In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
df = pd.read_csv("data-export (1).csv")
```

In [3]:
```
df.head()
```

Out[3]:

	# ------- ---------- ---------- ---------- ---	Unnamed: 1	Unnamed: 2	Unnamed: 3	Unnamed: 4	Unnamed: 5	Unna
0	Session primary channel group (Default channel...	Date + hour (YYYYMMDDHH)	Users	Sessions	Engaged sessions	Average engagement time per session	Engaged se p
1	Direct	2024041623	237	300	144	47.526666666666700	0.60759493670
2	Organic Social	2024041719	208	267	132	32.09737827715360	0.63461538461
3	Direct	2024041723	188	233	115	39.93991416309010	0.61170212765
4	Organic Social	2024041718	187	256	125	32.16015625	0.66844919786

In [5]:
```
df.columns = df.iloc[0]
df = df.drop(index = 0).reset_index(drop = True)
df.columns = ["channel group", "DataHour", "Users", "Sessions", "Engaged sessions",
```

In [6]:
```
df.head()
```

Out[6]:

	channel group	DataHour	Users	Sessions	Engaged sessions	Average engagement time per session	Engaged sessions per user	Ever
0	Direct	2024041623	237	300	144	47.526666666666700	0.6075949367088610	4.673
1	Organic Social	2024041719	208	267	132	32.09737827715360	0.6346153846153850	4.295
2	Direct	2024041723	188	233	115	39.93991416309010	0.6117021276595740	4.587
3	Organic Social	2024041718	187	256	125	32.16015625	0.6684491978609630	
4	Organic Social	2024041720	175	221	112	46.918552036199100	0.64	4.529

In [14]:
```
df["DataHour"] = pd.to_datetime(df["DataHour"], format="%Y%m%d%H", errors='coerce')
```

In [15]:
```
df.head()
```

Out[15]:

	channel group	DataHour	Users	Sessions	Engaged sessions	Average engagement time per session	Engaged sessions per user	Events
0	Direct	2024-04-16 23:00:00	237	300	144	47.526666666666700	0.6075949367088610	4.67333
1	Organic Social	2024-04-17 19:00:00	208	267	132	32.09737827715360	0.6346153846153850	4.29588
2	Direct	2024-04-17 23:00:00	188	233	115	39.93991416309010	0.6117021276595740	4.58798
3	Organic Social	2024-04-17 18:00:00	187	256	125	32.16015625	0.6684491978609630	
4	Organic Social	2024-04-17 20:00:00	175	221	112	46.918552036199100	0.64	4.5294

In [16]:

```
numeric_cols = df.columns.drop(["channel group", "DataHour"])
df[numeric_cols] = df[numeric_cols].apply(pd.to_numeric, errors='coerce')
df["Hour"] = df["DataHour"].dt.hour
```

In [17]:

```
df.head()
```

Out[17]:

	channel group	DataHour	Users	Sessions	Engaged sessions	Average engagement time per session	Engaged sessions per user	Events per session	Engagement rate
0	Direct	2024-04-16 23:00:00	237	300	144	47.526667	0.607595	4.673333	0.480000
1	Organic Social	2024-04-17 19:00:00	208	267	132	32.097378	0.634615	4.295880	0.494382
2	Direct	2024-04-17 23:00:00	188	233	115	39.939914	0.611702	4.587983	0.493562
3	Organic Social	2024-04-17 18:00:00	187	256	125	32.160156	0.668449	4.078125	0.488281
4	Organic Social	2024-04-17 20:00:00	175	221	112	46.918552	0.640000	4.529412	0.506787

In [18]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3182 entries, 0 to 3181
Data columns (total 11 columns):
 #   Column                                Non-Null Count  Dtype
---  ------                                --------------  -----
 0   channel group                         3182 non-null   object
 1   DataHour                              3182 non-null   datetime64[ns]
 2   Users                                 3182 non-null   int64
 3   Sessions                              3182 non-null   int64
 4   Engaged sessions                      3182 non-null   int64
 5   Average engagement time per session  3182 non-null   float64
 6   Engaged sessions per user             3182 non-null   float64
 7   Events per session                    3182 non-null   float64
 8   Engagement rate                       3182 non-null   float64
 9   Event count                           3182 non-null   int64
 10  Hour                                  3182 non-null   int32
dtypes: datetime64[ns](1), float64(4), int32(1), int64(4), object(1)
memory usage: 261.2+ KB
```

