PLAN 390 Homework 2 Write Up

Link to github repository: https://github.com/akunna1/PLAN_390_Homework_2

Using the Fire Department Dataset:

Answers to questions:

1. How long does it take Wake County Fire to respond to incidents, on average (i.e. the

time between when an incident is dispatched and when firefighters arrive on the

scene)? (hint: you can subtract lubridate date columns from each other). [1 point]

- 318.7927 seconds (approximately 5.3 minutes) is the average response time for Wake
  County Fire to respond to incidents.

- I calculated that from arrival_time – dispatch_time = response_time_secs

- Average (response_time_secs). I had to exclude all the NA values here using na.rm =
  TRUE

2. Does this response time vary by station? What stations have the highest and lowest

average response times? [0.5 points]

- Each station has a unique average response time ranging between 200 to 500 seconds

- Station 29 has the highest average response time, which is 495.7640 secs

- Station 13 has the lowest average response time, which is 223.0000 secs

Showing the maximum average response time:

Showing the minimum average response time:

3. Have Wake County Fire's response times been going up or down over time? What might

be the reason for these changes? [0.5 points]

- Yes, it has been going up and down over time as seen in the graph below.

- The changes in response time could be due to the availability of resources and the time of the day. For example, if Wake County Fire is called multiple times a day to the same area or neighborhood, response times in other areas may suffer. The time of day has an effect on response times. Graveyard shift response times (12am – 6am) are generally the slowest because there are generally fewer firefighters on duty ready to respond to emergencies during those times.
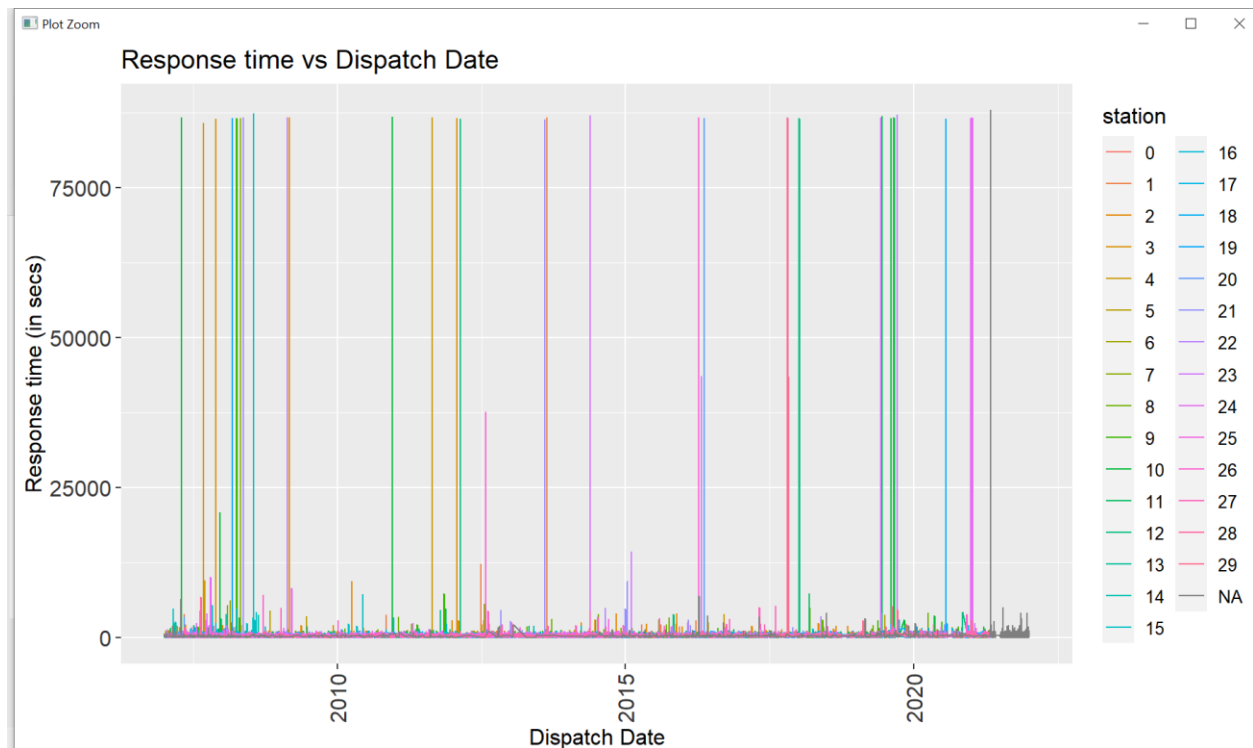
4. At what times of day are fire calls most likely to occur? [1 point]

