

SUPPLEMENTARY INFORMATION

Selected Pharmaceutical Analysis in a Wastewater Treatment Plant during COVID-19 Infection Waves in South Africa

Nikitha Inarmal and Brenda Moodley*

School of Chemistry and Physics, University of KwaZulu-Natal, Westville Campus, 4000,
South Africa

E-mail first author: 215001342@stu.ukzn.ac.za

*E-mail corresponding author: moodleyb3@ukzn.ac.za

List of tables and figures

Table S1: pH values obtained for samples over each sampling season

Table S2: Inlet concentrations of analytes quantified during each sampling period

Table S3: Daily active COVID-19 cases experienced in South Africa during sampling periods

Figure S1: Relationship between daily pharmaceutical concentration and daily COVID-19 cases

Table S1: pH values obtained for samples over each sampling season

	Date	pH at sampling points			
		Inlet	Balancing tank	Secondary effluent	Maturation river
January/February 2022	31/01/2022	4.68	6.63	7.02	7.97
	1/02/2022	5.21	6.03	7.34	7.63
	2/02/2022	5.36	6.64	6.97	7.09
	3/02/2022	5.47	6.97	7.22	7.75
	4/02/2022	6.41	6.91	7.85	7.69
	5/02/2022	5.10	7.25	7.41	7.84
	6/02/2022	4.31	6.12	7.77	7.61
April 2022	18/04/2022	6.37	6.33	7.36	7.56
	19/04/2022	6.45	6.41	7.21	7.87
	20/04/2022	6.81	6.96	7.02	7.96
	21/04/2022	5.36	6.77	7.69	7.41
	22/04/2022	6.83	5.37	7.87	8.82
	23/04/2022	5.62	6.82	8.36	7.65
	24/04/2022	5.77	6.45	6.99	7.90
June 2022	6/06/2022	5.19	6.91	7.42	8.14
	7/06/2022	6.16	6.19	7.31	7.66
	8/06/2022	5.78	6.88	7.91	8.52
	9/06/2022	5.91	6.46	7.08	7.69
	10/06/2022	5.12	6.31	7.63	7.47
	11/06/2022	6.31	6.28	7.55	7.23
	12/06/2022	6.07	6.74	7.38	7.44

Table S2: Inlet concentrations of analytes quantified during each sampling period

Analyte	Day	Concentrations/mg L ⁻¹		
		FEB 2022	APR 2022	JUN 2022
		INLET	INLET	INLET
MET	Mon	0.1390 ± 0.008815	0.05727 ± 0.0001500	0.07748 ± 0.003010
	Tues	0.08065 ± 0.01126	0.04458 ± 0.004890	0.02550 ± 0.002497
	Wed	0.06350 ± 0.007637	0.1905 ± 0.0004100	0.07081 ± 0.01697
	Thurs	0.1093 ± 0.01427	0.04449 ± 0.0005300	0.02884 ± 0.004940
	Fri	0.01883 ± 0.002544	0.04744 ± 0.0009400	0.02933 ± 0.001369
	Sat	0.1793 ± 0.007225	0.08553 ± 0.0004900	0.04740 ± 0.006980
	Sun	0.1456 ± 0.03178	0.03650 ± 0.001120	0.08211 ± 0.002210
CAF	Mon	0.09350 ± 0.01617	0.1436 ± 0.002720	0.1488 ± 0.08740
	Tues	0.2138 ± 0.01033	0.2479 ± 0.0007700	0.9241 ± 0.06865
	Wed	0.06947 ± 0.03386	0.2476 ± 0.005030	1.094 ± 0.1604
	Thurs	0.06928 ± 0.02598	0.1892 ± 0.001650	1.149 ± 0.1306
	Fri	0.007587 ± 0.001230	0.1998 ± 0.0003800	1.174 ± 0.1531
	Sat	0.1066 ± 0.004490	0.2049 ± 0.003210	1.125 ± 0.1720
	Sun	0.07947 ± 0.007450	0.1973 ± 0.003700	1.243 ± 0.01137
SMX NOH	Mon	0.2421 ± 0.0383	0.05215 ± 0.001690	0.09135 ± 0.006360
	Tues	0.2035 ± 0.05850	0.08105 ± 0.001610	0.2878 ± 0.1352
	Wed	0.2139 ± 0.02570	0.08705 ± 0.0003300	0.2921 ± 0.005850
	Thurs	0.2667 ± 0.05030	0.06976 ± 0.0004000	0.2754 ± 0.004490
	Fri	0.3438 ± 0.03640	0.08285 ± 0.0002600	0.2904 ± 0.04369
	Sat	0.2693 ± 0.01140	0.1409 ± 0.0002600	0.2786 ± 0.01121
	Sun	0.2476 ± 0.06660	0.08423 ± 0.0002200	0.2840 ± 0.01198
SMX	Mon	0.1760 ± 0.007700	0.009818 ± 0.0006100	0.2022 ± 0.01646
	Tues	0.1128 ± 0.01132	0.01650 ± 0.005200	0.3002 ± 0.001380
	Wed	0.09471 ± 0.007400	0.03435 ± 0.0003700	0.2157 ± 0.01612
	Thurs	0.09465 ± 0.01250	0.02521 ± 0.0003100	0.2196 ± 0.01367
	Fri	0.05661 ± 0.002620	0.04040 ± 0.0003100	0.2156 ± 0.01506
	Sat	0.1912 ± 0.006100	0.1024 ± 0.0005800	0.2239 ± 0.009250
	Sun	0.1585 ± 0.03500	0.03569 ± 0.001230	0.2174 ± 0.008810
NEV	Mon	0.1780 ± 0.006200	0.01522 ± 0.0003600	0.09738 ± 0.003180
	Tues	0.1310 ± 0.08490	0.01556 ± 0.004920	0.1038 ± 0.002470
	Wed	0.1375 ± 0.006100	0.03878 ± 0.0004100	0.1052 ± 0.008040
	Thurs	0.1190 ± 0.01050	0.03163 ± 0.0003600	0.09983 ± 0.005470
	Fri	0.07090 ± 0.01930	0.03755 ± 0.0001100	0.1023 ± 0.008520

