



Impact of Chase Stadium Events

On Fire Department Call Volumes & Police Incidents in Dogpatch or Mission Bay

Are Sports Fans Causing an Uptick in Police Incidents or Fire Department Call Volume?

San Francisco has been home to the AT&T Stadium for many years now, and while the stadium is a great source of joy for many, it is also a source of pain for locals.

For example, have you ever been late to an engagement because you were stuck on an overcrowded, tardy, and broken down Caltrain/Muni, filled with the light scent of alcohol and a sea of orange/black jerseys?

If so, you've likely been impacted by a Giants game! Frequent and powerful, Giants games have the power to bring many folks together, and also, hold them together on public transit. It has even gotten to a point where a website has been created to inform you whether or not there is a Giants game today: www.isthereagiantsgametoday.com.

Because of this, I was curious to see if this surge of sports fans had an impact on more than just my daily commute, and I decided to look into this with a smaller subset of data: the recent opening of the Chase Center Stadium - home to the Golden State Warriors.



Introduction to the datasets

Fire Department Calls for Service from April 12th, 2000 to Present

- 5243306 entries, 44 columns
- Columns of Interest: Call Date, Call Type, Zip code of Incident
- Null Values: 14,297 entries for Zip code of Incident
- Data Cleaning:
 - Looked up largest groups of addresses without Zipcode that pertained to Mission Bay/ Dogpatch and provided the zip code after cross-referencing Google Maps. Found 600 incidents related to Mission Bay/ Dogpatch.
 - Reduced the dataframe to only focus on incidents most likely to relate to an Event at the Chase Center, such as: 'Train / Rail Incident', 'Odor (Strange / Unknown)', 'Explosion', 'Traffic Collision', 'Alarms', 'Structure Fire', 'Other', 'Medical Incident'

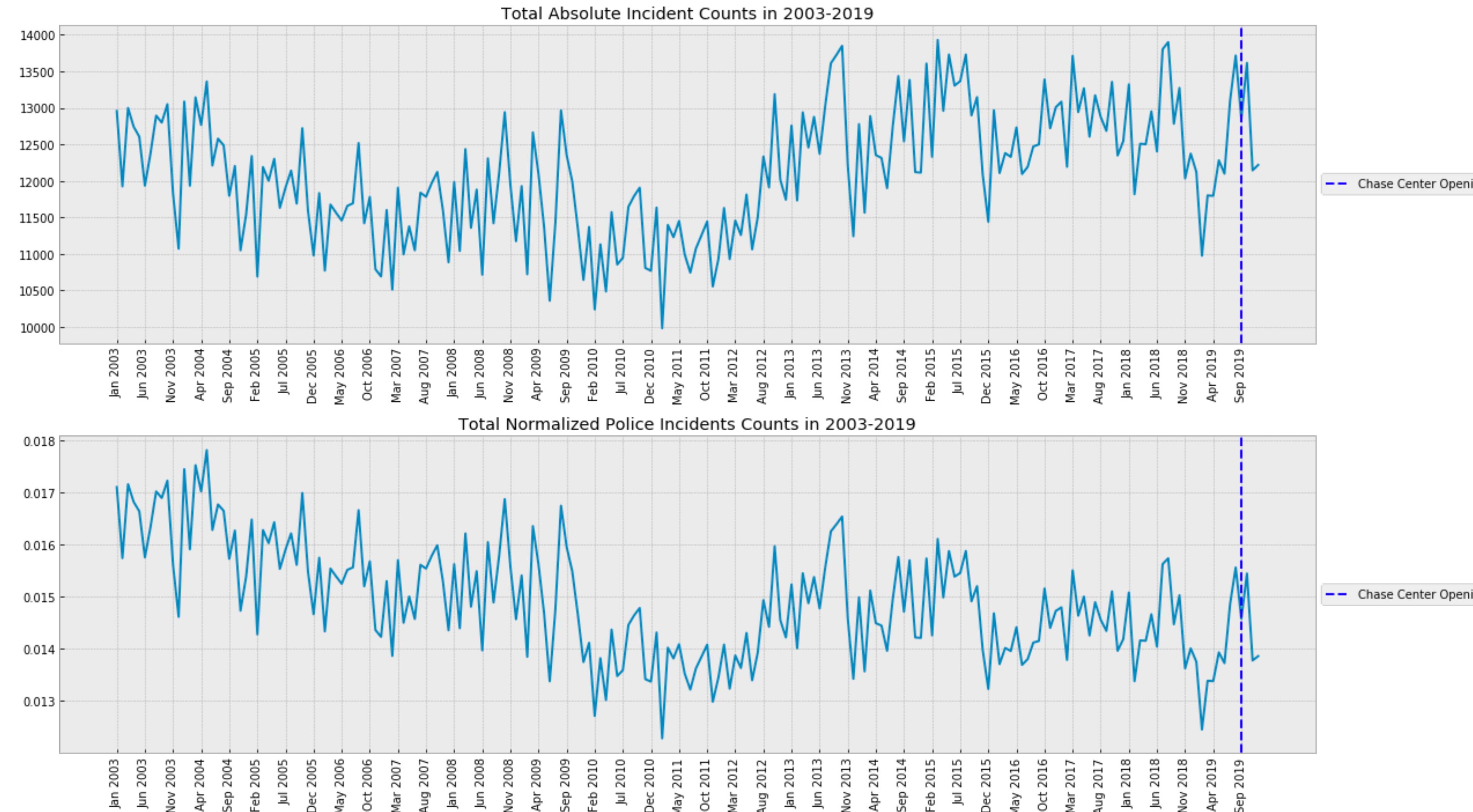
Police Incident Reports from January 1st, 2003 - Present

- Report 1: 2018 - Present: 332828 entries, 36 columns
- Report 2: 2003 - 2018: 2215024 entries, 33 columns
- Columns of Interest: Incident Date, Incident Category, Incident Description, Latitude, Longitude
- Data Cleaning:
 - Combined the historical report to the present report using pandas
 - Because I wanted to look at zip codes related to the Mission Bay & Dogpatch Areas, I used the haversine distance formulas in order to calculate the nearest zip code to the incident based on Latitude & Longitude.
 - Also reduced the data frame to focus only on incidents more likely to relate to Chase Center Events, such as: 'Non-Criminal', 'Stolen Property', 'Miscellaneous Investigation', 'Other Miscellaneous', 'Assault', 'Larceny Theft', 'Malicious Mischief', 'Disorderly Conduct', 'Other', 'Suspicious Occ', 'Disorderly Conduct', 'Traffic Collision', 'Liquor Laws', 'Fire Report', 'Suspicious'

Chase Center Events & Dates

- Scrapped json file from chasecenter.com/events in order to get the dates and event names for all events held at the Chase Center since opening
- 92 entries, 25 columns
- Converted to a pandas dataframe in order to pull only the event date, name, and category for analysis & hypothesis testing

