CAB230 Assignment 1 Report

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World Happiness Index

Contents

Introduction

The World Happiness Index application was built with the purpose of displaying the information from the World Happiness Report an initiative of the United Nations. The Report contains a wide range of information about each country's living suitability, which is summarised into an overall 'Happiness' ranking to allow for comparison and rankings between countries. This application takes an abridged version of the Report from the years 2015 to 2020 and displays the data and its aspects in several ways that is easy for the user to navigate, use and search for specific factors and countries.

Completeness and Limitations

The application has many functionalities which enables it to be a robust and usable app. It displays all the data required in the Ag-Grid React tables with client-side filtering and sorting of the data. There are also react-chartjs-2 line and bar charts which helps the client to visualise the data. Navigation between pages is handled by a react router that seamlessly transitions between pages of the app. Data entry is supported through react forms and the inputs are used for working successful API communication such as user registration/login endpoints and authenticated data routes. Partial matching is slightly implemented in the drop-down menus where the client can enter a letter and it loads the first result that matches that letter and subsequent inputs of that letter loads the next matches. Finally, to present the app cleanly CSS styling was implemented to organise components in a logical manner and make the app aesthetically pleasing.

Although this app is functional, it is not without its flaws. The input boxes do not support partial matching and client side filtering is lacking in some areas of the app. Error handling is limited when incorrect data is entered with a lack of error messages. Although charts are implemented properly into the app, when something new is inputted on the screen, it refreshes the charts, and there was not much imagination when creating the app. Finally, although CSS styling is implemented, the app still has a lot to be left desired in making this app stand out and impress the user.
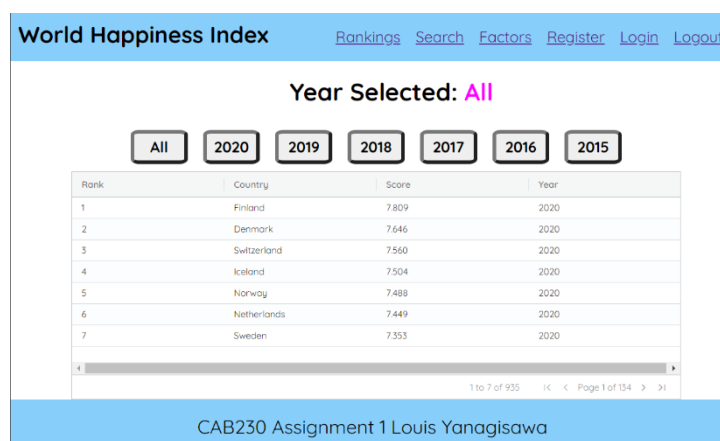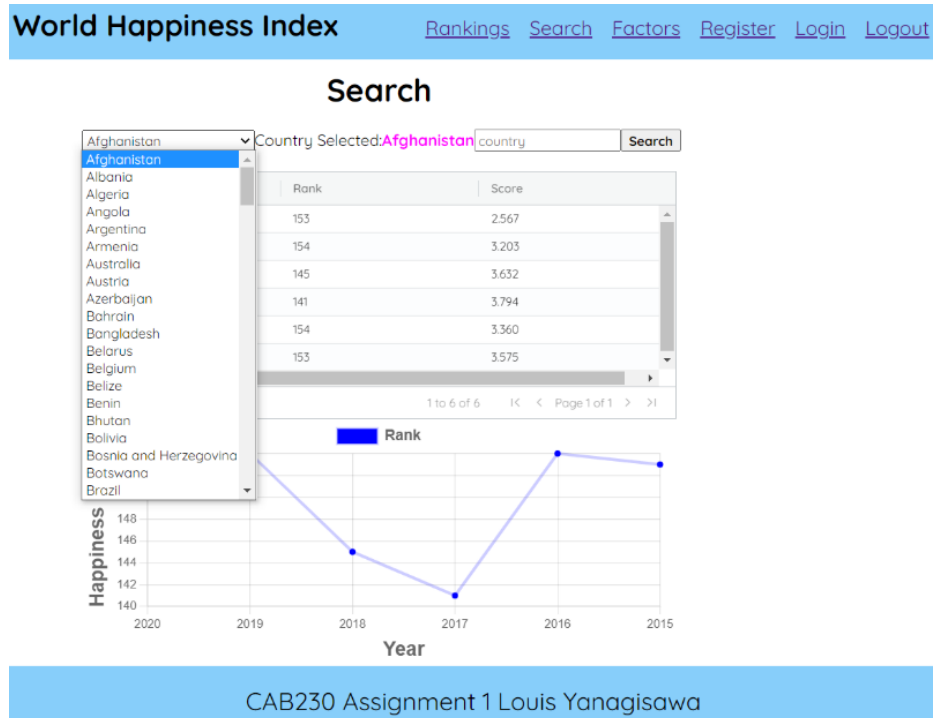
Use of End Points

Rankings Page

FIGURE 1: RANKINGS PAGE

The Rankings page displays the data retrieved from the /rankings endpoint through the Ag-Grid React module with options to select what year you want displayed and telling you what year is currently selected through client-side filtering.

Search Page

FIGURE 2: SEARCH PAGE

The Search page displays a single country's rankings over the years in a table. It allows the user to visualise the country's ranking trend in a line graph. The option to select the country you want to view is to use the dropdown menu and the dropdown menu uses data from the /countries endpoint to fill out the options.
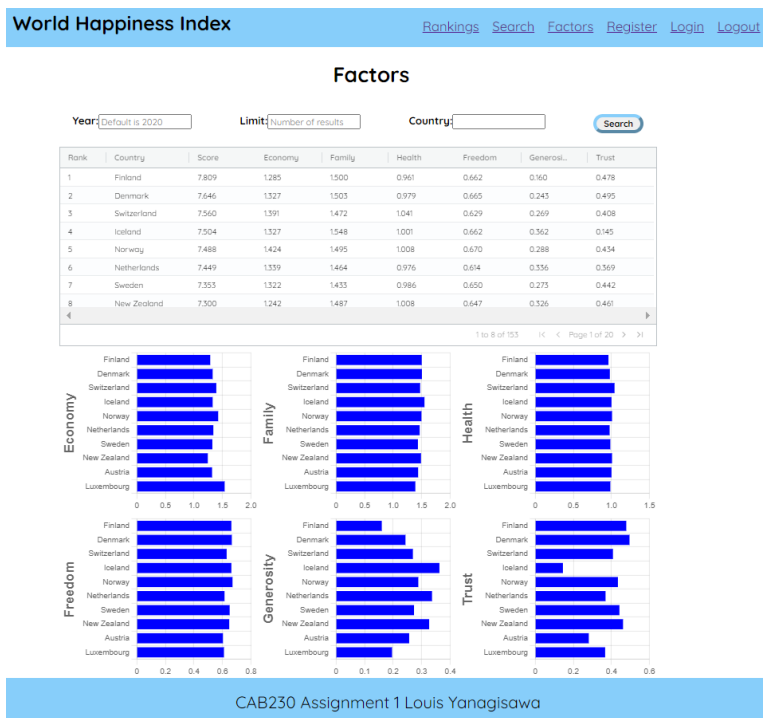
Factor Page

FIGURE 3: FACTORS PAGE WHILE LOGGED IN

The Factors page display the ranking with additional factors of that country and the data is retrieved from the /factor/{year} endpoint. The data is only displayed when the user has logged in and is authenticated. The user can filter down the data to select specific year, country and even the number of results returned. The data is then displayed in bar chart format.