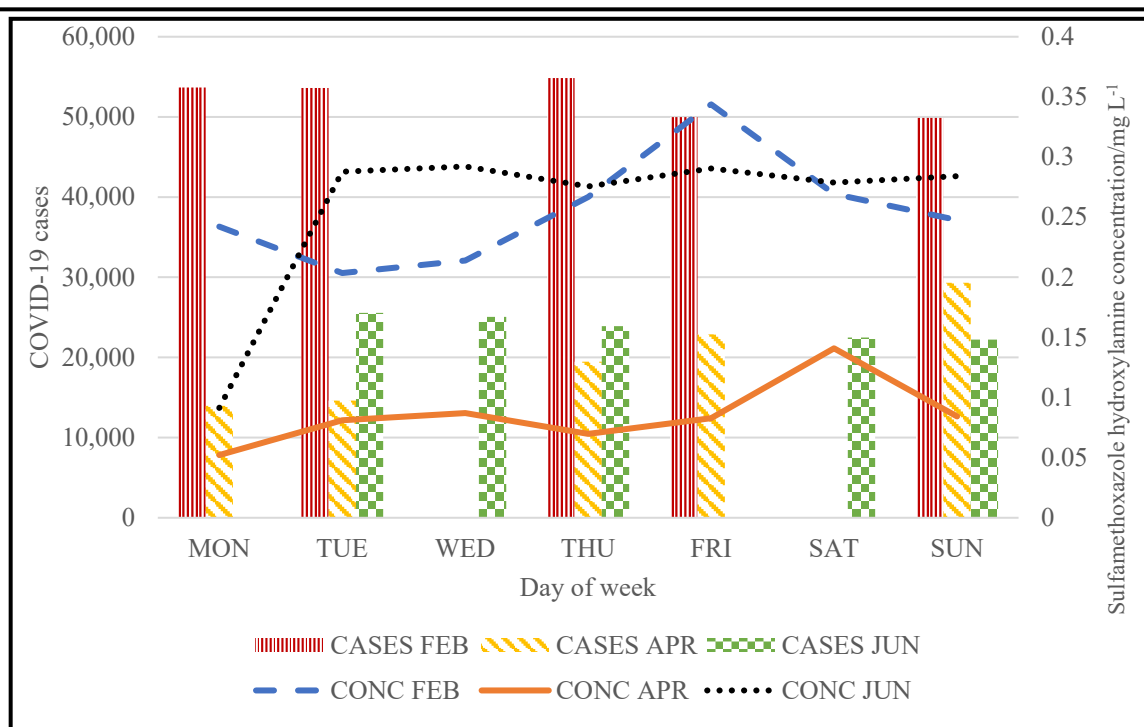
	Sat	0.2032 ± 0.005700	0.1093 ± 0.0005600	0.1099 ± 0.007980
	Sun	0.1679 ± 0.03280	0.03568 ± 0.0002500	0.1298 ± 0.02944
PRED	Mon	0.1854 ± 0.03210	0.01249 ± 0.001200	0.05159 ± 0.005290
	Tues	0.1383 ± 0.08430	0.008775 ± 0.0001027	0.01343 ± 0.002428
	Wed	0.1396 ± 0.005900	0.01359 ± 0.0004700	0.05012 ± 0.02065
	Thurs	0.1428 ± 0.01070	0.02280 ± 0.0002800	0.4482 ± 0.07341
	Fri	0.08830 ± 0.01780	0.03478 ± 0.0006300	0.1408 ± 0.01185
	Sat	0.2052 ± 0.005400	0.1079 ± 0.0006100	0.1362 ± 0.02599
	Sun	0.1751 ± 0.03040	0.04799 ± 0.0001800	0.08158 ± 0.01165
VAL	Mon	0.1813 ± 0.05940	0.02325 ± 0.001200	0.2238 ± 0.01999
	Tues	0.1265 ± 0.08790	0.02129 ± 0.01314	0.2319 ± 0.02237
	Wed	0.1271 ± 0.006100	0.04456 ± 0.0008300	0.2290 ± 0.05301
	Thurs	0.1304 ± 0.01120	0.02999 ± 0.0005400	0.2719 ± 0.08014
	Fri	0.06860 ± 0.01900	0.04299 ± 0.0005100	0.1204 ± 0.02827
	Sat	0.2080 ± 0.005400	0.1132 ± 0.0005900	0.2323 ± 0.01220
	Sun	0.1720 ± 0.03110	0.05348 ± 0.0005200	0.1422 ± 0.04834
RIF	Mon	0.1217 ± 0.01230	0.1608 ± 0.0008100	0.3449 ± 0.008470
	Tues	0.1205 ± 0.02280	0.1448 ± 0.0003800	0.2057 ± 0.008670
