Differential impact of government lockdown policies on reducing air pollution levels and related mortality in Europe

Rochelle Schneider[1,2,3,4*,] **Pierre Masselot**[1], **Ana M. Vicedo-Cabrera**[5,6], **Francesco Sera**[1,7], **Marta Blangiardo**[8], **Chiara Forlani**[8], **John Douros**[9], **Oriol Jorba**[10], **Mario Adani**[11], **Rostislav Kouznetsov**[12,13], **Florian Couvidat** [14], **Joaquim Arteta**[15], **Blandine Raux**[14], **Marc Guevara**[10], **Augustin Colette**[14], **Jérôme Barré**[4], **Vincent-Henri Peuch**[4], **and Antonio Gasparrini**[1,3,16]

[1] Department of Public Health, Environments and Society, London School of Hygiene & Tropical Medicine, WC1H 9SH, London, United Kingdom
[2] European Space Agency, 00044, Frascati, Italy
[3] Centre on Climate Change and Planetary Health, London School of Hygiene & Tropical Medicine, WC1H 9SH, London, United Kingdom
[4] European Centre for Medium-Range Weather Forecast, RG2 9AX, Reading, United Kingdom
[5] Institute of Social and Preventive Medicine, University of Bern, 3012, Bern, Switzerland
[6] Oeschger Center for Climate Change Research, University of Bern, 3012, Bern, Switzerland
[7] Department of Statistics, Computer Science and Applications "G. Parenti", University of Florence, 60550, Florence, Italy
[8] MRC Centre for Environment and Health, Department of Epidemiology and Biostatistics, Imperial College London, London, W2 1NY, United Kingdom
[9] Royal Netherlands Meteorological Institute (KNMI), 3731, GA De Bilt,The Netherlands
[10] Barcelona Supercomputing Centre, 08034, Barcelona, Spain
[11] Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), 40129, Bologna,Italy
[12] Finnish Meteorological Institute (FMI), 00560, Helsinki, Finland
[13] A.M. Obukhov Institute for Atmospheric Physics (IAPh), 119017, Moscow, Russia
[14] National Institute for Industrial Environment and Risks (INERIS), 60550, Verneuil-en-Halatte, France
[15] National Center for Meteorological Research (CNRM), University of Toulouse, Météo-France, CNRS, UMR 3589, 31057, Toulouse, France
[16] Centre for Statistical Methodology, London School of Hygiene & Tropical Medicine, WC1E 7HT, London, United Kingdom

*email: Rochelle.Schneider@lshtm.ac.uk

ID	Description	Flag	Levels
C1	School closing	Yes	0 - no measures 1 - recommend closing or all schools open with alterations resulting in significant differences compared to non-Covid-19 operations 2 - require closing (only some levels or categories, eg just high school, or just public schools) 3 - require closing all levels
C2	Workplace closing	Yes	0 - no measures 1 - recommend closing (or recommend work from home) 2 - require closing (or work from home) for some sectors or categories of workers 3 - require closing (or work from home) for all-but-essential workplaces (e.g. grocery stores, doctors)
C3	Cancel public events	Yes	0 - no measures 1 - recommend cancelling 2 - require cancelling
C4	Restrictions on gathering	Yes	0 - no restrictions 1 - restrictions on very large gatherings (the limit is above 1000 people) 2 - restrictions on gatherings between 101-1000 people 3 - restrictions on gatherings between 11-100 people 4 - restrictions on gatherings of 10 people or less
C5	Close public transport	Yes	0 - no measures 1 - recommend closing (or significantly reduce volume/route/means of transport available) 2 - require closing (or prohibit most citizens from using it)
C6	Stay at home requirements	Yes	0 - no measures 1 - recommend not leaving house 2 - require not leaving house with exceptions for daily exercise, grocery shopping, and 'essential' trips 3 - require not leaving house with minimal exceptions (eg allowed to leave once a week, or only one person can leave at a time, etc)
C7	Restriction on internal movement	Yes	0 - no measures 1 - recommend not to travel between regions/cities 2 - internal movement restrictions in place
C8	International travel controls	No	0 - no restrictions 1 - screening arrivals 2 - quarantine arrivals from some or all regions 3 - ban arrivals from some regions 4 - ban on all regions or total border closure
H1	Public information campaigns	Yes	0 - no Covid-19 public information campaign 1 - public officials urging caution about Covid-19 2- coordinated public information campaign (eg across traditional and social media)

