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World Happiness Analysis

Overview: The project aims at measuring the happiness index of the world by performing data analysis. The data set being used is published by the United Nations and was collected by conducting life evaluation questions asked in a poll. It includes data from across the world and we are going to analyse multiple factors that might influence happiness amongst people.

The data set considered,currently has 5 years worth of data from the year 2015 to 2019. Data cleaning,wrangling,structuring,enriching and manipulation will be done on all the data sets based on requirement for forming meaningful insights.

Installation of the required packages for analysis:

```
#install.packages("ggcorrplot")
#install.packages( Rtools )
#install.packages( plotly )
#install.packages("heatmaply")
#install.packages("ggcorrplot")
#install.packages( fuzzyjoin )
#install.packages( hrbrthemes )
#install.packages( zoo )
#install.packages( ggplotly )
#library( ggplot2 )
library( tidyverse )
```

```
## -- Attaching packages ---------------------------------------- tidyverse 1.3.1 --

## v ggplot2 3.3.5 v purrr 0.3.4
## v tibble 3.1.4 v dplyr 1.0.7 ##
v tidyr 1.1.3 v stringr 1.4.0 ##
v readr 2.0.1 v forcats 0.5.1

## -- Conflicts ------------------------------------------
tidyverse_conflicts() -## x dplyr::filter() masks stats::filter() ## x
dplyr::lag()masks stats::lag()
```

```
library( dplyr )
library( plotly )
```

```
##
## Attaching package: 'plotly'
## The following object is masked from 'package:ggplot2':
##
##    last_plot

## The following object is masked from 'package:stats':
##
##    filter

## The following object is masked from 'package:graphics':
##
##    layout
```

```
library( ggcorrplot )
library( stringr )
library( fuzzyjoin )
#ggplotly( corr.plot
) library( plotly )
library( heatmaply )
```

```
## Loading required package: viridis

## Loading required package: viridisLite

##
## ======================
## Welcome to heatmaply version
1.3.0 ##
## Type citation('heatmaply') for how to cite the package.
## Type ?heatmaply for the main documentation.
##
## The github page is: https://github.com/talgalili/heatmaply/
## Please submit your suggestions and bug-reports at:
https://github.com/talgalili/heatmaply/issues ## You may ask questions at stackoverflow,
use the r and heatmaply tags:
##https://stackoverflow.com/questions/tagged/heatmaply
## ======================
```

```
library( hrbrthemes )
```

```
## NOTE: Either Arial Narrow or Roboto Condensed fonts are required to use these themes.

## Please use hrbrthemes::import_roboto_condensed() to install Roboto Condensed and

## if Arial Narrow is not on your system, please see https://bit.ly/arialnarrow
```

```
library(reshape2)
```

```
##
## Attaching package: 'reshape2'

## The following object is masked from 'package:tidyr':
##
##    smiths
#hrbrthemes::import_roboto_condensed()
library( zoo )
```

```
##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##   as.Date, as.Date.numeric
```

```
# The required packages are installed along with their corresponding libraries.
```

The Data sets present in the csv files are read to obtain the data required for Analysis

```
getwd()
```

```
## [1] "/Users/nithin/Downloads"
```

```
setwd( /Users/nithin/Documents/Foundations of Data Analytics /Project 1
/Data ) getwd()
```

```
## [1] "/Users/nithin/Documents/Foundations of Data Analytics /Project 1 /Data"
```

```
happiness_2015 <- read.csv( 2015.csv ) #
The happiness data for the years
2015happiness_2016 <- read.csv( 2016.csv )
# 2019 is read using the read.csv
happiness_2017 <- read.csv( 2017.csv ) #
function
happiness_2018 <- read.csv( 2018.csv )
happiness_2019 <- read.csv( 2019.csv )
country_data <- read.csv( Country.csv )
```

Data Enriching and Manipulation:

Data enriching involves adding value to the data already collected to enhance it for the analysis to be done at hand.In this case,we add the column year to give the data more context.

```
happiness_2015$Year <-    # Here we are adding a column "year" for each of the
2015
happiness_2016$Year <-    # 5 data sets.Each of these data sets contains
2016
happiness_2017$Year <-    # the happiness data for that year,but the year is
2017
happiness_2018$Year <-    # not mentioned in them.
2018 happiness_2019$Year
<- 2019
```

World Happiness Data for the years:

Data Manipulation and cleaning is done to ensure that there is consistency in the data.For each of the years mentioned below the data required is filtered,and manipulated to bring it a standardized form. 2015-

```
df_2015_filtered <- happiness_2015 %>% select
  (Country , Region, Happiness.Rank,
  Happiness.Score,
  Economy..GDP.per.Capita.,Health..Life.Expectancy.,
         Freedom, Trust..Government.Corruption., Family, Year )

# The required data is selected from the data set of the world happiness
# in the year 2015.The factors that could possibly affect the
# happiness score in different parts of the world are considered and
placed in #the df_2015_filtered variable.

df_2015_filtered <- rename_with(df_2015_filtered,
                            ~ tolower(gsub(".", "_", .x, fixed =

TRUE))) # The columns considered are edited to fit a standardized

form.

df_2015_filtered    <-    df_2015_filtered    %>%    rename(economy_or_gdp    =
economy__gdp_per_capita_,

#head(df_2015_filtered,5)

knitr::kable(head(df_2015_filtered,5),"pipe",col.names
=c("Country","Region","Happiness Rank"
```

Country	Region	Happiness Rank	Happiness Score	Economy or GDP	Health	Freedom	Perception Of Government Corruption	Family or Social Support	Year
Switzerlan	Wdestern Europe	1	7.587	1.39651	0.94143	0.66557	0.41978	1.34951	2015
Iceland	Western Europe	2	7.561	1.30232	0.94784	0.62877	0.14145	1.40223	2015
Denmark	Western Europe	3	7.527	1.32548	0.87464	0.64938	0.48357	1.36058	2015
Norway	Western Europe	4	7.522	1.45900	0.88521	0.66973	0.36503	1.33095	2015
Canada	North America	5	7.427	1.32629	0.90563	0.63297	0.32957	1.32261	2015

```
# The columns are renamed to give appropriate names which are common to all
the
# years having the same column names,each corresponding to the relevant data #
pertaining to that year.
```