Register Page
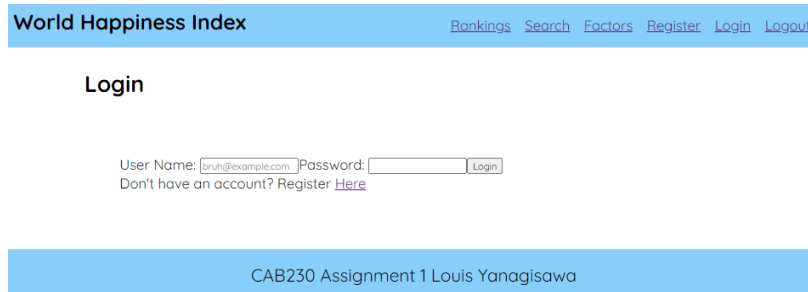
FIGURE 4: REGISTER PAGE

The Register page allows the user to register an account so they can access the data on the Factors page. To register the account the users information is sent to the /user/register endpoint.
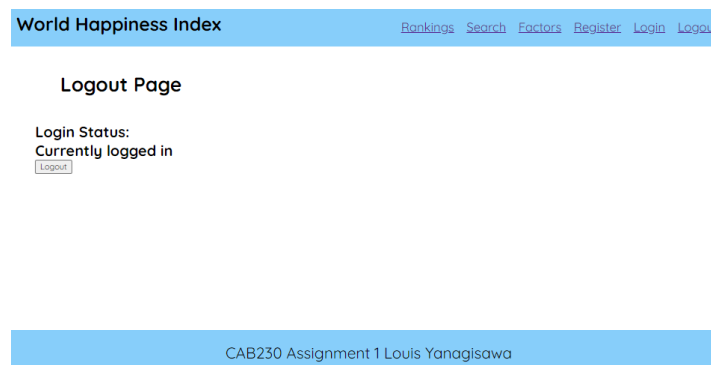
Login Page

FIGURE 5: LOGIN PAGE

The login page allows users to login and the login data is verified with the user/login endpoint. If the user does not have an account, then they can be redirected to the Register page

Logout Page

FIGURE 6: LOGOUT PAGE WHILE LOGGED IN

The logout page allows the user to log out of there account by removing the JWT token from the computer that is used to verify if a user is logged in or not.

Modules Used

Ag-grid-react
Module to provide fully-featured table components, including sorting and filtering.

https://www.ag-grid.com/react-grid/

React-chartjs-2
Module to display data in graph format (line graph, bar graph, etc).

https://www.npmjs.com/package/react-chartjs-2

Application Design

Navigation and Layout

The first thing that was planned when starting this app was drafting what the pages of the app would be. This app has several tasks to manage, so it was decided to have six pages to cover all these functionalities. The pages were:

1. Ranking;
2. Search;
3. Factors;
4. Register;
5. Login and
6. Logout.

Quick sketches were done to understand the layout and what functionalities would be on each page. Since app consists of many pages that hold different information, the next step was to create the navigation bar. The navigation bar should allow the user to navigate through to any page. The layout of the navigation bar went through many iterations, such as being a vertical dot point list on the left or having the navigation bar horizontally under the title spreading spanning the whole page, but these designs were clunky and took away from the rest of the app, so they were scrapped for the final design or putting the nav bar horizontally in the top right of the page.
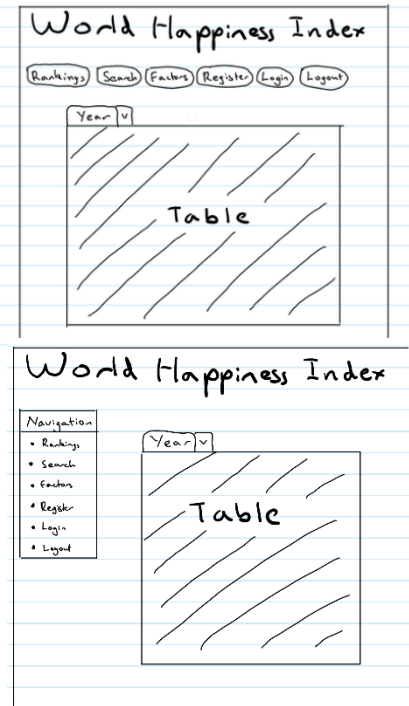
FIGURE 7: NAVIGATION BAR WIREFRAMING

Different chart types were also considered. In the factors page a single bar chart containing all the factors with countries being the subgroup of the chart was initially planned but with six factors and up to ten countries the design would get too convoluted and hard to interpret so the design was scrapped for an individual horizontal bar chart for each factor

When implementing the app, it was realised quickly how bare and uninteresting it was so to resolve this issue a header and footer were added to create a border around app to help the focus the users attention to the main functions of the app. Furthermore, to add more detail a colour scheme was chosen to help users identify different parts of the app, blue for the header, footer, charts and buttons when hovered over; black for text; white for background; pink for dynamic changing text values and red for warning and error messages.

Usability and Quality of Design

Regarding the display of the app, the layout is simple and is effective in the information it conveys to the user. Padding and margins are added to the components to distinguish themselves from one another and a header and footer, with different colours, are present to help panel the content and focus the user's attention to the main parts of the screen. Display is also well organised with related content being grouped into rows or columns. Attempts were also made to reduce the clumsiness of the dynamic content and one example is on the Factors page. On the Factors page there are several charts comparing the countries to one another, but the user has an option to select only one country and when that happens instead of displaying meaningless charts the charts do not display at all to reduce clumsy UI.

Although the display is effective there is still a lot to be left desired. The simplicity of the app leaves a lot of unutilised white space and although there is a header and footer there is appearance of a fullwidth hero or any icons or images for that matter. Furthermore, the footer content is not aligned with the components above it and has no functionalities or meaningful information. The components do not follow much of a grid format which can lead to lack of clarity on screen.

Now looking at the navigation it is intuitive and well placed as all the navigation links are grouped together inside the header on the right. The buttons are clearly labelled to what page they take you too and each page has a large heading in bold text that signifies to the user what page they are currently situated. Furthermore, on pages with restricted content there are messages with links that take the user exactly where they need to go to gain access such as on the Factors and Login page.

