EMS Ambulance Placement Analytics

Results of NOLAlytics project

City of New Orleans

June 6, 2017

Executive Summary

- EMS partnered with OPA to create a data-driven ambulance placement policy that aimed at improving the reliability and equity of timely response to emergency calls

- Leveraging advanced analytics, open source software, and a pro bono partnership with LSU, OPA provided EMS a no-cost map of optimal posting locations for both day shifts and nights shifts that is scalable to resource levels

- Testing shows that the new protocol enhanced equity in response times across districts and benefited the historically poorest served districts (4th district/West Bank) the most. Fourth district response time compliance improved 20% under the new ambulance placement protocol

- Overall, there was a modest, but statistically significant improvement in overall response time compliance during the night shift

- During the day shift, when there are typically fewer ambulances available, response time compliance held flat

Problem

- Service calls up 12% between 2014 and 2016

- Response times have fallen from 80% of code 3 calls <12 minutes (2014) to 72% of code 3 calls <12 minutes (2016)

- Response times in outer reaches of the city, especially the 4th district (Algiers) and 7th district (New Orleans East) lag from rest of the city

Proposed solution

- Revise EMS' ambulance placement protocols to improve coverage of likely calls

- Goal: Maximize area of city within acceptable (<12 minute) time threshold

- Assumptions learned from user engagement:
  - Low elasticity of movement of ambulances while waiting for calls. Not practical to have a different scenarios as each ambulance becomes available
  - Desire for low-tech solution – paper map is best
  - Realistic locations include existing set plus hospitals, police and fire stations

Methodolgy
Developed in conjunction with LSU Analytics program

- Given modal ambulances available (3), find combination of candidate location points that cover most historic call points (3 yrs EMS 911 calls) within 8 minute drive time (from ESRI's network analysis tool for high-traffic and low-traffic scenarios)

- Data:
  - EMS 911 calls (3 yrs)
  - High traffic and low drive times (ESRI network analysis)
  - Candidate locations – existing locations plus fire, police stations and ambulances
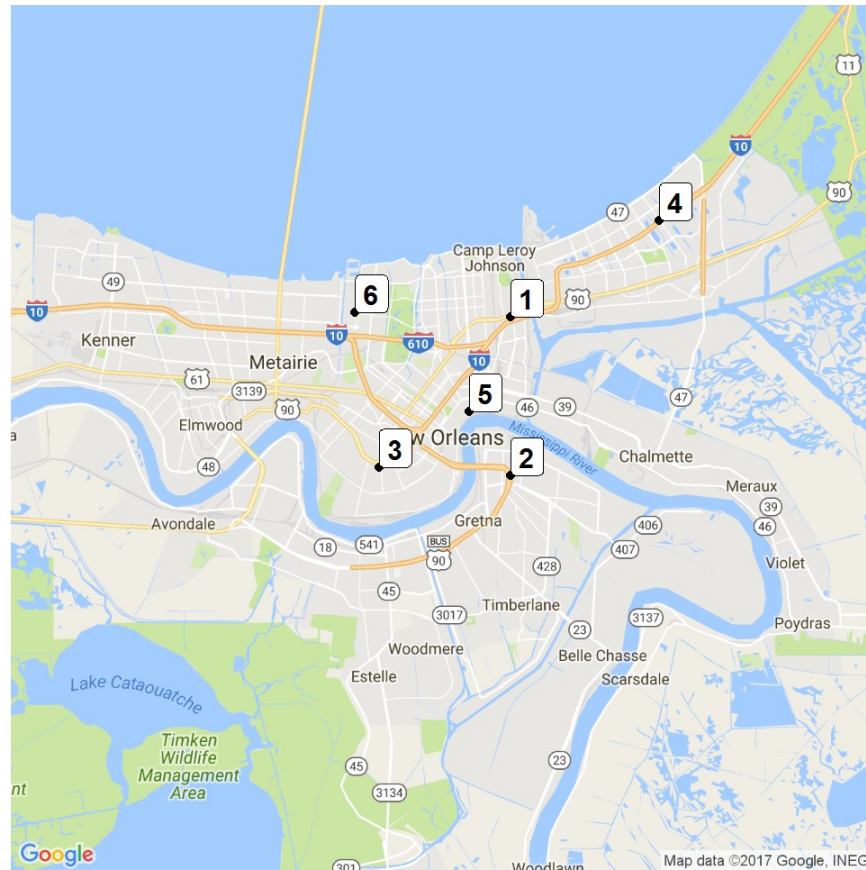 - Analysis conducted in R (less ESRI drive time polygons)

