The Case for Increasing Public Defense Funding in the Bay Area

Information Visualization & Presentation, Spring 2021

Tiffany Pham, Arika Verma, Jyen Yiee Wong

Project Goals

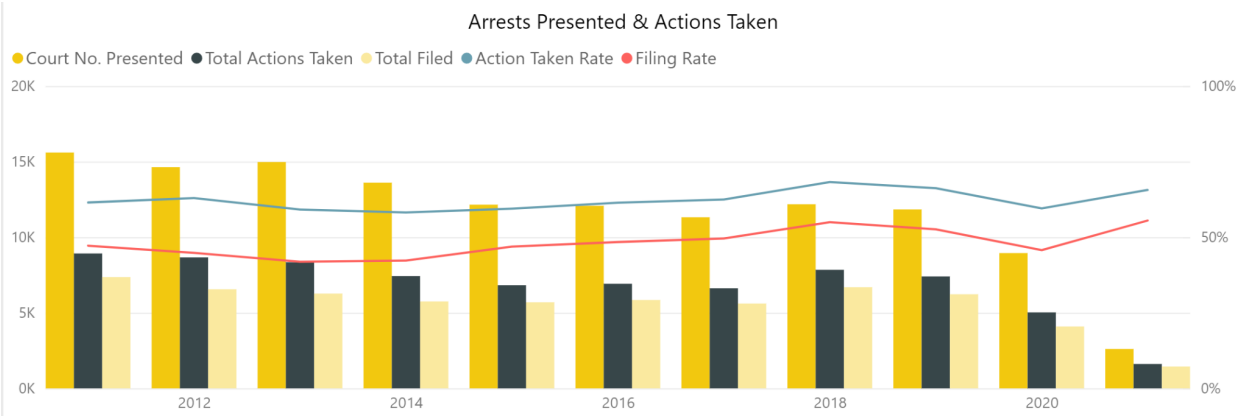
The purpose of our project was to communicate information about aspects of the California criminal justice system. Specifically, we were interested in presenting information about the amount of funding allocated for public defense, law enforcement, and incarceration/corrections. We wanted to visually communicate a story around how funding is used and how communities are impacted by these allocations.

From the interface, we wanted the audience to understand discrepancies in funding over time for public defense and law enforcement in the Bay Area. We also wanted to provide context for that funding by demonstrating how that funding was being used by law enforcement. We chose to highlight how law enforcement uses funding to acquire state-of-the-art surveillance technology, and how funding is used by public defense through public defender caseloads in the Bay Area. Finally, we wanted to connect these issues to the people most impacted by the funding decisions: the jail population.

Our ultimate goal was to galvanize an audience to advocate for reform around funding within the criminal justice system, by demonstrating discrepancies in funding and how it is being used.

Related Work

At the outset of our project, we drew upon past data visualizations in the criminal justice system, from sources like San Francisco District Attorney's "DA Stat", which publishes three dashboards that visualize information about arrests and prosecutor caseload over time. Below, you can see how DA Stat chooses to depict district attorney caseloads, for both misdemeanor and felony cases, over time. This was highly relevant to us, as we were interested in similar data for Bay Area public defenders.



Other related work includes: visualizations from the Brennan Center, which presents, via a map, information about law enforcement acquisition of different data monitoring software in different cities in the US, as well as bar chart visualizations from ProPublica about recidivism rates based on the use of machine learning software by corrections facilities.

We were inspired by data visualizations from Shelby Perkins and Craig Nelson of Stanford University's Freeman Spogli Institute, who documented surveillance technologies used by Bay Area cities for the San Francisco Public Press. Below is an example of the visualizations that they created.

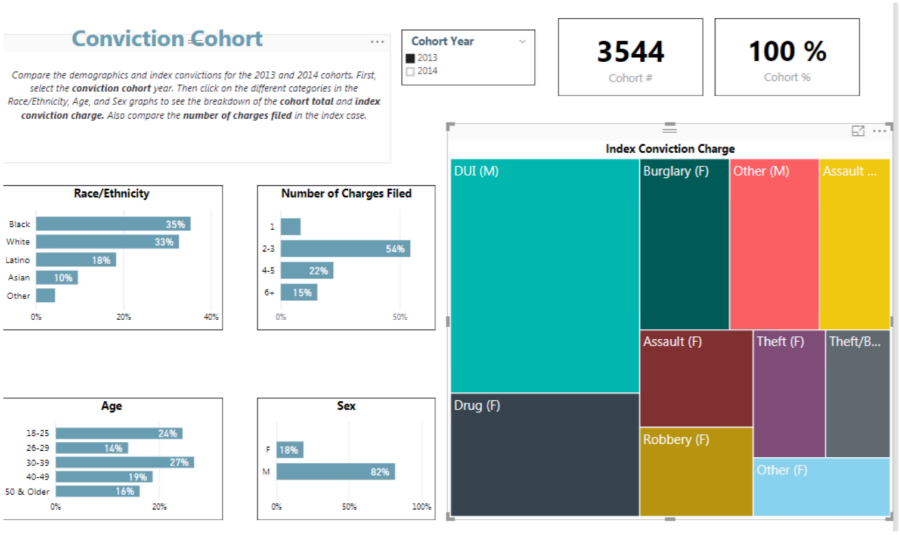
Technology	Agencies Using Technology
Body Worn Cameras	55
Automatic License Plate Readers	41
Camera Network	36
Camera Registry	33
Drones	16
Gunshot Detection	9

The visualization details the number of law enforcement agencies in the Bay Area that use various surveillance technologies. Presenting this data in aggregate informed the way we chose to present the popularity of surveillance technologies in the Bay Area—in aggregate as well as by individual Bay Area city.

We also looked to the variety of visualizations presented in the following dashboard, excerpted from the paper "Developing Data Dashboards to Drive Criminal Justice Decisions" by Russo, Janetta, and Duane (2018). The dashboard describes information about cohorts of convicted people by year, incorporating bar charts and a tree map. As

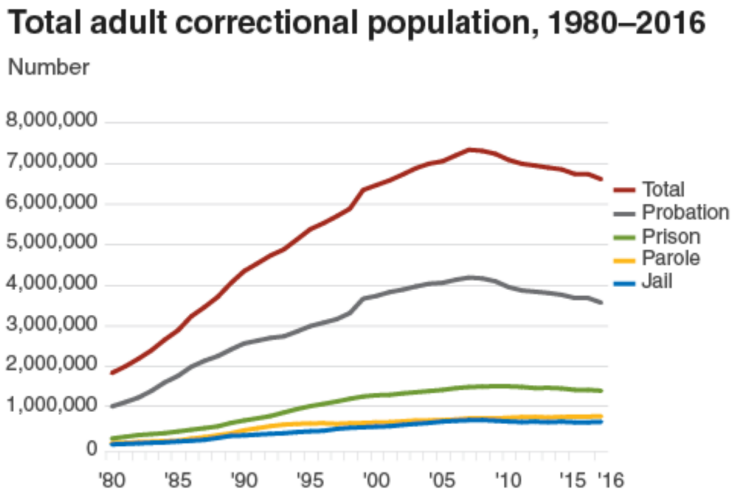
some of our visualizations concern jail populations, we considered the variety of visualizations presented in the dashboard as we developed or visualizations.

Conviction Cohort Overview



Source: Illustrative data from San Francisco District Attorney's Office.

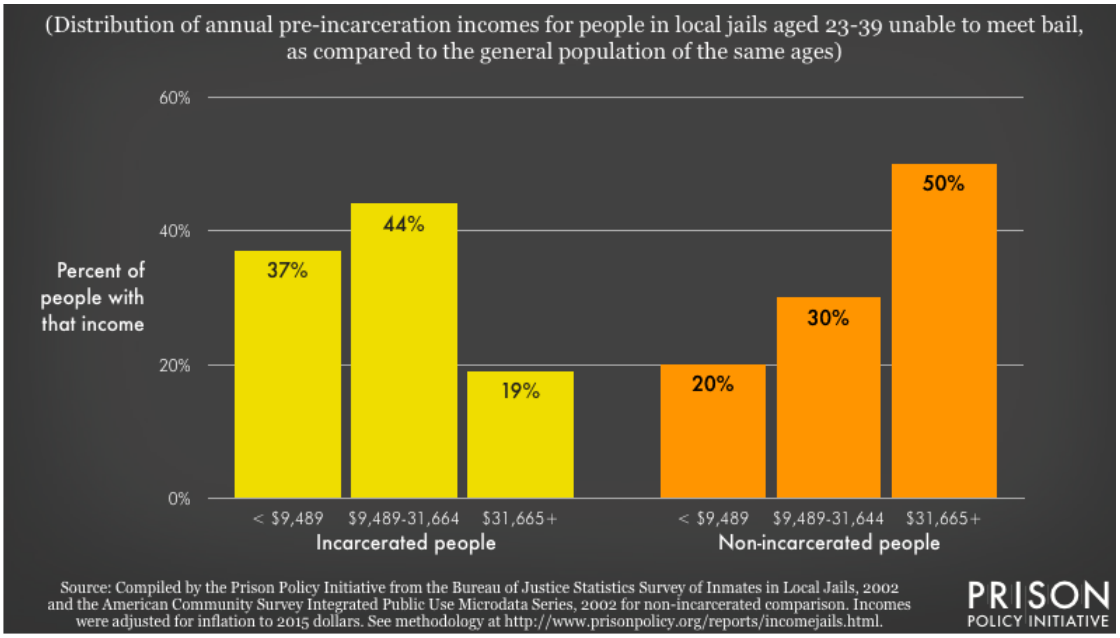
Given that we would be including information about incarcerated peoples over time (jail and pre-trial jail populations especially), we reviewed visualizations from the Bureau of Justice Statistics concerning the adult correctional population. We were particularly interested in how the Bureau chose to depict differences between various correctional populations.



