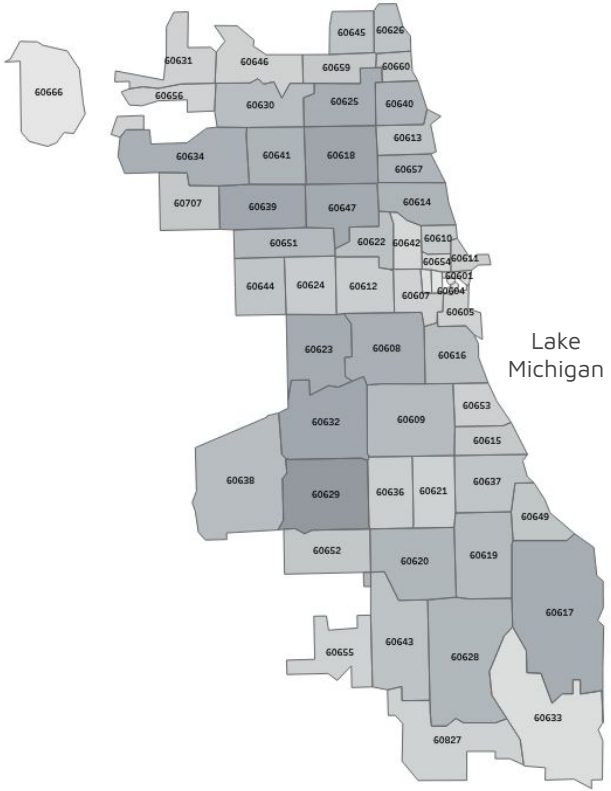
FORECASTING DIVVY BIKE SHARE DEMAND DURING COVID-19

Lisa VanderVoort

Divvy Bike Share Service

Chicago by Zip Code



MY PRE-COVID OBSERVATIONS OF DIVVY

MY PRE-COVID OBSERVATIONS OF DIVVY

MY COVID OBSERVATIONS OF DIVVY

"What's with everyone riding Divvy bikes in our neighborhood?"

Can data science explain what's happening?

Is the way people use Divvy bikes different during Covid-19 than before Covid-19?

THE DATA & MODELING PROCESS

Bike Share Data

January 1, 2017 through
August 31, 2020
Over 13 million rides
Chicago, IL

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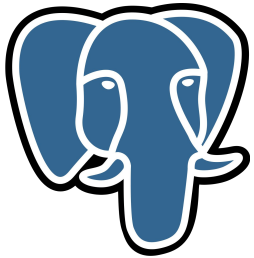

Data Cleaning & Feature Engineering

PostgreSQL Database
SQLAlchemy
Aggregated by rides per day

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Over 13 million rides
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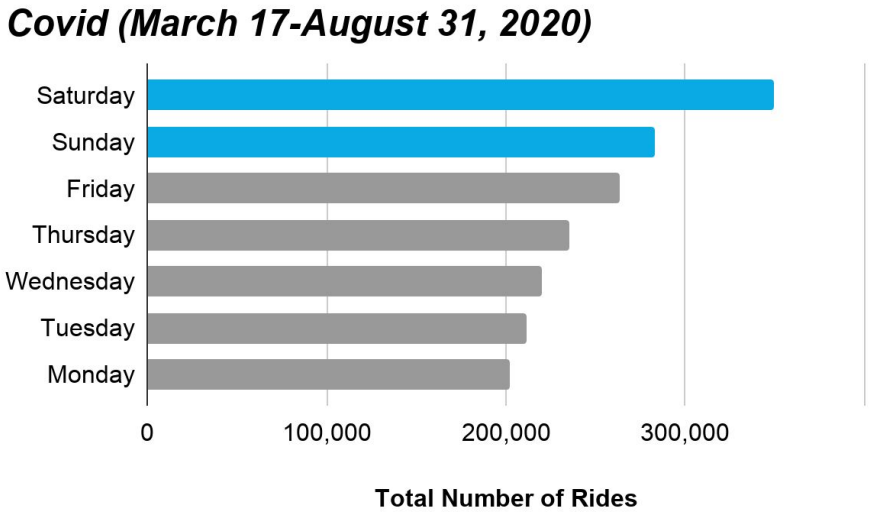
Facebook Prophet Forecasting

