World Happiness Report 2022:

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Data Set: World Happiness Report 2022

The World Happiness Report is an annual record of data collected from over 100 world-wide countries. It specifically takes information from surveys and gives each country surveyed a "happiness score". This dataset of the 2022 report not only includes each country surveyed, but also explanations for each happiness score. Some of the variables include: "Explained by: GDP per Capita, Social Support, Healthy Life Expectancy, Freedom to make Life Choices, Generosity, and Perceptions of Corruption".

The "happiness score" is based on a scale from 0 to 10. Those who are surveyed are asked to rate their current lives on this particular scale. Ultimately, these scores can help visualize social and economic developments in the world today while also providing an overall view of the happiness rate around the world.

Important Notes:

- Early 2023 surveys are included in the 2022 report (World Happiness Report [WHR], 2022).
- The surveys in the report are taken throughout the 2022 calendar year (WHR, 2022).
- The "Explained by" variables do not affect a country's "happiness score" (WHR, 2022).
- The "Explained by" variables describe what makes a country and it's people happy (WHR 2022).

Variables Used in Project and Their Meanings:

- *Explained by: GDP per capita*: "How much each country produces divided by the number of people in the country" (WHR, 2022).
- *Explained by: Social Support*: "Having someone to count on in times of trouble" (WHR, 2022).
- *Explained by: Healthy life expectancy*: A person's physical and mental health well-being (WHR, 2022).
- *Explained by: Freedom to make life choices*: Human rights, the "right to life and liberty, freedom from slavery and torture, opinion and expression, work and education without discrimination" (WHR, 2022)
- *Explained by: Generosity*: "Positive community engagement and a central way humans connect with each other" (WHR, 2022)
- *Explained by: Perception of corruption*: The belief of corruption in the government and businesses. "Do people trust their governments and in the benevolence of others?" (WHR, 2022).

```
import numpy as np
import pandas as pd
import matplotlib as mpl
import matplotlib.pyplot as plt
```

```
%matplotlib inline
```

```
!pwd
```

```
     /content
```

```
!ls
```

```
     drive  sample_data
```

```
%cd drive/
```

```
     /content/drive
```

```
%cd MyDrive/
```

```
     /content/drive/MyDrive
```

```
%cd Colab\ Notebooks
```

```
/content/drive/MyDrive/Colab Notebooks
```

```
rankings = pd.read_csv('rankings.csv')
```

```
rankings.head()
```

	RANK	Country	Happiness score	Whisker-high	Whisker-low	Dystopia (1.83) + residual	Explained by: GDP per capita	Explained by: Social support	Explained by: Healthy life expectancy	Explained by: Freedom to make life choices	Explained by: Generosity	Explained by: Perceptions of corruption
0	1	Finland	7.821	7.886	7.756	2.518	1.892	1.258	0.775	0.736	0.109	0.534
1	2	Denmark	7.636	7.710	7.563	2.226	1.953	1.243	0.777	0.719	0.188	0.532
2	3	Iceland	7.557	7.651	7.464	2.320	1.936	1.320	0.803	0.718	0.270	0.191
3	4	Switzerland	7.512	7.586	7.437	2.153	2.026	1.226	0.822	0.677	0.147	0.461

```
rankings.describe()
```

	RANK	Happiness score	Whisker-high	Whisker-low	Dystopia (1.83) + residual	Explained by: GDP per capita	Explained by: Social support	Explained by: Healthy life expectancy	Explained by: Freedom to make life choices	Explained by: Generosity	Explained by: Perceptions of corruption
count	146.000000	146.000000	146.000000	146.000000	146.000000	146.000000	146.000000	146.000000	146.000000	146.000000	146.000000
mean	73.500000	5.553575	5.673589	5.433568	1.831808	1.410445	0.905863	0.586171	0.517226	0.147377	0.154781
std	42.290661	1.086843	1.065621	1.109380	0.534994	0.421663	0.280122	0.176336	0.145859	0.082799	0.127514
min	1.000000	2.404000	2.469000	2.339000	0.187000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	37.250000	4.888750	5.006250	4.754750	1.555250	1.095500	0.732000	0.463250	0.440500	0.089000	0.068250
50%	73.500000	5.568500	5.680000	5.453000	1.894500	1.445500	0.957500	0.621500	0.543500	0.132500	0.119500
75%	109.750000	6.305000	6.448750	6.190000	2.153000	1.784750	1.114250	0.719750	0.626000	0.197750	0.198500

