World Happiness Report 2023 - EDA

In this project, an analysis of the World Happiness Report 2023 dataset was conducted, exploring the relationships between happiness scores, regional trends, and key indicators such as GDP per capita, social support, healthy life expectancy, freedom to make life choices, generosity, and perceptions of corruption.

The dataset was downloaded from the World Happiness Report website, which provides open access to the data and tools for analysis. By examining these relationships, insights were gained into the complex and multifaceted nature of happiness and well-being, and potential strategies for promoting happiness and improving quality of life around the world were identified. Finally, the happiness scores of all the countries around the world were presented on a map with a timeline from 2005 to 2022.

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
import warnings
warnings.filterwarnings("ignore")
```

World Happiness Report 2023 Dataset

In [2]:
```
WHR_df = pd.read_csv("world Happiness Report 2023.csv")
WHR_df.head(4)
```

Out[2]:

	Country name	iso alpha	Regional indicator	Happiness score	Standard error of ladder score	upperwhisker	lowerwhisker	Logged GDP per capita	Social support	Healthy life expectancy	...	Generosity	Perception o corruptio
0	Afghanistan	AFG	South Asia	1.859	0.033	1.923	1.795	7.324	0.341	54.712	...	-0.081	0.84
1	Albania	ALB	Central and Eastern Europe	5.277	0.066	5.406	5.148	9.567	0.718	69.150	...	-0.007	0.87
2	Algeria	DZA	Middle East and North Africa	5.329	0.062	5.451	5.207	9.300	0.855	66.549	...	-0.117	0.71
3	Argentina	ARG	Latin America and Caribbean	6.024	0.063	6.147	5.900	9.959	0.891	67.200	...	-0.089	0.81

4 rows × 21 columns

Filter the columns and copy only the ones that will be used for analysis.

In [3]:
```
columns = ['Country name', 'iso alpha', 'Regional indicator', 'Happiness score',
           'Logged GDP per capita', 'Social support',
           'Healthy life expectancy', 'Freedom to make life choices',
           'Generosity', 'Perceptions of corruption']
happy_df = WHR_df[columns].copy()
happy_df.head()
```

Out[3]:

	Country name	iso alpha	Regional indicator	Happiness score	Logged GDP per capita	Social support	Healthy life expectancy	Freedom to make life choices	Generosity	Perceptions of corruption
0	Afghanistan	AFG	South Asia	1.859	7.324	0.341	54.712	0.382	-0.081	0.847
1	Albania	ALB	Central and Eastern Europe	5.277	9.567	0.718	69.150	0.794	-0.007	0.878
2	Algeria	DZA	Middle East and North Africa	5.329	9.300	0.855	66.549	0.571	-0.117	0.717
3	Argentina	ARG	Latin America and Caribbean	6.024	9.959	0.891	67.200	0.823	-0.089	0.814
4	Armenia	ARM	Commonwealth of Independent States	5.342	9.615	0.790	67.789	0.796	-0.155	0.705

Convert all column names to uppercase

In [4]:
```
happy_df.columns = happy_df.columns.str.upper()
happy_df.head()
```

Out[4]:

	COUNTRY NAME	ISO ALPHA	REGIONAL INDICATOR	HAPPINESS SCORE	LOGGED GDP PER CAPITA	SOCIAL SUPPORT	HEALTHY LIFE EXPECTANCY	FREEDOM TO MAKE LIFE CHOICES	GENEROSITY	PERCEPTIONS OF CORRUPTION
0	Afghanistan	AFG	South Asia	1.859	7.324	0.341	54.712	0.382	-0.081	0.847
1	Albania	ALB	Central and Eastern Europe	5.277	9.567	0.718	69.150	0.794	-0.007	0.878
2	Algeria	DZA	Middle East and North Africa	5.329	9.300	0.855	66.549	0.571	-0.117	0.717
3	Argentina	ARG	Latin America and Caribbean	6.024	9.959	0.891	67.200	0.823	-0.089	0.814
4	Armenia	ARM	Commonwealth of Independent States	5.342	9.615	0.790	67.789	0.796	-0.155	0.705

Data info

In [5]:
```
happy_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 137 entries, 0 to 136
Data columns (total 10 columns):
 #   Column                        Non-Null Count  Dtype  
---  ------                        --------------  -----  
 0   COUNTRY NAME                  137 non-null    object 
 1   ISO ALPHA                     137 non-null    object 
 2   REGIONAL INDICATOR            137 non-null    object 
 3   HAPPINESS SCORE               137 non-null    float64
 4   LOGGED GDP PER CAPITA         137 non-null    float64
 5   SOCIAL SUPPORT                137 non-null    float64
 6   HEALTHY LIFE EXPECTANCY       136 non-null    float64
 7   FREEDOM TO MAKE LIFE CHOICES  137 non-null    float64
 8   GENEROSITY                    137 non-null    float64
 9   PERCEPTIONS OF CORRUPTION     137 non-null    float64
dtypes: float64(7), object(3)
memory usage: 10.8+ KB
```

In [6]:
```
# Check if there are any missing values
happy_df.isnull().sum()
```

Out[6]:
```
COUNTRY NAME                    0
ISO ALPHA                       0
REGIONAL INDICATOR              0
HAPPINESS SCORE                 0
LOGGED GDP PER CAPITA           0
SOCIAL SUPPORT                  0
HEALTHY LIFE EXPECTANCY         1
FREEDOM TO MAKE LIFE CHOICES    0
GENEROSITY                      0
PERCEPTIONS OF CORRUPTION       0
dtype: int64
```

In [7]:
```
happy_df[happy_df.isnull().any(axis = 1)]
```

Out[7]:

	COUNTRY NAME	ISO ALPHA	REGIONAL INDICATOR	HAPPINESS SCORE	LOGGED GDP PER CAPITA	SOCIAL SUPPORT	HEALTHY LIFE EXPECTANCY	FREEDOM TO MAKE LIFE CHOICES	GENEROSITY	PERCEPTIONS OF CORRUPTION
116	State of Palestine	PSE	Middle East and North Africa	4.908	8.716	0.859	NaN	0.694	-0.132	0.836

A missing value has been found in the "healthy life expectancy" column for the State of Palestine. It has been decided not to make any assumptions or fill in the missing value, as this could bias the information. Since the value is not provided in the report, it will be left as is. This decision will not impact the analysis, and the missing value has been noted for future reference.

