

SUPPLEMENTARY TABLES

Supplementary table 1. Patient demographic and clinical characteristics stratified by rheumatic disease diagnostic subgroup									
Parameter	Inflammatory joint diseases			Rheumatoid arthritis			Connective tissue diseases and vasculitis		
	Not deceased	Deceased	Total	Not deceased	Deceased	Total	Not deceased	Deceased	Total
N	2158	215	2373	1224	170	1394	1035	158	1193
General									
Age [years]	55.7 (14.3)	71.6 (11.7)	57.1 (14.8)	59.2 (13.9)	72.5 (11.1)	60.8 (14.3)	55.1 (16.3)	66.7 (17.4)	56.7 (16.9)
≤ 30 years	103 (4.8)	1 (0.5)	104 (4.4)	37 (3)	1 (0.6)	38 (2.7)	73 (7.1)	8 (5.1)	81 (6.8)
31 – 50 years	637 (29.5)	9 (4.2)	646 (27.2)	264 (21.6)	5 (2.9)	269 (19.3)	337 (32.6)	20 (12.7)	357 (29.9)
51 – 65 years	878 (40.7)	45 (20.9)	923 (38.9)	514 (42)	34 (20)	548 (39.3)	334 (32.3)	35 (22.2)	369 (30.9)
66 – 75 years	359 (16.6)	72 (33.5)	431 (18.2)	262 (21.4)	56 (32.9)	318 (22.8)	155 (15)	35 (22.2)	190 (15.9)
> 75 years	181 (8.4)	88 (40.9)	269 (11.3)	147 (12)	74 (43.5)	221 (15.9)	136 (13.1)	60 (38)	196 (16.4)
Male sex	709 (32.9)	82 (38.1)	791 (33.3)	292 (23.9)	55 (32.4)	347 (24.9)	240 (23.2)	67 (42.4)	307 (25.7)
Ever smoker	443 (24.1) (N=1839)	65 (40.1) (N=162)	508 (25.4) (N=2001)	260 (25.4) (N=1025)	56 (43.1) (N=130)	316 (27.4) (N=1155)	185 (20.6) (N=897)	36 (27.5) (N=131)	221 (21.5) (N=1028)
Regions									
African Region	10 (0.5)	1 (0.5)	11 (0.5)	7 (0.6)	1 (0.6)	8 (0.6)	2 (0.2)	1 (0.6)	3 (0.3)
Eastern Mediterranean Region	46 (2.1)	4 (1.9)	50 (2.1)	33 (2.7)	4 (2.4)	37 (2.7)	37 (3.6)	8 (5.1)	45 (3.8)
European Region	1405 (65.1)	157 (73)	1562	725 (59.2)	121 (71.2)	846 (60.7)	533 (51.5)	103 (65.2)	636 (53.3)
North American Region	595 (27.6)	44 (20.5)	639 (26.9)	392 (32)	38 (22.4)	430 (30.8)	397 (38.4)	35 (22.2)	432 (36.2)
South American Region	68 (3.2)	4 (1.9)	72 (3)	48 (3.9)	1 (0.6)	49 (3.5)	42 (4.1)	5 (3.2)	47 (3.9)
South-East Asian Region	8 (0.4)	0	8 (0.3)	3 (0.2)	0	3 (0.2)	2 (0.2)	0	2 (0.2)
Western Pacific Region	26 (1.2)	5 (2.3)	31 (1.3)	16 (1.3)	5 (2.9)	21 (1.5)	22 (2.1)	6 (3.8)	28 (2.3)
Inflammatory joint diseases									
Rheumatoid arthritis	1224 (56.7)	170 (79.1)	1394	1224 (100)	170 (100)	1394 (100)	53 (5.1)	9 (5.7)	62 (5.2)
Spondyloarthritis	416 (19.3)	15 (7)	431 (18.2)	1 (0.1)	0	1 (0.1)	2 (0.2)	0	2 (0.2)
Psoriatic arthritis	420 (19.5)	20 (9.3)	440 (18.5)	1 (0.1)	1 (0.6)	2 (0.1)	8 (0.8)	0	8 (0.7)

JIA (poly, oligo, not systemic)	21 (1)	4 (1.9)	25 (1.1)	2 (0.2)	0	2 (0.1)	0	0	0
Other inflammatory arthritis	90 (4.2)	8 (3.7)	98 (4.1)	3 (0.2)	0	3 (0.2)	7 (0.7)	1 (0.6)	8 (0.7)
Total Inflammatory joint diseases	2158 (100)	215 (100)	2373 (100)	1224 (100)	170 (100)	1394 (100)	68 (6.6)	10 (6.3)	78 (6.5)
Connective tissue diseases / Vasculitis									
SLE	20 (0.9)	3 (1.4)	23 (1)	18 (1.5)	3 (1.8)	21 (1.5)	355 (34.3)	36 (22.8)	391 (32.8)
CTDs (other than SLE)	38 (1.8)	7 (3.3)	45 (1.9)	33 (2.7)	6 (3.5)	39 (2.8)	473 (45.7)	60 (38)	533 (44.7)
Vasculitis	14 (0.6)	1 (0.5)	15 (0.6)	6 (0.5)	1 (0.6)	7 (0.5)	258 (24.9)	68 (43)	326 (27.3)
Total CTD	68 (3.2)	10 (4.7)	78 (3.3)	53 (4.3)	9 (5.3)	62 (4.4)	1035 (100)	158 (100)	1193 (100)
Other RMDs									