When approaching this dataset, I wanted to start with looking at the lowest scoring countries.

```
score_min = rankings.groupby('Country')['Happiness score'].min().sort_values()
score_min
```

```
Country
Afghanistan    2.404
Lebanon        2.955
Zimbabwe       2.995
Rwanda         3.268
Botswana       3.471
               ...
Netherlands    7.415
Switzerland    7.512
Iceland        7.557
Denmark        7.636
Finland        7.821
Name: Happiness score, Length: 145, dtype: float64
```

```
gdp_max = rankings.groupby(['Country', 'Happiness score'])['Explained by: GDP per capita'].max().sort_values()
gdp_max
```

```
Country              Happiness score
Venezuela            4.925              0.000
Niger                5.003              0.570
Mozambique           5.048              0.578
Liberia              5.122              0.636
Malawi               3.750              0.648
                                        ...
United Arab Emirates 6.576              1.998
Switzerland          7.512              2.026
Ireland              7.041              2.129
Singapore            6.480              2.149
```

```
Luxembourg            7.404             2.209
Name: Explained by: GDP per capita, Length: 146, dtype: float64
```

```
ss_max = rankings.groupby(['Country', 'Happiness score'])['Explained by: Social support'].max().sort_values()
ss_max
```

```
Country       Happiness score
Afghanistan   2.404             0.000
Benin         4.623             0.064
Rwanda        3.268             0.133
Morocco       5.060             0.268
Malawi        3.750             0.279
                                ...
Slovenia      6.630             1.249
Finland       7.821             1.258
Czechia       6.920             1.260
Turkmenistan  5.474             1.319
Iceland       7.557             1.320
Name: Explained by: Social support, Length: 146, dtype: float64
```

```
health_max = rankings.groupby(['Country', 'Happiness score'])['Explained by: Healthy life expectancy'].max().sort_values()
health_max
```

```
Country      Happiness score
Lesotho      3.512             0.000
Mozambique   5.048             0.191
Eswatini     4.396             0.197
Chad         4.251             0.225
Zimbabwe     2.995             0.270
                               ...
Switzerland  7.512             0.822
South Korea  5.935             0.841
Singapore    6.480             0.851
Japan        6.039             0.866
Hong Kong    5.425             0.942
Name: Explained by: Healthy life expectancy, Length: 146, dtype: float64
```

```
freedom_max = rankings.groupby(['Country', 'Happiness score'])['Explained by: Freedom to make life choices'].max().sort_values()
freedom_max
```

```
Country      Happiness score
Afghanistan  2.404             0.000
Lebanon      2.955             0.103
Algeria      5.122             0.146
Chad         4.251             0.180
Comoros      4.609             0.185
                               ...
Denmark      7.636             0.719
Sweden       7.384             0.724
Norway       7.365             0.728
Finland      7.821             0.736
Cambodia     4.640             0.740
Name: Explained by: Freedom to make life choices, Length: 146, dtype: float64
```

```
gen_max = rankings.groupby(['Country', 'Happiness score'])['Explained by: Generosity'].max().sort_values()
gen_max
```

```
Country    Happiness score
Georgia    4.973             0.000
Japan      6.039             0.007
Botswana   3.471             0.012
Greece     5.948             0.015
Portugal   6.016             0.016
                             ...
Thailand   5.891             0.321
Kenya      4.543             0.322
Gambia     5.164             0.388
Myanmar    4.394             0.452
Indonesia  5.240             0.468
Name: Explained by: Generosity, Length: 146, dtype: float64
```

```
pc_max = rankings.groupby(['Country', 'Happiness score'])['Explained by: Perceptions of corruption'].max().sort_values()
pc_max
```

```
Country                Happiness score
Croatia                6.125             0.000
Afghanistan            2.404             0.005
Bosnia and Herzegovina 5.768             0.006
Romania                6.477             0.006
```

```
Ukraine                 5.084             0.017
                                          ...
Sweden                  7.384             0.512
Denmark                 7.636             0.532
Finland                 7.821             0.534
Rwanda                  3.268             0.544
Singapore               6.480             0.587
Name: Explained by: Perceptions of corruption, Length: 146, dtype: float64
```

The lowest five scoring countries are Afghanistan, Lebanon, Zimbabwe, Rwanda, and Botswana. While the top five countries are Finland, Denmark, Iceland, Switzerland, and the Netherlands. Afghanistan had the lowest score of 2.4 while the highest score is 7.8 with Finland. There is a difference of 5.4. The two lowest scoring countries are located in the Middle East, the next three lowest scoring countries are located in Africa. In contrast to the five highest scoring countries which are located in Europe. There's a pattern with underdevloped and developing countries being the lowest ranking while the highest ranking countries tend to be developed.

The groupbys help visualize where both ends of the happiness score spectrum stand relating to each variable.

```
afghanistan = rankings.loc[rankings['Country'] == 'Afghanistan']
afghanistan
```

	RANK	Country	Happiness score	Whisker-high	Whisker-low	Dystopia (1.83) + residual	Explained by: GDP per capita	Explained by: Social support	Explained by: Healthy life expectancy	Explained by: Freedom to make life choices	Explained by: Generosity	Explained by: Perceptions of corruption

I wanted to look into why Afghanistan has such a low score. Looking at the "Explained by" variables, GDP per capita scores the highest with 0.758. While social support and freedom to make life choices have scores of 0.

The World Happiness Report defines "Social Support" as "having someone to count on in times of trouble" (WHR, 2022). When it comes to the people of Afghanistan, it appears they do not rely on this for their happiness. "Freedom to make Life Choices" has the same score as well.

```
finland = rankings.loc[rankings['Country'] == 'Finland']
finland
```

	RANK	Country	Happiness score	Whisker-high	Whisker-low	Dystopia (1.83) + residual	Explained by: GDP per capita	Explained by: Social support	Explained by: Healthy life expectancy	Explained by: Freedom to make life choices	Explained by: Generosity	Explained by: Perceptions of corruption

Finland also has GDP per capita as their highest scoring "Explained by" variables. Their second highest scoring is social support while the lowest score is generosity.