Exploratory Data Analysis - Police Incidents

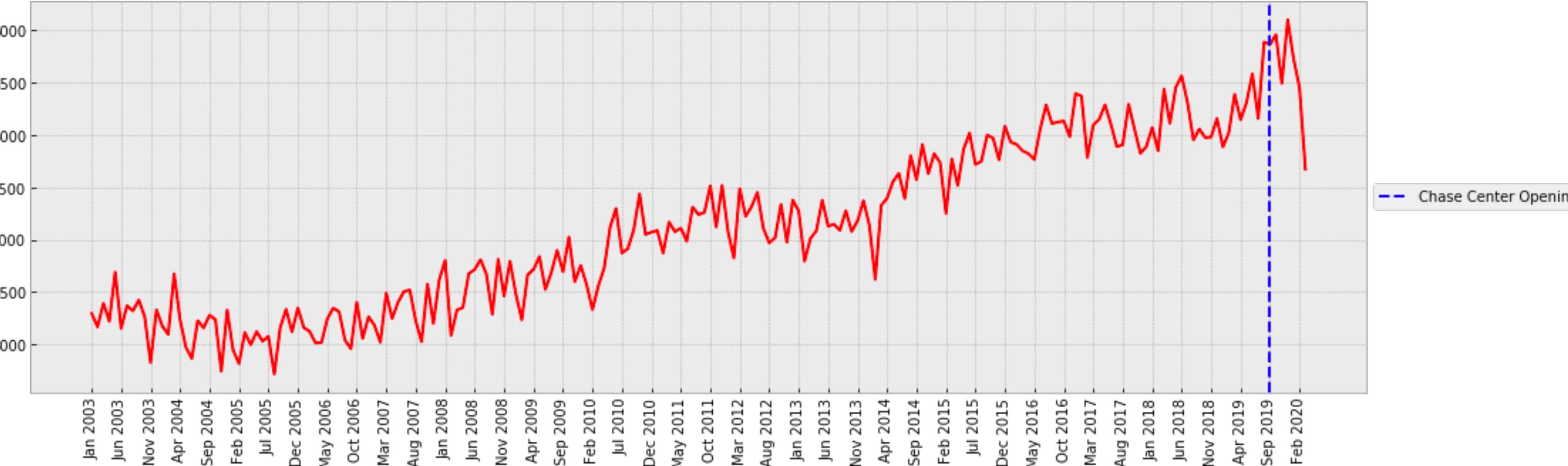


Steep decline up until 2011, where it has gradually increased and is relatively flat since 2013 and actually decreasing since the Chase Stadium Opened.

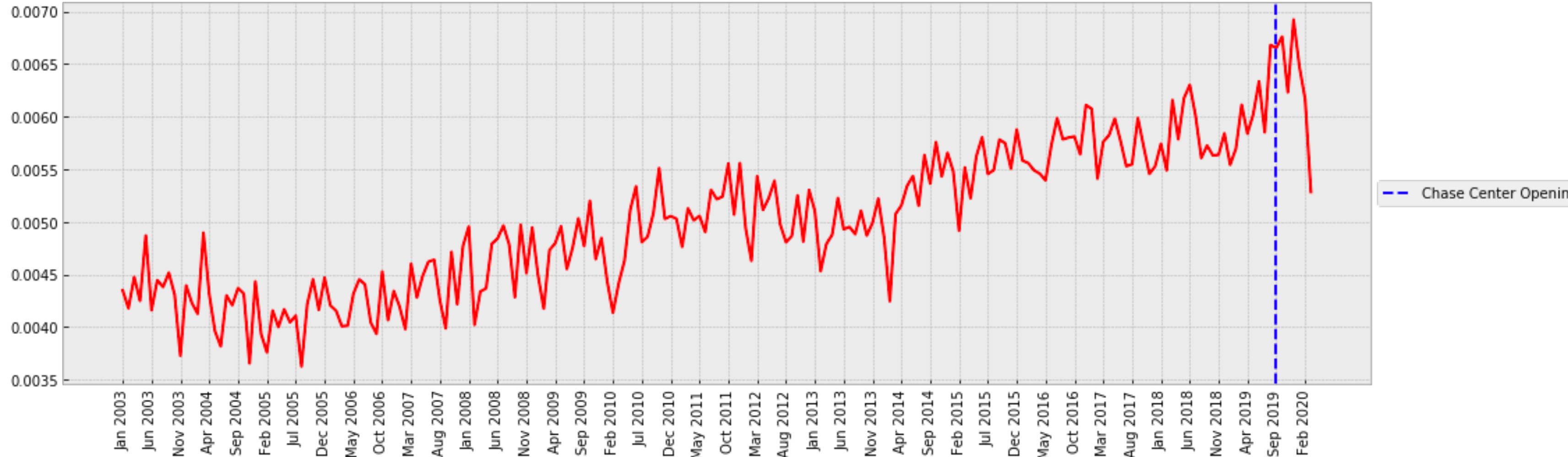
Seasonal peaks and lows per quarter, though trending down with normalization for population.

