Final Project (Group 2)

Group 2

2024-05-09

- Research Question/Hypothesis: What variable in the world happiness report (family, health, trust, generosity, and economics) has the greatest effect on a nation's happiness score?

- Hypothesis: Economics plays the largest role in a nation's happiness score.

```r
library(readxl)
library(dplyr)
library(ggplot2)
library(tidyr)

data <- read_excel("2019.xls")

colnames(data)
```

```
## [1] "Overall rank"                 "Country or region"
## [3] "Score"                        "GDP per capita"
## [5] "Social support"               "Healthy life expectancy"
## [7] "Freedom to make life choices" "Generosity"
## [9] "Perceptions of corruption"
```

```r
library(readxl)

data <- read_excel("2019.xls")

print(colnames(data))
```

```
## [1] "Overall rank"                 "Country or region"
## [3] "Score"                        "GDP per capita"
## [5] "Social support"               "Healthy life expectancy"
## [7] "Freedom to make life choices" "Generosity"
## [9] "Perceptions of corruption"
```

```r
data <- data %>%
  rename(
    Economy = `GDP per capita`,
    Social = 'Social support',
    Health = `Healthy life expectancy`,
    Freedom = `Freedom to make life choices`,
    Corruption = 'Perceptions of corruption',
    Happiness_Score = `Score`
  )
print(colnames(data))
```

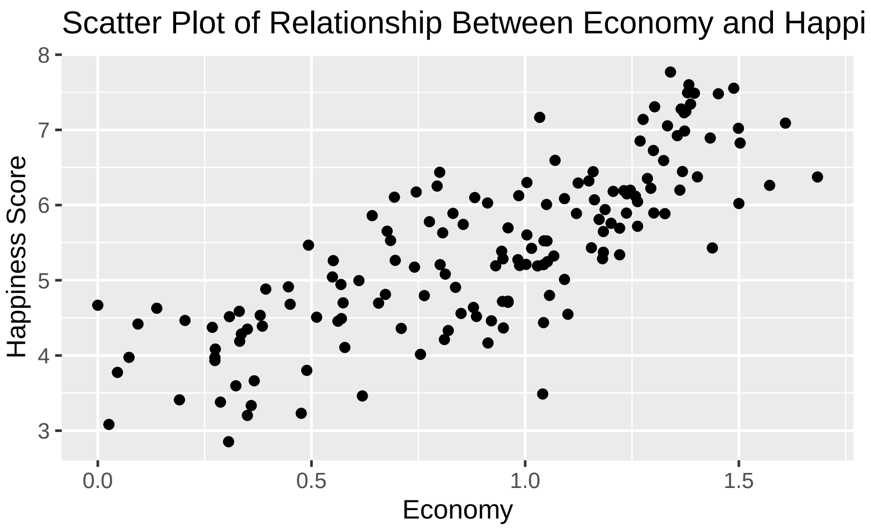
```
## [1] "Overall rank"      "Country or region" "Happiness_Score"
## [4] "Economy"           "Social"            "Health"
## [7] "Freedom"           "Generosity"        "Corruption"
```

```r
  head(
    select(data, Economy, Social, Health, Freedom, Corruption, Happiness_Score)
  )
```

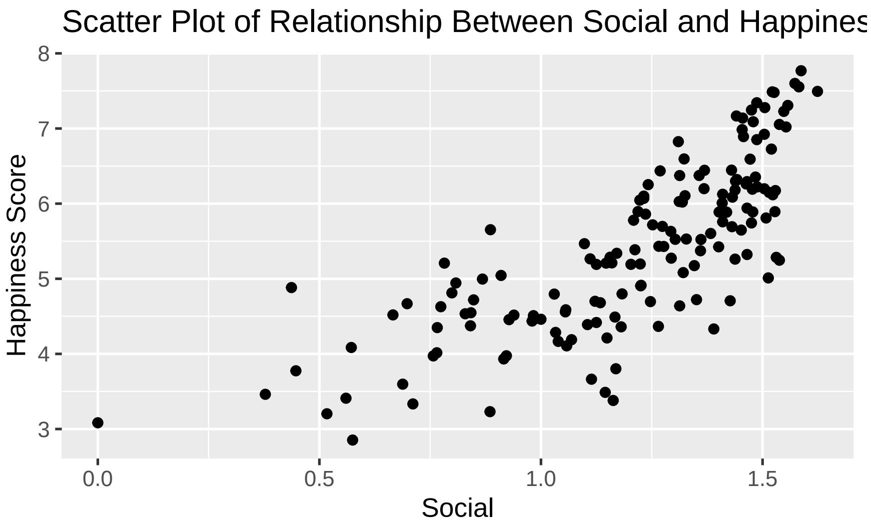
Economy	Social	Health	Freedom	Corruption	Happiness_Score
1.340	1.587	0.986	0.596	0.393	7.769
1.383	1.573	0.996	0.592	0.410	7.600
1.488	1.582	1.028	0.603	0.341	7.554
1.380	1.624	1.026	0.591	0.118	7.494
1.396	1.522	0.999	0.557	0.298	7.488
1.452	1.526	1.052	0.572	0.343	7.480