It's interesting that both countries highest "Explained by" variables is GDP per capita. According to the World Bank, Finland's GDP per capita was 53,654.80 in US dollars in 2021 (The World Bank, 2021). Aghanistan was reported to have a GDP per capita of 368.80 in US dollars in 2021 (The World Bank, 2021).

When comparing Finland, a developed country, to Afghanistan, an underdeveloped country, there comes a question of what resources result in higher rates of happiness? GDP per capita seems to be one of the running contenders in answering this question. But what about social support which is second in Finland and last in Afghanistan? There is also freedom to make life choices which is on opposite ends of the spectrum for Finland and Afghanistan.

More Summary Statistics

```
united_states = rankings[rankings['Country'] == 'United States']
united_states
```

	RANK	Country	Happiness score	Whisker-high	Whisker-low	Dystopia (1.83) + residual	Explained by: GDP per capita	Explained by: Social support	Explained by: Healthy life expectancy	Explained by: Freedom to make life	Explained by: Generosity	Explained by: Perceptions of

The United States is ranked 16th in the world. The pattern continues with GDP per capita being the highest scoring "Explained by" variable. Just like Finland, social support is the second highest score. The lowest score is perceptions of corruption.

```
zimbabwe = rankings[rankings['Country'] == 'Zimbabwe']
zimbabwe
```

	RANK	Country	Happiness score	Whisker-high	Whisker-low	Dystopia (1.83) + residual	Explained by: GDP per capita	Explained by: Social support	Explained by: Healthy life expectancy	Explained by: Freedom to make life choices	Explained by: Generosity	Explained by: Perceptions of corruption

Again, the highest scoring "Explained by" variable is GDP per capita. But Zimbabwe breaks the pattern for underdeveloped and developing countries with social support being the lowest score. This time social support is the second highest score and the lowest score is perceptions of corruption.

This brings up the questions: What makes a developed country happy? What is least attributed to a developed country's happiness? What about underdeveloped and developing countries?

```
rankings.mean()
```

```
<ipython-input-22-df80408f4472>:1: FutureWarning: The default value of numeric_only in DataFrame.mean is deprecated. In a future versior
  rankings.mean()
RANK                                  73.500000
Happiness score                        5.553575
Whisker-high                           5.673589
Whisker-low                            5.433568
Dystopia (1.83) + residual             1.831808
Explained by: GDP per capita           1.410445
Explained by: Social support           0.905863
Explained by: Healthy life expectancy  0.586171
Explained by: Freedom to make life choices  0.517226
Explained by: Generosity               0.147377
Explained by: Perceptions of corruption  0.154781
dtype: float64
```

The mean of GDP per capita is higher than social support. Social support is the second highest average score though. Generosity is the lowest average score with perceptions of corruption following close behind it. It appears that the top three resources that make a country happy is money, social support, and good health on average.

New Columns

```
rankings['Percent of GDP per capita to happiness score'] = rankings['Explained by: GDP per capita']/rankings['Happiness score']
```

```
rankings['Percent of social support to happiness score'] = rankings['Explained by: Social support']/rankings['Happiness score']
```

```
rankings['Percent of perceptions of corruption to happiness score'] = rankings['Explained by: Perceptions of corruption']/rankings['Happiness
```

```
rankings['Percent of generosity to happiness score'] = rankings['Explained by: Generosity']/rankings['Happiness score']
rankings.head()
```

	RANK	Country	Happiness score	Whisker-high	Whisker-low	Dystopia (1.83) + residual	Explained by: GDP per capita	Explained by: Social support	Explained by: Healthy life expectancy	Explained by: Freedom to make life choices	Explained by: Generosity	Explained by: Perceptions of corruption	Per of capit happi s
0	1	Finland	7.821	7.886	7.756	2.518	1.892	1.258	0.775	0.736	0.109	0.534	0.24
1	2	Denmark	7.636	7.710	7.563	2.226	1.953	1.243	0.777	0.719	0.188	0.532	0.25
2	3	Iceland	7.557	7.651	7.464	2.320	1.936	1.320	0.803	0.718	0.270	0.191	0.25

I wanted to make percentages of GDP per capita, social support, perceptions of corruption and generosity to the happiness score to easily visualize how much each variable makes up the happiness score and to help determine what factor is greater than the others.

