World Happiness

What factors determine the quality of life?

By Kuhu Halder & Achuth Suresh Nair

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What is quality of life?

Quality of life (QOL) is defined by the World Health Organization as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns".

Standard indicators of the quality of life include wealth, employment, the environment, physical and mental health, education, recreation and leisure time, social belonging, religious beliefs, safety, security and freedom.

https://www.who.int/healthinfo/survey/whoqol-qualityoflife/en/

Motivation

Happiness is a very subjective feeling and can be hard to quantify. The World Happiness Report has surveyed and evaluated key metrics that can affect quality of life and life satisfaction in various countries.

On a personal level, the notion of happiness can differ from person to person based on their personal experiences, emotions, stress levels, mental health, etc.

However access to resources, having a support system, education, freedom are some metrics and indicators which can affect happiness in a national level. This is what we hope to explore and investigate in this project.

Data sources

World Happiness Report

The **World Happiness Report** is a landmark survey of the state of global happiness.

Sample size of each country is **1000** people.

The happiness scores and rankings use data from the **Gallup World Poll**.

Happiness score or the **Cantril ladder score**: subjects rate their own current lives by thinking of a ladder with the best possible life for them being a 10 and the worst possible life being a 0.

Dataset

Other data sources

World Population in 2020

Life expectancy Data by the WHO

Adult Mortality rates

World Happiness Report Data 2021

Process + Methods

Methods

- Merged the 2021 world happiness report data with the 2020 population, adult mortality rate (both genders), and life expectancy data to further investigate the effects of world happiness on these metrics.
- Visualized trends from 2019, 2020, 2021, 2022 to see if happiness changed from pre-COVID and during COVID and post-COVID.
- Used Plotly for interactive visualizations in Python.
- Performed correlation analysis and hypothesis testing for features in our dataset.

Libraries used

```
# statistics and data
import pandas as pd
import scipy.stats as stat
import numpy as np
import statsmodels
import scipy.stats as stats
from warnings import filterwarnings
filterwarnings('ignore')

# visualizations
import plotly.express as px
import plotly.graph_objects as go
import geopandas
import plotly.figure_factory as ff
import matplotlib.pyplot as plt
import seaborn as sns
sns.set_style('whitegrid')

import pycountry
from IPython.display import Image
```

Correlation Analysis and Hypothesis Testing of the Features

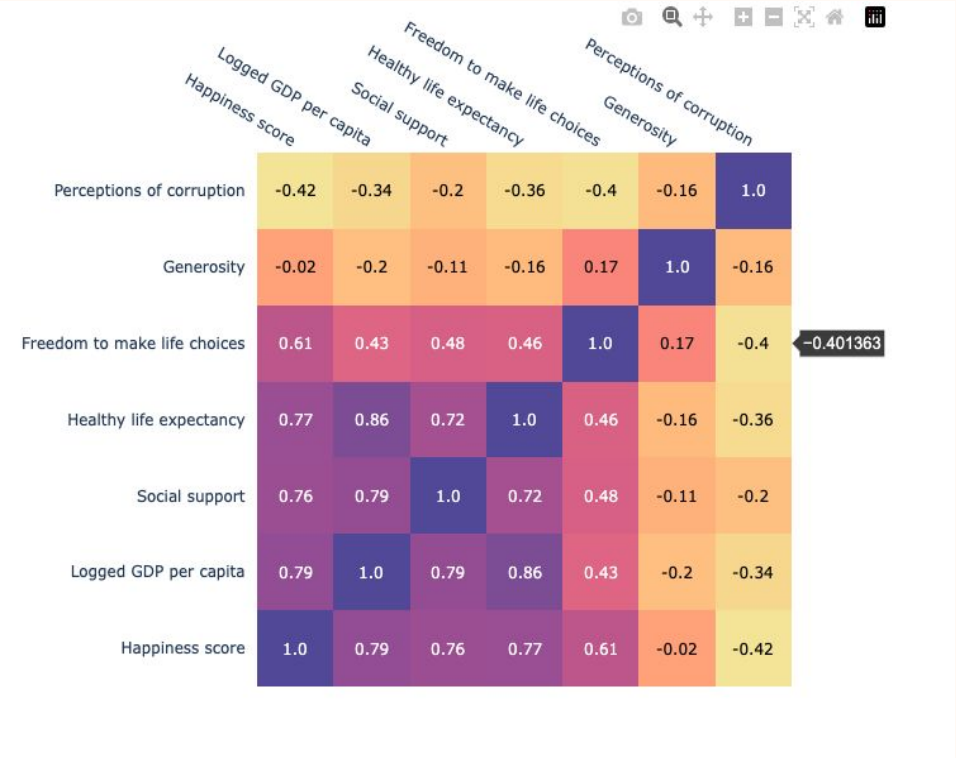
Factors affecting world happiness

We will perform correlation analysis between world happiness and the following features

- Logged GDP per capita
- Social support
- Life expectancy
- Freedom to make life choices
- Generosity
- Perceptions of corruption
- Adult mortality rate
- Population