In [8]:
```
# Choose the Numerical columns for further analysis
numerical_columns = ['HAPPINESS SCORE', 'LOGGED GDP PER CAPITA', 'SOCIAL SUPPORT',
                     'HEALTHY LIFE EXPECTANCY','FREEDOM TO MAKE LIFE CHOICES',
                     'GENEROSITY', 'PERCEPTIONS OF CORRUPTION']
happy_df[numerical_columns].describe()
```

Out[8]:

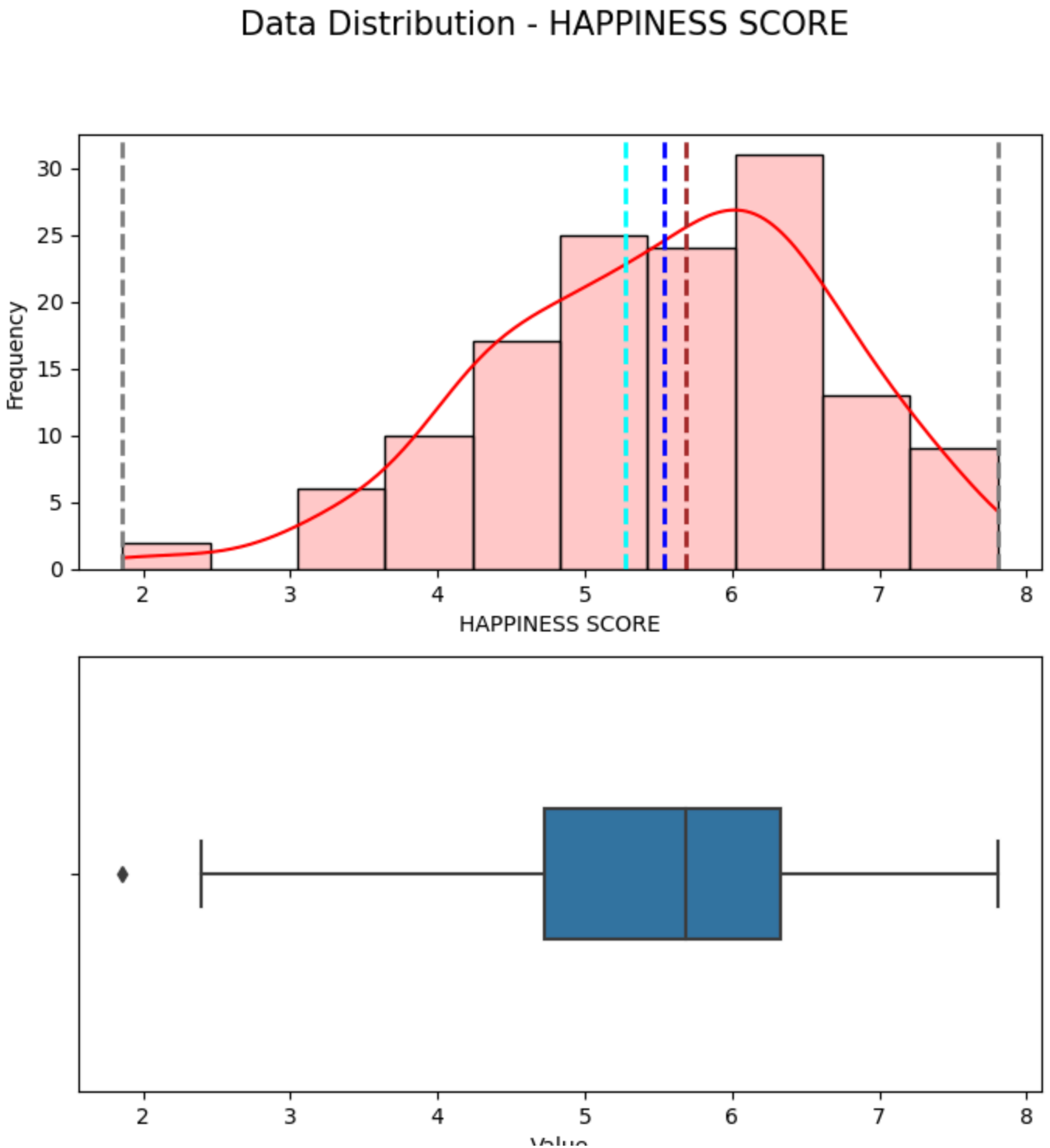
	HAPPINESS SCORE	LOGGED GDP PER CAPITA	SOCIAL SUPPORT	HEALTHY LIFE EXPECTANCY	FREEDOM TO MAKE LIFE CHOICES	GENEROSITY	PERCEPTIONS OF CORRUPTION
count	137.000000	137.000000	137.000000	136.000000	137.000000	137.000000	137.000000
mean	5.539796	9.449796	0.799073	64.967632	0.787394	0.022431	0.725401
std	1.139929	1.207302	0.129222	5.750390	0.112371	0.141707	0.176956
min	1.859000	5.527000	0.341000	51.530000	0.382000	-0.254000	0.146000
25%	4.724000	8.591000	0.722000	60.648500	0.724000	-0.074000	0.668000
50%	5.684000	9.567000	0.827000	65.837500	0.801000	0.001000	0.774000
75%	6.334000	10.540000	0.896000	69.412500	0.874000	0.117000	0.846000
max	7.804000	11.660000	0.983000	77.280000	0.961000	0.531000	0.929000

The distribution of numerical data using both histograms and boxplots...

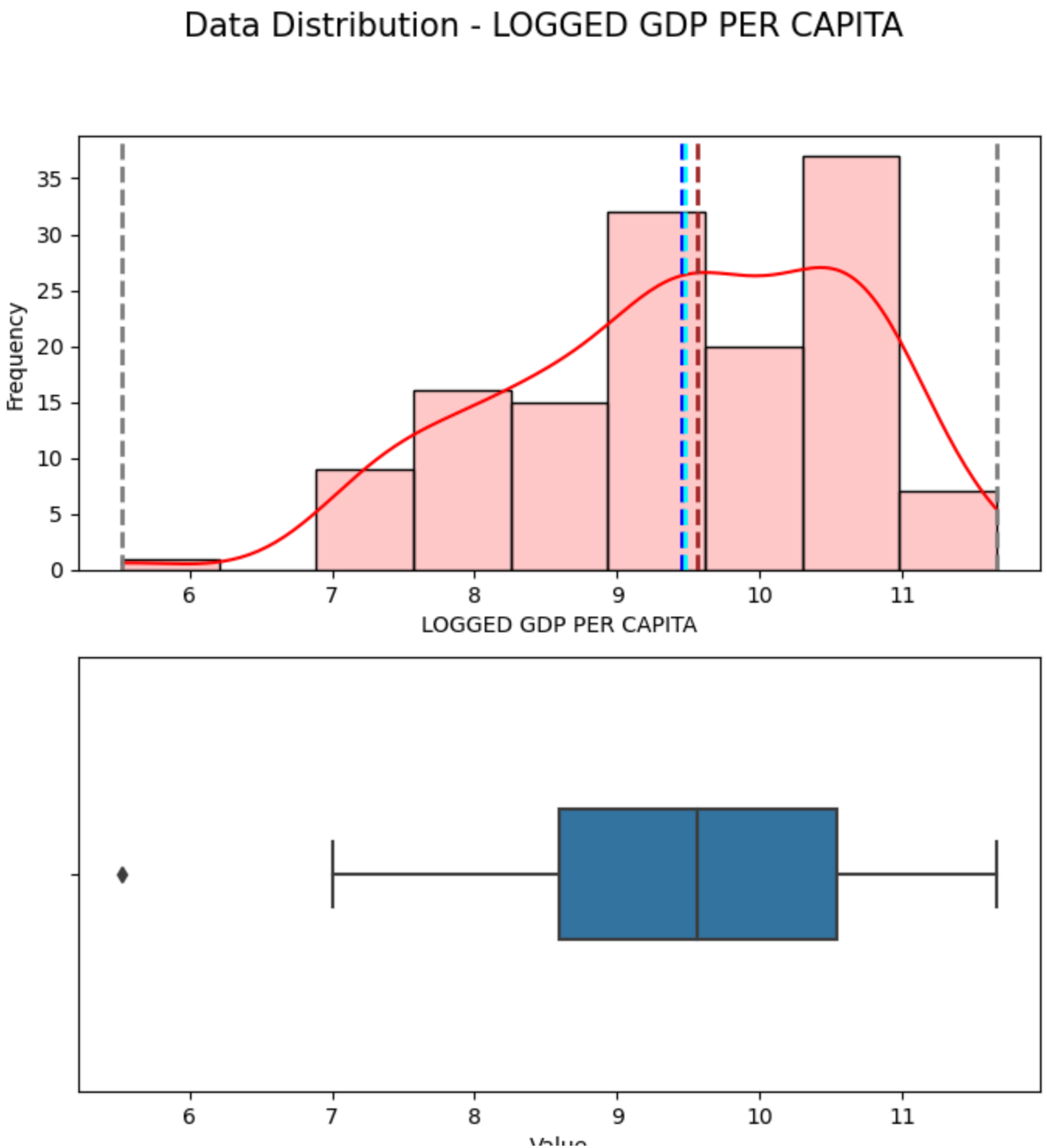
In [9]:
