data-analysis-copy1-2

September 19, 2024

[6]:
```
#Written by Yagmur Parmaksiz 19.09.2024
```

[7]:
```
#import libraries
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

[18]:
```
# load xlsx file note that Pandas requires the openpyxl library to read .xlsx␣
  ↪files.
train_data = pd.read_excel("side_effect_data.xlsx")
train_data.head() #default size 5
```

[18]:
```
   Kullanici_id Cinsiyet Dogum_Tarihi    Uyruk         Il  \
0           107     Male   1960-03-01  Turkiye  Canakkale
1           140     Male   1939-10-12  Turkiye    Trabzon
2             2   Female   1976-12-17  Turkiye  Canakkale
3            83     Male   1977-06-17  Turkiye      Adana
4             7   Female   1976-09-03  Turkiye      Izmir

                         Ilac_Adi Ilac_Baslangic_Tarihi Ilac_Bitis_Tarihi  \
0                 trifluoperazine            2022-01-09        2022-03-04
1                fluphenazine hcl            2022-01-09        2022-03-08
2                 warfarin sodium            2022-01-11        2022-03-12
3                   valproic acid            2022-01-04        2022-03-12
4  carbamazepine extended release            2022-01-13        2022-03-06

                Yan_Etki Yan_Etki_Bildirim_Tarihi Alerjilerim  \
0               Kabizlik      2022-02-19 18:28:43       Ceviz
1              Yorgunluk      2022-02-03 20:48:17         Toz
2               Carpinti      2022-02-04 05:29:20         Muz
3             Sinirlilik      2022-02-08 01:01:21      Pancar
4  Agizda Farkli Bir Tat      2022-02-12 05:33:06         NaN

              Kronik Hastaliklarim  Baba Kronik Hastaliklari  \
0  Hipertansiyon, Kan Hastaliklari      Guatr, Hipertansiyon
1                              NaN              Guatr, Diger
```

```
2       Kalp Hastaliklari, Diyabet             Diyabet, KOAH
3                   Diyabet, Diger  Kalp Hastaliklari, Diger
4       Diyabet, Kalp Hastaliklari  Alzheimer, Hipertansiyon

           Anne Kronik Hastaliklari    Kiz Kardes Kronik Hastaliklari  \
0                              KOAH  Kemik Erimesi, Kalp Hastaliklari
1  Hipertansiyon, Kalp Hastaliklari
2            Kemik Erimesi, Diyabet            Diyabet, Kemik Erimesi
3                               NaN                             Astim
4   Kan Hastaliklari, Kemik Erimesi                    Diyabet, Diger

  Erkek Kardes Kronik Hastaliklari Kan Grubu   Kilo    Boy
0             Kemik Erimesi, Guatr     B RH-  103.0  191.0
1                    KOAH, Diyabet       NaN   81.0  181.0
2                            Diger     B RH-   93.0  158.0
3        Kalp Hastaliklari, Kanser    AB RH-    NaN  165.0
4         Alzheimer, Hipertansiyon    AB RH-   99.0  172.0
```

```
[19]: train_data.describe() # To get summary statistics for numerical columns
```

```
[19]:        Kullanici_id                   Dogum_Tarihi  \
      count   2357.000000                           2357
      mean      97.216801  1974-11-25 04:06:12.677131936
      min        1.000000            1939-10-12 00:00:00
      25%       47.000000            1959-02-05 00:00:00
      50%       97.000000            1973-09-09 00:00:00
      75%      146.000000            1992-03-24 00:00:00
      max      196.000000            2011-04-25 00:00:00
      std       57.017200                            NaN

                     Ilac_Baslangic_Tarihi              Ilac_Bitis_Tarihi  \
      count                           2357                           2357
      mean   2022-01-07 10:47:36.173101312  2022-03-10 16:25:27.365294848
      min              2022-01-01 00:00:00            2022-03-02 00:00:00
      25%              2022-01-04 00:00:00            2022-03-06 00:00:00
      50%              2022-01-07 00:00:00            2022-03-11 00:00:00
      75%              2022-01-11 00:00:00            2022-03-15 00:00:00
      max              2022-01-14 00:00:00            2022-03-19 00:00:00
      std                              NaN                            NaN

                  Yan_Etki_Bildirim_Tarihi         Kilo          Boy
      count                           2357  2064.000000  2243.000000
      mean   2022-02-10 17:09:30.742044928    80.863857   174.638431
      min              2022-02-01 04:34:33    50.000000   145.000000
      25%              2022-02-04 05:29:20    65.000000   160.000000
      50%              2022-02-09 20:53:54    83.000000   176.000000
      75%              2022-02-17 07:08:01    96.000000   187.000000
```

```
max               2022-02-19 21:47:39   110.000000   203.000000
std                               NaN    18.635269    16.516552
```