Although the navigation is not without its flaws. The navigation bar itself does not indicate what page the user is currently situated and pressing buttons do not provide much feedback. Furthermore, the navigation bar buttons do not contrast much with the header and may be difficult to read for users with vision impairments.

When comparing this app to user expectations from other apps there are areas where it does and does not hold up. Navigation is seamless and load times for tables and charts are minimal and the app does not crash, and error messages are usually present to provide responsive feedback if the user has done something wrong. Although the app is functional it might leave users wanting more with the lack of images and icons that grab their attention and impress, the UI could definitely have had a more impressive and interesting design.

The visual design is consistent adding to the user interface. The fonts, text sizes and colours are visually consistent across all screens. A single font type was used for all text except the tables and charts and the colour scheme does not consist of too many colours, only around five, and high contrast colours such as red, as the main theme is blue, is used sparingly only important information, such as error messages, for when user attention is needed. The same font sizes for the page headings are all the same and the information font sizes are mostly consistent. Dynamic data is also consistent with all the tables being of the same design and the charts sharing a colour scheme.

Consistent visual design is lacking in some areas such as the page title. Although the page titles are all the same size, they are situated in different locations depending on the page which may throw users off. Furthermore, the header and footer locations are not consistent with the location depending on how much information is on screen. The margins and padding of components is also not consistent between pages and no grid like structure has been used to organise them.

Accessibility
- The simplicity of the app means that there are not many non-text elements; the only non-text elements present in the app are the charts and tables. In this case, text equivalents do not exist. Some input boxes have ghost text to signify user what type of content to enter.
- The information conveyed through colour is only conveyed through colour, no extra styling is implemented to make important information stand out. For example, the error messages are red. Red indicates that they are important to the user, and no other cues are used. Another example are the buttons, when hovering over them only the colour changes, the size, shape or type of the button does not change.

- The document is organized in a way that even without style sheets the content is readable and conveys its message clearly. The way the code is written the components are ordered and grouped logically so even if CSS is turned off the app is still easily usable and readable.
- As there is not much dynamic content in the app, all the text equivalents are updated when dynamic content changes. For example, in the Rankings page when a year is selected there is a label that updates as well that tells you what year is selected. Another example is in the Search page the label that tells you what country is currently selected and is updated when you select another country.
- The app fails in attempting to avoid the screen to flicker as in every page with a graph in it the graph renders every time a value is entered into the input boxes.
- The app succeeds in using clear language as there is not much text on each page, only what is needed so any explanation is succinct and precise. Error messages tell the user what is wrong and how to resolve these issues and instructions are concise.
- The tables in this app have clear column headers, distinguished form the data by the different background colour, but no row headers and have clear lines separating each row but none for the columns.

FIGURE 8: RANKINGS PAGE WITH CSS

Technical Description

Architecture

FIGURE 9: APPLICATION DOCUMENTS

FIGURE 10: SRC FOLDER PAGES

The responsibilities of the app are sorted into folders to easy organise, view and access them. The components folder holds all the components of the app including the Header, Footer and Navigation

and also the Charts function which returns the chart. The Function folder contains all the functions used in the app which only includes the useFetch hook. The pages folder contains all the separate pages of the app including the Ranking, Search, Factors, Register, Login and Logout page. The rest of the files out in the open are entry point and styling of the app including App.js index.css and index.js.

Test Plan

Task	Expected Outcome	Result	Screenshot (appendix)
Select certain year in Rankings page	Result displayed, Year selected displays correct year	PASS	1
Select certain country in Search page	Result display, chart displayed	PASS	2
Enter incorrect country name in Search page	Result not displayed	PASS	3
Open Factors page without logging in	Result not displayed, error message displayed	PASS	4
Open Factors page while logged in	Result displayed, charts displayed	PASS	5
Search specific year in Factors page	Result for that year displayed, charts displayed	PASS	6
Search specific limit in Factors page	Limit number of results and charts displayed	PASS	7
Search specific country in Factors page	Results of that country displayed, chart not displayed	PASS	8
Search invalid year in Factors page	Results not displayed	PASS	9
Search invalid limit in Factors page	Results not displayed appears	PASS	10
Search invalid country in Factors page	Results not displayed	PASS	11
Enter in a number in the country input box in the Factors page	Input box not updated; error message displayed	FAIL: error message is displayed by input box is still updated	12
Enter in a letter in the limit input box in the Factors page	Input box not updated; error message displayed	FAIL: error message is displayed by input box is still updated	13
Enter in letter in the year input box in the Factors page	Input box not updated; error message displayed	FAIL: error message is displayed by input box is still updated	14

Register with valid details	Register successful	PASS	15
Register with invalid details	Register fails, error message appears	PASS	16
Login with valid details	Login Successful	PASS	17
Login with invalid details	Login fails error message appears	PASS	18
Open Logout page while logged in	Logout button appears, login status is true	PASS	19
Open Logout page while not logged in	No logout button appears, login status is false	PASS	20
Logout	Successfully logout	PASS	21
Use navigation bar	Successfully navigate to another page	PASS	22
Use error message link to go to login page	Successfully navigate to the login page	PASS	23

Difficulties / Exclusions / Unresolved & Persistent errors

- Roadblocks
  - There were many difficulties getting the charts for react-chartjs-2 to work and sizing them. Documentation of react-chartjs-2 was limited and finding out how the inputs of the chart works was difficult, but this issue was resolved through reading stack overflow queries and looking at the documentation for chartjs and trying to use similar format for the JavaScript version on the react version. Furthermore, the sizing was not working so adding containers to help size the charts fixed the issue.
  - The Ag-Grid would keep crashing because it would run before useFetch could retrieve the data; thus, it would try and map a null data set. To fix this issue, I searched online and found a simple logical expression that only runs the Ag-Grid when the data is not null.
- Exclusions
  - Partial matching in the input boxes were excluded because of time constraints.
  - Photos and logos were excluded from the app because of time constraints.
  - Dynamic content sizing was excluded because of time constraints and technical limitations.
  - Error handling when user enters incorrect data query was excluded because of time constraints.
  - More CSS to make the page look cleaner could have been added.
- Bugs
  - On pages with charts, every time a new value is inputted into the input box the chart loads itself again.
  - Regex used to stop certain values being inputted into the input box fails, although the error message appears, unless the backspace button clears all values then the regex filtering works correctly.