In [19]:
```
df.describe()
```

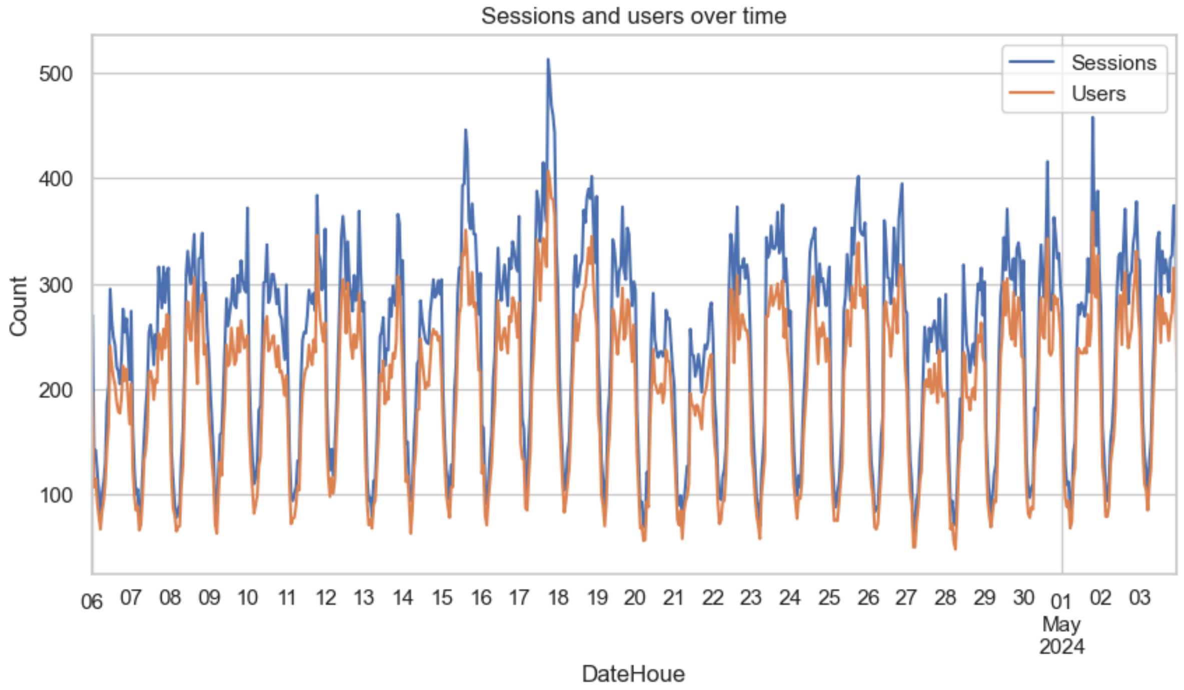
Out[19]:

	DataHour	Users	Sessions	Engaged sessions	Average engagement time per session	Engaged sessions per user	Ever s
count	3182	3182.000000	3182.000000	3182.000000	3182.000000	3182.000000	3182.0
mean	2024-04-20 01:17:07.278441216	41.935889	51.192646	28.325581	66.644581	0.606450	4.0
min	2024-04-06 00:00:00	0.000000	1.000000	0.000000	0.000000	0.000000	1.0
25%	2024-04-13 02:15:00	20.000000	24.000000	13.000000	32.103034	0.561404	3.7
50%	2024-04-20 02:00:00	42.000000	51.000000	27.000000	49.020202	0.666667	4.4
75%	2024-04-26 22:00:00	60.000000	71.000000	41.000000	71.487069	0.750000	5.2
max	2024-05-03 23:00:00	237.000000	300.000000	144.000000	4525.000000	2.000000	56.0
std	NaN	29.582258	36.919962	20.650569	127.200659	0.264023	2.7

