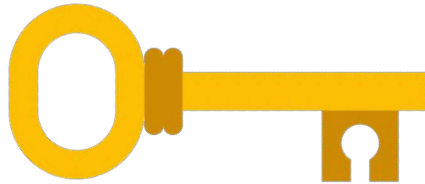

Key to Happiness



Pursuit of Happiness

- **Goal:**
 - Understand the different dimensions that play a role in our subjective well being of happiness, and how those might vary across countries.
 - By looking at these trends and interactions, we hope that users will walk away with ideas on how to improve their happiness at an individual, national, and global level!
- **Target Audience:** Everyone! We hope our website hosted on github.io goes viral
- **Questions:**
 - How happy is the world in general? Do we see trends across continents?
 - What are the happiest vs saddest countries?
 - What features (value indicators) are correlated with happiness?
 - How do features (values) vary in importance across countries?

World Map Explorer

- **Purpose:** Provide the user with a high level overview of world happiness by country
- **Colored by:** Happiness Score
- **On Hover:** Country Name, Happiness Score, Happiness Rank
- **Visual Channels:** Spatial region, color hue

Welcome to our World Happiness Map Explorer!

- **Limitations:** You have to hover over every country to get to the next level detail
- **Solutions:** Added the Top 5 / Bottom 5 visualization to give users an idea of interesting countries to dive into in the following tabs

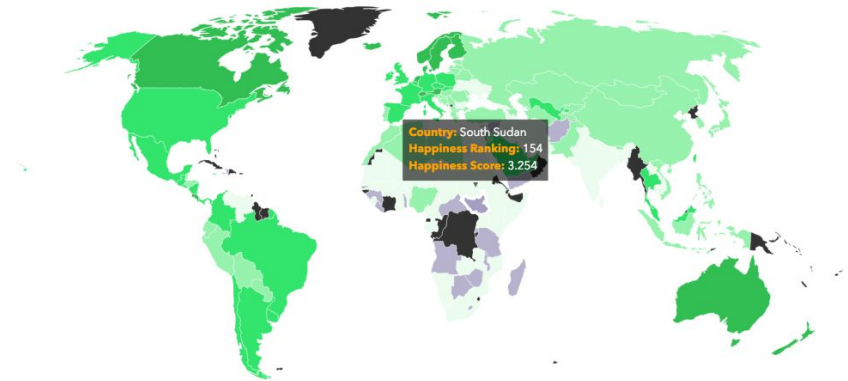
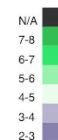
Top 5 Happy Countries:

1. Finland: 7.63
2. Norway: 7.59
3. Denmark: 7.56
4. Iceland: 7.50
5. Switzerland: 7.49

Bottom 5 Happy Countries:

1. Central African Republic: 3.083
2. South Sudan: 3.254
3. Tanzania: 3.303
4. Yemen: 3.355
5. Rwanda: 3.408

Happiness Score



World Map Explorer Insights

- **Range of happiness:** Though the happiness index score is from 1-10 we see from the legend that countries only fall between the range of 2-8
- **Happiest countries:** Australia and Canada stand out as the happiest in dark green. Looking at the Top 5 countries, we see that though their large land mass caught our attention first with the green, there are actually happier (and smaller) countries in Europe
- **Saddest countries:** The entire sub saharan regions seem very sad as the light green stands out. India and Sri Lanka also stand out on the map as lower range countries taking a large land volume.
- **No data countries:** There is no data from certain countries: i.e. North Korea, we suspect their happiness might be even lower due to oppression from such areas of study

Welcome to our World Happiness Map Explorer!

- **Top 5:** The top 5 countries - makes it clear that western europe as a region ranks highest in happiness
- **Bottom 5:** From the bottom 5 countries - it is clear that sub saharan Africa ranks lowest overall as a region
- Both of these insights are once again supported via the regional variance box plots on the next visualization