2016-

```
# happiness score in different parts of the world are considered and
placed in #the df_2016_filtered variable.



df_2016_filtered <- rename_with(df_2016_filtered, ~ tolower(gsub(".", "_",

.x, fixed = # The columns considered are edited to fit a standardized form.

df_2016_filtered <- df_2016_filtered %>% rename(economy_or_gdp =
economy__gdp_per_capita_, perception_of_govt_corruption=
trust__government_corruption_, family_or_social_support = family
)
#head(df_2016_filtered,5)

knitr::kable(head(df_2016_filtered,5),"pipe",col.names
=c("Country","Region","Happiness Rank"
df_2016_filtered <- happiness_2016 %>% select
  (Country , Region, Happiness.Rank,
  Happiness.Score,
  Economy..GDP.per.Capita.,Health..Life.Expectancy.,
         Freedom, Trust..Government.Corruption.,Family, Year )

# The required data is selected form the data set of the world happiness
# in the year 2016.The factors that could possibly affect the
                                                                TRUE)))

                                                    health = hea

                                                    ,"Happines
```

Country	Region	Happiness Rank	Happiness Score	Economy or GDP	Health	Freedom	Perception Of Government Corruption	Family or Social Support	Year
Denmark	Western Europe	1	7.526	1.44178	0.79504	0.57941	0.44453	1.16374	2016
Switzerlan	Western Europe	2	7.509	1.52733	0.86303	0.58557	0.41203	1.14524	2016
Iceland	Western Europe	3	7.501	1.42666	0.86733	0.56624	0.14975	1.18326	2016

Norway	Western Europe	4	7.498	1.57744	0.795790.59609	0.35776	1.12690	2016
Finland	Western Europe	5	7.413	1.40598	0.810910.57104	0.41004	1.13464	2016

```
# The columns are renamed to give appropriate names which are common to all
the
# years having the same column names,each corresponding to the relevant data #
pertaining to that year.
```

2017-

```
df_2017_filtered <- happiness_2017 %>% select
  (Country , Happiness.Rank, Happiness.Score,
         Economy..GDP.per.Capita.,Health..Life.Expectancy.,
         Freedom, Trust..Government.Corruption.,Family, Year)

# The required data is selected form the data set of the world happiness
# in the year 2017.The factors that could possibly affect the
# happiness score in different part of the world are considered and
placed in #the df_2017_filtered variable

#region missing in the 2017 table
df_2017_filtered <- rename_with(df_2017_filtered, ~ tolower(gsub(".", "_",
.x, fixed =
                                                                TRUE)))
                                                                health = heal
```

```
# The columns considered are edited to fit a standardized form.


df_2017_filtered <- df_2017_filtered %>% rename(economy_or_gdp =
economy__gdp_per_capita_, perception_of_govt_corruption=
trust__government_corruption_, family_or_social_support = family )

# The columns are renamed to give appropriate names which are common
to all the # years having the same column names,each corresponding
to the relevant data # pertaining to that year.


#df_2017_filtered  <-  df_2017_filtered  %>%  left_join(select(df_2016_filtered

region), by= "co # The region column is not present in the 2017 world data ind

that needs to be added.

# df_2017_filtered

df_2017_filtered <- df_2017_filtered %>% regex_inner_join(select(
df_2017_filtered <- select(df_2017_filtered, -country.y) %>% rename(country=
country.x)

# Here we are adding the region for the 2017 data Using regex inner join instea
join to help w
# For example the Country Cyprus has the name as Cyprus for a few years and
North Cyprus colSums(is.na(df_2017_filtered))
                                                    df_2015_filtered , country, region),


                                                                    for few ye


##                     country             happiness_rank
##     0     0 ##  happiness_score    economy_or_gdp
## 0 0 ## health freedom
##     0     0 ## perception_of_govt_corruption
family_or_social_support
## 0 0 ## year region
##                          0                          0

#validating and checking for null values

#head(df_2017_filtered,5) knitr::kable(head(df_2017_filtered,5),"pipe",col.name
=c("Country","Region","Happiness Rank"

                                                                    ,"Happines
```

Country	Region	Happiness Rank	Happiness Score	Economy or GDP	Health	Freedom	Perception Of Government Corruption	Family or Social Support	Year	
Norway	1	7.537	1.616463	0.79666	0.63542	0.31596	38	1.533524	2017	Western Europe

Country Region	Happiness Rank	Happiness Score	Economy GDP	Health	Freedom	Perception Of Government Corruption	Family or Social Support	Year
Denmark	2	7.522	1.482383	0.79256550.62600607.4007701			1.551122	2017 Western Europe
Iceland	3	7.504	1.480633	0.83355210.62716206.1535266			1.610574	2017 Western Europe
Switzerland	4	7.494	1.564980	0.85813130.6200706.3670073			1.516912	2017 Western Europe
Finland	5	7.469	1.443572	0.80915770.6179509.3826115			1.540247	2017 Western Europe

2018-

```
df_2018_filtered <- happiness_2018 %>%
  select (Country.or.region , Overall.rank,
  Score,
     GDP.per.capita,Healthy.life.expectancy, Freedom.to.make.life.choices
          , Perceptions.of.corruption, Social.support, Year)

# The required data is selected form the data set of the world happiness
# in the year 2018.The factors that could possibly affect the
# happiness score in different parts of the world are considered and placed in
#the df_2018_filtered variable

df_2018_filtered <- rename_with(df_2018_filtered, ~ tolower(gsub(".", "_",

.x, fixed = # The columns considered are edited to fit a standardized form.

df_2018_filtered <- df_2018_filtered %>% rename(country =
 country_or_region,economy_or_gdp = health =
 healthy_life_expectancy,perception_of_govt_corruption=
 perceptions_of_corruption , )
# The columns are renamed to give appropriate names which are common
to all the # years having the same column names,each corresponding
to the relevant data # pertaining to that year.

#df_2018_filtered  <-  df_2018_filtered  %>%  left_join(select(df_2016_filtered

region), by= "co # The region column is not present in the 2017 world data ind

that needs to be added.

#adding region to 2018 data by joining on country

df_2018_filtered <- df_2018_filtered %>% regex_inner_join(select(
df_2018_filtered <- select(df_2018_filtered, -country.y) %>% rename(country=
country.x)

## Here we are adding the region for the 2018 data Using regex inner join inste
inner join to help


#head(df_2018_filtered,5) knitr::kable(head(df_2018_filtered,5),"pipe",col.name
=c("Country","Region","Happiness Rank"
                                                                    TRUE)))
```

```
 gdp_per_c
ap
family_or_
so
```

```
df_2015_filtered , country, region),
```

```
,"Happines
```