Sessions and user over time

In [20]:
```
sns.set(style="whitegrid")
```

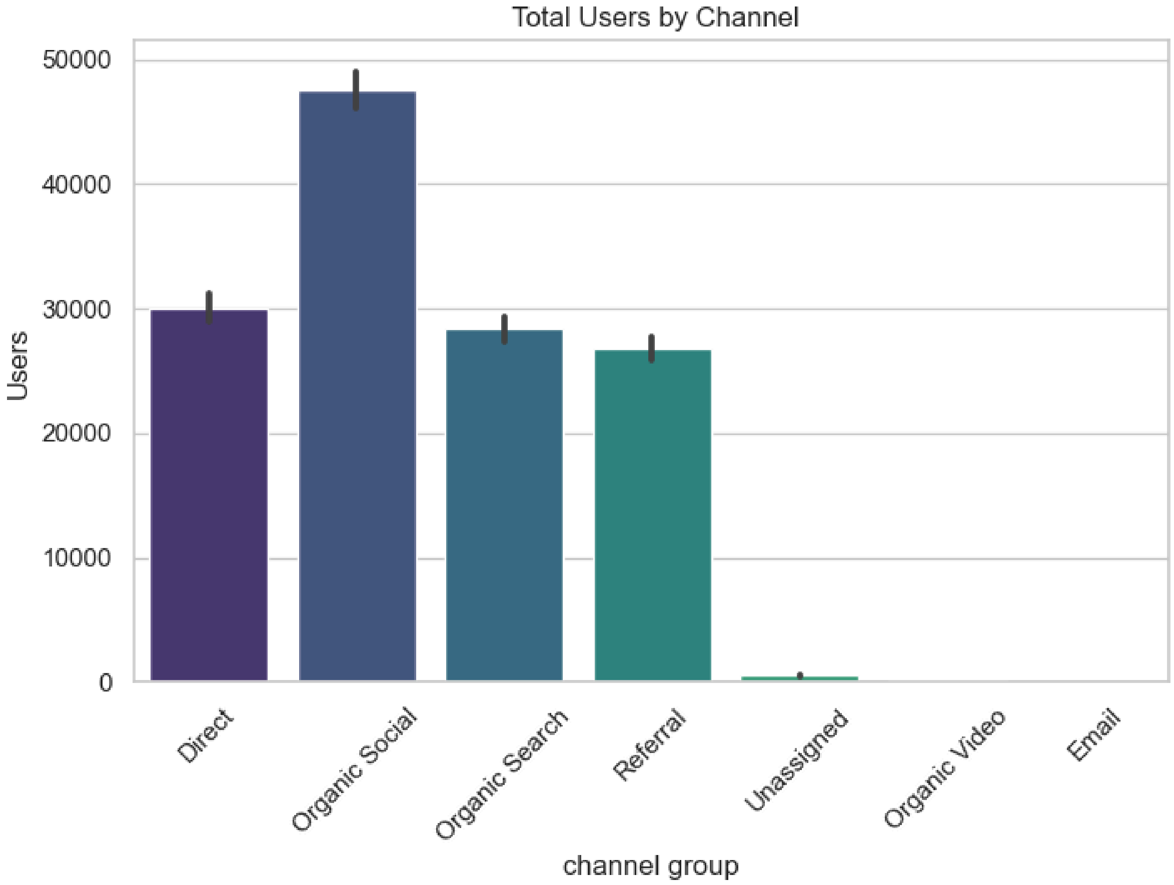
In [22]:
```
plt.figure(figsize=(10,5))
df.groupby("DataHour")[["Sessions","Users"]].sum().plot(ax=plt.gca())
plt.title("Sessions and users over time")
plt.xlabel("DateHoue")
plt.ylabel("Count")
plt.show()
```



Total users by channel

In [23]:

```
plt.figure(figsize=(8, 5))
sns.barplot(data=df, x="channel group", y="Users", estimator=np.sum, palette="viric
plt.title(" Total Users by Channel")
plt.xticks(rotation=45)
plt.show()
```