Ranking Trends

```
rankings.iloc[0:10]
```

	RANK	Country	Happiness score	Whisker-high	Whisker-low	Dystopia (1.83) + residual	Explained by: GDP per capita	Explained by: Social support	Explained by: Healthy life expectancy	Explained by: Freedom to make life choices	Explained by: Generosity	Explained by: Perceptions of corruption	Per of capit happi s
0	1	Finland	7.821	7.886	7.756	2.518	1.892	1.258	0.775	0.736	0.109	0.534	0.24
1	2	Denmark	7.636	7.710	7.563	2.226	1.953	1.243	0.777	0.719	0.188	0.532	0.25
2	3	Iceland	7.557	7.651	7.464	2.320	1.936	1.320	0.803	0.718	0.270	0.191	0.25
3	4	Switzerland	7.512	7.586	7.437	2.153	2.026	1.226	0.822	0.677	0.147	0.461	0.26
4	5	Netherlands	7.415	7.471	7.359	2.137	1.945	1.206	0.787	0.651	0.271	0.419	0.26
5	6	Luxembourg	7.404	7.501	7.307	2.042	2.209	1.155	0.790	0.700	0.120	0.388	0.29
6	7	Sweden	7.384	7.454	7.315	2.003	1.920	1.204	0.803	0.724	0.218	0.512	0.26
7	8	Norway	7.365	7.440	7.290	1.925	1.997	1.239	0.786	0.728	0.217	0.474	0.27
8	9	Israel	7.364	7.426	7.301	2.634	1.826	1.221	0.818	0.568	0.155	0.143	0.24
9	10	New Zealand	7.200	7.279	7.120	1.954	1.852	1.235	0.752	0.680	0.245	0.483	0.25

The top ten countries with the highest happiness score are all considered developed countries. All of these countries have GDP per capita as their highest "Explained by" variable. Their second highest is social support and their third highest is healthy life expectancy.

```
rankings.iloc[134:146]
```

	RANK	Country	Happiness score	Whisker-high	Whisker-low	Dystopia (1.83) + residual	Explained by: GDP per capita	Explained by: Social support	Explained by: Healthy life expectancy	Explained by: Freedom to make life choices	Explained by: Generosity	Explained by: Perceptions of corruption	Pe capi hapi
134	135	Togo	4.112	4.272	3.953	2.061	0.771	0.322	0.360	0.292	0.174	0.132	0.

The bottom ten countries are considered to be underdeveloped or developing. Their highest scores are GDP per capita besides Lesotho with their highest score being social support only by 0.01 more than their score for GDP per capita.

137	138	Malawi	3.790	3.941	3.639	1.661	0.048	0.279	0.368	0.477	0.146	0.157	0.

The percentages also show where GDP per capita is greater than social support and generosity. For the most part, generosity has a considerably lower percentage from GDP per capita and social support. The lowest percent being Botswana with 0.3%. But there are considerably more scores with perception of corruption being the lowest score. The lowest being Afghanistan with a percent of 0.2%.

140	141	Lesotho	3.512	3.748	3.276	1.312	0.839	0.848	0.000	0.419	0.076	0.018	0.

```
rankings.iloc[64:75]
```

	RANK	Country	Happiness score	Whisker-high	Whisker-low	Dystopia (1.83) + residual	Explained by: GDP per capita	Explained by: Social support	Explained by: Healthy life expectancy	Explained by: Freedom to make life choices	Explained by: Generosity	Explained by: Perceptions of corruption	Pe c capi happ
64	65	Belarus	5.821	5.950	5.693	1.811	1.562	1.157	0.629	0.342	0.040	0.282	0.2
65	66	Colombia	5.781	5.903	5.659	1.971	1.452	0.929	0.720	0.545	0.087	0.077	0.2
66	67	Bosnia and Herzegovina	5.768	5.877	5.659	1.869	1.468	1.068	0.665	0.448	0.244	0.006	0.2
67	68	Mongolia	5.761	5.845	5.676	1.999	1.393	1.197	0.467	0.398	0.247	0.059	0.2
68	69	Dominican Republic	5.737	5.873	5.601	1.751	1.538	1.003	0.577	0.606	0.084	0.179	0.2
69	70	Malaysia	5.711	5.845	5.578	1.471	1.689	0.938	0.620	0.654	0.213	0.126	0.2
70	71	Bolivia	5.600	5.709	5.491	2.107	1.256	0.880	0.555	0.627	0.112	0.064	0.2
71	72	China	5.585	5.650	5.520	1.516	1.508	0.958	0.705	0.656	0.099	0.142	0.2
72	73	Paraguay	5.578	5.689	5.467	1.555	1.409	1.130	0.624	0.629	0.171	0.059	0.2
73	74	Peru	5.559	5.679	5.439	1.890	1.397	0.865	0.735	0.545	0.090	0.037	0.2
74	75	Montenegro	5.547	5.681	5.413	1.619	1.573	1.023	0.659	0.460	0.135	0.077	0.2

The ten middle rankings of the list are mostly considered developing countries. Again, there is a trend of GDP per capita having the highest score for each country and social support having the second highest score. While generosity and perception of corruption are interchangable for lowest score, but generosity does hold the lowest average score.

