COVID-19 MAP TRACKER

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DESCRIPTION

- **Covid-19 Map Tracker** gives the COVID-19 related information (Total Cases, Deaths, Vaccines) state-wise via an **interactive map**, where the user hovers over to each state and gets the required information.
- Key Information is readily available at a glance.
- Simulation allows the user to switch between cases and vaccinations information, and gives leverage to the user to check COVID information of each state in the US.
- User takes survey and gives feedback on their experience with the map.

Targeted E - Efficiency

- We focused on improving efficiency.
- Navigating and finding information about a state is as simple as hovering the mouse over the state of interest
- If the user wants to alternate between COVID-19 case and death data, and vaccination data, they can do so by clicking on the appropriate tab with the correct map.
- The map, along with with the information displayed when hovering over a state loads instantaneously.

From our personal experiences of navigating through COVID-19 Interactive Maps, we found it difficult to find the information we were looking for in a timely manner. Some maps would have have no interactivity and would solely rely on a color palette to convey case and death data, while others were inflated with so much information that it took time and effort to find what you were looking for. Additionally, the tools provided by some interactive maps were not user friendly and sometimes required us to reload the entire map in order to revert the map back to its accessible and readable state. We focused on improving efficiency because we wanted to address these issues we encountered and create a more user friendly, interactive map.

Measurement of Improvement - Screen Time

- To determine how well we improved efficiency with each iteration, we had users complete a set of tasks and timed how long it took to accomplish each one.
- If the user completes their tasks within 2 minutes, we believe that the map was effective in providing the information they desired in a straightforward and timely manner.
- Most importantly, we want to see the total user time spent in the map looking for the requested information decrease over each iteration.

Target Population

- Individuals in the U.S. with access to a PC/Tablet/Phone, aged 18+, who are worried about the country's or state's COVID-19 status as far as cases, deaths, and vaccinations.
- Frontline workers, Food delivery guys, restaurant owners etc.
- Individual who wants to stay up to date with the current pandemic situation.

This target group are the most likely to continuously check in on the state of affairs surrounding the pandemic. In this group however, they are using different sites to obtain information, such as the NYTimes map and the CDC map. We aim to centralize this data on one singular map, so everyone has access to the same data, as well as making their search for the pandemic metrics much faster. These people would be able to find the most essential and relevant data concerning the pandemic using our map.

Industry Data

- We have researched into who is actively keeping up to date with the COVID-19 pandemic situation. According to the CDC site where it tracks demographics and their cases metric, the people most affected by COVID-19 are people aged 18 to 54 years. We think that because their age group is affected the most, those would be the same people that would stay up to date on the pandemic situation.
- There are several other COVID-19 interactive maps on the Internet, most notable the NYTimes map and the CDC map.
    - The NYTime map provided a very detailed view of data by county. There were 5 different views: Hot Spots, Risk Levels, Total Cases, Deaths, Cases per Capita
    - The CDC maps were minimalistic and focused on state data. However, each map had to be accessed on a different webpage

Referenced Data: https://covid.cdc.gov/covid-data-tracker/#demographicsovertime
Interactive maps used as references:
https://covid.cdc.gov/covid-data-tracker/#cases
https://covid.cdc.gov/covid-data-tracker/#vaccinations
https://www.nytimes.com/interactive/2021/us/covid-cases.html

Persona

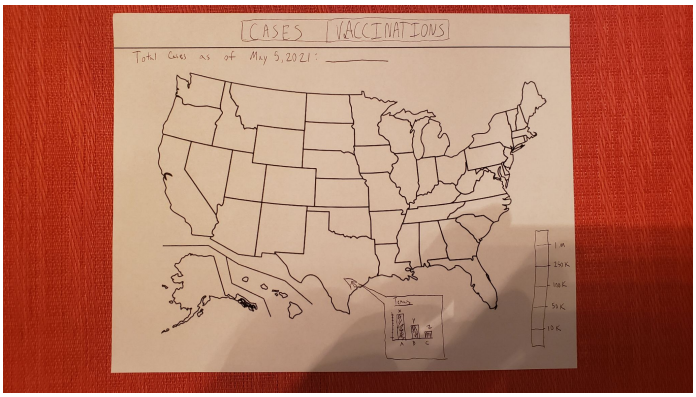
Name: Stan Roger
Family: Single
Occupation: Analyst

Stan is working as an analyst and wishes that there was one centralized site that gives valuable information on the pandemic. He is currently working from home.

Having been kept exceptional on the circumstance through different COVID-19 tracking sites, he has tracked down that most locales were unintuitive and crowded, going to different site pages to discover data on the same topic.

Stan's associate tracked down an intuitive guide that acts as that unified hub and recommended that Stan investigate it. Stan is pleasantly surprised. As an analyst and statistician, he found it satisfying to find all the information he needs in the palm of his hand. Knowing that he had to keep up to date with the current trends in the pandemic situation, not only was it easy to navigate and find data, he would be able to do his job faster, as one of the projects he was assigned to deal with COVID-19 statistics and how the recent increase in vaccinations would affect workflow if it allowed the employees back into the office

First Design - Paper Prototype



We wanted to include data sets that we assumed people would want to see. Whether or not that is the case remains to be seen once the users interact with the map. We would put more general data sets in favor of specific data sets in order to cast a net over a wider audience that would want to see this type of information. For the color scheme, we wanted to take colorblindness into account, and choose an appropriate color palette for accessibility. In addition, the hover functionality would include a bar graph visualization of our selected data sets.

