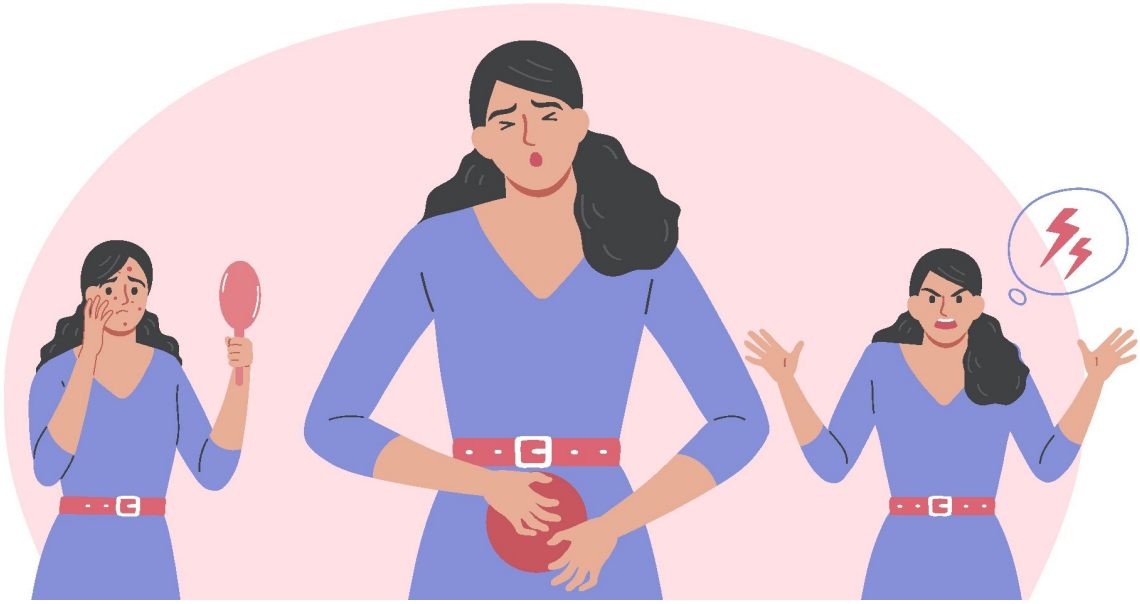
Menstrual Health and PCOD Risk Analysis

Various Health Conditions Due to Menstruation (like PCOS)



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

In [2]:
```
import warnings
warnings.filterwarnings('ignore')
```

In [3]:
```
df = pd.read_csv('periods.csv')
```

In [4]:
```
df.head()
```

Out[4]:

	number_of_peak	Age	Length_of_cycle	Estimated_day_of_ovulution	Length_of_Leutal_Phase	Length_of_menses	Unusual_Bleeding	Height
0	3	18	27	14	9	5	no	5 6
1	4	18	25	17	10	6	yes	5 6
2	2	19	30	17	13	4	no	5 3
3	3	19	28	16	14	6	no	5 1
4	2	19	35	18	15	5	no	5'3

In [5]:
```
df.tail()
```

Out[5]:

	number_of_peak	Age	Length_of_cycle	Estimated_day_of_ovulution	Length_of_Leutal_Phase	Length_of_menses	Unusual_Bleeding	Heig
157	2	19	35	16	12	5	no	
158	2	18	30	13	14	6	no	
159	3	19	40	16	14	6	no	
160	2	18	32	15	14	8	no	
161	3	19	28	7	14	6	no	5

In [6]:
```
df.shape
```

In [6]:
```
df.shape
```

Out[6]:
```
(162, 13)
```

In [7]:
```
df.columns
```

Out[7]:
```
Index(['number_of_peak', 'Age', 'Length_of_cycle',
       'Estimated_day_of_ovulution', 'Length_of_Leutal_Phase',
       'Length_of_menses', 'Unusual_Bleeding', 'Height', 'Weight', 'Income',
       'BMI', 'Mean_of_length_of_cycle', 'Menses_score'],
      dtype='object')
```

In [8]:
```
df.duplicated().sum()
```

Out[8]:
```
81
```

In [9]:
```
df = df.drop_duplicates()
```

In [10]:
```
df.isnull().sum()
```

Out[10]:
```
number_of_peak               0
Age                          0
Length_of_cycle              0
Estimated_day_of_ovulution   0
Length_of_Leutal_Phase       0
Length_of_menses             0
Unusual_Bleeding             0
Height                       0
Weight                       0
Income                       0
BMI                          0
Mean_of_length_of_cycle      0
Menses_score                 0
dtype: int64
```

In [11]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 81 entries, 0 to 80
Data columns (total 13 columns):
 #   Column                       Non-Null Count  Dtype  
---  ------                       --------------  -----  
 0   number_of_peak               81 non-null     int64  
 1   Age                          81 non-null     int64  
 2   Length_of_cycle              81 non-null     int64  
 3   Estimated_day_of_ovulution   81 non-null     int64  
 4   Length_of_Leutal_Phase       81 non-null     int64  
 5   Length_of_menses             81 non-null     int64  
 6   Unusual_Bleeding             81 non-null     object 
 7   Height                       81 non-null     object 
 8   Weight                       81 non-null     float64
 9   Income                       81 non-null     int64  
 10  BMI                          81 non-null     float64
 11  Mean_of_length_of_cycle      81 non-null     int64  
 12  Menses_score                 81 non-null     float64
dtypes: float64(3), int64(8), object(2)
memory usage: 8.9+ KB
```

In [12]:
```
df.describe()
```

Out[12]:

	number_of_peak	Age	Length_of_cycle	Estimated_day_of_ovulution	Length_of_Leutal_Phase	Length_of_menses	Weight	Incc
count	81.000000	81.000000	81.000000	81.000000	81.000000	81.000000	81.000000	8
mean	2.518519	19.333333	29.283951	15.135802	12.753086	5.061728	56.696296	
std	0.709068	1.457738	4.204862	2.359836	3.280743	1.028903	9.500993	
min	1.000000	14.000000	22.000000	7.000000	7.000000	1.000000	40.000000	
25%	2.000000	19.000000	27.000000	14.000000	10.000000	5.000000	51.000000	
50%	2.000000	19.000000	28.000000	15.000000	13.000000	5.000000	55.000000	
75%	3.000000	20.000000	30.000000	16.000000	14.000000	6.000000	60.000000	
max	5.000000	25.000000	40.000000	22.000000	30.000000	8.000000	85.000000	

In [13]:
```
df.nunique()
```

Out[13]:
```
number_of_peak                5
Age                           8
Length_of_cycle              16
Estimated_day_of_ovulution   12
Length_of_Leutal_Phase       12
Length_of_menses              7
Unusual_Bleeding              4
Height                       27
Weight                       27
Income                        1
BMI                          44
Mean_of_length_of_cycle      18
Menses_score                  7
dtype: int64
```

In [14]:
```
df['Height']
```

Out[14]:
```
0      5 6
1      5 6
2      5 3
3      5 1
4      5'3
      ...
76     5'3
77     5'6
78     5'3
79     5'6
80    5'2"
Name: Height, Length: 81, dtype: object
```

In [15]:
```
df['Height'] = df['Height'].str.strip()
df['Height'] = df['Height'].str.replace(' ', "'")
df['Height'] = df['Height'].str.replace('"', '')
df['Height'] = df['Height'].apply(lambda x: f"{x[0]}'{x[2:]}" if "'" not in x else x)

def convert_to_inches(x):
    try:
        if "'" in x:
            feet, inches = map(int, x.split("'"))
            return feet * 12 + inches
        else:
            return pd.to_numeric(x, errors='coerce')
    except ValueError:
        return pd.to_numeric(x, errors='coerce')

df['Height'] = df['Height'].apply(convert_to_inches)
```

In [16]:
```
df['Height']
```

Out[16]:
```
0     66.0
1     66.0
2     63.0
3     61.0
4     63.0
      ...
76    63.0
77    66.0
78    63.0
79    66.0
80    62.0
Name: Height, Length: 81, dtype: float64
```

In [17]:
```
df['Unusual_Bleeding'] = df['Unusual_Bleeding'].str.lower()
df['Unusual_Bleeding'] = df['Unusual_Bleeding'].map({'yes': 'Yes', 'no': 'No'})
```

In [18]:
```
df['Income'] = df['Income'].apply(lambda x: 'Low' if x == 0 else 'High')
df['Menses_score'] = df['Menses_score'].apply(lambda x: 'Low' if x <= 3 else 'High')
```

In [19]:
```
object_columns = df.select_dtypes(include=['object']).columns
print("Object type columns:")
print(object_columns)

numerical_columns = df.select_dtypes(include=['int64', 'float64']).columns
print("\nNumerical type columns:")
print(numerical_columns)
```

```
Object type columns:
Index(['Unusual_Bleeding', 'Income', 'Menses_score'], dtype='object')

Numerical type columns:
Index(['number_of_peak', 'Age', 'Length_of_cycle',
       'Estimated_day_of_ovulution', 'Length_of_Leutal_Phase',
       'Length_of_menses', 'Height', 'Weight', 'BMI',
       'Mean_of_length_of_cycle'],
      dtype='object')
```

In [20]:
```
def classify_features(df):
    categorical_features = []
```

```
    non_categorical_features = []
    discrete_features = []
    continuous_features = []

    for column in df.columns:
        if df[column].dtype == 'object':
            if df[column].nunique() < 10:
                categorical_features.append(column)
            else:
                non_categorical_features.append(column)
        elif df[column].dtype in ['int64', 'float64']:
            if df[column].nunique() < 10:
                discrete_features.append(column)
            else:
                continuous_features.append(column)

    return categorical_features, non_categorical_features, discrete_features, continuous_features
```

In [21]:
```
categorical, non_categorical, discrete, continuous = classify_features(df)
```

In [22]:
```
print("Categorical Features:", categorical)
print("Non-Categorical Features:", non_categorical)
print("Discrete Features:", discrete)
print("Continuous Features:", continuous)
```

```
Categorical Features: ['Unusual_Bleeding', 'Income', 'Menses_score']
Non-Categorical Features: []
Discrete Features: ['number_of_peak', 'Age', 'Length_of_menses']
Continuous Features: ['Length_of_cycle', 'Estimated_day_of_ovulution', 'Length_of_Leutal_Phase', 'Height', 'Wei
ght', 'BMI', 'Mean_of_length_of_cycle']
```

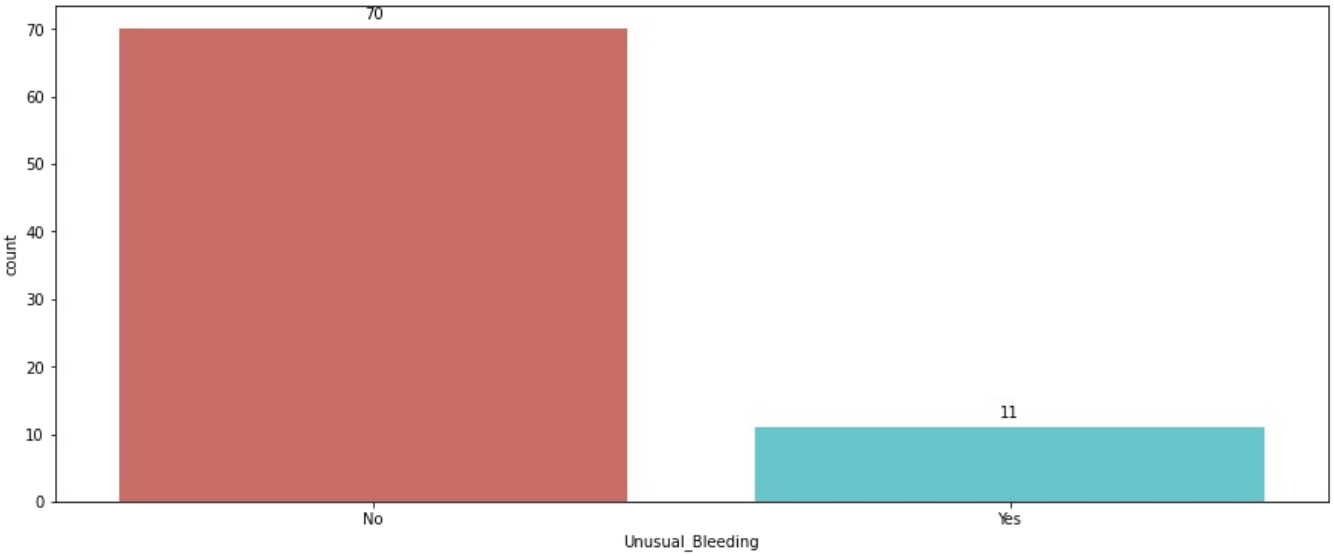
In [23]:
```
for i in categorical:
    print(i, ':')
    print(df[i].unique())
    print()
```

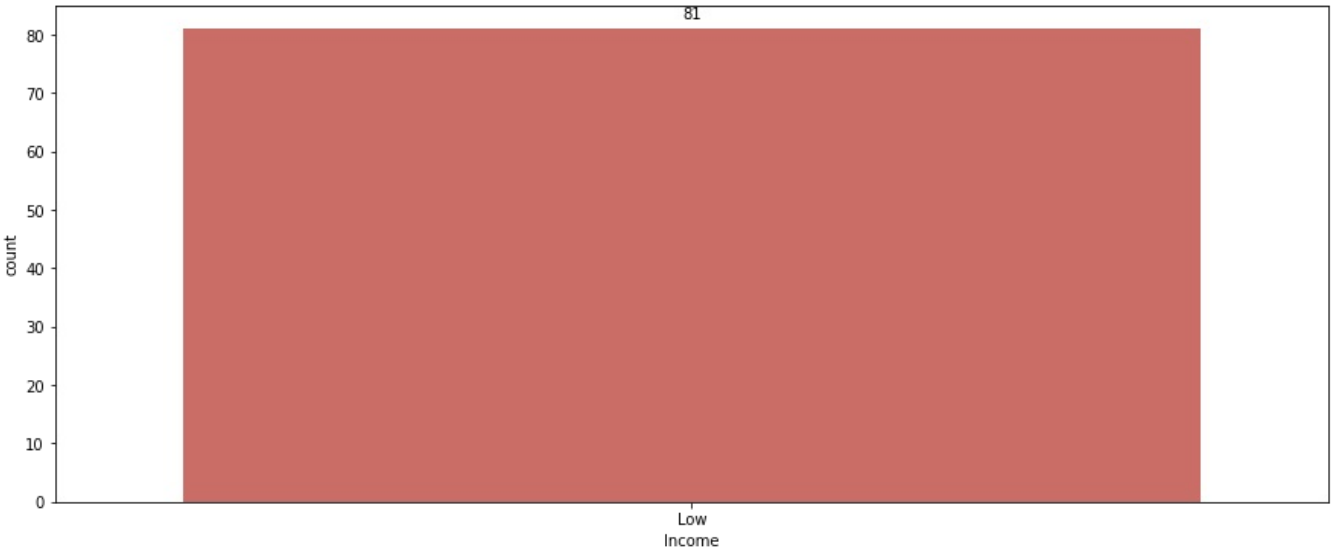
```
Unusual_Bleeding :
['No' 'Yes']

Income :
['Low']

Menses_score :
['High' 'Low']
```

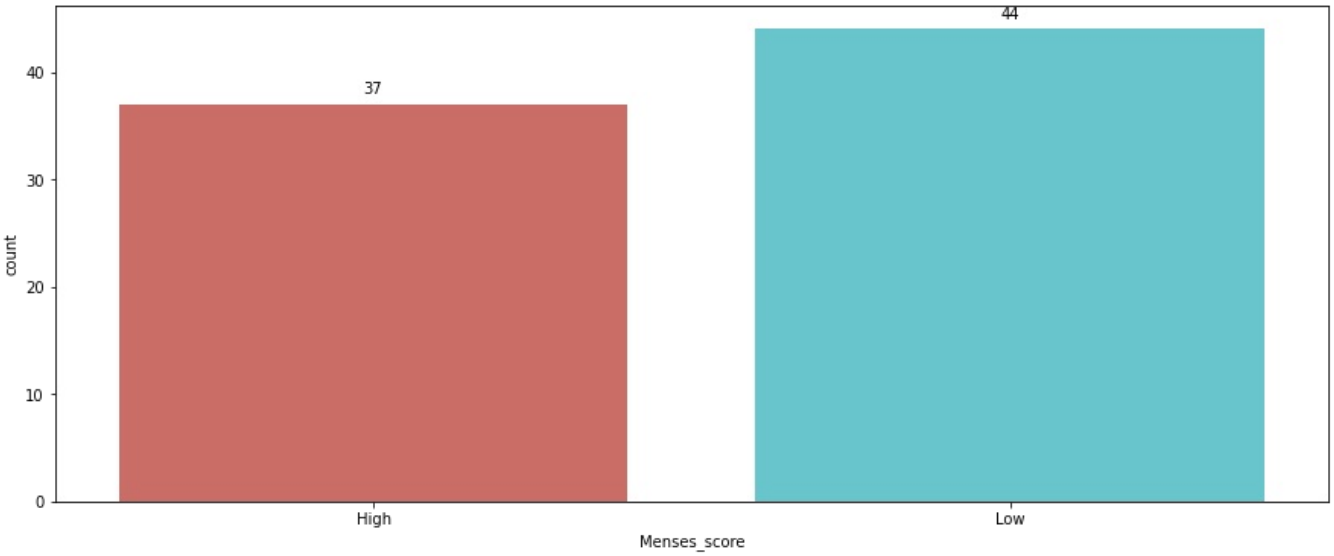
In [24]:
```
for i in categorical:
    print(i, ':')
    print(df[i].value_counts())
    print()
```

```
Unusual_Bleeding :
No     70
Yes    11
Name: Unusual_Bleeding, dtype: int64

Income :
Low    81
Name: Income, dtype: int64

Menses_score :
Low     44
High    37
Name: Menses_score, dtype: int64
```

In [25]:
```
for i in categorical:
    plt.figure(figsize=(15, 6))
    ax = sns.countplot(x=i, data=df, palette='hls')
    for p in ax.patches:
        ax.annotate(f'{p.get_height()}', (p.get_x() + p.get_width() / 2., p.get_height()),
                    ha='center', va='center', xytext=(0, 10), textcoords='offset points')
    plt.show()
```

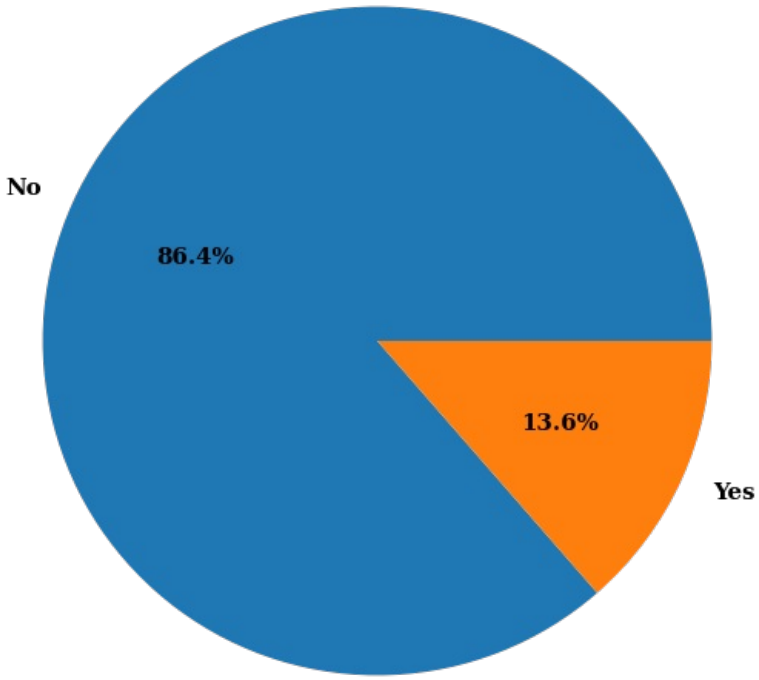




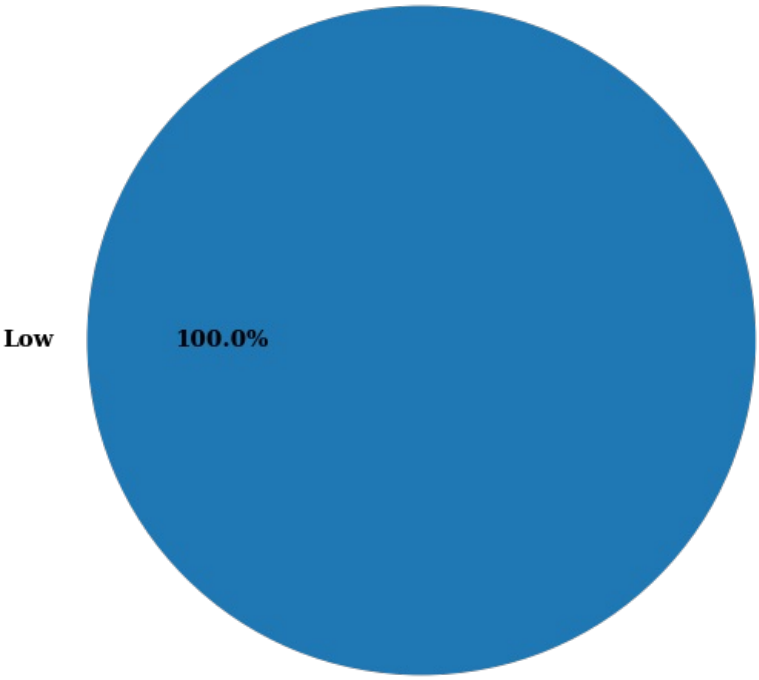


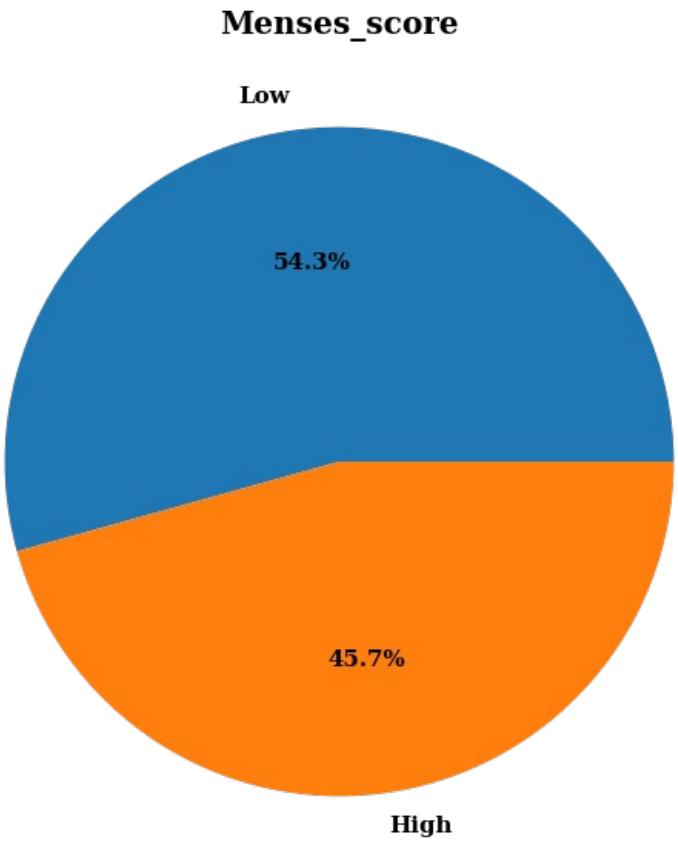
In [26]:
```
for i in categorical:
    plt.figure(figsize=(20,10))
    plt.pie(df[i].value_counts(), labels=df[i].value_counts().index, autopct='%1.1f%%', textprops={'fontsize':
                                        'color': 'black',
                                        'weight': 'bold',
                                        'family': 'serif' })
    hfont = {'fontname':'serif', 'weight': 'bold'}
    plt.title(i, size=20, **hfont)
    plt.show()
```

Unusual_Bleeding



Income





In [27]:
```
for i in discrete:
    print(i, ':')
    print(df[i].unique())
    print()
```

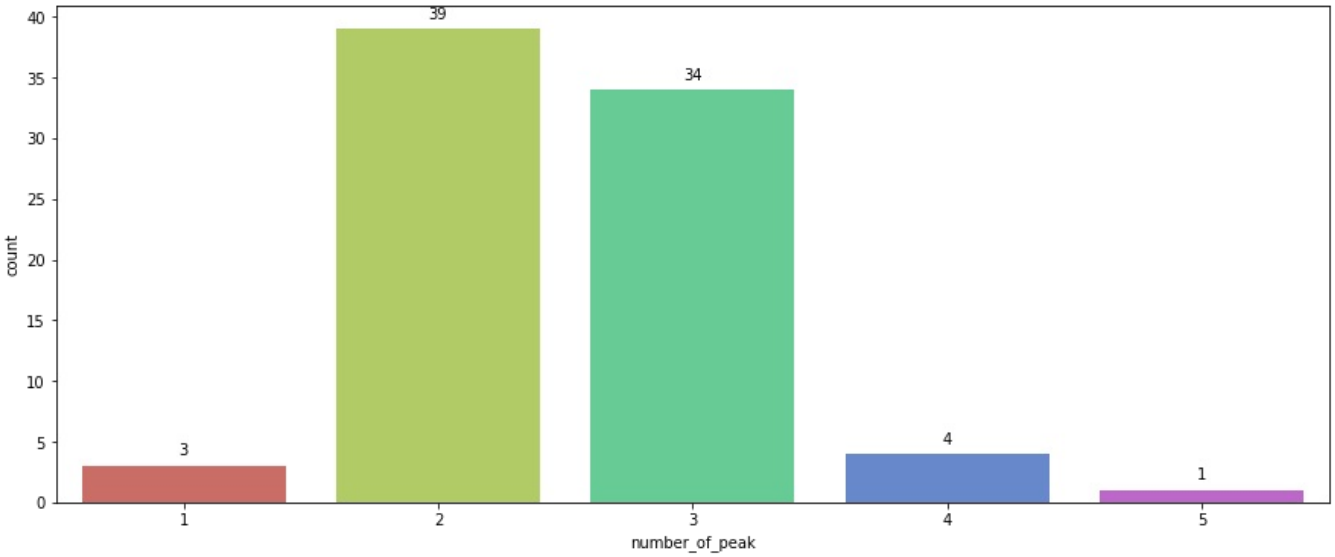
```
number_of_peak :
[3 4 2 5 1]

Age :
[18 19 20 22 23 14 17 25]

Length_of_menses :
[5 6 4 3 1 7 8]
```

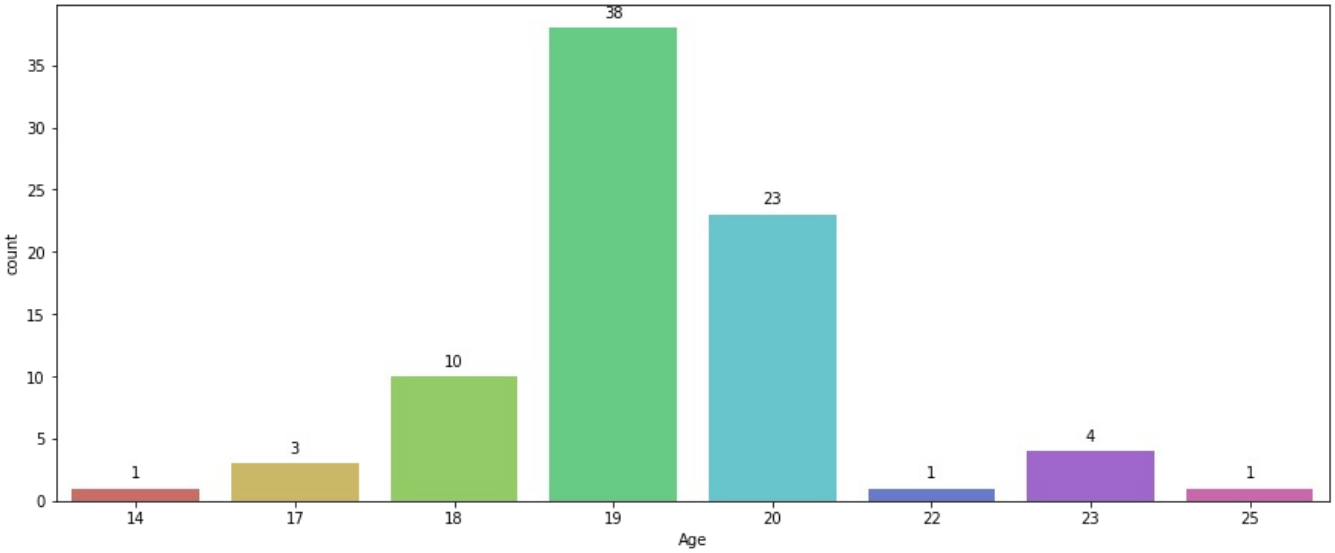
In [28]:
```
for i in discrete:
    print(i, ':')
    print(df[i].value_counts())
    print()
```

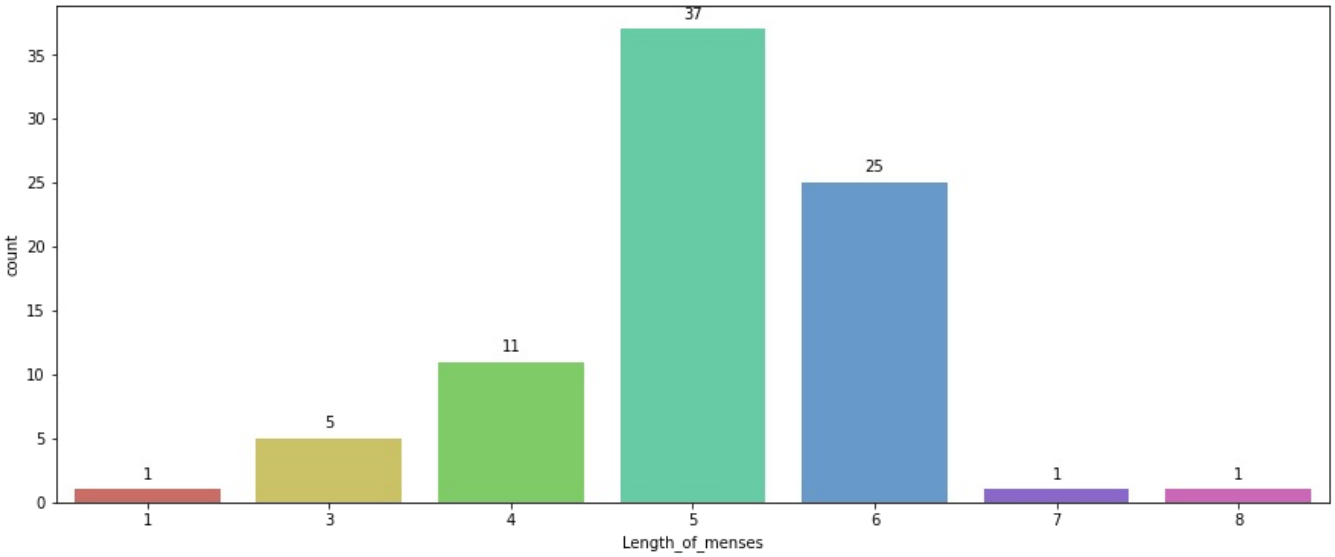
```
number_of_peak :
2    39
3    34
4     4
1     3
5     1
Name: number_of_peak, dtype: int64

Age :
19    38
20    23
18    10
23     4
17     3
22     1
14     1
25     1
Name: Age, dtype: int64