```
# Create a function that displays the distribution of numerical
# data using both histograms and boxplots.
```

```
def show_distribution(var):
    var_min = happy_df[var].min()
    var_mean = happy_df[var].mean()
    var_median = happy_df[var].median()
    var_mode = happy_df[var].mode()[0]
    var_max = happy_df[var].max()

    # Histogram
    fig, ax = plt.subplots(2, 1, figsize = (8,8))
    sns.histplot(happy_df, x = var, kde = True, color = 'red',
                 alpha = 0.2, ax = ax[0])
    ax[0].set_ylabel("Frequency")

    ax[0].axvline(x = var_min, color = 'gray', linewidth = 2, linestyle = "--")
    ax[0].axvline(x = var_mean, color = 'blue', linewidth = 2, linestyle = "--")
    ax[0].axvline(x = var_median, color = 'brown', linewidth = 2, linestyle = "--")
    ax[0].axvline(x = var_mode, color = 'cyan', linewidth = 2, linestyle = "--")
    ax[0].axvline(x = var_max, color = 'gray', linewidth = 2, linestyle = "--")

    # Box plot
    sns.boxplot(happy_df, x = var, width = 0.3, ax = ax[1],)
    ax[1].set_xlabel("Value")

    fig.suptitle("Data Distribution - " + var, size = 15)
    fig.show()
```

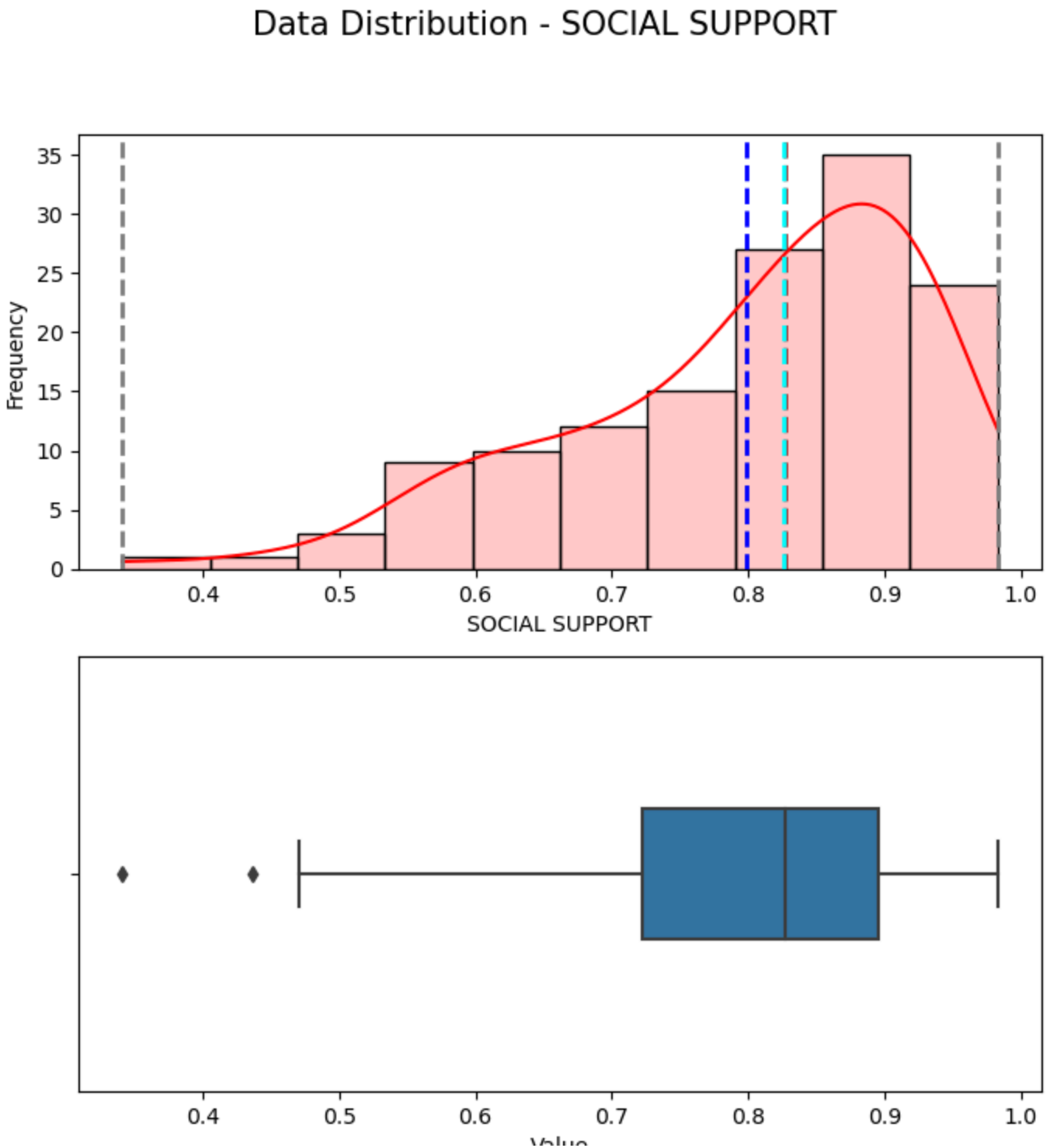
