

Supplement Material

April - May 2020					2010 - 2019	2018 - 2019		April - May 2020		
COVID-19 Disease Parameters					Air Pollutants					
State	Incidence	Mortality	ICU	Mechanical ventilation	PM _{2.5} (µg/m³)	NO ₂ (µg/m³)	PM _{2.5} (µg/m³)	NO ₂ (µg/m³)	PM _{2.5} (µg/m³)	NO ₂ (µg/m³)
Baden-Württemberg	53.6 (39.6)	2.7 (2.3)	78.7 (68.9)	52.9 (49.6)	12.8 (1.3)	19.6 (3.8)	12.1 (1.4)	18.4 (3.7)	8.1 (2.4)	12.3 (5.3)
Bayern	60.7 (49.1)	3.8 (5.1)	90.7 (125.0)	63.1 (87.0)	12.9 (0.6)	18.6 (3.4)	12.5 (0.8)	17.5 (3.8)	8.4 (2.4)	11.2 (4.4)
Berlin	33.6 (-)	1.4 (-)	74.3 (-)	59.6 (-)	16.7 (-)	20.0 (-)	13.7 (-)	18.4 (-)	8.4 (2.6)	13.6 (3.8)
Brandenburg	27.2 (23.1)	0.9 (1.1)	27.2 (35.2)	12.6 (13.8)	14.0 (1.4)	14.0 (3.4)	12.7 (0.8)	12.6 (3.6)	7.4 (2.5)	8.0 (2.8)
Bremen	82.5 (47.0)	3.3 (1.5)	66.4 (53.0)	38.5 (25.2)	13.4 (0.3)	21.8 (0.4)	12.8 (0.1)	20.0 (0.7)	8.2 (3.2)	13.4 (5.0)
Hamburg	36.4 (-)	3.1 (-)	82.0 (-)	67.5 (-)	14.1 (-)	23.5 (-)	12.9 (-)	22.9 (-)	8.1 (2.8)	16.9 (4.7)
Hessen	39.3 (33.4)	2.0 (3.4)	56.5 (44.1)	40.8 (35.7)	13.2 (0.5)	18.2 (6.1)	12.4 (0.9)	16.9 (6.5)	8.3 (2.6)	11.8 (6.7)
Mecklenburg-Vorpommern	6.1 (2.9)	0.1 (0.3)	6.1 (8.1)	3.7 (5.3)	12.6 (0.4)	10.5 (4.4)	12.0 (0.8)	10.0 (4.4)	7.1 (3.3)	6.6 (4.0)
Niedersachsen	21.1 (18.6)	1.3 (2.0)	27.1 (31.9)	18.3 (25.2)	12.6 (0.8)	15.6 (3.0)	12.2 (0.9)	14.6 (2.8)	8.0 (2.3)	9.6 (3.5)
Nordrhein-Westfalen	42.0 (26.1)	1.9 (2.1)	47.1 (31.1)	34.2 (26.9)	14.0 (1.3)	21.9 (4.4)	13.3 (1.5)	20.8 (4.8)	9.4 (3.1)	15.9 (7.2)
Rheinland-Pfalz	23.6 (20.2)	1.2 (1.7)	36.8 (47.4)	23.7 (36.5)	12.9 (1.1)	17.1 (5.4)	12.3 (1.1)	15.8 (5.5)	8.6 (2.6)	11.1 (5.6)
Saarland	31.8 (11.8)	2.7 (3.0)	46.2 (39.0)	21.4 (17.7)	13.1 (0.5)	17.7 (2.5)	12.5 (0.7)	16.3 (2.6)	8.3 (2.3)	11.0 (3.3)
Sachsen	23.3 (19.3)	1.1 (1.6)	39.5 (64.1)	23.0 (30.7)	13.5 (1.0)	16.4 (3.8)	12.7 (1.3)	13.9 (3.9)	8.0 (2.3)	9.6 (3.7)
Sachsen-Anhalt	14.8 (13.4)	0.6 (1.1)	17.7 (21.9)	10.0 (15.3)	13.7 (1.2)	15.8 (3.3)	12.5 (0.9)	14.4 (3.6)	8.1 (2.6)	10.2 (3.8)