Forecast demand from September 1-December 31, 2020

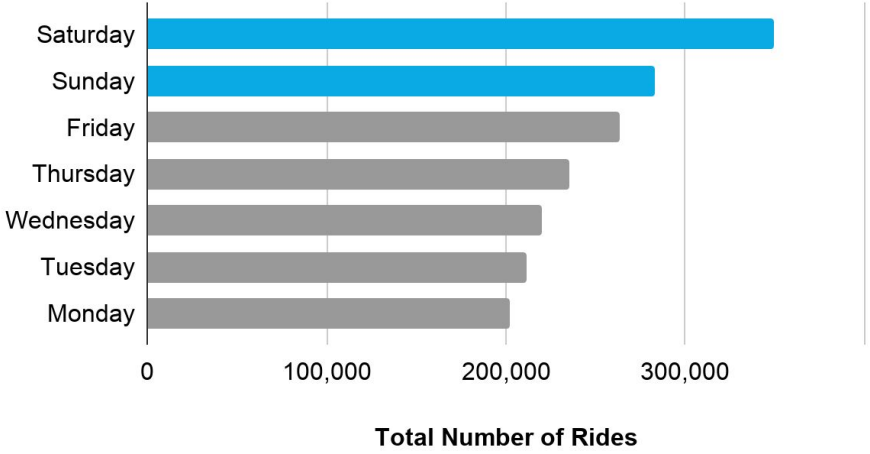
COVID-19 CHANGES IN DIVVY CONSUMER BEHAVIOR

Weekends are uniquely popular during Covid-19.

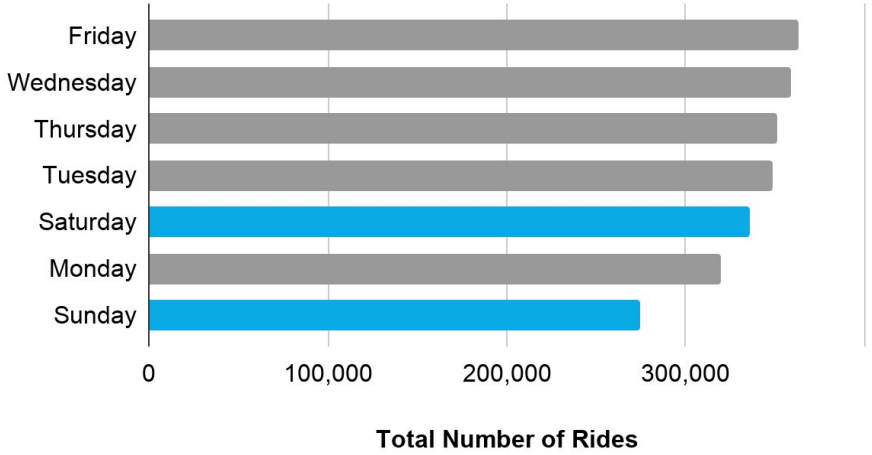


Weekends are uniquely popular during Covid-19.