In [10]:
```
# Call show_distribution function
for column in numerical_columns:
    show_distribution(column)
```


Data Distribution - HAPPINESS SCORE
Frequency
HAPPINESS SCORE
Value

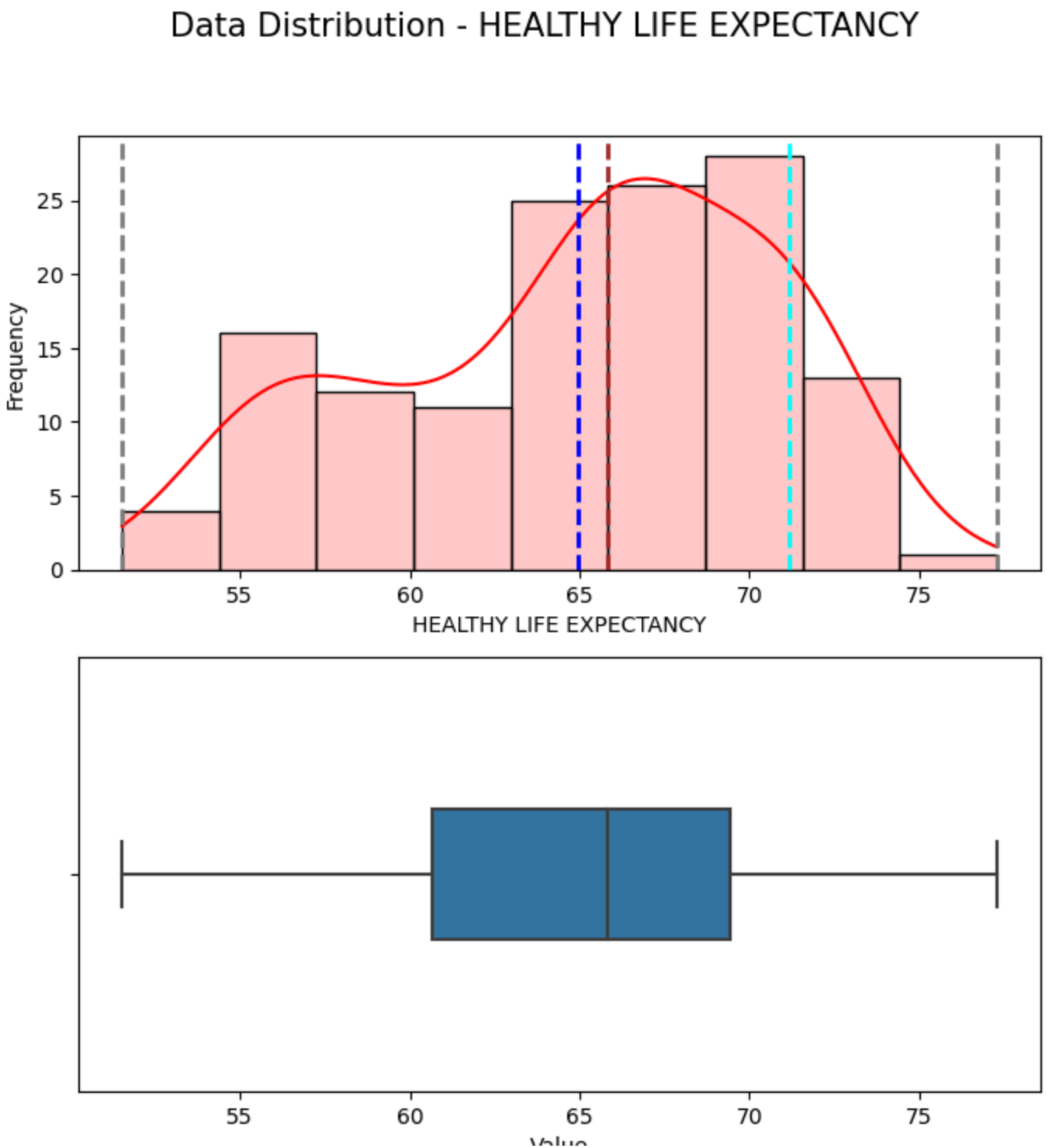
value


Data Distribution - LOGGED GDP PER CAPITA
Frequency
0
5
10
15
20
25
30
35
6
7
8
9
10
11
LOGGED GDP PER CAPITA
6
7
8
9
10
11

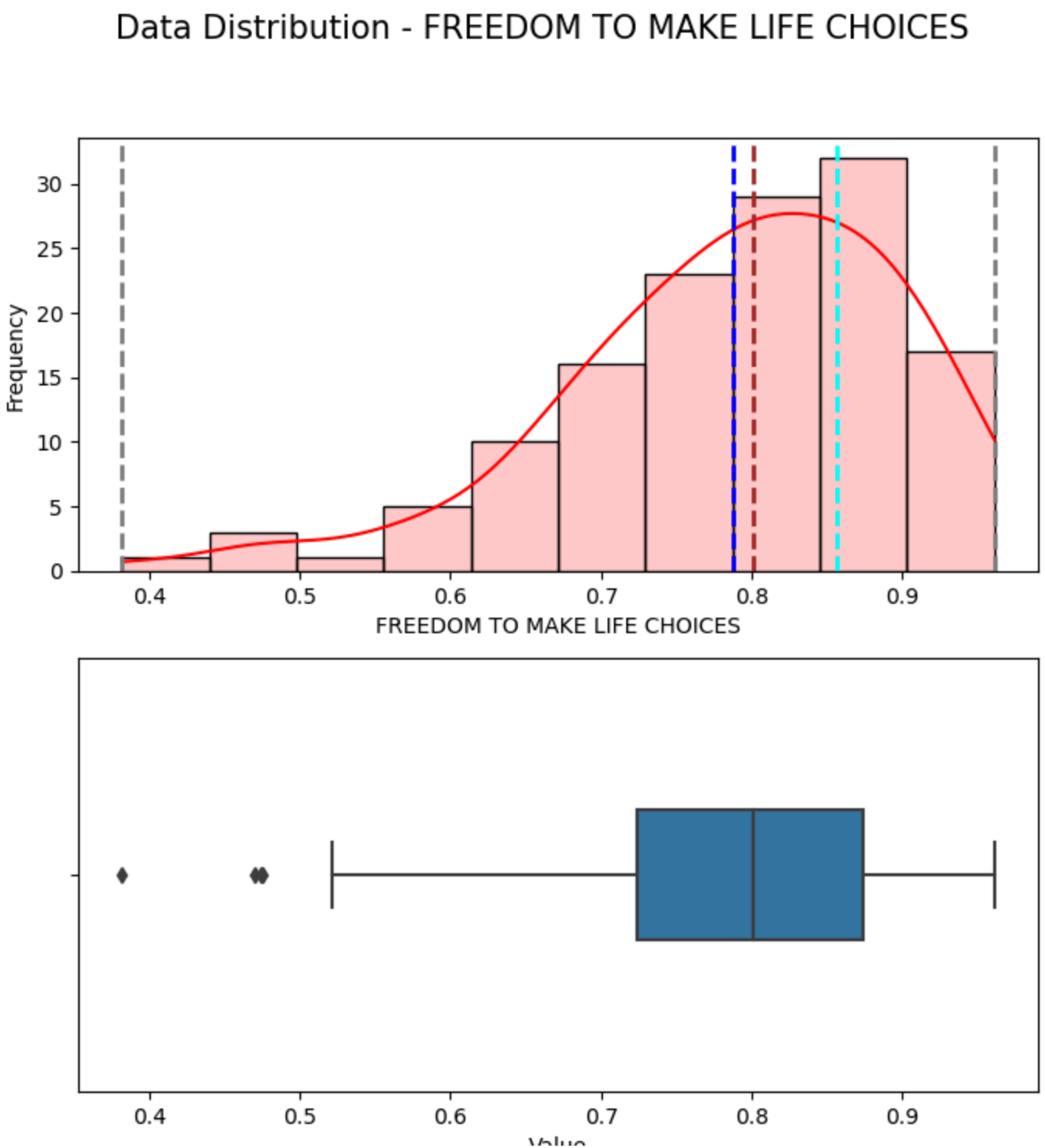
value


Data Distribution - SOCIAL SUPPORT
Frequency
SOCIAL SUPPORT
Value

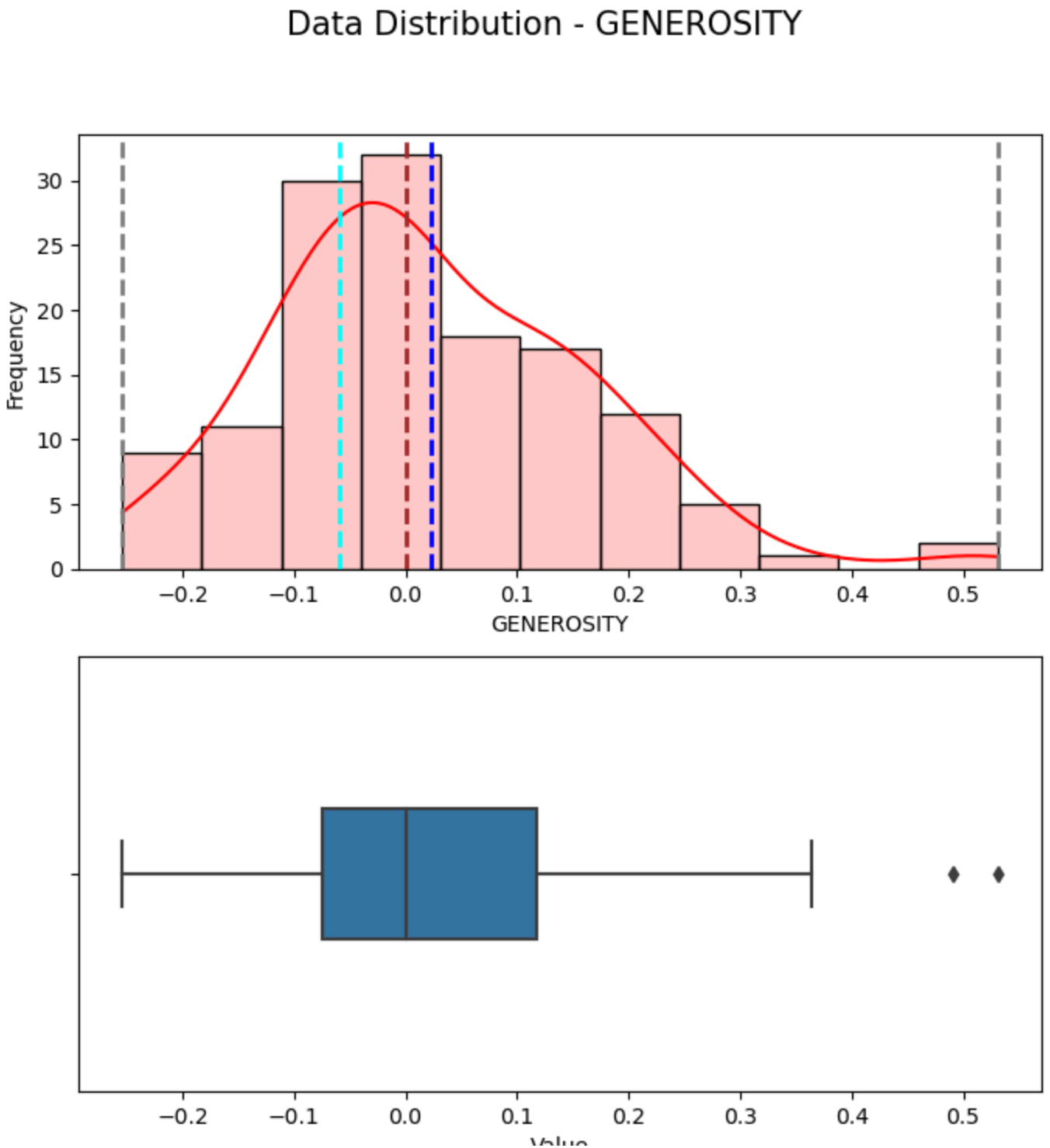
value


Data Distribution - HEALTHY LIFE EXPECTANCY
Frequency
0
5
10
15
20
25
55
60
65
70
75
HEALTHY LIFE EXPECTANCY
55
60
65
70
75

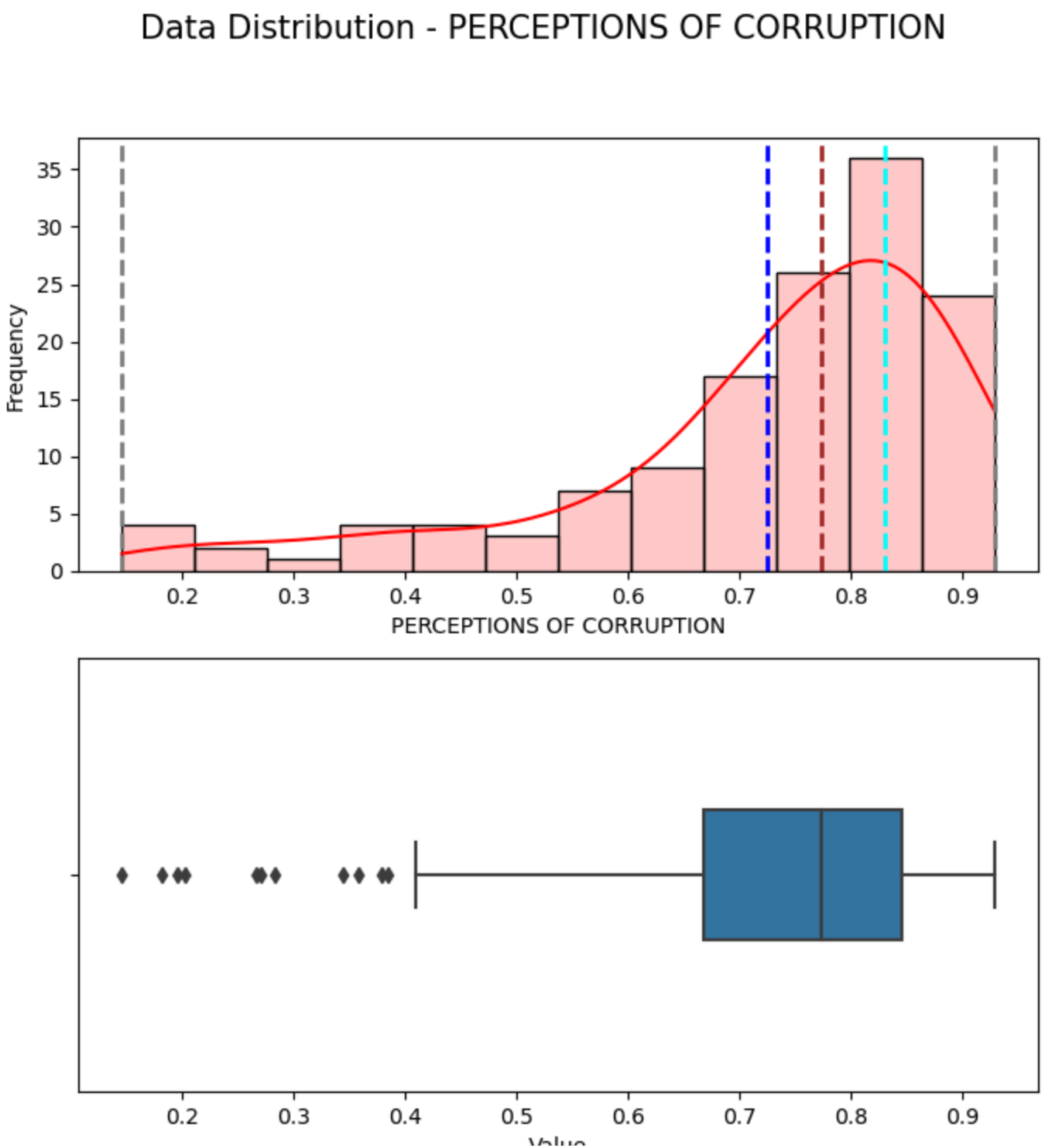
value


Data Distribution - FREEDOM TO MAKE LIFE CHOICES
Frequency
0
5
10
15
20
25
30
0.4
0.5
0.6
0.7
0.8
0.9
FREEDOM TO MAKE LIFE CHOICES
0.4
0.5
0.6
0.7
0.8
0.9

value


Data Distribution - GENEROSITY
Frequency
GENEROSITY
Value

value


Data Distribution - PERCEPTIONS OF CORRUPTION
Frequency
PERCEPTIONS OF CORRUPTION
Value

value