Table **A1.** Description of policy indicators used in computing the Stringency Index (SI). The maximum level reported in the fourth column is the value used to standardize the indicators before computing the SI. This original source of this table can be found on the OxCGRT webpage[1].

City	Country	SI Max	NO_2	O_3	$PM_{2.5}$	PM_{10}
Amsterdam	Netherlands	79.63	-5.8 (-6.2 ; -5.3)	2.5 (2.0 ; 3.1)	-1.8 (-2.0 ; -1.6)	-2.0 (-2.2 ; -1.8)
Ankara	Turkey	77.78	-6.7 (-7.5 ; -6.0)	-1.6 (-2.3 ; -0.9)	-0.3 (-0.5 ; 0.0)	-0.5 (-0.8 ; -0.2)
Athens	Greece	84.26	-10.2 (-10.7 ; -9.7)	0.6 (0.1 ; 1.1)	-1.6 (-1.8 ; -1.4)	-2.0 (-2.2 ; -1.8)
Barcelona	Spain	85.19	-8.7 (-9.1 ; -8.2)	-0.2 (-0.7 ; 0.3)	-1.8 (-2.0 ; -1.6)	-2.1 (-2.3 ; -1.9)
Belgrade	Serbia	100	-1.2 (-2.2 ; -0.2)	-2.3 (-3.6 ; -1.1)	-0.4 (-0.8 ; -0.0)	-0.5 (-0.9 ; -0.1)
Berlin	Germany	76.85	-3.3 (-4.1 ; -2.6)	0.2 (-0.5 ; 1.0)	-1.3 (-1.6 ; -1.1)	-1.5 (-1.8 ; -1.2)
Bern	Switzerland	73.15	-4.9 (-5.7 ; -4.0)	-2.3 (-3.1 ; -1.6)	-3.0 (-3.3 ; -2.7)	-3.3 (-3.7 ; -3.0)
Birmingham	United Kingdom	75.93	-7.3 (-8.2 ; -6.5)	2.5 (1.7 ; 3.3)	-2.5 (-2.8 ; -2.1)	-2.7 (-3.1 ; -2.3)
Bratislava	Slovakia	87.04	-2.9 (-3.3 ; -2.4)	-1.4 (-1.9 ; -0.9)	-1.1 (-1.2 ; -0.9)	-1.2 (-1.4 ; -1.0)
Brussels	Belgium	81.48	-8.0 (-8.4 ; -7.7)	3.0 (2.6 ; 3.4)	-1.9 (-2.1 ; -1.7)	-2.1 (-2.3 ; -2.0)
Bucharest	Romania	87.04	-3.1 (-3.5 ; -2.6)	-1.5 (-2.0 ; -0.9)	-0.6 (-0.8 ; -0.4)	-0.8 (-0.9 ; -0.6)
Budapest	Hungary	76.85	-3.4 (-4.1 ; -2.8)	-2.0 (-2.7 ; -1.4)	-0.9 (-1.2 ; -0.7)	-1.1 (-1.4 ; -0.8)
Cologne	Germany	76.85	-6.0 (-6.6 ; -5.3)	1.5 (0.8 ; 2.2)	-2.3 (-2.6 ; -2.1)	-2.6 (-2.9 ; -2.3)
Copenhagen	Denmark	72.22	-4.7 (-6.0 ; -3.4)	2.6 (1.4 ; 3.8)	-1.3 (-1.7 ; -0.8)	-1.5 (-2.0 ; -1.0)