Exploratory Data Analysis - Fire Department Call Volume

Fire Call Counts in Mission Bay/Dogpatch: 2015-2019



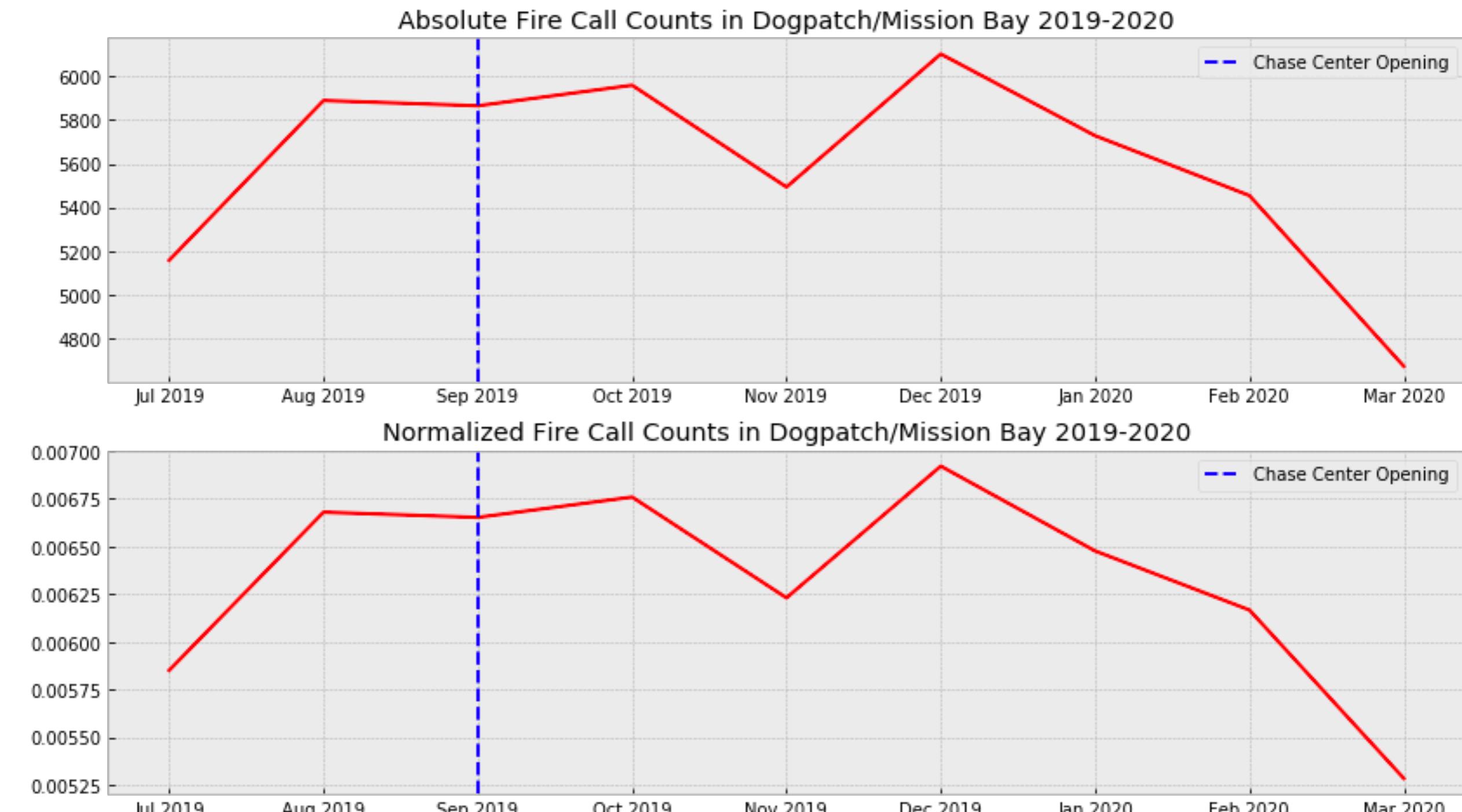
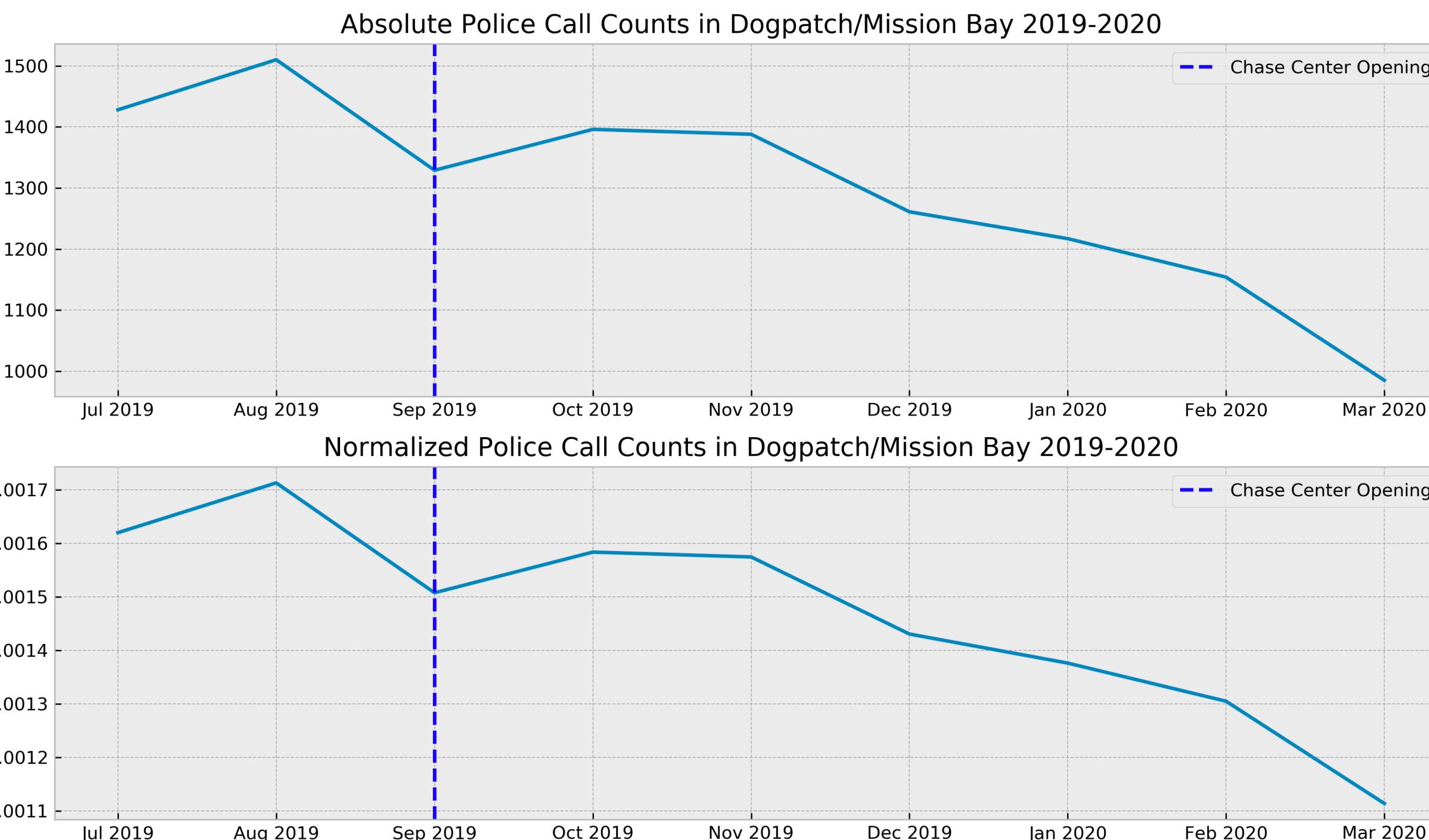
Normalized Fire Call Counts in Mission Bay/Dogpatch: 2015-2019



Calls to the Fire Department have been increasing year over year, even when normalizing for population growth.

Still quarterly seasonality, like Police Incidents, but trending up.

What about in 2019?



Both Police Incidents & Fire Department Calls begin to decrease after the Chase Stadium Opened.

- For Fire Department Calls, this is expected as there seems to be seasonal peaks and drops every quarter
- Police Incidents on the other hand were dropping year over year, which could impact these numbers.

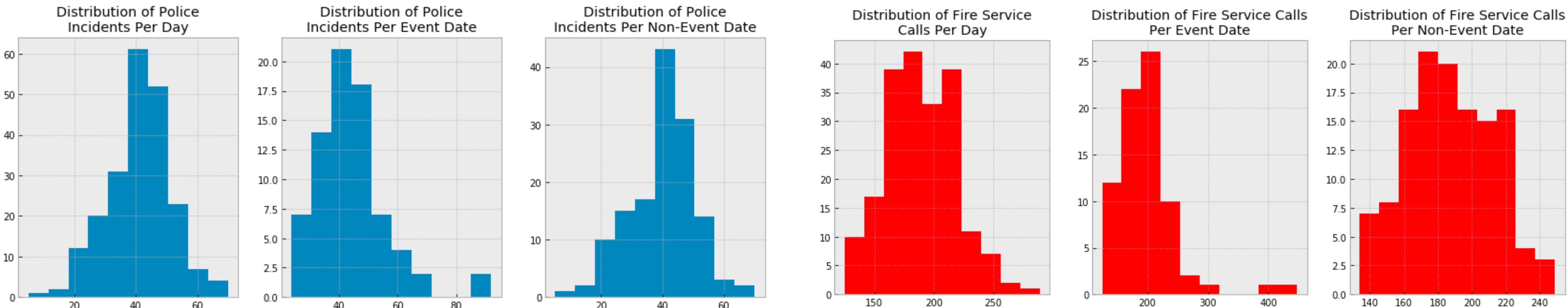
Because of this, I will focus my hypothesis test only on dates after the Chase Center opened.

Hypothesis Testing - Events are causing an increase!

Null Hypothesis: Fire Department Calls & Police Incidents during event dates = non-event dates

Alternative Hypothesis: Fire Department Calls & Police Incidents during event dates > non-event dates

Alpha: 0.05



The distribution of Police Incidents and Fire Department Call Volume seems roughly normal, with a few outliers which were removed from the dataset.

However, because both samples (Sample 1: Incidents/Calls on Event Dates, Sample 2: Incidents/Calls not on Event Dates) have different SD & Sample Sizes, we cannot use the CLT for our hypothesis test.

Instead, we will use MannWhitney U-test & Welch's T-Test.

Results: Events are causing an increase!