[Module 2: Junhyung Kim, Jiho Lee]

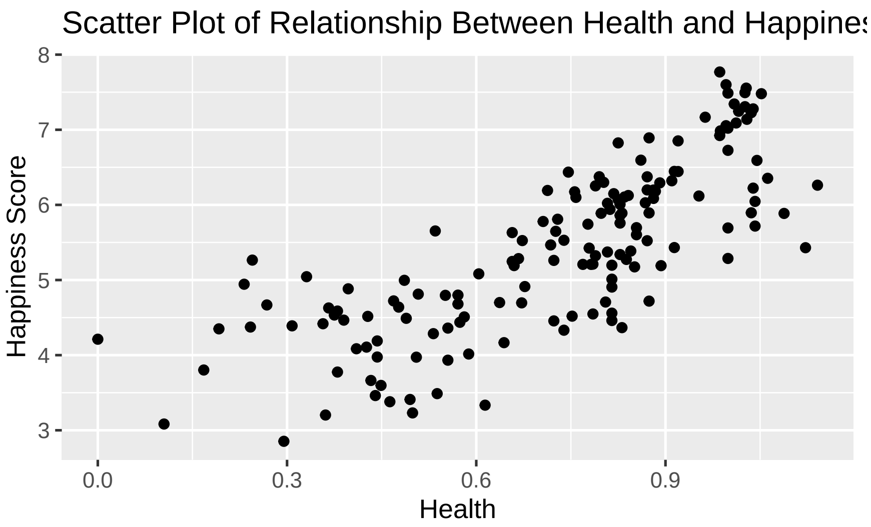
```r
data %>%
ggplot() +
geom_point(mapping = aes (x = Economy, y= Happiness_Score)) +
labs(title =
       "Scatter Plot of Relationship Between Economy and Happiness Score",
x = "Economy", y = "Happiness Score")
```



```r
data %>%
ggplot() +
geom_point(mapping = aes (x = Social, y= Happiness_Score)) +
labs(title =
       "Scatter Plot of Relationship Between Social and Happiness Score",
x = "Social", y = "Happiness Score")
```



```r
data %>%
ggplot() +
geom_point(mapping = aes (x = Health, y= Happiness_Score)) +
labs(title =
       "Scatter Plot of Relationship Between Health and Happiness Score",
x = "Health", y = "Happiness Score")
```



[Module 4: Eugene Kim, - Explanatory Data Analysis]

```r
str(data)
```

```
## tibble [156 x 9] (S3: tbl_df/tbl/data.frame)
##  $ Overall rank     : num [1:156] 1 2 3 4 5 6 7 8 9 10 ...
##  $ Country or region: chr [1:156] "Finland" "Denmark" "Norway" "Iceland" ...
##  $ Happiness_Score  : num [1:156] 7.77 7.6 7.55 7.49 7.49 ...
##  $ Economy          : num [1:156] 1.34 1.38 1.49 1.38 1.4 ...
##  $ Social           : num [1:156] 1.59 1.57 1.58 1.62 1.52 ...
##  $ Health           : num [1:156] 0.986 0.996 1.028 1.026 0.999 ...
##  $ Freedom          : num [1:156] 0.596 0.592 0.603 0.591 0.557 0.572 0.574 0.585 0.584 0.53
##  $ Generosity       : num [1:156] 0.153 0.252 0.271 0.354 0.322 0.263 0.267 0.33 0.285 0.244
##  $ Corruption       : num [1:156] 0.393 0.41 0.341 0.118 0.298 0.343 0.373 0.38 0.308 0.226
```

```r
head(
    select(data, Economy, Social, Health, Freedom, Corruption, Happiness_Score)
  )
```

Economy	Social	Health	Freedom	Corruption	Happiness_Score
1.340	1.587	0.986	0.596	0.393	7.769
1.383	1.573	0.996	0.592	0.410	7.600
1.488	1.582	1.028	0.603	0.341	7.554
1.380	1.624	1.026	0.591	0.118	7.494
1.396	1.522	0.999	0.557	0.298	7.488
1.452	1.526	1.052	0.572	0.343	7.480

```
tail(select(data, Economy, Social, Health, Freedom, Corruption, Happiness_Score)
  )
```