Dublin	Ireland	90.74	-2.9 (-3.4 ; -2.4)	0.3 (-0.3 ; 0.9)	-0.5 (-0.7 ; -0.3)	-0.6 (-0.8 ; -0.4)
Hamburg	Germany	76.85	-4.3 (-5.0 ; -3.6)	1.4 (0.7 ; 2.2)	-1.4 (-1.7 ; -1.2)	-1.6 (-1.9 ; -1.3)
Helsinki	Finland	60.19	-2.1 (-3.7 ; -0.6)	0.6 (-1.1 ; 2.3)	-0.4 (-1.0 ; 0.1)	-0.6 (-1.1 ; -0.0)
Lisbon	Portugal	87.96	-6.8 (-7.1 ; -6.4)	0.6 (0.1 ; 1.0)	-2.7 (-2.9 ; -2.6)	-3.6 (-3.8 ; -3.5)
Ljubljana	Slovenia	89.81	-2.6 (-3.1 ; -2.1)	-3.1 (-3.7 ; -2.5)	-1.0 (-1.2 ; -0.8)	-1.1 (-1.4 ; -0.9)
London	United Kingdom	75.93	-9.0 (-10.1 ; -7.9)	2.9 (1.9 ; 4.0)	-2.6 (-3.0 ; -2.2)	-2.9 (-3.4 ; -2.5)
Luxembourg	Luxembourg	79.63	-4.8 (-5.3 ; -4.3)	-0.8 (-1.4 ; -0.2)	-2.5 (-2.7 ; -2.3)	-2.7 (-2.9 ; -2.5)
Lyon	France	87.96	-4.9 (-5.3 ; -4.5)	-2.1 (-2.5 ; -1.6)	-1.2 (-1.4 ; -1.1)	-1.4 (-1.6 ; -1.2)
Madrid	Spain	85.19	-9.1 (-9.6 ; -8.7)	-1.2 (-1.7 ; -0.7)	-1.2 (-1.4 ; -1.0)	-1.5 (-1.7 ; -1.3)
Marseille	France	87.96	-2.3 (-2.7 ; -1.9)	-3.2 (-3.6 ; -2.7)	-0.8 (-0.9 ; -0.6)	-0.9 (-1.0 ; -0.7)
Milan	Italy	93.52	-7.9 (-8.5 ; -7.3)	2.1 (1.4 ; 2.9)	-2.6 (-2.8 ; -2.4)	-2.8 (-3.0 ; -2.5)
Monaco	France	87.96	-1.9 (-2.3 ; -1.5)	-4.1 (-4.6 ; -3.7)	-0.9 (-1.0 ; -0.7)	-0.9 (-1.1 ; -0.8)
Munich	Germany	76.85	-4.6 (-5.3 ; -3.9)	-1.4 (-2.1 ; -0.7)	-2.2 (-2.4 ; -1.9)	-2.4 (-2.7 ; -2.1)
Naples	Italy	93.52	-5.8 (-6.4 ; -5.2)	1.3 (0.5 ; 2.0)	-1.1 (-1.3 ; -0.8)	-1.1 (-1.4 ; -0.9)
Nicosia	Cyprus	94.44	-1.1 (-1.6 ; -0.6)	-3.5 (-4.2 ; -2.9)	-0.4 (-0.6 ; -0.2)	-0.5 (-0.7 ; -0.2)
Oslo	Norway	79.63	-1.9 (-2.5 ; -1.3)	0.8 (0.2 ; 1.5)	-0.5 (-0.7 ; -0.2)	-0.6 (-0.8 ; -0.3)
Paris	France	87.96	-7.0 (-7.9 ; -6.2)	0.2 (-0.7 ; 1.1)	-1.4 (-1.7 ; -1.1)	-1.7 (-2.0 ; -1.3)
Prague	Czech Republic	82.41	-3.6 (-4.1 ; -3.0)	0.6 (-0.1 ; 1.2)	-1.4 (-1.6 ; -1.1)	-1.4 (-1.7 ; -1.2)