	Wed	0.1231 ± 0.003500	0.2656 ± 0.001200	0.1626 ± 0.02959
	Thurs	0.1344 ± 0.005300	0.2696 ± 0.001630	0.1950 ± 0.09376
	Fri	0.1674 ± 0.008400	0.2947 ± 0.00005400	0.2020 ± 0.01627
	Sat	0.1621 ± 0.003900	0.2944 ± 0.0008200	0.2153 ± 0.007170
	Sun	0.1673 ± 0.01460	0.2921 ± 0.0002400	0.1478 ± 0.01434
EE2	Mon	0.1835 ± 0.01130	0.008684 ± 0.0006600	0.2590 ± 0.07143
	Tues	0.1213 ± 0.09270	0.01163 ± 0.006320	0.2121 ± 0.07863
	Wed	0.1151 ± 0.007300	0.01709 ± 0.0005000	0.1381 ± 0.009710
	Thurs	0.1098 ± 0.01140	0.02150 ± 0.0003600	0.2009 ± 0.01040
	Fri	0.05119 ± 0.002830	0.04390 ± 0.0005400	0.1138 ± 0.006160
	Sat	0.2010 ± 0.006300	0.1058 ± 0.0008700	0.2364 ± 0.03551
	Sun	0.1663 ± 0.03220	0.04119 ± 0.0004400	0.2701 ± 0.01845
IVE	Mon	0.6525 ± 0.07831	0.008520 ± 0.002240	0.1129 ± 0.02020
	Tues	0.2979 ± 0.07156	0.008184 ± 0.006100	0.09050 ± 0.004600
	Wed	0.4630 ± 0.02426	0.02382 ± 0.004410	0.07600 ± 0.01180
	Thurs	0.8289 ± 0.01025	0.04796 ± 0.0006200	0.1002 ± 0.005800
	Fri	0.4668 ± 0.1307	0.02185 ± 0.009190	0.02954 ± 0.008500
	Sat	0.5610 ± 0.003946	0.1043 ± 0.001220	0.1245 ± 0.001800
	Sun	0.9794 ± 0.2776	0.03163 ± 0.0007000	0.1018 ± 0.01450