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 128 entries, 0 to 127
Data columns (total 14 columns):
 #   Column                        Non-Null Count  Dtype
---  ------                        --------------  -----
 0   Country                       128 non-null    object
 1   Continents                    128 non-null    object
 2   Happiness score               128 non-null    float64
 3   Logged GDP per capita         128 non-null    float64
 4   Social support                128 non-null    float64
 5   Healthy life expectancy       128 non-null    float64
 6   Freedom to make life choices  128 non-null    float64
 7   Generosity                    128 non-null    float64
 8   Perceptions of corruption     128 non-null    float64
 9   Population                    128 non-null    int64
 10  Year_x                        128 non-null    object
 11  mortality_rate                128 non-null    float64
 12  Life expectancy               128 non-null    float64
 13  Year_y                        128 non-null    int64
dtypes: float64(9), int64(2), object(3)
memory usage: 15.0+ KB
```

Correlation Heatmap

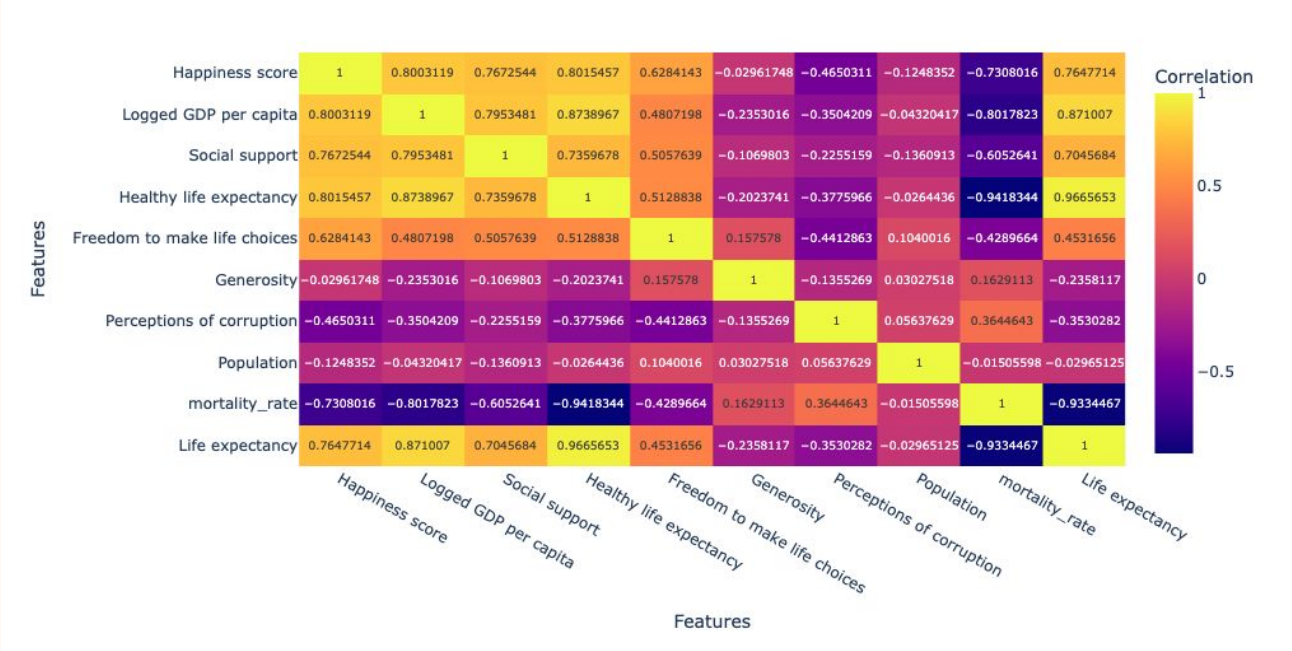