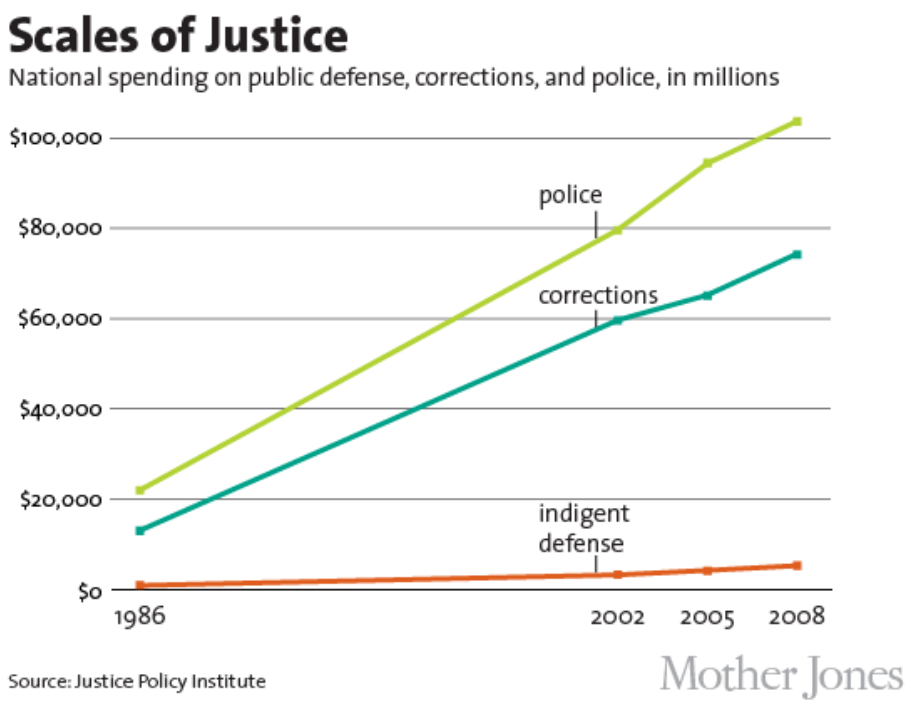
Source: Bureau of Justice Statistics, Annual Survey of Jails, Annual Survey of Parole, Annual Survey of Probation, Census of Jail Inmates, and National Prisoner Statistics, 1980–2016.

Additionally, we were also motivated by the San Francisco Public Defender's Office's effort in making their data more transparent and accessible. Every year, the SF Public Defender's office releases their annual report in the form of a calendar (screenshot below). Even though we ultimately chose not to use the data presented in their calendars (due to some inconsistencies in the types of data that were presented), we were inspired to visualize similar types of data, such as Public Defenders' annual caseloads.

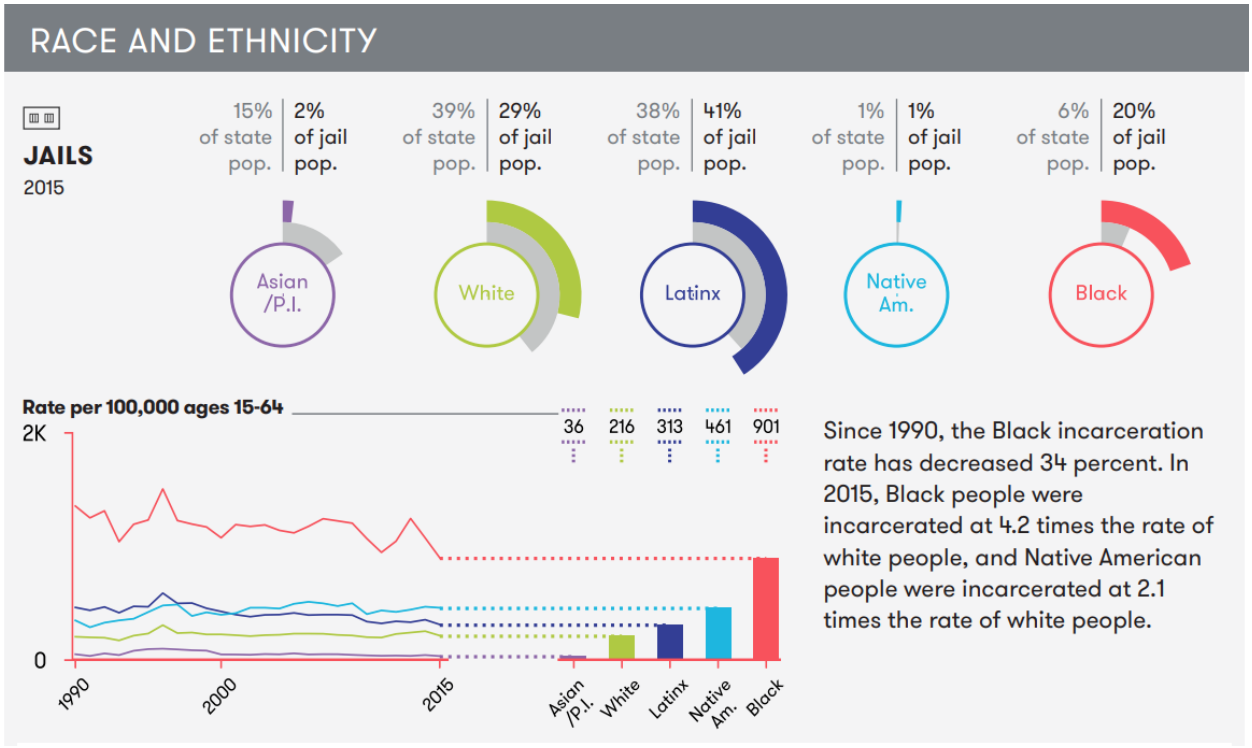
Related work from the Prison Policy Initiative(PPI) also inspired our project. PPI advocates against the overcriminalization of people in the U.S. and conducts research in their advocacy efforts. Below is a screen shot from one of their publications, highlighting how money bail perpetuates an endless cycle of poverty and jail time.



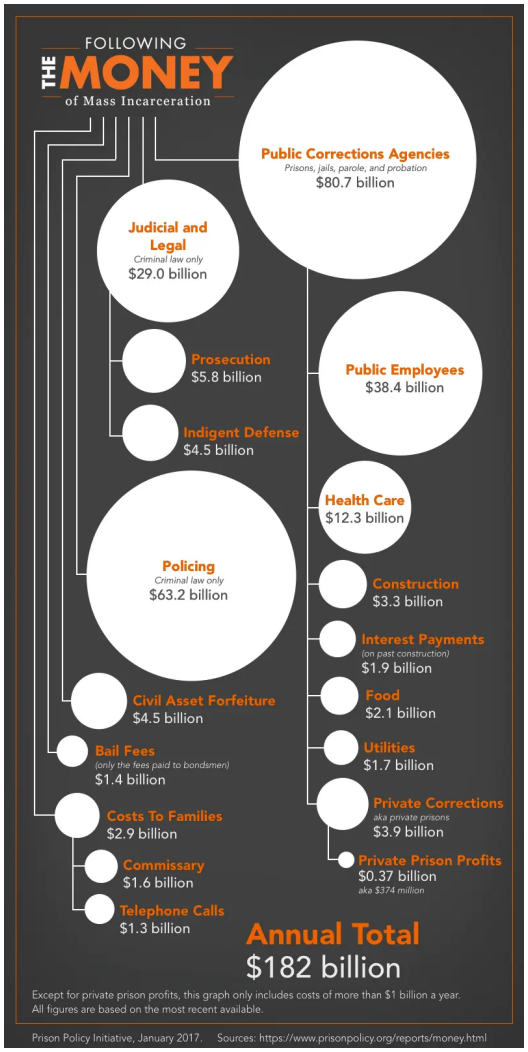
This article from Mother Jones is also highly relevant to the narrative we were exploring through our visualizations. This article explores the nation's public defense crisis, pulling data from various sources such as the Justice Policy Institute and the National Legal Aid and Defender Association. For instance, in the following screenshot, they show how national spending on indigent defense remains low with small increases while spending on police and corrections have noticeably increased over time. This inspired us to explore similar variables within the Bay Area.



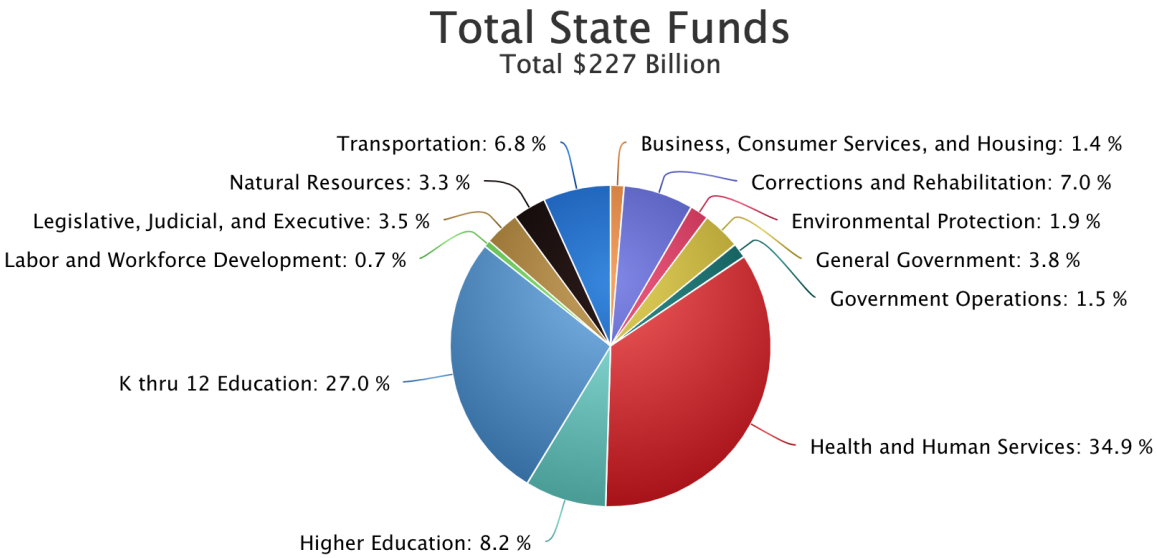
The Vera Institute has a number of interesting visualizations around the prison system in the United States, and also at the state level. The visualization below, focused on race within California jails and made good use of narrative text to explain the visualizations. While many people know that the criminal justice system is biased against minorities, they may not realize how these biases play out statistically in the jail system, which is why we thought this was an important visualization.