Pristina	Kosovo	92.59	-2.0 (-2.6 ; -1.4)	-1.6 (-2.3 ; -0.8)	-0.4 (-0.6 ; -0.2)	-0.5 (-0.7 ; -0.2)
Reykjavik	Iceland	53.7	-3.9 (-7.2 ; -0.6)	0.0 (-2.9 ; 2.9)	-0.7 (-1.9 ; 0.5)	-0.6 (-2.1 ; 0.8)
Riga	Latvia	65.74	-1.5 (-3.0 ; -0.1)	-0.2 (-1.5 ; 1.0)	-0.4 (-0.8 ; 0.1)	-0.4 (-0.9 ; 0.1)
Rome	Italy	93.52	-4.8 (-5.3 ; -4.2)	-0.4 (-1.0 ; 0.3)	-1.1 (-1.3 ; -0.9)	-1.2 (-1.4 ; -1.0)
Sarajevo	Bosnia and Herzegovina	92.59	-0.6 (-1.2 ; -0.0)	-2.4 (-3.1 ; -1.7)	-0.3 (-0.5 ; -0.1)	-0.3 (-0.6 ; -0.1)
Sofia	Bulgaria	73.15	-3.7 (-4.7 ; -2.8)	-1.8 (-2.6 ; -1.0)	-0.7 (-1.0 ; -0.4)	-0.8 (-1.1 ; -0.5)
Stockholm	Sweden	46.3	-3.7 (-7.2 ; -0.2)	0.2 (-2.7 ; 3.2)	-0.8 (-1.8 ; 0.3)	-1.1 (-2.4 ; 0.2)
Tallinn	Estonia	77.78	-1.4 (-2.1 ; -0.7)	-0.1 (-0.8 ; 0.6)	-0.3 (-0.6 ; 0.0)	-0.3 (-0.6 ; 0.0)
Tirana	Albania	89.81	-2.4 (-2.9 ; -2.0)	-2.4 (-2.9 ; -1.9)	-0.7 (-0.8 ; -0.5)	-0.8 (-0.9 ; -0.6)
Turin	Italy	93.52	-5.9 (-6.4 ; -5.4)	0.2 (-0.4 ; 0.9)	-2.0 (-2.2 ; -1.8)	-2.2 (-2.4 ; -2.0)
Valencia	Spain	85.19	-5.1 (-5.5 ; -4.7)	-2.2 (-2.6 ; -1.7)	-1.3 (-1.5 ; -1.2)	-1.6 (-1.8 ; -1.4)
Vienna	Austria	85.19	-3.3 (-3.8 ; -2.8)	-1.2 (-1.7 ; -0.6)	-1.3 (-1.4 ; -1.1)	-1.4 (-1.6 ; -1.2)
Vilnius	Lithuania	87.04	-1.8 (-2.1 ; -1.4)	-0.4 (-0.9 ; 0.0)	-0.4 (-0.6 ; -0.3)	-0.5 (-0.7 ; -0.3)
Warsaw	Poland	83.33	-3.2 (-3.7 ; -2.6)	-0.2 (-0.8 ; 0.4)	-0.8 (-1.0 ; -0.6)	-0.9 (-1.1 ; -0.7)
Zagreb	Croatia	96.3	-1.7 (-2.4 ; -1.1)	-3.3 (-4.1 ; -2.5)	-0.7 (-0.9 ; -0.4)	-0.8 (-1.1 ; -0.6)
TOTAL		100	-4.4 (-5.6 ; -3.2)	-0.3 (-1.3 ; 0.6)	-1.0 (-1.6 ; -0.4)	-1.2 (-1.9 ; -0.4)

Table **A2**. Estimated (mean) and 95% credible limits (low, high) of change in concentration of the air pollutants (μg/m^3) for an 80% score of the Stringency Index. The chosen threshold of 80% represents the maximum value reached by most of the 47 cities. The column SI Max displays the maximum SI value reached by city

Model names	Operated by
CHIMERE[2]	INERIS (Institut National de l'Environnement Industriel et des Risques) France
LOTOS-EUROS[3]	KNMI (Koninklijk Nederlands Meteorologisch Instituut) the Netherlands
MOCAGE[4]	Meteo-France (France)
SILAM[5]	FMI (Ilmatieteen Laitos) Finland
MINNI [6]	ENEA (Energy and Sustainable Economic Development), Italy
MONARCH[7]	BSC (Barcelona Supercomputing Centre), Spain

Table **A3**. Individual models contributing to the CAMS ENSEMBLE.