April - May 2020					2010 - 2019		2018 - 2019		April - May 2020	
COVID-19 Disease Parameters					Air Pollutants					
State	Incidence	Mortality	ICU	Mechanical ventilation	PM _{2.5} (µg/m³)	NO ₂ (µg/m³)	PM _{2.5} (µg/m³)	NO ₂ (µg/m³)	PM _{2.5} (µg/m³)	NO ₂ (µg/m³)
Schleswig-Holstein	19.7 (18.4)	0.7 (1.4)	13.5 (13.1)	10.0 (10.5)	12.6 (0.8)	14.7 (3.4)	12.6 (1.1)	13.8 (3.7)	8.1 (2.6)	10.8 (5.0)
Thüringen	48.3 (75.5)	3.8 (7.8)	53.1 (64.6)	37.5 (49.6)	12.7 (1.2)	15.7 (4.5)	12.1 (1.3)	14.3 (4.3)	8.6 (2.6)	9.9 (3.7)
Total	40.3 (40.4)	2.2 (3.7)	54.4 (76.2)	37.1 (54.0)	13.1 (1.1)	17.8 (4.7)	12.5 (1.1)	16.6 (4.9)	9.8 (4.3)	12.6 (6.0)

Table S1: Disease outcomes and air pollution levels by state. All disease parameters are given as means per 100,000 residents for the entire period April 16th – May 16th 2020. PM_{2.5} and NO₂ levels are provided as means of the annual means for the periods 2010 – 2019 and 2018 – 2019. For the period April 16th – May 16th 2020, the means of the 48-hour means per county were calculated. Standard deviations for all parameters are given in parentheses.

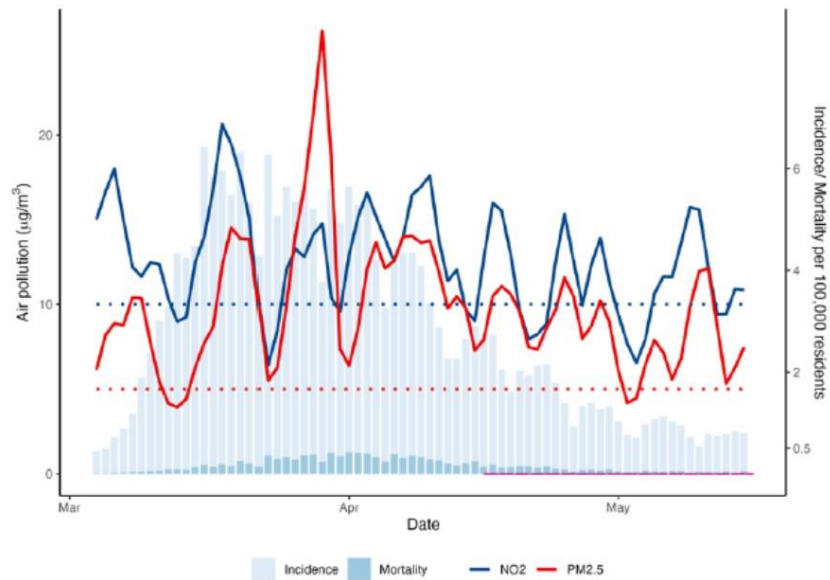


Figure 3: Incidence and mortality and NO₂-levels and PM_{2.5}-levels over time in March – May 2020. Pollution variables for a given date are given as average of the previous 48 hours. The dashed colored lines are WHO-recommended thresholds annual average levels of NO₂ and PM_{2.5}. The pink line indicates the period for which data is available in the DIVI-register.