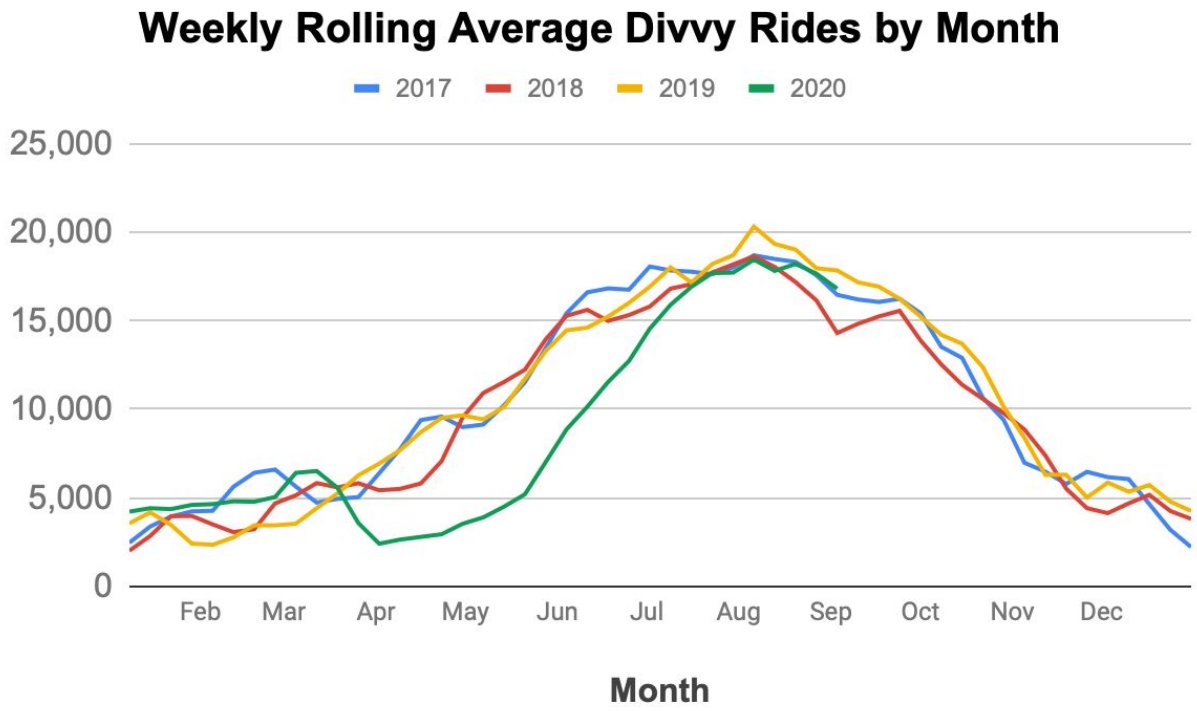
Covid (March 17-August 31, 2020)



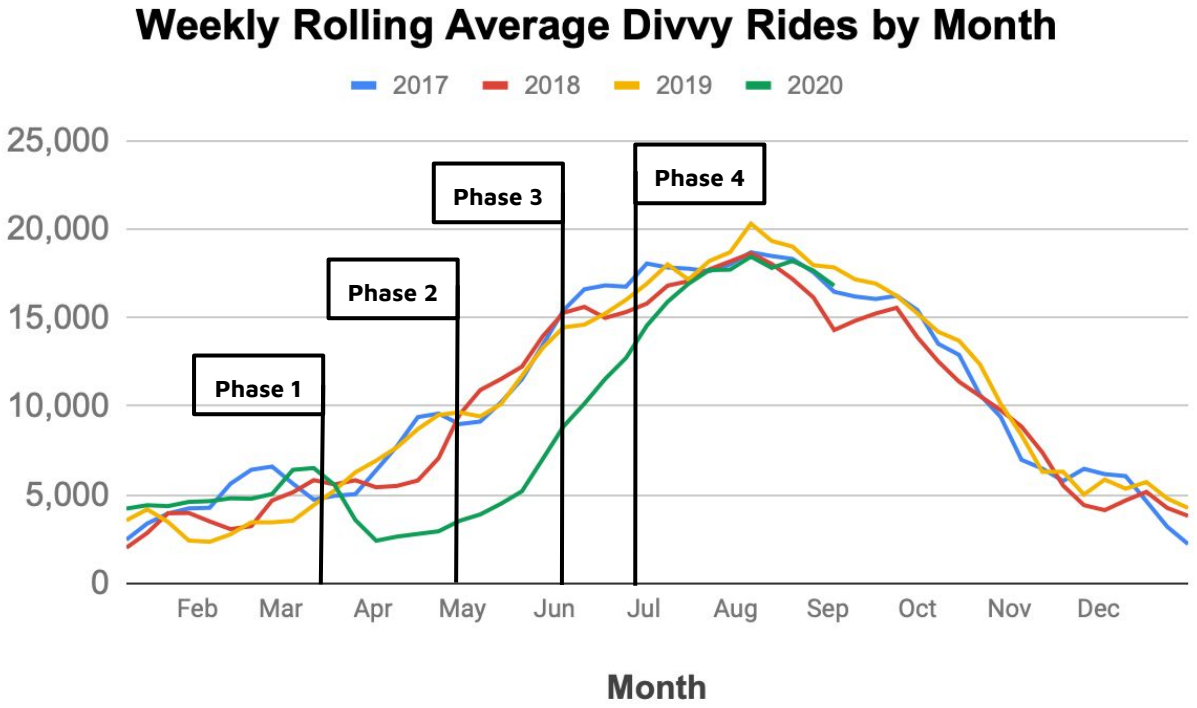
Pre-Covid (March 17-August 31, 2019)



Divvy ride demand follows clear seasonality.