Length_of_menses :
5    37
6    25
4    11
3     5
1     1
7     1
8     1
Name: Length_of_menses, dtype: int64
```

In [29]:
```
for i in discrete:
    plt.figure(figsize=(15, 6))
```

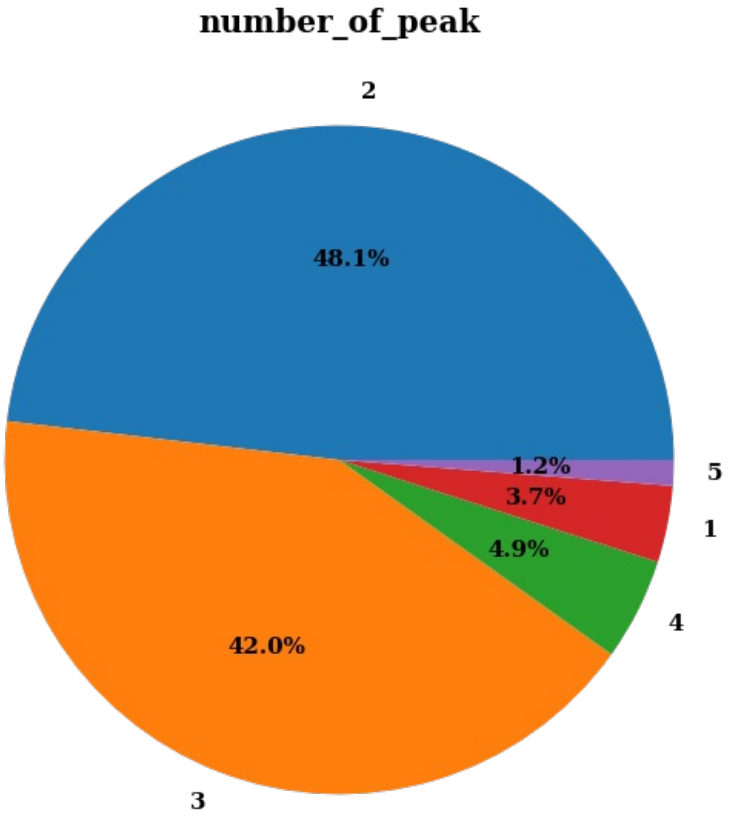
```
    ax = sns.countplot(x=i, data=df, palette='hls')
    for p in ax.patches:
        ax.annotate(f'{p.get_height()}', (p.get_x() + p.get_width() / 2., p.get_height()),
                    ha='center', va='center', xytext=(0, 10), textcoords='offset points')
    plt.show()
```

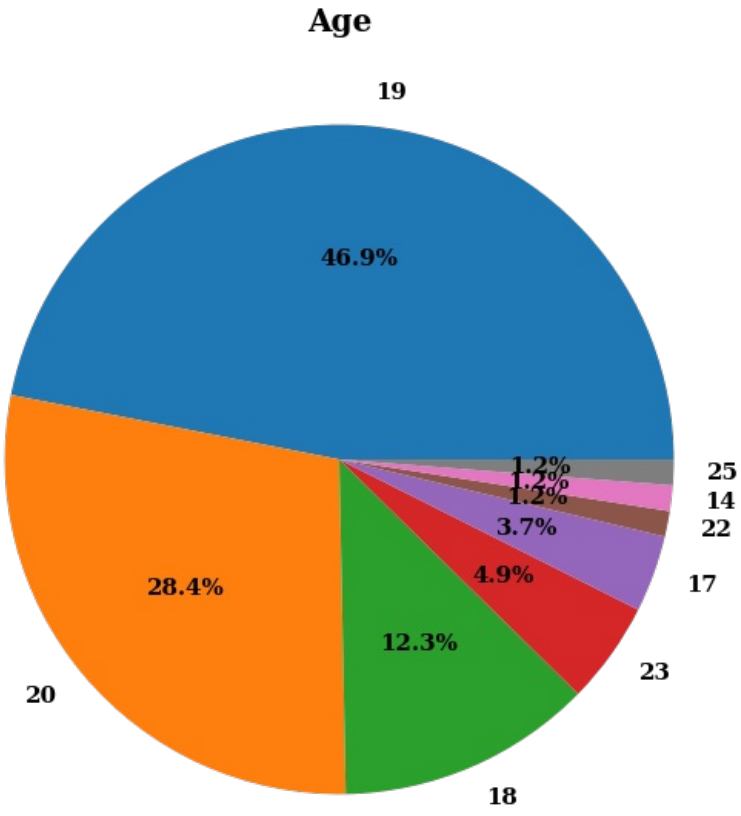


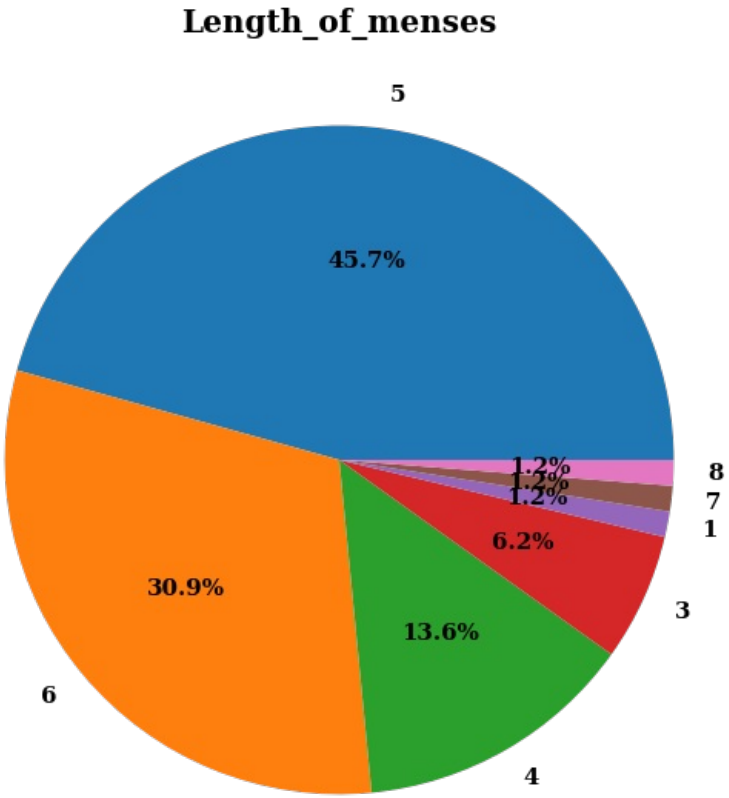




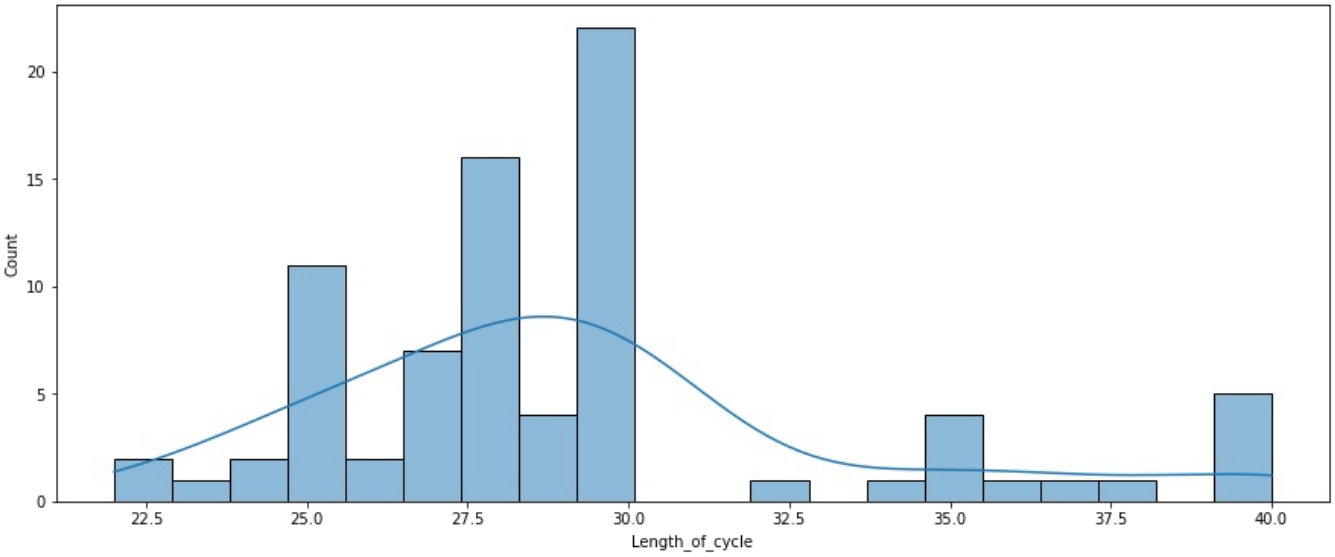
In [30]:
```
for i in discrete:
    plt.figure(figsize=(20,10))
    plt.pie(df[i].value_counts(), labels=df[i].value_counts().index, autopct='%1.1f%%', textprops={'fontsize':
                                        'color': 'black',
                                        'weight': 'bold',
                                        'family': 'serif' })
    hfont = {'fontname':'serif', 'weight': 'bold'}
    plt.title(i, size=20, **hfont)
    plt.show()
```

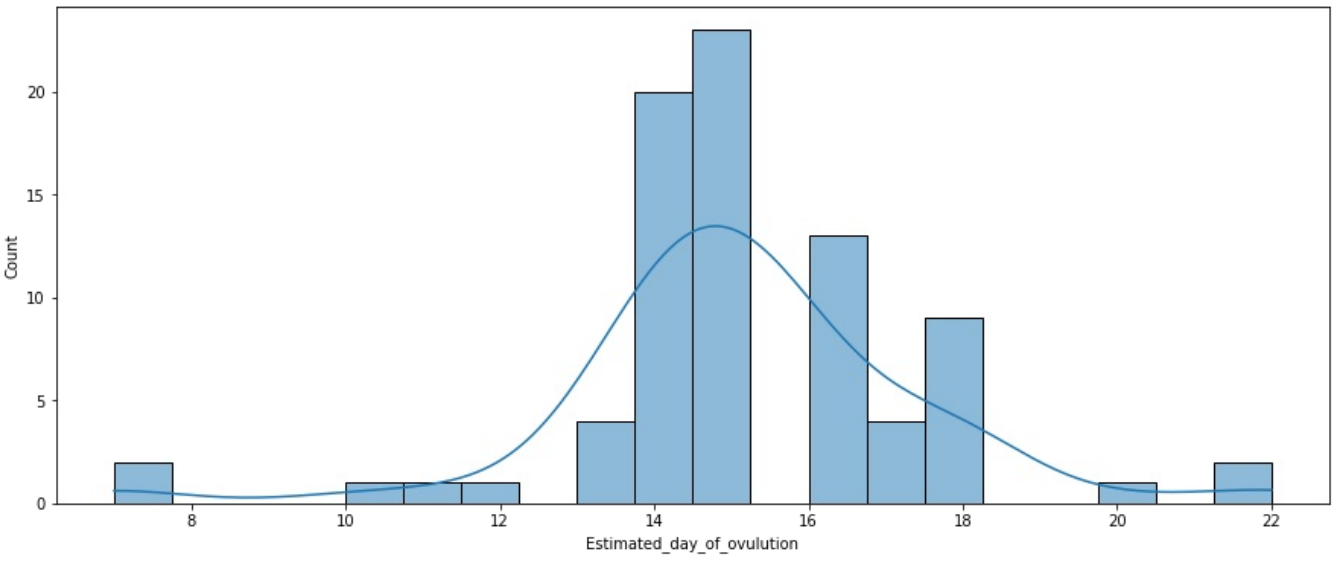

number_of_peak
2
48.1%
1.2%
5
3.7%
1
4.9%
4
42.0%
3

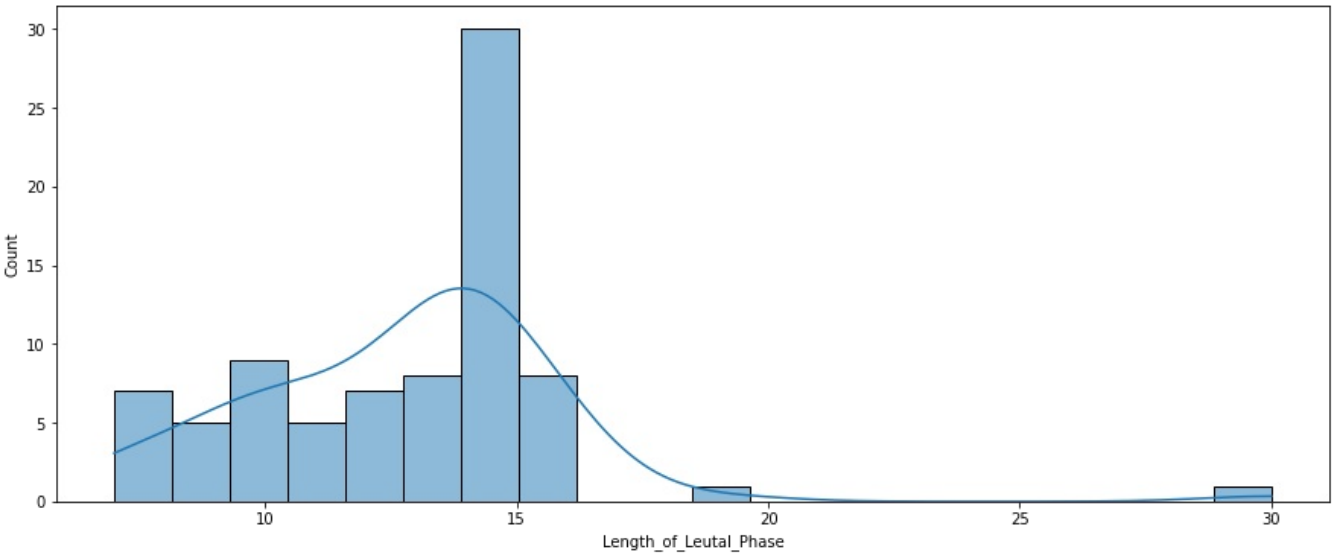

Age
19
46.9%
1.2%
25
1.2%
14
1.2%
22
3.7%
17
4.9%
23
28.4%
12.3%
20
18

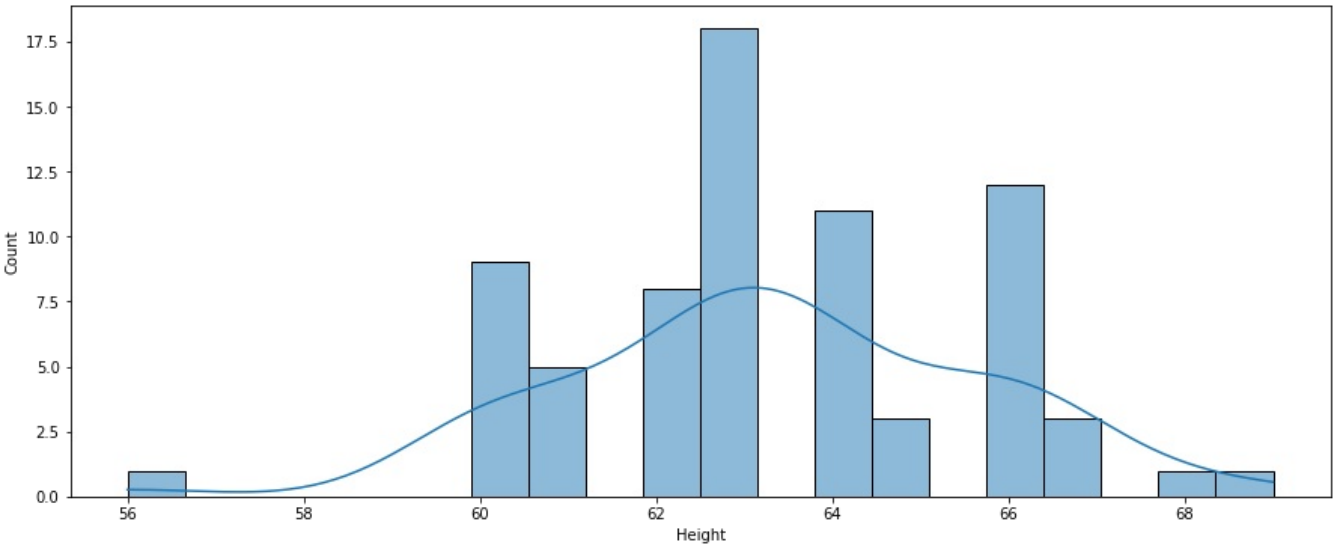


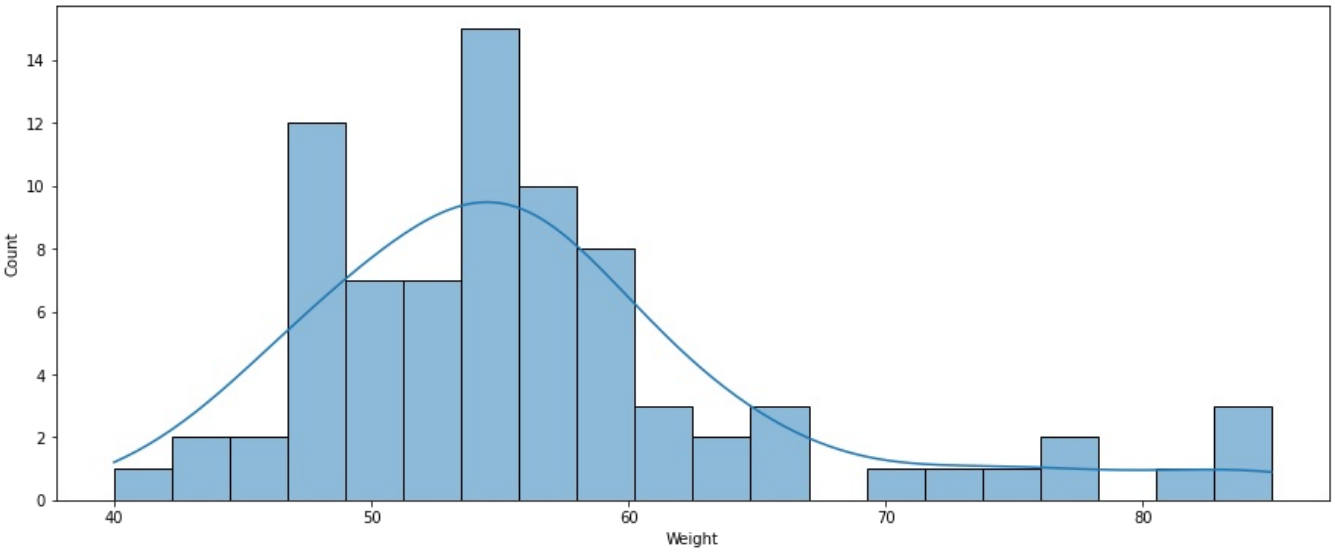
In [31]:
```
for i in continuous:
    plt.figure(figsize=(15,6))
    sns.histplot(df[i], bins = 20, kde = True, palette='hls')
    plt.show()
```

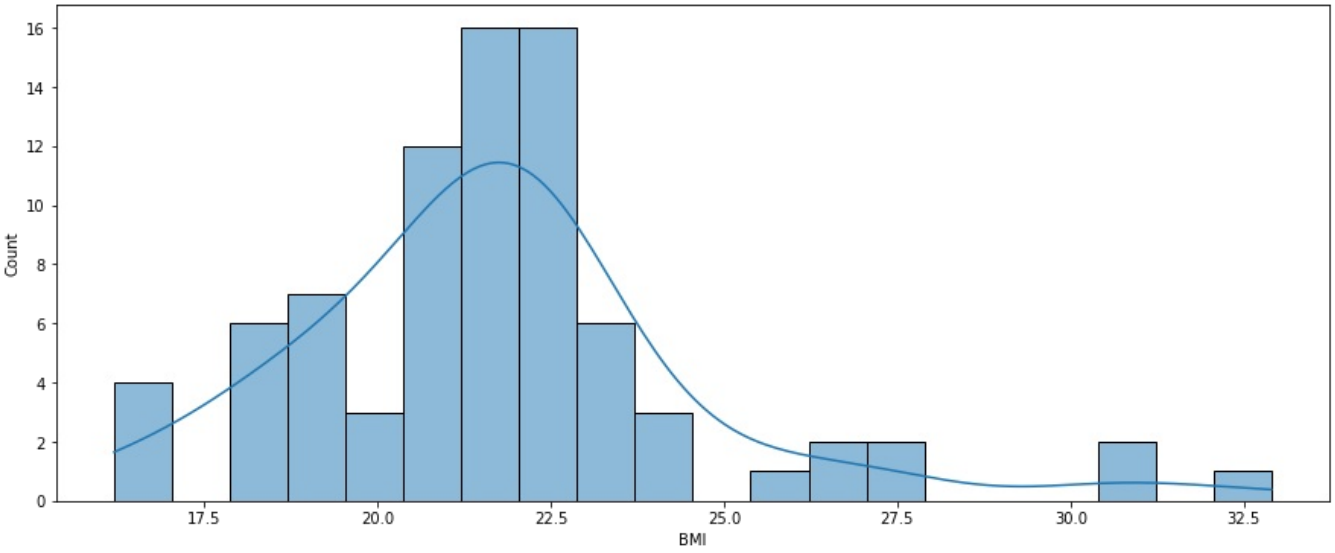


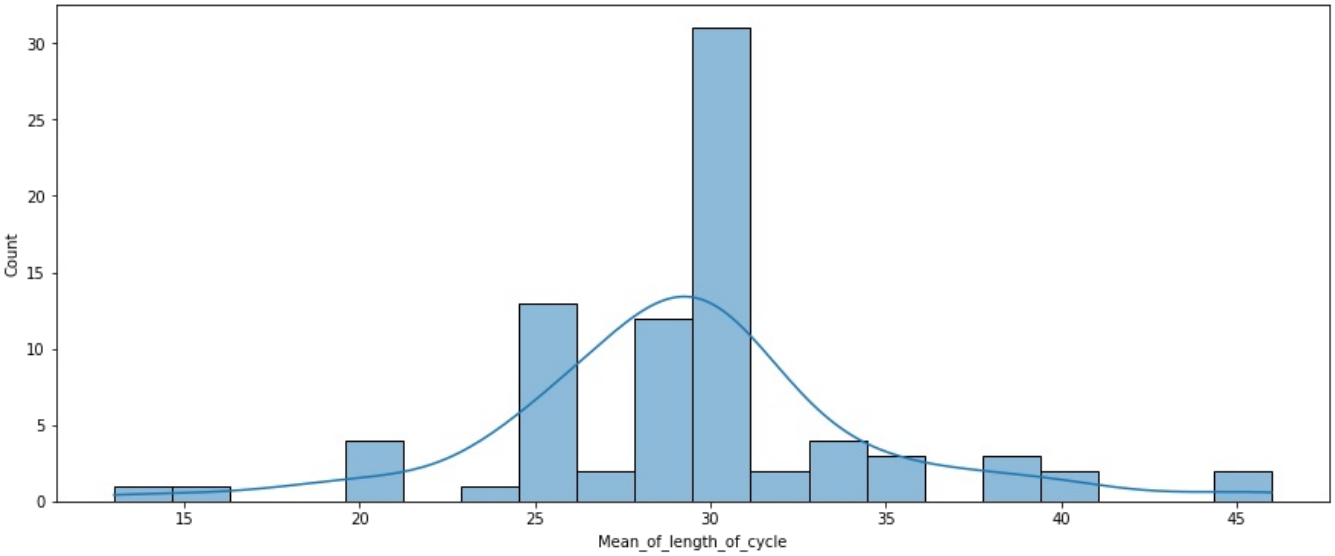



Count
Length_of_Leutal_Phase

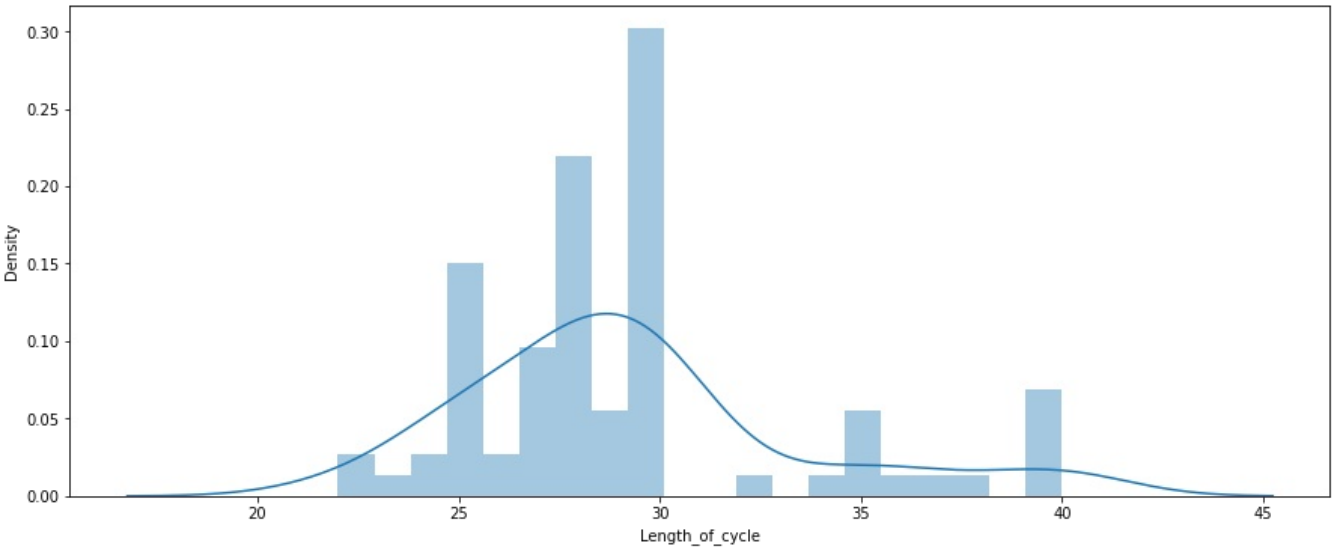

Count
Height

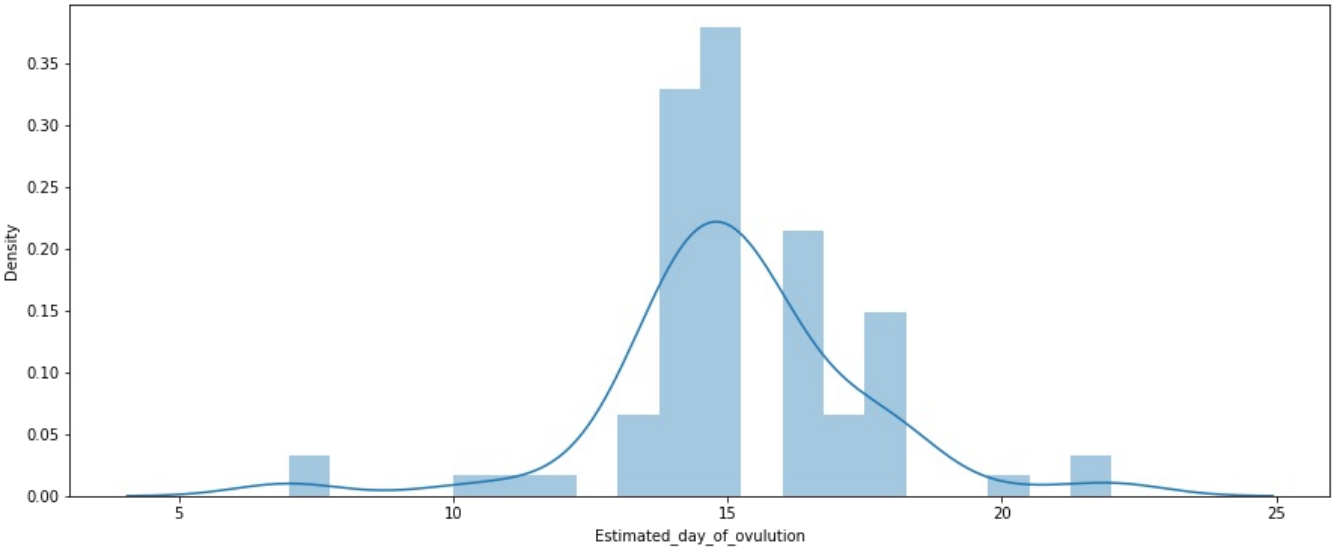

Count
Weight

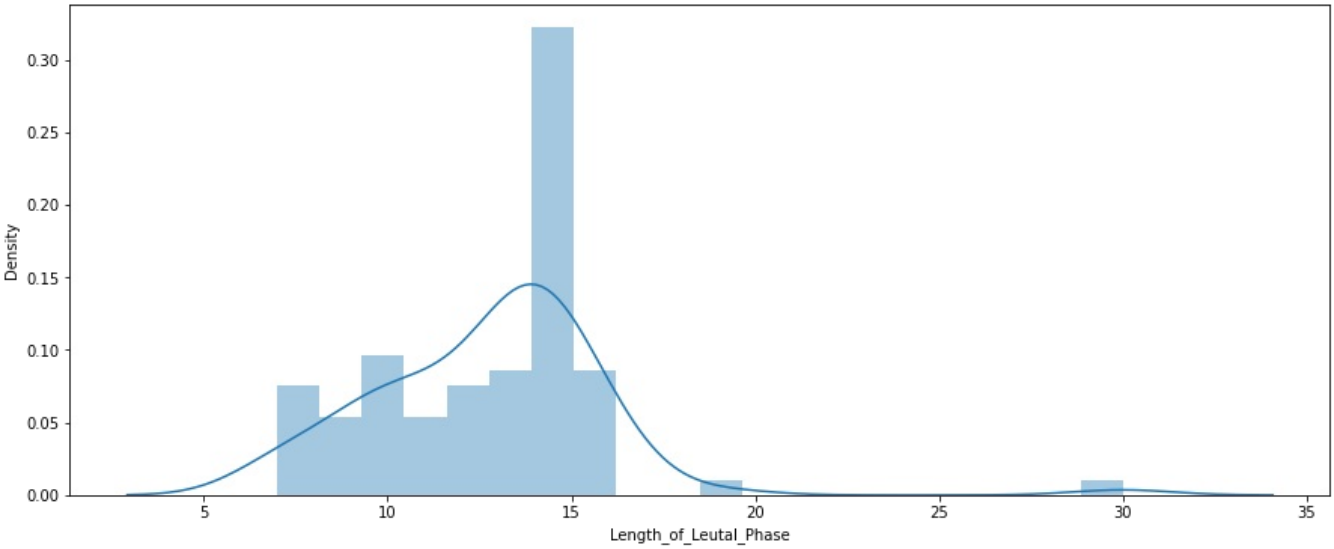


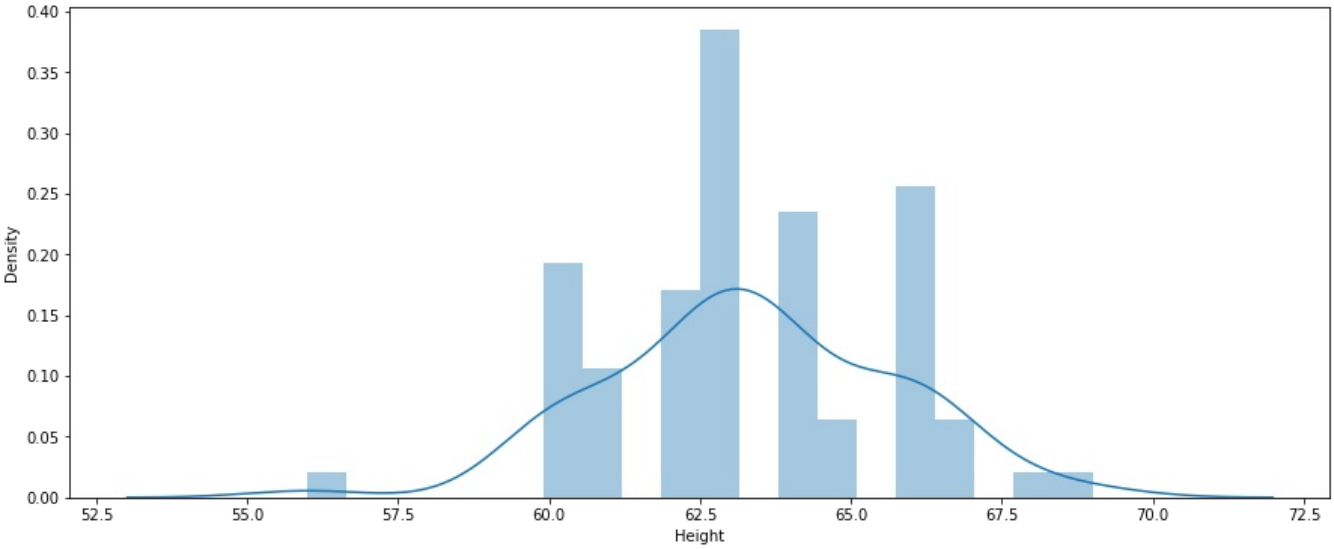


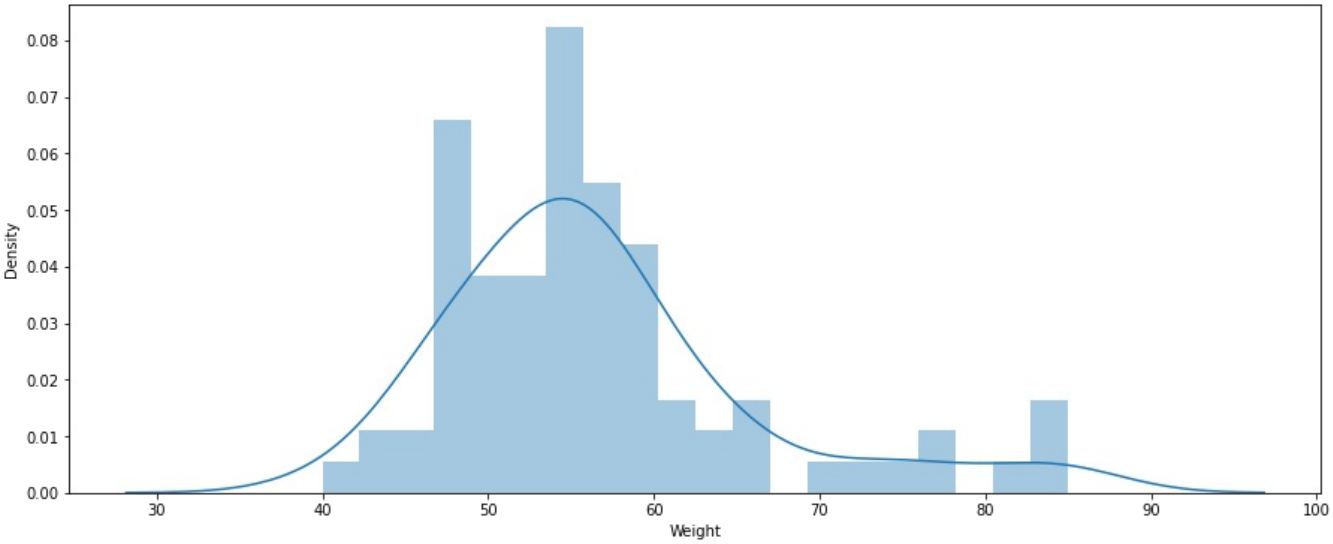
In [32]:
```
for i in continuous:
    plt.figure(figsize=(15,6))
    sns.distplot(df[i], bins = 20, kde = True)
    plt.show()
```

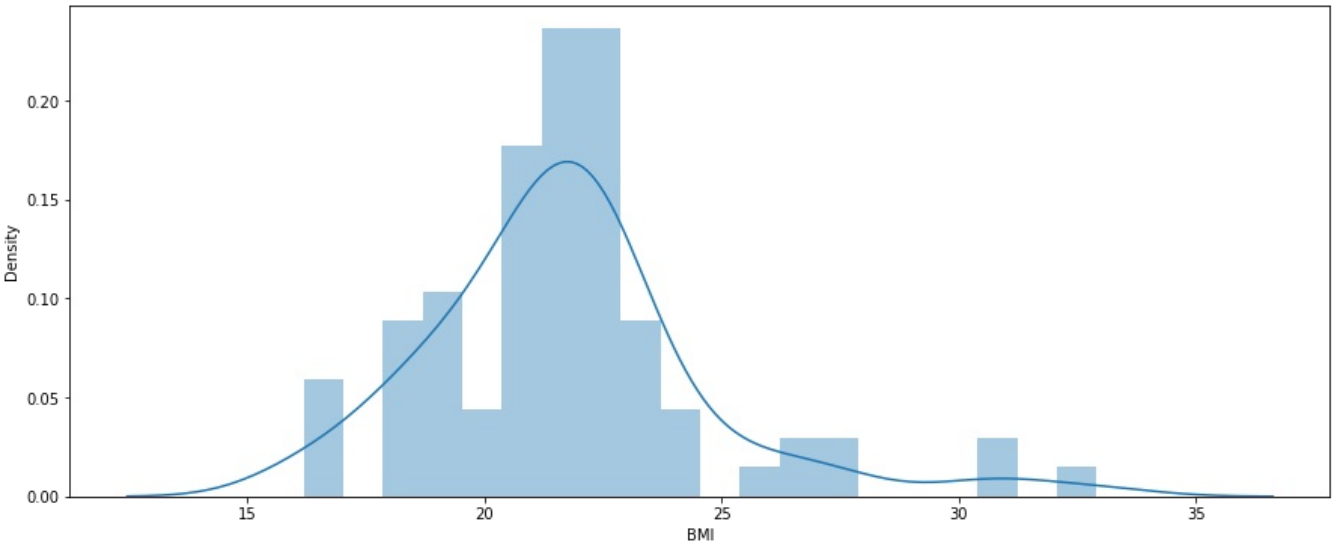

Density
0.30
0.25
0.20
0.15
0.10
0.05
0.00
20
25
30
35
40
45
Length_of_cycle

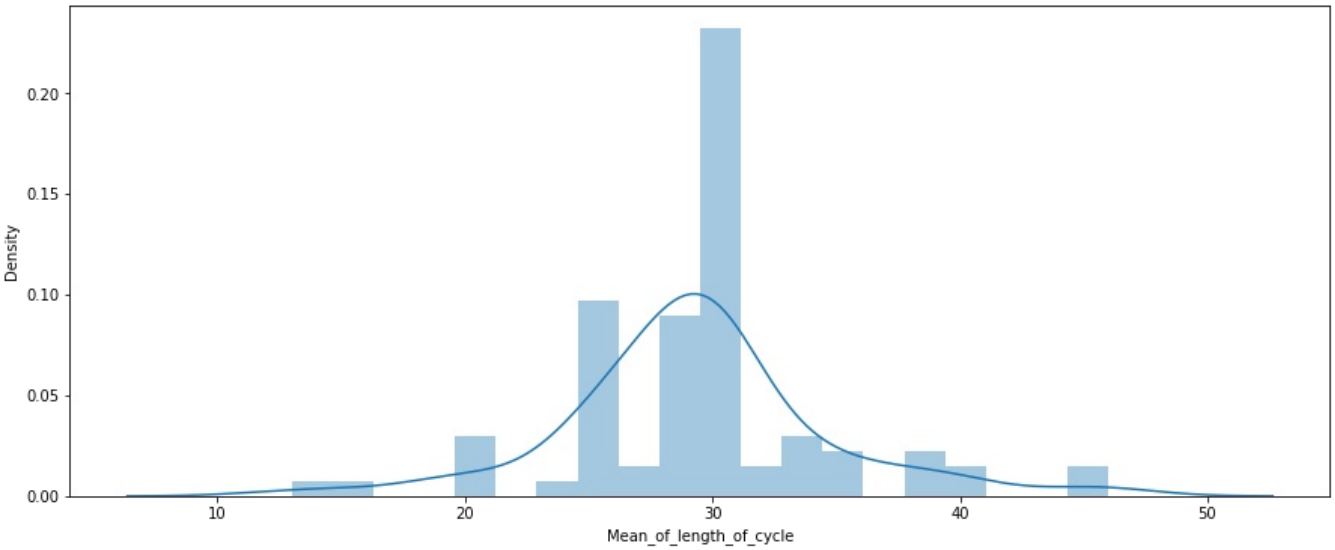

Density
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
5
10
15
20
25
Estimated_day_of_ovulution


Density
0.30
0.25
0.20
0.15
0.10
0.05
0.00
5
10
15
20
25
30
35
Length_of_Leutal_Phase

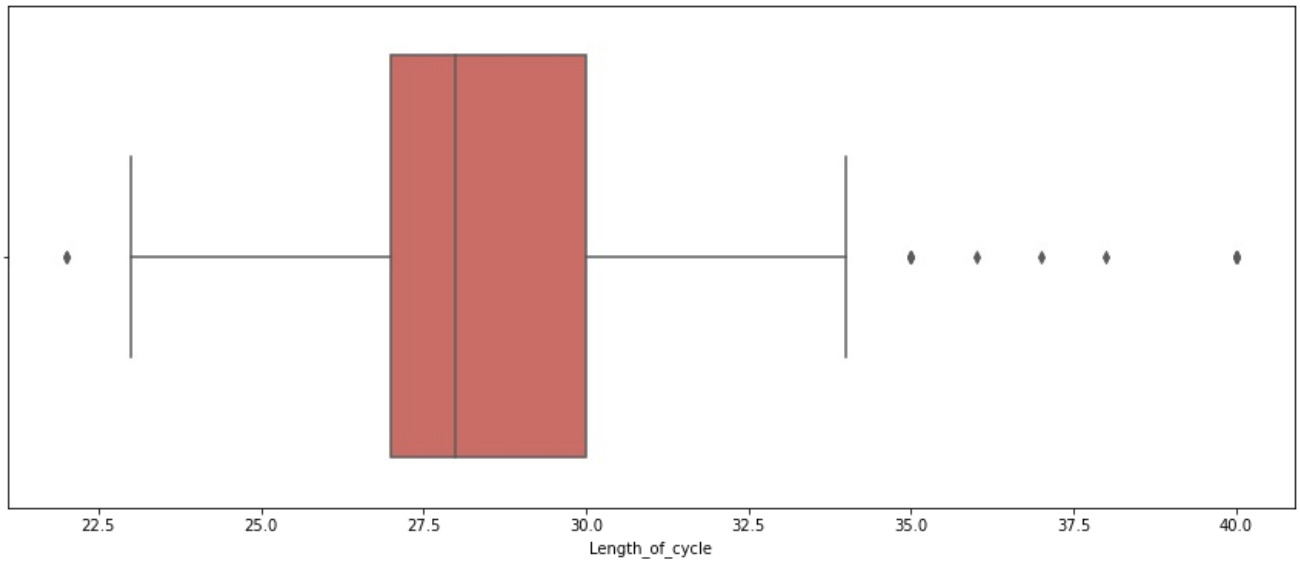

Density
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
52.5
55.0
57.5
60.0
62.5
65.0
67.5
70.0
72.5
Height

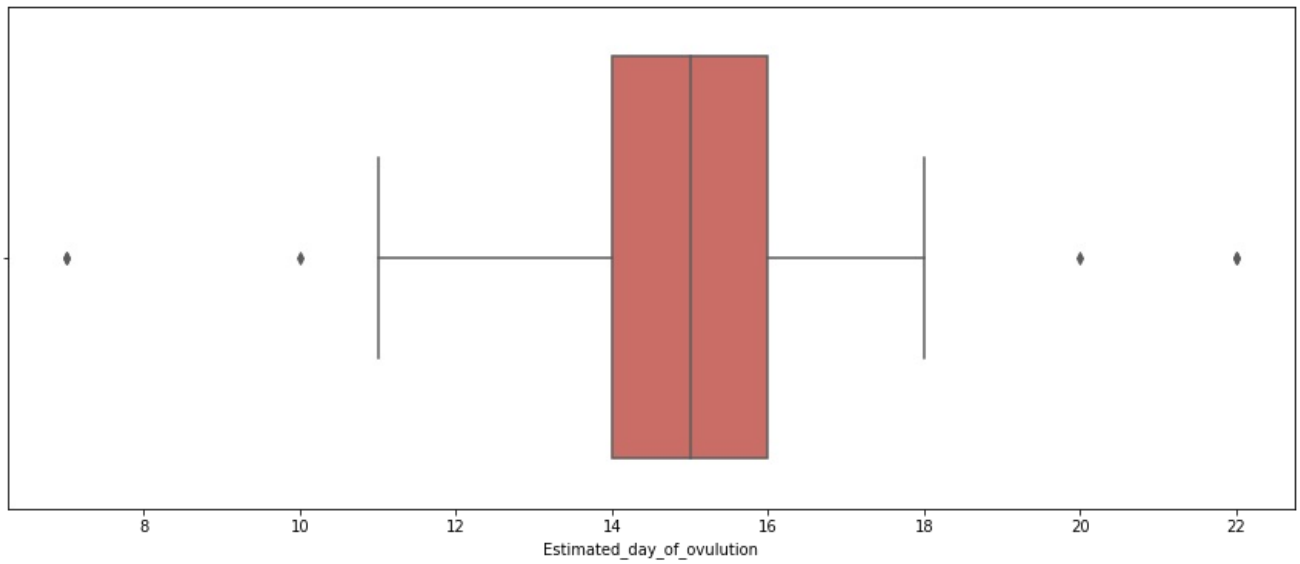

Density
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
30
40
50
60
70
80
90
100
Weight

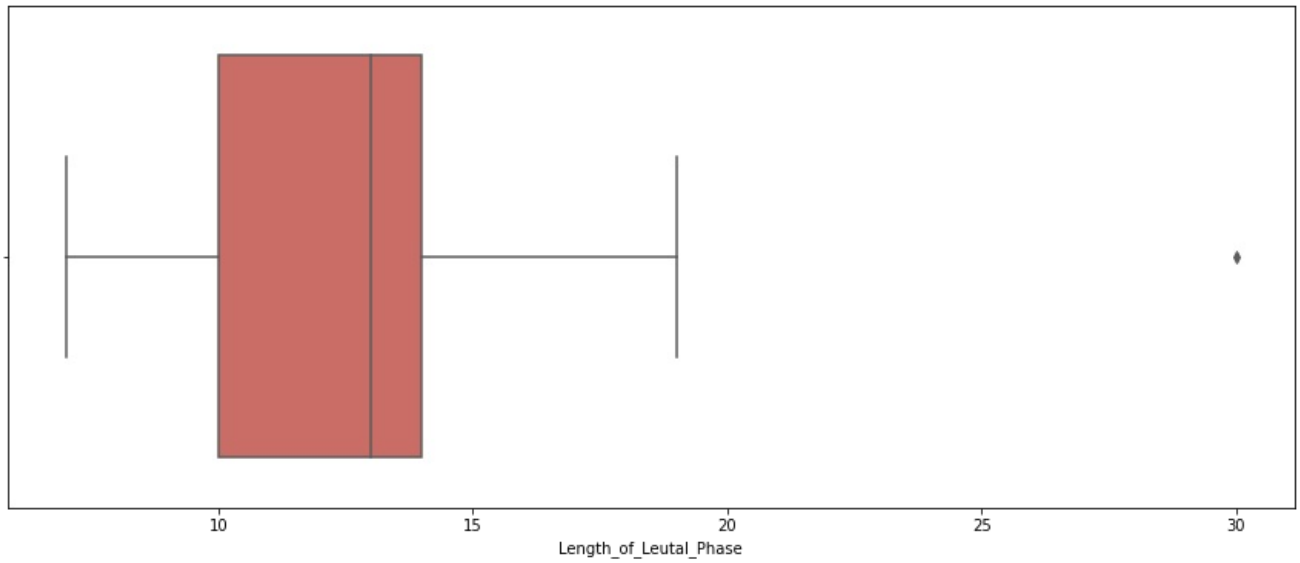

Density
0.20
0.15
0.10
0.05
0.00
15
20
25
30
35
BMI

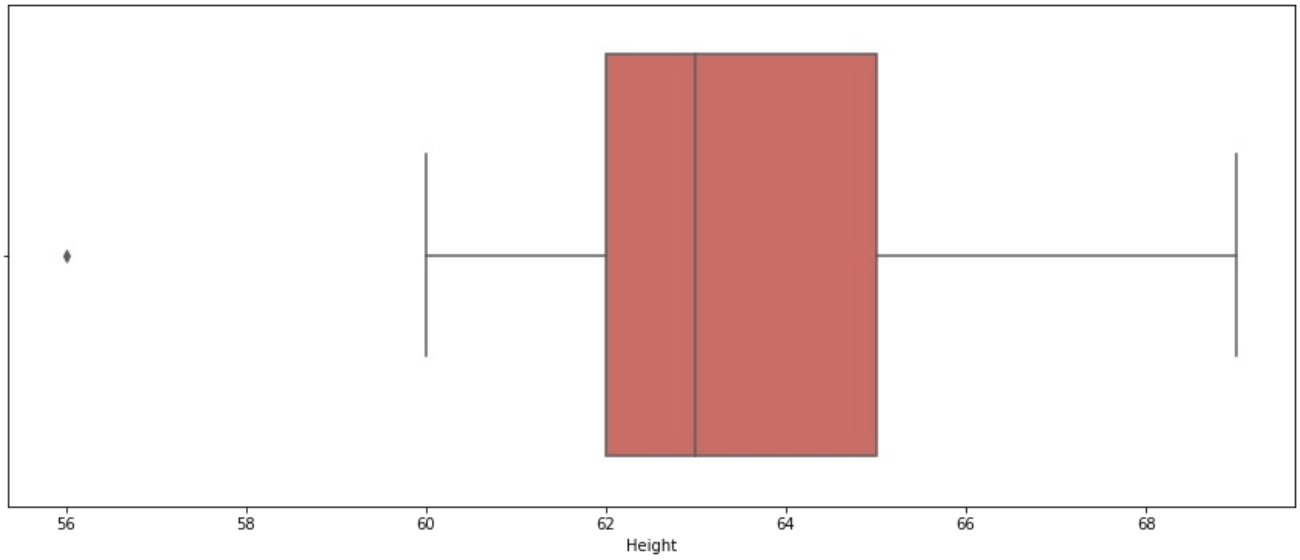