There is likely **strong positive correlation** between Happiness score and GDP per Capita, Social Support, life expectancy.

There is likely **no correlation** between Happiness score and Generosity.

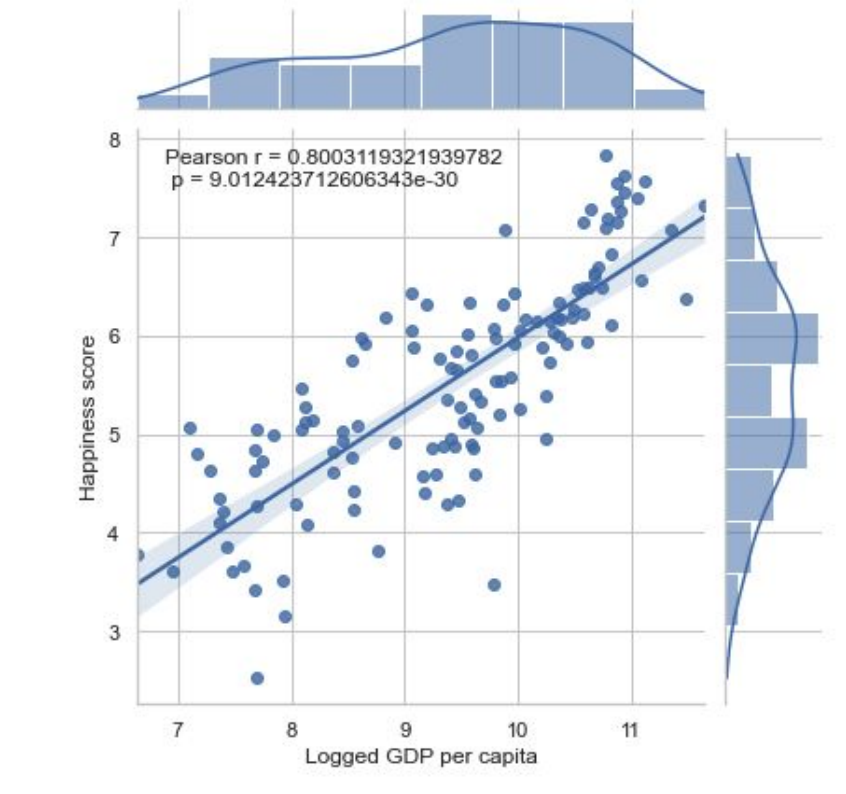
There is likely **some correlation** between Happiness and Perceptions of corruption and freedom to make life choices.

Correlation Matrix (contd.)



There seems to be **no correlation** between Happiness score and Population.
There seems to be a **strong negative correlation** between Happiness and Mortality Rate.
Correlation doesn't imply causation!!!!

Happiness Score and GDP



Null Hypothesis: There is no correlation between Happiness and GDP.

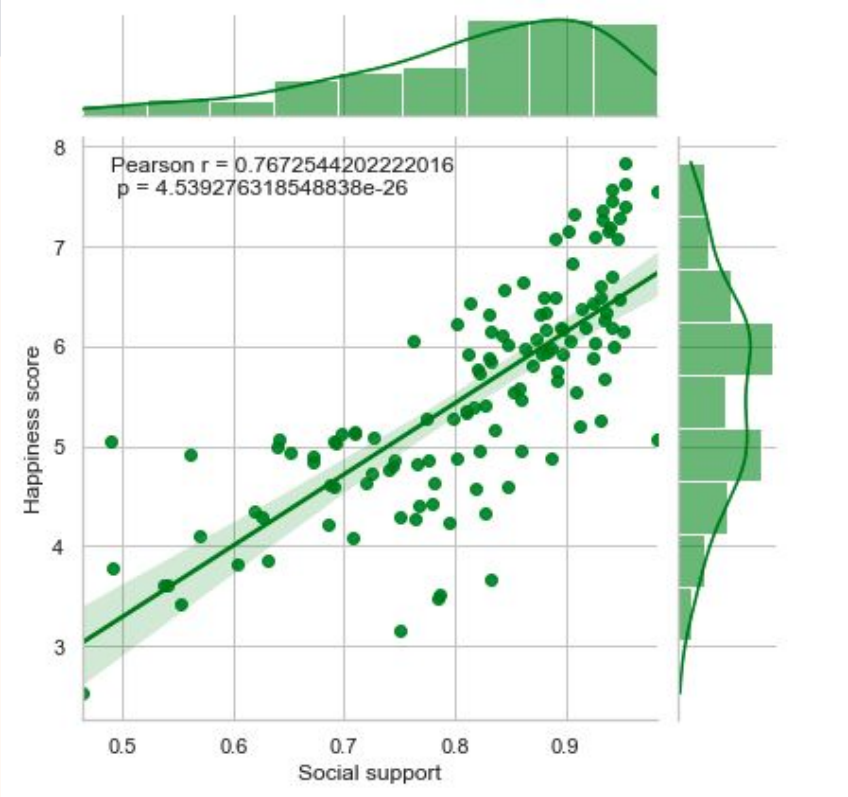
Alternative Hypothesis: There is correlation between Happiness and GDP.

Pearsonr correlation coefficient: 0.8003
p-value: 9e-30

Null hypothesis is rejected as $p<0.05$ (statistically significant evidence against the null hypothesis)

The data suggests that there is likely **strong positive correlation** between Happiness and GDP.

Happiness Score and Social Support