Total	58 (2.7)	12 (5.6)	70 (2.9)	30 (2.5)	6 (3.5)	36 (2.6)	37 (3.6)	13 (8.2)	50 (4.2)
Disease activity	<i>N=1563</i>	<i>N=168</i>	<i>N=1731</i>	<i>N=943</i>	<i>N=131</i>	<i>N=1074</i>	<i>N=822</i>	<i>N=118</i>	<i>N=940</i>
Remission	488 (31.2)	54 (32.1)	542 (31.3)	291 (30.9)	40 (30.5)	331 (30.8)	256 (31.1)	32 (27.1)	288 (30.6)
Minimal/low disease activity	771 (49.3)	65 (38.7)	836 (48.3)	464 (49.2)	51 (38.9)	515 (48)	421 (51.2)	38 (32.2)	459 (48.8)
Moderate disease activity	264 (16.9)	38 (22.6)	302 (17.4)	161 (17.1)	30 (22.9)	191 (17.8)	115 (14)	25 (21.2)	140 (14.9)
Severe/high disease activity	40 (2.6)	11 (6.5)	51 (2.9)	27 (2.9)	10 (7.6)	37 (3.4)	30 (3.6)	23 (19.5)	53 (5.6)
Other outcomes									
Hospitalised	774 (38.1) (<i>N=2030</i>)	201 (95.3) (<i>N=211</i>)	975 (43.5) (<i>N=2241</i>)	497 (43.3) (<i>N=1148</i>)	158 (95.2) (<i>N=166</i>)	655 (49.8) (<i>N=1314</i>)	522 (52.8) (<i>N=989</i>)	153 (98.1) (<i>N=156</i>)	675 (59) (<i>N=1145</i>)
Invasive ventilation	37 (2.1) (<i>N=1771</i>)	75 (43.9) (<i>N=171</i>)	112 (5.8) (<i>N=1942</i>)	22 (2.2) (<i>N=993</i>)	61 (44.5) (<i>N=137</i>)	83 (7.3) (<i>N=1130</i>)	28 (3.4) (<i>N=815</i>)	44 (38.3) (<i>N=115</i>)	72 (7.7) (<i>N=930</i>)
Comorbidities	<i>N=2143</i>	<i>N=214</i>	<i>N=2357</i>	<i>N=1215</i>	<i>N=169</i>	<i>N=1384</i>	<i>N=1026</i>	<i>N=155</i>	<i>N=1181</i>
Hypertension	658 (30.7)	116 (54.2)	774 (32.8)	423 (34.8)	90 (53.3)	513 (37.1)	385 (37.5)	87 (56.1)	472 (40)
Cardiovascular disease	183 (8.5)	71 (33.2)	254 (10.8)	126 (10.4)	54 (32)	180 (13)	121 (11.8)	43 (27.7)	164 (13.9)
Cerebrovascular disease	49 (2.3)	10 (4.7)	59 (2.5)	38 (3.1)	8 (4.7)	46 (3.3)	34 (3.3)	8 (5.2)	42 (3.6)
Chronic lung disease	332 (15.5)	78 (36.4)	410 (17.4)	231 (19)	65 (38.5)	296 (21.4)	234 (22.8)	58 (37.4)	292 (24.7)
Chronic kidney disease	83 (3.9)	27 (12.6)	110 (4.7)	61 (5)	21 (12.4)	82 (5.9)	85 (8.3)	42 (27.1)	127 (10.8)
Obesity (BMI ≥ 30)	370 (17.3)	38 (17.8)	408 (17.3)	205 (16.9)	27 (16)	232 (16.8)	155 (15.1)	19 (12.3)	174 (14.7)
Morbid obesity (BMI ≥ 40)	51 (2.4)	8 (3.7)	59 (2.5)	28 (2.3)	8 (4.7)	36 (2.6)	50 (4.9)	8 (5.2)	58 (4.9)
Diabetes	260 (12.1)	55 (25.7)	315 (13.4)	176 (14.5)	39 (23.1)	215 (15.5)	126 (12.3)	36 (23.2)	162 (13.7)

Cancer	98 (4.6)	23 (10.7)	121 (5.1)	68 (5.6)	18 (10.7)	86 (6.2)	61 (5.9)	20 (12.9)	81 (6.9)
Other comorbidities	509 (23.8)	73 (34.1)	582 (24.7)	216 (17.8)	48 (28.4)	264 (19.1)	230 (22.4)	45 (29.0)	275 (23.3)
Number of comorbidities	1.2 (1.3)	2.5 (1.7)	1.4 (1.4)	1.3 (1.3)	2.3 (1.6)	1.4 (1.4)	1.5 (1.4)	2.5 (1.5)	1.6 (1.4)
No comorbidity	770 (35.9)	18 (8.4)	788 (33.4)	397 (32.7)	16 (9.5)	413 (29.8)	267 (26)	10 (6.5)	277 (23.5)
One comorbidity	639 (29.8)	50 (23.4)	689 (29.2)	374 (30.8)	39 (23.1)	413 (29.8)	357 (34.8)	31 (20)	388 (32.9)
Two comorbidities	390 (18.2)	63 (29.4)	453 (19.2)	238 (19.6)	52 (30.8)	290 (21)	182 (17.7)	43 (27.7)	225 (19.1)
≥ 3 comorbidityes	344 (16.1)	83 (38.8)	427 (18.1)	206 (17)	62 (36.7)	268 (19.4)	220 (21.4)	71 (45.8)	291 (24.6)
DMARD therapies									
csDMARDs monotherapy	487 (22.6)	51 (23.7)	538 (22.7)	351 (28.7)	43 (25.3)	394 (28.3)	91 (8.8)	10 (6.3)	101 (8.5)
csDMARDs combination therapy	611 (28.3)	53 (24.7)	664 (28)	440 (35.9)	51 (30)	491 (35.2)	92 (8.9)	12 (7.6)	104 (8.7)