Police Incidents

Number of Event Dates: 75

Number of Non-Event Dates: 138

Incidents on Event Dates: 3337

Incidents not on Event Dates: 5483

MannWhitneyU Test Result :

pvalue = 0.026 -> [Significant](#)

T-Test Statistic & Distribution:

pvalue = 0.009 -> [Significant](#)

Fire Department Call Volume

Number of Event Dates: 75

Number of Non-Event Dates: 134

Incidents on Event Dates: 15761

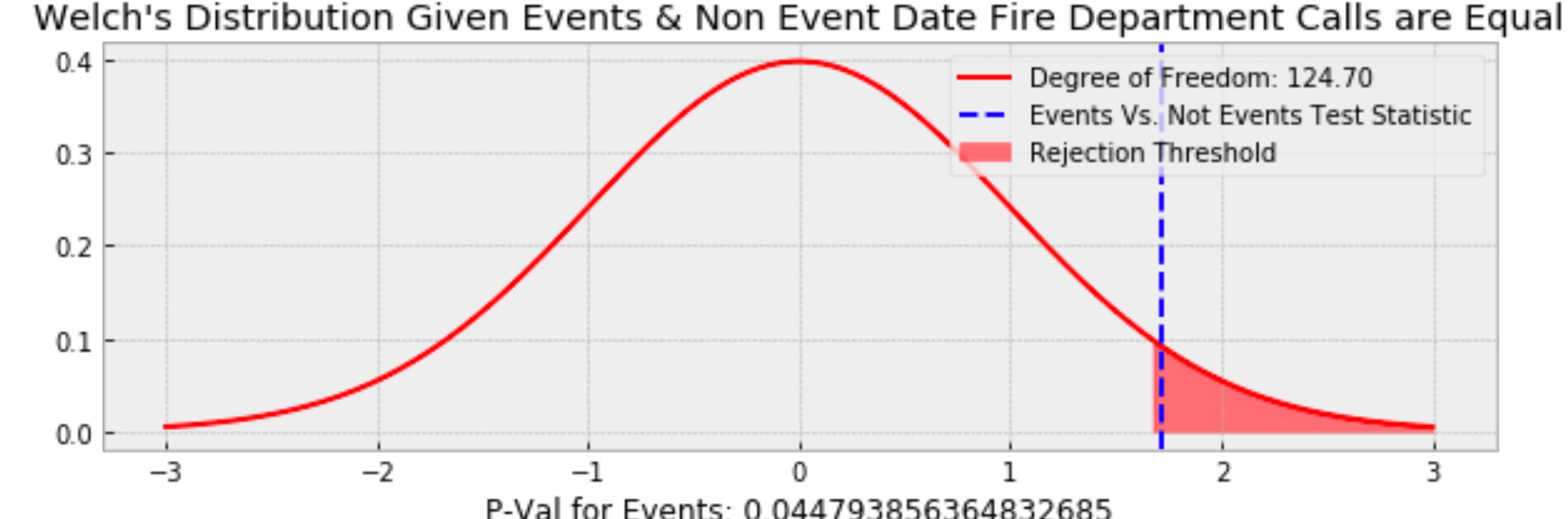
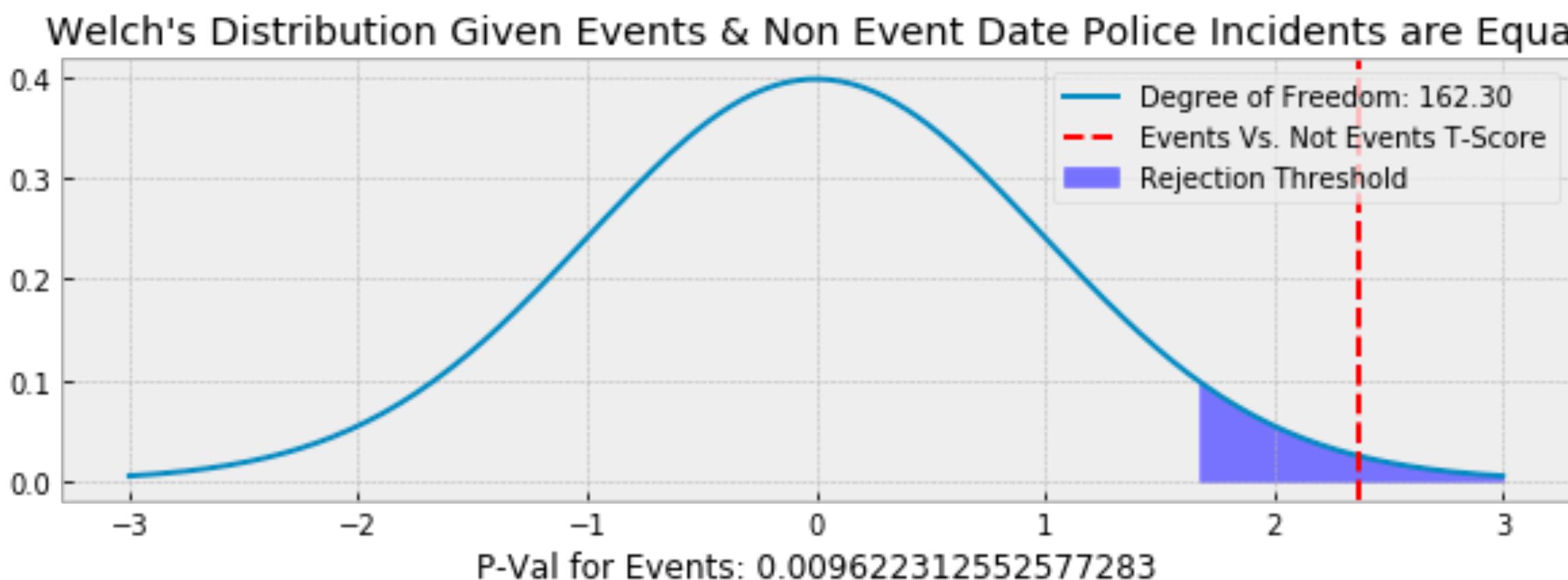
Incidents not on Event Dates: 24776

MannWhitneyU Test Result :

pvalue = 0.069 -> [Not-Significant](#)

T-Test Statistic & Distribution:

pvalue = 0.044 -> [Significant](#)



What About Shelter-In-Place (SIP)?

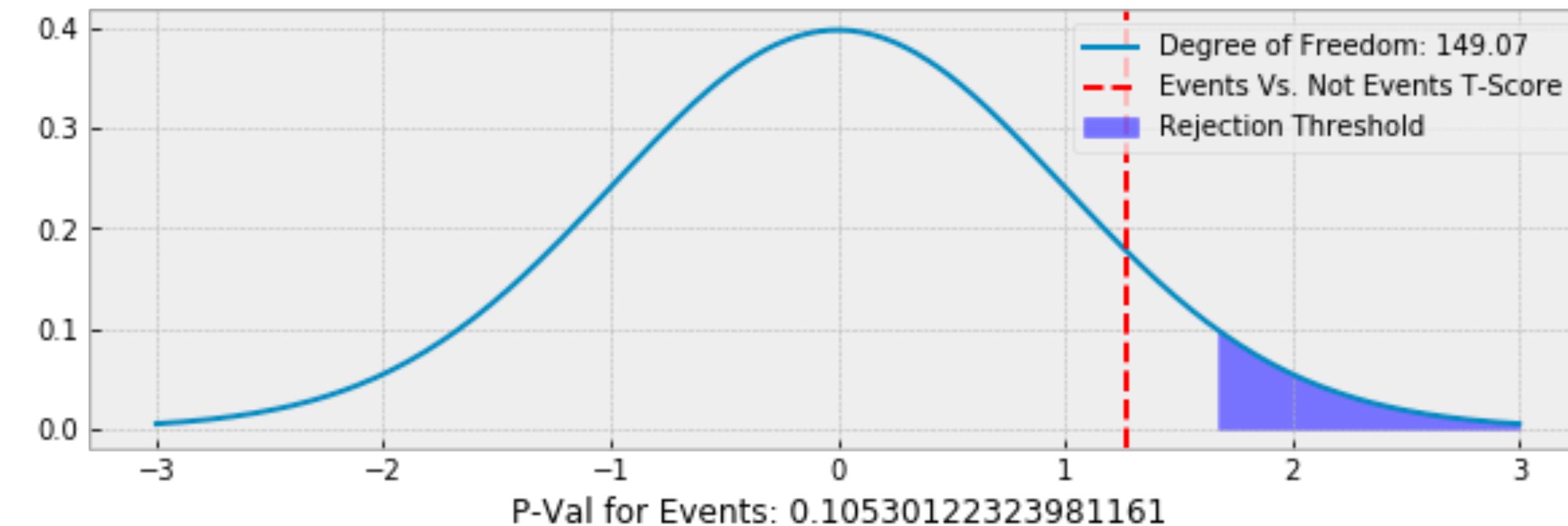
The data was captured from 9/6/2019 - 3/31/2020. Major Tech companies started having employees work from home around early March, and official Shelter In Place measures were enacted 3/19/2020. How did that impact calls/incidents?

