

SPORTS



FINAL

# DAILY NEWS

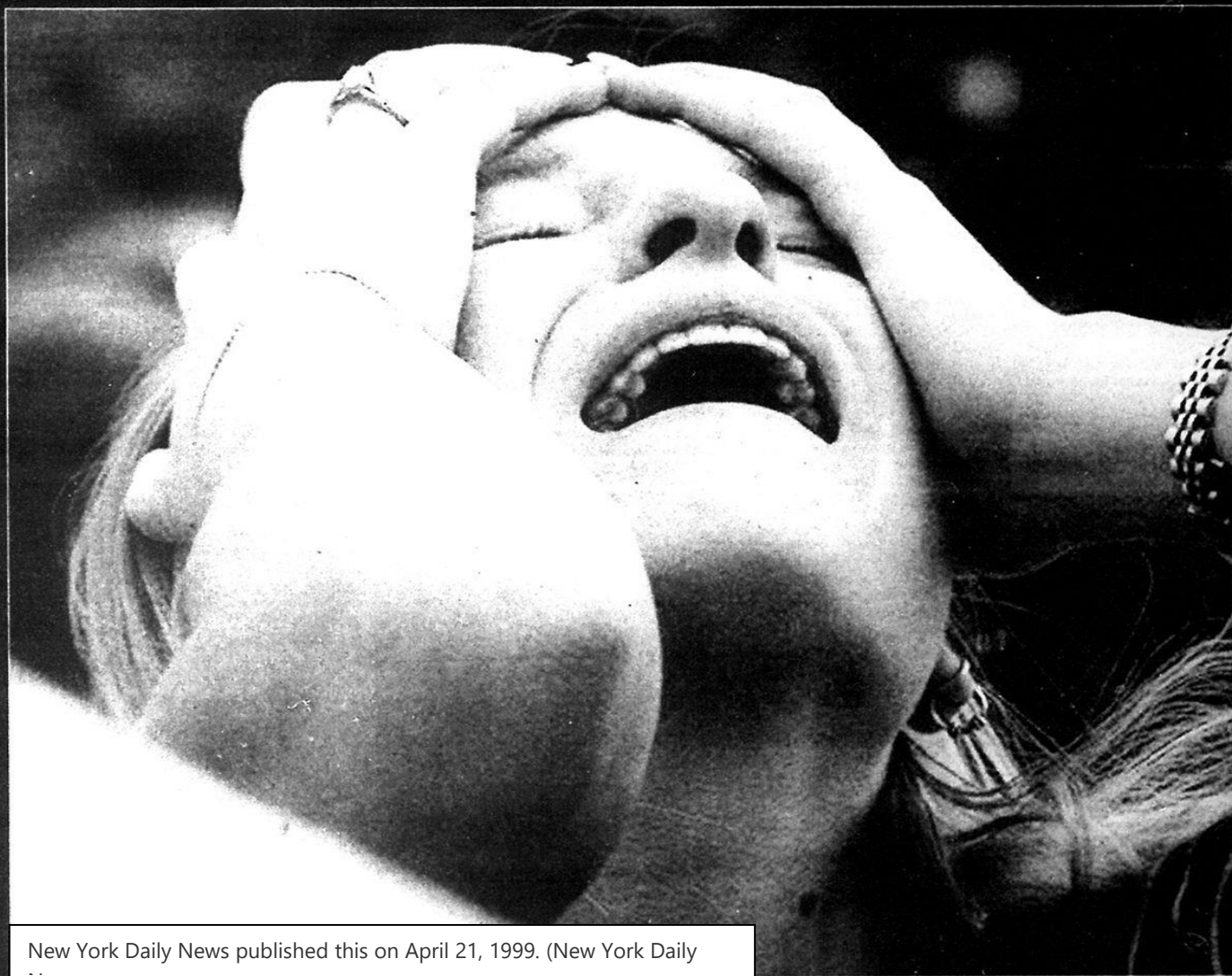
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NEW YORK'S HOMETOWN NEWSPAPER

Wednesday, April 21, 1999

## WHAT CAUSES THE US SCHOOL SHOOTINGS?



New York Daily News published this on April 21, 1999. (New York Daily

**Giggling gunmen invade high school  
in suicide mission, killing up to 25**

12 PAGES OF COVERAGE BEGINS ON PAGE 2

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## Introduction:

Columbine was not the first shooting that was witnessed by United states but it was one of the worst shootings in the history of United States and gathered attention of people from all over the world. It's been two decades since the fateful shootings, but the rate of shooting incidents has only been increasing.

There have been several heated discussions on reforming the gun laws in US and no action has been taken by the government despite reports showing widespread public support for measures to prevent these tragedies. A recent mention of how the NRL plays an important role in controlling the gun laws in US sparked my interest in doing a visualization report to shed light on the increasing trend of school shootings for past two decades. ("New Zealand just did it. Why not the US?", 2020)

Obtaining verified datasets for this project was bit of a task and involved lot of research. The entire narrative makes use of three to four different datasets combined together to shed light on the shooting's incidents for past 20 years, highlighting the number of casualties, investigating time trends, suspects and their affiliation with school to derive the main cause behind these tragedies. The main dataset that was used for the entire project was from-K-12 School Shootings website. ("Dataset - K-12 School Shooting Database", 2020)

## Intended Audience:

**General Public:** The narrative helps in finding the true cause behind these gun tragedies and strong protests from the civilians might push the government to reform the gun laws thus reducing the increasing number of gun tragedies in US.

## Design:

**Sheet 1:** This sheet has all the ideas that I had for visualizing my dataset. In this step I decided on the datasets I would use and drew out all the rough ideas I had in my mind. I then filtered out all the redundant graphs and finalized on three ideas. These three ideas are explained in detail in the subsequent design sheets.

**Sheet 2:** The designs in the sheet set the stage for the story by showing the overview of incidents from past 20 days with the help of a dot distribution map. To give more control of exploring the data to the user, I decided to include an animation element which was inspired by Boerick's design. This animation helps the user to control the duration for which he would like to explore the shooting designs. When hovered, the dots in the map give insightful information on the shooting incidents.

In continuum to the above design, I came up with an idea to visualize a section of time frame to study any patterns in the occurrence of these shootings. Hence, I designed a bar chart which shows the distribution of school shootings by day and month for two years.

**Sheet 3:** This sheet focuses on providing information on suspects. I was inspired by a blog I read to design a pyramid graph to show the distribution of male and female suspects across different categories like the overview ( which gives information on the youngest shooter and the average age of the shooter), Weapon type and suspects affiliation with school. The pyramid chart is provided with buttons for the user to navigate between the categories.