A reminder that our targeted E is efficiency. To measure whether or not the efficiency of our design is improved, we have a set number of timed tasks for our users to do while they are on the map. If the completion time meets the requirements of our measurement of improvement (within 2 minutes for completion of all tasks), then our E will have improved. If not, there are obviously changes that we'll have to make in order to reduce the completion time.

This map is targeted towards people aged 18+ who are concerned about the state of affairs concerning the pandemic in the U.S. The data in the hover tooltip shows information that is generally relevant to all people in our target audience.

The simplicity of our map is what sets it apart from the other interactive maps. Our map features the data at a statewide level as to lessen the memory load on the users as well as processing the map. In this way, the users won't be burdened with knowing county-level information, and can focus on state information.

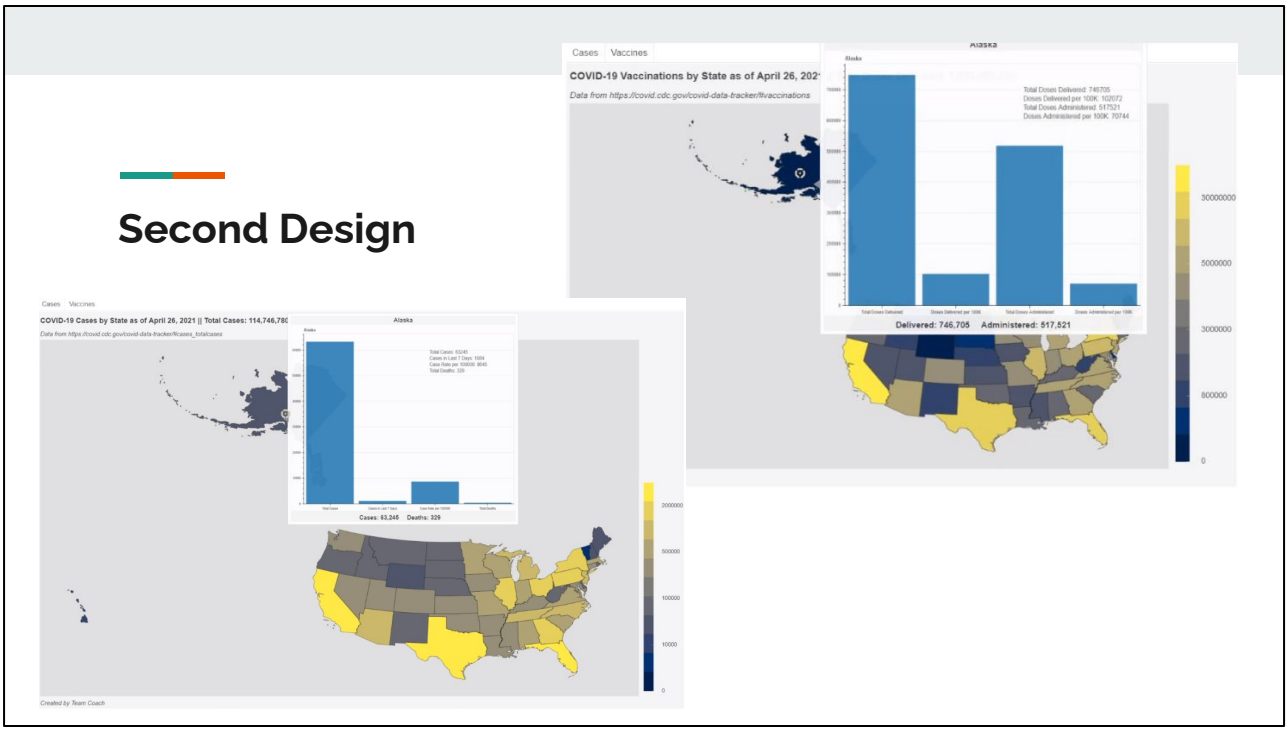
Our site holds two maps within one page, as opposed to having to navigate to another webpage for another map. All maps are preloaded into one page, and users can switch between the maps using the tabs up at the top-left corner of the site. It is designed this way to lessen the amount of time users spend navigating between web pages to find the information they need.

Tasks for Testing

1. Find the number of COVID-19 cases in New York, California, Texas, New Jersey, and Florida
2. Find the number of vaccinations delivered in New York, California, Texas, New Jersey, and Florida
3. Find the number of COVID-19 deaths in Massachusetts, Rhode Island, Delaware, and Maryland
4. Find the number of vaccinations administered in Massachusetts, Rhode Island, Delaware, and Maryland.

We chose this set of tasks for several reasons:
We expected that they would have an easy time finding the bigger states and finding their relevant information. However, we wanted to see how they would perform when searching for information in the smaller states such as Delaware or Rhode Island. We intentionally chose these smaller states to test the readability and accessibility of our map. We want users to be able to quickly find information about any state regardless of their size or location.

After the completion of the test, users were sent a Google Forms survey to complete so we could see what worked, what did not, and where we could make improvements.



This design is based off of the first paper prototype design.