In [24]:

```
df.head()
```

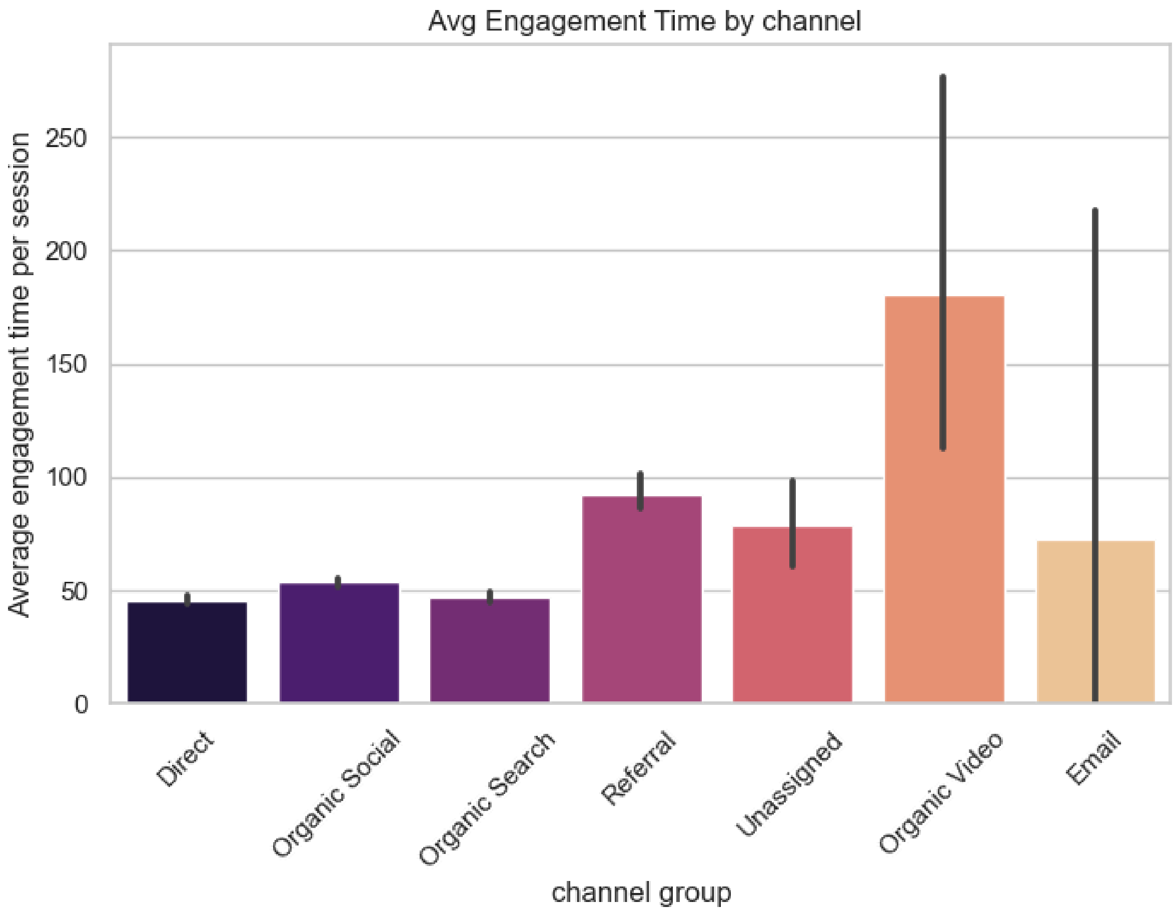
Out[24]:

	channel group	DataHour	Users	Sessions	Engaged sessions	Average engagement time per session	Engaged sessions per user	Events per session	Engagement rate
0	Direct	2024-04-16 23:00:00	237	300	144	47.526667	0.607595	4.673333	0.480000
1	Organic Social	2024-04-17 19:00:00	208	267	132	32.097378	0.634615	4.295880	0.494382
2	Direct	2024-04-17 23:00:00	188	233	115	39.939914	0.611702	4.587983	0.493562