Outliers, which are data points that significantly differ from other observations, have been found in the distribution of "perceptions of corruption." However, it has been decided to include these outliers in the analysis. They might indicate the presence of exceptional or unusual situations in the country.

A scatter plot has been created to further explore the distribution of the factors, depicting the relationship between the happiness score and other factors.

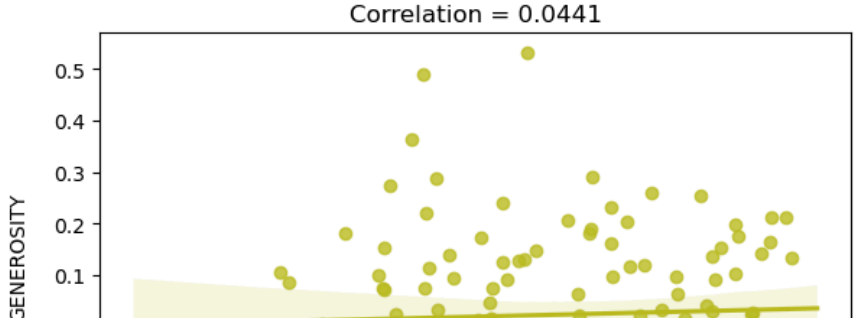
In [11]:
```
#Happiness score vs other factors
tab_20_colors = ["#1f77b4", "#2ca02c", "#9467bd", "#e377c2", "#bcbd22", "#9edae5"]
fig, ax = plt.subplots(3, 2, figsize = (12,12))
i = 0
for j, column in enumerate(numerical_columns[1:]):
    corr = happy_df['HAPPINESS SCORE'].corr(happy_df[column])
    sns.regplot(happy_df, x = "HAPPINESS SCORE", y = column,
                color = tab_20_colors[i], ax = ax[j//2, j%2])
    ax[j//2, j%2].set_title("Correlation = {:.4f}".format(corr))
    i += 1
fig.tight_layout()
fig.subplots_adjust(hspace = 0.3)
fig.show()
```

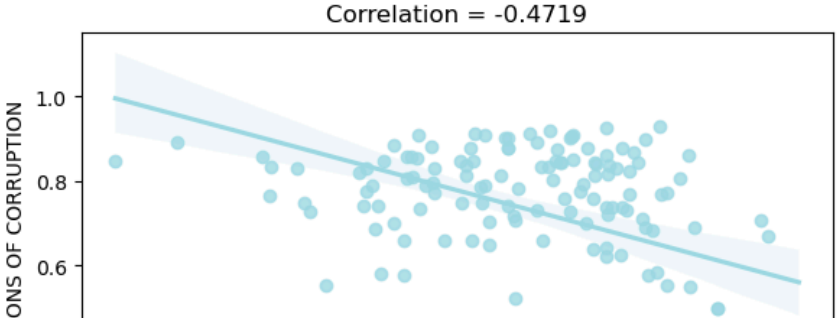

Correlation = 0.7844
LOGGED GDP PER CAPITA
HAPPINESS SCORE

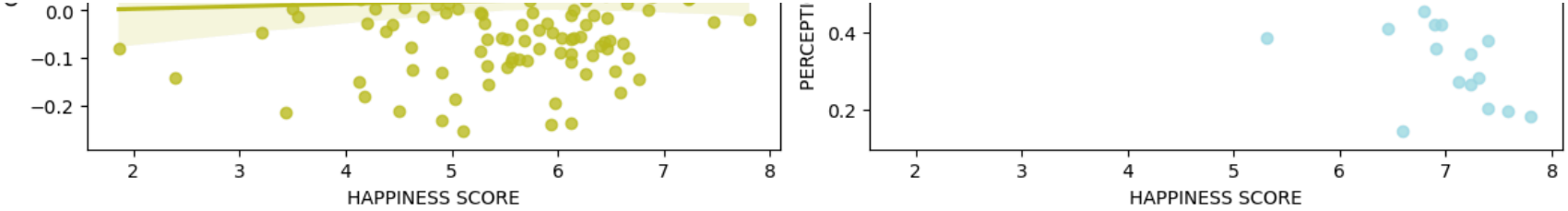

Correlation = 0.8345
SOCIAL SUPPORT
HAPPINESS SCORE