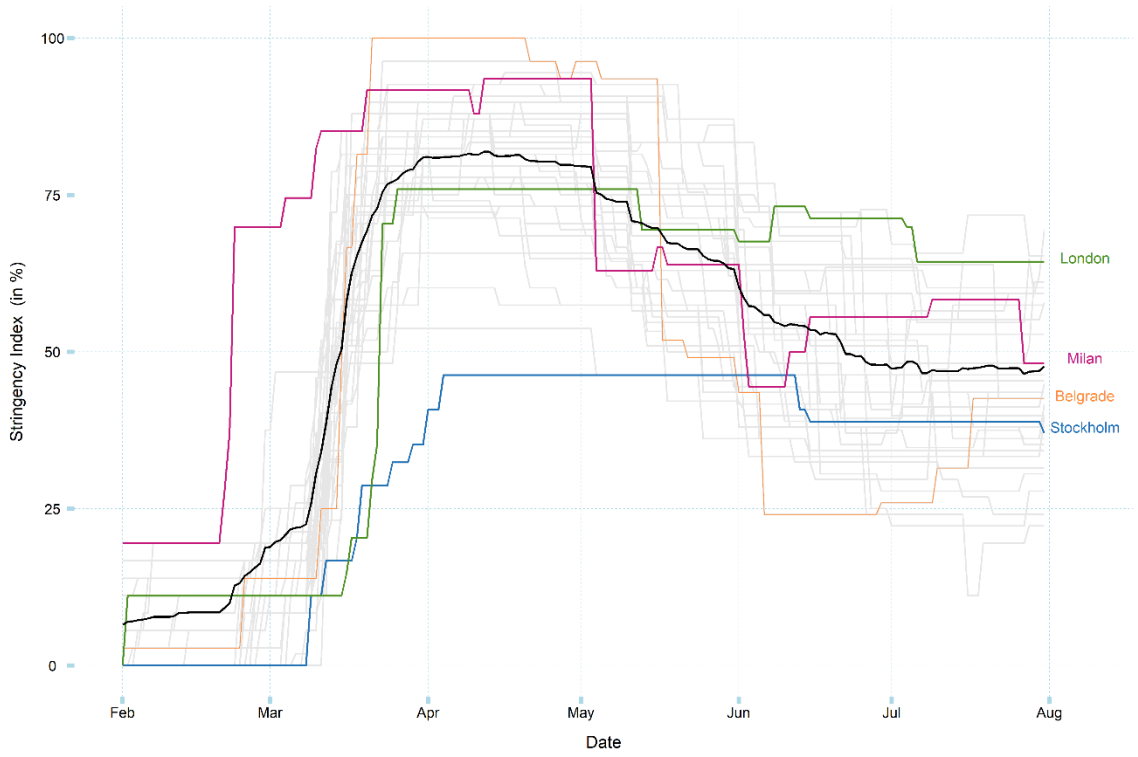

Figure **A1**. Level of SI (policy strictness) over the study period for 47 cities (solid light grey lines) and their average (solid thick black line). Figure created using R software, version 4.0.3[8]