Second Design - User Results (6 new users)

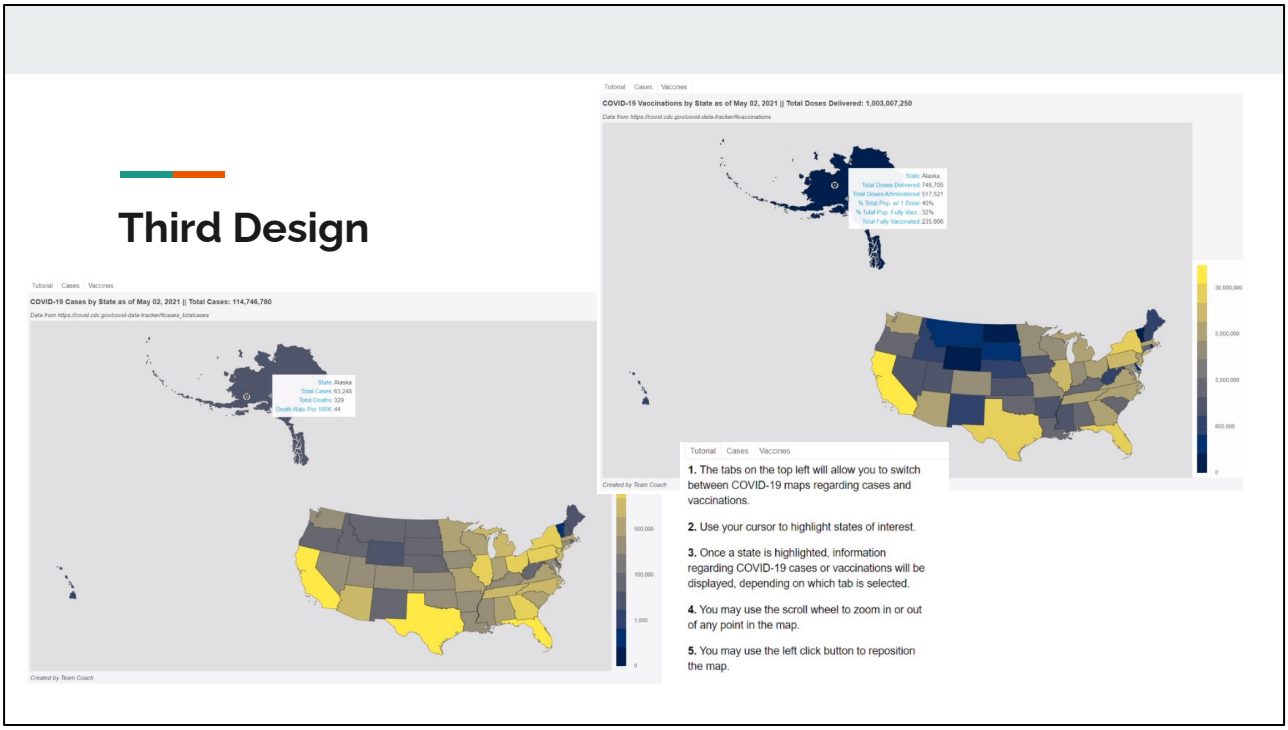
User	Task 1	Task 2	Task 3	Task 4	Total Time
Yasmin*	1 min. 20 sec.	1 min. 15 sec.	2 min. 45 sec.	1 min. 10 sec.	6 min. 30 sec.
Whitney*	10 sec.	35 sec.	33 sec.	27 sec.	1 min. 45 sec.
Yu*	50 sec.	53 sec.	55 sec.	1 min. 6 sec.	3 min. 44 sec.
Jerry*	15 sec.	12 sec.	18 sec.	15 sec.	1 min.
Jake*	41 sec.	33 sec.	53 sec.	39 sec.	2 min. 46 sec.
Steven*	1 min.	37 sec.	50 sec.	48 sec.	3 min. 15 sec.

NOTE: * denotes new user

These results were mostly expected on our end. Task 3's average completion time is noticeably longer than the rest of the tasks. Task 3 asks the users to find information on the smallest states in the U.S., which they struggled with; without a zoom/pan tool at their disposal, the users had difficulty accessing the information from the smaller states. Task 1's average time was the second longest among the task times. This is due to the fact that the users were not provided any documentation on how to operate the map. This was intentionally left out to see how much documentation was required, if necessary, and how users would initially respond without this information given. Yasmin in particular took the most time because she is not computer savvy. We wanted to see how well someone with little computer experience would perform as well.

Second Design - User Feedback

- In general, the majority of the users did not know at first what the controls were for the map. In the first iteration, the map only had the hover mechanic, so there was no zoom or panning tool.
    - All users noted that it was very hard to look for the smaller states, let alone hovering over it for information. They all suggested to implement a zoom/pan function.
- A majority of the users asked for different data sets to be shown, such as adding data on the percent population and number of people who were vaccinated. They also noted that they did not want to see Doses Delivered/Administered per 100K.
- Overall, the users liked the idea of the map, and found that it is generally readable for the most part aside from the glaring issues, but the color scheme was not desirable.



In this third design, we applied user recommendations from the first survey. This is what was added/changed::

1. New tutorial tab in which it explains the functionality of the map. This is the first thing the users will see upon loading the site.
2. Following user requests from the first survey, the cases map now reports on:
    a. Total Cases
    b. Total Deaths
    c. Death Rate Per 100K
3. The vaccines map now reports on:
    a. Total Doses Delivered
    b. Total Doses Administered
    c. Percent of Total Population with 1 Dose
    d. Percent of Total Population Fully Vaccinated
    e. Total Number of People Fully Vaccinated
4. Removal of bar graph image from the vaccine map; we wanted to see if the users would prefer the non-image tooltips over the bar graph.

