

# Nonuniform Impacts of COVID-19 Lockdown on Air Quality over the United States

## Supplemental Information

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**Table S1.** Information of U.S. EPA NCore sites in this study and the mean concentrations of criteria air pollutants by site during the COVID-19 reference (January 15 – March 7) and first-phase lockdown (March 15 – April 25) period for year 2020. (2017–2019 baseline data not shown)

Site ID	AQS ID*	State	County	Latitude	Longitude	Zip Code	Pop. Density <sup>†</sup>	Reference Period (P0)					Lockdown Period (P1)				
								NO <sub>2</sub> <sup>‡</sup> (ppb)	CO <sup>‡</sup> (ppm)	PM <sub>2.5</sub> <sup>‡</sup> (µg m <sup>-3</sup> )	PM <sub>10</sub> <sup>‡</sup> (µg m <sup>-3</sup> )	O <sub>3</sub> <sup>‡</sup> (ppb)	NO <sub>2</sub> <sup>‡</sup> (ppb)	CO <sup>‡</sup> (ppm)	PM <sub>2.5</sub> <sup>‡</sup> (µg m <sup>-3</sup> )	PM <sub>10</sub> <sup>‡</sup> (µg m <sup>-3</sup> )	O <sub>3</sub> <sup>‡</sup> (ppb)
NV1	320030540	Nevada	Clark	36.142	-115.079	89121	6969	18.9	0.59	10.3	33.9	23	7.0	0.26	4.6	15.6	39
UT1	490353006	Utah	Salt Lake	40.736	-111.872	84105	7283	22.0		5.5		24	8.0		3.1		41
CA1	060190011	California	Fresno	36.785	-119.773	93726	6344	14.7	0.45	15.0	34.1	20	4.9	0.20	5.6	12.3	28
CA2	060850005	California	Santa Clara	37.348	-121.895	95112	7885	14.7	0.41	8.7		24	6.1	0.22	4.9		30
NY1	360810124	New York	Queens	40.736	-73.822	11367	17252	18.5	0.29	6.4		24	8.3	0.15	3.5		36
VA1	510870014	Virginia	Henrico	37.557	-77.400	23223	2830	7.7	0.26			27	3.2	0.19			36
MA1	250250042	Massachusetts	Suffolk	42.330	-71.083	02119	15871	14.3	0.27	5.8		26	7.3	0.18	3.4		35
CA3	060658001	California	Riverside	34.000	-117.416	92509	2418	17.5	0.36	10.6	40.4	29	9.3	0.21	6.3	21.8	36
CA4	060670006	California	Sacramento	38.614	-121.368	95821	4691	8.1	0.32	10.1		27	3.1	0.17	4.2		34
NC1	371830014	North Carolina	Wake	35.856	-78.574	27616	1903	6.0	0.23		11.3	29	2.5	0.20		14.5	36
IN1	180970078	Indiana	Marion	39.811	-86.114	46218	3077	10.1	0.25	10.3	16.3	27	6.7	0.25	11.1	19.3	31
RI1	440071010	Rhode Island	Providence	41.841	-71.361	02916	3185	8.4		6.3		26	4.4		3.8		37
AZ1	040139997	Arizona	Maricopa	33.504	-112.096	85015	7709	16.7	0.42	8.3	27.7	24	9.2	0.25	4.8	16.8	34
MO1	295100085	Missouri	St. Louis City	38.656	-90.198	63107	4962	12.6	0.26	8.1		23	9.2	0.22	7.8		29
MD1	240330030	Maryland	Prince George's	39.055	-76.878	20705	1657	8.3		4.9		28	4.2		4.1		37
OK1	401431127	Oklahoma	Tulsa	36.205	-95.977	74106	2330	7.9	0.26	8.7		28	4.9	0.17	8.8		32
OH1	390610040	Ohio	Hamilton	39.129	-84.504	45219	9418	9.8	0.21	8.5	17.4	26	6.8	0.20	8.9	20.7	33
NM1	350010023	New Mexico	Bernalillo	35.134	-106.585	87109	3997	11.7	0.22	4.4	14.4	27	5.7	0.17	3.4	14.3	41
MN1	270031002	Minnesota	Anoka	45.138	-93.208	55449	1042	8.2		8.3	10.7	31	4.9		6.2	9.5	34
GA1	130890002	Georgia	DeKalb	33.688	-84.291	30034	2543	10.7	0.28	7.7	11.7	21	8.1	0.26	8.8	15.1	28
OR1	410510080	Oregon	Multnomah	45.497	-122.603	97206	5509	8.5		6.9		22	6.0		5.9		30
WA1	530330080	Washington	King	47.568	-122.309	98108	2989	10.5	0.22	3.4		23	7.5	0.19	3.9		30

**Table S1. Continued.**

OH2	390350060	Ohio	Cuyahoga	41.492	-81.678	44115	3730	9.0	0.22	8.7	16.2	28	8.2	0.20	7.7	14.5	28
HI1	150030010	Hawaii	Honolulu	21.324	47.568	96707	895	4.6		4.1	14.7		3.1		3.6	11.9	
KS1	202090021	Kansas	Wyandotte	39.117	-94.636	66102	2621	10.8		11.3		24	7.5		11.6		31
MD2	240230002	Maryland	Garrett	39.706	-79.012	21532	201	1.8	0.13	4.1		36	1.6	0.12	4.3		39
ND1	380150003	North Dakota	Burleigh	46.825	-100.768	58501	1157	6.6	0.19	5.1		26	3.7	0.16	4.8		31
WY1	560210100	Wyoming	Laramie	41.182	-104.778	82009	314	3.8	0.14	1.5	5.2	33	2.6	0.15	2.2	6.2	34

\*AQS IDs are site codes identifiable by the U.S. EPA Air Quality System (<https://www.epa.gov/aqs>)

†Population density corresponds to each site's zip code is derived from the ZIP Code Database: <https://www.unitedstateszipcodes.org>

\*Mean pollutant concentrations are based on daily values initially reported from the NCore sites, which may be subject to changes before submitted to the U.S. EPA Air Quality System.

**Table S2.** Spearman correlation coefficients among percentage changes ( $\Delta I\%$ ) of criteria air pollutants due to the lockdown. Calculations are based on 28 NCore sites (Table 1) excluding missing data. Numbers in the bracket represent the 95% confidence interval. Significant results are marked in bold.

Corr. Coef.	NO <sub>2</sub>	CO	PM <sub>2.5</sub>	PM <sub>10</sub>	O <sub>3</sub>
NO <sub>2</sub>	-				
CO	<b>0.52 (0.10, 0.77)</b>	-			
PM <sub>2.5</sub>	<b>0.71 (0.43, 0.85)</b>	<b>0.71 (0.37, 0.88)</b>	-		
PM <sub>10</sub>	0.38 (-0.23, 0.76)	<b>0.84 (0.44, 0.95)</b>	<b>0.78 (0.35, 0.93)</b>	-	
O <sub>3</sub>	-0.09 (-0.45, 0.30)	0.09 (-0.35, 0.50)	-0.19 (-0.54, 0.23)	0.01 (-0.56, 0.58)	-