City name	Country	Total deaths	Excess deaths by pollutant-specific using only the **BAU** scenario concentrations			
			NO_2	O_3	$PM_{2.5}$	PM_{10}
Amsterdam	Netherlands	3,899	32.9 (26.1 ; 39.3)	53.9 (35.9 ; 71.3)	22.0 (19.1 ; 24.9)	21.1 (18.9 ; 23.5)
Ankara	Turkey	7,131	65.7 (52.1 ; 78.4)	112.7 (75.1 ; 149.0)	92.6 (80.5 ; 104.7)	85.0 (76.2 ; 94.4)
Athens	Greece	17,842	244.1 (193.9 ; 291.2)	301.2 (200.6 ; 398.1)	148.5 (129.0 ; 168.0)	155.4 (139.1 ; 172.4)
Barcelona	Spain	16,670	218.8 (173.7 ; 261.0)	258.6 (172.2 ; 341.8)	151.4 (131.5 ; 171.2)	139.6 (125.0 ; 155.0)
Belgrade	Serbia	6,979	18.6 (14.8 ; 22.3)	108.9 (72.5 ; 143.9)	59.7 (51.9 ; 67.5)	49.9 (44.6 ; 55.3)
Berlin	Germany	16,108	73.3 (58.2 ; 87.6)	234.2 (155.9 ; 309.6)	80.7 (70.1 ; 91.3)	70.3 (62.9 ; 78.0)
Bern	Switzerland	898	3.2 (2.5 ; 3.8)	13.9 (9.3 ; 18.4)	4.3 (3.8 ; 4.9)	3.7 (3.4 ; 4.2)
Birmingham	United Kingdom	8,984	49.5 (39.3 ; 59.1)	126.5 (84.2 ; 167.3)	49.3 (42.8 ; 55.8)	46.7 (41.8 ; 51.8)
Bratislava	Slovakia	1,684	6.8 (5.4 ; 8.1)	26.0 (17.3 ; 34.3)	9.8 (8.5 ; 11.1)	7.7 (6.9 ; 8.6)
Brussels	Belgium	5,077	43.3 (34.4 ; 51.7)	71.5 (47.6 ; 94.5)	35.0 (30.4 ; 39.6)	30.4 (27.3 ; 33.8)
Bucharest	Romania	10,704	73.4 (58.3 ; 87.7)	164.9 (109.8 ; 217.9)	95.3 (82.8 ; 107.8)	79.4 (71.1 ; 88.1)
Budapest	Hungary	10,783	61.7 (49.0 ; 73.7)	167.3 (111.4 ; 221.1)	82.9 (72.1 ; 93.8)	69.0 (61.8 ; 76.6)
Cologne	Germany	8,161	77.3 (61.3 ; 92.2)	115.4 (76.8 ; 152.6)	53.8 (46.7 ; 60.8)	47.4 (42.5 ; 52.7)
Copenhagen	Denmark	5,764	26.7 (21.2 ; 31.9)	79.3 (52.8 ; 104.8)	24.5 (21.3 ; 27.8)	24.9 (22.3 ; 27.6)
Dublin	Ireland	2,960	13.9 (11.0 ; 16.6)	41.0 (27.3 ; 54.2)	12.5 (10.9 ; 14.2)	14.4 (12.9 ; 15.9)
Hamburg	Germany	7,854	61.3 (48.7 ; 73.2)	107.4 (71.5 ; 142.0)	41.3 (35.8 ; 46.7)	38.6 (34.6 ; 42.9)
Helsinki	Finland	3,320	12.2 (9.7 ; 14.6)	45.6 (30.4 ; 60.3)	9.7 (8.4 ; 11.0)	10.3 (9.2 ; 11.4)
Lisbon	Portugal	9,775	64.8 (51.5 ; 77.4)	151.3 (100.7 ; 199.9)	83.0 (72.1 ; 93.9)	85.8 (76.8 ; 95.2)
Ljubljana	Slovenia	1,023	5.5 (4.4 ; 6.6)	16.3 (10.8 ; 21.5)	9.7 (8.4 ; 10.9)	7.2 (6.5 ; 8.0)
London	United Kingdom	26,966	222.0 (176.2 ; 265.0)	380.1 (253.0 ; 502.5)	162.0 (140.7 ; 183.3)	152.6 (136.6 ; 169.4)
Luxembourg	Luxembourg	424	1.7 (1.4 ; 2.1)	6.3 (4.2 ; 8.3)	2.2 (1.9 ; 2.5)	1.9 (1.7 ; 2.1)
Lyon	France	3,993	31.8 (25.2 ; 37.9)	61.8 (41.1 ; 81.6)	26.5 (23.1 ; 30.0)	23.2 (20.8 ; 25.7)
Madrid	Spain	17,256	152.5 (121.1 ; 182.0)	274.6 (182.9 ; 362.9)	114.3 (99.3 ; 129.3)	104.7 (93.7 ; 116.2)
Marseille	France	4,039	16.9 (13.4 ; 20.2)	70.8 (47.1 ; 93.5)	21.0 (18.2 ; 23.8)	20.4 (18.2 ; 22.6)
Milan	Italy	14,221	151.2 (120.1 ; 180.4)	250.5 (166.9 ; 331.0)	169.0 (147.0 ; 191.1)	125.4 (112.3 ; 139.2)
Monaco	France	320	1.0 (0.8 ; 1.2)	5.7 (3.8 ; 7.5)	1.6 (1.4 ; 1.8)	1.4 (1.2 ; 1.5)
Munich	Germany	5,979	37.4 (29.7 ; 44.7)	93.0 (61.9 ; 123.0)	32.9 (28.6 ; 37.3)	27.5 (24.6 ; 30.5)
Naples	Italy	13,563	125.7 (99.8 ; 150.1)	235.0 (156.5 ; 310.5)	107.2 (93.2 ; 121.3)	103.5 (92.7 ; 114.9)
Nicosia	Cyprus	757	1.8 (1.4 ; 2.1)	13.7 (9.2 ; 18.2)	4.4 (3.8 ; 5.0)	5.2 (4.6 ; 5.7)
Oslo	Norway	2,241	13.0 (10.3 ; 15.5)	29.9 (19.9 ; 39.6)	9.4 (8.2 ; 10.7)	7.8 (7.0 ; 8.7)
Paris	France	30,743	291.6 (231.5 ; 348.0)	436.3 (290.5 ; 576.9)	216.1 (187.8 ; 244.5)	192.0 (171.9 ; 213.2)
Prague	Czech Republic	5,355	23.8 (18.9 ; 28.4)	80.9 (53.9 ; 106.9)	33.8 (29.3 ; 38.2)	26.5 (23.7 ; 29.4)