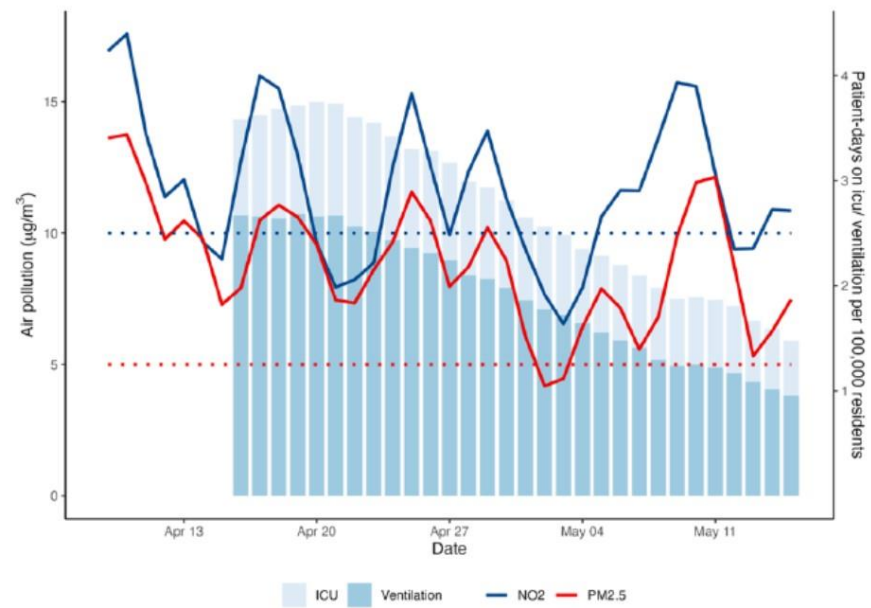


Figure 4: Patient-days on ICU and on mechanical ventilation and NO₂-levels and PM_{2.5}-levels over time in April – May 2020. The dashed colored lines are WHO-recommended thresholds for annual average levels of NO₂ and PM_{2.5}.