User Guide

The first page that is loaded when the app runs is the Rankings page, and this page contains a table displaying the ranking data. There are buttons above the table which allow the user to select data from specific years and there is text above the buttons telling the user what year is currently selected. In the table the user can search for specific entries or change the display order of the rankings by

pressing the column header name or the three lines that appear when you hover over the column header. Once done the user can then navigate to other pages using the navigation bar situated at the top right-hand corner of the page.
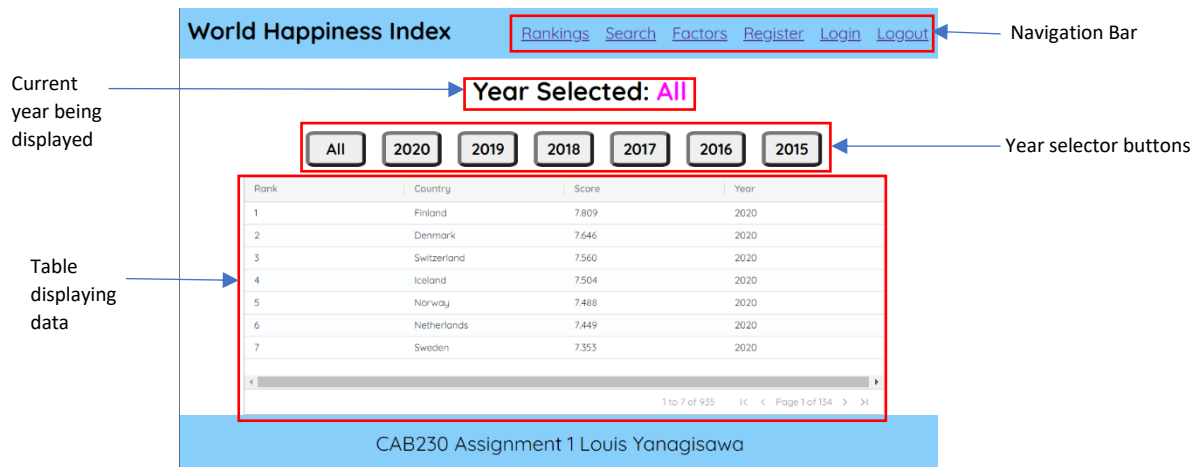

FIGURE 11: LABELLED RANKINGS PAGE

The next page the user can go to is the Search page. In this page users can search for specific countries to view their rankings in a table and in a line graph. Table includes the same client-side filtering and sorting as the rankings page. Users can either select a country in the dropdown box or in the input box, situated either side of the text displaying what country is currently displayed. If using the input box, users must press the search button to the right of it to load the country. Partial matching is available when using the drop-down menu and is used by clicking the dropdown menu and typing in a letter and the first country with that starts with that letter appears, then subsequent typing of the letter finds the next country starting with that letter and so on. Incorrect entries into the input box will yield no results but also no error message. Once user is done, they can navigate to other pages using the navigation bar.
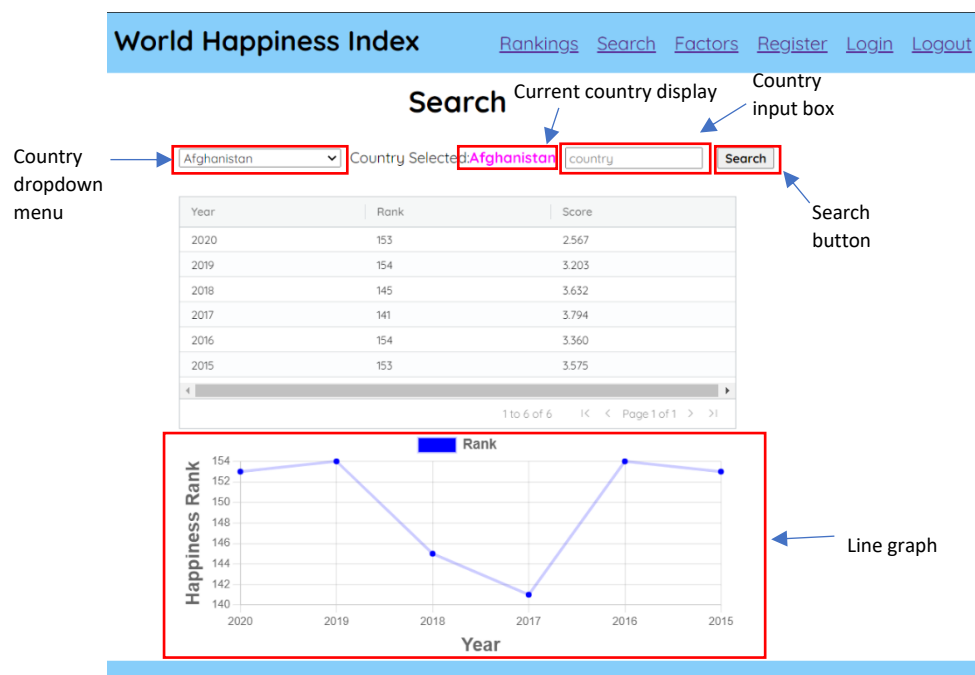

FIGURE 12: LABELLED SEARCH PAGE

The next page is factors. In this page the table displays the ranking data along with the factor scores for each country, and charts that display the factor comparison between each country. This page will only display data is a user is logged in so if they are not an error message will appear with links to both the register and login page. The table includes client-side filtering and sorting same as the previous User can also search for specific country, year and the number of results returned using the input bar. Once user is done, they can navigate to other pages using the navigation bar.
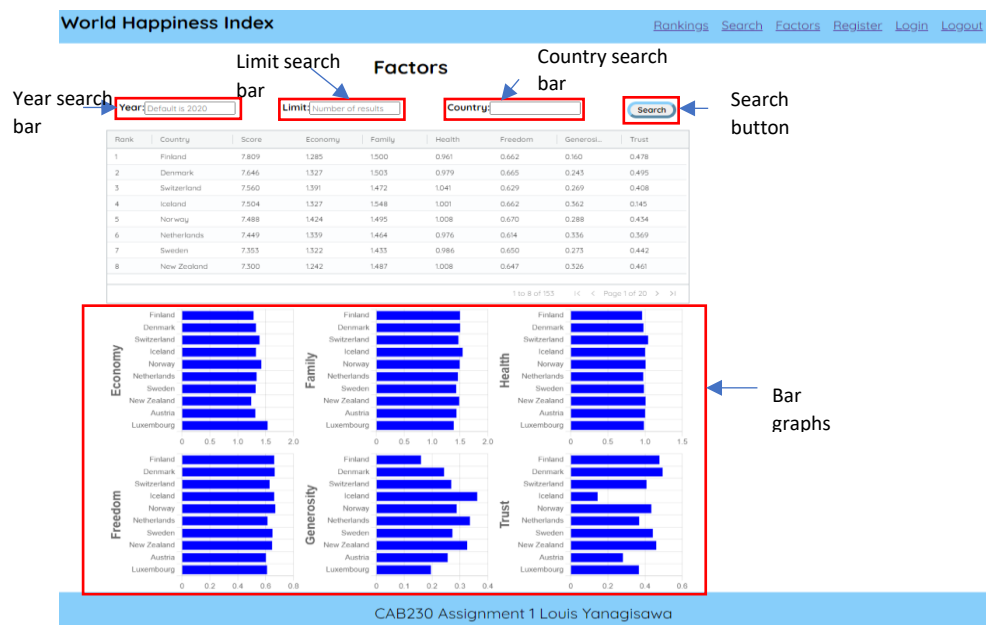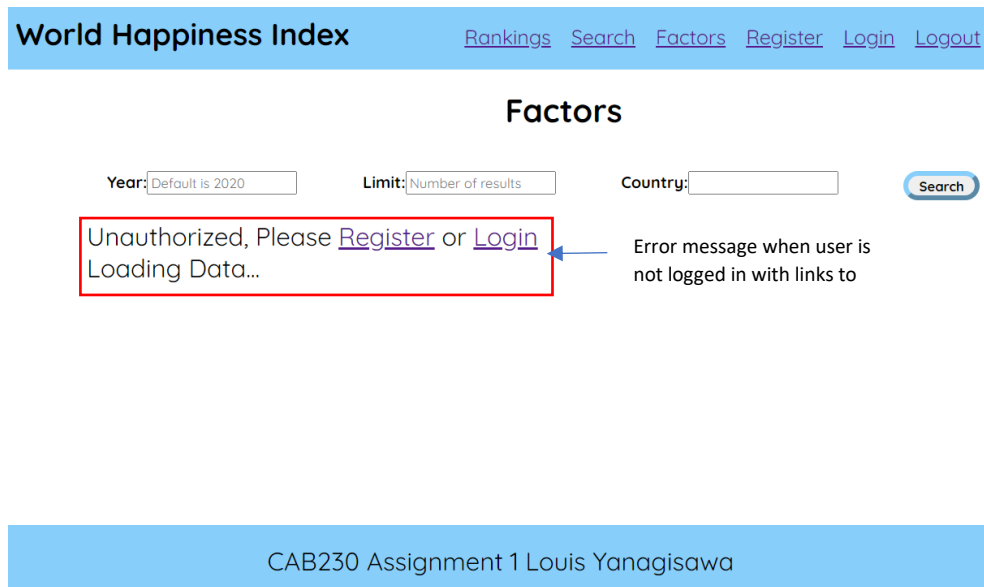