MET: metformin, CAF: caffeine, SMX NOH: sulfamethoxazole hydroxylamine, SMX: sulfamethoxazole, NEV: nevirapine, PRED: prednisolone, VAL: valsartan, RIF: rifampicin, EE2: 17 α -ethynylestradiol, IVE: ivermectin.

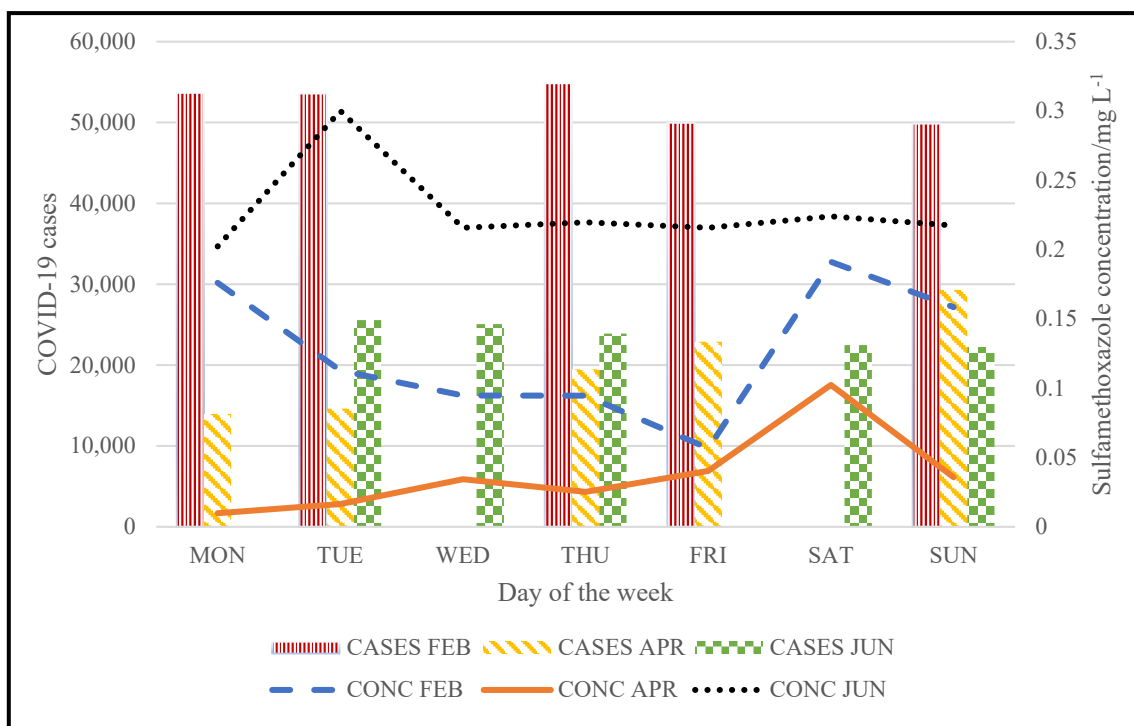
ND: not detected.

Table S3: Daily active COVID-19 cases experienced in South Africa during sampling periods

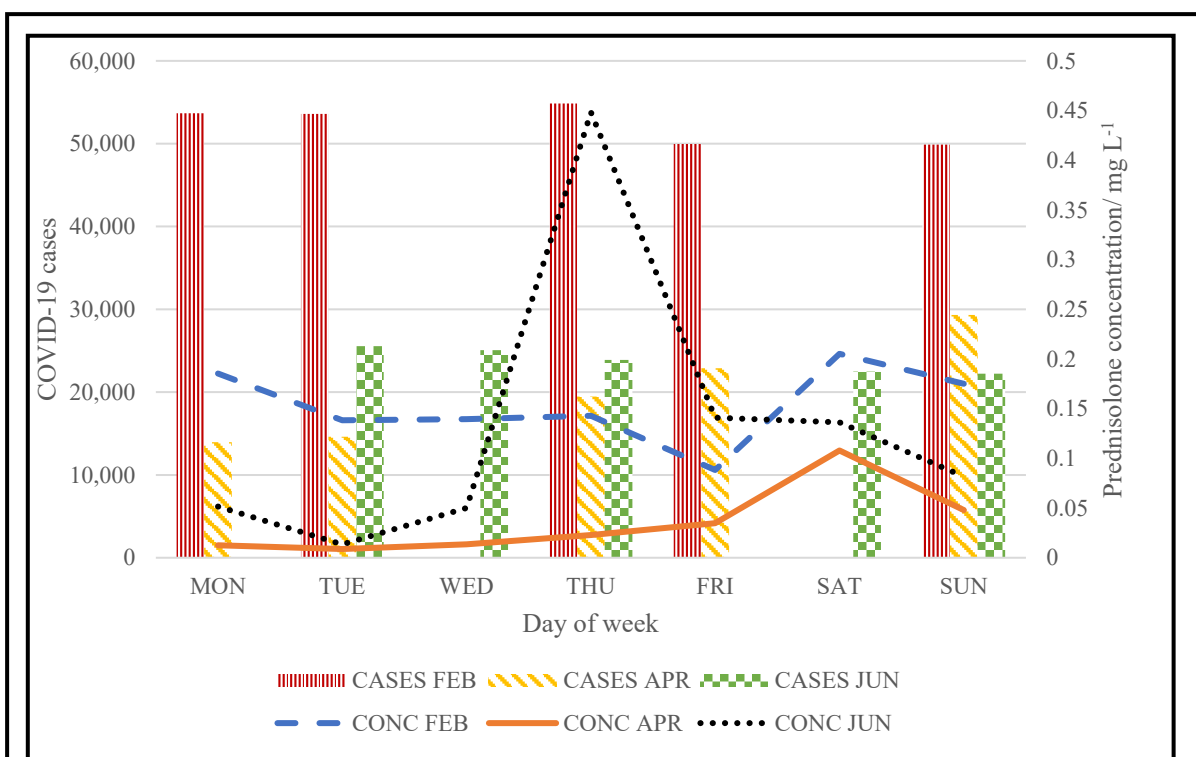
Day of week	Total number of active cases recorded		
	31 January – 6 February 2022	18 – 24 April 2022	6 – 12 June 2022
Monday	53 668	13 957	–
Tuesday	53 601	14 611	25 556
Wednesday	–	–	25 065
Thursday	54 849	19 472	23 897
Friday	49 967	22 891	–
Saturday	–	–	22 482
Sunday	49 878	29 311	22 233



