Analysis of Global Crises and Their Impact on Interational Well-Being

Group 8

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Purpose

This study aims to investigate the relationship between freedom of citizens (i.e. freedom of choices, a just government) and quality of life for citizens. The more freedom for citizens allows for better quality of life.

Abstract

This paper will aim to show as freedom of citizens increase and citizen's quality of life improves. The relationship we look for is a positive correlation. First, for the first insight, we explore the relationship of cyclone frequencies and geological location. Cyclones of higher category appear more frequently near the equator (~2000 km from the equator), more freedom allows for an individual to choose where they can locate themselves and those who choose to live farther away from the equator may feel less burdened by constant cyclones. Second, a more just government allows for a citizen to live with more freedom, from th second insight, "perception of corruption" for a government and "COVID cases" shows us for some continents, there are lower cases of COVID when the government is perceived to be fair. Though there also exists a negative correlation, where continents (i.e. Asia) with more corrupt ruling powers have lower total count of COVID cases. Third, again back to the notion of choosing where to live, from the third insight, we observe average GDP in relation to distance from the equator. Areas farther from the equator tend to have higher on average higher GDP than those closer to the equator. We now show evidence to further support our original purpose. That freedom of citizens in fact impacts the quality of life for citizens.

Introduction

Quality of life determines happiness which is impacted by many factors. Some important factors are environmental and socioeconomic factors. Environmentally we must keep in mind location, since different countries in different continents vary in climate, geographic identity, etc. Whilst socioeconomically, different countries have different forms of government, culture.

In this report, we will explore the geographical aspect and governance aspect of freedom and what do these factors impact on an individual's daily life through exploring and digesting our data. We will explore data; COVID cases during the year 2020, cyclones from NOAA (National Oceanic and Atmospheric Administration), happiness data from (World Happiness Report). We apply uni-variate and bi-variate analysis, specifically for the bard chart and ridge line graph we care about the frequency (weight) of our independent variables, for the scatter plot to determine the relationship between our variable x and y is applying bivariate analysis.

By the end of the report, we will have shown in general that as freedom increases for citizens and individuals, so to does quality of life.

Data Description

«Cyclones Data»

```
## Simple feature collection with 84601 features and 5 fields
## Geometry type: POINT
## Dimension:     XY
## Bounding box:  xmin: -180 ymin: 0.4 xmax: 179.9 ymax: 83
## Geodetic CRS:  WGS 84
## # A tibble: 84,601 x 6
##    country                     lat  long category km_distance_from_equator     geometry
##    <chr>                     <dbl> <dbl> <ord>                         <dbl>  <POINT [°]>
##  1 <NA>                       28   -94.8 1                             3098.   (-94.8 28)
##  2 <NA>                       28   -95.4 1                             3098.   (-95.4 28)
##  3 <NA>                       28   -96   1                             3098.     (-96 28)
##  4 <NA>                       28.1 -96.5 1                             3110. (-96.5 28.1)
##  5 <NA>                       28.2 -96.8 1                             3121. (-96.8 28.2)
##  6 United States of America   28.2 -97   1                             3121.   (-97 28.2)
##  7 United States of America   28.3 -97.6 TS                            3132. (-97.6 28.3)
##  8 United States of America   28.4 -98.3 TS                            3143. (-98.3 28.4)
##  9 United States of America   28.6 -98.9 TS                            3165. (-98.9 28.6)
## 10 United States of America   29   -99.4 TS                            3209.   (-99.4 29)
## # i 84,591 more rows
```

The data set `cyclone_data` provided by the National Hurricane Center and the Central Pacific Hurricane Center records hurricane entries in the Atlantic and North Pacific basins from 1851 to 2022 and 1949 to 2022, respectively. The data frame includes detailed time stamps, coordinates, and categories, which are vital for analysis.

The preliminary step in supporting the analysis involved converting the coordinates into the Cartesian coordinate system. Next, we used the `rnaturalearth` package and `geolocation` to convert the coordinates into country identifiers and determine each storm's distance in kilometers from the equator. As shown in Figure 1 in the appendix, cyclones are now accurately distributed across the North Atlantic and Northeast Pacific basins with the correct identifiers.