Null Hypothesis: There is no correlation between Happiness and Social Support.

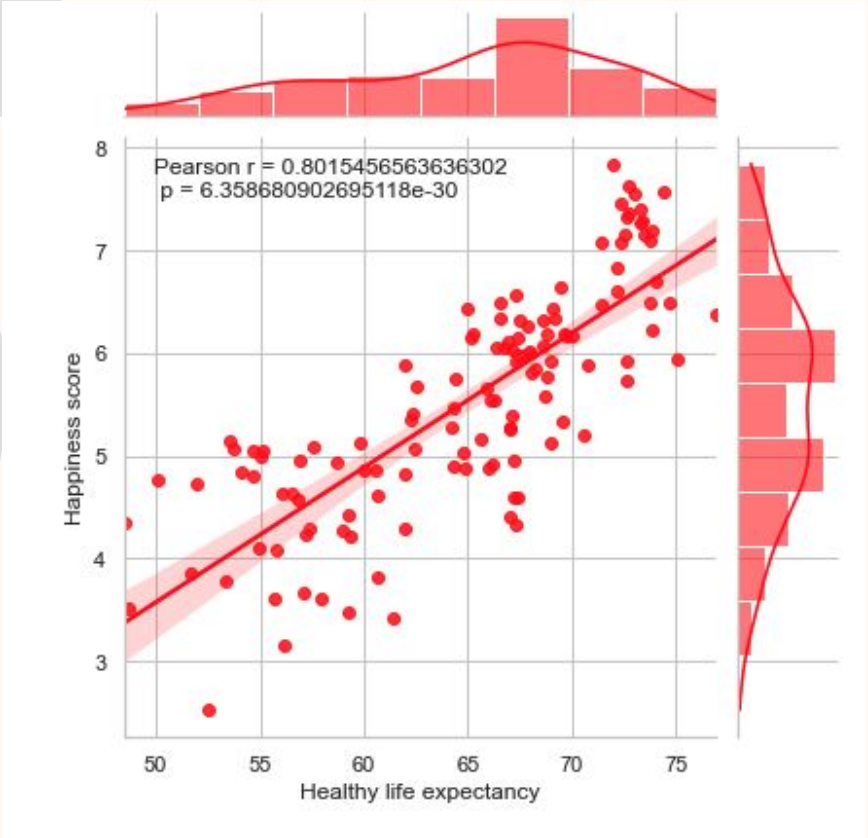
Alternative Hypothesis: There is correlation between Happiness and Social Support.

Pearsonr correlation coefficient: 0.767
p-value: 4.5e-26

Null hypothesis is rejected as $p<0.05$ (statistically significant evidence against the null hypothesis)

The data suggests that there is likely **strong positive correlation** between Happiness and Social Support or having a family to rely on.

Happiness Score and Life expectancy



Null Hypothesis: There is no correlation between Happiness and Life expectancy.

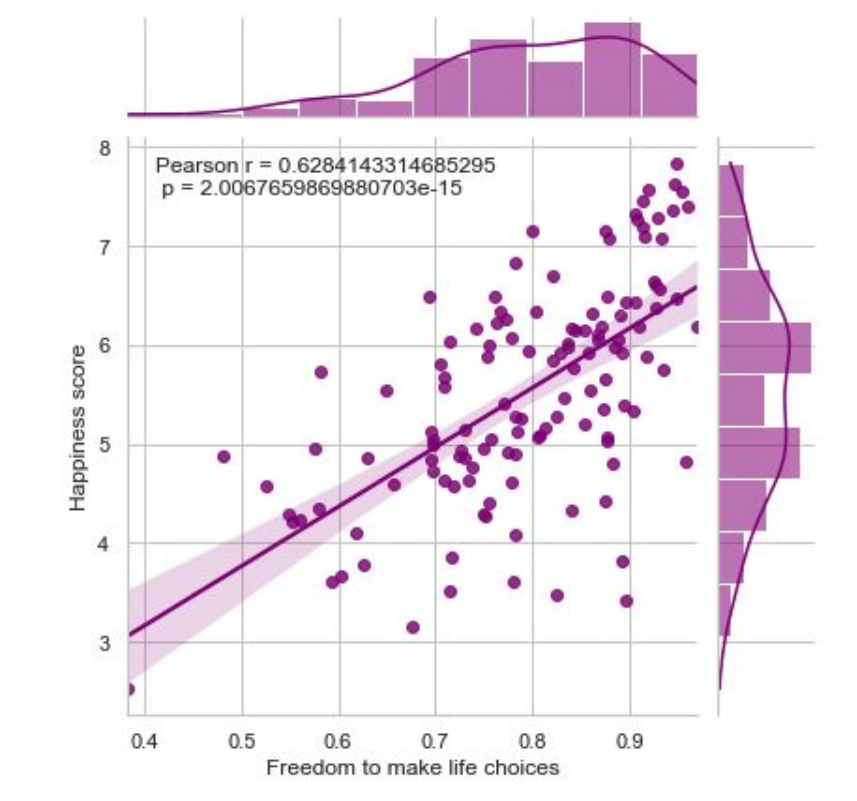
Alternative Hypothesis: There is correlation between Happiness and Life expectancy.

Pearsonr correlation coefficient: 0.801
p-value: 6.3e-30

Null hypothesis is rejected as $p<0.05$ (statistically significant evidence against the null hypothesis)

The data suggests that there is likely **strong positive correlation** between Happiness and Life expectancy.

Happiness Score and Freedom to make life choices



Null Hypothesis: There is no correlation between Happiness and Freedom to make life choices.