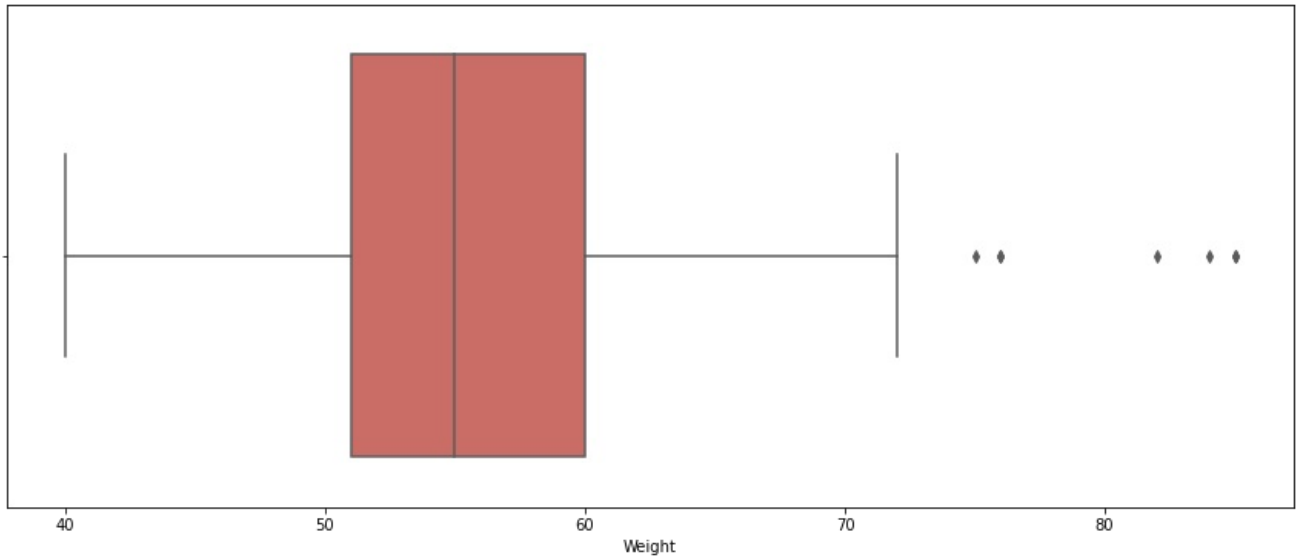
In [33]:
```
for i in continuous:
    plt.figure(figsize=(15,6))
    sns.boxplot(i, data = df, palette='hls')
    plt.show()
```

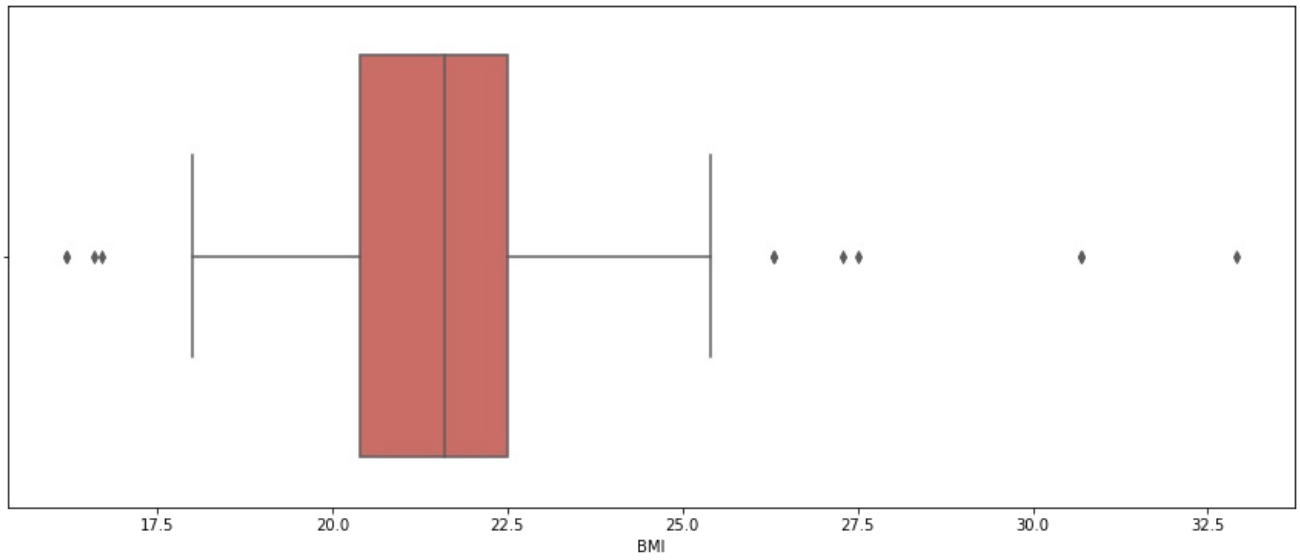


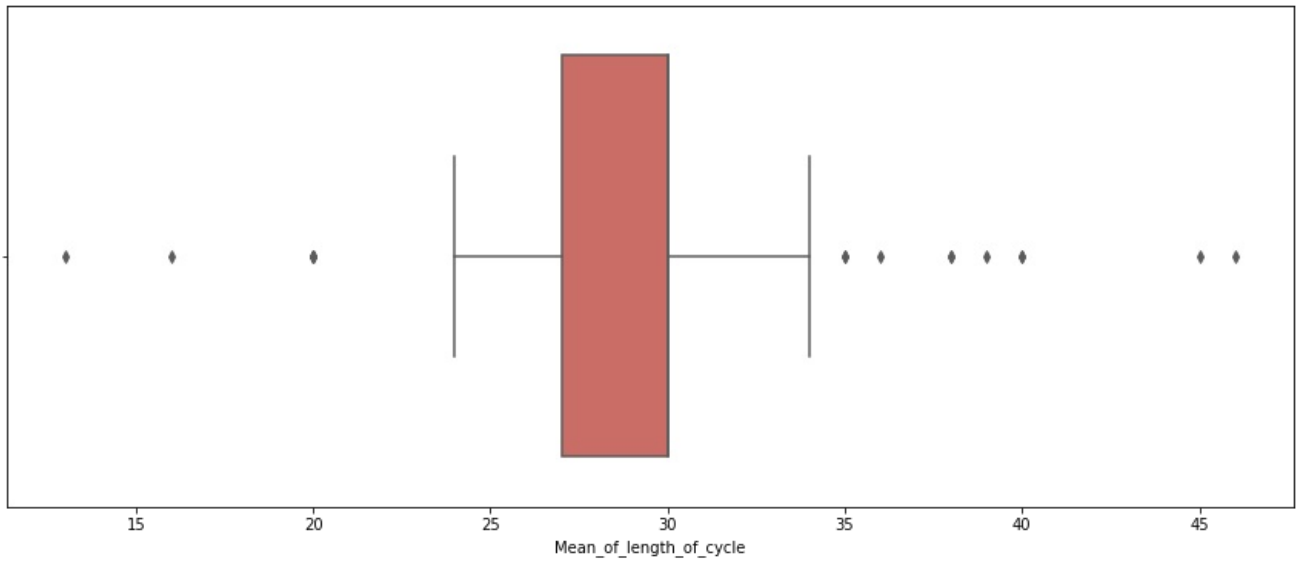



10
15
20
25
30
Length_of_Leutal_Phase

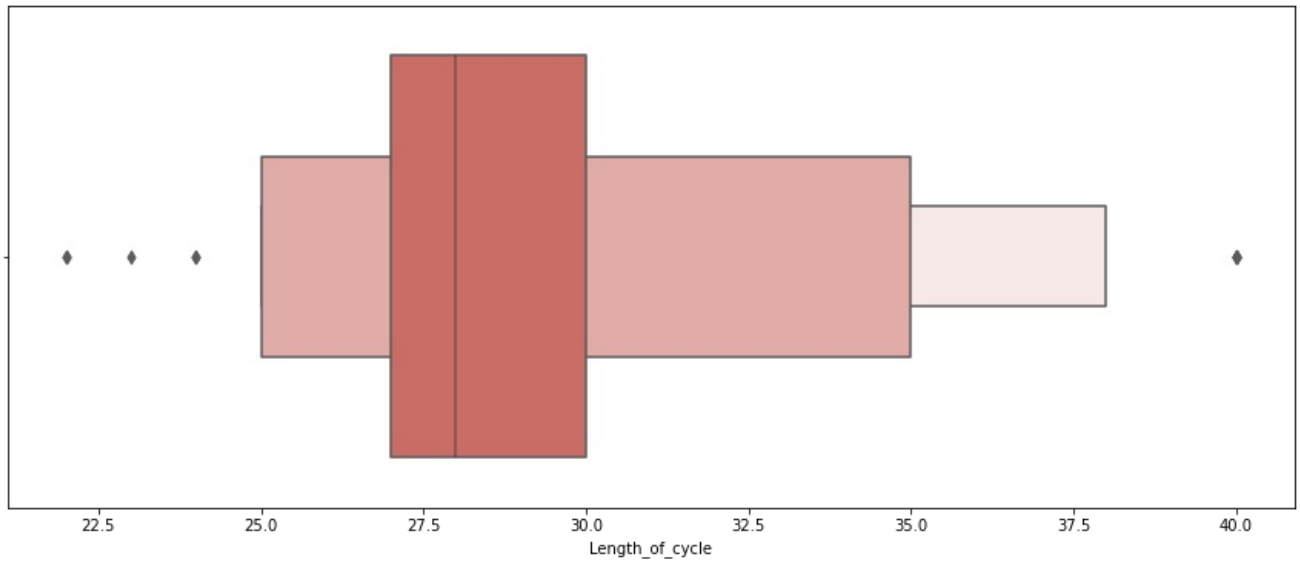

56
58
60
62
64
66
68
Height

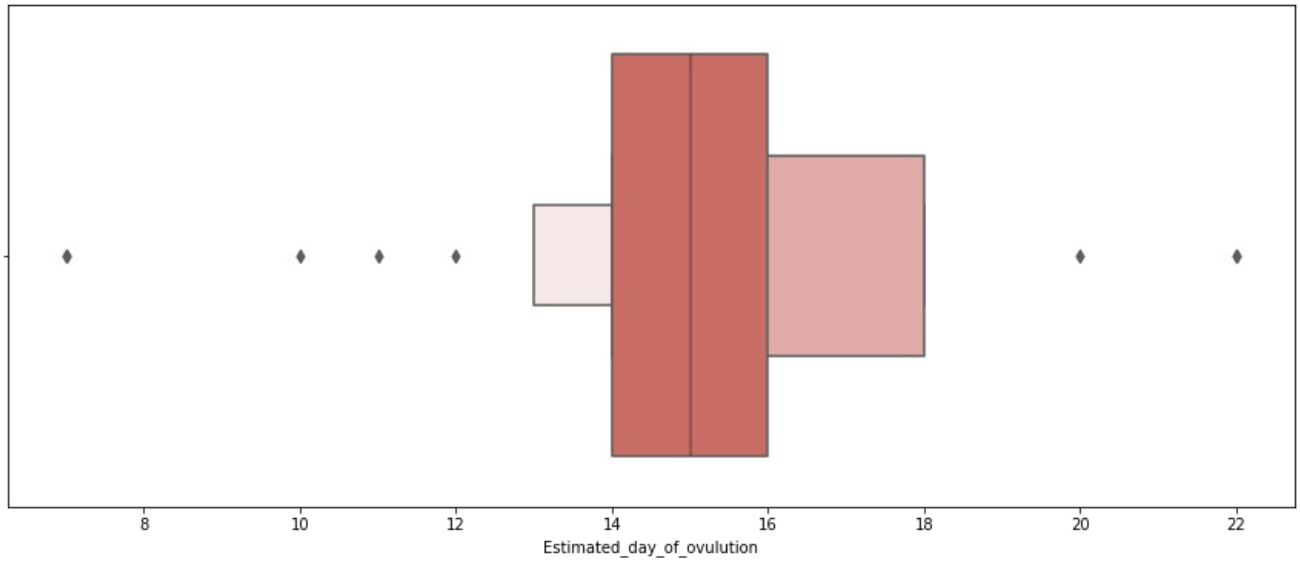

40
50
60
70
80
Weight

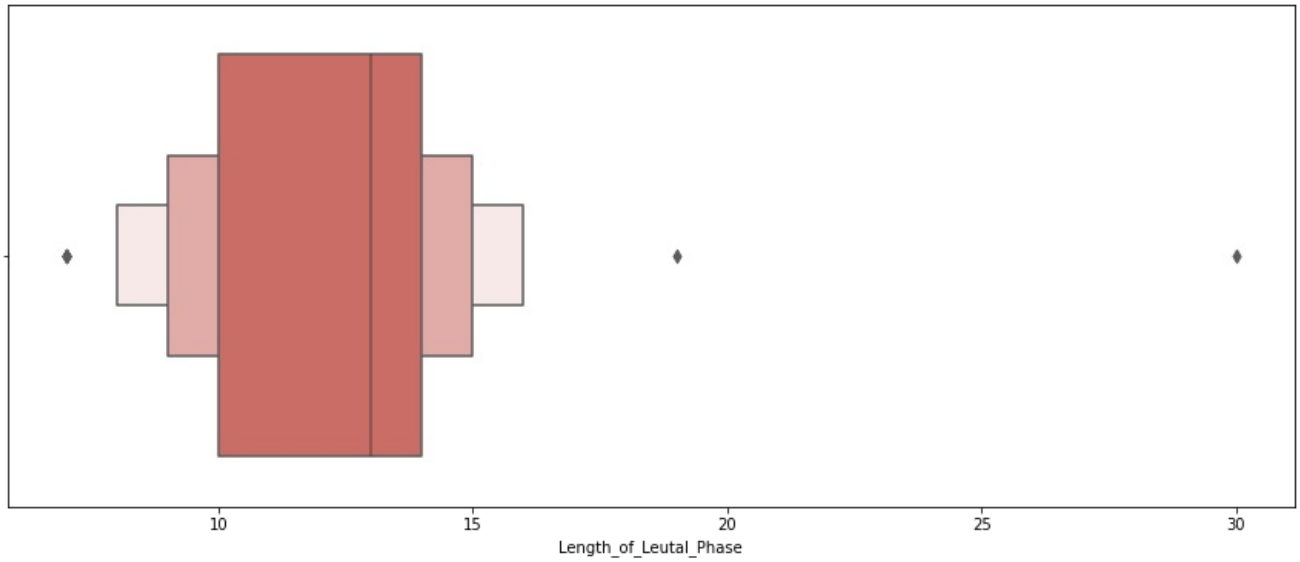


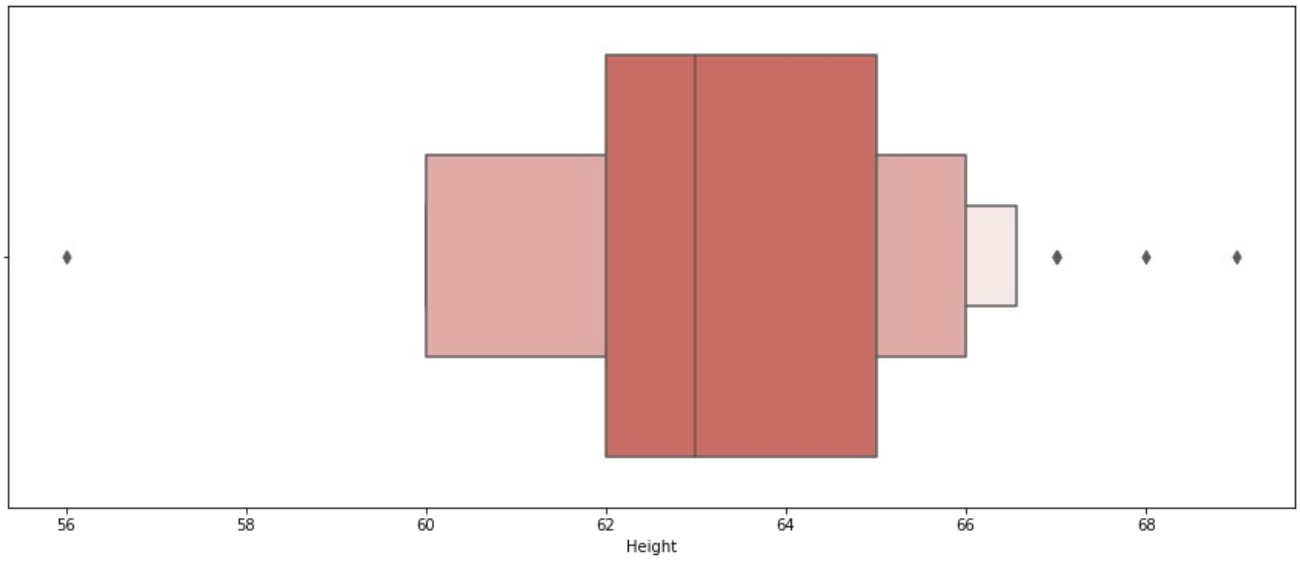


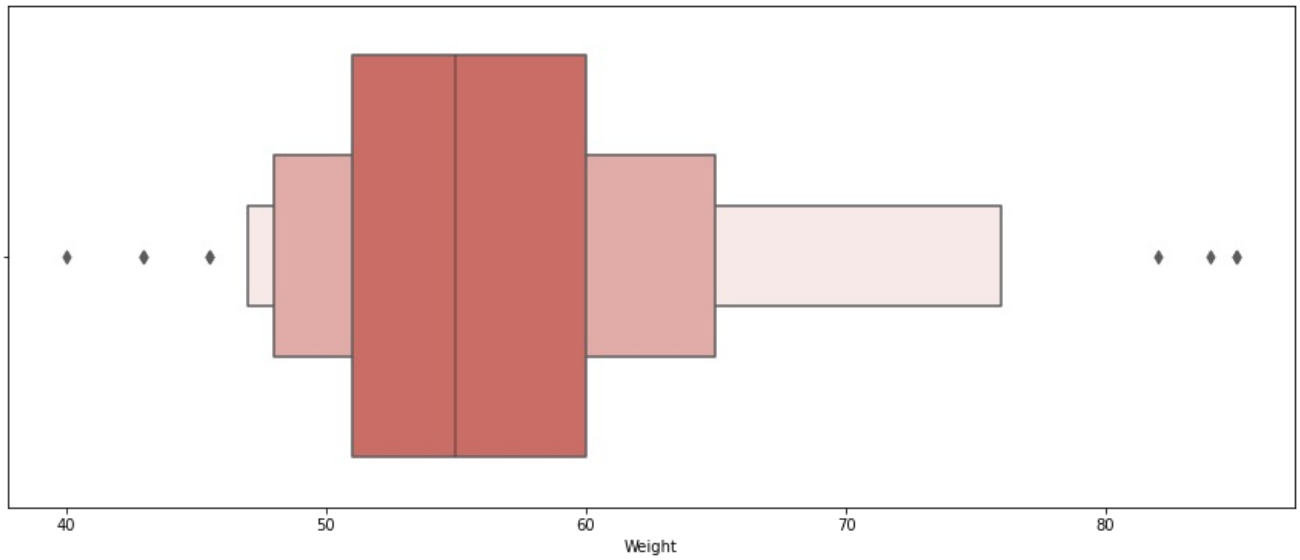
In [34]:
```
for i in continuous:
    plt.figure(figsize=(15,6))
    sns.boxenplot(i, data = df, palette='hls')
    plt.show()
```

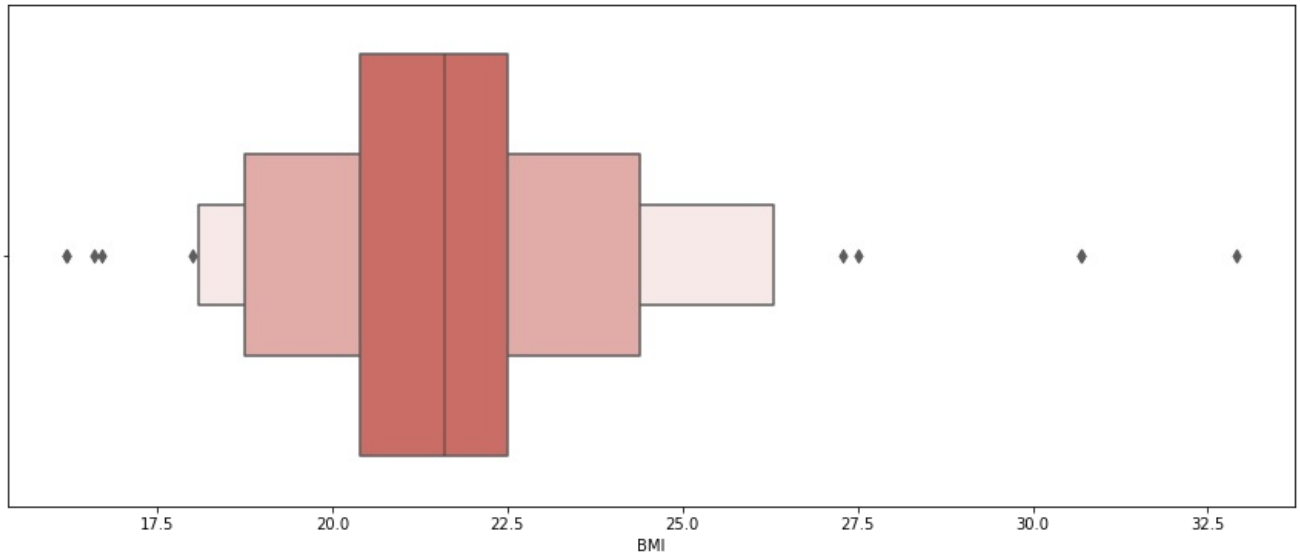


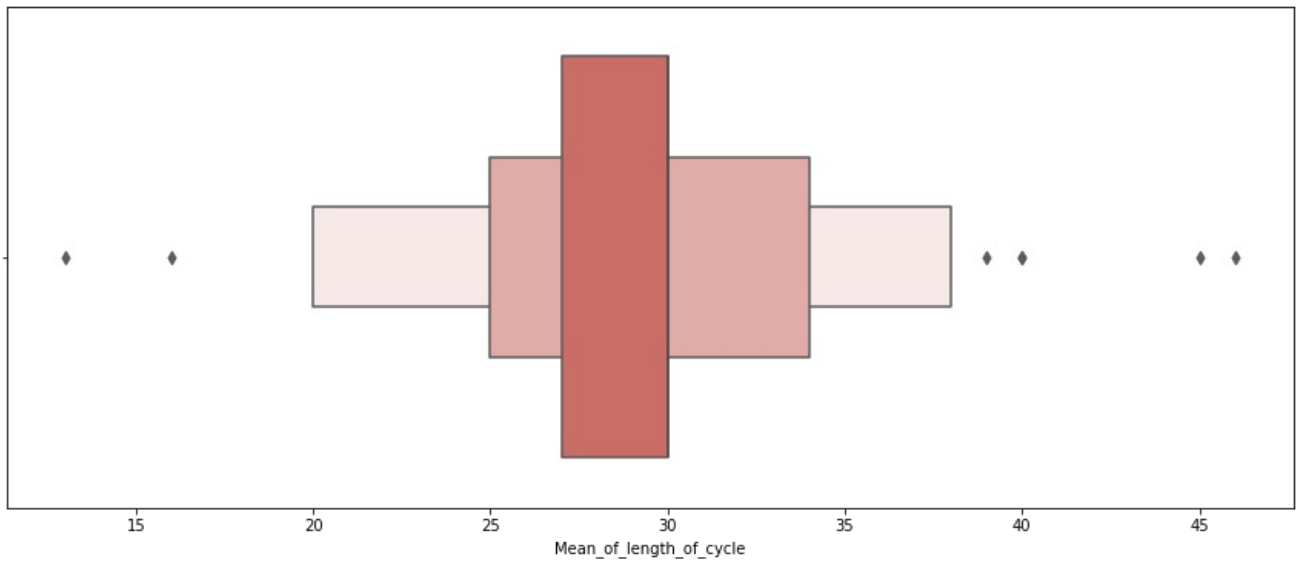

8
10
12
14
16
18
20
22
Estimated_day_of_ovulution


10
15
20
25
30
Length_of_Leutal_Phase

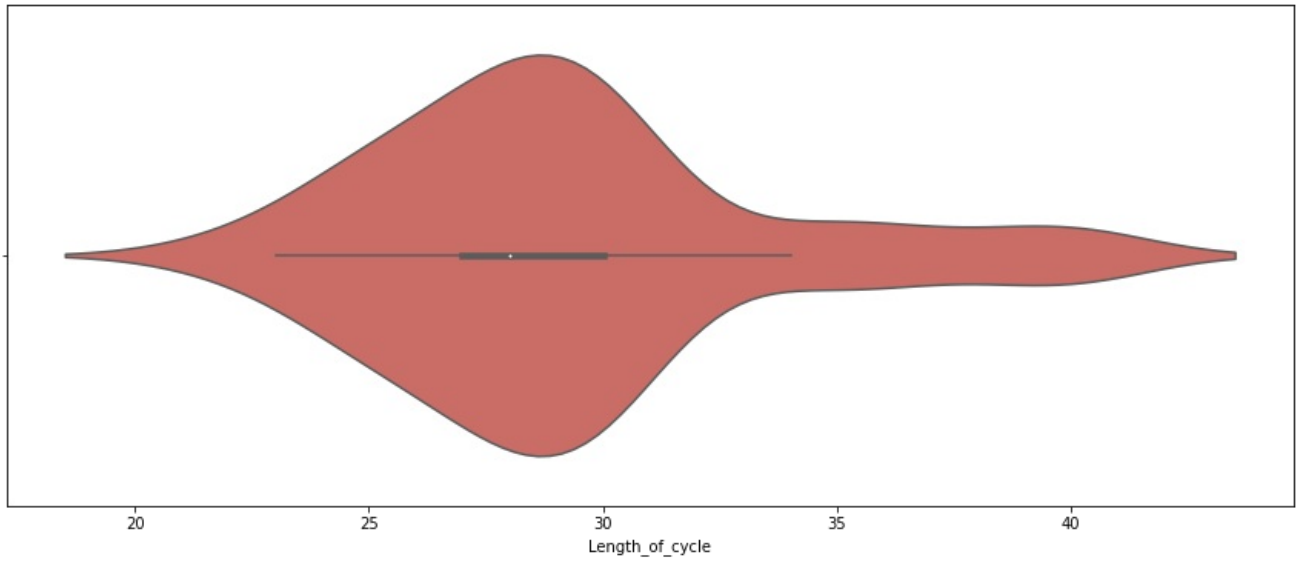

56
58
60
62
64
66
68
Height

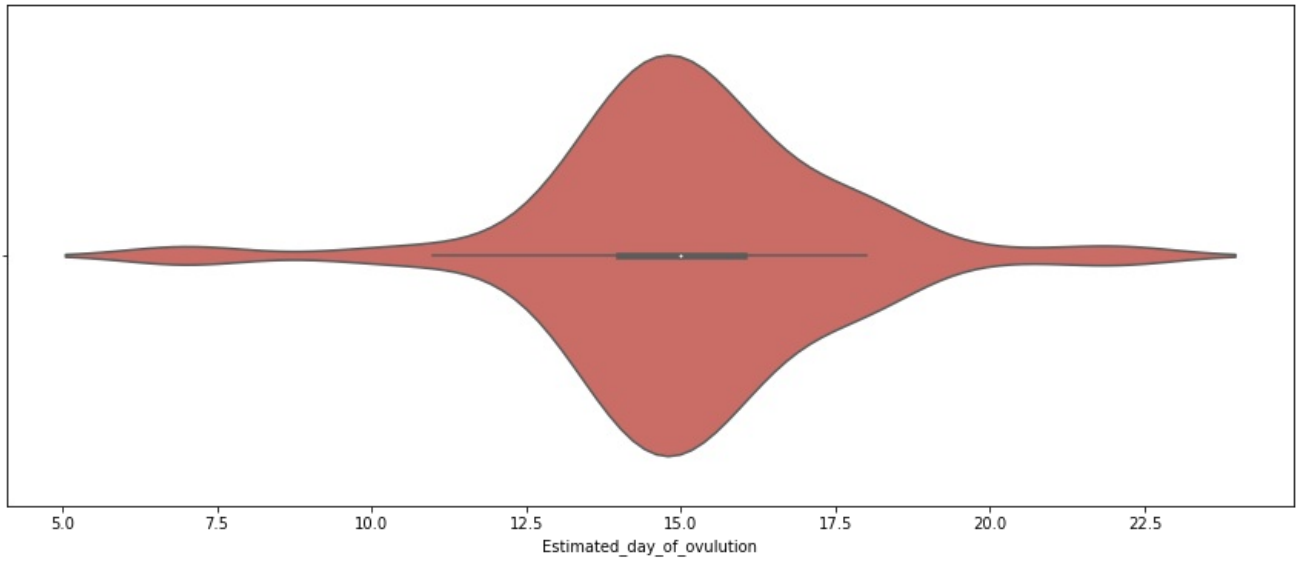


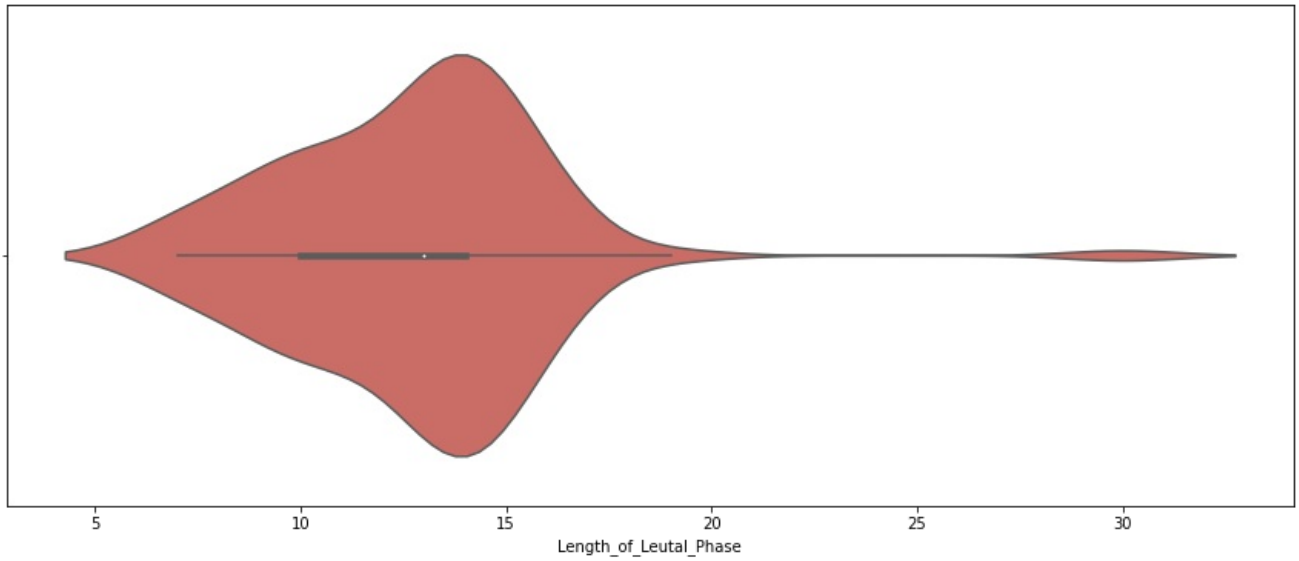


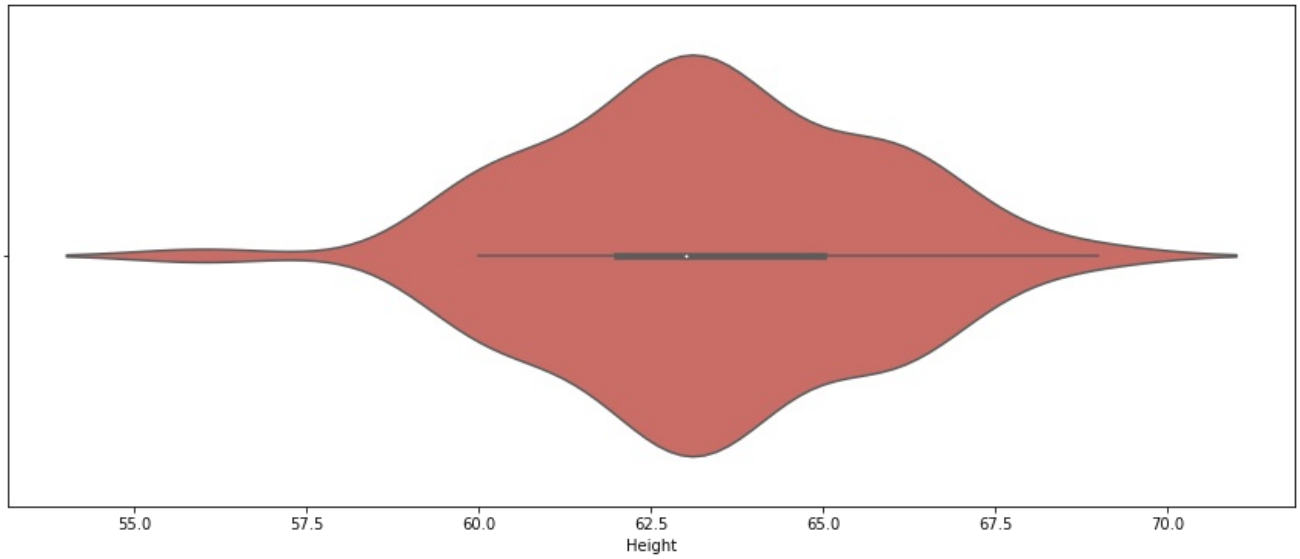


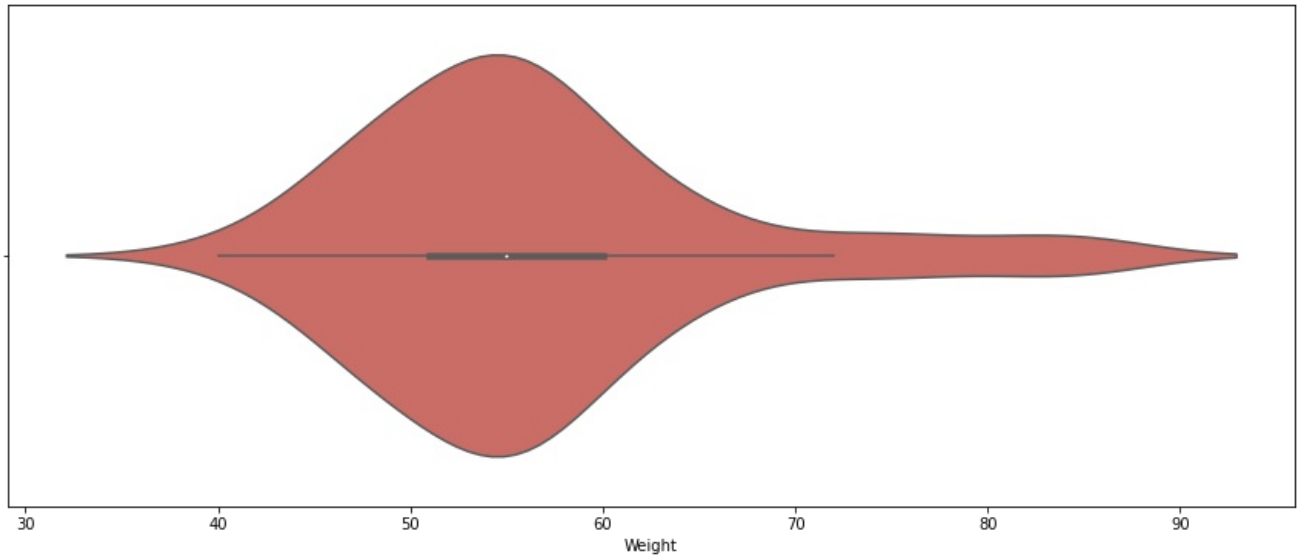
In [35]:
```
for i in continuous:
    plt.figure(figsize=(15,6))
    sns.violinplot(i, data = df, palette='hls')
    plt.show()
```

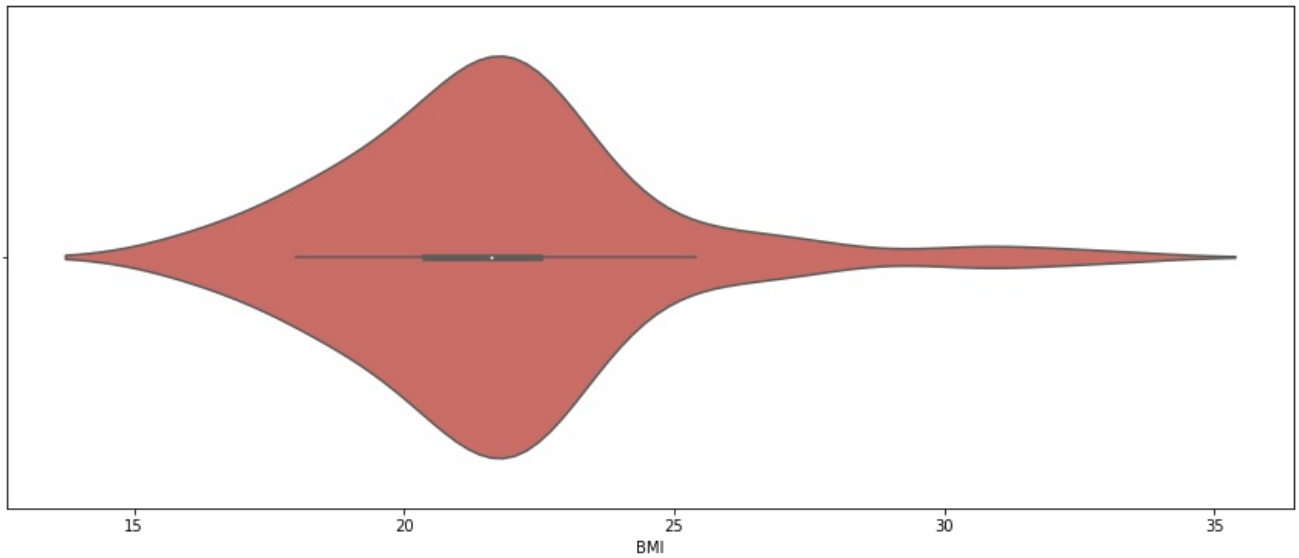

20
25
30
35
40
Length_of_cycle

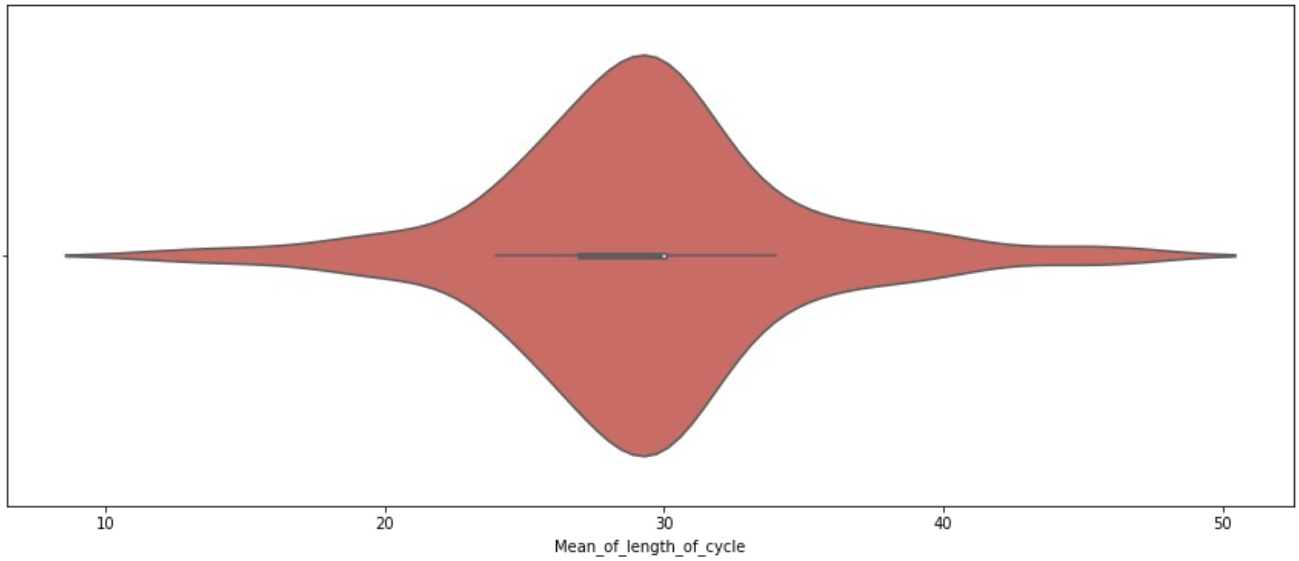

5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
Estimated_day_of_ovulution


5
10
15
20
25
30
Length_of_Leutal_Phase

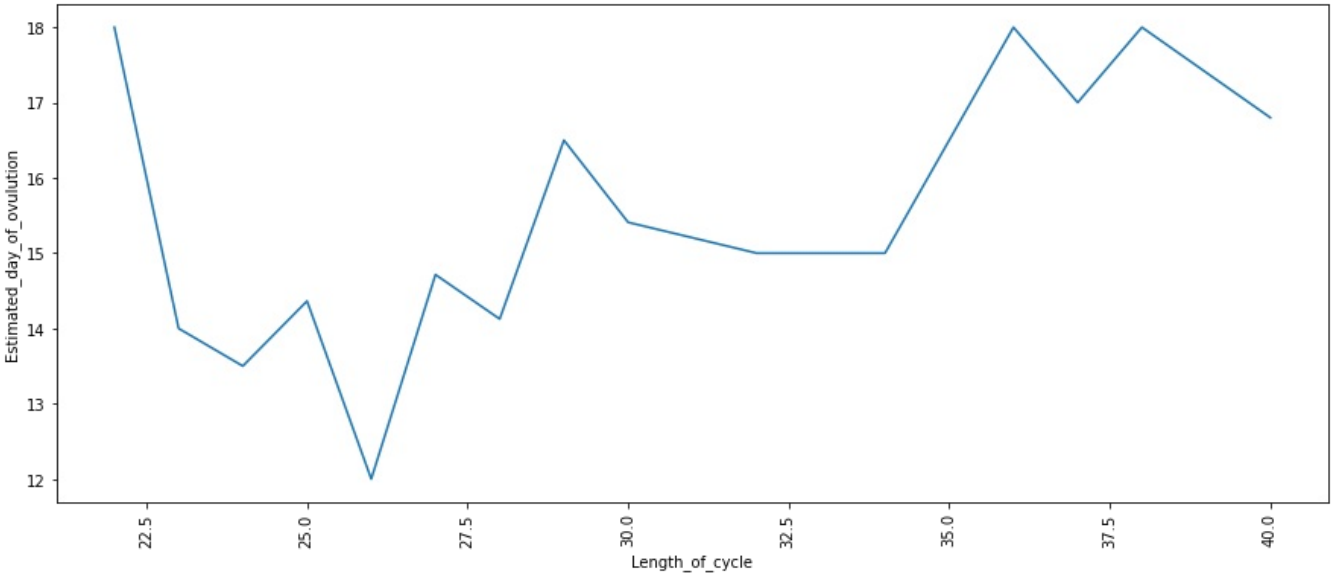

55.0
57.5
60.0
62.5
65.0
67.5
70.0
Height

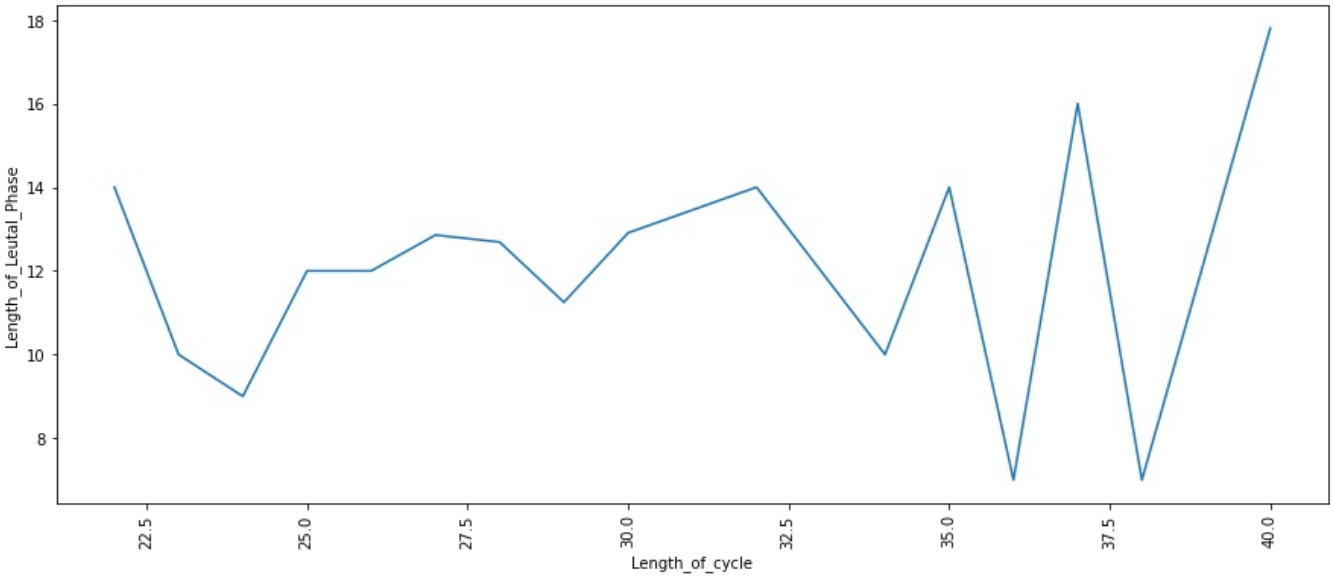

30
40
50
60
70
80
90
Weight

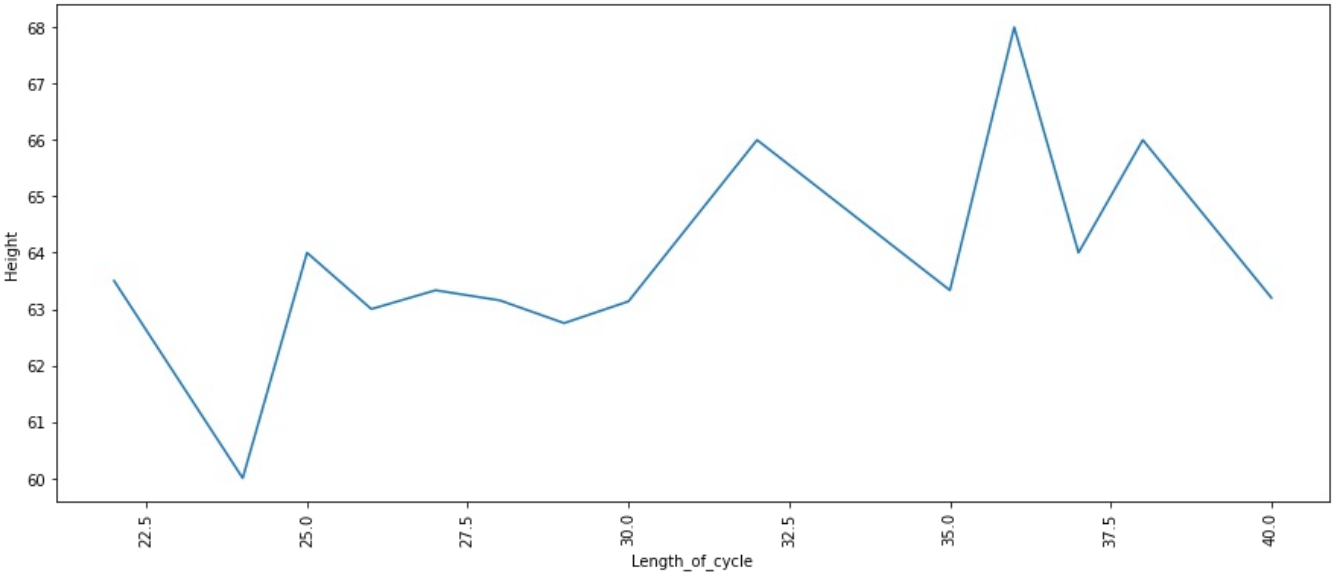

15
20
25
30
35
BMI

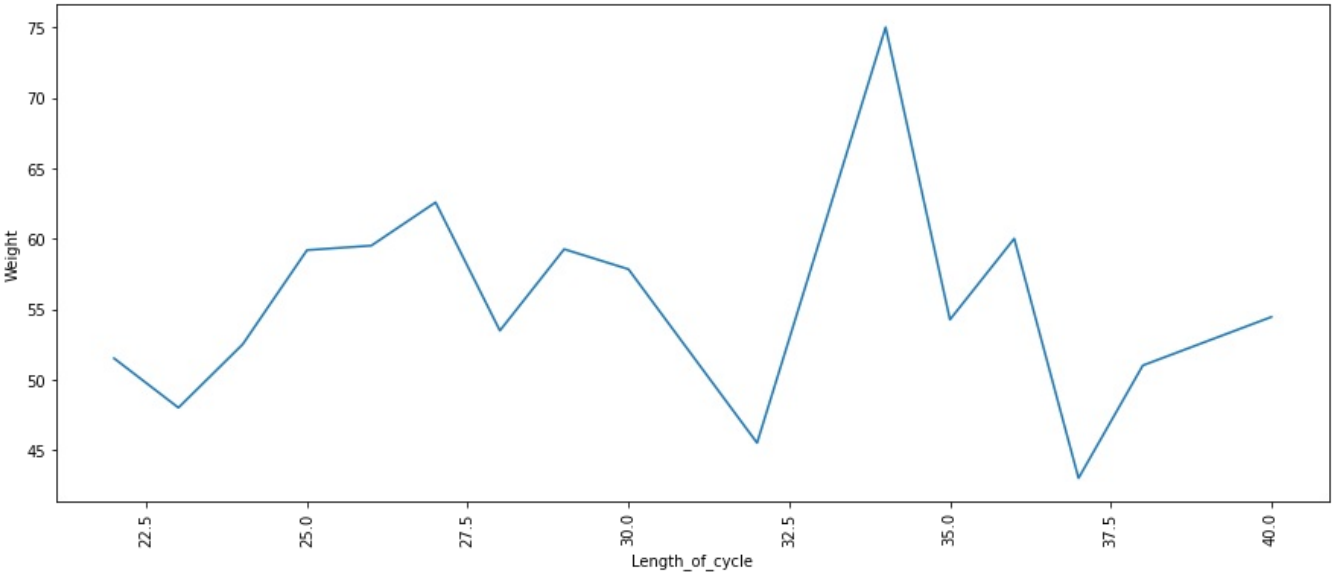


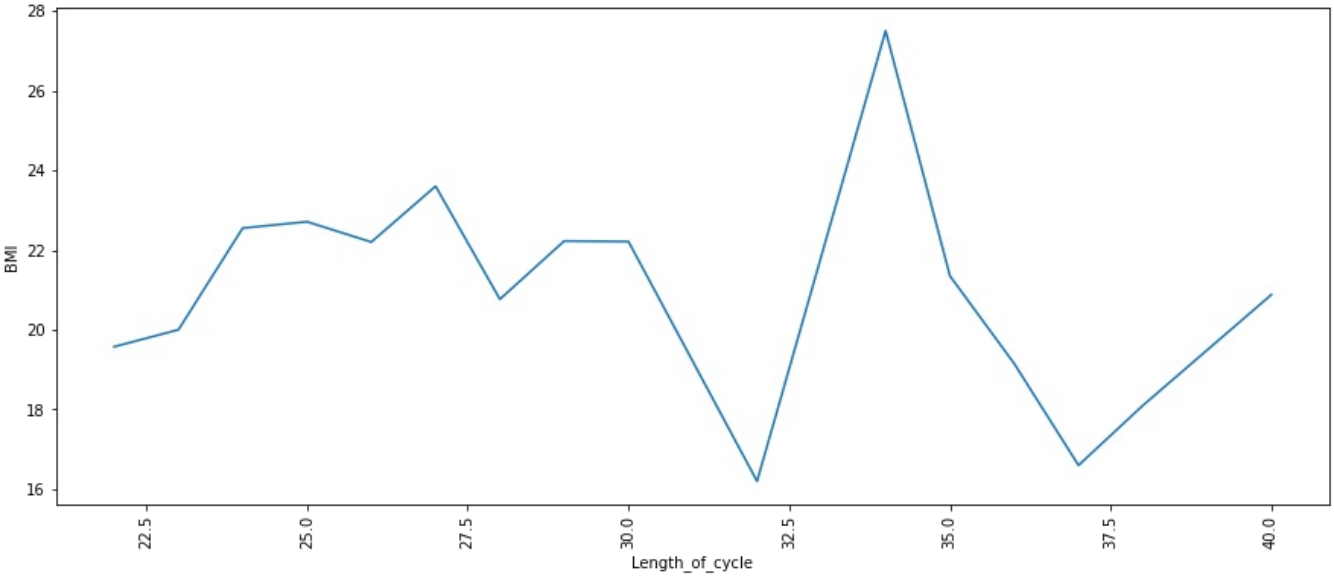
In [36]:
```
for i in continuous:
    for j in continuous:
        if i != j:
            plt.figure(figsize=(15,6))
            sns.lineplot(x = i, y = j, data = df, ci = None, palette='hls')
            plt.xticks(rotation = 90)
            plt.show()
```

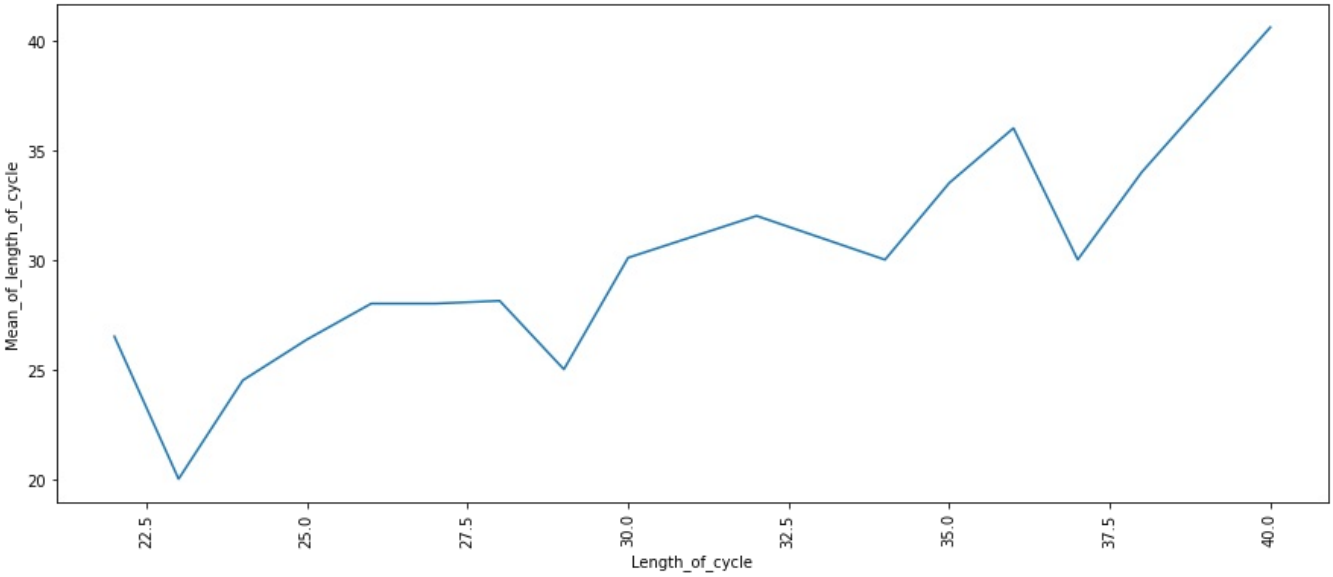


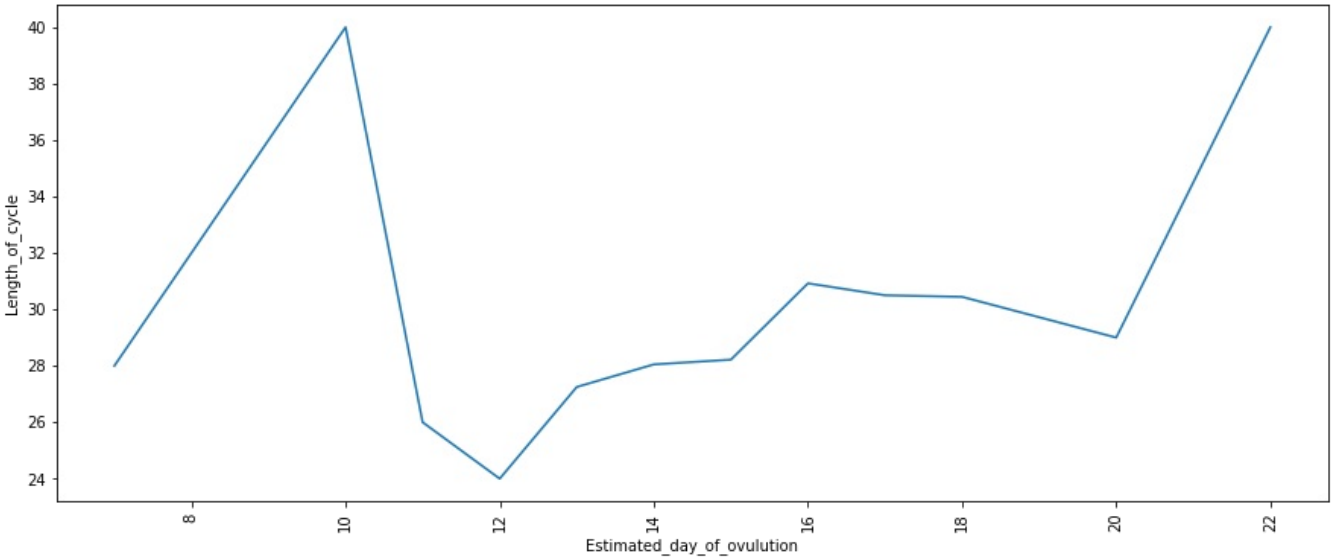


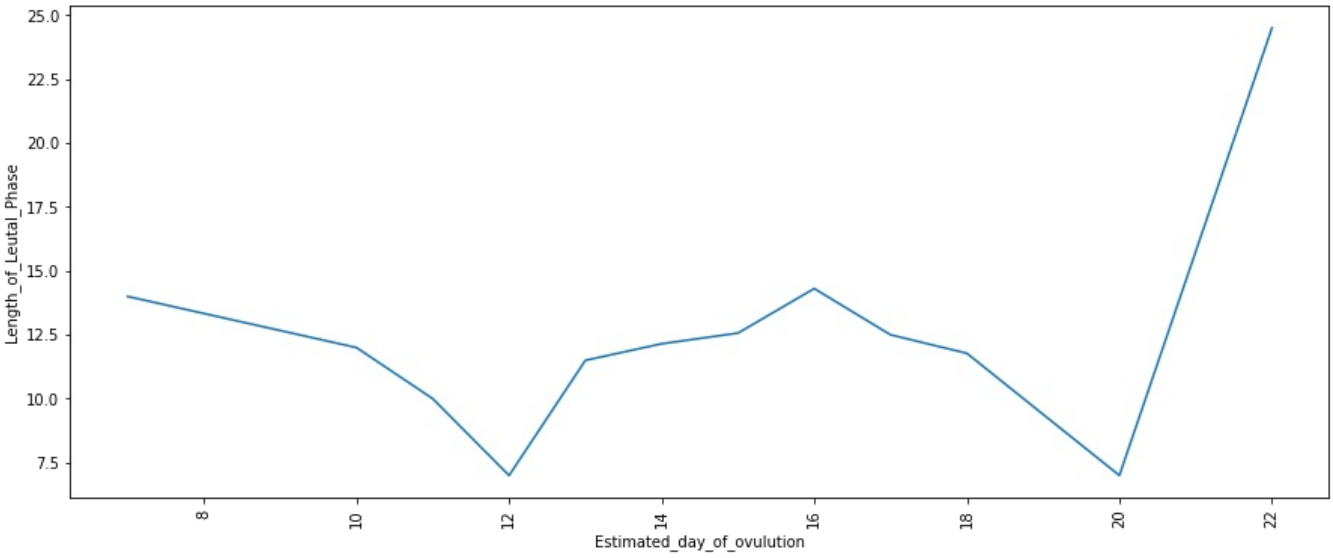

Height
68
67
66
65
64
63
62
61
60
22.5
25.0
27.5
30.0
32.5
35.0
37.5
40.0
Length_of_cycle

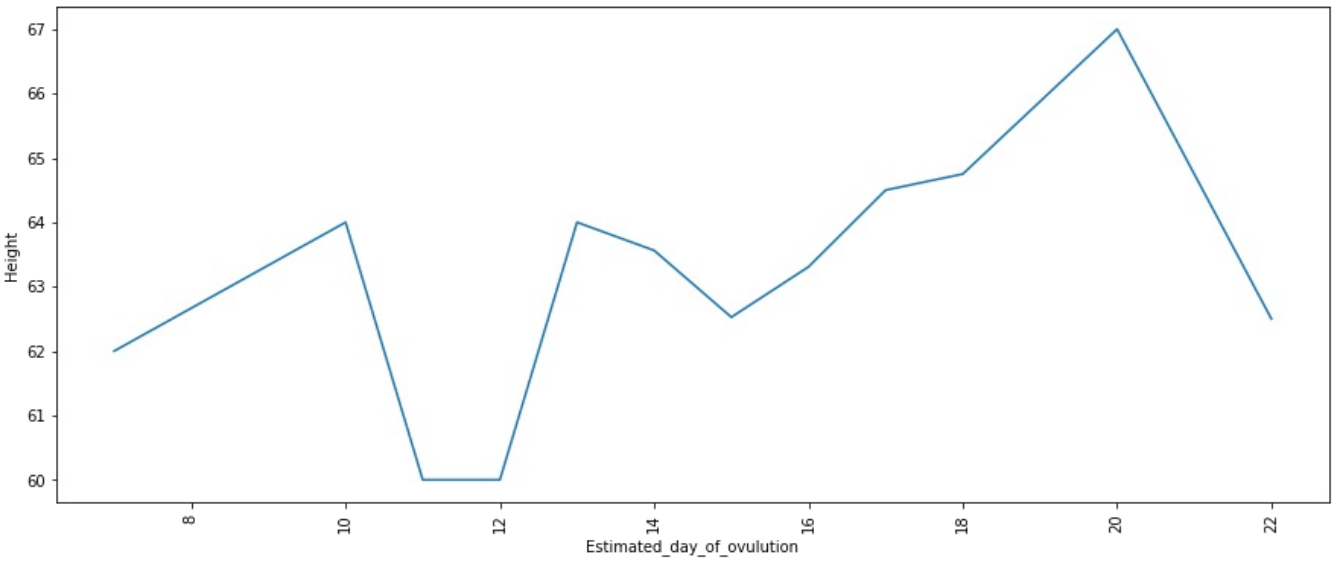

Weight
75
70
65
60
55
50
45
22.5
25.0
27.5
30.0
32.5
35.0
37.5
40.0
Length_of_cycle

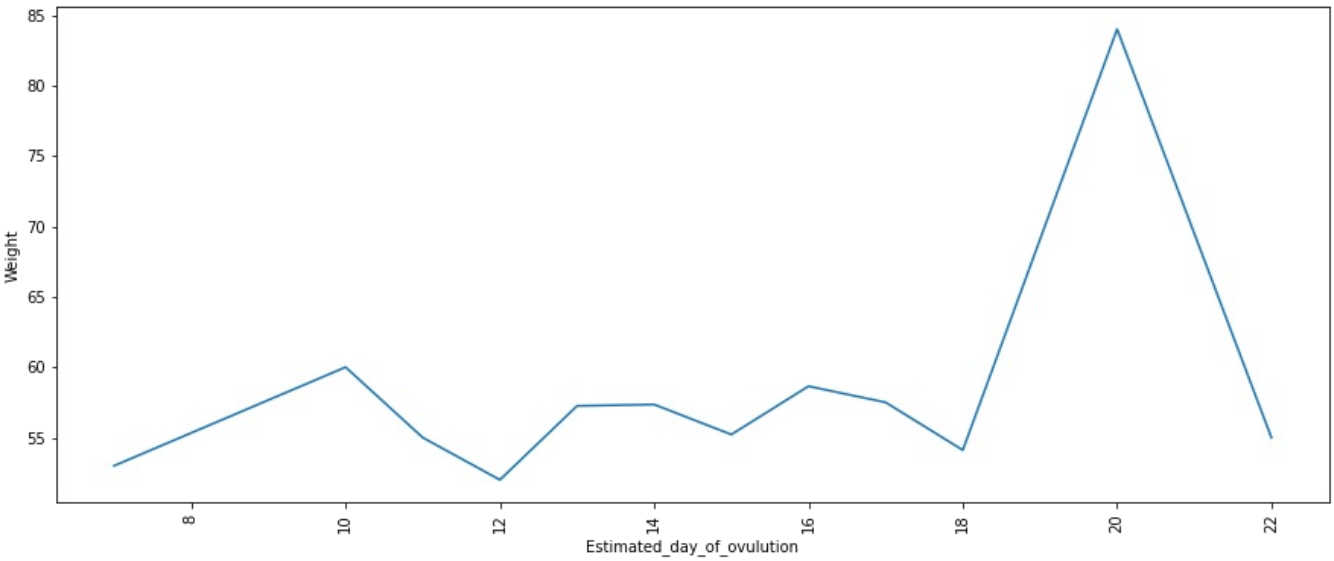

BMI
28
26
24
22
20
18
16
22.5
25.0
27.5
30.0
32.5
35.0
37.5
40.0
Length_of_cycle

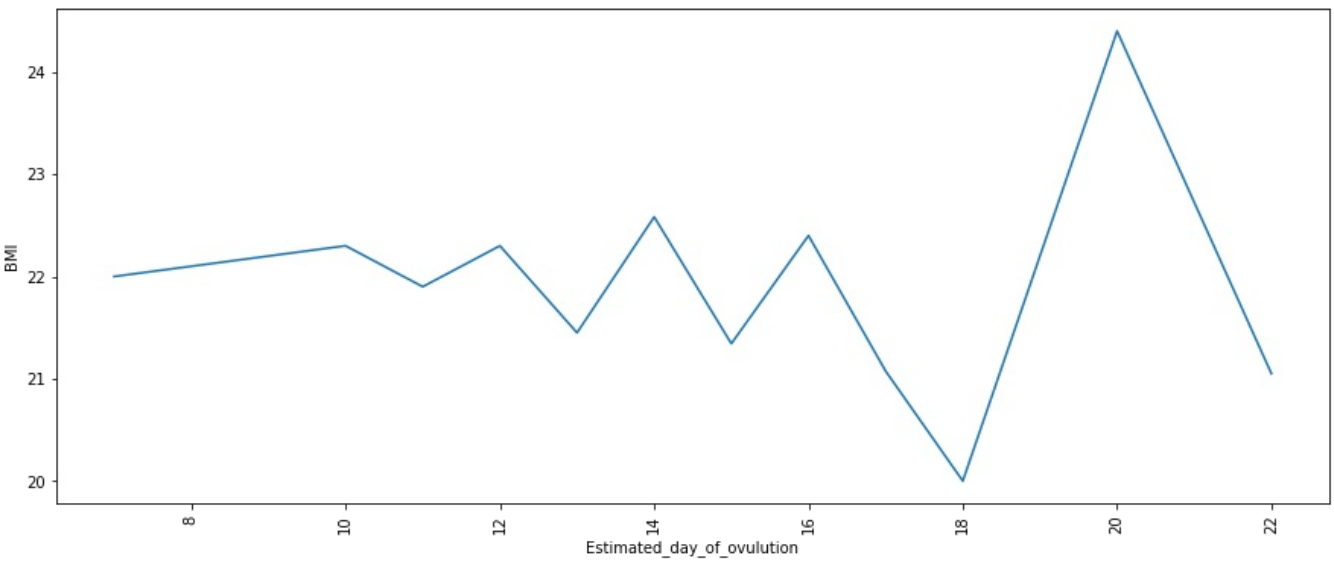

Mean_of_length_of_cycle
40
35
30
25
20
22.5
25.0
27.5
30.0
32.5
35.0
37.5
40.0
Length_of_cycle

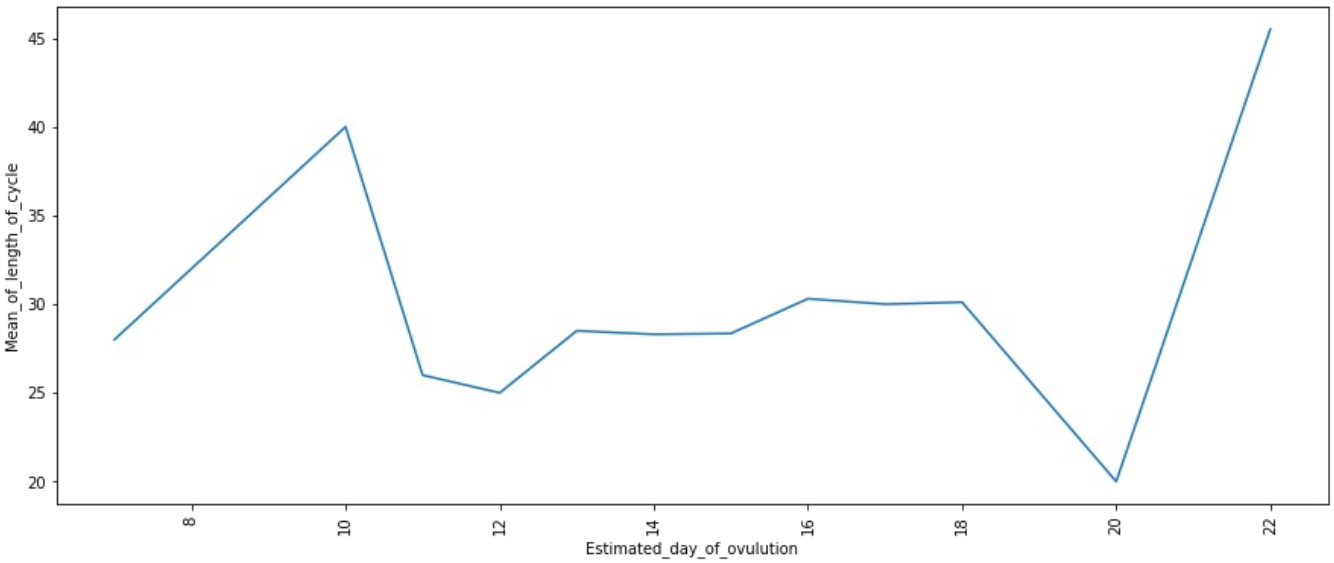

Length_of_cycle
40
38
36
34
32
30
28
26
24
8
10
12
14
16
18
20
22
Estimated_day_of_ovulution