Country	Region	Happiness Rank	Happiness Score	Economy or GDP	Health	Freedom	Perception Of Government Corruption	Family or Social Support	Year	
Finland	1	7.632	1.305	0.874	0.681	0.393	1.592	2018	Western Europe	
Norway	2	7.594	1.456	0.861	0.686	0.340	1.582	2018	Western Europe	
Denmark	3	7.555	1.351	0.868	0.683	0.408	1.590	2018	Western Europe	
Iceland	4	7.495	1.343	0.914	0.677	0.138	1.644	2018	Western Europe	
Switzerland	5	7.487	1.420	0.927	0.660	0.357	1.549	2018	Western Europe	

2019-

```
df_2019_filtered <- happiness_2019 %>%
  select (Country.or.region , Overall.rank,
  Score,
     GDP.per.capita,Healthy.life.expectancy, Freedom.to.make.life.choices
          , Perceptions.of.corruption, Social.support, Year)

# The required data is selected form the data set of the world happiness
# in the year 2019.The factors that could possibly affect the
# happiness score in different parts of the world are considered and placed in
#the df_2019_filtered variable

df_2019_filtered <- rename_with(df_2019_filtered, ~ tolower(gsub(".", "_",

.x, fixed = # The columns considered are edited to fit a standardized form.

df_2019_filtered <- df_2019_filtered %>% rename(country =
country_or_region,economy_or_gdp = happiness_rank = overall_rank, freedom =
freedom_to_make_life_choices
)

# The columns are renamed to give appropriate names which are common
to all the # years having the same column names,each corresponding
to the relevant data # pertaining to that year.

#df_2019_filtered  <-  df_2019_filtered  %>%  left_join(select(df_2016_filtered

region), by= "co # The region column is not present in the 2017 world data ind

that needs to be added.

#adding region to 2018 data by joining on country

df_2019_filtered <- df_2019_filtered %>% regex_inner_join(select(
df_2019_filtered <- select(df_2019_filtered, -country.y) %>% rename(country=
country.x)

## Here we are adding the region for the 2019 data Using regex inner join inste
inner join to help


#df_2019_filtered
                                                                    TRUE)))


                                                                        gdp_per_ca
```

```
                                                    df_2015_filtered , country, region),
```

```
knitr::kable(head(df_2019_filtered,5),"pipe",col.names
=c("Country","Region","Happiness Rank"                                  ,"Happines
```

Country	Region	Happiness Rank	Happiness Score	Economy or GDP	Health	Freedom	Perception Of Government Corruption	Family or Social Support	Year
Finland	1	7.769	1.340	0.986	0.596	0.393	1.587	2019	Western Europe
Denmark	2	7.600	1.383	0.996	0.592	0.410	1.573	2019	Western Europe
Norway	3	7.554	1.488	1.028	0.603	0.341	1.582	2019	Western Europe
Iceland	4	7.494	1.380	1.026	0.591	0.118	1.624	2019	Western Europe
Netherland	5s	7.488	1.396	0.999	0.557	0.298	1.522	2019	Western Europe

Data Wrangling:

Data wrangling involves unifying messy raw data into a form which is simpler to access and handle.In this case all the di erent data sets of the years are combined to create a single master data set,containing all the data that is required for analysis.

```
#Union all has been identified as the best approach while combining data. If we
to combine the

df_15_16 <- union_all(df_2015_filtered, df_2016_filtered)
df_15_16_17 <- union_all(df_15_16,df_2017_filtered)
df_2018_filtered$perception_of_govt_corruption <-
as.double(df_2018_filtered$
                                                    perception_of_govt_corrupt
```

```
## Warning: NAs introduced by coercion
```

```
# The data type is converted into double in order to maintain uniformity.


df_15_16_17_18 <- union_all(df_15_16_17,
df_2018_filtered) df_final <- union_all(df_15_16_17_18,
df_2019_filtered)

#df_final

knitr::kable(head(df_final,5),"pipe",col.names
=c("Country","Region","Happiness Rank",
                                                                    "Happiness
                                                                        Score"
```

Country	Region	Happiness Rank	Happiness Score	Economy or GDP	Health	Freedom	Perception Of Government	Corruption	Family or Social Support	Year
Switzerlan	Western Europe	1	7.587	1.39651	0.94143	0.66557		0.41978	1.34951	2015
Iceland	Western Europe	2	7.561	1.30232	0.94784	0.62877		0.14145	1.40223	2015
Denmark	Western Europe	3	7.527	1.32548	0.87464	0.64938		0.48357	1.36058	2015
Norway	Western Europe	4	7.522	1.45900	0.88521	0.66973		0.36503	1.33095	2015
Canada	North America	5	7.427	1.32629	0.90563	0.63297		0.32957	1.32261	2015

```
# The data frames for all the years are combined together using the
union all # function.As we can see the the df_15_16 variable
contains the union or
# combining data sets of the years 2015 and 2016 followed by 2017
and 18 and # finally the union of all of them are stored in the
df_final variable.
```

Data Cleaning:

Data cleaning also involves taking care of the null values by removing them so they do not a ect our analysis.Here we check if there are any NA values in the final data frame and also remove the temporary variable which are not required any more.

```
remove(df_15_16)
remove(df_15_16_17)
remove(df_15_16_17_18)

# the temporary variables created in order to perform the union function are
# later deleted as we have the final data frame which contains all the unions.
#validating and checking for null vales
colSums(is.na(df_final))
```

```
##                    country                     region
##                          0                          0
##               happiness_rank           happiness_score
##                          0                          0
##               economy_or_gdp                     health
```

```
##    0     0 ##  freedom perception_of_govt_corruption
## 0 1 ## family_or_social_support year
##                           0                         0
```

```
NA_df <- df_final[rowSums(is.na(df_final)) > 0,]
head(NA_df,5)
```

```
##                country                      region happiness_rank
## 489 United Arab Emirates Middle East and Northern Africa    20
##happiness_score economy_or_gdp health freedom perception_of_govt_corruption
## 489         6.774        2.096  0.67  0.284                          NA
##  family_or_social_support year
## 489                0.776 2018
```

```
#checking for NA values in the df_final which contains all the unions.
```