Early on in our process, the Marshall Project's "Following the Money of Mass Incarceration" visualization was very helpful in understanding the different components of the criminal justice system. This was especially useful in developing a baseline understanding of which areas of the criminal justice system are heavily funded - and understanding the different stakeholders impacted by this process. In fact, this was one of the few visualizations we saw which attempted to connect the dots across funding across the entire the criminal justice system. Ideally we could have expanded on each of these pieces in the visualization (to really focus on funding), but that data was not always available.



The California Budget shown on the Governer's website showed state spending in a zoomable pie chart, which was the original inspiration behind the Observable implementation of a sunburst chart. While it was interesting to see the breakdown of all of the different components that state-level spending goes towards in California, we ultimately honed in on only the Corrections & Rehabilitation department spending (which is available upon click in the below visualization) because it was more directly relevant to our narrative. This was still a valuable data source for the project.



Description of Visualizations

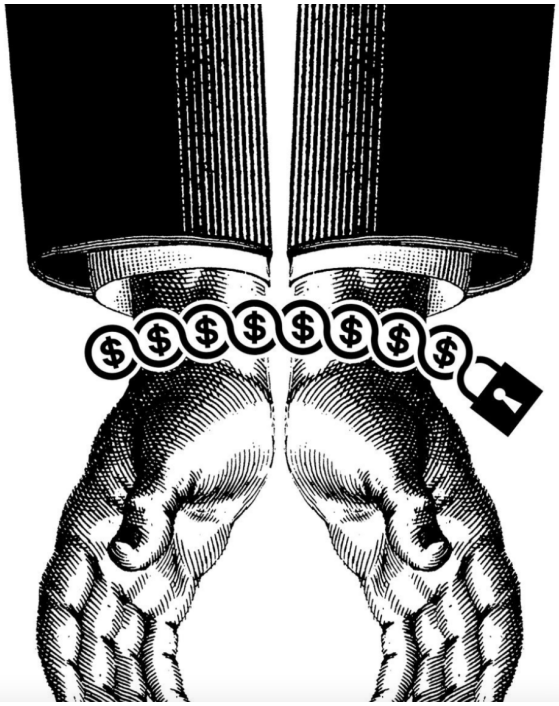
High Level Screen Capture of Website

Screen capture of final visualizations linked here: https://drive.google.com/file/d/16fPC_LGcAQ5s3aWw3I08EVqshgR4ZQDf/view?usp=sharing

Introduction

We began the visualization with an introduction. Based on feedback from Marti, we understood that we needed to explain the purpose and goal of the visualization, and to define key terms (e.g. public defender). Originally, we had a navigation bar above the header image, but the visualizations are pieced together in a way that it is better for the user to navigate from the very beginning to the end. Therefore, we removed the navigation options to keep the user focused on the content on the screen. While there is a fair amount of of text in the first two introductory sections, the icons, shapes, and use of color make these interesting to look at and easy to understand.

The Case for Increasing Public Defense Funding in the Bay Area



Introduction

Public Defense

Police Surveillance

Incarceration

Public defenders work to protect some of the most vulnerable people in our society. However, in contrast to the law enforcement and incarceration systems, their efforts are severely underfunded.

Let's take a critical look at the justice system's funding priorities across: **public defense**, **police surveillance**, and **incarceration** in the Bay Area.

What Is a Public Defender?

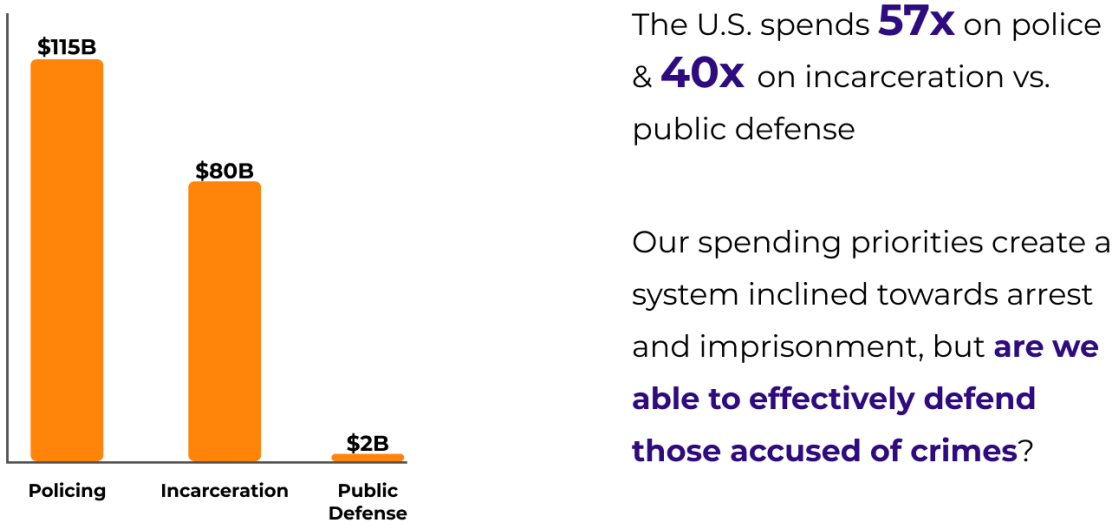
Public defenders are lawyers appointed to **represent criminal defendants** who cannot afford to hire a lawyer.

The Sixth Amendment to the US constitution **guarantees** this right.

Funding Priorities within the United States Justice System

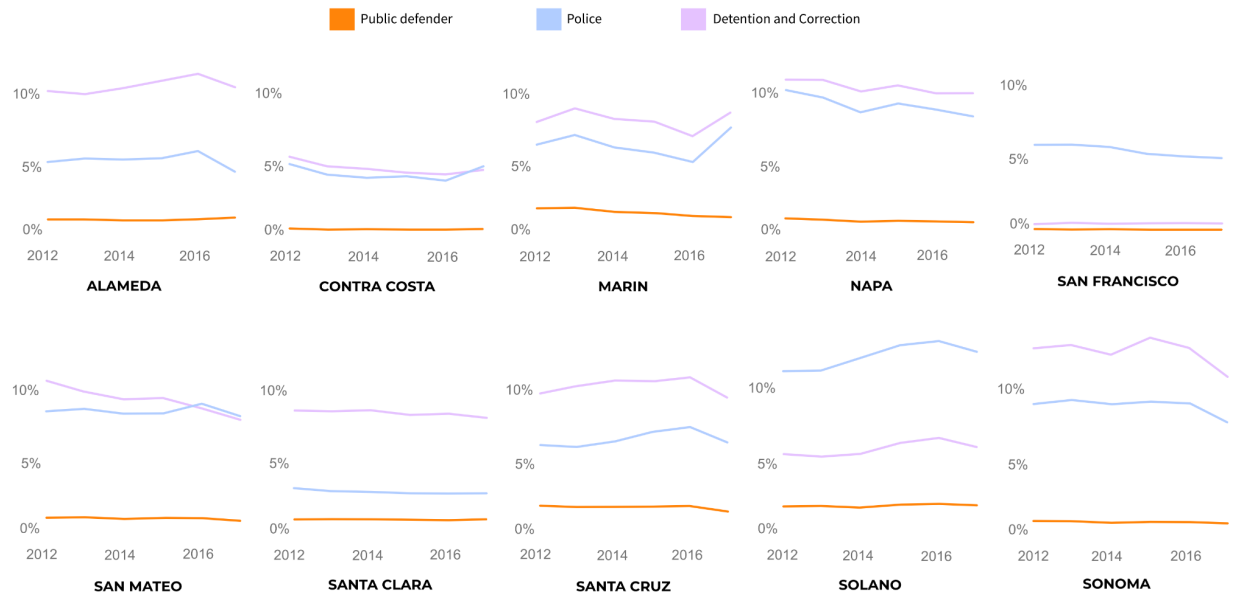
In order to contextualize the key aspects of the criminal justice system (also based on Marti's feedback), we presented the funding amounts of the U.S. police, incarceration (corrections), and public defense system in a barchart. The aim of this visualization is to present the stark difference in funding between public defense and the other two categories. The narrative qualifies this difference by providing the difference in multiples (e.g. 57 times, 40 times). We also present a question which provokes the reader

towards thinking about the implications of this potentially surprising data.