Methotrexate monotherapy	430 (19.9)	41 (19.1)	471 (19.8)	306 (25)	34 (20)	340 (24.4)	88 (8.5)	6 (3.8)	94 (7.9)
Methotrexate combination therapy	531 (24.6)	45 (20.9)	576 (24.3)	372 (30.4)	44 (25.9)	416 (29.8)	87 (8.4)	9 (5.7)	96 (8)
Leflunomide monotherapy	57 (2.6)	10 (4.7)	67 (2.8)	45 (3.7)	9 (5.3)	54 (3.9)	3 (0.3)	4 (2.5)	7 (0.6)
Leflunomide combination therapy	114 (5.3)	9 (4.2)	123 (5.2)	98 (8)	8 (4.7)	106 (7.6)	7 (0.7)	3 (1.9)	10 (0.8)
Sulfasalazine monotherapy	48 (2.2)	16 (7.4)	64 (2.7)	22 (1.8)	8 (4.7)	30 (2.2)	3 (0.3)	1 (0.6)	4 (0.3)
Sulfasalazine combination therapy	124 (5.7)	24 (11.2)	148 (6.2)	76 (6.2)	20 (11.8)	96 (6.9)	7 (0.7)	2 (1.3)	9 (0.8)
Antimalarial monotherapy	74 (3.4)	8 (3.7)	82 (3.5)	56 (4.6)	8 (4.7)	64 (4.6)	212 (20.5)	9 (5.7)	221 (18.5)
Antimalarial combination therapy	175 (8.1)	23 (10.7)	198 (8.3)	156 (12.7)	23 (13.5)	179 (12.8)	169 (16.3)	17 (10.8)	186 (15.6)
Immunosuppressants monotherapy	9 (0.4)	3 (1.4)	12 (0.5)	7 (0.6)	3 (1.8)	10 (0.7)	132 (12.8)	21 (13.3)	153 (12.8)
Immunosuppressants combination therapy	20 (0.9)	1 (0.5)	21 (0.9)	16 (1.3)		16 (1.1)	127 (12.3)	18 (11.4)	145 (12.2)
Mycophenolate mofetil monotherapy	3 (0.1)	1 (0.5)	4 (0.2)	2 (0.2)	1 (0.6)	3 (0.2)	64 (6.2)	13 (8.2)	77 (6.5)
Mycophenolate mofetil combination therapy	3 (0.1)	0	3 (0.1)	3 (0.2)	0	3 (0.2)	77 (7.4)	14 (8.9)	91 (7.6)
Azathioprine monotherapy	4 (0.2)	1 (0.5)	5 (0.2)	3 (0.2)	1 (0.6)	4 (0.3)	54 (5.2)	4 (2.5)	58 (4.9)
Azathioprine combi	12 (0.6)	1 (0.5)	13 (0.5)	9 (0.7)	0	9 (0.6)	39 (3.8)	2 (1.3)	41 (3.4)
Cyclophosphamide monotherapy	0	0	0	0	0	0	9 (0.9)	3 (1.9)	12 (1)
Cyclophosphamide combination	0	0	0	0	0	0	5 (0.5)	4 (2.5)	9 (0.8)
Tacrolimus monotherapy	0	1 (0.5)	1 (0)	0	1 (0.6)	1 (0.1)	4 (0.4)	1 (0.6)	5 (0.4)
Tacrolimus combination therapy	2 (0.1)	0	2 (0.1)	1 (0.1)	0	1 (0.1)	8 (0.8)	0	8 (0.7)
Cyclosporin monotherapy	2 (0.1)	0	2 (0.1)	2 (0.2)	0	2 (0.1)	1 (0.1)	0	1 (0.1)

Cyclosporin combination therapy	4 (0.2)	0	4 (0.2)	4 (0.3)	0	4 (0.3)	8 (0.8)	1 (0.6)	9 (0.8)
bDMARDs monotherapy	581 (26.9)	29 (13.5)	610 (25.7)	163 (13.3)	19 (11.2)	182 (13.1)	81 (7.8)	18 (11.4)	99 (8.3)
bDMARD combination therapy	478 (22.2)	31 (14.4)	509 (21.5)	308 (25.2)	29 (17.1)	337 (24.2)	91 (8.8)	15 (9.5)	106 (8.9)
TNF inhibitors monotherapy	417 (19.3)	12 (5.6)	429 (18.1)	88 (7.2)	4 (2.4)	92 (6.6)	15 (1.4)	1 (0.6)	16 (1.3)
TNF inhibitors combination therapy	322 (14.9)	14 (6.5)	336 (14.2)	189 (15.4)	12 (7.1)	201 (14.4)	20 (1.9)	3 (1.9)	23 (1.9)
Abatacept monotherapy	25 (1.2)	4 (1.9)	29 (1.2)	20 (1.6)	4 (2.4)	24 (1.7)	2 (0.2)	0	2 (0.2)
Abatacept combination therapy	43 (2)	5 (2.3)	48 (2)	41 (3.3)	5 (2.9)	46 (3.3)	6 (0.6)	0	6 (0.5)
B-cell-targeted bDMARDs monotherapy	22 (1)	11 (5.1)	33 (1.4)	20 (1.6)	10 (5.9)	30 (2.2)	45 (4.3)	15 (9.5)	60 (5)
B-cell-targeted bDMARDs combination therapy	49 (2.3)	11 (5.1)	60 (2.5)	48 (3.9)	11 (6.5)	59 (4.2)	62 (6)	8 (5.1)	70 (5.9)
Rituximab monotherapy	22 (1)	11 (5.1)	33 (1.4)	20 (1.6)	10 (5.9)	30 (2.2)	40 (3.9)	15 (9.5)	55 (4.6)
Rituximab combi	47 (2.2)	11 (5.1)	58 (2.4)	46 (3.8)	11 (6.5)	57 (4.1)	42 (4.1)	7 (4.4)	49 (4.1)