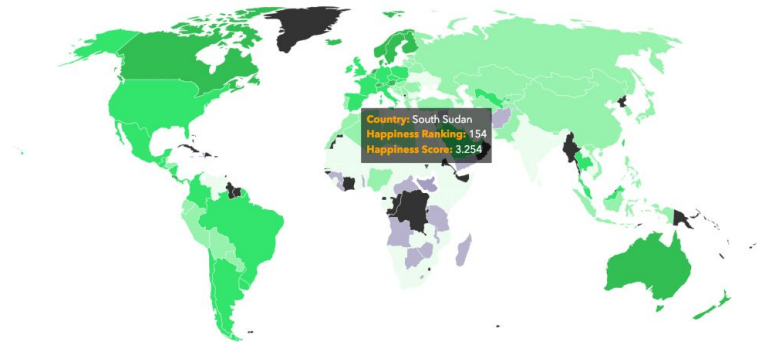
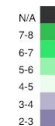
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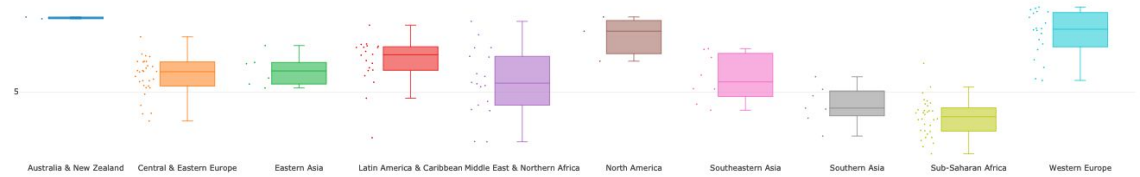
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Happiness Score



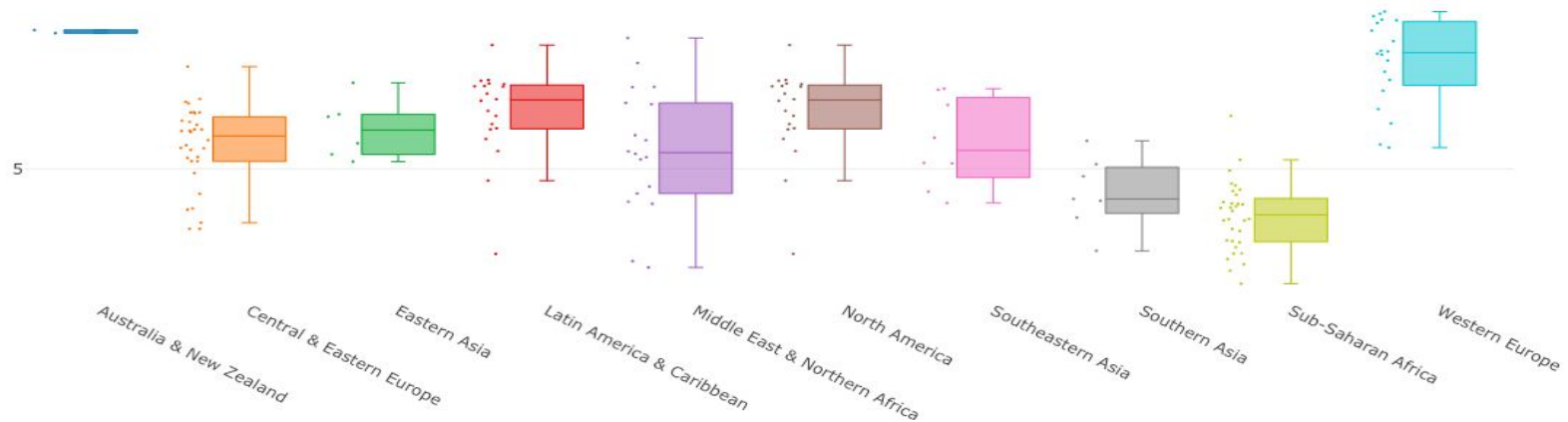
Regional Variance



- **Purpose:** Analyze average happiness by region, and the variation of happiness across a given region
 - **X axis:** Region
 - **Y axis:** Happiness Score
- **Colored by:** Region
- **On Hover:**
 - **Boxplot:** Min, Max, Median, 3rd quantile, 1st quantile
 - **Point:** Y value (Happiness Score)
- **Visual Channels:** Position on common scale, length, area (2D size)
- **Limitations:** There is not a very large spread of data (Y axis range of happiness score)
- **Solutions:** Zoomed in on the box plot chart to see small differences and put a single line for the middle of happiness score to quickly get a sense of if region is above or below the mid-point happiness line

Regional Variance Insights

- **Australia & New Zealand:** Both in the Top 10 happiest countries
- **Western Europe:** Mean and lower quantile is higher than all other regions (except Australia & New Zealand)
- **Sub Saharan Africa:** Stands out as the lowest mean and variance in the boxplot, echoing the takeaway from the map
- **Middle East & Northern Africa** has the highest variance or range of happiness
 - **Israel** being the highest (7.19) to **Tanzania** being the lowest (3.3)