«World Covid 2020»

```
## # A tibble: 252 x 6
## # Groups:   country [250]
##    country             continent     total_cases hemisphere distance_to_equator_km
##    <chr>               <chr>               <dbl> <chr>                        <dbl>
##  1 Afghanistan         Asia              8284992 North                        4017. (((7405225 448779
##  2 Africa              <NA>            285057531 <NA>                           NA
##  3 Albania             Europe            3444855 North                        5035. (((2153184 514139
##  4 Algeria             Africa           10188569 North                        3302. (((954738.6 443035
##  5 American Samoa      Oceania                 0 South                        1609. (((-19005161 -161
##  6 Andorra             Europe             650844 North                        5243. (((189917.1 52366
##  7 Angola              Africa            1275899 South                        1386. (((1455252 -516503
##  8 Anguilla            North America        1005 North                        2064. (((-7013264 206351
##  9 Antigua and Barbuda North America       22209 <NA>                           NA
## 10 Argentina           South America          NA South                        4386. (((-6412992 -3527
## # i 242 more rows
```

The `covid_2020` data set, provided by Our World in Data contains a comprehensive list of the total reported cases of COVID-19 cases across many countries and continents in 2020. To aid in the analysis `rnaturalearth` and `geolocation` was used to find the hemisphere and distance to the equator in kilometers.

«World Happiness Census»

The `happiness` data set is global census on a countries economic, social, and political stability provided by World Happiness Report. From part 1, extra steps were applied to clean the data set. Some steps taken are renaming countries to allow for easy joining of data sets (happiness dataset and world map). For this case only specific columns were needed and hence selected specific columns.

Combining the Data

For the first data set, Cyclones data "sf_join" was used to create geographical data for a map for distances of cyclones from the equator (this was not used but is in the appendix). Only necessary columns were selected from the data set. For the second data set, World data was used from 'rnaturalearth' package. First countries were renamed to allow for easier joining of data sets. New columns were created for the world map to be created. Then the data set is combined with COVID_2020 by country. For the third data set, country names were changed for easier merge. Then applying "right_join" to keep the data from world_map and combine with happiness report data. This again is combined with world data, this time applying "left_join" to keep the data from happiness data and combine with world data.

Exploratory Data Analysis

We explored many aspects of the data, but will demonstrate three. These are «Geographic and environmental Factors VS a countries overall well being», «Covid Cases Vs perception of corruption», and <>

The analysis highlighted an interesting finding, as shown in @ref(fig:insight1): a significant concentration of COVID-19 cases appears within the 1500-2500 km range from the equator, suggesting a strong relationship between COVID-19 cases and cyclone activity within a margin of approximately 9 degrees of longitude. This area also highlights a geographical strip pointing to a general trend of lower GDP, government stability, and overall happiness.