Belimumab monotherapy	0	0	0	0	0	0	5 (0.5)	0	5 (0.4)
Belimumab combination therapy	2 (0.1)	0	2 (0.1)	2 (0.2)	0	2 (0.1)	21 (2)	1 (0.6)	22 (1.8)
IL-6 inhibitors monotherapy	36 (1.7)	1 (0.5)	37 (1.6)	33 (2.7)	1 (0.6)	34 (2.4)	18 (1.7)	2 (1.3)	20 (1.7)
IL-6 inhibitors combination therapy	31 (1.4)	0	31 (1.3)	29 (2.4)	0	29 (2.1)	1 (0.1)	2 (1.3)	3 (0.3)
IL-1 inhibitors monotherapy	1 (0)	0	1 (0)	0	0	0	1 (0.1)	0	1 (0.1)
IL-1 inhibitors combination therapy	3 (0.1)	1 (0.5)	4 (0.2)	3 (0.2)	1 (0.6)	4 (0.3)	1 (0.1)	2 (1.3)	3 (0.3)
IL-17, IL-23, IL-12/23 inhibitors monotherapy	78 (3.6)	1 (0.5)	79 (3.3)	1 (0.1)	0	1 (0.1)	0	0	0
IL-17, IL-23, IL-12/23 inhibitors combination therapy	34 (1.6)	0	34 (1.4)	1 (0.1)	0	1 (0.1)	1 (0.1)	0	1 (0.1)
tsDMARDs monotherapy	61 (2.8)	5 (2.3)	66 (2.8)	47 (3.8)	4 (2.4)	51 (3.7)	0	0	0
tsDMARDs (*) combination therapy	68 (3.2)	10 (4.7)	78 (3.3)	59 (4.8)	9 (5.3)	68 (4.9)	6 (0.6)	2 (1.3)	8 (0.7)
JAK inhibitors monotherapy	54 (2.5)	4 (1.9)	58 (2.4)	47 (3.8)	4 (2.4)	51 (3.7)	0	0	0
JAK inhibitors combination therapy	65 (3)	9 (4.2)	74 (3.1)	59 (4.8)	9 (5.3)	68 (4.9)	5 (0.5)	2 (1.3)	7 (0.6)
Apremilast monotherapy	7 (0.3)	1 (0.5)	8 (0.3)	0	0	0	0	0	0
Apremilast combination therapy	3 (0.1)	1 (0.5)	4 (0.2)	0	0	0	0	0	0
No DMARD therapies	201 (9.3)	38 (17.7)	239 (10.1)	85 (6.9)	25 (14.7)	110 (7.9)	286 (27.6)	67 (42.4)	353 (29.6)
Further therapies									
Glucocorticoids (#)	521 (24.5) (N=2130)	101 (48.6) (N=208)	622 (26.6) (N=2338)	417 (34.6) (N=1205)	90 (54.2) (N=166)	507 (37) (N=1371)	501 (48.8) (N=1027)	115 (74.2) (N=155)	616 (52.1) (N=1182)

0 mg/d < Glucocorticoids <= 10mg/d	448 (21.3) (N=2108)	83 (40.9) (N=203)	531 (23) (N=2311)	366 (30.8) (N=1190)	74 (46) (N=161)	440 (32.6) (N=1351)	373 (37.3) (N=999)	68 (47.6) (N=143)	441 (38.6) (N=1142)
Glucocorticoids > 10 mg/d	48 (2.3) (N=2108)	12 (5.9) (N=203)	60 (2.6) (N=2311)	34 (2.9) (N=1190)	10 (6.2) (N=161)	44 (3.3) (N=1351)	100 (10) (N=999)	35 (24.5) (N=143)	135 (11.8) (N=1142)
NSAID	484 (24.2) (N=2002)	26 (13.8) (N=188)	510 (23.3) (N=2190)	240 (21.3) (N=1129)	22 (14.8) (N=149)	262 (20.5) (N=1278)	112 (11.6) (N=966)	12 (8.6) (N=140)	124 (11.2) (N=1106)

Data are N (column %) for categorical variables or mean (SD) for continuous variables. Table includes all patients with a non-missing outcome and non-missing values for age, sex and disease modifying anti-rheumatic drugs (DMARDs) (101 patients excluded). Data refers to patients with non-missing values for the respective variable, total N for patients with non-missing values is given in parentheses for variables with missing values. (*) Includes one patient on a study medication (Lenabasum). (#) Includes patients with a missing glucocorticoid dose.

bDMARD, biologic disease modifying antirheumatic drugs; BMI, body mass index; csDMARD, conventional synthetic disease modifying antirheumatic drugs; CTD, connective tissue diseases; DMARD, disease modifying antirheumatic drugs; IL, interleukin; JAK, Janus kinase; JIA, juvenile idiopathic arthritis; N, number; NSAID, non-steroidal anti-inflammatory drugs; SLE, systemic lupus erythematosus; TNF; tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.