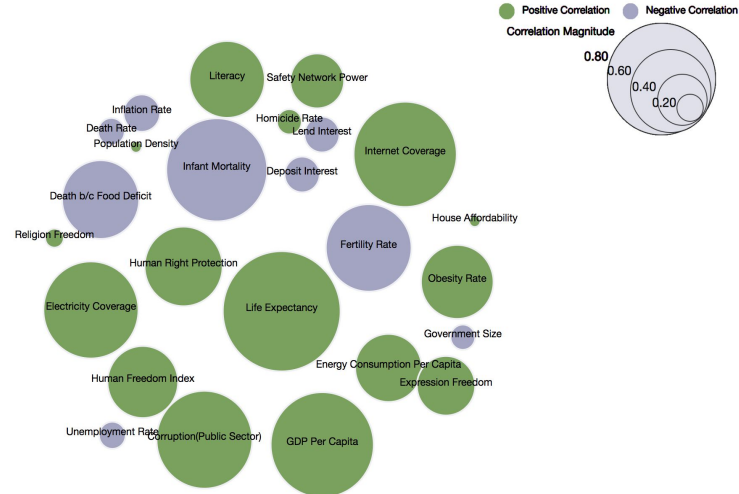


Feature Importance on Happiness Scores

- **Purpose:**
 - We have 25 features in total. This bubble chart is used to show the feature importance based on correlations between features and happiness score
 - Get a view of what features (value indicators) are most correlated with Happiness
 - What type and magnitude of the correlation each feature has with Happiness
- **Colored by:** Positive or Negative Correlation
- **Sized by:** Magnitude of Correlation
- **On Hover:** Feature name, feature category, feature correlation with happiness
- **Visual Channels:** Motion, Color hue, Area (2D size)
- **Limitations:** When the magnitude of the correlation is similar, it's hard to tell the size difference between bubbles
- **Solutions:** We added label with the value on hover of the bubble and added a legend on size

Feature Importance Group By Category

Feature Importance on Happiness Scores



Feature Importance Bubble Chart Insight

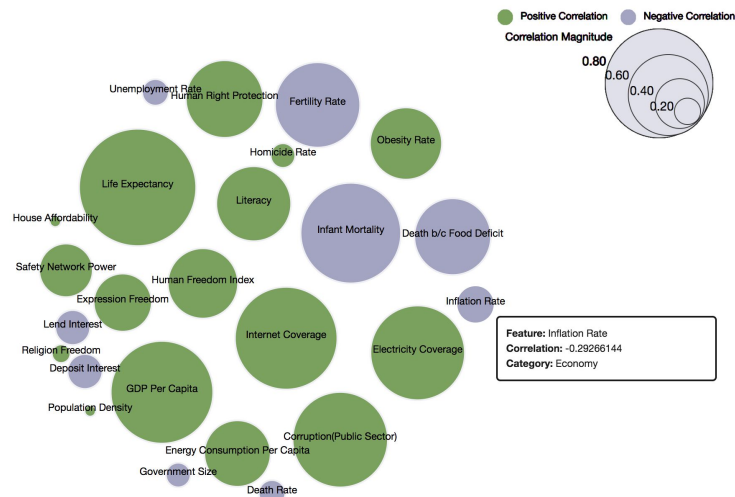
- **Range of Correlations:** We collected 25 features in total and their correlations with happiness scores range from -0.7172 to 0.7937

- **Features with high positive correlations:** Life Expectancy(years), GDP per capita(\$), Internet Coverage(%), Corruption Perception Index(1-100, perceived levels of public sector[1] corruption) and Electricity Coverage(%)

- **Features with high negative correlations:** Infant Mortality(infant per 1,000 live births), Fertility Rate(# of babies), Depth of Food Deficit(kilocalories per person per day)