Third Design - User Results (8 Users - 2 new)

User	Task 1	Task 2	Task 3	Task 4	Total Time
Yasmin	15 sec.	19 sec.	1 min. 4 sec.	1 min.	2 min. 38 sec.
Whitney	25 sec.	20 sec.	30 sec.	20 sec.	1 min. 35 sec.
Yu	1 min. 41 sec.	37 sec.	31 sec.	26 sec.	3 min. 15 sec.
Jenny*	14 sec.	32 sec.	1 min. 4 sec.	20 sec.	2 min. 10 sec.
Jerry	10 sec.	10 sec.	11 sec.	10 sec.	41 sec.
Jake	27 sec.	16 sec.	19 sec.	16 sec.	1 min. 19 sec.
Steven	35 sec.	35 sec.	1 min. 1 sec.	30 sec.	2 min. 35 sec.
Justin*	1 min. 30 sec.	1 min.	1 min. 20 sec.	1 min. 10 sec.	5 min.

NOTE: * denotes new user

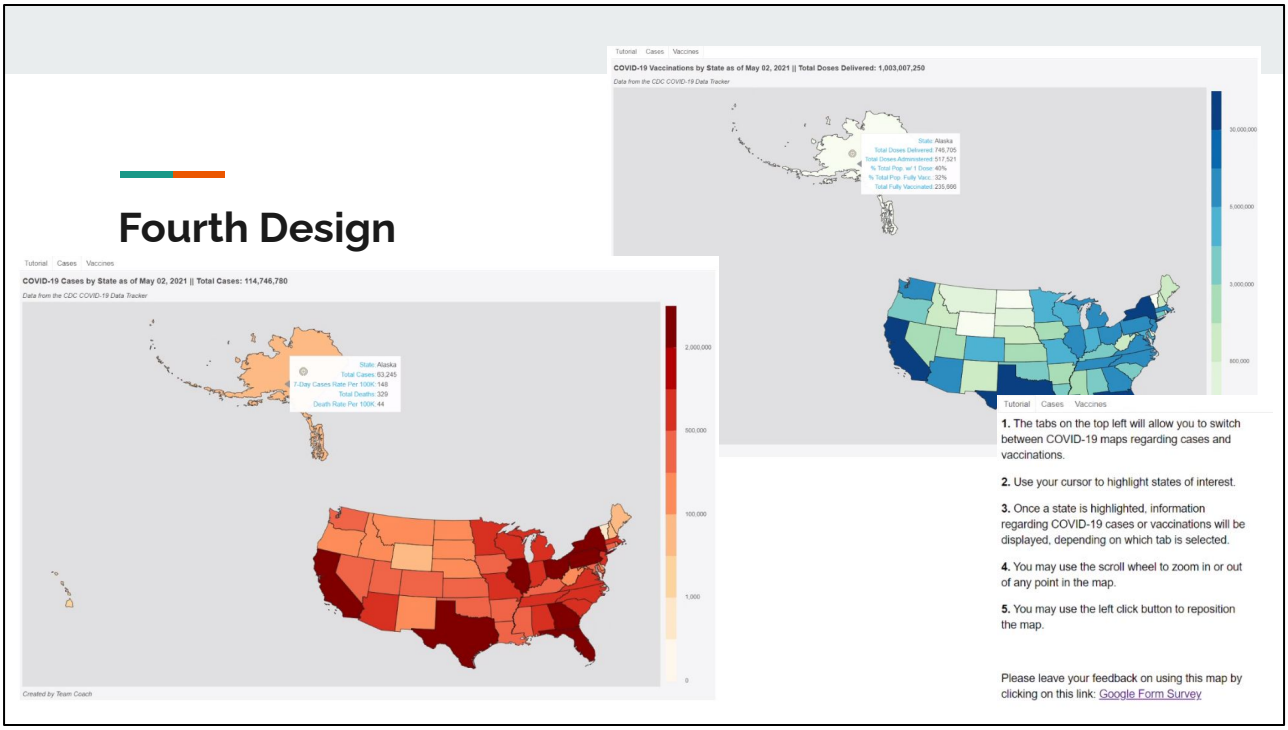
Two new users were added for testing while the rest were returning users from the first iteration. Yasmin performed significantly better in the second test. Yu in particular took extra time to familiarize himself with the zoom and drag features within the first task, which would explain the inflated completion time. He also took the time to search for information in other states as well. Justin, one of the users, is also not technologically savvy, so he did not perform as well as the others. However, he still did complete the tasks faster than Yasmin did in her first test. Jenny was also added to this iteration but she finished slightly over two minutes, which is what we consider to be a success. Overall, all returning users displayed improvements in their performances, half of which saw completion times roughly within 2 minutes.

These improvements in completion times could be attributed to the zoom and drag functions added. Users had an easier time maneuvering through the smaller states using these two features. Furthermore, the tutorial was helpful in describing to users what actions were possible when using the map.

Third Design - User Feedback

- The most notable change to this design was the removal of the bar graph image from the hover. An overwhelming majority of the users preferred the removal of the bar graph, as it improved the map readability.
- Additionally, the removal of the bar graphs from the hover tools improved map and information load times when hovering over a state.
- The users asked for a different color palette as they did not find it visually appealing.
- A tutorial tab was added, and it's the first thing the users see upon entering the site. The general consensus is that it is a helpful feature, but some chose not to read it regardless.
- This design added zoom and drag functionalities. All users agreed that they were extremely helpful, as they could zoom in on the smaller states and reposition the map to nearby states.