FIGURE 13: FACTORS PAGE WHILE LOGGED IN

FIGURE 14: FACTORS PAGE WHILE LOGGED OUT

The next page is Register. In this page users can register an account to login and access information on the Factors page. The page consists of an input box for the suers email address and password and a register button to register their account. If the user leaves an input box and attempts to register an error message will appear telling the user that both an email and password are required. Once user has successfully registered, a 'registration successful' message will appear. Once user is done, they can navigate to other pages using the navigation bar.

FIGURE 15: LABELLED REGISTER PAGE

The next page is Login. In this page users can login with there account by entering their details into the input boxes and pressing login. There is also a message with a link that takes you to the register page if user does not currently have an account. If user login fails an error message will appear and if successful a success message will appear. Once user is done, they can navigate to other pages using the navigation bar.

FIGURE 16: LABELLED LOGIN PAGE

The next page is Logout. On this page users can logout of the app if there want to. The page displays a login status and if false the logout button will not appear and a message with a link to the login page will appear but if true the logout button will appear and pressing this button will log the user out and will display a farewell message. Once user is done, they can navigate to other pages using the navigation bar.

FIGURE 17: LOGOUT PAGE WHILE LOGGED IN

FIGURE 18: LOGOUT PAGE WHEN LOGGED OUT

Appendices

Appendix 1: Select Year Successful

World Happiness Index   Rankings Search Factors Register Login Logout

Year Selected: 2020

| All | 2020 | 2019 | 2018 | 2017 | 2016 | 2015 |

Rank	Country	Score	Year
1	Finland	7.809	2020
2	Denmark	7.646	2020
3	Switzerland	7.560	2020
4	Iceland	7.504	2020
5	Norway	7.488	2020
6	Netherlands	7.449	2020
7	Sweden	7.353	2020

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Appendix 2: Search Country Successful

World Happiness Index   Rankings   Search   Factors   Register   Login   Logout

Search

| Australia ⌄ | Country Selected:Australia | Australia | Search |

Year	Rank	Score
2020	12	7.223
2019	11	7.228
2018	10	7.272
2017	10	7.284
2016	9	7.313
2015	10	7.284

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Appendix 3: Search invalid country

World Happiness Index   Rankings   Search   Factors   Register   Login   Logout

Search

Afghanistan ▼   Country Selected:**bruh** | bruh | | Search |

Year	Rank	Score

No Rows To Show

0 to 0 of 0   I<   <   Page 0 of 0   >   >I
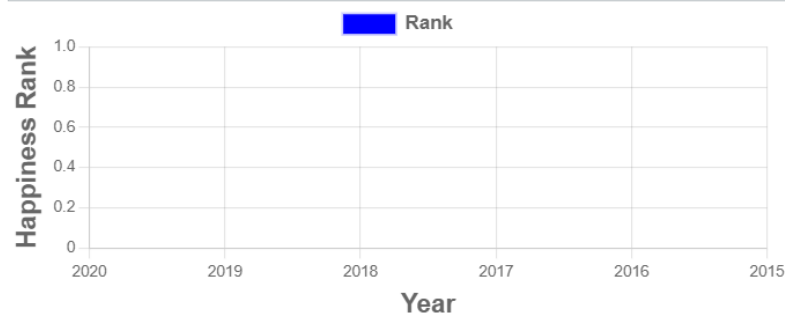
■ **Rank**

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Appendix 4: Factors page when user is not logged in

World Happiness Index   Rankings   Search   Factors   Register   Login   Logout

Factors

Year: [Default is 2020]   **Limit:** [Number of results]   **Country:** [   ]   (Search)

Unauthorized, Please Register or Login
Loading Data...

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Appendix 5: Factors page while logged in

World Happiness Index   Rankings   Search   Factors   Register   Login   Logout

Factors

Year: Default is 2020   **Limit:** Number of results   **Country:** [   ]   Search

Rank	Country	Score	Economy	Family	Health	Freedom	Generosi...	Trust
1	Finland	7.809	1.285	1.500	0.961	0.662	0.160	0.478
2	Denmark	7.646	1.327	1.503	0.979	0.665	0.243	0.495
3	Switzerland	7.560	1.391	1.472	1.041	0.629	0.269	0.408
4	Iceland	7.504	1.327	1.548	1.001	0.662	0.362	0.145
5	Norway	7.488	1.424	1.495	1.008	0.670	0.288	0.434
6	Netherlands	7.449	1.339	1.464	0.976	0.614	0.336	0.369
7	Sweden	7.353	1.322	1.433	0.986	0.650	0.273	0.442
8	New Zealand	7.300	1.242	1.487	1.008	0.647	0.326	0.461

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Appendix 6: Search year in factors page

