In [1]:

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

In [2]:

```
nesarc = pd.read_csv('nesarc.csv', low_memory=False)
pd.set_option('display.float_format', lambda x:'%f'%x)
```

From Prac 1

Columns/Data used in Prac 1

In [3]:

```
nesarc['S2AQ5B'] = pd.to_numeric(nesarc['S2AQ5B'], errors='coerce') #convert variable t
o numeric
nesarc['S2AQ5D'] = pd.to_numeric(nesarc['S2AQ5D'], errors='coerce') #convert variable t
o numeric
nesarc['S2AQ5A'] = pd.to_numeric(nesarc['S2AQ5A'], errors='coerce') #convert variable t
o numeric
nesarc['S2BQ1B1'] = pd.to_numeric(nesarc['S2BQ1B1'], errors='coerce') #convert variable
 to numeric
nesarc['AGE'] = pd.to_numeric(nesarc['AGE'], errors='coerce') #convert variable to nume
ric
```

From Prac 2

A subset of nesarc data, with the following criteria

Age from 26 to 50

Beer drinking status - S2AQ5A = Y

In [4]:

```
sub1=nesarc[(nesarc['AGE']>=26) & (nesarc['AGE']<=50) & (nesarc['S2AQ5A']==1)]
sub2=sub1.copy()
```

From Prac 2

SETTING MISSING DATA

In [5]:

```
sub2['S2AQ5D']=sub2['S2AQ5D'].replace(99, np.nan)

sub2['S2AQ5B']=sub2['S2AQ5B'].replace(8, np.nan)
sub2['S2AQ5B']=sub2['S2AQ5B'].replace(9, np.nan)
sub2['S2AQ5B']=sub2['S2AQ5B'].replace(10, np.nan)
sub2['S2AQ5B']=sub2['S2AQ5B'].replace(99, np.nan)

sub2['S2BQ1B1']=sub2['S2BQ1B1'].replace(9, np.nan)
```

From Prac 2

Recode data

In [6]:

```
recode2 = {1:30, 2:26, 3:14, 4:8, 5:4, 6:2.5, 7:1}
sub2['BEER_FEQMO']= sub2['S2AQ5B'].map(recode2)

recode3 = {2:0, 1:1}
sub2['S2BQ1B1']= sub2['S2BQ1B1'].map(recode3)
```

From Prac 2

Create secondary variables

In [7]:

```
# A secondary variable multiplying the number of days beer consumed/month and the appro
x number of
# beer consumed/day
sub2['NUMBEERMO_EST']=sub2['BEER_FEQMO'] * sub2['S2AQ5D']
```

Draw a Line chart

Age vs Number of beer consumed per month (NUMBEERMO_EST)

a) mean number of beer consumed

var = mean number of beers consumed a month, grouped by age

In [8]:

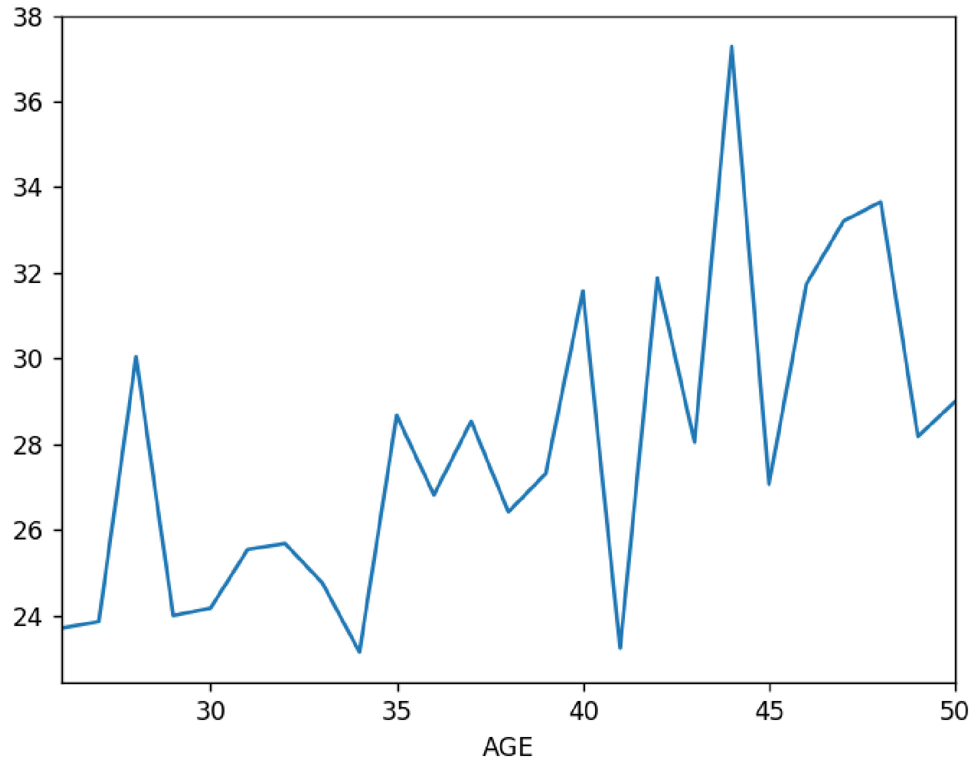
```
var = sub2.groupby(['AGE']).NUMBEERMO_EST.mean()
print(var)
```

```
AGE
26    23.701357
27    23.854545
28    30.035270
29    23.994949
30    24.170530
31    25.541033
32    25.678994
33    24.761017
34    23.143713
35    28.668478
36    26.813272
37    28.530387
38    26.414773
39    27.307122
40    31.571023
41    23.233788
42    31.877676
43    28.045455
44    37.279762
45    27.067241
46    31.727799
47    33.204918
48    33.655303
49    28.177778
50    28.995614
Name: NUMBEERMO_EST, dtype: float64
```