Pristina	Kosovo	NA	NA (NA ; NA)	NA (NA ; NA)	NA (NA ; NA)	NA (NA ; NA)
Reykjavik	Iceland	591	1.0 (0.8 ; 1.2)	8.1 (5.4 ; 10.7)	1.1 (1.0 ; 1.3)	1.4 (1.2 ; 1.5)
Riga	Latvia	3,811	12.8 (10.1 ; 15.3)	51.4 (34.2 ; 68.0)	21.2 (18.4 ; 24.0)	18.6 (16.6 ; 20.6)
Rome	Italy	10,969	72.8 (57.8 ; 87.0)	188.4 (125.5 ; 249.0)	83.3 (72.4 ; 94.2)	78.0 (69.9 ; 86.6)
Sarajevo	Bosnia and Herzegovina	1,974	2.9 (2.3 ; 3.5)	30.2 (20.1 ; 39.9)	14.1 (12.3 ; 16.0)	12.2 (10.9 ; 13.5)
Sofia	Bulgaria	5,382	18.9 (15.0 ; 22.6)	81.8 (54.4 ; 108.1)	44.4 (38.6 ; 50.2)	39.0 (34.9 ; 43.3)
Stockholm	Sweden	4,535	16.4 (13.0 ; 19.6)	62.8 (41.8 ; 83.0)	13.0 (11.3 ; 14.7)	12.9 (11.5 ; 14.3)
Tallinn	Estonia	1,695	6.0 (4.7 ; 7.1)	23.2 (15.4 ; 30.6)	5.4 (4.7 ; 6.1)	4.7 (4.2 ; 5.3)
Tirana	Albania	2,086	8.2 (6.5 ; 9.8)	35.0 (23.3 ; 46.2)	15.5 (13.5 ; 17.5)	14.6 (13.0 ; 16.2)
Turin	Italy	6,899	53.5 (42.5 ; 63.9)	119.5 (79.6 ; 157.9)	80.0 (69.6 ; 90.5)	59.4 (53.2 ; 65.9)
Valencia	Spain	6,400	38.7 (30.7 ; 46.2)	107.1 (71.3 ; 141.6)	41.9 (36.4 ; 47.4)	40.5 (36.3 ; 45.0)
Vienna	Austria	8,226	46.5 (36.9 ; 55.5)	127.2 (84.7 ; 168.1)	45.8 (39.8 ; 51.9)	37.4 (33.5 ; 41.5)
Vilnius	Lithuania	2,107	4.4 (3.5 ; 5.3)	28.3 (18.8 ; 37.4)	8.3 (7.2 ; 9.4)	6.8 (6.1 ; 7.5)
Warsaw	Poland	9,423	52.8 (41.9 ; 63.0)	134.2 (89.3 ; 177.4)	73.1 (63.6 ; 82.8)	59.6 (53.4 ; 66.2)
Zagreb	Croatia	3,680	14.3 (11.3 ; 17.1)	58.6 (39.0 ; 77.5)	27.0 (23.4 ; 30.5)	22.4 (20.1 ; 24.9)
TOTAL		339,251	2,572.9 (2,042.3 ; 3,070.9)	5,190.0 (3,455.9 ; 6,860.7)	2,440.6 (2,120.8 ; 2,761.2)	2,186.1 (1,957.5 ; 2,427.1)