3	Organic Social	2024-04-17 18:00:00	187	256	125	32.160156	0.668449	4.078125	0.488281
4	Organic Social	2024-04-17 20:00:00	175	221	112	46.918552	0.640000	4.529412	0.506787

Average engagement time by channel

In [27]:

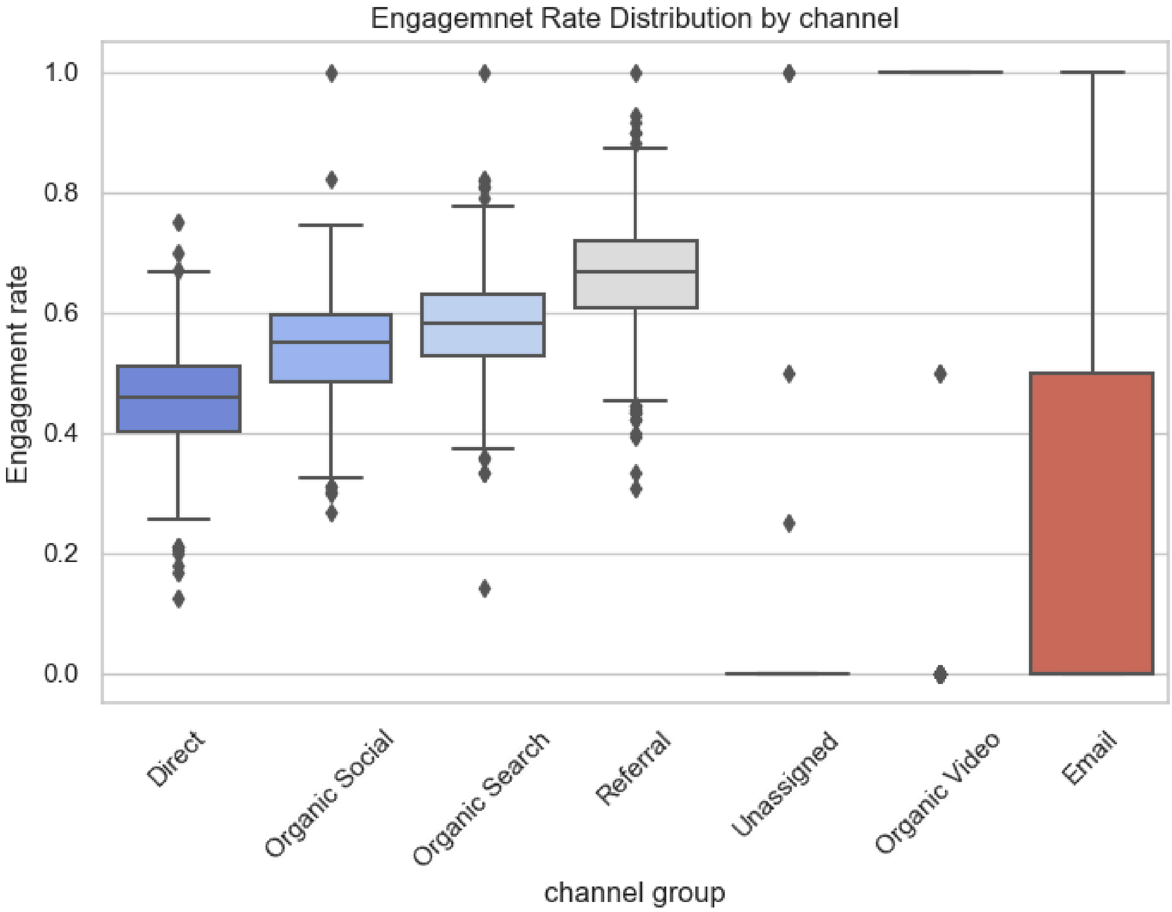
```
plt.figure(figsize=(8, 5))
sns.barplot(data=df, x="channel group", y="Average engagement time per session", es
plt.title(" Avg Engagement Time by channel")
plt.xticks(rotation=45)
plt.show()
```