```
[20]: train_data.columns # List all column names in the DataFrame
```

```
[20]: Index(['Kullanici_id', 'Cinsiyet', 'Dogum_Tarihi', 'Uyruk', 'Il', 'Ilac_Adi',
             'Ilac_Baslangic_Tarihi', 'Ilac_Bitis_Tarihi', 'Yan_Etki',
             'Yan_Etki_Bildirim_Tarihi', 'Alerjilerim', 'Kronik Hastaliklarim',
             'Baba Kronik Hastaliklari', 'Anne Kronik Hastaliklari',
             'Kiz Kardes Kronik Hastaliklari', 'Erkek Kardes Kronik Hastaliklari',
             'Kan Grubu', 'Kilo', 'Boy'],
            dtype='object')
```

```
[21]: train_data.info() # To get a summary of the DataFrame
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2357 entries, 0 to 2356
Data columns (total 19 columns):
 #   Column                            Non-Null Count  Dtype
---  ------                            --------------  -----
 0   Kullanici_id                      2357 non-null   int64
 1   Cinsiyet                          1579 non-null   object
 2   Dogum_Tarihi                      2357 non-null   datetime64[ns]
 3   Uyruk                             2357 non-null   object
 4   Il                                2130 non-null   object
 5   Ilac_Adi                          2357 non-null   object
 6   Ilac_Baslangic_Tarihi             2357 non-null   datetime64[ns]
 7   Ilac_Bitis_Tarihi                 2357 non-null   datetime64[ns]
 8   Yan_Etki                          2357 non-null   object
 9   Yan_Etki_Bildirim_Tarihi          2357 non-null   datetime64[ns]
 10  Alerjilerim                       1873 non-null   object
 11  Kronik Hastaliklarim              1965 non-null   object
 12  Baba Kronik Hastaliklari          2201 non-null   object
 13  Anne Kronik Hastaliklari          2140 non-null   object
 14  Kiz Kardes Kronik Hastaliklari    2260 non-null   object
 15  Erkek Kardes Kronik Hastaliklari  2236 non-null   object
 16  Kan Grubu                         2010 non-null   object
 17  Kilo                              2064 non-null   float64
 18  Boy                               2243 non-null   float64
dtypes: datetime64[ns](4), float64(2), int64(1), object(12)
memory usage: 350.0+ KB
```

```
[22]: train_data.shape #It provides the dimensions of the DataFrame, which includes␣
        ↪the number of rows and columns.
```

```
[22]: (2357, 19)
```

[23]:
```
train_data.index #To get the index of the DataFrame
```

[23]:
```
RangeIndex(start=0, stop=2357, step=1)
```

[25]:
```
train_data.dtypes #To get data types of each column
```

[25]:
```
Kullanici_id                                 int64
Cinsiyet                                    object
Dogum_Tarihi                        datetime64[ns]
Uyruk                                       object
Il                                          object
Ilac_Adi                                    object
Ilac_Baslangic_Tarihi               datetime64[ns]
Ilac_Bitis_Tarihi                   datetime64[ns]
Yan_Etki                                    object
Yan_Etki_Bildirim_Tarihi            datetime64[ns]
Alerjilerim                                 object
Kronik Hastaliklarim                        object
Baba Kronik Hastaliklari                    object
Anne Kronik Hastaliklari                    object
Kiz Kardes Kronik Hastaliklari              object
Erkek Kardes Kronik Hastaliklari            object
Kan Grubu                                   object
Kilo                                       float64
Boy                                        float64
dtype: object
```

[26]:
```
train_data.isnull() #Check for missing values in each column
```

[26]:
```
      Kullanici_id  Cinsiyet  Dogum_Tarihi  Uyruk     Il  Ilac_Adi  \
0            False     False         False  False  False     False
1            False     False         False  False  False     False
2            False     False         False  False  False     False
3            False     False         False  False  False     False
4            False     False         False  False  False     False
…                …         …             …      …      …         …
2352         False      True         False  False   True     False
2353         False     False         False  False  False     False
2354         False     False         False  False  False     False
2355         False     False         False  False  False     False
2356         False     False         False  False  False     False

