Supporting Information

Spatial aggregation methods for interpreting wastewater concentrations at jurisdictional scales: Insights from two SARS-CoV-2 monitoring programs

Elana M. G. Chan[1], Elisabeth Burnor[2], Alessandro Zulli[1,3], Chunye Lu[4], Alexander T. Yu[2], Alexandria B. Boehm[1]*

[1] Department of Civil and Environmental Engineering, Stanford University School of Engineering and Doerr School of Sustainability, Stanford, California 94305, United States

[2] California Department of Public Health, Center for Infectious Diseases, Richmond, California, 94804, United States

[3] Division of Infectious Diseases and Geographic Medicine, Stanford University School of

Medicine, Stanford, California 94305, United States

[4] California Department of Public Health, Center for Laboratory Sciences, Richmond,

California, 94804, United States

*Email: aboehm@stanford.edu

Table of contents

Further details: Wastewater treatment plants in the two monitoring programs

Table S1 and **Table S2** list the WWTPs in the national, single laboratory monitoring program and California, multi-laboratory monitoring program, respectively. Data in **Table S1** are provided and described in a data descriptor by Boehm et al. [1]. As stated in the main text, we included wastewater concentrations obtained from WWTPs. Thus, we excluded samples collected from Codiga, Stanford, CA and South San Diego, CA as they represent subsewershed locations within the Palo Alto WWTP and San Diego WWTP service areas, respectively. We obtained the population of each state from the US Census Bureau [2]. The HHS region of each state is shown in **Fig. 2a**. Data in **Table S2** are provided by the California Health and Human Services Open Data Portal Wastewater Surveillance Data [3] and described in the **Supporting Information** below. We obtained the population of each county from the US Census Bureau [4].

Table S1. Details of the wastewater treatment plants in the national, single laboratory monitoring program

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
			HHS Region 1				
Connecticut (3,617,176)	Stamford	Stamford, CT	140,000	2023-10-27, 2024-12-27	172	106272.94 (46618.46, 221434.4)	336155696.42 (276489160.38, 458254321.21)
Maine (1,395,722)	Bangor	Bangor, ME	40,000	2023-05-15, 2024-12-26	227	43324.69 (13629.4, 83327.58)	115019041.33 (73965457.68, 176602990.04)
	Brunswick	Brunswick, ME	10,000	2023-01-04, 2024-06-27	212	80538.26 (34060.46, 171403.37)	139685713.44 (106324436.64, 183668034.36)
	Lewiston	Lewiston, ME	60,000	2023-09-14, 2024-12-26	168	191303.51 (82016.58, 350912.78)	162775224.72 (117574120.16, 209691753.14)
	Portland	Portland, ME	65,000	2023-01-04, 2024-12-27	222	114275.5 (62098.28, 249835.23)	180454764.32 (119920399.43, 260060962.39)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	York Beach	York, ME	10,000	2023-01-18, 2024-06-06	200	64413.99 (29795.26, 127649.6)	108498977.51 (79515987.29, 158597023.05)
Massachusetts (7,001,399)	Boston Metropolitan Area	Boston, MA	2,400,000	2023-01-02, 2024-12-25	302	89837.23 (49211.03, 183621.28)	210265727.57 (158567081.04, 277311577.23)
	Millbury	Millbury, MA	250,000	2023-02-27, 2024-12-26	265	134282.57 (53568.17, 330982.68)	146446642.47 (101634807.45, 217501771.22)
New Hampshire (1,402,054)	Concord	Hall Street, Concord, NH	45,000	2023-01-03, 2024-06-26	223	83897.39 (38429.73, 197074.62)	154998520.37 (112009164.27, 214753297.31)
	Concord	Penacook, Concord, NH	4,000	2023-01-03, 2024-06-26	220	107979.6 (35087.15, 322016.6)	164052054.09 (114887681.9, 238852130.88)
	Dover	Dover, NH	30,000	2023-01-03, 2024-12-24	298	138990.7 (65406.49, 303142.1)	149039933.66 (99021146.66, 223619019.22)
Vermont (647,464)	Essex Junction	Essex Junction, VT	30,000	2023-03-03, 2024-12-27	274	119616.35 (56124.14, 207346.27)	255912765.2 (200271031.67, 323321210.98)
	Montpelier	Montpelier, VT	10,100	2023-03-06, 2024-12-26	271	181605.78 (73124.81, 350786.44)	248487276.51 (175545786.71, 346249601.42)
	South Burlington	South Burlington, VT	16,000	2023-03-21, 2024-12-26	168	107664.3 (42884.16, 235442.15)	249703911.34 (197210000.49, 313690564.73)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
				HHS Region 2			
New Jersey (9,290,841)	Belmar	Belmar, NJ	52,672	2023-05-24, 2024-12-26	309	47557.89 (24121.02, 124611.24)	220977380.13 (163503883, 309242474.24)
	Bridgeton	Bridgeton, NJ	50,000	2023-01-16, 2024-12-27	257	35636.25 (12066.07, 97363.7)	496262232.44 (327690516.68, 768789408.15)
	Bridgewater	Bridgewater, NJ	130,000	2023-01-16, 2024-12-27	234	79936.26 (36721.26, 183533.41)	195648259.94 (133959769.9, 306192918.59)
	Newark	Newark, NJ	1,500,000	2023-01-02, 2024-12-18	252	55068.58 (26406.31, 165259.44)	256754446.83 (191355821.99, 326255002.65)
	Oakhurst	Oakhurst, NJ	50,000	2023-10-18, 2024-12-27	210	152241.11 (62606.85, 416876.26)	435861798.85 (293265162.85, 627235089.9)
	Union Beach	Union Beach, NJ	100,000	2023-01-03, 2024-12-27	262	105249.81 (58696.33, 203441.67)	226243136.88 (169711739.6, 316635040.99)
New York (19,571,216)	Ithaca	Ithaca, NY	90,000	2023-03-13, 2024-12-27	147	155955.47 (64002.89, 367497.87)	253858313.93 (176418205.99, 367467242.79)
	Oswego	Oswego, NY	30,000	2023-05-15, 2024-12-16	215	93825.5 (43910.98, 234693.8)	148168326.77 (107443788.58, 206059051.78)
				HHS Region 3			

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
Delaware (1,031,890)	Seaford	Seaford, DE	13,172	2023-01-03, 2024-12-23	295	23804.68 (13143.62, 57676.09)	310493402.06 (240260543.8, 411881072.76)
District of Columbia (678,972)	Washington	Blue Plains, Washington, DC	2,000,000	2023-04-11, 2024-12-27	82	167744.46 (85791.46, 433613.66)	274974285.71 (206208161.34, 435071920.42)
Maryland (6,180,253)	Hagerstown	Hagerstown, MD	90,000	2023-04-28, 2024-12-27	306	84163.46 (29980.36, 205188.02)	231884670.3 (149010809.71, 350985670.26)
	Hollywood	Hollywood, MD	55,000	2023-08-28, 2024-12-23	268	61637.02 (27287.09, 121062.16)	183991986.74 (126476498.19, 274889386.79)
Pennsylvania (12,961,683)	Chester	Chester, PA	220,000	2023-07-31, 2024-12-26	276	55893.64 (25969.81, 115595.97)	182080327.09 (129742948.39, 252065131.01)
	Harrisburg	Harrisburg, PA	125,000	2023-02-08, 2024-12-27	313	112004.75 (39545.23, 285145.05)	249959591.26 (166729382.49, 372091219.65)
	State College	University Park, PA	16,000	2023-11-12, 2024-06-03	84	39572.31 (11156.34, 107994.99)	184799573.5 (118056206.59, 304232234.1)
Virginia (8,715,698)	Fredericksburg	Little Falls Run, Stafford, VA	50,000	2023-01-04, 2024-12-27	270	9294.7 (4528.63, 19990.56)	360417578.98 (287337804.73, 456825594.39)
	Hillsville	Hillsville, VA	3,000	2023-01-04, 2024-12-23	230	2896.91 (0, 8895.74)	155486064.55 (126974321.55, 192198327.67)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Stafford	Aquia, Stafford, VA	100,000	2023-01-03, 2024-12-26	271	7196.61 (4201.67, 14410.55)	365597679.46 (295101303.78, 441573882.06)
West Virginia (1,770,071)	Wheeling	Wheeling, WV	100,000	2023-01-01, 2024-12-27	258	34582.1 (17482.11, 70554.19)	210498591.64 (158562514.17, 272198236.48)
				HHS Region 4			
Alabama (5,108,468)	Bessemer	Bessemer, AL	225,000	2023-12-17, 2024-06-27	312	91646.4 (44683.29, 220658.45)	259762527.65 (183082339.44, 380997450.2)
	Birmingham	Cahaba River, Birmingham, AL	95,000	2023-03-01, 2024-12-18	281	72100.82 (34885.84, 193939.61)	303578220.63 (211960486.18, 407184470.2)
	Birmingham	Village Creek, Birmingham, AL	200,000	2023-01-02, 2024-06-28	281	43127.01 (13516, 140197.9)	242978407.71 (154417094.24, 349548556.8)
	Fultondale	Fultondale, AL	77,000	2023-03-01, 2024-12-18	287	38245.92 (17271.82, 92725.84)	235051190.42 (163687662.85, 309564614.2)
	Pinson	Pinson, AL	30,000	2023-04-10, 2024-12-27	287	24103.48 (7695.08, 63614.9)	176007952.07 (112743137.5, 256982204.91)
Florida (22,610,726)	Altamonte Springs	Altamonte Springs, FL	95,000	2023-01-02, 2024-12-27	225	137138.8 (66411.48, 274340.56)	258337239.55 (171642520.54, 365478433.4)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Jupiter	Jupiter, FL	90,000	2023-01-02, 2024-12-27	309	50725.22 (24429.78, 108035.5)	165607344.37 (122854080.82, 220156067.03)
	Key Biscayne	Key Biscayne, FL	829,725	2023-01-05, 2024-12-27	269	57749.46 (36251.61, 109191.94)	149905962.34 (112325831.04, 209590691.38)
	Miami	South Miami, FL	920,528	2023-02-06, 2024-12-27	142	60233.32 (35380.27, 88977.06)	174232736.19 (128215834.34, 232777843)
	North Miami	North Miami, FL	776,150	2023-02-13, 2024-12-27	294	18376.38 (9530.01, 38424.79)	125150431.71 (86090059, 172993183.37)
	Orlando	Eastern, Orange County, FL	195,299	2023-01-04, 2024-06-28	257	83491.63 (40351.05, 145394.94)	146151869.03 (108358738.78, 205624811.76)
	Orlando	Northwest, Orange County, FL	66,690	2023-01-02, 2024-12-27	259	45634.33 (22462.38, 101912.64)	155081436.48 (111156432.76, 231177685.47)
	Orlando	South, Orange County, FL	183,009	2023-01-22, 2024-12-24	258	59693.36 (34166.88, 115320.58)	187630187.41 (146633794.02, 252037476.8)
	Saint Petersburg	Northeast, Saint Petersburg, FL	89,847	2023-01-15, 2023-12-28	198	101246.57 (48027.67, 227460.52)	178068044.42 (130021423.34, 243253327.01)
	Saint Petersburg	Northwest, Saint Petersburg, FL	94,218	2023-01-16, 2024-12-27	204	97658.55 (45798.56, 245843.36)	168048069.13 (118547731.35, 241039319.82)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Saint Petersburg	Southwest, Saint Petersburg, FL	47,790	2023-01-02, 2024-12-19	199	72666.75 (29069.09, 188799.58)	144480190.01 (108050409.6, 210391339.46)
	Tallahassee	Tallahassee, FL	212,065	2023-01-02, 2024-12-19	220	134181.31 (42305.89, 284076.75)	215224796.33 (156936171.09, 321418968.85)
	Winter Garden	Southwest, Orange County, FL	50,000	2023-01-02, 2024-12-19	254	45891.56 (22440.38, 103698.8)	113017513.49 (84255041.22, 159849435.29)
Georgia (11,029,227)	Atlanta	RM Clayton, Atlanta, GA	294,660	2023-08-07, 2024-12-27	279	57112.45 (30950.57, 115569.11)	327162617.41 (224600410.66, 456969753.32)
	Atlanta	South River, Atlanta, GA	105,160	2023-08-07, 2024-12-27	278	63225.9 (28343.85, 142262.4)	198078278.7 (131868057.88, 266029075.77)
	Atlanta	Utoy Creek, Atlanta, GA	70,887	2023-08-07, 2024-12-27	278	43402.15 (22460.02, 123297.75)	180322958.59 (115279156.96, 257157165.2)
	College Park	College Park, GA	73,821	2023-07-11, 2024-12-26	290	103540.3 (37159.57, 256636.96)	214126078.99 (160029699.08, 319597823.9)
	Columbus	Columbus, GA	278,000	2023-01-02, 2024-12-19	192	74280.09 (27309.61, 149579.73)	256146657.05 (197389518.16, 331756640.99)
	Roswell	Big Creek, Roswell, GA	189,593	2023-01-03, 2024-12-26	307	116658.12 (51597.35, 270276)	307798156.8 (211806243.32, 456369886.39)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Roswell	Johns Creek, Roswell, GA	84,486	2023-01-03, 2024-12-26	306	116756.62 (50479.52, 287899.58)	290895843.81 (193080754.69, 422599429.77)
	Roswell	Little River, Roswell, GA	12,818	2023-01-03, 2024-12-26	307	151818.52 (60211.97, 303880.43)	190298570.95 (138749023.65, 255557437.38)
Kentucky (4,526,154)	Louisville	Louisville, KY	423,913	2023-01-02, 2024-12-25	202	24140.39 (11431.29, 64813.95)	140683409.38 (114326420.94, 173134112.96)
Mississippi (2,939,690)	Gautier	Gautier, MS	19,008	2023-01-02, 2024-12-25	156	39860.88 (11326.81, 100010.53)	92020208.45 (66583532.43, 137687379.98)
	Pascagoula	Pascagoula Moss Point, MS	34,333	2023-01-02, 2024-12-25	155	64591.17 (21460.86, 224995.34)	122262307.53 (81766469.28, 176263671.19)
North Carolina (10,835,491)	Kinston	Kinston, NC	25,000	2023-01-02, 2024-12-25	267	56921.69 (18374.31, 146197.82)	95286605.47 (67427060.09, 139259177.65)
	Wilson	Wilson, NC	50,000	2023-01-02, 2024-12-25	188	32400.36 (14291.4, 71508.87)	211944638.98 (169381144.76, 259945396.62)
	Winston- Salem	Winston-Salem, NC	92,000	2023-01-03, 2024-12-19	285	60023.03 (24936.82, 199171.82)	316494899.54 (198495664.24, 507658964.97)
Tennessee (7,126,489)	Chattanooga	Chattanooga, TN	400,000	2023-11-13, 2024-12-24	229	29355.75 (13739.94, 75095.89)	106048063.15 (77158961.34, 152761378.46)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Memphis	Memphis, TN	300,000	2023-11-12, 2024-12-24	208	28410.16 (15036.19, 60317.52)	102557289.74 (69323930.14, 151422383.48)
				HHS Region 5			
Illinois (12,549,689)	Glen Ellyn	Glen Ellyn, IL	86,000	2023-01-03, 2024-12-27	287	82052.13 (36844.3, 163259.52)	362472534.17 (258056330.98, 465864598.48)
	Wheaton	Wheaton, IL	63,000	2023-09-18, 2024-12-27	302	103816.58 (50045.39, 222913.19)	499256872.21 (374290514.87, 603478211.78)
Indiana (6,862,199)	Bloomington	Bloomington, IN	56,090	2023-01-04, 2024-12-20	324	92045.65 (35085.97, 193925.03)	267803997.07 (176927789, 386245654.64)
	Carmel	Carmel, IN	86,000	2023-06-12, 2024-12-27	260	102437.67 (57880.4, 172896.04)	502295592.28 (395614870.61, 641297180.28)
	Jeffersonville	Downtown, Jeffersonville, IN	25,000	2023-07-30, 2024-12-26	306	77584.93 (36599.62, 171196.62)	182315777.11 (124192444.27, 264500560.56)
	Jeffersonville	North, Jeffersonville, IN	25,000	2023-01-03, 2024-12-26	305	73957.23 (34150.18, 157306.07)	205098355.94 (155034620.17, 291279669.87)
	South Bend	South Bend, IN	130,000	2023-01-02, 2024-12-27	289	87579.55 (37200.13, 229523.34)	350482289.47 (240230139.54, 539992201.85)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
Michigan (10,037,261)	Ann Arbor	Ann Arbor, MI	125,000	2023-01-03, 2024-12-19	307	143712.26 (66965.26, 306866.92)	357788543.73 (229102638.61, 516790649.3)
	Jackson	Jackson, MI	90,000	2023-05-01, 2024-12-27	310	160330.24 (70863.73, 276651.26)	288478107.55 (230695997.83, 380759244.93)
	Jenison	Jenison, MI	75,000	2023-01-03, 2024-12-27	312	101325.62 (40370.81, 197857.93)	320743710.21 (243323621.86, 434199034.4)
	Mt. Pleasant	Mt. Pleasant, MI	21,690	2023-01-03, 2024-12-27	256	56321.87 (26305.04, 136744.55)	160475865.97 (94500697.44, 246011771.87)
	Traverse City	Traverse City, MI	30,623	2023-01-29, 2024-12-26	294	109659.18 (52211.96, 254340.9)	211500707.77 (138627776.39, 304415449.5)
	Warren	Warren, MI	140,000	2023-01-02, 2024-12-28	277	184362.47 (72298.93, 478732.06)	192826888.37 (135226406.52, 291425772.1)
Minnesota (5,737,915)	Mankato	Mankato, MN	70,000	2023-01-01, 2024-12-27	310	90180.92 (40871.09, 193120.24)	391409380.8 (321141706.01, 467240735.79)
	Red Wing	Red Wing, MN	16,000	2023-01-02, 2024-12-27	255	111017.27 (45294.89, 211351.23)	407622158.5 (309667169.77, 525902732.82)
	Rochester	Rochester, MN	120,000	2023-04-09, 2024-12-27	305	137317.2 (62160.45, 221050.51)	459949721.37 (359614218, 580886745.57)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	St. Cloud	St. Cloud, MN	120,000	2023-01-23, 2024-12-27	272	109232.64 (50926.64, 219836.58)	242564510.8 (179031178.06, 348745669.02)
Ohio (11,785,935)	Akron	Akron, OH	365,000	2023-01-03, 2024-12-26	290	163075.05 (69956.59, 323401.06)	248083184.6 (178320182.8, 313631277.22)
	Youngstown	Youngstown, OH	174,000	2023-01-03, 2024-12-26	308	87746.85 (36998.34, 189190.22)	186565425.83 (137166289.98, 240919658.85)
Wisconsin (5,910,955)	Wausau	Wausau, WI	44,000	2023-05-08, 2024-12-27	231	103320.29 (43010.8, 237965.68)	225874859.36 (157585307.09, 360423360.88)
HHS Region 6							
Arkansas (3,067,732)	Harrison	Harrison, AR	15,000	2023-01-03, 2024-12-27	261	86749.54 (28515.48, 244274.27)	167343848.62 (119714974.05, 235249207.49)
Louisiana (4,573,749)	New Orleans	East Bank, New Orleans, LA	333,406	2023-04-03, 2024-12-27	171	86383.61 (29400.83, 188153.8)	147439364.42 (115137781.63, 208535836.49)
	New Orleans	West Bank, New Orleans, LA	50,591	2023-01-06, 2024-12-27	161	86318.43 (25680.05, 278587.76)	190296465.12 (112241508.28, 289210867.57)
Texas (30,503,301)	Amarillo	Hollywood Road, Amarillo, TX	60,000	2023-01-04, 2024-12-27	309	68741.4 (29847.71, 148751.45)	296551907.44 (198314827.94, 486294065.88)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Amarillo	River Road, Amarillo, TX	140,000	2023-06-17, 2024-12-27	307	90942.24 (35269.06, 194783.9)	481692136.35 (334389333.16, 746818048.38)
	Dallas	Dallas Central, Dallas, TX	270,000	2023-04-23, 2024-12-27	207	91563.83 (44144.76, 182461.13)	681400285.75 (437886062.83, 1075866408.96)
	Dallas	Southside, Dallas, TX	421,700	2023-11-27, 2024-12-27	143	80293.99 (36590.57, 201284.3)	1030888439.43 (729126365.48, 1411304812.56)
	Dallas	White Rock Central, Dallas, TX	630,000	2023-11-27, 2024-12-27	211	62389.9 (29604.66, 155723.48)	669808225.76 (478349358.44, 915853479.62)
	Gainesville	Gainesville, TX	17,300	2023-01-01, 2024-12-24	291	44806.1 (15773.31, 162385.46)	499701334.63 (349437972.68, 732201010.21)
	Garland	Garland, TX	200,000	2023-01-08, 2024-12-24	298	79603.64 (41750.04, 160009.71)	812702892.1 (635945476.54, 1017967064.24)
	Laredo	South, Laredo, TX	120,000	2023-06-28, 2024-12-26	283	49932 (19204.61, 150161.09)	1858977475.94 (1216109844.84, 2893274231.85)
	Laredo	Zacate Creek, Laredo, TX	140,000	2023-06-22, 2024-12-27	281	58148.23 (25047.36, 144845.41)	1562045045.5 (1081831829.13, 2384124019.32)
	Sunnyvale	Sunnyvale, TX	186,000	2023-06-28, 2024-12-26	207	30097.48 (12117.22, 66382.72)	585424183.95 (465918292.09, 716064199.39)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Wichita Falls, TX	Wichita Falls, TX	90,000	2023-01-03, 2024-12-27	299	55842.75 (27187.48, 105408.56)	727474636.19 (544844021.33, 916635262.56)
	Woodlands	Woodlands SJRA WWTF No. 1, TX	65,000	2023-01-02, 2024-12-27	290	63552.69 (31755.44, 134225.75)	207806763.08 (138117319.31, 273447347.06)
	Woodlands	Woodlands SJRA WWTF No. 2, TX	70,000	2023-01-04, 2024-12-27	290	54281.33 (24877.92, 157458.48)	196798384.18 (138828101.64, 321347400.16)
	Woodlands	Woodlands SJRA WWTF No. 3, TX	15,000	2023-01-04, 2024-12-27	212	55148.44 (17883.48, 158491.41)	261136200.43 (167973127.31, 398137486.82)
HHS Region 7							
Iowa (3,207,004)	Clinton	Clinton, IA	29,300	2023-01-01, 2024-12-26	304	5734.32 (0, 12116.91)	115763832.19 (88133824.32, 149180551.26)
	Coralville	Coralville, IA	23,000	2023-01-03, 2024-12-27	296	206916.29 (86884.02, 440606.89)	338224045.37 (224695619.81, 490648004.87)
	Marshalltown	Marshalltown, IA	27,400	2023-02-20, 2024-12-27	294	62247.89 (23563.32, 125057.79)	585735659.72 (386571794.09, 920354885.31)
	Muscatine	Muscatine, IA	24,400	2023-02-20, 2024-12-27	298	56229.84 (17627.46, 135029.15)	349274283.41 (269089646.18, 445111591.36)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Ottumwa	Ottumwa, IA	25,529	2023-02-20, 2024-06-28	311	36533.03 (13420.39, 92942.24)	172622275.59 (125440493.83, 249605941.21)
Kansas (2,940,546)	Kansas City	Kaw Point, Kansas City, KS	90,000	2023-01-16, 2024-12-27	299	45125.55 (22043.36, 87754.71)	638204795.32 (503762210.98, 792579874.61)
	Kansas City	P20, Kansas City, KS	35,000	2023-01-23, 2024-12-27	281	85875.5 (25681.29, 197162.02)	475776266.55 (338249747.31, 684071673.82)
	Kansas City	Wolcott, Kansas City, KS	15,000	2023-01-22, 2024-12-26	285	136105.45 (48324.75, 301450.53)	313755892.08 (202815707.87, 461213277.2)
	Lawrence	Lawrence, KS	80,000	2023-01-03, 2024-12-26	296	151238.09 (68813.05, 266906.17)	380407345.69 (296846586.26, 485818380.54)
	Salina	Salina, KS	47,000	2023-01-03, 2024-12-27	312	76391.13 (37708.6, 152415.07)	1171630259.03 (696020519.13, 1971508856.04)
Nebraska (1,978,379)	Lincoln	Northeast, Lincoln, NE	60,000	2023-01-10, 2024-12-24	220	136103.65 (67784.87, 264903.78)	199723776.11 (128768190.25, 301974743.71)
	Lincoln	Theresa Street, Lincoln, NE	240,000	2023-01-10, 2024-12-24	220	92690.92 (46868.48, 213478.18)	230124062.37 (159117176.72, 370404781.43)
HHS Region 8							

