Supplementary Material

The Relation Between Atmospheric Aerosol Concentration and Sars-CoV-2 Variants' Infection and Mortality Rates in the United States: A Remote-Sensing Perspective

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Table S1: List of counties in the state of California for which CDC deaths and cases were

retrieved.

County	Latitude	Longitude	Population
Butte	39.6672776	-121.60053	219186
Colusa	39.1788196	-122.23317	21547
Glenn	39.598759	-122.39385	28393
Lake	39.101243	-122.75362	64386
Mendocino	39.4381191	-123.39113	86749
Nevada	39.3039477	-120.76273	99755
Placer	39.0616723	-120.72406	398329
Plumas	40.0035599	-120.83952	18807
Shasta	40.7639142	-122.03969	180080
Sierra	39.577135	-120.52007	3005
Sutter	39.0341754	-121.69459	96971
Tehama	40.1257094	-122.23702	65084
Trinity	40.6491767	-123.11471	12285
Yuba	39.2625593	-121.35356	78668

Table S2: List of counties in the states of North and South Carolina for which CDC deaths and cases were retrieved.

County	Latitude	Longitude	Population
Anson	34.9740324	-80.099533	24446
Bladen	34.6129624	-78.561801	32722
Brunswick	34.070565	-78.228142	142820
Cabarrus	35.3877799	-80.552672	216453
Chatham	35.7039442	-79.255415	74470
Columbus	34.2674408	-78.658014	55508
Cumberland	35.0476213	-78.826232	335509
Davidson	35.791155	-80.212566	167609
Davie	35.9309993	-80.544966	42846
Duplin	34.9344981	-77.931405	58741
Hoke	35.018883	-79.236517	55234
Iredell	35.8095051	-80.874313	181806
Johnston	35.51745	-78.366227	209339
Lee	35.4762315	-79.175694	61779
Mecklenburg	35.2446927	-80.831767	1110356
Moore	35.3088526	-79.484742	100880
Randolph	35.7101509	-79.805703	143667
Richmond	35.0041772	-79.74491	44829
Robeson	34.642445	-79.102505	130625
Sampson	34.9882037	-78.369141	63531
Scotland	34.8386299	-79.475798	34823
Stanly	35.3164781	-80.250932	62806
Chesterfield	34.641374	-80.156401	45650
Darlington	34.3335834	-79.960275	66618
Dillon	34.3900779	-79.377419	30479
Florence	34.0236175	-79.701893	138293
Horry	33.9212828	-78.995553	354081
Kershaw	34.3398825	-80.587632	66551
Lancaster	34.6827084	-80.70513	98012
Lee	34.1639309	-80.256907	16828
Marion	34.0785975	-79.364008	30657
Marlboro	34.5990558	-79.675612	26118
Richland	34.0179126	-80.902672	415759
Sumter	33.9182653	-80.379423	106721

Statistical Approach

We calculate the correlation between AOD and the number of fatalities or cases per million population using the standard least squares method, which is suitable for this study since we are only concerned with these two variables (e.g., Cantrell et al., 2008). The analysis of the causal factors deriving this correlation is beyond the scope of this study.

Table S3: List of counties in the state of Illinois for which CDC deaths and cases were retrieved.

County	Latitude	Longitude	Population
Boone	42.3235928	-88.823458	53544
Cook	41.8414485	-87.816588	5150233
DeKalb	41.893733	-88.769585	104897
DuPage	41.8511697	-88.086427	922921
Grundy	41.285696	-88.419057	51054
Kane	41.9384273	-88.428614	532403
Kankakee	41.1374699	-87.862053	109862
Kendall	41.5908101	-88.428696	128990
LaSalle	41.3442613	-88.886339	108669
McHenry	42.3245117	-88.452482	307774
Will	41.4461927	-87.978627	690743

Table S4: List of correlation parameters for the case fatality ratio (deaths per number of confirmed cases) and mortality rate per AOD (<0.2) for various regions.

