Tracking Women's Political Empowerment and Suffrage (1900-2000)

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Introduction

What is the Women's Political Empowerment Index?

The Women's Political Empowerment Index, created by Aksel Sundtron, Pamela Paxton, Yi-Ting Wanf, and Staffan Lindberg with the University of Gothenburg and V-Dem Institute, measures political empowerment, which is defined as the "process of increasing capacity for women, leading to greater choice, agency, and participation in societal decision-making. (Sundstrom *)." The WPEI is calculated by combining three sub-indices or sub-indicators to create one measurement that characterizes overall political empowerment for over 100 years (1900-2012) and more than 150 countries. This index takes into account newly formed countries and changing central concepts of women's rights, while also providing a better representation of the Global South, an area often forgotten or misconstrued.

The Three Sub-Indices

The WPEI is calculated using three sub-indices covering choice, agency, and participation.

The Women's Civil Liberties Index addresses disempowerment and the denial of a woman's choice to be involved in the political realm. This tracks if women can make key decisions based on the current legal framework and societal thought. Civil Liberties listed by Sundstrom et al. include Freedom of Movement, Freedom from Forced Labor, Access to Justice, and Property Rights. These are the fundamental liberties needed for greater societal participation and personal autonomy.

The Women's Civil Society Participation Index deals with agency, or the ability for women to be change-makers and active members in politics. The idea of "Civic Agency" is a crucial part of this index as it covers women's participation in social organizations that historically have been the leaders in growing movements and creating changes in society. Freedoms related to this index include freedom of discussion, participation in civil society organizations, and representation in media. By having the capacity and opportunities that allow women to partake in public discourse and community organization, women can aid in changing social norms and bettering political agendas.

The Women's Political Participation Index tracks the presence and standing of women in political positions. Without the inclusion of women in legislation, decision-making, and power distribution there is no political equality regardless of overall freedoms granted. Political Participation is broken into two categories, Descriptive and Substantive Representation. Descriptive representation focuses on women's role in political processes and inclusion in legislative positions. Substantive Representation considers women's ability to influence and shape policy outside their inclusion in government positions. Tracking the direct involvement of women in politics gives a better understanding of women's influence on policy decisions of equality.

Capstone Background

The goal of the Tracking Women's Empowerment Project is to analyze women's political progression around the world over the 20th century. Tracking political empowerment helps in understanding how, over time, women's access to civil liberties, participation in civil society, and representation in politics have improved. The division or growth of cultural identities and modernization of societal thoughts can be seen in the created maps that provide a visual representation of shifting trends. The modern women's rights movement grew with international recognition, improving everyday life for many, and inspiring the youth to strive for complete equality. While the dream of a woman head of state or representative continues to become a reality it is important to understand the struggle, spread, and growth that brought about greater political empowerment.

Research Questions

These three questions address the dataset's temporal, regional, and multi-category nature that guided the project's main goals.

1. Can women's political empowerment be categorized and reflect the changes in nation-state building, modernization, and gender equality over the 20th Century?
2. What trends emerge from the mapping of empowerment categories and how do changes in women's suffrage influence these categorizations?
3. Does this mapping method showcase regional patterns in women's political empowerment or suffrage?

Data

The main variables used in this project were suffrage and wpei. Table 1 describes the majority of variables in the main dataset. These variables, along with the three sub-indices, country name, country ID, and country abbreviations were accessed through the 'vdemdata' R package, directly provided by the V-Dem Institute. Continent data was accessed through the 'countrycodes' R package while mapping variables such as latitude and longitude were added through the 'maps' package. The 'ggplot2' package, the 'tidyverse' package, and the 'dplyr' package were used to separate data and create visualizations. All of the information for this project was combined into a Shiny App.

Table 1: Data Variables

Name	Type	Description
WPEI	numeric	Numeric Value between 0 and 1 that represents Women's Political Empowerment Index
Category	factor	Factor variable representing the WPEI stage of the region
Voting	numeric	Numeric Value of 0 or 1 that determines whether suffrage is present
Region	character	Name of nation, colony, or republic
Year	integer	Numeric value between 1900 and 2000
Decade	numeric	Numeric Value that categorizes the corresponding ten-year period of the year
Continent	character	Larger category in which the region is located
Liberties	numeric	Numeric Score representing the Women's Civil Liberties Index
Society	numeric	Numeric Score representing the Women's Civil Society Participation Index
Participation	numeric	Numeric Score representing the Women's Political Participation Index
Abbr	character	Country Code that corresponds to region and ID variable
Change Point	character	Category that determines whether a change has occurred in voting from the previous year
ID	numeric	Country ID that corresponds to region and ID variable