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
Colorado (5,877,610)	Parker	North, Parker, CO	35,000	2023-01-09, 2024-12-24	288	109419.11 (60490.36, 208526.57)	310008064.81 (217054017.7, 474220647.79)
	Parker	South, Parker, CO	25,000	2023-01-04, 2024-12-27	285	90164.59 (47244.15, 183542.63)	274793423.35 (184362073.5, 406590351.3)
South Dakota (919,318)	Yankton	Yankton, SD	20,000	2023-01-02, 2024-12-27	261	103164.37 (41262.81, 243672.8)	205844785.1 (145807091.67, 307530427.9)
Utah (3,417,734)	Provo	Provo, UT	115,000	2023-08-02, 2024-12-27	204	218224.2 (103896.84, 357619.24)	664363467.68 (520163841.07, 891159594)
	Salt Lake City	Central Salt Lake Valley, UT	600,000	2023-08-02, 2024-12-27	309	160435.56 (88959.7, 301647.88)	852490441.78 (672037272.11, 1044213432.26)
HHS Region 9							
California (38,965,193)	Carson	Los Angeles County, CA	3,500,000	2023-01-03, 2024-12-26	312	118944.03 (57780.56, 234882.72)	1196901753.7 (899975727.19, 1643842486.96)
	Davis	Davis, CA	68,000	2023-04-25, 2024-12-27	303	85433.19 (44436.63, 158193.1)	587539095.5 (428516178.17, 790537467.89)
	Esparto	Esparto, CA	4,006	2023-01-02, 2024-12-25	226	44809.41 (20574.95, 101651.59)	893387959.48 (584071934.99, 1474872174.55)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Fairfield	Fairfield, CA	155,000	2023-01-03, 2024-12-27	233	85865.53 (53775.84, 157604.21)	813370580.84 (660153521.82, 1018997864.86)
	Gilroy	Gilroy, CA	110,338	2023-01-02, 2024-05-31	728	59659.69 (30382.26, 111642.13)	515462811.68 (339089876.09, 807180481.5)
	Half Moon Bay	Half Moon Bay, CA	28,000	2023-01-01, 2024-12-25	211	120459.28 (60583.07, 234988.84)	561828054.8 (350389800.34, 844358541.07)
	Hollister	Hollister, CA	42,000	2023-01-01, 2024-12-27	211	133238.42 (45585.97, 322177.13)	1159009370.34 (766551431.32, 1715206516.31)
	Indio	Indio, CA	91,765	2023-01-04, 2024-06-28	312	56566.27 (21949.71, 100726.9)	1562247396.44 (1195508813.99, 2209147176.14)
	Laguna Niguel	Coastal, Laguna Niguel, CA	48,000	2023-01-02, 2024-06-28	234	163955.55 (86320.21, 288033.41)	465246805.02 (309023872.35, 698590251.38)
	Laguna Niguel	JB Latham, Laguna Niguel, CA	120,000	2023-01-01, 2024-12-28	235	125623.3 (67566.42, 274868.35)	488961762.38 (356109859.9, 743421150.08)
	Laguna Niguel	Regional, Laguna Niguel, CA	129,000	2023-01-06, 2024-06-28	233	94880.48 (52474.63, 169463.82)	420544937.02 (318379459.28, 608331269.41)
	Lancaster	Lancaster, CA	200,000	2023-01-02, 2024-06-28	220	70042.97 (32332.83, 145950.31)	652076652.82 (460563604.28, 928544177.27)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Lompoc	Lompoc, CA	69,290	2023-01-02, 2024-12-27	309	141063.16 (48327.42, 331772.28)	869386418.33 (551401183.48, 1265596141.18)
	Los Banos	Los Banos, CA	42,000	2023-01-03, 2024-06-28	226	64268.83 (25958.55, 144015.42)	1053234811.92 (707133821.7, 1635755238.93)
	Madera	Madera, CA	67,944	2023-01-03, 2024-06-28	196	46447.03 (24675, 73564.58)	1082330488.39 (884223995.67, 1384823357.01)
	Mammoth Lakes	Mammoth, CA	35,000	2023-01-03, 2024-06-28	175	130292.44 (45873.77, 287930.82)	733147393.62 (534069918.93, 1115690834.02)
	Marina	Marina, CA	262,000	2023-01-02, 2024-06-27	290	122994.99 (66006.57, 241009.02)	1205404317.19 (825689088.13, 1883383412.12)
	Martinez	Contra Costa County, CA	484,800	2023-01-03, 2024-12-27	213	158780.65 (96412.7, 234520.86)	725954239.02 (545568867.38, 933447055.83)
	Merced	Merced, CA	91,000	2023-01-03, 2024-06-28	312	61696.75 (35244.77, 106850.21)	1166637966.12 (887053800, 1564001542.64)
	Mill Valley	Mill Valley, CA	30,000	2023-03-06, 2024-06-28	230	91569.01 (55218.9, 159176.54)	295174294.26 (226654703.1, 366510064.15)
	Modesto	Modesto, CA	230,000	2023-03-15, 2024-06-28	231	39006.11 (0, 75834.2)	1026806077.32 (741162721.15, 1333533488.94)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Napa	Napa, CA	83,300	2023-01-03, 2024-12-27	304	157085.06 (89360.01, 290935.01)	1566202388.1 (1222750449.59, 1953475571.25)
	Novato	Novato, CA	53,000	2023-01-05, 2024-06-25	308	123939.48 (60360.28, 245560.57)	364759702.63 (272345699.73, 533459258.55)
	Oakland	Oakland, CA	740,000	2023-01-02, 2024-12-27	233	85705.76 (44650.97, 145127.83)	503194360.28 (381988008.14, 736291823.82)
	Ontario	Ontario, CA	890,000	2023-01-03, 2024-06-20	287	66410.7 (32921.77, 136143.77)	852414741.22 (655461971.93, 1127436866.73)
	Pacifica	Pacifica, CA	40,000	2023-01-03, 2024-06-27	133	168177.78 (86351.08, 435500.33)	388382322.17 (238816479.32, 563013951.84)
	Palo Alto	Palo Alto, CA	236,000	2023-01-02, 2024-12-27	727	170495.23 (88895.29, 294716.38)	788460531.25 (589219465.08, 1026411579.27)
	Paso Robles	Paso Robles, CA	31,037	2023-01-02, 2024-12-27	307	78284.32 (31534.49, 166033.38)	1373099797.74 (1067632992.03, 1738053828.38)
	Petaluma	Petaluma, CA	65,000	2023-01-03, 2024-06-27	100	142345.89 (60839.08, 247922.96)	496326729.45 (321192245.54, 707578780.09)
	Playa Del Rey	Los Angeles, CA	4,000,000	2023-01-04, 2024-12-24	310	68254.39 (37791.53, 129089.74)	741868899.46 (551019890.51, 1128652506.09)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Richmond	West Contra Costa County, CA	100,000	2023-01-02, 2024-05-15	190	109616.18 (61607.69, 200367.84)	584680217.58 (409944469.34, 808118239.86)
	Riverside	Riverside, CA	350,000	2023-01-01, 2024-12-28	302	67385.62 (30542.66, 137746.38)	938750745.72 (619867532.61, 1539111300.57)
	Sacramento	Sacramento, CA	1,480,000	2023-01-02, 2024-12-26	727	134751.74 (73851.26, 220775.83)	780503240 (625605223.72, 982488312.15)
	San Diego	San Diego, CA	2,200,000	2023-01-03, 2024-05-30	294	144554.93 (69642.06, 297574.04)	952221622.17 (639437471.65, 1412428400.34)
	San Francisco	Southeast San Francisco, CA	750,000	2023-01-02, 2024-06-27	712	164185.45 (91108.95, 286285.71)	645458779.03 (478732562.72, 842235339.87)
	San Francisco, CA	Oceanside, San Francisco, CA	250,000	2023-01-25, 2024-12-27	693	178137.36 (94059.32, 296035.17)	390919213.36 (282119520.43, 521110338.97)
	San Jose	San Jose, CA	1,500,000	2023-01-01, 2024-12-28	727	293552.74 (179855.01, 497134.42)	1317509403.6 (1118173246.92, 1597463400.12)
	San Leandro	San Leandro, CA	50,000	2023-01-01, 2024-12-25	234	124206.63 (52736.2, 224169.37)	465701470.44 (289640255.53, 702044511.23)
	San Mateo	San Mateo, CA	150,000	2023-01-04, 2023-03-10	224	116954.24 (58669.57, 219433.44)	624773958.96 (462888812.46, 809780964.29)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	San Rafael	Las Gallinas, San Rafael, CA	30,000	2023-01-01, 2024-12-28	235	142952.3 (84381.86, 313149.34)	372080467.07 (283991926.76, 527941811.21)
	San Rafael	San Rafael, CA	104,250	2023-01-01, 2024-12-28	190	103905.62 (46311.96, 258439.16)	374579561.14 (271002459.23, 538351506.99)
	Santa Cruz	Santa Cruz County, CA	160,000	2023-01-01, 2024-12-28	231	106504.23 (62389.29, 203977.41)	399702901.97 (303125929.08, 498745476.57)
	Santa Cruz	Santa Cruz, CA	160,000	2023-01-03, 2024-06-27	308	92025.56 (43834.84, 165244.75)	364444721.09 (272730625.21, 477084305.89)
	Santa Rosa	Santa Rosa, CA	230,000	2023-01-02, 2024-06-28	301	113456.55 (64553.63, 205145.83)	1178346706.07 (962912185.63, 1521669284.4)
	Sausalito	Sausalito, CA	18,000	2023-01-03, 2024-06-26	203	123603.15 (71892.21, 227187.9)	270202086.82 (186913130.49, 385415182.01)
	Silicon Valley	Redwood City, CA	199,000	2023-01-02, 2024-12-22	643	98299.37 (53089.38, 190520.44)	641940926.46 (478689386.08, 861673285.27)
	Sunnyvale	Sunnyvale, CA	153,000	2023-01-01, 2024-06-30	716	172694.91 (91225.41, 303075.97)	1292344884.08 (1022179318.23, 1664279553.74)
	Turlock	Turlock, CA	86,000	2023-01-01, 2024-12-26	312	35798.71 (18206.48, 78520.79)	387338713.89 (224575963.58, 613106908.81)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Union City	Fremont, CA	229,476	2023-01-02, 2024-12-25	188	113037.7 (59314.26, 211677.16)	381983266.97 (263567823.58, 549363353.04)
	Union City	Newark, CA	47,229	2023-01-03, 2024-06-27	148	87320.44 (50083.48, 174678.41)	458933034.58 (323360824.53, 668071436.09)
	Union City	Union City, CA	68,150	2023-01-01, 2024-12-27	146	108672.27 (57518.7, 215234.39)	436873934.68 (349628233.73, 564707458.45)
	Vallejo	Vallejo, CA	121,000	2023-01-01, 2024-12-28	312	128451.05 (57747.98, 290335.37)	651493229.87 (391783783.83, 997492099.39)
	Windsor	Windsor, CA	28,000	2023-01-02, 2024-12-27	215	125809.69 (61270.76, 247759.27)	575298812.6 (409163942.59, 941379738.73)
	Winters	Winters, CA	7,286	2023-01-03, 2024-12-26	209	22580.53 (8715.43, 62341.5)	459083664.6 (318565005.33, 713518928.08)
	Woodland	Woodland, CA	59,000	2023-01-03, 2024-06-27	269	68890.7 (39410.65, 142076.66)	706663537.4 (452657307.88, 1200776063.79)
Hawaii (1,435,138)	Hilo	Hilo, HI	16,257	2023-01-03, 2024-06-27	83	69172.55 (39625.67, 146368.07)	137445826.98 (102259353.55, 177088014.21)
	Honolulu	Honouliuli, Honolulu, HI	300,000	2023-01-03, 2024-12-26	235	99760.34 (50173.66, 185175.79)	283446727.06 (211232734.49, 401093754.37)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Honolulu	Kailua, Honolulu, HI	90,000	2023-01-03, 2024-06-28	159	112870.1 (66681.92, 213903.65)	240037388.56 (168074595.63, 315737081.97)
	Honolulu	Sand Island, Honolulu, HI	390,000	2023-01-04, 2024-06-27	236	162868.95 (82923.3, 291871.33)	399210071.85 (285656815.77, 527859531.63)
	Honolulu	Wahiawa, Honolulu, HI	18,000	2023-01-02, 2024-12-23	157	90725.36 (48703.89, 180561.61)	235839795.3 (173433603.12, 299750760.24)
	Honolulu	Waianae, Honolulu, HI	44,000	2023-05-08, 2024-01-10	158	87207.85 (53339.77, 180391.68)	182425200.19 (138226414.63, 248187859.5)
Nevada (3,194,176)	Las Vegas	Las Vegas, NV	990,000	2023-06-26, 2024-12-26	290	110889.3 (56737.52, 209323.26)	443911431.89 (329102871.79, 616292521.04)
HHS Region 10							
Alaska (733,406)	Anchorage	Anchorage, AK	220,000	2023-06-26, 2024-06-26	241	191189.23 (86304.8, 422368.7)	266439301.8 (184907210.77, 396243372.29)
Idaho (1,964,726)	Boise	Lander Street, Boise, ID	108,556	2023-06-26, 2024-12-26	304	97563.04 (54826.64, 188263.9)	235462164.02 (163950803.65, 346610830.23)
	Boise	West Boise, ID	186,901	2023-06-26, 2024-06-26	302	111447 (54736.14, 235519.19)	268853276.25 (182851768.95, 366125965)