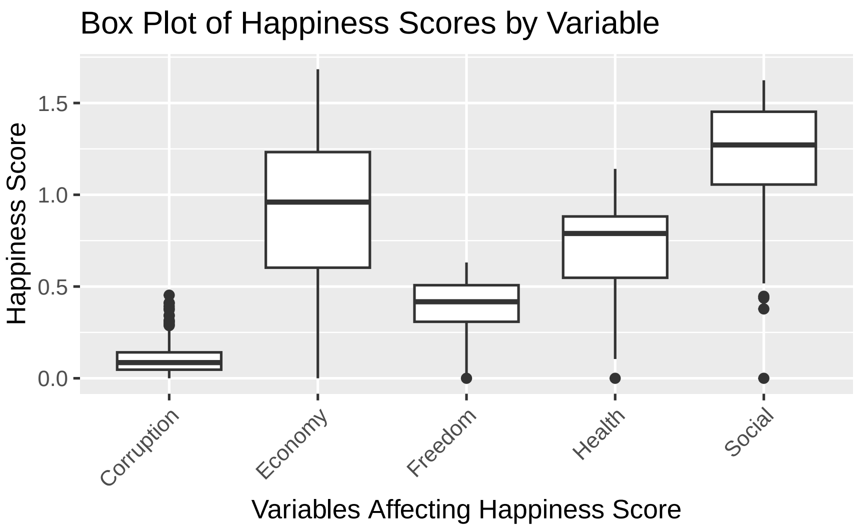
Economy	Social	Health	Freedom	Corruption	Happiness_Score
0.287	1.163	0.463	0.143	0.077	3.380
0.359	0.711	0.614	0.555	0.411	3.334
0.476	0.885	0.499	0.417	0.147	3.231
0.350	0.517	0.361	0.000	0.025	3.203
0.026	0.000	0.105	0.225	0.035	3.083
0.306	0.575	0.295	0.010	0.091	2.853

*Summary statistics

*Box Plot

```
data_long <- data %>%
  gather(key = "Variable", value = "Score", Economy, Social, Health, Freedom, Corruption)

ggplot(data_long, aes(x = Variable, y = Score)) +
  geom_boxplot(width = 0.7) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  labs(title = "Box Plot of Happiness Scores by Variable", x = "Variables Affecting Happiness S
```



- Distribution of the values: Corruption variable is narrowly distributed, mostly concentrated near the lower score values, showing a low happiness score in relation to perceived corruption.

Economy variable has a broader distribution with more variability in scores.

Freedom variable has a mid-range median and spread in values.

Health variable shows higher median happiness scores, implying positive correlation between good health and higher happiness score.

Social variable has widest range of scores, indicating a varied impact of social factors on happiness.

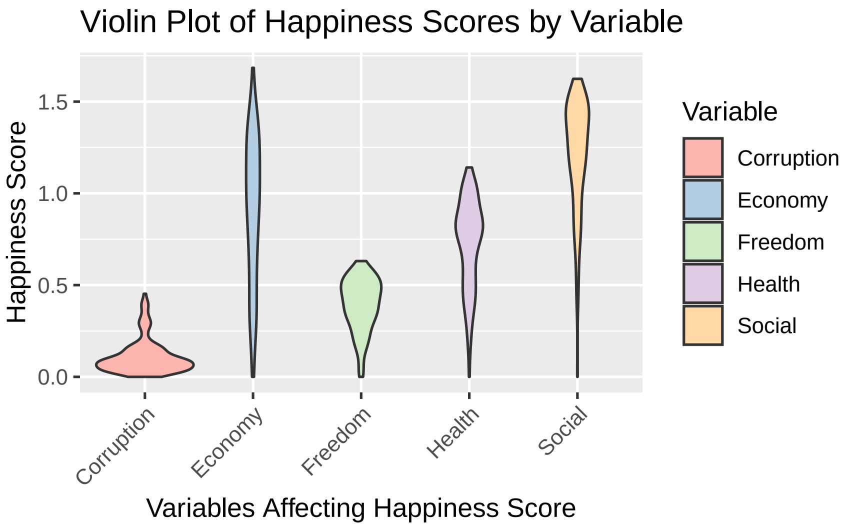
- Outliers: Corruption: Features multiple outliers at the lower end, which might represent instances where perceived corruption is significantly impacting happiness.

Social have a few lower outliers. Economy, freedom and health do not show clear outliers in this plot.

- Inter-quartile Range (IQR): Corruption shows a very tight IQR, close to the lower score limits. Economy, Freedom, and Health have moderately sized IQRs. Social has the largest IQR, suggesting significant variability in how social factors affect happiness.