Sharp decline and rapid rise in bike demand in 2020 connected to Chicago's phased Covid-19 response.



Phase 1
March 17-April 30
Strict stay-at-home

Phase 2
May 1-June 2
Stay-at-home

Phase 3
June 3-25
Cautiously reopen

Phase 4
June 26-Present
Gradually resume

FORECASTING DIVVY DEMAND THROUGH COVID 2020

Iterative Layered Forecasting of Divvy Bike Share Demand

- Forecast demand specifically for September 1-December 31, 2020
- Daily demand across all stations in Chicago
- Optimized for MAE and RMSE and averaged over the forecasted window

Building a Model with Covid-19 Seasonalities

	Baseline
Seasonality	N/A
MAE	3231.5
RMSE	4158.6

Building a Model with Covid-19 Seasonalities

	Baseline	+ Pre/ During Covid
Seasonality	N/A	Weekly
MAE	3231.5	3168.0
RMSE	4158.6	4098.1

Building a Model with Covid-19 Seasonalities

	Baseline	+ Pre/ During Covid	+ Phase 1	+ Phase 2	+ Phase 3	+ Phase 4
Seasonality	N/A	Weekly	Yearly	Yearly	Yearly	Yearly
MAE	3231.5	3168.0	2996.5	3085.9	2899.2	2999.4
RMSE	4158.6	4098.1	3881.3	3981.7	3749.3	3885.7