New maps
Day time (assumes high traffic and day time demand)
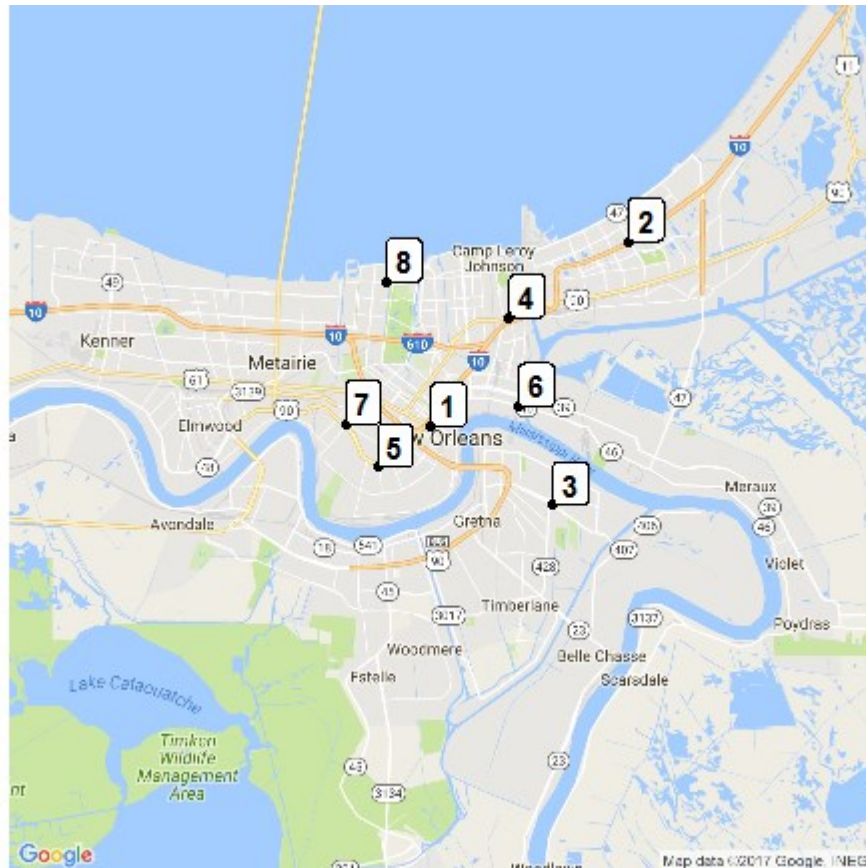
New maps
Night time (assumes low traffic and night time demand)

Reflections on maps

- The day time map for the most part confirmed existing intuition about the best places to put ambulance (first Tulane Medical Center, then NO East, then West Bank)

- The night time map proposed a substantially different list that what was used previously (first Gentilly, TMC unused)

Reflections on maps

Prior Locations Used

Posting locations include:

a. TMC / ILH Hospitals
b. Holiday and Gen DeGaulle
c. CCC Tolls
d. I-10 and Read
e. I-10 and Downman
f. I-10 and Bullard
g. Touro Hospital
h. Ochsner-Baptist Hospital
i. 5000 Old Gentilly
j. Elysian Fields / N. Miro
k. Harrison / Ponchartrain Blvd