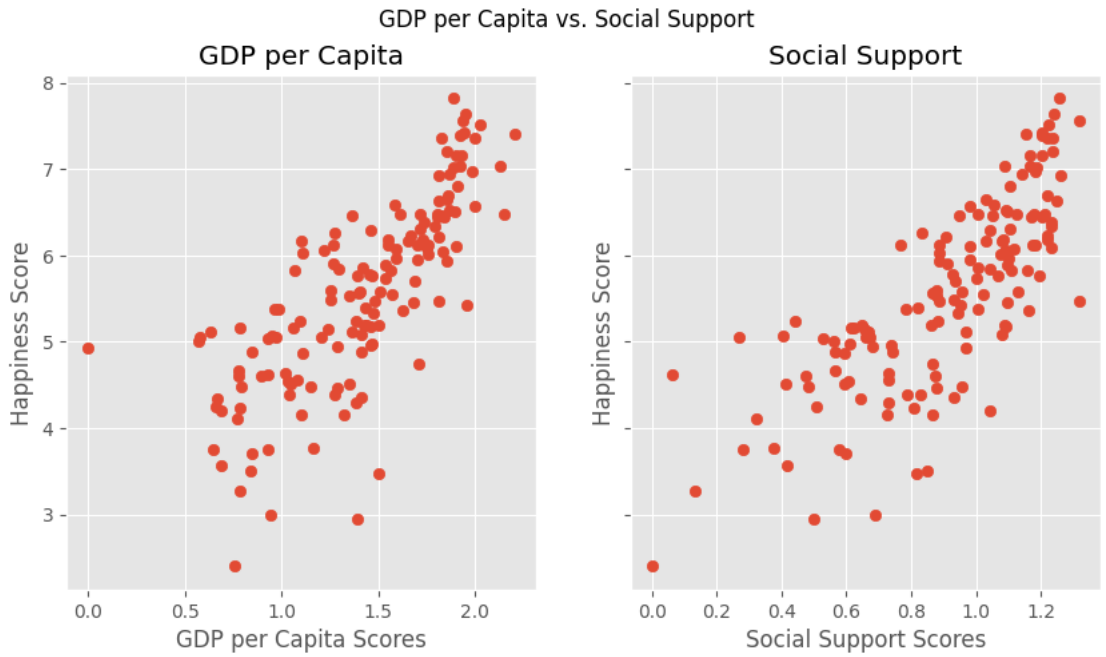
Looking at each of these lists tells a story of a need for a healthy economic environment and social support amongst a country's society. While it also puts a spotlight on the need for generosity improvement and attitudes toward government.

Healthy life expectancy and freedom to make life choices have similar numbers among the countries surveyed. They are usually interchangable between third and fourth place on the scale of what makes individuals happy in their country.

Plot: GDP per Capita vs. Social Support

```
gdp = rankings[rankings['Explained by: GDP per capita'].notnull()]
social_support = rankings[rankings['Explained by: Social support'].notnull()]


plt.style.use('ggplot')

fig, (ax1, ax2) = plt.subplots(1, 2, sharey = True, figsize = (10, 5))
```

```
scatter_gdp = ax1.scatter('Explained by: GDP per capita', 'Happiness score', data = gdp)

scatter_social = ax2.scatter('Explained by: Social support', 'Happiness score', data = social_support)

plt.suptitle('GDP per Capita vs. Social Support')

ax1.set(xlabel = 'GDP per Capita Scores', ylabel = 'Happiness Score', title = 'GDP per Capita')
ax2.set(xlabel = 'Social Support Scores', ylabel = 'Happiness Score', title = 'Social Support')

plt.show()
```



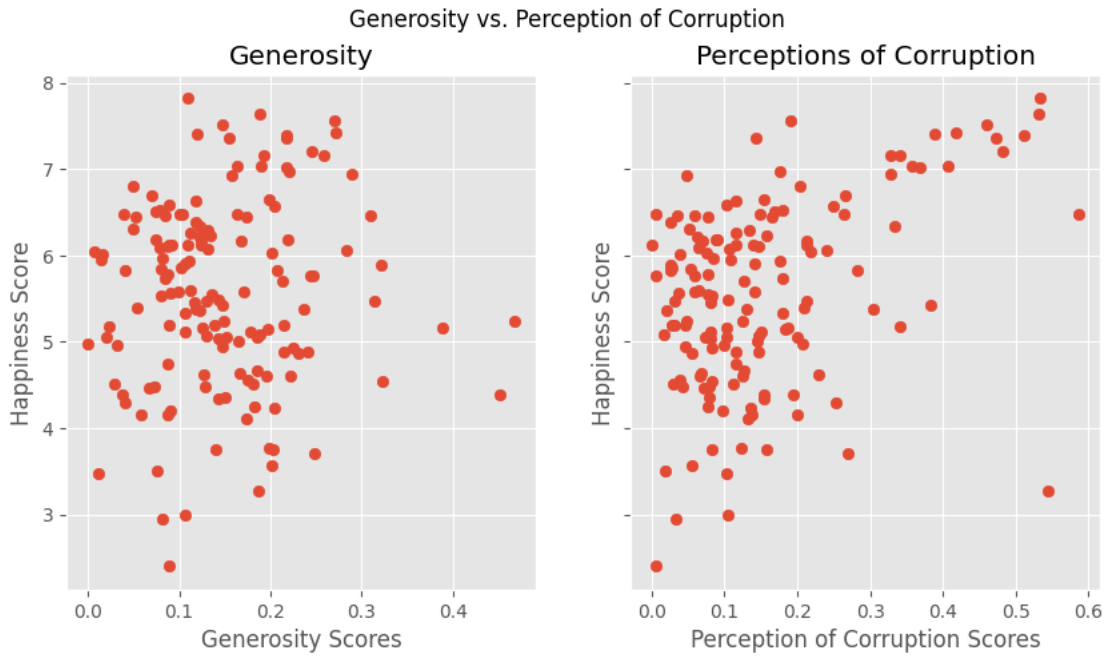
Both GDP per capita and social support have similar trends of the greater the happiness score the higher the scores are. Although, both graphs are using different scales.