Engagemnet Rate Distribution by channel

In [31]:

```python
plt.figure(figsize=(8, 5))
sns.boxplot(data=df, x="channel group", y="Engagement rate", palette="coolwarm")
plt.title("Engagemnet Rate Distribution by channel")
plt.xticks(rotation=45)
plt.show()
```



Engaged vs non engaged sessions

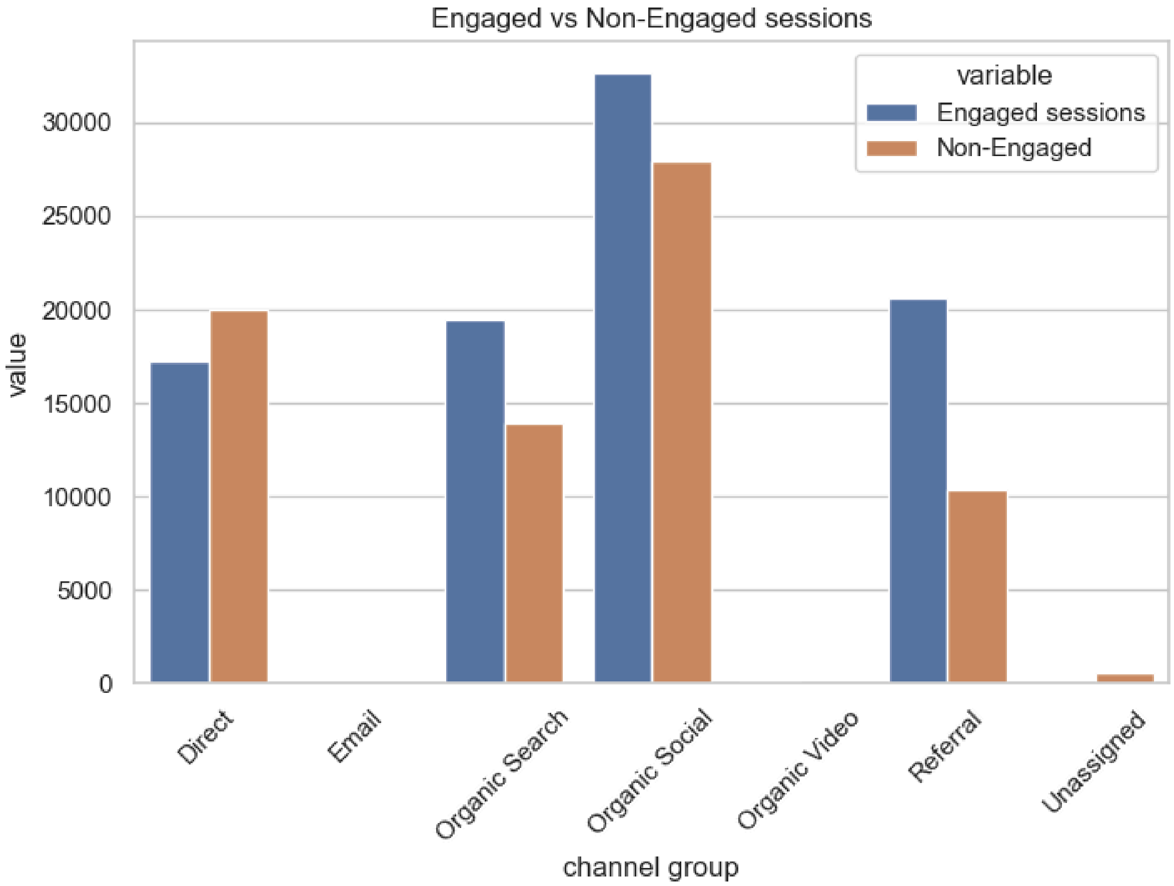
In [32]:
```
df.head()
```

Out[32]:

	channel group	DataHour	Users	Sessions	Engaged sessions	Average engagement time per session	Engaged sessions per user	Events per session	Engagement rate
0	Direct	2024-04-16 23:00:00	237	300	144	47.526667	0.607595	4.673333	0.480000
1	Organic Social	2024-04-17 19:00:00	208	267	132	32.097378	0.634615	4.295880	0.494382
2	Direct	2024-04-17 23:00:00	188	233	115	39.939914	0.611702	4.587983	0.493562
3	Organic Social	2024-04-17 18:00:00	187	256	125	32.160156	0.668449	4.078125	0.488281
4	Organic Social	2024-04-17 20:00:00	175	221	112	46.918552	0.640000	4.529412	0.506787

In [40]:
```
Session_df = df.groupby("channel group")[["Sessions", "Engaged sessions"]].sum().re
Session_df["Non-Engaged"] = Session_df["Sessions"] - Session_df["Engaged sessions"]
```

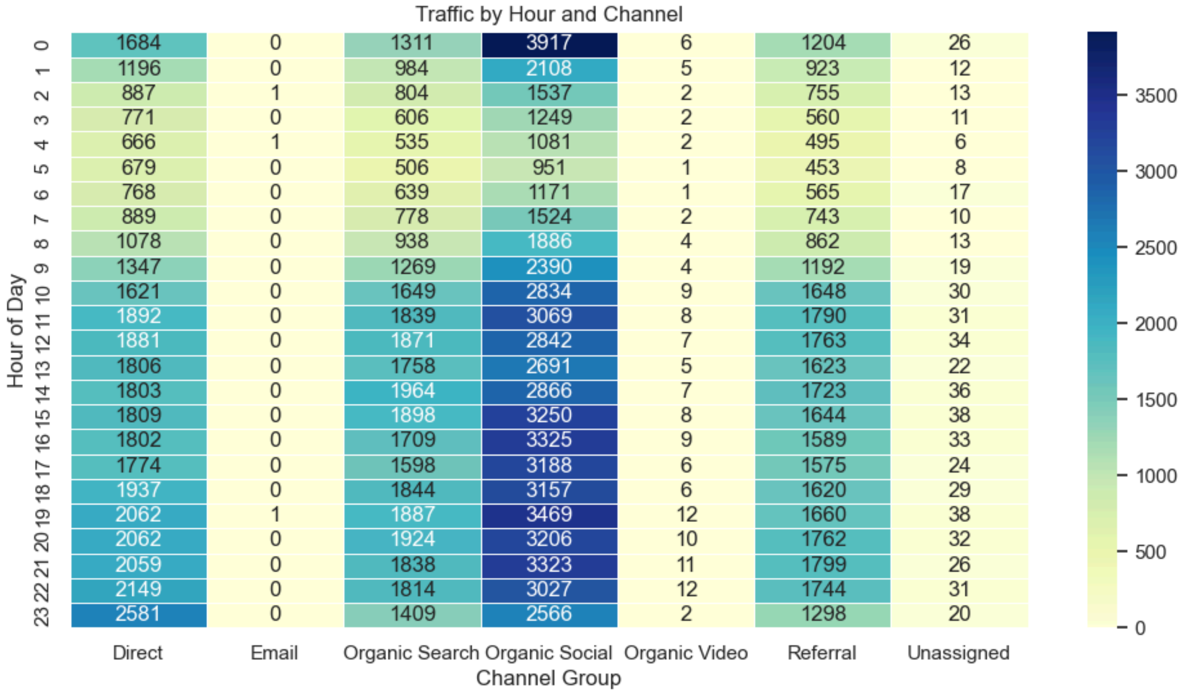
```
Session_df_melted = Session_df.melt(id_vars="channel group", value_vars=["Engaged s
plt.figure(figsize=(8, 5))
sns.barplot(data=Session_df_melted, x="channel group", y="value", hue="variable")
plt.title("Engaged vs Non-Engaged sessions")
plt.xticks(rotation=45)
plt.show()
```