Tracking over the 20th Century

The 20th Century is considered the era of nation-states and modernization which greatly impacted the geopolitical landscape of the time. The fall of empires such as the Ottomans and the Austro-Hungarians, the decolonization of the Global South, and the fall of the Soviet Union were just some of the events of the century that saw the creation of over 100 new nation-states. New sovereign states established institutions that determined new rights and who deserved to be granted these liberties. While many new nations found themselves liberated, many women found their freedoms still limited although independence had occurred. This 100-year time span saw a prioritization of the new cultural and social identities while forgetting about equality and freedoms for all humans. Because of this, the data was filtered from 1900 to 2000 focusing the project on the 20th Century. Because the past helps shape the present this range provides background that can be used to understand the current stance of women's rights internationally. The feminist movement, which originated from the Suffragettes of the early 1900s, adapted to the post-colonial world of the 1950s, radicalized in the 1970s, and modernized in the 1990s continues to evolve to expand its reach and influence. The modern women's suffrage and empowerment movements have been a century-long journey that must continue to be studied to properly understand and appreciate gender rights progression into the new millennium.

Suffrage

As mentioned before, the 20th Century saw women in almost all countries receive the vote. This is a crucial step in empowerment, allowing women direct involvement and influence in the political realm. The 'v2fusuffrage' from the 'vdemdata' package was used for tracking granted suffrage. This was originally a number between 0 and 100 representing regime changes or limitations of suffrage, such as only a certain demographic or ethnicity allowed. As this project focuses on empowerment, to prevent the confusion of visualizing limited suffrage, the suffrage variable was simplified into a no right to vote, represented by 0, and the right to vote, represented by 1. Including suffrage in tracking political empowerment provides a better background for empowerment level shifts and diversifies the overall tracking analysis.

Creating Empowerment Categories

Category Splitting

In order to create the empowerment categories, split points, or the specific data points at which the index could be divided into similar groups, were found. This was done using the Quantile Method which divides the data into equal segments, or quantiles. Each quantile is a fraction of the data that is specified and adjustable. Originally, a three-empowerment categorization was attempted to represent the beginning, middle, and end stages of a country's progression in empowerment. When the index was split into thirds the data was distorted and countries with a higher WPEI were not accurately represented as the 'middle' category was too broad to differentiate. To address this issue the data was

split into quarters making the 'middle' category into two distinct categories. The revised categorization, in Table 2, resulted in four empowerment categories: nascent, emerging, developing, and established.

Table 2: Empowerment Categories

Category	Range
Nascent	WPEI < 0.188
Emerging	0.188<WPEI<0.336
Developing	0.336<WPEI<0.546
Established	WPEI>0.546

The nascent category represents countries that are at the beginning stages of empowerment, the emerging category represents countries that have made some, but not significant, progress, the developing category represents countries that have made noticeable progress in all areas of empowerment, and the established category represents countries that have reached full political empowerment.