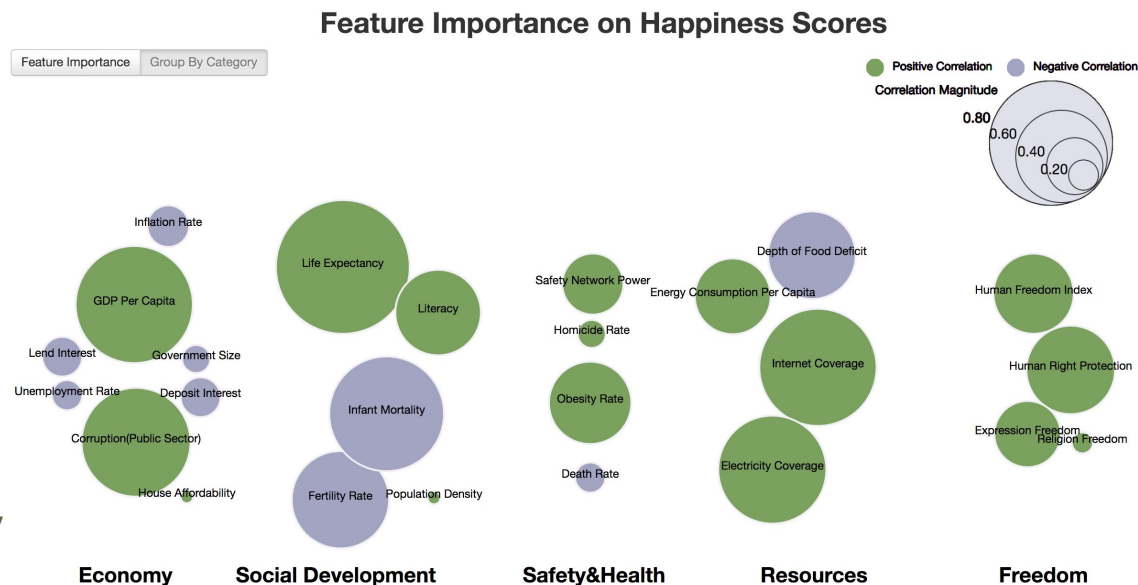
Feature Importance Group By Category

Feature Importance on Happiness Scores



Feature Importance by Category

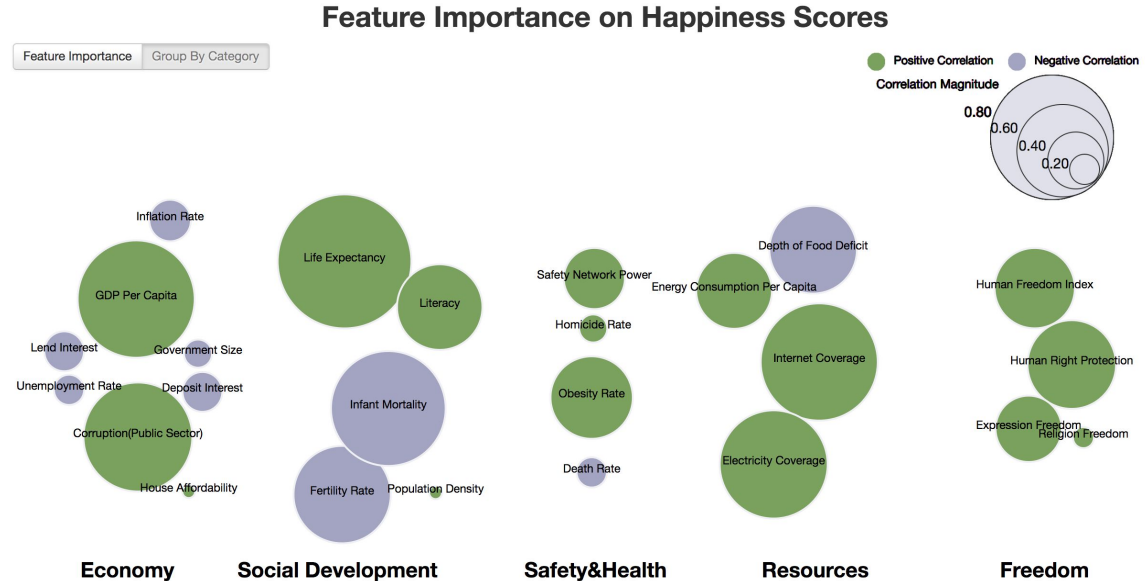
- **Purpose:** We have 25 features in total. We grouped them into five categories. This bubble chart is used to present the feature importances across different categories.
- **Categories:**
 - Resources
 - Social Development
 - Safety&Health
 - Economy
 - Freedom
- **Animation:** 25 bubbles which originally stayed at the center separated into five groups
- **On Hover:** Feature name, feature category, feature correlation with happiness
- **Visual Channels:** Motion, Color hue, Area (2D size)