Data Validation:

Data validation is checking if the data has undergone the cleansing it requires to be used.However in this case we find that a NA value in the UAE gives us an error ,hence we take the average value of other values on the same column instead of discarding it to prevent data loss.

```
#Finding the records with NA values

NA_df <- df_final[rowSums(is.na(df_final)) > 0,]


#There is an NA value for perception of govt_corruption for United Arab emirates

#replacing the missing NA value of perception of govt corruption with the average perce

govt cor df_final$perception_of_govt_corruption = as.numeric(as.factor(df_final$

#changing datatype for calculating the mean

# Due to the presence of an NA value for perception of govt_corruption for United Arab
error # In this case we have taken an average of the perception of govt corruption me
UAE the valu

df_UAE <- df_final %>% dplyr::filter(df_final$country ==
  United Arab Emirates )
df_final$perception_of_govt_corruption[is.na(df_final$perception_of_govt_corruption)]<-


#validating the replaced values and checking for NAs
colSums(is.na(df_final))
                                                    perception_of_govt_corruption))

                                                                    mean(df_UAE$per

##                    country                     region
##                          0                          0
##             happiness_rank           happiness_score
##                          0                          0
##             economy_or_gdp                     health
##                          0                          0
##                    freedom perception_of_govt_corruption
## 0 0 ## family_or_social_support year
##                          0                          0
NA_df <- df_final[rowSums(is.na(df_final))
> 0,]

NA_df

## [1] country                    region
## [3] happiness_rank            happiness_score
## [5] economy_or_gdp             health
## [7] freedom                   perception_of_govt_corruption
## [9] family_or_social_support  year
```

```
## <0 rows> (or 0-length row.names)
```

Business Question 1: To find the happiest countries all over the world based on the happiness score

```
top_country_list <- df_final %>%
  group_by(country) %>%
  summarise(happiness_score= sum(happiness_score)) %>%
arrange(desc(happiness_score)) %>% slice(1:5)
head(top_country_list,5)
```

```
## # A tibble: 5 x 2
##  country   happiness_score
##    <chr> <dbl> ## 1
Nigeria     41.1 ## 2 Denmark
37.7 ## 3 Norway  37.7
## 4 Finland            37.7
## 5 Switzerland        37.6
```

```
knitr::kable(top_country_list,"pipe",col.names =c("Country","Happiness Score"),align
=c("c","c"))
```

Country	Happiness Score
Nigeria	41.131
Denmark	37.730
Norway	37.705
Finland	37.689
Switzerland	37.557

```
# Based on the master data set created df_final we group the countries based
# on the happiness score and arrange them in descending order to obtain the top 5
countries with highest
```

Conclusion: When the data across all the years have been considered. The above table shows us that Nigeria is the country with the highest happiness score of 41.131,while Switzerland comes in at fifth position with a score of 37.557.

This is an interesting finding as Nigeria doesn't make it to the top 5 list for any of the years even though it has the highest happiness score across all the years.

Business Question 2: To find out the countries that take up the top spot on the happiness score over the years

```
countries_rank_1 <- df_final %>% dplyr::filter(happiness_rank == 1) %>%
select(                                                                    country
                                                                             year
                                                                        happiness_

#head(countries_rank_1, 5,)

knitr::kable(countries_rank_1,"pipe",col.names =c("Country","Year","Happiness
Score"),                                                                  align
                                                                  =c("c","c",
```

Country	Year	Happiness Score
Switzerland	2015	7.587
Denmark	2016	7.526
Norway	2017	7.537

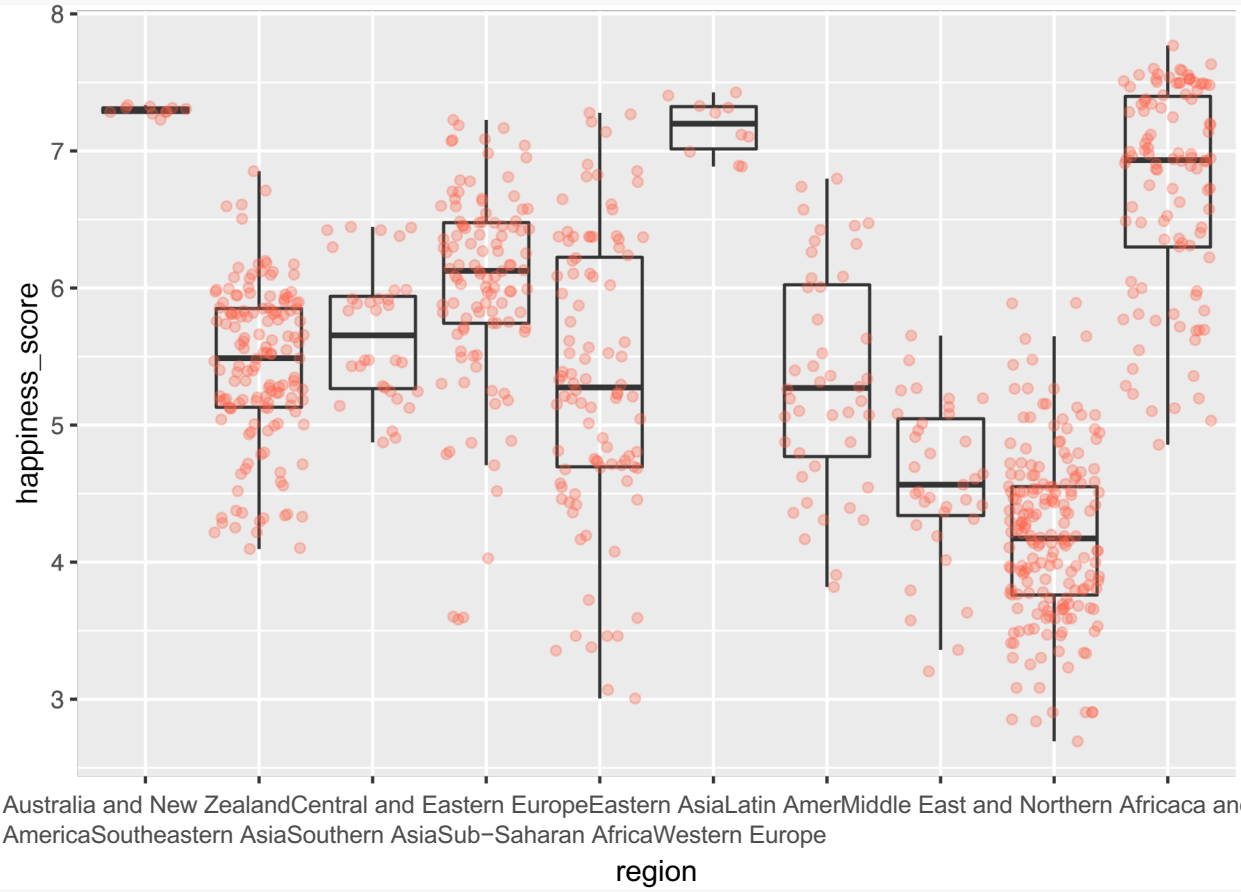
Finland	2018	7.632
Finland	2019	7.769

```
# From the master data set df_final we filter based on the top happiness score over the years,displaying
```