      Ilac_Baslangic_Tarihi  Ilac_Bitis_Tarihi  Yan_Etki  \
0                     False              False     False
1                     False              False     False
2                     False              False     False
3                     False              False     False
```

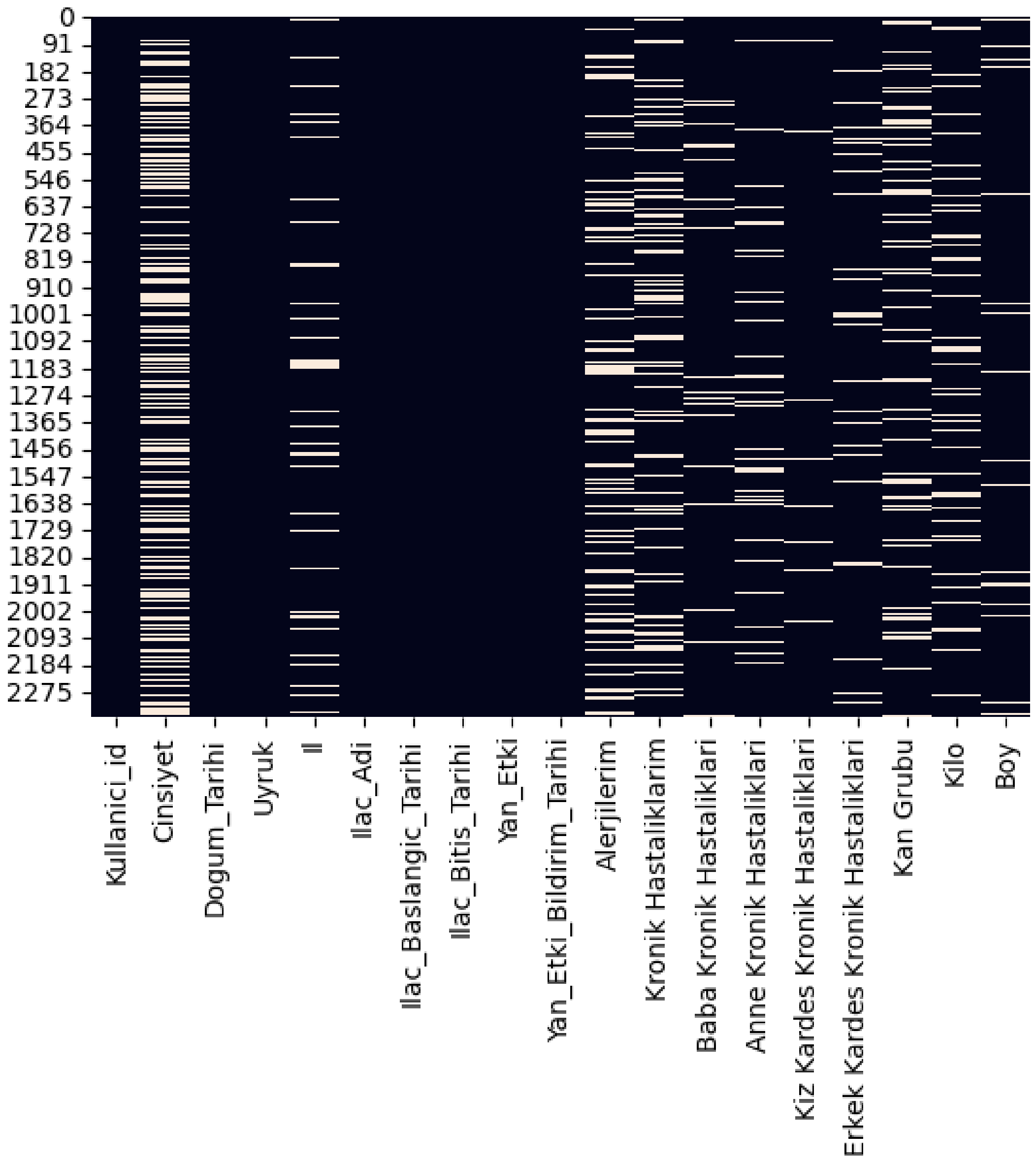
```
4                     False              False     False
…                     …                …       …
2352                  False              False     False
2353                  False              False     False
2354                  False              False     False
2355                  False              False     False
2356                  False              False     False

      Yan_Etki_Bildirim_Tarihi  Alerjilerim  Kronik Hastaliklarim  \
0                        False        False                 False
1                        False        False                  True
2                        False        False                 False
3                        False        False                 False
4                        False         True                 False
…                        …          …                   …
2352                     False        False                  True
2353                     False        False                  True
2354                     False        False                 False
2355                     False        False                 False
2356                     False         True                 False

      Baba Kronik Hastaliklari  Anne Kronik Hastaliklari  \
0                        False                     False
1                        False                     False
2                        False                     False
3                        False                      True
4                        False                     False
…                        …                       …
2352                     False                     False
2353                     False                     False
2354                     False                      True
2355                      True                     False
2356                     False                     False

      Kiz Kardes Kronik Hastaliklari  Erkek Kardes Kronik Hastaliklari  \
0                              False                             False
1                              False                             False
2                              False                             False
3                              False                             False
4                              False                             False
…                              …                               …
2352                           False                             False
2353                           False                             False
2354                           False                             False
2355                           False                             False
2356                           False                             False
```

```
      Kan Grubu   Kilo    Boy
0         False  False  False
1          True  False  False
2         False  False  False
3         False   True  False
4         False  False  False
…           …     …     …
2352       True  False  False
2353      False   True  False
2354      False  False  False
2355       True  False  False
2356      False  False  False