Feature Importance by Category Insights

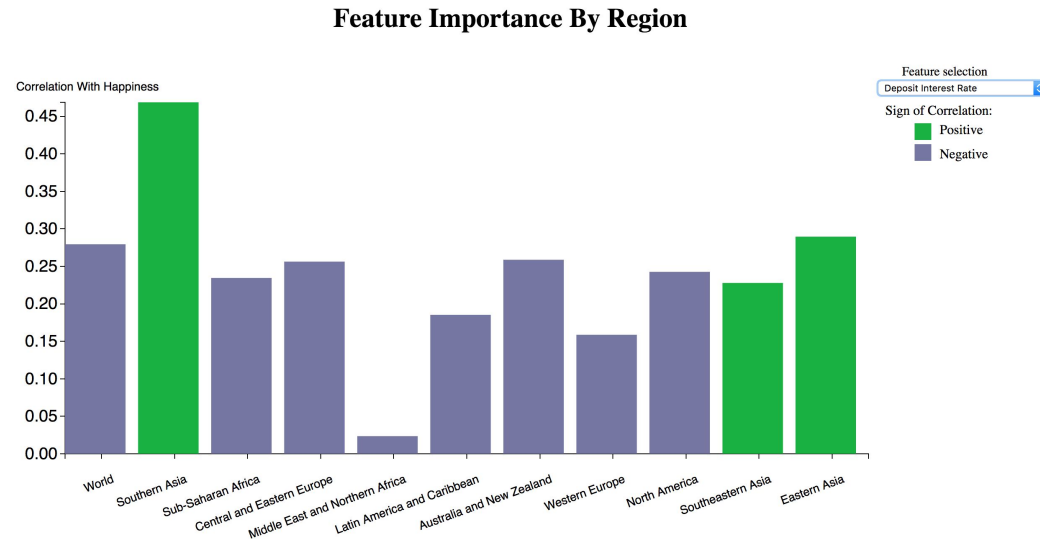
- Almost all of the large bubbles go to the social development, resources and economy categories.

- Maslow's hierarchy of needs.** The hierarchy is represented by a pyramid where the bottom level is physiological needs like food, water, warmth and some money. So people will receive most happiness from getting satisfied with their basic needs. After that, people start to care more about safety of lives like infant mortality, life expectancy. They will then be happier when they get more freedom in religion, expression and etc.



Feature Importance by Region

- **Purpose:**
 - People in different regions gain happiness from different things.
 - Can select any feature from the drop down menu and compare different correlations across all the regions and with the overall world correlation.
- **Colored by:** Positive or Negative Correlation
- **X-axis:** 10 Regions
- **Y-axis:** Correlation between selected feature and Happiness Score
- **Toggle by:** Feature (value indicator)
- **On Hover:** Feature Name, Correlation
- **Limitations:** Positive and negative on the same scale, because we wanted to compare magnitude
- **Solutions:** Colored each bar by the positive or negative correlation

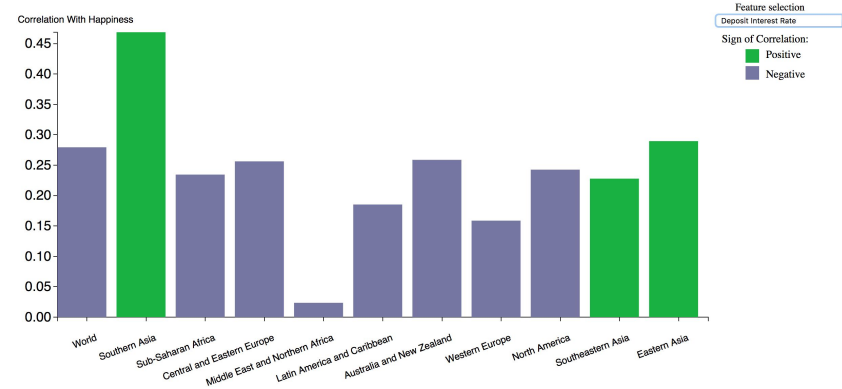


Feature Importance By Region Insights

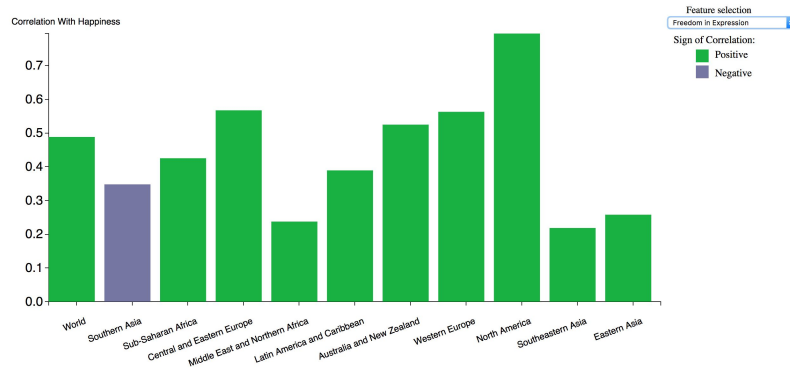
Deposit Interest Rate

- Worldwide correlation is -0.279
- Southern Asia, South Eastern Asia and Eastern Asia have positive correlations between deposit interest rate and happiness scores
- Asian people like to save money in banks to earn interests compared to people in other regions. So the higher the deposit interest rate, the more money Asian people can earn by putting money in banks. So they are happier.