Supplementary table 2. Patient demographic and clinical characteristics stratified by country (six countries with the highest number of reported cases)							
Parameter	USA	France	UK	Italy	Spain	Germany	Total
N	1005	793	435	315	247	198	2993
General							
Age [years]	55.2 (15.1)	56.2 (16.3)	61.2 (16.4)	61.9 (13.7)	59.7 (15.7)	58.2 (13.8)	57.6 (15.6)
< 30 years	66 (6.6)	39 (4.9)	16 (3.7)	6 (1.9)	10 (4)	6 (3)	143 (4.8)
30 – 49 years	300 (29.9)	268 (33.8)	97 (22.3)	58 (18.4)	56 (22.7)	48 (24.2)	268 (33.8)
50 – 65 years	390 (38.8)	248 (31.3)	131 (30.1)	107 (34)	92 (37.2)	93 (47)	248 (31.3)
66 - 75 years	146 (14.5)	128 (16.1)	92 (21.1)	93 (29.5)	43 (17.4)	26 (13.1)	528 (17.6)
> 75 years	103 (10.2)	110 (13.9)	99 (22.8)	51 (16.2)	46 (18.6)	25 (12.6)	434 (14.5)
Male sex	241 (24)	272 (34.3)	169 (38.9)	107 (34)	95 (38.5)	74 (37.4)	958 (32)
Ever smoker	261 (27.3) (N=956)	80 (10.1) (N=793)	132 (45.2) (N=292)	86 (29.5) (N=292)	60 (27.5) (N=218)	14 (77.8) (N=18)	633 (24.6) (N=2569)
Inflammatory joint diseases							
Rheumatoid arthritis	388 (38.6)	247 (31.2)	187 (43.0)	105 (33.3)	88 (35.6)	99 (50.0)	1114 (37.2)
Spondyloarthritis	47 (4.7)	193 (24.3)	29 (6.7)	24 (7.6)	32 (13)	19 (9.6)	344 (11.5)
Psoriatic arthritis	101 (10)	74 (9.3)	61 (14)	64 (20.3)	31 (12.6)	32 (16.2)	363 (12.1)
JIA (poly, oligo, not systemic)	7 (0.7)	2 (0.3)	2 (0.5)	2 (0.6)	3 (1.2)	0	16 (0.5)
Other inflammatory arthritis	41 (4.1)	15 (1.9)	28 (6.4)	3 (1)	3 (1.2)	0	90 (3)
Total IJD	577 (57.4)	531 (67)	305 (70.1)	198 (62.9)	157 (63.6)	150 (75.8)	1918 (64.1)
Connective tissue diseases / Vasculitis							
Systemic lupus erythematosus	167 (16.6)	50 (6.3)	28 (6.4)	18 (5.7)	27 (10.9)	9 (4.5)	299 (10)
CTDs (other than SLE)	186 (18.5)	90 (11.3)	38 (8.7)	53 (16.8)	44 (17.8)	19 (9.6)	430 (14.4)
Vasculitis	67 (6.7)	71 (9)	51 (11.7)	44 (14)	22 (8.9)	18 (9.1)	273 (9.1)
Total CTD	394 (39.2)	211 (26.6)	111 (25.5)	114 (36.2)	85 (34.4)	43 (21.7)	958 (32)
Other rheumatic diseases							
Total	132 (13.1)	52 (6.6)	53 (12.2)	8 (2.5)	20 (8.1)	13 (6.6)	278 (9.3)
Disease activity (DA)							
	N=950		N=364	N=315	242	N=181	N=2052
Remission	211 (22.2)	N/A	109 (29.9)	93 (29.5)	113 (46.7)	102 (56.4)	628 (30.6)
Minimal/low DA	521 (54.8)	N/A	172 (47.3)	160 (50.8)	108 (44.6)	53 (29.3)	1014 (49.4)
Moderate DA	185 (19.5)	N/A	69 (19)	53 (16.8)	17 (7)	19 (10.5)	343 (16.7)
Severe/high DA	33 (3.5)	N/A	14 (3.8)	9 (2.9)	4 (1.7)	7 (3.9)	67 (3.3)
Other outcomes							
Death	70 (7.0)	62 (7.8)	91 (20.9)	53 (16.8)	21 (8.5)	15 (7.6)	312 (10.4)
Hospitalised	357 (39.1) (N=914)	334 (42.1) (N=793)	275 (65.8) (N=418)	201 (64.2) (N=313)	133 (55.6) (N=239)	60 (30.6) (N=196)	1360 (47.3) (N=2873)
Invasive ventilation	64 (7.9) (N=807)	N/A	28 (7.5) (N=371)	23 (7.5) (N=308)	7 (3) (N=231)	15 (7.7) (N=196)	137 (5.8) (N=1913)

Comorbidities	<i>N=1000</i>	<i>N=791</i>	<i>N=434</i>	<i>N=300</i>	<i>N=247</i>	<i>N=192</i>	<i>N=2964</i>
Hypertension	399 (39.9)	220 (27.8)	140 (32.3)	147 (49)	103 (41.7)	72 (36.4)	1081 (36.4)
Cardiovascular disease	112 (11.2)	76 (9.6)	72 (16.6)	72 (24)	18 (7.3)	27 (13.6)	377 (12.7)
Cerebrovascular disease	27 (2.7)	28 (3.5)	17 (3.9)	14 (4.7)	6 (2.4)	0	92 (3.1)
Chronic lung disease	231 (23.1)	113 (14.3)	108 (24.9)	75 (25)	54 (21.9)	32 (16.2)	613 (20.6)
Chronic kidney disease	85 (8.5)	46 (5.8)	28 (6.5)	27 (9)	11 (4.5)	15 (7.6)	212 (7.1)
Obesity (BMI ≥ 30)	244 (24.4)	138 (17.4)	39 (9)	47 (15.7)	31 (12.6)	30 (15.2)	529 (17.8)
Morbid obesity (BMI ≥ 40)	87 (8.7)	0	11 (2.5)	7 (2.3)	2 (0.8)	7 (3.5)	114 (3.8)
Diabetes	171 (17.1)	74 (9.4)	73 (16.8)	42 (14)	31 (12.6)	17 (8.6)	408 (13.7)