As we can see from the table above we have obtained the list of all the countries that have held the top spot between the years 2016-2019.We can see that all of the countries in the list belong the European region.

To compare the happiness scores of di erent regions based on the happiness score

```
ggplot(data = df_final, aes(x = region, y = happiness_score)) +
  geom_boxplot(alpha = 0) +
  geom_jitter(alpha = 0.3, color = "tomato")
```

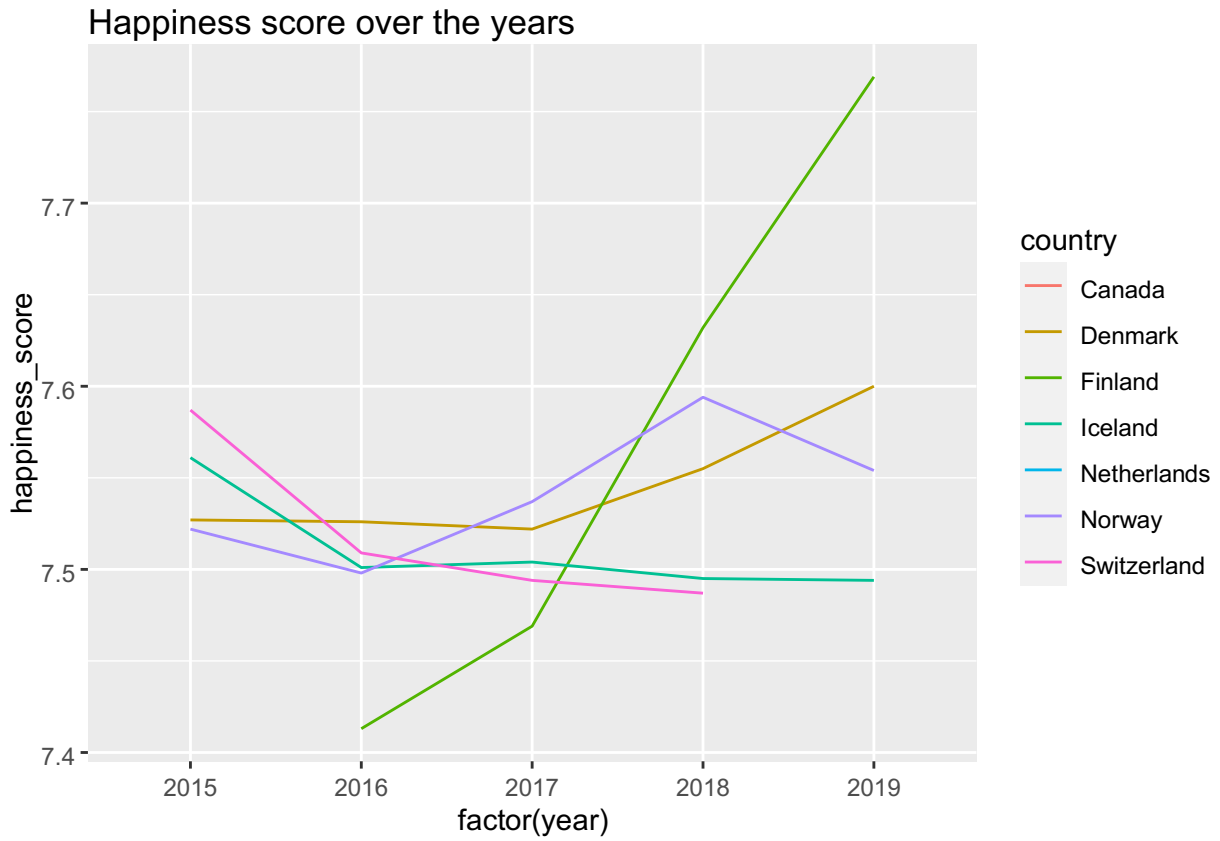



```
#We create a box plot which shows us the happiness score of different regions.As #we can see in this box
```

Conclusion: Australia and New Zeal and is seen to have the highest average happiness score without many deviations,while the lowest is seen in the sub Saharan African region. The European region doesn't rank as high even though it has some of the happiest countries like Finland and Switzerland there are many countries which rank very low in the the happiness index.As seen in the box plot we can see that a lot of countries are shown scattered below the average happiness index line. The outliers and countries with very low happiness score tend to pull down the average for Europe

Business Question 4: To find the country with a significant hike in happiness over the years

```
countries_top_5 <- df_final %>% dplyr::filter(happiness_rank == 1 |
                                              happiness_rank == 2 |
                                              happiness_rank == 3 |
                                              happiness_rank == 4 |
                                              happiness_rank == 5)
#select(country, year, happiness_score)
#Checking the variation of scores over the years for the top 5 countries in all years ggplot(countries_top_5, aes(x = factor(year), y = happiness_score, group = country))
colour = country, geom_line() +
  ggtitle("Happiness score over the years")
```




```
## Here we are comparing the happiness scores of the top 5 countries over the years.With the x axis repr
```

Conclusion: The plot shows us that there is a significant hike in the happiness score for Finland over the years,while there is dip in the score for Switzerland over the years.
Canada and Netherlands pop up in the but not on the graph as they've appeared in the top five list only once in the 5 years