Feature Importance By Region



Feature Importance By Region

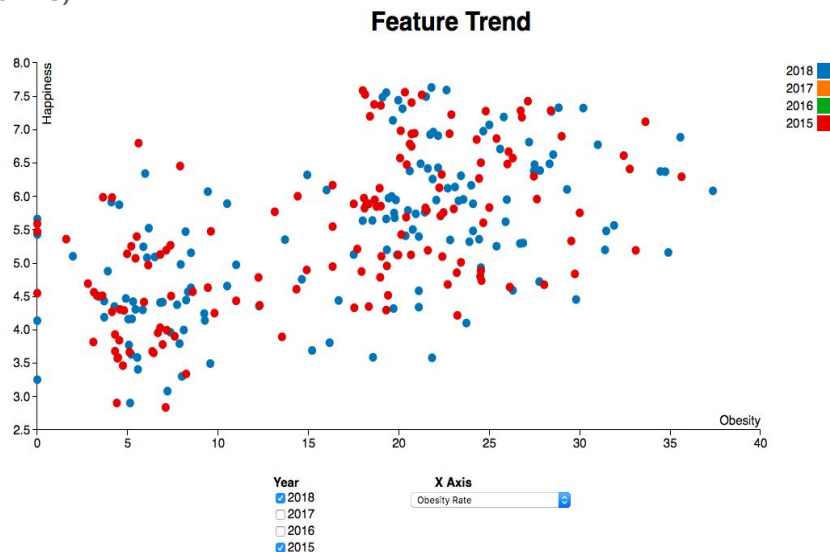


Freedom in Expression

- Worldwide correlation is 0.49
- North America has the positive highest correlation of 0.79
- Recall the Maslow's hierarchy of needs I just mentioned, we know that developed countries in North America like the United States and Canada, they did very well on satisfying people's basic needs, so people start to appreciate more about higher level needs like freedom.

Feature Trend

- **Purpose:**
 - Plot countries by feature (value indicator) and happiness score too see the trend (positive, negative, linear, nonlinear)
- **Toggle By:** Feature on X axis,
Year (Include 0, 1, 2, 3 or all 4 years of data at 1 time)
- **Colored by:** Year
- **On Hover:** Country Name
- **Visual Channels:** color hue, position on common scale
- **Limitations:** You can only see one feature at a time
- **Solutions:**
 - Happiness & Feature Interaction - so we can still see on the same chart, but across 2 features to check for interaction effects
 - Country-wise Comparison - which can only compare 2 countries



Feature Trend Insights

- **Freedom**

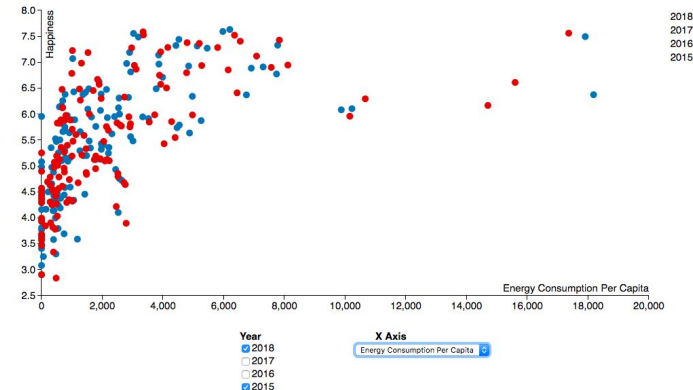
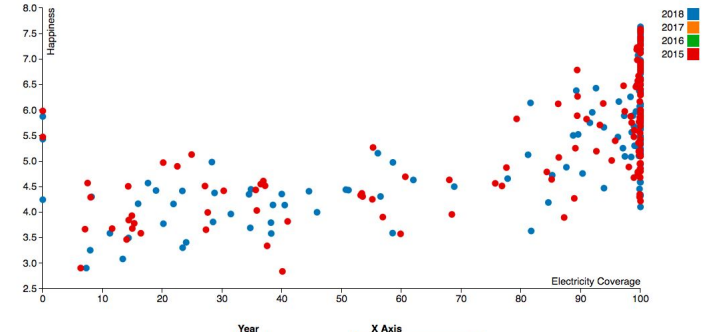
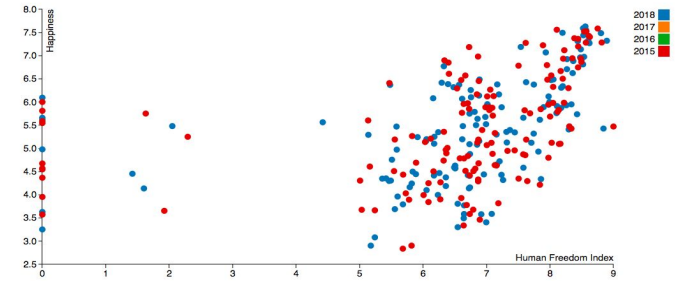
As human freedom index increases, happiness increases with minimum free happiness index being 5 with a few outliers