Final model: Pre/during Covid-19 weekly and Phases 1-3 yearly seasonalities

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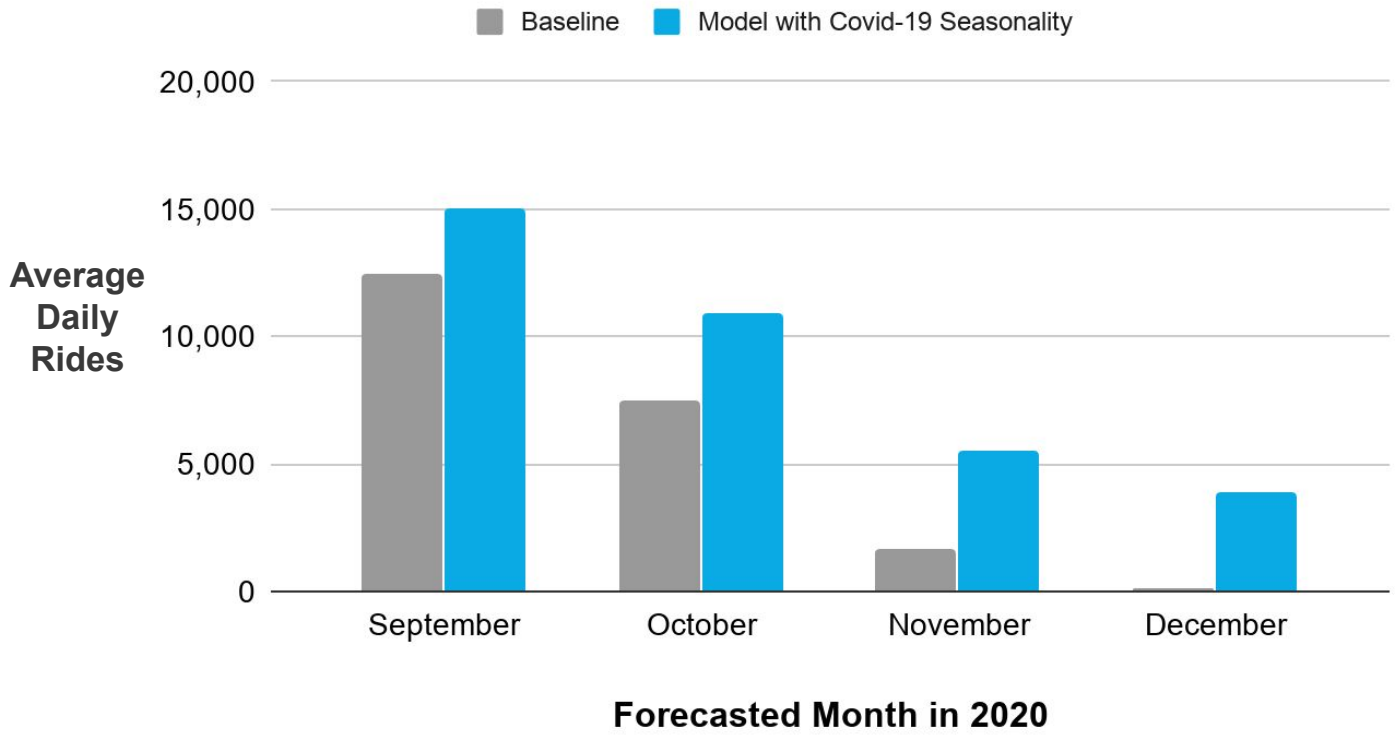
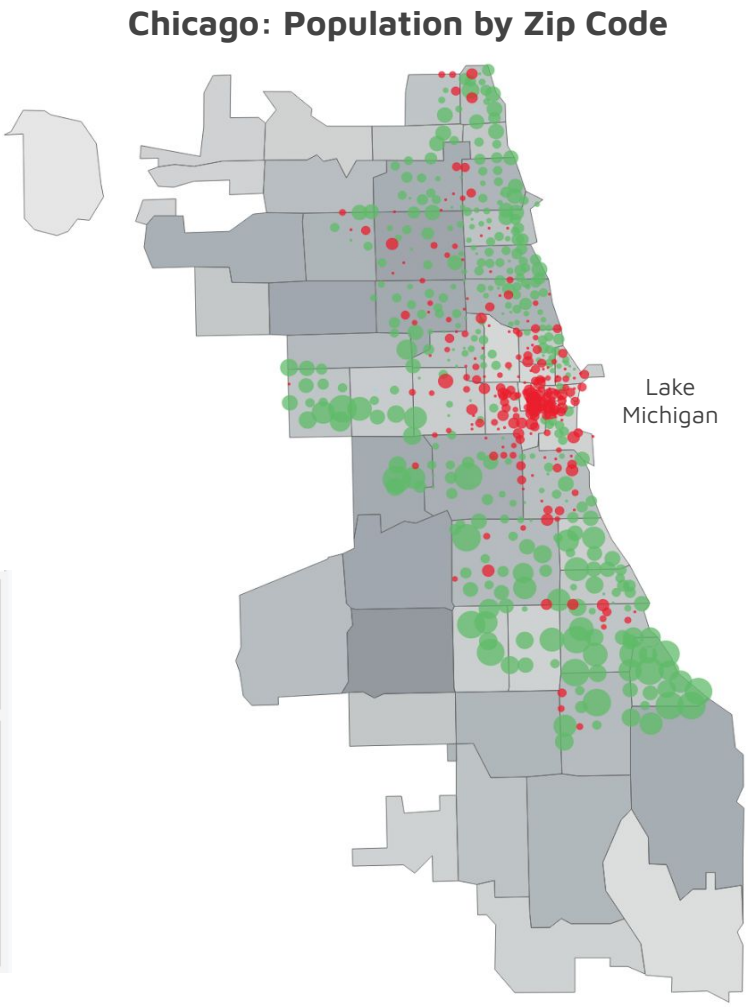
Seasonality	N/A	Weekly	Yearly	Yearly	Yearly	Yearly
MAE	3231.5	3168.0	2996.5	3085.9	**2752.7**	2999.4
RMSE	4158.6	4098.1	3881.3	3981.7	**3550.4**	3885.7

Model with Covid-19 seasonality forecasts higher daily demand through the end of the year



