Data Audit Report

In [ ]:

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

In [ ]:

```
# Load datasets
dataset1 = pd.read_excel("datasets/dataset1.xlsm")
dataset2 = pd.read_excel("datasets/dataset2.xlsm")
```

Dataset 1

In [117]:

```
dataset1.head()
```

Out[117]:

	Patient_Number	Blood_Pressure_Abnormality	Level_of_Hemoglobin	Genetic_Pedigree_Coefficient	Age	BMI	Sex	Pregnanc
0	1	1	11.28	0.90	34	23	1	1
1	2	0	9.75	0.23	54	33	1	Na
2	3	1	10.79	0.91	70	49	0	Na
3	4	0	11.00	0.43	71	50	0	Na
4	5	1	14.17	0.83	52	19	0	Na

Basic info

In [79]:

```
dataset1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2000 entries, 0 to 1999
Data columns (total 14 columns):
 #   Column                          Non-Null Count  Dtype
---  ------                          --------------  -----
 0   Patient_Number                  2000 non-null   int64
 1   Blood_Pressure_Abnormality      2000 non-null   int64
 2   Level_of_Hemoglobin             2000 non-null   float64
 3   Genetic_Pedigree_Coefficient    1908 non-null   float64
 4   Age                             2000 non-null   int64
 5   BMI                             2000 non-null   int64
 6   Sex                             2000 non-null   int64
```

```
 7   Pregnancy                       442 non-null    float64
 8   Smoking                         2000 non-null   int64
 9   salt_content_in_the_diet        2000 non-null   int64
 10  alcohol_consumption_per_day     1758 non-null   float64
 11  Level_of_Stress                 2000 non-null   int64
 12  Chronic_kidney_disease          2000 non-null   int64
 13  Adrenal_and_thyroid_disorders   2000 non-null   int64
dtypes: float64(4), int64(10)
memory usage: 218.9 KB
```