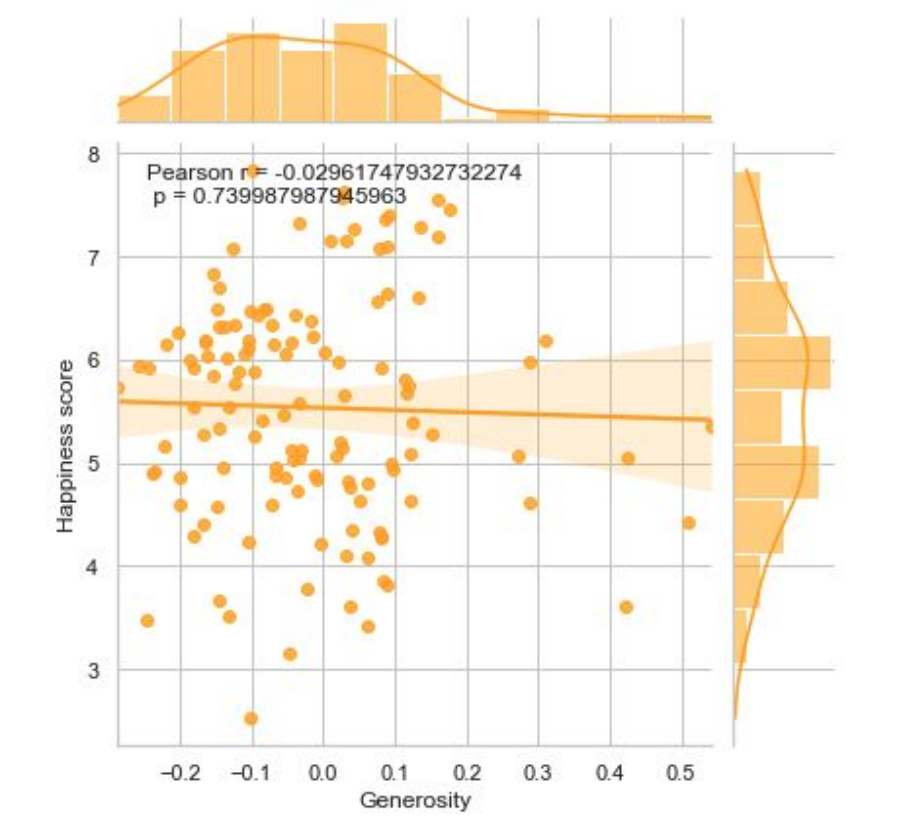
Alternative Hypothesis: There is correlation between Happiness and Freedom to make life choices.

Pearsonr correlation coefficient: 0.628
p-value: 2e-15

Null hypothesis is rejected as $p<0.05$ (statistically significant evidence against the null hypothesis)

The data suggests that there is likely **strong positive correlation** between Happiness and Freedom to make life choices.

Happiness Score and Generosity



Null Hypothesis: There is no correlation between Happiness and Generosity.

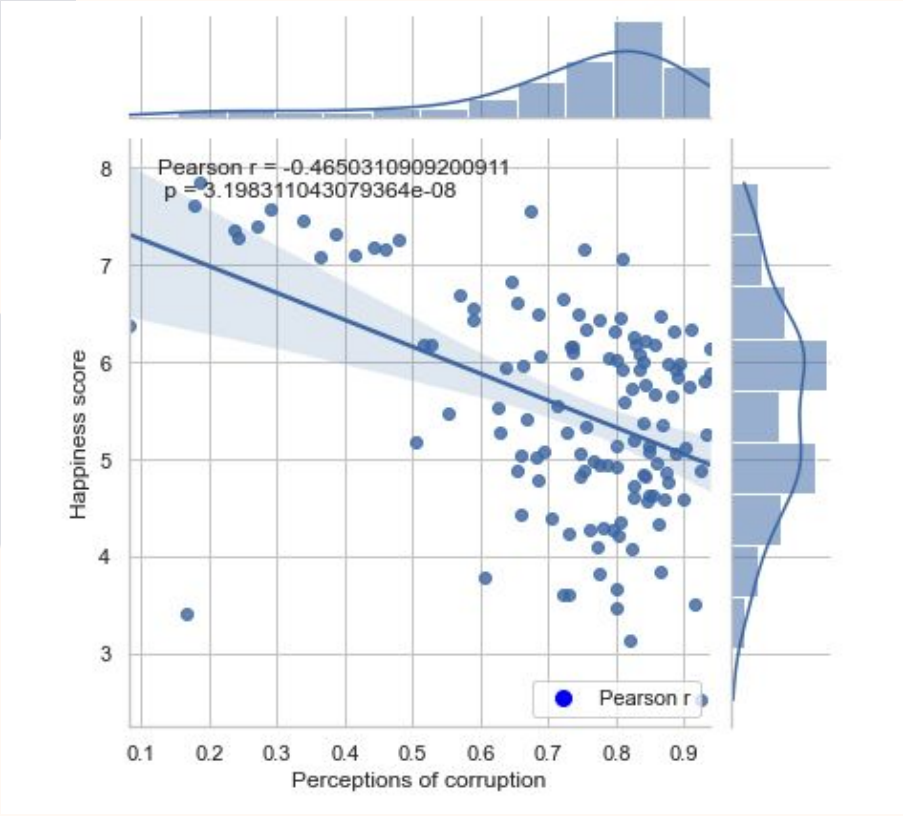
Alternative Hypothesis: There is correlation between Happiness and Generosity.

Pearsonr correlation coefficient: -0.0296
p-value: 0.74

Null hypothesis is accepted as p>0.05 (statistically significant evidence for the null hypothesis)

The data suggests that there is likely **no correlation** between Happiness and Generosity.

Happiness Score and Perceptions of Corruption



Null Hypothesis: There is no correlation between Happiness and Perceptions of Corruption.

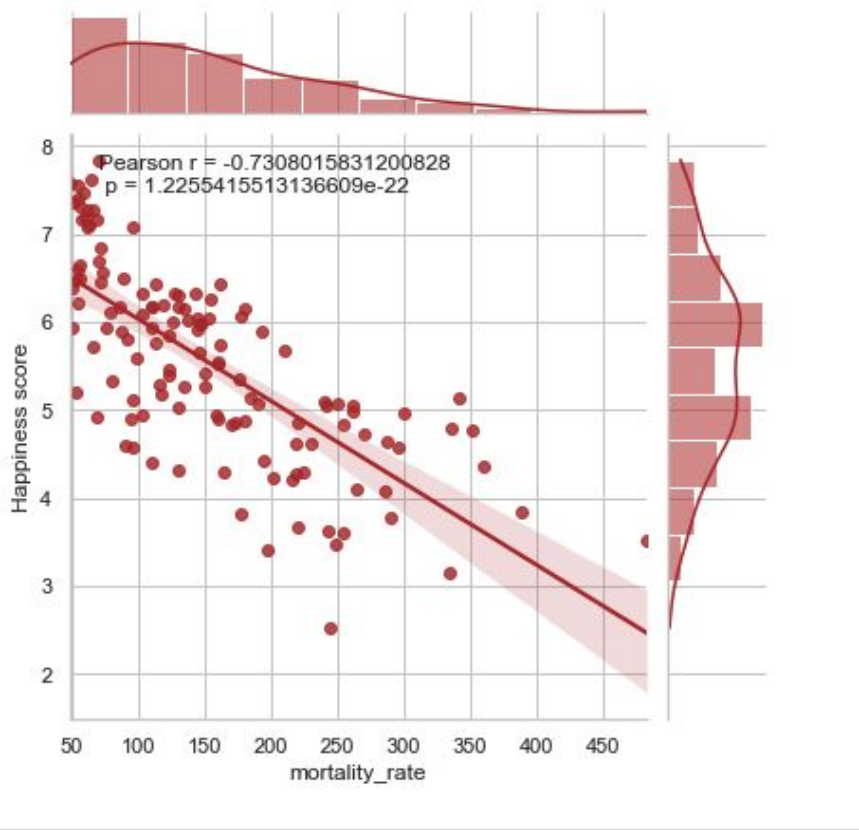
Alternative Hypothesis: There is correlation between Happiness and Perceptions of Corruption.