- **Electricity Coverage**

All countries happier than 5, have greater than 80% electricity coverage. However, there is a huge variance of happiness at 100% coverage. It's easy to conclude in this that you need electricity to be happy but having electricity doesn't mean you will be happy. It's a basic need that needs to be met.

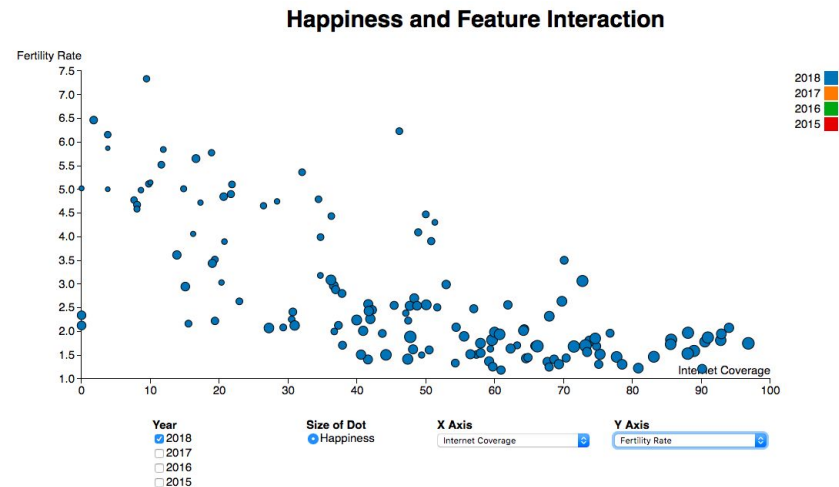
- **Energy Consumption Per Capita**

As energy consumption increases per capita increases, happiness increase but there is a threshold at 8,000 units per capita with a few outliers. Beyond this, countries with higher consumption are not any happier and called 'irresponsible' and 'wasteful' by a few. The countries like- Iceland, Qatar and Tobago do this because of overabundance.



Happiness and Feature Interaction

- **Purpose:**
 - Plot countries by 2 feature (value indicator) and size the bubble by happiness score too see the interaction trend (positive, negative, linear, nonlinear)
- **Toggle By:** Feature on X axis, Feature on Y axis,
Year (Include 0, 1, 2, 3 or all 4 years of data at 1 time)
- **Colored by:** Year
- **On Hover:** Country Name
- **Visual Channels:**
 - color hue, position on common scale , size
- **Limitations:** You can only compare two features at a time
- **Solutions:**
 - Country-wise Comparison - which can only compare 2 countries