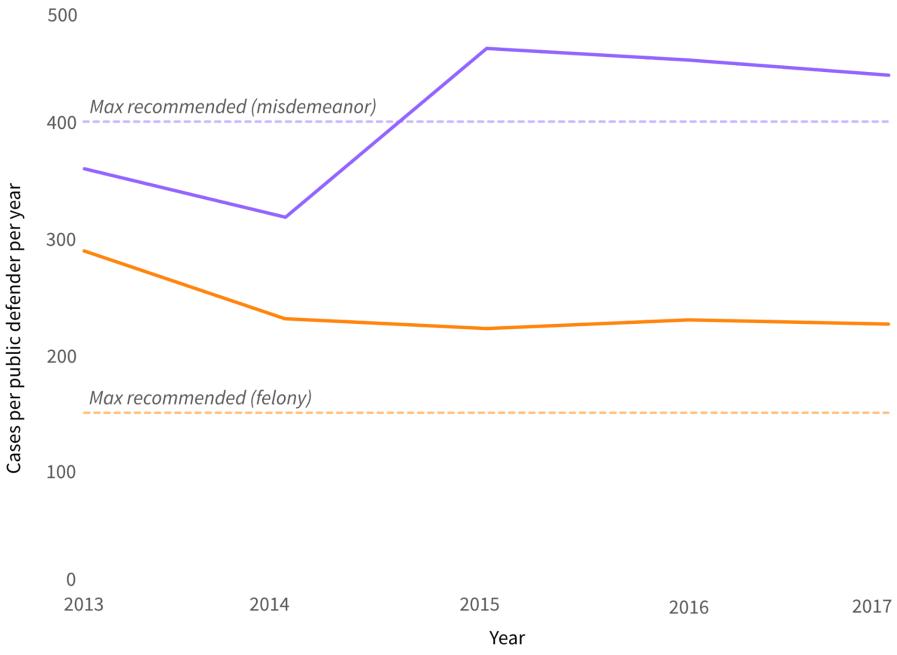


Bay Area Counties' Expenditures on Public Defenders Compared to Police and Corrections

In this section, we wanted to highlight how underfunded public defenders are, especially compared to the police and corrections departments. In the graph below, we show the percentage of how much each Bay Area county spends on public defenders, police and corrections every year. We decided to go with a small multiples chart because it allowed for easy comparison between the different counties. Line charts were used as we wanted to show trends across time. After receiving feedback from usability testing that the legend was not obvious and that some of the individual charts were hard to read, we made the legend visually more prominent, added more spacing and removed grid lines. We also visually highlighted the Public Defenders data with a bright orange while giving police and corrections departments more muted colors.



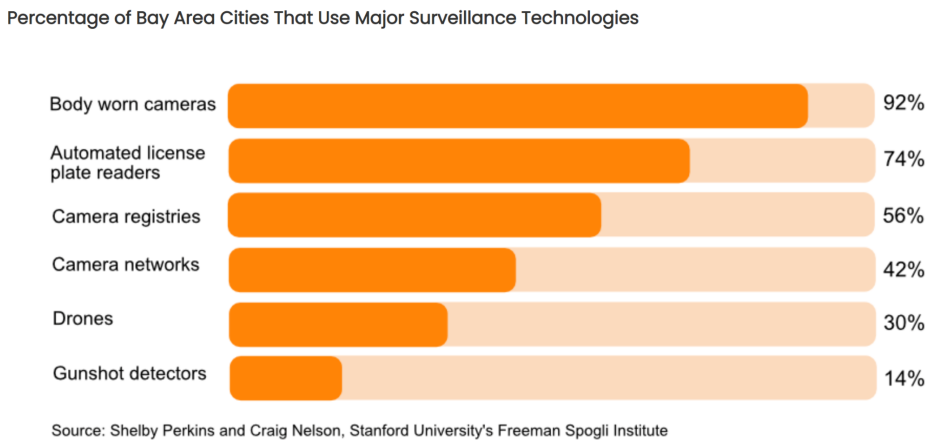
Then, we wanted to show that public defenders are often overworked. To give users a point of comparison, we added a reference line denoting the maximum recommended caseloads as outlined by the U.S. Department of Justice's National Advisory Commision(NAC). Similar to the graph before, we used another line chart here to show trends across time. Particularly, we wanted to highlight how their caseloads have largely stayed above the maximum recommended numbers.



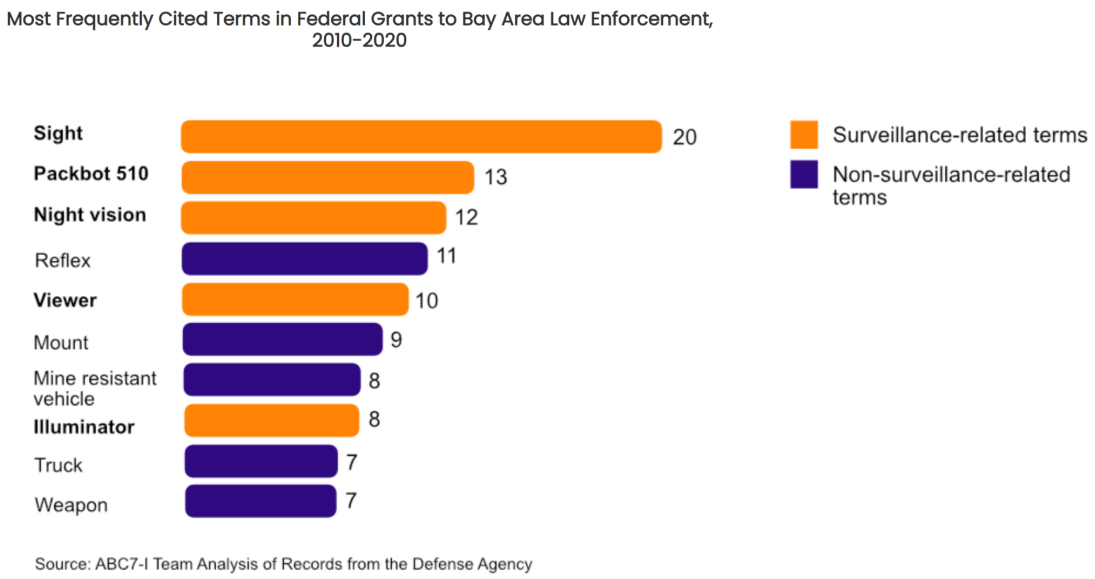
Law Enforcement's Use of Funding for Surveillance Technology

In this section of the visualization, we were interested in demonstrating how Bay Area law enforcement use their funding to acquire surveillance technologies. We highlight the extent that law enforcement use surveillance technologies to later connect that use to the targeting of marginalized communities through surveillance technology.

The following is a bar chart that shows the percentage of Bay Area cities whose law enforcement agencies use the following technologies. The goal, from this visualization, was to have a viewer understand the extent that surveillance technologies are popular in the Bay Area (especially body worn cameras and automated license plate readers, which 92% and 74% of cities use, respectively).

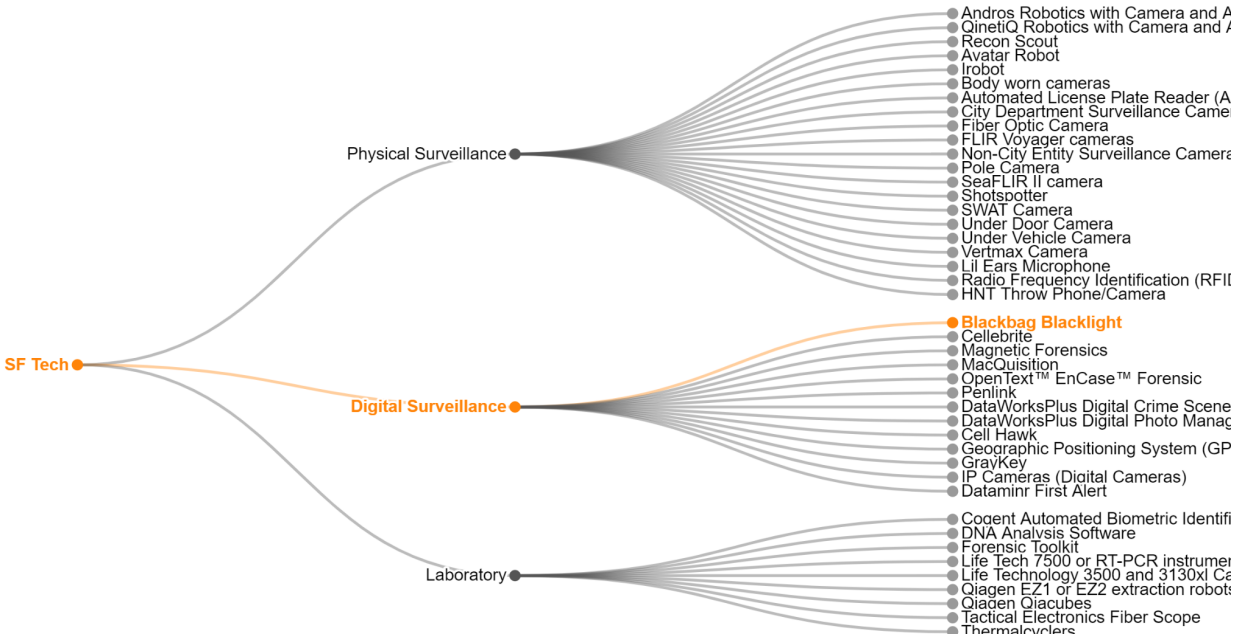


The following bar chart shows the most commonly cited terms in federal grants to Bay Area law enforcement. We were interested in highlighting how many of the most popular terms concern surveillance (such as "sight" and "night vision"). As a result, we differentiate between terms relating to surveillance and terms not relating to surveillance. Through feedback and usability testing, we added a legend and changed the colors to be more legible.



The following is a tree network showing the categorical breakdown of surveillance technologies in San Francisco. Our major goal was to have a viewer understand the scale of surveillance technologies used by San Francisco law enforcement, as well as get a sense for the breakdown of types of surveillance technologies. The visualization is interactive, as a viewer is able to hover over a specific technology's node and see how it is categorized.

This visualization went through multiple rounds of iteration. It was initially a collapsible tree, but through usability testing, we learned that expanding the tree was found to be cumbersome—this was especially the case when the data was organized at multiple layers of parent and child nodes; as such, we restructured the data to limit the number of layers. We also added the hover and highlighting functionality so that viewers could more quickly identify a technology's categorization.



The following visualization allows viewers to, through a dropdown menu, select a Bay Area city and see the major surveillance technologies that its law enforcement uses. We chose this visualization to close the section on law enforcement's use of surveillance technologies to drive home the ubiquity of surveillance technology—by allowing viewers to see for themselves that surveillance technologies are being used in their backyards.