Number of missing data

In [110]:

```
dataset1.isnull().sum()
```

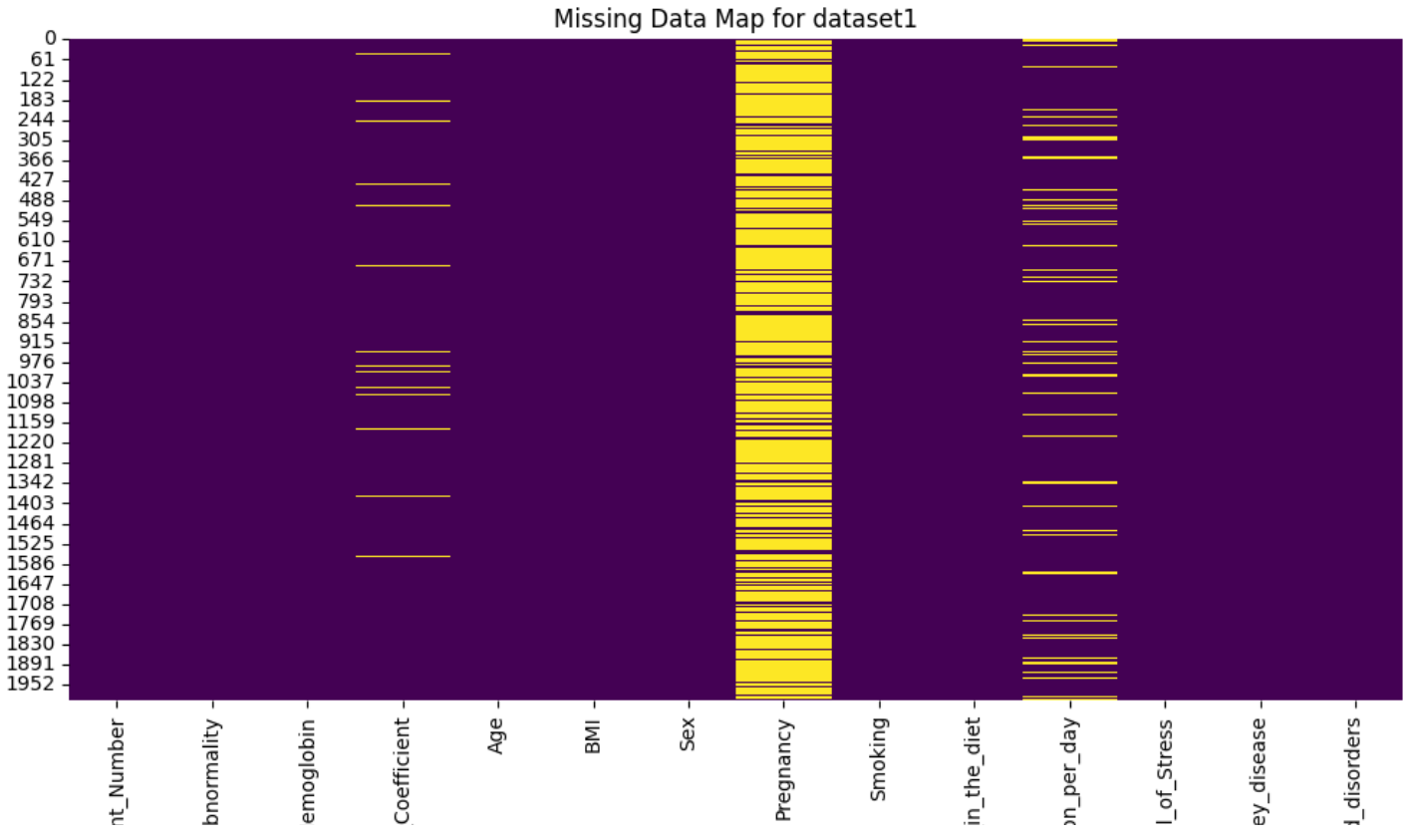
Out[110]:

```
Patient_Number                      0
Blood_Pressure_Abnormality          0
Level_of_Hemoglobin                 0
Genetic_Pedigree_Coefficient       92
Age                                 0
BMI                                 0
Sex                                 0
Pregnancy                        1558
Smoking                             0
salt_content_in_the_diet            0
alcohol_consumption_per_day       242
Level_of_Stress                     0
Chronic_kidney_disease              0
Adrenal_and_thyroid_disorders       0
dtype: int64
```

Missing data heatmap

In [104]:

```
plt.figure(figsize=(12, 6))
sns.heatmap(dataset1.isnull(), cbar=False, cmap="viridis")
plt.title("Missing Data Map for dataset1")
plt.show()
```



Conclusions:

- Since all the data in the dataset are numerical, it's important to clarify in the prompt the meaning of some categorical variables so that the model can interpret them correctly. For example: 0 represents "male" and 1 represents "female" for the gender variable.
- A lot of missing data in "pregnancy" variable.
- For missing data, I suggest filling in the values as follows:
  - For the "pregnancy" variable fill with 0.
  - For the "Genetic_Pedigree_Coefficient" variable, use the median value of the existing data, as this will minimize the impact of outliers while providing a reasonable estimate.
  - For the "alcohol_consumption_per_day" variable, use the median value as well, as it reflects the central tendency and can fill in missing values without introducing bias.

Feature Engineering:

- Add age group column for grouping by the following categories: -> "0-18", "19-25", "26-35", "36-45", "46-55", "56-65", "66-75", "76-100"
- Add BMI category column for grouping by the following categories: -> "Underweight", "Normal", "Overweight", "Obese"