Police Incidents

MannWhitneyU Test Result :
pvalue = 0.15 -> Not Significant

T-Test Statistic & Distribution:
pvalue = 0.11 -> Not Significant

Welch's Distribution Given Events & Non Event Date Police Incidents are Equal Without SIP

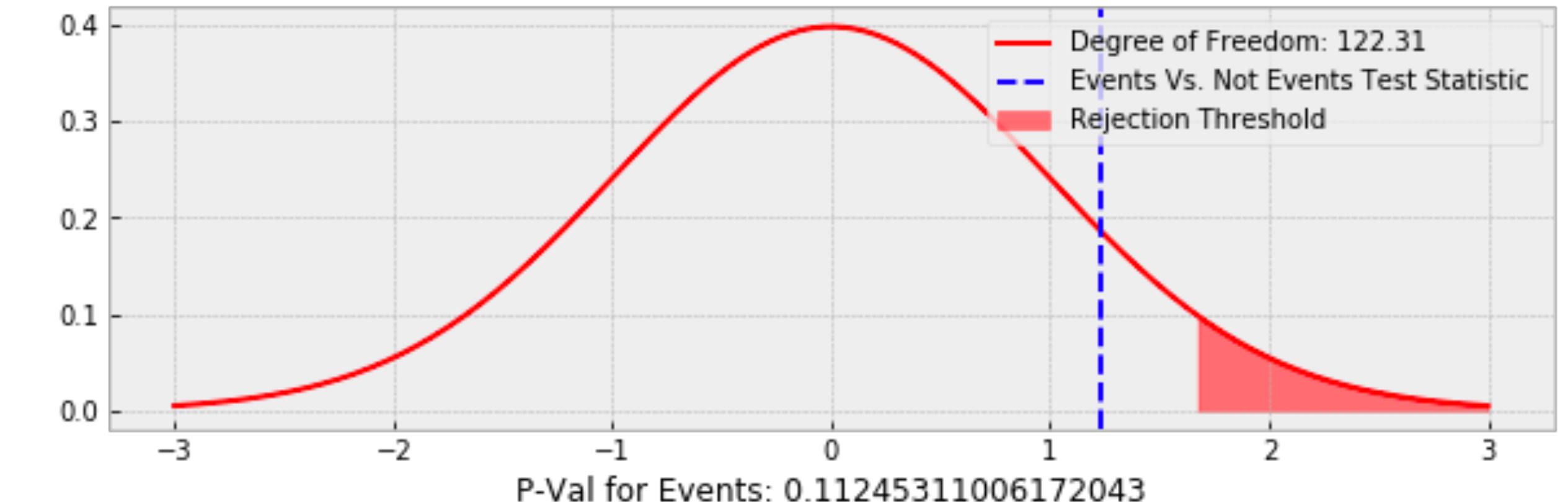


Fire Department Call Volume

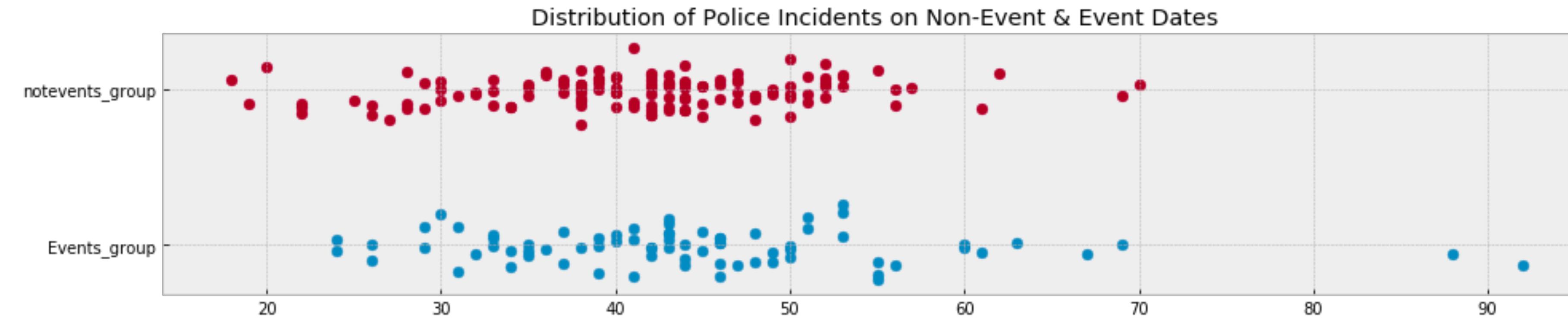
MannWhitneyU Test Result :
pvalue = 0.15 -> Not-Significant

