Derby air pollution analysis

- Analysed by **Alex Large** (Junior Data Analyst) as a furlough project
- Sharing graphs on Instagram at @**derbyairpollution**
- My **email**: alexanderklarge@gmail.com
- Analysed with **Python** coding language
- **Code** visible here: https://github.com/productivityboyz/Air-Pollution-Project (main file = Alex's Air Pollution Analysis.ipynb)

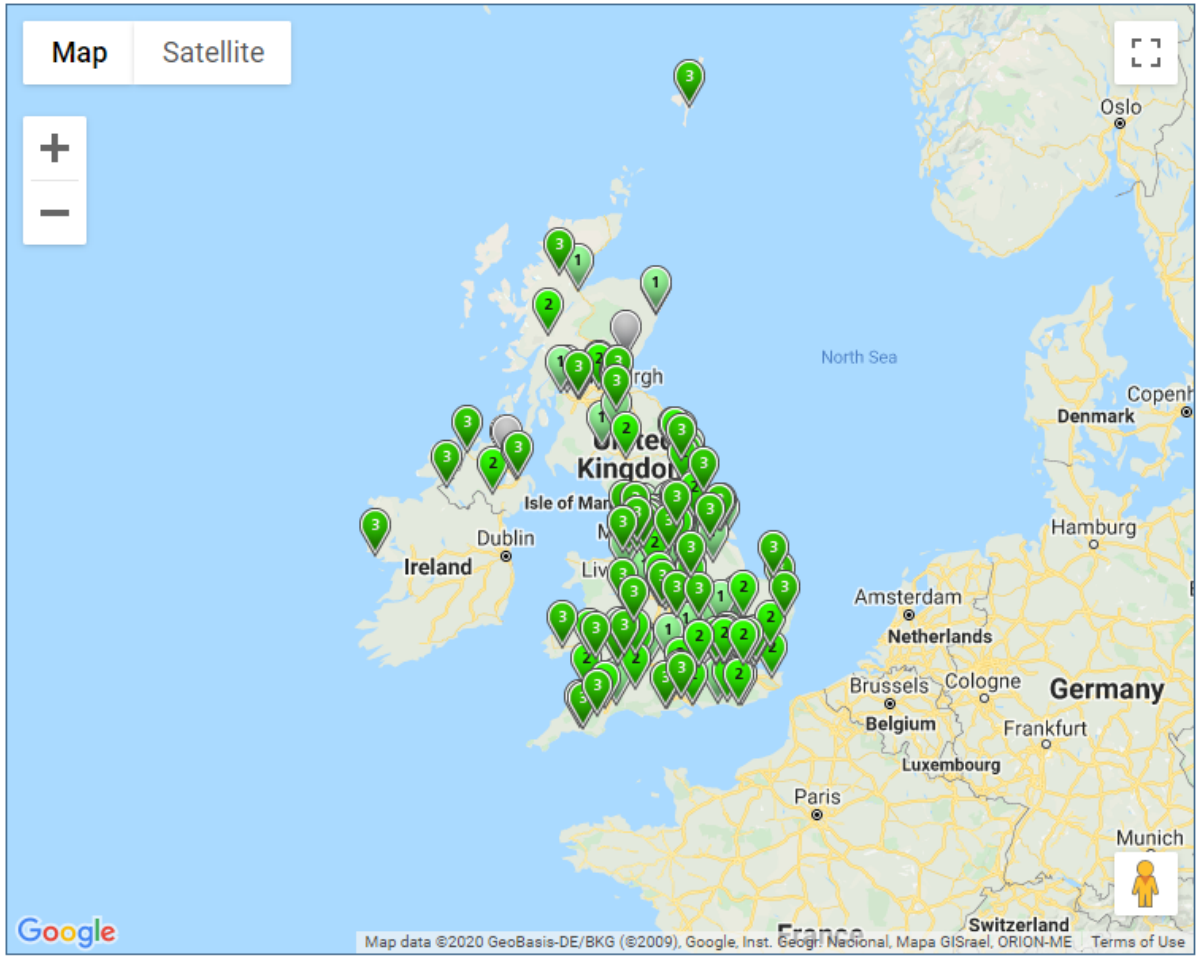
Interactive monitoring networks map

Use the interactive map below to explore different UK monitoring networks. The map shows the current sites within the network selected. Information about the selected network is shown below the map.

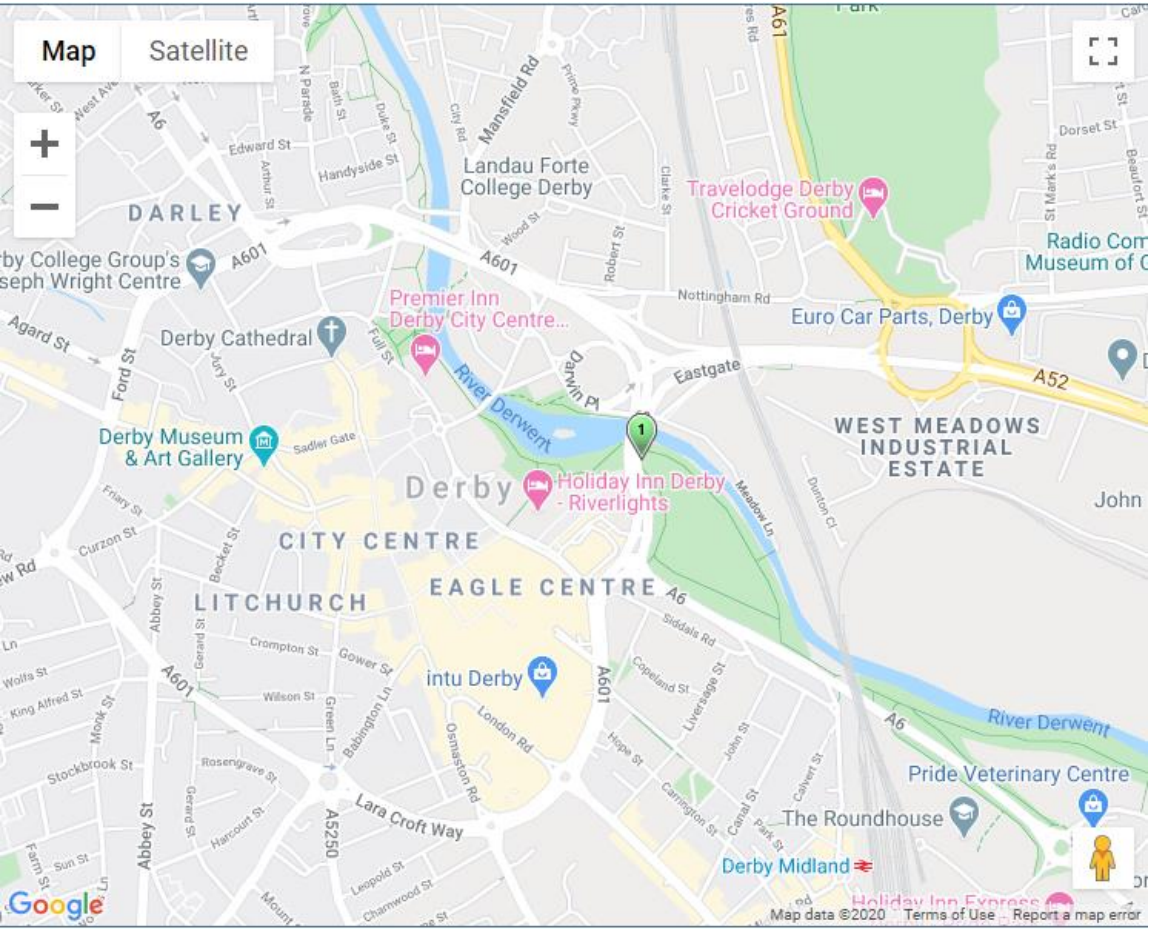
Map options

Filter by network

- (●) Automatic Urban and Rural
  - ⓘ Markers show latest pollution index
- ( ) Automatic Hydrocarbon
- ( ) Non-Automatic Hydrocarbon
- ( ) PAH
- ( ) TOMPs
- ( ) Black Carbon
- ( ) Heavy Metals
- ( ) Particulates
- ( ) Stratospheric Ozone and UV
- ( ) UKEAP: Precip-Net
- ( ) UKEAP: Acid Gas and Aerosol
- ( ) UKEAP: Rural NO2
- ( ) UKEAP: National Ammonia
- ( ) UKEAP: Automatic Mercury



https://uk-air.defra.gov.uk/interactive-map - url for map
https://uk-air.defra.gov.uk/networks/network-info?view=aurn – info on the AURN


Map
Satellite
DARLEY
Landau Forte College Derby
Travelodge Derby Cricket Ground
Premier Inn Derby City Centre...
Derby Cathedral
Euro Car Parts, Derby
Nottingham Rd
Eastgate
A52
A601
River Derwent
WEST MEADOWS INDUSTRIAL ESTATE
Derby Museum & Art Gallery
Holiday Inn Derby - Riverlights
Derby
CITY CENTRE
EAGLE CENTRE
LITCHURCH
intu Derby
A6
Pride Veterinary Centre
The Roundhouse
Derby Midland
Lara Croft Way
A5250
Google
Map data ©2020
Terms of Use
Report a map error

A601
Derby, England
View on Google Maps
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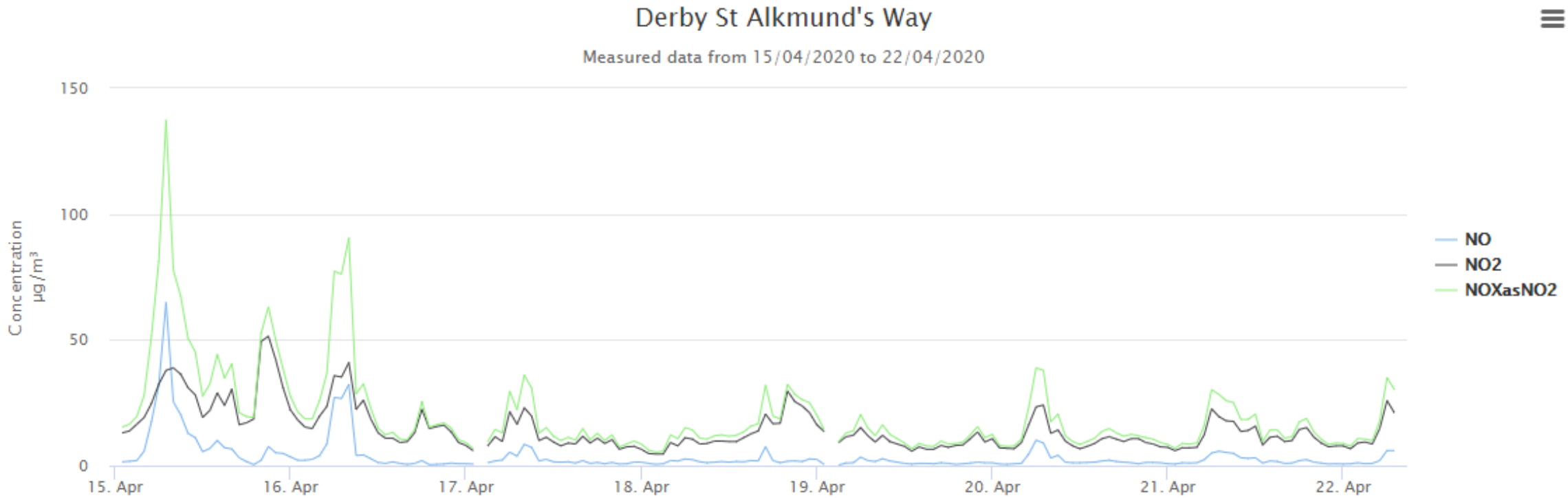
Report a problem

Graph of hourly measurements for Derby St Alkmund's Way

The last 7 days of hourly averaged measurements are shown below as an interactive timeseries graph. Click the legend to toggle pollutant lines on and off.



Local Authority Details

CSV data files for Derby St Alkmund's Way monitoring site

Listed below are links to CSV data files for Derby St Alkmund's Way. These files contain one year's automatic monitoring data and are updated daily. There are two formats to the files, firstly a file containing all pollutants measured at the site for each year followed by pollutant specific data files grouped by monitoring network.

To get the very latest data for Derby St Alkmund's Way use the Data Selector.