Overall, this iteration garnered a warmer reception from its users. The addition of the zoom/pan tool really made the user's navigation experience easier. The tutorial added was simple and straight to the point. This allowed users to quickly familiarize themselves with the functionalities of the map. Furthermore, by keeping the tutorial succinct, users were able to absorb all the information quickly and without losing interest. For the next iteration, we planned to make the map more aesthetically pleasing while also maintaining a color blind friendly experience. The majority of users requested that 7-Day Cases rate per 100K be added to the cases map.



1. Following user requests from the second survey, we added 7-Day Cases Rate Per 100K data set to the cases map.
2. The cases map is now represented by hues of red while the vaccinations map is represented by hues of blue.
    a. Both palettes have been confirmed to be color-blind friendly.
    b. Furthermore, this helps users visually distinguish between each map when searching for information
3. We temporarily added a link to the survey at the bottom of the tutorial tab.

Fourth Design - User Results (8 users - 1 new)

User	Task 1	Task 2	Task 3	Task 4	Total Time
Yasmin	20 sec.	14 sec.	43 sec.	24 sec.	1 min. 41 sec.
Whitney	16 sec.	10 sec.	19 sec.	12 sec.	57 sec.
Yu	1 min. 39 sec.	22 sec.	26 sec.	22 sec.	2 min. 49 sec.
Jenny	18 sec.	34 sec.	32 sec.	13 sec.	1 min. 37 sec.
Phil*	55 sec.	29 sec.	31 sec.	28 sec.	2 min. 24 sec.
Jake	17 sec.	10 sec.	13 sec.	15 sec.	56 sec.
Steven	40 sec.	20 sec.	33 sec.	35 sec.	2 min. 10 sec.
Justin	45 sec.	27 sec.	1 min.	28 sec.	3 min.

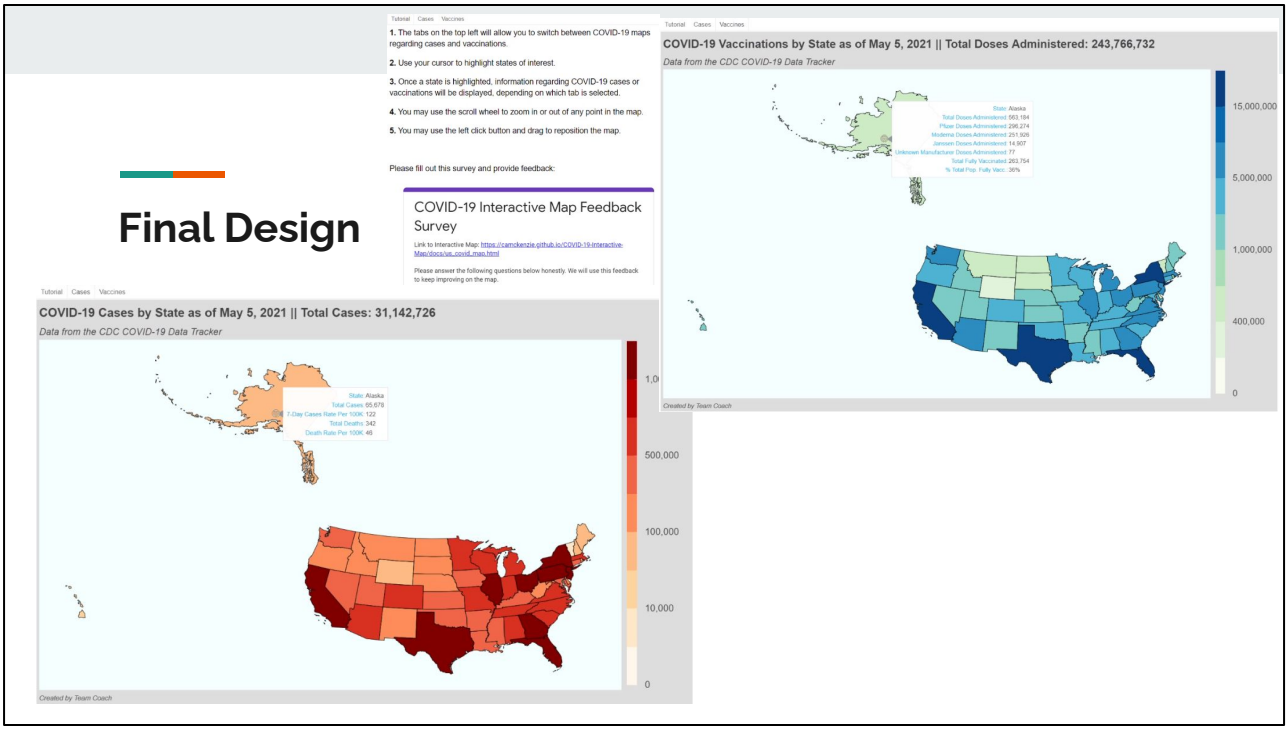
NOTE: * highlights new user

Yu spent extra time within the first task to look over the changes that were made from the previous iteration. He also took the time to comment how much better and more readable each graph was. If you discount the time he spent exploring the map, his completion time would be closer to two minutes. Phil, a new user, almost completed his tasks within 2 minutes, suggesting that our improvements are effective to newcomers as well. Overall, the total completion time has been reduced yet again in this iteration. Four users completed their tasks within 2 minutes and two users finished within 2 minutes and 24 seconds. Considering how well these users performed compared to our 2 minute measurement of improvement maximum completion time, we believe that we effectively improved the efficiency of our program.