T-Test Statistic & Distribution:
pvalue = 0.11 -> Not Significant

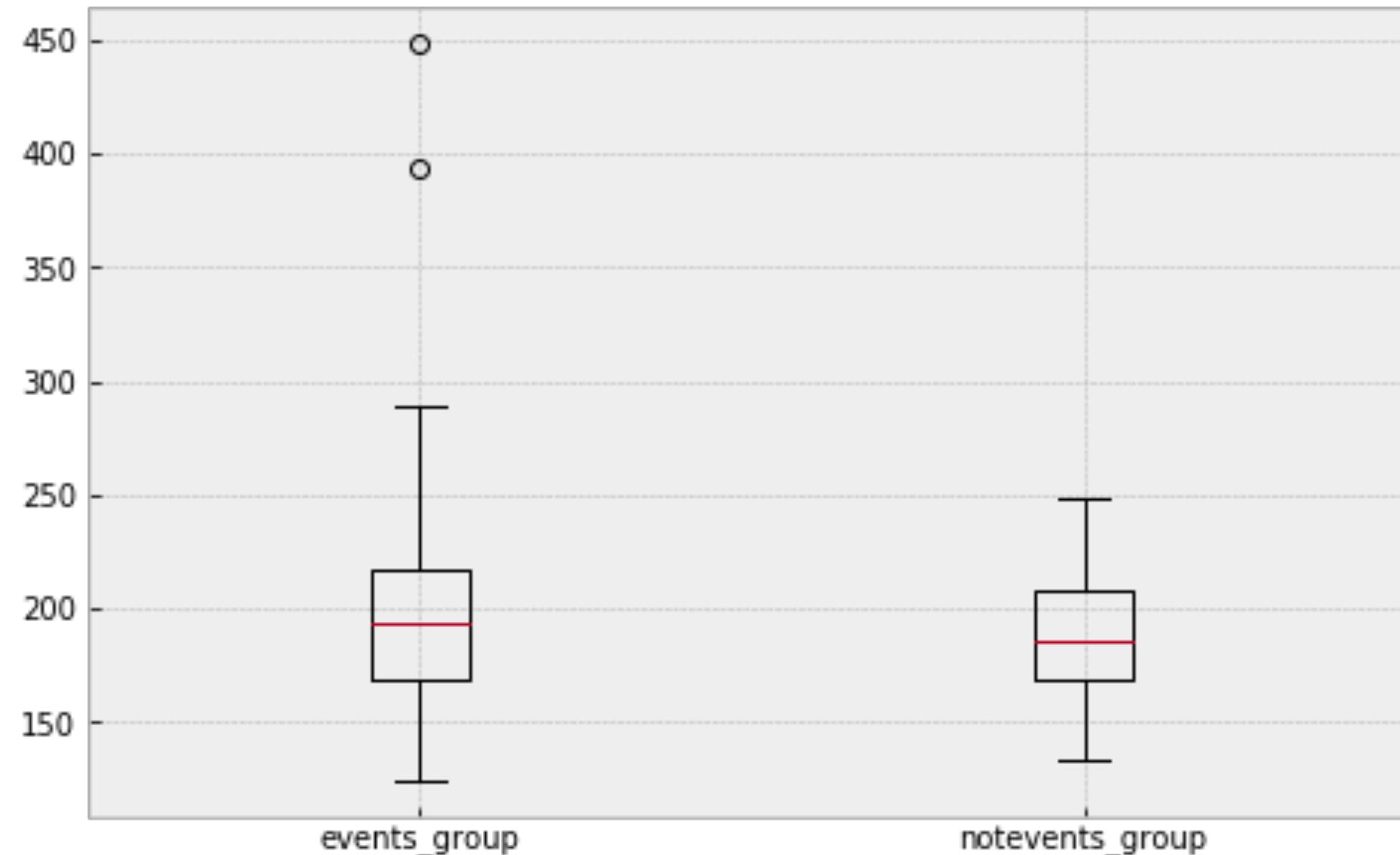
Welch's Distribution Given Events & Non Event Date Fire Department Calls are Equal Without SIP



Outliers - Could sports fans be more troublesome?



Distribution of Fire Department Calls on Non-Event & Event Dates



Outliers removed from the datasets were on 12/21/2019 & 1/11/2020, and present in both the fire department and police incidents reports.

Chase Event 12/21/2019:
-AI Attles Classic college basketball showcase

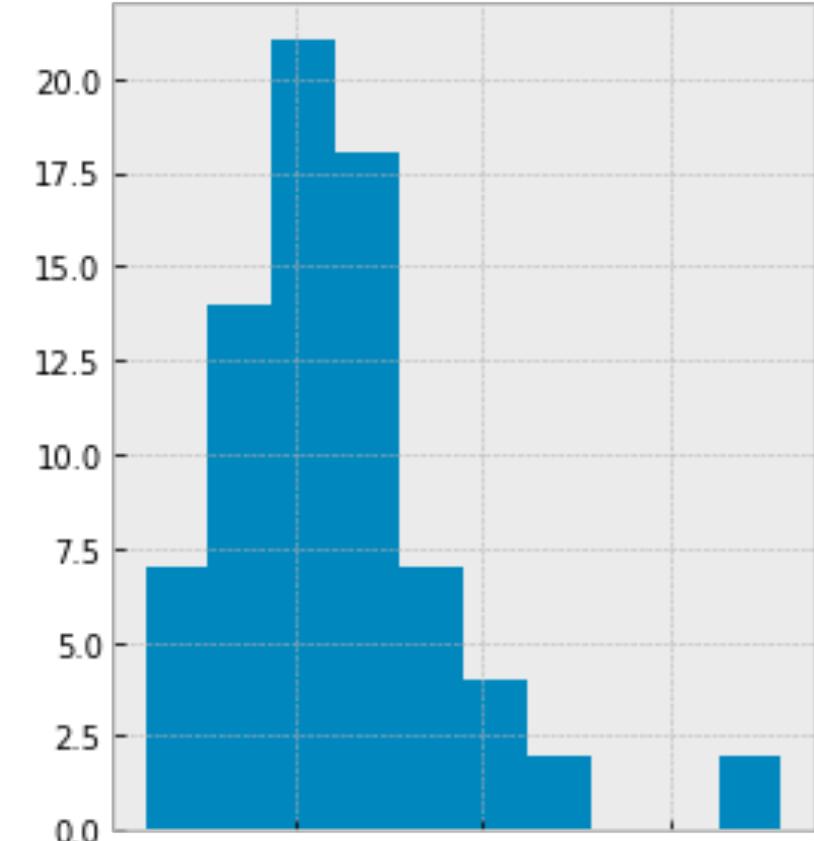
Chase Event 1/11/2020:
-Harlem Globetrotters Pushing the Limits World Tour

Both events are related to basketball, could basketball have a higher impact than non-basketball related events?

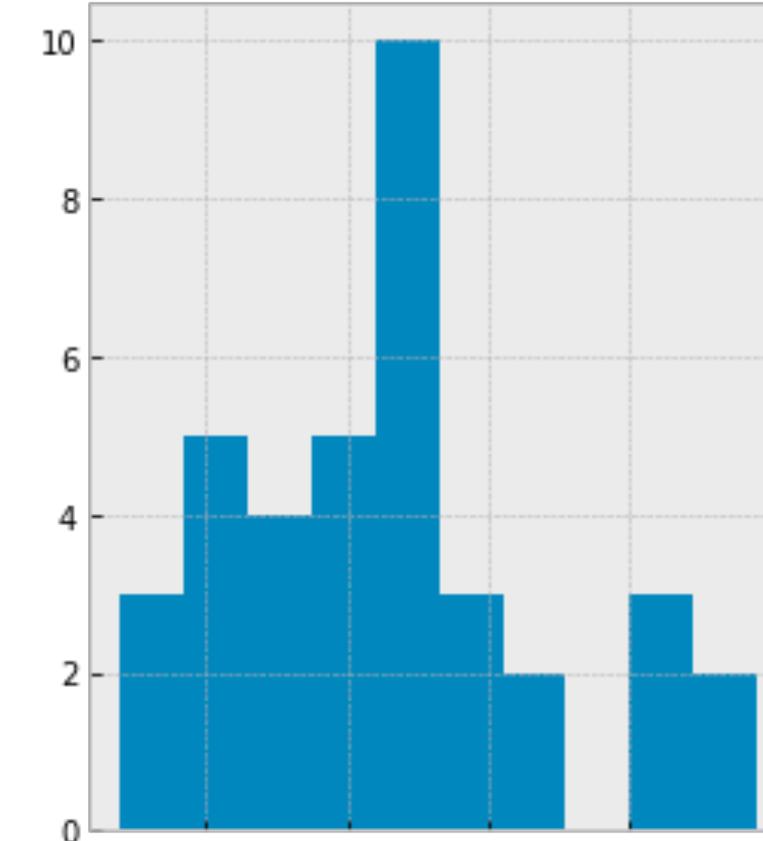
Basketball Causing More Harm Than Concerts?

Because the two major outliers in the Event Dates were both basketball related, could basketball events be driving more incidents/calls than non-basketball related events?