Statistics

In [81]:

```
dataset1.describe()
```

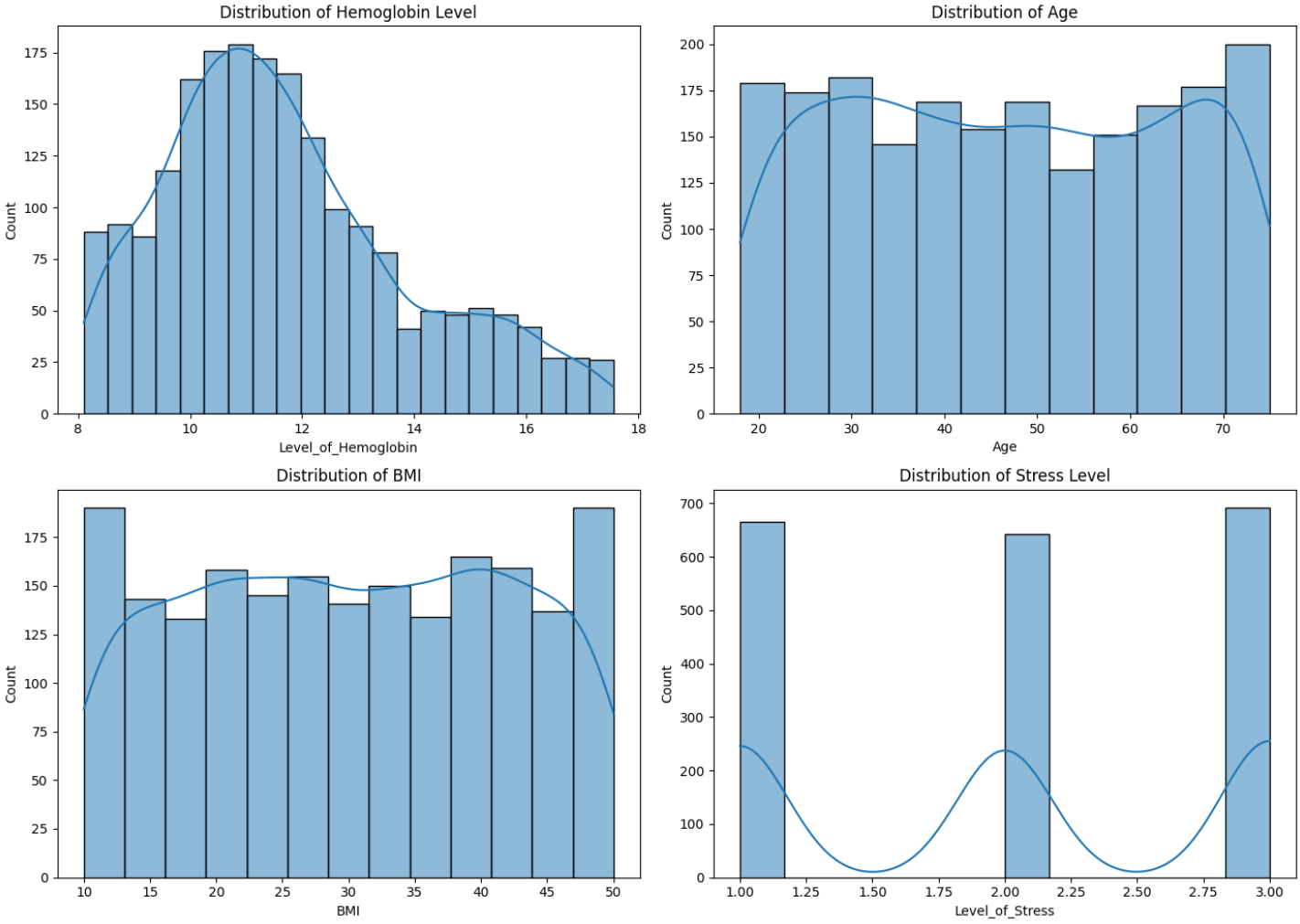
Out[81]:

	Patient_Number	Blood_Pressure_Abnormality	Level_of_Hemoglobin	Genetic_Pedigree_Coefficient	Age	
count	2000.000000	2000.000000	2000.000000	1908.000000	2000.000000	2000.00
mean	1000.500000	0.493500	11.710035	0.494817	46.558500	30.08
std	577.494589	0.500083	2.186701	0.291736	17.107832	11.76
min	1.000000	0.000000	8.100000	0.000000	18.000000	10.00
25%	500.750000	0.000000	10.147500	0.240000	32.000000	20.00
50%	1000.500000	0.000000	11.330000	0.490000	46.000000	30.00
75%	1500.250000	1.000000	12.945000	0.740000	62.000000	40.00
max	2000.000000	1.000000	17.560000	1.000000	75.000000	50.00

Distribution analysis for some key variables

In [88]:

```
fig, axes = plt.subplots(2, 2, figsize=(14, 10))

sns.histplot(dataset1["Level_of_Hemoglobin"], kde=True, ax=axes[0, 0])
axes[0, 0].set_title("Distribution of Hemoglobin Level")

sns.histplot(dataset1["Age"], kde=True, ax=axes[0, 1])
axes[0, 1].set_title("Distribution of Age")

sns.histplot(dataset1["BMI"], kde=True, ax=axes[1, 0])
axes[1, 0].set_title("Distribution of BMI")

sns.histplot(dataset1["Level_of_Stress"], kde=True, ax=axes[1, 1])
axes[1, 1].set_title("Distribution of Stress Level")

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



Variable Distributions:

- **A lot of patients have extreme bmi values (check the correctness of this values)**
- **Uniform distribution of stress levels and age.**

Correlations Between Variables::

Potential correlations may exist between:

- **Blood_Pressure_Abnormality and BMI or salt_content_in_the_diet.**
- **Level_of_Stress, Alcohol_consumption_per_day and Smoking**

Dataset 2

In [118]:

```
dataset2.head()
```

Out[118]:

	Patient_Number	Day_Number	Physical_activity
0	1	1	23590.0
1	1	2	10411.0
2	1	3	7815.0
3	1	4	12366.0
4	1	5	NaN

Basic info

In [80]:

```
dataset2.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20000 entries, 0 to 19999
Data columns (total 3 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   Patient_Number     20000 non-null  int64  
 1   Day_Number         20000 non-null  int64  
 2   Physical_activity  16159 non-null  float64
dtypes: float64(1), int64(2)
memory usage: 468.9 KB
```

Missing data

Number of missing data

In [111]:

```
dataset2.isnull().sum()
```

Out[111]:

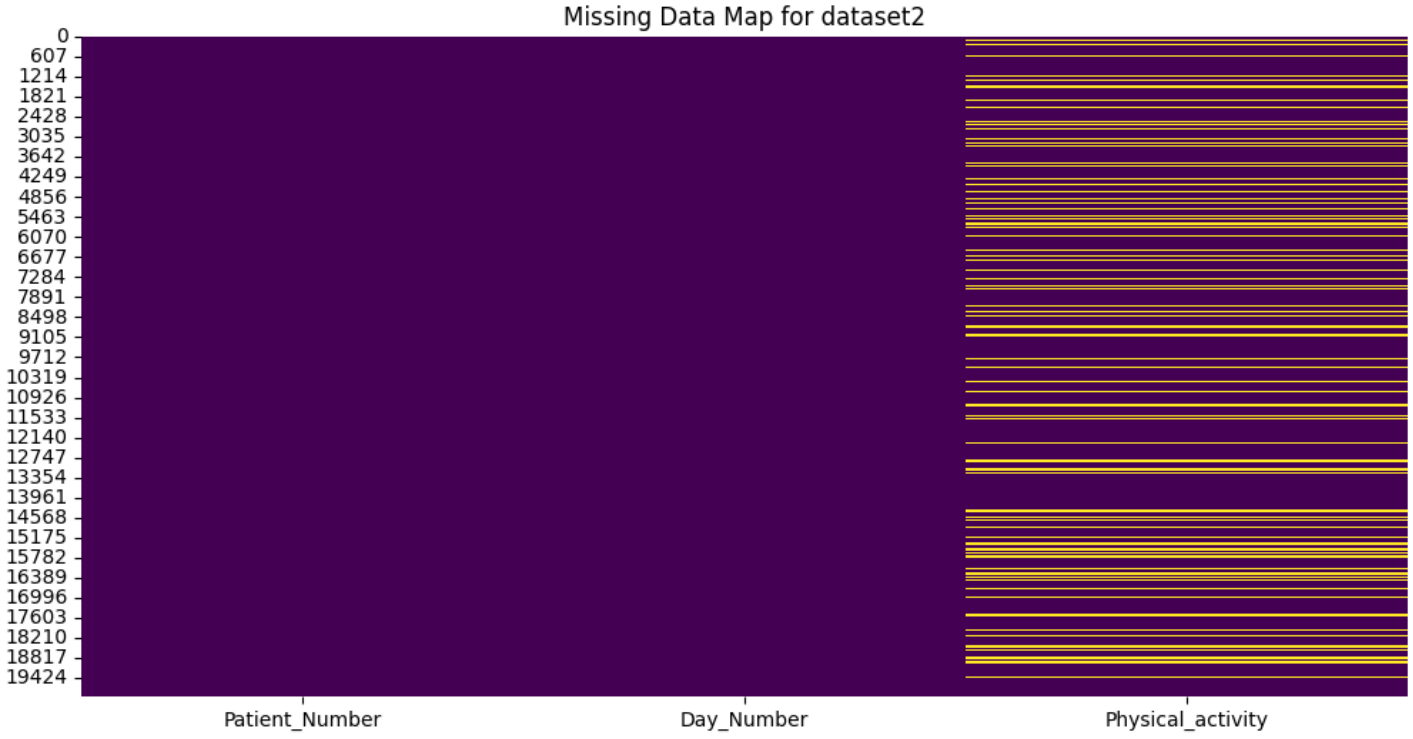
```
Patient_Number           0
Day_Number               0
Physical_activity     3841
dtype: int64
```

Missing data heatmap

In [113]:

```
plt.figure(figsize=(12, 6))
```

```
sns.heatmap(dataset2.isnull(), cbar=False, cmap="viridis")
plt.title("Missing Data Map for dataset2")
plt.show()
```



Conclusions:

- **We can join dataset1 and dataset2 using the Patient_Number.**
- **Due to significant missing data, I suggest replacing the "Physical_activity" column with a column containing the median value for each patient. This will help reduce the data and standardize the datasets.**

Feature Engineering:

- **Add 'activity_level' column for grouping by the following categories: -> "sedentary", "lightly_active", "moderately_active", "very_active"**

Statistics

In [82]:

```
dataset2.describe()
```

Out[82]:

	Patient_Number	Day_Number	Physical_activity
count	20000.000000	20000.000000	16159.000000
mean	1000.500000	5.500000	25353.499969
std	577.364631	2.872353	9885.999907
min	1.000000	1.000000	628.000000
25%	500.750000	3.000000	18564.000000
50%	1000.500000	5.500000	25488.000000
75%	1500.250000	8.000000	32080.000000
max	2000.000000	10.000000	49980.000000

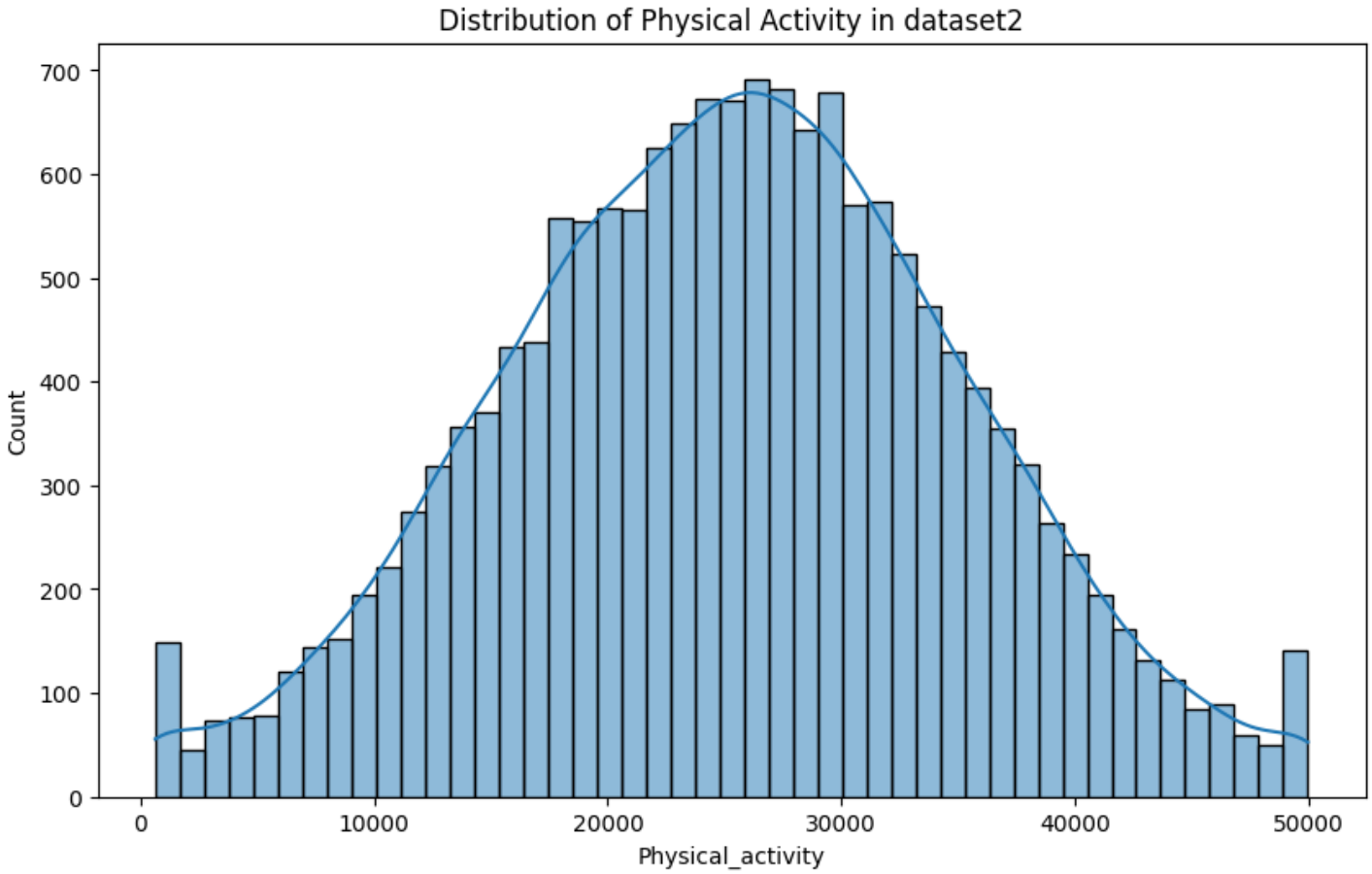
max 2000.000000 10.000000 49980.000000

Patient_Number Day_Number Physical_activity

Distribution analysis for Physical Activity

In [99]:

```
plt.figure(figsize=(10, 6))
sns.histplot(dataset2["Physical_activity"], kde=True)
plt.title("Distribution of Physical Activity in dataset2")
plt.show()
```



Variable Distributions:

- **Physical_activity shows a sharp peak in the range of about 20,000-30,000, but there are also extreme values.**

Correlations Between Variables::

Potential correlations may exist between:

- **'Physical_activity' with 'BMI', 'age' and 'alcohol_consumption_per_day'**