COVID-19 Disease Parameters							Air Pollutants				
State	April - May 2020			2010 - 2019			2018 - 2019				
	Incidence	Mortality	ICU	Mechanical ventilation	PM _{2.5} (µg/m ³)	NO ₂ (µg/m ³)	PM _{2.5} (µg/m ³)	NO ₂ (µg/m ³)	PM _{2.5} (µg/m ³)	NO ₂ (µg/m ³)	PM _{2.5} (µg/m ³)
Baden-Württemberg	53.6 (39.6)	2.7 (2.3)	78.7 (68.9)	52.9 (49.6)	12.8 (1.3)	19.6 (3.8)	12.1 (1.4)	18.4 (3.7)	8.1 (2.4)	12.3 (5.3)	12.3 (5.3)
Bayern	60.7 (49.1)	3.8 (5.1)	90.7 (125.0)	63.1 (87.0)	12.9 (0.6)	18.6 (3.4)	12.5 (0.8)	17.5 (3.8)	8.4 (2.4)	11.2 (4.4)	11.2 (4.4)
Berlin	33.6 (-)	1.4 (-)	74.3 (-)	59.6 (-)	16.7 (-)	20.0 (-)	13.7 (-)	18.4 (-)	8.4 (2.6)	13.6 (3.8)	13.6 (3.8)
Brandenburg	27.2 (23.1)	0.9 (1.1)	27.2 (35.2)	12.6 (13.8)	14.0 (1.4)	14.0 (3.4)	12.7 (0.8)	12.6 (3.6)	7.4 (2.5)	8.0 (2.8)	8.0 (2.8)
Bremen	82.5 (47.0)	3.3 (1.5)	66.4 (53.0)	38.5 (25.2)	13.4 (0.3)	21.8 (0.4)	12.8 (0.1)	20.0 (0.7)	8.2 (3.2)	13.4 (5.0)	13.4 (5.0)
Hamburg	36.4 (-)	3.1 (-)	82.0 (-)	67.5 (-)	14.1 (-)	23.5 (-)	12.9 (-)	22.9 (-)	8.1 (2.8)	16.9 (4.7)	16.9 (4.7)
Hessen	39.3 (33.4)	2.0 (3.4)	56.5 (44.1)	40.8 (35.7)	13.2 (0.5)	18.2 (6.1)	12.4 (0.9)	16.9 (6.5)	8.3 (2.6)	11.8 (6.7)	11.8 (6.7)
Mecklenburg-Vorpommern	6.1 (2.9)	0.1 (0.3)	6.1 (8.1)	3.7 (5.3)	12.6 (0.4)	10.5 (4.4)	12.0 (0.8)	10.0 (4.4)	7.1 (3.3)	6.6 (4.0)	6.6 (4.0)
Niedersachsen	21.1 (18.6)	1.3 (2.0)	27.1 (31.9)	18.3 (25.2)	12.6 (0.8)	15.6 (3.0)	12.2 (0.9)	14.6 (2.8)	8.0 (2.3)	9.6 (3.5)	9.6 (3.5)
Nordrhein-Westfalen	42.0 (26.1)	1.9 (2.1)	47.1 (31.1)	34.2 (26.9)	14.0 (1.3)	21.9 (4.4)	13.3 (1.5)	20.8 (4.8)	9.4 (3.1)	15.9 (7.2)	15.9 (7.2)
Rheinland-Pfalz	23.6 (20.2)	1.2 (1.7)	36.8 (47.4)	23.7 (36.5)	12.9 (1.1)	17.1 (5.4)	12.3 (1.1)	15.8 (5.5)	8.6 (2.6)	11.1 (5.6)	11.1 (5.6)
Saarland	31.8 (11.8)	2.7 (3.0)	46.2 (39.0)	21.4 (17.7)	13.1 (0.5)	17.7 (2.5)	12.5 (0.7)	16.3 (2.6)	8.3 (2.3)	11.0 (3.3)	11.0 (3.3)
Sachsen	23.3 (19.3)	1.1 (1.6)	39.5 (64.1)	23.0 (30.7)	13.5 (1.0)	16.4 (3.8)	12.7 (1.3)	13.9 (3.9)	8.0 (2.3)	9.6 (3.7)	9.6 (3.7)
Sachsen-Anhalt	14.8 (13.4)	0.6 (1.1)	17.7 (21.9)	10.0 (15.3)	13.7 (1.2)	15.8 (3.3)	12.5 (0.9)	14.4 (3.6)	8.1 (2.6)	10.2 (3.8)	10.2 (3.8)
Schleswig-Holstein	19.7 (18.4)	0.7 (1.4)	13.5 (13.1)	10.0 (10.5)	12.6 (0.8)	14.7 (3.4)	12.6 (1.1)	13.8 (3.7)	8.1 (2.6)	10.8 (5.0)	10.8 (5.0)
Thüringen	48.3 (75.5)	3.8 (7.8)	53.1 (64.6)	37.5 (49.6)	12.7 (1.2)	15.7 (4.5)	12.1 (1.3)	14.3 (4.3)	8.6 (2.6)	9.9 (3.7)	9.9 (3.7)
Total	40.3 (40.4)	2.2 (3.7)	54.4 (76.2)	37.1 (54.0)	13.1 (1.1)	17.8 (4.7)	12.5 (1.1)	16.6 (4.9)	9.8 (4.3)	12.6 (6.0)	12.6 (6.0)

Table S1: Disease outcomes and air pollution levels by state. All disease parameters are given as means per 100,000 residents for the entire period April 16th – May 16th 2020. PM_{2.5} and NO₂ levels are provided as means of the annual means for the periods 2010 – 2019 and 2018 – 2019. For the period April 16th – May 16th 2020, the means of the 48-hour means per county were calculated. Standard deviations for all parameters are given in parentheses.