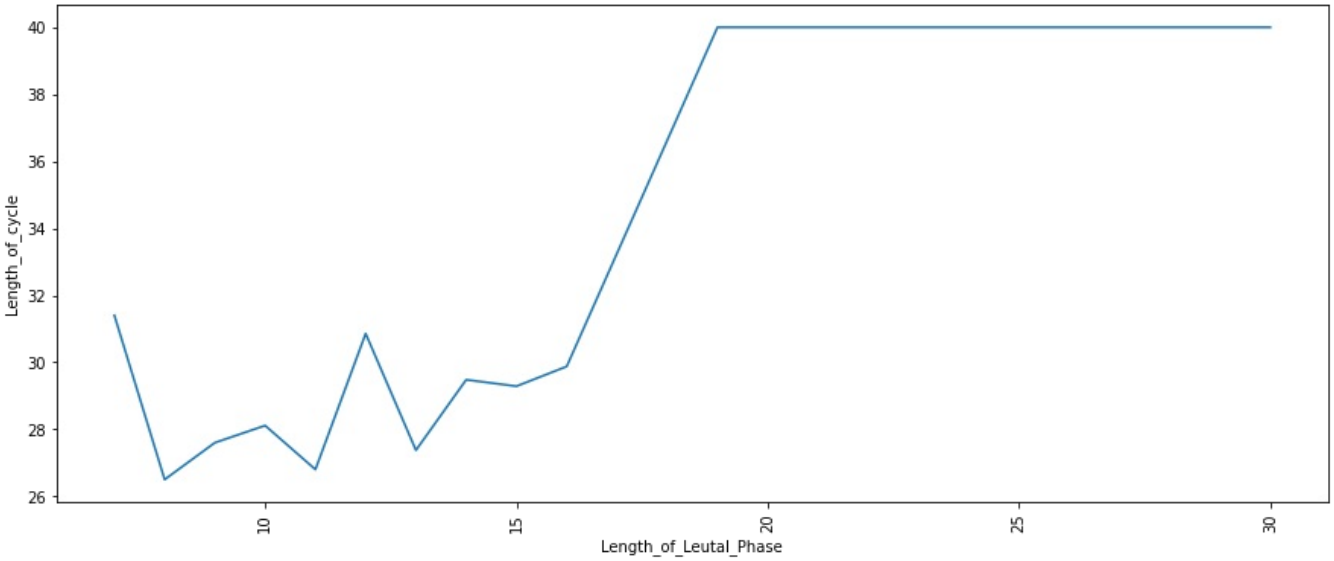

Length_of_Leutal_Phase
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
8
10
12
14
16
18
20
22
Estimated_day_of_ovulution

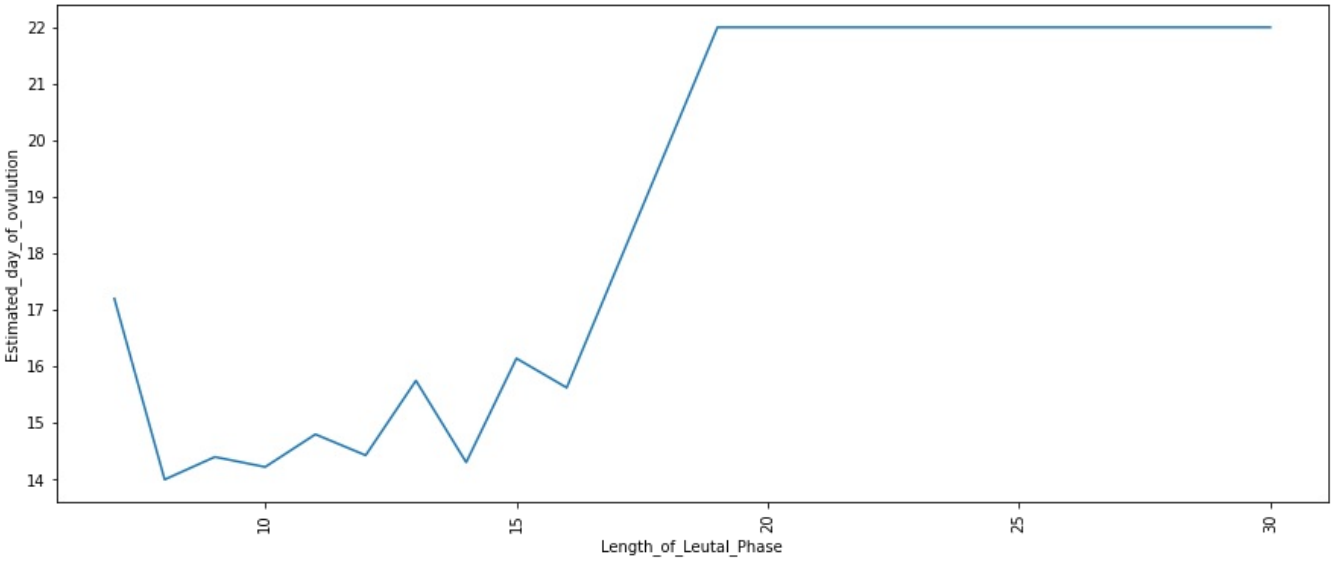

Height
67
66
65
64
63
62
61
60
8
10
12
14
16
18
20
22
Estimated_day_of_ovulution

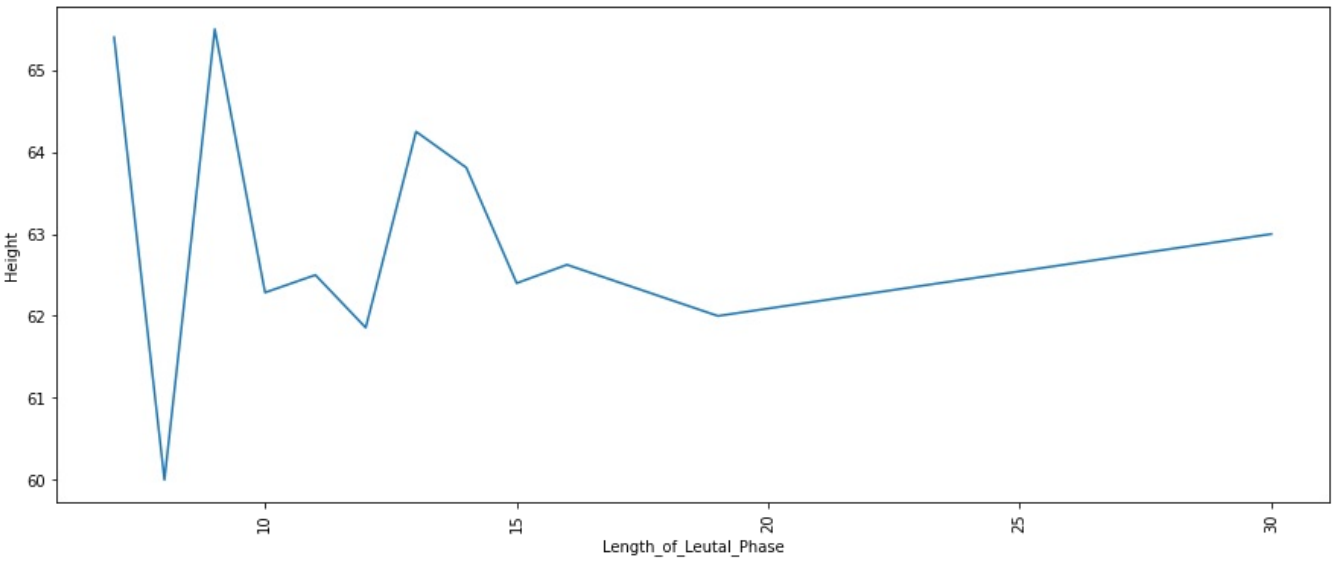

Weight
85
80
75
70
65
60
55
8
10
12
14
16
18
20
22
Estimated_day_of_ovulution

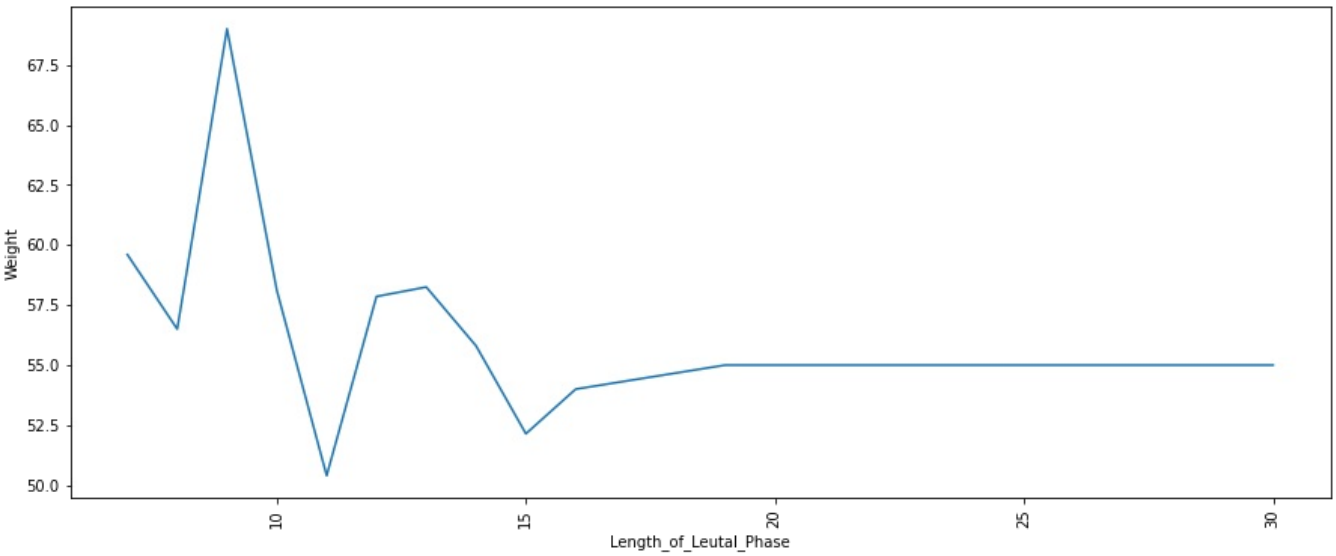

BMI
24
23
22
21
20
8
10
12
14
16
18
20
22
Estimated_day_of_ovulution

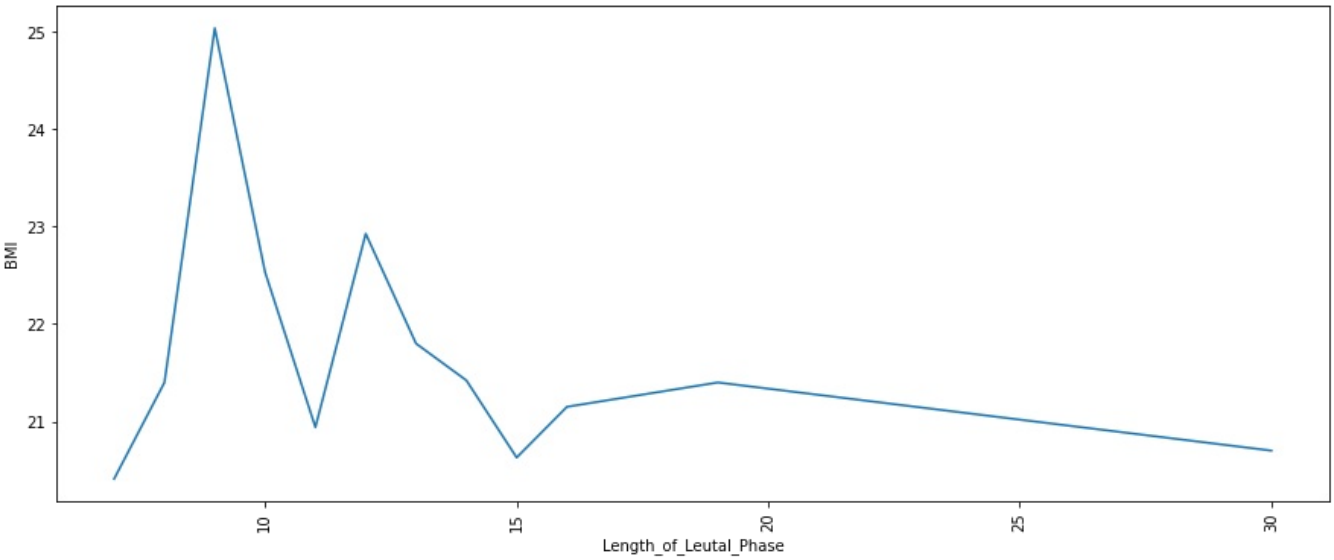

Mean_of_length_of_cycle
45
40
35
30
25
20
8
10
12
14
16
18
20
22
Estimated_day_of_ovulution

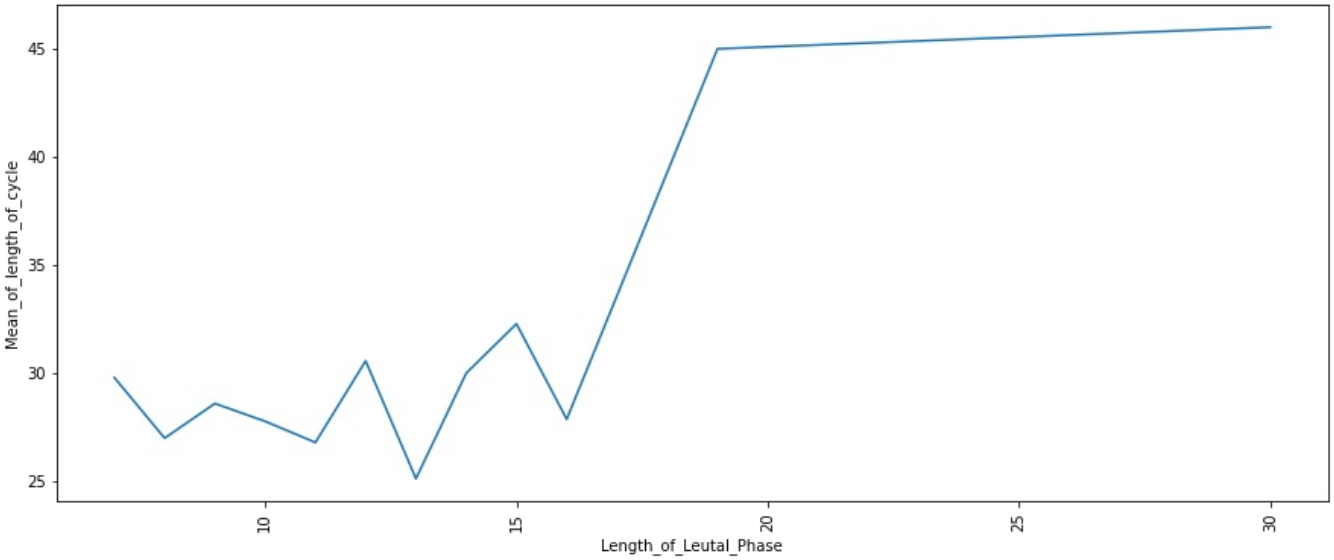

Length_of_cycle
40
38
36
34
32
30
28
26
10
15
20
25
30
Length_of_Leutal_Phase

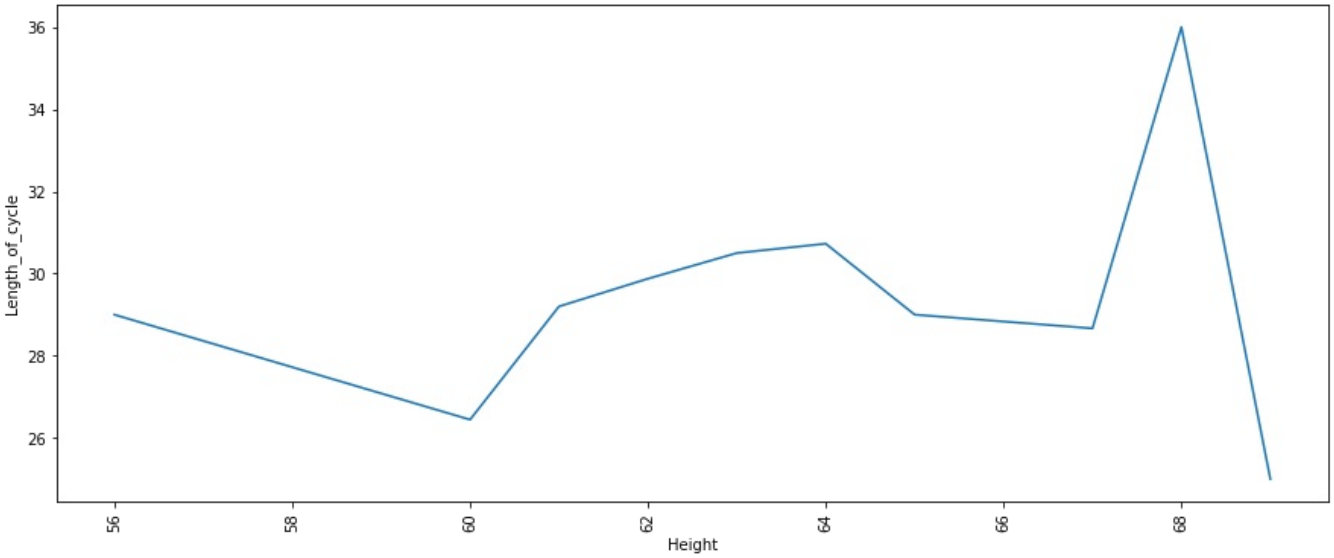

Estimated_day_of_ovulution
22
21
20
19
18
17
16
15
14
10
15
20
25
30
Length_of_Leutal_Phase

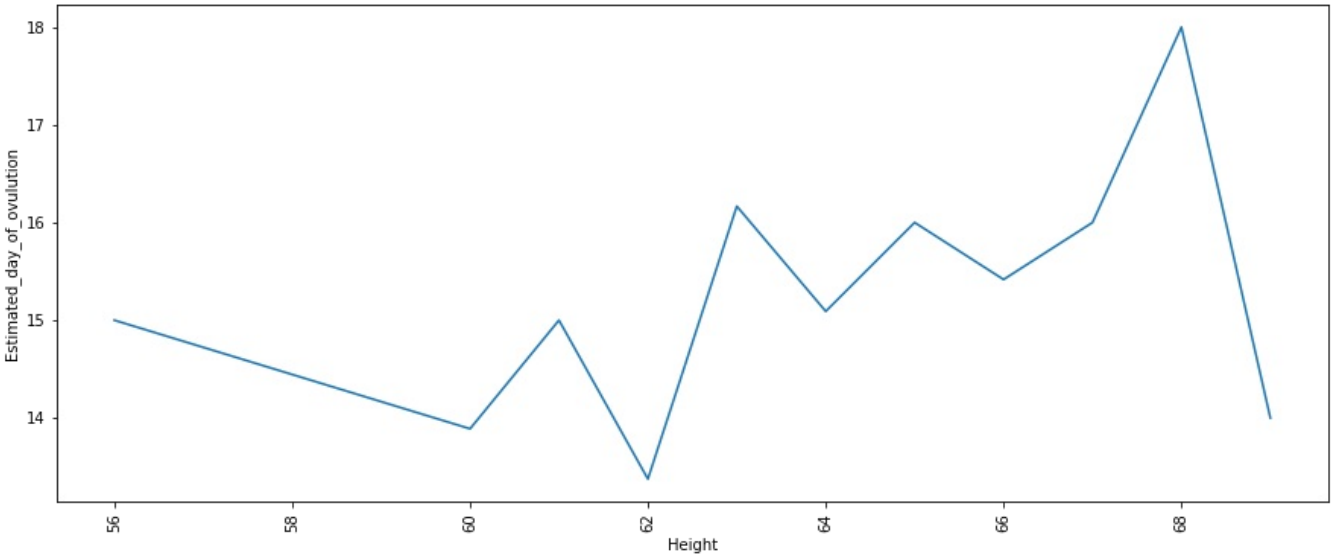

Height
65
64
63
62
61
60
10
15
20
25
30
Length_of_Leutal_Phase

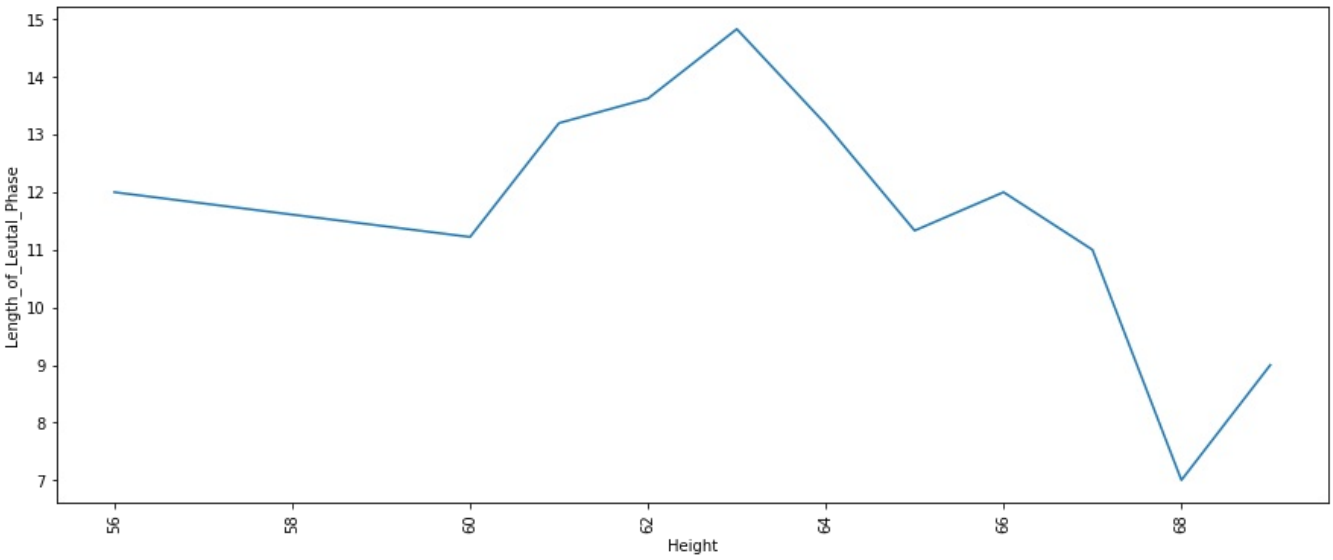

Weight
67.5
65.0
62.5
60.0
57.5
55.0
52.5
50.0
10
15
20
25
30
Length_of_Leutal_Phase

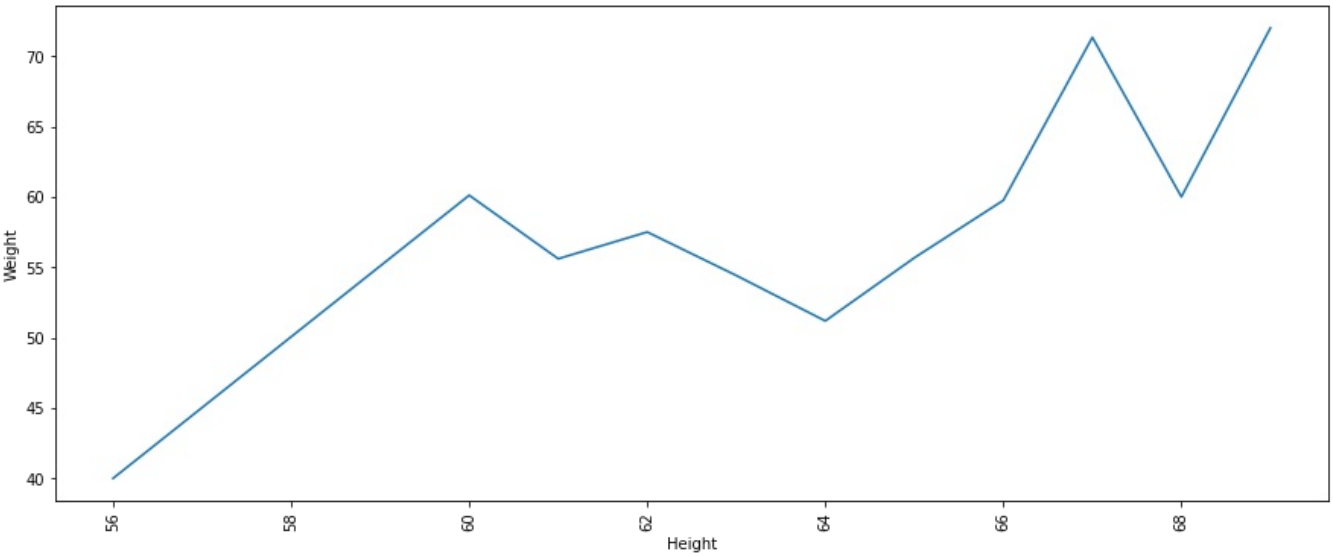

BMI
25
24
23
22
21
10
15
20
25
30
Length_of_Leutal_Phase

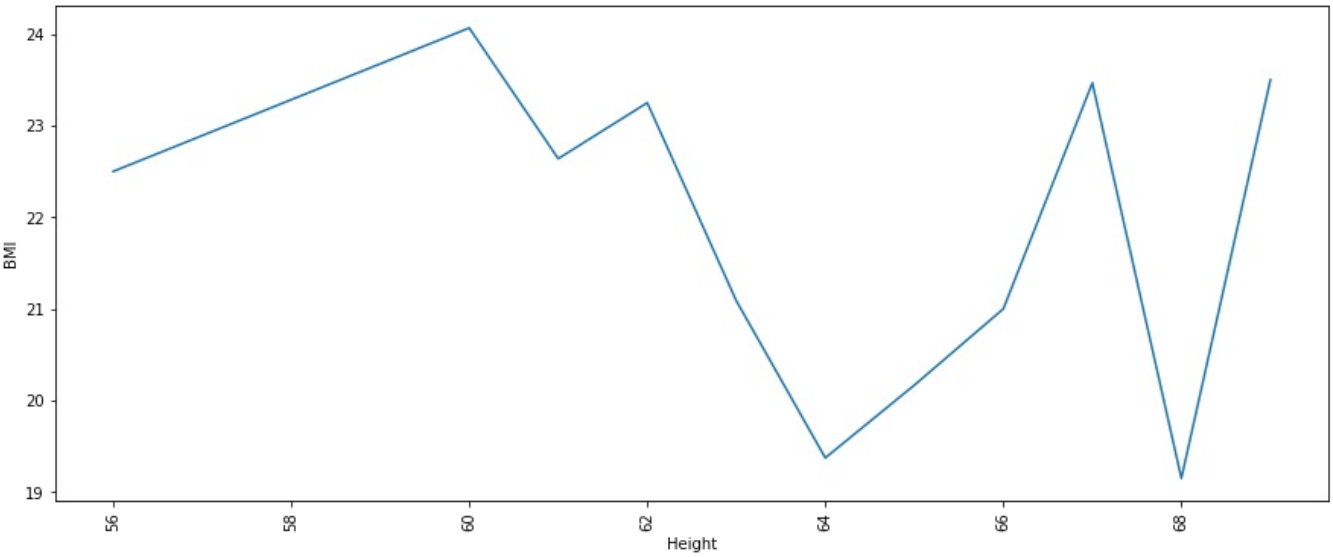

Mean_of_length_of_cycle
45
40
35
30
25
10
15
20
25
30
Length_of_Leutal_Phase

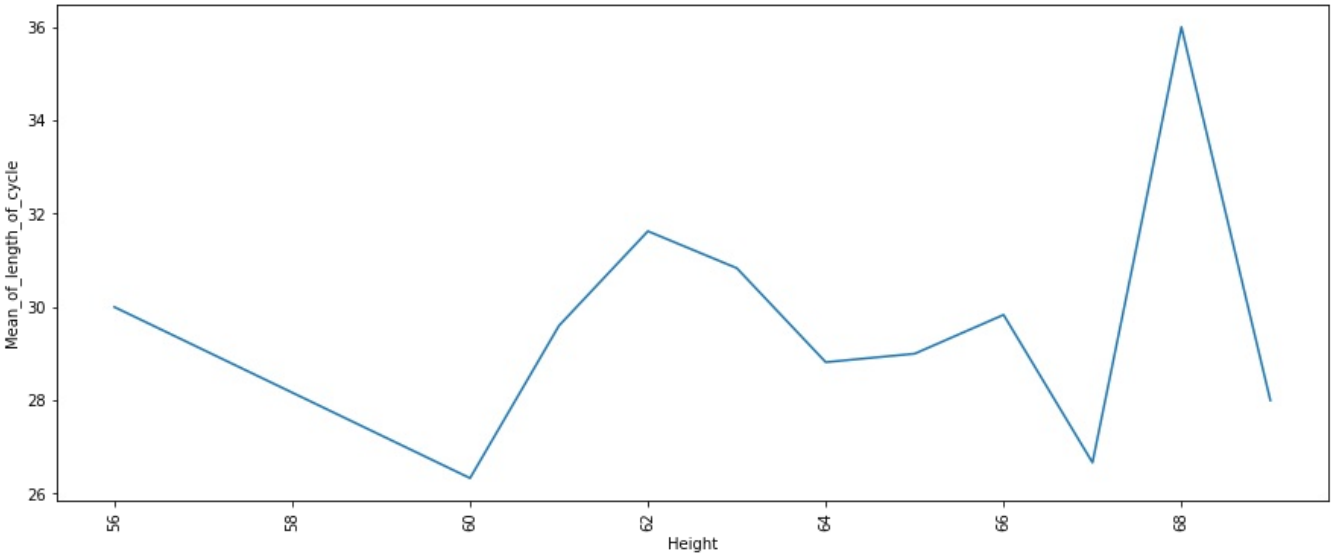

Length_of_cycle
36
34
32
30
28
26
56
58
60
62
64
66
68
Height

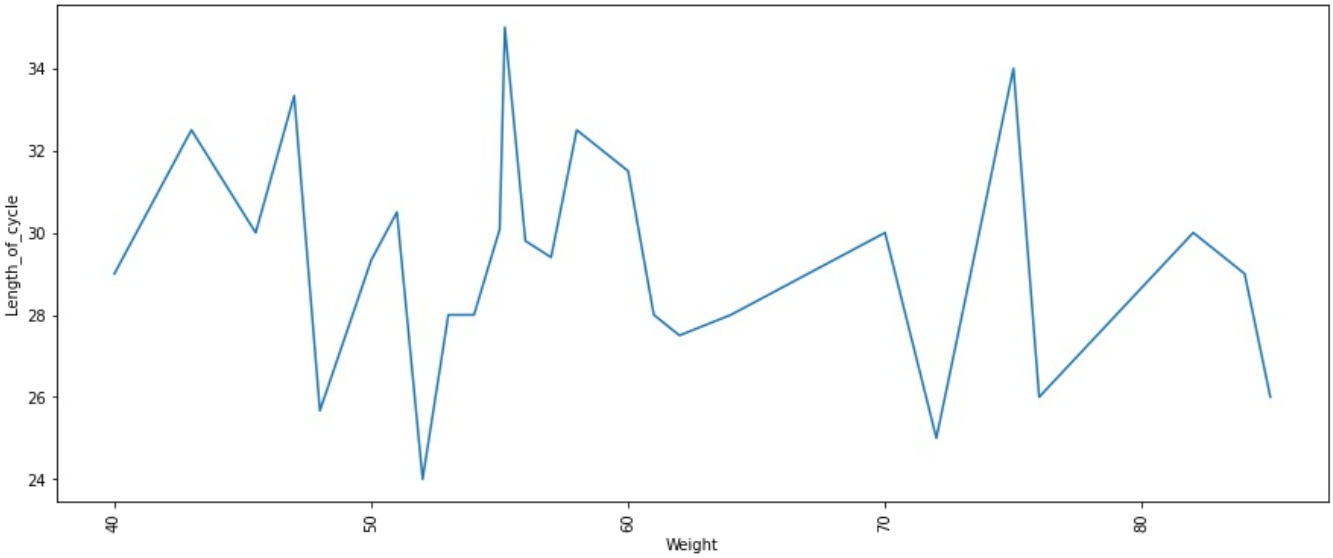

Estimated_day_of_ovulution
18
17
16
15
14
56
58
60
62
64
66
68
Height

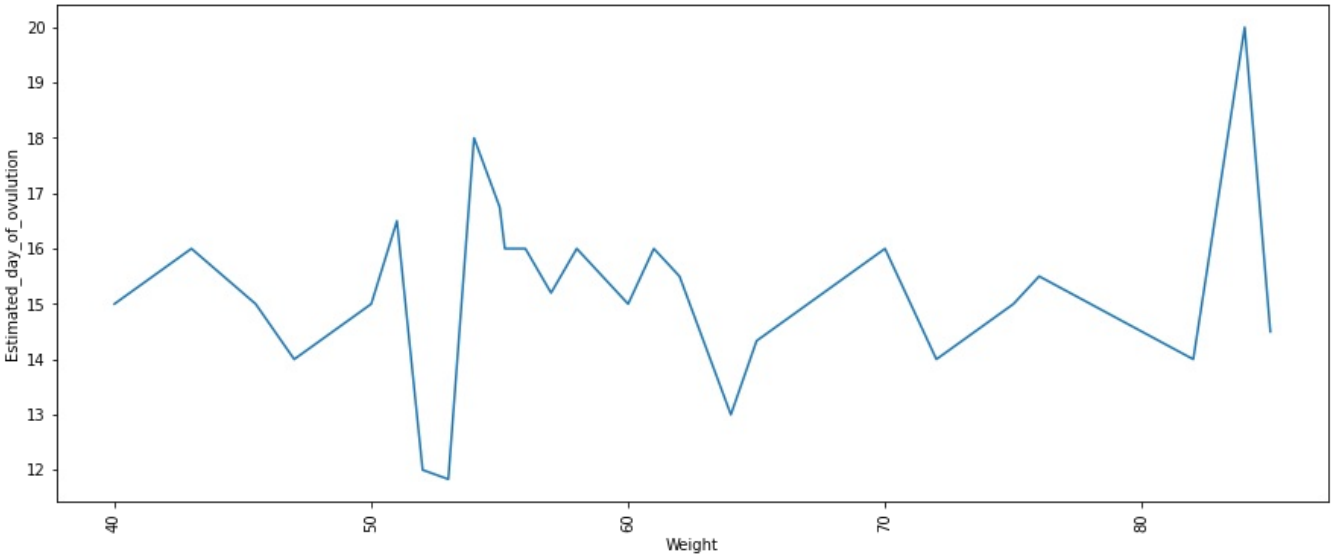

Length_of_Leutal_Phase
15
14
13
12
11
10
9
8
7
56
58
60
62
64
66
68
Height

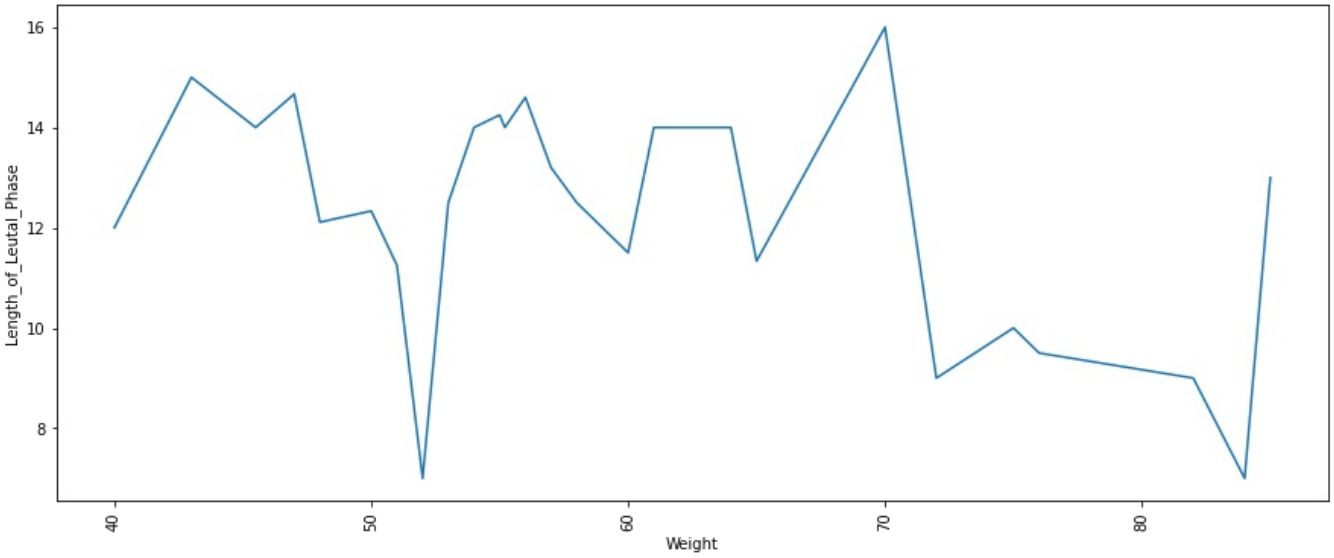

Weight
70
65
60
55
50
45
40
56
58
60
62
64
66
68
Height

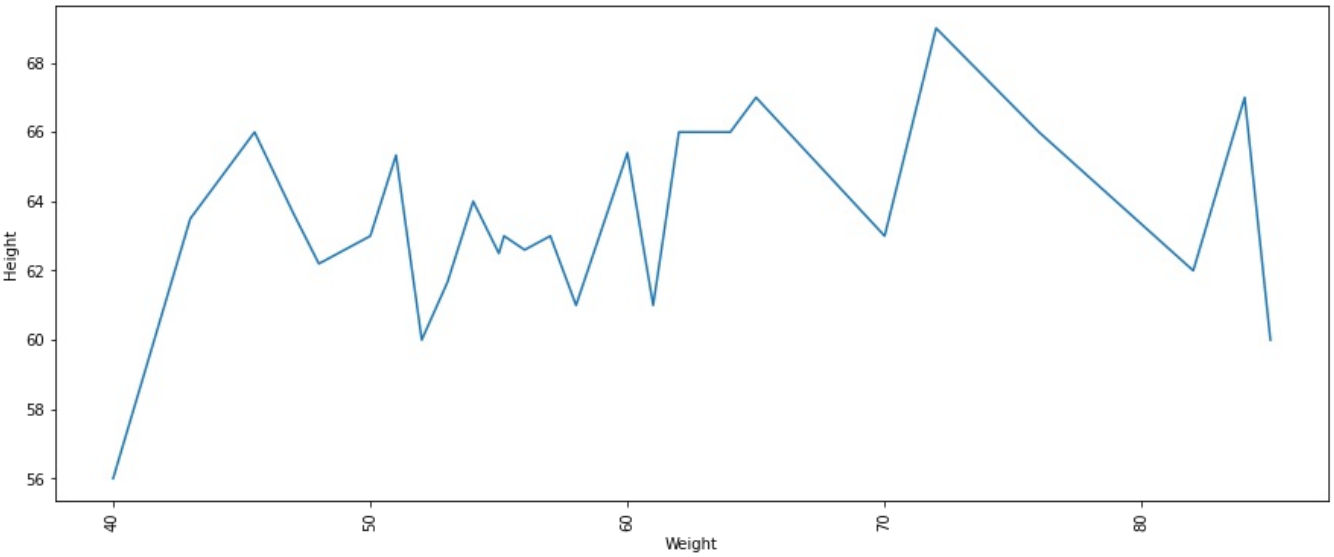

BMI
24
23
22
21
20
19
56
58
60
62
64
66
68
Height

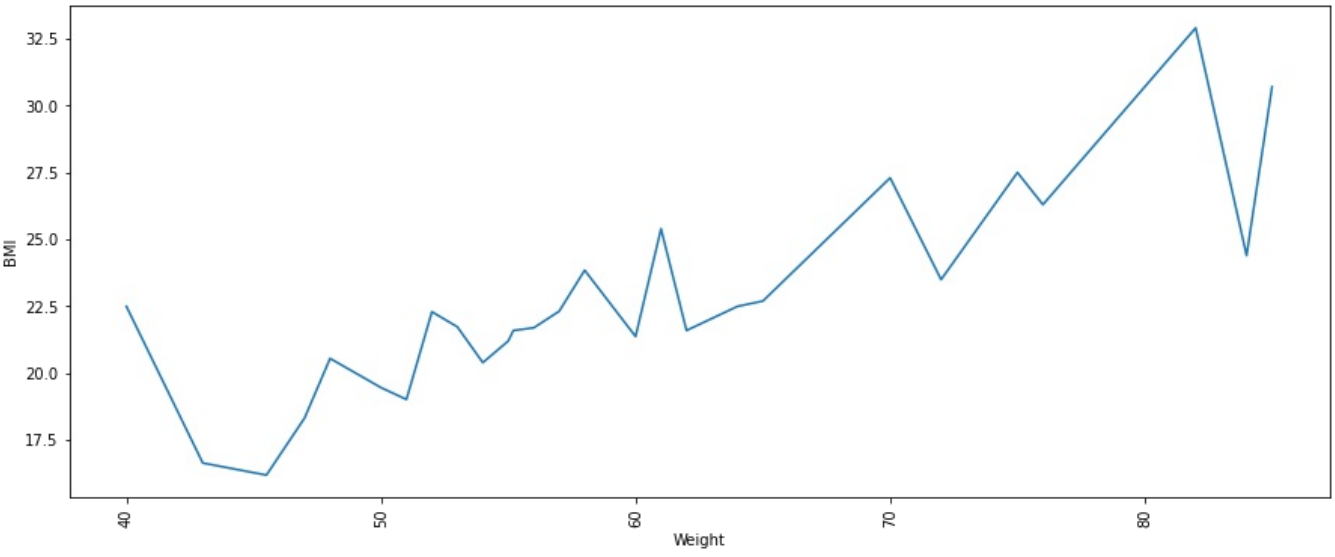

Mean_of_length_of_cycle
36
34
32
30
28
26
56
58
60
62
64
66
68
Height

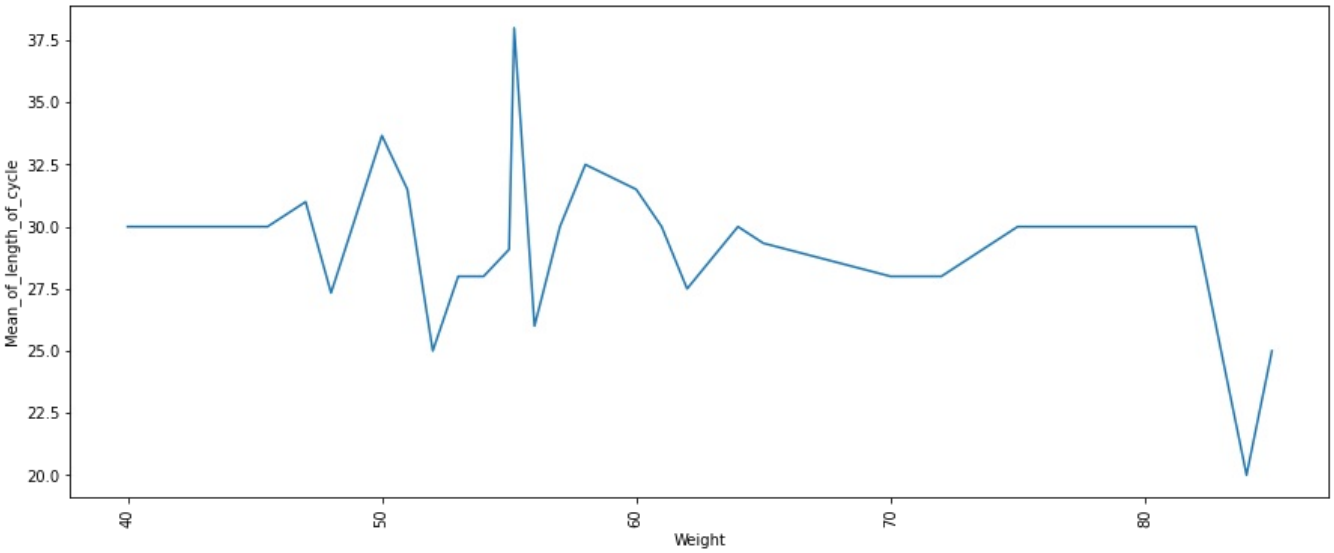

Length_of_cycle
34
32
30
28
26
24
40
50
60
70
80
Weight

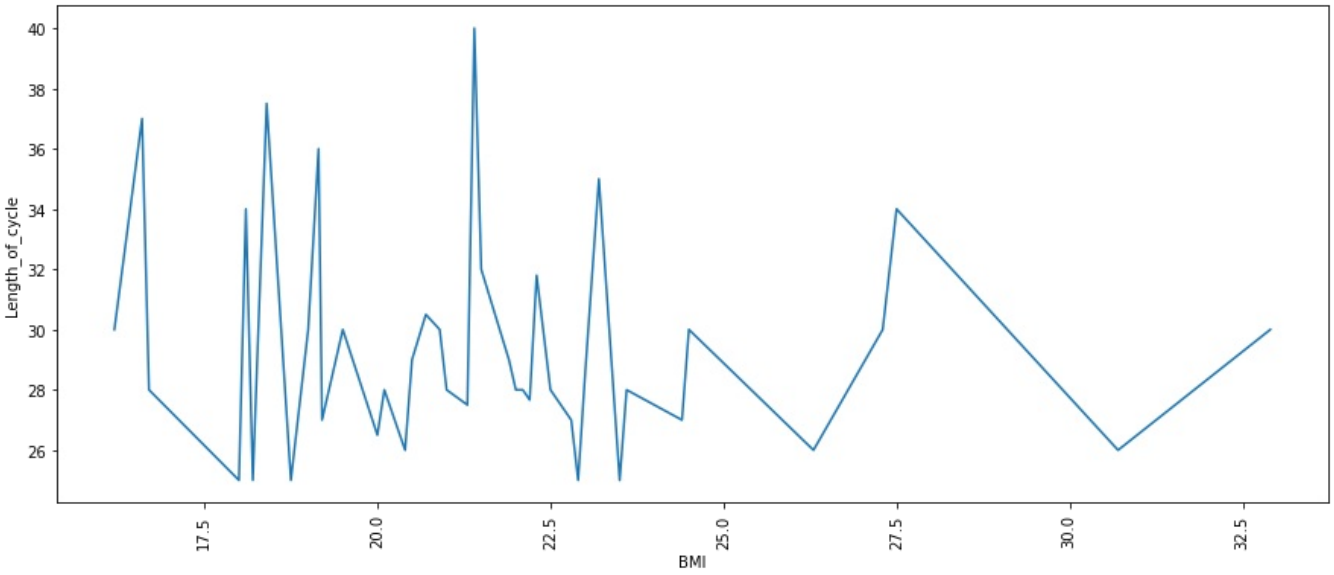

Estimated_day_of_ovulution
20
19
18
17
16
15
14
13
12
40
50
60
70
80
Weight

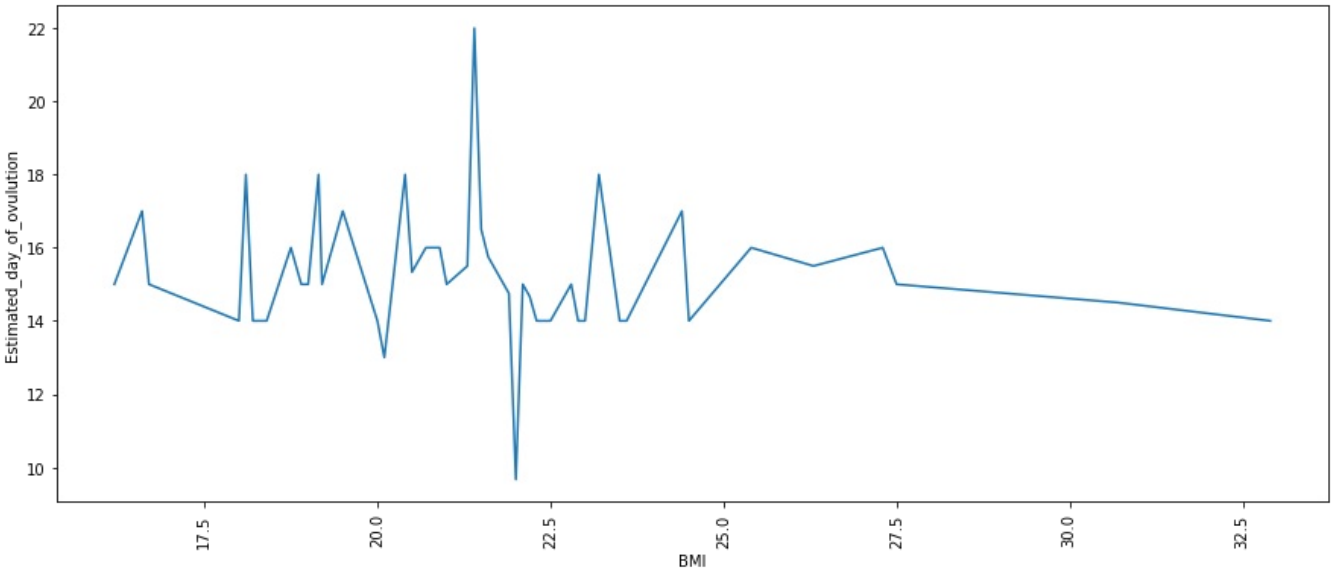

Length_of_Leutal_Phase
16
14
12
10
8
40
50
60
70
80
Weight

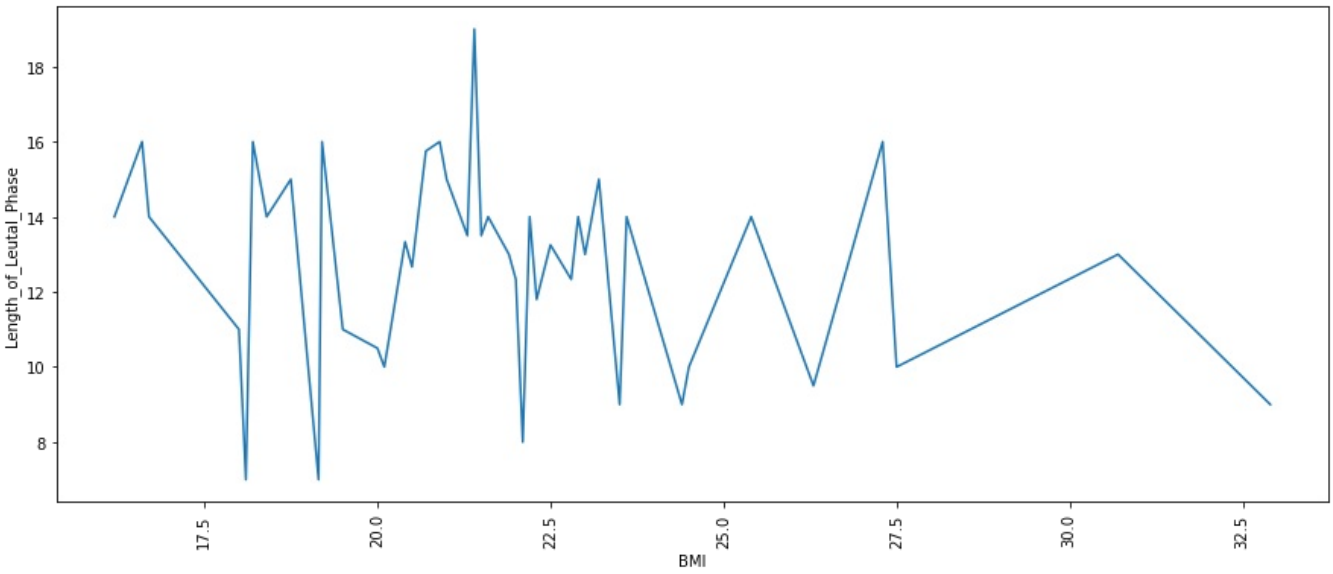

Height
68
66
64
62
60
58
56
40
50
60
70
80
Weight

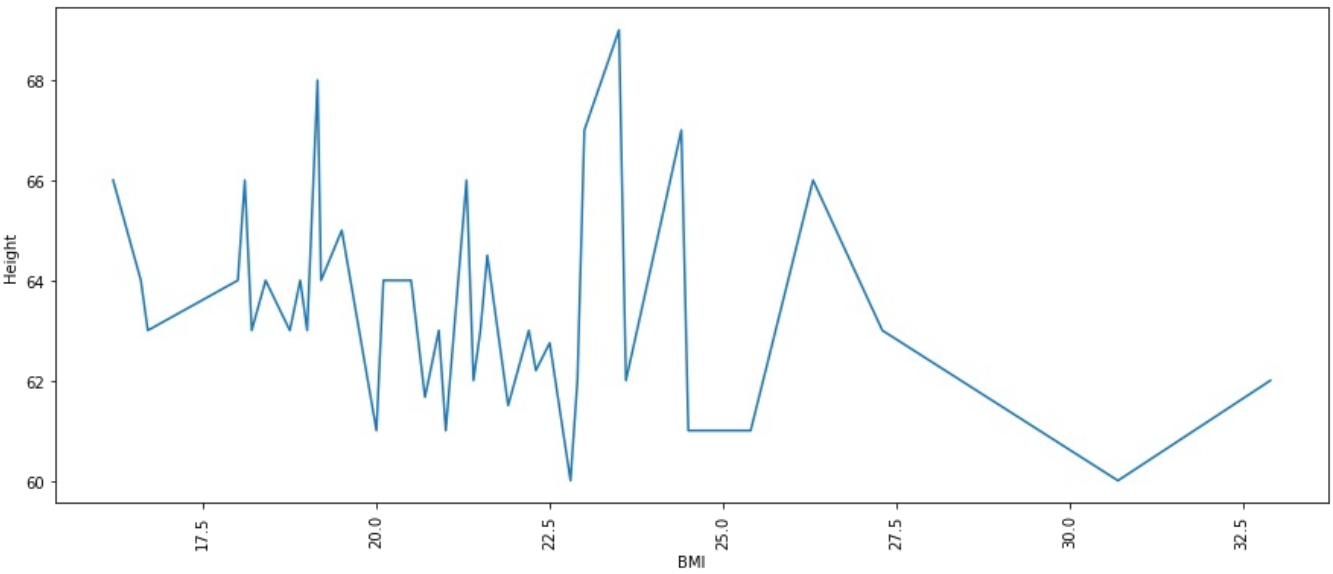

BMI
32.5
30.0
27.5
25.0
22.5
20.0
17.5
40
50
60
70
80
Weight

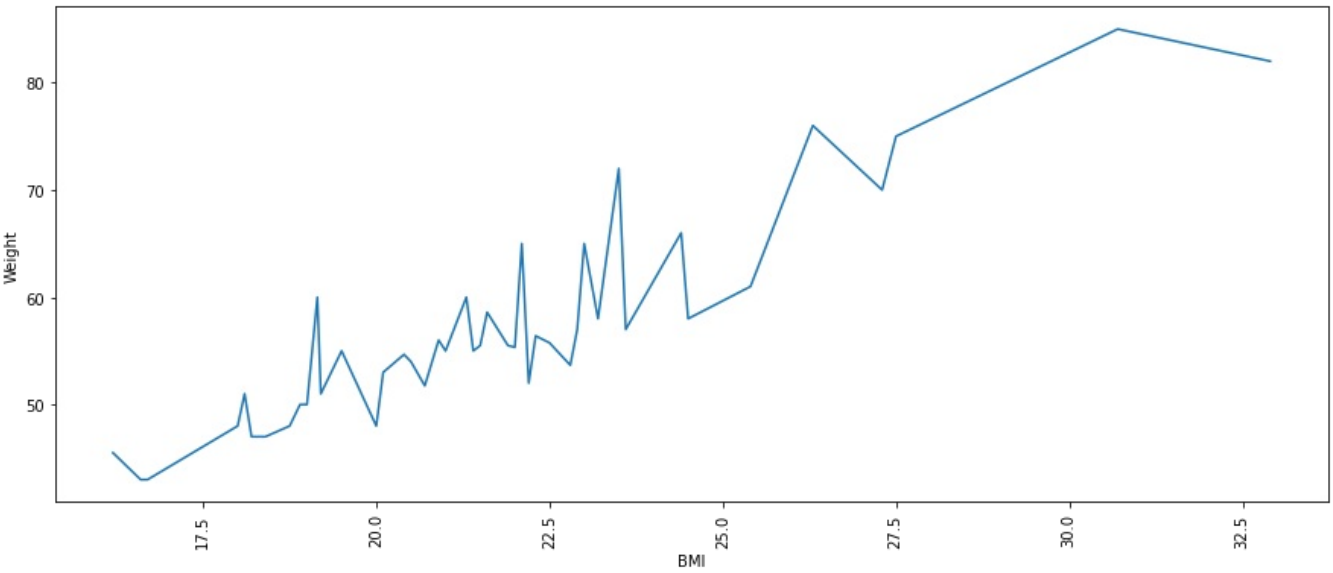

Mean_of_length_of_cycle
37.5
35.0
32.5
30.0
27.5
25.0
22.5
20.0
40
50
60
70
80
Weight

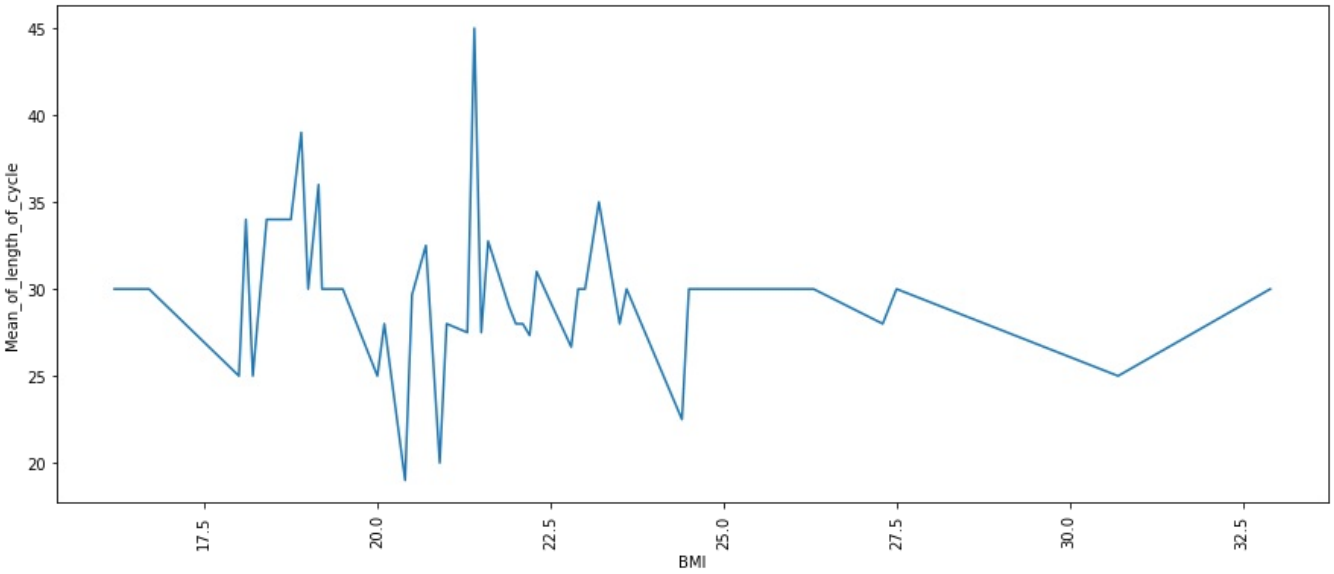

Length_of_cycle
40
38
36
34
32
30
28
26
17.5
20.0
22.5
25.0
27.5
30.0
32.5
BMI

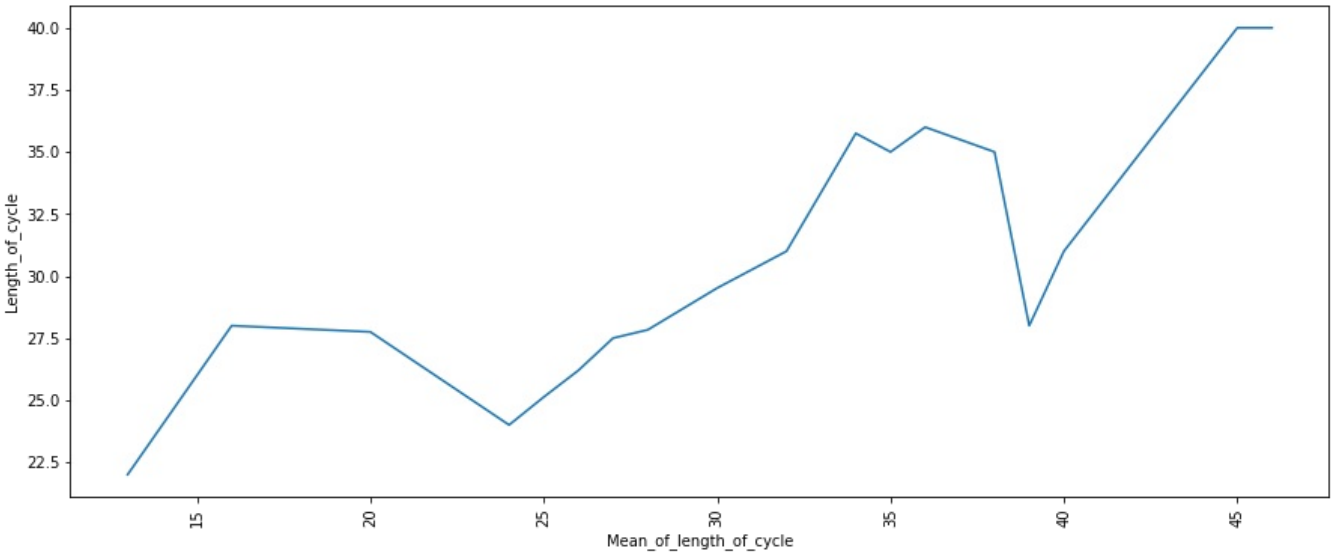