Posting decisions will be based on availability of resources, traffic patterns, shift change and known events / incidents impacting traffic flow; ie: Mardi Gras.
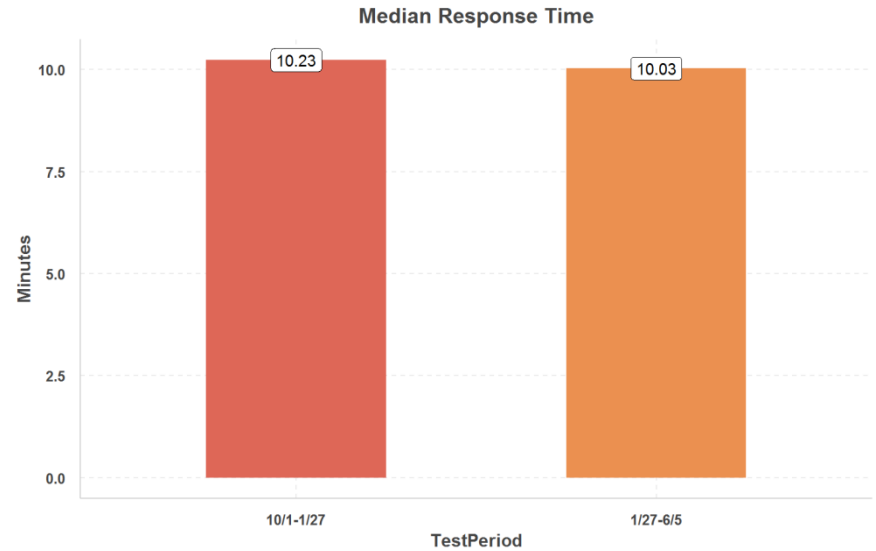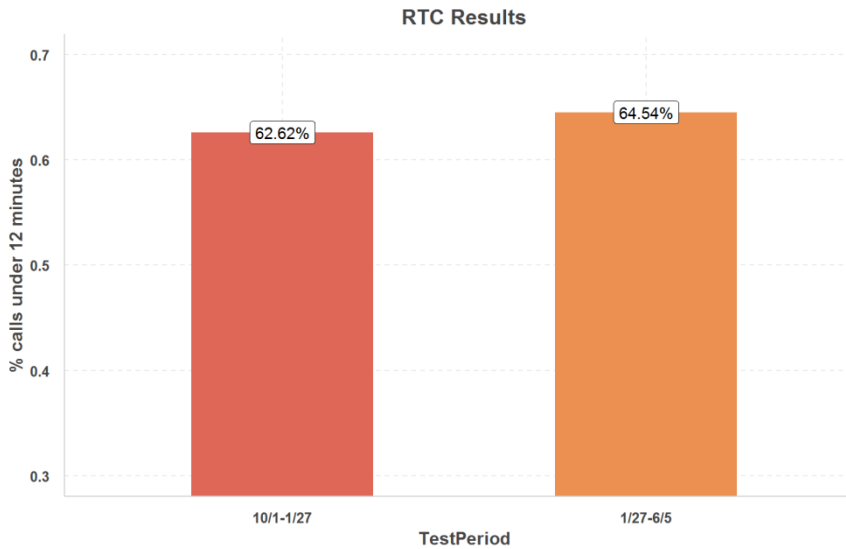
New Dayshift List

Name	Address	Primary Location	Rank
Tulane Medical Center		X	1
I-10 and Read Blvd		X	2
Holiday and DeGaulle		X	3
Old Gentilly/5000			4
Baptist			5
ENGINE 24	1040 POLAND AVE.		6
SQUIRT 25	2430 S. CARROLLTON AVE.		7
SQUIRT 13	987 ROBERT E. LEE BLVD.		8