RECOMMENDATIONS TO DIVVY USING TABLEAU VISUALIZATIONS

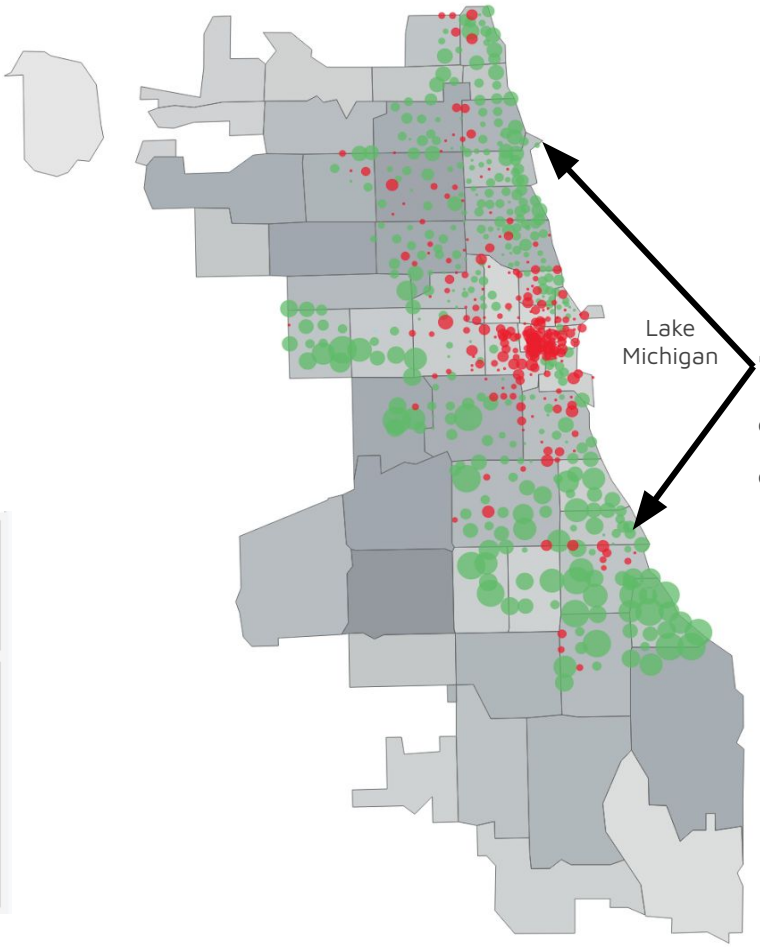
Comparing 2019 to 2020: Chicago's Change in Divvy Demand During Phase 4 (June 26-August 31)



tableau

Comparing 2019 to 2020: Chicago's Change in Divvy Demand During Phase 4 (June 26-August 31)

Chicago: Population by Zip Code



1. Increase bikes available in residential areas of Chicago

Population Count (2018)