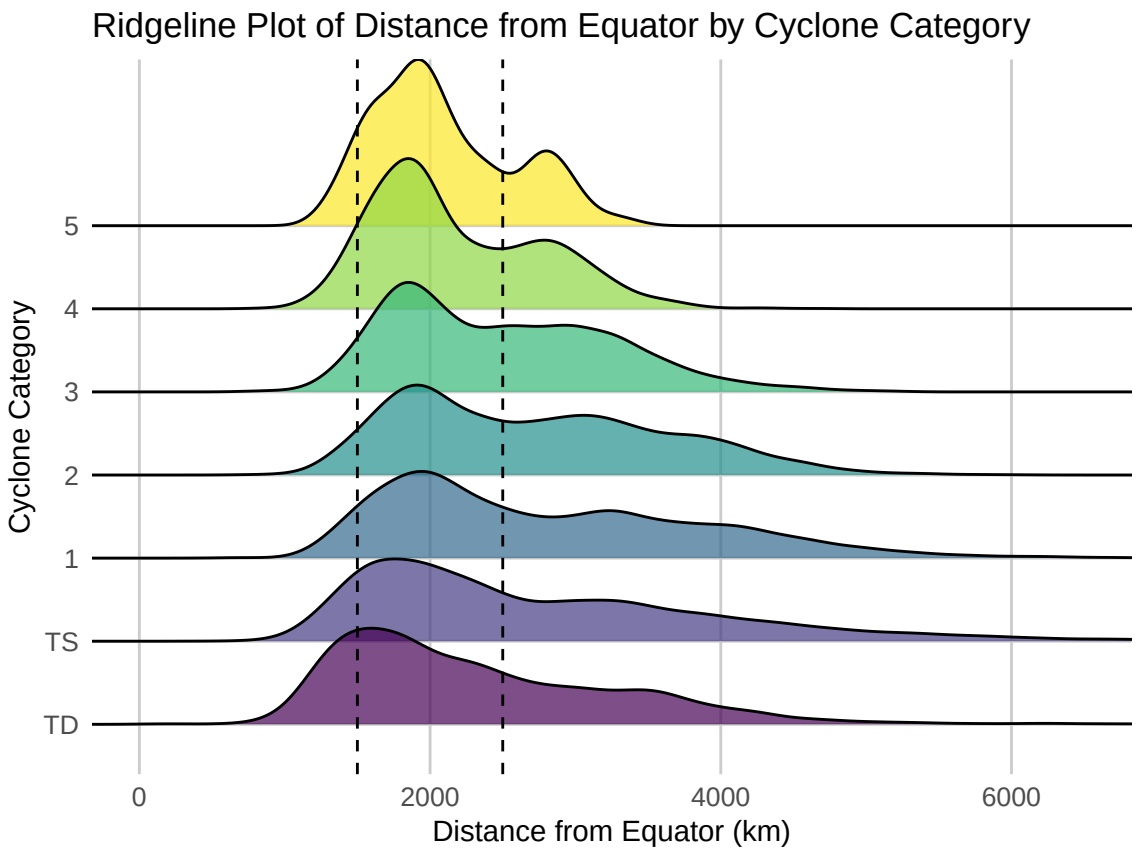

Figure 1: Cyclone catergory frequency by distance from equator

Characteristic	**Africa** N = 43[1]	**Asia** N = 42[1]	
perceptions_of_corruption	0.79 (0.68, 0.83)	0.75 (0.66, 0.81)	
Unknown	2	9	
total_cases	1,462,743 (449,633, 4,177,518)	12,265,276 (1,737,447, 25,951,524)	10,340,2
Unknown	0	1	

[1]Median (Q1, Q3)

A report conducted by the National Library of Medicine highlights a strong correlation between COVID-19 cases and proximity to the equator, suggesting that certain geographic and environmental factors may influence virus spread and outbreak. This observation signifies a trend where regions near the equator are subject to unique vulnerabilities, not only experiencing increased COVID-19 cases but also facing intensified cyclone activity (as shown in the figure above), volcanic activity, elevated ocean currents, seasonal flooding, and the presence of natural carbon sinks.

Applying this insight into the analysis, it is evident that there are strong correlations to geological crises such as cyclones and COVID-19, and key indicators like GDP, life satisfaction, social support, and the overall well-being of countries.These crises profoundly impact not only economic stability but also the social and health of a nation, as evidenced by happiness levels in Figure 5 of the appendix. This reinforces the insight that crisis have a strong effect on the affected regions economic and social dynamics.

The next insight that we found is shown in @ref(fig:insight2).

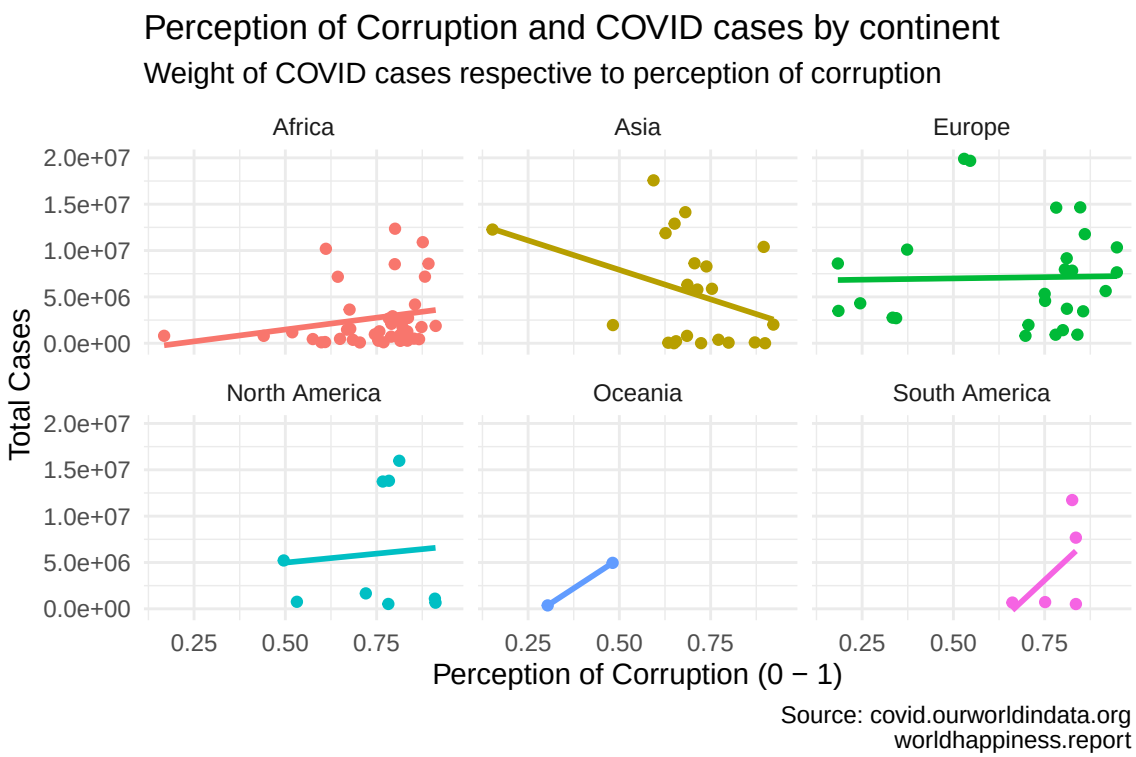

Figure 2: Covid cases by perception of corruption

This insight is supported by the summary statistics in table @ref(tab:summary_stats)