Correlation = 0.7469
HEALTHY LIFE EXPECTANCY
HAPPINESS SCORE


Correlation = 0.6629
FREEDOM TO MAKE LIFE CHOICES
HAPPINESS SCORE

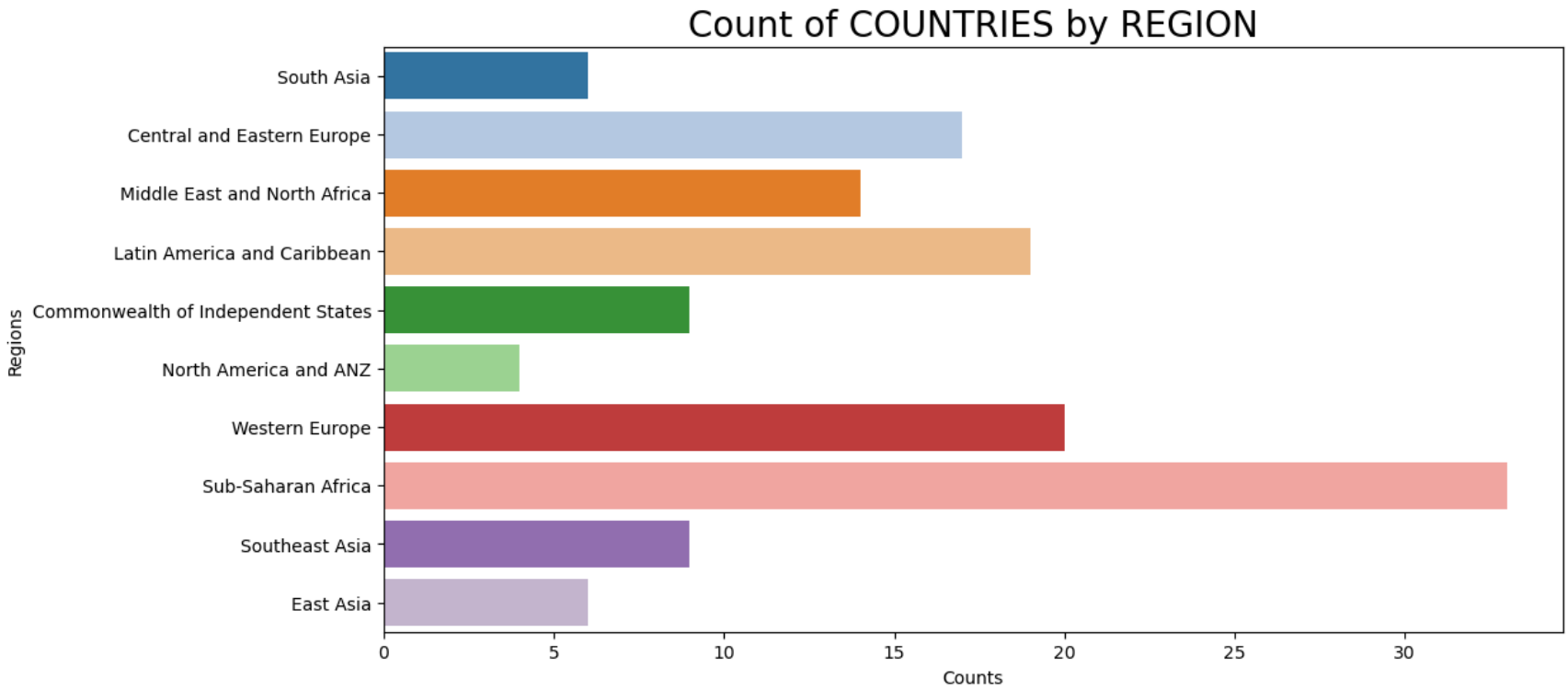

Correlation = 0.0441
GENEROSITY


Correlation = -0.4719
ONS OF CORRUPTION



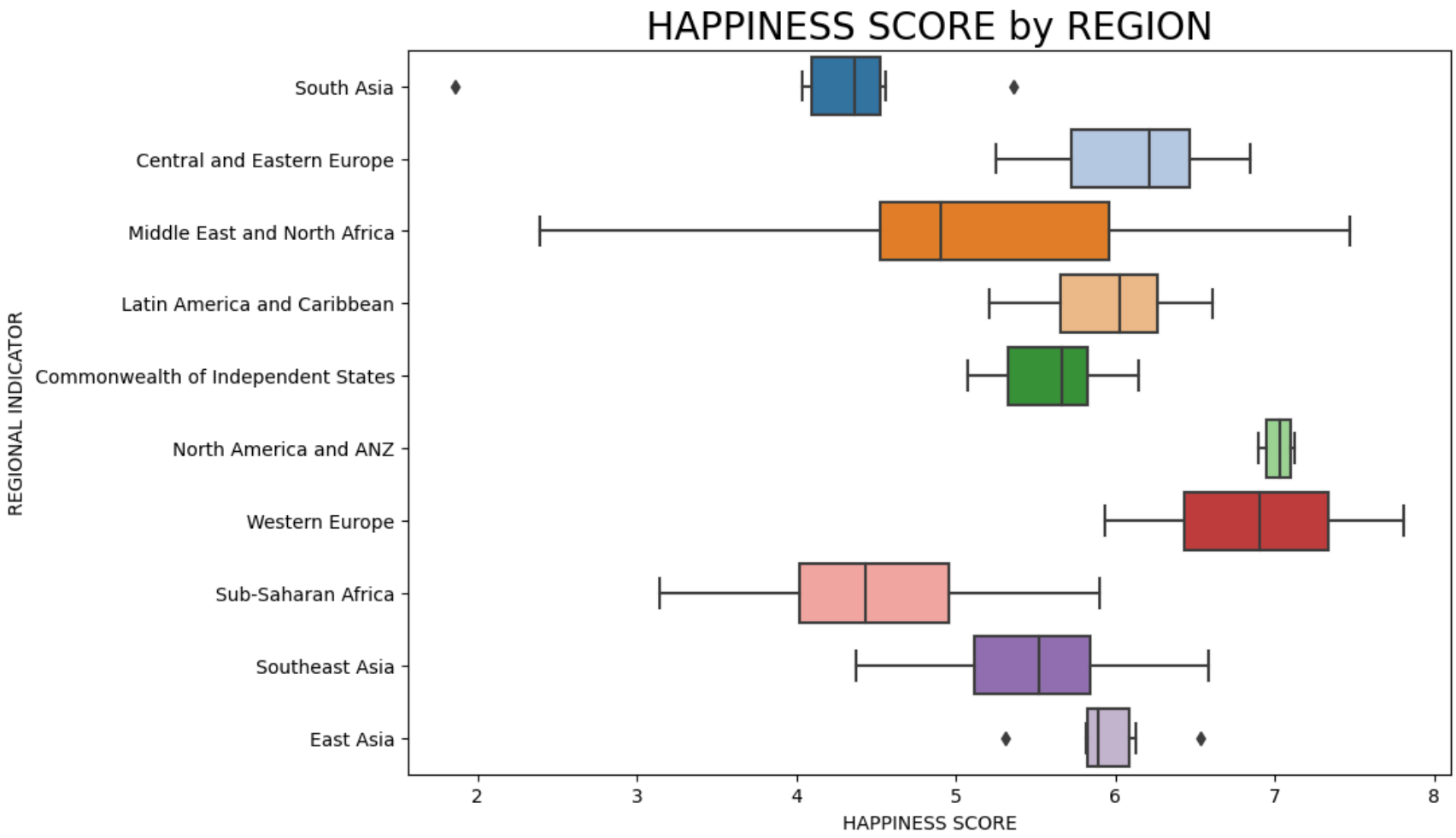
Analysis of happiness score and other factors across different region..

In [12]:
```
#Count of Countries by Region
fig = plt.figure(figsize = (12,6))
sns.countplot(happy_df, y = 'REGIONAL INDICATOR', palette = 'tab20')
plt.ylabel("Regions")
plt.xlabel("Counts")
plt.title("Count of COUNTRIES by REGION", size = 20)
plt.show()
```



In [13]:
```
#Boxplot
fig = plt.figure(figsize = (10,7))
sns.boxplot(happy_df, y = 'REGIONAL INDICATOR', x = "HAPPINESS SCORE",
            palette = 'tab20')
plt.title("HAPPINESS SCORE by REGION", size = 20)
```

Out[13]:
```
Text(0.5, 1.0, 'HAPPINESS SCORE by REGION')
```

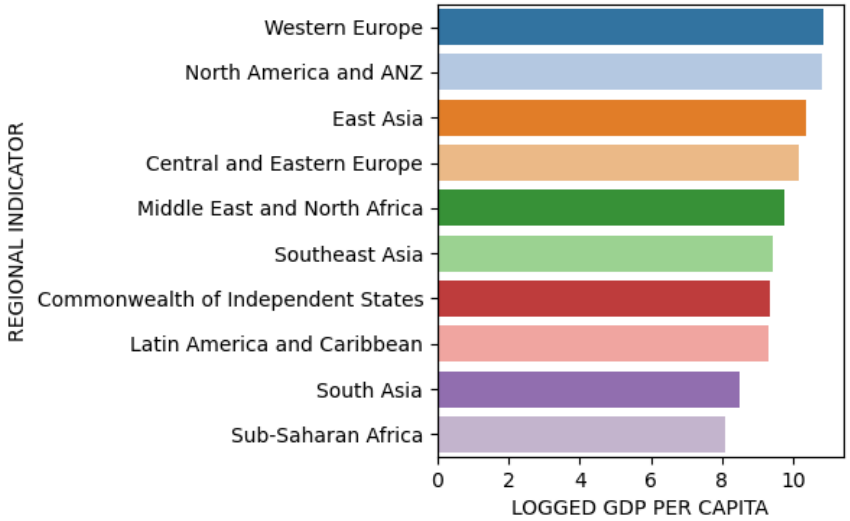


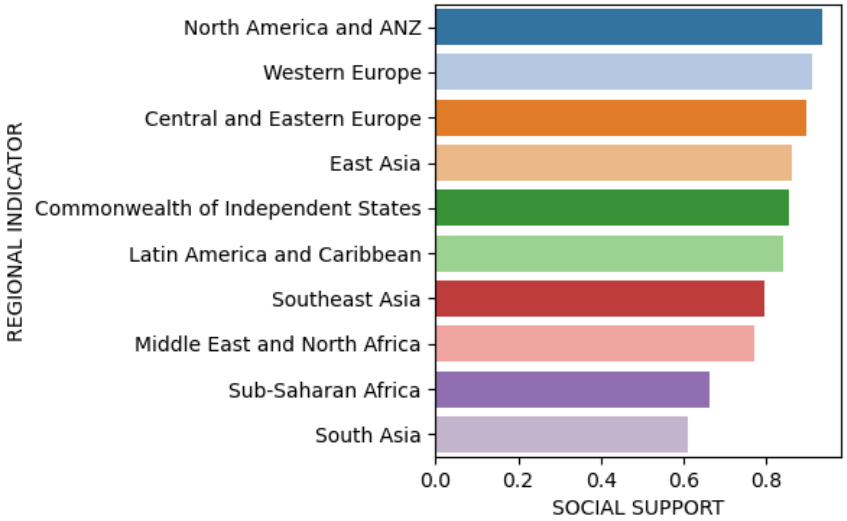
-The box plot analysis indicates that higher median happiness scores are observed in the Western Europe, North America, and ANZ regions compared to other regions.

