

# Comparison of 2020 Monthly and Annual Average CO, NO<sub>2</sub>, O<sub>3</sub>, SO<sub>2</sub> and PM<sub>2.5</sub> Concentrations in New Jersey with Data from 2019 and 2021

Analysis of the Covid-19 Impact on Air Quality in New Jersey

NJDEP Bureau of Air Monitoring

3/16/2022

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- Air Quality exceedance days, 2010-2021
- Expanded Analysis for all criteria pollutants
  - Analyze carbon monoxide, nitrogen dioxide and sulfur dioxide data
- Determine if impact from Covid is continuing in 2021
- Summary

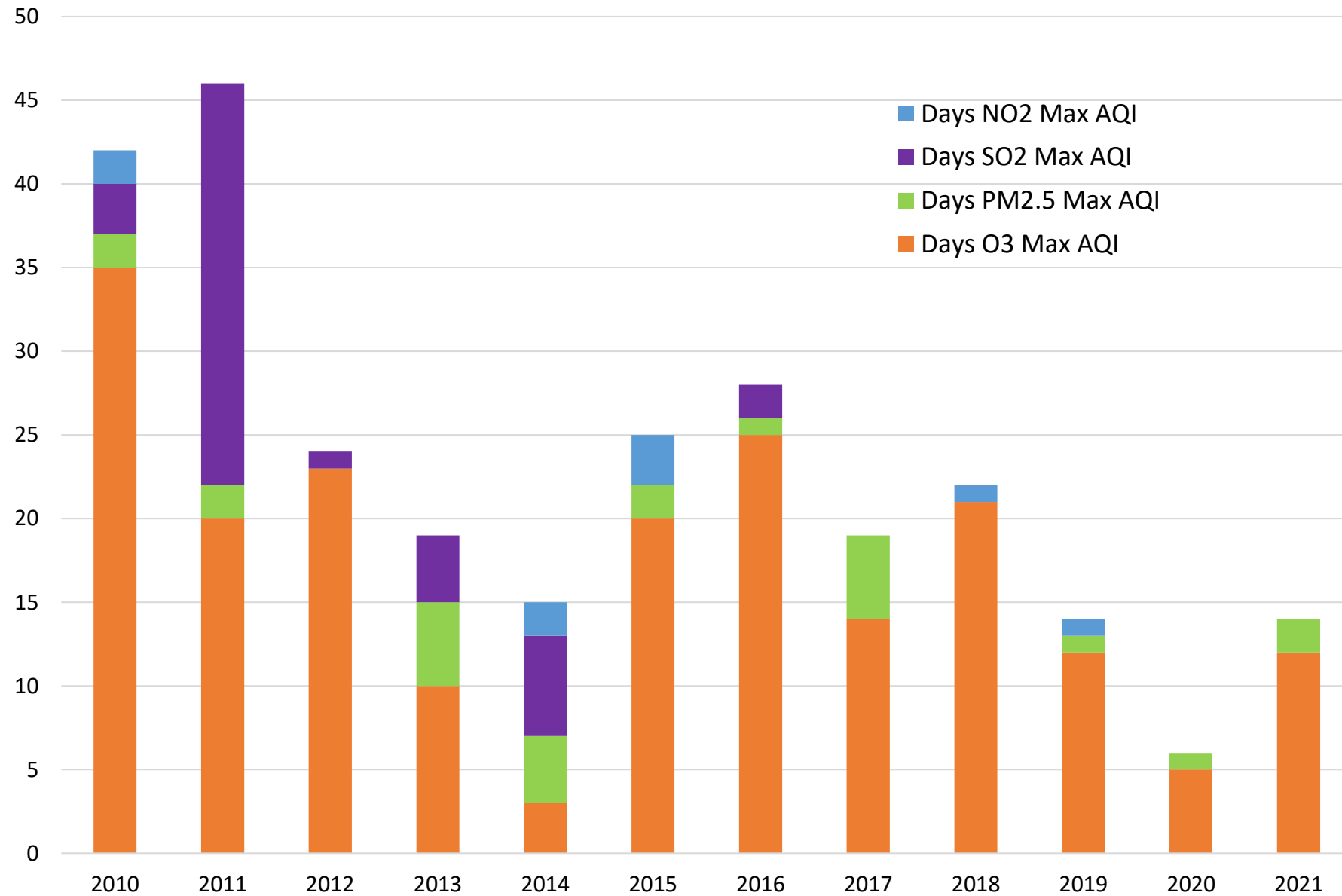
# Previous Analyses

- Transportation
  - 50% reduction in light duty traffic in April 2020
  - 30% reduction in heavy duty traffic in April 2020
  - Return to 2019 volume in 2021
- Nitrogen Oxides (NOx) at 3 urban stations
  - >40% reduction in monthly NOx levels, April-May 2020
  - Update: NOx levels in 2021 back to 2019 except Jersey City
- PM2.5 at 3 urban stations
  - >30% reduction in monthly PM2.5 concentrations at urban air monitoring stations, April-May 2020
  - Update: PM2.5 levels in 2021 impacted by wildfires

# Previous Analyses

- Ozone (O<sub>3</sub>) at 6 stations
  - Analyze daily maximum 8-hour average O<sub>3</sub> concentrations
  - -0.5% to -9.5% decrease in 1-year average levels
  - Return to  $\pm 2\%$  of 2017-2019 average in 2021
- Benzene from Elizabeth Exit 13 stations
  - Not conclusive because 2019 concentrations were low

# Air Quality Index (AQI) Days Over 100 in New Jersey



# New Analysis

- Carbon monoxide (CO), 6 stations
  - Monthly average and annual average concentrations
- Sulfur Dioxide (SO<sub>2</sub>), 9 stations
  - Monthly average and annual average concentrations
- Nitrogen Dioxide (NO<sub>2</sub>), 9 stations
  - Monthly average and annual average concentrations
- Ozone (O<sub>3</sub>), 16 stations,
  - Monthly average and 8-month season average (March-Oct) concentrations
- Fine particles (PM<sub>2.5</sub>), 12 continuous monitors
  - Monthly average and annual average concentrations