Estimated_day_of_ovulution
22
20
18
16
14
12
10
17.5
20.0
22.5
25.0
27.5
30.0
32.5
BMI

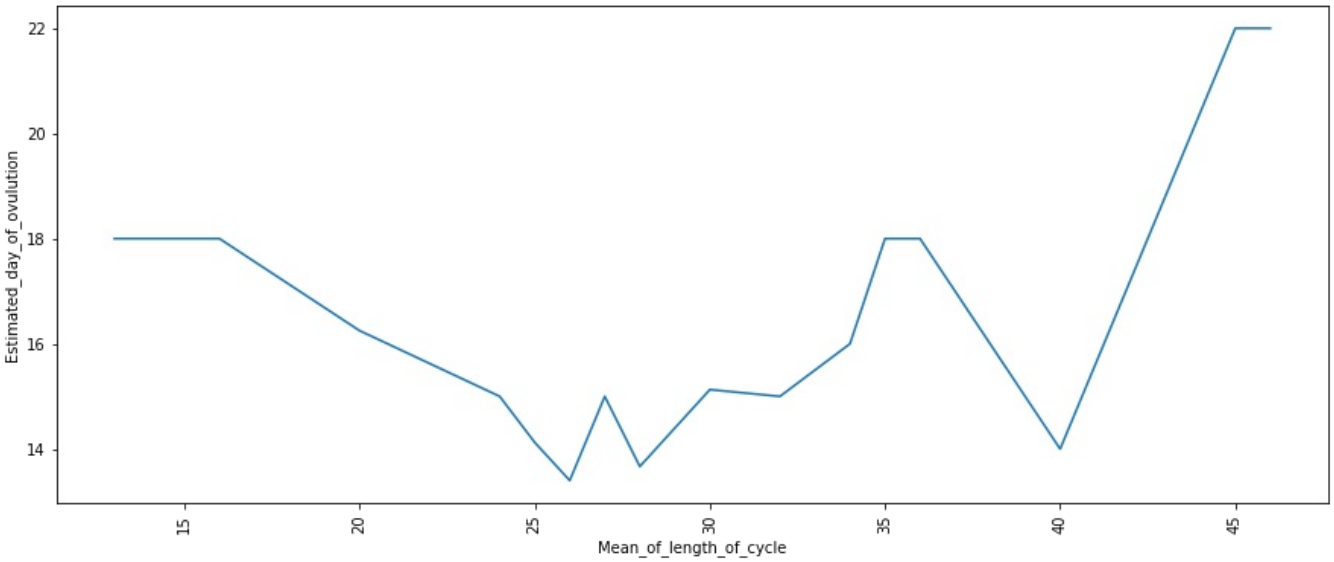

Length_of_Leutal_Phase
18
16
14
12
10
8
17.5
20.0
22.5
25.0
27.5
30.0
32.5
BMI

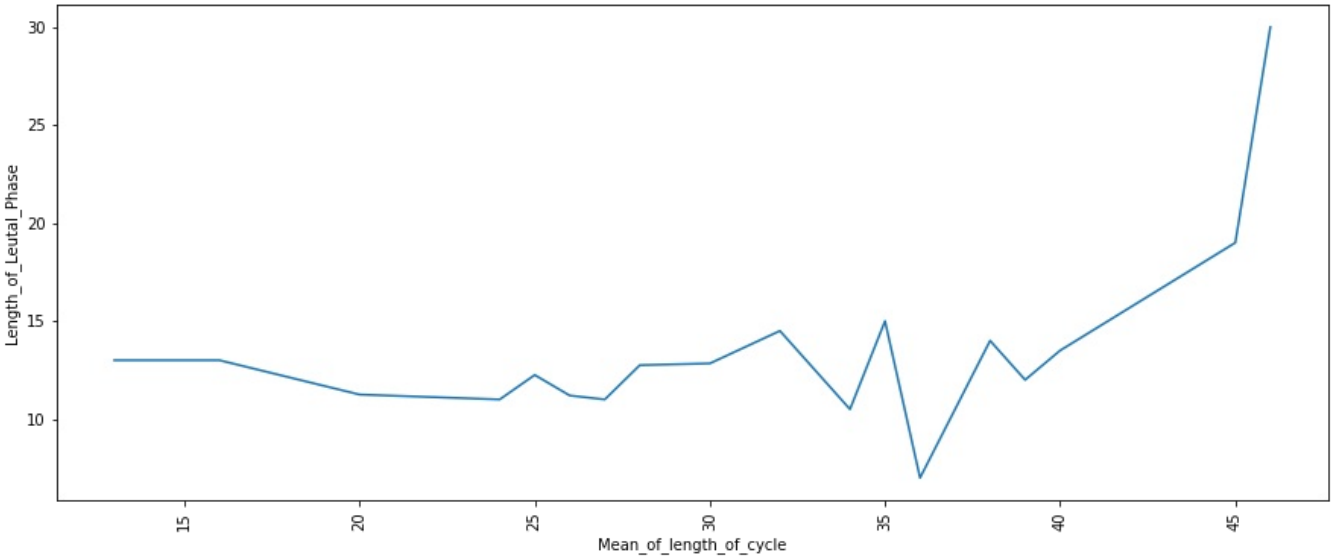

Height
68
66
64
62
60
17.5
20.0
22.5
25.0
27.5
30.0
32.5
BMI

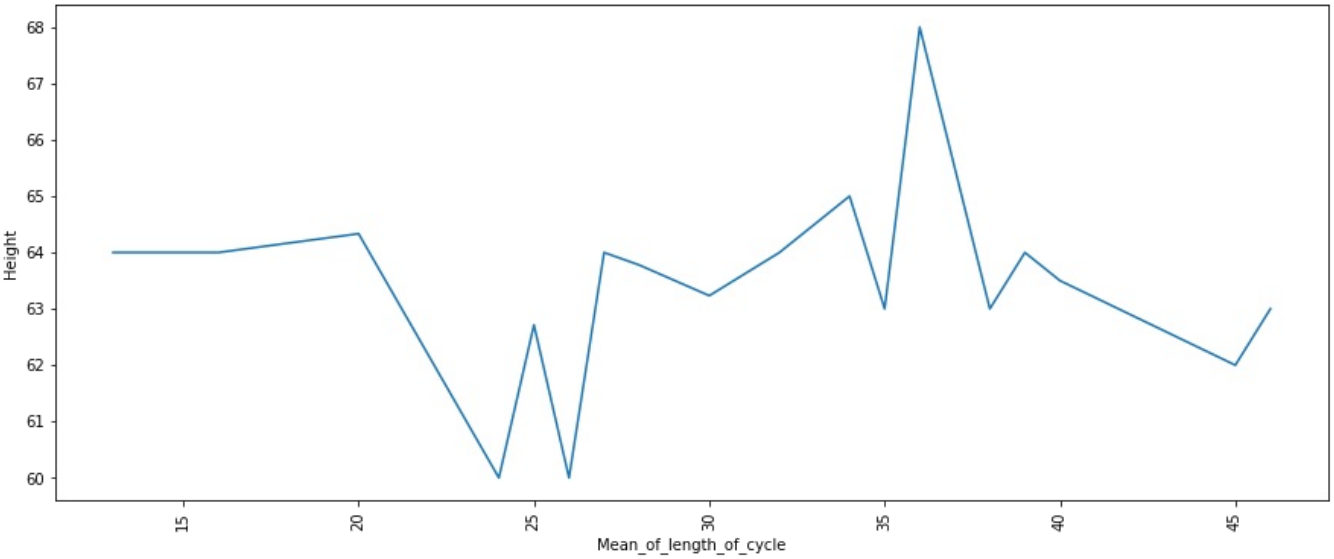

Weight
80
70
60
50
17.5
20.0
22.5
25.0
27.5
30.0
32.5
BMI

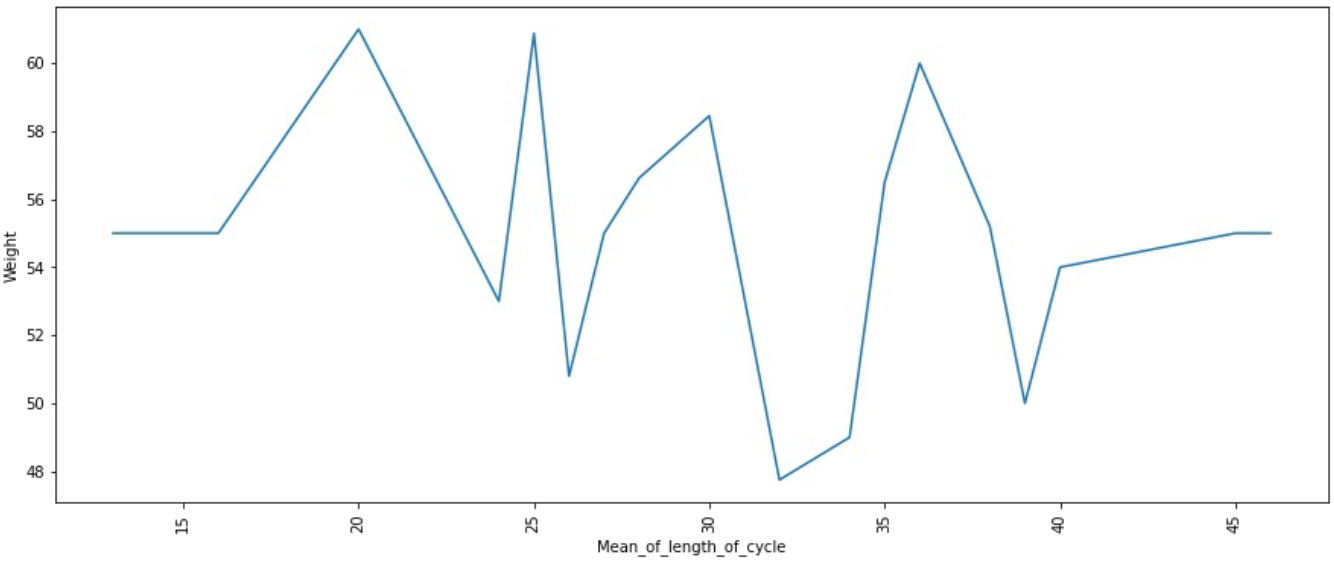

Mean_of_length_of_cycle
45
40
35
30
25
20
17.5
20.0
22.5
25.0
27.5
30.0
32.5
BMI

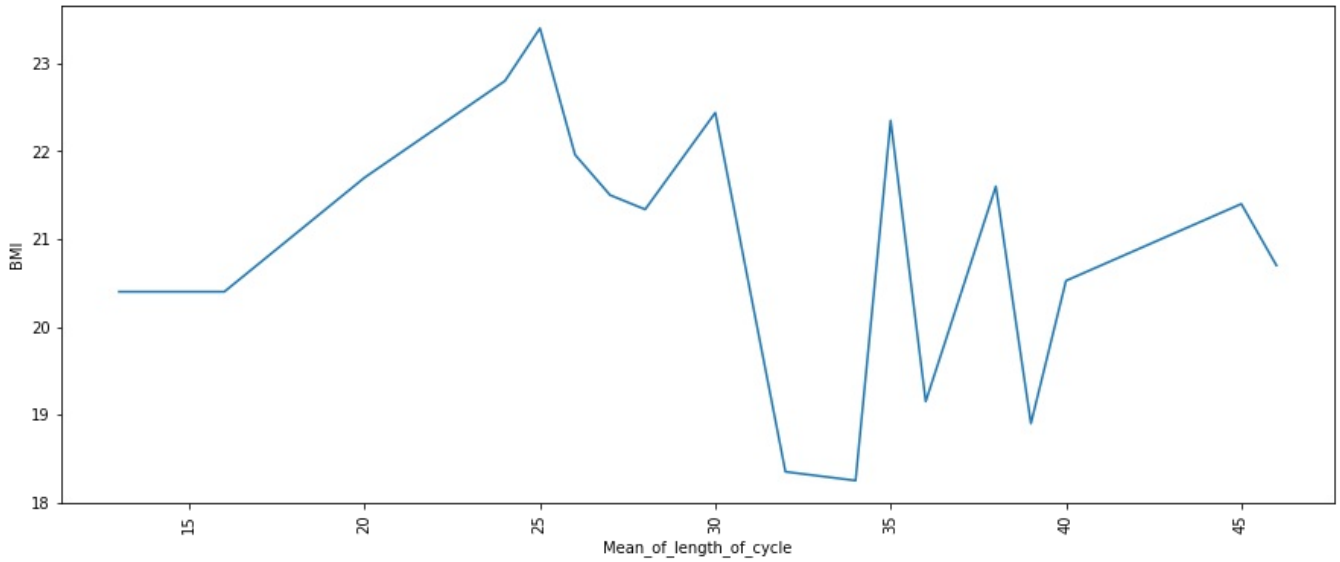

Length_of_cycle
40.0
37.5
35.0
32.5
30.0
27.5
25.0
22.5
15
20
25
30
35
40
45
Mean_of_length_of_cycle


Estimated_day_of_ovulution
22
20
18
16
14
15
20
25
30
35
40
45
Mean_of_length_of_cycle

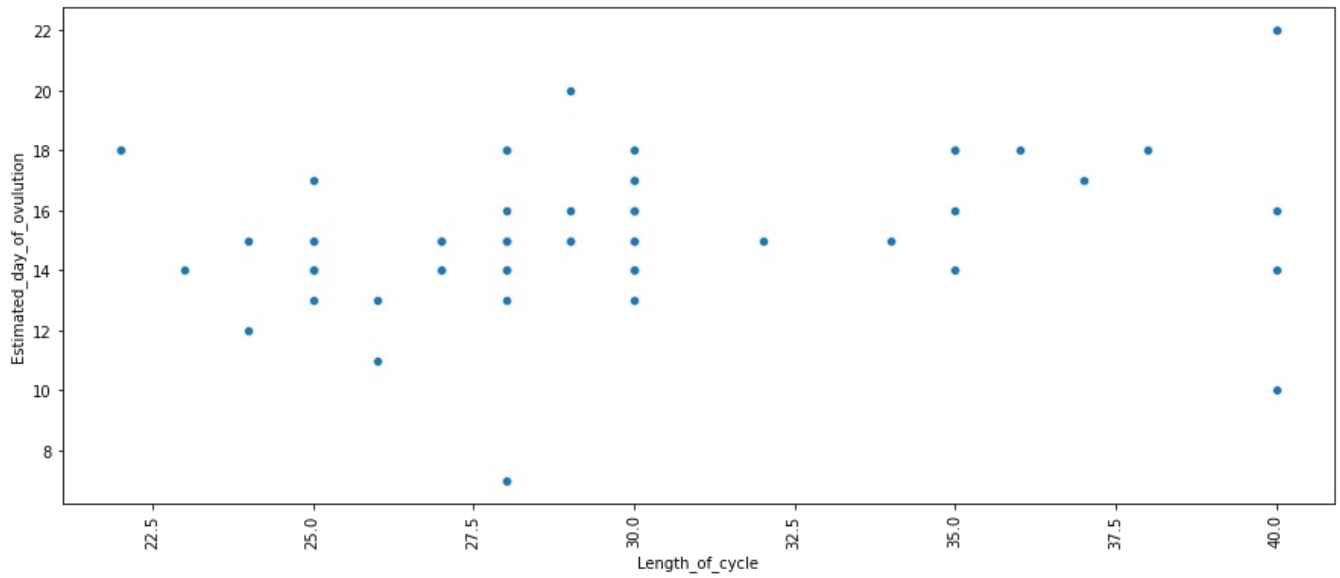

Length_of_Leutal_Phase
30
25
20
15
10
15
20
25
30
35
40
45
Mean_of_length_of_cycle

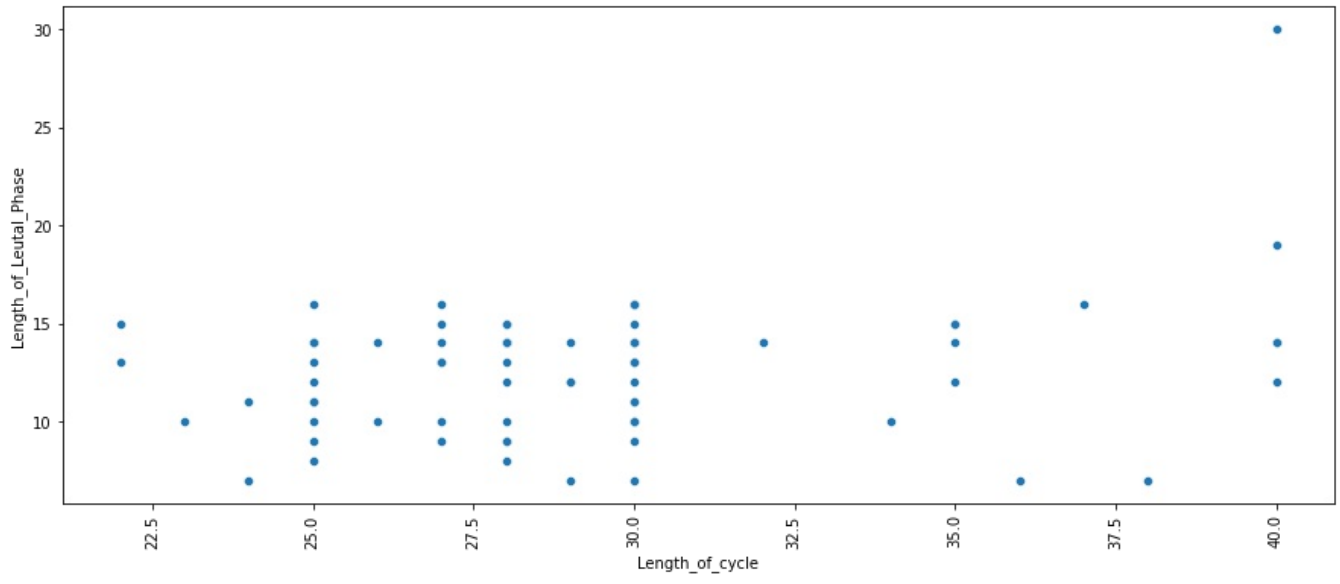

Height
68
67
66
65
64
63
62
61
60
15
20
25
30
35
40
45
Mean_of_length_of_cycle

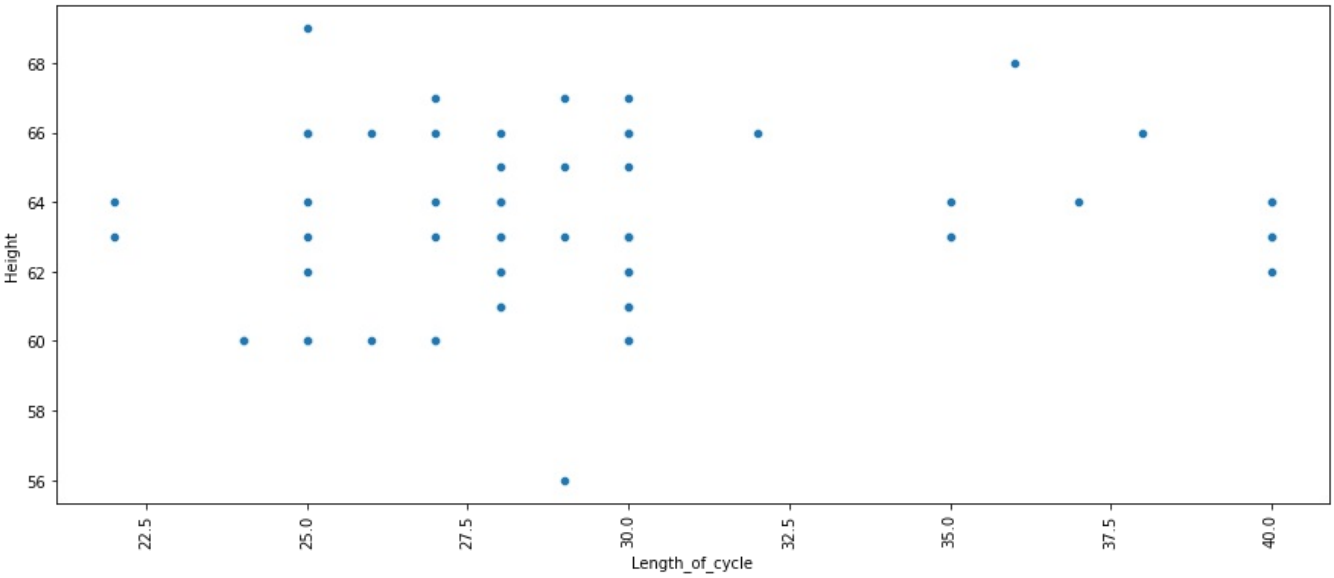

Weight
60
58
56
54
52
50
48
15
20
25
30
35
40
45
Mean_of_length_of_cycle

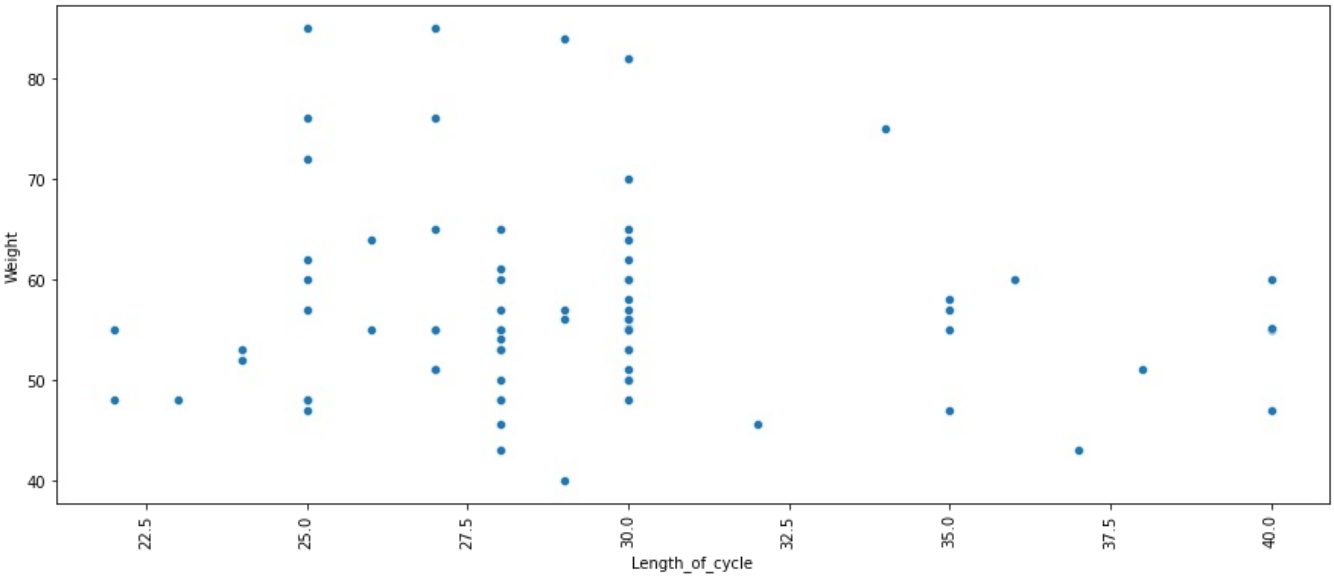


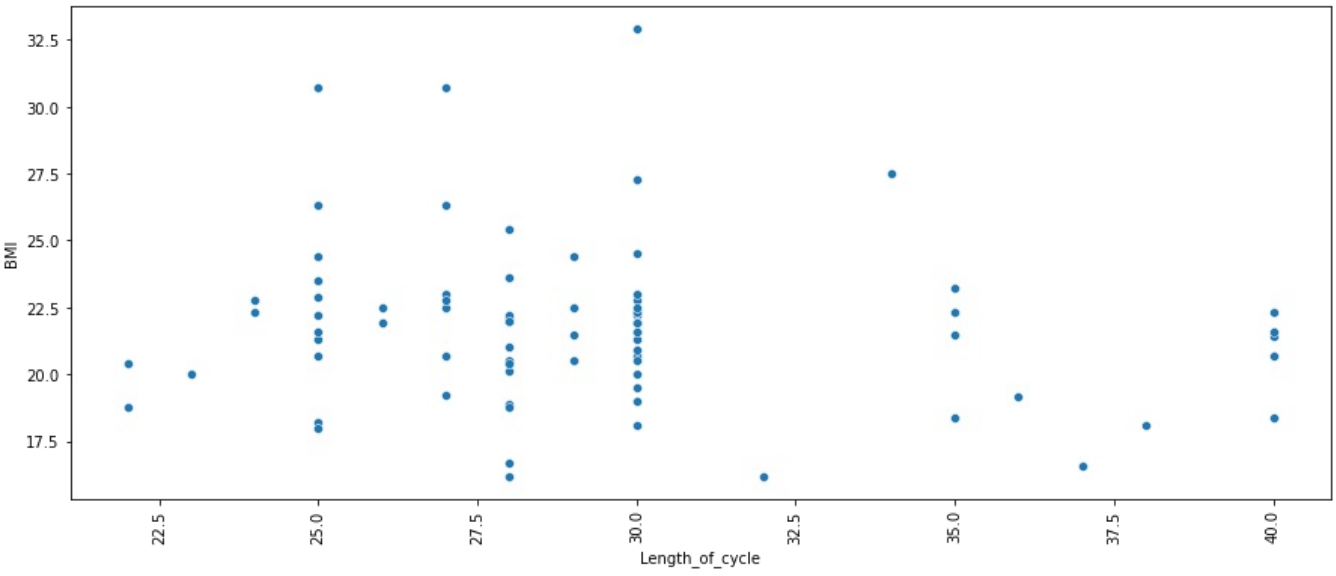
In [37]:
```
for i in continuous:
    for j in continuous:
        if i != j:
            plt.figure(figsize=(15,6))
            sns.scatterplot(x = i, y = j, data = df, ci = None, palette='hls')
            plt.xticks(rotation = 90)
            plt.show()
```

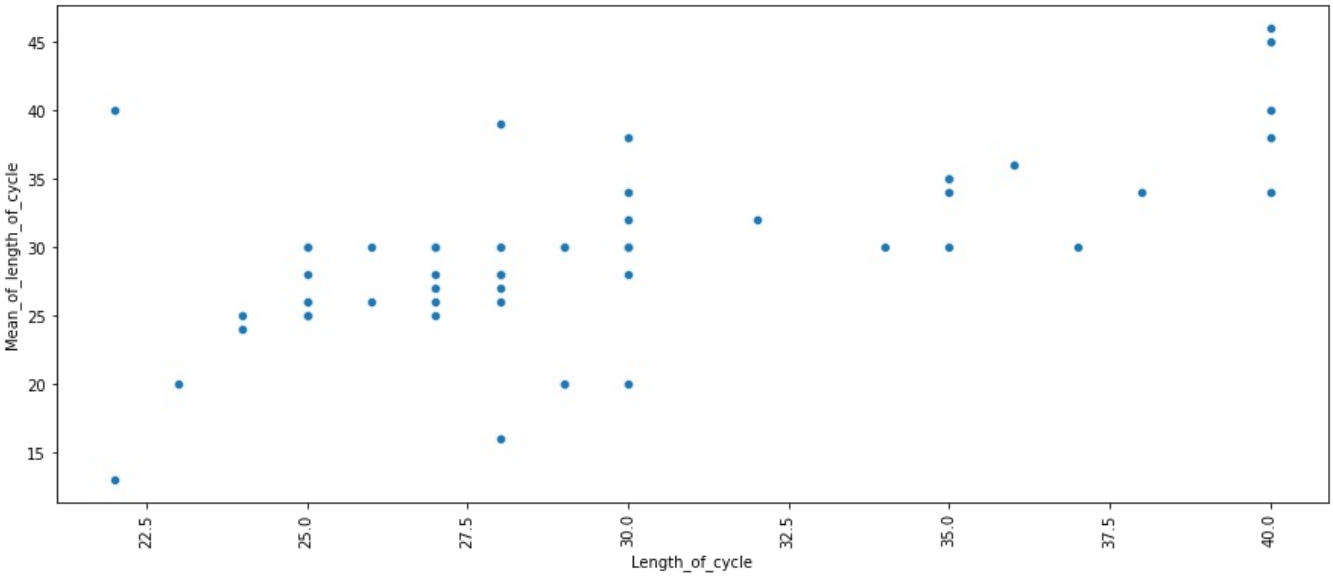


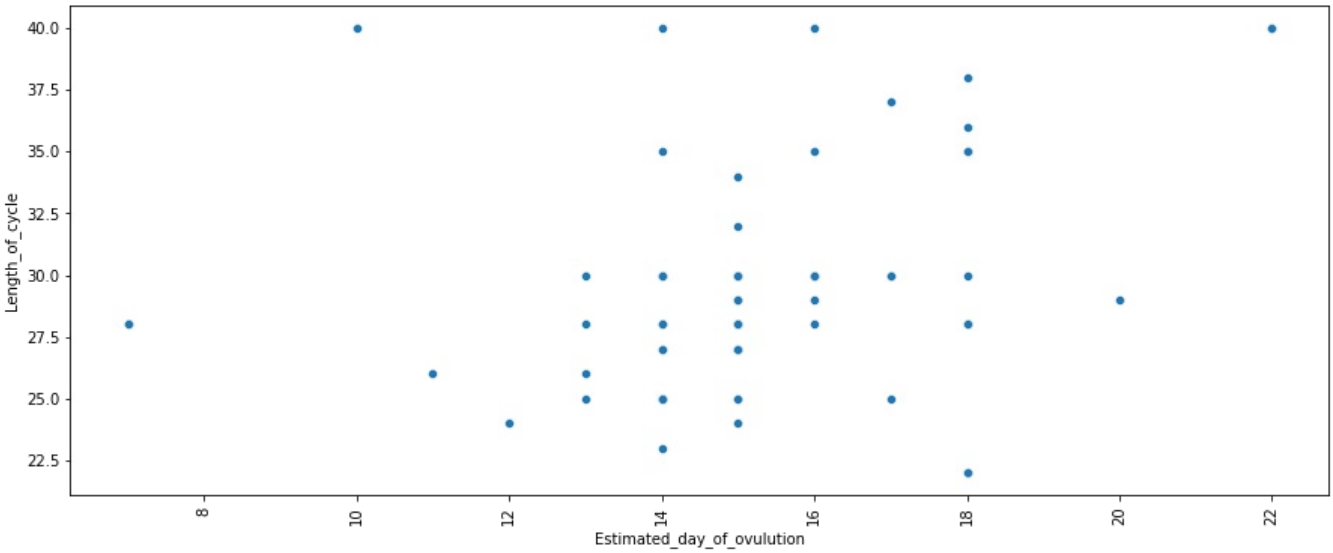


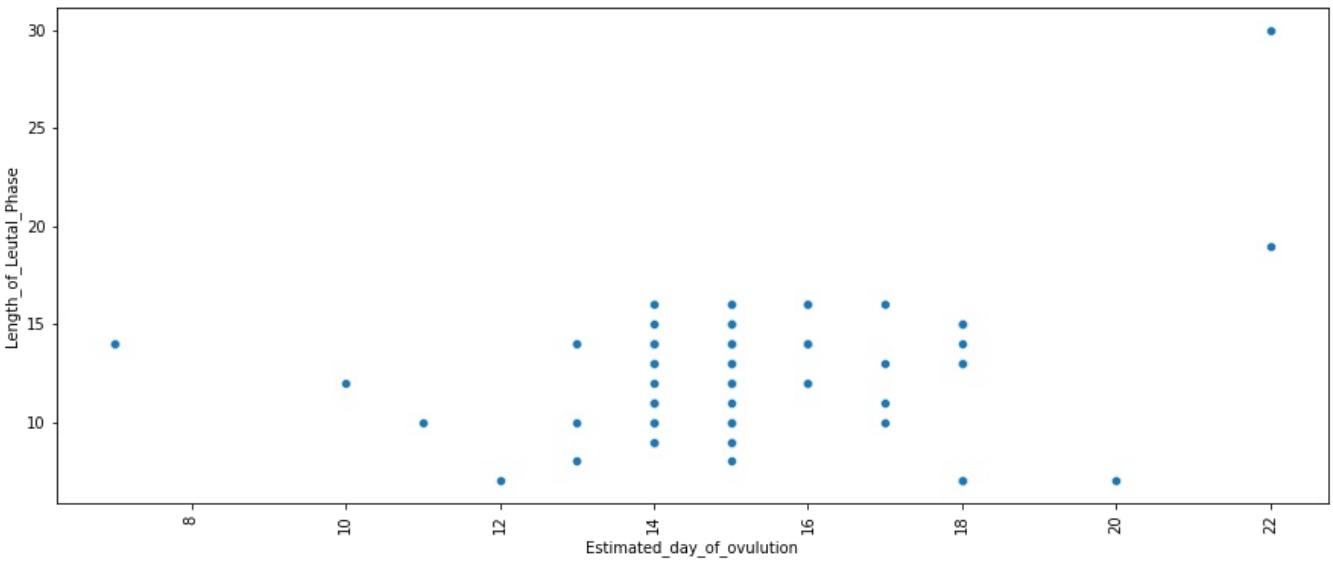

Height
68
66
64
62
60
58
56
22.5
25.0
27.5
30.0
32.5
35.0
37.5
40.0
Length_of_cycle

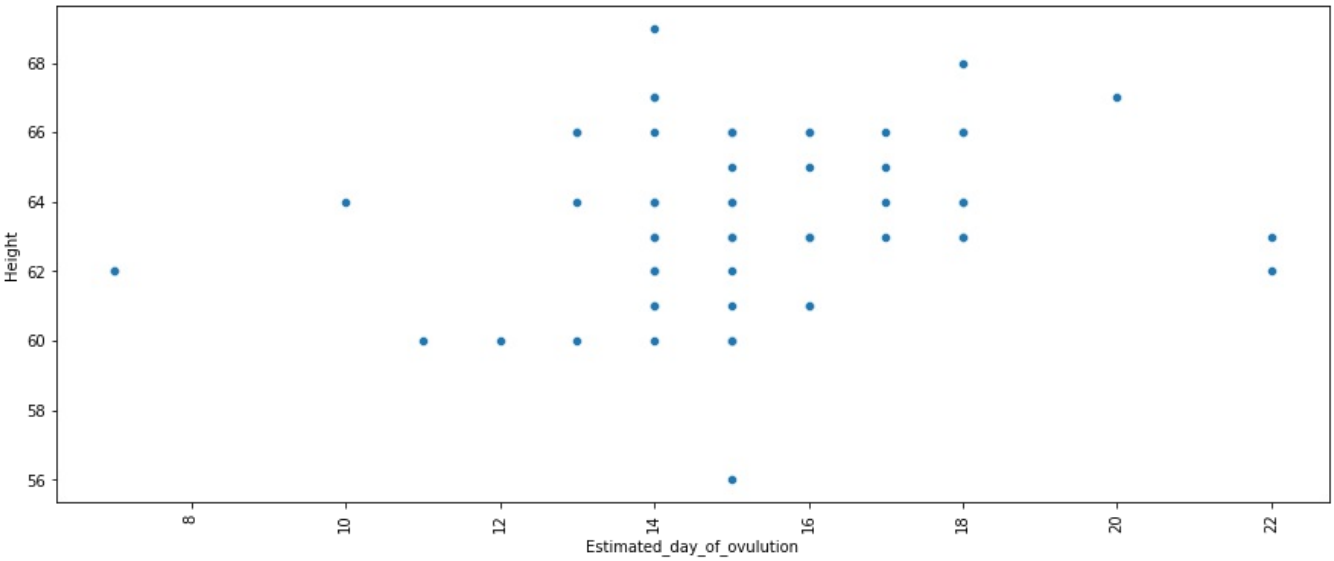

Weight
80
70
60
50
40
22.5
25.0
27.5
30.0
32.5
35.0
37.5
40.0
Length_of_cycle

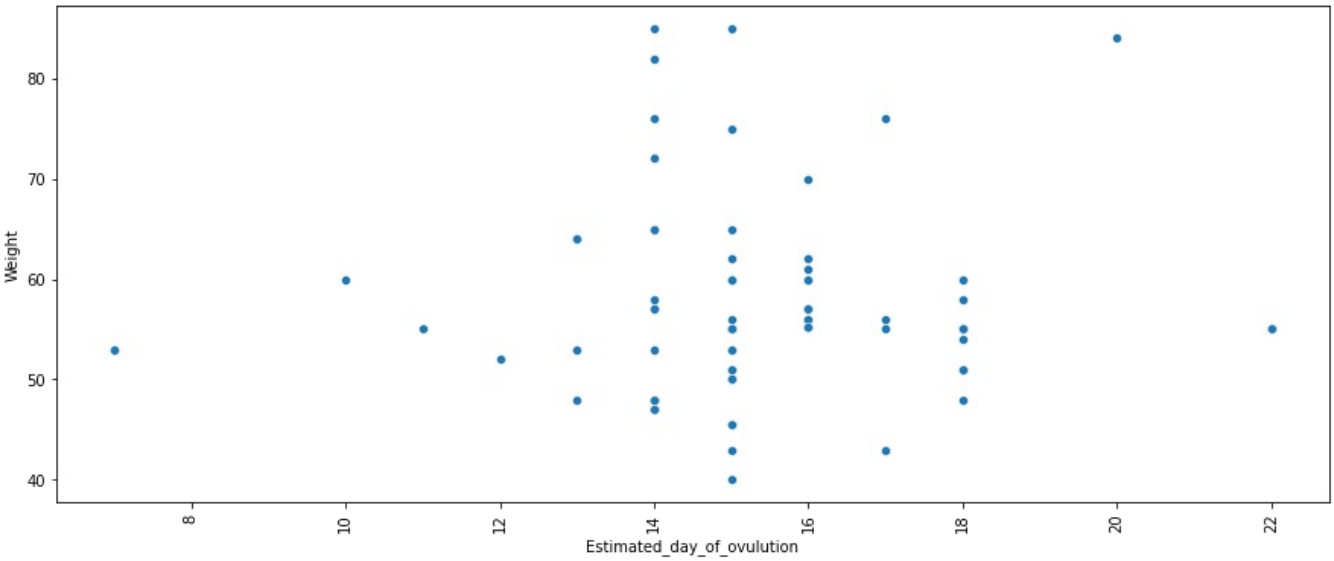

BMI
32.5
30.0
27.5
25.0
22.5
20.0
17.5
22.5
25.0
27.5
30.0
32.5
35.0
37.5
40.0
Length_of_cycle

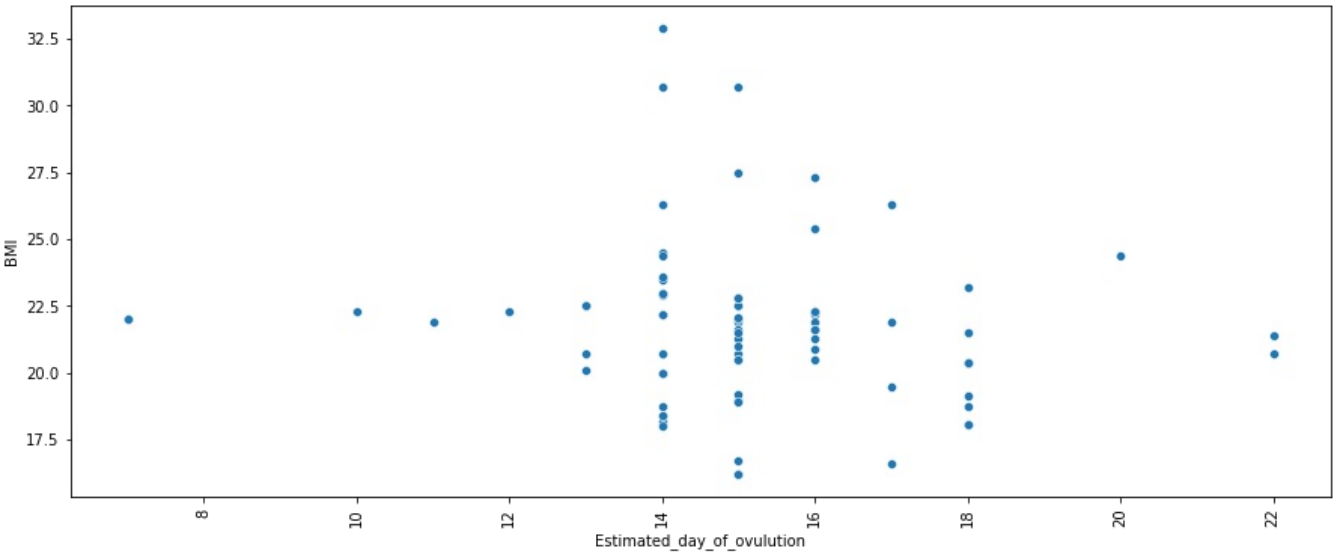

Mean_of_length_of_cycle
Length_of_cycle
45
40
35
30
25
20
15
22.5
25.0
27.5
30.0
32.5
35.0
37.5
40.0

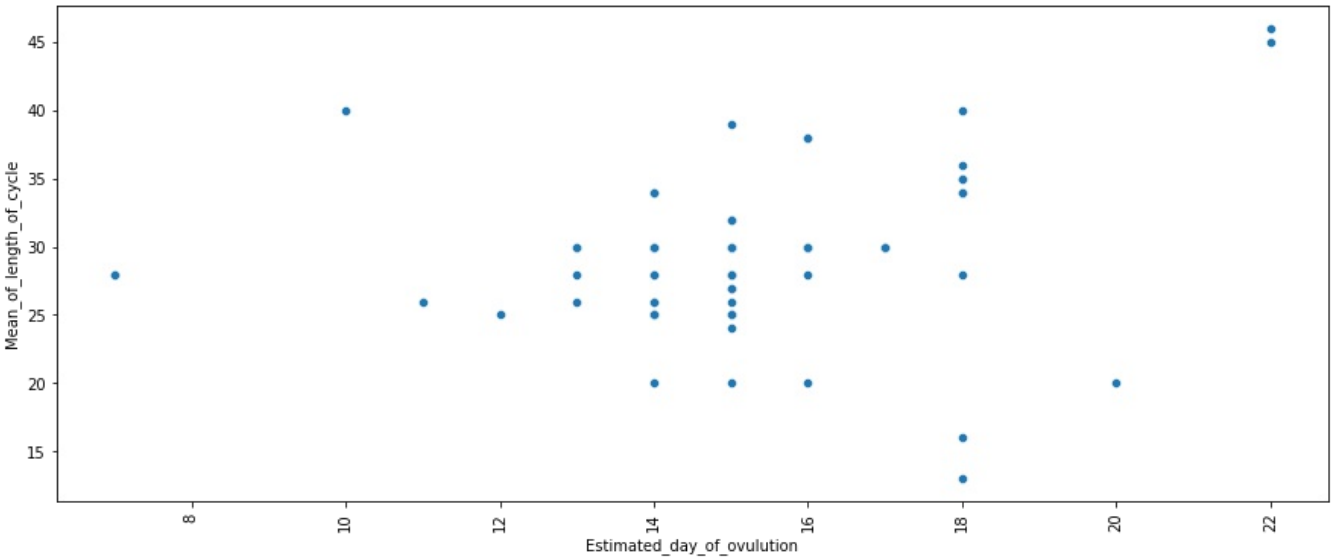

Length_of_cycle
Estimated_day_of_ovulution
40.0
37.5
35.0
32.5
30.0
27.5
25.0
22.5
8
10
12
14
16
18
20
22

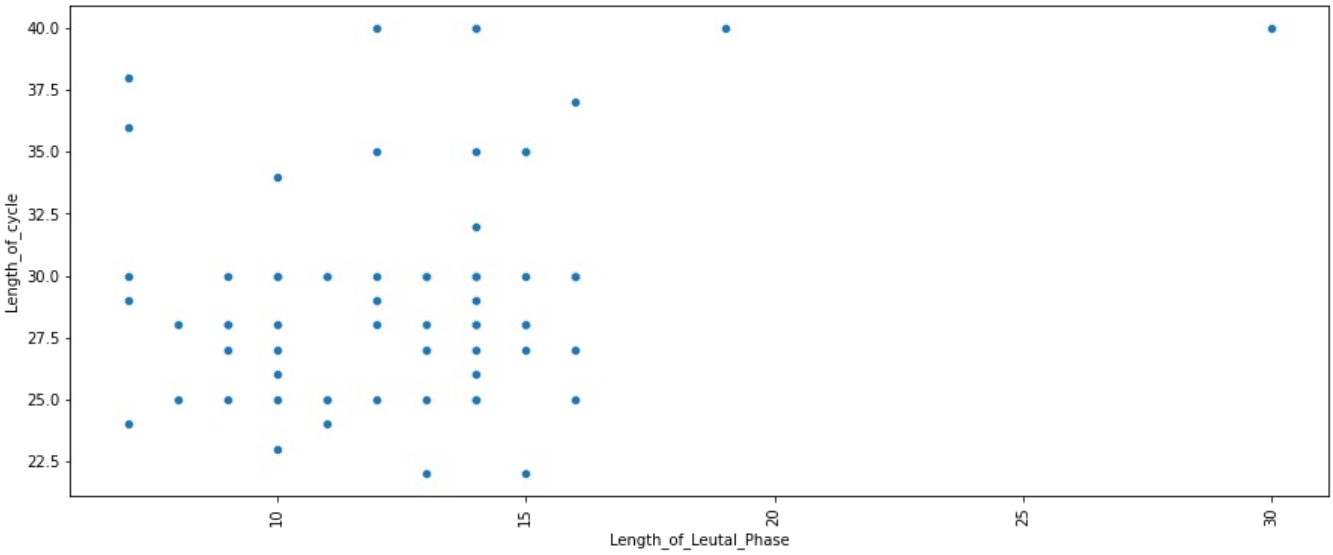

Length_of_Leutal_Phase
Estimated_day_of_ovulution
30
25
20
15
10
8
10
12
14
16
18
20
22

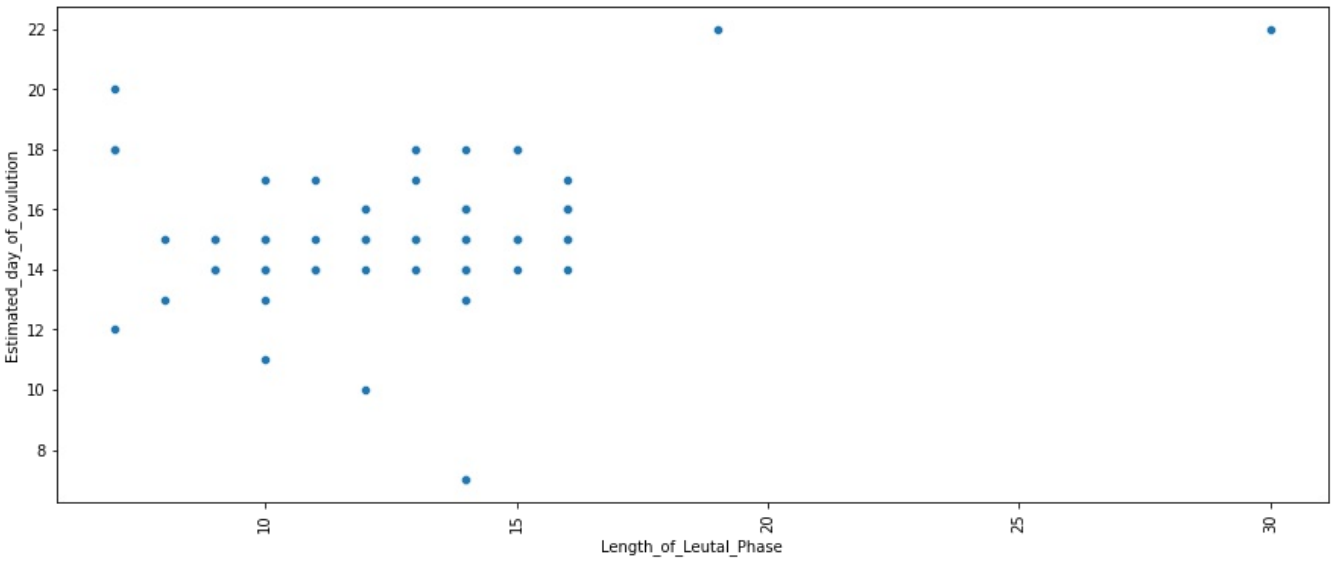

Height
68
66
64
62
60
58
56
8
10
12
14
16
18
20
22
Estimated_day_of_ovulution

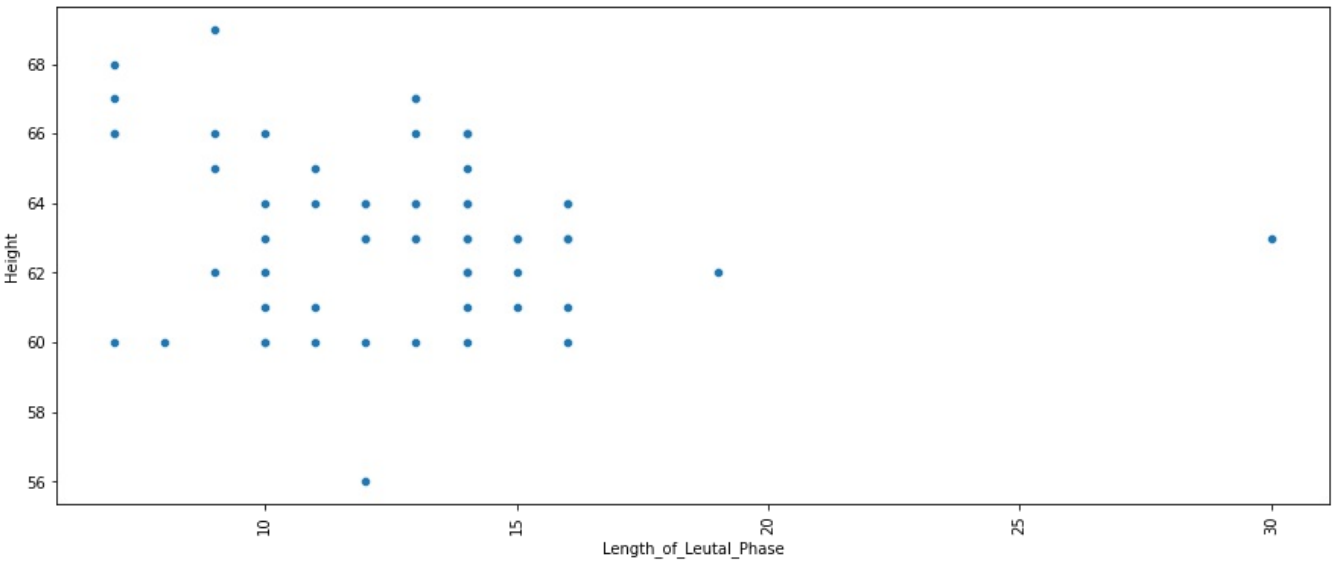

Weight
80
70
60
50
40
8
10
12
14
16
18
20
22
Estimated_day_of_ovulution

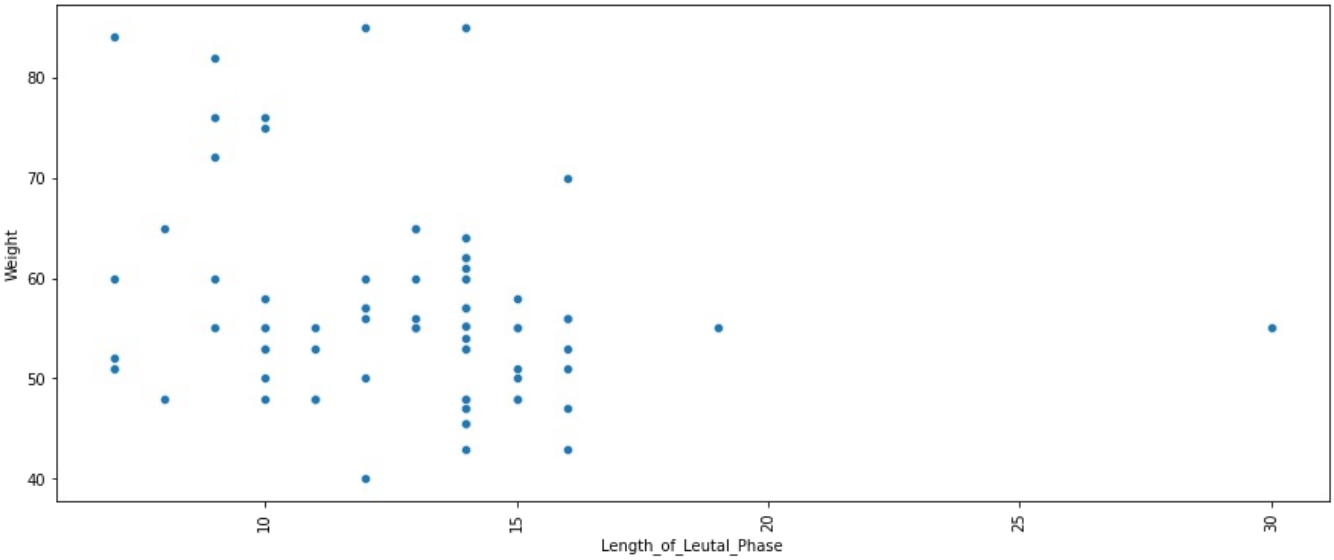

BMI
32.5
30.0
27.5
25.0
22.5
20.0
17.5
8
10
12
14
16
18
20
22
Estimated_day_of_ovulution

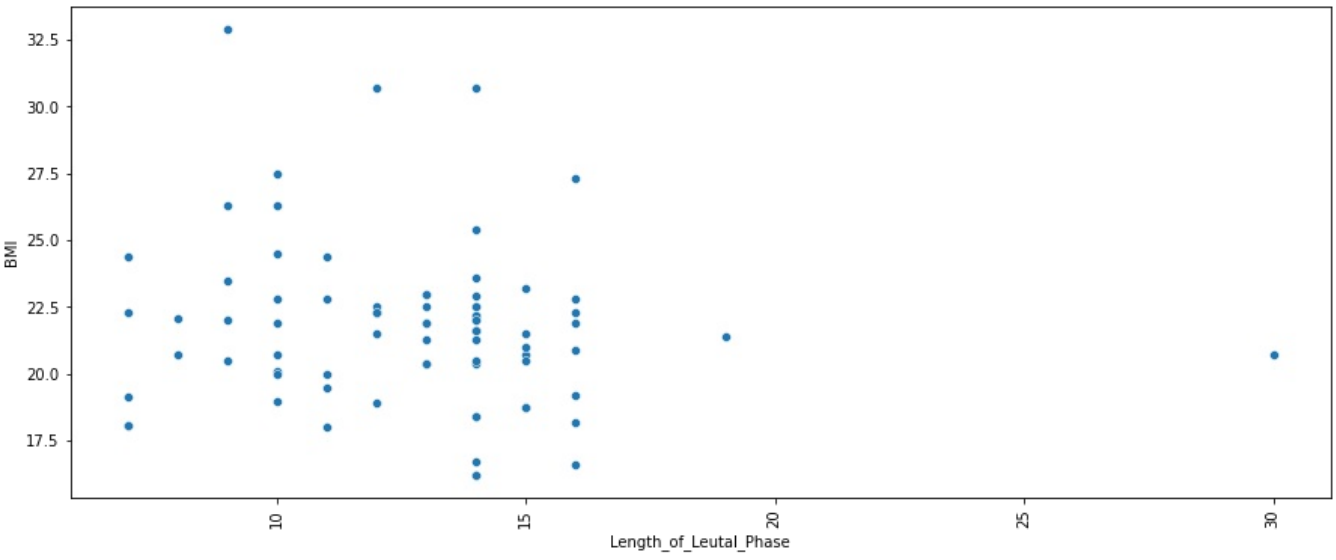

Mean_of_length_of_cycle