This visualization went through iteration, as initially, the question "what major surveillance technologies does your city's law enforcement use?" was embedded into Observable. We chose, however, to remove the question from Observable and instead add it to the HTML above the dropdown menu to provide a more coherent order and narrative to the visualizations.

Why does Surveillance matter?

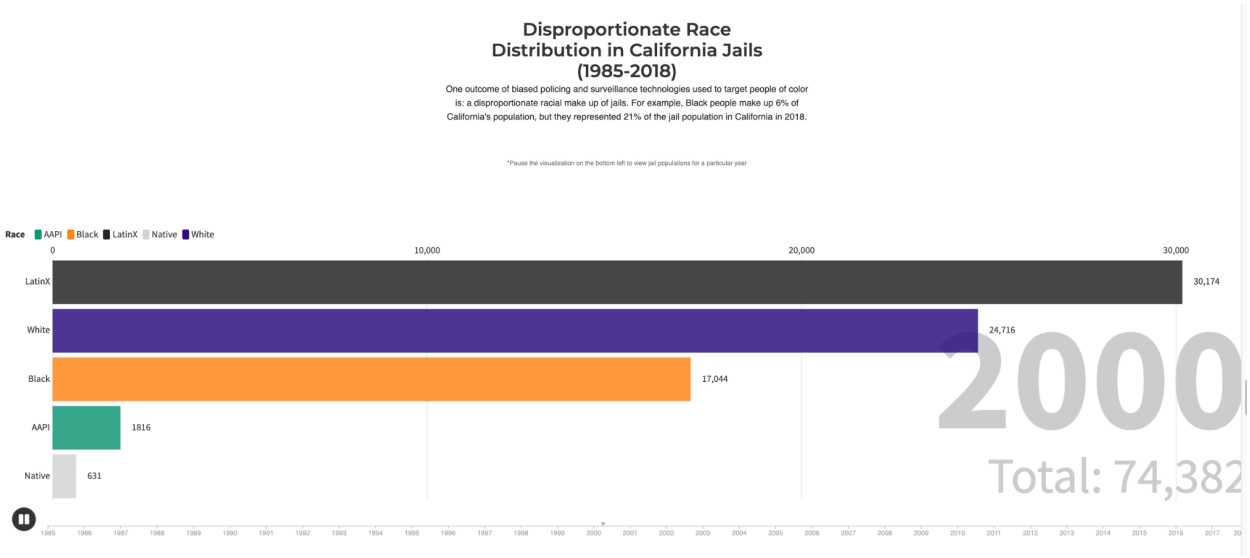
While this next section is not an information visualization, we wanted connect the narrative explicitly from the surveillance section to the next section which focuses on the incarceration system in California.

“Cutting-edge technologies are prone to be targeted at communities of color.”

California Corrections System

This next section aims to highlight the change in race in the jail system in California. This graph was originally a choropleth map on Tableau, but it was not intuitive to users. We used Flourish (an information visualization tool) to create a running bar chart, which plays on a loop and adjusts the jail population by race and year. This is a very useful visualization because it shows how different races are more or less prevalent in particular years (potentially implying policing tactics). Also, it the text highlights the fact that black people are overrepresented in jail (in comparison to their overall representation in California’s population).

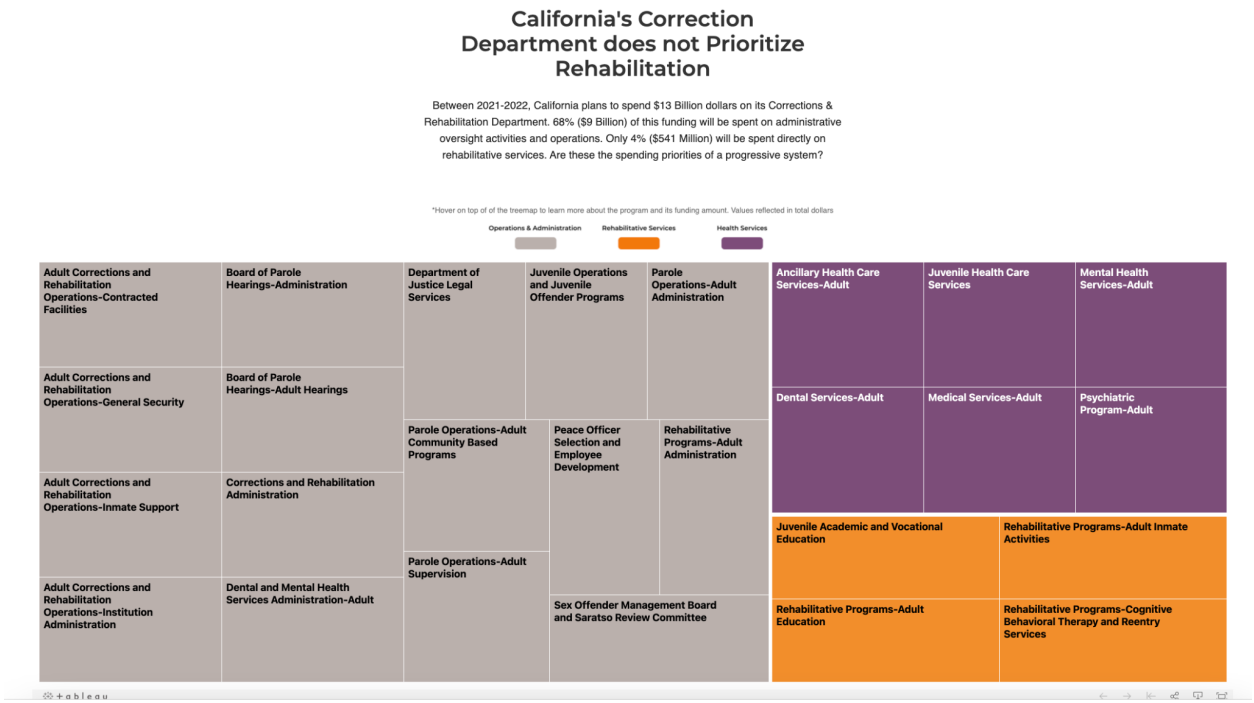
Please note: The following image is distorted, as we had to zoom out to capture the entire visualization.



The following visualization is a simple line chart, which compares the total jail population in California, and the pre-trial population in jail in California. Over time, the user can see that the total population in jail has increased, and subsequently the pre-trial population in jail has increased. While this may be because of structural inefficiencies, the right to a “speedy trial” is protected by the U.S. constitution. Unfortunately, with such a large amount of people in jail who are pre-trial and the heavy caseload faced by public defenders, speedy trials are unlikely to happen. While this chart was in in our first iteration (when we performed usability testing), we added it to provide additional context to users about this issue.

This simple bar chart visualization shows the amount of bail that offenders must pay. The high cost associated with certain offenses could also be a reason that the jail population has increased over time.

This treemap visualization shows the different programs that California's correction department spends its money on. This data in this chart was originally presented through an interactive sunburst diagram, but based on Marti's feedback we decided to show the data in a more immediately comprehensible manner. It is very clear to see that there are three main categories of programs, and the narrative text supports the user in understanding the quantities associated with the programs (which ultimately supports the title).



Implications

Lastly, based on the feedback from Marti on the need to create a cohesive narrative for the user we added an implications section. This section aims to tie together the above visualizations and leave the reader with a clear takeaway.

Implications

The distribution of funds between public defense, law enforcement, and incarceration should be thoroughly re-evaluated.

As demonstrated through the above visualizations, Bay Area law enforcement uses their vast funds to acquire surveillance technologies which target low income people of color, while public defenders struggle to defend those same groups of people.

Data

Miranda Rights

- http://www.mirandawarning.org/whatareyourmirandarights.html

Comparative Bar Chart (Police, Incarceration, Public Defense):

- https://www2.census.gov/programs-surveys/gov-finances/tables/2018/alfin_summary_brief.pdf
- https://www.bjs.gov/content/pub/pdf/sgide0812.pdf
- https://www.themarshallproject.org/2019/12/17/the-hidden-cost-of-incarceration#:~:text=The%20Bureau%20of%20Justice%20Statistics,2.3%20million%20people%20behind%20bars.

Bay Area County Expenditure

- Expenditure data from San Francisco was manually pulled from http://openbook-report.sfgov.org/OBMiddleware/report.aspx?reportname=1
- Expenditure data from other Bay Area counties downloaded as CSV from https://counties.bythenumbers.sco.ca.gov/
- I created an excel spreadsheet and combined the relevant data from the two sources above

Public Defenders Caseload in Alameda

- Every year, the Alameda Public Defender's office gives a maintenance of effort (MOE) budget presentation. This presentation is publicly available and includes data from the past fiscal year, such as the number of cases per attorney. For instance, here's the presentation link for 2017-2018 https://acgov.org/MS/OpenBudget/pdf/FY17-18/Public%20Defender%20Budget%20Presentation%202017-06-27.pdf. I pulled the caseload data from the different years and combined it in an excel spreadsheet.

Law Enforcement's Use of Funding for Surveillance Technology

Percentage of Bay Area Cities That Use Major Surveillance Technologies; What major surveillance technologies does your city's law enforcement use?

- Data on the surveillance technologies used by law enforcement agencies in 50 Bay Area cities. By Shelby Perkins and Craig Nelson from Stanford University's Freeman Spogli Institute. https://www.sfpublicpress.org/why-law-enforcement-should-publicize-surveillance-policies-procedures/

    - I contacted Shelby Perkins, who shared an excel spreadsheet that contained a list of individual law enforcement agencies and instances when they used a particular technology. Using that spreadsheet, I created another spreadsheet broken down by city (rather than individual law enforcement agency) and the types of technology used by law enforcement in that city. I also calculated the total percentages of cities from those listed that used the various types of technology.