Traffic by hour and channel

In [44]:

```
heatmap_data = df.groupby(["Hour", "channel group"])["Sessions"].sum().unstack().fi

plt.figure(figsize=(12, 6))
sns.heatmap(heatmap_data, cmap="YlGnBu", linewidth=.5, annot=True, fmt='.0f')
plt.title("Traffic by Hour and Channel")
plt.xlabel("Channel Group")
plt.ylabel("Hour of Day")
plt.show()
```



Hour of Day	Direct	Email	Organic Search	Organic Social	Organic Video	Referral	Unassigned
0	1684	0	1311	3917	6	1204	26
1	1196	0	984	2108	5	923	12
2	887	1	804	1537	2	755	13
3	771	0	606	1249	2	560	11
4	666	1	535	1081	2	495	6
5	679	0	506	951	1	453	8
6	768	0	639	1171	1	565	17
7	889	0	778	1524	2	743	10
8	1078	0	938	1886	4	862	13
9	1347	0	1269	2390	4	1192	19
10	1621	0	1649	2834	9	1648	30
11	1892	0	1839	3069	8	1790	31
12	1881	0	1871	2842	7	1763	34
13	1806	0	1758	2691	5	1623	22
14	1803	0	1964	2866	7	1723	36
15	1809	0	1898	3250	8	1644	38
16	1802	0	1709	3325	9	1589	33
17	1774	0	1598	3188	6	1575	24
18	1937	0	1844	3157	6	1620	29
19	2062	1	1887	3469	12	1660	38
20	2062	0	1924	3206	10	1762	32
21	2059	0	1838	3323	11	1799	26
22	2149	0	1814	3027	12	1744	31
23	2581	0	1409	2566	2	1298	20

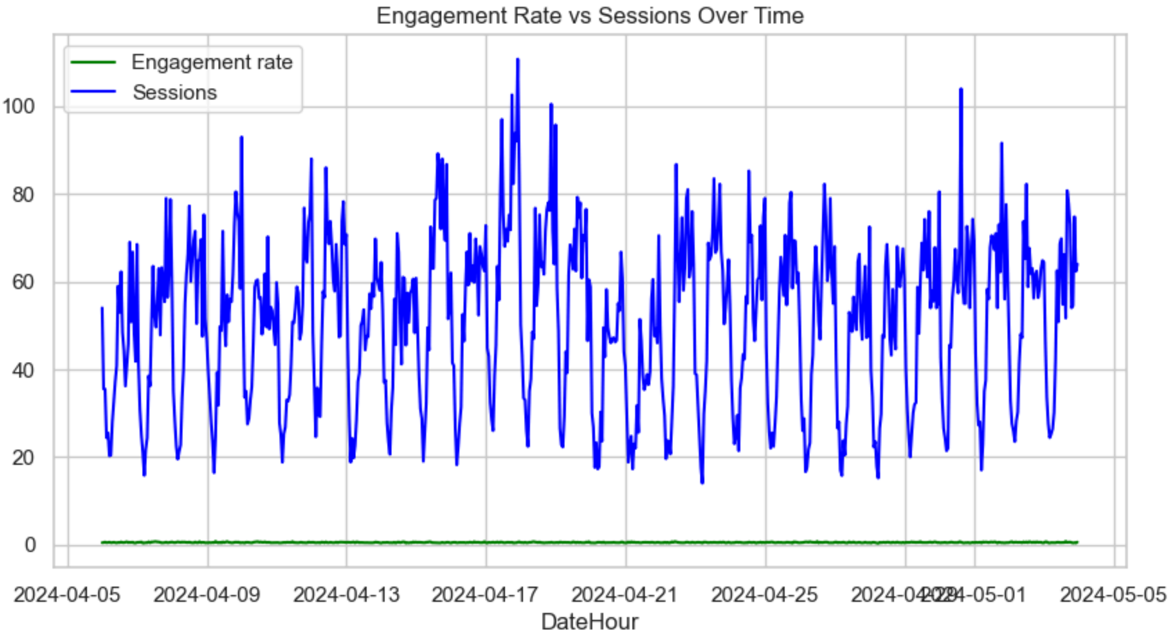
Engagement rate vs sessions over time

In [45]:
```
df.head()
```

Out[45]:

	channel group	DataHour	Users	Sessions	Engaged sessions	Average engagement time per session	Engaged sessions per user	Events per session	Engagement rate
0	Direct	2024-04-16 23:00:00	237	300	144	47.526667	0.607595	4.673333	0.480000
1	Organic Social	2024-04-17 19:00:00	208	267	132	32.097378	0.634615	4.295880	0.494382
2	Direct	2024-04-17 23:00:00	188	233	115	39.939914	0.611702	4.587983	0.493562
3	Organic Social	2024-04-17 18:00:00	187	256	125	32.160156	0.668449	4.078125	0.488281
4	Organic Social	2024-04-17 20:00:00	175	221	112	46.918552	0.640000	4.529412	0.506787