- 22h (10pm)

- I got that by looking at the count for dispatch_hour

5. The dataset contains all types of fire department calls, other than emergency medical

services (which are removed to protect privacy). The codes for the different incident types can be found on page 3-22 of the National Fire Incident Reporting System Complete Reference Guide. How many calls to Wake County Fire are recorded in this dataset, and how many of them are actual fires? [0.5 points]

- 229,047 calls to Wake County Fire are recorded in this dataset
- 17,231 calls to Wake County Fire are actual fires

6. It is reasonable that firefighters might respond more quickly to some types of incidents than others (e.g., a building fire, code 111 might be higher priority than a cat stuck in a tree, code 542). Using the reference guide linked above to determine appropriate incident codes, evaluate the average response time to actual fires. Is this response time faster than the average response time for all incidents? [0.5 points]

- It takes 311.1936 seconds (approximately 5.2 minutes) for Wake County Fire to respond to actual fires. It is faster than the average response time for all incidents, which was 318.7927 seconds (5.3 mins)
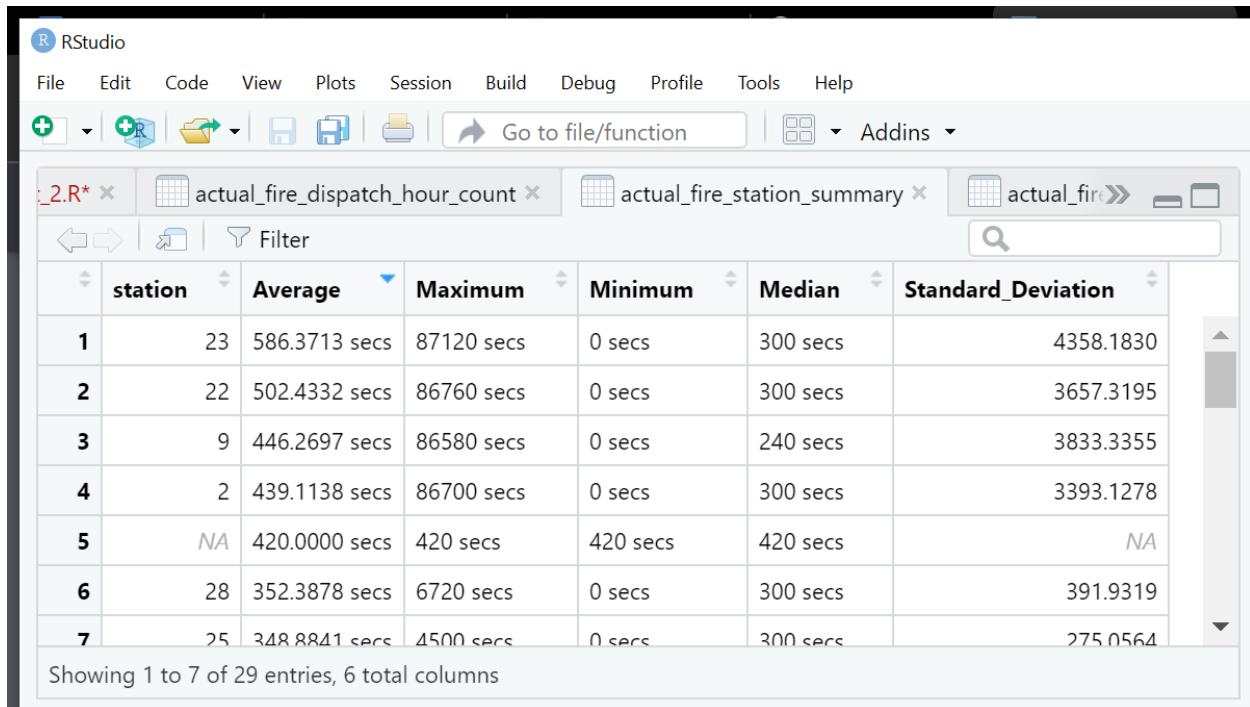
7. Repeat the analysis for questions 2-4 for actual fires, rather than all incidents. [2 points]