Correlation of Indicators

Once the empowerment categories were determined correlation tests were performed to analyze the interaction between the sub-indices within each empowerment category. This helps in identifying key drivers and intervention targets. Key drivers are the sub-indices with a strong correlation to high empowerment which helps determine the most influential factors in women's empowerment. For sub-indices with a weak correlation, targeted interventions can help address specific barriers to increasing empowerment. This correlation was performed across the following three pairings: Civil Society and Civil Liberties, Civil Society and Political Participation, and, Civil Liberties and Political Participation. Table 3 shows the correlation coefficients between the sub-indices across the empowerment categories. Across the nascent category, correlation relationships between the three pairings are weak, showing the lack of empowerment structure. The emerging and developing categories show a strong negative correlation between civil liberties and political participation. This shows an influence of lower civil liberties, resulting in lower political participation which may occur due to the transitional nature of the categories. As these categories represent the 'middle' of empowerment a back and forth can occur between the sub-indices based on the allowance or restriction of freedoms for women. The established category has a positive correlation between higher civil liberties and political participation reflecting a higher, structured empowerment environment that allows for greater freedoms.
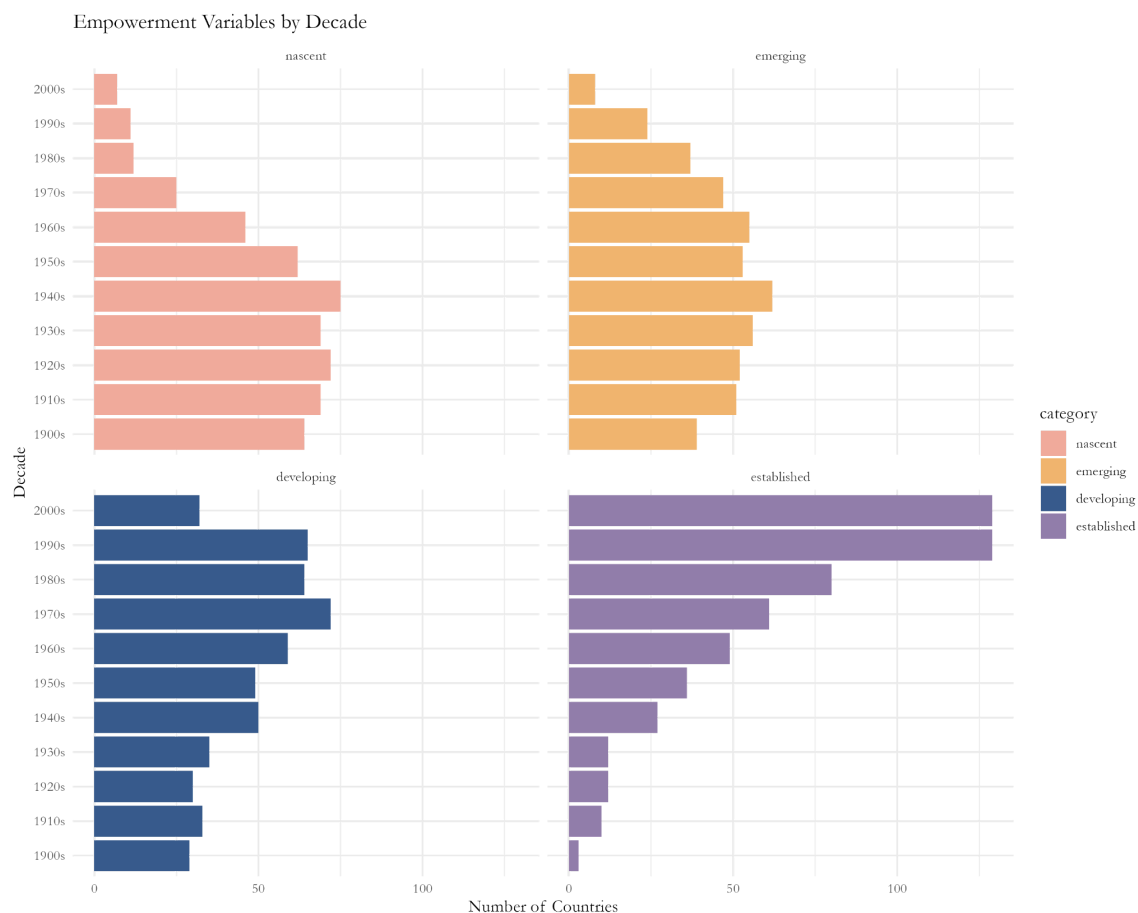
Table 3: Correlation Calculations

Category	Civil Society and Civil Liberties	Civil Society and Political Participation	Civil Liberties and Political Participation
Nascent	-0.07942348	0.05531654	-0.1336073*
Emerging	-0.22664845	-0.1002801	-0.6189087*
Developing	-0.07360711	-0.09743562	-0.6376153*
Established	0.43980447*	0.34631430*	-0.1018835

Empowerment over the 20th Century

        A decade analysis of each empowerment category highlights significant historical and geopolitical events that influenced these trends. Figure 1 shows Empowerment Variables by decade, providing a visual breakdown by category. The Nascent category, in pink, peaks in the 1950s representing the independence movement of Africa and Asia which saw an increase in nations with initial stages of civil, political, and societal institutions. The orange Emerging category peaks in the 50s and 60s, showcasing the post-World War II era with a focus on structured governance and a solidified civil society. The blue Developing category peaks in the 60s and 80s, reflecting the political and civil changes of the period, such as civil rights movements, regime fluctuations, and democratization. Overall trends show that political empowerment and historical changes are intertwined to showcase the progression and challenges faced throughout the 20th century.