[2357 rows x 19 columns]
```

[27]:
```
train_data.isnull().sum() #How many null values are there in each column?
```

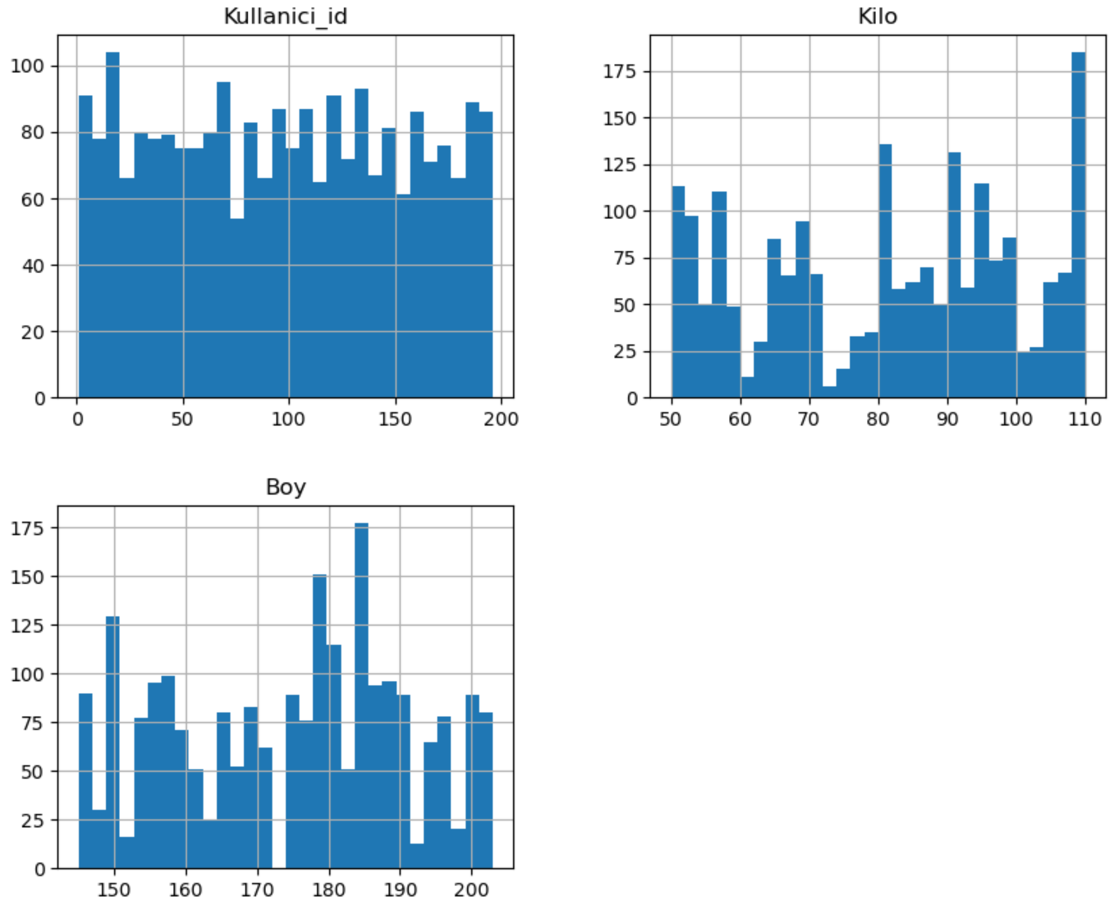
[27]:
```
Kullanici_id                        0
Cinsiyet                          778
Dogum_Tarihi                        0
Uyruk                               0
Il                                227
Ilac_Adi                            0
Ilac_Baslangic_Tarihi               0
Ilac_Bitis_Tarihi                   0
Yan_Etki                            0
Yan_Etki_Bildirim_Tarihi            0
Alerjilerim                       484
Kronik Hastaliklarim              392