2) Does this response time vary by station? What stations have the highest and lowest average response times?

- Each station has a unique average response time ranging between 200 to 600 seconds
- Station 29 has the highest average response time, which is 586.3713 secs

- Station 13 has the lowest average response time, which is 232.7666 secs

Showing the maximum average response time:

Showing the minimum average response time:

RStudio

File   Edit   Code   View   Plots   Session   Build   Debug   Profile   Tools   Help

Go to file/function   ▾ Addins ▾

:_2.R* ✕   actual_fire_dispatch_hour_count ✕   actual_fire_station_summary ✕   actual_fir ≫

Filter

	station	Average	Maximum	Minimum	Median	Standard_Deviation
1	3	232.7666 secs	1144 secs	0 secs	240 secs	117.1334
2	7	240.8027 secs	1860 secs	0 secs	240 secs	141.3407
3	1	250.0814 secs	2820 secs	0 secs	240 secs	179.7152
4	5	271.0142 secs	3600 secs	0 secs	240 secs	204.6823
5	17	272.7032 secs	1080 secs	0 secs	240 secs	130.8402
6	4	276.9760 secs	1320 secs	0 secs	240 secs	135.6555
7	10	278.3915 secs	2400 secs	0 secs	240 secs	149.8153

Showing 1 to 7 of 29 entries, 6 total columns

3) Have Wake County Fire's response times been going up or down over time? What might

be the reason for these changes?

- Yes, it has been going up and down over time as seen in the graph below.

- The changes in response time could be due to the availability of resources and the time of
  the day. For example, if Wake County Fire is called multiple times a day to the same area
  or neighborhood, response times in other areas may suffer. The time of day has an effect
  on response times. Graveyard shift response times (12am – 6am) are generally the
  slowest because there are generally fewer firefighters on duty ready to respond to
  emergencies during those times.