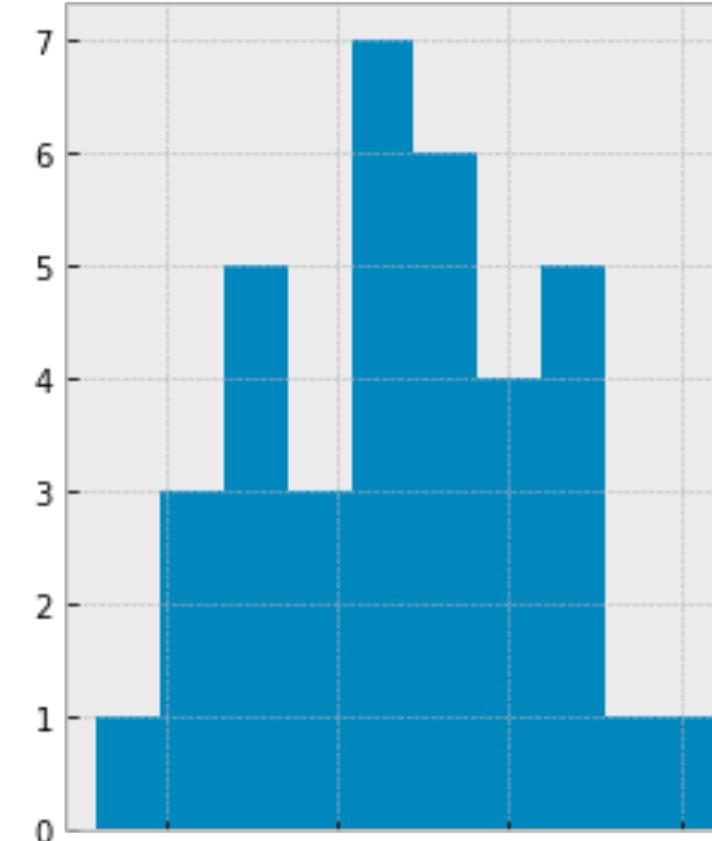
Distribution of Police Incidents
Per Event Date



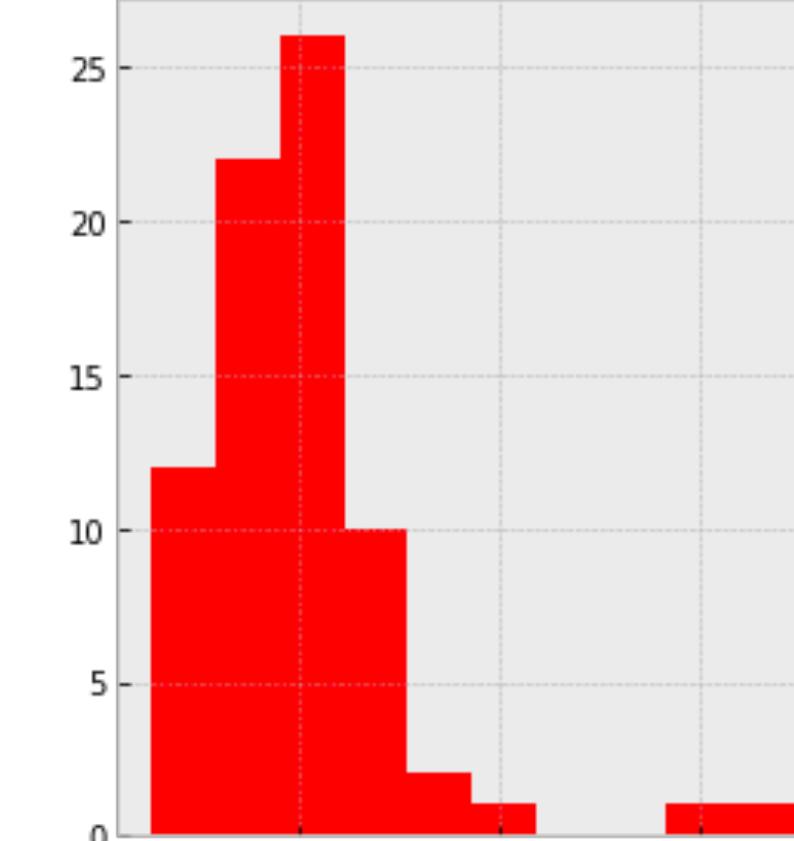
Distribution of Police Incidents
Per Bball Date



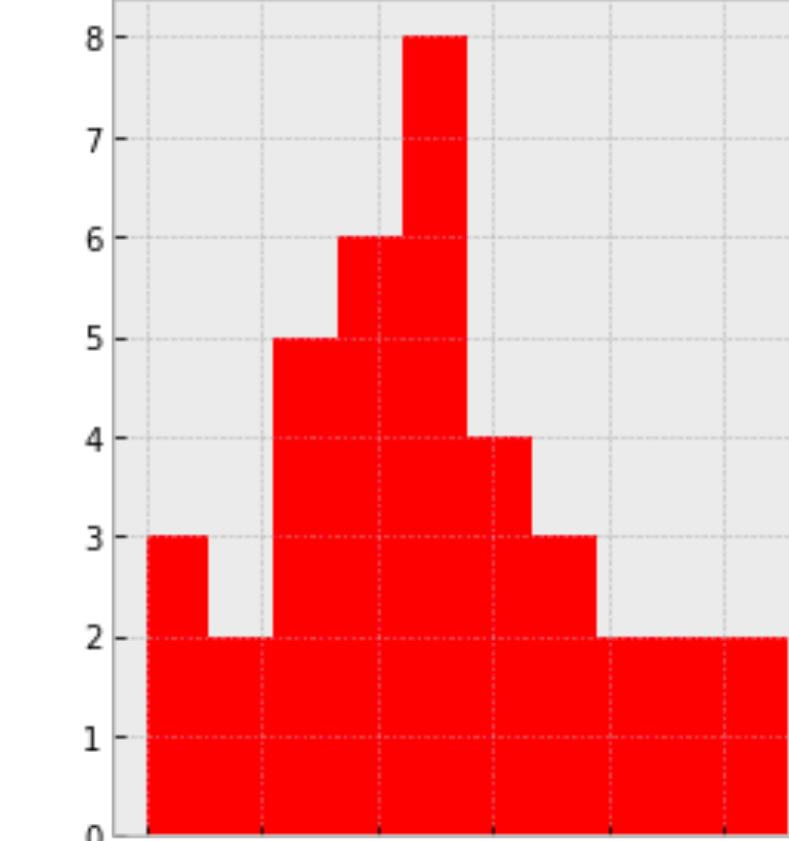
Distribution of Police Incidents
Per Concert Date



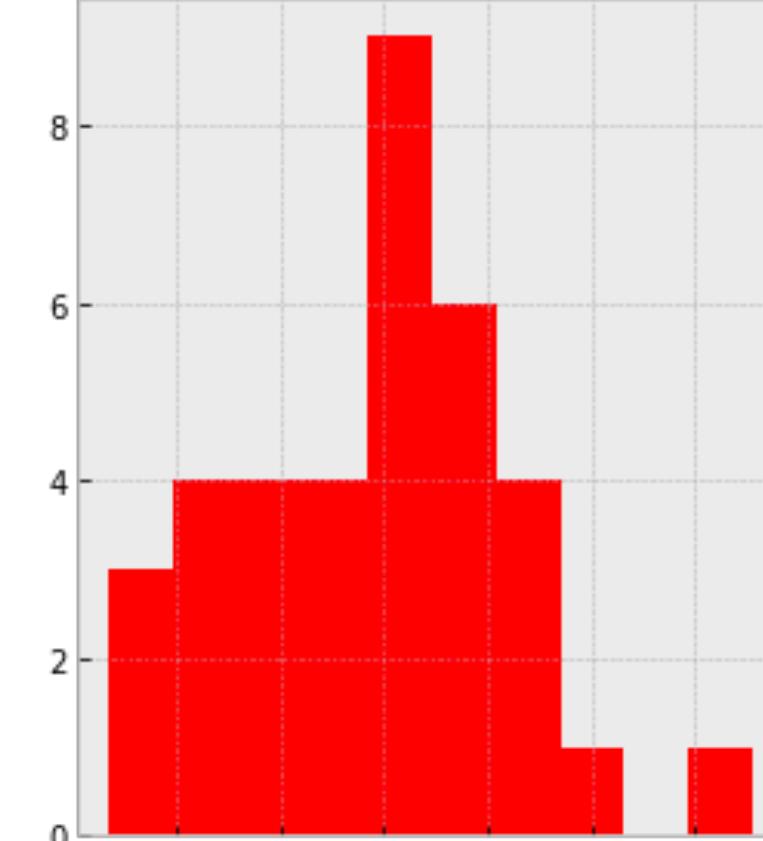
Distribution of Fire Service Calls
Per Event Date