**Sheet 4:** This sheet focuses on deducing the causes behind the shooting incidents. I designed a doughnut chart to show the distribution of incidents across various different reasons of shootings. Hovering on each slice will show the information on the arrows inside the doughnut hole.

**Sheet 5:** This sheet presents a basic outline of the web application I have designed. It contains all the designs in the above sheets. Each design is placed has its own SVG element to avoid overlapping of the images while the user scrolls down the application. More details on the implementation is shared in the following pages.

#### Designs proposed but not implemented:

1. **Stacked Bar Chart-** The pyramid bar graph seemed the right choice for showing the distribution between the genders than the stacked bar chart so this idea was not taken forward.
2. **Radial Chart-** In my opinion, the radial chart would have been an intuitive and visually appealing design for showing the causes behind the shootings but implementing it was hard as I couldn't find sources that would help me fit my design expectations.

## Implementation:

### Dot Density Map :

I had several designs in mind to show the overview of the shootings for two decades but I chose to implement Boeric's design as the information provided by this visualization was easy to read and gives more control to the user on the data, he/she wants to explore.

This was very tough to implement as it involved Map Box. The necessary information for the map was extracted from the dataset but it lacked the co-ordinates to plot the points on the map. So, I uploaded the dataset to tableau and exported data with coordinates to feed to an online tool which converted the file to a .geoJSON format.

Boerick's design was implemented with classic Mapbox JS and the current version of Mapbox GL was not compatible with his code("Mass Shootings in the US", 2020) . A considerable amount of time was spent on building an interactive map and syncing with code but it failed. In the end I decided to use Boerick's Mapbox.js design to sync the code with my data. The initial design was

changed to show data transition between months which required understanding cross filter JavaScript library to implement the animation.

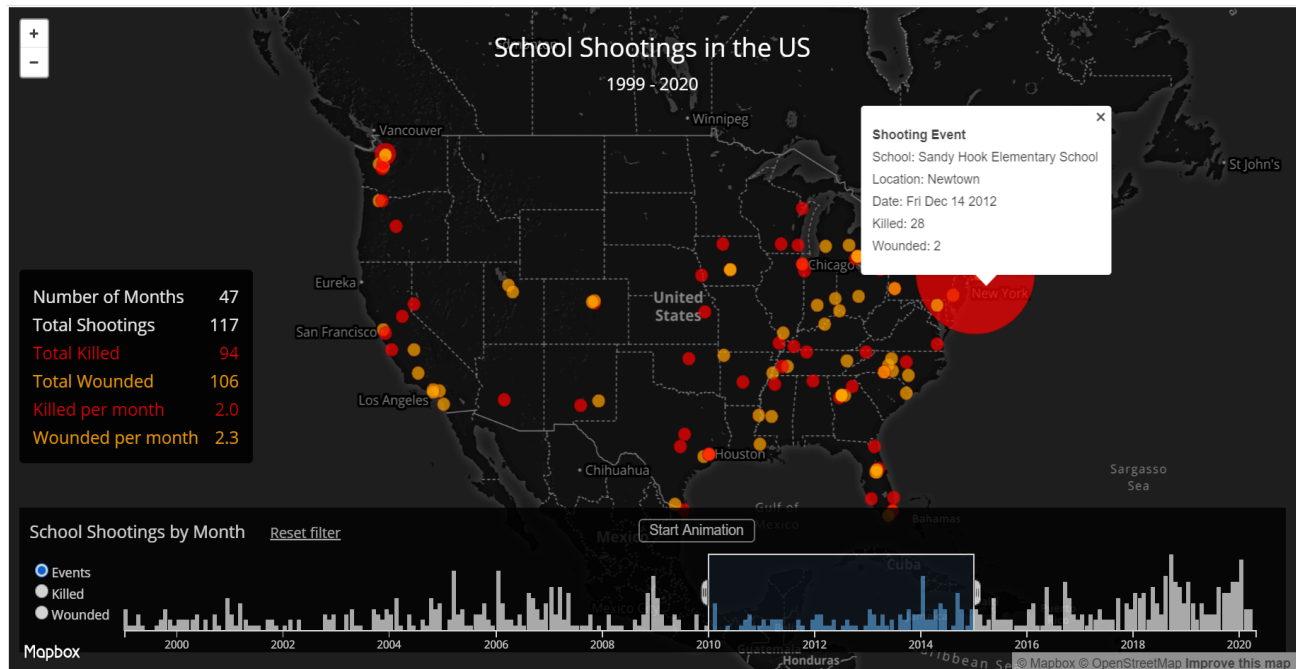


Figure 1: Overview of the dot density map

The bar chart at the bottom of the map is interactive which lets the user to choose the months they want to explore the data. The legend of the graph in accordance with the data change in the bar graph. The red circles represent the number of killings as shown in figure 1 and the yellow ones represent the wounded as shown in figure 2.

When the user clicks on start animation, the circles move around to represent the incidents that take place over a course of time and this feature also gives lot of options for the user such as speeding up the animation, resuming it or slowing it down. This phase of the visualization is represented in the figure 3 below:



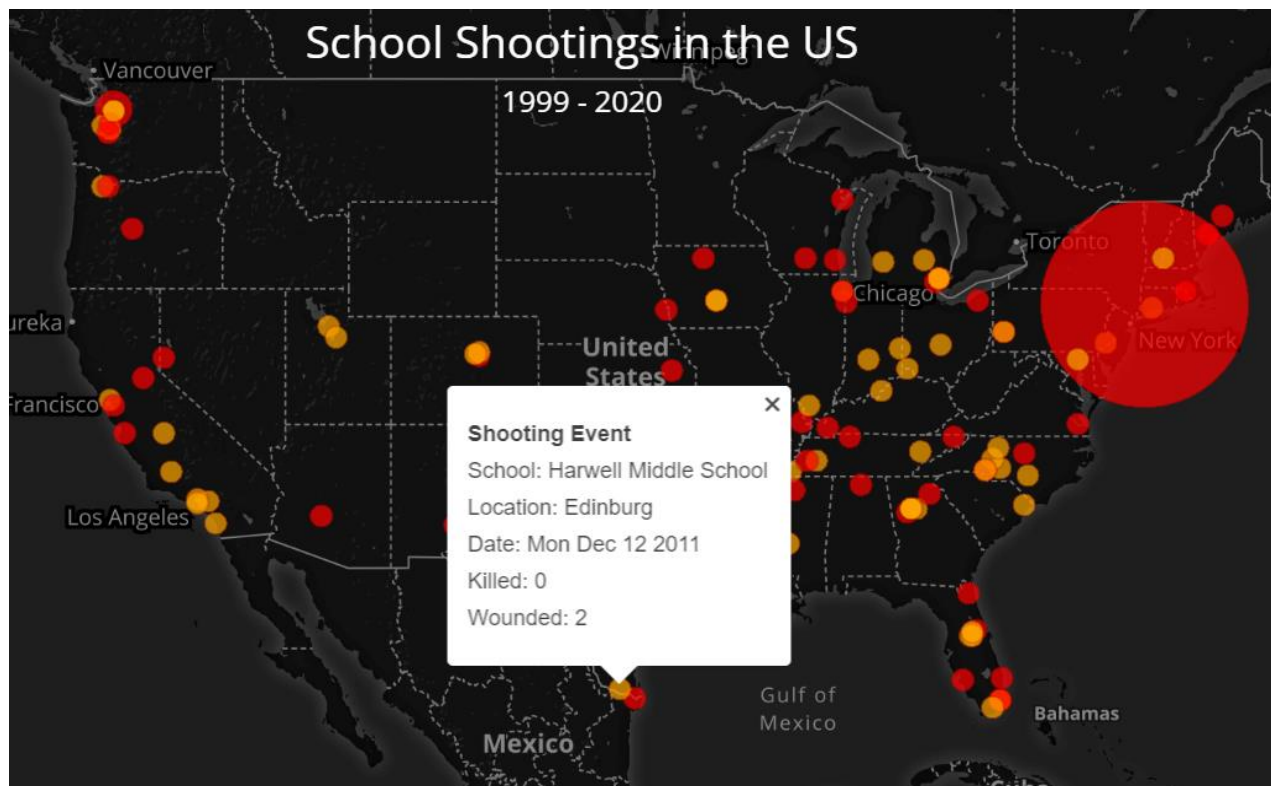


Figure 2: Yellow dot showing only wounded information

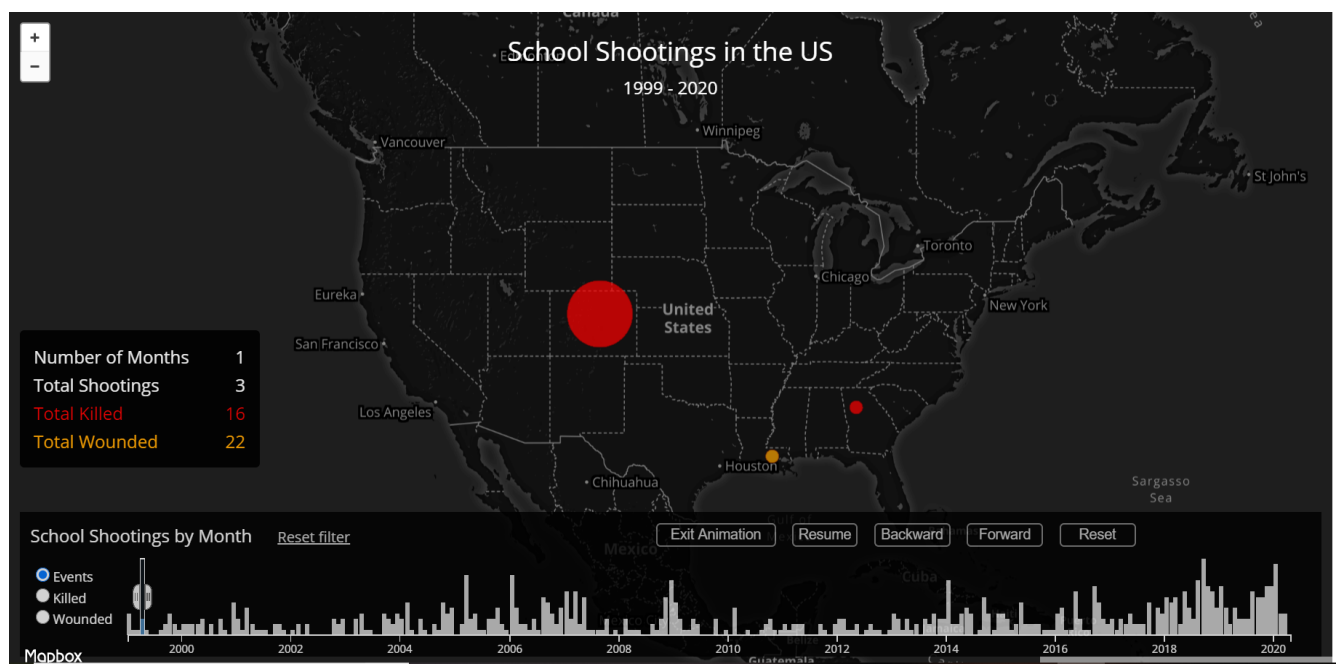


Figure 3: Data being Animated.

## Time Series Graph:

To check if there are any patterns in the way the incidents occur, I designed a bar chart plot by day and month. To keep the analysis simpler, a subset of information for year 2018-2020 was extracted from the main dataset and then cleaned for visualization. The button at the top of the graph helps user in toggling the bar graph to represent information by day or by month.