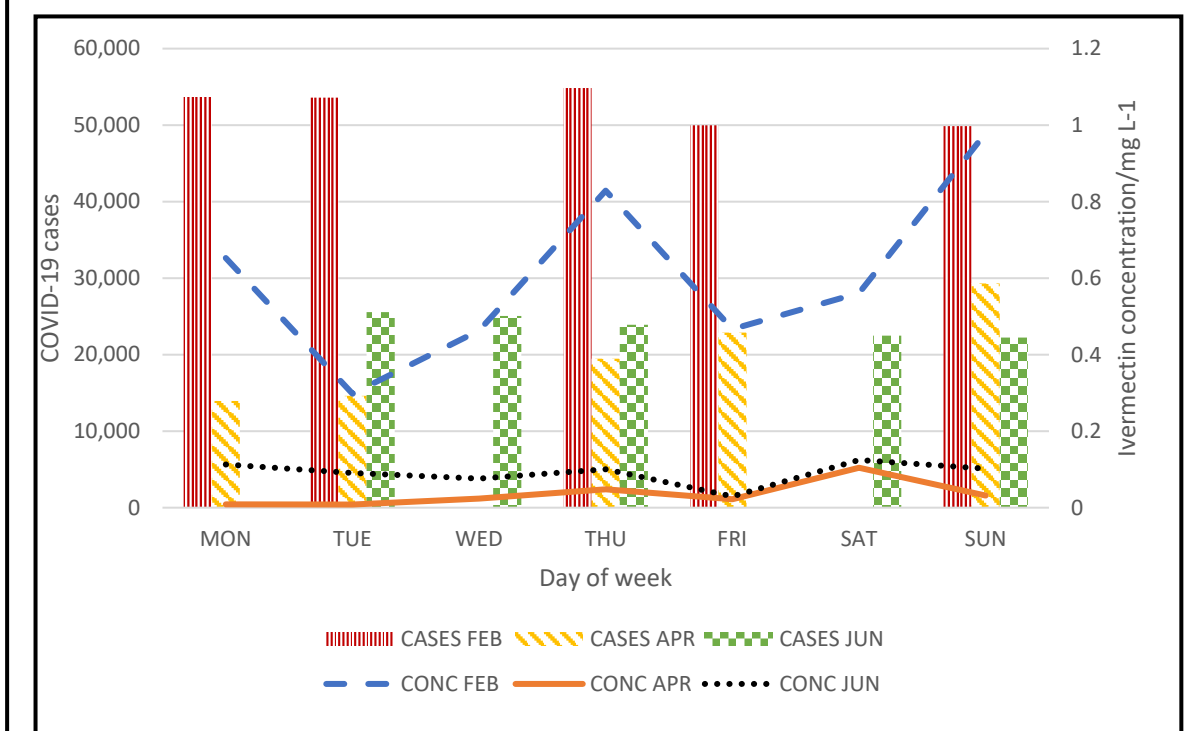
(a) Sulfamethoxazole hydroxylamine



(b) Sulfamethoxazole



(c) Prednisolone



(d) Ivermectin

Figure S1: Relationship between daily pharmaceutical concentration and daily COVID-19 cases.