Deep-dive into Finland-

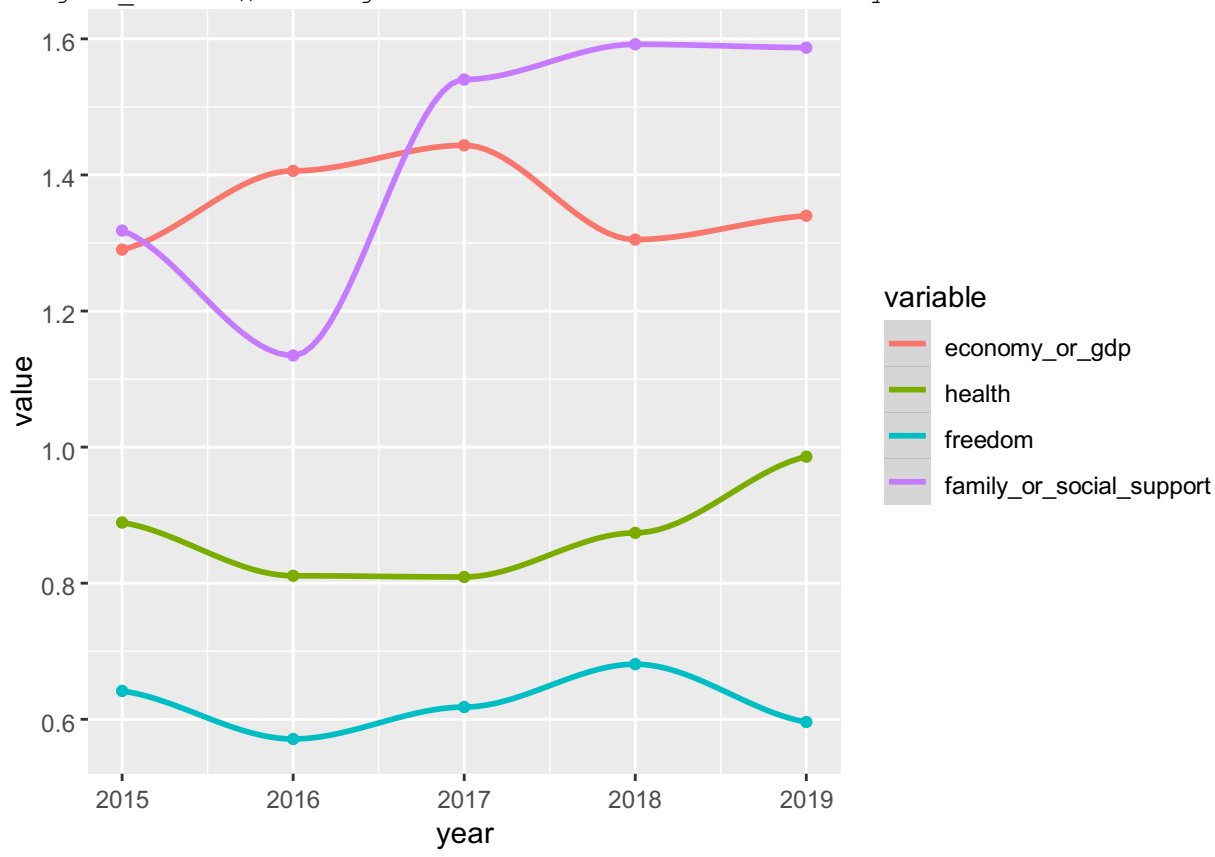
Business questions for Finland - 1) What are the factors causing the spike in Finland's happiness score from 2016 to 109? 2) Is there a specific factor that shows a similar trend to the happiness score?

Conclusion: The family or social support has seen a significant rise in Finland in the years starting from 2016 to 2019. It can be observed that a similar spike has been noticed in the happiness score for Finland in the previous graphs displaying the happiness score variation for top countries. The family_or_social_support factor could be the influencing the spike in the overall score

```
library(reshape2) knitr::opts_chunk$set(warning
= FALSE, message = FALSE)

#filtering the data for Finland from the final dataframe
df_finland <- df_final %>% dplyr::filter(country ==
Finland )

#Excluding the categorical data columns along with the less important
factors df_finland <- select(df_finland, -region, -happiness_rank, -
country, -

#reshaping the data to be suitable for making yearly
graph for d <- melt(df_finland, id.vars="year")

# plots
ggplot(d, aes(year,value,
  col=variable)) + geom_point() +
  geom_smooth()
```

```
perception_of_govt_corruption, -ha
```

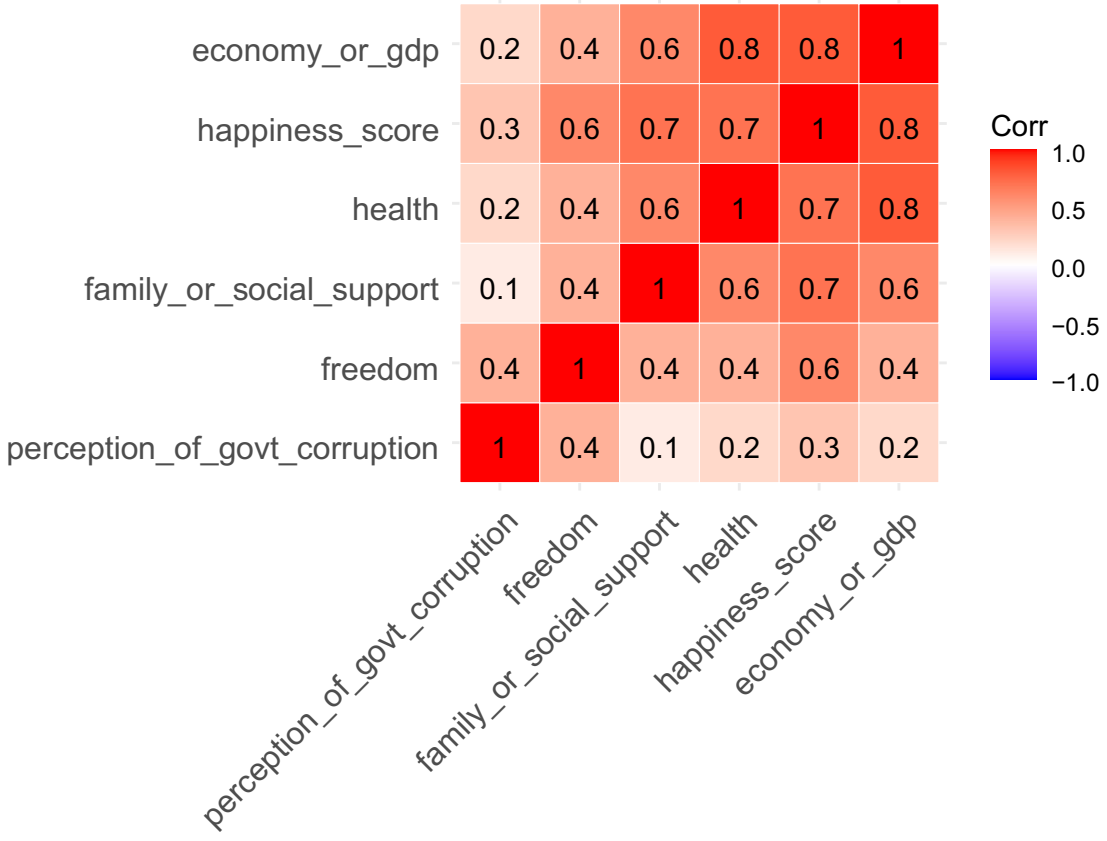
```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