From Scientific Reports (Sci Rep), the paper implies that corruption leads to lower rates of vaccination. This

can result in higher counts of COVID cases. Also Globalization and Health also accounts to how corruption can manifest due to catastrophic events such as a pandemic. Then corruption affects how we tackle on health issues and health issues also affect how corruption is procured in the globlal stage.

Finally, @ref(fig:insight3) shows . . .

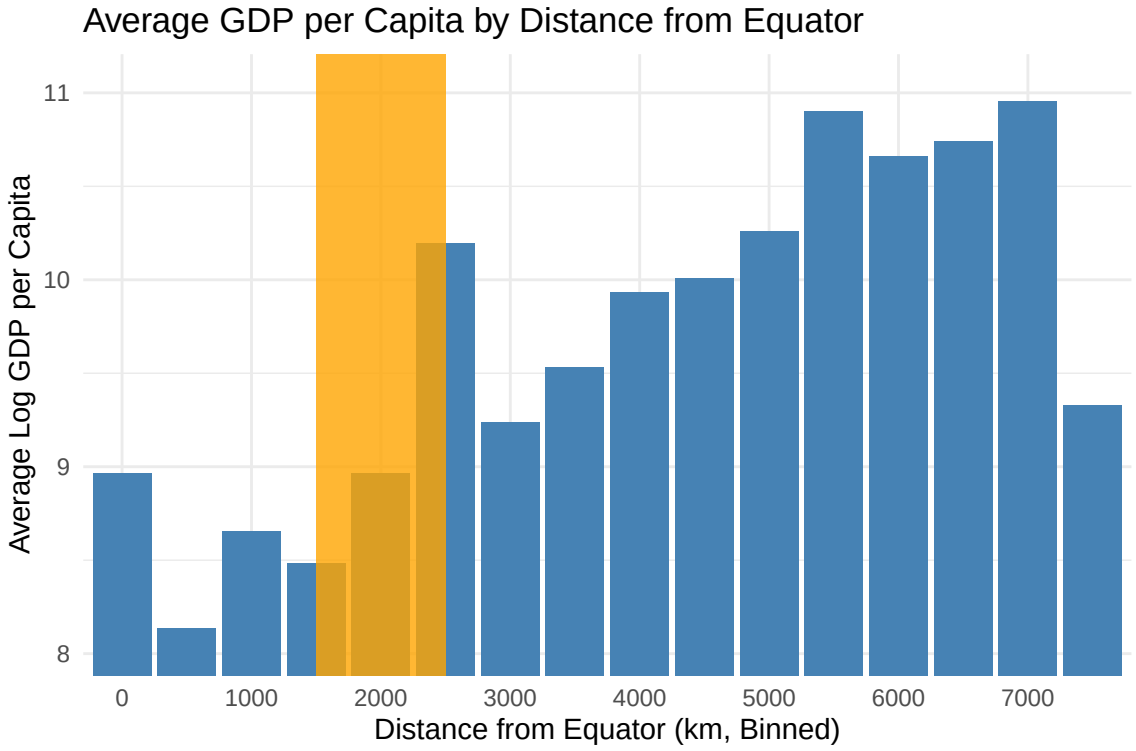

Figure 3: Average GDP by distance from equator

Firstly, countries are grouped by their distance from the equator into 500km intervals to effectively display all the info. The plot then compares this info to the average GDP of each group.

We can see the positive correlation between the two variables. As the distance from the equator begins to increase, the average GDP per capita also increases. There are some outliers such as the countries right at the equator and the ones at 2500km away, which is highlight by the golden bar.

A big reason as to why such a correlation exists is the effect of warmer weather on the climate. Warmer weather makes it harder to grow crops, limits water availability, increases number of parasites and potential diseases, and overall leads to poorer health.

Conclusion and Future Work

Overall, we found that geographic and environmental factors, freedom to make life choices, and perceptions of corruption play significant roles in shaping a country's stability and overall well-being. In particular, regions closer to the equator show greater vulnerability to crises, such as COVID-19 outbreaks and natural disasters, which negatively impact GDP and social support. At the same time, greater personal freedom and transparency in governance correlate with higher life satisfaction, highlighting the importance of governance in fostering well-being.