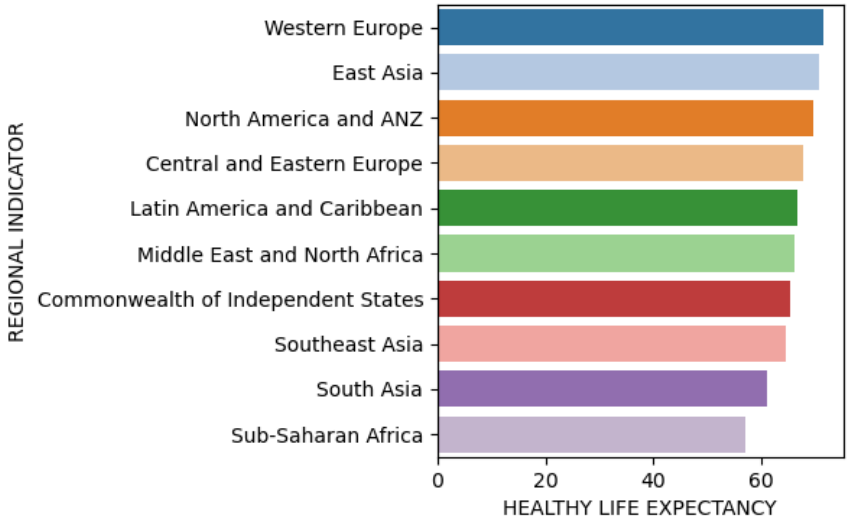
-An outlier is observed in the South Asia region, where Afghanistan has a notably lower happiness score. This may be attributed to political instability and a lower healthy life expectancy in Afghanistan.

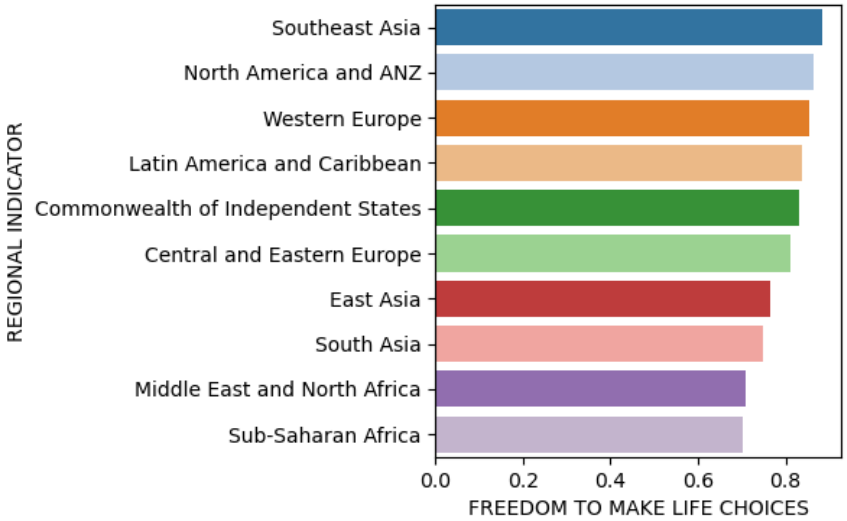
An analysis was conducted to further explore the factors that may contribute to higher or lower happiness scores across different regions. A bar chart was created to depict (represent) the average values of various factors, such as GDP per capita, social support, healthy life expectancy, etc., across different regions.

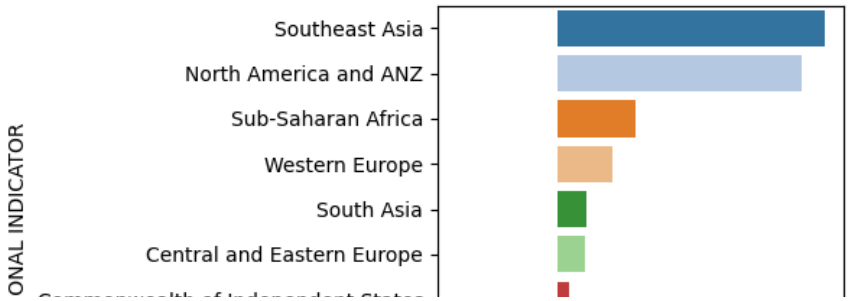
In [14]:
```
region_wise = happy_df.groupby("REGIONAL INDICATOR")[numerical_columns].mean().reset_index()
fig, ax = plt.subplots(3, 2, figsize = (12,12))
for i, column in enumerate(numerical_columns[1:]):
    region_wise.sort_values(column, ascending = False, inplace = True)
    sns.barplot(region_wise, x = column, y = 'REGIONAL INDICATOR', palette = 'tab20', ax = ax[i//2, i%2])
fig.tight_layout()
fig.subplots_adjust(hspace = 0.3)
fig.show()
```

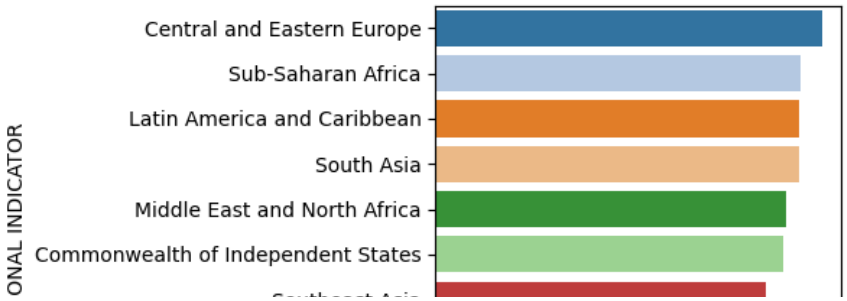

Western Europe
North America and ANZ
East Asia
Central and Eastern Europe
Middle East and North Africa
Southeast Asia
Commonwealth of Independent States
Latin America and Caribbean
South Asia
Sub-Saharan Africa
REGIONAL INDICATOR
0
2
4
6
8
10
LOGGED GDP PER CAPITA

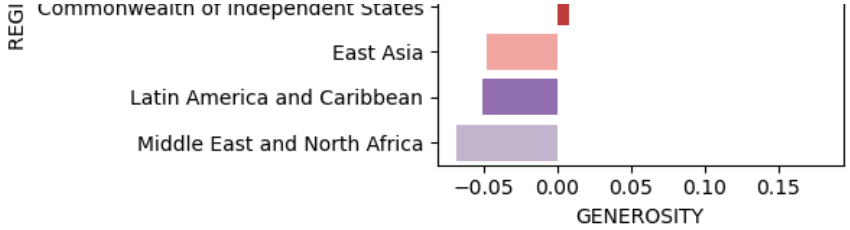

North America and ANZ
Western Europe
Central and Eastern Europe
East Asia
Commonwealth of Independent States
Latin America and Caribbean
Southeast Asia
Middle East and North Africa
Sub-Saharan Africa
South Asia
REGIONAL INDICATOR
0.0
0.2
0.4
0.6
0.8
SOCIAL SUPPORT

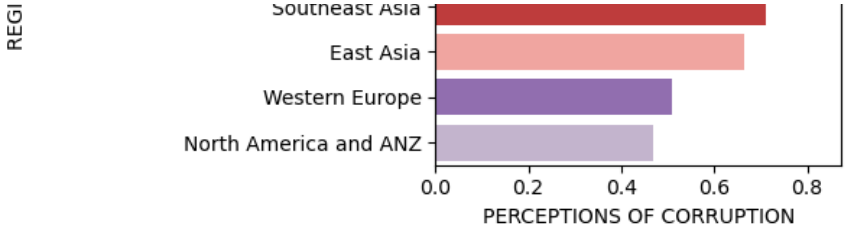

Western Europe
East Asia
North America and ANZ
Central and Eastern Europe
Latin America and Caribbean
Middle East and North Africa
Commonwealth of Independent States
Southeast Asia
South Asia
Sub-Saharan Africa
REGIONAL INDICATOR
0
20
40
60
HEALTHY LIFE EXPECTANCY


Southeast Asia
North America and ANZ
Western Europe
Latin America and Caribbean
Commonwealth of Independent States
Central and Eastern Europe
East Asia
South Asia
Middle East and North Africa
Sub-Saharan Africa
REGIONAL INDICATOR
0.0
0.2
0.4
0.6
0.8
FREEDOM TO MAKE LIFE CHOICES


Southeast Asia
North America and ANZ
Sub-Saharan Africa
Western Europe
South Asia
Central and Eastern Europe
ONAL INDICATOR


Central and Eastern Europe
Sub-Saharan Africa
Latin America and Caribbean