Figure 1: Empowerment Categories over the Decades

Empowerment Variables by Decade

Creating Empowerment Periods

The empowerment periods represent the dominating years for each empowerment category. These help in describing the context of women's progression, visibility, and freedoms on a broader spectrum. To find the Empowerment Periods two methods were used, visualizations and threshold calculations. Both were used to determine the final periods for an overall holistic representation.

Graphic Visualization

The graphs used to determine Empowerment Periods were created using category counts by each year. This was then analyzed in a combined graph (Figure 2) and category faceted graphs (Figure 3) using the Plotly R package for data interaction across all categories simultaneously using the hover feature. The peak years were taken to represent the height of the empowerment category and the upward and downward trends concerning the other categories were used to determine beginning and end years. With the visual representations the nascent and established periods were easy to trace, however, the emerging and developing periods required further analysis.
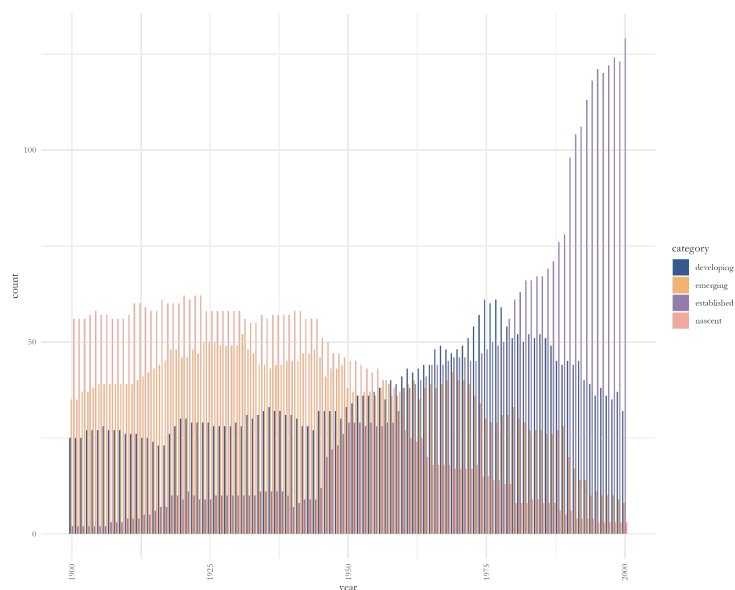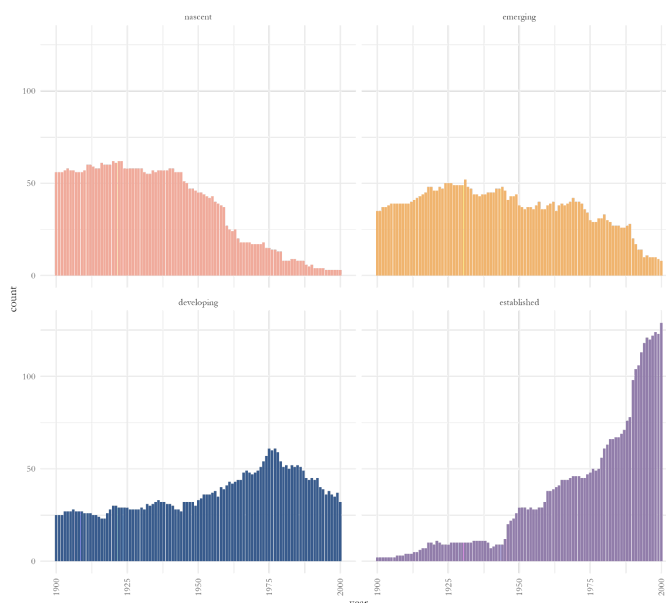
Figure 2: Combined Category Count   Figure 3: Facet Category Count

Threshold Calculations

To support the visual analysis, threshold calculations were performed at 75, 80, and 90 percent to find exact representations for the nascent and established categories and better understand the middle categories. The higher the threshold basis the more selective the parameters for category consideration are. Tables 4, 5, and 6 show the calculation results that were analyzed. Ultimately, the 90% threshold heavily influenced empowerment category determination as it was stricter in its criteria.

The other threshold calculations helped to adjust the developing category, as the emerging category had been removed.