Our findings reveal a complex relationship between proximity to the equator and national challenges, as countries within certain latitude ranges face compounded vulnerabilities. Additionally, freedom to make life

choices appears closely tied to social support and satisfaction, suggesting that individual autonomy may be essential for improving quality of life. The significant correlation between perceived corruption and COVID-19 cases further underscores the importance of transparent governance, especially during public health crises.

The following steps in this analysis expand our approach by exploring regional variations within countries, considering the effects of policy measures, and assessing additional factors like urbanization and healthcare access. These expansions could provide a more nuanced understanding of the diverse factors affecting national well-being. Further research into causal links between geographic location and economic or social outcomes could deepen insights into how environmental and governance factors interact.

The limitations of this analysis include our reliance on national-level data, which may obscure subnational disparities that could offer a more detailed picture. Additionally, our analysis captures a specific moment, missing how policy shifts or environmental changes could alter these trends. Cultural differences, potential measurement biases, and the correlational nature of our findings limit the ability to establish causal links, as unmeasured factors may play significant roles in our observed trends. Recognizing these limitations makes our conclusions more robust and emphasizes the complex dynamics of well-being across global contexts.

References

I am not strict about MLA or APA style or anything like that. For this report, I would much rather have your citations be easy to match to your insights.

The easiest way is to use Rmd's footnote syntax. This will put a number beside the word where the footnote appears, and the full text of the footnote at the bottom of the page (pdf) or end of the document (html). The syntax is:[1], where I suggest that you put in something like this[2] to make references for this assignment.

Alternatively, you could make a list of citations with their main arguments and why they're relevent to your insights, methods, etc.

The link above also references "bibtex" files. These are also extremely convenient, but have a steep learning curve and they make it difficult to tie them to an insight. If you use bibtext, then make sure that you provide a sentence to describe the source and it's relevance when you cite it - don't just add citations to the end of a sentence (this is common practice in academia, but I want to know that your citations are directly relevant for this assignmnet).