Fourth Design - User Feedback

- The most notable change was the differing color schemes for the cases map and the vaccines map. All the users liked the change in color scheme, as it visually correlated to the type of data being presented, as well as it being colorblind-friendly.
- Most users wanted to see the specific vaccine metrics (Moderna, Pfizer, Janssen, etc.) in addition to the total metrics.
- Most users felt that the “total doses delivered” metric was less useful than the “total doses administered” metric and suggested to focus on that metric instead.

The fourth design did not have as much of a drastic change as the third design. The same tools were provided. We simply changed the colors and the metrics being reported.



- We have increased the font size for all text surrounding the map to improve readability
- Added a more visually appealing background to make the U.S. stand out more
- Updated the data sets according to the user feedback from the last iteration to include:
    - Added: Pfizer, Moderna, Janssen and unknown manufacturers total doses administered data
    - Removed: Total Doses Delivered data
    - Nothing changed in the cases map, as the users were satisfied with the data being presented
- Not much had to be changed from fourth to final design. Users were very satisfied with previous iteration.

Demo of Final Design

Here is a link to a demo of the interactive map:

- https://youtu.be/I_rfTL1TBfA

This map will work best if you are on a desktop computer using Chrome, Firefox, or Safari.

PAR: Perception Attention and Retention Review

Perception:

There is a separate map of the U.S. in both the cases and vaccinations tabs. Each map has its states colored in using a different color palette, so the user can visually distinguish which map is being displayed. The states are separated with clearly drawn black lines. The hover tool is slightly transparent, so it does not interfere with viewing the map at any point in time. The hover tool does not display too much information as to overwhelm the user or cover too much of the map when being displayed. Furthermore the information displayed is consistent and expected for the tab currently selected. When the information is displayed, the data is clearly written out in a clean font, which is clearly legible. The color bar at the right helps users perceive how affected each state is by COVID-19 cases or how many vaccines have been administered at a glance of the map.

PAR: Perception Attention and Retention Review (cont.)

Attention :

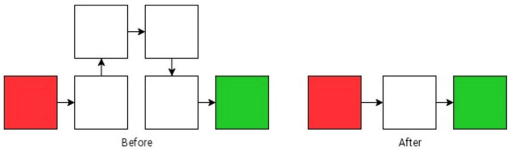
The tutorial was written as short and as simple as possible. Users will require very little time to read through it and understand how to navigate through the map. The hover tool was constructed in a way as to display the information instantaneously; when users hover over a state looking for data, they do not have to wait, no matter how fast they hover their mouse over consecutive states in a row. Switching displays from cases data to vaccination data is as simple as a single click to swap to a different map and tab. The users are able to access information as quickly as possible, so as to not lose attention or interest.

PAR: Perception Attention and Retention Review (cont.)

Retention :

Navigating through the map is simple and straightforward. The user only has to hover over a state with their mouse to access information on that state's case and vaccination data. Whenever the html file is loaded, it begins at the tutorial tab, which instructs the user how to use the map. This tutorial can serve as a reminder of how to utilize the map and what functions are available to the user. There is very little for the user to retain, so given the above retention is met easily.

Simplicity Review



Reduce:

- Reduced functionality to only zoom and drag
- Controls/tool buttons are hidden
- User can access tutorial, cases, and vaccinations tabs with one click

Organize:

- Cases and Vaccinations data broken up between two tabs/maps
- Only essential information displayed when hovering over state

Time:

- Loading the information upon hovering over a state is instantaneous
- No wait time between swapping maps and loading the maps

The three laws of simplicity that were most relevant to our project were reduce, organize, and time.

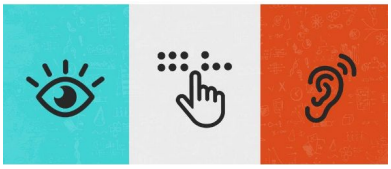
Giving the user too many functions to work with could lead to more errors.To keep the map simple, users focused, and prevent overwhelming the user with options, we decided it was best to reduce user features to only zoom and drag. They would only need these tools to investigate smaller states, which are harder to distinguish, and to reposition the map to other, nearby small states. We did not see the purpose in adding any other tools. Furthermore, we removed the controls toolbar, so users did not have to manually select a tool to use when they wanted to use it; they were not able to use both tools at once. Lastly, only one click is needed to switch between each tab, minimizing the number of clicks necessary.

There is a lot of information regarding COVID-19 available, and we wanted to provide users with an interactive map that would provide this data without overwhelming them. We organized cases and vaccination data into separate tabs, so the user could easily select which type of information they wanted to receive. Additionally, to help distinguish between the two maps at a glance, we used two separate color palettes, both of which are color-blind friendly. Through testing and user feedback, we were able to create two separate maps which displayed data that was most important to the user; anything information that was considered redundant or unhelpful was removed.

We believed the user should be able to find their information as quickly as possible or even at a glance. Upon hovering over a state, an information tooltip is immediately

shown by the state of interest containing COVID-19 metrics. Swapping to another state and getting their information takes no time at all. All the maps are preloaded on the site, so swapping to a different map takes virtually no time at all since the map is already loaded and ready for viewing.

Accessibility Review



Color-Blindness

- Both maps use colorblind-friendly palettes.
  - They allow users to see the severity of COVID-19 cases and the progress of U.S. vaccination administration at a glance.