Estimated_day_of_ovulution

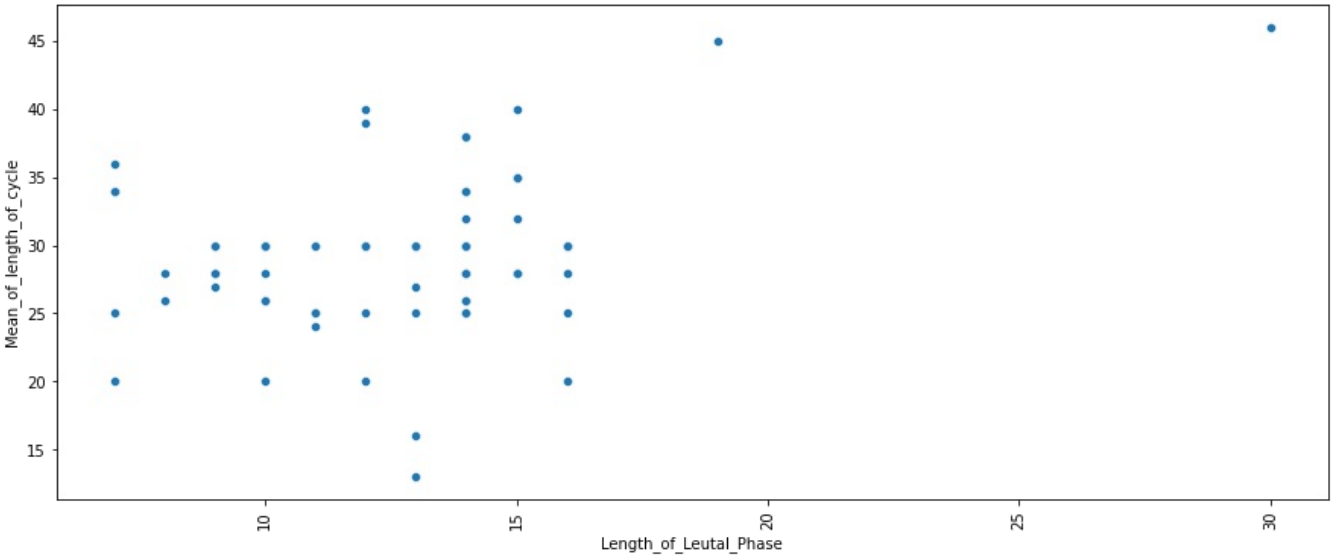

Length_of_cycle
Length_of_Leutal_Phase

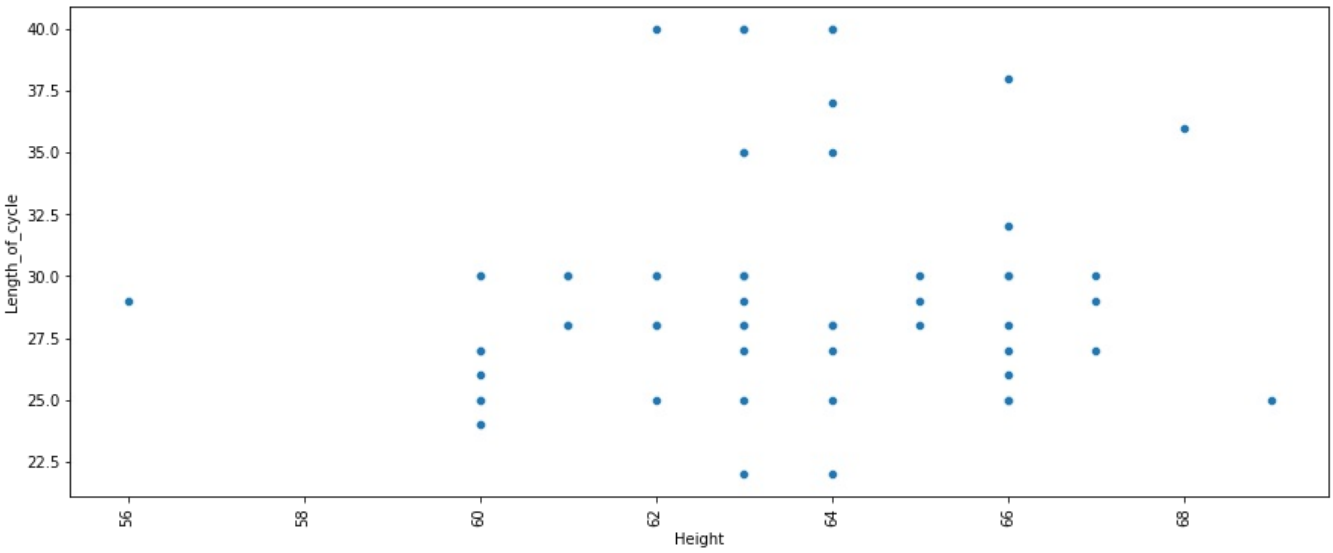

Estimated_day_of_ovulution
Length_of_Leutal_Phase

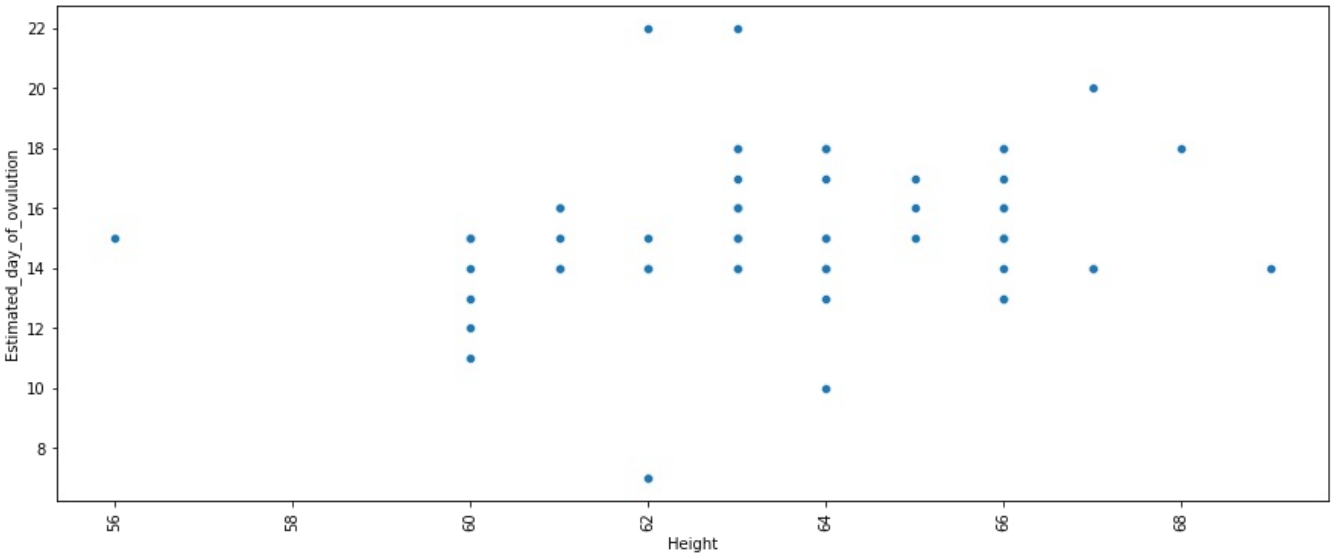

Height
68
66
64
62
60
58
56
10
15
20
25
30
Length_of_Leutal_Phase

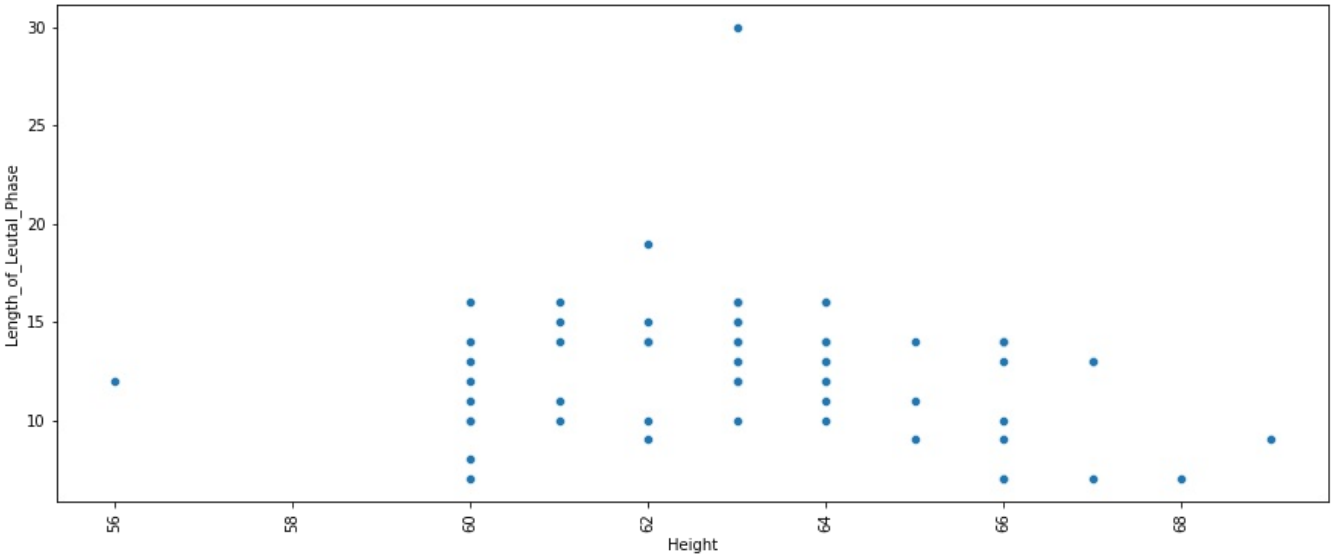

Weight
80
70
60
50
40
10
15
20
25
30
Length_of_Leutal_Phase

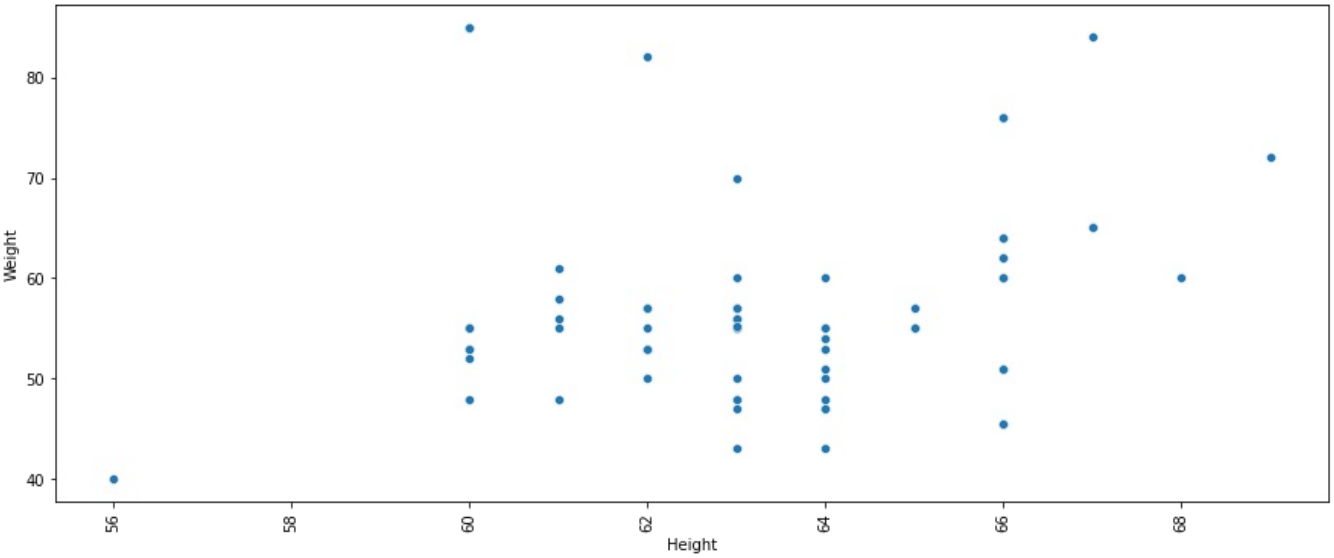

BMI
32.5
30.0
27.5
25.0
22.5
20.0
17.5
10
15
20
25
30
Length_of_Leutal_Phase

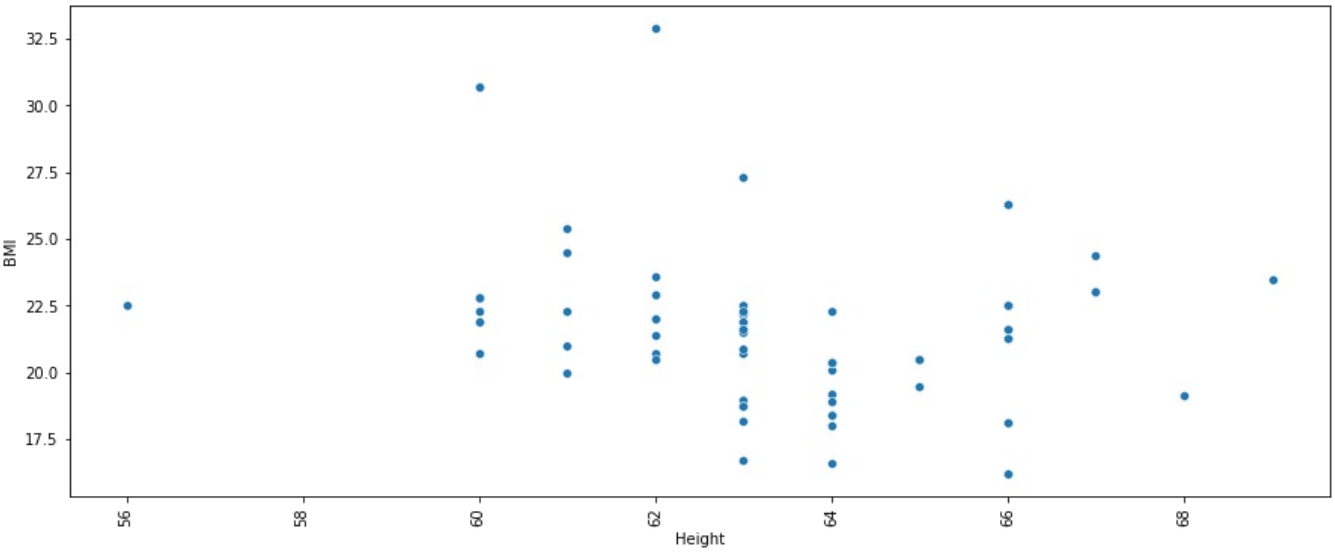

Mean_of_length_of_cycle
Length_of_Leutal_Phase

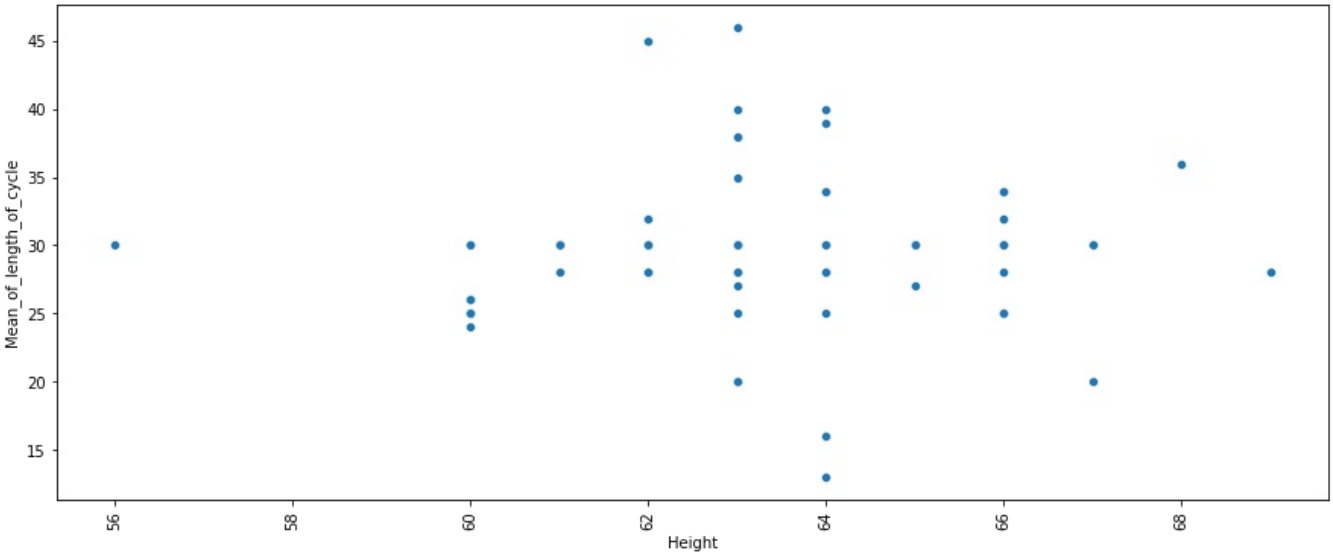

Length_of_cycle
Height

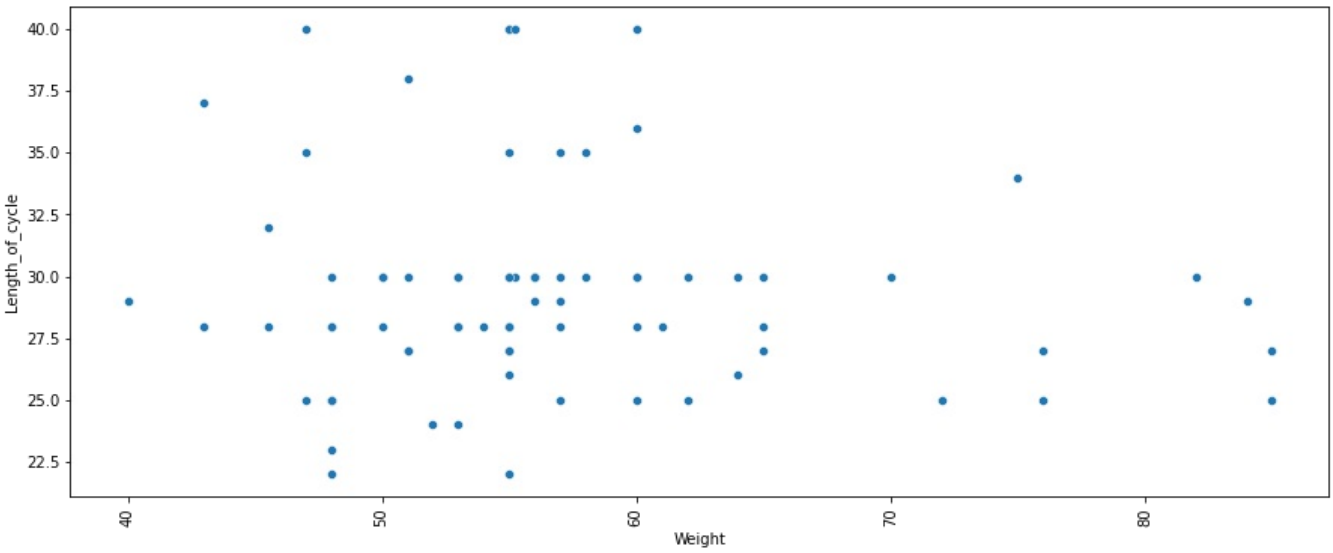

Estimated_day_of_ovulution
Height


Length_of_Leutal_Phase
Height


Weight
Height


BMI
Height


Mean_of_length_of_cycle
45
40
35
30
25
20
15
56
58
60
62
64
66
68
Height


Length_of_cycle
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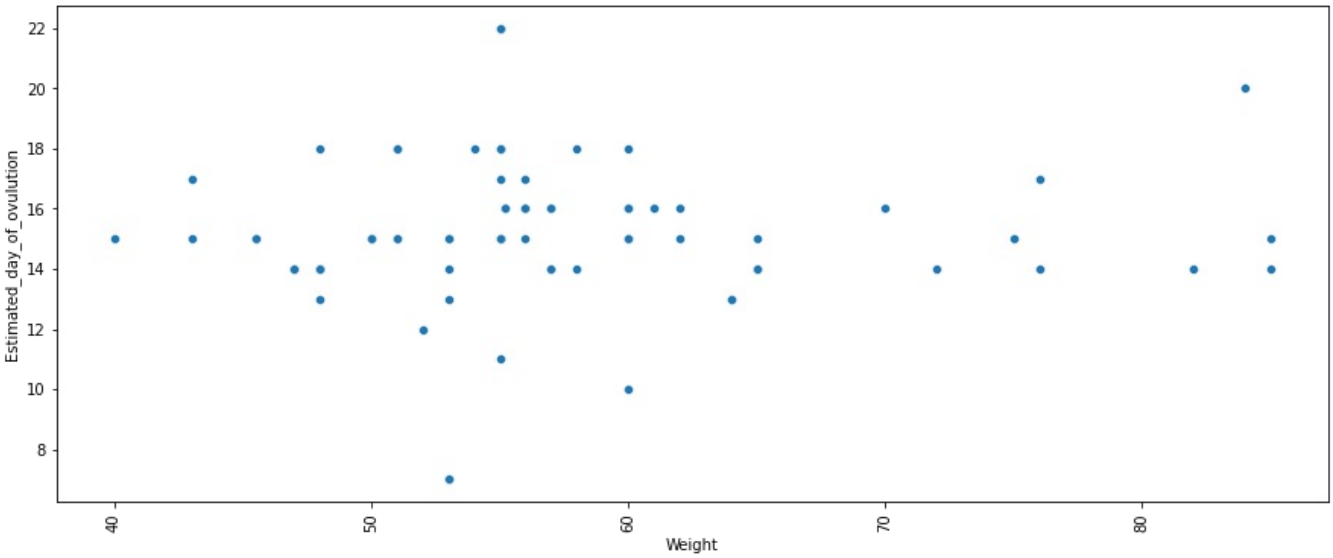
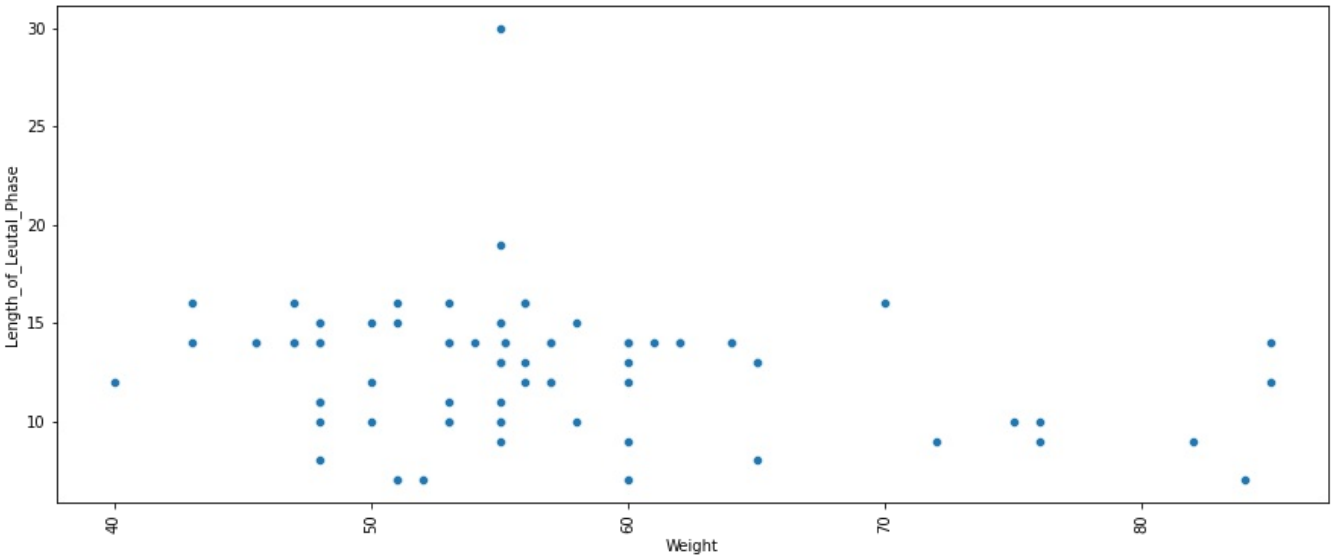
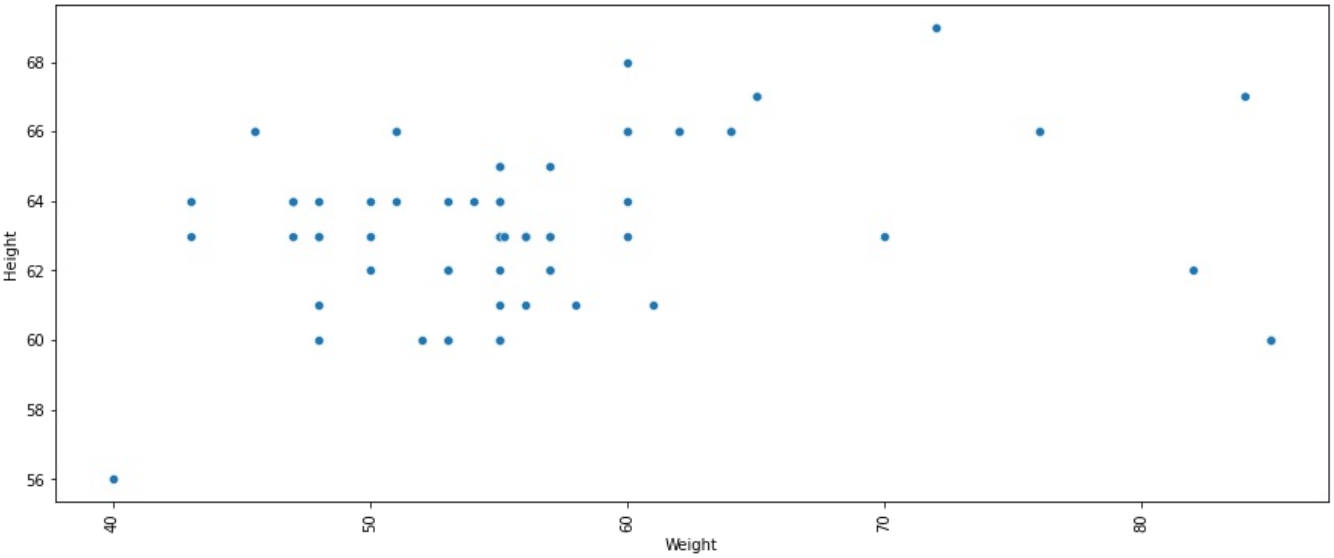
35.0
32.5
30.0
27.5
25.0
22.5
40
50
60
70
80
Weight


Estimated_day_of_ovulution
22
20
18
16
14
12
10
8
40
50
60
70
80
Weight


Length_of_Leutal_Phase
Weight
30
25
20
15
10
40
50
60
70
80


Height
Weight
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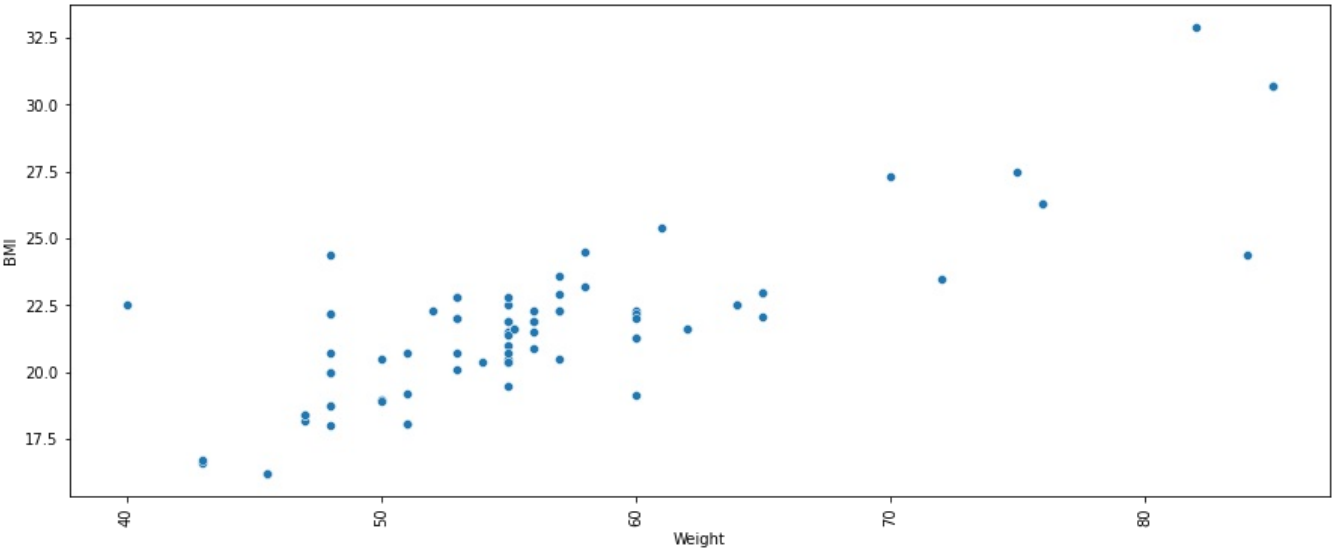
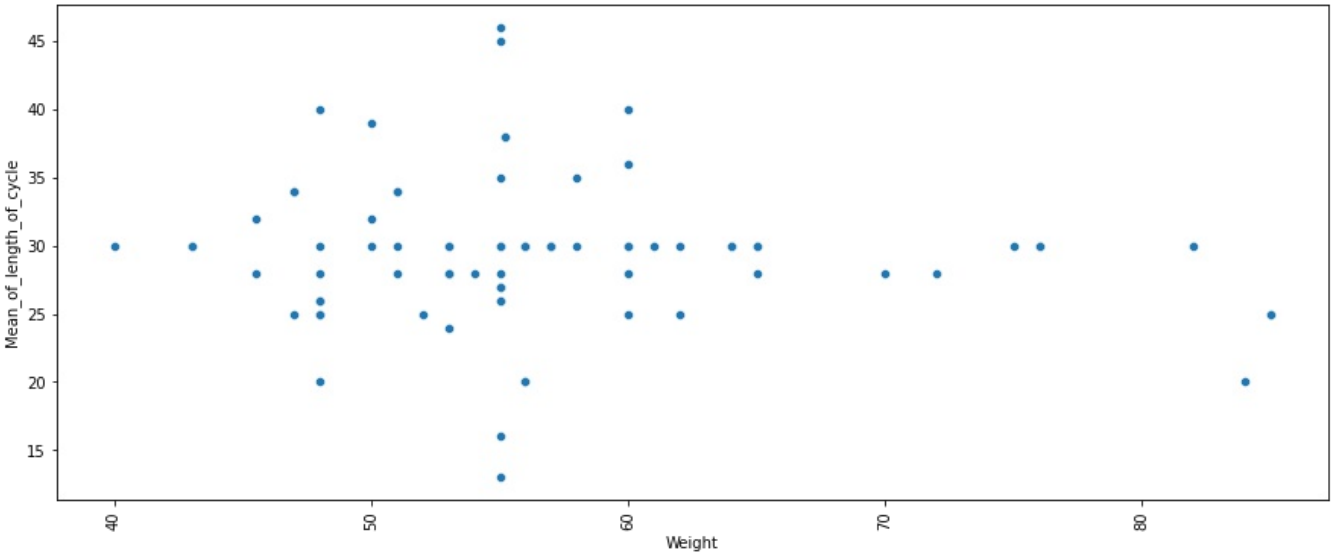
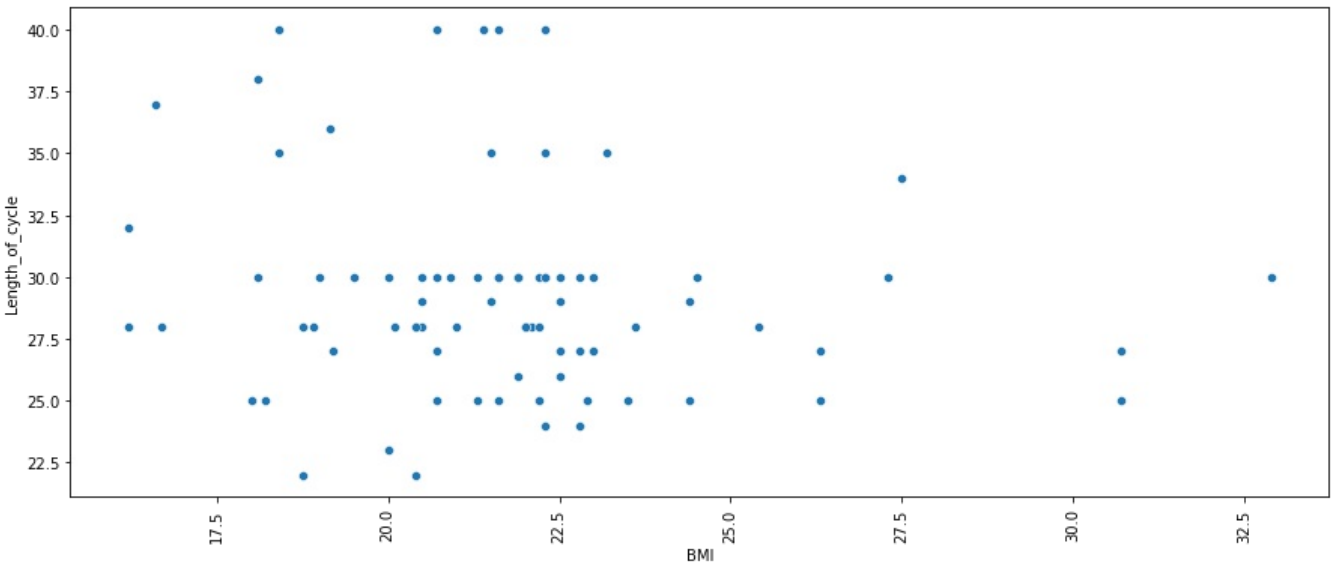
66
64
62
60
58
56
40
50
60
70
80


BMI
Weight
32.5
30.0
27.5
25.0
22.5
20.0
17.5
40
50
60
70
80


Mean_of_length_of_cycle
45
40
35
30
25
20
15
40
50
60
70
80
Weight


Length_of_cycle
40.0
37.5
35.0
32.5
30.0
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25.0
22.5
17.5
20.0
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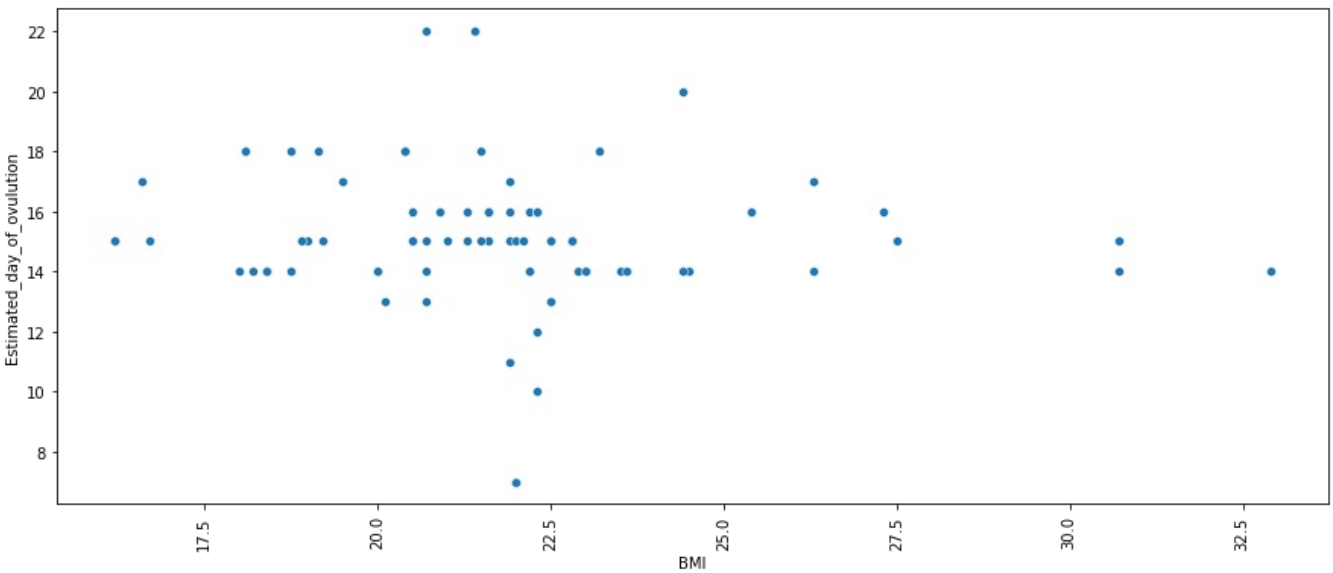
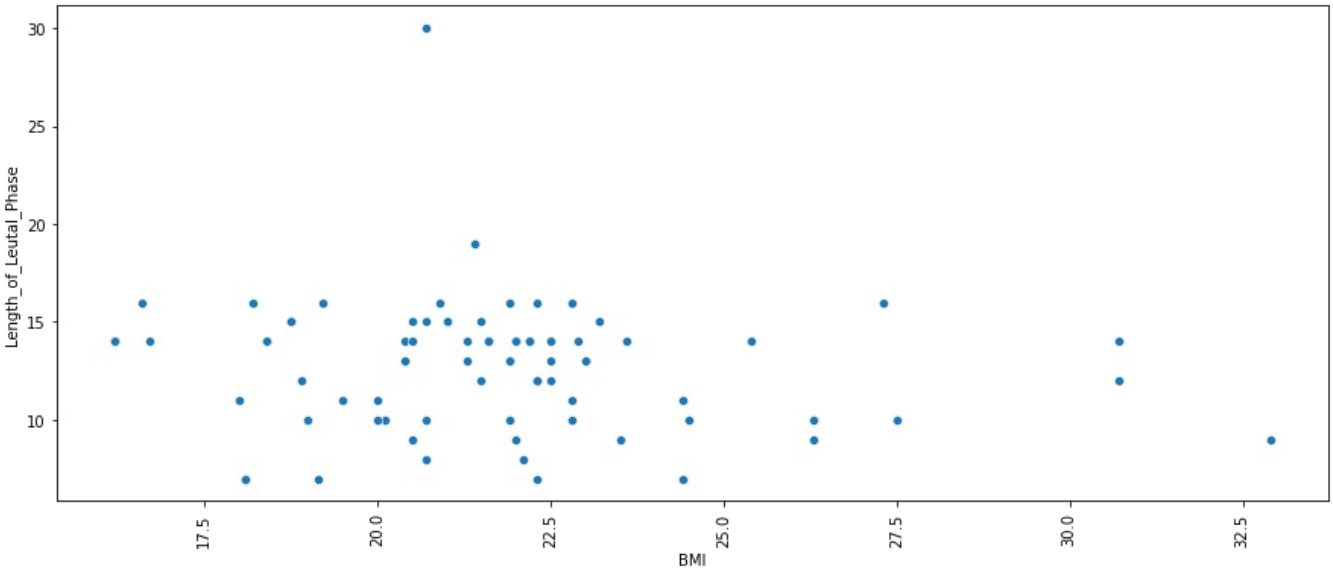
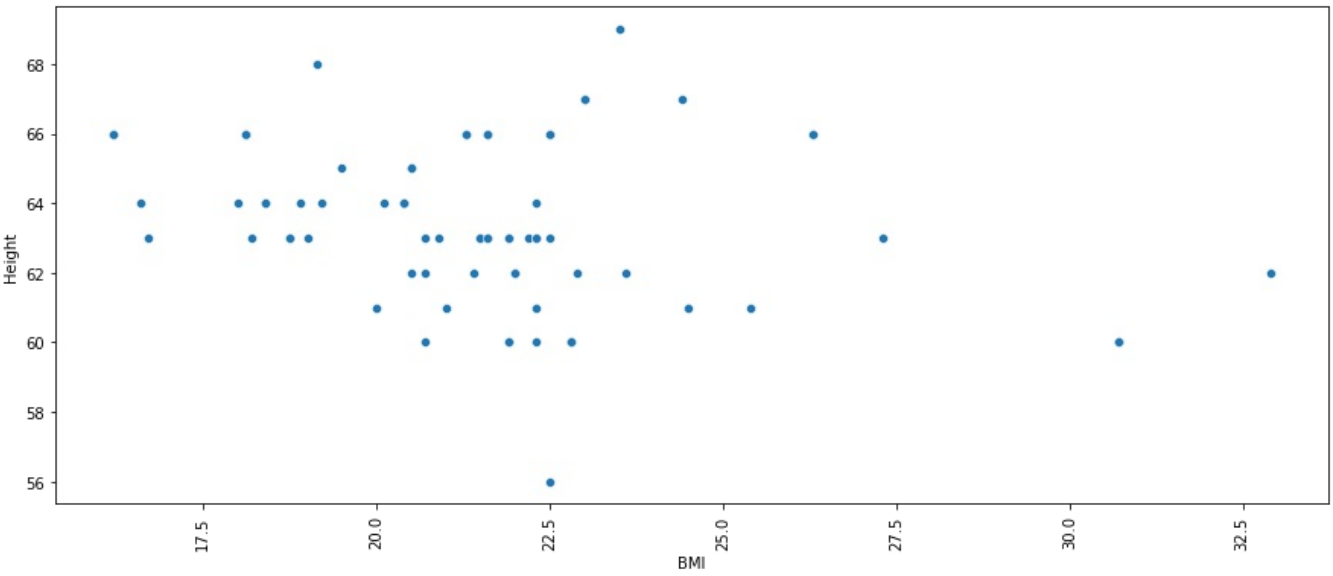
25.0
27.5
30.0
32.5
BMI


Estimated_day_of_ovulution
22
20
18
16
14
12
10
8
17.5
20.0
22.5
25.0
27.5
30.0
32.5
BMI


Length_of_Leutal_Phase
30
25
20
15
10
17.5
20.0
22.5
25.0
27.5
30.0
32.5
BMI


Height
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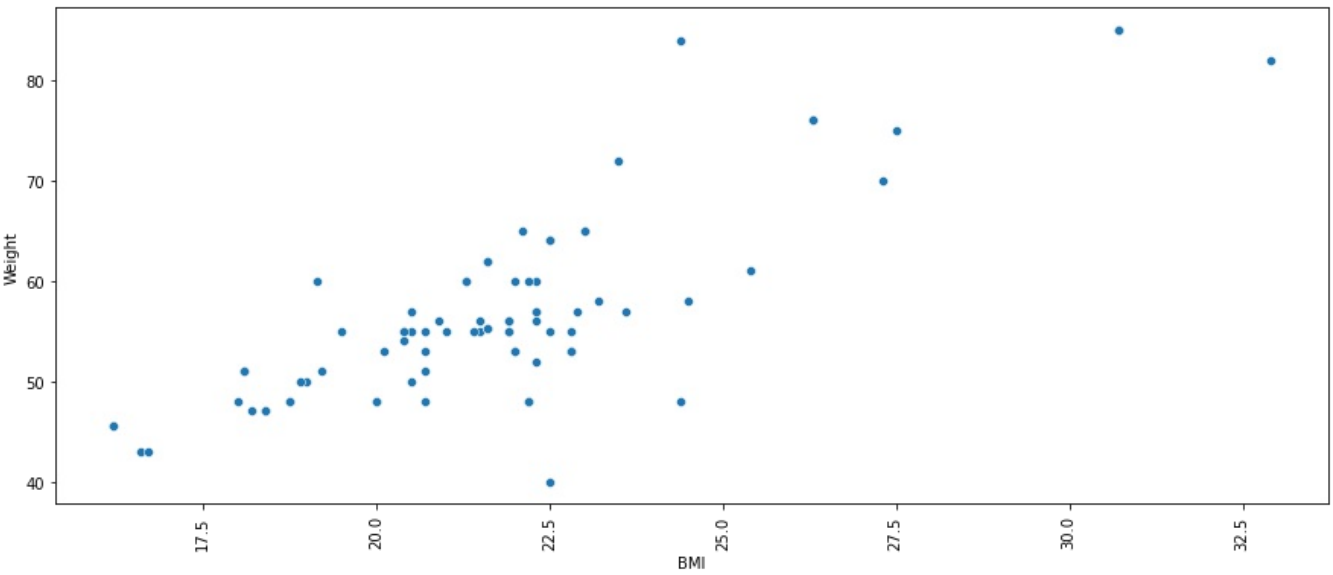
66
64
62
60
58
56
17.5
20.0
22.5
25.0
27.5
30.0
32.5
BMI


Weight
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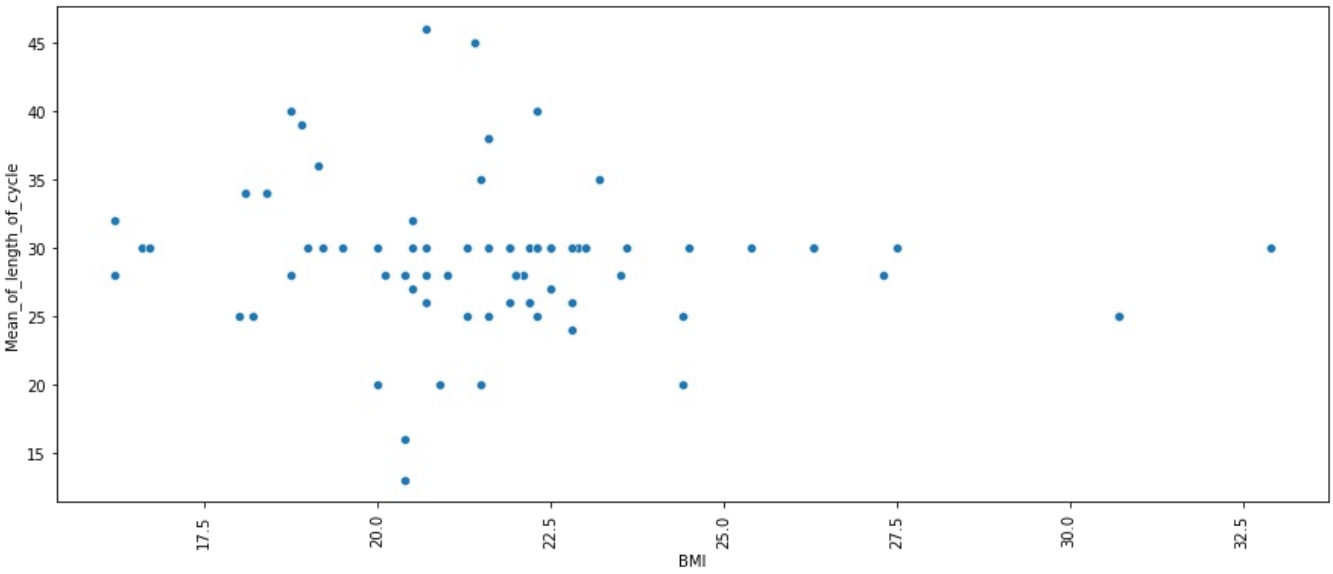
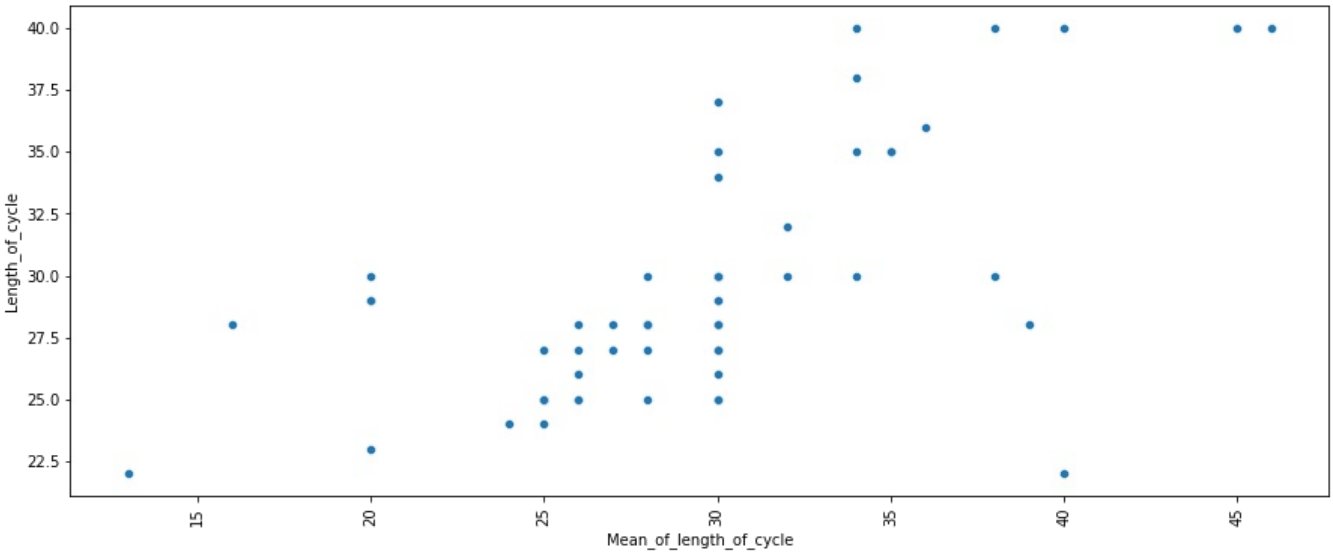
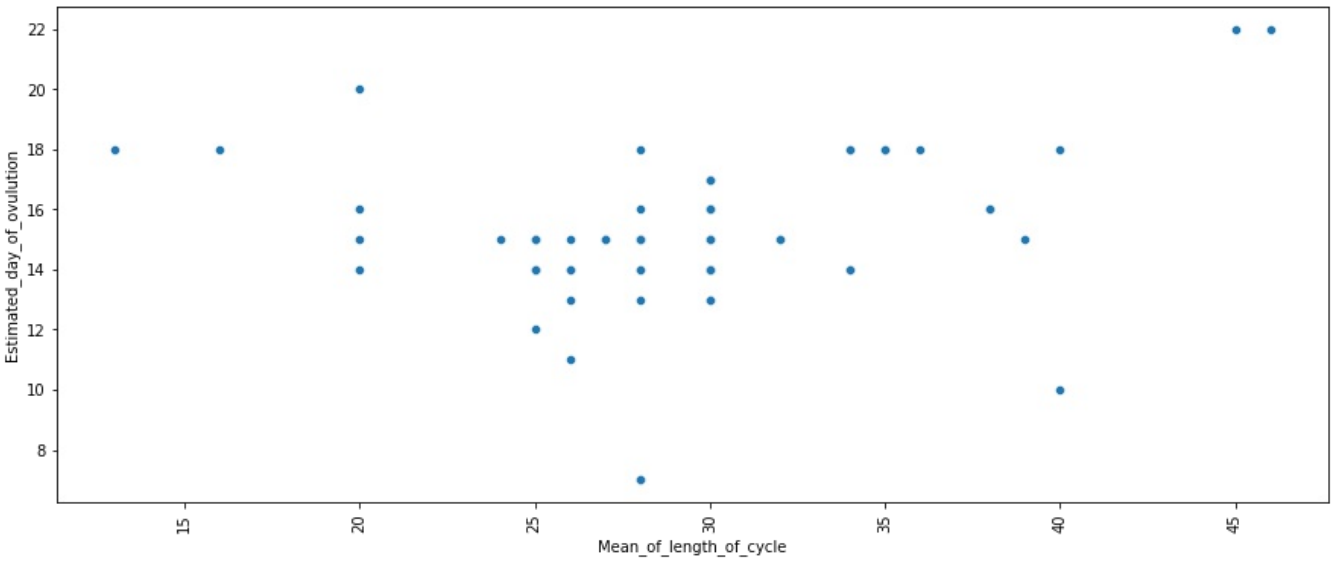
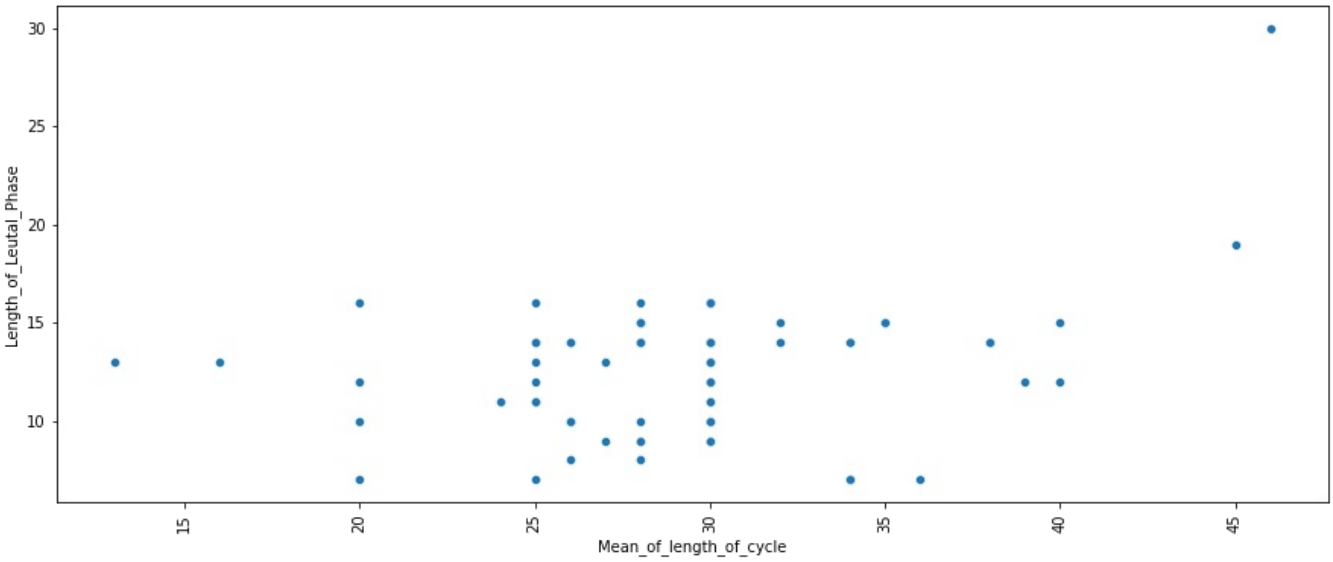
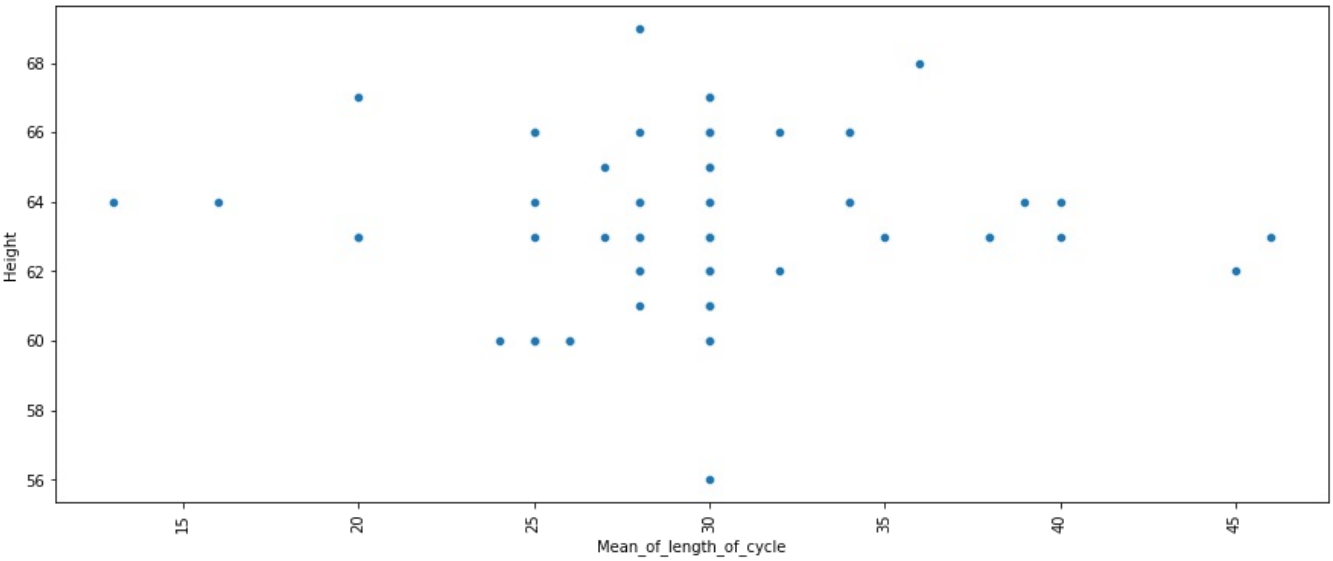
70
60
50
40
17.5
20.0
22.5
25.0
27.5
30.0
32.5
BMI

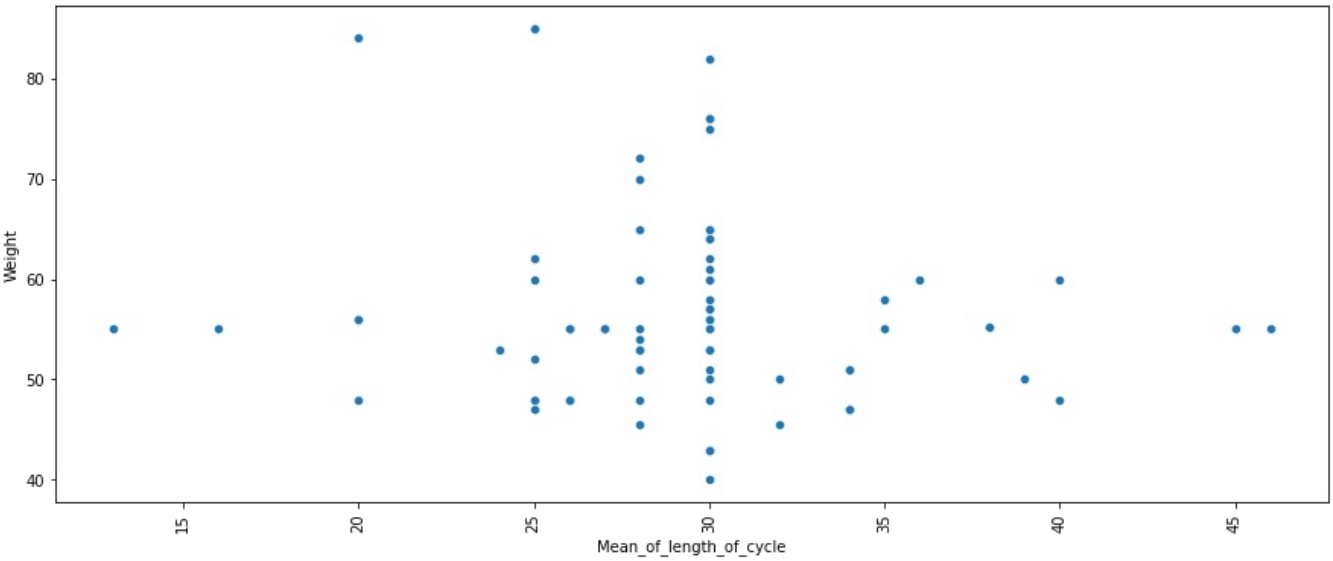

Mean_of_length_of_cycle
BMI

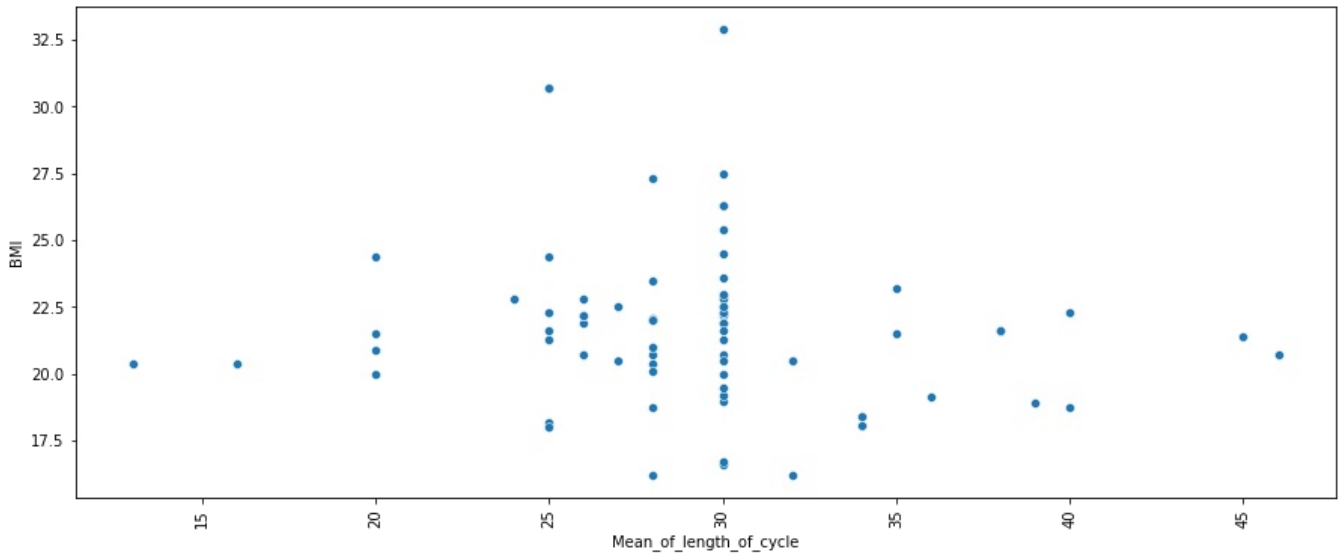

Length_of_cycle
Mean_of_length_of_cycle


Estimated_day_of_ovulution