State (Population)	Location	Wastewater Treatment Plant	Population Served	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)
	Coeur D Alene	Coeur d'Alene, ID	50,540	2023-06-26, 2024-06-26	272	101793.87 (56593.88, 166146.37)	332215842.91 (242766027.22, 430141909.3)
Washington (7,812,880)	Snohomish	Snohomish, WA	10,150	2023-03-27, 2024-12-27	185	79165.81 (29639.47, 169575.72)	231008689.26 (149887569.4, 344881517.77)

Abbreviations: IQR = interquartile range, gc/g = gene copies per gram

Table S2. Details of the wastewater treatment plants in the California, multi-laboratory monitoring program

County (Population)	Wastewater Treatment Plant Location	Population Served[a]	Laboratory 1 (gc/g)				Laboratory 2 (gc/L)			
			First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/L (IQR)	Median PMMoV RNA in gc/L (IQR)
Alameda (1,663,823)	East Bay	740,000	2023-01-03, 2024-06-27	248	87661.8 (46163.2, 145315.37)	499445541.89 (378839088.89, 738629018.1)	2023-01-03, 2023-10-26	180	192267.7 (112373.97, 315734.02)	727086065 (445159384.74, 863310710)
	San Leandro	50,000	2023-01-03, 2024-06-27	249	129576.93 (53905.9, 231330.35)	483456356.71 (311235815.67, 716525758.32)				
	Union City - Fremont Basin	229,476	2023-01-03, 2024-12-26	196	113754.99 (59314.26, 211677.16)	388076298.02 (266246304.6, 559181461.16)				
	Union City - Newark Basin	47,229	2023-01-03, 2024-06-27	157	88103.13 (50921.28, 174530.09)	461728588.58 (328513299.81, 673587980.76)				
	Union City - Union Basin	68,150	2023-01-03, 2024-06-27	154	111262.08 (59134, 220812.8)	436873934.68 (351363300.38, 564707458.45)				
Butte (213,605)	Chico	101,299					2023-09-05, 2024-12-18	185	237957.6 (104711.4, 404658.5)	352848600 (296313630, 421127010)
	Oroville	44,000					2023-07-24, 2024-12-19	166	208548.15 (81912.58, 365192.52)	327500830 (255534075, 420535637.5)
Contra Costa (1,162,648)	Central San	486,050	2023-01-05, 2024-06-25	225	155256.34 (97205.2, 233518.04)	718856389.72 (537778458.07, 933447055.83)	2023-01-02, 2024-12-18	303	218996.56 (145502.8, 337601.65)	462892890 (374584090, 537634270)
	Delta Diablo: Pittsburg/Antioch/Bay Point	218,281					2023-06-26, 2024-12-18	180	175021.05 (84899, 336783.12)	1082022690 (927145230, 1255206182.5)

County (Population)	Wastewater Treatment Plant Location	Population Served[a]	Laboratory 1 (gc/g)				Laboratory 2 (gc/L)			
			First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/L (IQR)	Median PMMoV RNA in gc/L (IQR)
	Richmond	100,000	2023-01-02, 2024-06-27	204	114071.05 (63612.26, 202316.67)	589712535.16 (412170141.25, 819317146.98)				
Del Norte (27,462)	Crescent City	15,372					2023-10-04, 2024-12-18	122	140124.45 (61712.35, 231715.65)	189337455 (146419552.5, 229419000)
Fresno (1,008,280)	Fresno	650,000					2023-01-01, 2024-12-03	289	148825 (92127.9, 226585.2)	594436390 (490946270, 682522720)
Humboldt (136,132)	Eureka	45,000					2023-07-30, 2024-12-19	212	158179.15 (58368.45, 277360.25)	263027985 (142849952.5, 332240532.5)
Imperial (179,578)	Calexico	40,000					2023-01-04, 2023-05-31	108	209101.2 (143954.95, 349061.98)	2089435870 (1913190362.5, 2364325260)
Kern (906,883)	East Bakersfield	169,480					2023-01-03, 2024-12-19	302	111942.9 (43677.33, 248677.33)	861754260 (738736020, 1059765055)
	West Bakersfield	279,023					2023-01-04, 2023-06-29	146	165272.8 (110133.23, 323385.66)	760234605 (680878035, 852249220)
Kings (152,515)	Hanford	56,000					2023-08-07, 2024-08-07	133	54608.7 (28839.4, 100650.7)	413040480 (368703640, 507599010)
Lake (68,024)	Southeast	13,200					2023-01-01, 2024-12-16	351	73149.1 (28973.85, 174240.25)	899343684.9 (592174145, 1167600540)
Los Angeles (9,936,690)	County	3,500,000	2023-01-01, 2024-12-25	327	122377.41 (59424.17, 241151.06)	1203709090.5 (919293433.69, 1663120978.74)	2023-01-01, 2024-12-18	357	96053.1 (48153.2, 170700.7)	1155004070 (1002323670, 1293295768.23)

County (Population)	Wastewater Treatment Plant Location	Population Served[a]	Laboratory 1 (gc/g)				Laboratory 2 (gc/L)			
			First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/L (IQR)	Median PMMoV RNA in gc/L (IQR)
	Lancaster	200,000	2023-01-02, 2024-06-27	234	70679.97 (32743.26, 155833.96)	656562903.73 (465503567.57, 977509104.56)				
	City - Hyperion	4,000,000	2023-01-02, 2024-12-25	325	72461.55 (38499.41, 143931.29)	767691681.64 (566638898.99, 1144256950.9)	2023-01-02, 2024-12-17	356	159608.3 (91121.65, 300751.82)	926166665 (805155937.5, 1040710402.5)
Madera (157,243)	Madera City	67,944	2023-03-06, 2024-06-28	196	46447.03 (24675, 73564.58)	1082330488.39 (884223995.67, 1384823357.01)				
Marin (260,485)	CMSA: San Rafael/Larkspur	104,250	2023-01-02, 2024-12-22	200	107358.79 (48002.63, 275279.32)	374391948.29 (270061618.59, 534825437.85)				
	Las Gallinas	30,000	2023-01-03, 2024-06-26	248	149286.05 (87911.42, 328980.08)	372120958.76 (285235105.34, 539581924.84)				
	Novato	53,000	2023-01-02, 2024-12-27	322	129292.95 (60846.45, 258457.19)	364759702.63 (276291497.95, 525823637.04)				
	Sausalito	18,000	2023-01-03, 2024-06-27	217	133821.14 (73010.37, 227424.19)	267330447.15 (186842772.58, 383786851.13)				
	Mill Valley	30,000	2023-01-03, 2024-06-20	245	96201.2 (56687.75, 164465.31)	294067429.03 (223739782.28, 363685536.58)				
Mariposa (17,130)	El Portal: Yosemite Valley/Np	2,200					2023-08-22, 2024-12-18	116	122653 (40820.52, 202362.35)	475238605 (342348930, 660767782.5)
Merced (282,290)	Los Banos	42,000	2023-01-03, 2024-06-28	240	67371.77 (29425.67, 147862.82)	1072725189.32 (716649885.42, 1661244079.79)				

County (Population)	Wastewater Treatment Plant Location	Population Served[a]	Laboratory 1 (gc/g)				Laboratory 2 (gc/L)			
			First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/L (IQR)	Median PMMoV RNA in gc/L (IQR)
	Merced	91,000	2023-01-02, 2024-12-27	326	63897.76 (35700.75, 108154.73)	1166239304.61 (888070566.93, 1572579998.24)				
Mono (13,219)	Mammoth Lakes	35,000	2023-03-15, 2024-06-28	175	130292.44 (45873.77, 287930.82)	733147393.62 (534069918.93, 1115690834.02)				
Monterey (437,609)	Marina	262,000	2023-01-03, 2024-12-27	302	127192.06 (69465.95, 244613.41)	1207584707.54 (826478094.76, 1883383412.12)				
Napa (137,384)	American Canyon	20,256					2023-01-02, 2024-12-19	345	229687.1 (133620.74, 394727.6)	442661040 (343141130, 536581010)
	Napa	83,300	2023-01-02, 2024-12-27	317	165302.52 (90552.93, 316341.22)	1567042506.88 (1235244699.8, 1950772473.73)				
Nevada (102,322)	Tahoe-Truckee	50,000					2024-01-14, 2024-12-19	144	268593 (115401.97, 420169.45)	583336710 (491066682.5, 673772372.5)
Orange (3,175,227)	Laguna Niguel - Coastal	48,000	2023-01-03, 2024-06-28	248	173591.66 (87733.5, 295189.89)	474329445.04 (315829708.32, 696351036.37)				
	Laguna Niguel - JB Latham	120,000	2023-01-03, 2024-06-28	249	143835.89 (71520.4, 292535.95)	509342161.43 (359422012.72, 772672896)				
	Laguna Niguel - Regional	129,000	2023-01-03, 2024-06-28	247	100221.03 (53910.15, 183241.59)	438725772.77 (322435834.34, 635121769.02)				
	Orange	1,800,000					2023-01-01, 2024-12-11	352	191738.8 (108957.02, 314901.9)	1093501805 (967279190, 1234975525)

County (Population)	Wastewater Treatment Plant Location	Population Served[a]	Laboratory 1 (gc/g)				Laboratory 2 (gc/L)			
			First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/L (IQR)	Median PMMoV RNA in gc/L (IQR)
Placer (406,608)	Roseville - Southeast - Dry Creek	108,444					2023-09-19, 2024-12-18	148	140402.25 (69125.18, 278446.93)	271161060 (203496660, 307600045)
Plumas (19,650)	Quincy	4,217					2023-01-03, 2024-12-17	153	53607.8 (8833.5, 215217.3)	178241260 (81598000, 263521490)
Riverside (2,429,487)	Riverside	350,000	2023-01-25, 2024-12-27	306	67808.85 (31037.86, 140475.33)	938976387.51 (625262853.07, 1556180739.46)				
	Indio	91,765	2023-01-02, 2024-12-27	326	56681.11 (22505.03, 102436.98)	1602590852.77 (1211169560.61, 2231487698.07)				
Sacramento (1,579,211)	Sacramento	1,480,000	2023-01-01, 2024-12-28	797	139394.55 (78446.94, 222476.13)	790416821.96 (632417330.42, 9.95e+08)				
San Benito (64,753)	Hollister	42,000	2023-01-02, 2024-06-28	223	134793.5 (49216.85, 325693)	1188340502.05 (781797298.34, 1817064556.09)				
San Bernardino (2,180,563)	Ontario	890,000	2023-01-04, 2024-12-24	301	71089.18 (36126.39, 148374.06)	854287825.92 (666777266.29, 1125864531.34)				
	San Bernardino	325,000					2023-01-03, 2024-12-16	325	124347.4 (68053.2, 233924.5)	819399220 (671235430, 1008697330)
San Diego (3,289,701)	San Diego	2,200,000	2023-01-01, 2024-12-25	309	150633.44 (78296.49, 304165.92)	951977857 (644988077.76, 1416078833.97)	2023-01-01, 2024-12-16	341	151240.5 (84197.6, 251937)	942867710 (771474500, 1109152120)
San Francisco (851,036)	Oceanside	250,000	2023-01-01, 2024-12-28	758	181733.21 (97114.93, 301355.03)	389633496.95 (276099180.66, 519938730.82)	2023-01-01, 2023-06-07	119	332741 (197765.3, 456129.35)	463082490 (307505183.92, 562243360)