Note: Data points on X axis and Y axis correspond to missing values

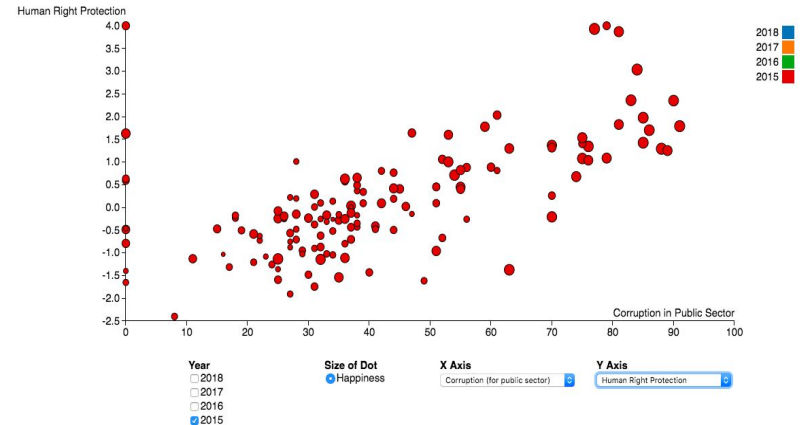
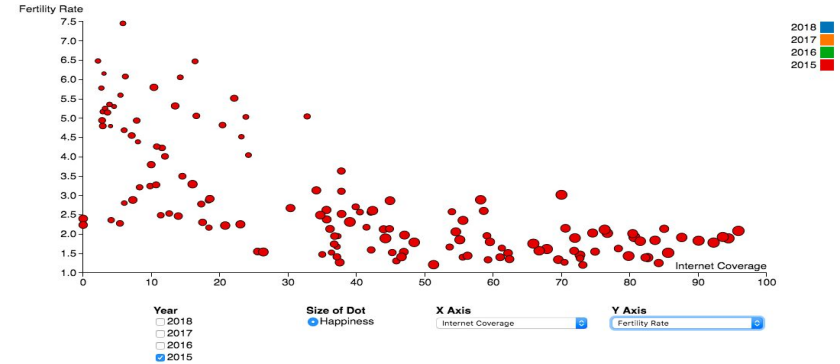
Happiness and Feature Interaction Insights

- **Internet coverage vs Fertility**

It was interesting to notice that all countries with less than 30% internet coverage rate had fertility higher than 5 and scored low on happiness. As internet coverage increased, fertility stagnated at 2. And these were the happy countries.

- **Human Right Protection Index vs Corruption in Public sector**

As human right population index increases, corruption also decreases and happiness increases. This justifies our intuition perfectly.



Country-wise Comparison

- **Purpose:**
 - Where does each country rank on each factor (value indicators)
 - Compare two countries across all factor (value indicators) to understand how they may be similar or vary across countries
 - Whether countries that rank high on happiness also rank high on contributing factors (where a lower numeric value corresponds to a higher rank)

- **Toggle By:** Country
- **Colored by:** Country
- **On Hover:** Rank of Country
- **Visual Channels:** Color Hue, Length, Position on Common Scale
- **Limitations:**

- Can't see multiple countries across a features
- Can't see absolute value of each feature, only know the rank of each country

- **Solutions:**
 - Feature Trend - compare multiple countries across features and happiness score

HOW COUNTRIES RANK ON EACH FACTOR

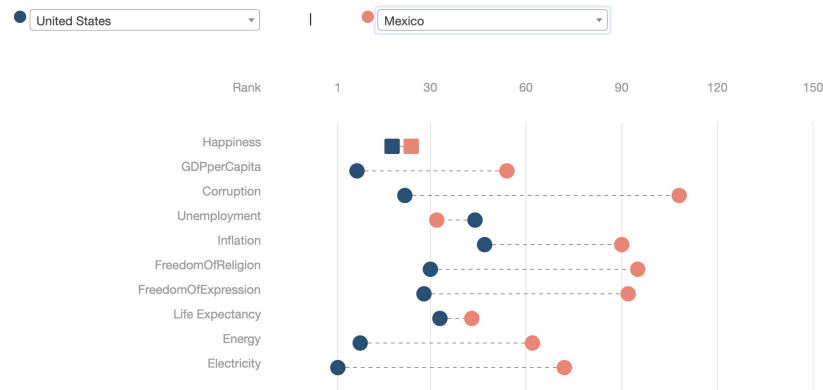


Country-wise Comparison Insights

- Finland, the happiest ranked country in the world, ranks high on all factors with the exception of unemployment.
- Burundi and Central African Republic, ranked poorly on most factors and are also among the least happy countries.
- Looking at some of the countries that the MSiA cohort spans across: United States; India; China
 - China ranks much better than India on happiness and the factors contributing to that include Life Expectancy, GDP per capita, Energy Resources for Consumption and Inflation. A surprising insight is that it ranks poorly on freedom of expression and religion, which implies that those factors aren't valued as much by the country
 - United States and China are almost opposites in terms of ranks on happiness and each underlying factor, reaffirming the importance of these features
 - United States and Mexico have very similar happiness rankings despite Mexico being on the opposite side of the spectrum for most features. This anomaly directs us to think that Happiness being subjective could be perceived differently by the two countries.



NOTE: Countries with a rank of 0 indicate a lack of information for the country corresponding to that factor.



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Thank you!