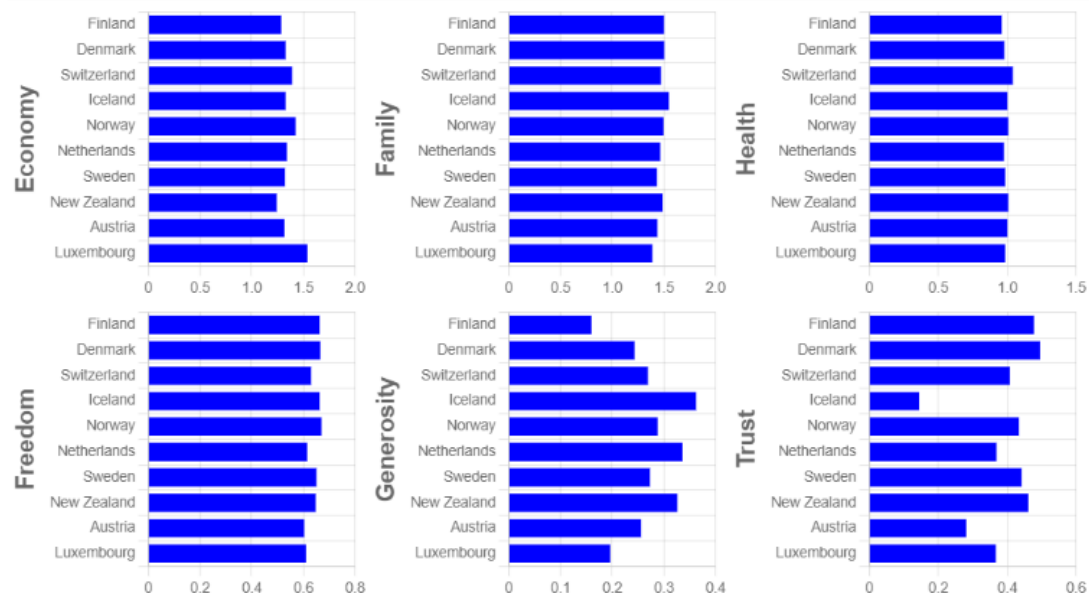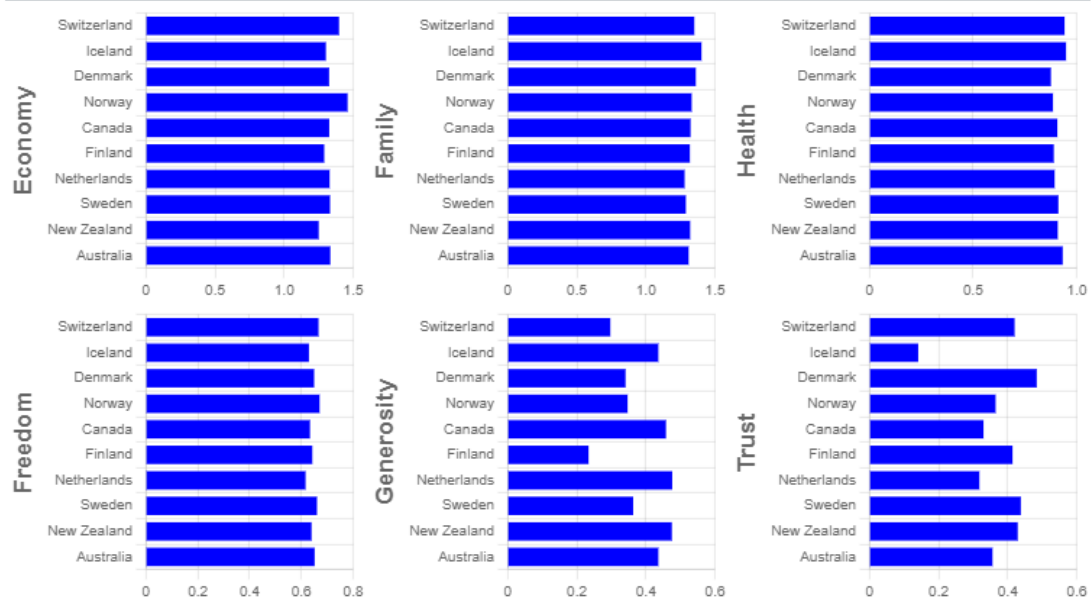**World Happiness Index**   Rankings   Search   Factors   Register   Login   Logout

Factors

Year: 2015   Limit: Number of results   Country: Search

Rank	Country	Score	Economy	Family	Health	Freedom	Generosi...	Trust
1	Switzerland	7.587	1.397	1.350	0.941	0.666	0.297	0.420
2	Iceland	7.561	1.302	1.402	0.948	0.629	0.436	0.141
3	Denmark	7.527	1.325	1.361	0.875	0.649	0.341	0.484
4	Norway	7.522	1.459	1.331	0.885	0.670	0.347	0.365
5	Canada	7.427	1.326	1.323	0.906	0.633	0.458	0.330
6	Finland	7.406	1.290	1.318	0.889	0.642	0.234	0.414
7	Netherlands	7.378	1.329	1.280	0.893	0.616	0.476	0.318
8	Sweden	7.364	1.332	1.289	0.911	0.660	0.363	0.438

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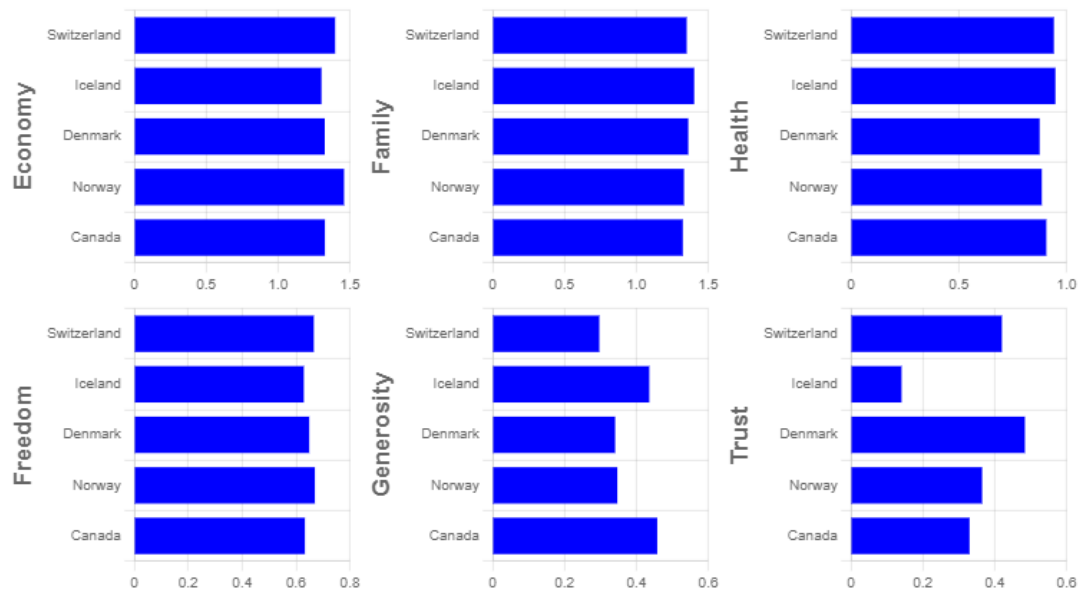## Appendix 7: Set limit in Factors page