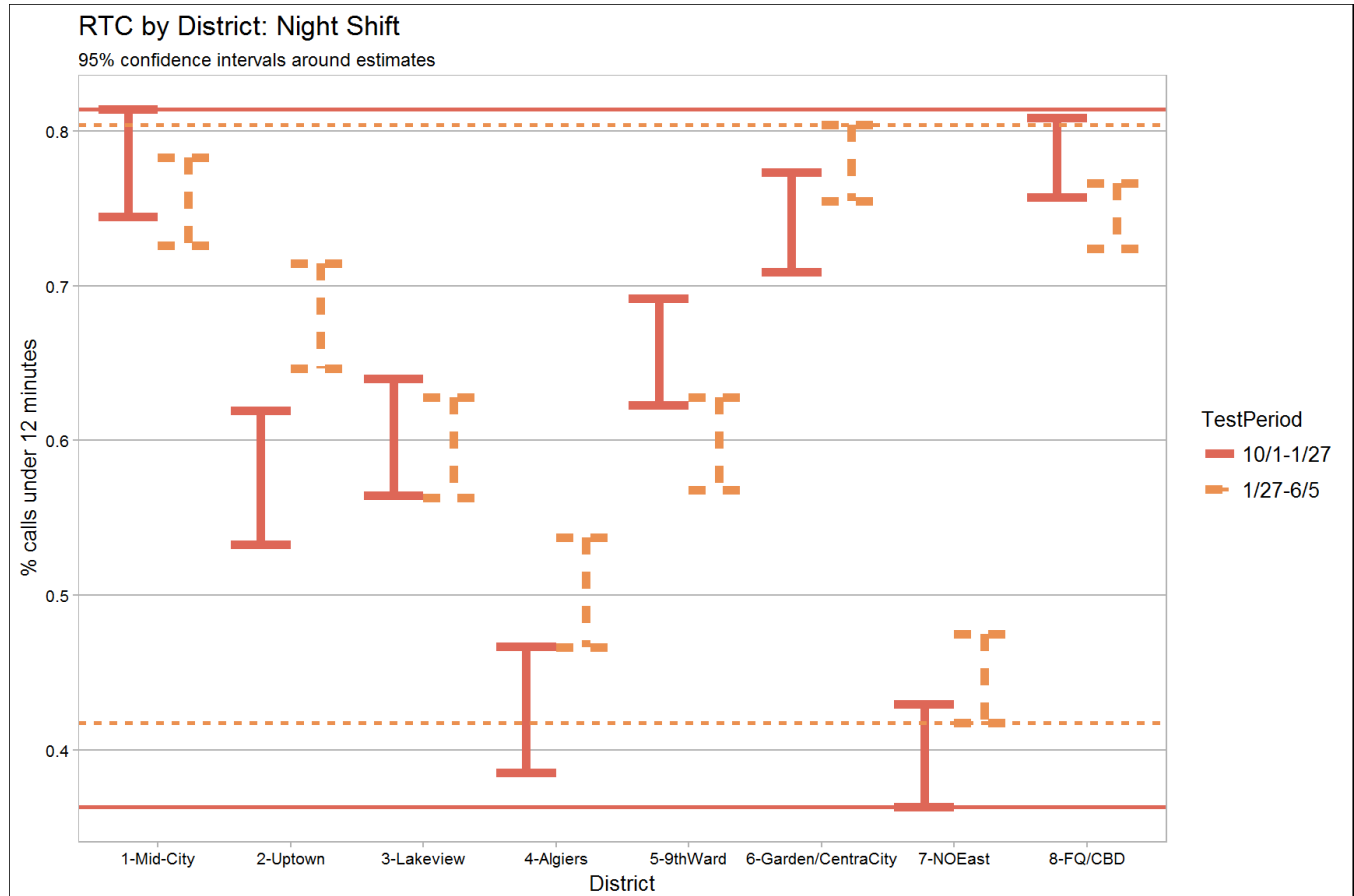# Results from testing
## Night time protocol results in faster response times