Actual Fires Response time vs Dispatch Date
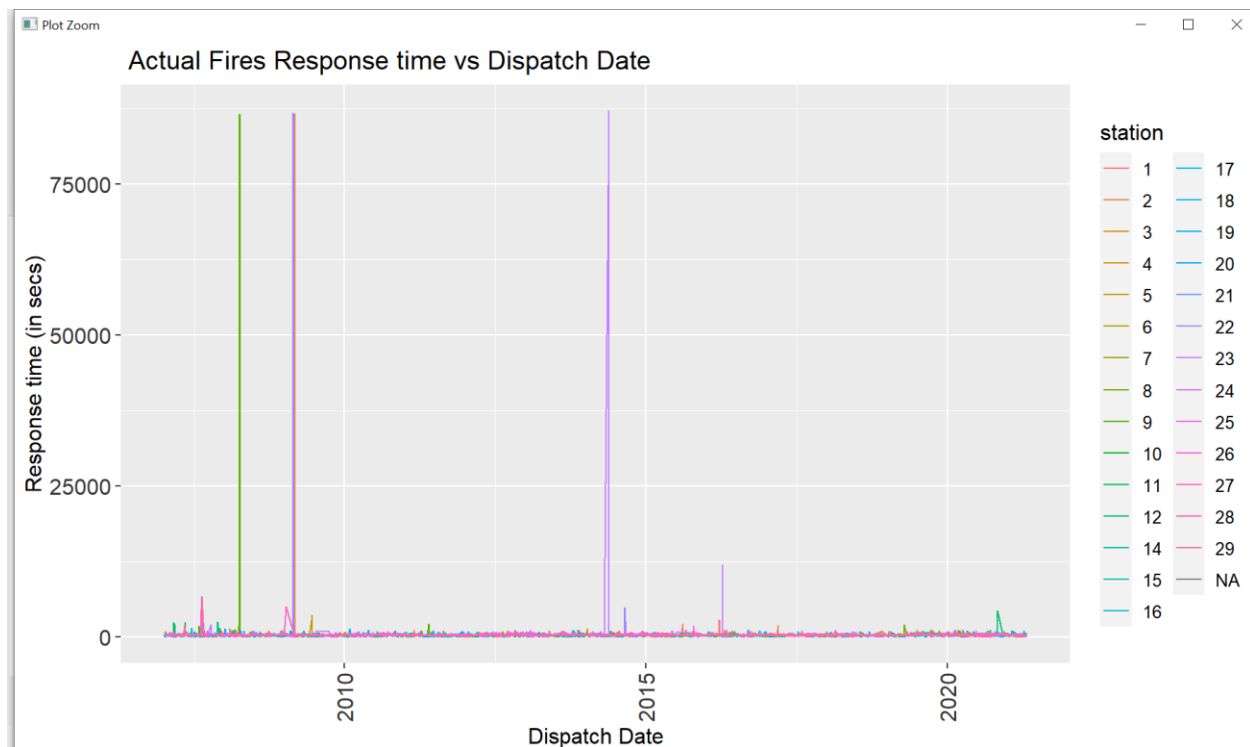
4) At what times of day are fire calls most likely to occur?

- 21hr (9 pm)

- I got that by looking at the count for dispatch_hour

New columns I created:

arrival_time: includes arrival date and time. It was added to the fire_incidents_data table.

dispatch_time: includes dispatch date and time. It was added to the fire_incidents_data table.

cleared_time: includes cleared date and time. It was added to the fire_incidents_data table.

response_time_secs: It was added to the fire_incidents_data table. It was created from arrival_time – dispatch_time.

dispatch_hour: It was created from dispatch date and time; it includes only hours. It was added to clean_fire_incidents_data

Data frames used and created:

- **fire_incidents_data:** the original data. I added 4 extra columns to it i.e. arrival_time, dispatch_time, cleared_time (was not used) response_time_secs,

- **clean_fire_incidents_data:** similar to the fire_incidents_data dataset but includes only response_time_secs that are greater than 0 and are not "NA" values.

- **station_summary:** was created using summarize and group by station. It was used to find which station had the highest and lowest average response time in question 2.

- **dispatch_hour_count:** shows count for dispatch hours

- **actual_fire_data:** includes only actual fire i.e. where the numbers in incident_type column are less than 200 (all 100s values).

- **actual_fire_station_summary**

- **actual_fire_dispatch_hour_count**

Small calculations made using columns:

- **avg_response_time:** the average of response_time_secs in the fire_incidents_data dataset

- **actual_fire_avg_response_time**

Notes about missing data for each data set:

- **fire_incidents_data** contains missing data which is represented by "NA". It has 229,047 entries.

- To calculate **avg_response_time** for question 1, I removed all the "NA" values.

- To create the **clean_fire_incidents_data**, I had to remove all **response_time_secs** (i.e., a column in the data set) that were less than 0 and were "NA" values (i.e. missing values). It has 184,382 entries.

- To create **station_summary**, I removed all the "NA" values (i.e., missing values)

- To create **actual_fire_data**, I removed all the "NA" values (i.e., missing values). It contains 17,231 entries.