County (Population)	Wastewater Treatment Plant Location	Population Served[a]	Laboratory 1 (gc/g)				Laboratory 2 (gc/L)			
			First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/L (IQR)	Median PMMoV RNA in gc/L (IQR)
	Southeast	750,000	2023-01-01, 2024-12-28	783	171576.44 (94258.55, 296840.3)	646146599.32 (480225849.67, 828704543.98)	2023-01-01, 2024-12-18	356	231549.83 (137661.28, 411426)	524266835 (403530802.5, 620779712.5)
San Luis Obispo (281,712)	Paso Robles	31,037	2023-01-02, 2024-12-26	322	81211.42 (33648.46, 184729.82)	1381110110.74 (1069843081.79, 1738422973.51)				
	City of SLO	47,545					2023-08-07, 2024-12-16	200	172204.15 (79617.22, 324378.77)	486384030 (415570170, 553280585)
San Mateo (754,250)	Pacifica	40,000	2023-01-02, 2024-05-15	146	168320.79 (93619.16, 421406.81)	393279242.89 (257756102.46, 560435277.66)				
	San Mateo	150,000	2023-01-02, 2024-06-28	237	126092.45 (62977.53, 234266.19)	620397382.01 (458338905.27, 800852720.94)				
	Half Moon Bay	28,000	2023-01-06, 2024-06-28	219	120459.28 (63093.76, 238681.4)	563852740.6 (354827289.7, 844358541.07)				
	Silicon Valley	199,000	2023-01-01, 2024-12-27	714	105090.69 (55997.49, 210689.02)	652775988.55 (481632164.08, 886721567.76)				
Santa Barbara (445,213)	Lompoc	69,290	2023-01-03, 2024-12-27	323	145063.9 (50529.58, 350289.28)	885937068.28 (556015257.73, 1275521402.54)				
	El Estero	77,600					2023-07-10, 2024-12-16	218	209640.15 (95193.65, 503743.92)	873687955 (710951207.5, 1054955365)
Santa Clara (1,916,831)	Palo Alto	236,000	2023-01-01, 2024-12-28	796	174099.94 (93973.92, 299913.59)	810088080.45 (608994278.87, 1039593035.69)				

County (Population)	Wastewater Treatment Plant Location	Population Served[a]	Laboratory 1 (gc/g)				Laboratory 2 (gc/L)			
			First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/L (IQR)	Median PMMoV RNA in gc/L (IQR)
	Gilroy/Morgan Hill	110,338	2023-01-01, 2024-12-28	799	64617.43 (32496.93, 122631.35)	530137424.78 (348362477.6, 821330905.51)				
	San Jose	1,500,000	2023-01-01, 2024-12-28	796	305135.34 (188415.75, 497479.15)	1331738752.08 (1122991629.79, 1612340022.35)				
	Sunnyvale	153,000	2023-01-01, 2024-12-28	786	181676.26 (100658.72, 323933.04)	1322551994 (1044704757.94, 1702304396.66)				
Santa Cruz (268,571)	Santa Cruz City	160,000	2023-01-01, 2024-12-26	321	92680.4 (43939.51, 177543.17)	365937510.74 (272907796.96, 475776737.16)				
	Santa Cruz County	160,000	2023-01-01, 2024-06-30	244	112151.88 (63765.51, 210289.65)	404647031.92 (306938954.84, 509363362.64)				
Shasta (181,852)	Redding - Clear Creek	60,000					2023-08-21, 2024-12-19	192	183223.7 (113754.15, 300900.38)	233546810 (158225372.5, 275562767.5)
Solano (450,995)	Fairfield	155,000	2023-01-02, 2024-06-28	247	94263.7 (55039.49, 165388.02)	813034095.52 (658676461.75, 1016803321.91)				
	Vallejo	121,000	2023-01-03, 2024-12-26	327	133567.4 (59268.15, 308611.51)	660699283.88 (396942262.37, 1019244267.51)				
Sonoma (488,436)	Petaluma	65,000	2023-01-03, 2024-05-30	115	149655.96 (60701.52, 251613.66)	499849623.54 (317832679.92, 739778609.3)				
	Santa Rosa	230,000	2023-01-02, 2024-12-25	316	114809.01 (65930.22, 206954.26)	1187495787.78 (967306523.87, 1531692979.87)				

County (Population)	Wastewater Treatment Plant Location	Population Served[a]	Laboratory 1 (gc/g)				Laboratory 2 (gc/L)			
			First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/g (IQR)	Median PMMoV RNA in gc/g (IQR)	First/Last Sample Date	Sample Count	Median SARS-CoV-2 RNA in gc/L (IQR)	Median PMMoV RNA in gc/L (IQR)
	Windsor	28,000	2023-01-03, 2024-06-28	227	139228.49 (62383.63, 256721.19)	575298812.6 (418790459.29, 934048613)				
Stanislaus (552,063)	Modesto	230,000	2023-01-03, 2024-06-27	246	41102.62 (16093.28, 76784.64)	1034368176.79 (751064543.34, 1359405888.98)				
	Turlock	86,000	2023-01-02, 2024-12-27	326	36421.51 (18926.02, 82045.74)	400868367.19 (228991243.91, 614593533.39)				
Sutter (99,101)	Yuba City	70,000					2023-08-21, 2024-12-18	181	109675.1 (51927.1, 204032.6)	400521830 (344394440, 495486620)
Ventura (842,009)	Oxnard	250,000					2023-06-26, 2024-12-17	221	112395.5 (62044.3, 242559.9)	1311463120 (1123876240, 1599824540)
Yolo (217,141)	Davis	68,017	2023-01-01, 2024-12-27	320	85975.81 (47628.67, 159580.1)	588801067.56 (438908252.57, 800637486.47)				
	Esparto	4,006	2023-01-04, 2024-06-28	238	48470.35 (21583.51, 102060.09)	906264594.13 (595047689.86, 1482015204.92)				
	Winters	7,286	2023-01-04, 2024-06-27	222	24041.9 (8969.77, 71935.01)	467026842.53 (323364589.25, 769872092.06)				
	Woodland	59,000	2023-01-02, 2024-12-23	283	69729.31 (42035.47, 144148.32)	715844184.07 (473174771.43, 1227845942.45)				

[a] There were some differences in the reported wastewater treatment plant service population between laboratories. The service population reported here is the average population estimate of all reported population estimates for the wastewater treatment plant.

Blank cells indicate that samples from the wastewater treatment plant were not analyzed by the laboratory indicated in the column header.

Abbreviations: IQR = interquartile range, gc/g = gene copies per gram, gc/L = gene copies per liter

Further details: California, multi-laboratory wastewater monitoring program methods

As stated in the main text, wastewater concentrations are contributed to the California, multi-laboratory monitoring program by multiple laboratories. For this analysis, we used data contributed by two distinct laboratories. The first laboratory is the same laboratory used by the national, single laboratory program; detailed methods and data are available in a data descriptor by Boehm et al. [1]. The second laboratory is the California Department of Health State Drinking Water and Radiation Laboratory (DWRL). DWRL methods for SARS-CoV-2 wastewater monitoring are described below.

DWRL monitored wastewater concentrations of SARS-CoV-2 RNA at sites during the study period. Approximately 50 mL of 24-hour composite influent wastewater samples were collected from wastewater treatment utilities using autosamplers three times per week. Samples were stored and shipped to DWRL at 4°C. The laboratory methods used by DWRL for processing wastewater samples were adapted from the methods described in Karthikeyan et al. [5].

Concentration and Extraction. Influent wastewater samples were mixed by inversion followed by 10 to 15 seconds of vortexing. 5 mL aliquots of mixed wastewater influent samples were concentrated in duplicate using Ceres Nanotrap® Magnetic Virus Particles (SKU# 44202). Negative concentration/extraction controls (NEC) were prepared by conducting the concentration/extraction procedure with nuclease free water to identify cross-contamination during processing. 500 µL of the concentrated wastewater samples were eluted into MagMax Microbiome Lysis Solution (Cat# A42361) in preparation for nucleic acid extraction. Prior to extraction, lysed samples were spiked with bovine coronavirus (BCoV), as positive recovery control, to a final dilution of 1 to 1,000 (or 90 copies per microliter). The KingFisher Flex and Apex were used to extract nucleic acid (NA) from 450 µL of lysed wastewater samples using the Thermo Fisher MagMAX Viral/Pathogen Nucleic Acid Isolation Kit to a final extraction volume of 50 µL. Extracts were either analyzed immediately or stored at -80°C until analysis. Extraction duplicates were stored at -80°C for long-term storage to be used for repeating analyses in the case of quality control failures or for future analyses.

ddPCR. NA extracts were used as a template in digital droplet RT-PCR (ddPCR) assay targeting pathogen-specific genes utilizing the primers and probes specified in **Table S3**. Pathogen targets were quantified with a four-plex assay including: SARS-CoV-2, influenza A, respiratory syncytial virus (RSV), and mpox clade II. Influenza A H5N1 (H5) was quantified as a single-plex. Concentrations of pepper mild mottle virus (PMMoV) and spiked bovine coronavirus (BCoV) were also measured. PMMoV was measured as an internal process control and an indicator of fecal strength in wastewater samples. PMMoV and BCoV were run as a duplex assay. The ddPCR reaction mix consisted of 5 µL of NA extract template, 5 µL of Bio-Rad One-Step RT-ddPCR Advanced Kit for Probes (CAT# 1864022), 2 µL of reverse transcriptase (CAT# 1864022), 1 µL of 300 mM dithiothreitol (DTT) (CAT# 1864022), and primer probe mixtures (PPMs) for each multiplexed pathogen target, to the final concentrations described in

Table S3. For the multiplex assay, 1.2 µL of each of the four PPMs and 2.2 µL of nuclease-free water were added. For the H5 singleplex assay, 2.4 µL of the PPM and 4.6 µL of nuclease-free water were added and 2.4 µL of the PPMs and 2.2 µL of nuclease-free water for the duplex assay. ddPCR was performed with the following thermal cycling protocol: reverse transcription at 50°C for 60 minutes, enzyme activation at 95°C for 10 minutes, followed by 40 two-step cycles of denaturation at 94°C for 30 seconds and anneal/extension at 57°C for 1 minute. This was followed by enzyme deactivation at 98°C for 10 minutes, droplet stabilization at 4°C for 30 minutes, and hold at 6°C. Droplets were analyzed using the QX600 droplet reader (Bio-Rad) within 48 hours after PCR, and each wastewater sample was analyzed in technical triplicate. utilizing the QX Manager Software 2.1 Standard Edition (Bio-Rad). Positive droplets were established utilizing the PTC and negative control wells for each individual target by setting a threshold according to the fluorescent amplitude. The thresholds were set where there was clear separation between the negative droplet baseline and the positive droplet population of the PTC wells. This threshold was then applied to all sample wells. Results from triplicate wells were merged by taking an arithmetic mean of the three wells. For a sample to be considered positive, the detected concentration should be above the targets' pre-determined Limits of Detection (LoDs).

Quality Control. Negative extraction controls were included in duplicate in each round of concentrations and extractions. PCR-positive template controls (PTC) and no-template controls (NTC) (negative PCR controls) were run in triplicate on each PCR plate along with the negative extraction controls. For quality control (QC) of ddPCR, a minimum of 10,000 droplets were required per well and a maximum of 30,000 droplets. Samples with 2 or more wells with droplet counts below 10,000 were re-run. The PCR-positive controls for each gene target are described in **Table S3**. The no-template control (NTC) consisted of nuclease free water used in place of sample extract to identify contamination during ddPCR plate preparation. If a plate did not have more than 2 droplets above the set threshold in each negative control replicate, it passed QC. If a sample did not have a clear separation between positive and negative droplets and low fluorescent amplitude due to enzyme inhibition, the sample was marked for a re-run using the extraction duplicate. For any plate that did not pass QC for NTC, PTC or the negative extraction controls, the plate was re-run. BCoV recovery rates were measured as workflow quality control metric. If a sample had a BCoV recovery rate less than 10%, it was marked for a re-run for all targets, and if an entire plate had a BCoV rate less than 30%, the entire plate was re-run for all targets.

Data Usage Notes. As stated in the main text, we included wastewater concentrations obtained from WWTPs. Thus, we excluded samples collected from subsewershed locations within the southeast San Francisco WWTP, Palo Alto WWTP, and San Diego WWTP as sampling was also conducted at this WWTP. We also excluded samples with reported quality control issues such as samples not being stored at the appropriate temperature. Moreover, on days when multiple SARS-CoV-2 RNA and PMMoV RNA concentrations were reported for a WWTP, we calculated the arithmetic mean of all reported PMMoV-normalized SARS-CoV-2 RNA concentrations to obtain a single normalized concentration per WWTP each day. There were also differences in WWTP service population estimates among laboratories; we additionally calculated the arithmetic mean of all reported population estimates associated with

PMMoV-normalized SARS-CoV-2 RNA concentrations to obtain a single population estimate per WWTP each day. Lastly, some SARS-CoV-2 RNA and PMMoV RNA concentrations were reported in the dataset without units. After clarification with the California Department of Public Health, we were able to assume units of gene copies per gram (gc/g) for these concentrations. All concentration units were converted to a linear scale prior to data analysis.

Table S3: Targets Measured by the California Department of Health State Drinking Water and Radiation Laboratory

Target (gene)	Positive control material	Primers/Probes	Concentration
SARS-CoV-2 (N)	Parental Wuhan strain extract from live viral culture[a]	Forward: CAT TAC GTT TGG TGG ACC CT	450 nM
		Reverse: CCT TGC CAT GTT GAG TGA GA	450 nM
		Probe: /56-FAM/CG CGA TCA A/ZEN/A ACA ACG TCG G/3IABkFQ/	125 nM
Influenza A (M)	Influenza A extract from live viral culture[a]	Forward: CAA GAC CAA TCY TGT CAC CTC TGA C	450 nM
		Reverse: GCA TTY TGG ACA AAV CGT CTA CG	450 nM
		Probe: 5'-/FAM/TGC AGT CCT /ZEN/ CGC TCA CTG GGC ACG/3IABkFQ/-3'	125 nM
Influenza A (H5N1) (H)	IDT gBlock	Forward: TAT AGA RGG AGG ATG GCA GG	900 nM
		Reverse: ACD GCC TCA AAY TGA GTG TT	900 nM
		Probe: 5'-/5ATTO590N/AG GGG AGT G/TAO/G KTA CGC TGC RGA C/3IAbRQSp/-3'	250 nM
RSV (RNA polymerase)	RSV A/B extract from live viral culture[a]	Forward: GGC AAA TAT GGA AAC ATA CGT GAA	450 nM
		Reverse: TCT TTT TCT AGG ACA TTG TAY TGA ACA G	450 nM
		Probe: /5HEX/CT GTG TAT G/ZEN/T GGA GCC TTC GTG AAG CT/3IABkFQ/	125 nM

Target (gene)	Positive control material	Primers/Probes	Concentration
Mpox clade II (G2R)	Mpox G2R WA clade II extract from live viral culture[a]	Forward: CAC ACC GTC TCT TCC ACA GA	450 nM
		Reverse: GAT ACA GGT TAA TTT CCA CAT CG	450 nM
		Probe: /5Cy5/AA CCC GTC G/ZEN/T AAC CAG CAA TAC ATT T/3IABkFQ/	125 nM
Mpox clade I (E3L)	Synthetic hMPXV 1 (Congo Basin) DNA control (Twist Bioscience, cat #106056)	Forward: TAG GCC GTG TAT CAG CAT CC	900 nM
		Reverse: AGC TCT GTA TGA TCT TCA ACG T	900 nM
		Probe: 5'-/5HEX/CGTCGGAAC/ZEN/TGTACACCA TAGTAC/3IABkFQ/-3'	250 nM
PMMoV	RNA control (Promega, cat # AM2070)	Forward: GAG TGG TTT GAC CTT AAC GTT TGA	900 nM
		Reverse: TTG TCG GTT GCA ATG CAA GT	900 nM
		Probe: /5HEX/CC TAC CGA A/ZEN/G CAA ATG /3IABkFQ/	250 nM
BCoV	Commercial (Merck cat #43819, 25 x 1 dose)	Forward: CTG GAA GTT GGT GGA GTT	900 nM
		Reverse: ATT ATC GGC CTA ACA TAC ATC	900 nM
		Probe: /56-FAM/CC TTC ATA T/ZEN/C TAT ACA CAT CAA GTT GTT /3IABkFQ/	250 nM

[a] Positive control extracted from live viral culture, provided by Viral and Rickettsial Disease Laboratory (VRDL) at California Department of Health (CDPH)

Abbreviations: BCoV = bovine coronavirus, hMPXV = human mpox virus, IDT = Integrated DNA Technologies, PMMoV = pepper mild mottle virus, RSV = respiratory syncytial virus, WA = Western Africa

Further details: Wastewater Viral Activity Level (WVAL)

The WVAL metric is used by the US Centers for Disease Control (CDC) for the National Wastewater Surveillance System (NWSS) [6]. The WVAL value represents the number of standard deviations about a prespecified baseline, transformed to the linear scale; we calculated WVAL values based on the methodology used by CDC as of March 2025 [6]. Based on the March 2025 version of the methodology, sites must have at least 6 weeks of data in order to calculate the WVAL [6]. All WWTPs included in this analysis had at least 6 weeks of monitoring data.

Input concentration data. The CDC only uses normalized wastewater concentrations, preferably flow-population ("flowpop") normalization, to compute the WVAL. For our analysis, we considered both smoothed unnormalized and smoothed PMMoV-normalized wastewater concentrations. We additionally conducted a supplementary analysis using smoothed flowpop-normalized wastewater concentrations. All input concentration data are natural log transformed prior to further calculations.