RTC Results

Median Response Time

Results for testing
Night time protocol benefits the poorest performing districts the most, promoting equity

	10/1-1/27	1/27-6/5
maxRTC	78.4%	78.0%
minRTC	39.6%	44.6%
spread	38.8%	33.5%

RTC by District: Night Shift
95% confidence intervals around estimates

y-axis: % calls under 12 minutes
x-axis: District — 1-Mid-City, 2-Uptown, 3-Lakeview, 4-Algiers, 5-9thWard, 6-Garden/CentraCity, 7-NOEast, 8-FQ/CBD
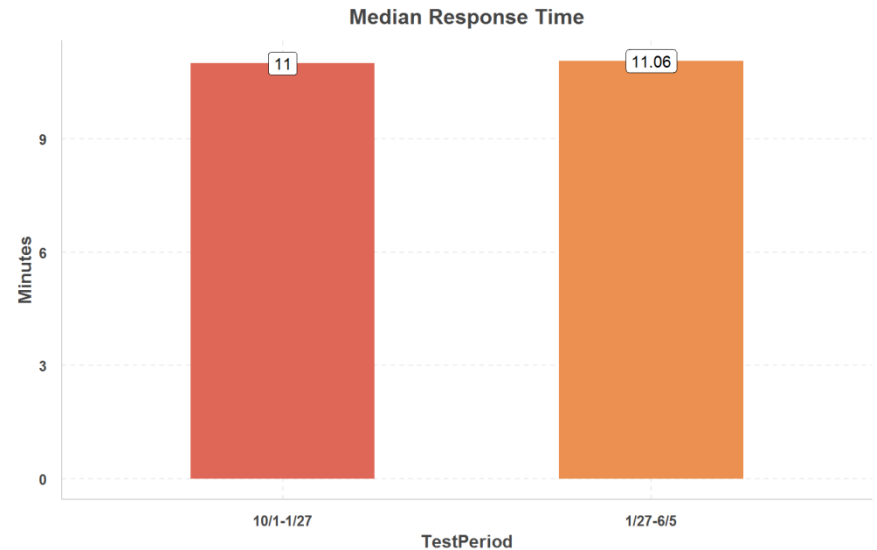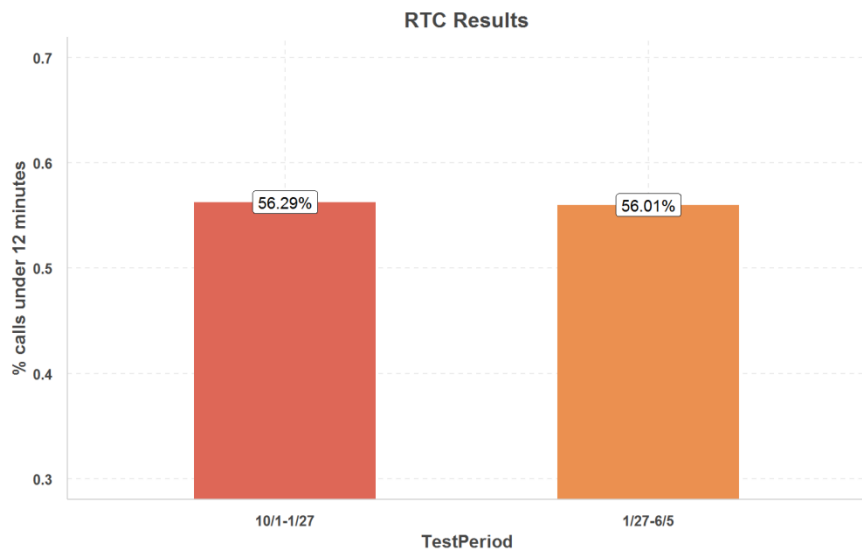
TestPeriod
— 10/1-1/27
-- 1/27-6/5