We felt that color-blindness was the most applicable and relevant to our map. From the start, we had planned to convey number of cases and number of vaccinations with a sequential color palette, where the hue would be darker in states that had more cases and more vaccinations. At first, we considered creating a toggle to switch to a color-blind mode of each map. However, we felt it would be more inclusive to simply create both maps using color-blind friendly palettes only. Additionally, by scrapping this toggle, we were able to improve the simplicity of our map, specifically reduction and time principles, more effectively. To ensure that we used color-blind friendly palettes, we used the following website to create our color schemes: https://colorbrewer2.org/

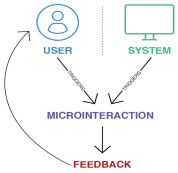
Heuristic Evaluation

We are using Kessel's Heuristic Evaluation List:

- Simple and natural dialogue
  - The tutorial uses simple language
  - The data is conveyed using simple language
- Speak the users' language
  - Functions refer to left click button and scroll wheel
- Minimize the users' memory load
  - Geometry of state images simplified
  - Bar graphs removed from tool tips
- Consistency
  - Maps created with same proportions and functions.
- Feedback
  - Survey included for feedback
- Prevent errors
  - Tutorial set as starting page
  - Limited tools
- Help and documentation
  - Tutorial tab provides instructions on how to use the map

The map satisfies 7 of the 10 most applicable heuristics on Kessel's Heuristic Evaluation List. The system provides data concerning COVID-19 cases, deaths, and vaccinations using as simple language as possible. The documentation provided gives instructions to users using natural language as well. Additionally, the tutorial speaks the users language by referring to only the left click button and the scroll wheel to utilize the program's functionality. To minimize the users' memory load and improve performance and load times, we simplified the geometry of the states with a simple line of code. Additionally, we removed the bar graphs from the hover tool, allowing data to load instantaneously, no matter how quickly the user hovers their mouse over consecutive states. The COVID-19 case and vaccination maps are consistent in which they are the same size, run the same tools, and convey information in the same exact way; by hovering over a state. A Google Forms survey was inserted into the tutorial tab to allow users to provide feedback for future iterations of the map. Finally, we set the tutorial as the starting page in hopes that users would read it, learn how to use the map, and decrease the likelihood of running into any errors. Furthermore, tools were limited to only the zoom and drag functions to leave even less room for error.

Microinteractions



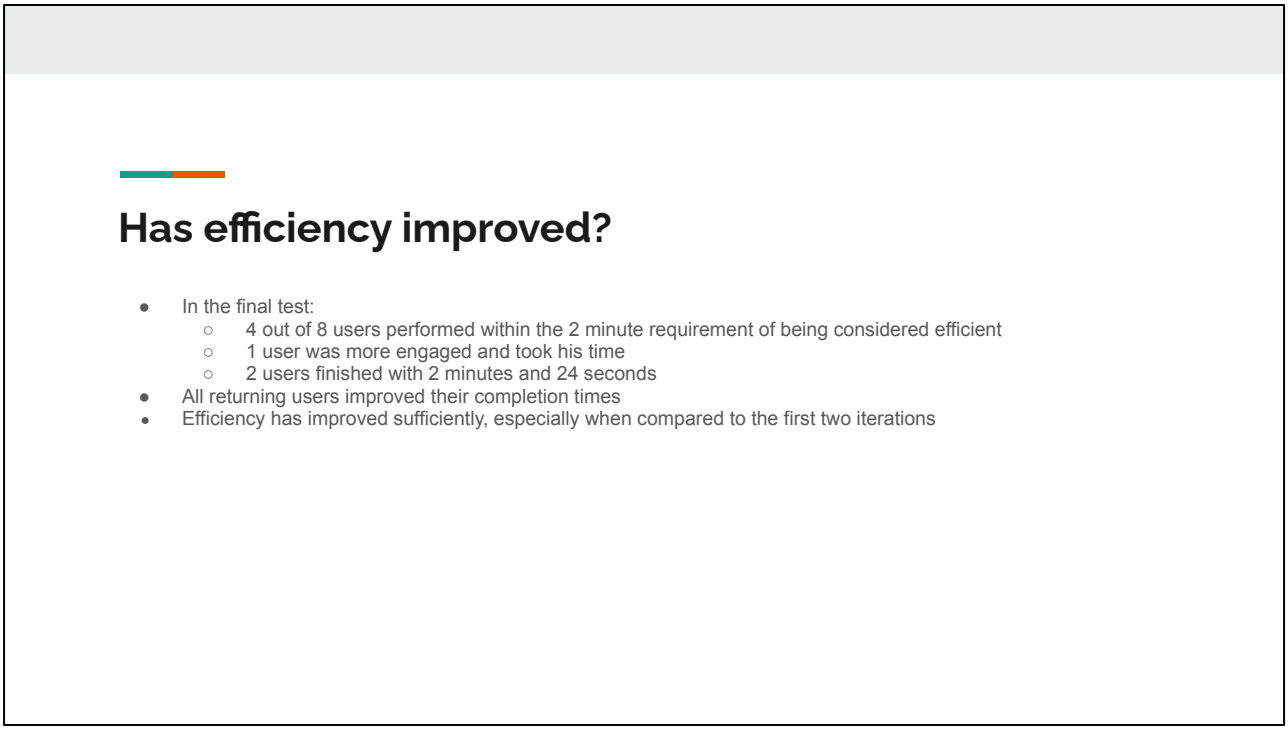
- Trigger
  - Hovering over a state triggers this microinteraction
- Rules
  - Hovering over a state will generate a tooltip with COVID-19 information about the state
- Feedback
  - Hover tool will display the information tooltip next to the state
- Loops and Modes
  - As long as mouse is hovered over a state, then the tooltip will remain until the cursor is moved to a different state or off the map

- Trigger
  - Left click button on tab
- Rules
  - Click tabs on top left to switch between maps
- Feedback
  - Clicking on a different tab will display map of different color scheme
    - Clicking on tutorial tab will show text and survey
- Loops and Modes
  - Tab selected affects which information is displayed (Cases vs Vaccination data)

The left side describes the hover tool functionality while the right side describes switching between tabs/modes.