Baba Kronik Hastaliklari          156
Anne Kronik Hastaliklari          217
Kiz Kardes Kronik Hastaliklari     97
Erkek Kardes Kronik Hastaliklari  121
Kan Grubu                         347
Kilo                              293
Boy                               114
dtype: int64
```

[28]:
```
#Use a heatmap to visualize where missing data is present.
sns.heatmap(train_data.isnull(), cbar=False)
plt.show()
```



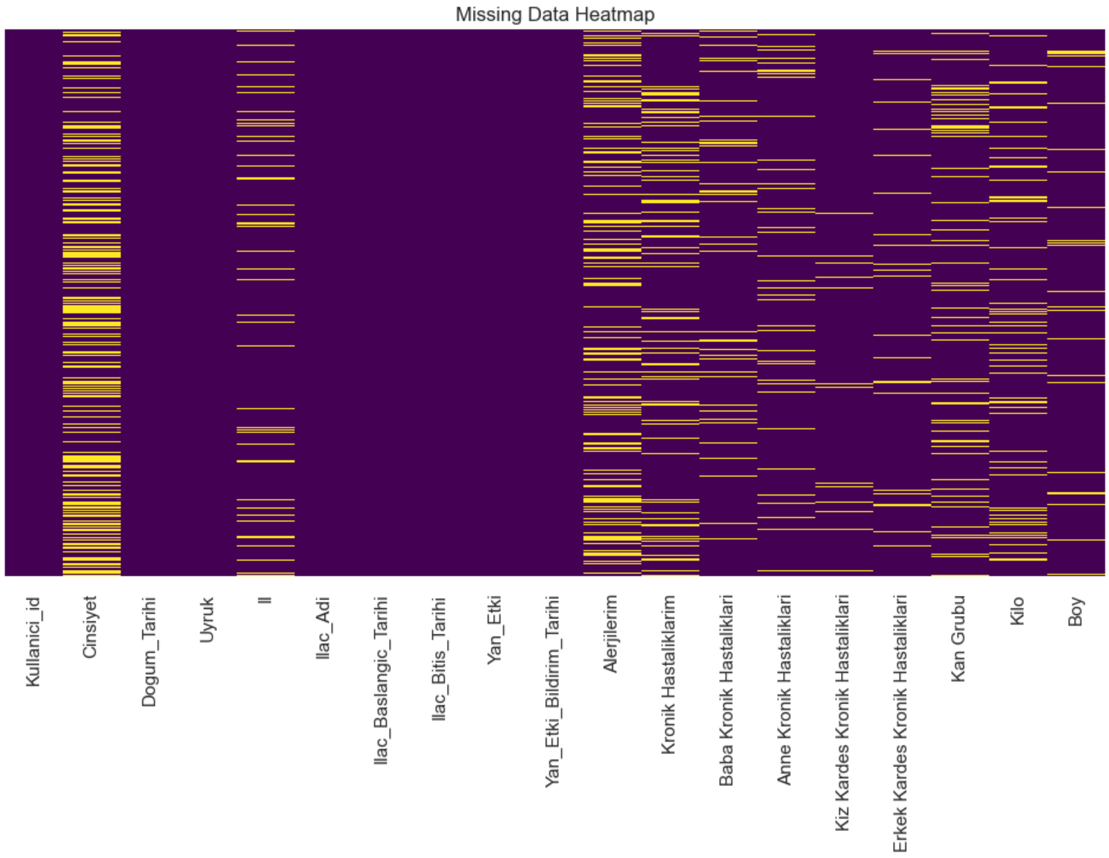
[32]:

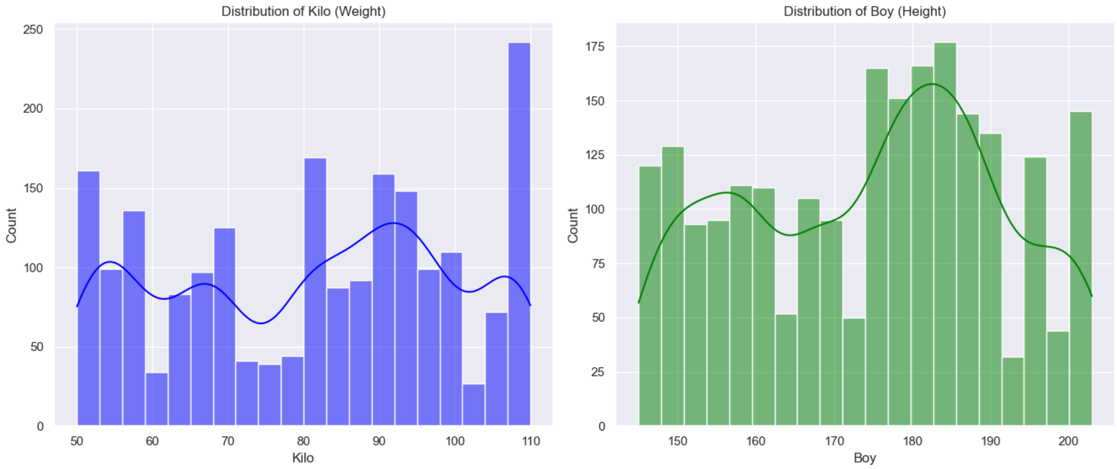
```
# Provide numerical columns
numerical_columns = train_data.select_dtypes(include=['number']).columns