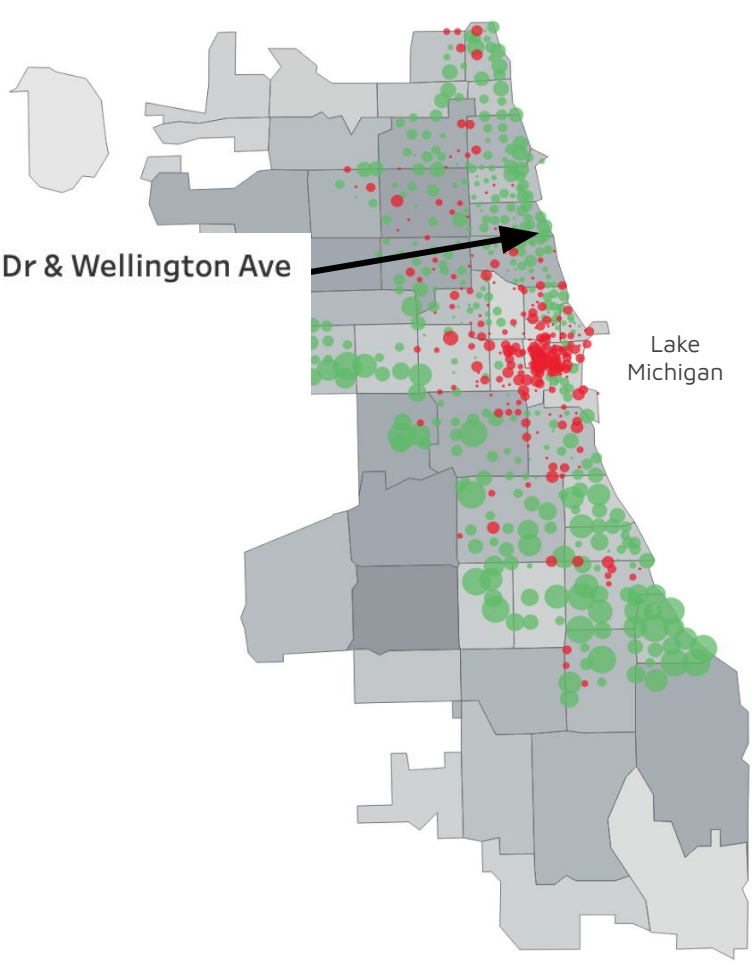
0 — 111,850

Magnitude of Change '19 to '20

- -83
- 0
- 100
- 200
- ≥ 300

Station with Notable Increase in Demand

Divvy Station Name:	Lake Shore Dr & Wellington Ave
Percent Change in Rides:	95%
Number Rides 2020:	9,811
Number Rides 2019:	5,026



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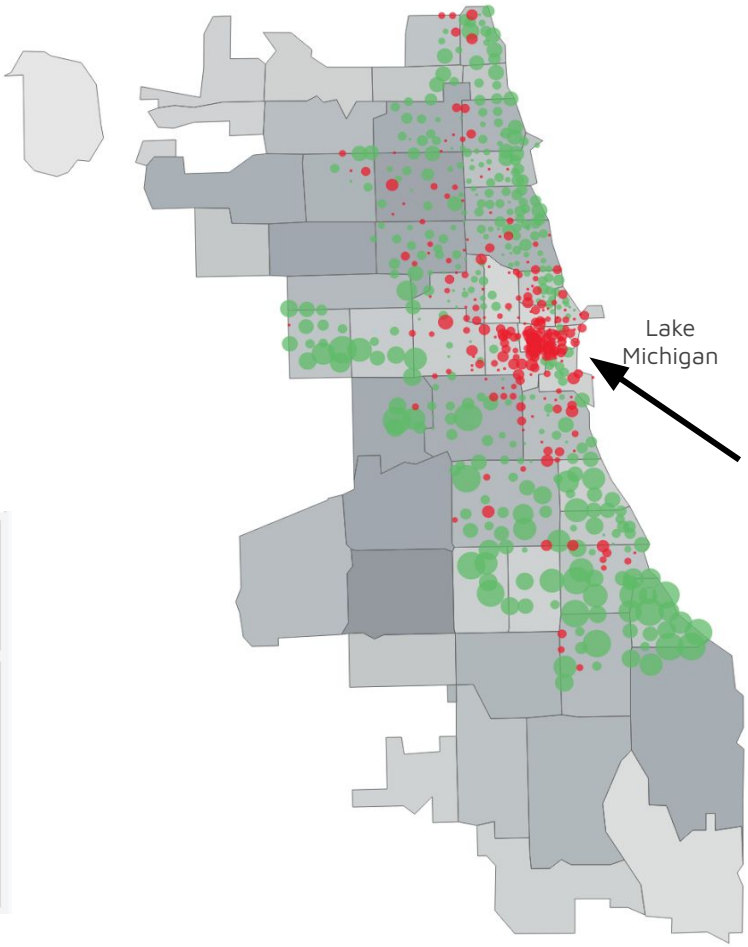

2. Decrease bikes available in the downtown loop area

Population Count (2018)

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Magnitude of Change '19 to '20