Cancer	68 (6.8)	36 (4.6)	19 (4.4)	34 (11.3)	23 (9.3)	7 (3.5)	187 (6.3)
Other comorbidities	213 (21.3)	159 (20.1)	151 (34.8)	145 (48.3)	67 (27.1)	53 (27.6)	788 (36.2)
Number of comorbidities	1.7 (1.5)	1.1 (1.1)	1.6 (1.4)	2.3 (1.8)	1.5 (1.4)	1.3 (1.3)	1.5 (1.5)
No comorbidity	250 (25)	277 (35)	105 (24.2)	44 (14.7)	70 (28.3)	67 (33.8)	813 (27.4)
One comorbidity	275 (27.5)	276 (34.9)	136 (31.3)	79 (26.3)	77 (31.2)	58 (29.3)	901 (30.3)
Two comorbidities	211 (21.1)	143 (18.1)	98 (22.6)	57 (19)	51 (20.6)	39 (19.7)	599 (20.2)
≥ 3 comorbidities	264 (26.4)	95 (12)	95 (21.9)	120 (40)	49 (19.8)	34 (17.2)	657 (22.1)
DMARD therapies							
csDMARDs mono	106 (10.5)	159 (20.1)	91 (20.9)	66 (21)	51 (20.6)	52 (26.3)	525 (17.5)
csDMARDs combi	208 (20.7)	164 (20.7)	84 (19.3)	58 (18.4)	40 (16.2)	33 (16.7)	587 (19.6)
Methotrexate mono	88 (8.8)	151 (19)	83 (19.1)	55 (17.5)	45 (18.2)	47 (23.7)	469 (15.7)
Methotrexate combi	174 (17.3)	142 (17.9)	78 (17.9)	52 (16.5)	36 (14.6)	33 (16.7)	515 (17.2)
Leflunomide mono	18 (1.8)	8 (1)	8 (1.8)	11 (3.5)	6 (2.4)	5 (2.5)	56 (1.9)
Leflunomide combi	40 (4)	22 (2.8)	11 (2.5)	6 (1.9)	7 (2.8)	3 (1.5)	89 (3)
Sulfasalazine mono	7 (0.7)	3 (0.4)	21 (4.8)	4 (1.3)	6 (2.4)	7 (3.5)	48 (1.6)
Sulfasalazine combi	33 (3.3)	6 (0.8)	47 (10.8)	10 (3.2)	10 (4)	2 (1)	108 (3.6)
Antimalarial mono	120 (11.9)	32 (4)	20 (4.6)	28 (8.9)	15 (6.1)	8 (4)	223 (7.5)
Antimalarial combi	132 (13.1)	34 (4.3)	48 (11)	31 (9.8)	18 (7.3)	10 (5.1)	273 (9.1)
Immunosuppressants mono	66 (6.6)	14 (1.8)	23 (5.3)	17 (5.4)	9 (3.6)	10 (5.1)	139 (4.6)
Immunosuppressants combi	75 (7.5)	14 (1.8)	17 (3.9)	13 (4.1)	6 (2.4)	2 (1)	127 (4.2)
Mycophenolate mofetil mono	42 (4.2)	8 (1)	11 (2.5)	6 (1.9)	3 (1.2)	2 (1)	72 (2.4)
Mycophenolate mofetil combi	44 (4.4)	9 (1.1)	13 (3)	6 (1.9)	3 (1.2)	2 (1)	77 (2.6)
Azathioprine mono	17 (1.7)	6 (0.8)	9 (2.1)	8 (2.5)	5 (2)	7 (3.5)	52 (1.7)
Azathioprine combi	24 (2.4)	5 (0.6)	3 (0.7)	4 (1.3)	3 (1.2)	0	39 (1.3)
Cyclophosph. mono	2 (0.2)	0	3 (0.7)	2 (0.6)	1 (0.4)	1 (0.5)	9 (0.3)
Cyclophosph. combi	6 (0.6)	0	1 (0.2)	1 (0.3)	0	0	8 (0.3)
Tacrolimus mono	5 (0.5)	0	0	0	0	0	5 (0.2)
Tacrolimus combi	9 (0.9)	0	0	0	1 (0.4)	0	10 (0.3)
Cyclosporin mono	0	0	0	1 (0.3)	0	0	1 (0)
Cyclosporin combi	1 (0.1)	0	1 (0.2)	4 (1.3)	0	0	6 (0.2)
bDMARDs monotherapy	174 (17.3)	228 (28.8)	53 (12.2)	63 (20)	44 (17.8)	43 (21.7)	605 (20.2)
bDMARDs combination therapy	178 (17.7)	144 (18.2)	67 (15.4)	48 (15.2)	34 (13.8)	29 (14.7)	500 (16.7)
TNF inhibitors mono	100 (10)	145 (18.3)	29 (6.7)	45 (14.3)	27 (10.9)	26 (13.1)	372 (12.4)
TNF inhibitors combi	106 (10.5)	84 (10.6)	39 (9)	28 (8.9)	19 (7.7)	13 (6.6)	289 (9.7)
Abatacept mono	14 (1.4)	6 (0.8)	1 (0.2)	5 (1.6)	0	0	26 (0.9)
Abatacept combi	20 (2)	13 (1.6)	3 (0.7)	2 (0.6)	3 (1.2)	3 (1.5)	44 (1.5)
B-cell affecting bDMARDs mono	29 (2.9)	26 (3.3)	10 (2.3)	1 (0.3)	8 (3.2)	3 (1.5)	77 (2.6)

B-cell affecting bDMARDs combi	37 (3.7)	22 (2.8)	20 (4.6)	9 (2.9)	8 (3.2)	10 (5.1)	106 (3.5)
Rituximab mono	26 (2.6)	26 (3.3)	10 (2.3)	1 (0.3)	7 (2.8)	3 (1.5)	73 (2.4)
Rituximab combi	24 (2.4)	20 (2.5)	19 (4.4)	7 (2.2)	8 (3.2)	8 (4)	86 (2.9)
Belimumab mono	3 (0.3)	0	0	0	1 (0.4)	0	4 (0.1)
Belimumab combi	13 (1.3)	2 (0.3)	1 (0.2)	2 (0.6)	1 (0.4)	2 (1)	21 (0.7)
IL-6 inhibitors mono	11 (1.1)	18 (2.3)	3 (0.7)	4 (1.3)	3 (1.2)	6 (3)	45 (1.5)
IL-6 inhibitors combi	12 (1.2)	11 (1.4)	2 (0.5)	3 (1)	3 (1.2)	0	31 (1)
IL-1 inhibitors mono	0	9 (1.1)	1 (0.2)	0	1 (0.4)	0	11 (0.4)
IL-1 inhibitors combi	2 (0.2)	0	1 (0.2)	2 (0.6)	0	0	5 (0.2)