Distribution of Fire Service Calls
Per Bball Date



Distribution of Fire Service Calls
Per Concert Date



- MannWhitneyU Test Result (Fire Service): pvalue = 0.078 -> [Not Significant](#)
- MannWhitneyU Test Result (Police Incidents): pvalue = 0.18 -> [Not Significant](#)
- T-Test Statistic & Distribution (Fire Service) : pvalue = 0.10 -> [Not Significant](#)
- T-Test Statistic & Distribution (Police Incidents) : pvalue = 0.26 -> [Not Significant](#)



Conclusion: Sports fans are only congesting public transit, and not much else.

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1. No significant difference in police incidents or fire department call volume on dates with events at the Chase Center.
 2. Shelter in Place has had a significant impact on decreasing call volume & incidents.
 3. No significant difference between basketball events and concerts on police incidents or call volume.

*Thank
you*



Assumptions Made & Caveats....

- Data was normalized using annual population for SF as a whole, not drilled down to population per zip code.
- The Chase Center Stadium opened in September of 2019, and due to Shelter In Place, the months for observation and comparison are only 5 months.
- Looked into the week days of events versus non events in case the distribution of events was majority on weekends, which I hypothesize would have higher incidents/fire calls in general. Events were biased towards Saturdays with 25% of Events on Saturdays.
 - **Day of Week Events Distribution:**
 - Monday: 0.13
 - Tuesday: 0.12
 - Wednesday: 0.13
 - Thursday: 0.16
 - Friday: 0.12
 - Saturday: 0.26
 - Sunday: 0.09

For the future, I would like to:

- Look into Saturdays in particular to compare events versus non-events.
- Compare results again after more time has passed.
- What about the same analysis, but for the Giants games?

In terms of incidents or calls overall, not related to Events/Non-Events:

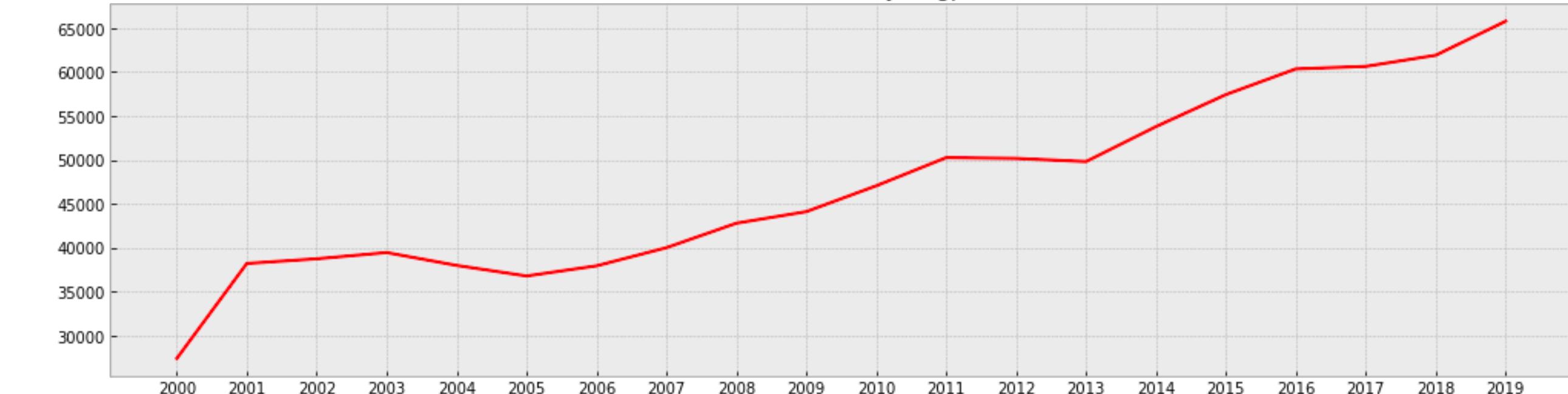
- Time of day or day of week impact on call volume/incidents
- What exactly happened on 12/21/2019 & 1/11/2020 that drove both incidents & call volume so high?
- Why was crime so low in 2010-2012?

APPENDIX & EXTRA DATA VISUALIZATIONS

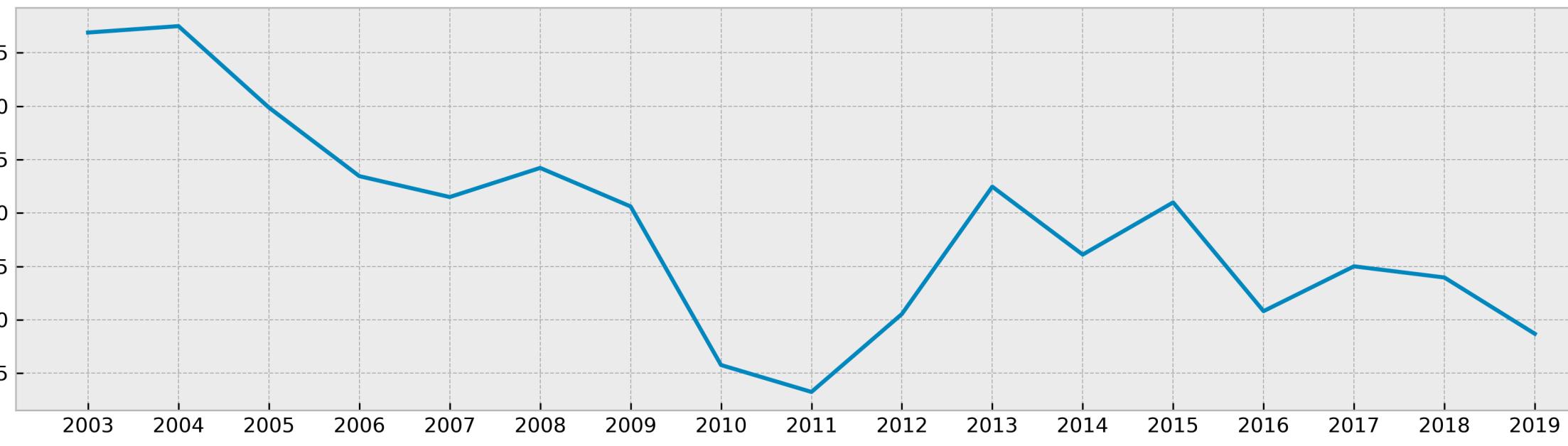
Total Police Incidents From 2003 - 2019



Fire Service Calls in Mission Bay/Dogpatch Over Years



Normalized Total Police Incidents From 2003 - 2019



Normalized Fire Service Calls in Mission Bay/Dogpatch Over Years