Most Frequently Cited Terms in Federal Grants to Bay Area Law Enforcement, 2010-2020:

- Data on federal grants given to Bay Area law enforcement from 2010 to 2020. By the ABC7-I Team, who retrieved records from the Defense Agency. https://abc7news.com/bay-area-police-equipment-petaluma-mrap-receives-most-military-pd/6281864/
    - The data is presented as a list of records of federal grants to Bay Area law enforcement detailing the law enforcement agency, item name, item count, and total value of the grant. I created an excel spreadsheet and copy and pasted this data. I extracted the “item name” section and, using Python and a Jupyter notebook, calculated the frequency of terms in “item name”--identifying the most common and least common terms in federal grants.

Take a look at the surveillance technologies that San Francisco law enforcement use:

- Data on surveillance technologies used by San Francisco law enforcement. Retrieved from San Francisco’s Committee on Information Technology (COIT). https://sfcoit.org/SurveillanceInventory
    - The data is presented as a list of technologies that San Francisco law enforcement use. I created an excel spreadsheet, added the list of technologies, and then categorized the technologies (as to whether they had to do with physical, digital, or laboratory surveillance). I then created a JSON file and formatted the data to be used to make a tree network.

Why does surveillance matter?

- Collated from sources listed above

Race Distribution of Jailed Persons (1985-2018):

- https://github.com/vera-institute/incarceration-trends

California Jail Pretrial Population

- https://github.com/vera-institute/incarceration-trends

Bail:

- http://sanfranciscobailbonds.com/san-francisco-bail-schedule/#:~:text=For%20all%20unscheduled%20felonies%2C%20the,amount%20as%20the%20offense%20itself.

California's Correction Department does not Prioritize Rehabilitation:

- http://www.ebudget.ca.gov/budget/2021-22/#/Home

Tools

Website

- GitHub, HTML, CSS

Visualizations

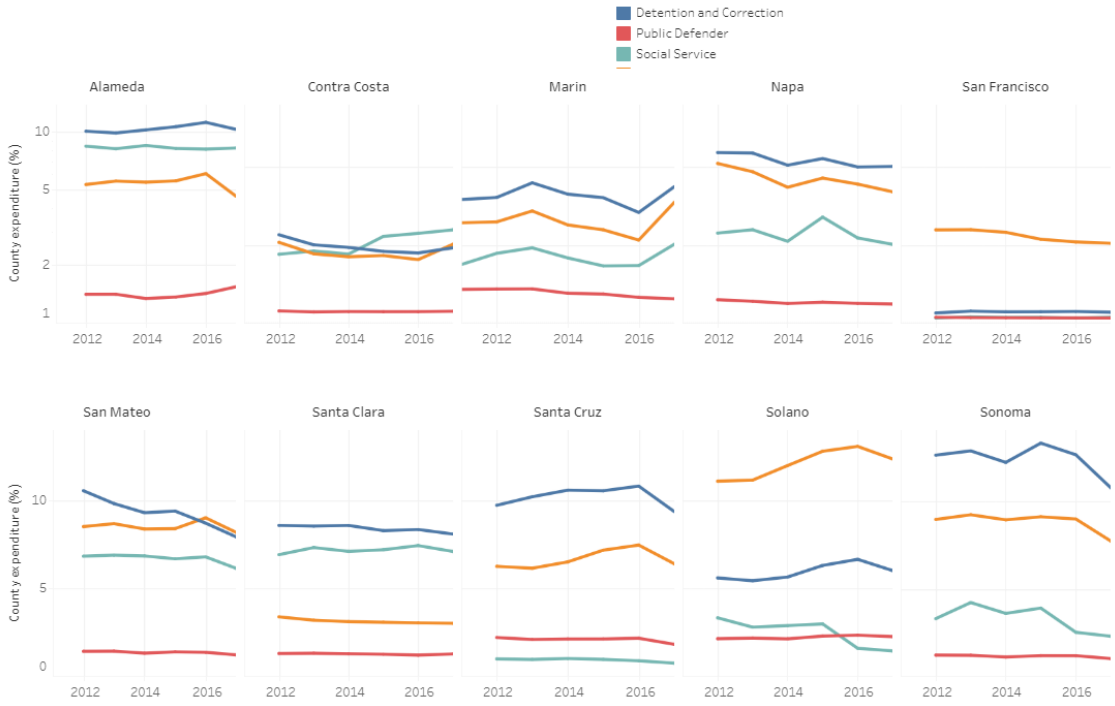
- Tableau
- Observable/D3
- Flourish
- Affinity Designer & Figma

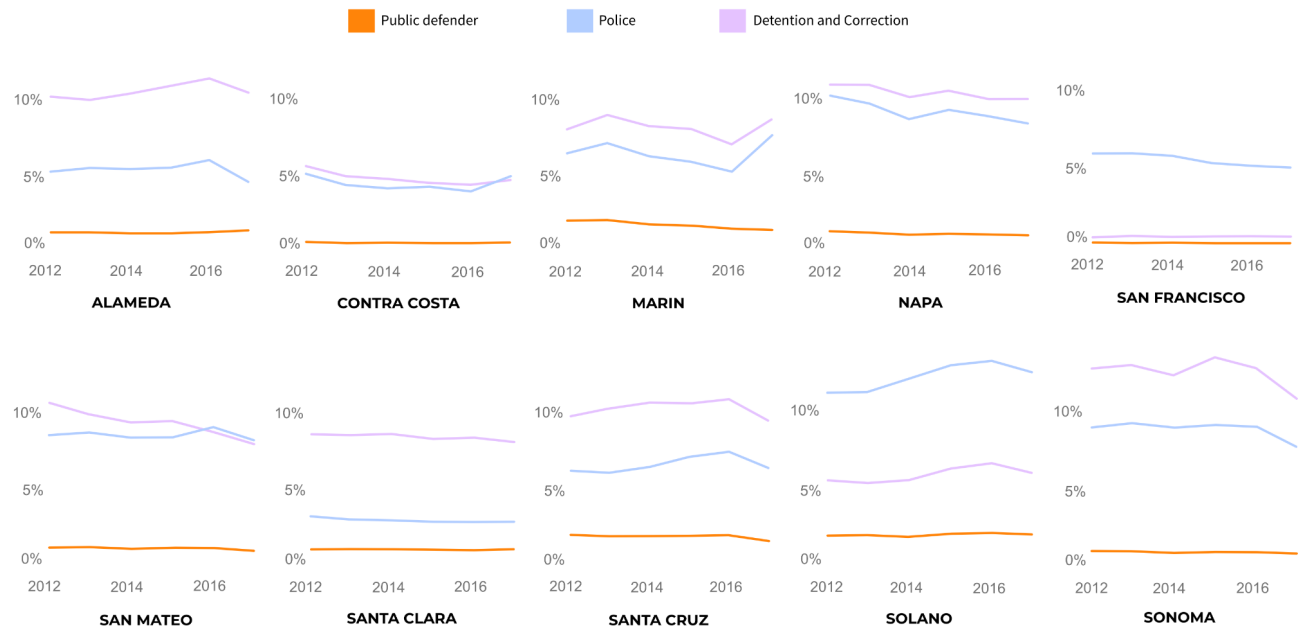
Results

Usability testing and peer feedback deeply impacted our final project, and we underwent several iterations of testing and revision (with users and Marti!). Here is a link to our original usability testing results. We will use this section of the paper discussing iterations we made to our final designs based on discussions with Marti and our team members.

One of our visualizations on public defenders is a small multiples line chart, showing the expenditure in different Bay Area Counties on public defenders, detention and corrections, social services and police. In our first iteration (first image below), we uploaded a Tableau file. Although users found the chart interesting and were able to see the discrepancies in expenditures, there were still some clear usability and visualization issues. Firstly, the legend did not show all of the categories and users had to scroll to see the third category. Additionally, users also felt that because the 4 colors were equally salient, they weren't sure if there was a specific category they should be paying closer attention to (in usability testing, it took people a while to realize that public defenders were consistently at the bottom). Thus, after a few iterations, we decided to