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- 0
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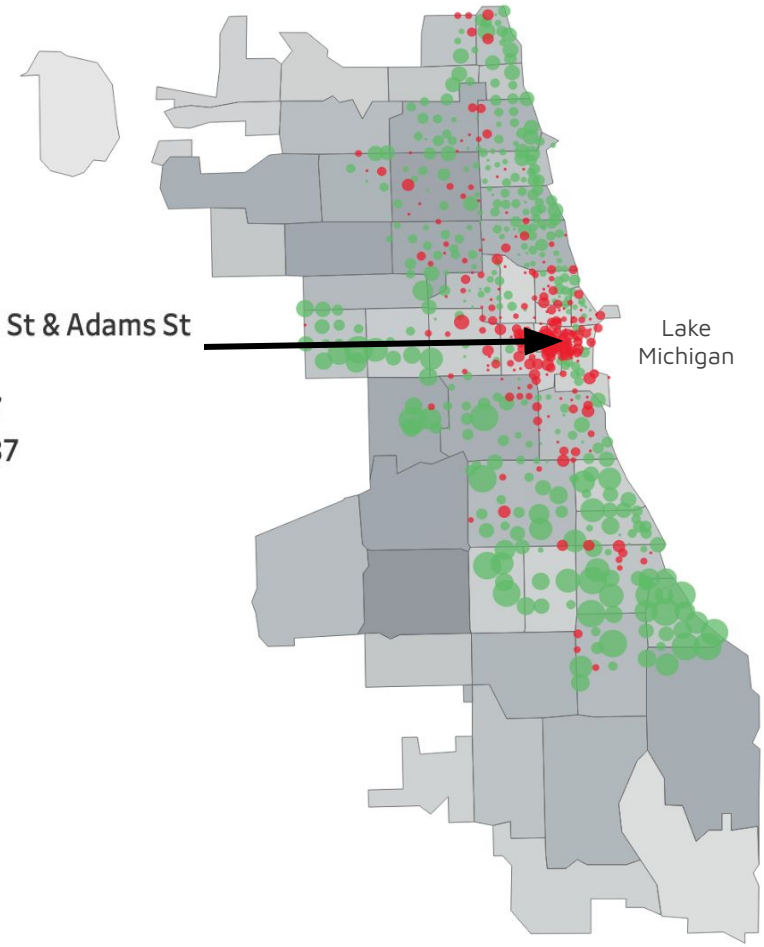
Station with Notable Decrease in Demand

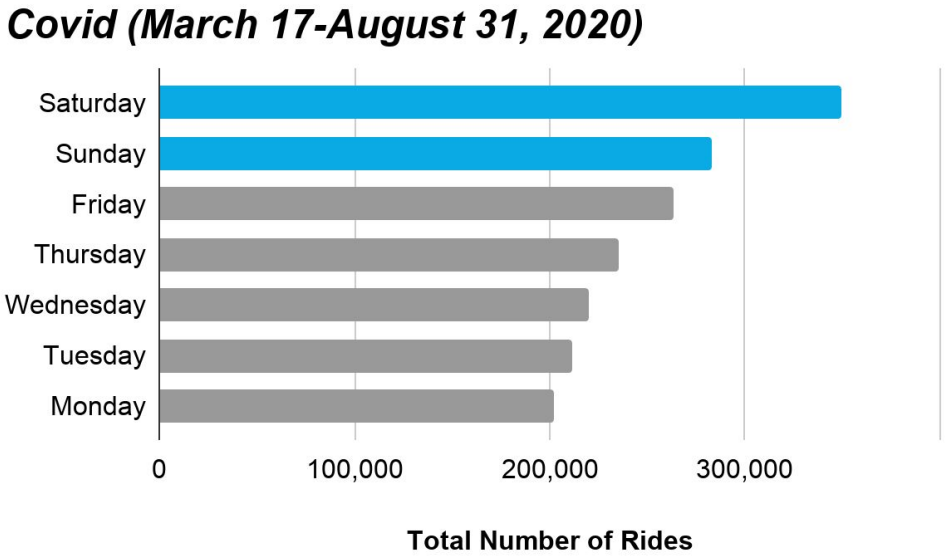
Chicago: Population by Zip Code



Divvy Station Name: **Canal St & Adams St**
Percent Change in Rides: **-83%**
Number Rides 2020: **2,427**
Number Rides 2019: **14,487**

2. Decrease bikes available in the downtown loop area

During Covid-19, weekends are uniquely popular for rides.



3. Increase bikes available on weekends

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THANK YOU!