Underdeveloped and developing countries that have a low GDP per capita cannot sustain a healthy working environment. They have low pay, unsafe working conditions, and long hours. These factors affect how individuals interact with their friends and family. Low pay leads to long hours and can cause workers to have more than one job. Long hours and low pay directly contribute to the amount of time a person spends with their loved ones. If their job or jobs are keeping them away from home and friends, social support is weak and might not even exist. GDP per capita and social support correlate because the more money a country outputs creates more opportunities for it's people. The more opportunities for social interactions allows more support from loved ones. Ultimately, this relates to the determination of how high a happiness score is.

Plot: Generosity vs. Perception of Corruption

```
generosity = rankings[rankings['Explained by: Generosity'].notnull()]
perceptions_of_corruption = rankings[rankings['Explained by: Perceptions of corruption'].notnull()]


plt.style.use('ggplot')

fig, (ax1, ax2) = plt.subplots(1, 2, sharey = True, figsize = (10, 5))

scatter_gen = ax1.scatter('Explained by: Generosity', 'Happiness score', data = generosity)

scatter_pc = ax2.scatter('Explained by: Perceptions of corruption', 'Happiness score', data = perceptions_of_corruption)

plt.suptitle('Generosity vs. Perception of Corruption')

ax1.set(xlabel = 'Generosity Scores', ylabel = 'Happiness Score', title = 'Generosity')
ax2.set(xlabel = 'Perception of Corruption Scores', ylabel = 'Happiness Score', title = 'Perceptions of Corruption')
```

```
plt.show()
```



The majority of happiness scores have low generosity and perception of corrutpion scores. But there are a number of happiness scores above 6 that have considerably high perception of corruption scores. Again, both graphs are using slightly different scales.

Perceptions of corruption insinuates trust levels between a country's people and government as well as between communities within the country. When there is little-to-no trust between an individual-to-system relationship or individual-to-individual relationship there is less chance of generous acts in the population, resulting in low generosity scores.

The majority of perception of corruption scores relay there is a belief of a low amount of corruption in governments and businesses. Why do the majority of the countries have low generosity scores when most seem to be at least somewhat trusting of their governments? GDP per capita, healthy life expectancy, social support, and freedom to make life choices can all affect generosity in a country. But this could also mean that most individuals in a society are preoccupied with their own lives or their culture doesn't support a generous attitude.

GDP per capita can affect whether a person has the ability to afford or has the time to participate in generous actions. If a country does not have a high healthy life expectancy individuals are more likely to look after themselves and ensure their health and possibly their family's health. Weak social support in a society causes people to feel lonely and less willing to interact with others, hindering them from generosity. Freedom to make life choices determines if an individual is able to enact a service of generosity.

The low scores of perception of corruption show that most countries see the political health of their society as not important to their happiness. The low generosity scores paint a picture of how generosity is not influential to someone's happiness.

Bar Graph: Comparison of 3 Developed and Underdeveloped and Developing Countries

Four bar graphs can be used to gain a better understanding of these variables. The bar graphs will compare the GDP per capita, social support, generosity, and perception of corruption of six countries.

```
italy = rankings[rankings['Country'] == 'Italy']
canada = rankings[rankings['Country'] == 'Canada']
us = rankings[rankings['Country'] == 'United States']

tanzania = rankings[rankings['Country'] == 'Tanzania']
guinea = rankings[rankings['Country'] == 'Guinea']
nepal = rankings[rankings['Country'] == 'Nepal']
```

GDP per Capita

```
italy_gdp = italy['Explained by: GDP per capita']
canada_gdp = canada['Explained by: GDP per capita']
us_gdp = us['Explained by: GDP per capita']

tanzania_gdp = tanzania['Explained by: GDP per capita']
guinea_gdp = guinea['Explained by: GDP per capita']
nepal_gdp = nepal['Explained by: GDP per capita']


gdp_mean = rankings['Explained by: GDP per capita'].mean()


gdp = pd.Series([1.834, 1.886, 1.982, 0.848, 0.848, 0.984],
                index = ['Italy', 'Canada', 'United States', 'Tanzania', 'Guinea', 'Nepal'])
gdp
```

```
Italy            1.834
Canada           1.886
United States    1.982
Tanzania         0.848
Guinea           0.848
Nepal            0.984
dtype: float64
```

Social Support

```
italy_ss = italy['Explained by: Social support']
canada_ss = canada['Explained by: Social support']
us_ss = us['Explained by: Social support']

tanzania_ss = tanzania['Explained by: Social support']
guinea_ss = guinea['Explained by: Social support']
nepal_ss = nepal['Explained by: Social support']


ss_mean = rankings['Explained by: Social support'].mean()
ss_mean
```

```
0.9058630136986301
```

```
social_support = pd.Series([1.052, 1.188, 1.182, 0.597, 0.566, 0.784],
                           index = ['Italy', 'Canada', 'United States', 'Tanzania',
                                    'Guinea', 'Nepal'])
social_support
```

```
Italy            1.052
Canada           1.188
United States    1.182
Tanzania         0.597
Guinea           0.566
Nepal            0.784
dtype: float64
```