Table **A4**. The sample of 46 cities (except Pristina (Kosovo)) selected from the European CAMS Air Quality information webpage. Reported are: total deaths and an estimate of the death burden of each pollutant under BAU scenario. The total deaths were estimated for each city using the crude death rate, population, and the number of days comprising the study period (February-July). The excess deaths were estimated for each pollutant and city based on Equation 3, replacing y_{it} by the corresponding BAU-only concentration time series.

References

1. OxCGRT/covid-policy-tracker. *GitHub* https://github.com/OxCGRT/covid-policy-tracker.
2. Mailler, S. *et al.* CHIMERE-2017: from urban to hemispheric chemistry-transport modeling. *Geosci. Model Dev.* **10**, 2397–2423 (2017).
3. Manders, A. M. M. *et al.* Curriculum vitae of the LOTOS–EUROS (v2.0) chemistry transport model. *Geosci. Model Dev.* **10**, 4145–4173 (2017).
4. Guth, J., Josse, B., Marécal, V., Joly, M. & Hamer, P. First implementation of secondary inorganic aerosols in the MOCAGE version R2.15.0 chemistry transport model. *Geosci. Model Dev.* **9**, 137–160 (2016).
5. Sofiev, M. *et al. Construction of an Eulerian atmospheric dispersion model based on the advection algorithm of M. Galperin: dynamic cores v.4 and 5 of SILAM v.5.5*. https://gmd.copernicus.org/preprints/8/2905/2015/gmdd-8-2905-2015.pdf (2015) doi:10.5194/gmdd-8-2905-2015.
6. AMS-MINNI national air quality simulation on Italy for the calendar year 2015. Annual air quality simulation of MINNI Atmospheric Modelling System: results for the calendar year 2015 and comparison with observed data. https://iris.enea.it/handle/20.500.12079/52259#.YSI93IhKhPY.
7. Badia, A. *et al.* Description and evaluation of the Multiscale Online Nonhydrostatic AtmospheRe CHemistry model (NMMB-MONARCH) version 1.0: gas-phase chemistry at global scale. *Geosci. Model Dev.* **10**, 609–638 (2017).
8. R: The R Project for Statistical Computing. https://www.r-project.org/.