Table 4: Threshold Calculations at 90%

90% Threshold	Start	End
Nascent	1900	1944
Emerging	1918	1944
Developing	1974	1978
Established	1994	2000

Table 5: Threshold Calculations at 80%

80% Threshold	Start	End
Nascent	1900	1946
Emerging	1914	1969
Developing	1967	1987
Established	1991	2000

Table 6: Threshold Calculations at 75%

75% Threshold	Start	End
Nascent	1900	1948
Emerging	1905	1972
Developing	1966	1987
Established	1990	2000

Condensing Periods

The final Empowerment Periods are listed in Table 7. Both the graph and all the threshold calculations show overlaps of the emerging category with the nascent and developing categories. Throughout the graph, there is no period where the emerging category is noticeably above the others. In all thresholds, the nascent and emerging categories had almost three decades of overlap while the emerging and developing categories had a variety of decade overlaps. This results in no significant, defined emerging period. Instead, the thresholds were adjusted using the visualization findings to incorporate the emerging period into the nascent and developing periods.

Table 7: Empowerment Periods

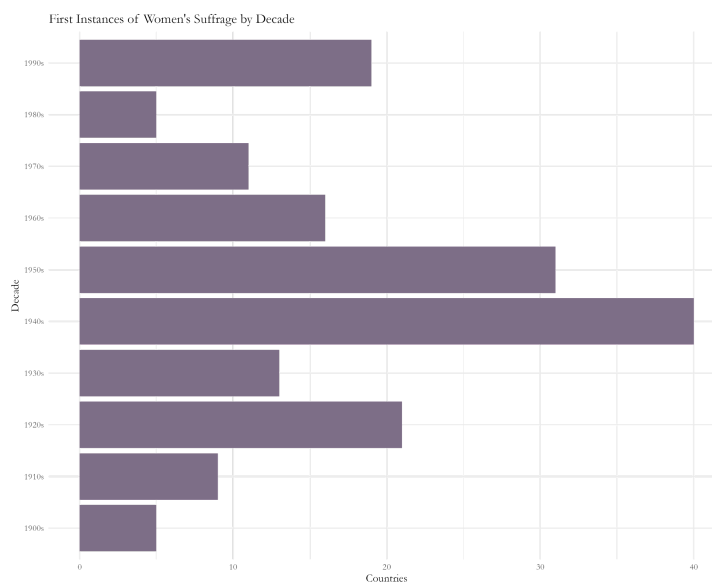| Period	Years
Nascent	1900 – 1955
Developing	1956 – 1978
Established	1979 - 2000

Impact of Suffrage

Suffrage, or the right to vote, resulted in a more empowered female population, as seen by the empowerment category changes, who took this victory and continued to push barriers to encourage greater political participation and women's leadership. Trends in the relationship between suffrage and empowerment can be analyzed to find where gaining the right to vote has resulted in greater political empowerment, seen through any empowerment category shifts.

Decade Analysis

Figure 4 depicts a count of the first voting instances of suffrage by the decade. This was calculated using a created change point variable which tracks the year a change in voting from 0 to 1 occurs and the corresponding decade. The increase in the 20s can be attributed to the Suffrage Movements in Europe and the United States. The 40s and 50s have the highest number of first suffrage instances which can be attributed to the period of decolonization and the emergence of the African and Asian nations. The spike in the 90s represents the breakup of the Soviet Union and Yugoslavia which created over 20 new countries in Eurasia. This shows how suffrage can be tracked to reflect the changing global geopolitical landscape.
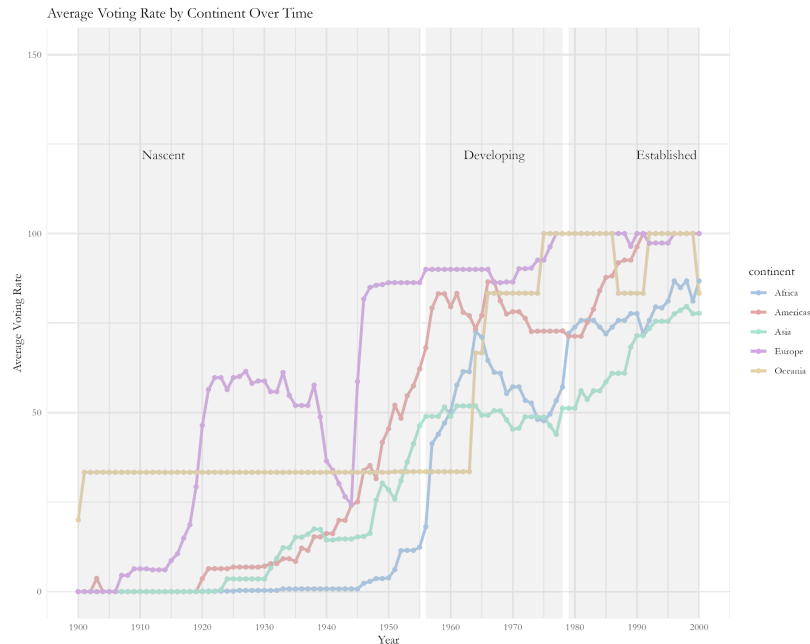
Figure 4: First Voting Instances by Decade