Daytime Testing

The question of where to position units is only relevant when there are units available to post, but there are typically less than 2 ambulances available for much of the day shift.
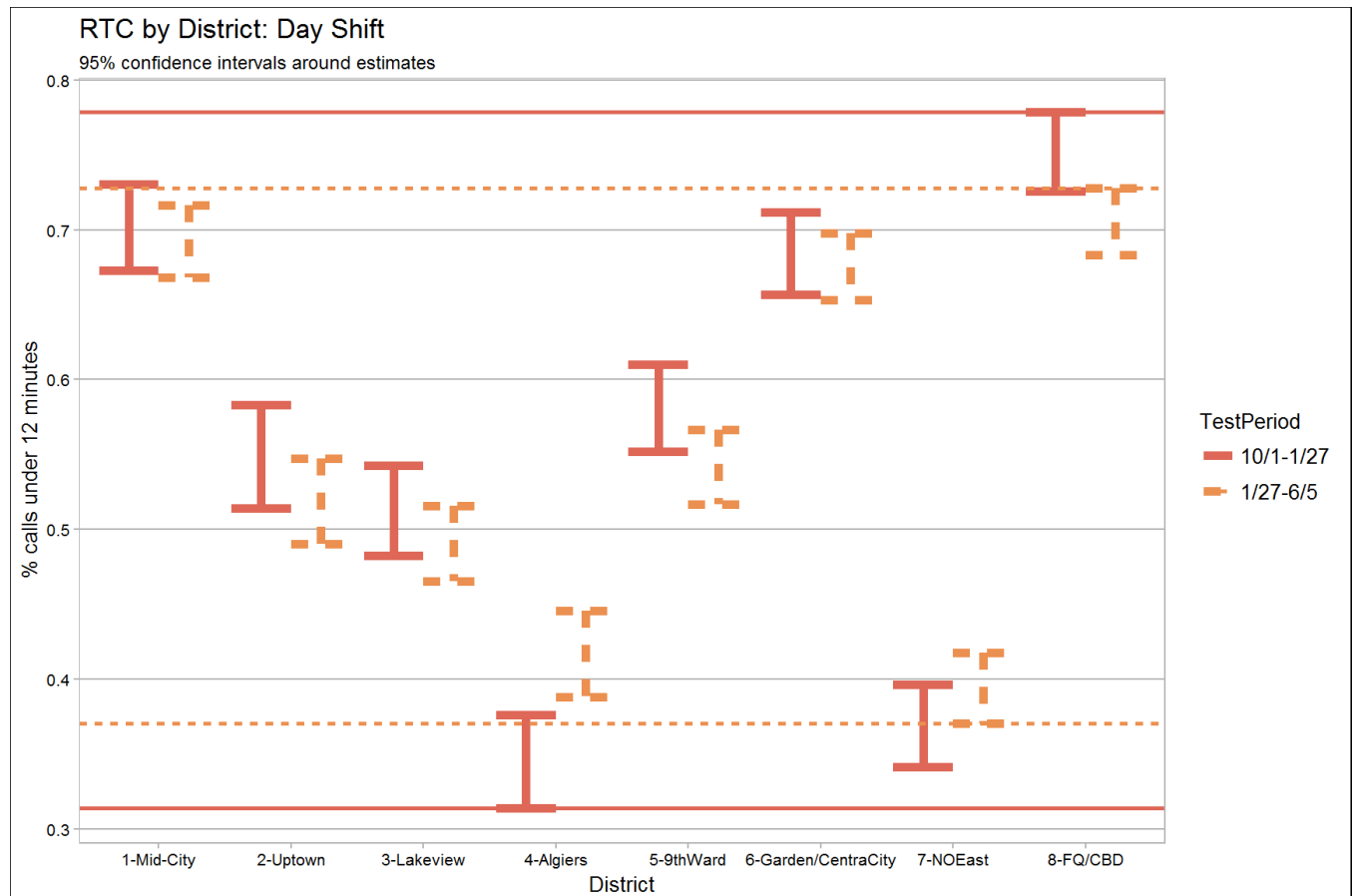

