.g., bundled snack offers, parenting-themed promotions, or kid-friendly products.

Increase Spend Among Young Customers: Promote larger pack sizes or cross-promotions (e.g., party snacks) to increase spend per purchase among Young Singles/Couples.

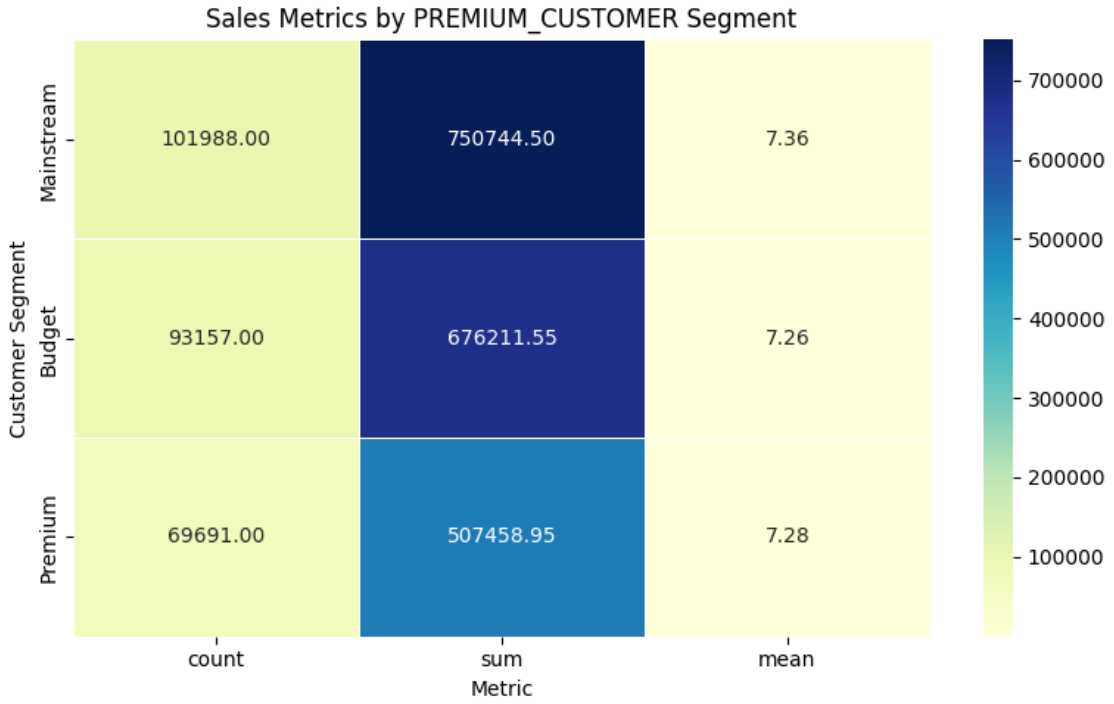
[134]:
```
premium_avg=df.groupby('PREMIUM_CUSTOMER')['TOT_SALES'].agg(['count', 'sum',␣
↪'mean']).sort_values('sum', ascending=False)
avg
```

```
/tmp/ipython-input-134-996061465.py:1: FutureWarning: The default of
observed=False is deprecated and will be changed to True in a future version of
pandas. Pass observed=False to retain current behavior or observed=True to adopt
the future default and silence this warning.
  premium_avg=df.groupby('PREMIUM_CUSTOMER')['TOT_SALES'].agg(['count', 'sum',
'mean']).sort_values('sum', ascending=False)
```

[134]:

	count	sum	mean
LIFESTAGE			
OLDER SINGLES/COUPLES	54479	402426.75	7.386823
RETIREES	49763	366470.90	7.364325
OLDER FAMILIES	48596	353767.20	7.279760
YOUNG FAMILIES	43592	316160.10	7.252709
YOUNG SINGLES/COUPLES	36377	260405.30	7.158515
MIDAGE SINGLES/COUPLES	25110	184751.30	7.357678
NEW FAMILIES	6919	50433.45	7.289124

[135]:
```
plt.figure(figsize=(8, 5))
sns.heatmap(premium_avg, annot=True, cmap="YlGnBu", fmt=".2f", linewidths=0.5)
plt.title("Sales Metrics by PREMIUM_CUSTOMER Segment")
plt.xlabel("Metric")
plt.ylabel("Customer Segment")
plt.tight_layout()
plt.show()
```



Insights

Mainstream customers have the highest sales and transaction count – they are the key target segment.

Budget customers buy frequently but spend slightly less per transaction.

Premium customers are fewer but maintain a comparable average spend.

Average spend per transaction is consistent (~$7.30–$7.36) across all segments.

Focus marketing broadly on Mainstream, offer value deals to Budget, and premium offerings to Premium.

Recommendations

Prioritize Mainstream segment in campaigns—they drive the bulk of sales.

Offer value bundles or discounts for Budget customers to boost volume.

Introduce premium or health-focused options for Premium customers to increase engagement.