*Violin Plot

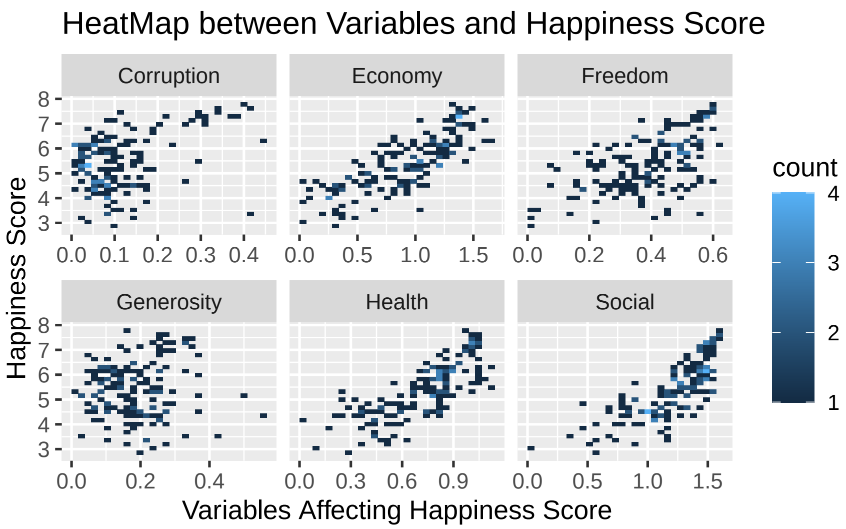
```
ggplot(data_long, aes(x = Variable, y = Score, fill = Variable)) +
  geom_violin(trim = TRUE) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  labs(title = "Violin Plot of Happiness Scores by Variable", x = "Variables Affecting Happines
  scale_fill_brewer(palette = "Pastel1")
```



- The Social and Health variables seem to have the most highest positive impact on happiness scores. Both variables are located inthe upper range.
- Economy and Freedom shows less impact than the social and health variables. The variability in economic and freedom seems to impact the happiness score per situation.
- Corruption has high negative impact on happiness score, as the values are concentrated at the lower end of the plot.

*Heatmap

```
data %>%
  pivot_longer(cols = Economy:Corruption, names_to = "Variable", values_to = "value") %>%
  ggplot() +
  geom_bin2d(mapping = aes(x = value, y = Happiness_Score)) +
  labs(title = "HeatMap between Variables and Happiness Score", x= "Variables Affecting Happin
  facet_wrap(~ Variable, scales = "free_x")
```



*Summary

```
data_long_economy <- data_long %>%
  filter(Variable == "Economy")
```

```
data_long_economy %>%
  summarize(
    mean= mean(Score),
    median =median(Score),
    sd=sd(Score),
    iqr=IQR(Score),
    min=min(Score),
    max=max(Score)
 )
```

mean	median	sd	iqr	min	max
0.9051474	0.96	0.3983895	0.62975	0	1.684

```
data_long_social <- data_long %>%
  filter(Variable == "Social")
```

```
data_long_social %>%
  summarize(
    mean= mean(Score),
    median =median(Score),
    sd=sd(Score),
    iqr=IQR(Score),
    min=min(Score),
    max=max(Score)
 )
```

mean	median	sd	iqr	min	max
1.208814	1.2715	0.2991914	0.39675	0	1.624

```
data_long_health <- data_long %>%
  filter(Variable == "Health")
```

```
data_long_health %>%
  summarize(
    mean= mean(Score),
    median =median(Score),
    sd=sd(Score),
    iqr=IQR(Score),
    min=min(Score),
    max=max(Score)
 )
```

mean	median	sd	iqr	min	max
0.7252436	0.789	0.242124	0.334	0	1.141

```
data_long_freedom <- data_long %>%
  filter(Variable == "Freedom")
```

```
data_long_freedom %>%
  summarize(
    mean= mean(Score),
    median =median(Score),
    sd=sd(Score),
    iqr=IQR(Score),
    min=min(Score),
    max=max(Score)
 )
```

mean	median	sd	iqr	min	max
0.3925705	0.417	0.1432895	0.19925	0	0.631

```
data_long_corruption <- data_long %>%
  filter(Variable == "Corruption")
```

```
data_long_corruption %>%
  summarize(
    mean= mean(Score),
    median =median(Score),
    sd=sd(Score),
    iqr=IQR(Score),
    min=min(Score),
    max=max(Score)
 )
```

mean	median	sd	iqr	min	max
0.1106026	0.0855	0.0945378	0.09425	0	0.453