# Plot histograms for numerical columns
if not numerical_columns.empty:
    train_data[numerical_columns].hist(bins=30, figsize=(10, 8))
    plt.show()
else:
    print("No numerical columns to plot.")
```



[39]:
```
# Set up the plot style
sns.set(style="darkgrid")

# Visualize missing data using a heatmap
plt.figure(figsize=(12, 6))
sns.heatmap(train_data.isnull(), cbar=False, cmap='viridis', yticklabels=False)
plt.title('Missing Data Heatmap')
plt.show()

# Distribution plots for Kilo (Weight) and Boy (Height) to observe their␣
 ↪distribution
plt.figure(figsize=(14, 6))

# Kilo distribution
plt.subplot(1, 2, 1)
sns.histplot(train_data['Kilo'].dropna(), kde=True, color='blue', bins=20)
plt.title('Distribution of Kilo (Weight)')
```

```
# Boy distribution
plt.subplot(1, 2, 2)
sns.histplot(train_data['Boy'].dropna(), kde=True, color='green', bins=20)
plt.title('Distribution of Boy (Height)')

plt.tight_layout()
plt.show()
```

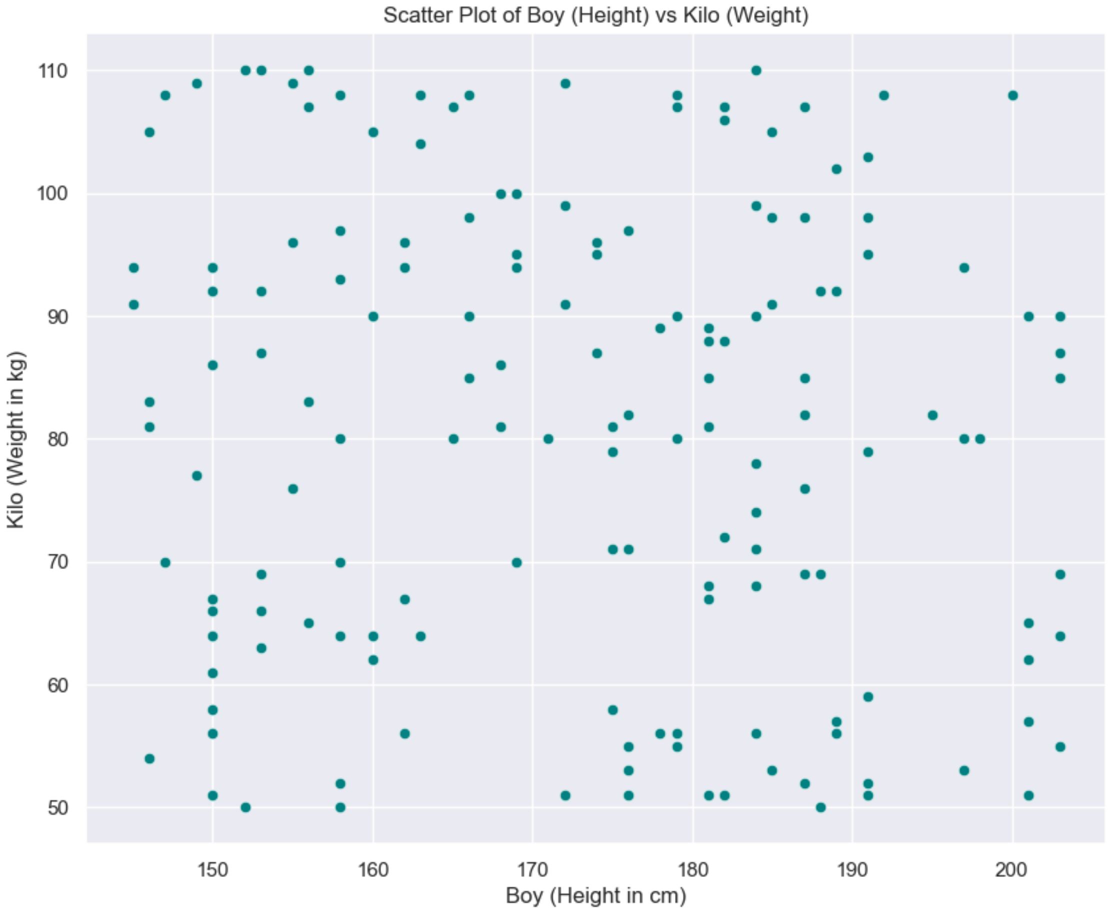


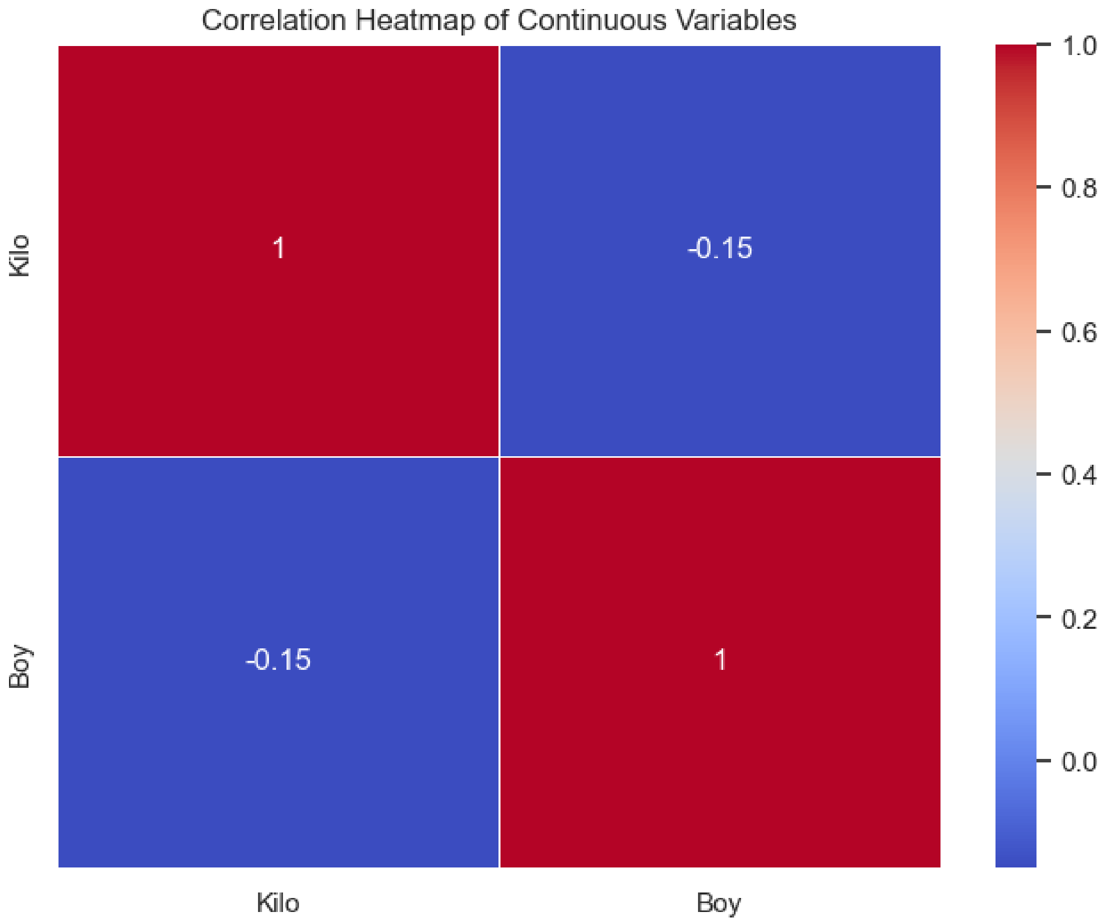


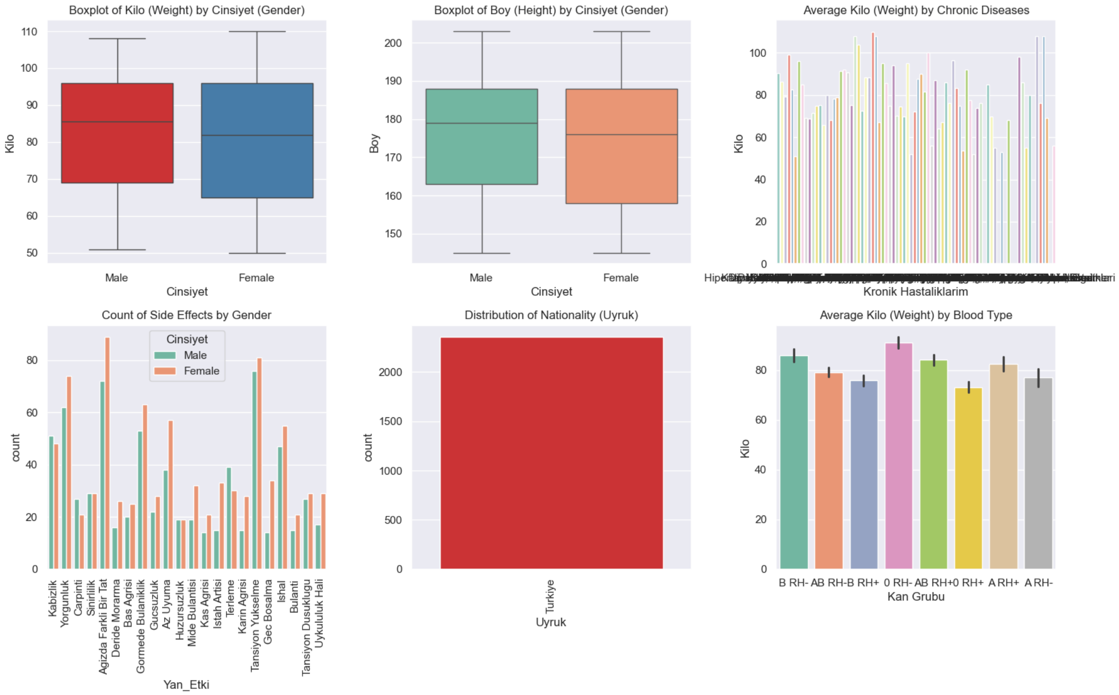
[46]:

```
# Set up figure size for the scatter plot and correlation matrix
plt.figure(figsize=(10, 8))

# Scatter plot between Boy (Height) and Kilo (Weight)
sns.scatterplot(x='Boy', y='Kilo', data=train_data, alpha=0.7, color='teal')
plt.title('Scatter Plot of Boy (Height) vs Kilo (Weight)')
plt.xlabel('Boy (Height in cm)')
plt.ylabel('Kilo (Weight in kg)')
plt.show()

continuous_vars = train_data[['Kilo', 'Boy']]  # You can add other continuous␣
 ↪variables if needed
corr_matrix = continuous_vars.corr()

# Heatmap of the correlation matrix for continuous variables
plt.figure(figsize=(8, 6))
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', linewidths=0.5,␣
 ↪linecolor='white')
plt.title('Correlation Heatmap of Continuous Variables')
plt.show()

# Now, let's visualize relationships between the categorical and continuous␣
 ↪variables:
plt.figure(figsize=(16, 10))

# Boxplot: Kilo (Weight) distribution by Cinsiyet (Gender)
plt.subplot(2, 3, 1)
sns.boxplot(x='Cinsiyet', y='Kilo', hue='Cinsiyet', data=train_data,␣
 ↪palette='Set1', legend=False)
plt.title('Boxplot of Kilo (Weight) by Cinsiyet (Gender)')
```

```python
# Boxplot: Boy (Height) distribution by Cinsiyet (Gender)
plt.subplot(2, 3, 2)
sns.boxplot(x='Cinsiyet', y='Boy', hue='Cinsiyet', data=train_data, palette='Set2', legend=False)
plt.title('Boxplot of Boy (Height) by Cinsiyet (Gender)')

# Barplot: Average Kilo (Weight) by Kronik Hastaliklarim (Chronic Diseases)
plt.subplot(2, 3, 3)
sns.barplot(x='Kronik Hastaliklarim', y='Kilo', hue='Kronik Hastaliklarim', data=train_data, errorbar=None, palette='Set3', legend=False)
plt.title('Average Kilo (Weight) by Chronic Diseases')

# Barplot: Count of Yan_Etki (Side Effects) by Cinsiyet (Gender)
plt.subplot(2, 3, 4)
sns.countplot(x='Yan_Etki', hue='Cinsiyet', data=train_data, palette='Set2')
plt.xticks(rotation=90)
plt.title('Count of Side Effects by Gender')

# Countplot: Distribution of Uyruk (Nationality)
plt.subplot(2, 3, 5)
sns.countplot(x='Uyruk', hue='Uyruk', data=train_data, palette='Set1', legend=False)
plt.title('Distribution of Nationality (Uyruk)')
plt.xticks(rotation=90)

# Barplot: Average Weight by Blood Type (Kan Grubu)
plt.subplot(2, 3, 6)
sns.barplot(x='Kan Grubu', y='Kilo', hue='Kan Grubu', data=train_data, palette='Set2', legend=False)
plt.title('Average Kilo (Weight) by Blood Type')

plt.tight_layout()
plt.show()
```


Scatter Plot of Boy (Height) vs Kilo (Weight)
Kilo (Weight in kg)
110
100
90
80
70
60
50
150
160
170
180
190
200
Boy (Height in cm)


Correlation Heatmap of Continuous Variables
Kilo
Boy
1
-0.15
-0.15
1
Kilo
Boy
1.0
0.8
0.6
0.4
0.2
0.0



Boxplot of Kilo (Weight) by Cinsiyet (Gender)
Kilo
110
100
90
80
70
60
50
Male
Female
Cinsiyet
Boxplot of Boy (Height) by Cinsiyet (Gender)
Boy
200
190
180
170
160
150
Male
Female
Cinsiyet
Average Kilo (Weight) by Chronic Diseases
Kilo
100
80
60
40
20
0
Kronik Hastaliklarim
Count of Side Effects by Gender
count
80
60
40
20
0
Cinsiyet
Male
Female
Kabizlik
Yorgunluk
Carpinti
Sinirlilik
Agizda Farkli Bir Tat
Deride Morarma
Bas Agrisi
Gormede Bulaniklik
Gucsuzluk
Az Uyuma
Huzursuzluk
Mide Bulantisi
Kas Agrisi
Istah Artisi
Terleme
Karin Agrisi
Tansiyon Yukselme
Gec Bosalma
Ishal
Bulanti
Tansiyon Dusuklugu
Uykululuk Hali
Yan_Etki
Distribution of Nationality (Uyruk)
count
2000
1500
1000
500
0
Turkiye
Uyruk
Average Kilo (Weight) by Blood Type
Kilo
80
60
40
20
0
B RH-
AB RH-
B RH+
0 RH-
AB RH+
0 RH+
A RH+
A RH-
Kan Grubu