Generosity

```
italy_gen = italy['Explained by: Generosity']
canada_gen = canada['Explained by: Generosity']
us_gen = us['Explained by: Generosity']

tanzania_gen = tanzania['Explained by: Generosity']
guinea_gen = guinea['Explained by: Generosity']
nepal_gen = nepal['Explained by: Generosity']


gen_mean = rankings['Explained by: Generosity'].mean()
gen_mean
```

```
0.14737671232876715
```

```
generosity = pd.Series([0.085, 0.217, 0.22, 0.248, 0.214, 0.237],
                       index = ['Italy', 'Canada', 'United States', 'Tanzania',
```

```
                                'Guinea', 'Nepal'])
generosity
```

```
     Italy            0.085
     Canada           0.217
     United States    0.220
     Tanzania         0.248
     Guinea           0.214
     Nepal            0.237
     dtype: float64
```

Perception of Corruption

```
italy_pc = italy['Explained by: Perceptions of corruption']
canada_pc = canada['Explained by: Perceptions of corruption']
us_pc = us['Explained by: Perceptions of corruption']

tanzania_pc = tanzania['Explained by: Perceptions of corruption']
guinea_pc = guinea['Explained by: Perceptions of corruption']
nepal_pc = nepal['Explained by: Perceptions of corruption']


pc_mean = rankings['Explained by: Perceptions of corruption'].mean()
pc_mean
```

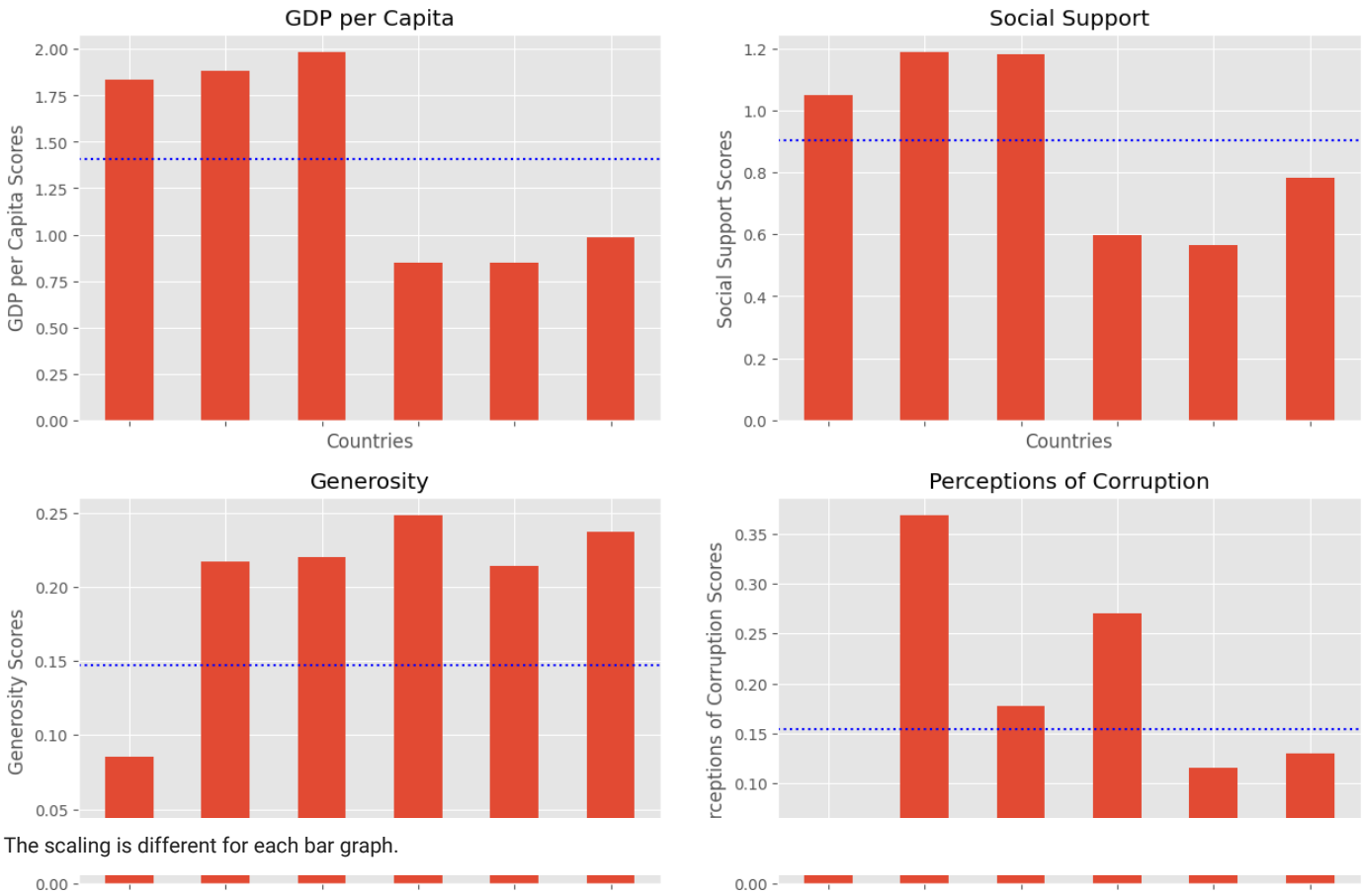
```
     0.1547808219178082
```

```
perceptions_of_corruption = pd.Series([0.059, 0.368, 0.177, 0.27, 0.116, 0.13],
                                      index = ['Italy', 'Canada', 'United States',
                                               'Tanzania', 'Guinea', 'Nepal'])
perceptions_of_corruption
```

```
     Italy            0.059
     Canada           0.368
     United States    0.177
     Tanzania         0.270
     Guinea           0.116
     Nepal            0.130
     dtype: float64
```