Pearsonr correlation coefficient: -0.46
p-value: 3.19e-08

Null hypothesis is rejected as $p<0.05$ (statistically significant evidence against the null hypothesis)

The data suggests that there is likely **some negative correlation** between Happiness and Perceptions of Corruption.

Happiness Score and Mortality Rate



Null Hypothesis: There is no correlation between Happiness and Mortality Rate.

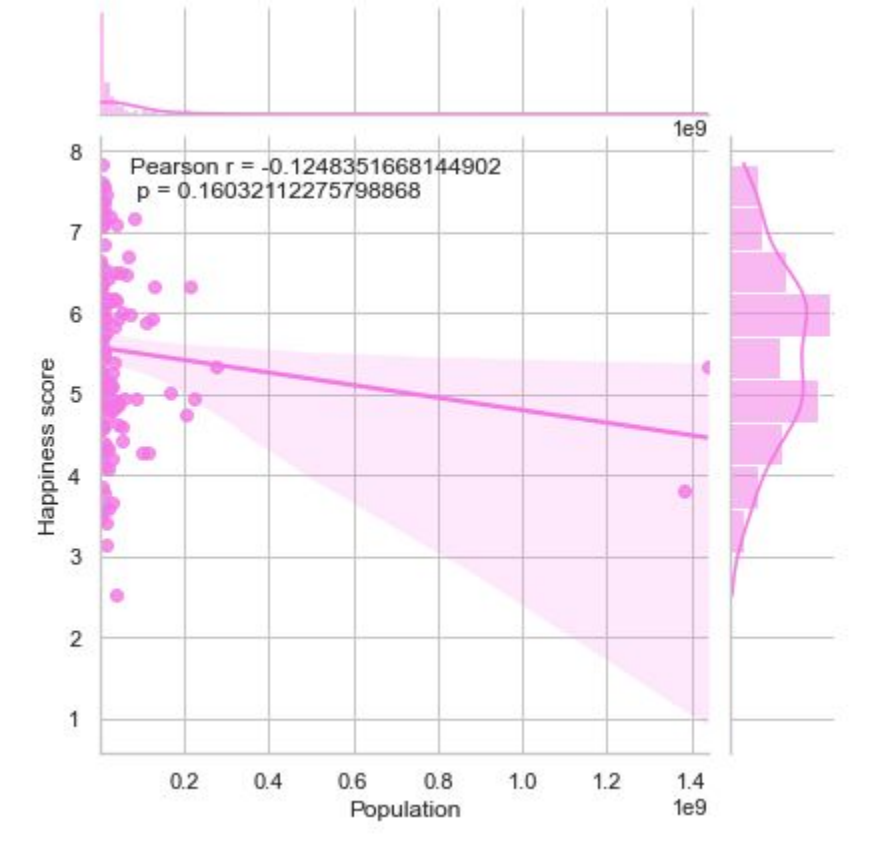
Alternative Hypothesis: There is correlation between Happiness and Mortality Rate.

Pearsonr correlation coefficient: -0.73
p-value: 1.22e-22

Null hypothesis is rejected as $p<0.05$ (statistically significant evidence against the null hypothesis)

The data suggests that there is likely **strong negative correlation** between Happiness and Mortality Rate.

Happiness Score and Population



Null Hypothesis: There is no correlation between Happiness and Population.

Alternative Hypothesis: There is correlation between Happiness and Population.

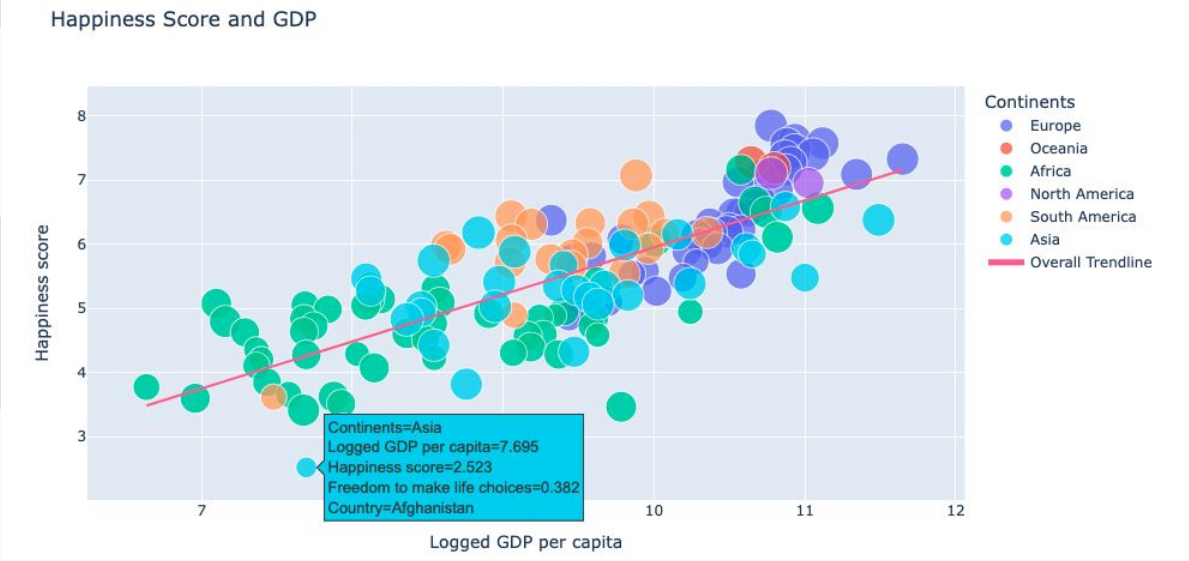
Pearsonr correlation coefficient: -0.124
p-value: 0.16