Final Data from Users

- After adding the different color schemes, users appreciated the color scheme and commented on how appealing the map looks.
- As we added the zoom and drag feature, and changes to the font size, as the users are already familiar with the states and their shapes, hovering on each state has become a lot more easier for them.
- Adding specific vaccine metrics (Moderna, Pfizer, Janssen, etc.) in addition to the total metrics, simplified the decisions for users as to which vaccine they can go for based on users' consumption.



Given the results from our tests, efficiency has clearly improved.

What we considered to be meeting the efficiency requirement was if a user was able to complete all of their assigned tasks with 2 minutes. In our first test, only 2 out of the 6 total users finished their tasks within 2 minutes. Everyone else needed at least 3 minutes to familiarize themselves with the map and find the required information. By the final test, 4 of the 8 users had completed their objectives within our threshold. One user's time was inflated because he was engaged and taking his time looking up information from other states; keeping that in mind, he could have easily completed everything within 2 minutes. Two users were finished within 2 minutes and 24 seconds, which is very close to 2 minutes. Regardless, all returning users improved their completion times.

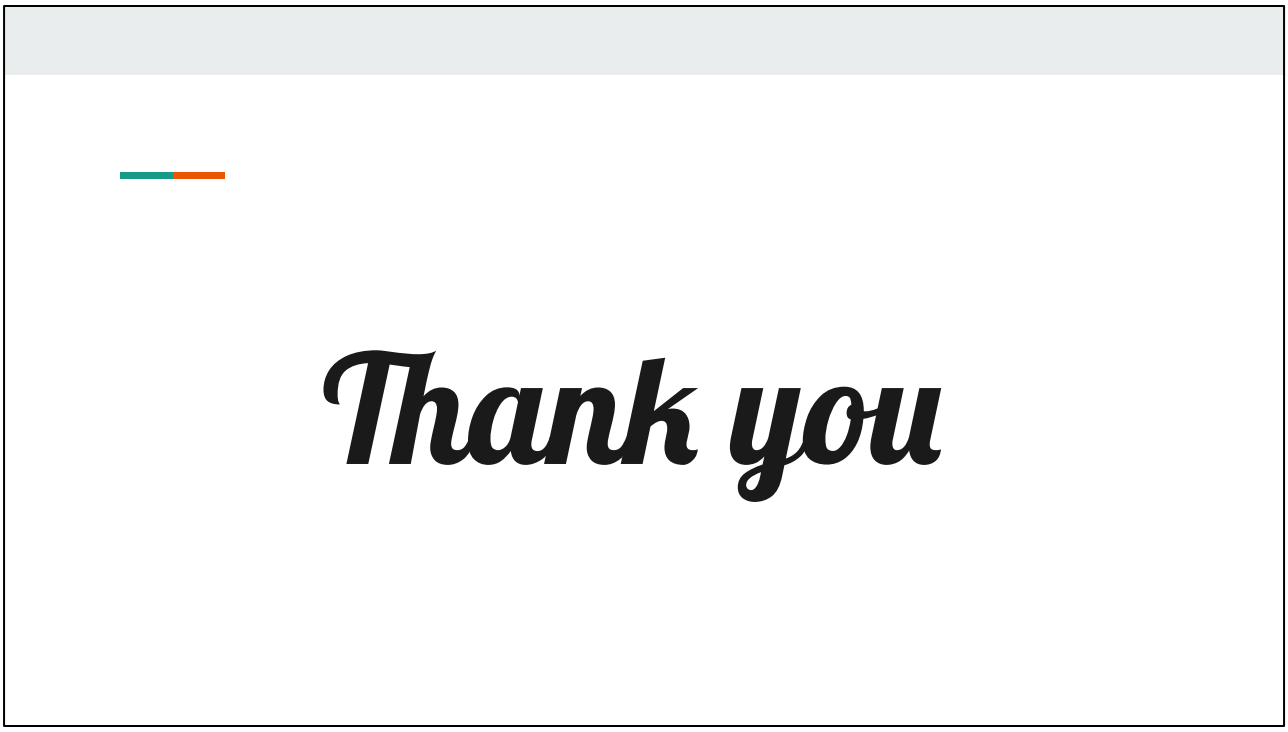
Future Work

- Include abbreviations of states
- Include a drop down box to access information for specific states
- Have data automatically update
- Include historical data where user can obtain cumulative results at specific dates
- Expand COVID-19 Interactive Map to a WorldWide Map

For the time being, we will not be continuing this project. Perhaps in the future when we gain access to the tools necessary to automatically update data, we may revisit this project.

References

https://covid.cdc.gov/covid-data-tracker/#demographicsovertime
https://www.nytimes.com/interactive/2021/us/covid-cases.html
https://covid.cdc.gov/covid-data-tracker/#cases
https://covid.cdc.gov/covid-data-tracker/#vaccinations
https://colorbrewer2.org/


Thank you