Mean_of_length_of_cycle

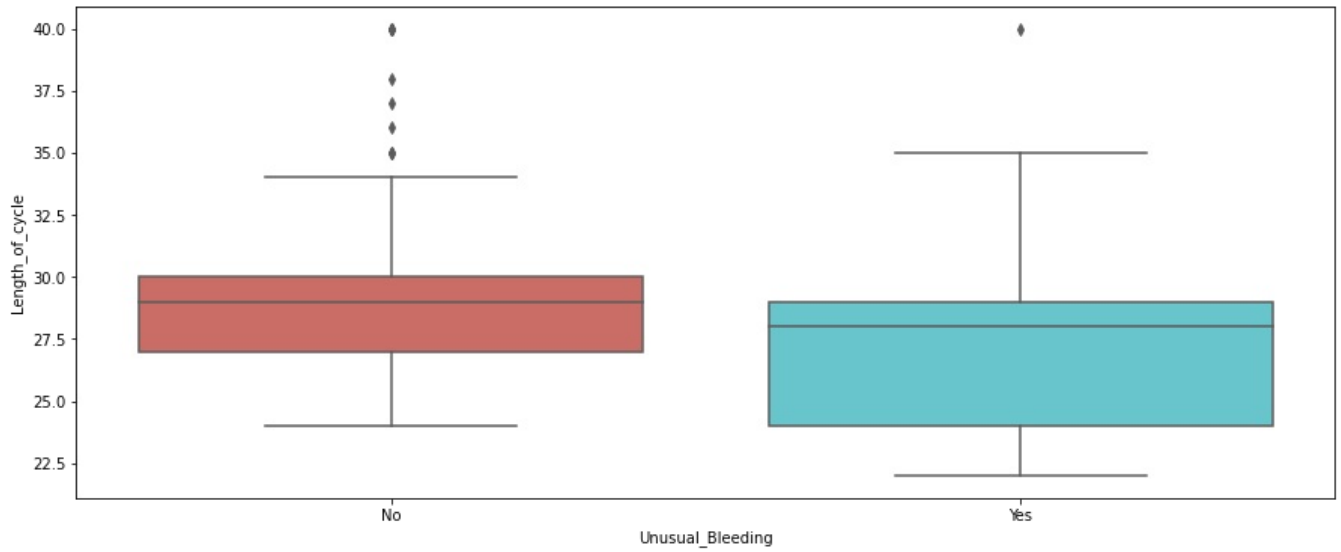

Length_of_Leutal_Phase
Mean_of_length_of_cycle

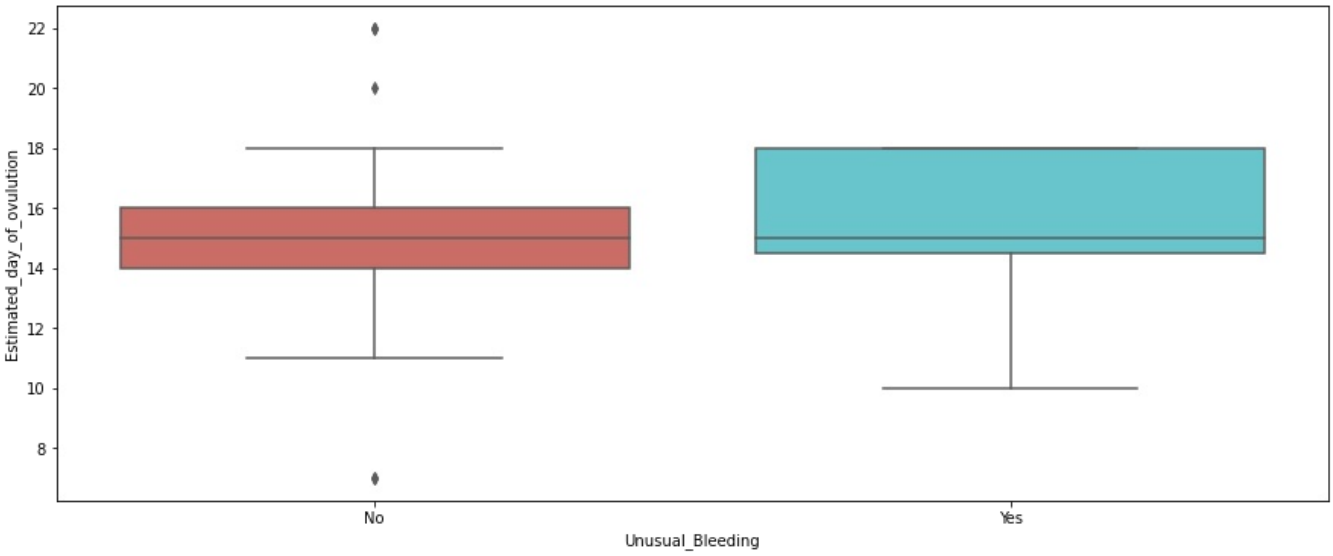

Height
Mean_of_length_of_cycle

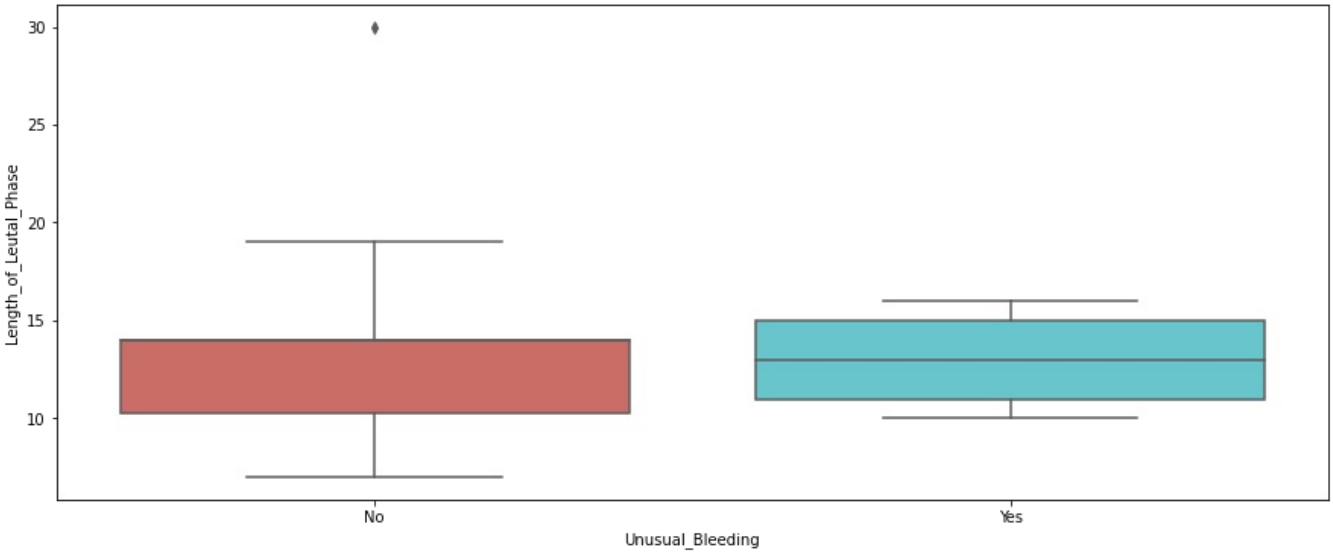

Weight
Mean_of_length_of_cycle

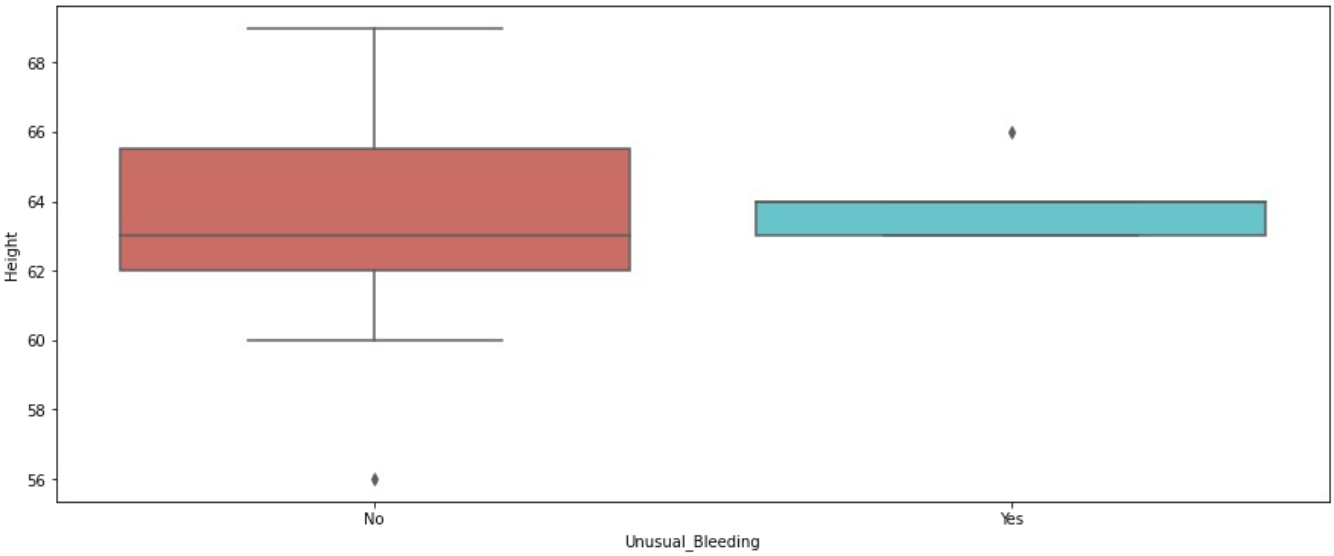


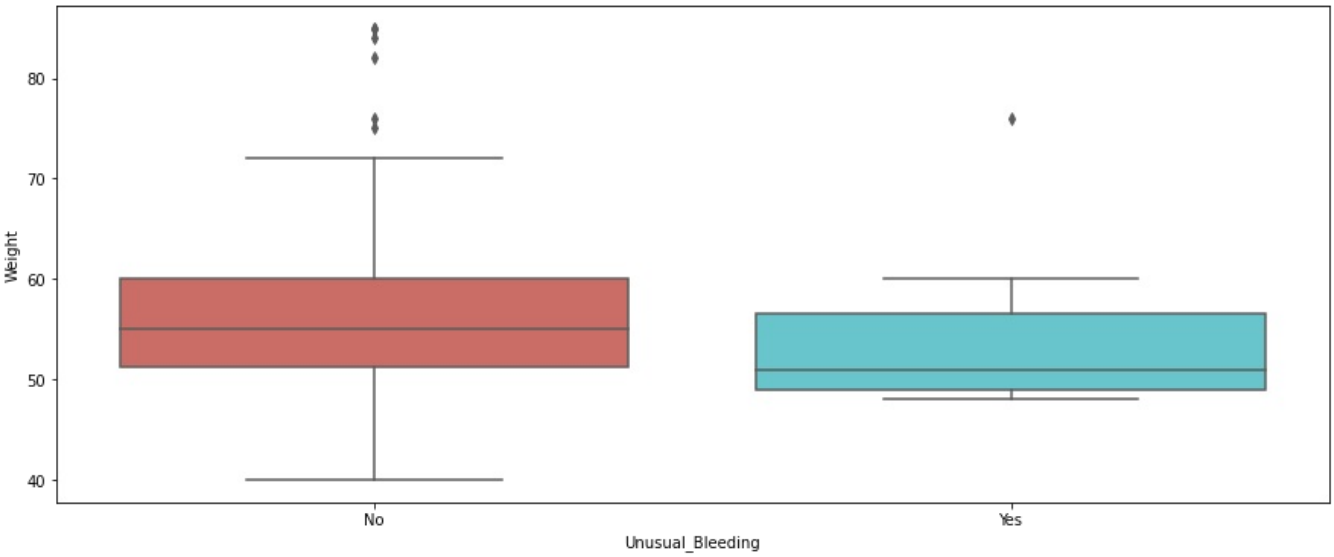
In [38]:
```
for i in categorical:
    for j in continuous:
        plt.figure(figsize=(15,6))
        sns.boxplot(x = df[i], y = df[j], data = df, palette = 'hls')
        plt.show()
```

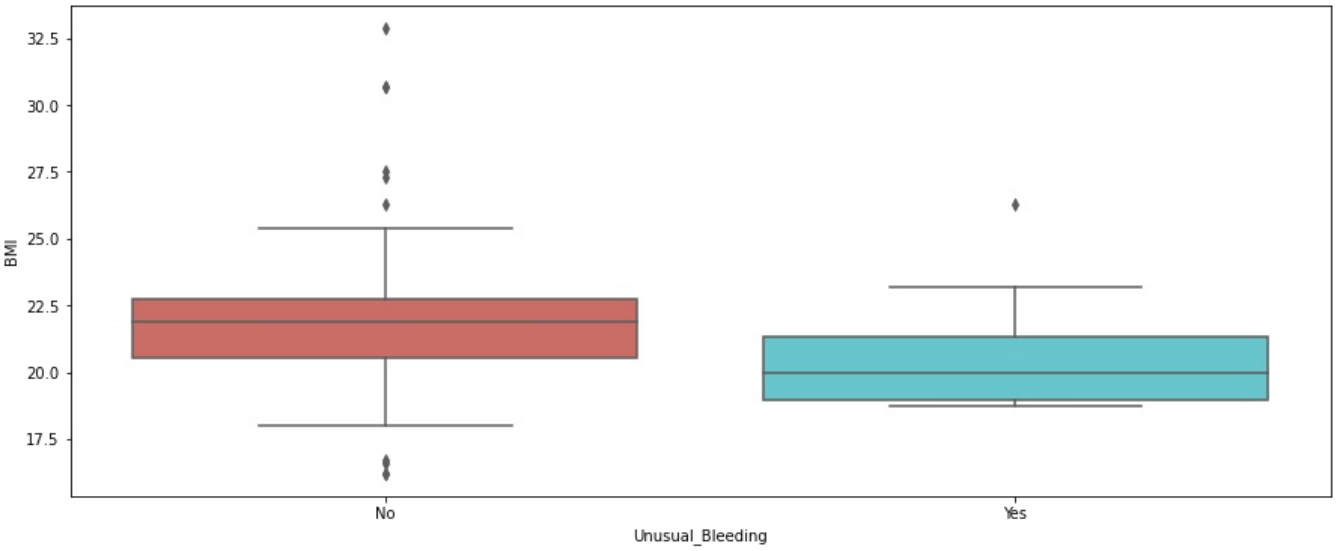


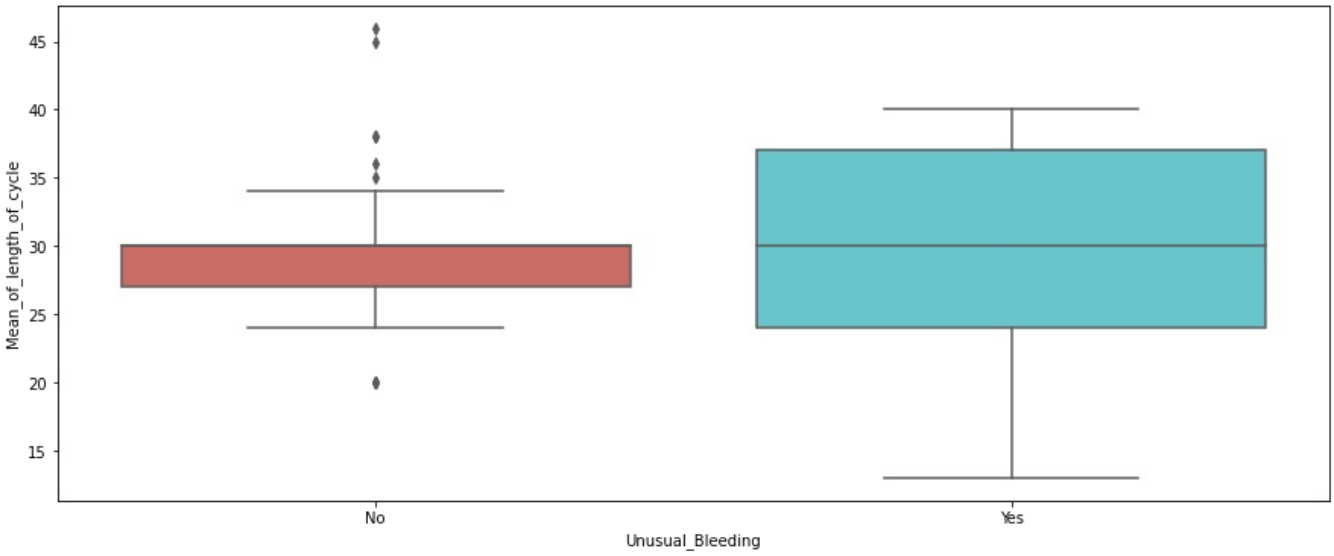

Estimated_day_of_ovulution
22
20
18
16
14
12
10
8
No
Yes
Unusual_Bleeding

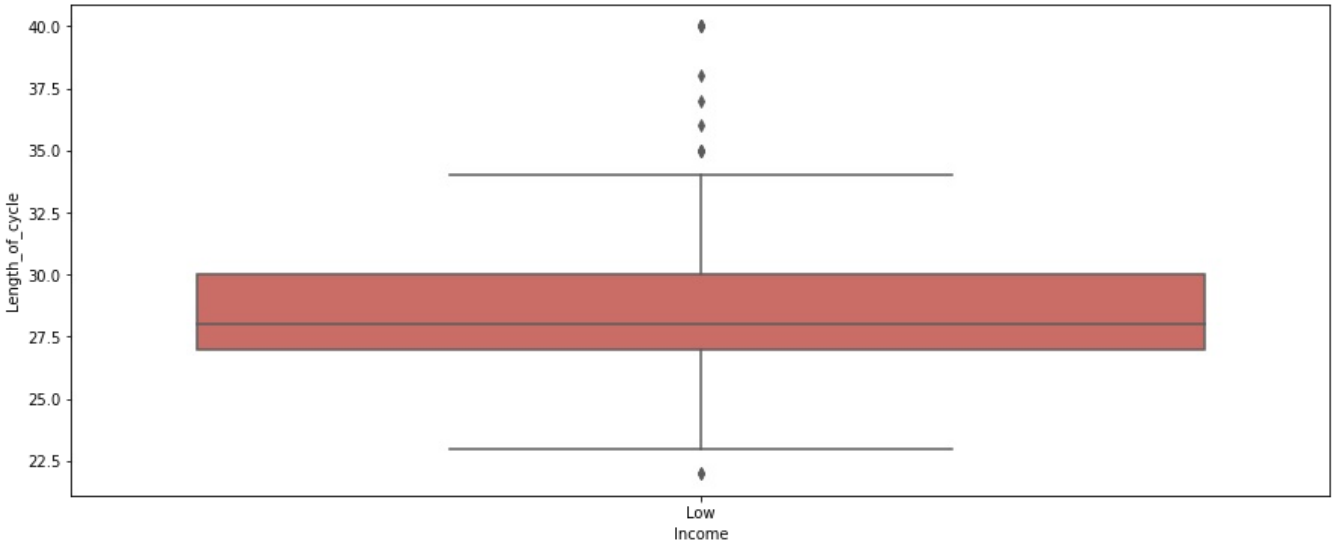

Length_of_Leutal_Phase
30
25
20
15
10
No
Yes
Unusual_Bleeding

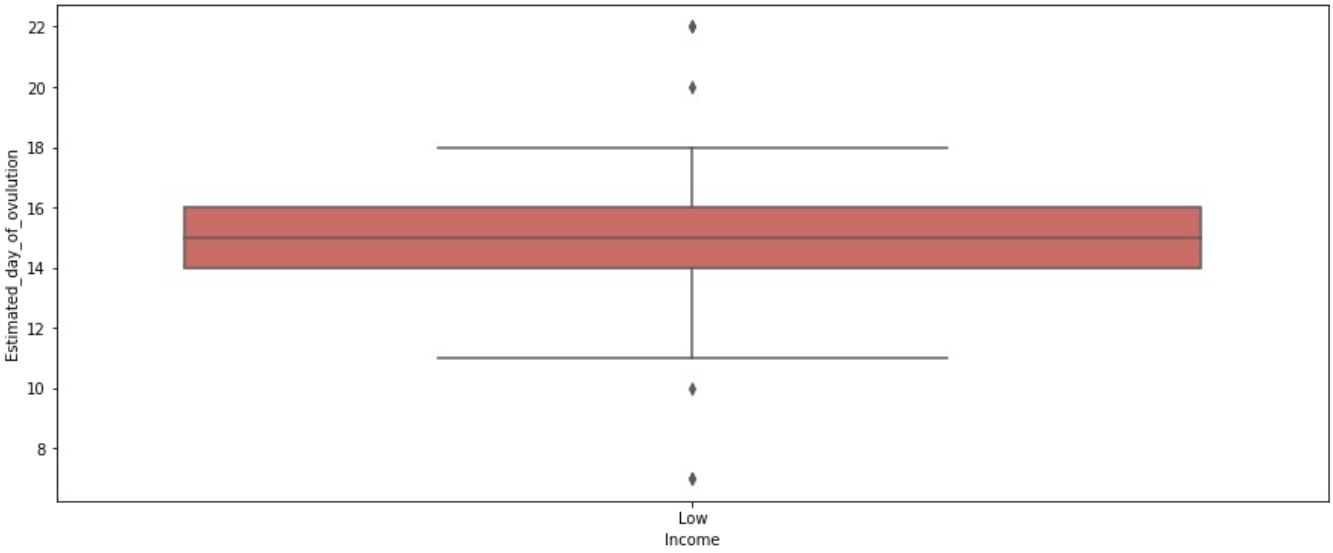

68
66
64
62
60
58
56
Height
No
Yes
Unusual_Bleeding

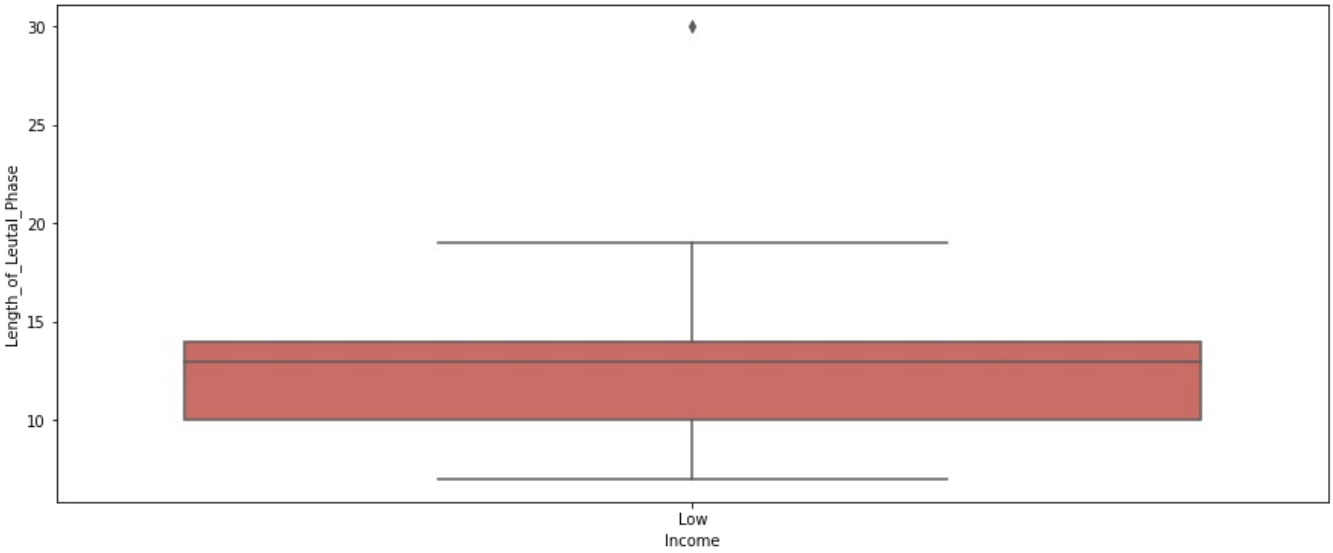

80
70
60
50
40
Weight
No
Yes
Unusual_Bleeding

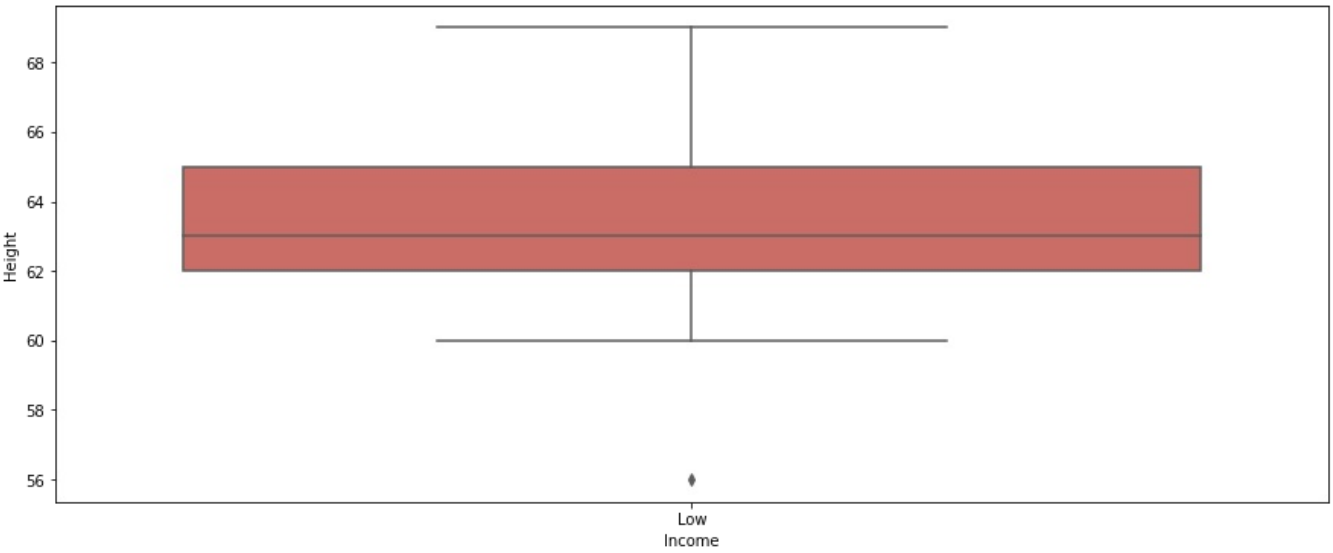

BMI
32.5
30.0
27.5
25.0
22.5
20.0
17.5
No
Yes
Unusual_Bleeding

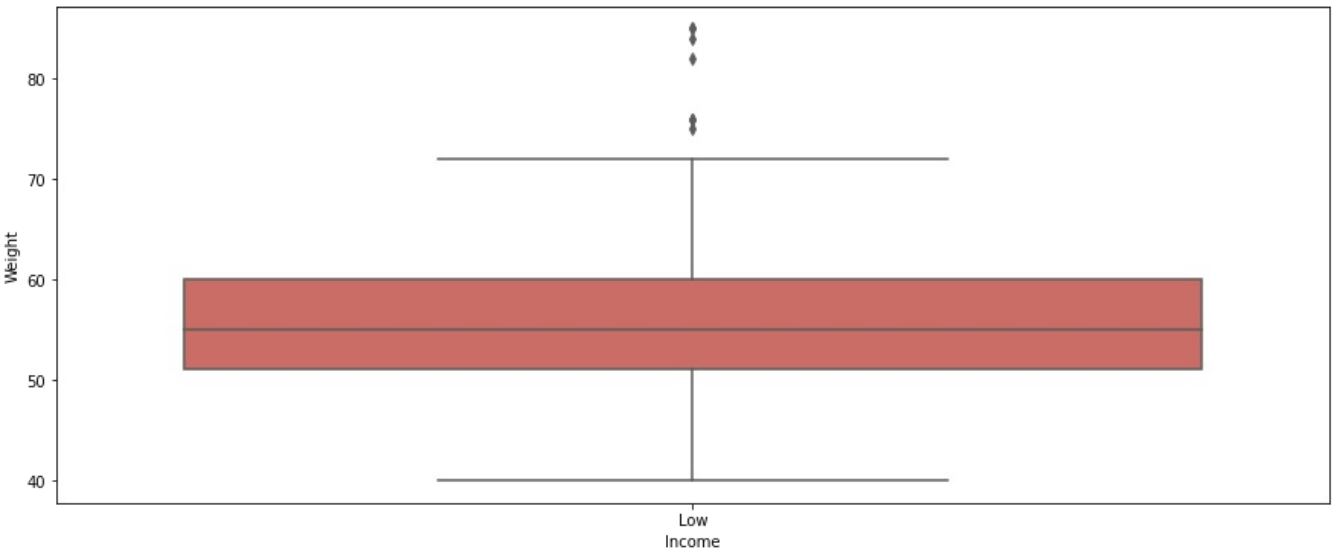

Mean_of_length_of_cycle
45
40
35
30
25
20
15
No
Yes
Unusual_Bleeding

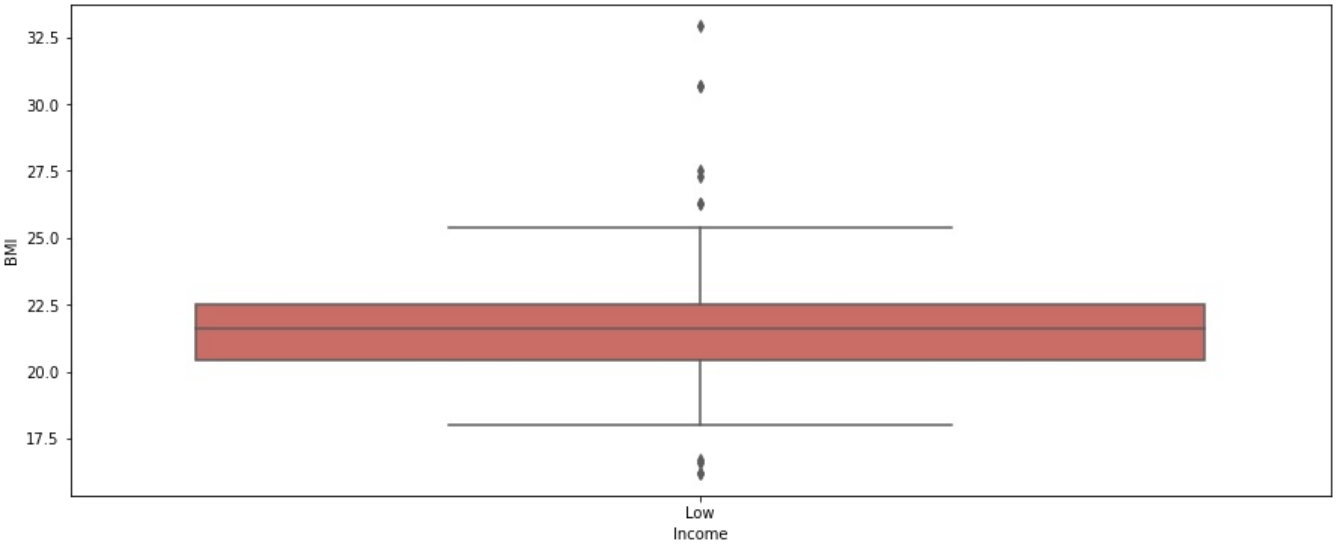

Length_of_cycle
40.0
37.5
35.0
32.5
30.0
27.5
25.0
22.5
Low
Income

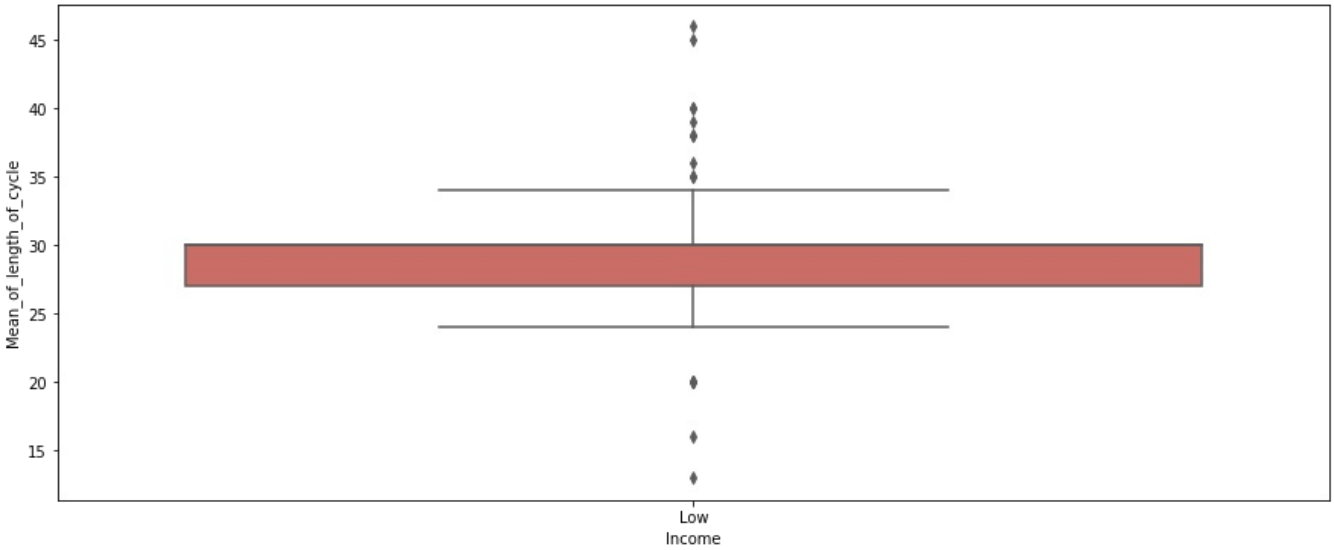

Estimated_day_of_ovulution
22
20
18
16
14
12
10
8
Low
Income

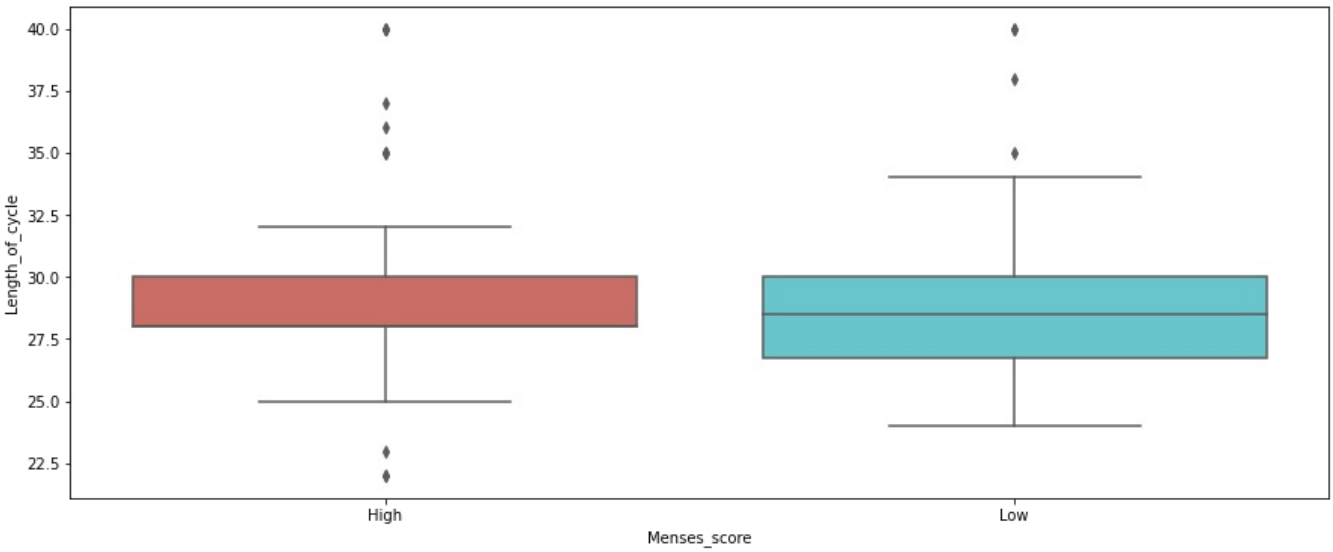

Length_of_Leutal_Phase
30
25
20
15
10
Low
Income

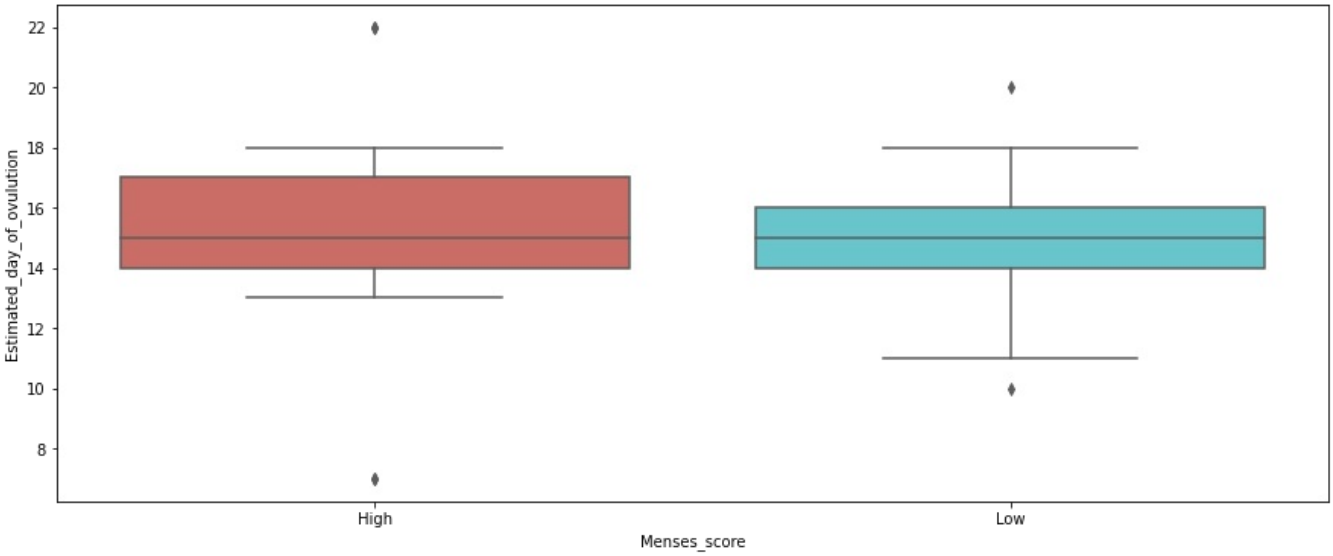

Height
68
66
64
62
60
58
56
Low
Income

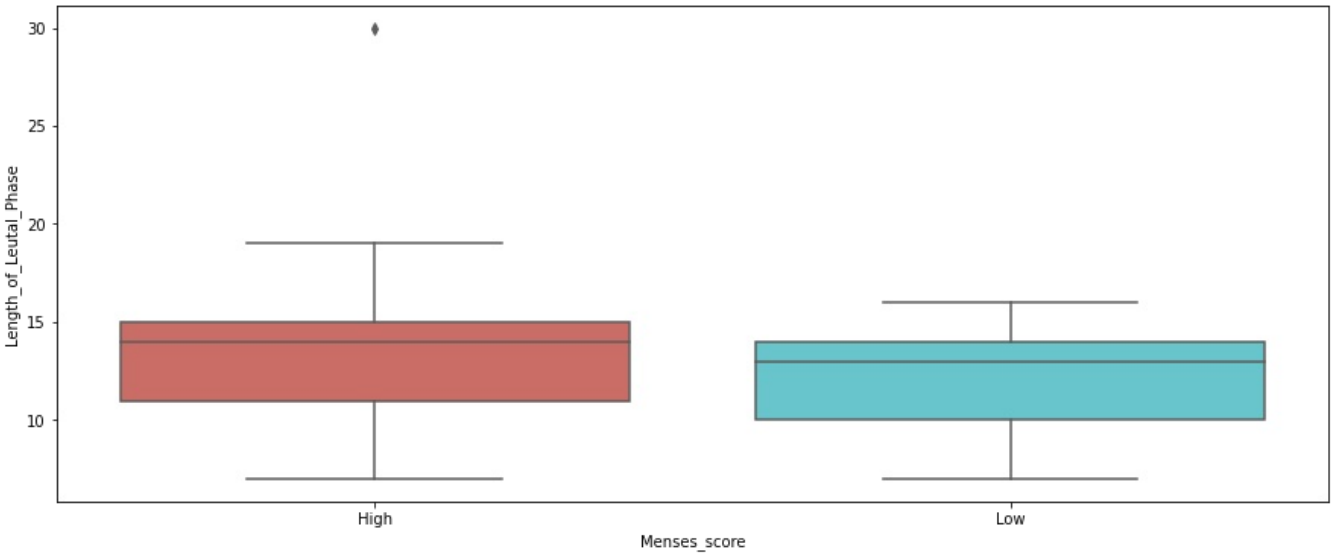

Weight
80
70
60
50
40
Low
Income

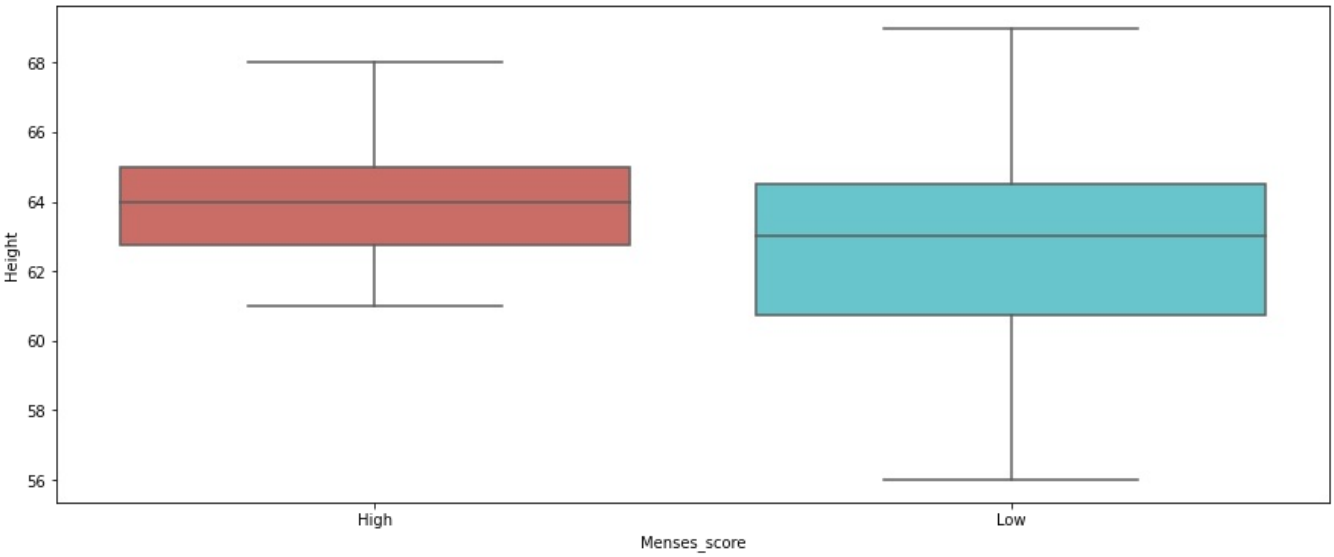

BMI
32.5
30.0
27.5
25.0
22.5
20.0
17.5
Low
Income

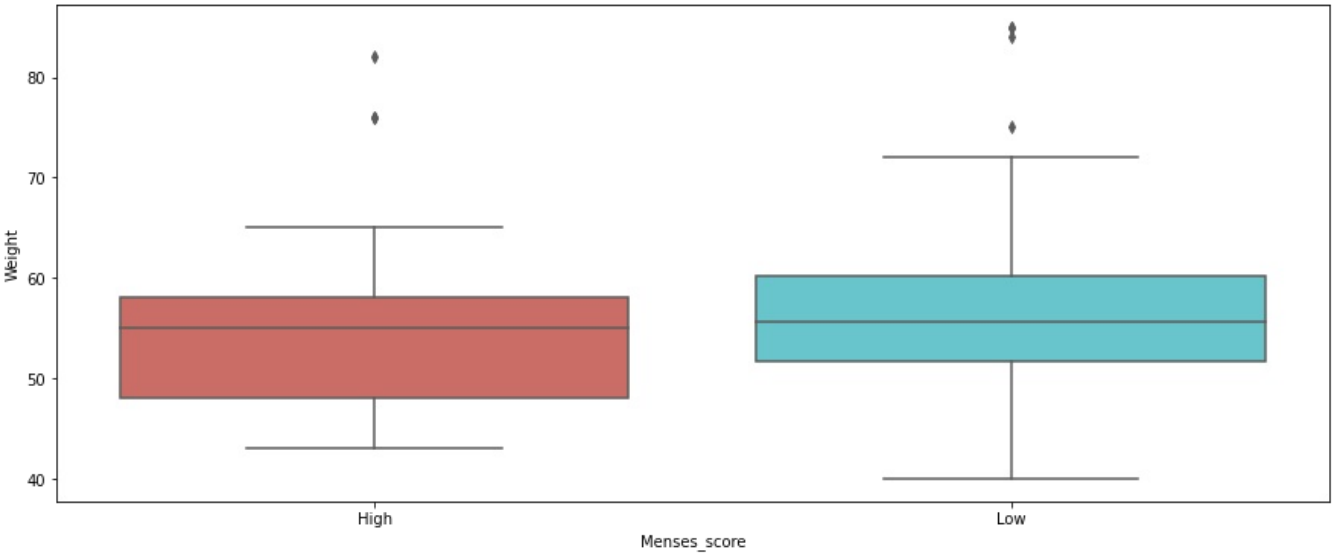

Mean_of_length_of_cycle
45
40
35
30
25
20
15
Low
Income

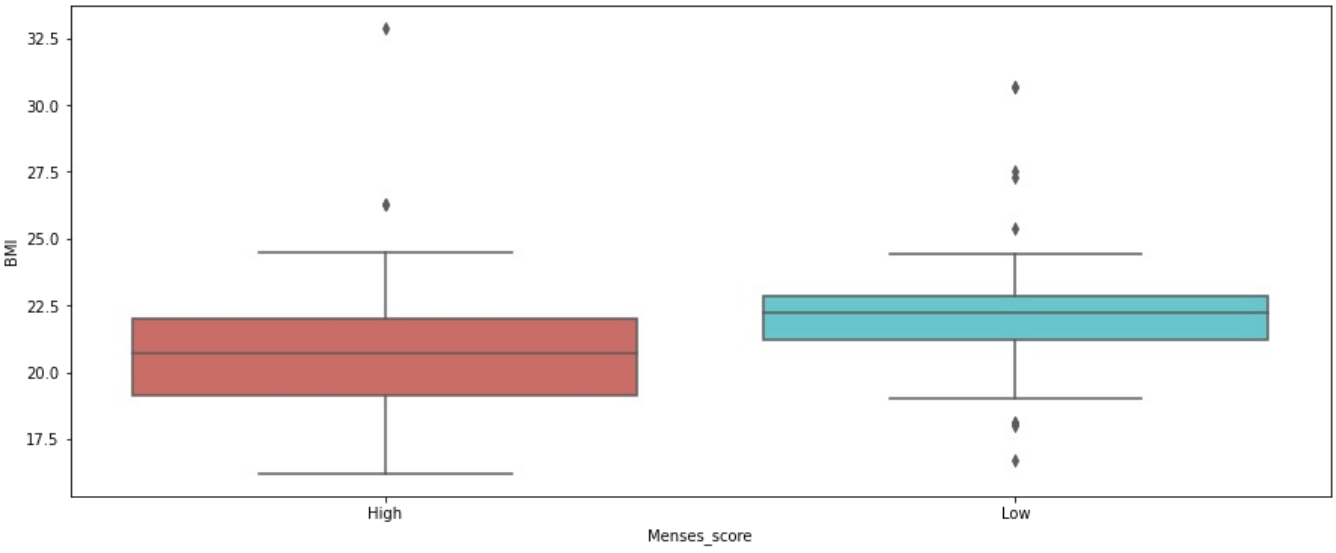

Length_of_cycle
40.0
37.5
35.0
32.5
30.0
27.5
25.0
22.5
High
Low
Menses_score

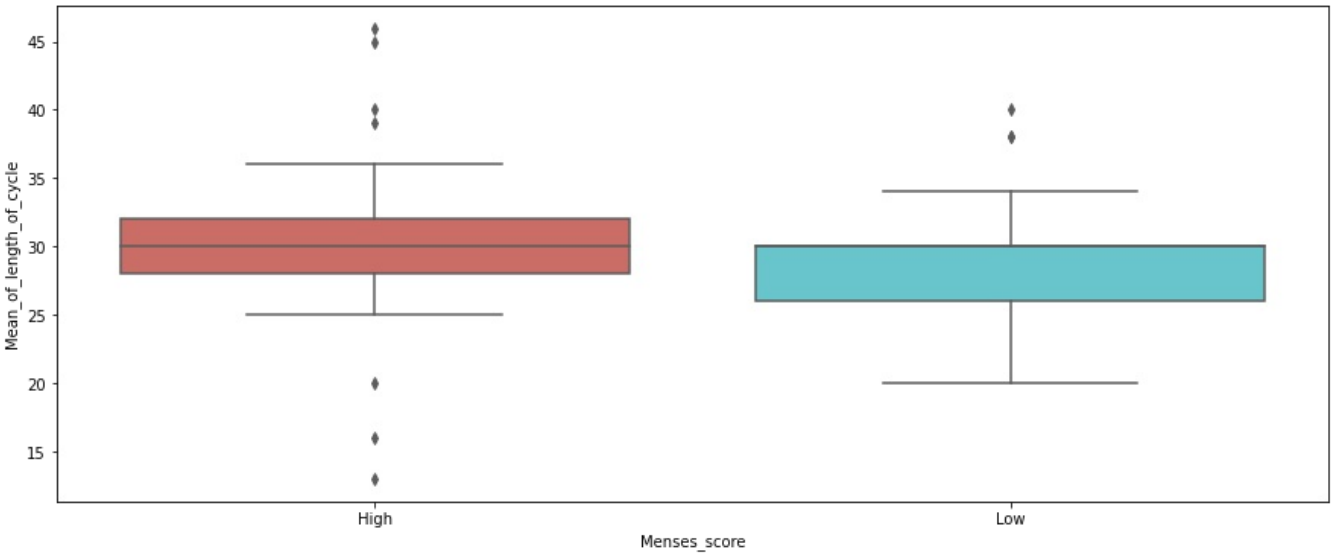

Estimated_day_of_ovulution
22
20
18
16
14
12
10
8
High
Low
Menses_score


Length_of_Leutal_Phase
30
25
20
15
10
High
Low
Menses_score

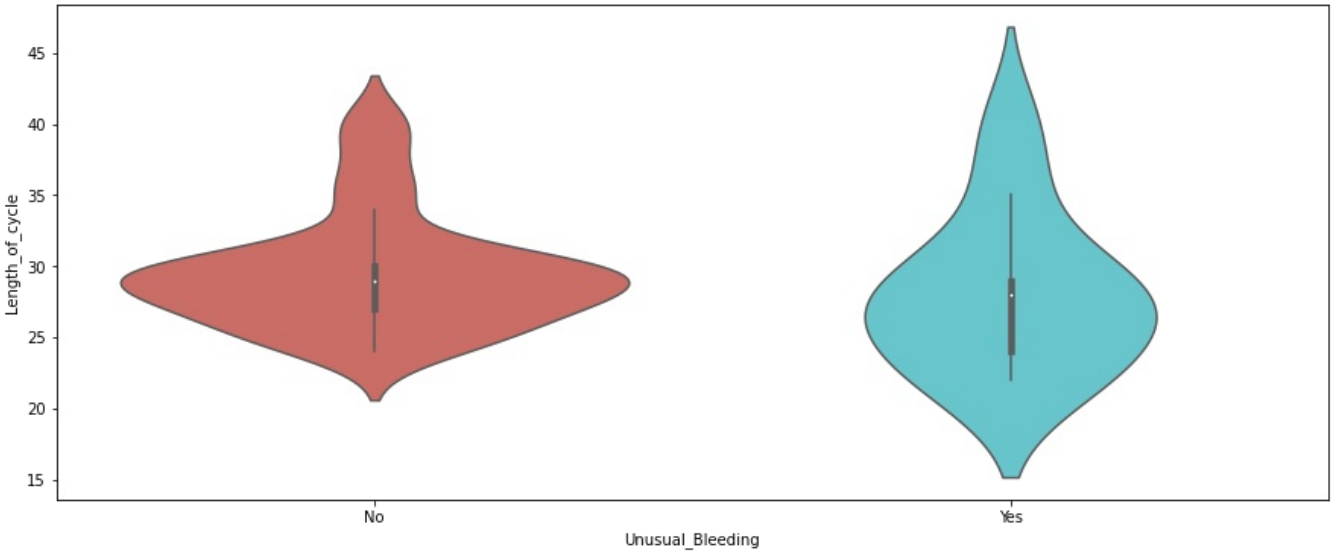

Height
68
66
64
62
60
58
56
High
Low
Menses_score

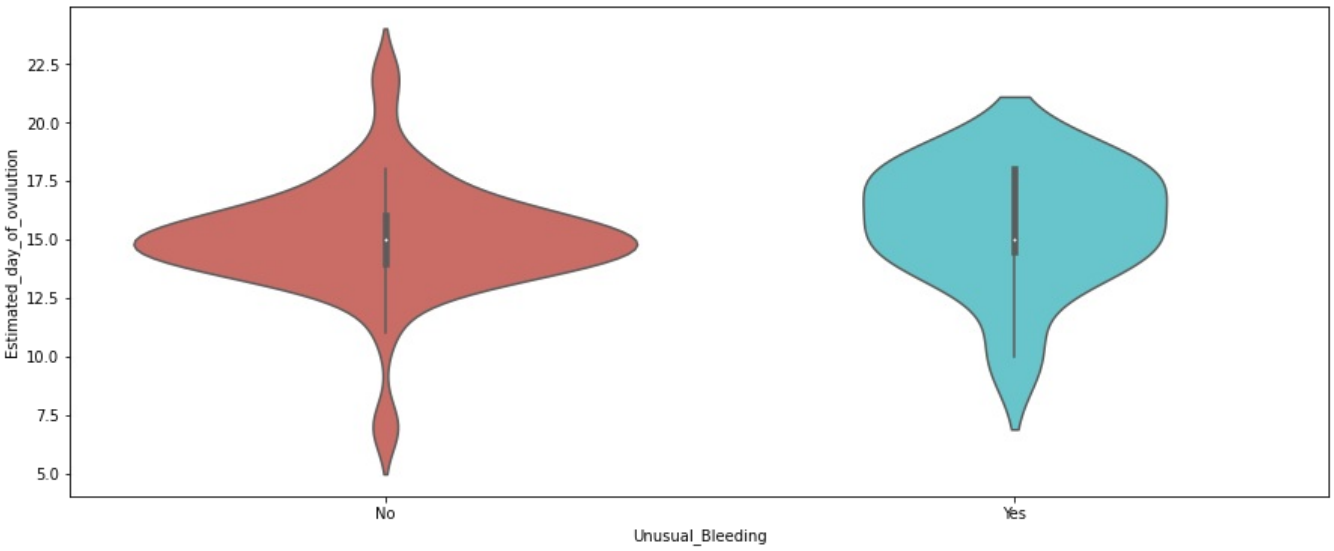

Weight
80
70
60
50
40
High
Low
Menses_score

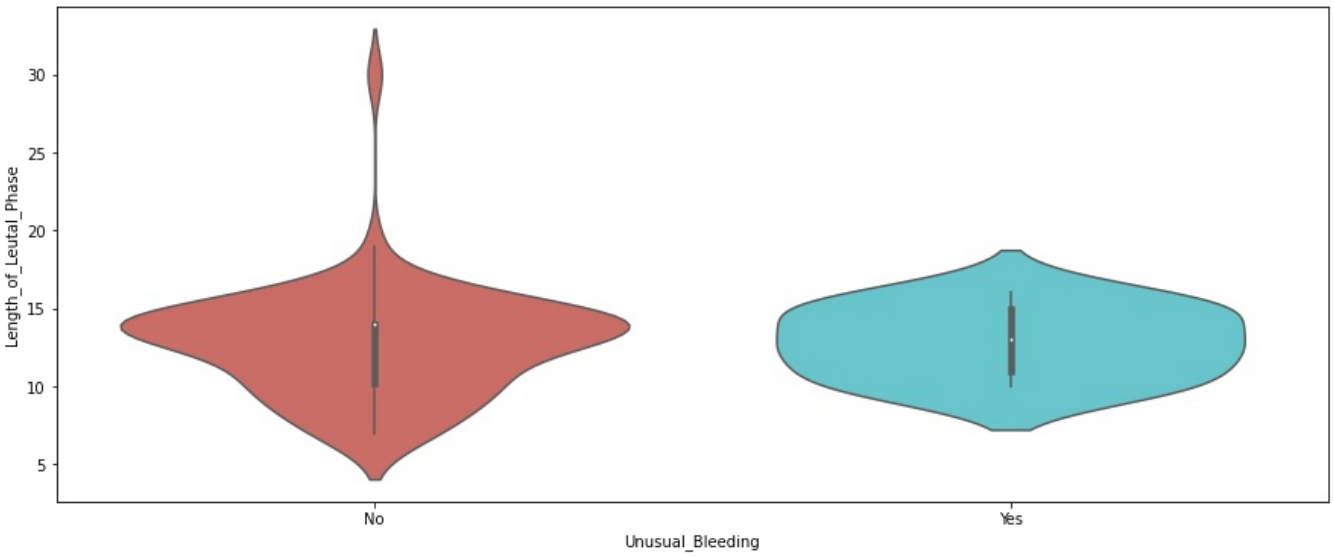

BMI
32.5
30.0
27.5
25.0
22.5
20.0
17.5
High
Low
Menses_score

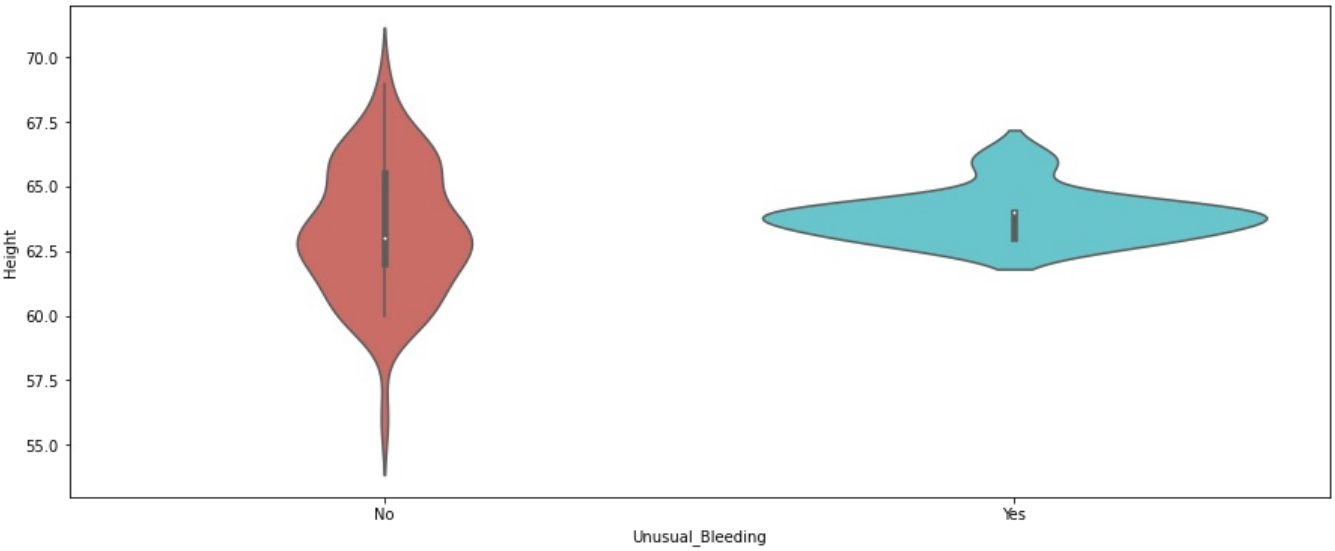


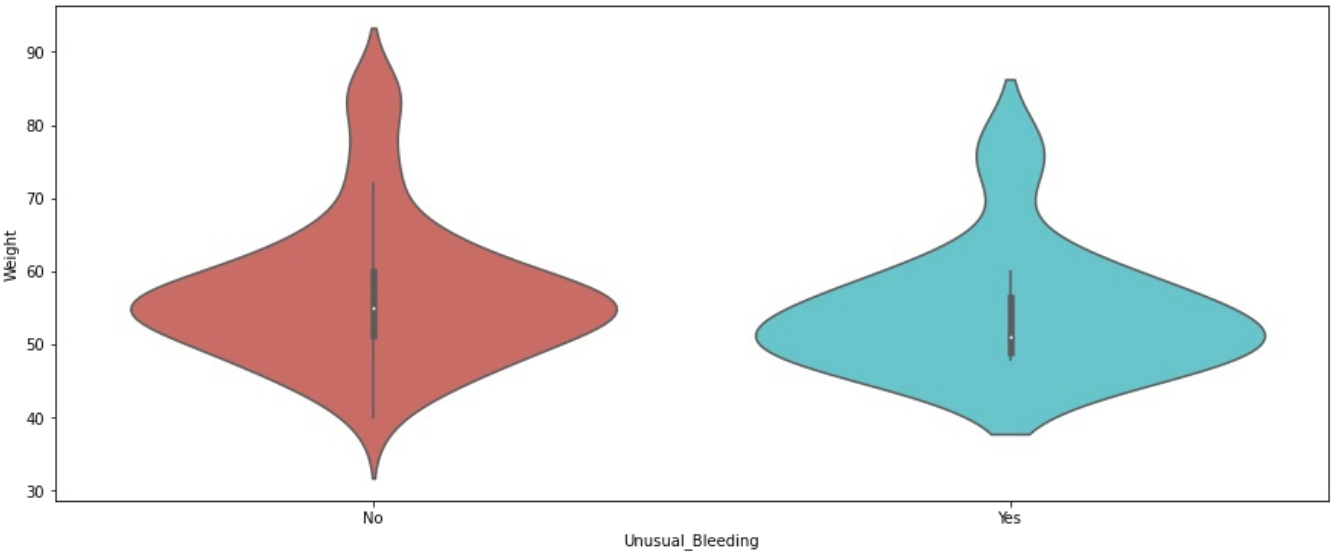
In [39]:
```
for i in categorical:
    for j in continuous:
        plt.figure(figsize=(15,6))
        sns.violinplot(x = df[i], y = df[j], data = df, palette = 'hls')
        plt.show()
```

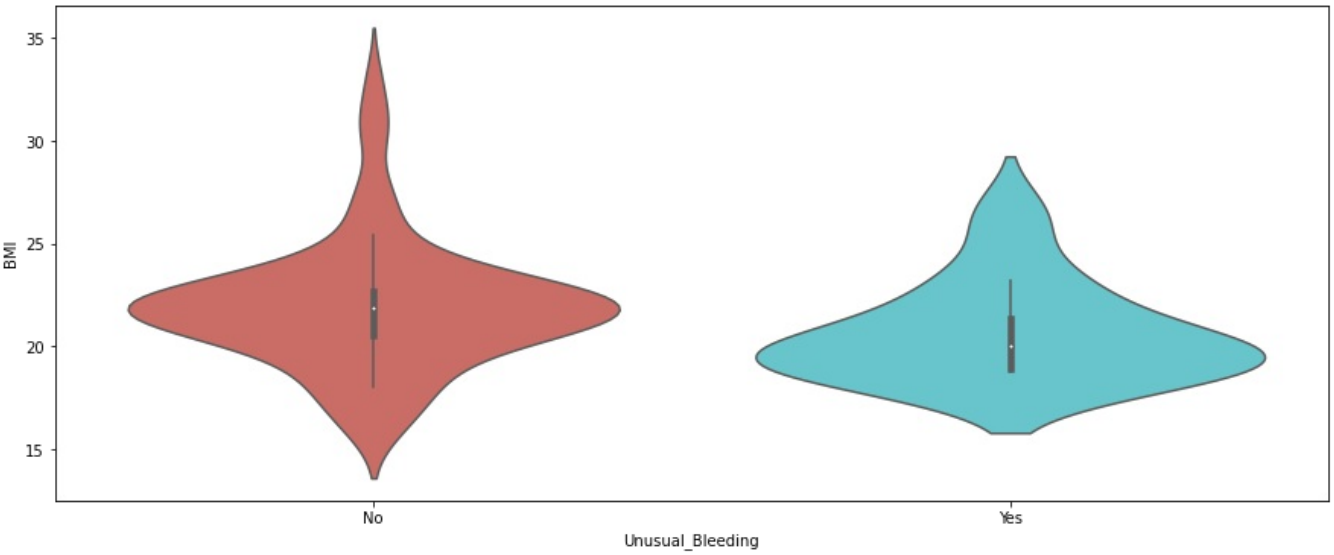


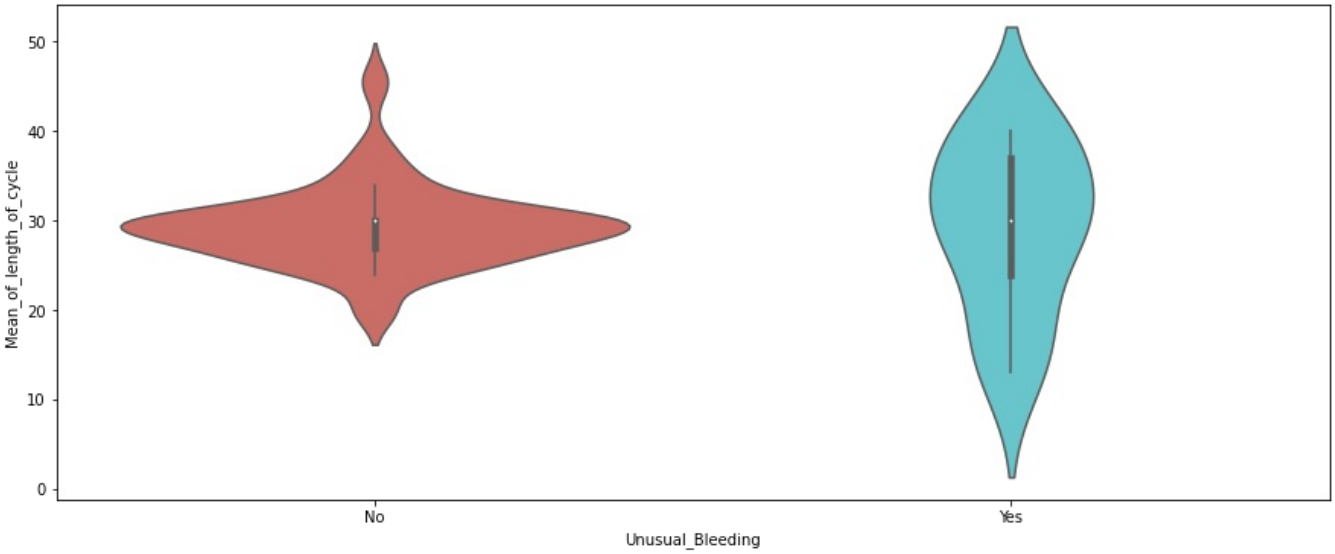