Continental Divide

Figure 5 shows average voting instances by Continent over time with an overlay of the empowerment periods. The steady rise of voting instances see spikes at the empowerment period end and beginning years showing an impact on voting and empowerment. The Global North divide can be seen in the quick rise of voting instances in Europe throughout the nascent period with over half of its countries having the right to vote by the 1940s. Meanwhile, the Americas, Asia, and Africa saw the beginning of steady growth in the 1940s which marked the start of independent nation-states in these continents. The rise and fall of Africa and the Americas in

the 60s into the 80s represent the regime shifts and coups that plagued the area and resulted in varied freedoms. This visualization provides the best tracking of voting internationally, while also tracking empowerment side-by-side.
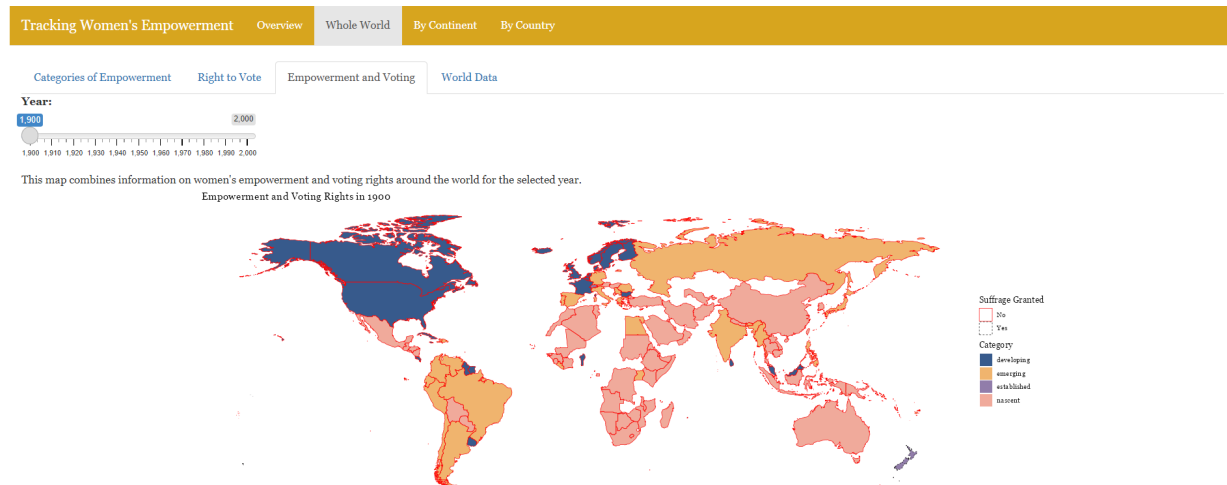
Figure 5: Average Voting Instances by Continent

Shiny App Dashboard

A shiny App Dashboard is the final product of the Capstone Project that combines all information and provides better visualization of overtime mapping. With an overview panel, pictured in Figure 6, users can learn more about the WPEI, its sub-indices, and the creation of empowerment categories and periods. The World, Continent, and Country tabs each contain three maps that show empowerment categories, suffrage, and combined empowerment and suffrage (depicted in Figure 7), with a slider tab that allows users to move through the years. Unfortunately, this app was unable to be published live due to the large amount of data and storage required.

Figure 6: Overview Panel

Figure 7: World Map Panel

Conclusion

This project accomplished its goals from the initial research questions. Empowerment can be tracked globally using a categorical scale. Suffrage provides another dimension for understanding empowerment shifts and when combined can follow historical events or the regional progression of increased women's rights.

Further Research Potential

Further research would focus on socio-cultural divides, specifically the divide between the First and Third World. The exploitation of the Third World by the First World has resulted in a gap of knowledge for Africa and Asia. Because the WPEI addresses this discrepancy it is the best index for further research into the Global South and North Divide.

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