Baseline and standard deviation calculations. For each sampling site, the baseline is the 10th percentile of the log-transformed input concentration data within a specified time frame; the standard deviation is calculated using log-transformed input concentration data within the same time frame. For SARS-CoV-2, the CDC recalculates baselines and standard deviations every six calendar months (Jan 1 and Jul 1) using the past 12 months of data for sites with over six months of data. For sites with under six months of data, the CDC updates baselines and standard deviations until six months of data are obtained, after which baselines and standard deviations remain unchanged until the next Jan 1 or Jul 1 when baselines and standard deviations are recalculated. We conducted our analysis in a retrospective manner; therefore, we calculated the final baseline and standard deviation value for each site based on all data between 1 January 2023 to 28 December 2024. For sites with less than six months (182 days) of data, we calculated the baseline and standard deviation with all available data. For sites with greater than or equal to six months (182 days) of data but less than or equal to six months (182 days) of data from the most recent Jan 1 or Jul 1, we calculated the baseline and standard deviation with just the first six months (182 days) of data. For all other sites with greater than or equal to six months (182 days) of data, we calculated the baseline and standard deviation using just the past 365 days of data from the most recent Jan 1 or Jul 1 with reported data.

WVAL calculation. For each site, the number of standard deviations (SDs) that each log-transformed input concentration deviates from the baseline is first calculated as follows: $deviation = (input\ concentration - baseline) / SD$. This deviation value is then converted back to a linear scale to obtain the WVAL for the site: $WVAL = e^{deviation}$. The CDC spatial aggregates WVAL values by calculating the median value among geographies. We considered several spatial aggregation approaches as described in the main text.

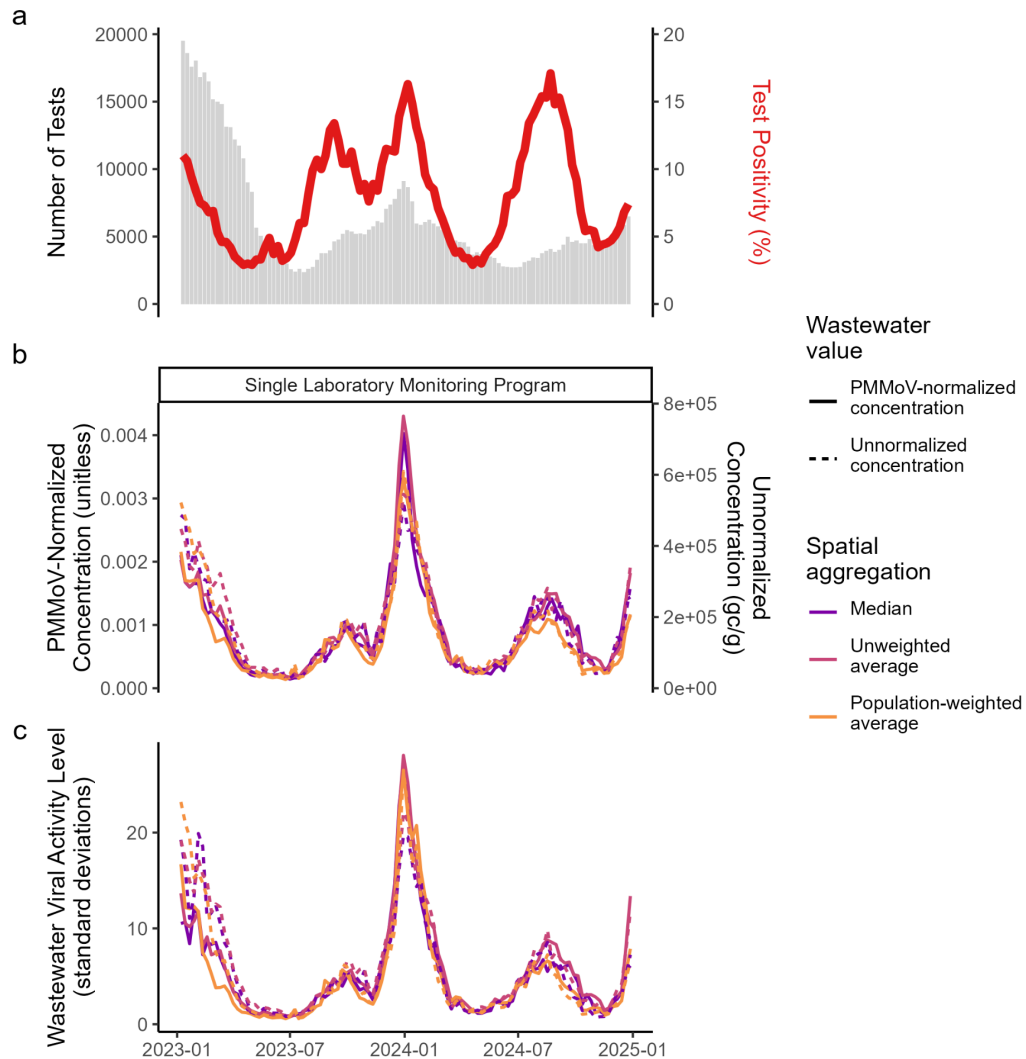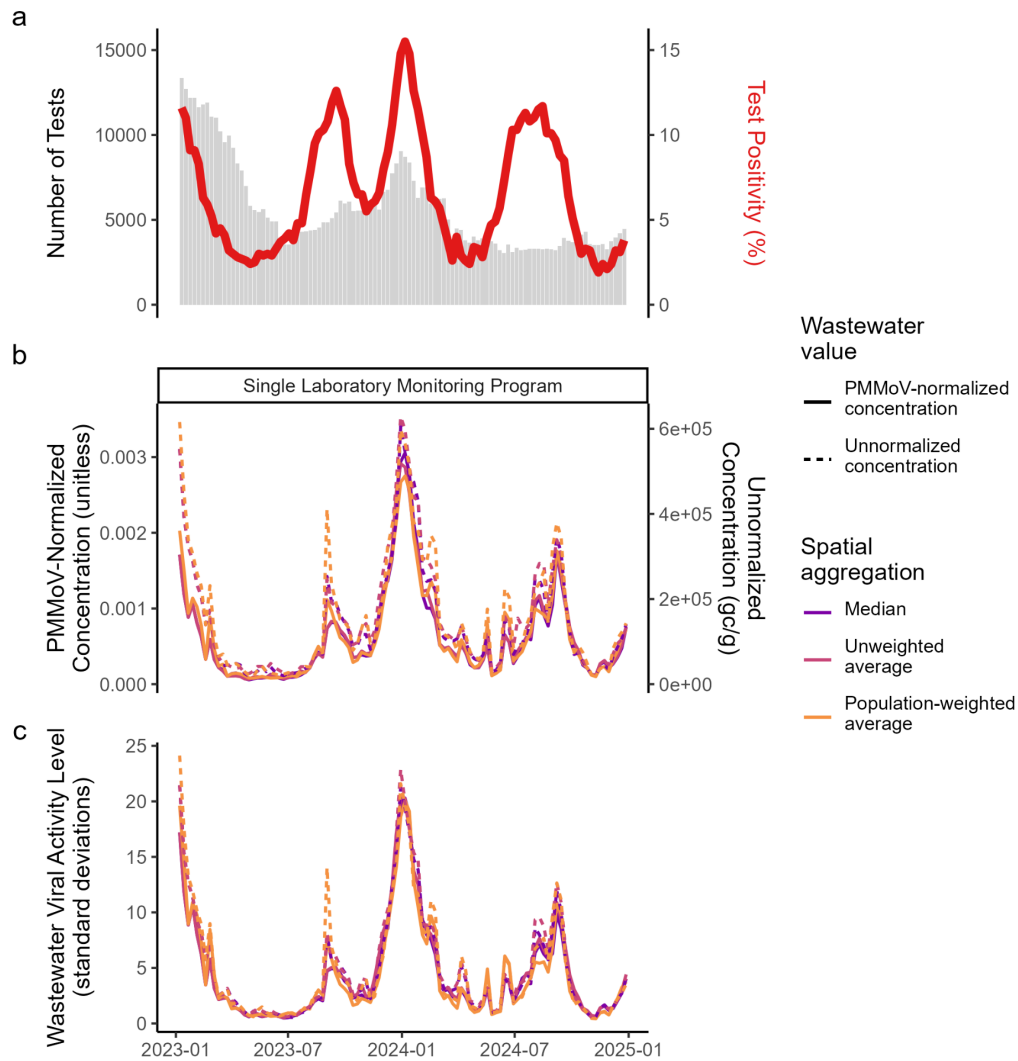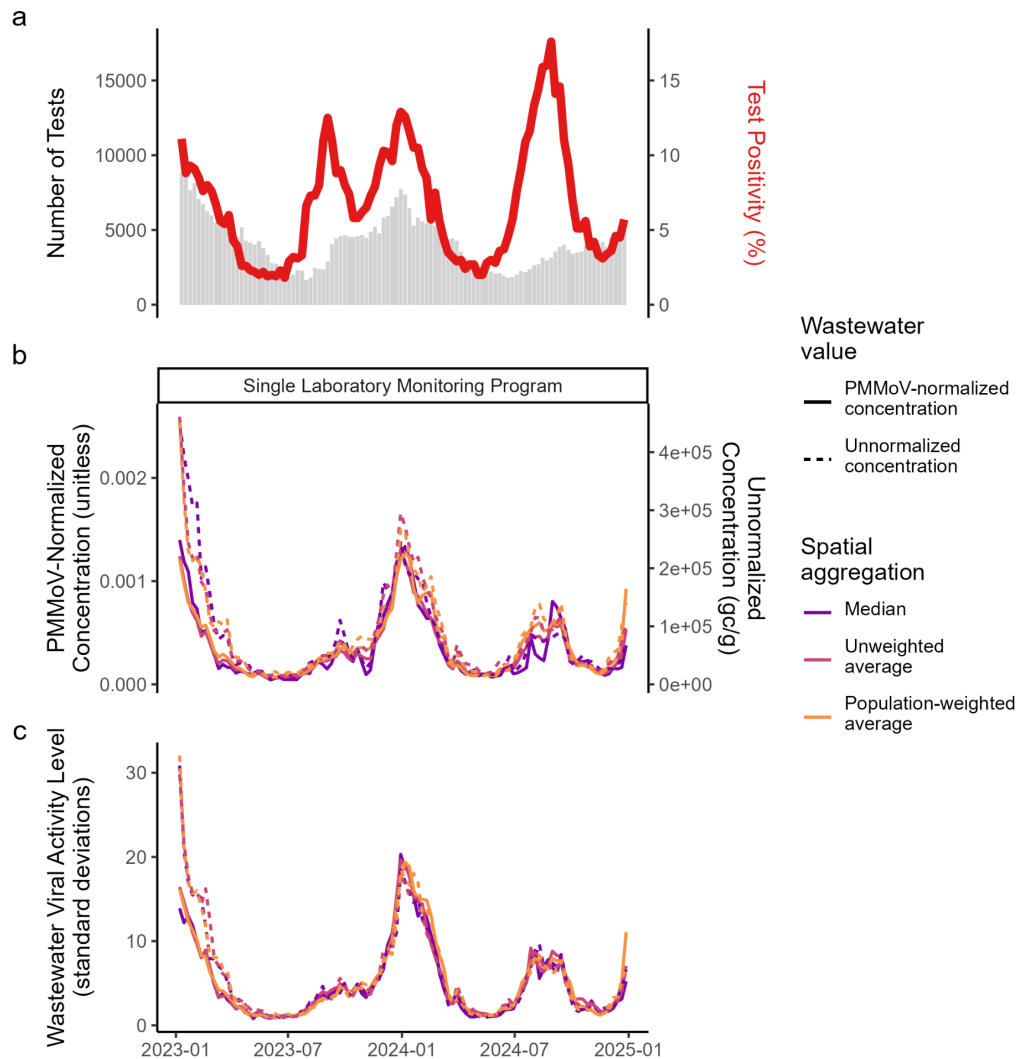# Weekly COVID-19 test positivity and wastewater SARS-CoV-2 metrics: HHS regions

Fig. S1 Weekly temporal correlation between COVID-19 test positivity and wastewater SARS-CoV-2 metric, HHS Region 1. (a) COVID-19 test volume (left y-axis; gray bars) and test positivity (right y-axis; red line) from NREVSS. (b) Aggregated wastewater SARS-CoV-2 RNA concentrations (left y-axis: normalized by PMMoV; right y-axis: unnormalized) and (c) aggregated wastewater viral activity levels (calculated using PMMoV-normalized and unnormalized concentrations) using wastewater monitoring data from the single laboratory program. Solid lines represent wastewater metrics determined using PMMoV-normalized concentrations; dashed lines represent wastewater metrics determined using unnormalized concentrations. Lines are colored by spatial aggregation method (purple: median, pink: unweighted average, orange: population-weighted average). Abbreviations: gc/g = gene copies per gram, HHS = Health and Human Services, NREVSS = National Respiratory and Enteric Virus Surveillance System, PMMoV = pepper mild mottle virus.
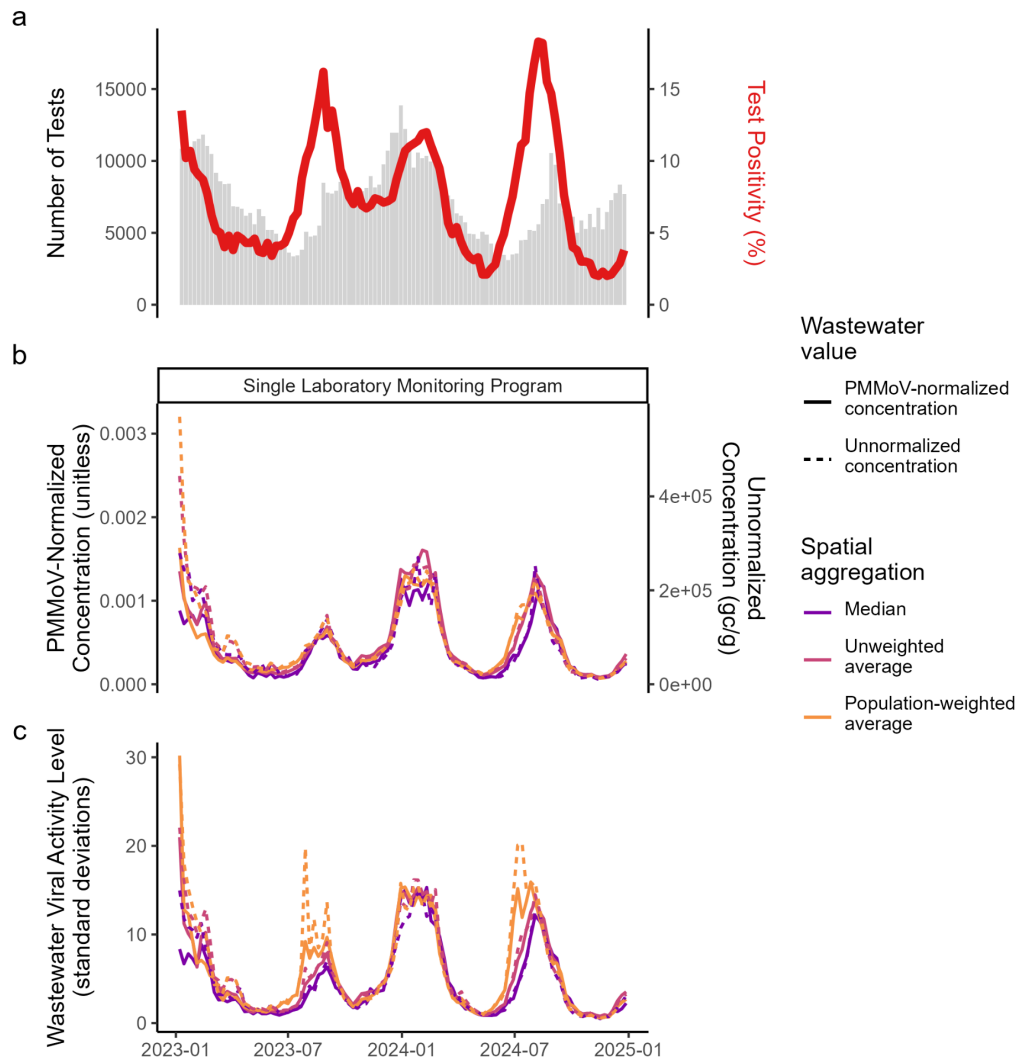
Fig. S2 Weekly temporal correlation between COVID-19 test positivity and wastewater SARS-CoV-2 metric, HHS Region 2. (a) COVID-19 test volume (left y-axis; gray bars) and test positivity (right y-axis; red line) from NREVSS. (b) Aggregated wastewater SARS-CoV-2 RNA concentrations (left y-axis: normalized by PMMoV; right y-axis: unnormalized) and (c) aggregated wastewater viral activity levels (calculated using PMMoV-normalized and unnormalized concentrations) using wastewater monitoring data from the single laboratory program. Solid lines represent wastewater metrics determined using PMMoV-normalized concentrations; dashed lines represent wastewater metrics determined using unnormalized concentrations. Lines are colored by spatial aggregation method (purple: median, pink: unweighted average, orange: population-weighted average). Abbreviations: gc/g = gene copies per gram, HHS = Health and Human Services, NREVSS = National Respiratory and Enteric Virus Surveillance System, PMMoV = pepper mild mottle virus.