 # The output provides the average amount of beer consumed by interviewees within different age groups ranging from 26 to 50. It indicates that most interviewees in this age range drink around 20 to 30 beers per month on average.

In [30]:

```
%matplotlib notebook
var.plot(kind='line')
```



 # The line graph illustrates the variation in the number of beer bottles consumed by interviewees between the ages of 26 and 50 on a monthly basis. The graph depicts fluctuations in beer consumption over the specified age range.

Out[30]:

<matplotlib.axes._subplots.AxesSubplot at 0x6c1b8552b0>

b) total number of beer consumed

var2 = sum number of beers consumed a month,

In [10]:

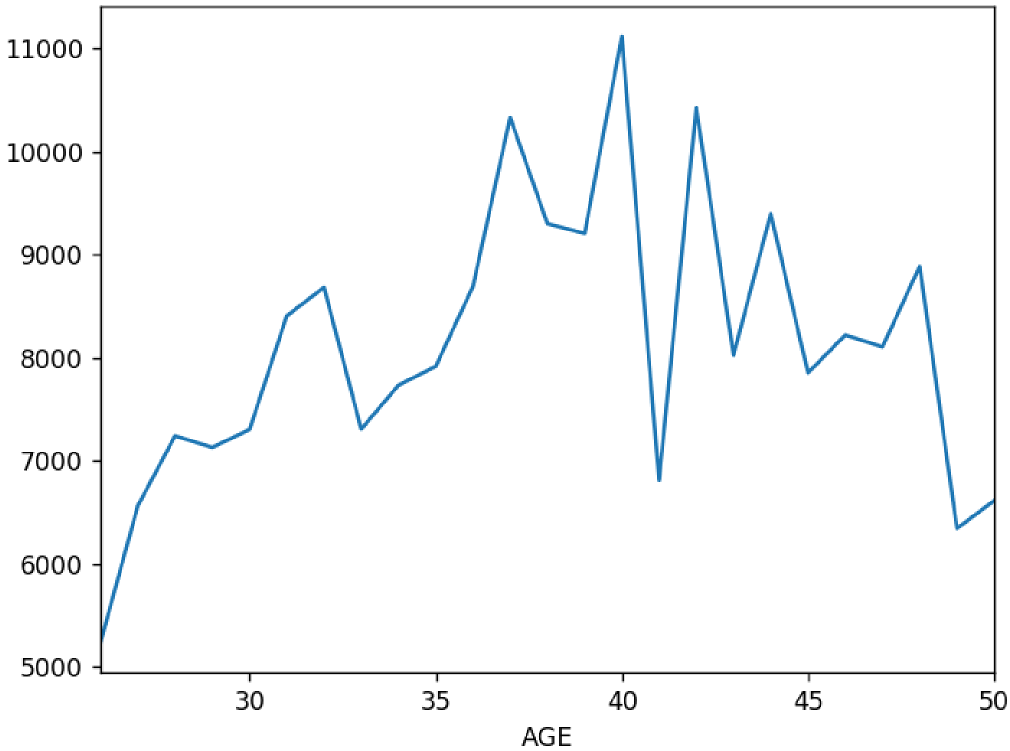
```
var2 = sub2.groupby(['AGE']).NUMBEERMO_EST.sum()
print(var2)
```

```
AGE
26     5238.000000
27     6560.000000
28     7238.500000
29     7126.500000
30     7299.500000
31     8403.000000
32     8679.500000
33     7304.500000
34     7730.000000
35     7912.500000
36     8687.500000
37    10328.000000
38     9298.000000
39     9202.500000
40    11113.000000
41     6807.500000
42    10424.000000
43     8021.000000
44     9394.500000
45     7849.500000
46     8217.500000
47     8102.000000
48     8885.000000
49     6340.000000
50     6611.000000
Name: NUMBEERMO_EST, dtype: float64
```

 # The result shows the total amount of beer consumed by interviewees every month, categorized by age from 26 to 50. Among this age group, individuals aged 40, 42, and 37 drink the highest amount of beer per month with 11,113, 10,424, and 10,328 bottles, respectively, while the 26-year-old group has the lowest amount with 5,238 bottles consumed every month.

In [31]:

```
fig = plt.figure()
var2.plot(kind='line')
```



 # The line graph illustrates the monthly beer consumption for each age group from 26 to 50 years old. It provides an overview of the variation in beer consumption among different age groups over time.

Out[31]:

<matplotlib.axes._subplots.AxesSubplot at 0x6c06ab77f0>

Draw a stacked Column Chart

x = age (AGE)

y = number of beers consumed per month (NUMBEERMO_EST)

stack is based on depedency on beer (S2BQ1B1)

var3 = mean number of beers consumed a month, grouped by age and beer depedency (S2BQ1B1)

In [12]:

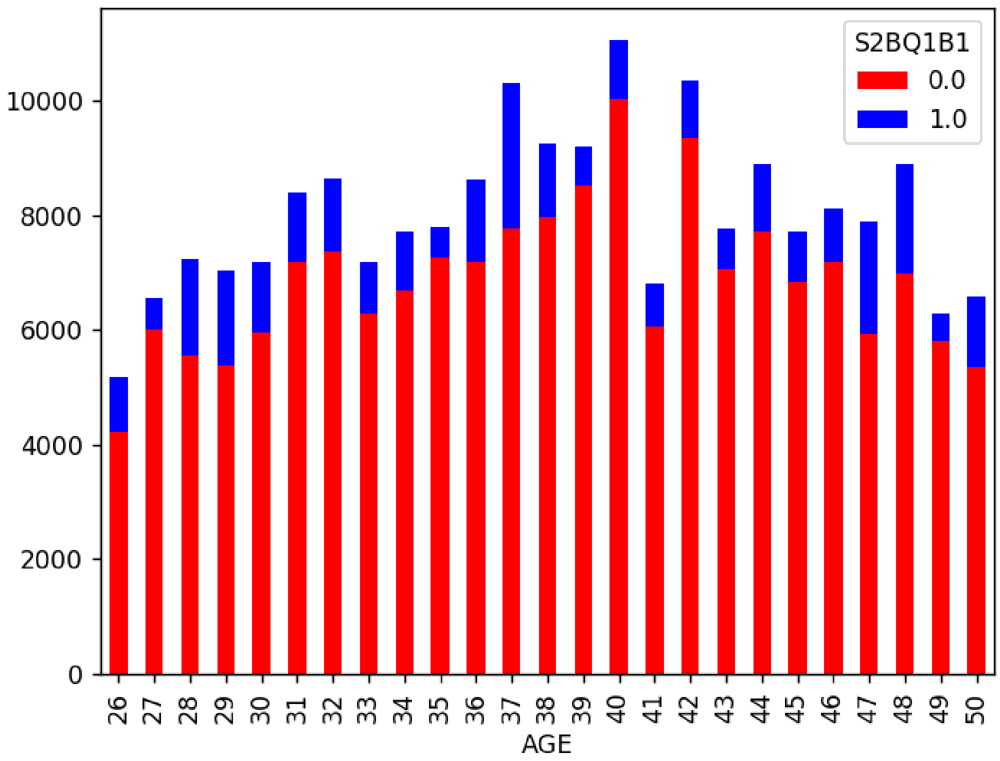
```
var3 = sub2.groupby(['AGE','S2BQ1B1']).NUMBEERMO_EST.sum()
print(var3)
```

```
AGE  S2BQ1B1
26   0.000000    4225.500000
     1.000000     949.000000
27   0.000000    6000.000000
     1.000000     560.000000
28   0.000000    5542.500000
     1.000000    1686.500000
29   0.000000    5363.500000
     1.000000    1675.000000
30   0.000000    5942.500000
     1.000000    1244.000000
31   0.000000    7185.500000
     1.000000    1212.500000
32   0.000000    7352.500000
     1.000000    1288.500000
33   0.000000    6279.000000
     1.000000     901.500000
34   0.000000    6672.000000
     1.000000    1039.500000
35   0.000000    7264.500000
     1.000000     518.000000
36   0.000000    7190.000000
     1.000000    1420.000000
37   0.000000    7765.000000
     1.000000    2531.000000
38   0.000000    7962.000000
     1.000000    1294.000000
39   0.000000    8519.000000
     1.000000     667.500000
40   0.000000   10030.500000
     1.000000    1022.500000
41   0.000000    6047.000000
     1.000000     755.500000
42   0.000000    9352.500000
     1.000000     986.500000
43   0.000000    7061.000000
     1.000000     695.000000
44   0.000000    7711.500000
     1.000000    1186.000000
45   0.000000    6839.000000
     1.000000     865.500000
46   0.000000    7180.000000
     1.000000     925.500000
47   0.000000    5938.500000
     1.000000    1949.000000
48   0.000000    6971.500000
     1.000000    1913.500000
49   0.000000    5799.500000
     1.000000     491.000000
50   0.000000    5341.500000
     1.000000    1230.500000
Name: NUMBEERMO_EST, dtype: float64
```

 # The result provides the total amount of beer consumed per month for each age group (from 26 to 50) and further divides the data based on whether interviewees are alcohol-dependent or not. It shows the variation in beer consumption between alcohol-dependent and non-alcohol-dependent individuals within each age group.

In [32]:

```
var3.unstack().plot(kind='bar', stacked=True,  color=['red','blue'], grid=False)
```




```
# The bar plot
provides a visual
representation of
the total amount of
beer consumed per
month by
interviewees aged
26 to 50, divided
into two groups
based on whether
they are alcohol-
dependent or not.
It illustrates the
variation in beer
consumption between
alcohol-dependent
and non-alcohol-
dependent
individuals within
each age group.
```

Out[32]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x6c0885bd68>
```

Draw a horizontal stacked Column Chart

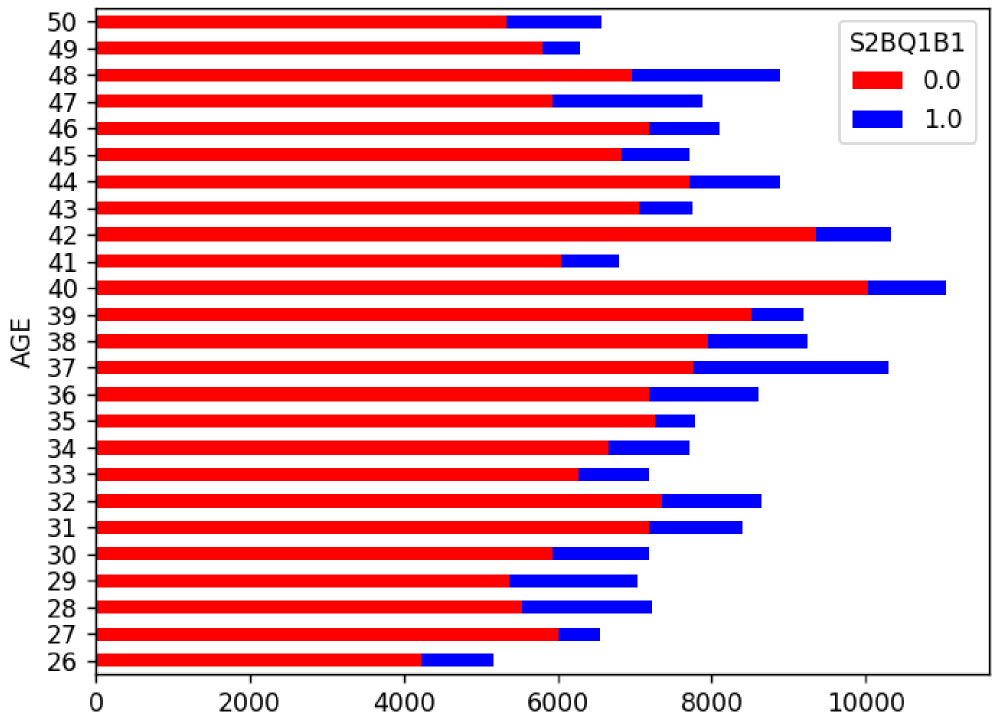
x = age (AGE)

y = number of beers consumed per month (NUMBEERMO_EST)

stack is based on depedency on beer (S2BQ1B1)

In [33]:

```
var3.unstack().plot(kind='barh', stacked=True,  color=['red','blue'], grid=False)
```



 # The horizontal bar plot shows the sum amount of beer consumed every month by interviewees from age 26 to age 50, divided into two groups based on whether they are alcohol-dependent or not. It provides a clear comparison of beer consumption between alcohol-dependent and non-alcohol-dependent individuals within each age group.

Out[33]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x6c14836588>
```

Draw a Pie Chart showing age (AGE) and total beer consumed a month (NUMBEERMO_EST)

hint use var2

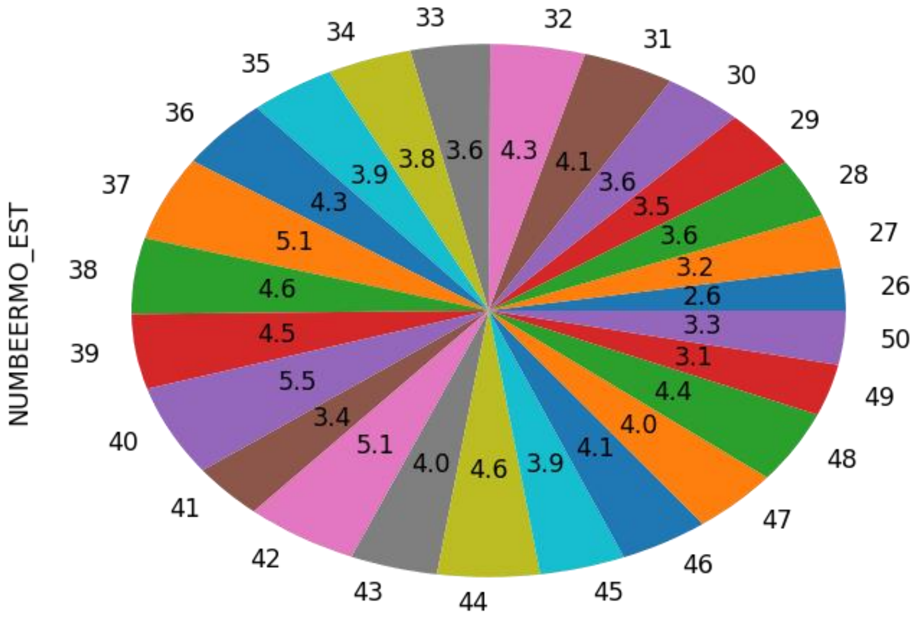
In [15]:

```
print(var2)
```

```
AGE
26     5238.000000
27     6560.000000
28     7238.500000
29     7126.500000
30     7299.500000
31     8403.000000
32     8679.500000
33     7304.500000
34     7730.000000
35     7912.500000
36     8687.500000
37    10328.000000
38     9298.000000
39     9202.500000
40    11113.000000
41     6807.500000
42    10424.000000
43     8021.000000
44     9394.500000
45     7849.500000
46     8217.500000
47     8102.000000
48     8885.000000
49     6340.000000
50     6611.000000
Name:  NUMBEERMO_EST, dtype: float64
```

In [34]:

```
fig = plt.figure()
var2.plot(kind='pie',autopct='%.1f')
```



The pie chart illustrates the distribution of beer consumption among different age groups (from 26 to 50). Each slice represents the proportion of beer consumed by each age group in relation to the total amount of beer consumed across all age groups.

Out[34]:

<matplotlib.axes._subplots.AxesSubplot at 0x6c14d07e10>

Draw a Violin Plot for age (AGE) and income (S1Q10A)

convert income (S1Q10A) to numeric

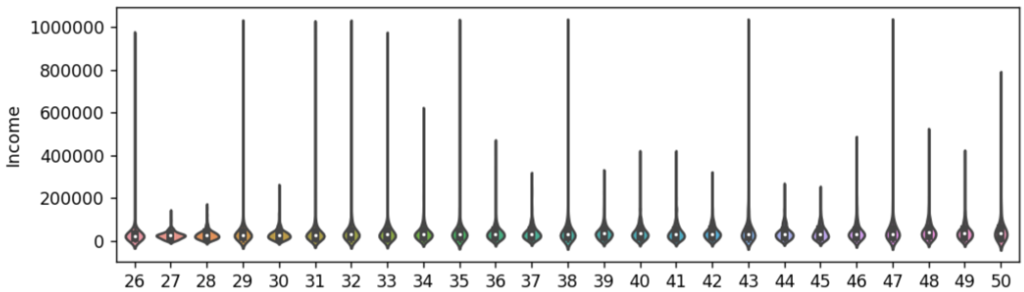
In [17]:

```
sub2['S1Q10A'] = pd.to_numeric(nesarc['S1Q10A']) #convert variable to numeric
```

Plot violin plot

In [35]:

```
fig = plt.figure()
sns.violinplot(x='AGE', y='S1Q10A', data=sub2)
plt.xlabel('Age')
plt.ylabel('Income')
```



Out[35]:

Text(0,0.5,'Income')

 # The violin plot displays the distribution of incomes from age 26 to 50. It indicates that there is a slight upward trend in income as the interviewees age, with the distribution widening at older ages, suggesting greater income

Draw a HeatMap for Ethnicity and Carton of Beer consumed per month, based on depedency on beer

Rename Race - From Module 4

In [19]:

```
# you can rename categorical variable values for graphing if original values are not in
formative
# first change the variable format to categorical if you haven’t already done so
sub2['ETHRACE2A'] = sub2['ETHRACE2A'].astype('category')

sub2['ETHRACE2A']=sub2['ETHRACE2A'].cat.rename_categories(["White", "Black", "NatAm",
"Asian", "Hispanic"])
```

Create a new variable CARTON_ADAY using CARTON_ADAY function provided

In [20]:

```
def CARTON_ADAY (row):
   if row['BEER_FEQMO'] >= 30 :
      return 1
   elif row['BEER_FEQMO'] < 30 :
      return 0

sub2['CARTON_ADAY'] = sub2.apply (lambda row: CARTON_ADAY (row),axis=1)
```

Print the size of CARTON_ADAY, grouped by category

In [21]:

```
c4= sub2.groupby('CARTON_ADAY').size()
print(c4)
```

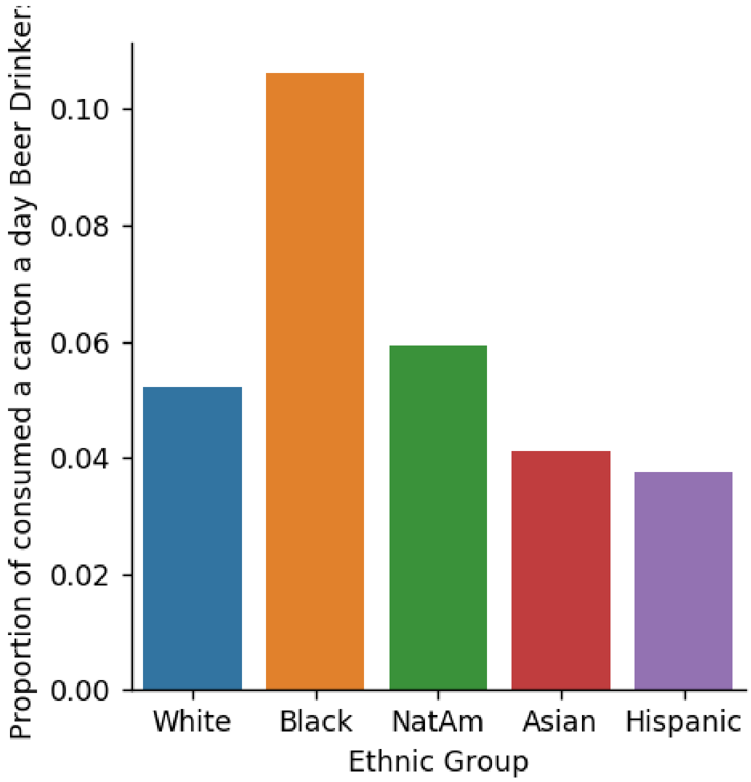
```
CARTON_ADAY
0.000000    6897
1.000000     417
dtype: int64
```

 # The results indicate that 6897 interviewees do not drink more than a carton of beer per day, while 417 interviewees consume more than a carton of beer daily. This information helps distinguish between the two groups based on their beer consumption patterns.

Draw bar chart to show relationship between race (ETHRACE2A) and CARTON_ADAY

In [36]:

```
# bivariate bar graph C->C
%matplotlib notebook
sns.factorplot(x='ETHRACE2A', y='CARTON_ADAY', data=sub2, kind="bar", ci=None)
plt.xlabel('Ethnic Group')
plt.ylabel('Proportion of consumed a carton a day Beer Drinkers')
```



 # The bar plot displays the proportion of individuals who consume more than a carton of beer per day in five different ethnic groups: White, Black, Native American, Asian, and Hispanic. The plot shows that Black individuals have the highest proportion (0.105) of beer drinkers consuming more than a carton per day, while Asians and Hispanics have lower proportions, around 0.04.

Out[36]:

```
Text(0.694444,0.5,'Proportion of consumed a carton a day Beer Drinkers')
```

Make copy of just race (ETHRACE2A) and CARTON_ADAY

In [23]:

```
sub3 = sub2[['ETHRACE2A','CARTON_ADAY']].copy()
sub3.head()
```

Out[23]:

	ETHRACE2A	CARTON_ADAY
1	Hispanic	nan
8	White	nan
12	Asian	0.000000
16	White	nan
24	Hispanic	nan

 # The data contains the ethnic groups and whether individuals drink more than a carton of beer per day. The "NaN" values indicate missing data for some individuals' carton per day drinking habits.

Create pivot table of race (ETHRACE2A) and CARTON_ADAY

In [24]:

```
table = pd.pivot_table(sub3, index=['ETHRACE2A'], columns=['CARTON_ADAY'], aggfunc=np.s
ize)
print(table)
```

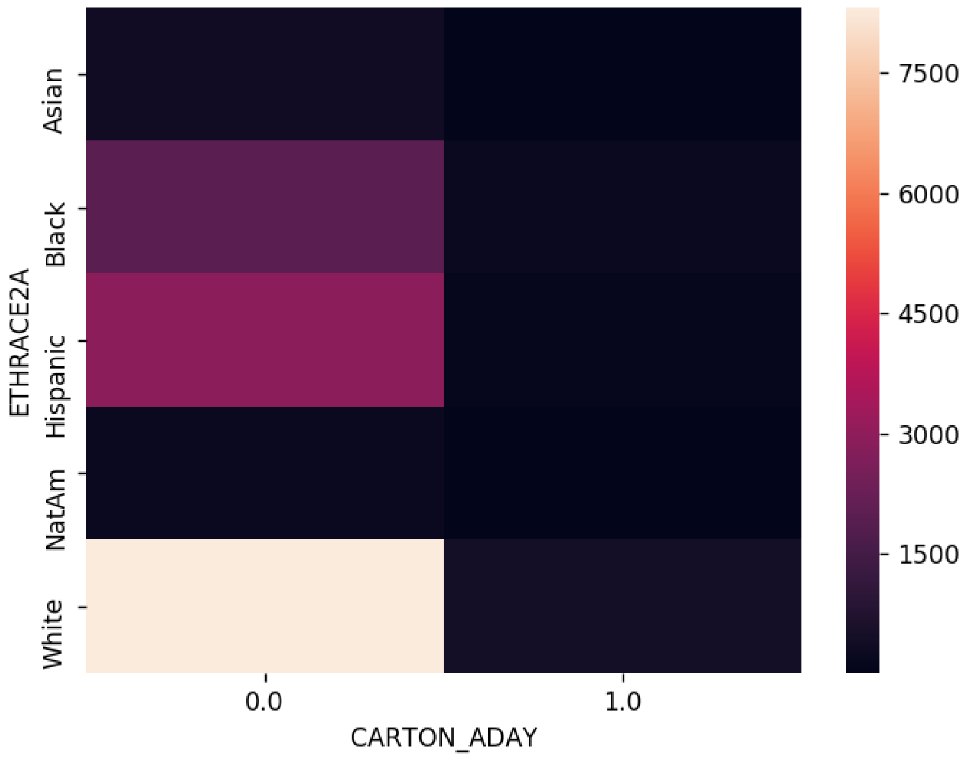
```
CARTON_ADAY  0.000000  1.000000
ETHRACE2A
Asian             374        16
Black            1972       234
Hispanic         2914       114
NatAm             222        14
White            8312       456
```

 # The pivot table displays the number of individuals from each ethnic group who drink less than a carton of beer per day (0.0) and the number of individuals who drink more than a carton of beer per day (1.0). For example, there are 8312 White individuals who drink less than a carton of beer per day, and 456 White individuals who drink more than a carton of beer per day. Similar information is provided for the other ethnic groups as well.

Draw heat map

In [37]:

```
fig = plt.figure()
sns.heatmap(table)
```



 # The heatmap visually represents the number of individuals from each ethnic group who drink less than a carton of beer per day (0.0) and the number of individuals who drink more than a carton of beer per day (1.0). The darker colors indicate higher counts of individuals in each category for each ethnic group.