Bar Graph Comparison

```
fig, ((ax1, ax2), (ax3, ax4)) = plt.subplots(2, 2, sharex = True, figsize = (15, 10))

ax1.bar(gdp.index, gdp, width = 0.5)
ax2.bar(social_support.index, social_support, width = 0.5)
ax3.bar(generosity.index, generosity, width = 0.5)
ax4.bar(perceptions_of_corruption.index, perceptions_of_corruption, width = 0.5)

ax1.set(xlabel = 'Countries', ylabel = 'GDP per Capita Scores', title = 'GDP per Capita')
ax2.set(xlabel = 'Countries', ylabel = 'Social Support Scores', title = 'Social Support')
ax3.set(xlabel = 'Countries', ylabel = 'Generosity Scores', title = 'Generosity')
ax4.set(xlabel = 'Countries', ylabel = 'Perceptions of Corruption Scores', title = 'Perceptions of Corruption')


ax1.axhline(gdp_mean, color = 'blue', ls = 'dotted')
ax2.axhline(ss_mean, color = 'blue', ls = 'dotted')
ax3.axhline(gen_mean, color = 'blue', ls = 'dotted')
ax4.axhline(pc_mean, color = 'blue', ls = 'dotted')

plt.show()
```



Note: The scaling is different for each bar graph.

The first three countries (Italy, Canada, and the U.S.) are considered developed countries, while the last three countries on the graph (Tanzania, Guinea, and Nepal) are considered underdeveloped or develping countries. The blue dotted line marks where the average score is for each variable.

GDP per Capita: The developed countries fall above the average and the underdeveloped and developing countries fall almost 0.5 below the average.

Social Support: Again, the developed countries fall above the average and the underdeveloped and develping countries fall almost 0.5 below the average.

Generosity: All the countries except Italy are above the average.

Perceptions of Corruption: Canada, the U.S., and Tanzania are above the average, while Italy, Guinea, and Nepal fall below. Only one of the countries that are above average is an underdeveloped country and only one of the countries below average is a developed country.

GDP per capita is the highest average score for a country's "Explained by" variable, yet the underdeveloped countries have a score below the GDP per capita average. The GDP per capita scores of the underdeveloped countries are still greater than any of their other scores compared.

GDP per capita and social support scores follow a similar trend. Generosity and perception of corruption are opposite each other. Generosity has one developed country below the average and perception of corruption has one underdeveloped country above the average. Perception of corruption also has one developed country below the average. With the three underdeveloped/developing countries observed they seem to lack what the developed countries have. The developed countries seem to lack what the underdeveloped/developing countries have.

Overarching Questions: What makes a developed country happy? What is least attributed to a developed country's happiness? What about underdeveloped and developing countries?

The results of the four bar graphs compared to the four scatter plots share some similarities with my initial thoughts of trends. The trends: GDP per capita and social support are the top two scoring variables and generosity and perception of corruption are the bottom two scoring

variables for developed countries. For undeveloped countries, GDP per capita and social support are the top two highest scores and generosity and perception of corruption are the bottom two scoring variables.

A developed country's happiness relies on how healthy the economy is and on a thriving society. Generosity isn't seen as a necessity for happiness. A lot of higher happiness score countries have a stronger trust toward their governments compared to other countries. The majority of corruption scores are the second lowest scoring variable. Although, a developed country's corruption score is higher than others, in terms of the country's other scores it is low. Individuals' trust in their government is not a big contributor to their happiness score.

An underdeveloped or developing country's happiness also relies on how healthy the economy is and a thriving society. Social support for lower happiness scoring countries are less than developed countrys' scores, but for the majority it is still their second highest scores. Generosity is the second lowest score and perception of corruption is the lowest score, similar to the developed countrys' results.

Conclusion

Developed countries and underdeveloped/developing countries have the same needs for happiness, but developed countries are farther along (meaning developed) than other countries in these needs. They have more resources to create a greater impact on their happiness while underdeveloped/developing countries do not. There is a divide between worlds with resources yet a lot of similarities in needs. A happy country consists of an economy that supports it's people and opportunities for communities to connect and rely on each other. A happy country does not completely focus on generosity or the political state of their society. This creates the question, what resources are lacking in underdeveloped/developing countries but not in developed countries and how does that affect their socities?

References

Sustainable Development Solutions Network. (2022). *World Happiness Report 2022*. World Happiness Report. https://worldhappiness.report/ed/2022/

The World Bank. (2021). *GDP per capita (current US$) - Finland*. The World Bank. https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=FI