Fig. S3 Weekly temporal correlation between COVID-19 test positivity and wastewater SARS-CoV-2 metric, HHS Region 3. (a) COVID-19 test volume (left y-axis; gray bars) and test positivity (right y-axis; red line) from NREVSS. (b) Aggregated wastewater SARS-CoV-2 RNA concentrations (left y-axis: normalized by PMMoV; right y-axis: unnormalized) and (c) aggregated wastewater viral activity levels (calculated using PMMoV-normalized and unnormalized concentrations) using wastewater monitoring data from the single laboratory program. Solid lines represent wastewater metrics determined using PMMoV-normalized concentrations; dashed lines represent wastewater metrics determined using unnormalized concentrations. Lines are colored by spatial aggregation method (purple: median, pink: unweighted average, orange: population-weighted average). Abbreviations: gc/g = gene copies per gram, HHS = Health and Human Services, NREVSS = National Respiratory and Enteric Virus Surveillance System, PMMoV = pepper mild mottle virus.
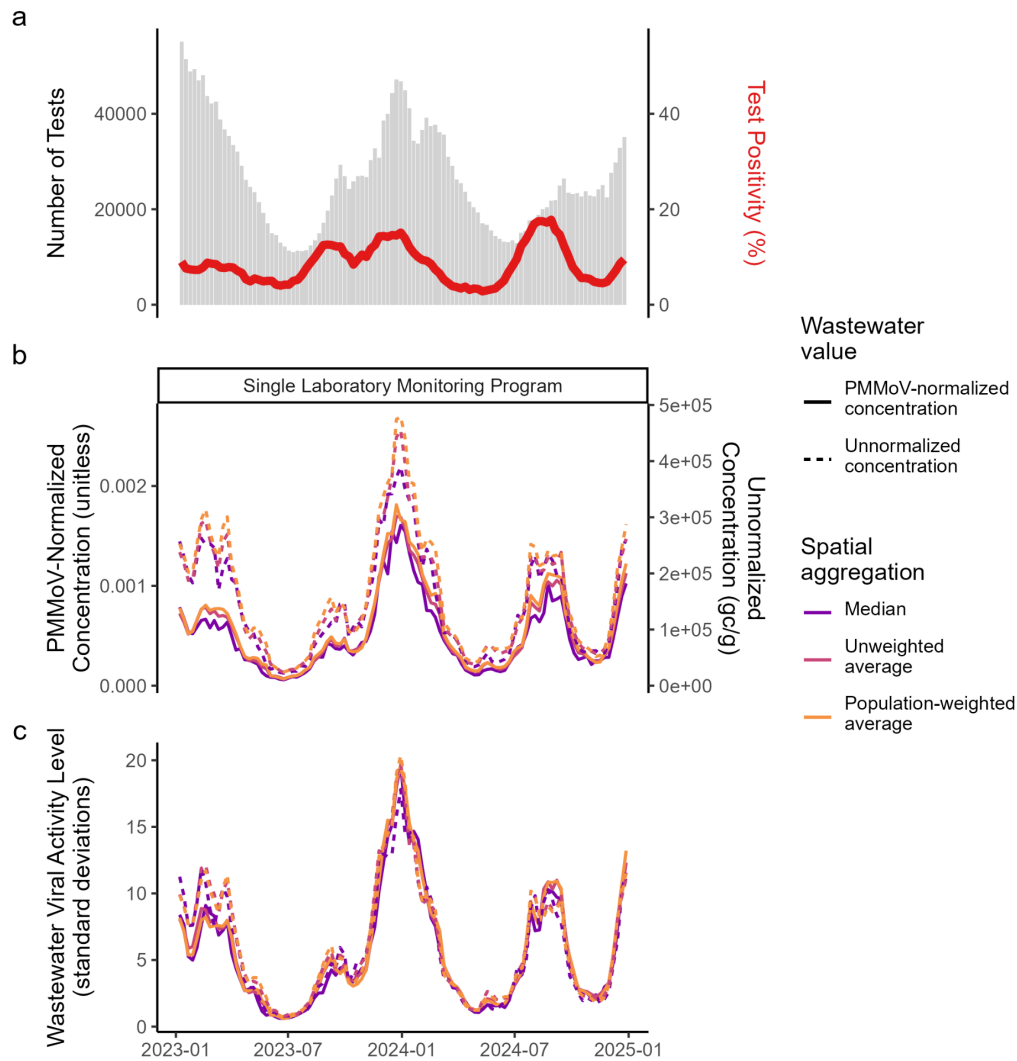
Fig. S4 Weekly temporal correlation between COVID-19 test positivity and wastewater SARS-CoV-2 metric, HHS Region 4. (a) COVID-19 test volume (left y-axis; gray bars) and test positivity (right y-axis; red line) from NREVSS. (b) Aggregated wastewater SARS-CoV-2 RNA concentrations (left y-axis: normalized by PMMoV; right y-axis: unnormalized) and (c) aggregated wastewater viral activity levels (calculated using PMMoV-normalized and unnormalized concentrations) using wastewater monitoring data from the single laboratory program. Solid lines represent wastewater metrics determined using PMMoV-normalized concentrations; dashed lines represent wastewater metrics determined using unnormalized concentrations. Lines are colored by spatial aggregation method (purple: median, pink: unweighted average, orange: population-weighted average). Abbreviations: gc/g = gene copies per gram, HHS = Health and Human Services, NREVSS = National Respiratory and Enteric Virus Surveillance System, PMMoV = pepper mild mottle virus.
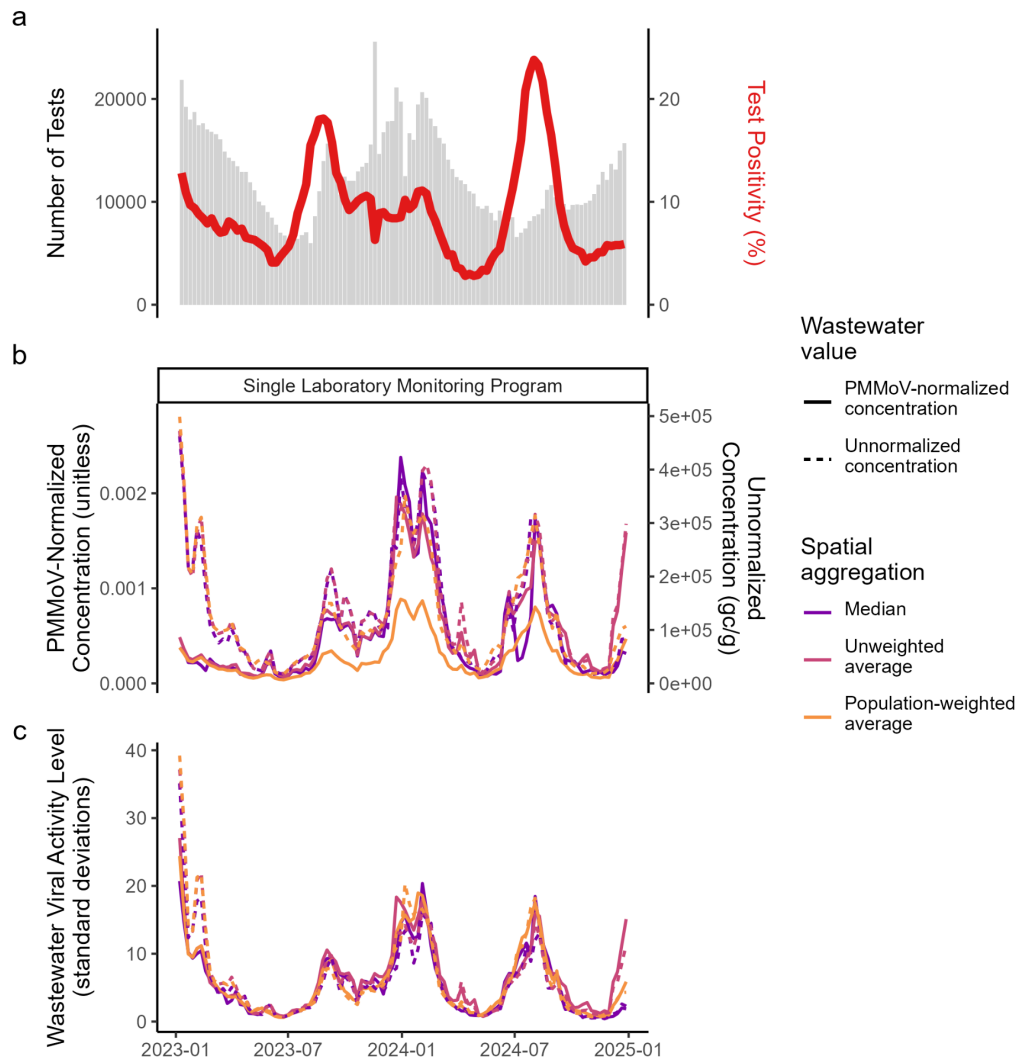
Fig. S5 Weekly temporal correlation between COVID-19 test positivity and wastewater SARS-CoV-2 metric, HHS Region 5. (a) COVID-19 test volume (left y-axis; gray bars) and test positivity (right y-axis; red line) from NREVSS. (b) Aggregated wastewater SARS-CoV-2 RNA concentrations (left y-axis: normalized by PMMoV; right y-axis: unnormalized) and (c) aggregated wastewater viral activity levels (calculated using PMMoV-normalized and unnormalized concentrations) using wastewater monitoring data from the single laboratory program. Solid lines represent wastewater metrics determined using PMMoV-normalized concentrations; dashed lines represent wastewater metrics determined using unnormalized concentrations. Lines are colored by spatial aggregation method (purple: median, pink: unweighted average, orange: population-weighted average). Abbreviations: gc/g = gene copies per gram, HHS = Health and Human Services, NREVSS = National Respiratory and Enteric Virus Surveillance System, PMMoV = pepper mild mottle virus.
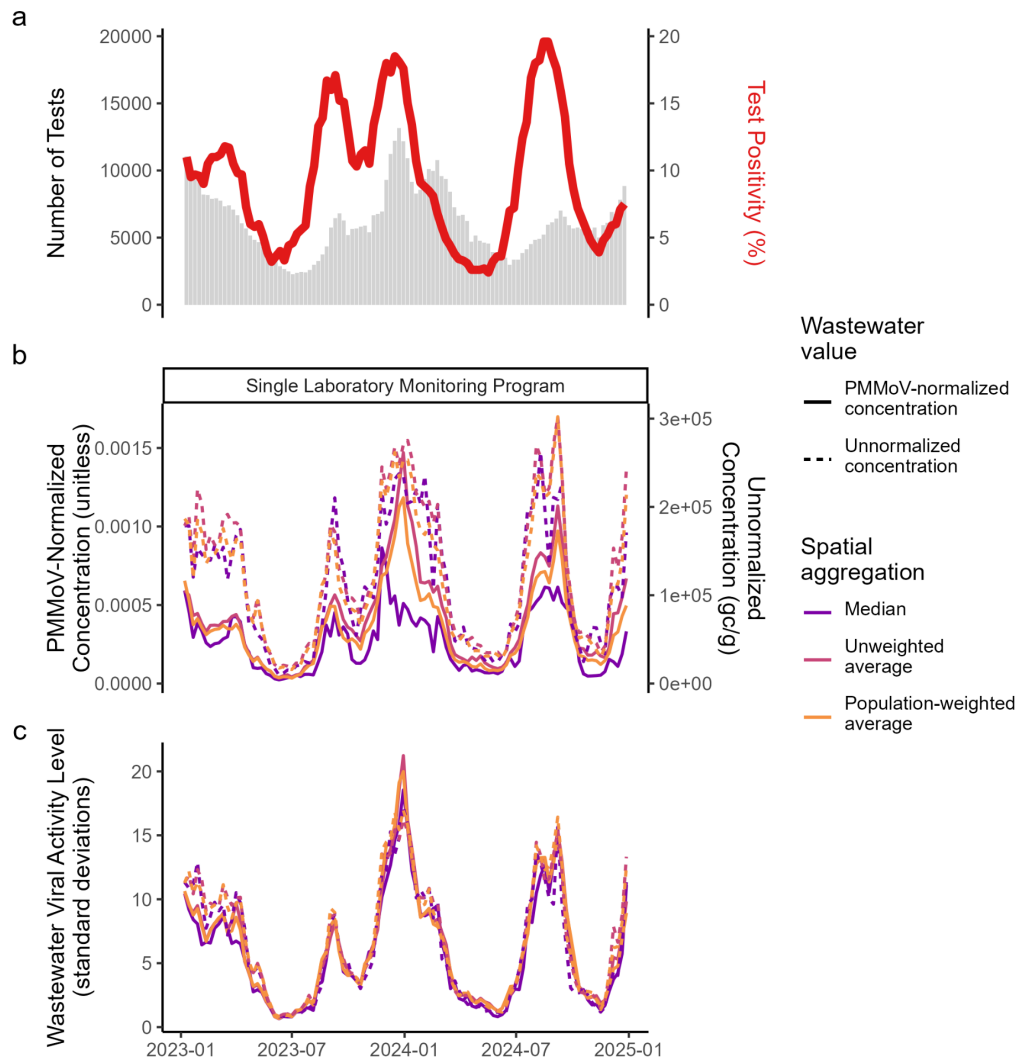
Fig. S6 Weekly temporal correlation between COVID-19 test positivity and wastewater SARS-CoV-2 metric, HHS Region 6. (a) COVID-19 test volume (left y-axis; gray bars) and test positivity (right y-axis; red line) from NREVSS. (b) Aggregated wastewater SARS-CoV-2 RNA concentrations (left y-axis: normalized by PMMoV; right y-axis: unnormalized) and (c) aggregated wastewater viral activity levels (calculated using PMMoV-normalized and unnormalized concentrations) using wastewater monitoring data from the single laboratory program. Solid lines represent wastewater metrics determined using PMMoV-normalized concentrations; dashed lines represent wastewater metrics determined using unnormalized concentrations. Lines are colored by spatial aggregation method (purple: median, pink: unweighted average, orange: population-weighted average). Abbreviations: gc/g = gene copies per gram, HHS = Health and Human Services, NREVSS = National Respiratory and Enteric Virus Surveillance System, PMMoV = pepper mild mottle virus.
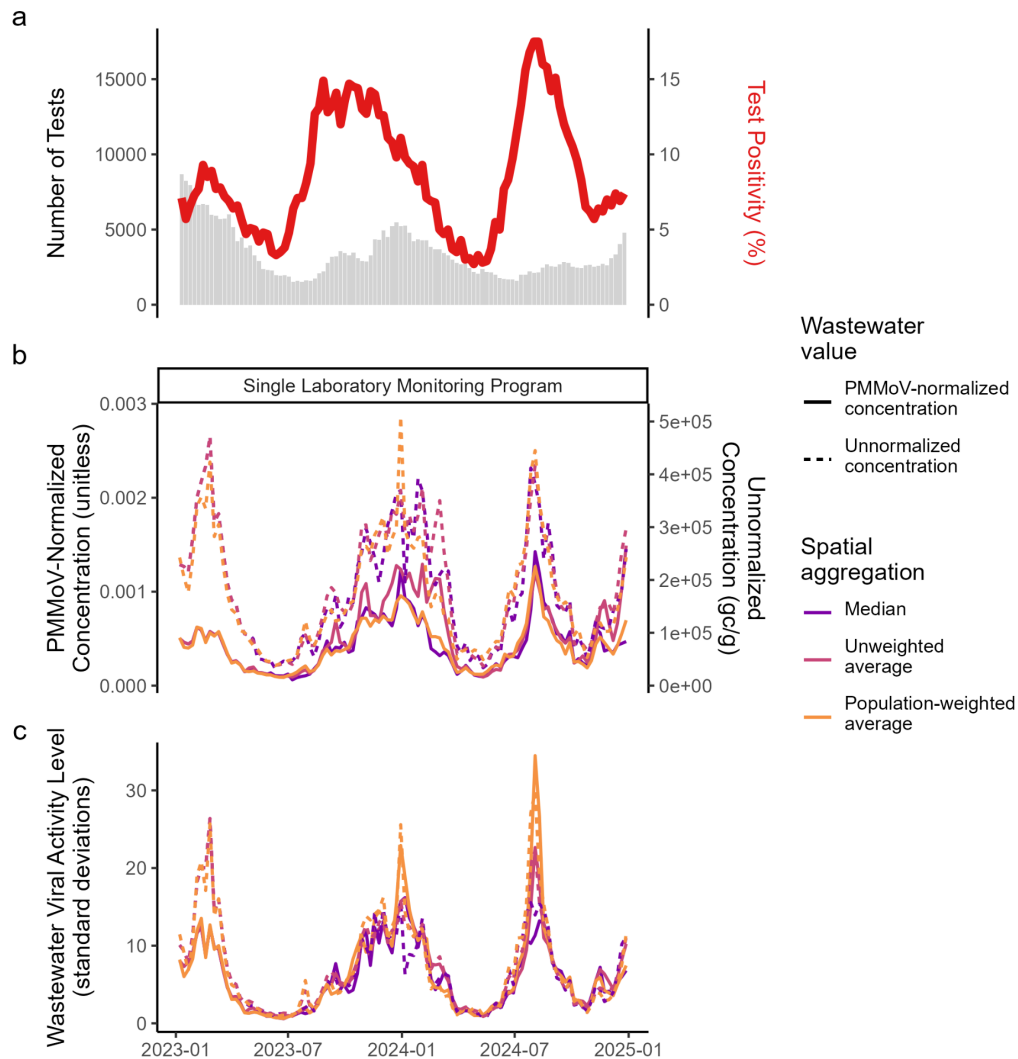
Fig. S7 Weekly temporal correlation between COVID-19 test positivity and wastewater SARS-CoV-2 metric, HHS Region 7. (a) COVID-19 test volume (left y-axis; gray bars) and test positivity (right y-axis; red line) from NREVSS. (b) Aggregated wastewater SARS-CoV-2 RNA concentrations (left y-axis: normalized by PMMoV; right y-axis: unnormalized) and (c) aggregated wastewater viral activity levels (calculated using PMMoV-normalized and unnormalized concentrations) using wastewater monitoring data from the single laboratory program. Solid lines represent wastewater metrics determined using PMMoV-normalized concentrations; dashed lines represent wastewater metrics determined using unnormalized concentrations. Lines are colored by spatial aggregation method (purple: median, pink: unweighted average, orange: population-weighted average). Abbreviations: gc/g = gene copies per gram, HHS = Health and Human Services, NREVSS = National Respiratory and Enteric Virus Surveillance System, PMMoV = pepper mild mottle virus.
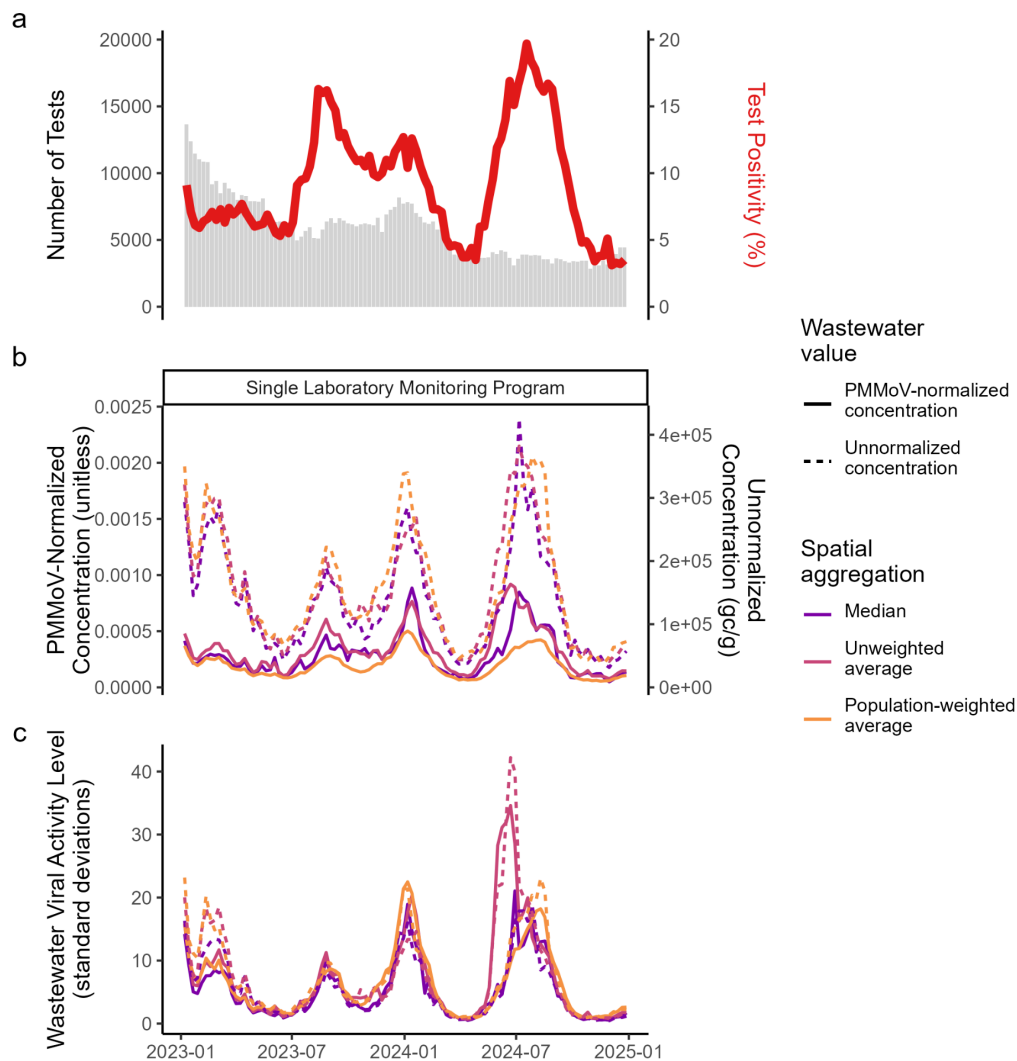
Fig. S8 Weekly temporal correlation between COVID-19 test positivity and wastewater SARS-CoV-2 metric, HHS Region 8. (a) COVID-19 test volume (left y-axis; gray bars) and test positivity (right y-axis; red line) from NREVSS. (b) Aggregated wastewater SARS-CoV-2 RNA concentrations (left y-axis: normalized by PMMoV; right y-axis: unnormalized) and (c) aggregated wastewater viral activity levels (calculated using PMMoV-normalized and unnormalized concentrations) using wastewater monitoring data from the single laboratory program. Solid lines represent wastewater metrics determined using PMMoV-normalized concentrations; dashed lines represent wastewater metrics determined using unnormalized concentrations. Lines are colored by spatial aggregation method (purple: median, pink: unweighted average, orange: population-weighted average). Abbreviations: gc/g = gene copies per gram, HHS = Health and Human Services, NREVSS = National Respiratory and Enteric Virus Surveillance System, PMMoV = pepper mild mottle virus.

Fig. S9 Weekly temporal correlation between COVID-19 test positivity and wastewater SARS-CoV-2 metric, HHS Region 9. (a) COVID-19 test volume (left y-axis; gray bars) and test positivity (right y-axis; red line) from NREVSS. (b) Aggregated wastewater SARS-CoV-2 RNA concentrations (left y-axis: normalized by PMMoV; right y-axis: unnormalized) and (c) aggregated wastewater viral activity levels (calculated using PMMoV-normalized and unnormalized concentrations) using wastewater monitoring data from the single laboratory program. Solid lines represent wastewater metrics determined using PMMoV-normalized concentrations; dashed lines represent wastewater metrics determined using unnormalized concentrations. Lines are colored by spatial aggregation method (purple: median, pink: unweighted average, orange: population-weighted average). Abbreviations: gc/g = gene copies per gram, HHS = Health and Human Services, NREVSS = National Respiratory and Enteric Virus Surveillance System, PMMoV = pepper mild mottle virus.
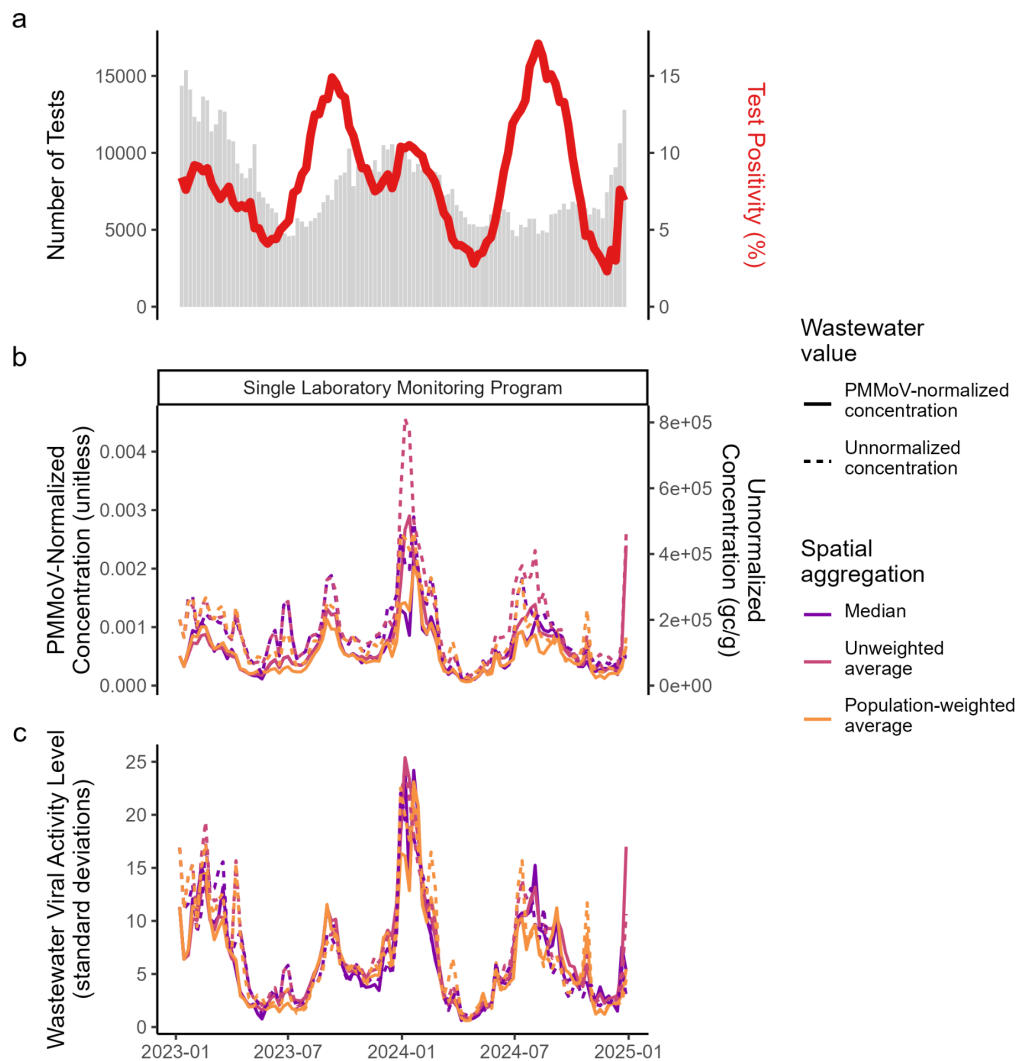
Fig. S10 Weekly temporal correlation between COVID-19 test positivity and wastewater SARS-CoV-2 metric, HHS Region 10. (a) COVID-19 test volume (left y-axis; gray bars) and test positivity (right y-axis; red line) from NREVSS. (b) Aggregated wastewater SARS-CoV-2 RNA concentrations (left y-axis: normalized by PMMoV; right y-axis: unnormalized) and (c) aggregated wastewater viral activity levels (calculated using PMMoV-normalized and unnormalized concentrations) using wastewater monitoring data from the single laboratory program. Solid lines represent wastewater metrics determined using PMMoV-normalized concentrations; dashed lines represent wastewater metrics determined using unnormalized concentrations. Lines are colored by spatial aggregation method (purple: median, pink: unweighted average, orange: population-weighted average). Abbreviations: gc/g = gene copies per gram, HHS = Health and Human Services, NREVSS = National Respiratory and Enteric Virus Surveillance System, PMMoV = pepper mild mottle virus.

Kendall's tau correlation results

Kendall's tau estimates with 95% confidence intervals (CIs) and p values are shown in **Table S4** for the California spatial scale (corresponds with **Fig. 4** in the main text), **Table S5** for the HHS region spatial scale (corresponds with **Fig. 5** in the main text), and **Table S6** for the national spatial scale (corresponds with **Fig. 6** in the main text).

Table S4. Temporal correlation between COVID-19 test positivity and SARS-CoV-2 wastewater metric: California spatial scale

Spatial Aggregation Method	Single laboratory program		Multi-laboratory program	
	Kendall's Tau [95% CI]	P Value	Kendall's Tau [95% CI]	P Value
Median of unnormalized concentrations	0.58 [0.51, 0.65]	< 0.0001		
Median of PMMoV-normalized concentrations	0.62 [0.57, 0.67]	< 0.0001	0.68 [0.63, 0.74]	< 0.0001
Unweighted average of unnormalized concentrations	0.59 [0.51, 0.66]	< 0.0001		
Unweighted average of PMMoV-normalized concentrations	0.61 [0.56, 0.66]	< 0.0001	0.63 [0.57, 0.70]	< 0.0001
Population-weighted average of unnormalized concentrations	0.64 [0.57, 0.70]	< 0.0001		
Population-weighted average of PMMoV-normalized concentrations	0.66 [0.61, 0.71]	< 0.0001	0.70 [0.65, 0.75]	< 0.0001
Median of WVAL using unnormalized concentrations	0.58 [0.51, 0.66]	< 0.0001		
Median of WVAL using PMMoV-normalized concentrations	0.64 [0.58, 0.70]	< 0.0001	0.67 [0.61, 0.72]	< 0.0001
Unweighted average of WVAL using unnormalized concentrations	0.58 [0.51, 0.65]	< 0.0001		
Unweighted average of WVAL using PMMoV-normalized concentrations	0.62 [0.56, 0.67]	< 0.0001	0.66 [0.60, 0.72]	< 0.0001
Population-weighted average of WVAL using unnormalized concentrations	0.62 [0.56, 0.69]	< 0.0001		
Population-weighted average of WVAL using PMMoV-normalized concentrations	0.67 [0.61, 0.72]	< 0.0001	0.69 [0.64, 0.74]	< 0.0001

COVID-19 test positivity data for California are from CDPH. State aggregated SARS-CoV-2 wastewater metrics are from either the single laboratory monitoring program or the multi-laboratory monitoring program (indicated by column header). Spatial aggregation approaches using unnormalized concentrations were not considered when using wastewater monitoring data from the multi-laboratory monitoring program; blank cells denote no correlation was calculated.

Abbreviations: CDPH = California Department of Public Health, CI = confidence interval, PMMoV = pepper mild mottle virus, WVAL = wastewater viral activity level

Table S5. Temporal correlation between COVID-19 test positivity and SARS-CoV-2 wastewater metric: HHS region spatial scale

Spatial Aggregation Method	Kendall's Tau [95% CI] (P value)									
	HHS 1	HHS 2	HHS 3	HHS 4	HHS 5	HHS 6	HHS 7	HHS 8	HHS 9	HHS 10
Median of unnormalized concentrations	0.49 [0.42, 0.57] (< 0.0001)	0.55 [0.47, 0.62] (< 0.0001)	0.59 [0.52, 0.66] (< 0.0001)	0.65 [0.60, 0.70] (< 0.0001)	0.53 [0.46, 0.60] (< 0.0001)	0.50 [0.43, 0.58] (< 0.0001)	0.56 [0.49, 0.64] (< 0.0001)	0.42 [0.31, 0.52] (< 0.0001)	0.54 [0.44, 0.64] (< 0.0001)	0.49 [0.40, 0.57] (< 0.0001)
Median of PMMoV-normalized concentrations	0.55 [0.48, 0.62] (< 0.0001)	0.56 [0.49, 0.63] (< 0.0001)	0.61 [0.54, 0.68] (< 0.0001)	0.66 [0.61, 0.71] (< 0.0001)	0.56 [0.49, 0.62] (< 0.0001)	0.43 [0.35, 0.51] (< 0.0001)	0.60 [0.53, 0.67] (< 0.0001)	0.51 [0.42, 0.60] (< 0.0001)	0.66 [0.60, 0.73] (< 0.0001)	0.59 [0.54, 0.65] (< 0.0001)
Unweighted average of unnormalized concentrations	0.47 [0.39, 0.56] (< 0.0001)	0.56 [0.49, 0.63] (< 0.0001)	0.59 [0.52, 0.65] (< 0.0001)	0.65 [0.59, 0.71] (< 0.0001)	0.53 [0.47, 0.6] (< 0.0001)	0.44 [0.35, 0.53] (< 0.0001)	0.58 [0.51, 0.65] (< 0.0001)	0.41 [0.30, 0.52] (< 0.0001)	0.54 [0.44, 0.64] (< 0.0001)	0.48 [0.38, 0.57] (< 0.0001)
Unweighted average of PMMoV-normalized concentrations	0.55 [0.48, 0.62] (< 0.0001)	0.56 [0.49, 0.63] (< 0.0001)	0.67 [0.61, 0.73] (< 0.0001)	0.69 [0.64, 0.74] (< 0.0001)	0.55 [0.49, 0.62] (< 0.0001)	0.39 [0.30, 0.47] (< 0.0001)	0.60 [0.52, 0.67] (< 0.0001)	0.39 [0.28, 0.51] (< 0.0001)	0.67 [0.62, 0.72] (< 0.0001)	0.59 [0.52, 0.65] (< 0.0001)
Population-weighted average of unnormalized concentrations	0.46 [0.39, 0.53] (< 0.0001)	0.53 [0.45, 0.61] (< 0.0001)	0.59 [0.52, 0.66] (< 0.0001)	0.68 [0.63, 0.74] (< 0.0001)	0.53 [0.47, 0.60] (< 0.0001)	0.51 [0.44, 0.58] (< 0.0001)	0.61 [0.54, 0.68] (< 0.0001)	0.49 [0.39, 0.58] (< 0.0001)	0.56 [0.46, 0.65] (< 0.0001)	0.42 [0.33, 0.52] (< 0.0001)
Population-weighted average of PMMoV-normalized concentrations	0.55 [0.48, 0.62] (< 0.0001)	0.54 [0.47, 0.61] (< 0.0001)	0.67 [0.60, 0.73] (< 0.0001)	0.72 [0.67, 0.76] (< 0.0001)	0.55 [0.48, 0.62] (< 0.0001)	0.47 [0.39, 0.55] (< 0.0001)	0.63 [0.57, 0.70] (< 0.0001)	0.50 [0.41, 0.59] (< 0.0001)	0.62 [0.55, 0.69] (< 0.0001)	0.56 [0.48, 0.63] (< 0.0001)
Median of WVAL using unnormalized concentrations	0.45 [0.37, 0.53] (< 0.0001)	0.53 [0.45, 0.60] (< 0.0001)	0.61 [0.55, 0.67] (< 0.0001)	0.66 [0.61, 0.71] (< 0.0001)	0.53 [0.47, 0.60] (< 0.0001)	0.52 [0.45, 0.60] (< 0.0001)	0.55 [0.48, 0.62] (< 0.0001)	0.45 [0.35, 0.56] (< 0.0001)	0.53 [0.43, 0.63] (< 0.0001)	0.44 [0.35, 0.54] (< 0.0001)
Median of WVAL using PMMoV-normalized concentrations	0.52 [0.44, 0.59] (< 0.0001)	0.56 [0.49, 0.63] (< 0.0001)	0.67 [0.61, 0.73] (< 0.0001)	0.68 [0.64, 0.73] (< 0.0001)	0.55 [0.49, 0.62] (< 0.0001)	0.57 [0.51, 0.64] (< 0.0001)	0.59 [0.52, 0.67] (< 0.0001)	0.47 [0.38, 0.56] (< 0.0001)	0.59 [0.51, 0.67] (< 0.0001)	0.52 [0.45, 0.6] (< 0.0001)

Spatial Aggregation Method	Kendall's Tau [95% CI] (P value)									
	HHS 1	HHS 2	HHS 3	HHS 4	HHS 5	HHS 6	HHS 7	HHS 8	HHS 9	HHS 10
Unweighted average of WVAL using unnormalized concentrations	0.46 [0.37, 0.54] (< 0.0001)	0.54 [0.47, 0.62] (< 0.0001)	0.60 [0.54, 0.66] (< 0.0001)	0.65 [0.60, 0.71] (< 0.0001)	0.53 [0.47, 0.59] (< 0.0001)	0.44 [0.35, 0.53] (< 0.0001)	0.57 [0.50, 0.64] (< 0.0001)	0.47 [0.36, 0.57] (< 0.0001)	0.53 [0.43, 0.62] (< 0.0001)	0.44 [0.34, 0.53] (< 0.0001)
Unweighted average of WVAL using PMMoV-normalized concentrations	0.55 [0.47, 0.62] (< 0.0001)	0.56 [0.49, 0.63] (< 0.0001)	0.67 [0.61, 0.73] (< 0.0001)	0.68 [0.64, 0.73] (< 0.0001)	0.57 [0.51, 0.63] (< 0.0001)	0.47 [0.38, 0.55] (< 0.0001)	0.59 [0.52, 0.66] (< 0.0001)	0.47 [0.37, 0.56] (< 0.0001)	0.58 [0.50, 0.66] (< 0.0001)	0.53 [0.45, 0.61] (< 0.0001)
Population-weighted average of WVAL using unnormalized concentrations	0.55 [0.48, 0.61] (< 0.0001)	0.54 [0.48, 0.61] (< 0.0001)	0.64 [0.57, 0.71] (< 0.0001)	0.71 [0.66, 0.76] (< 0.0001)	0.57 [0.51, 0.62] (< 0.0001)	0.56 [0.50, 0.63] (< 0.0001)	0.61 [0.54, 0.67] (< 0.0001)	0.52 [0.43, 0.61] (< 0.0001)	0.58 [0.51, 0.65] (< 0.0001)	0.50 [0.42, 0.58] (< 0.0001)
Population-weighted average of WVAL using PMMoV-normalized concentrations	0.45 [0.37, 0.52] (< 0.0001)	0.54 [0.46, 0.61] (< 0.0001)	0.57 [0.50, 0.63] (< 0.0001)	0.66 [0.61, 0.72] (< 0.0001)	0.54 [0.47, 0.60] (< 0.0001)	0.51 [0.44, 0.59] (< 0.0001)	0.58 [0.52, 0.65] (< 0.0001)	0.52 [0.42, 0.61] (< 0.0001)	0.54 [0.44, 0.63] (< 0.0001)	0.40 [0.30, 0.50] (< 0.0001)

COVID-19 test positivity data for each HHS region are from NREVSS. Regionally aggregated SARS-CoV-2 wastewater metrics are from the single laboratory monitoring program.

Abbreviations: CI = confidence interval, HHS = Health and Human Services, NREVSS = National Respiratory and Enteric Virus Surveillance System, PMMoV = pepper mild mottle virus, WVAL = wastewater viral activity level

Table S6. Temporal correlation between COVID-19 test positivity and SARS-CoV-2 wastewater metric: USA spatial scale

Spatial Aggregation Method	Kendall's Tau [95% CI]	P Value
Median of unnormalized concentrations	0.54 [0.47, 0.61]	< 0.0001
Median of PMMoV-normalized concentrations	0.58 [0.52, 0.64]	< 0.0001
Unweighted average of unnormalized concentrations	0.53 [0.46, 0.61]	< 0.0001
Unweighted average of PMMoV-normalized concentrations	0.57 [0.50, 0.63]	< 0.0001
Population-weighted average of unnormalized concentrations	0.56 [0.50, 0.63]	< 0.0001
Population-weighted average of PMMoV-normalized concentrations	0.59 [0.53, 0.64]	< 0.0001
Median of WVAL using unnormalized concentrations	0.53 [0.47, 0.60]	< 0.0001
Median of WVAL using PMMoV-normalized concentrations	0.57 [0.51, 0.63]	< 0.0001
Unweighted average of WVAL using unnormalized concentrations	0.52 [0.45, 0.60]	< 0.0001
Unweighted average of WVAL using PMMoV-normalized concentrations	0.57 [0.51, 0.63]	< 0.0001
Population-weighted average of WVAL using unnormalized concentrations	0.57 [0.50, 0.64]	< 0.0001
Population-weighted average of WVAL using PMMoV-normalized concentrations	0.62 [0.57, 0.68]	< 0.0001

COVID-19 test positivity data for the USA are from NREVSS. Nationally aggregated SARS-CoV-2 wastewater metrics are from the single laboratory monitoring program.

Abbreviations: CI = confidence interval, PMMoV = pepper mild mottle virus, NREVSS = National Respiratory and Enteric Virus Surveillance System, WVAL = wastewater viral activity level

Supplementary analysis: Flowpop normalization

Normalizing wastewater concentrations by flow rate and population ("flowpop") is an alternative normalization technique used by some wastewater monitoring programs. The multi-laboratory program includes some WWTPs reporting flow rate measurements, so we conducted a supplementary analysis using flowpop-normalized input wastewater values [3]. In total, 29 WWTPs spanning 24 unique counties reported flow rate in units of millions of gallons per day (MGD) during the study period. Samples collected from these WWTPs all reported SARS-CoV-2 RNA concentrations in units of gene copies per liter (gc/L). We normalized concentrations by flow and population as shown below.

$$normalized\ concentration\ [gc/d/person] =$$

$$\frac{concentration\ [gc/L] * flow\ rate\ [MGD]}{population\ served\ [persons]} * 3.78541\ [L/gal] * 10^6 [gal/million\ gal]$$

We further prepared and spatially aggregated flowpop-normalized concentrations as described in the main text. This supplementary analysis was only conducted at the California spatial scale using data from the multi-laboratory monitoring program as the single laboratory program does not report flow rate. Weekly SARS-CoV-2 wastewater metrics determined using flowpop-normalized input wastewater values and spatially aggregated for California are shown in **Fig. S11**. Results from Kendall's tau correlation between COVID-19 test positivity and each SARS-CoV-2 wastewater metric are reported in **Table S7**.
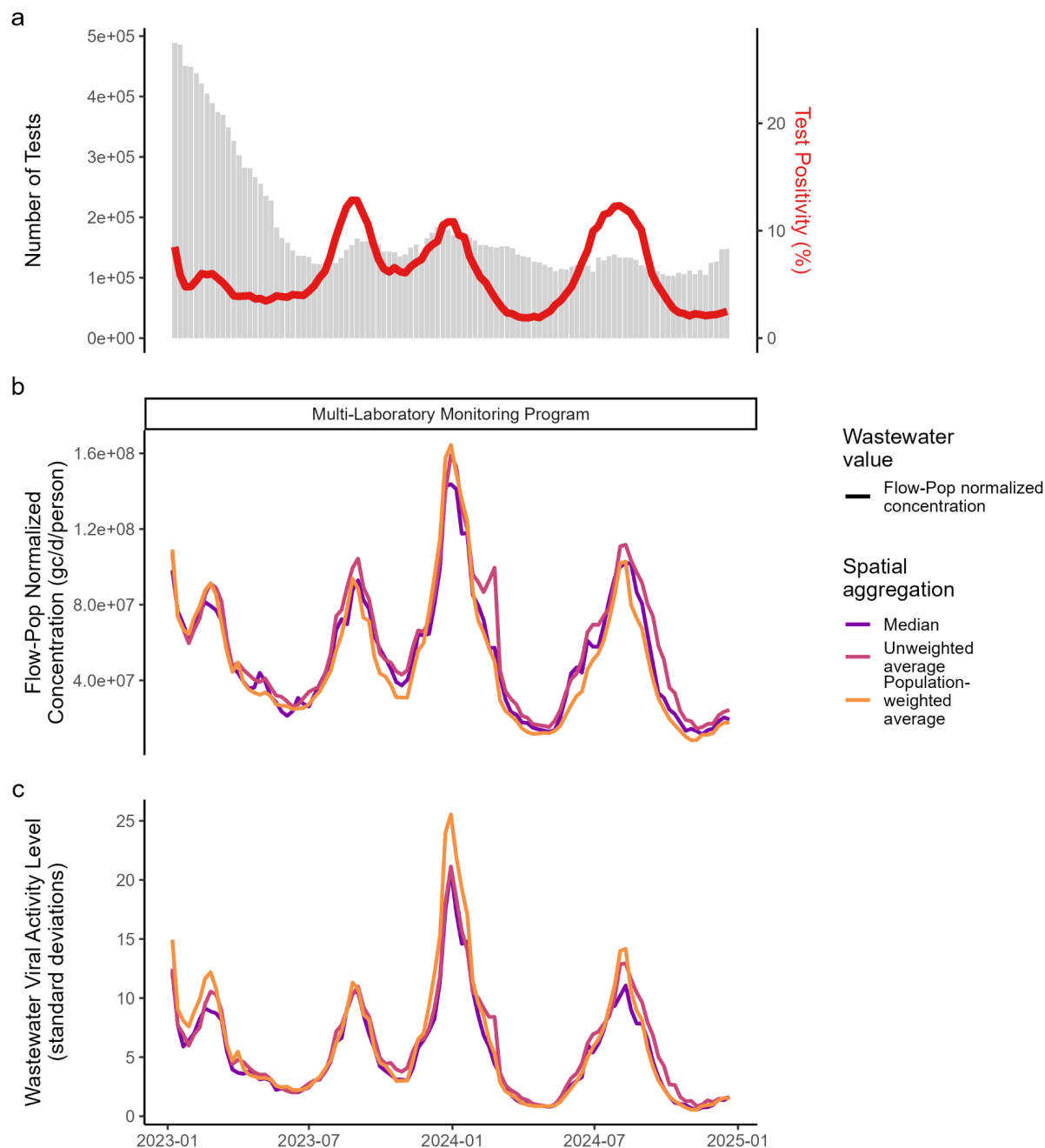
Fig. S11 Weekly temporal correlation between COVID-19 test positivity and wastewater SARS-CoV-2 metric, California spatial scale. (a) California COVID-19 test volume (left y-axis; gray bars) and test positivity (right y-axis; red line) from CDPH. (b) State aggregated wastewater SARS-CoV-2 RNA concentrations (flowpop-normalized concentrations only) and (c) state aggregated wastewater viral activity levels (calculated using flowpop-normalized concentrations only) using wastewater monitoring data from the multi-laboratory program. Lines are colored by spatial aggregation method (purple: median, pink: unweighted average, orange: population-weighted average). Abbreviations: CDPH = California Department of Public Health, gc/d/person = gene copies per day per person.

Table S7. Temporal correlation between COVID-19 test positivity and SARS-CoV-2 wastewater metric: California spatial scale with flowpop normalization

Spatial Aggregation Method	Kendall's Tau [95% CI]	P Value
Median of flowpop-normalized concentrations	0.71 [0.66, 0.75]	< 0.0001
Unweighted average of flowpop-normalized concentrations	0.71 [0.65, 0.76]	< 0.0001
Population-weighted average of flowpop-normalized concentrations	0.67 [0.62, 0.73]	< 0.0001
Median of WVAL using flowpop-normalized concentrations	0.69 [0.65, 0.74]	< 0.0001
Unweighted average of WVAL using flowpop-normalized concentrations	0.70 [0.65, 0.76]	< 0.0001
Population-weighted average of WVAL using flowpop-normalized concentrations	0.67 [0.62, 0.72]	< 0.0001

COVID-19 test positivity data for California from CDPH. State aggregated SARS-CoV-2 wastewater metrics from the multi-laboratory monitoring program.

Abbreviations: CDPH = California Department of Public Health, CI = confidence interval, WVAL = wastewater viral activity level, WWTP = wastewater treatment plant

References

1. Boehm AB, Wolfe MK, Bidwell AL, Zulli A, Chan-Herur V, White BJ, Shelden B, Duong D. Human pathogen nucleic acids in wastewater solids from 191 wastewater treatment plants in the United States. Sci Data. 2024 Oct 17;11(1):1141.

2. U.S. Census Bureau, Population Division. Annual Estimates of the Resident Population for the United States, Regions, States, District of Columbia, and Puerto Rico: April 1, 2020 to July 1, 2023 (NST-EST2023-POP) [Internet]. United States Census Bureau; 2023 [cited 2024 Apr 2]. Available from: https://www.census.gov/data/tables/time-series/demo/popest/2020s-state-total.html

3. California Department of Public Health. CDPH-Wastewater Surveillance Data, California [Internet]. California Health and Human Services Open Data Portal. [cited 2025 Mar 10]. Available from: https://data.chhs.ca.gov/dataset/wastewater-surveillance-data-california

4. U.S. Census Bureau. 2018-2022 American Community Survey 5-Year Data [Internet]. [cited 2025 Feb 24]. Available from: https://www.census.gov/programs-surveys/acs/data.html

5. Karthikeyan S, Ronquillo N, Belda-Ferre P, Alvarado D, Javidi T, Longhurst CA, Knight R. High-Throughput Wastewater SARS-CoV-2 Detection Enables Forecasting of Community Infection Dynamics in San Diego County. mSystems. 2021 Mar 2;6(2):10.1128/msystems.00045-21.

6. U.S. Centers for Disease Control and Prevention. About Wastewater Data [Internet]. Centers for Disease Control and Prevention. 2025 [cited 2025 Mar 12]. Available from: https://www.cdc.gov/nwss/about-data.html