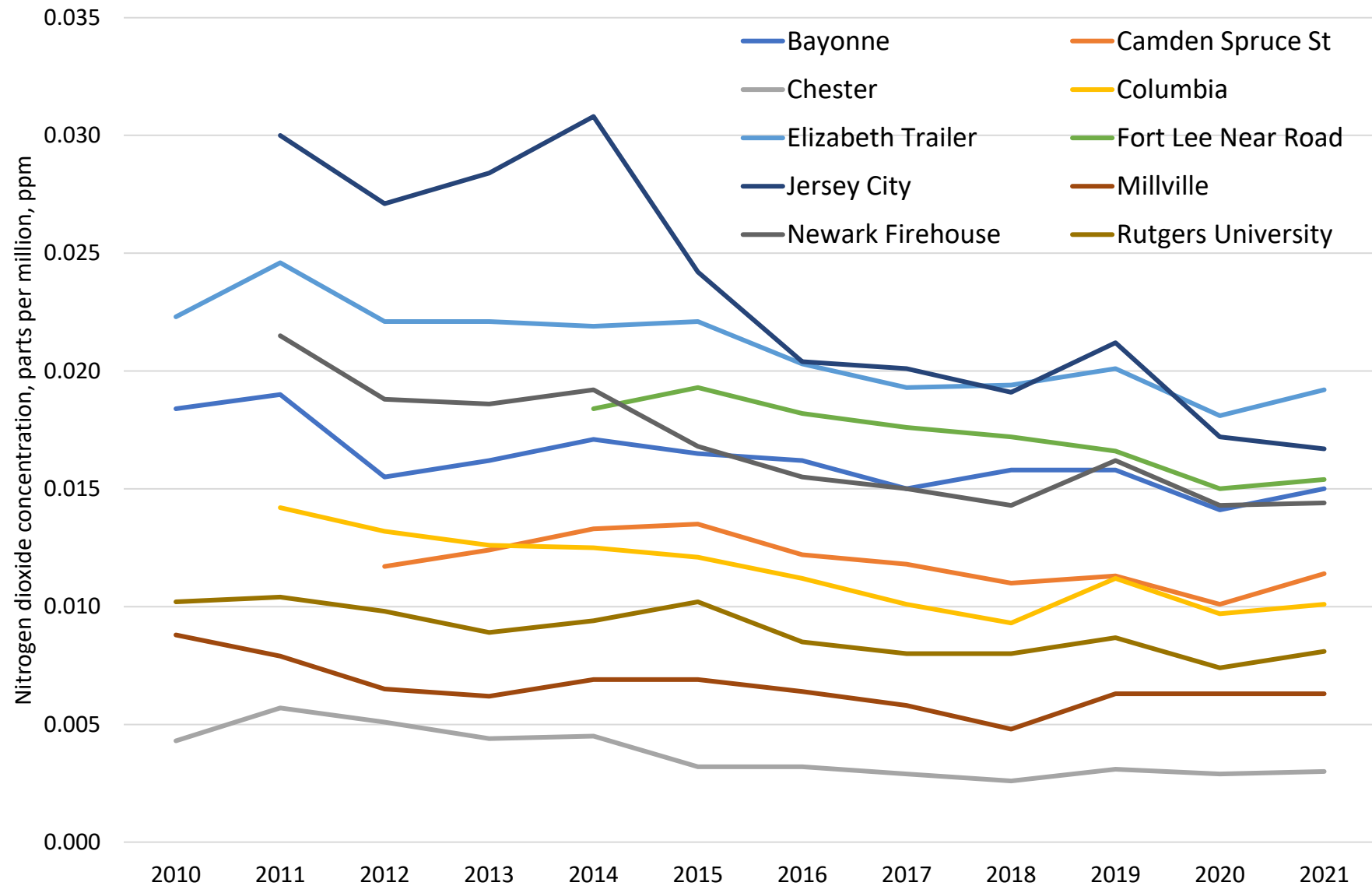
# Carbon Monoxide (CO) and Sulfur Dioxide (SO<sub>2</sub>)

- Concentrations of CO and SO<sub>2</sub> near detection limit in the last 5 years
  - Changed database for lower concentrations
  - Monthly average CO is <1 ppm
  - Monthly average SO<sub>2</sub> is <0.001 ppm
- Very small impact of Covid-19 lockdown on CO and SO<sub>2</sub>

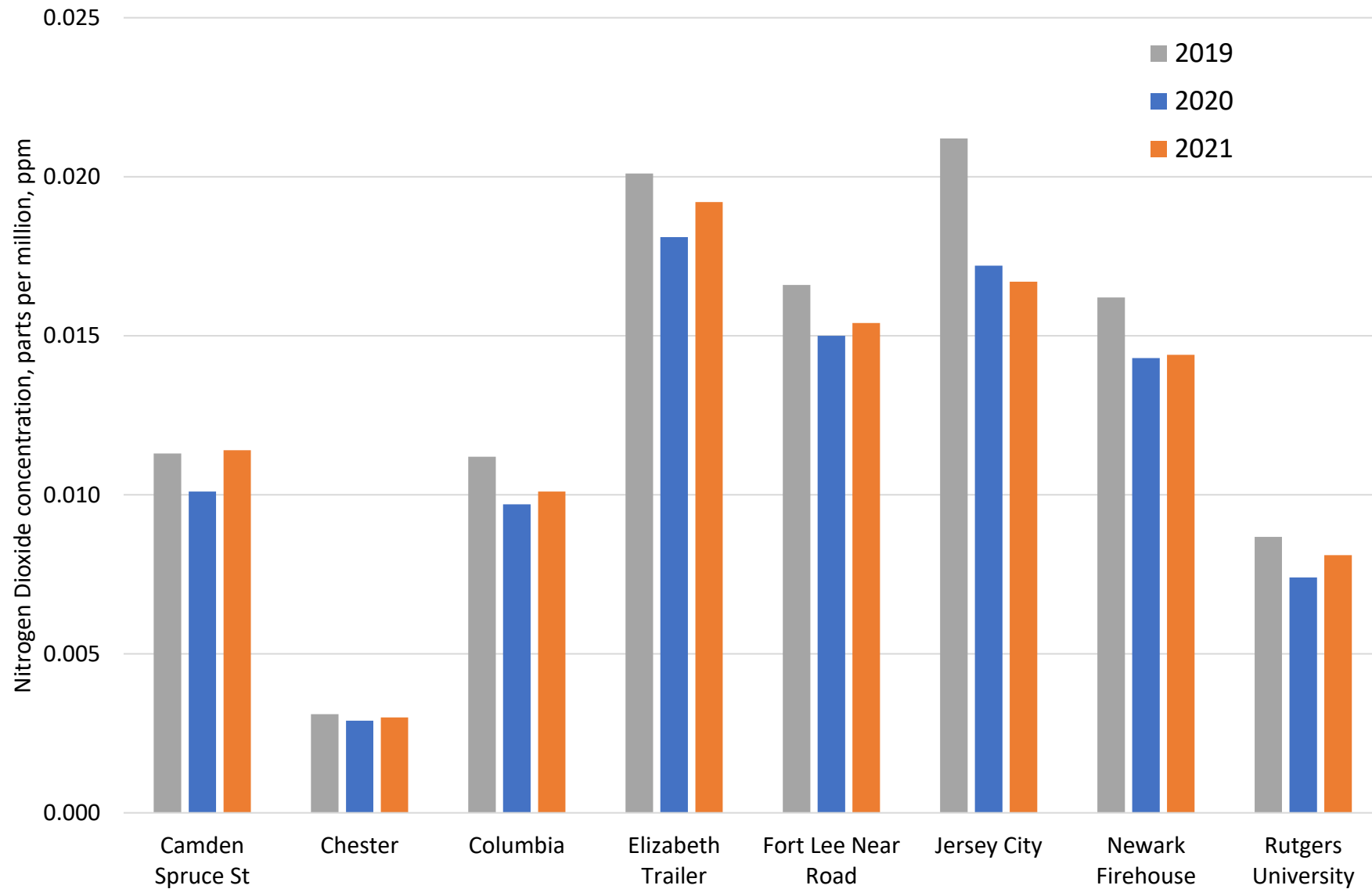
# Nitrogen Dioxide (NO<sub>2</sub>)

- Analyze monthly averages from 9 stations
- Covid year impact observed at all 9 stations (March-May data)
  - -42% to -23% decrease over 2019 concentrations
- Pre-covid (2010-2019) year-to-year average % difference in annual average NO<sub>2</sub> concentrations ranges from -3.6% to -0.3%
- Covid Impact in 2021 may be continuing at 8 of 9 stations
  - 7 stations have slightly higher NO<sub>2</sub> levels in 2021 than 2020, but < 2019
  - 1 station has lower NO<sub>2</sub> levels in 2021 than 2020
- 1 station has “recovered” from Covid impact: higher NO<sub>2</sub> levels in 2020 than 2019 (Camden Spruce St.)

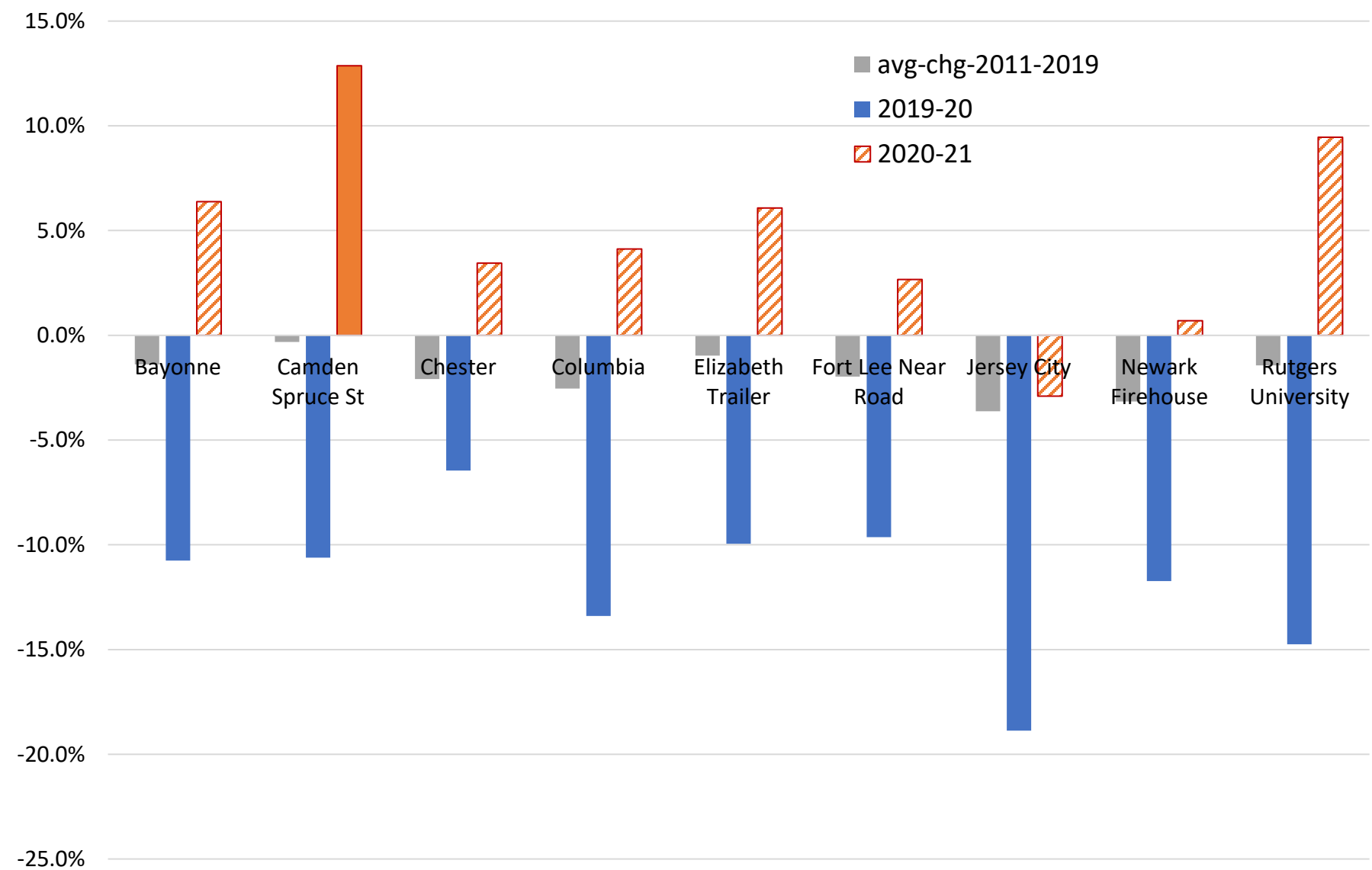
Trend in Annual Average Nitrogen Dioxide Concentrations at  
NJDEP Stations, 2010-2021, ppm



Annual Average Nitrogen Dioxide Concentrations at 9 NJDEP  
Stations, 2019-2021, ppm



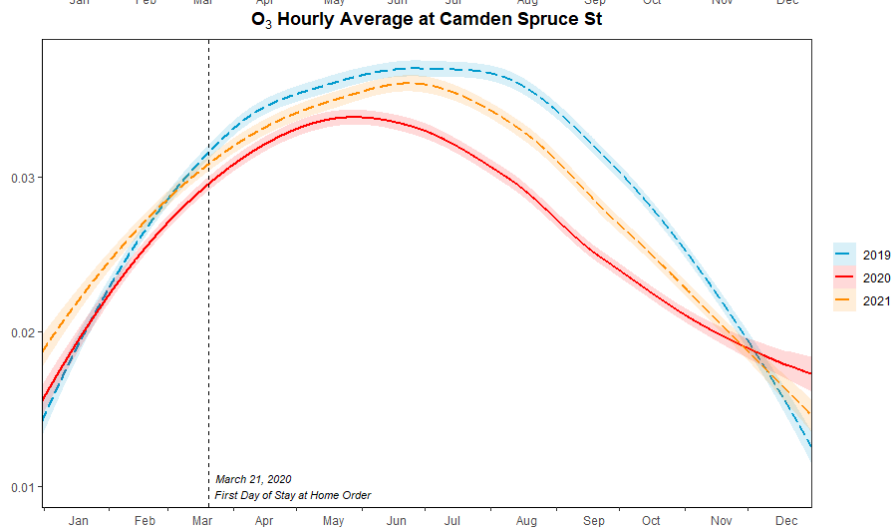
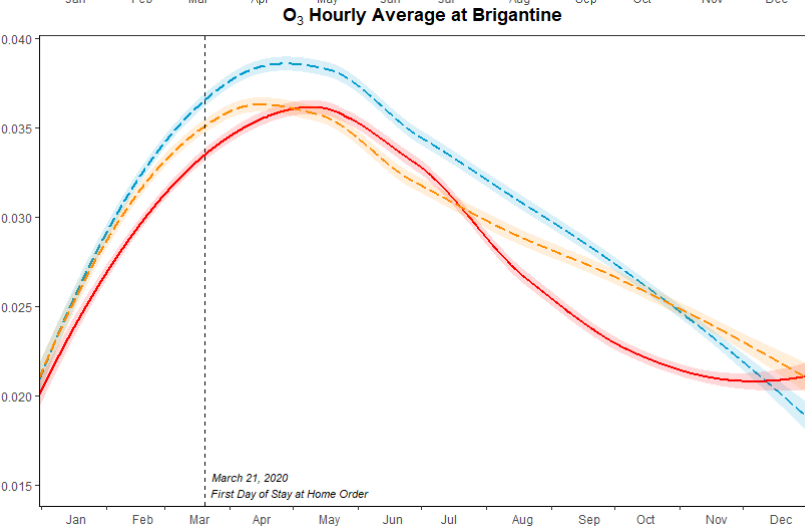
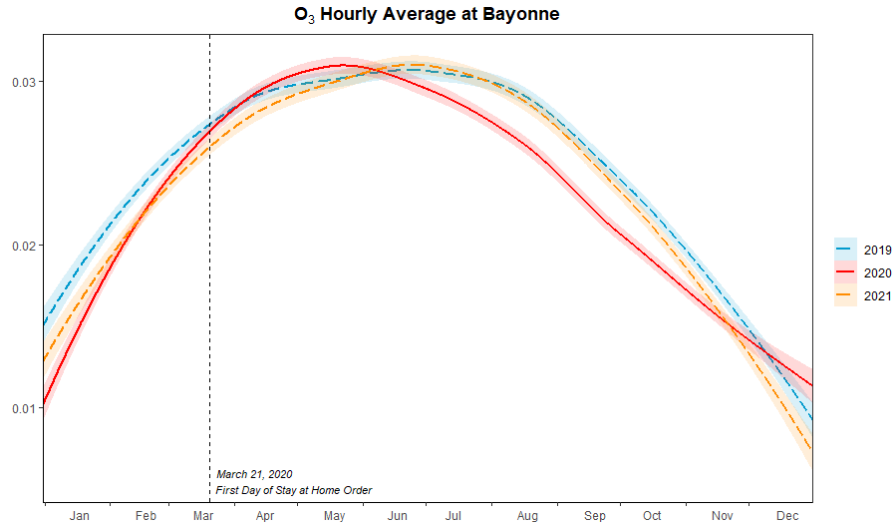
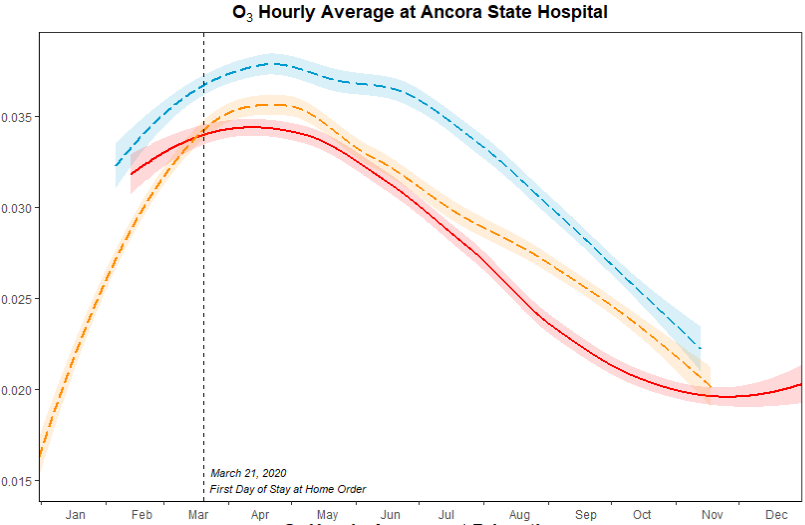
Percent Difference in Annual Average Nitrogen Dioxide Concentrations at 9 NJDEP Stations, 2019-2020 and 2020-2021



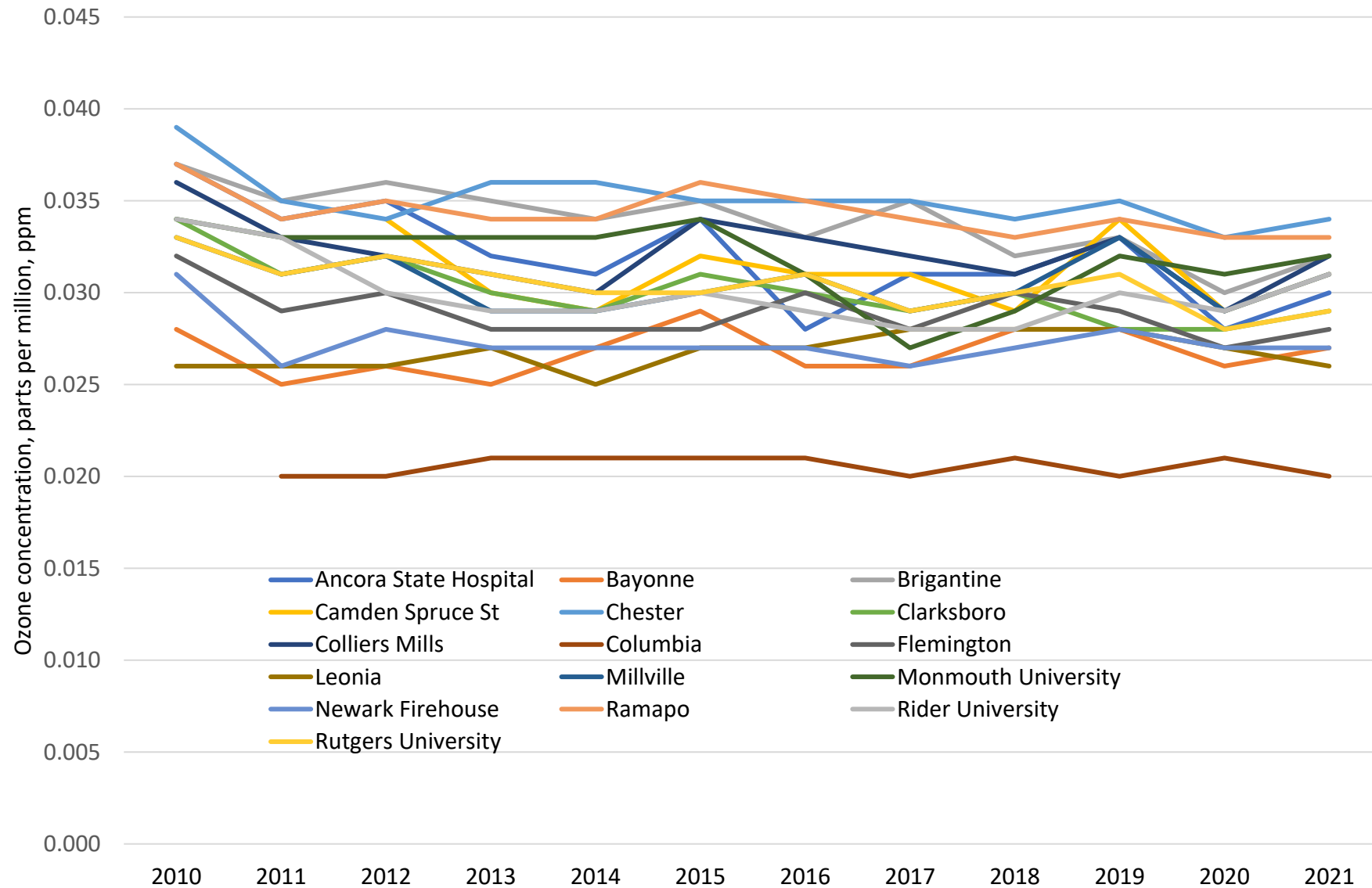
# Ozone ( $O_3$ )

- Analyze monthly averages from 16 stations
- Covid year impact observed at 14 of 16 stations (Mar-Oct data)
  - -15.2% to -2.9% decrease over 2019 concentrations
- Pre-covid (2010-2019) year-to-year average % difference in season average  $O_3$  concentration ranges from -2.0% to +0.9%
- Covid Impact in 2021 may be continuing at 13 of 16 stations
  - 9 stations have slightly higher  $O_3$  levels in 2021 than 2020, but < 2019
  - 2 station has lower  $O_3$  levels in 2021 than 2020
  - 2 stations have same  $O_3$  levels in 2021 as 2020, but 2020 was <2019
- 2 stations have “recovered” from Covid impact: higher  $O_3$  levels in 2021 than 2019 (recover from covid)
- 1 station was not impacted by Covid and has higher  $O_3$  levels in 2021 than 2020

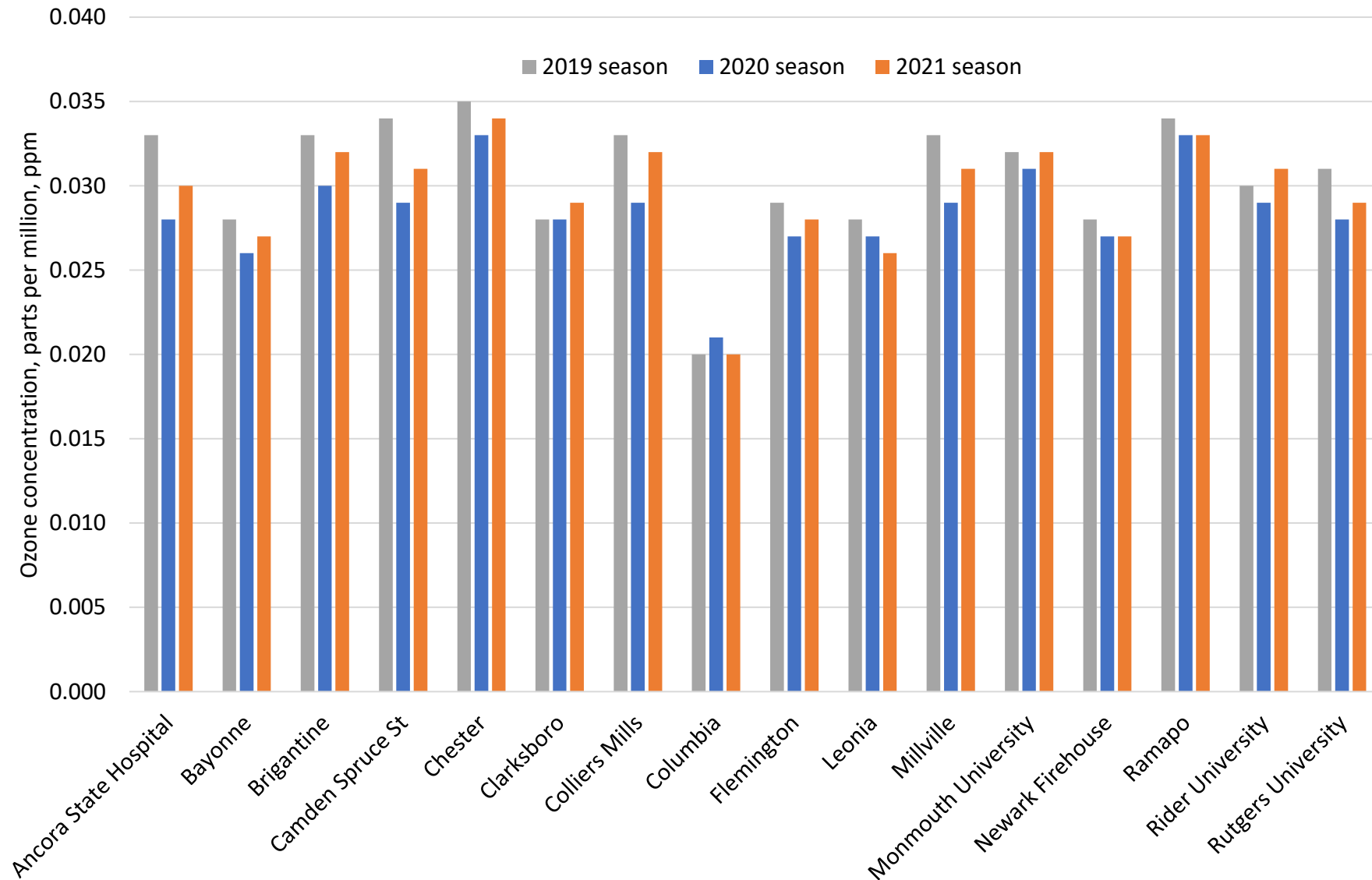
# Smooth Plot Charts of Monthly Average Ozone Concentrations at 4 NJDEP Stations



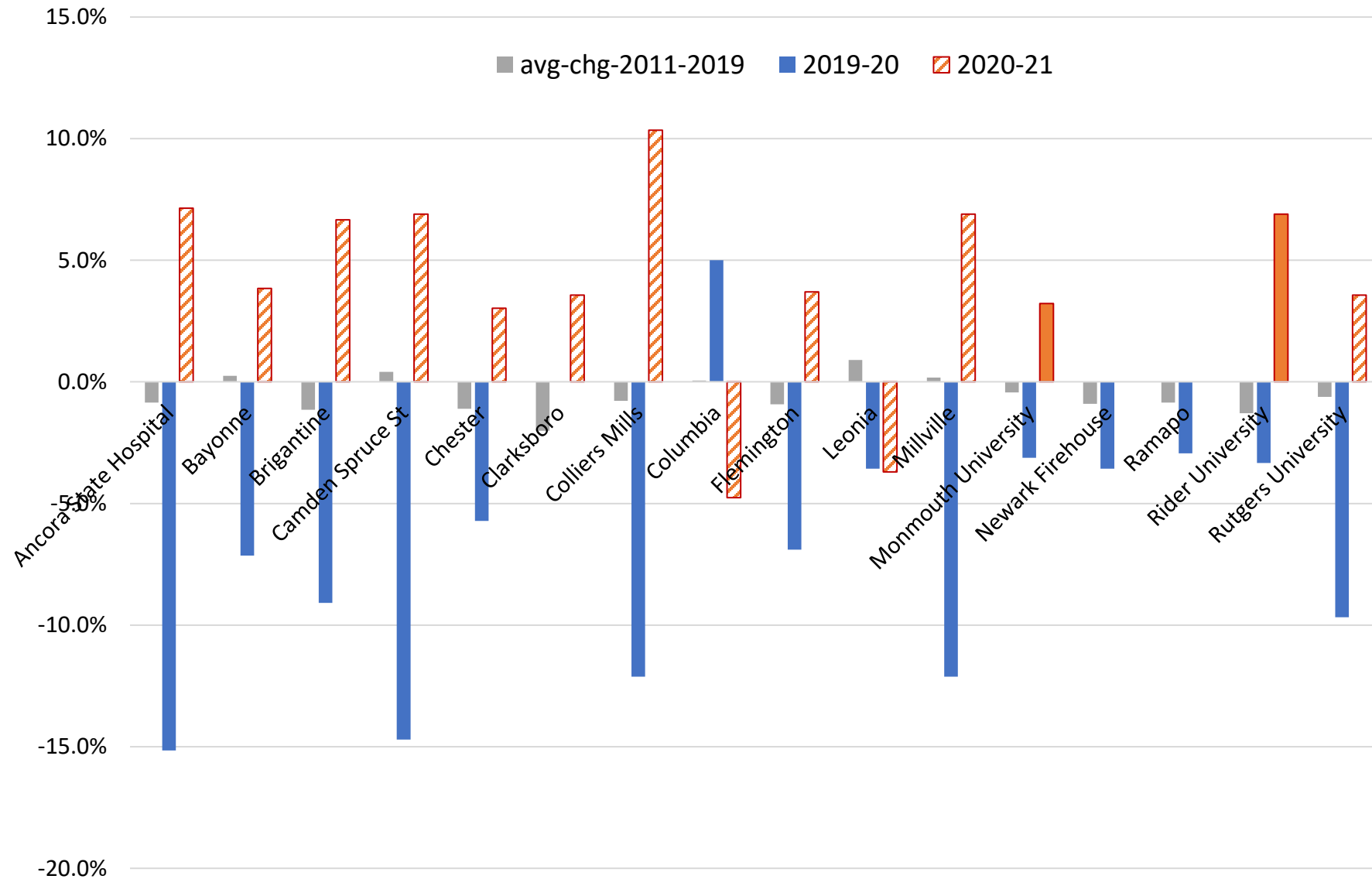
# Trend in Mar-Oct Average Ozone Concentrations at NJDEP Stations, 2010-2021, ppm



# Ozone Season (Mar-Oct) Average Ozone Concentrations at 16 NJDEP Stations, 2019-2021, ppm



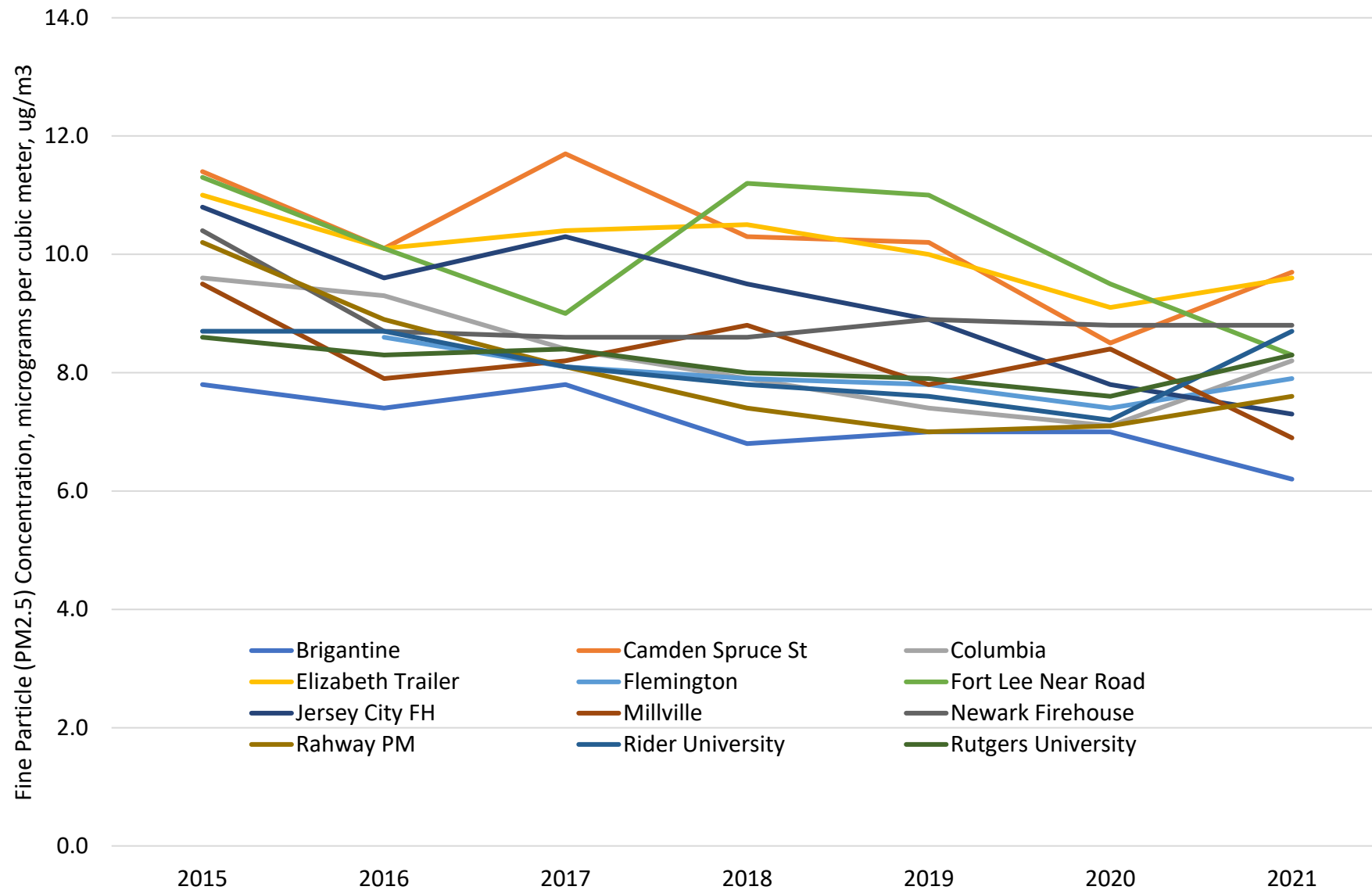
## Percent Difference in Ozone Season (Mar-Oct) Average Ozone Concentrations at 16 NJDEP Stations, 2019-2021



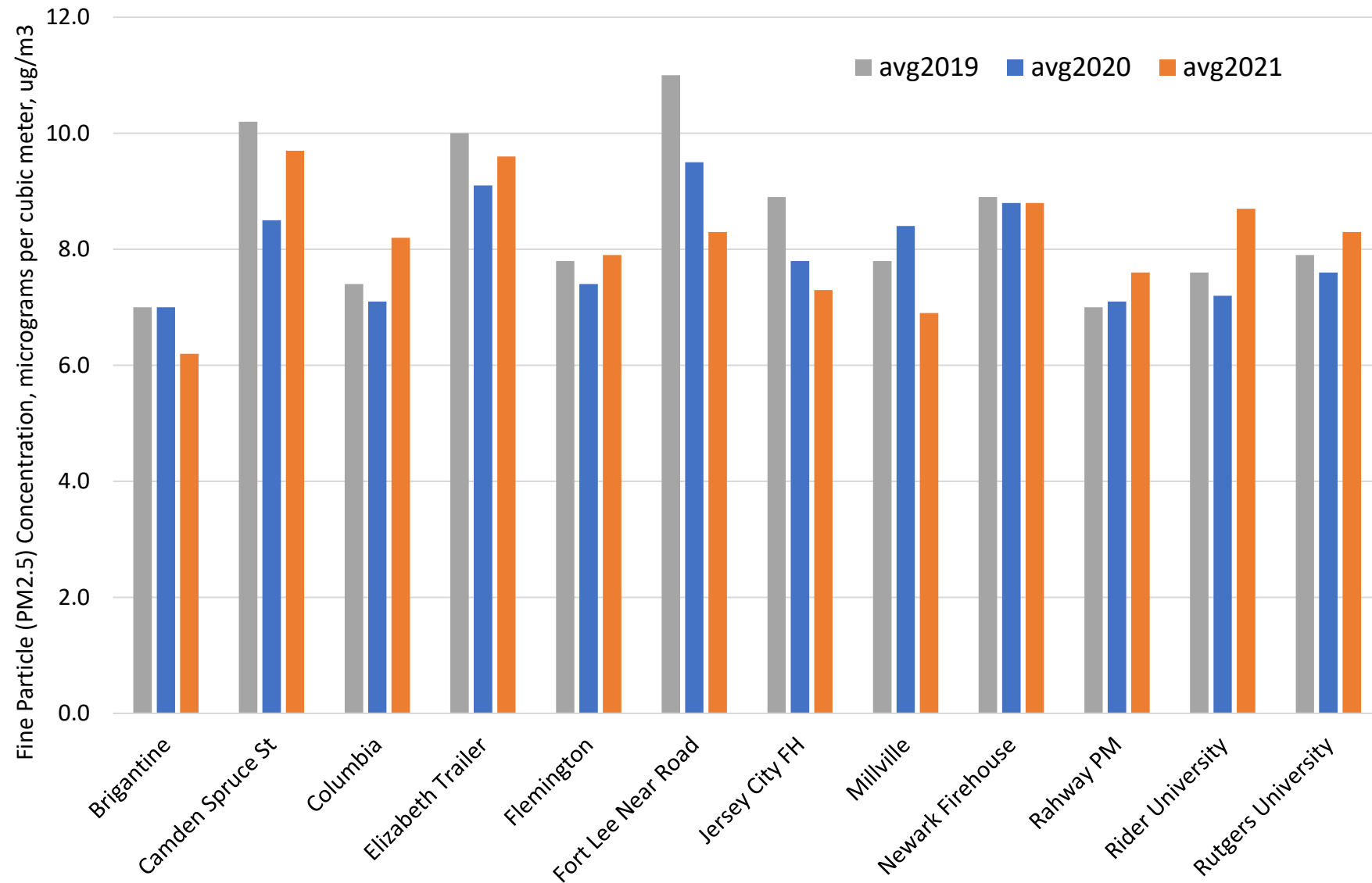
# Fine Particles (PM2.5)

- Analyze monthly and annual averages from 12 stations, 2015-2021, data from continuous monitors only (Filter data not included)
- Covid year impact observed at 10 of 12 stations (Mar-May data)
  - -27.9% to -12.5% decrease over 2019 concentrations
- Pre-covid (2015-2019) year-to-year average % difference in annual average PM2.5 concentration ranges from -6.3% to +0.3%
- Covid Impact may be continuing in 2021 at 7 of 12 stations
  - 3 stations have slightly higher PM2.5 levels in 2021 than 2020, but < 2019
  - 2 station have lower PM2.5 levels in 2021 than 2020, but no covid effect in 2020
  - 2 stations have lower PM2.5 levels in 2021 as 2020, and with covid effect
- 5 stations have “recovered” from Covid impact: higher PM2.5 levels in 2021 than 2019

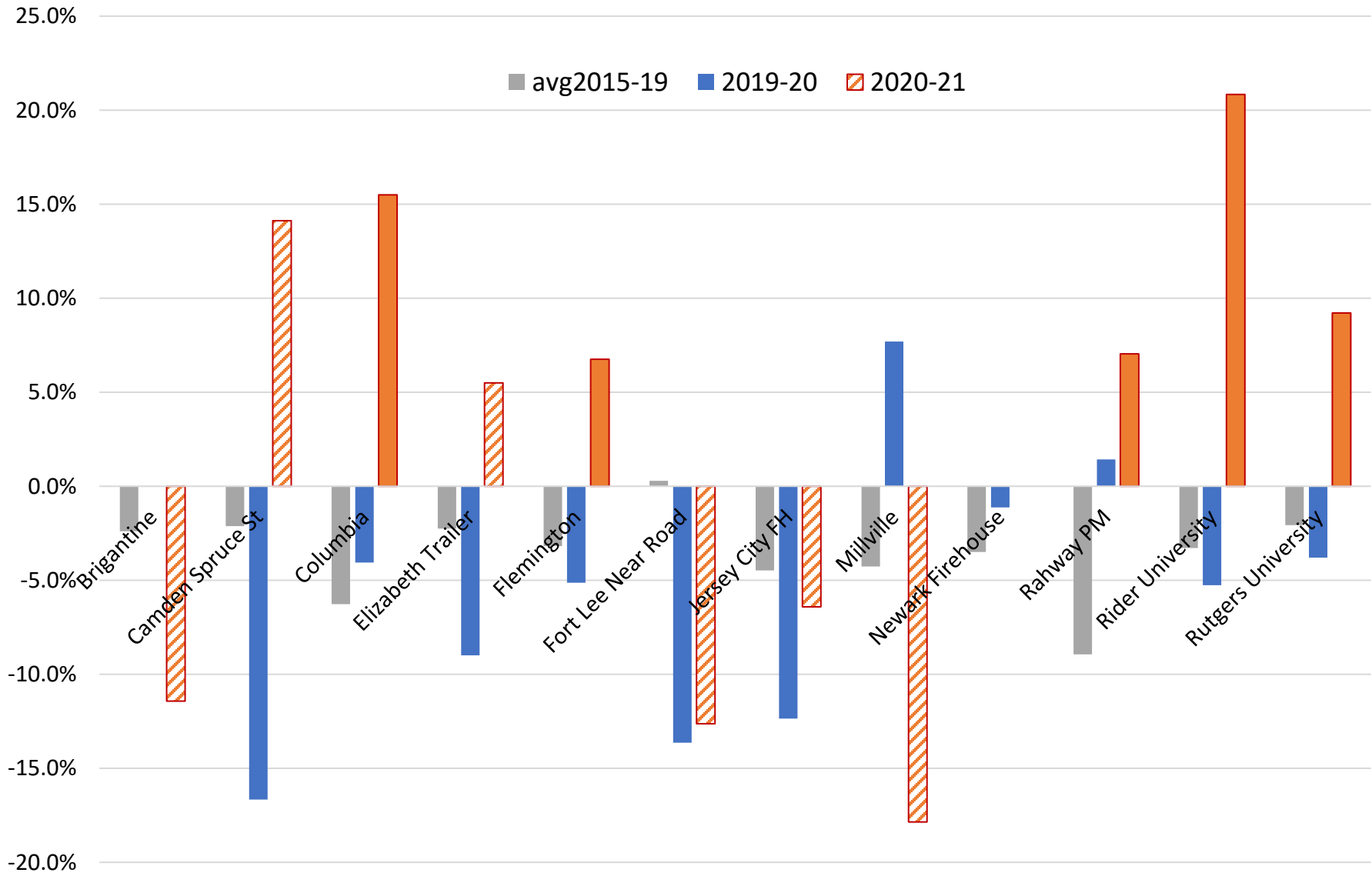
Trend in Annual Average Fine Particle (PM2.5) Concentrations at  
12 NJDEP Stations, 2015-2021, ug/m3



## Annual Average Fine Particle (PM2.5) Concentrations at 12 NJDEP Stations, 2019-2021, ug/m3



Percent Difference in Annual Average Fine Particle (PM2.5) Concentrations at 12 NJDEP Stations, 2019-2021



# Summary

- Analyzed monthly, annual average and seasonal average data for CO, NO<sub>2</sub>, O<sub>3</sub>, SO<sub>2</sub> and PM<sub>2.5</sub>
- No Covid impact for CO or SO<sub>2</sub> in 2020
- Covid impact observed at all 9 NO<sub>2</sub> stations
  - Continuing at 8 stations in 2021
- Covid impact observed at 14 of 16 O<sub>3</sub> stations
  - Continuing at 13 stations in 2021
- Covid impact observed at 10 of 12 PM<sub>2.5</sub> stations
  - Continuing at 7 stations in 2021

# Additional Future Analysis

- Use of statistical analysis to determine probability of Covid impact continuing into 2021
- Analysis of vehicle mix and/or more detailed traffic counts
- Analysis of maximum concentrations and/or comparison to the concentrations of National Ambient Air Quality Standards

2020 Air Quality Summary  
available at:

<https://www.nj.gov/dep/airmon/index.html>

Questions, comments

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Department of Environmental Protection

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### Current Air Quality

TABLE OF THE LATEST DATA

Current Status - POLLUTANTS

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