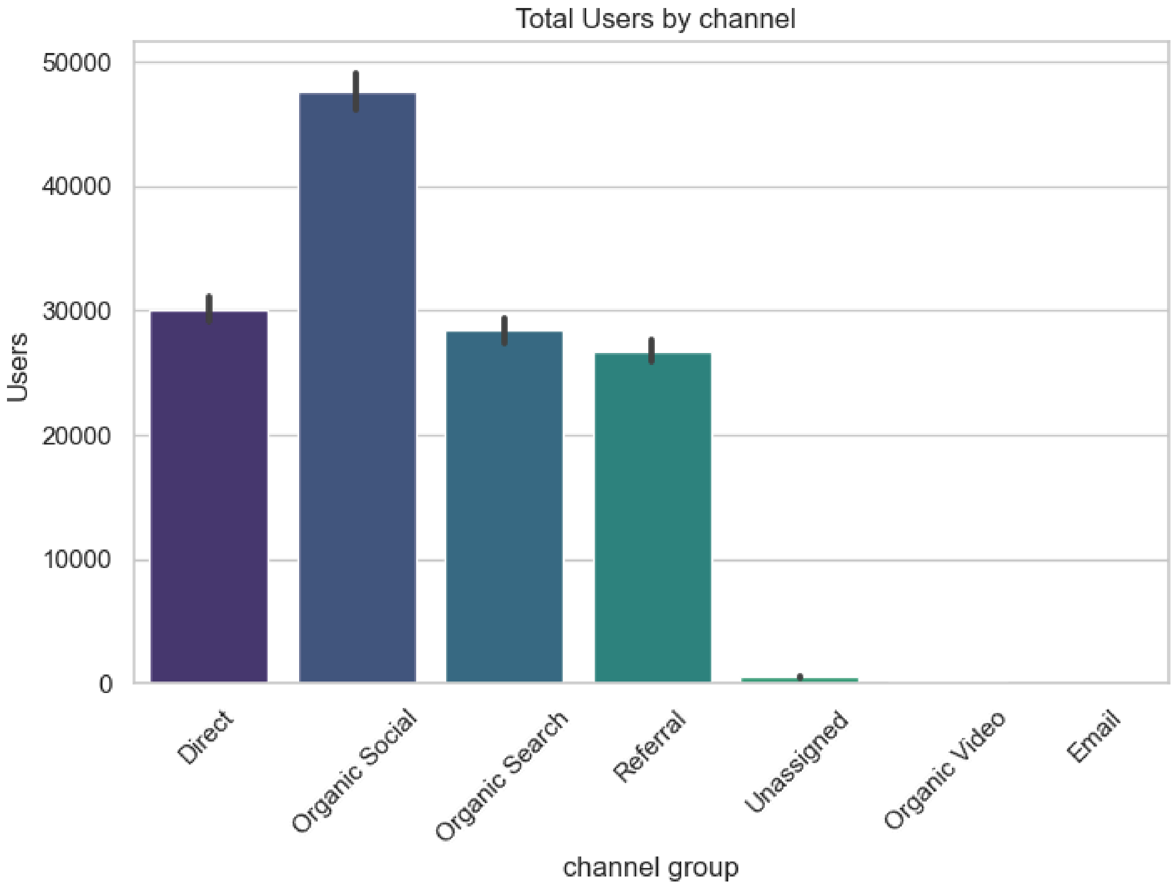
In [47]:
```
df_plot = df.groupby("DataHour")[["Engagement rate", "Sessions"]].mean().reset_inde

plt.figure(figsize=(10, 5))
plt.plot(df_plot["DataHour"], df_plot["Engagement rate"], label="Engagement rate",
plt.plot(df_plot["DataHour"], df_plot["Sessions"], label="Sessions", color="blue")
plt.title("Engagement Rate vs Sessions Over Time")
plt.xlabel("DateHour")
plt.legend()
plt.grid(True)
plt.show()
```



Total users by channel

In [48]:

```
plt.figure(figsize=(8, 5))
sns.barplot(data=df, x="channel group", y="Users", estimator=np.sum, palette="viric
plt.title(" Total Users by channel")
plt.xticks(rotation=45)
plt.show()
```



In [ ]: