Practical 5 - JosiahTeh IPYNB

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[3]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import statsmodels.formula.api as smf
import statsmodels.stats.multicomp as multi
import matplotlib.pyplot as plt
```

3 From Prac 1 to 3

[4]:
```
nesarc = pd.read_csv('nesarc.csv', low_memory=False)
pd.set_option('display.float_format', lambda x:'%f'%x)
```

[5]:
```
nesarc['S2AQ5B'] = pd.to_numeric(nesarc['S2AQ5B'], errors='coerce') #convert␣
↪variable to numeric
nesarc['S2AQ5D'] = pd.to_numeric(nesarc['S2AQ5D'], errors='coerce') #convert␣
↪variable to numeric
nesarc['S2AQ5A'] = pd.to_numeric(nesarc['S2AQ5A'], errors='coerce') #convert␣
↪variable to numeric
```

[6]:
```
sub1=nesarc[(nesarc['AGE']>=26) & (nesarc['AGE']<=50) & (nesarc['S2AQ5A']==1)]
sub2=sub1.copy()
```

[7]:
```
#SETTING MISSING DATA
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)
```

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

[9]:
```python
# Creating a secondary variable multiplying the days consumed beer/month and␣
↪the number of beer/per day
sub2['NUMBEERMO_EST']=sub2['BEER_FEQMO'] * sub2['S2AQ5D']
sub2['NUMBEERMO_EST']= pd.to_numeric(sub2['NUMBEERMO_EST'])
```

[10]:
```python
ct1 = sub2.groupby('NUMBEERMO_EST').size()
print (ct1)
```

```
NUMBEERMO_EST
1.000000      477
2.000000      407
2.500000      414
3.000000      172
4.000000      429
             …
520.000000      1
540.000000      2
624.000000      1
720.000000      2
900.000000      1
Length: 75, dtype: int64
```

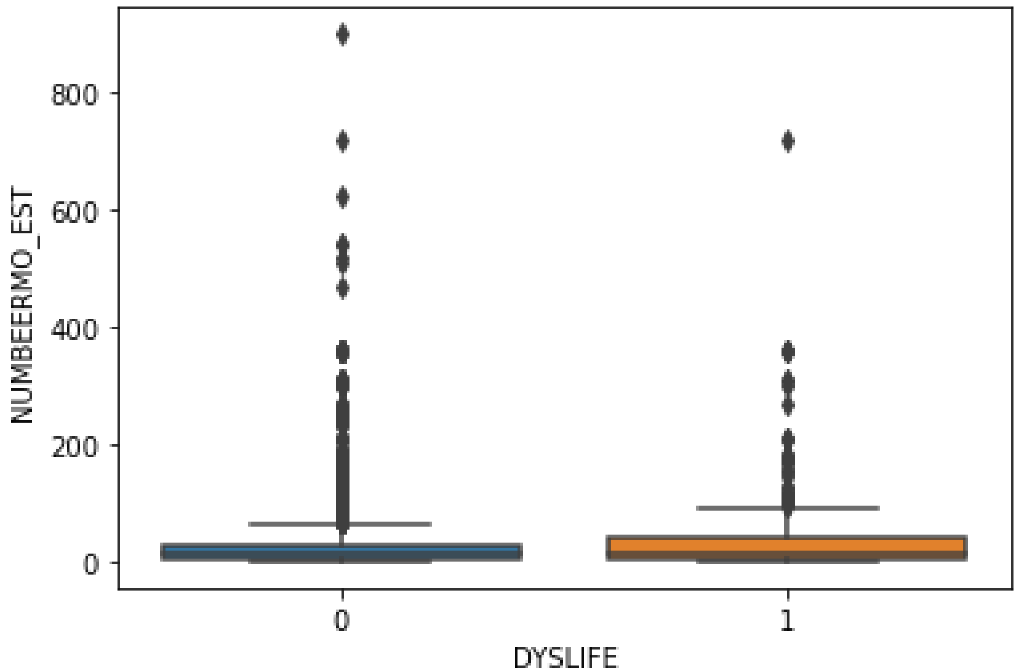
4 Categorical -> Quantitative - ANOVA

[11]:
```python
sub2['DYSLIFE'] = sub2['DYSLIFE'].astype('category')
```

5 Draw boxplot to show relationship between minor depression status (DYSLIFE (categorical)) and estimated number of beer consumed (NUMBEERMO_EST (quantitative))

[13]:
```python
# hint lecture cell 10
%matplotlib inline
sns.boxplot(x='DYSLIFE', y='NUMBEERMO_EST', data=sub2)
plt.xlabel('DYSLIFE')
plt.ylabel('NUMBEERMO_EST')
```

[13]:
```
Text(0, 0.5, 'NUMBEERMO_EST')
```



6 Perform ANOVA analysis between minor depression status (DYSLIFE (categorical)) and estimated number of beer consumed (NUMBEERMO_EST (quantitative))

[14]:
```python
# hint lecture cell 11
model1 = smf.ols(formula='NUMBEERMO_EST ~ C(DYSLIFE)', data=sub2).fit()
print (model1.summary())
```

```
                            OLS Regression Results
==============================================================================
Dep. Variable:          NUMBEERMO_EST   R-squared:                       0.003
Model:                            OLS   Adj. R-squared:                  0.003
Method:                 Least Squares   F-statistic:                     20.23
Date:                Wed, 08 Dec 2021   Prob (F-statistic):           6.99e-06
Time:                        19:23:55   Log-Likelihood:                -38804.
No. Observations:                7303   AIC:                         7.761e+04
Df Residuals:                    7301   BIC:                         7.763e+04
Df Model:                           1
Covariance Type:            nonrobust
================================================================================
===
                      coef    std err          t      P>|t|      [0.025
0.975]
--------------------------------------------------------------------------------
```

```
---
Intercept            27.2277      0.587     46.361      0.000      26.076
28.379
C(DYSLIFE)[T.1]      12.9670      2.883      4.497      0.000       7.315
18.619
==============================================================================
Omnibus:                     7622.371   Durbin-Watson:                   2.026
Prob(Omnibus):                  0.000   Jarque-Bera (JB):           640965.769
Skew:                           5.150   Prob(JB):                         0.00
Kurtosis:                      47.725   Cond. No.                         5.02
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
```

[15]:
```
sub3 = sub2[['NUMBEERMO_EST', 'DYSLIFE']].dropna()
```

7 print the mean of number of beer consumed grouped by minor depression status (use sub3)

[16]:
```
# hint lecture cell 13
print ('means for NUMBEERMO_EST by minor depression status')
m1 = sub3.groupby('DYSLIFE').mean()
print (m1)
```

```
means for NUMBEERMO_EST by minor depression status
         NUMBEERMO_EST
DYSLIFE
0            27.227714
1            40.194719
```

8 print the standard deviation (std) of number beer consumed grouped by minor depression status (use sub3)

[18]:
```
# hint lecture cell 14
print ('standard deviations for NUMBEERMO_EST by minor depression status')
sd1 = sub3.groupby('DYSLIFE').std()
print (sd1)
```

```
standard deviations for NUMBEERMO_EST by minor depression status
         NUMBEERMO_EST
DYSLIFE
0            47.678467
1            75.407118
```

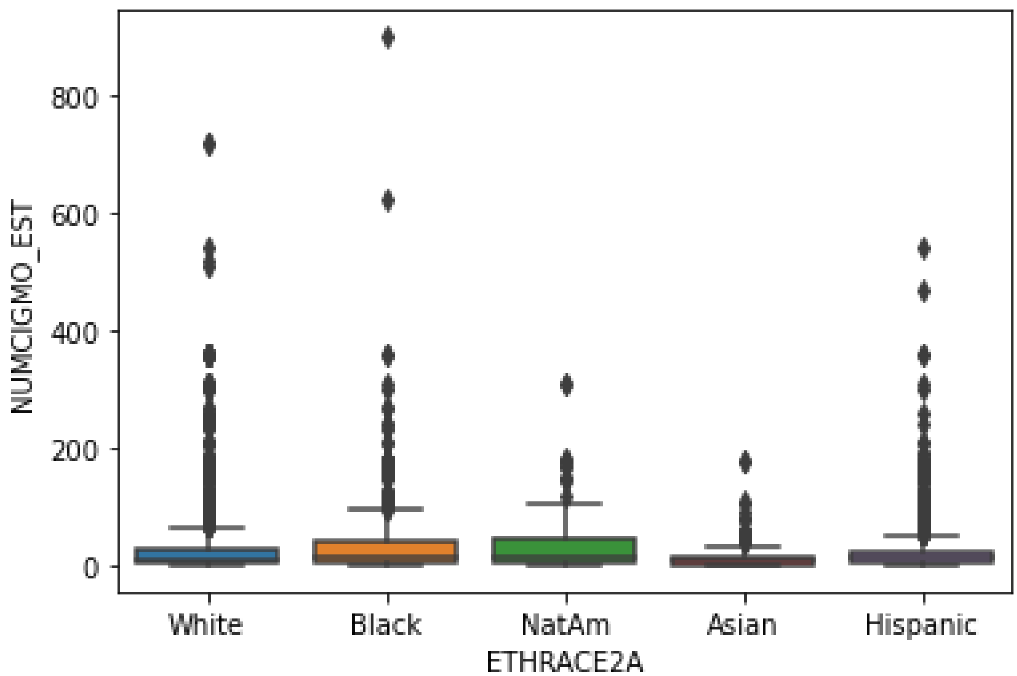
9 Categorical (>2) -> Quantitative - ANOVA

[19]:
```
sub2['ETHRACE2A'] = sub2['ETHRACE2A'].astype('category')
sub2['ETHRACE2A']=sub2['ETHRACE2A'].cat.rename_categories(["White", "Black",␣
↪"NatAm", "Asian", "Hispanic"])
```

10 Draw boxplot to show relationship between ethinicity (ETHRACE2A (categorical)) and estimated number of beer consumed (NUMBEERMO_EST (quantitative))

[23]:
```
# hint lecture cell 16
%matplotlib inline
sns.boxplot(x='ETHRACE2A', y='NUMBEERMO_EST', data=sub2)
plt.xlabel('ETHRACE2A')
plt.ylabel('NUMCIGMO_EST')
```

[23]:
```
Text(0, 0.5, 'NUMCIGMO_EST')
```



[24]:
```
sub4 = sub2[['NUMBEERMO_EST', 'ETHRACE2A']].dropna()
```

11 Perform ANOVA analysis between ethinicity (ETHRACE2A (categorical)) and estimated number of beer consumed (NUMBEERMO_EST (quantitative))

[27]:
```
# hint lecture cell 18
model2 = smf.ols(formula='NUMBEERMO_EST ~ C(ETHRACE2A)', data=sub4).fit()
print (model2.summary())
```

```
                            OLS Regression Results
==============================================================================
Dep. Variable:          NUMBEERMO_EST   R-squared:                       0.005
Model:                            OLS   Adj. R-squared:                  0.004
Method:                 Least Squares   F-statistic:                     8.261
Date:                Wed, 08 Dec 2021   Prob (F-statistic):           1.21e-06
Time:                        19:28:56   Log-Likelihood:                -38797.
No. Observations:                7303   AIC:                         7.760e+04
Df Residuals:                    7298   BIC:                         7.764e+04
Df Model:                           4
Covariance Type:            nonrobust
================================================================================
============
                               coef    std err          t      P>|t|      [0.025
0.975]
--------------------------------------------------------------------------------
------------
Intercept                   27.8589      0.742     37.535      0.000      26.404
29.314
C(ETHRACE2A)[T.Black]        4.5843      1.656      2.768      0.006       1.338
7.831
C(ETHRACE2A)[T.NatAm]       11.6496      4.581      2.543      0.011       2.670
20.629
C(ETHRACE2A)[T.Asian]      -11.2589      3.594     -3.133      0.002     -18.304
-4.214
C(ETHRACE2A)[T.Hispanic]    -3.2403      1.464     -2.213      0.027      -6.111
-0.370
==============================================================================
Omnibus:                     7639.304   Durbin-Watson:                   2.027
Prob(Omnibus):                  0.000   Jarque-Bera (JB):           646522.833
Skew:                           5.167   Prob(JB):                         0.00
Kurtosis:                      47.921   Cond. No.                         8.28
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
```

12 print the mean of number of beer consumed grouped by ethinicity

[29]:
```
# hint lecture cell 19
print ('means for NUMBEERMO_EST by ethinicity')
m2= sub4.groupby('ETHRACE2A').mean()
print (m2)
```

```
means for NUMBEERMO_EST by ethinicity
           NUMBEERMO_EST
ETHRACE2A
White          27.858922
Black          32.443182
NatAm          39.508475
Asian          16.600000
Hispanic       24.618638
```

13 print the standard deviation (std) of number of beer consumed grouped by ethinicity

[30]:
```
# hint lecture cell 20
print ('standard deviations for NUMBEERMO_EST  by ethnicity')
sd2 = sub4.groupby('ETHRACE2A').std()
print (sd2)
```

```
standard deviations for NUMBEERMO_EST  by ethnicity
           NUMBEERMO_EST
ETHRACE2A
White          50.537013
Black          55.289755
NatAm          57.231386
Asian          25.572698
Hispanic       41.073842
```

14 Perform Tukey's Honestly Significant Difference (Post hoc) test

[31]:
```
# hint lecture cell 21
mc1 = multi.MultiComparison(sub4['NUMBEERMO_EST'], sub4['ETHRACE2A'])
res1 = mc1.tukeyhsd()
print(res1.summary())
```

```
   Multiple Comparison of Means - Tukey HSD, FWER=0.05
=========================================================
 group1   group2  meandiff p-adj   lower    upper  reject
---------------------------------------------------------
```

Asian	Black	15.8432	0.001	5.4332	26.2532	True
Asian	Hispanic	8.0186	0.2007	-2.1752	18.2124	False
Asian	NatAm	22.9085	0.001	7.2827	38.5343	True
Asian	White	11.2589	0.015	1.4533	21.0646	True
Black	Hispanic	-7.8245	0.001	-13.1332	-2.5159	True
Black	NatAm	7.0653	0.5624	-5.9129	20.0435	False
Black	White	-4.5843	0.0448	-9.103	-0.0655	True
Hispanic	NatAm	14.8898	0.0132	2.0844	27.6953	True
Hispanic	White	3.2403	0.175	-0.7553	7.2359	False
NatAm	White	-11.6496	0.0816	-24.1482	0.8491	False