Ambulance Availability By Hour
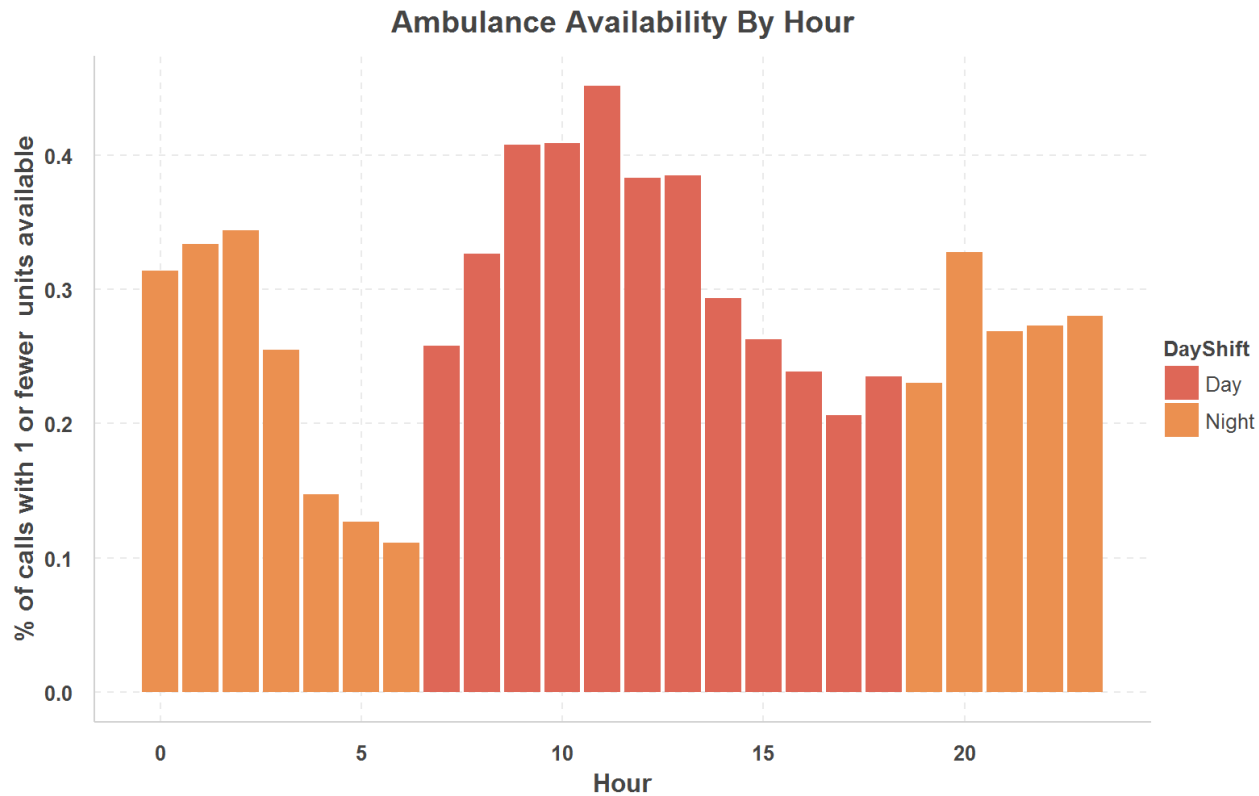
Daytime testing
As expected, there was no statistically significant changes to overall response times.

Daytime
But equity among districts improved

	10/1-1/27	1/27-6/5
maxRTC	75.3%	70.6%
minRTC	34.4%	39.4%
spread	40.9%	31.2%

RTC by District: Day Shift
95% confidence intervals around estimates

The initiative benefited the areas of the city (West Bank and New Orleans East) that suffered from slower response times the most