Apendix

[1] See the source view to see this footnote

[2] The relevance to the insight is ... . From <>, published on <>, url: <>

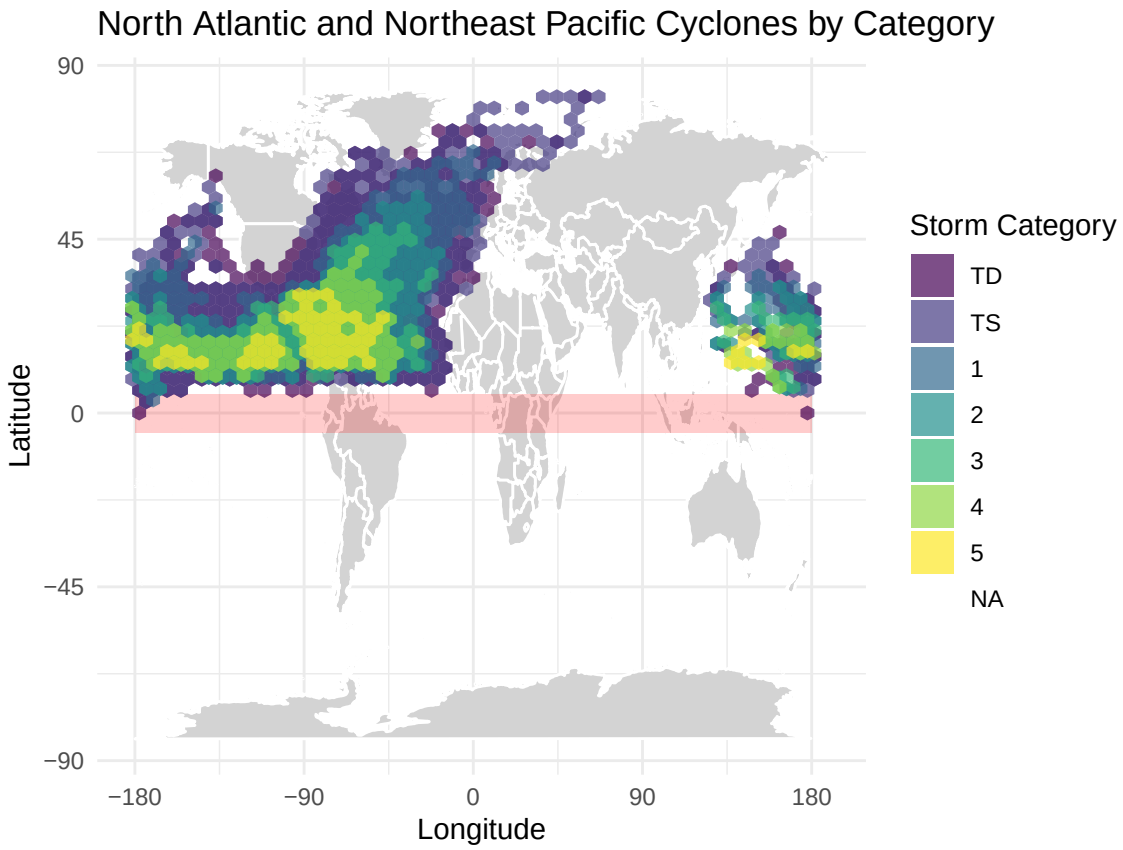

Figure 4: North Atlantic and