Null hypothesis is accepted as p>0.05 (statistically significant evidence for the null hypothesis)

The data suggests that there is likely **no correlation** between Happiness and Population.

Conclusions

Happiness and GDP for various Continents

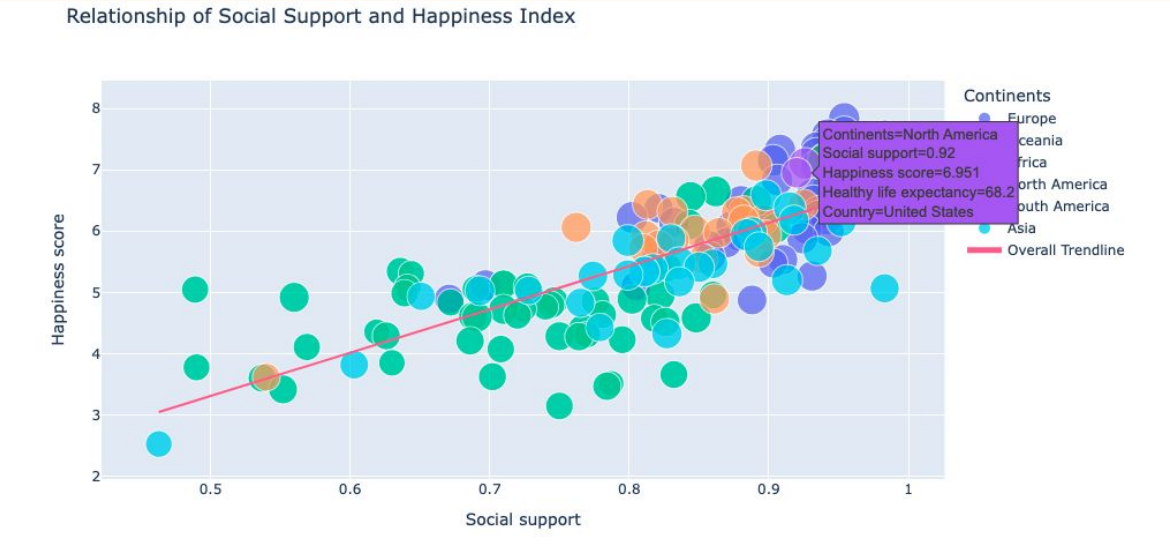


Happiness score is more in **developed countries** such as Europe and North America.

These developed countries have higher GDP, social support, and more freedom to make life choices.

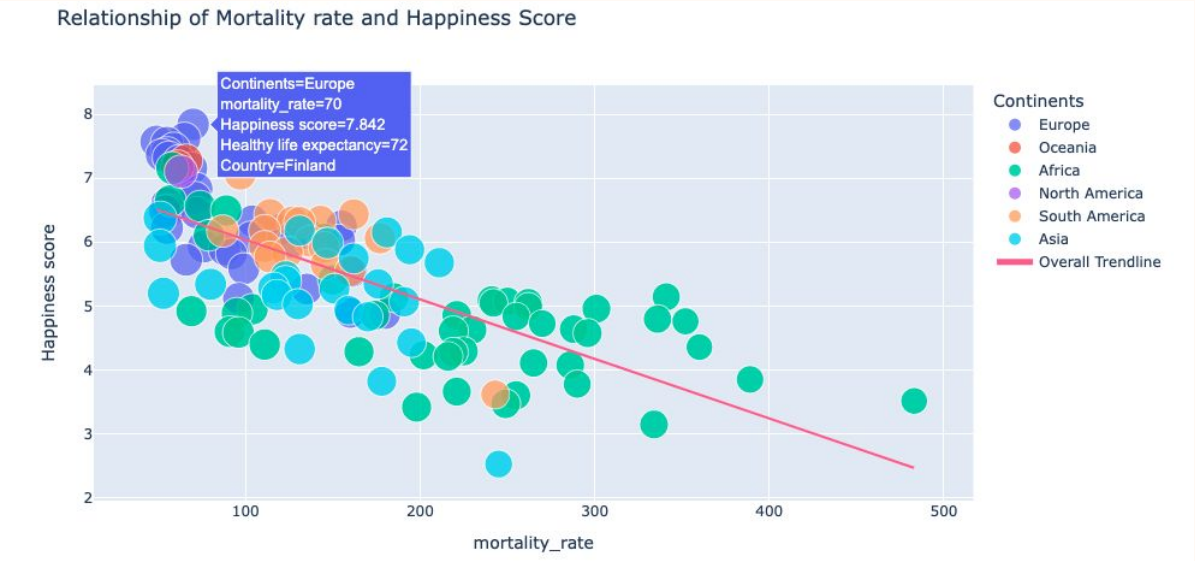
Developing countries such as Afghanistan has lower GDP and freedom to make life choices resulting in a lower happiness score.

Happiness and Social Support for Various Continents



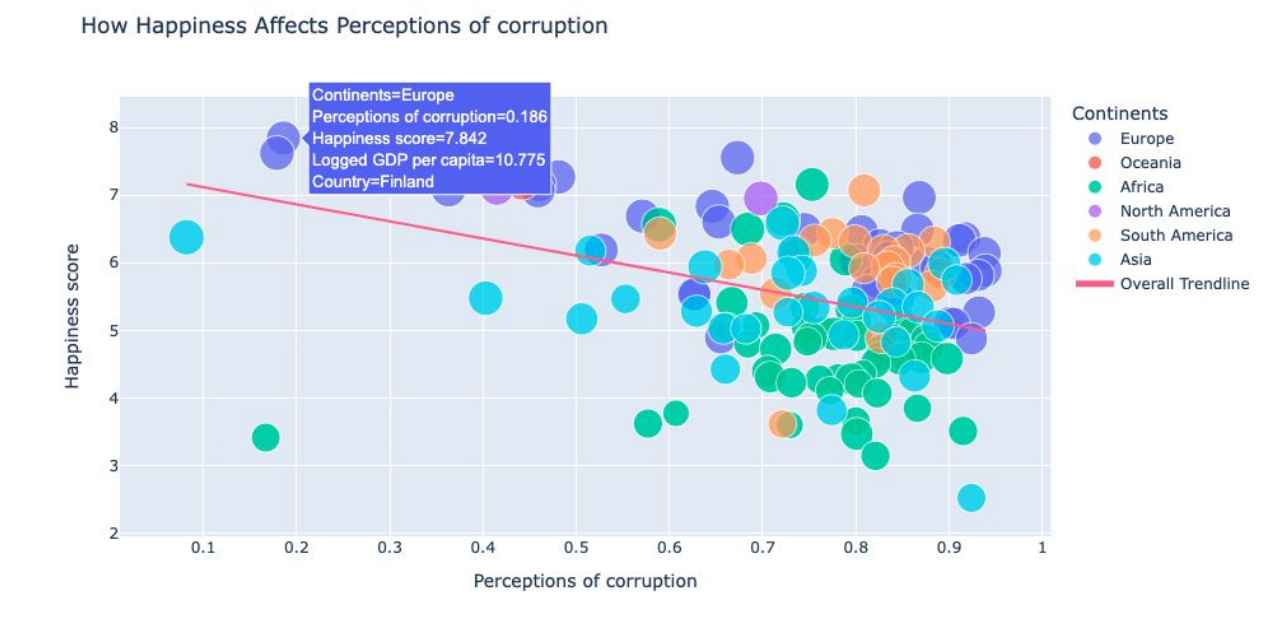
Countries with more social support have a higher happiness score resulting in a higher life expectancy.

Happiness and Mortality Rate for Various Continents

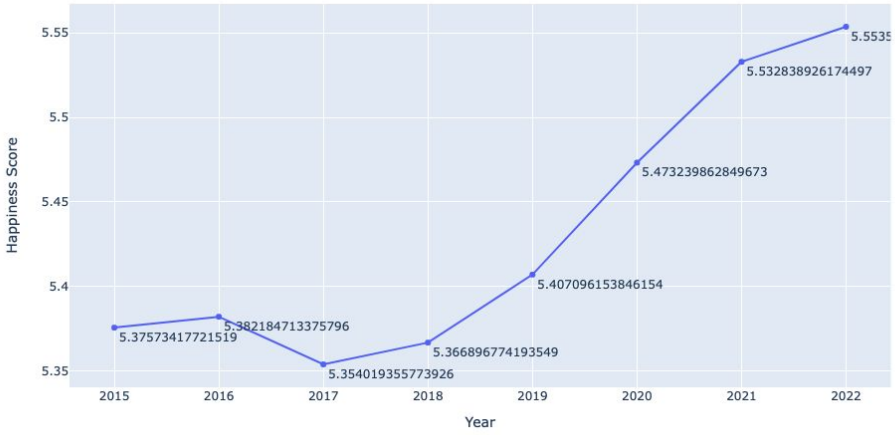


Countries with low mortality rate have higher happiness scores.

Happiness and Perceptions of Corruption for Various Continents

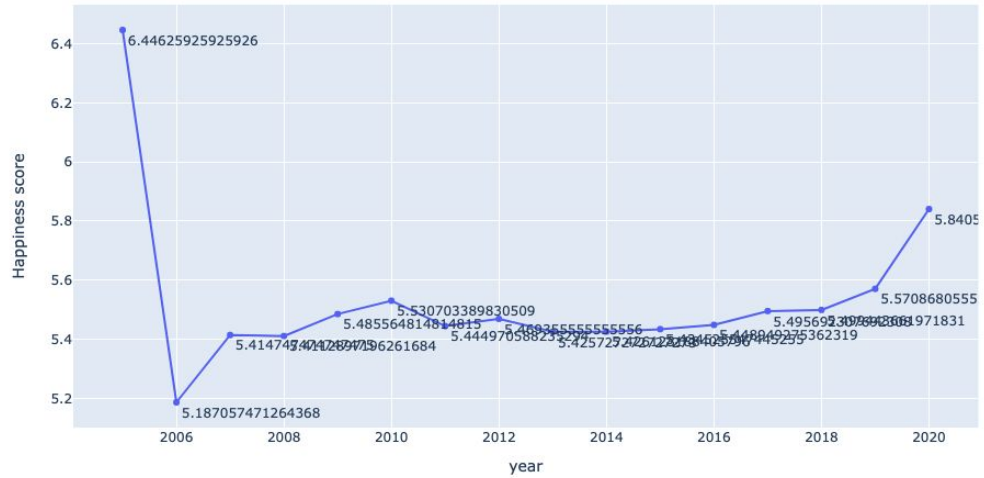


Countries with less corruption and more GDP have higher happiness score.



Happiness over the Years

As we can see from the graphs, world happiness look a plunge during 2006-2007 likely due to the Great Recession. We can see that in recent years, happiness has remain stable, although increasing post-COVID.



Final Thoughts

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- **GDP per capita** is a significant factor in determining the happiness and quality of people in countries. GDP provides opportunities for better living standards and build better infrastructure of the country.
- **Life expectancy** is significantly correlated with happiness. Countries with higher life expectancy have higher happiness scores. Countries with **low mortality rates** have higher life expectancy and high happiness scores.
- Most **populated** countries such as China and India have two of the lowest happiness scores.
- **Developed countries** with more GDP, social support, freedom to make life choices have higher happiness.
- **Generosity** or acts of giving doesn't increase happiness. Happiness is not directly correlated with Population.
- Correlation doesn't imply causation so there could be a country with high GDP but low happiness.