Other IL inhibitors (IL-17, IL-23, IL-12/23 inh.) mono	19 (1.9)	24 (3)	9 (2.1)	7 (2.2)	5 (2)	8 (4)	72 (2.4)
Other IL inhibitors (IL-17, IL-23, IL-12/23 inh.) combi	3 (0.3)	14 (1.8)	2 (0.5)	6 (1.9)	1 (0.4)	3 (1.5)	29 (1)
tsDMARDs mono	32 (3.2)	10 (1.3)	7 (1.6)	4 (1.3)	3 (1.2)	4 (2)	60 (2)
tsDMARDs (*) combi	43 (4.3)	15 (1.9)	4 (0.9)	9 (2.9)	3 (1.2)	3 (1.5)	77 (2.6)
JAK inhibitors mono	26 (2.6)	10 (1.3)	7 (1.6)	4 (1.3)	2 (0.8)	4 (2)	53 (1.8)
JAK inhibitors combi	40 (4)	15 (1.9)	3 (0.7)	8 (2.5)	3 (1.2)	3 (1.5)	72 (2.4)
Apremilast mono	6 (0.6)	0	0	0	1 (0.4)	0	7 (0.2)
Apremilast combi	2 (0.2)	0	1 (0.2)	1 (0.3)	0	0	4 (0.1)
No DMARD therapies	192 (19.1)	161 (20.3)	98 (22.5)	52 (16.5)	64 (25.9)	35 (17.7)	602 (20.1)
Further therapies							
Glucocorticoids (#)	283 (28.6) (N=990)	253 (31.9) (N=793)	128 (30) (N=427)	165 (52.4) (N=315)	98 (40.3) (N=243)	82 (41.6) (N=197)	1009 (34) (N=2965)
0 mg/d < GC <= 10mg/d	226 (22.9) (N=985)	205 (25.9) (N=791)	87 (20.5) (N=425)	135 (43.7) (N=309)	64 (30.2) (N=212)	74 (37.8) (N=196)	791 (27.1) (N=2918)
GC > 10 mg/d	52 (5.3) (N=985)	45 (5.7) (N=791)	37 (8.7) (N=425)	24 (7.8) (N=309)	3 (1.4) (N=212)	6 (3.1) (N=196)	167 (5.7) (N=2918)
NSAID	209 (22.9) (N=914)	85 (10.7) (N=793)	51 (13.3) (N=385)	53 (18.6) (N=285)	52 (21.9) (N=21.9)	36 (19.7) (N=19.7)	486 (17.4) (N=2798)
<p>Data are N (column %) for categorical variables or mean (SD) for continuous variables. Table includes all patients with a non-missing outcome and non-missing values for age, sex and disease modifying anti-rheumatic drugs (DMARDs) (101 patients excluded). Data refers to patients with non-missing values for the respective variable, total N for patients with non-missing values is given in parentheses for variables with missing values. (*) Includes one patient on a study medication (Lenabasum). (#) Includes patients with a missing glucocorticoid dose.</p> <p>bDMARD, biologic disease modifying antirheumatic drugs; BMI, body mass index; csDMARD, conventional synthetic disease modifying antirheumatic drugs; combi, combination therapy; CTD, connective tissue diseases; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IL, interleukin; JAK, Janus kinase; JIA, juvenile idiopathic arthritis; mono, monotherapy; N, number; NSAID, non-steroidal anti-inflammatory drugs; SLE, systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.</p>							

Supplementary table 3. Patient demographic and clinical characteristics stratified by main medication of interest

Parameter	MTX	LEF	ANTI-MALARIALS	SSZ	IMMUNO SUPPR.	TNFi	ABA	RTX	IL-6i	IL-17/23/12+23i	JAKi	No DMARDs	TOTAL
N	1237	203	665	222	338	804	83	193	90	116	134	739	3729
General													
Age [years]	58.3 (14.5)	59.5 (12.3)	53.3 (15.2)	59.0 (14.8)	50.1 (15.8)	51.1 (13.7)	59.0 (15.0)	56.2 (15.1)	57.7 (16.4)	50.1 (11.3)	58.3 (13.3)	62.8 (16.6)	57.0 (15.7)
Male sex	390 (31.5)	44 (21.7)	117 (17.6)	82 (36.9)	93 (27.5)	312 (38.8)	24 (28.9)	60 (31.1)	21 (23.3)	45 (38.8)	18 (13.4)	280 (37.9)	1195 (32)
Ever smoker	244 (23.4) (N=1044)	40 (24.7) (N=162)	129 (22.2) (N=582)	66 (37.3) (N=177)	54 (18.6) (N=290)	167 (23.6) (N=709)	20 (27.8) (N=72)	38 (23.3) (N=163)	10 (12.5) (N=80)	21 (20.8) (N=101)	28 (22.6) (N=124)	181 (29.8) (N=607)	776 (24.5) (N=3164)
Inflammatory joint diseases													
Rheumatoid arthritis	756 (61.1)	160 (78.8)	243 (36.5)	126 (56.8)	26 (7.7)	293 (36.4)	70 (84.3)	87 (45.1)	63 (70)	2 (1.7)	119 (88.8)	110 (14.9)	1394 (37.4)
Spondyloarthritis	74 (6)	4 (2)	6 (0.9)	35 (15.8)	6 (1.8)	271 (33.7)	2 (2.4)	0	2 (2.2)	43 (37.1)	4 (3)	59 (8)	431 (11.6)