World Happiness Index   Rankings   Search   Factors   Register   Login   Logout

Factors

| Year: 2015 | | Limit: 5 | | Country: | | Search |

Rank	Country	Score	Economy	Family	Health	Freedom	Generosi...	Trust
1	Switzerland	7.587	1.397	1.350	0.941	0.666	0.297	0.420
2	Iceland	7.561	1.302	1.402	0.948	0.629	0.436	0.141
3	Denmark	7.527	1.325	1.361	0.875	0.649	0.341	0.484
4	Norway	7.522	1.459	1.331	0.885	0.670	0.347	0.365
5	Canada	7.427	1.326	1.323	0.906	0.633	0.458	0.330

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Appendix 8: Search country in Factors page

World Happiness Index   Rankings Search Factors Register Login Logout

Factors

Year: 2015   Limit: Number of results   Country: australia   Search

Rank	Country	Score	Economy	Family	Health	Freedom	Generosi...	Trust
10	Australia	7.284	1.334	1.309	0.932	0.651	0.436	0.356

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Appendix 9: Search invalid year

World Happiness Index   Rankings   Search   Factors   Register   Login   Logout

Factors

Year: 2022   **Limit:** Number of results   **Country:**   (Search)

Rank	Country	Score	Economy	Family	Health	Freedom	Generosi...	Trust

No Rows To Show

0 to 0 of 0 |< < Page 0 of 0 > >|

Economy

Family

Health

0   0.2   0.4   0.6   0.8   1.0   0   0.2   0.4   0.6   0.8   1.0   0   0.2   0.4   0.6   0.8   1.0

Freedom

Generosity

Trust

0   0.2   0.4   0.6   0.8   1.0   0   0.2   0.4   0.6   0.8   1.0   0   0.2   0.4   0.6   0.8   1.0

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Appendix 10: Set invalid limit

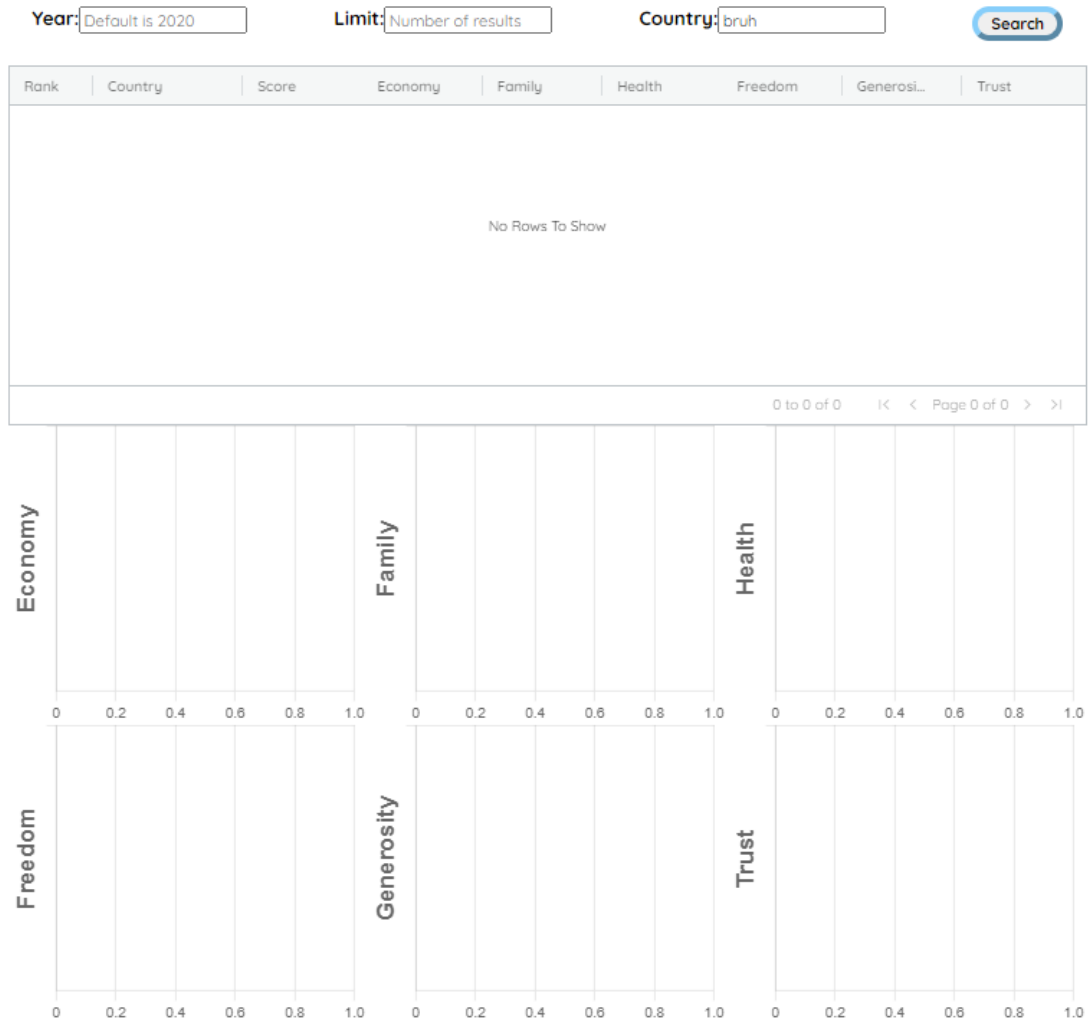**World Happiness Index**   Rankings Search Factors Register Login Logout

Factors

Year: [Default is 2020]   Limit: [0]   Country: [   ]   (Search)