South Asia
Middle East and North Africa
Commonwealth of Independent States
ONAL INDICATOR





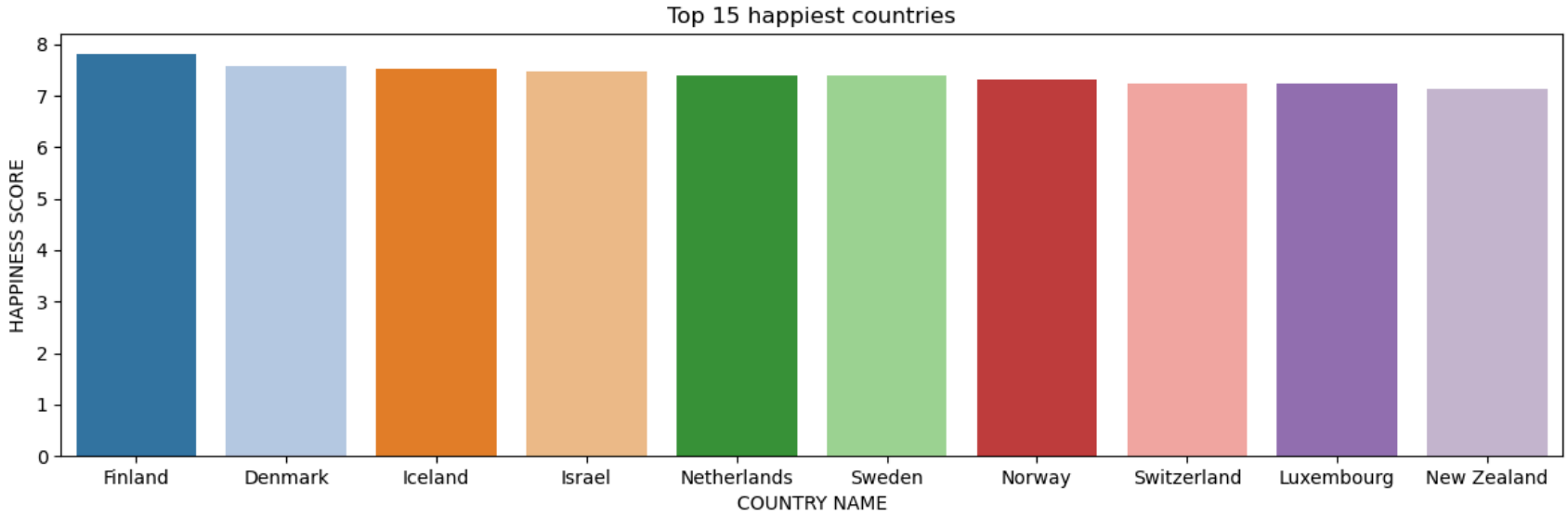
-It is suggested by this analysis that regions with higher median happiness scores, such as Western Europe, North America, and ANZ, tend to have higher average values in various key factors, including GDP per capita, social support, healthy life expectancy, and freedom to make life choices, compared to regions with lower median happiness scores.

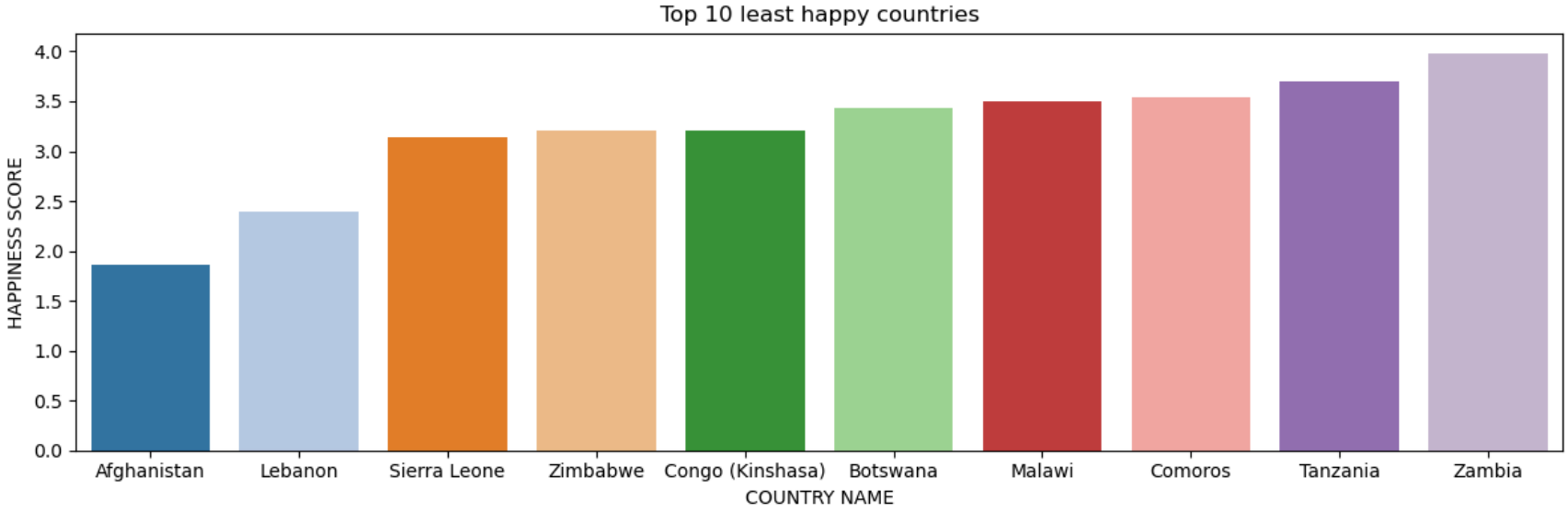
-Moreover, these regions exhibit lower average values in factors that are negatively associated with happiness levels, such as perceptions of corruption.

-These findings underscore the significance of economic prosperity, social support networks, access to healthcare, and freedom to make life choices in promoting happiness and well-being across different regions.

Top 15 happiest and least happy countries.

In [15]:
```
#A column chart was created to analyze the top 10 happiest and least happy countries.
top_10_happy_country = happy_df.sort_values('HAPPINESS SCORE', ascending = False)
bottom_10_happy_country = happy_df.sort_values('HAPPINESS SCORE', ascending = True)

fig, ax = plt.subplots(2, 1, figsize = (12,8))

sns.barplot(top_10_happy_country.iloc[:10], y = 'HAPPINESS SCORE',
            x = 'COUNTRY NAME', palette = 'tab20', ax = ax[0])
ax[0].set_title("Top 15 happiest countries")



sns.barplot(bottom_10_happy_country.iloc[:10], y = 'HAPPINESS SCORE',
            x = 'COUNTRY NAME', palette = 'tab20', ax = ax[1])
ax[1].set_title("Top 10 least happy countries")

fig.tight_layout()
fig.show()
```





-The analysis revealed that eight out of the top 10 happiest countries are from the Western Europe region.

-Similarly, the analysis of the top 10 least happy countries showed that eight out of 10 countries are from the Sub-Saharan Africa region.

CONCLUSION

This project has thoroughly examined happiness scores worldwide, showing how economic, social, and health factors influence people's well-being. The results indicate that boosting economic growth, building strong social networks, and improving healthcare access can increase happiness levels. Also, reducing corruption can help maintain these improvements. By making happiness a priority for individuals, communities, and policymakers, we can strive to create a fairer, more equal, and more satisfying world for everyone.

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