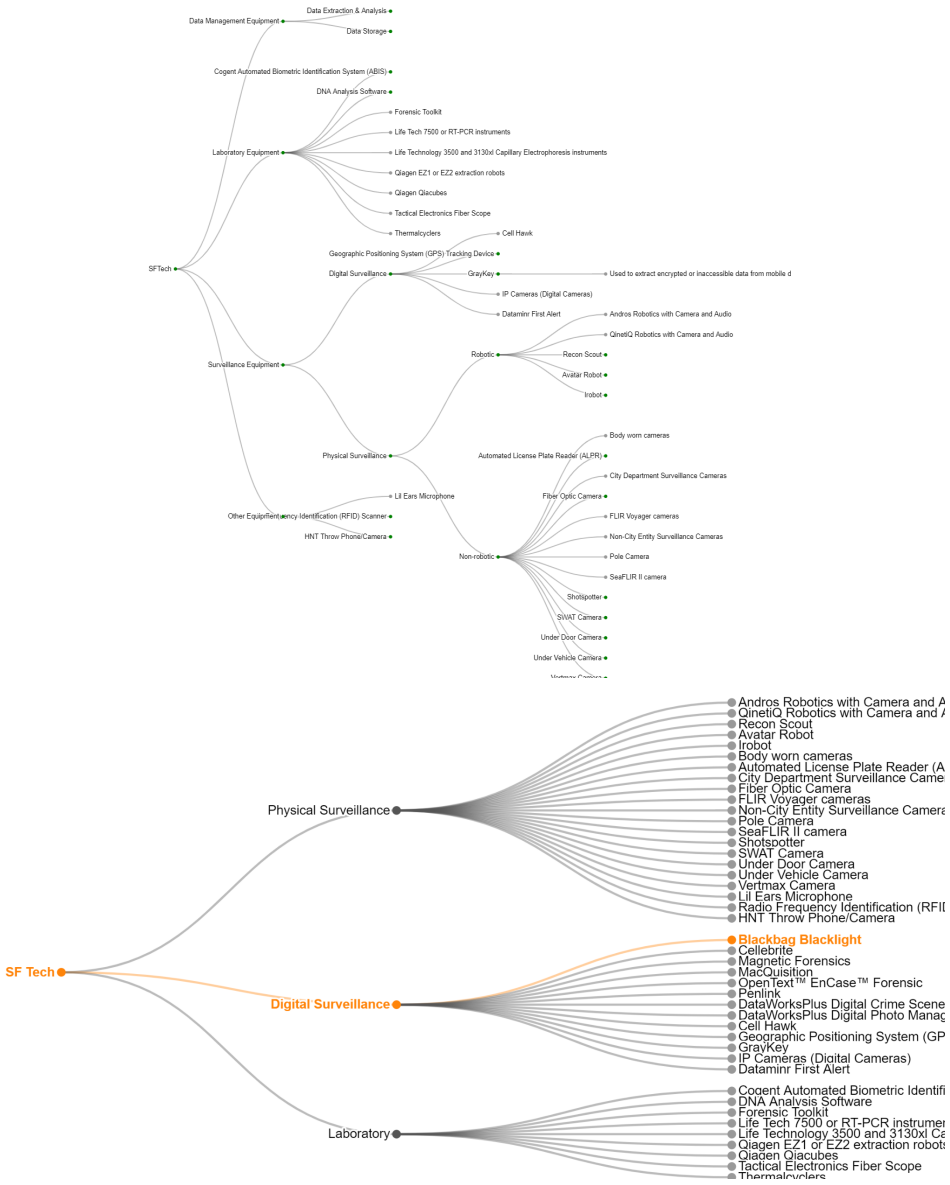
move the chart into Infinity Designer so that we can better control some of the visual elements. In our final design, we removed social services as a category because it was more distracting than helpful, and we wanted to remove any visual clutter. We also expanded the legend and lined them up horizontally on the top of the graph so users can easily refer to it. Additionally, because we wanted users to pay attention to the expenditure on public defense, we highlighted the public defender category with a bright orange and gave the other two categories more muted colors for comparison purposes. Lastly, we also spaced out each individual line chart more so that it is less visually overwhelming for users.



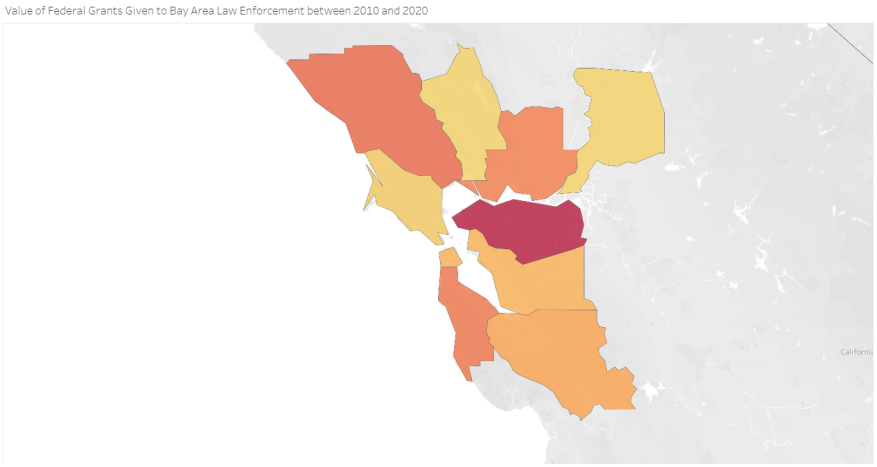


Regarding the visualizations on law enforcement's use of funding, early feedback raised several issues with the visualizations.For example, we found that the collapsible tree breaking down the different types of technologies used by San Francisco law enforcement had an overwhelming number of layers and was cumbersome to expand. It was unclear from the visualization that physical surveillance technologies were the most popular among law enforcement. As a result, we simplified the tree structure, removed the collapsibility, and added hover and highlight functionality. In later feedback, viewers were able to more quickly identify that physical surveillance technologies were the most popular. The tree structure, due to its simplification, also gave viewers more time to actually review the names of different technologies. Were the visualization to be done again, we would have liked to have added descriptions of a given technology once its node was hovered on.

The first and final versions of the visualization are presented below:

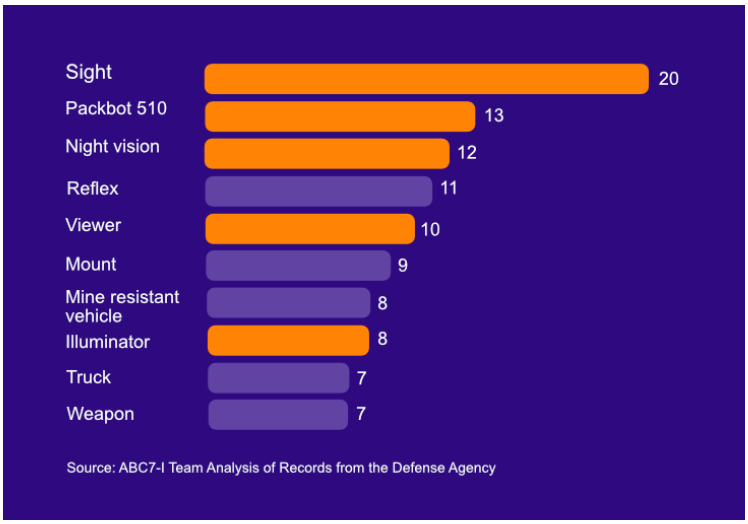


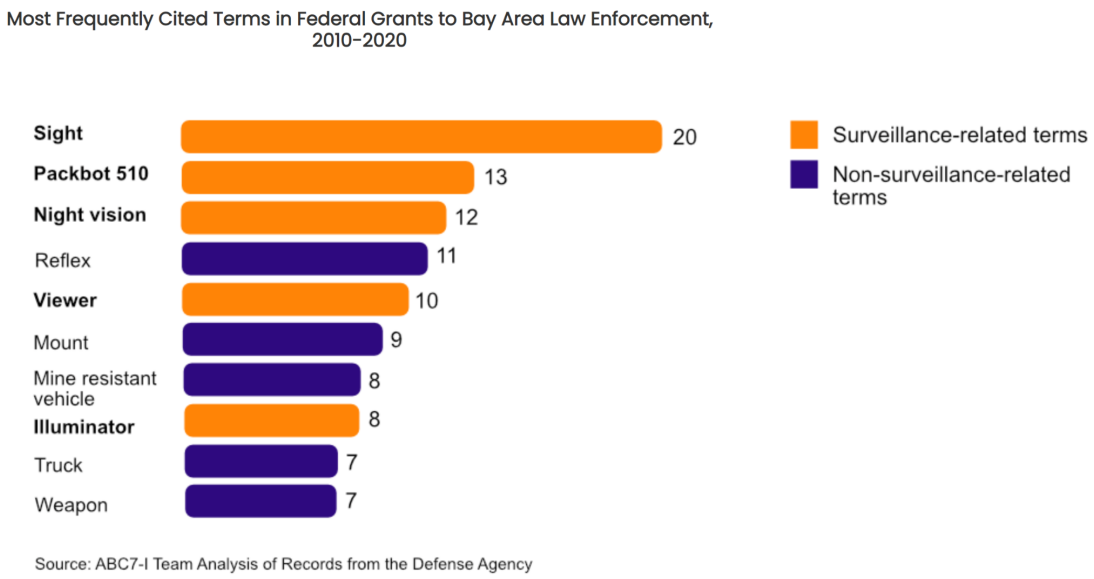
Our visualization allowing users to see what major surveillance technologies were used in their city (by selecting their city from a dropdown menu) was developed after receiving feedback about the choropleth below. Specifically, general feedback about the choropleth suggested that the information presented on it was not very rich. With that in mind, we decided to create another visualization that allowed users to very specifically learn more about surveillance technologies in their city. Feedback from the dropdown menu suggested that users were surprised and very interested in learning more about the surveillance technologies their city used. However, one area where the visualization could have improved was in clearly defining some of the technologies (e.g. defining the difference between a “camera network” and “camera registry”).



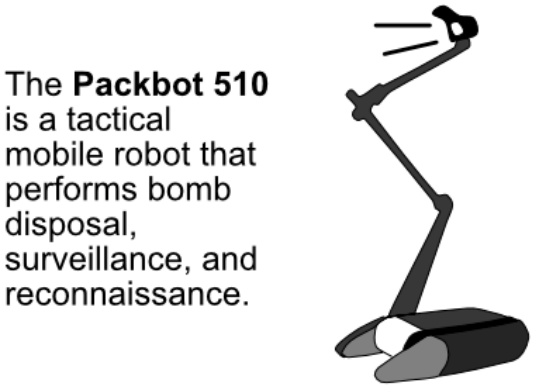
Regarding the bar chart on the most popular surveillance technologies used by Bay Area law enforcement, viewers were able to easily identify and compare the most and least frequently used surveillance technologies in the Bay Area. Regarding the most frequently used words in federal grants to Bay Area law enforcement, viewers found the initial iteration of the chart difficult to understand. Specifically, it was unclear through the colors that we were making a distinction between surveillance-related words and non-surveillance related words. We changed the colors and added a legend to improve legibility and comprehension. In the final version, users were able to leverage the legend, alongside the title, to better understand the bar chart.