Bad Request, invalid Parameters

Rank	Country	Score	Economy	Family	Health	Freedom	Generosi...	Trust

No Rows To Show

0 to 0 of 0   I< < Page 0 of 0 > >I

Economy

0   0.2   0.4   0.6   0.8   1.0

Family

0   0.2   0.4   0.6   0.8   1.0

Health

0   0.2   0.4   0.6   0.8   1.0

Freedom

0   0.2   0.4   0.6   0.8   1.0

Generosity

0   0.2   0.4   0.6   0.8   1.0

Trust

0   0.2   0.4   0.6   0.8   1.0
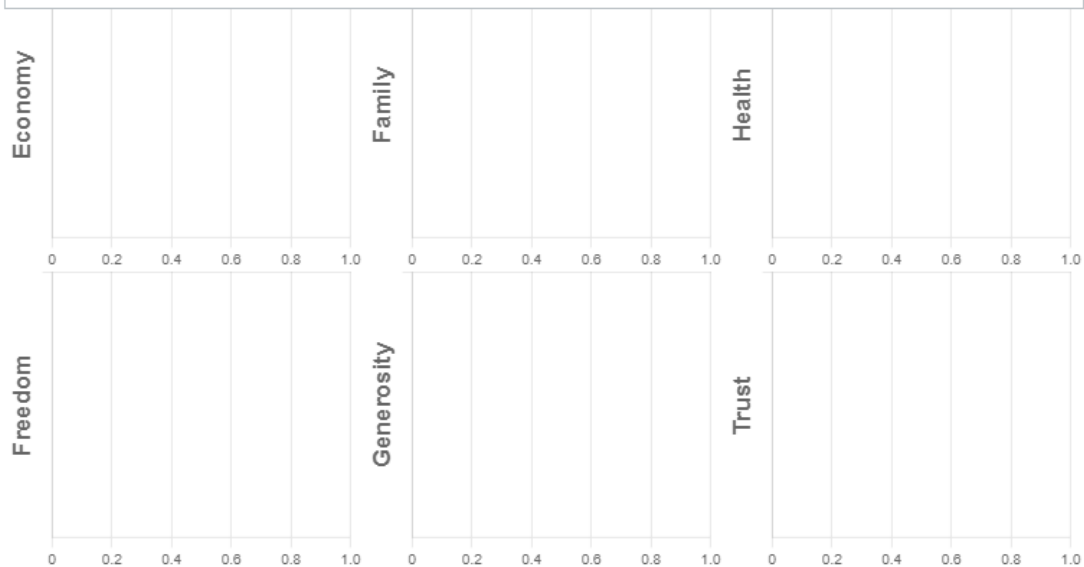
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Appendix 11: Search invalid country

World Happiness Index   Rankings Search Factors Register Login Logout

Factors

Year: [Default is 2020]   Limit: [Number of results]   Country: [bruh]   (Search)

Rank	Country	Score	Economy	Family	Health	Freedom	Generosi...	Trust

No Rows To Show

0 to 0 of 0 |< < Page 0 of 0 > >|

Economy
0   0.2   0.4   0.6   0.8   1.0

Family
0   0.2   0.4   0.6   0.8   1.0

Health
0   0.2   0.4   0.6   0.8   1.0

Freedom
0   0.2   0.4   0.6   0.8   1.0

Generosity
0   0.2   0.4   0.6   0.8   1.0

Trust
0   0.2   0.4   0.6   0.8   1.0

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Appendix 12: Type invalid input into country search bar

Appendix 13: Type invalid input into limit search bar

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Appendix 14: Type invalid input into year search bar

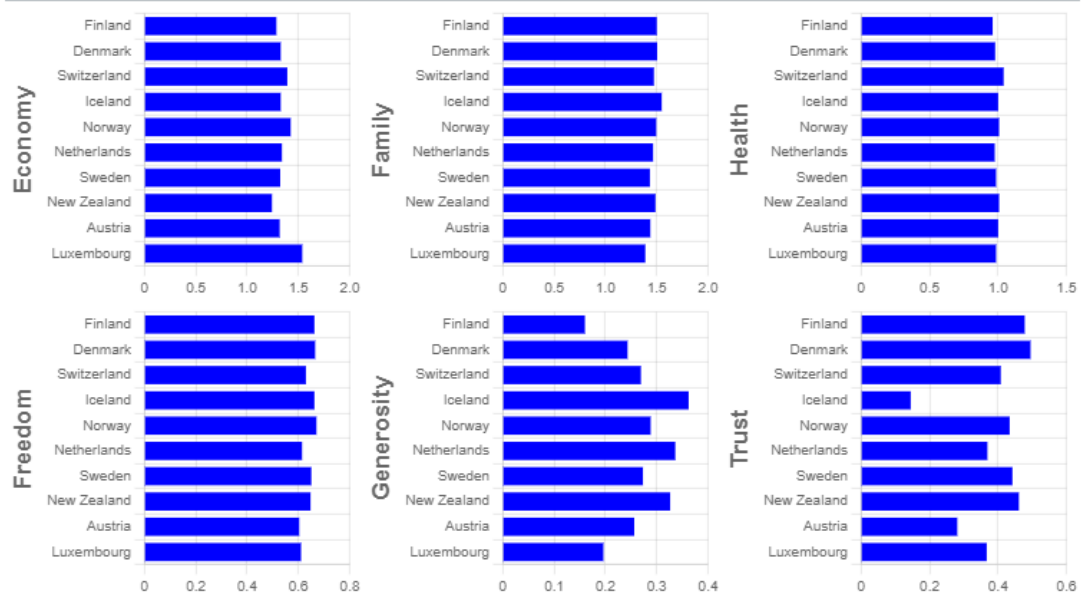**World Happiness Index**   Rankings Search Factors Register Login Logout

Factors

Year: aaaa   Limit: Number of results   Country: Search

Can only be numbers

Rank	Country	Score	Economy	Family	Health	Freedom	Generosi...	Trust
1	Finland	7.809	1.285	1.500	0.961	0.662	0.160	0.478
2	Denmark	7.646	1.327	1.503	0.979	0.665	0.243	0.495
3	Switzerland	7.560	1.391	1.472	1.041	0.629	0.269	0.408
4	Iceland	7.504	1.327	1.548	1.001	0.662	0.362	0.145
5	Norway	7.488	1.424	1.495	1.008	0.670	0.288	0.434
6	Netherlands	7.449	1.339	1.464	0.976	0.614	0.336	0.369
7	Sweden	7.353	1.322	1.433	0.986	0.650	0.273	0.442
8	New Zealand	7.300	1.242	1.487	1.008	0.647	0.326	0.461

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Appendix 15: Register valid account

Appendix 16: Register invalid account

Appendix 17: Login with valid account

Appendix 18: Login with invalid account

Appendix 19: Logout page while logged in

World Happiness Index   Rankings   Search   Factors   Register   Login   Logout

Logout Page

Login Status:
Currently logged in
Logout

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Appendix 20: Logout page while logged out

World Happiness Index   Rankings   Search   Factors   Register   Login   Logout

Logout Page

Login Status:
Currently not logged in. Please log in here

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Appendix 21: Logout of application

World Happiness Index   Rankings   Search   Factors   Register   Login   Logout

Logout Page

Login Status:
Currently not logged in. Please log in here
See you!

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Appendix 22: Use navigation bar

World Happiness Index   Rankings   Search   Factors   Register   Login   Logout

Year Selected: All

[All] [2020] [2019] [2018] [2017] [2016] [2015]

Rank	Country	Score	Year
1	Finland	7.809	2020
2	Denmark	7.646	2020
3	Switzerland	7.560	2020
4	Iceland	7.504	2020
5	Norway	7.488	2020
6	Netherlands	7.449	2020
7	Sweden	7.353	2020

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Appendix 23: Use login link to go to login page.

World Happiness Index   Rankings   Search   Factors   Register   Login   Logout

Login

User Name: [bruh@example.com] Password: [ ] [Login]
Don't have an account? Register Here

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