```
#Deep-diving into the factors for Finland as it had the most significant rise of
happiness_score amongns #Plotting the variation of the most important factors in Finland
using a line plot
```

Business Question 5:To find the factors that significantly a ect the happiness ## factor.

```
correlation_df <- df_final %>% select(happiness_score,
economy_or_gdp,health ,freedom, perception_of_govt_corruption,
family_or_social_support) # Selecting the factors to be included in
the analysis.

NA_df_corr <- correlation_df[rowSums(is.na(correlation_df))

> 0,] corr <- round(cor(correlation_df), 1)

# Rounding the score up to the first decimal point.

#corr

#correlation plot

ggcorrplot(corr, hc.order = TRUE, outline.col = "white", lab = TRUE)
```




```
# We create a correlation plot to see the correlation between various factors like
GDP,health,freedom,pe
```

Conclusion: As we can see from the plot that economy_or_gdp is the most contributing factor towards the happiness score with a correlation coe cient of 0.8 followed by health and social_support/family with a coe cient of 0.7. The least contributing factor seems to be perception of government corruption with a Pearson's correlation coe cient of 0.3.

Business Question 6: To visually represent the data based on color to show the intensity of the relation between the various factors.

```
heatmaply_cor(
  cor(corr), xlab
  = "Features",
  ylab =
  "Features",
  k_col = 2,
  k_row = 2
)
# Here we create a heat map which helps us to get a visual representation of the data by
using color int
```

Conclusion:As we can see higher the value (+1)the darker the color(red).Lower the value(-1) darker the color(blue),which indicates how each factor is related to the other.Happiness score is strongly related to family support and GDP hence it's more towards the red tinge,while the perception of government corruption is not as strongly related and hence it's more towards the blue tinge.

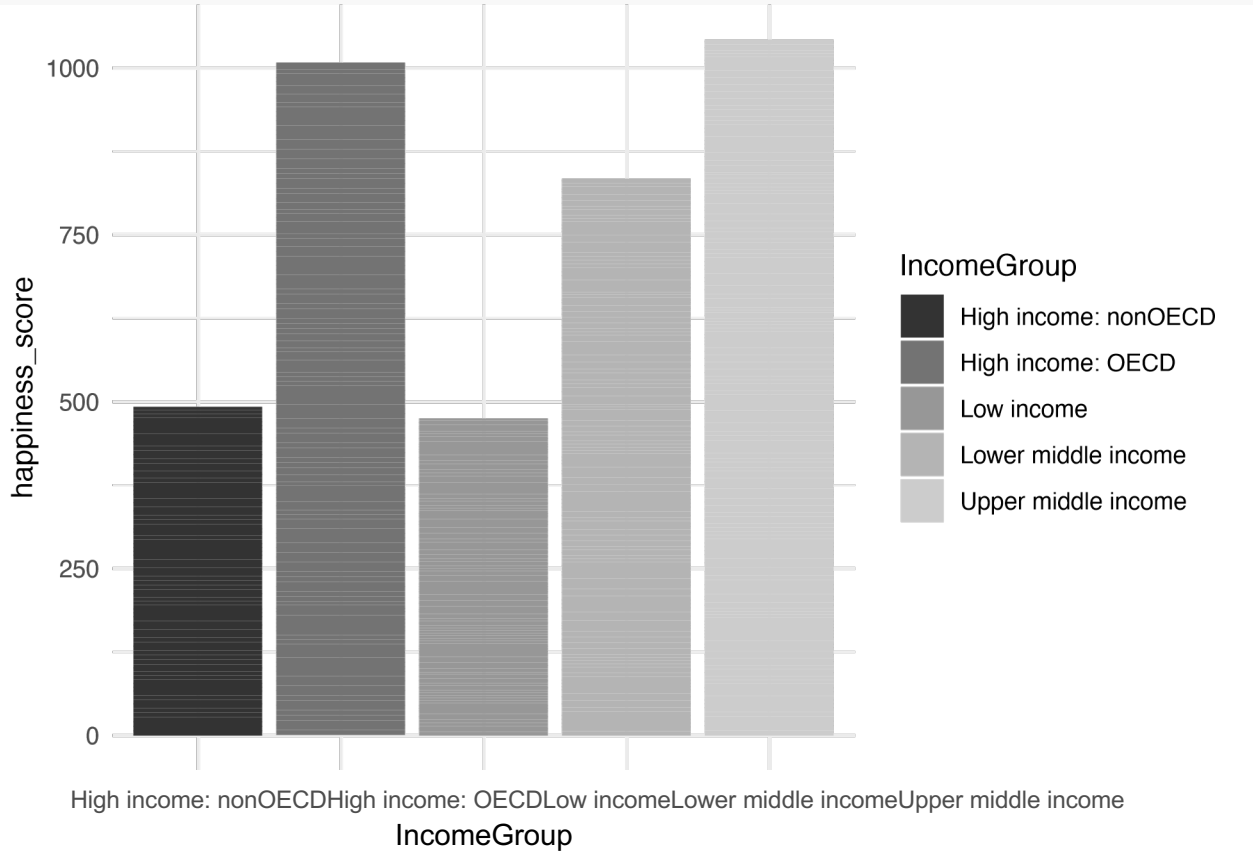
```
  #Joining the existing data frame with an external data source outside the chc

      to get extra a df_country <- df_final %>% inner_join(select(country_data

                                                                          Incom


#validating the joined data
colSums(is.na(df_country))
```

Business Question 7:To compare the di erent income groups to check if it a ects the happiness score.