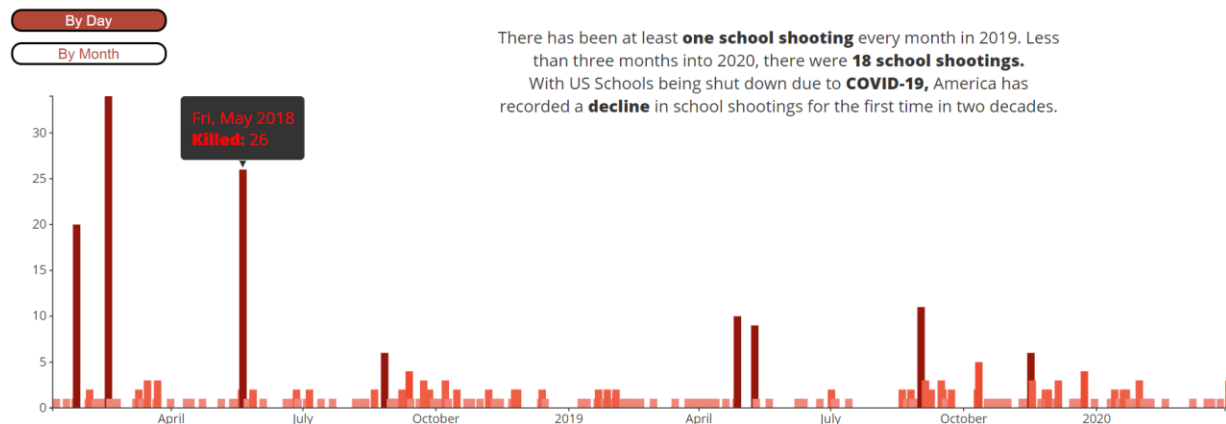
**Timeline of BloodBath (2018 - 2020)**

Figure 4: Bar Chart displaying information by day

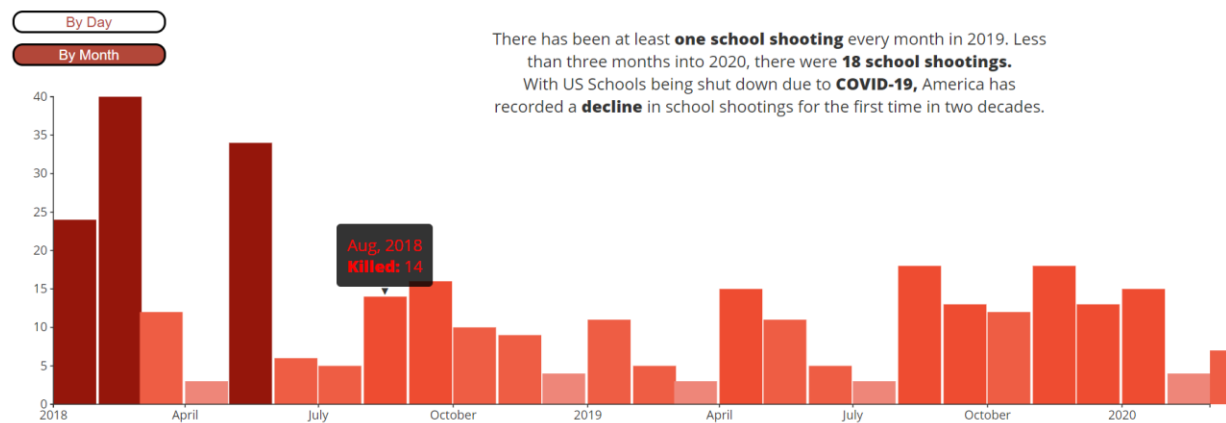


Figure 5: Bar Chart displaying information by month.

Initially the SVG dimensions were set, and the graph gets plotted on the same SVG element every time the trigger changes from day to month or vice versa. The transition from one dataset to another is enabled by using d3's transition method.

I felt my design wasn't very informative to the user, so I designed a tooltip which gives the user more information on the day the incident occurred with the count of casualties.

## Pyramid Chart:

I wanted to show the contrast of male and female suspects across various categories so I designed a pyramid chart. It contains two bar charts placed side by side with one of them flipped so their baselines meet. The three categories that were used to show the contrast of gender distribution were overview of their age, type of weapon used, affiliation with school. A single function was designed to update data each time a category is selected. During every update, all SVG elements are removed and created again. The visualization presented based on each button click is shown below.