Northeast Pacific Cyclones by Category

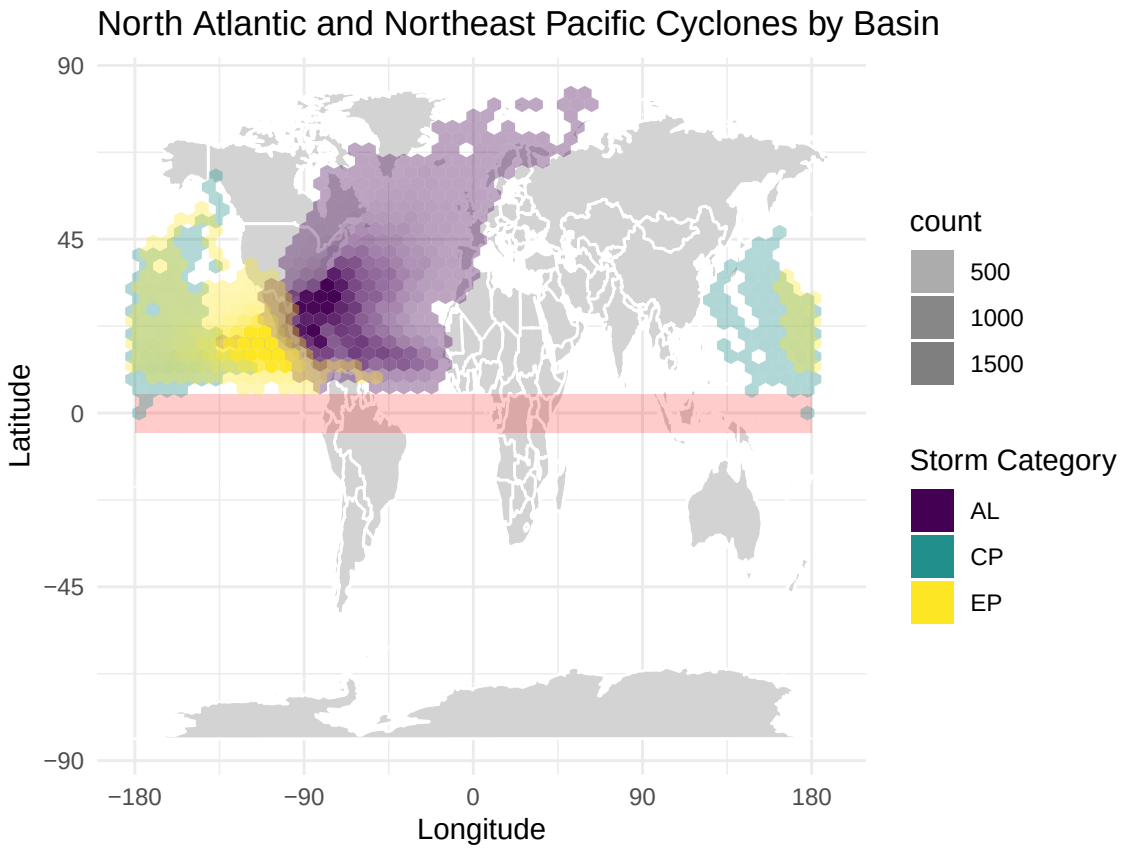

Figure 5: North Atlantic and Northeast Pacific Cyclones by Basin

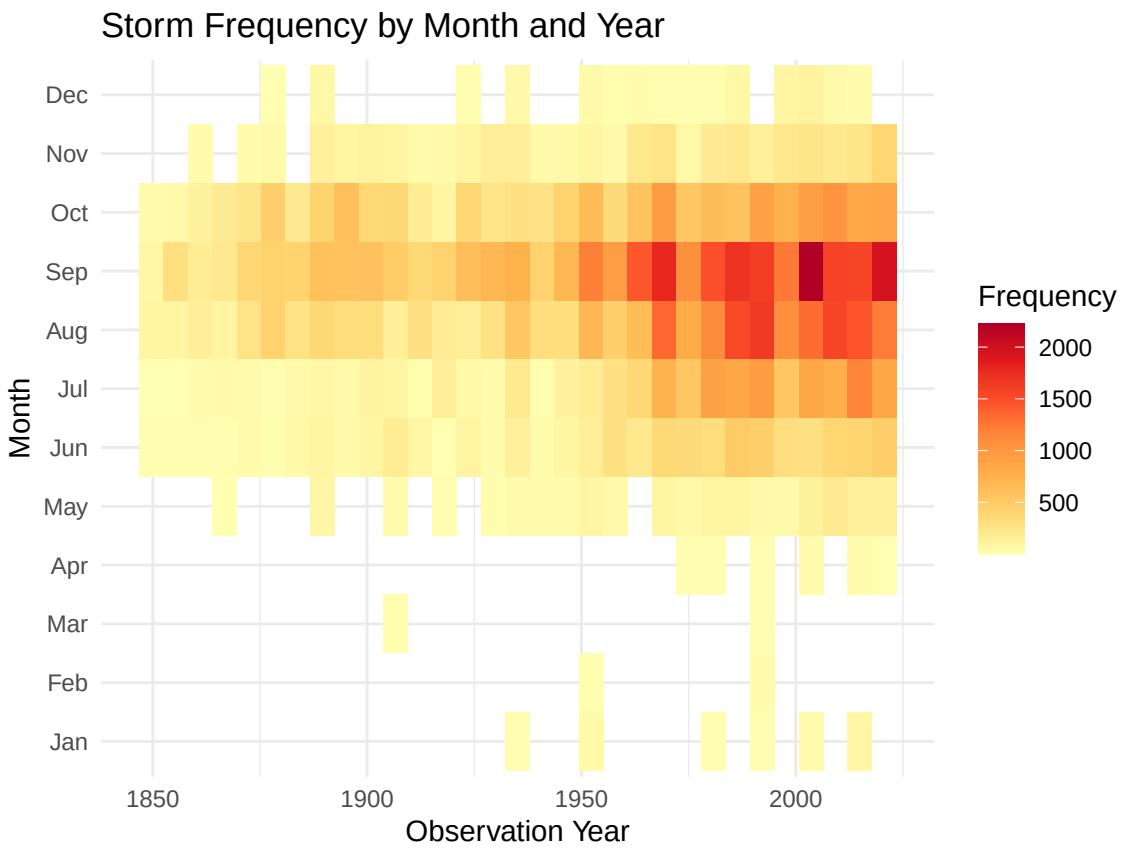