Out[37]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x6c05e2a9e8>
```

Draw a bubble Chart

Read in gapminder.csv

In [26]:

```
pd.set_option('display.float_format', lambda x:'%.2f'%x)

gapminder = pd.read_csv('gapminder.csv', low_memory=False)
gapminder.head()
```

Out[26]:

	country	incomeperperson	alcconsumption	armedforcesrate	breastcancerper
0	Afghanistan		.03	.5696534	26.8
1	Albania	1914.99655094922	7.29	1.0247361	57.4
2	Algeria	2231.99333515006	.69	2.306817	23.5
3	Andorra	21943.3398976022	10.17		
4	Angola	1381.00426770244	5.57	1.4613288	23.1

Convert internetuserate, urbanrate and incomeperperson to numeric

The table displays the first five rows of the 'gapminder' dataset, showing various statistics for different countries, including income per person, alcohol consumption, breast cancer rate, CO2 emissions, female employment rate, HIV rate, internet usage rate, life expectancy, oil consumption per person, polity score, residential electricity consumption, suicide rate, employment rate, and urbanization rate.

In [27]:

```
gapminder['internetuserate'] = pd.to_numeric(gapminder['internetuserate'],errors='coerc
e')
gapminder['urbanrate'] = pd.to_numeric(gapminder['urbanrate'],errors='coerce')
gapminder['incomeperperson'] = pd.to_numeric(gapminder['incomeperperson'],errors='coerc
e')
```

In [28]:

```
gapminder_clean=gapminder.dropna()
```

Draw a bubble Chart

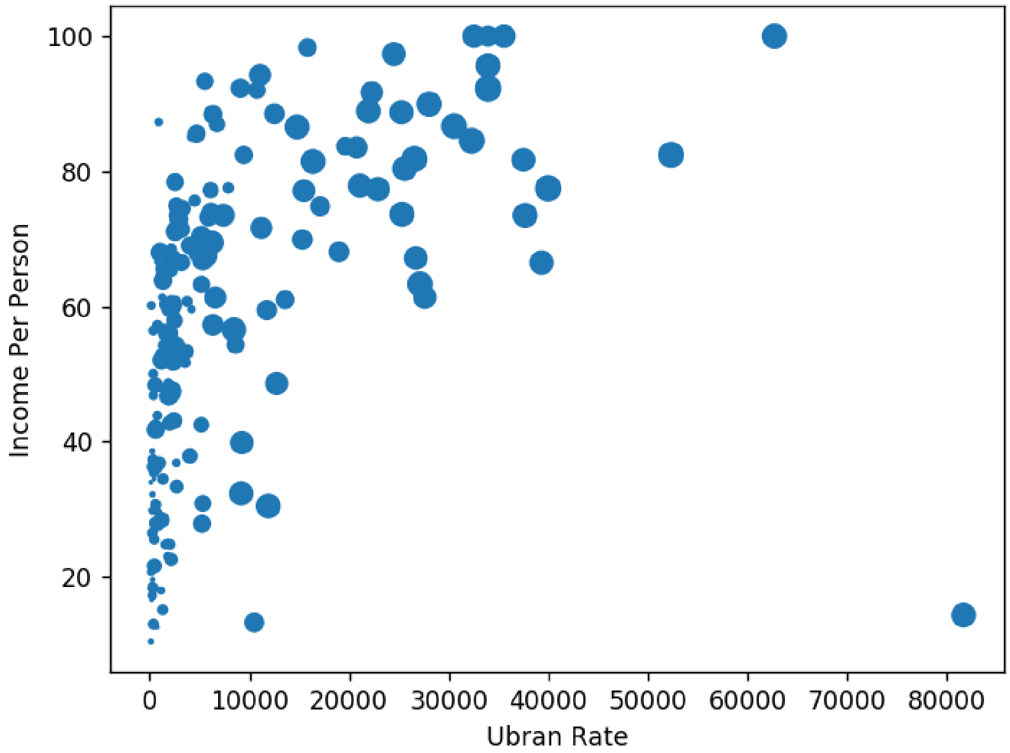
x = urbanrate

y = income per person

bubble size = internetuserate

In [29]:

```
# x = internetuserate
# y = incomeperperson
# Added third variable income as size of the bubble
%matplotlib notebook
fig = plt.figure()
plt.scatter(gapminder_clean['incomeperperson'],gapminder_clean['urbanrate'], s=gapminde
r_clean['internetuserate'])
plt.xlabel('Ubran Rate')
plt.ylabel('Income Per Person')
```



Out[29]:

```
Text(0,0.5,'Income Per Person')
```

 # The bubble chart displays the relationship between urbanization rate and income per person, with the size of the bubbles representing the internet usage rate. The chart suggests a positive correlation between urbanization rate and income per person, and larger bubbles indicate higher internet usage rates in those countries.