All Hourly Pollutant Data for site Derby St Alkmund's Way (Column Format)

2020 (CSV)	2019 (CSV)	2018 (CSV)	2017 (CSV)

Hourly Pollutant Files for Site Derby St Alkmund's Way in Automatic Urban Monitoring Network (in 24x365 Table Format)

Nitric oxide	Nitrogen dioxide	Nitrogen oxides as nitrogen dioxide
2020 (CSV)	2020 (CSV)	2020 (CSV)
2019 (CSV)	2019 (CSV)	2019 (CSV)
2018 (CSV)	2018 (CSV)	2018 (CSV)
2017 (CSV)	2017 (CSV)	2017 (CSV)

AutoSave Off | DESA_2020 | Search | Alex Large AL

File Home Insert Page Layout Formulas Data Review View Help Power Pivot | Share | Comments

Paste | Cut | Copy | Format Painter | Clipboard

Calibri | 11 | Font

Wrap Text | Merge & Center | Alignment

General | Number

Conditional Formatting | Format as Table | Normal | Bad | Good | Neutral | Calculation | Check Cell | Explanatory ... | Input | Styles

Insert | Delete | Format | Cells

AutoSum | Fill | Clear | Sort & Filter | Find & Select | Editing

Ideas | Ideas

Sensitivity | Sensitivity

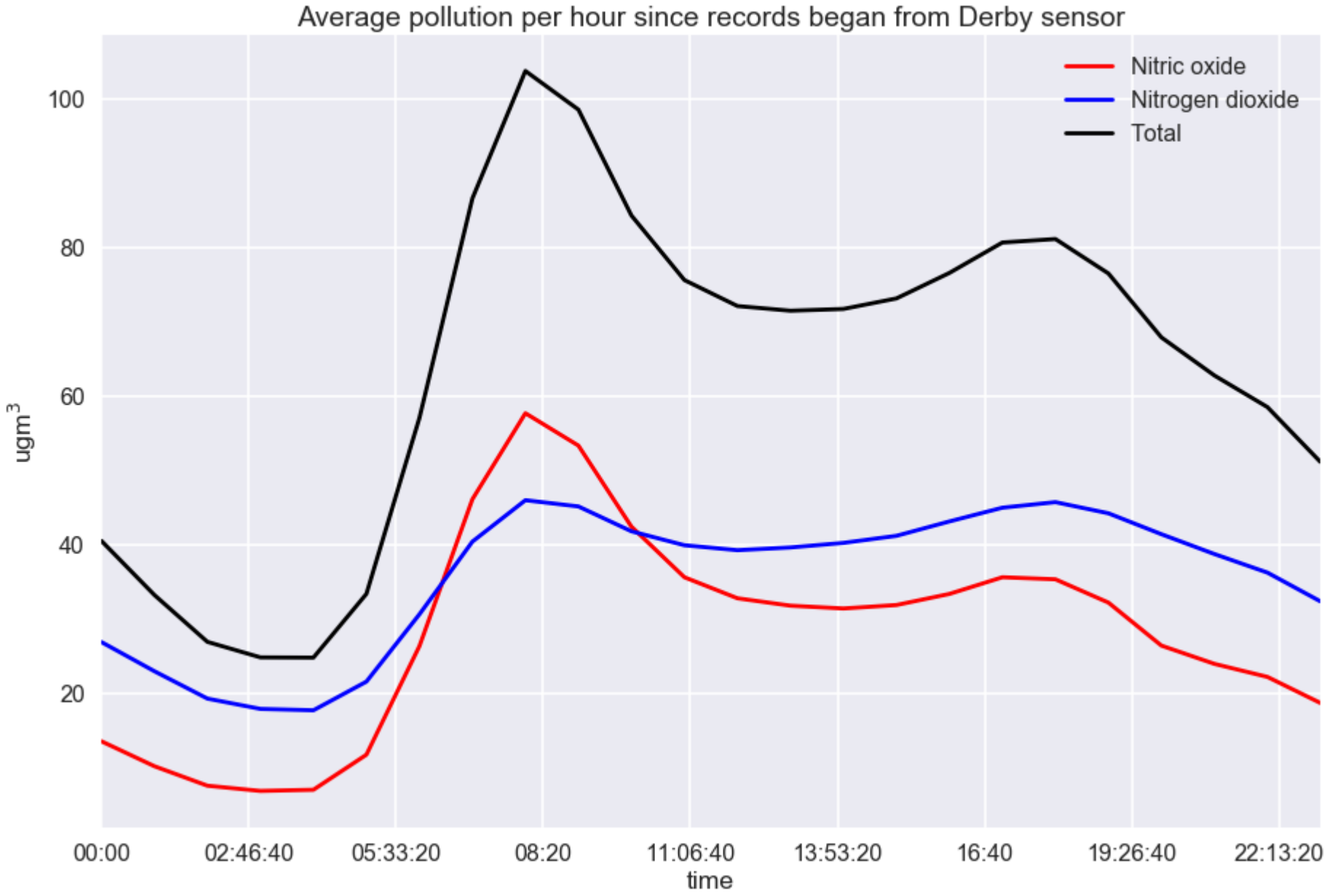
A1 | Data supplied by UK-AIR on 22/4/2020

	A	B	C	D	E	F	G	H	I	J	K
1	Data supplied by UK-AIR on 22/4/2020										
2	All Data GMT hour ending										
3	Status: R =	P*=As supplied									
4			Derby St Alkmund's Way								
5	Date	time	Nitric oxic	status	unit	Nitrogen (	status	unit	Nitrogen (	status	unit
6											
7	########	01:00	0.64587	P	ugm-3	13.84505	P	ugm-3	14.83537	P	ugm-3
8	########	02:00	0.11398	P	ugm-3	12.74074	P	ugm-3	12.9155	P	ugm-3
9	########	03:00	1.59568	P	ugm-3	16.49024	P	ugm-3	18.93692	P	ugm-3
10	########	04:00	8.29183	P	ugm-3	28.43237	P	ugm-3	41.14634	P	ugm-3
11	########	05:00	7.20905	P	ugm-3	32.23066	P	ugm-3	43.28438	P	ugm-3
12	########	06:00	8.12087	P	ugm-3	28.47635	P	ugm-3	40.92817	P	ugm-3
13	########	07:00	22.88089	P	ugm-3	40.62048	P	ugm-3	75.70403	P	ugm-3
14	########	08:00	36.13073	P	ugm-3	43.34281	P	ugm-3	98.74248	P	ugm-3
15	########	09:00	78.04579	P	ugm-3	42.29881	P	ugm-3	161.9674	P	ugm-3
16	########	10:00	43.65321	P	ugm-3	33.2484	P	ugm-3	100.1824	P	ugm-3
17	########	11:00	25.73032	P	ugm-3	27.13203	P	ugm-3	66.58464	P	ugm-3
18	########	12:00	15.61486	P	ugm-3	26.93415	P	ugm-3	50.8766	P	ugm-3
19	########	13:00	18.26482	P	ugm-3	28.49964	P	ugm-3	56.50531	P	ugm-3
20	########	14:00	24.79001	P	ugm-3	33.59166	P	ugm-3	71.60248	P	ugm-3
21	########	15:00	26.72762	P	ugm-3	37.47115	P	ugm-3	78.45293	P	ugm-3
22	########	16:00	30.97327	P	ugm-3	41.69508	P	ugm-3	89.18676	P	ugm-3
23	########	17:00	29.43458	P	ugm-3	41.7418	P	ugm-3	86.87419	P	ugm-3
24	########	18:00	23.96368	P	ugm-3	36.4295	P	ugm-3	73.17329	P	ugm-3
25	########	19:00	21.54166	P	ugm-3	35.47442	P	ugm-3	68.50451	P	ugm-3
26	########	20:00	12.36651	P	ugm-3	30.73677	P	ugm-3	49.69849	P	ugm-3
27	########	21:00	8.03538	P	ugm-3	21.97514	P	ugm-3	34.29589	P	ugm-3
28	########	22:00	6.69615	P	ugm-3	19.31619	P	ugm-3	29.58348	P	ugm-3
29	########	23:00	7.06658	P	ugm-3	17.83191	P	ugm-3	28.66717	P	ugm-3
30	########	24:00:00	3.56178	P	ugm-3	14.13009	P	ugm-3	19.59142	P	ugm-3
31	########	01:00	2.60674	P	ugm-3	14.1796	P	ugm-3	18.17654	P	ugm-3
32	########	02:00	1.58671	P	ugm-3	11.05477	P	ugm-3	13.48769	P	ugm-3
33	########	03:00	0.87836	P	ugm-3	10.37534	P	ugm-3	11.72213	P	ugm-3
34	########	04:00	2.18173	P	ugm-3	9.80957	P	ugm-3	13.15484	P	ugm-3
35	########	05:00	2.21006	P	ugm-3	9.24514	P	ugm-3	12.63386	P	ugm-3
36	########	06:00	8.75524	P	ugm-3	15.27301	P	ugm-3	28.69752	P	ugm-3
37	########	07:00	19.26719	P	ugm-3	28.93781	P	ugm-3	58.48042	P	ugm-3
38	########	08:00	29.72247	P	ugm-3	38.39138	P	ugm-3	83.96521	P	ugm-3

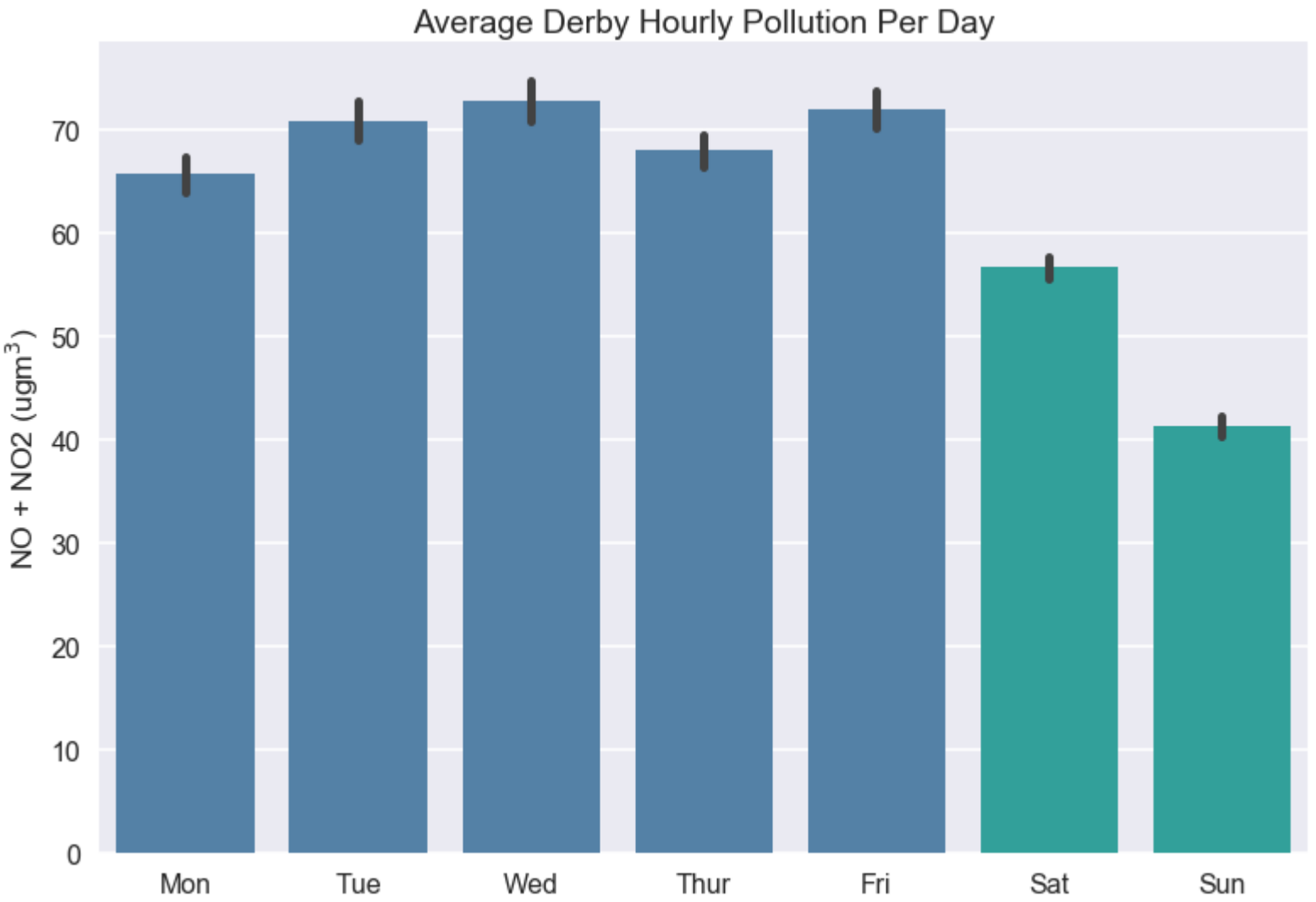
DESA_2020 | 100%

Quick Analysis of Whole Dataset

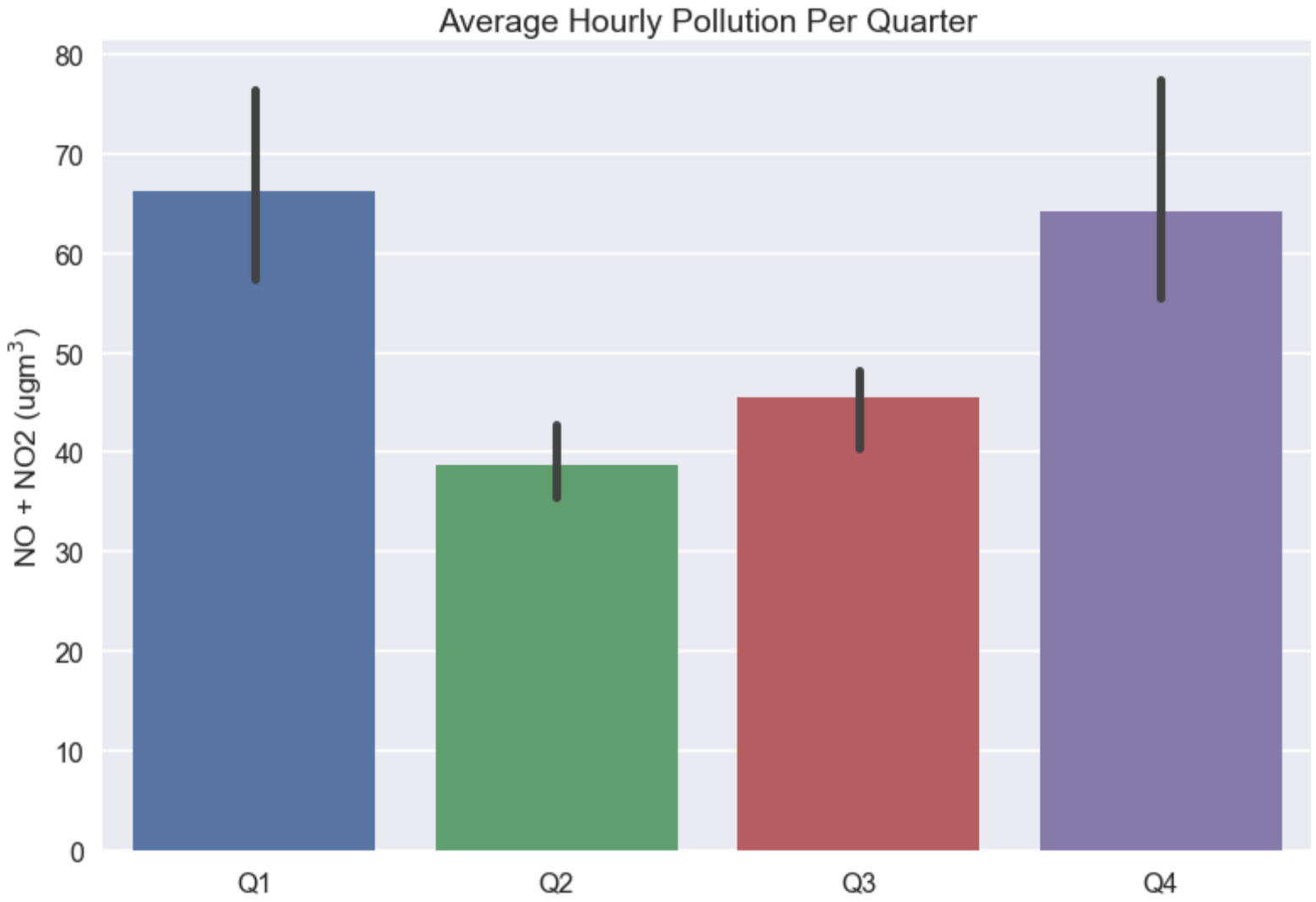
Average pollution over a day



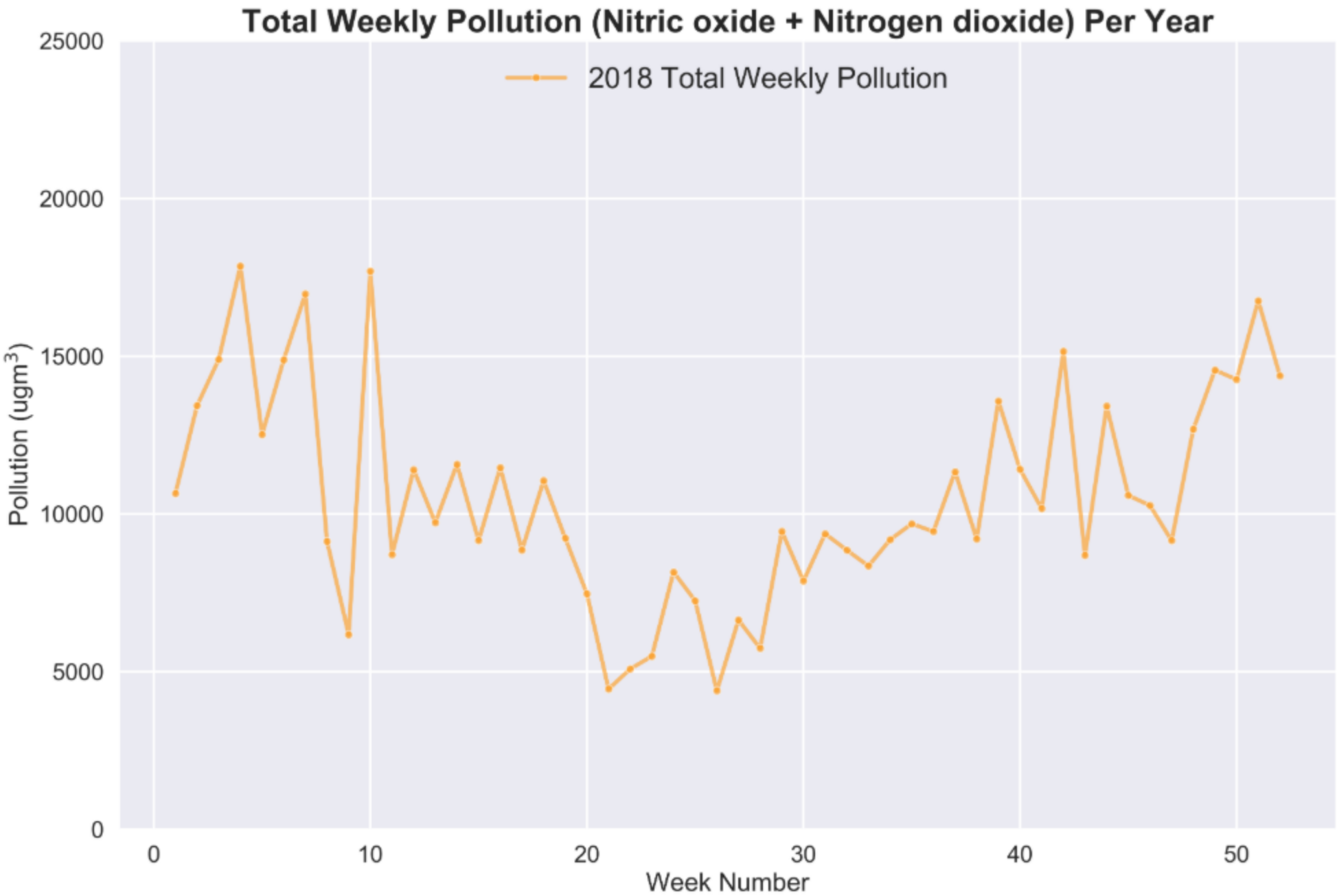
Average pollution across weekdays

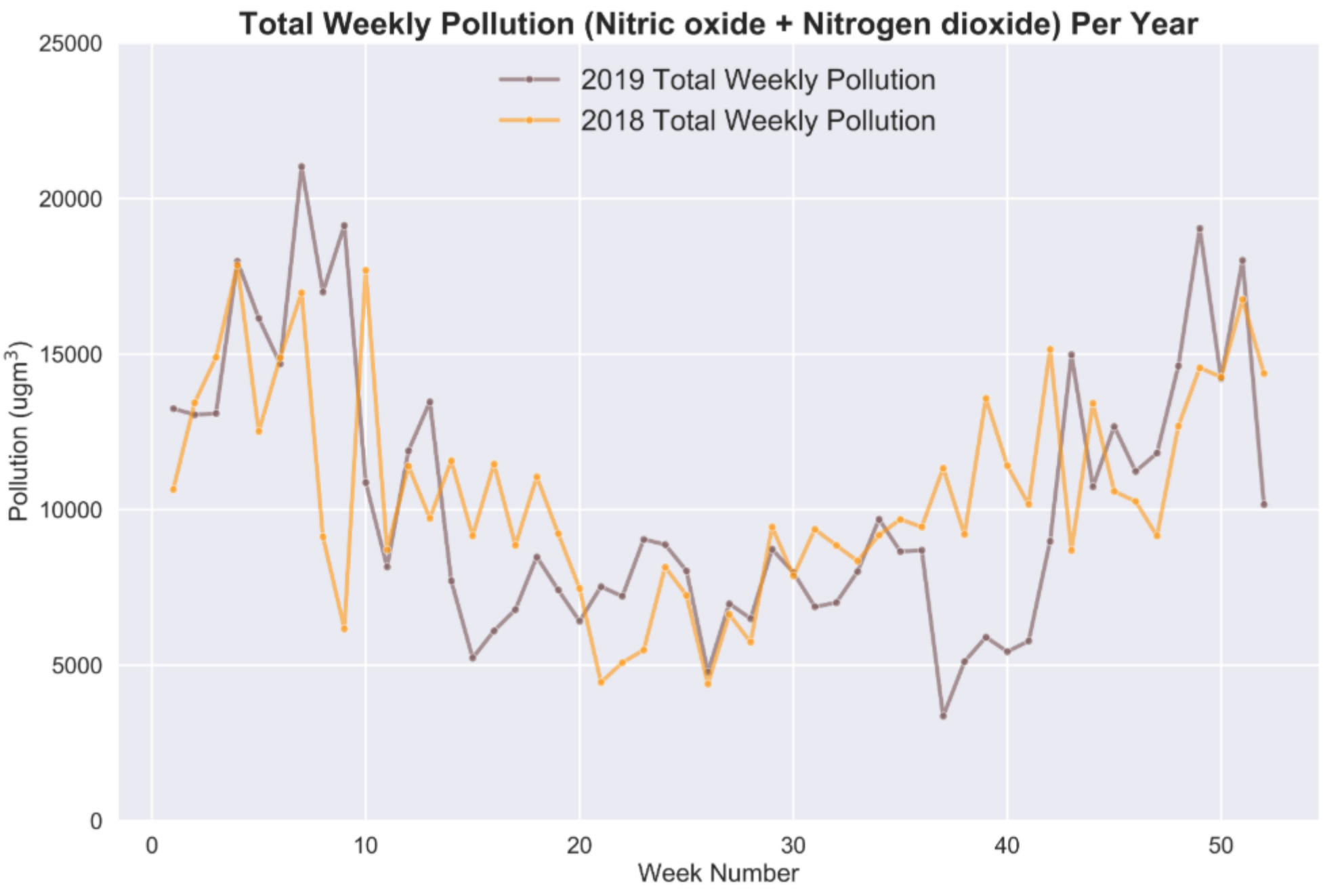


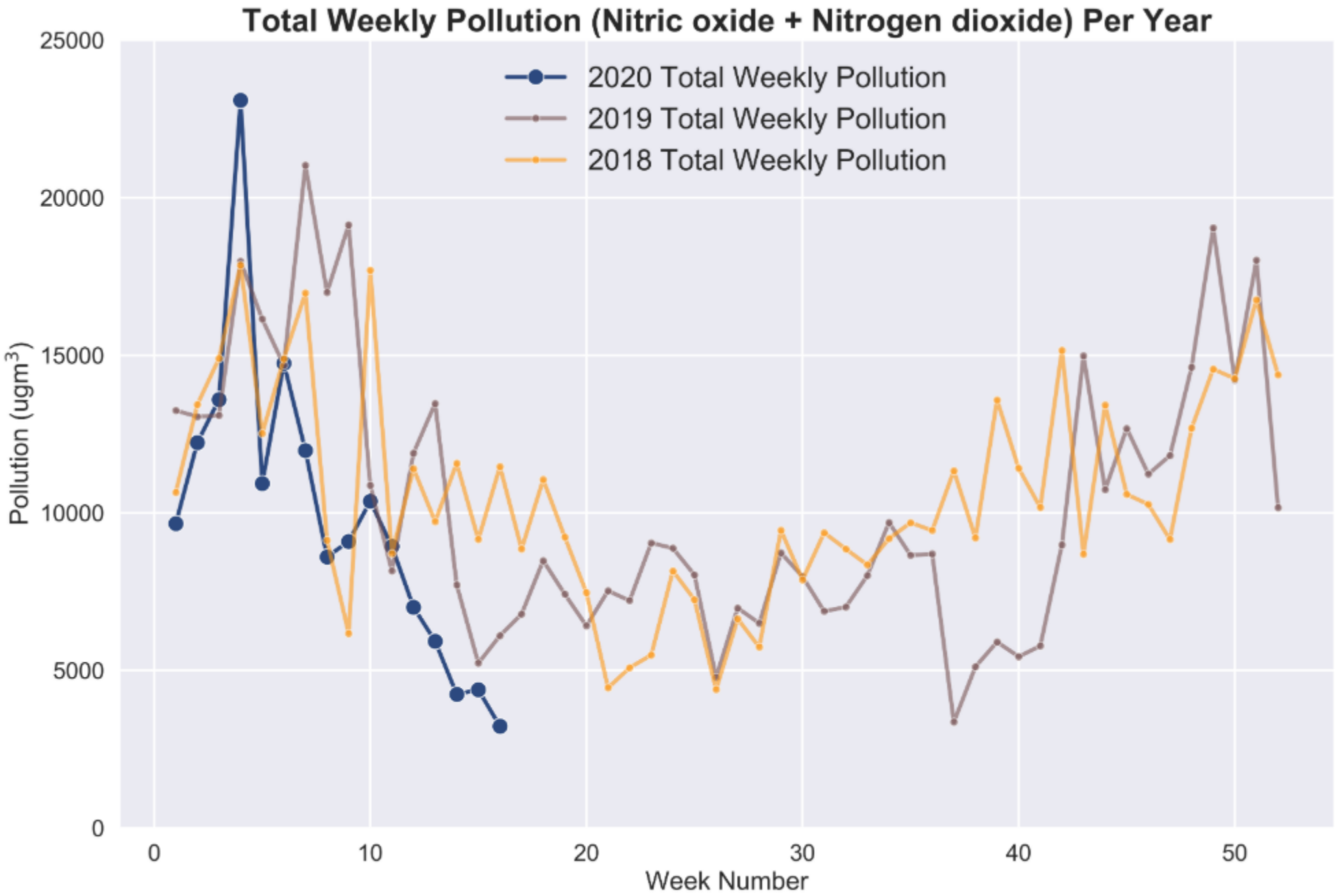
Pollution across quarters



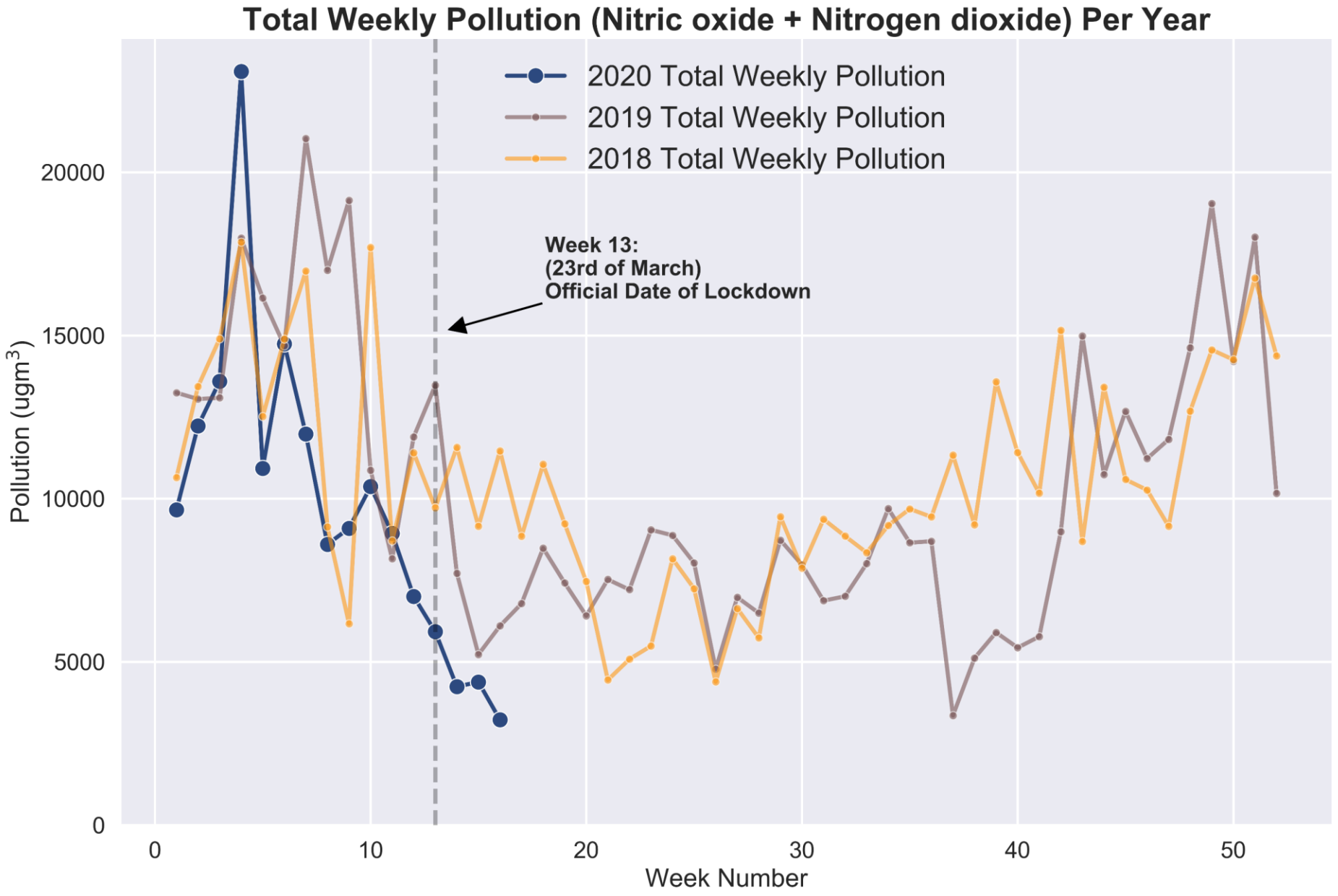
2020 weekly pollution vs previous years


Total Weekly Pollution (Nitric oxide + Nitrogen dioxide) Per Year
2018 Total Weekly Pollution
Pollution (ugm3)
25000
20000
15000
10000
5000
0
0
10
20
30
40
50
Week Number

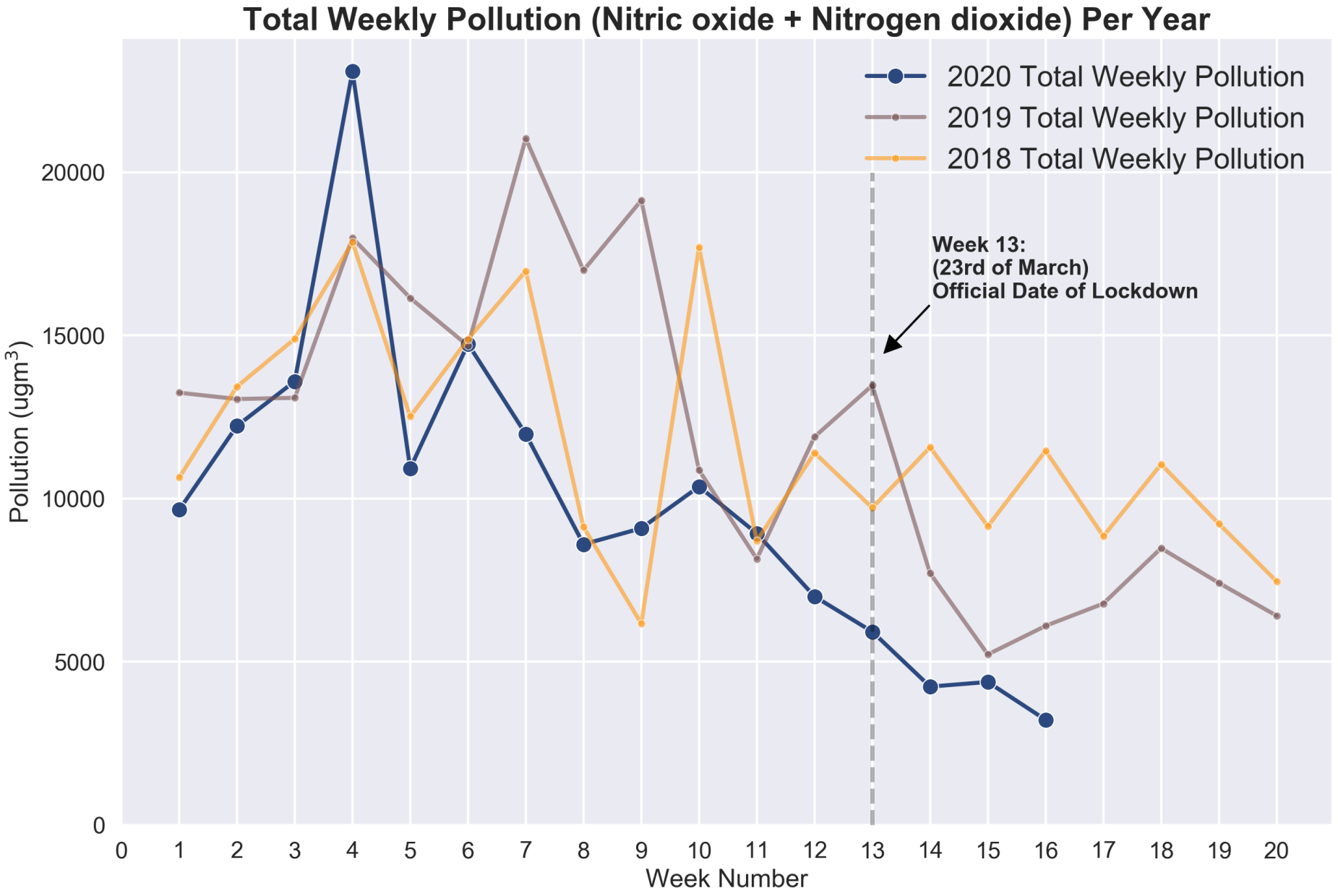

Total Weekly Pollution (Nitric oxide + Nitrogen dioxide) Per Year
2019 Total Weekly Pollution
2018 Total Weekly Pollution
Pollution (ugm3)
25000
20000
15000
10000
5000
0
0
10
20
30
40
50
Week Number


Total Weekly Pollution (Nitric oxide + Nitrogen dioxide) Per Year
2020 Total Weekly Pollution
2019 Total Weekly Pollution
2018 Total Weekly Pollution
Pollution (ugm^3)
25000
20000
15000
10000
5000
0
0
10
20
30
40
50
Week Number

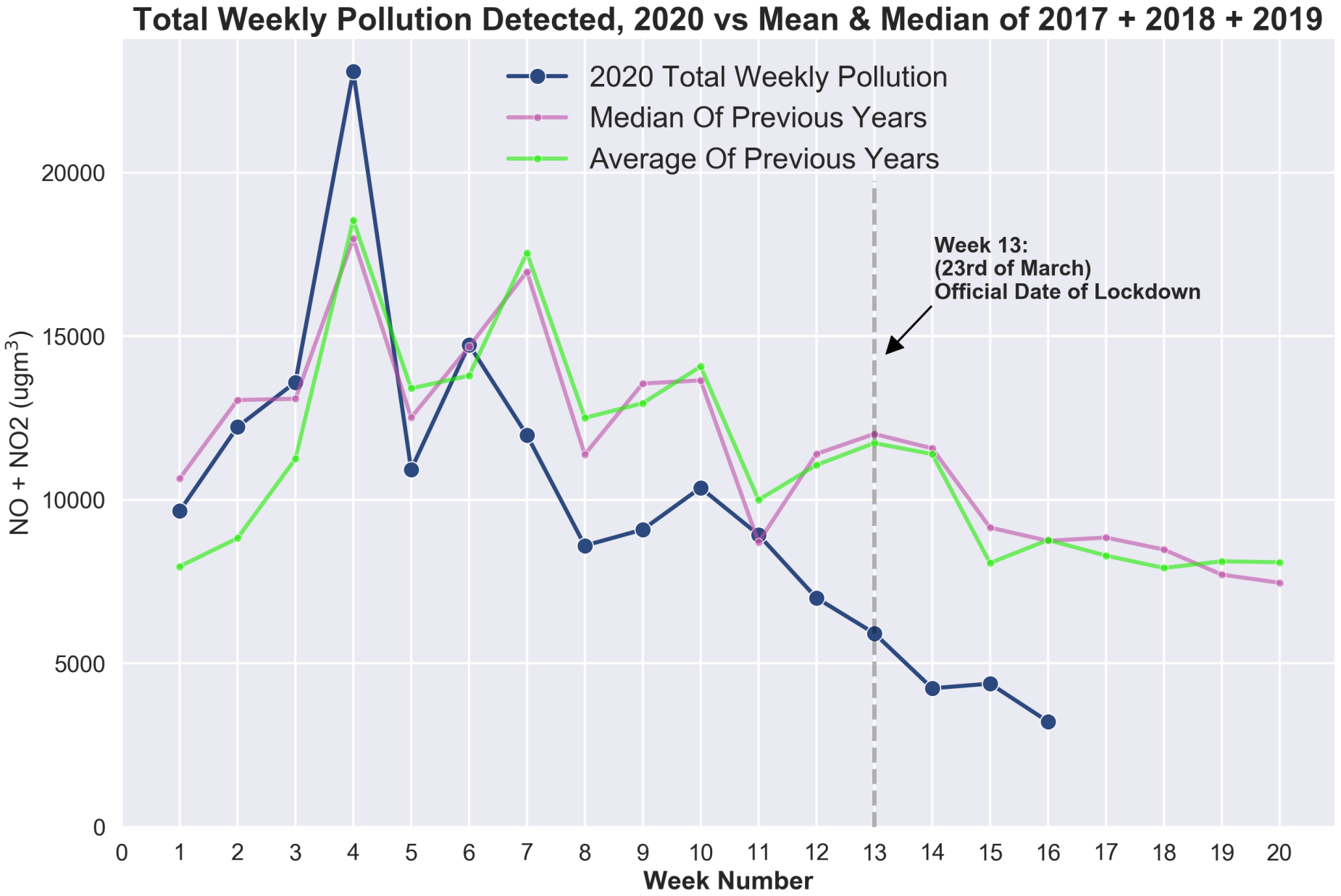
2020 compared to 2019 and 2018

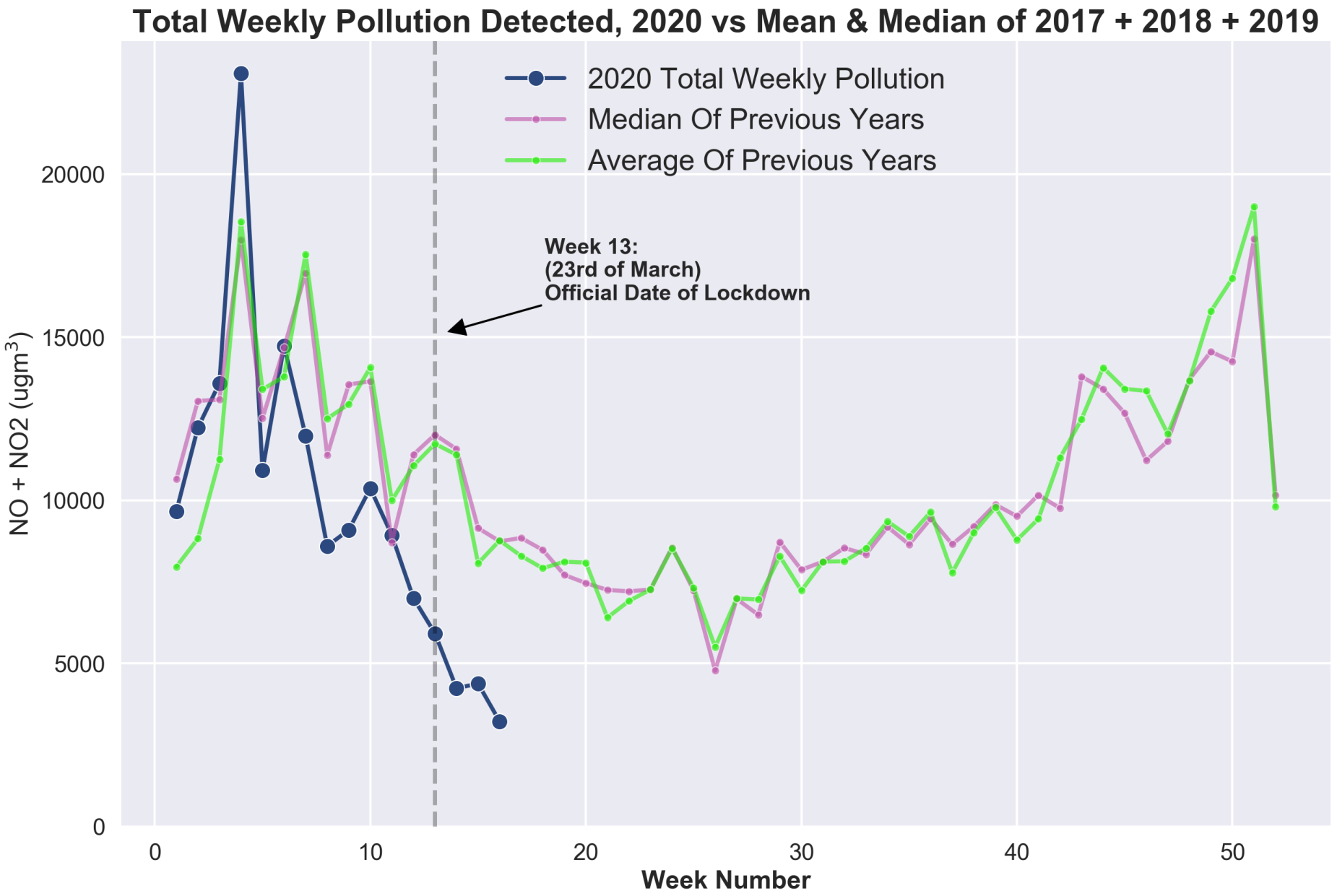


Previous graph but zoomed in

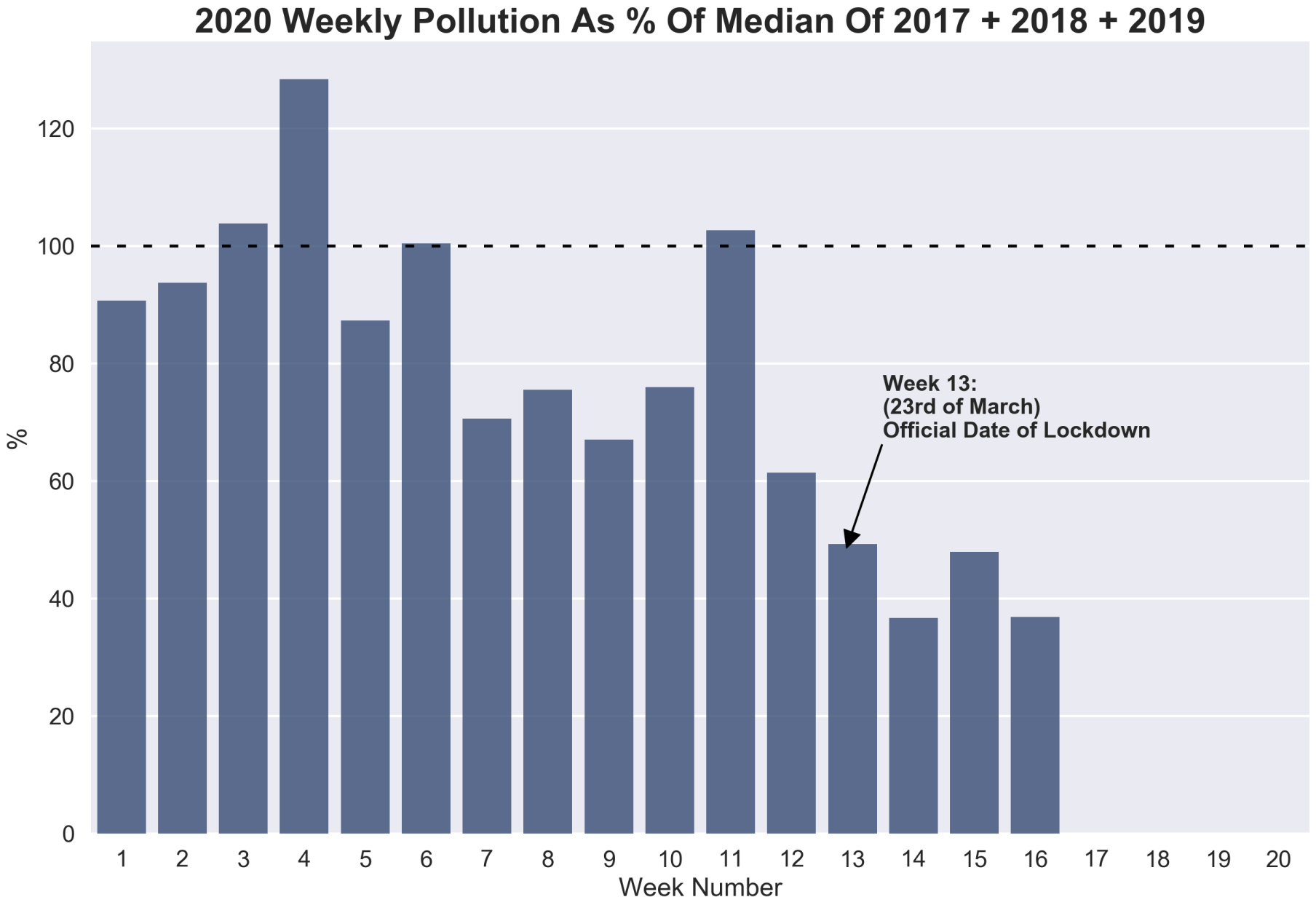


BETTER METHOD OF COMPARISON: Comparing 2020 to **median** and **mean** of 2017 + 2018 + 2019




Total Weekly Pollution Detected, 2020 vs Mean & Median of 2017 + 2018 + 2019
2020 Total Weekly Pollution
Median Of Previous Years
Average Of Previous Years
Week 13:
(23rd of March)
Official Date of Lockdown
NO + NO2 (ugm3)
0
5000
10000
15000
20000
0
10
20
30
40
50
Week Number

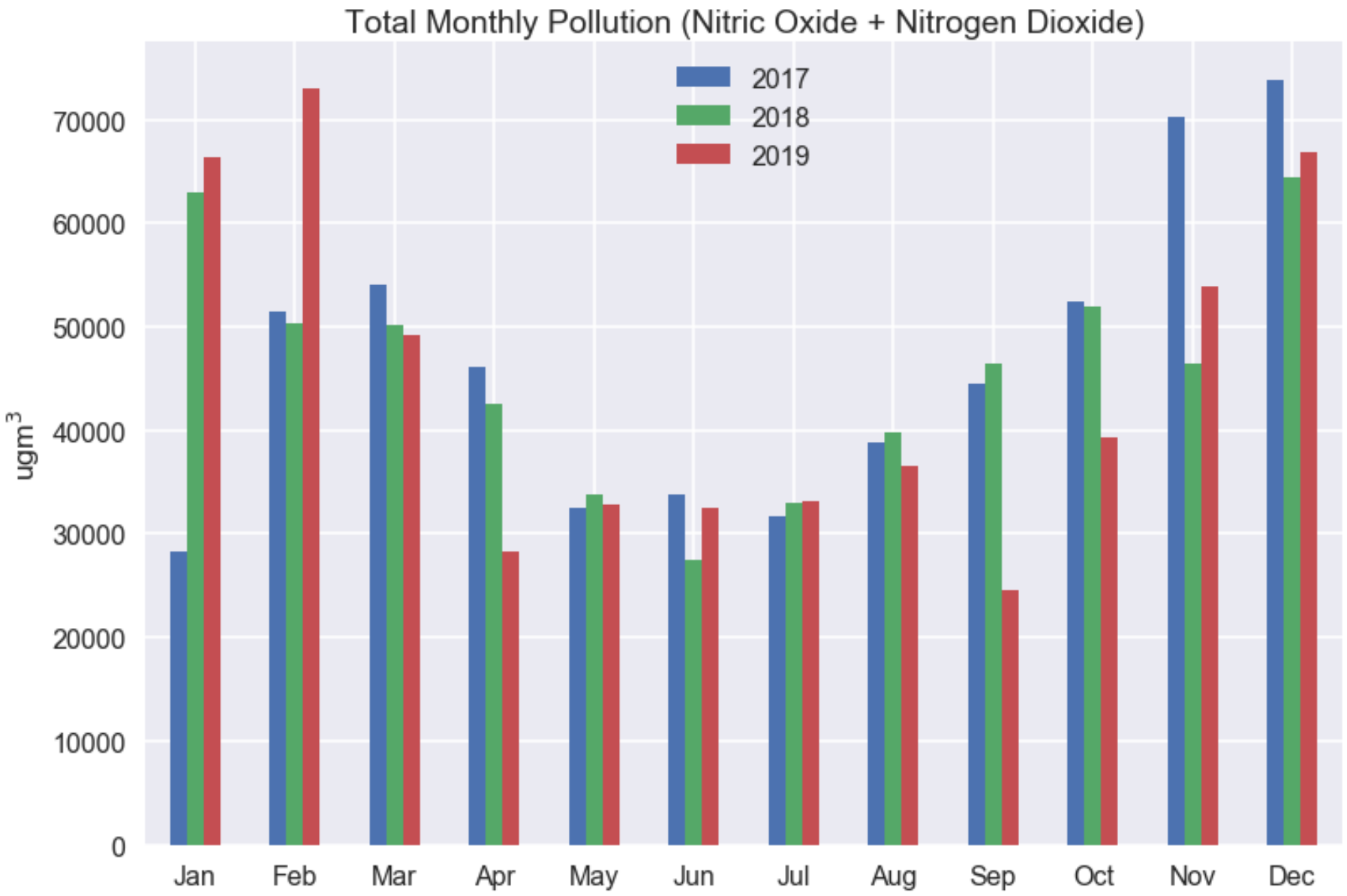
Similar to previous: asking “how is 2020 comparing to “normal” pollution levels measured in previous years?



Most weeks show pollution less than median (dashed line)

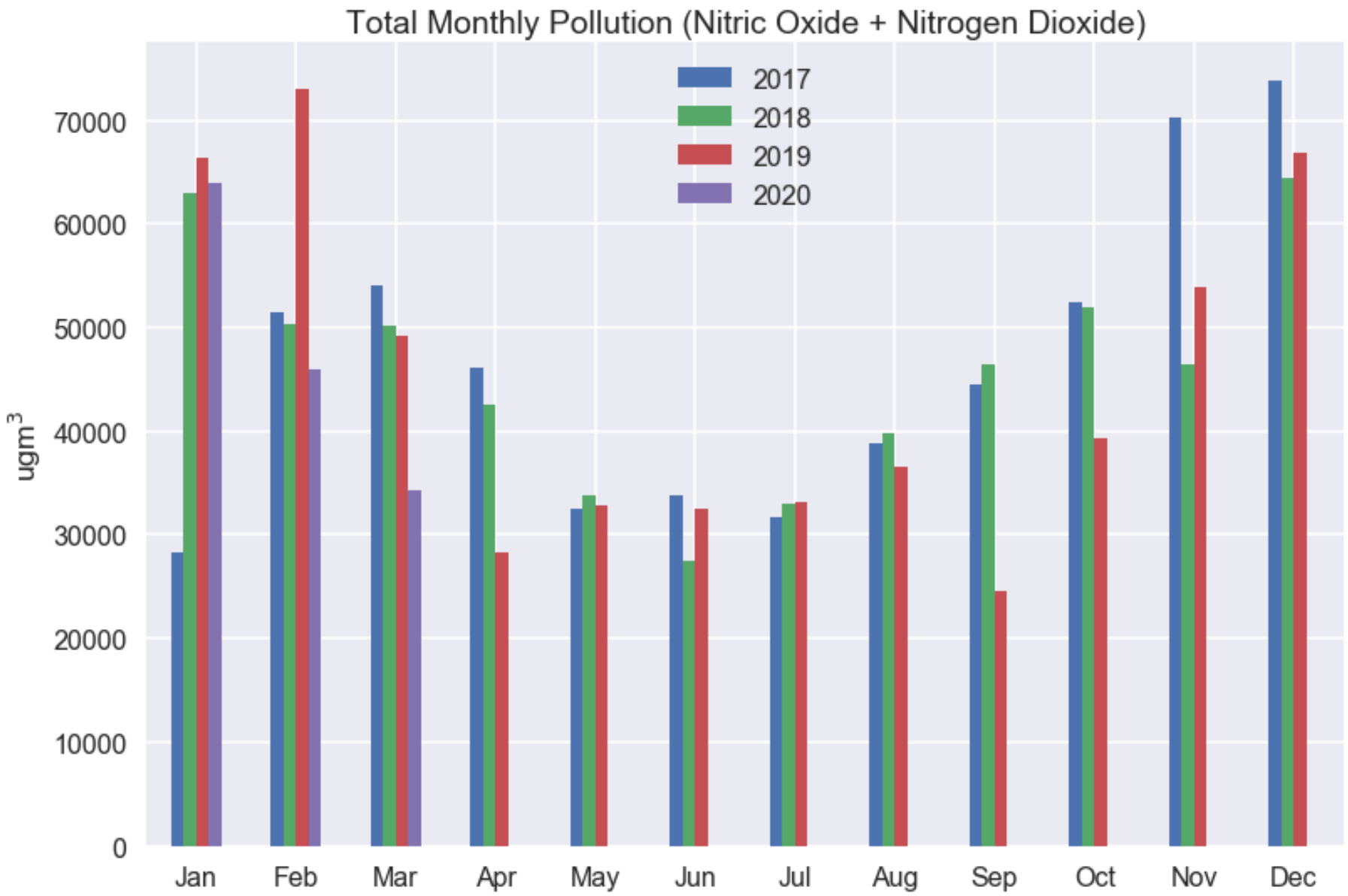
2020 monthly pollution vs previous years

How each **full month** of 2020 compares to previous 3 years

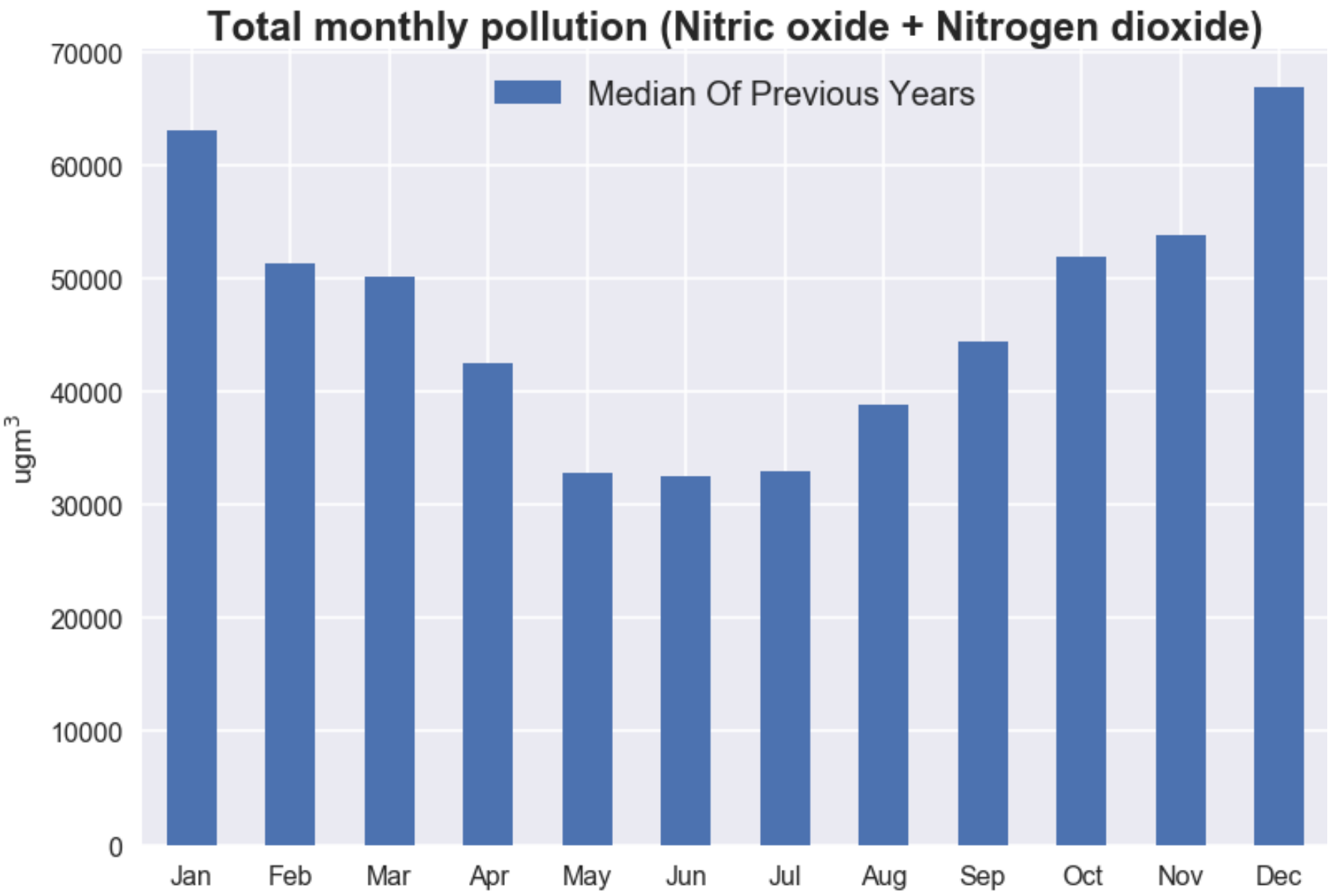


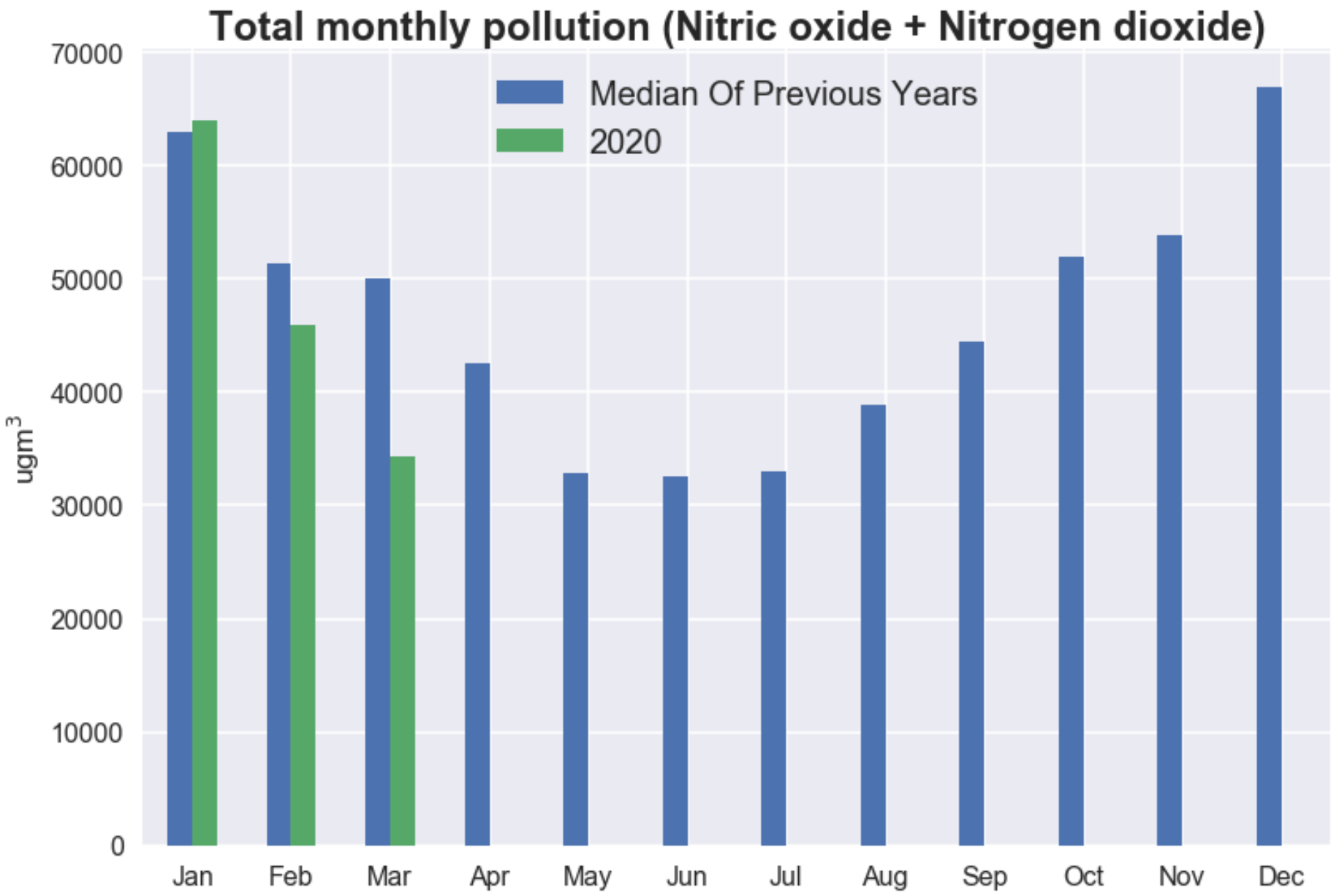
Note Q1 and Q4 have high pollution, and pollution drops in Q2 and Q3

How each **full month** of 2020 compares to previous 3 years

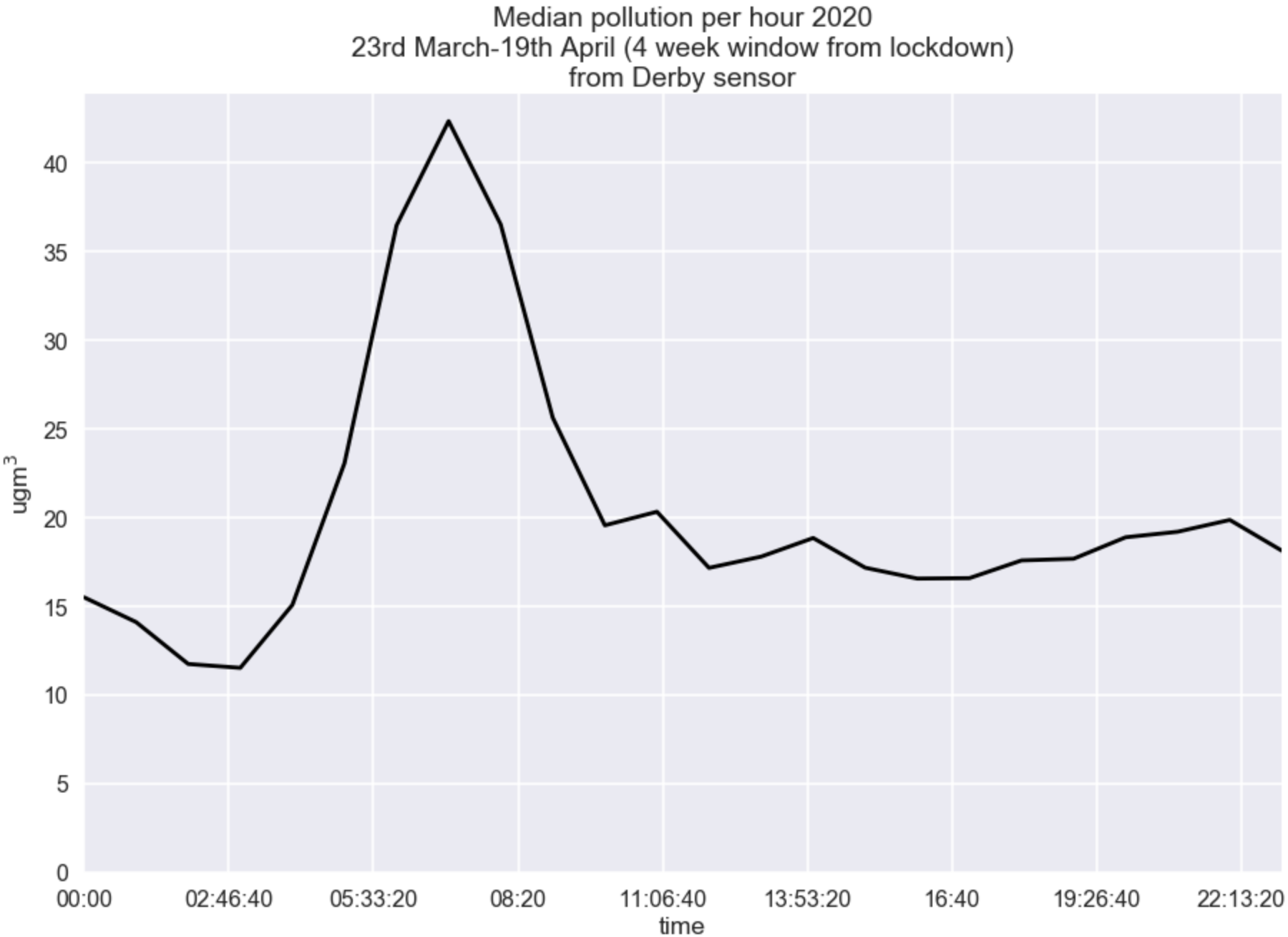


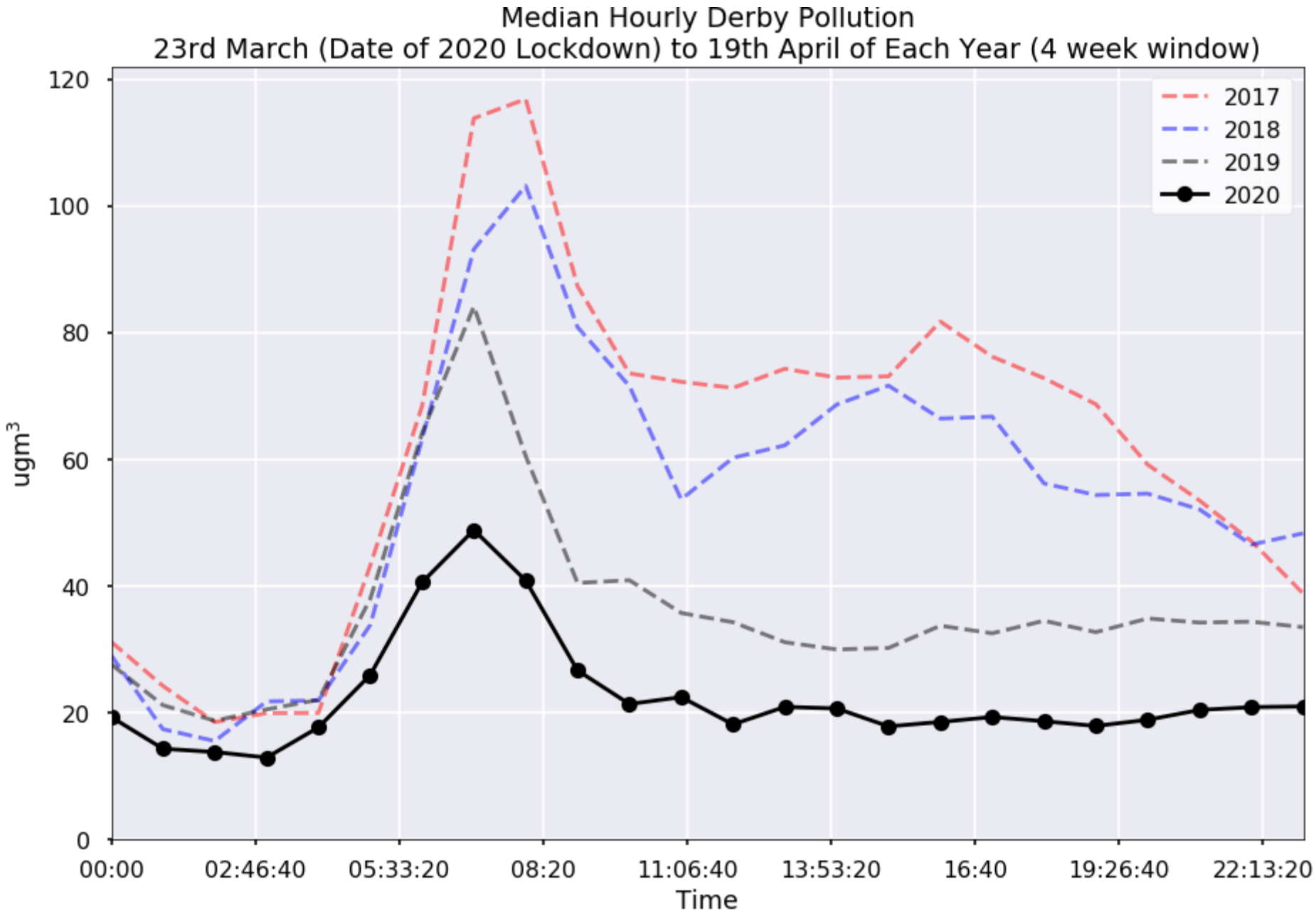
Note Q1 and Q4 have high pollution, and pollution drops in Q2 and Q3


Total monthly pollution (Nitric oxide + Nitrogen dioxide)
Median Of Previous Years
ugm^3
70000
60000
50000
40000
30000
20000
10000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Total monthly pollution (Nitric oxide + Nitrogen dioxide)
Median Of Previous Years
2020
ugm3
70000
60000
50000
40000
30000
20000
10000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

2020 hourly pollution since official lockdown


Median pollution per hour 2020
23rd March-19th April (4 week window from lockdown)
from Derby sensor
ugm3
0
5
10
15
20
25
30
35
40
00:00
02:46:40
05:33:20
08:20
11:06:40
13:53:20
16:40
19:26:40
22:13:20
time

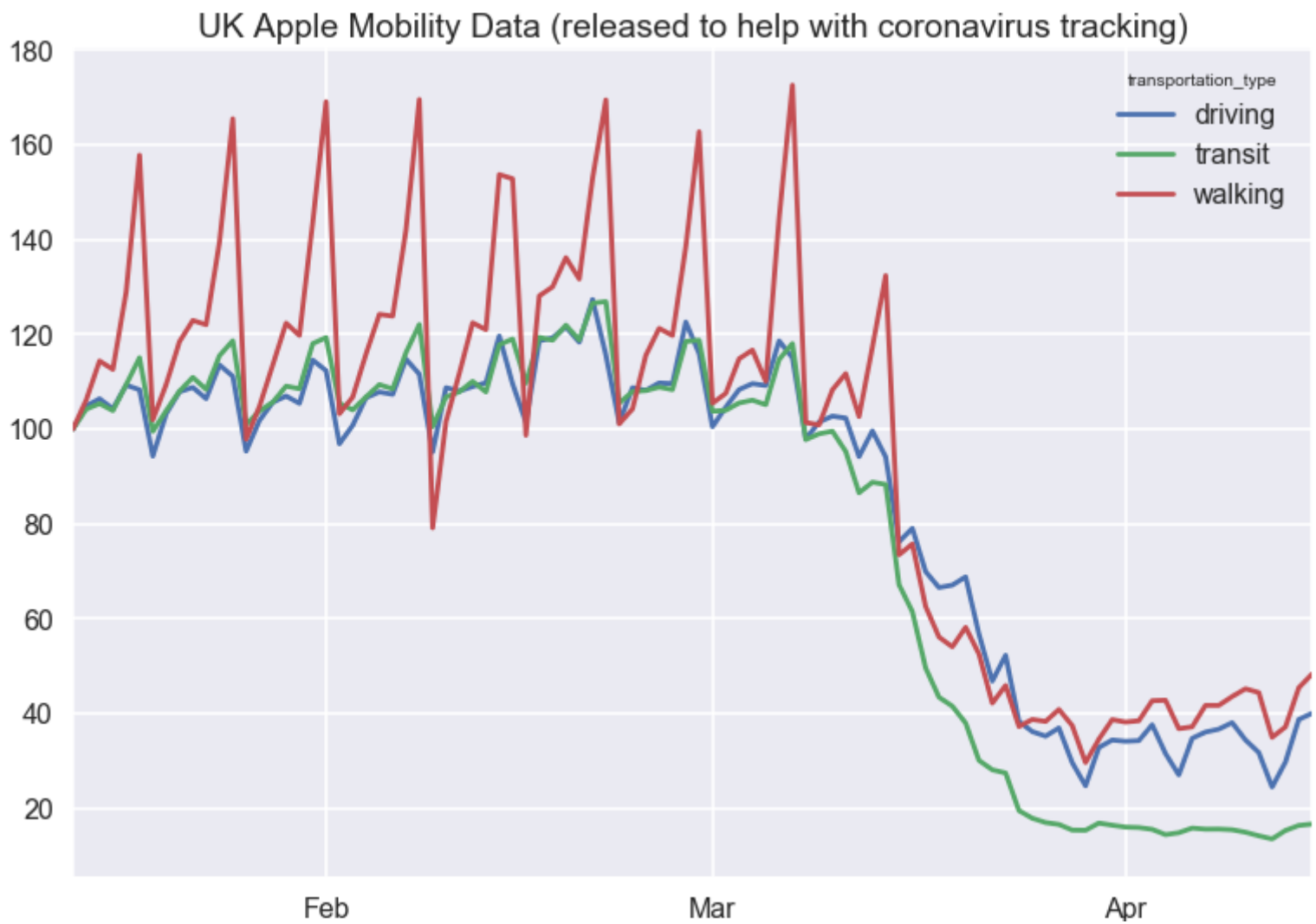

Median Hourly Derby Pollution
23rd March (Date of 2020 Lockdown) to 19th April of Each Year (4 week window)
2017
2018
2019
2020
120
100
80
60
40
20
0
ugm3
00:00
02:46:40
05:33:20
08:20
11:06:40
13:53:20
16:40
19:26:40
22:13:20
Time

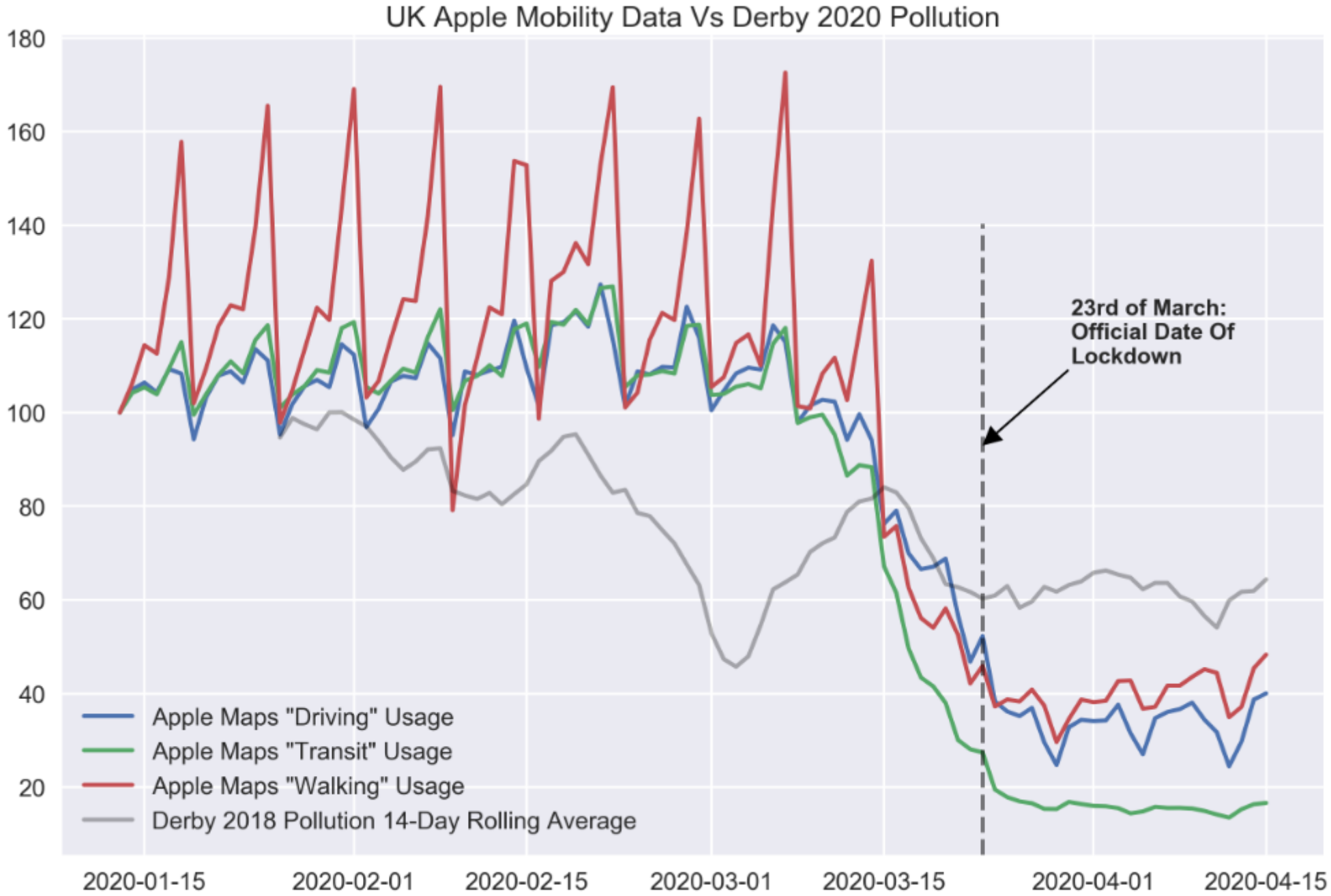
Final one:
2020 pollution vs Apple Mobility data

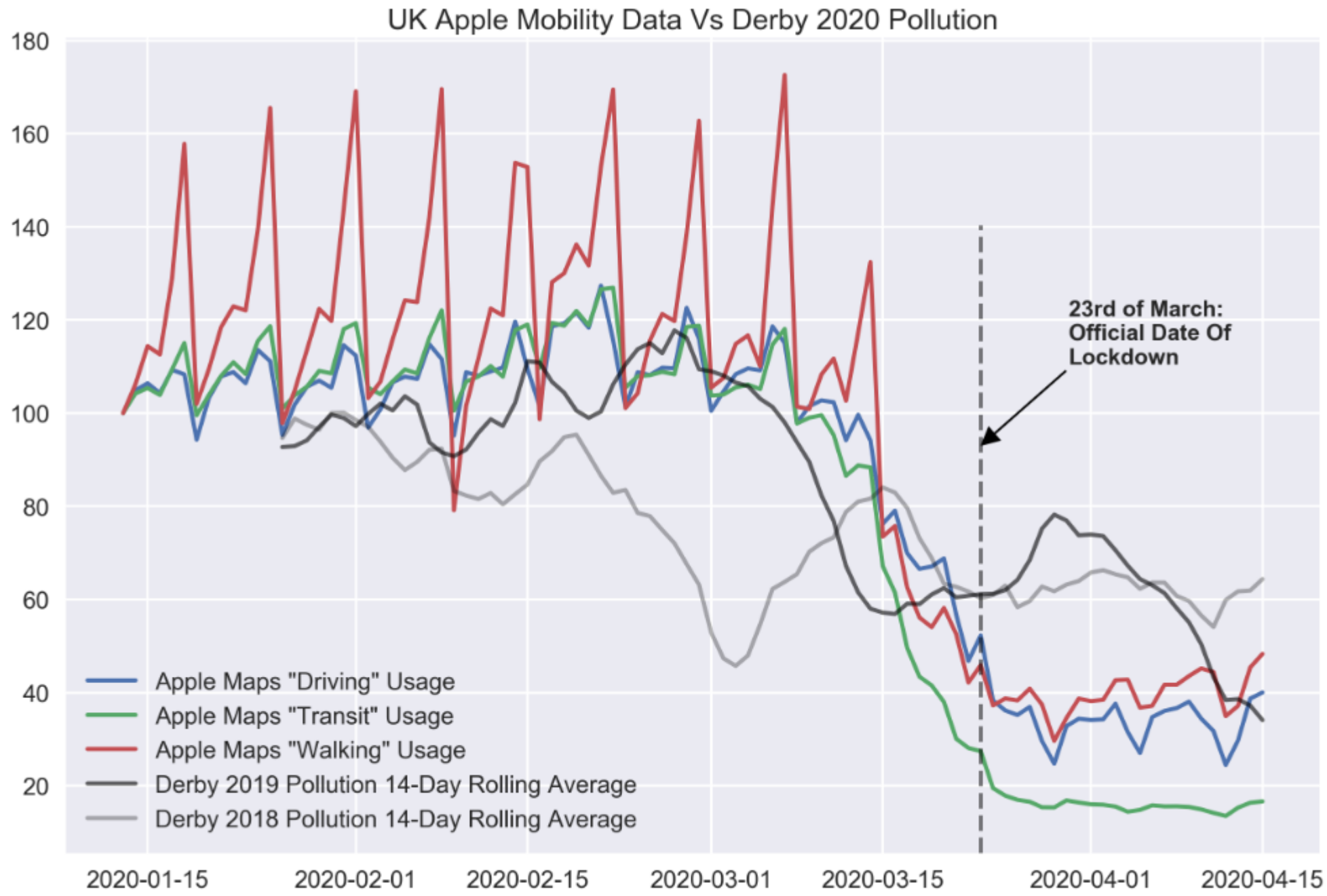
UPDATE

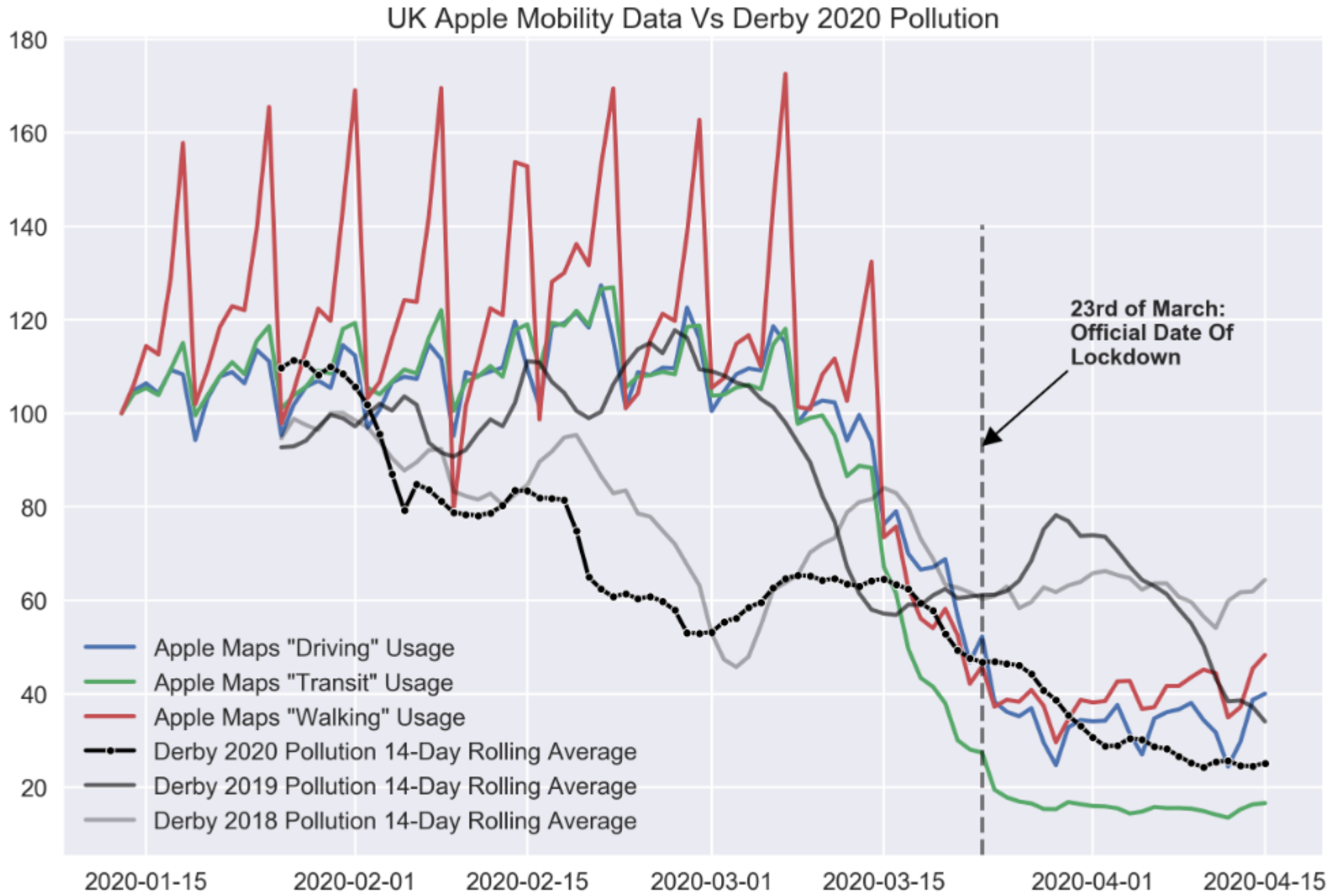
April 14, 2020

Apple makes mobility data available to aid COVID-19 efforts




UK Apple Mobility Data Vs Derby 2020 Pollution
180
160
140
120
100
80
60
40
20
23rd of March:
Official Date Of
Lockdown
Apple Maps "Driving" Usage
Apple Maps "Transit" Usage
Apple Maps "Walking" Usage
Derby 2018 Pollution 14-Day Rolling Average
2020-01-15
2020-02-01
2020-02-15
2020-03-01
2020-03-15
2020-04-01
2020-04-15


UK Apple Mobility Data Vs Derby 2020 Pollution
180
160
140
120
100
80
60
40
20
23rd of March:
Official Date Of
Lockdown
Apple Maps "Driving" Usage
Apple Maps "Transit" Usage
Apple Maps "Walking" Usage
Derby 2019 Pollution 14-Day Rolling Average
Derby 2018 Pollution 14-Day Rolling Average
2020-01-15
2020-02-01
2020-02-15
2020-03-01
2020-03-15
2020-04-01
2020-04-15


UK Apple Mobility Data Vs Derby 2020 Pollution
180
160
140
120
100
80
60
40
20
23rd of March:
Official Date Of
Lockdown
Apple Maps "Driving" Usage
Apple Maps "Transit" Usage
Apple Maps "Walking" Usage
Derby 2020 Pollution 14-Day Rolling Average
Derby 2019 Pollution 14-Day Rolling Average
Derby 2018 Pollution 14-Day Rolling Average
2020-01-15
2020-02-01
2020-02-15
2020-03-01
2020-03-15
2020-04-01
2020-04-15

What’s **next**?

What’s next

- Continuing weekly & monthly analysis, sharing to Instagram
- Further analysis, new questions & insights
  - Please feel free to get in touch if you have any ideas or questions!
- Adding weather data to allow machine learning – predict future pollution
- Website?