The first and final versions of the visualization are presented below:

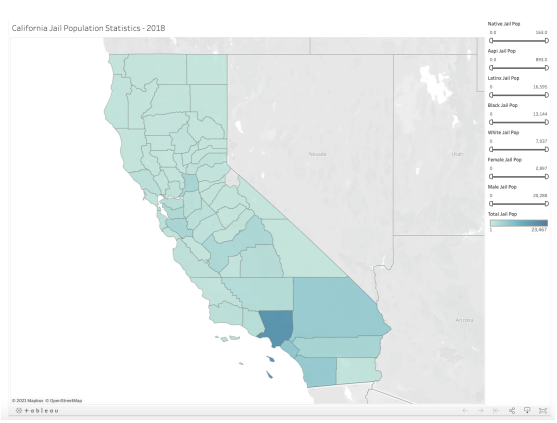




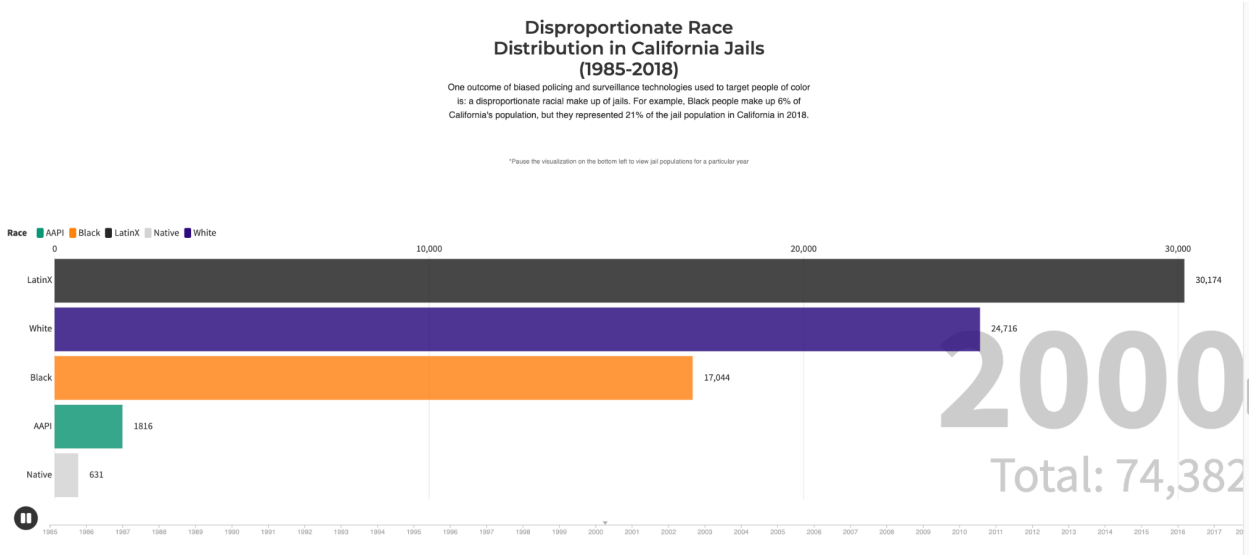
Through peer feedback, we also removed the following illustration concerning the Packbot 510, one of the surveillance terms listed in the bar chart. There were concerns that the illustration did not add to the narrative and, in fact, could potentially be distracting. The removed illustration can be seen below.



The jail population demographics visualizations went through numerous iterations. Initial Visualizations (v1 & v2):



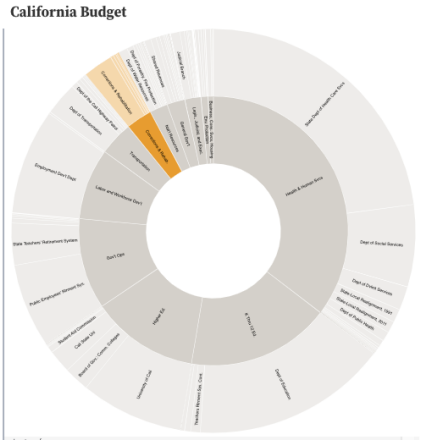
Final Visualization:



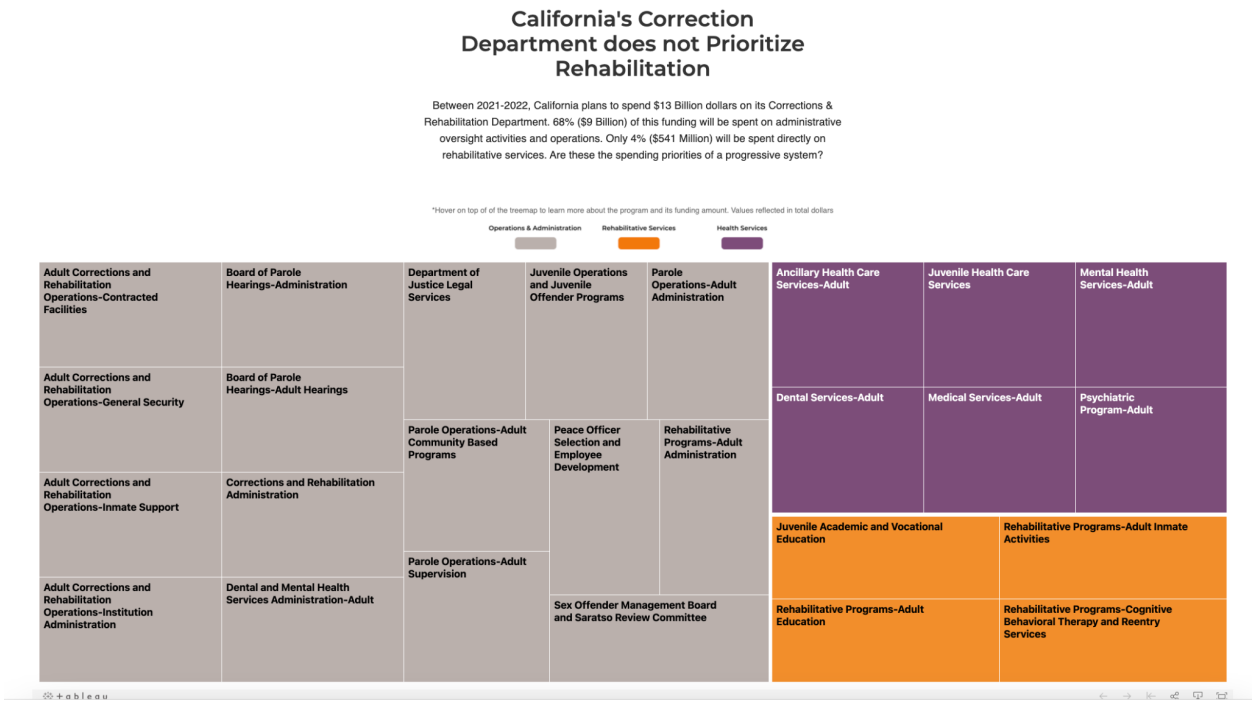
The first visualization (blue map), was attempting to use the raw data from the Bureau of Justice Statistics, which did not allow users to toggle a particular demographic (e.g. gender or race). This was very uneasy for users. Therefore, we iterated to the brown map, which did allow for toggling and labeled the county. However, the user still had to make a selection of a particular demographic aspect and then hover over the map to view the data. Based on feedback from Marti, we realized this was not useful towards storytelling and pivoted to using a running bar chart which very clearly and helpfully supports a narrative around the disproportionate representation of certain races in California's jails.

The corrections & rehabilitation treemap went through multiple iterations.

Initial Visualizations (v1 & v2):



Final Visualization:



As mentioned in the related work, we were inspired by the Governer of California's zoomable visualization of spending data. Our original thought was to present that information with even more layers of depth (v1 included the ability to zoom to two levels of data; whereas the Governer of California visualization just showed one level of data). Next, based on user feedback, we iterated to a design which highlighted the corrections spending (in orange). This version also included the total dollar value and percent of total of the particular program (and still included the data at two levels). However, based on Marti's feedback from the usability report, it was not supportive in telling a clear story. Therefore, we pivoted to a treemap.

Originally, we were attracted to the sunburst, because it presented *all* of the data in a relatively unfiltered manner. This would let the user draw their own conclusions. However, in spending time exploring the data, we realized that there are clear categorizations of spending, so we manually categorized the programs in order to present a narrative around the spending priorities of the corrections system. We hope this is more useful for the user.

Lastly, we also received feedback on the general usability of our website. Initially, our website consisted mostly of just our visualizations with very little text accompanying each visualization. Users found this a little confusing as the narrative of our combined visualizations were not obvious and users weren't sure what their takeaways were, even if they understood the individual charts. Our visualizations were also not clearly sectioned and were spaced very close to each other. Thus, we first thought more

critically about the storytelling aspect of our website. In particular, our group spent time brainstorming on the narrative, sections of our website, and added entirely new visualizations after speaking with Marti (documented here).

After multiple iterations, we came up with a website design that used text to help paint a clearer narrative, added introductory sections and visualizations, applied more white space between the visualizations, and utilized a clear color scheme to help break apart the different sections. As a result, we hope users are more able understand the visualizations and their takeaways. We are very proud of how far we have come (from our original brainstorm design)!

Visualization

Link to Final Visualization: https://oslointhesummer.github.io/publicdefense/

Work Distribution

Activity	Team Member & Proportion
Proposal	Tiffany (33%) Arika (33%) Jyen (33%)
Mid-Term Report	Tiffany (33%) Arika (33%) Jyen (33%)
Usability Testing	Tiffany (33%) Arika (33%) Jyen (33%)
Usability Report	Tiffany (33%) Arika (33%) Jyen (33%)
Final Visualizations (Web Page)	Tiffany: Surveillance visualizations Jyen: Defender caseload & county spending (small multiples) Arika: Introductory sections and

	incarceration related visualizations Narrative (Intro & Implications): Tiffany (50%) & Arika (50%) Formatting: Jyen (50%) & Arika (50%)
Final Report Write Up	Tiffany (33%) Arika (33%) Jyen (33%)
Project Management	Arika (80%) Tiffany (20%)

Software

GitHub Repository: https://github.com/oslointhesummer/publicdefense