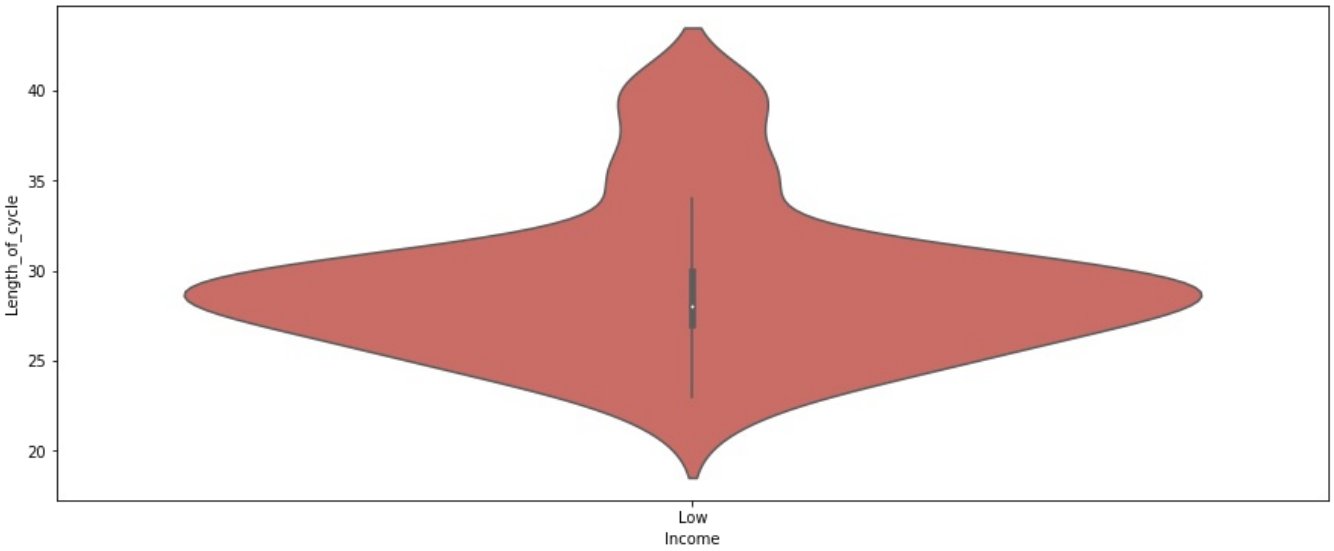

Length_of_Leutal_Phase
30
25
20
15
10
5
No
Yes
Unusual_Bleeding

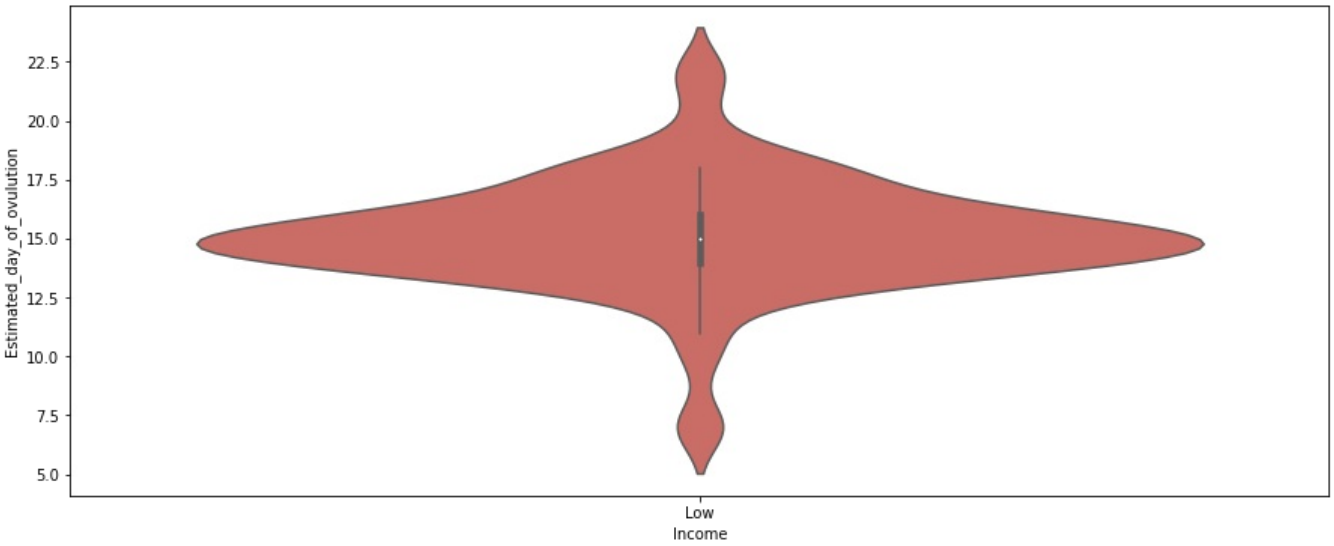

Height
70.0
67.5
65.0
62.5
60.0
57.5
55.0
No
Yes
Unusual_Bleeding

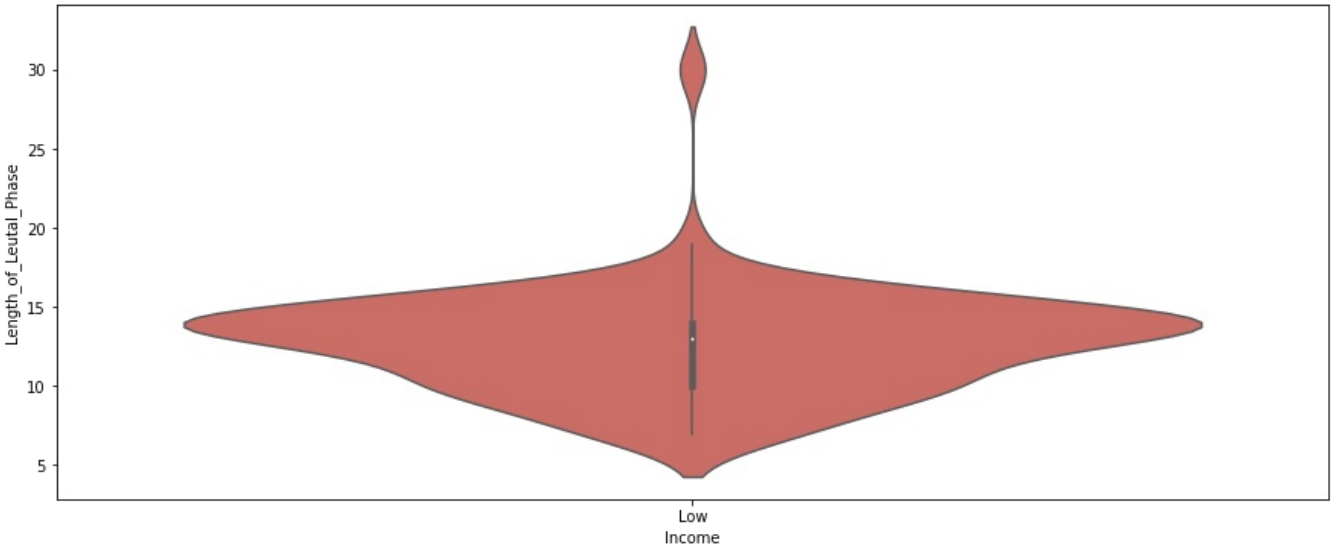

Weight
90
80
70
60
50
40
30
No
Yes
Unusual_Bleeding

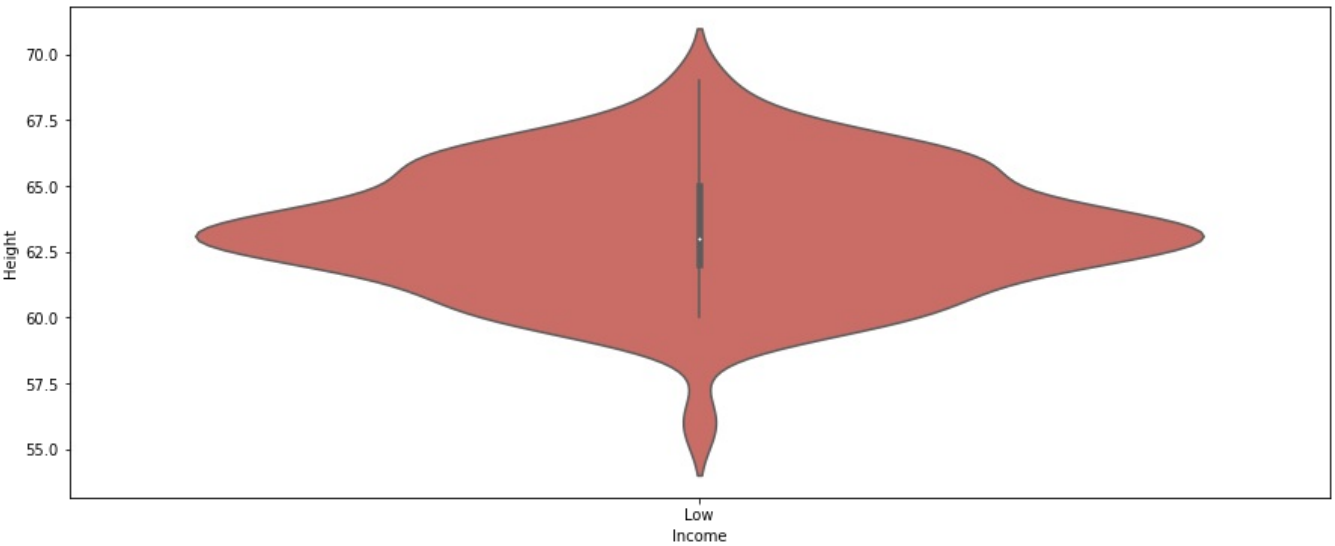

35
30
25
20
15
BMI
No
Yes
Unusual_Bleeding

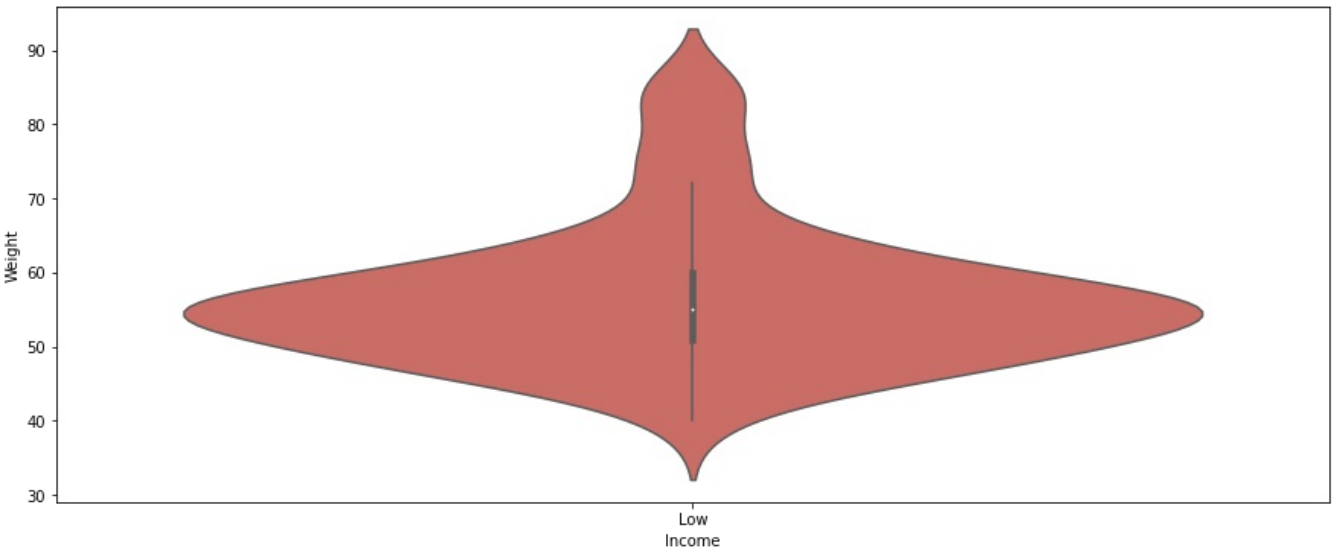

50
40
30
20
10
0
Mean_of_length_of_cycle
No
Yes
Unusual_Bleeding

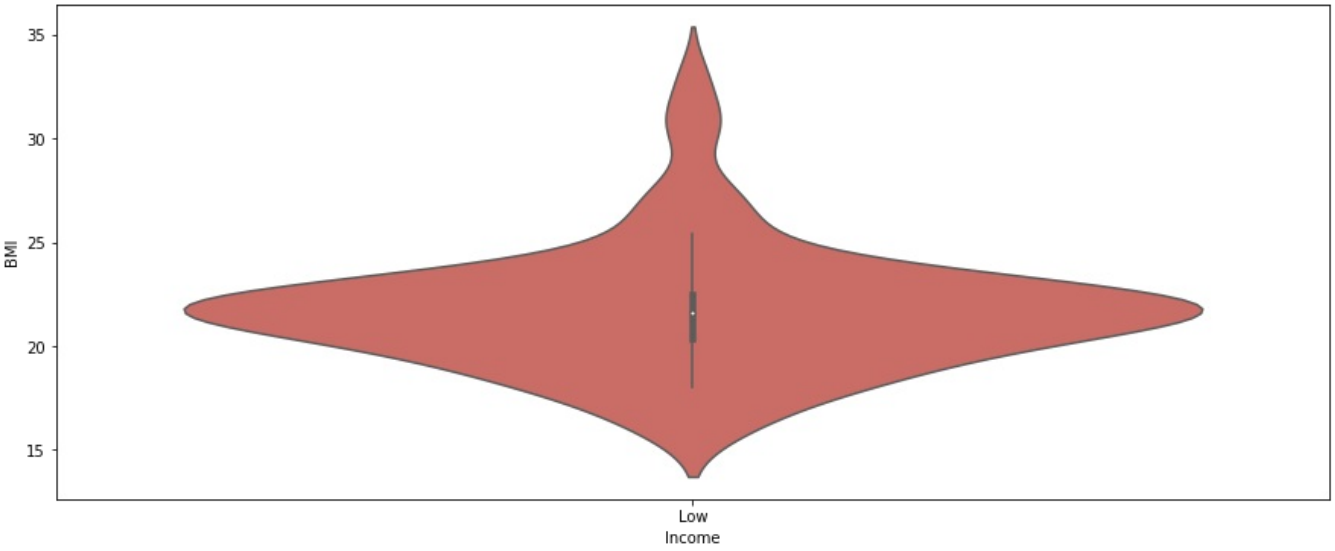

40
35
30
25
20
Length_of_cycle
Low
Income

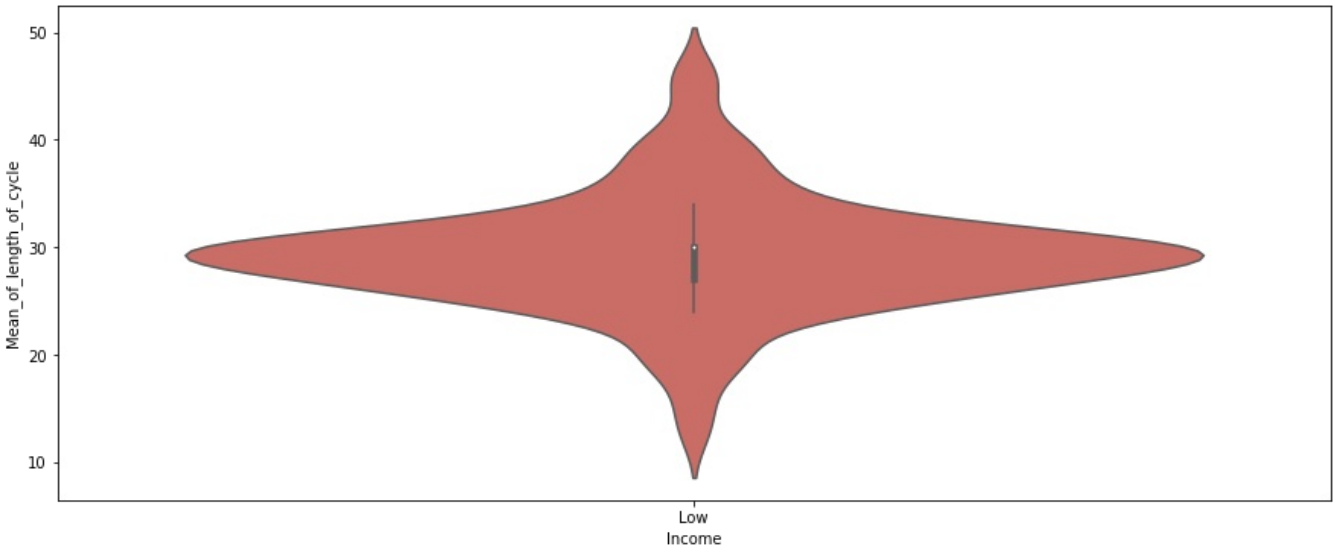

Estimated_day_of_ovulution
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
Low
Income

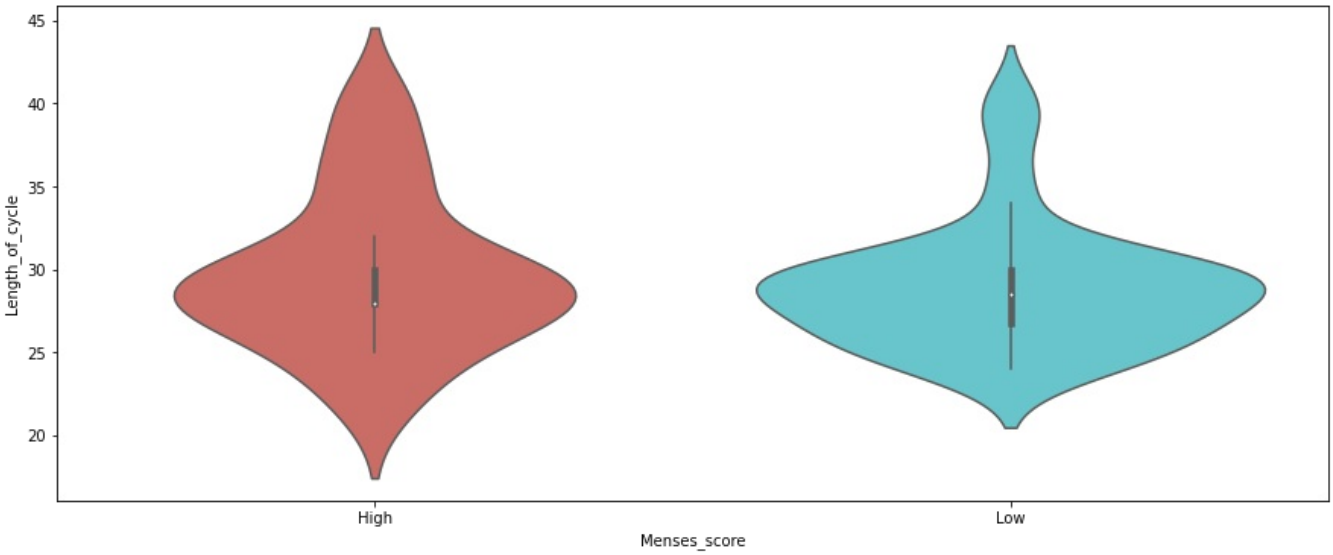

Length_of_Leutal_Phase
30
25
20
15
10
5
Low
Income

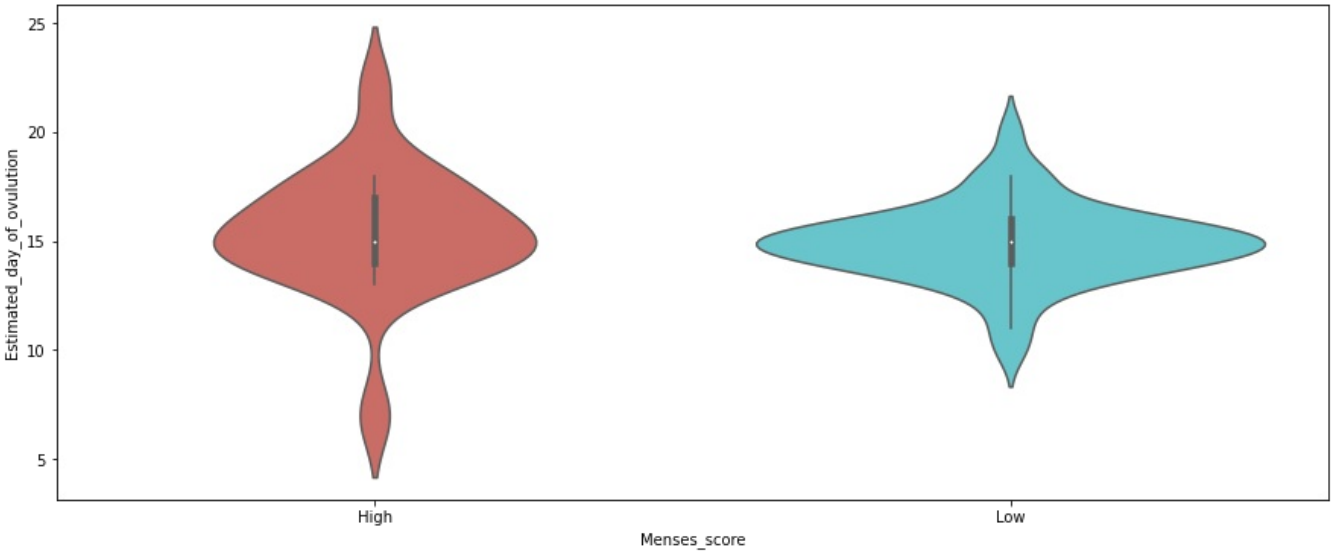

Height
70.0
67.5
65.0
62.5
60.0
57.5
55.0
Low
Income

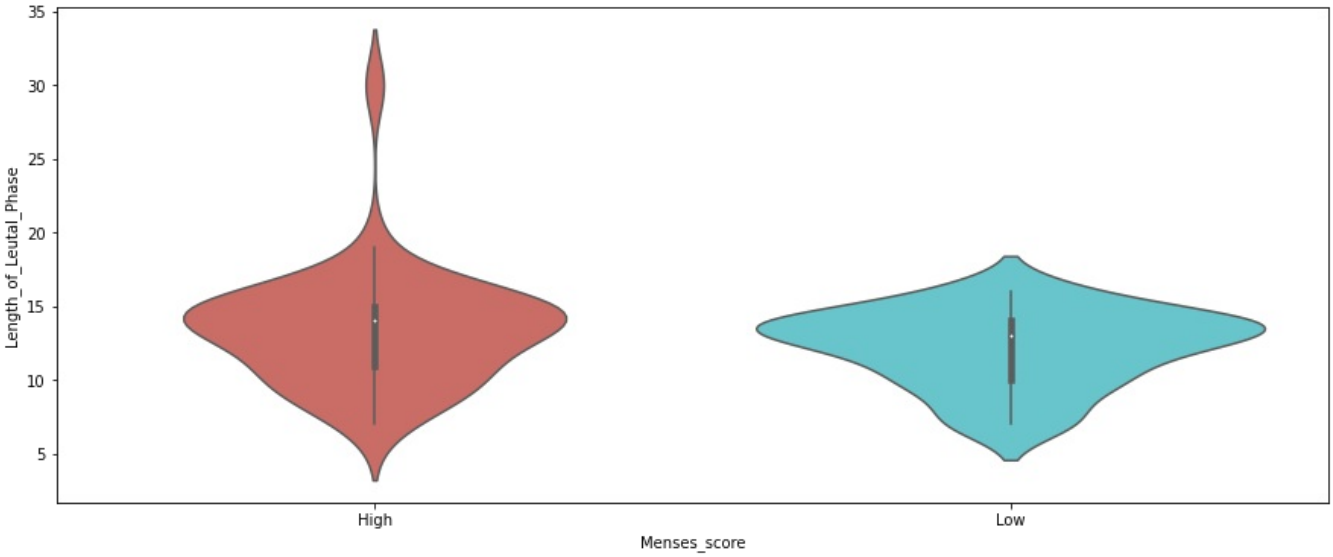

Weight
90
80
70
60
50
40
30
Low
Income

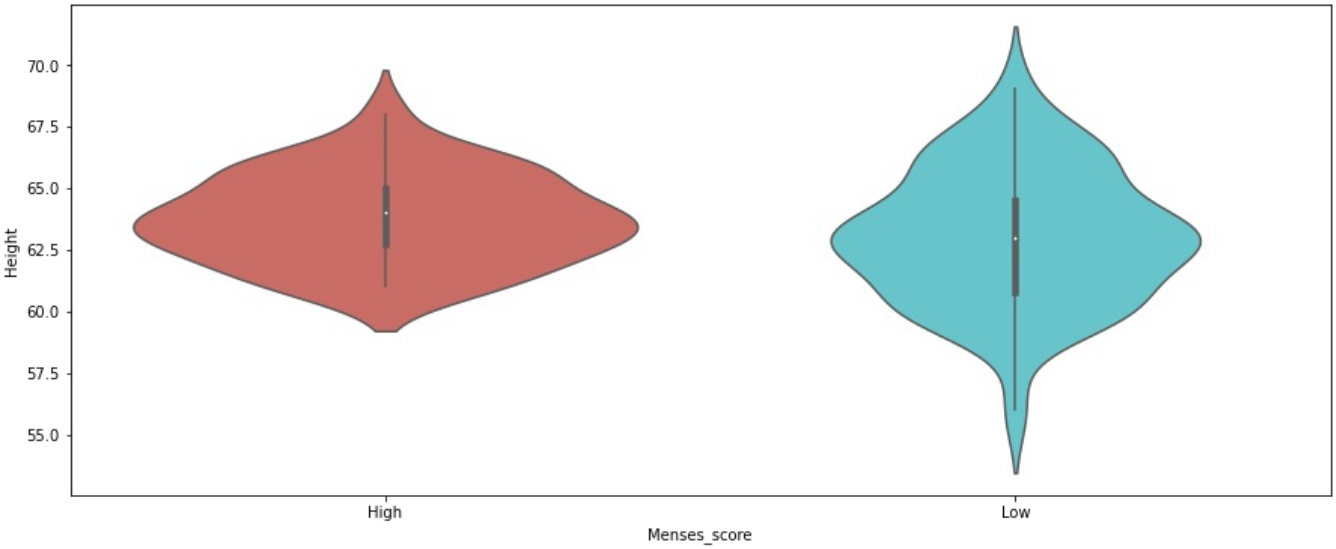

BMI
35
30
25
20
15
Low
Income

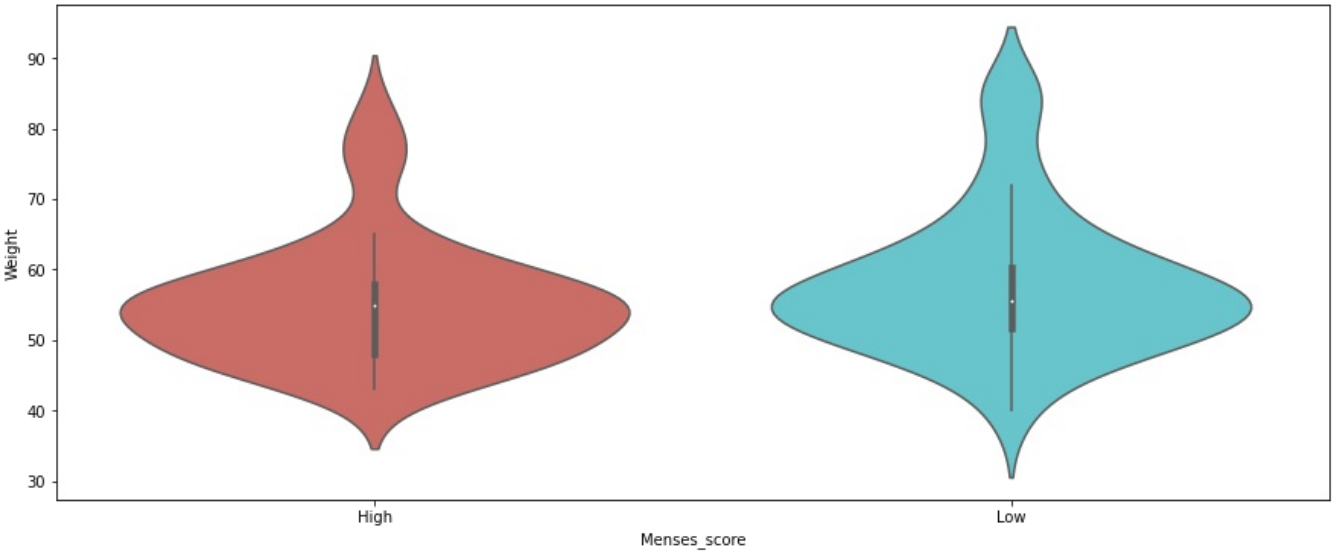

Mean_of_length_of_cycle
50
40
30
20
10
Low
Income

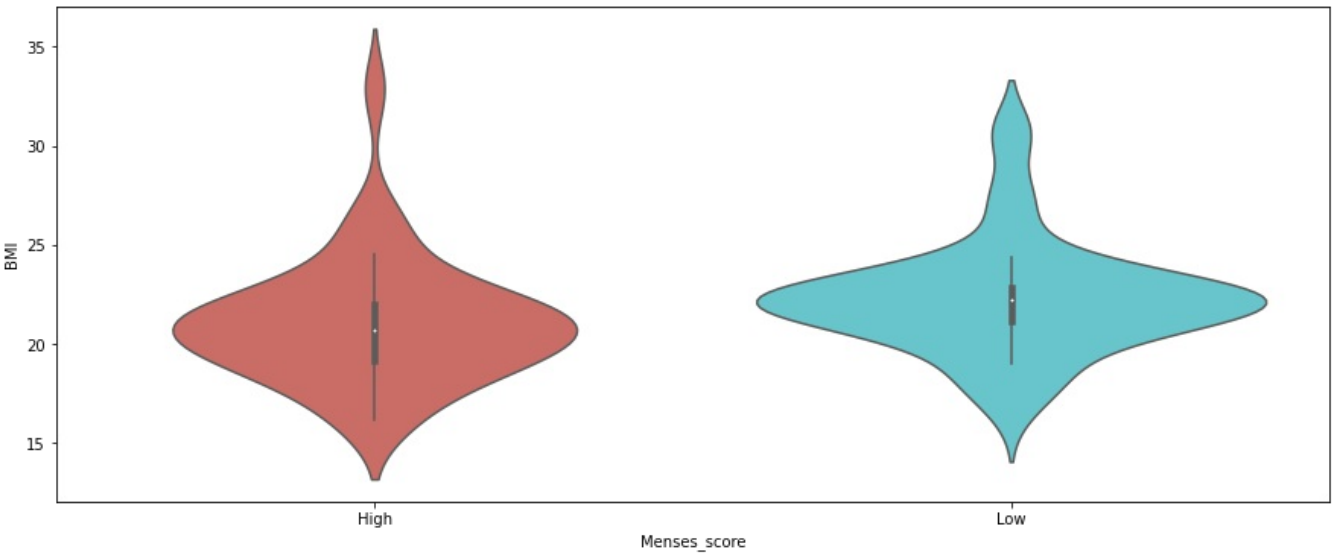

Length_of_cycle
45
40
35
30
25
20
High
Low
Menses_score

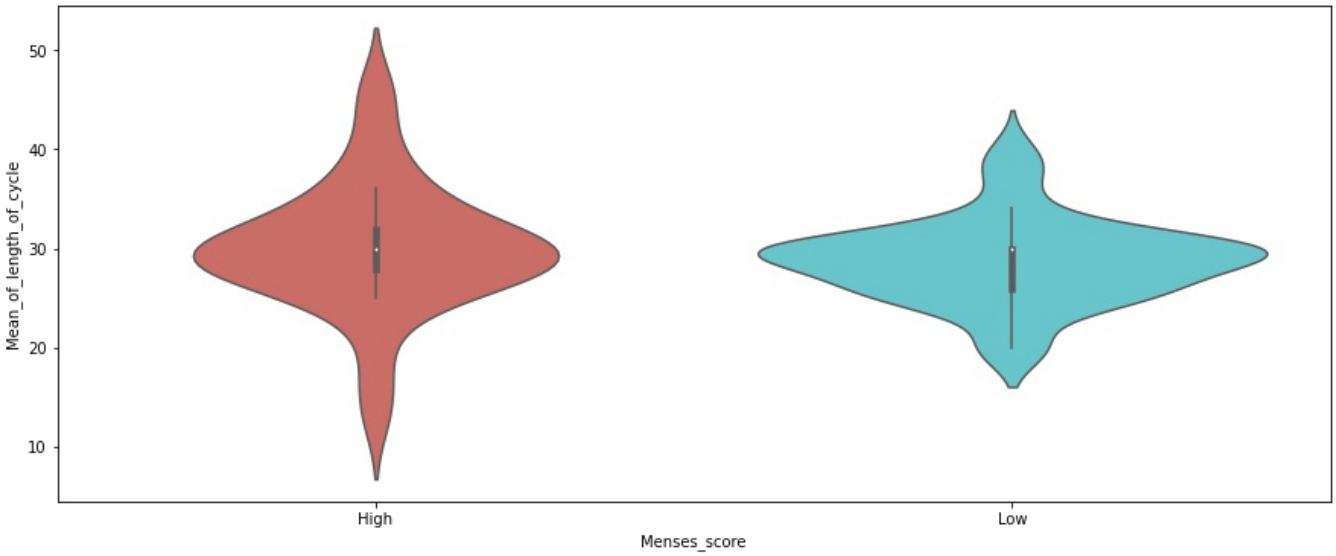

Estimated_day_of_ovulution
25
20
15
10
5
High
Low
Menses_score


Length_of_Leutal_Phase
35
30
25
20
15
10
5
High
Low
Menses_score


70.0
67.5
65.0
62.5
60.0
57.5
55.0
Height
High
Low
Menses_score


90
80
70
60
50
40
30
Weight
High
Low
Menses_score


35
30
25
20
15
BMI
High
Low
Menses_score



In [40]:
```
pivot_categorical = pd.pivot_table(df, values=continuous, index=categorical,
                                   aggfunc='mean')
```

In [41]:
```
pivot_categorical
```

Out[41]:

Unusual_Bleeding	Income	Menses_score	BMI	Estimated_day_of_ovulution	Height	Length_of_Leutal_Phase	Length_of_cycle	Mean
No	Low	High	21.132759	15.103448	63.692308	13.551724	30.655172	
		Low	22.458537	15.024390	62.945946	12.170732	28.658537	
Yes	Low	High	20.837500	16.500000	64.000000	12.875000	26.375000	
		Low	20.166667	13.333333	63.666667	12.666667	32.333333	

In [42]:
```
cross_tab_discrete = pd.crosstab(index=df['Unusual_Bleeding'],
                                 columns=df['number_of_peak'])
```

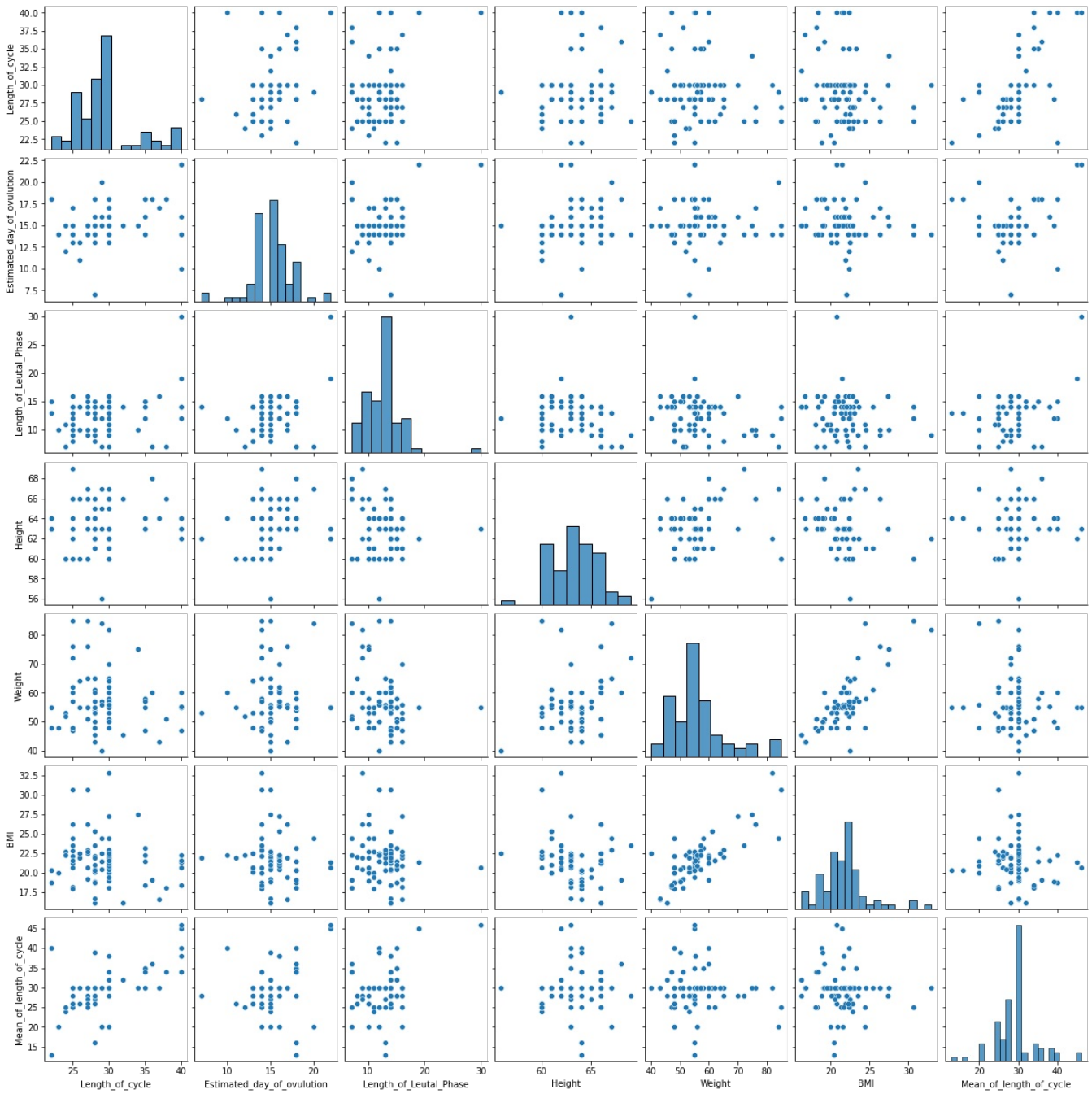
In [43]:
```
cross_tab_discrete
```

Out[43]:

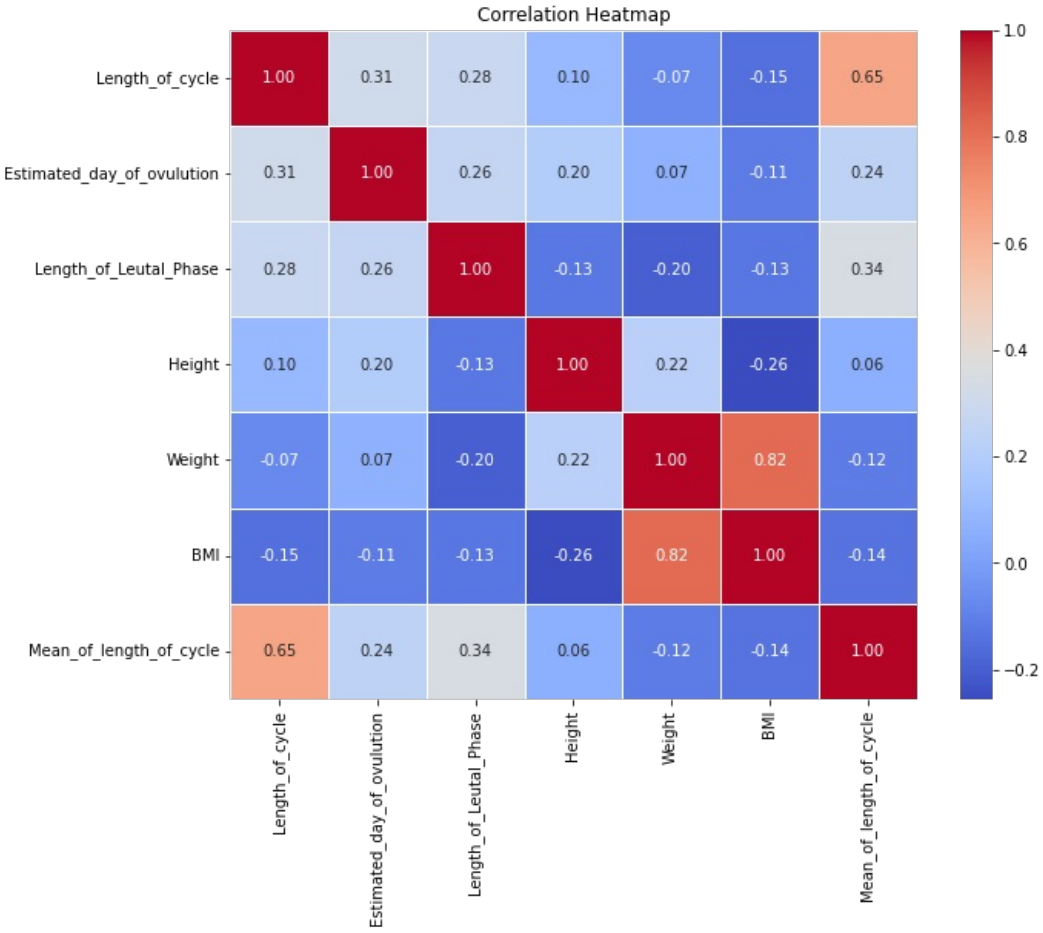
Unusual_Bleeding \ number_of_peak	1	2	3	4	5
No	3	35	30	2	0
Yes	0	4	4	2	1

In [44]:
```
plt.figure(figsize=(15,6))
sns.pairplot(df[continuous])
plt.show()
```

```
<Figure size 1080x432 with 0 Axes>
```



In [45]:
```
plt.figure(figsize=(10, 8))
sns.heatmap(df[continuous].corr(), annot=True, cmap='coolwarm', fmt='.2f', linewidths=0.5)
plt.title('Correlation Heatmap')
plt.show()
```



Thanks !!!