Figure 6: Storm Frequency by Month and Year

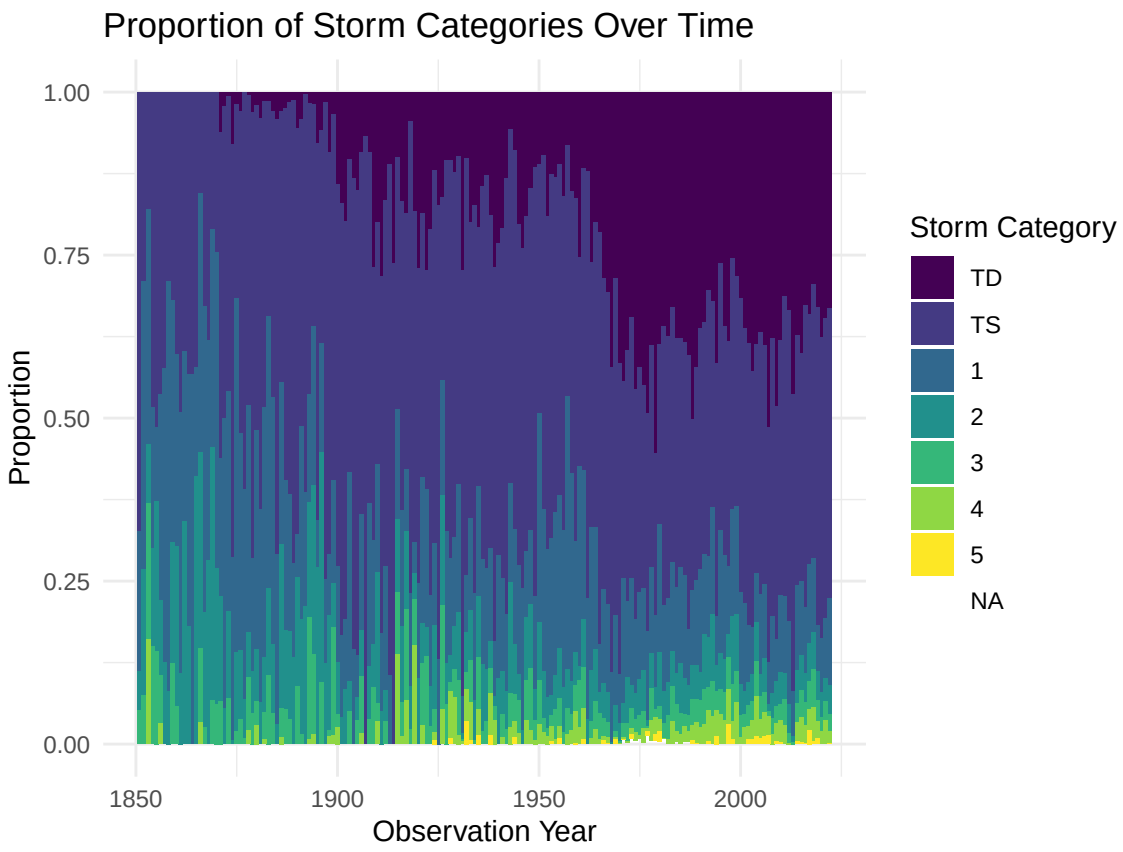

Figure 7: Proportion of Storm Categories Over Time

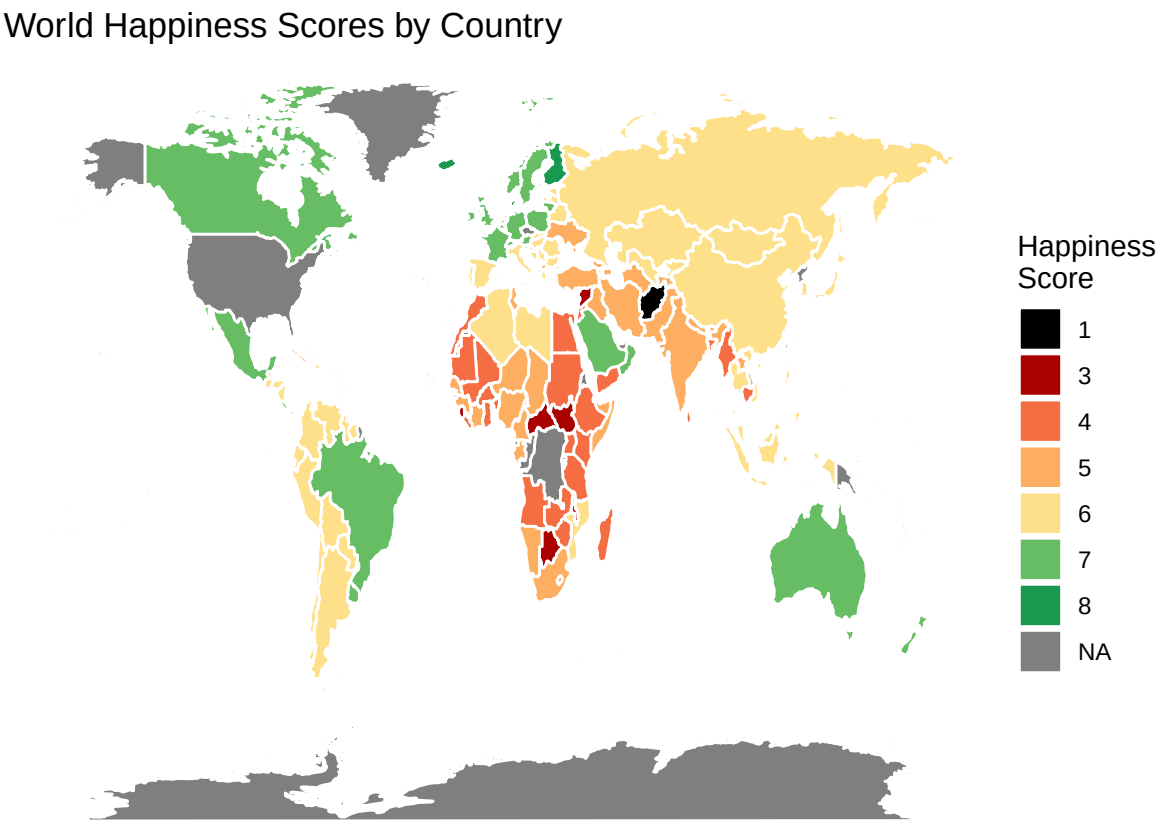

Figure 8: World Happiness Scores by Country