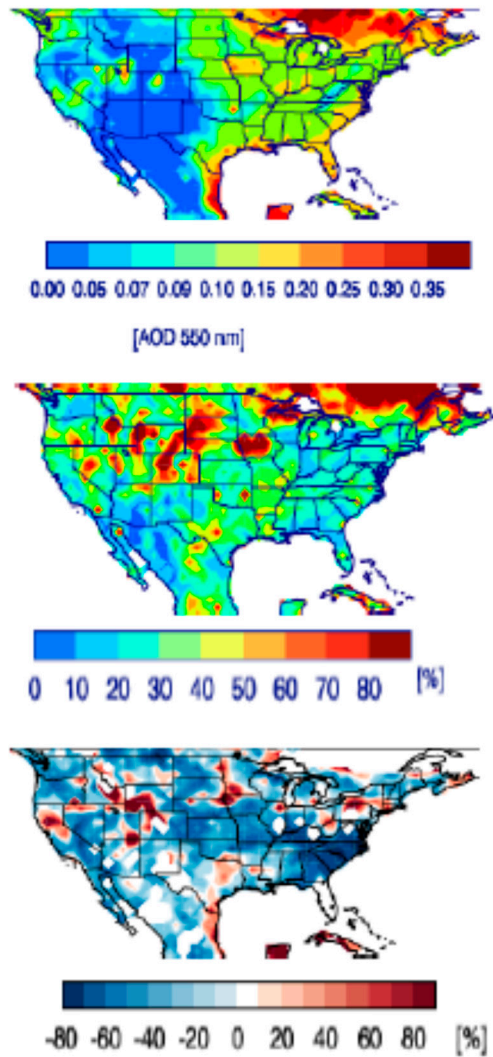| Covid-19 variant	Correlation Type	North and South Carolina		California		Illinois	
		Slope	R^2	Slope	R^2	Slope	R^2
Alpha	Case fatality ratio	0.013	0.93	0.011	0.89	0.013	0.65
	Morality rate/AOD	10.5	0.85	8.5	0.83	52.1	0.76
Delta	Case fatality ratio	0.011	0.81	0.012	0.90	0.009	0.94
	Morality rate/AOD	39.6	0.89	N/A	N/A	28.3	0.94
Omicron	Case fatality ratio	BA.1: 0.007 BA.2: 0.003	0.91 0.57	0.011 0.0017	0.61 0.53	0.008 0.001	0.94 0.92
	Morality rate/AOD	N/A	N/A	N/A	N/A	N/A	N/A

Figure S1: Top panel: Mean AOD levels during the reference period (2010–2019); Middle panel: detrended interannual variability (IAV) of the reference period; Bottom panel: Significant relative change (sig Δ) during the lockdown period of the COVID-19 pandemic. Blank areas in the last row (sig Δ) refer to insignificant differences. Adopted from Elshorbany et al., 2021.
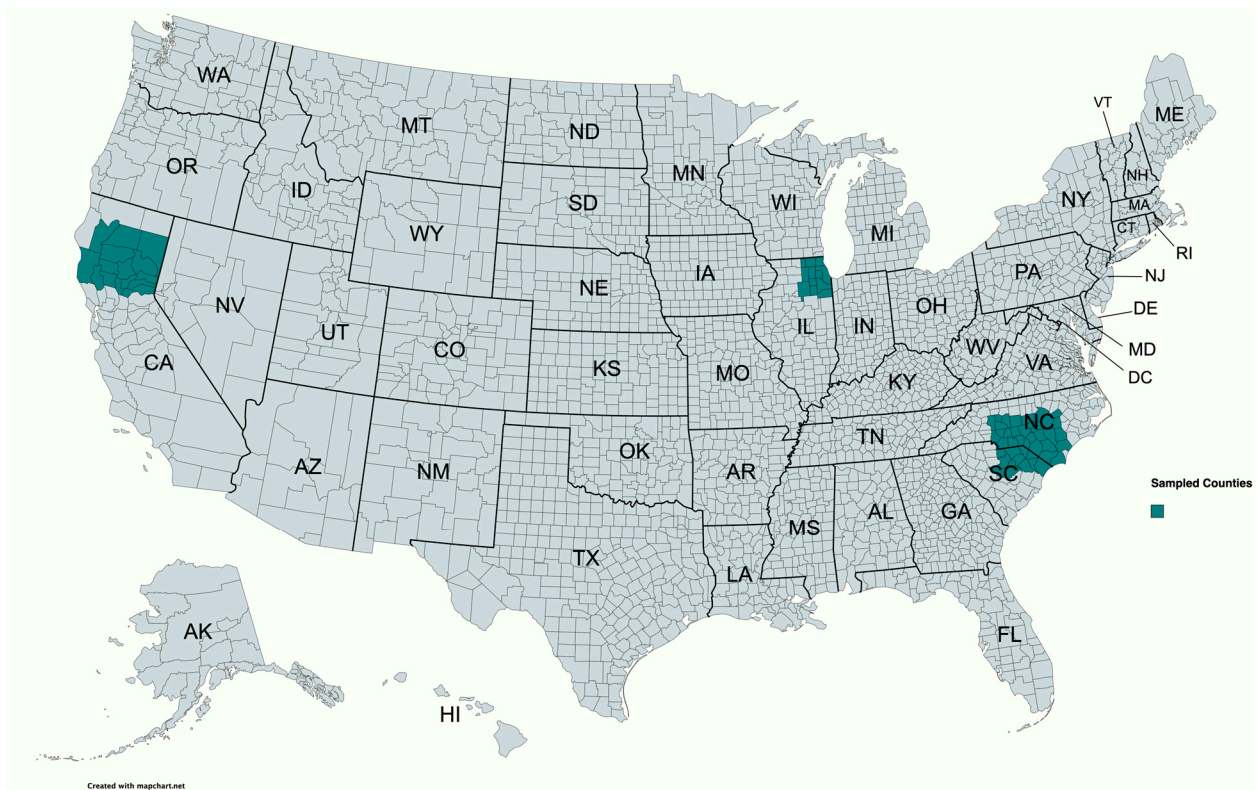
Figure S2: The selected regions used for the analysis in each state are marked. Adapted from US county maps, 2023.