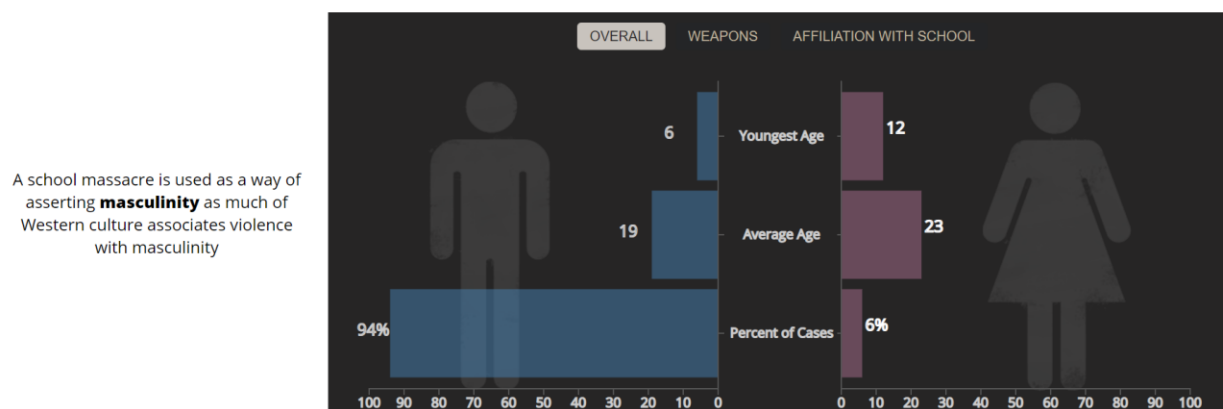


Figure 6: Pyramid Chart showing overview information

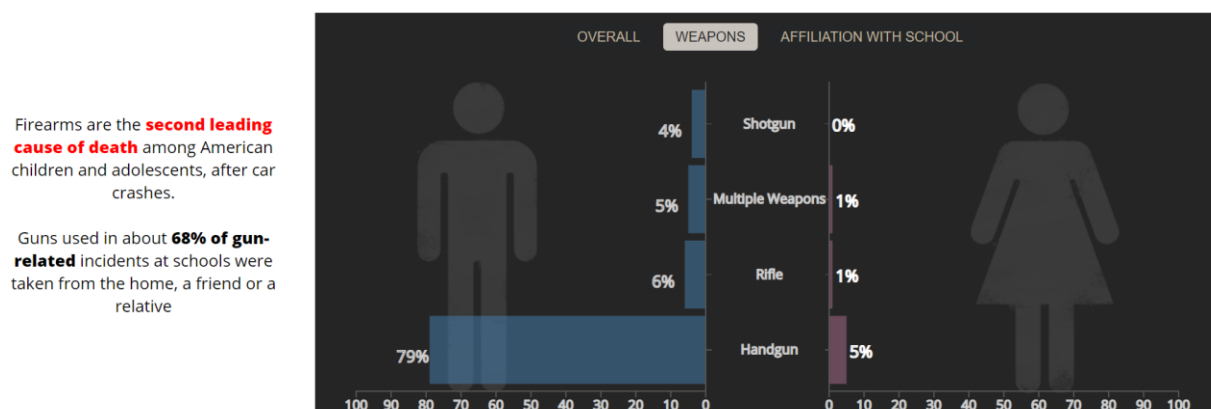


Figure 7: Pyramid Chart showing weapons information



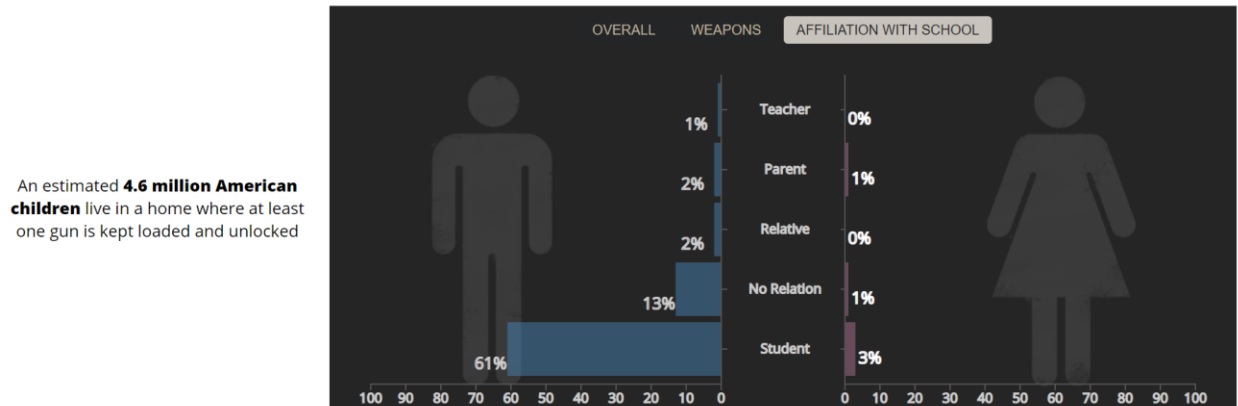


Figure 8: Pyramid Chart showing affiliation with school information

Donut chart:

Pie charts and donut charts are not very popular amongst creative heads but in my case the donut chart served its purpose of helping me visualize the various causes behind the killings. This was relatively simpler when compared to other visualizations. The chart is plotted in such a way that each slice has spacing with the rest of the categories and they are annotated with polylines. When you hover each slice, the corresponding information comes in the center of the doughnut. I was thinking of making this an animated feature but decided against it as the chart already had many elements and to involve a transition function would just make the feature too complicated. ("A static, reusable donut chart for D3.js v4.", 2020)

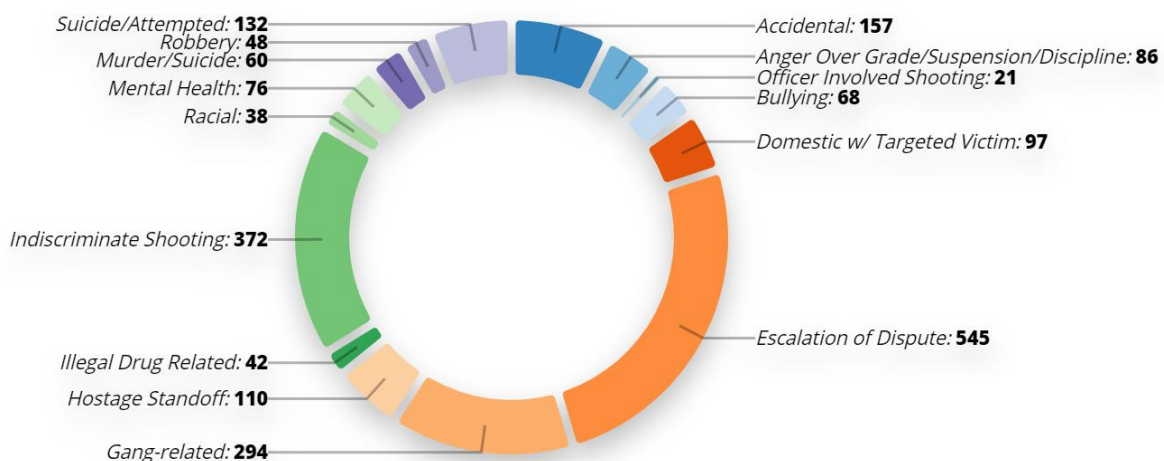


Figure 9: Donut Chart showing the cause behind killings.

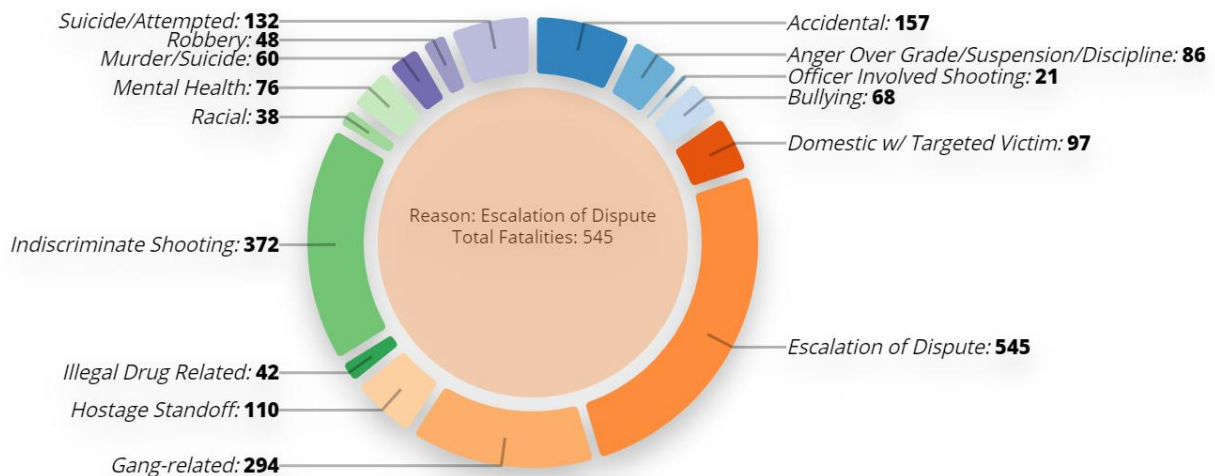


Figure 10: Hovering over a slice represent information in the hole of donut chart

#### Tools Used:

- ✓ Tableau: To retrieve the location co-ordinates to plot the points on the map.
- ✓ Online CSV to GeoJSON converter

#### Libraries and Language Used:

- ✓ D3.JS v3
- ✓ Mapbox API
- ✓ Crossfilter
- ✓ Googlefonts
- ✓ HTML, CSS
- ✓ D3-tip
- ✓ AOS- Animate on scroll

#### User Guide:

The code submitted has three important folders:

1. Data- It has all the necessary csv and tsv files required for this visualization
2. Img- The folder has all the images that were used as background for the webpage.
3. JS- This folder has all the script files for each visualization. As a good coding standard, I have included a separate script file for each visualization. The script files are as below:
  - doughnut.js
  - incident\_map.js
  - pyramid\_graph.js
  - time\_series.js

It has two important files:

1. Index.html: That contains the code for the layout of the page and the order in which each script is called.
2. Index.css- It is the styling sheet of the webpage which has all the styling features for each of the graphs. Each section is commented with the graph names for better understanding.