```
                                                                    c("country"="
```

```
##                     country                      region
##                           0                           0
##              happiness_rank           happiness_score
##                           0                           0
##              economy_or_gdp                      health
##                           0                           0
##                     freedom perception_of_govt_corruption
## 0 0 ## family_or_social_support year
##                           0                           0
##                 IncomeGroup
##                           0
```

```
q<-ggplot(df_country, aes(x=IncomeGroup, y=happiness_score,
  fill=IncomeGroup)) + geom_bar(stat="identity")+theme_minimal()
q<- q +
scale_fill_grey() q
```



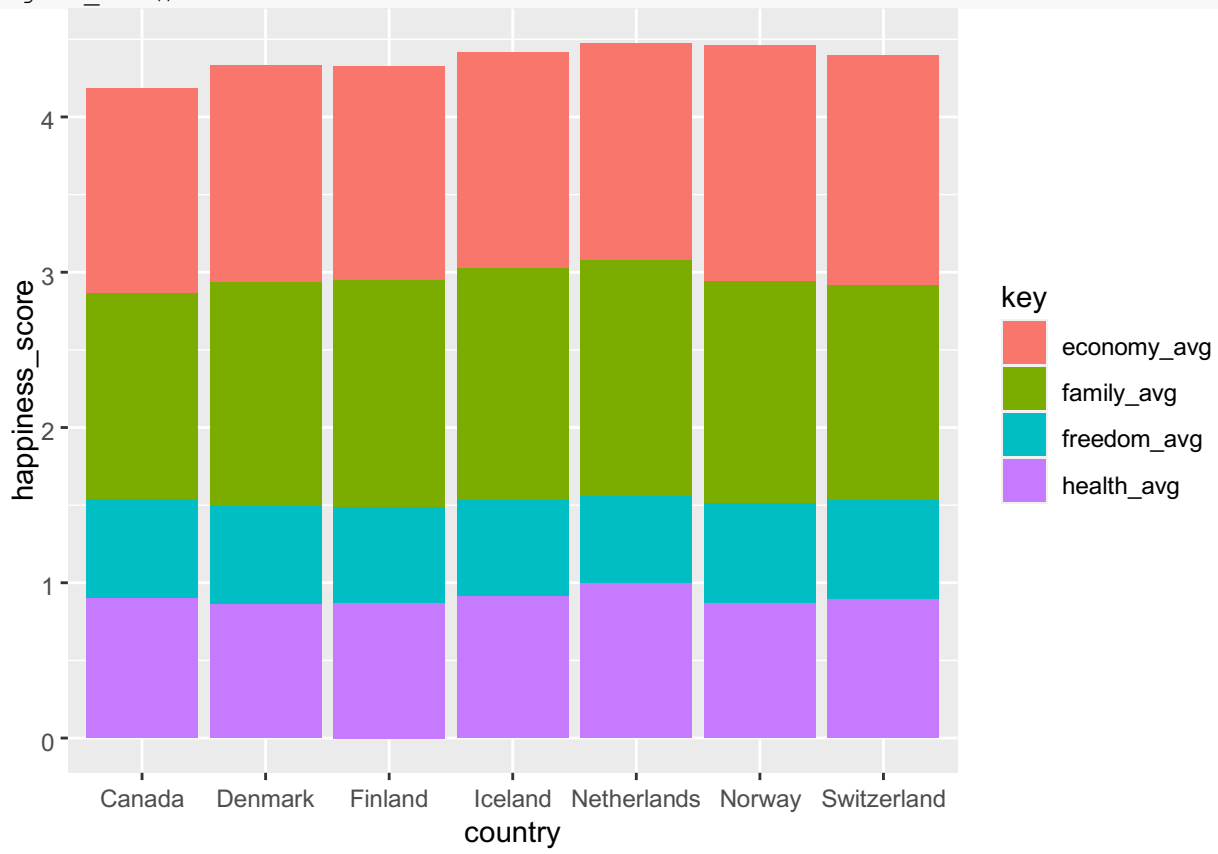

```
# A bar chart is created to compare the values

# In this case we consider another data set called country obtained from a government
website that conta
```

Conclusion: As we can see from the graph higher income countries don't really influence the happiness score,even though from our observations earlier it may seem that richer people are happier,but that is not the case.In fact middle and income group of countries seem to be much happier in comparison. Whereas, countries with Low income still have a low happiness score. This might imply that income or economical level matters to an extent, but after you have enough spendable income it might not matter how much extra money you have with respect to the score

Note- OECD is Organisation for Economic Co-operation and Development with a group of countries. OECD has a lot of the developed countries like USA, UK, Australia, New Zealand, Canada, Italy, Finland, Iceland etc

Business Question 8:

```
countries_top_5 %>% group_by(country)
  %>% summarise(n=n(), economy_avg =
  mean(economy_or_gdp), health_avg =
  mean(health),
            family_avg = mean(family_or_social_support),
            freedom_avg = mean(freedom),) %>%
  gather("key", "happiness_score", - c(country, n)) %>%
  ggplot(aes(x = country, y = happiness_score , group = key, fill = key)) +
  geom_col()
```




```
# Here we create a stacked bar graph to compare the extent to which each factor affects
the happiness sc
```

Conclusion: As we can see from the stacked bar graph that the family average occupies a huge chunk in the stack along with the economy followed by the health average while freedom comes in last for the counties considered.We can see that the health average and family is slightly more of an important factor in Netherlands compared to the other countries considered.

Inference: The Happiness data set helps us to get important insights into factors that seemingly a ect the happiness of the world.With di erent factors like poverty,low health systems,strained relationships and lack of freedom in many nations of the world is causing an widespread unhappiness,our attempt to take a closer look into the world's happiest and unhappiest countries and dividing the causes into basic factors to break down the possible causes,so that improvements in di erent fields may lead to happier nations and in turn a happier world. **References:**

https://www.kaggle.com/unsdsn/world-happiness

External data set- https://www.kaggle.com/kaggle/world-development-indicators