A user should load all these files in his/her computer and then run the index.html script. The starting page has an explore button which takes you to the next section of the webpage.



*Figure 11: Landing page of the web application*

Rest of the webpage can be accessed by using the scroller. Each graph is implemented with an interactivity element which lets the user choose what data he wants to see.

**Note:** Please be careful while you run the application using brackets as the application is known to misbehave.

When running the application in one of the MAC computers in University, I faced the below error:

Access to XMLHttpRequest at 'file:///Users/mjos0011/Downloads/US-School-Shootings-master/data/by\_day.csv' from origin 'null' has been blocked by CORS policy: Cross origin requests are only supported for protocol schemes: http, data, chrome, chrome-extension, https.

This is because MAC's inherent security doesn't let you run an index.html file referring to JavaScript's directly. If you are using MAC to run the application, it is highly advised to set up a

local http server in the directory the working code is in and then run the application. Refer to this link for setting up a http server- <https://1upnote.me/post/2019/02/set-up-local-http-server/>.

I have not faced the above issue with windows, but it is advised to always run the application by setting up a local http server.

## Conclusion:

While my data exploration project helped me answer questions on how the shootings are related to race or the location of region this narrative has helped me find out reasons as to why the shootings have been increasing over the years. It has helped me come to certain conclusions such as below:

1. The Shootings are higher on Fridays and higher when the school starts. It is tough to draw conclusions on this pattern as each year showed different results.
2. The number of male shooters is higher than female shooters and the suspects are usually students from the age group of 17-20.
3. The primary cause behind the shootings is because of conflicts between students. School authorities can take special care to avoid bullying and ragging in the school campus. Teenagers must be given extra attention and their behaviors must be monitored to avoid any untoward incidents.
4. While the data hasn't been able to show that the easy availability of weapons is the main cause of shootings, it is implied that these tragedies are on rise because the weapons are easily available for the students. The first step to putting an end to this would be to reform the gun laws in the country.

This whole project took me a week's time to develop and it was a great learning journey. D3 implementation of the visualization was very challenging due to my lack of knowledge in web technologies and a lot of time was spent in understanding the concepts before coding. I was in a dilemma as to how much information can be added in my narrative and had a tough time deciding the storyline. Every time I worked on a component, I had new ideas but the lack of time prevented me from implementing them.

In retrospect, I would have added source of information to the metadata of the dot density map and added more information to the donut chart like a graphical distribution of age for each category.

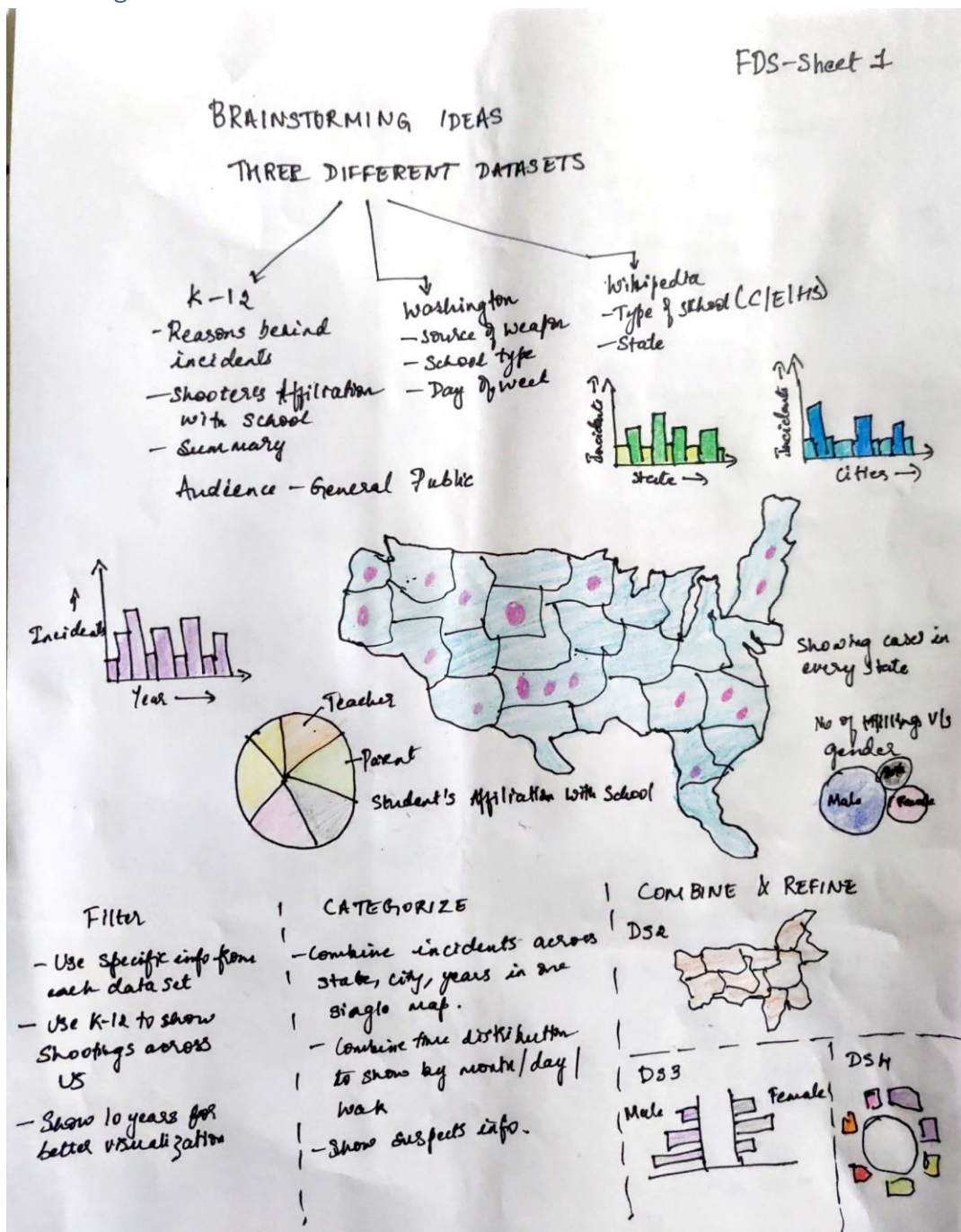
## References:

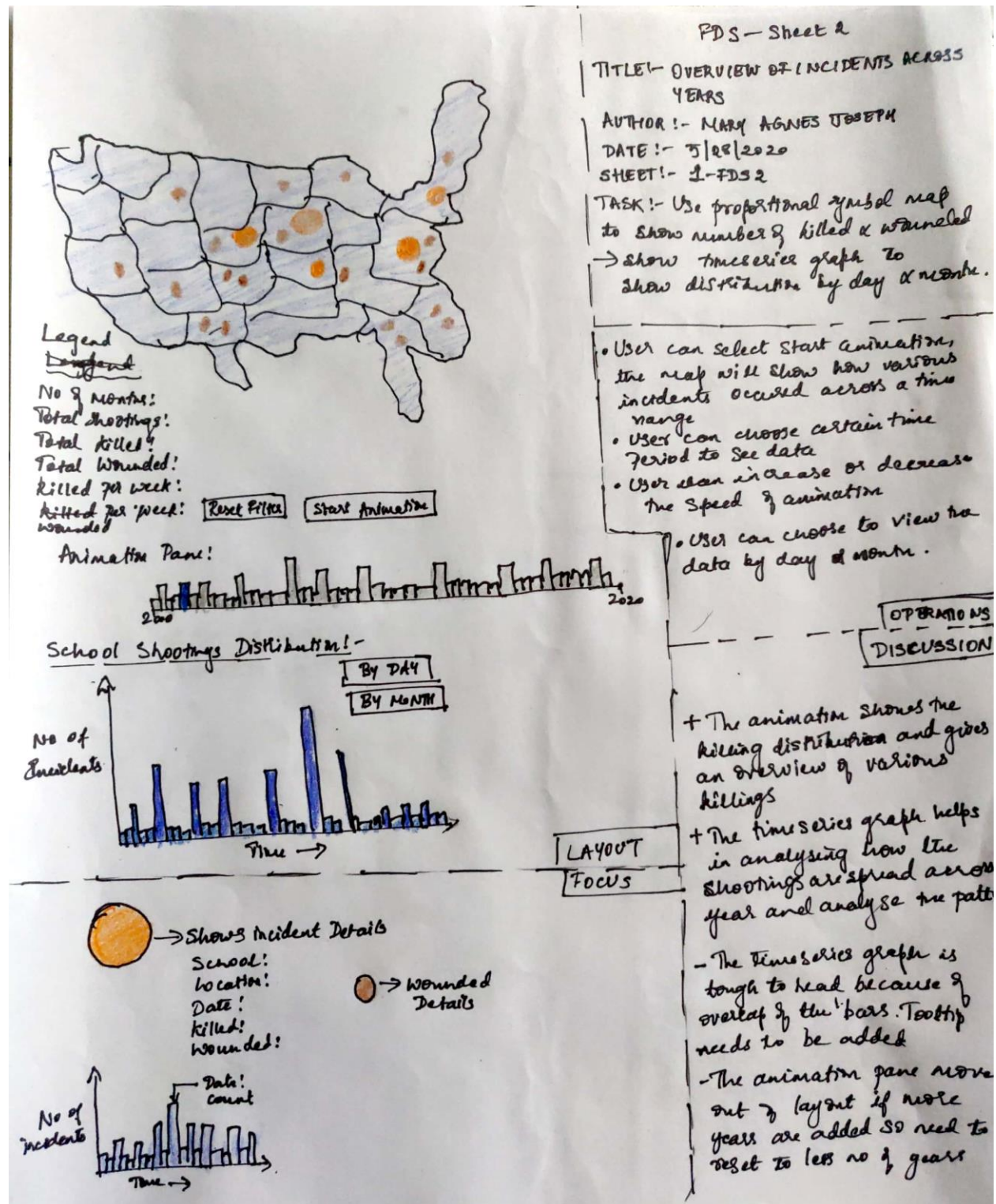
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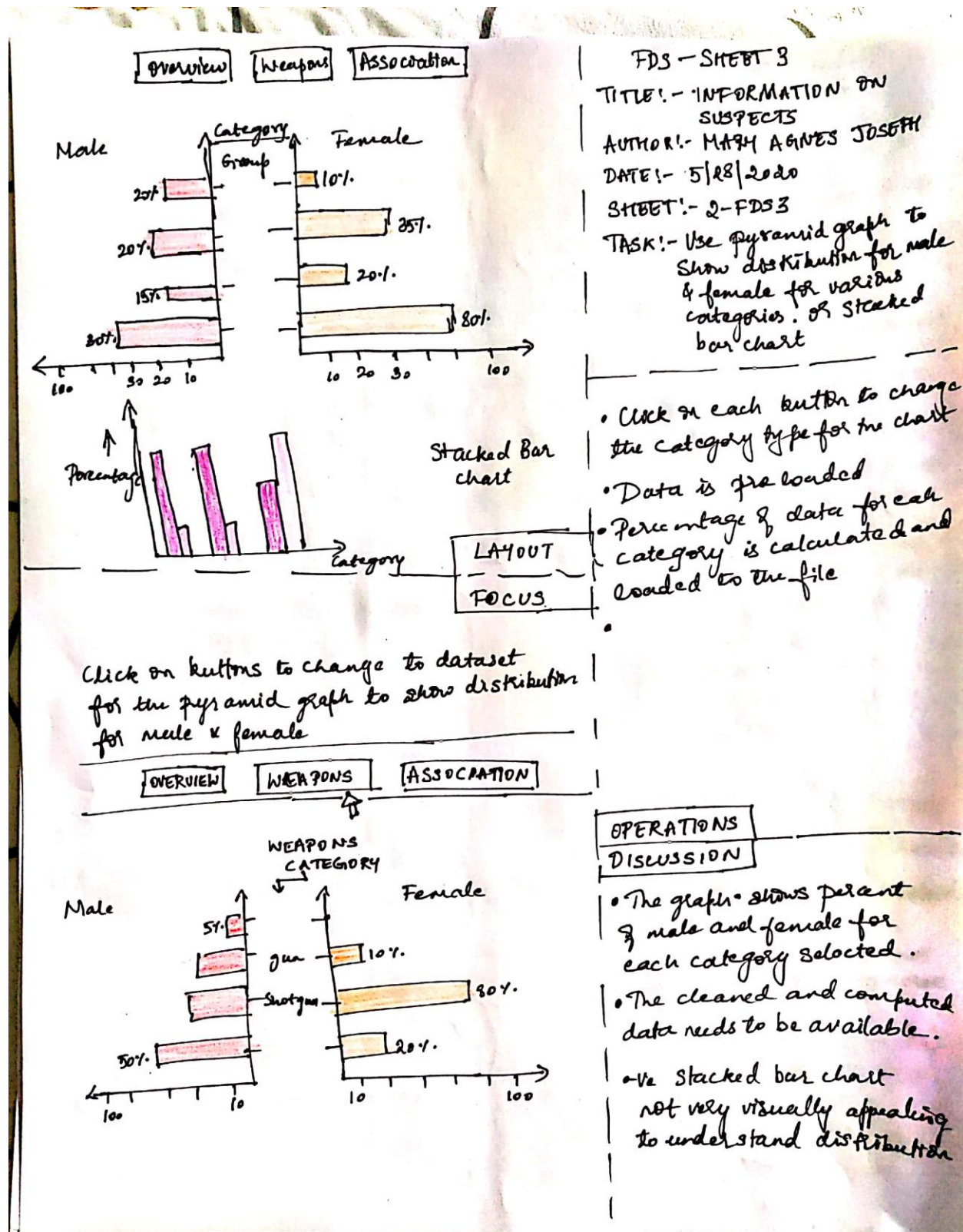
## Appendix:

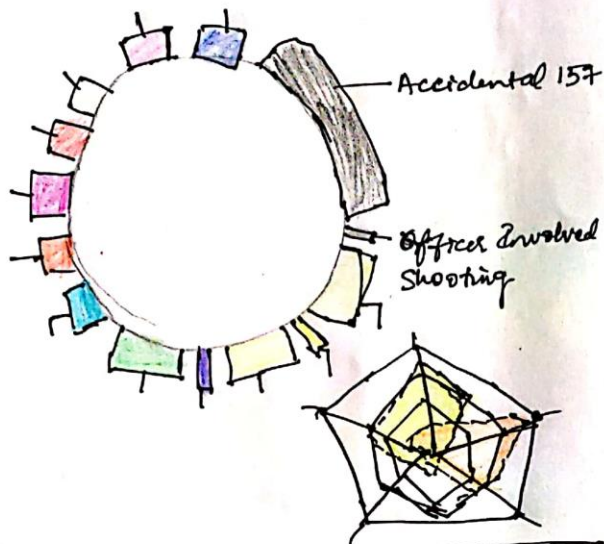
Five design sheets:







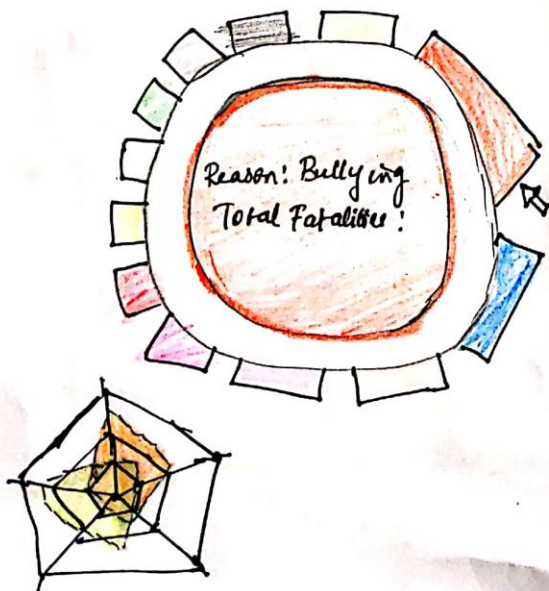




LAYOUT

FOCUS

Hover on each slice to display information in the inner circle



FDS-Sheet 4

TITLE:- MAIN CAUSES BEHIND THESE INCIDENTS

AUTHOR:- MARY AGNES JOSEPH

DATE:- 5/28/2020

SHEET:- 2-FDS 4

TASK:- Create an interactive donut chart to show the reasons behind the killings

- Data is cleaned and fed to the program
- Hovering over any slice will show the information inside the circle with total number of fatalities.

OPERATIONS

DETAIL

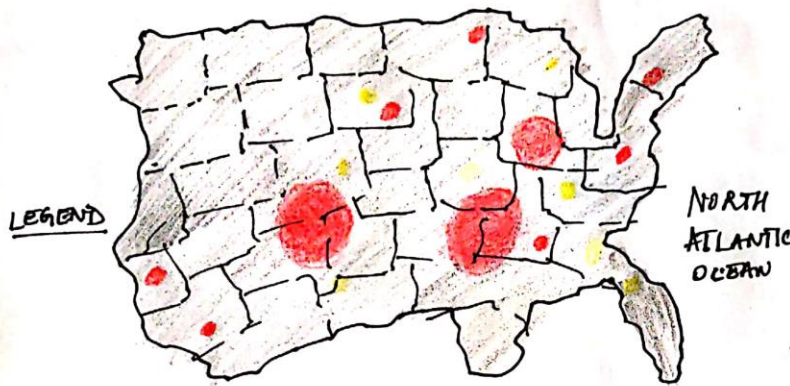
The Interactive graph to show distribution of causes behind the killings

-ve might have to include more information inside circle.

-ve radial is tougher to implement.



## SCHOOL SHOOTINGS IN THE US 1999-2020



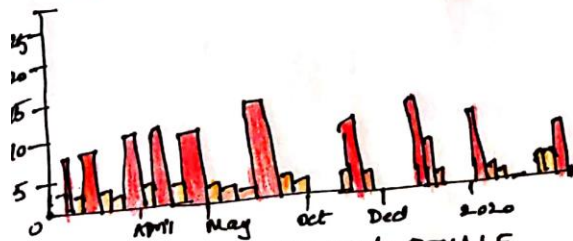
### School Shootings By month

- 0 Events
- 0 Wounded
- 0 Killed



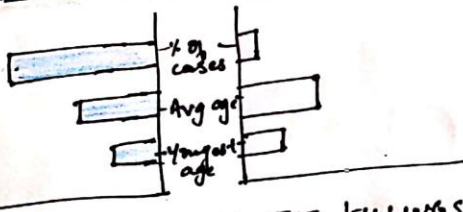
How are shootings distributed over the course of year

By Day By month



### THE SUSPECTS MALE V/S FEMALE

OVERALL WEAPONS ASSOCIATION



### MAIN CAUSE BEHIND THE KILLINGS



## FDS-Sheet 5 Realization

Title! - Scrollable web application using D3.js

Author! - Mary Agnes Joseph

Date! - 5/28/2020

Sheet! - 3-FDS 5

Task! - Develop a web application with components discussed in sheet, 2, 3 & 4 to tell story on US school shootings.

1) Data are pre-cleaned and stored in a folder for access.

2) It is a scrollable web application that has all the viz in different sections.

3) Each component has several interactive elements.

OPERATION

DETAIL

1) The story gives an overview of the shootings with an animated map and shows distribution of shootings across a year.

2) Then it shows information on suspects across various categories.

3) It concludes by showing the main causes behind these shootings.