Psoriatic arthritis	177 (14.3)	23 (11.3)	8 (1.2)	38 (17.1)	1 (0.3)	182 (22.6)	4 (4.8)	1 (0.5)	0	70 (60.3)	9 (6.7)	38 (5.1)	440 (11.8)
Total IJD	1047 (84.6)	190 (93.6)	280 (42.1)	212 (95.5)	33 (9.8)	765 (95.1)	77 (92.8)	91 (47.2)	68 (75.6)	113 (97.4)	132 (98.5)	239 (32.3)	2373 (63.6)
Connective tissue diseases/ Vasculitis													
SLE	49 (4)	7 (3.4)	257 (38.6)	3 (1.4)	127 (37.6)	6 (0.7)	2 (2.4)	15 (7.8)	1 (1.1)	1 (0.9)	5 (3.7)	48 (6.5)	391 (10.5)
CTDs (other than SLE)	104 (8.4)	4 (2)	171 (25.7)	5 (2.3)	134 (39.6)	19 (2.4)	6 (7.2)	52 (26.9)	1 (1.1)	0	3 (2.2)	156 (21.1)	533 (14.3)
Vasculitis	44 (3.6)	7 (3.4)	7 (1.1)	5 (2.3)	53 (15.7)	14 (1.7)	0	39 (20.2)	21 (23.3)	0	0	161 (21.8)	326 (8.7)
Total CTD	190 (15.4)	17 (8.4)	407 (61.2)	13 (5.9)	294 (87)	39 (4.9)	8 (9.6)	104 (53.9)	23 (25.6)	1 (0.9)	7 (5.2)	353 (47.8)	1193 (32)
Other RMDs													
Total	60 (4.9)	7 (3.4)	33 (5)	17 (7.7)	49 (14.5)	33 (4.1)	3 (3.6)	20 (10.4)	3 (3.3)	3 (2.6)	6 (4.5)	173 (23.4)	356 (9.5)
Disease activity													
	N=894	N=162	N=574	N=196	N=300	N=547	N=62	N=142	N=61	N=73	N=105	N=517	N=2758
Remission	307 (34.3)	40 (24.7)	146 (25.4)	50 (25.5)	66 (22)	184 (33.6)	14 (22.6)	36 (25.4)	16 (26.2)	20 (27.4)	19 (18.1)	215 (41.6)	893 (32.4)
Minimal/low	413 (46.2)	84 (51.9)	310 (54)	100 (51)	138 (46)	265 (48.4)	32 (51.6)	64 (45.1)	25 (41)	33 (45.2)	56 (53.3)	211 (40.8)	1309 (47.5)
Moderate DA	157 (17.6)	31 (19.1)	91 (15.9)	38 (19.4)	71 (23.7)	89 (16.3)	10 (16.1)	26 (18.3)	16 (26.2)	19 (26)	26 (24.8)	56 (10.8)	448 (16.2)
Severe/high DA	17 (1.9)	7 (4.3)	27 (4.7)	8 (4.1)	25 (8.3)	9 (1.6)	6 (9.7)	16 (11.3)	4 (6.6)	1 (1.4)	4 (3.8)	35 (6.8)	108 (3.9)

Other outcomes													
Hospitalised	541 (46.2) (N=1170)	103 (52.8) (N=195)	298 (47.1) (N=633)	126 (62.4) (N=202)	197 (60.4) (N=326)	207 (27.3) (N=758)	33 (42.9) (N=77)	127 (71.3) (N=178)	26 (29.9) (N=87)	37 (34.3) (N=108)	55 (43.7) (N=126)	442 (61.7) (N=716)	1739 (49) (N=3546)
Death	99 (8)	22 (10.8)	56 (8.4)	42 (18.9)	46 (13.6)	30 (3.7)	9 (10.8)	42 (21.8)	5 (5.6)	1 (0.9)	13 (9.7)	124 (16.8)	390 (10.5)
Comorbidities	N=1224	N=202	N=661	N=219	N=337	N=800	N=83	N=190	N=90	N=115	N=133	N=733	N=3700
Hypertension	422 (34.5)	71 (35.1)	239 (36.2)	85 (38.8)	127 (37.7)	196 (24.5)	28 (33.7)	58 (30.5)	24 (26.7)	29 (25.2)	55 (41.4)	332 (45.3)	1307 (35.3)
Cardiovascular disease	121 (9.9)	23 (11.4)	63 (9.5)	36 (16.4)	38 (11.3)	53 (6.6)	12 (14.5)	25 (13.2)	13 (14.4)	9 (7.8)	12 (9)	146 (19.9)	442 (11.9)
Cerebrovascular disease	31 (2.5)	7 (3.5)	19 (2.9)	9 (4.1)	11 (3.3)	13 (1.6)	1 (1.2)	5 (2.6)	3 (3.3)	2 (1.7)	4 (3)	31 (4.2)	109 (2.9)
Chronic lung disease	216 (17.6)	48 (23.8)	136 (20.6)	45 (20.5)	113 (33.5)	108 (13.5)	17 (20.5)	64 (33.7)	7 (7.8)	13 (11.3)	34 (25.6)	137 (18.7)	719 (19.4)
Chronic kidney disease	42 (3.4)	12 (5.9)	58 (8.8)	11 (5)	54 (16)	24 (3)	6 (7.2)	22 (11.6)	3 (3.3)	3 (2.6)	6 (4.5)	83 (11.3)	258 (7)
Obesity (BMI ≥ 30)	187 (15.3)	30 (14.9)	108 (16.3)	38 (17.4)	55 (16.3)	148 (18.5)	15 (18.1)	22 (11.6)	18 (20)	27 (23.5)	36 (27.1)	102 (13.9)	597 (16.1)
Morbid obesity (BMI ≥ 40)	33 (2.7)	6 (3)	34 (5.1)	6 (2.7)	26 (7.7)	24 (3)	4 (4.8)	13 (6.8)	2 (2.2)	2 (1.7)	12 (9)	20 (2.7)	122 (3.3)
Diabetes	170 (13.9)	39 (19.3)	80 (12.1)	38 (17.4)	46 (13.6)	75 (9.4)	14 (16.9)	26 (13.7)	13 (14.4)	12 (10.4)	19 (14.3)	121 (16.5)	505 (13.6)
Cancer	64 (5.2)	7 (3.5)	32 (4.8)	12 (5.5)	13 (3.9)	17 (2.1)	5 (6)	18 (9.5)	3 (3.3)	5 (4.3)	2 (1.5)	76 (10.4)	214 (5.8)
Other comorbidities	267 (21.8)	43 (21.3)	138 (20.9)	63 (28.8)	98 (29.1)	209 (26.1)	19 (22.9)	50 (26.3)	22 (24.4)	44 (38.3)	33 (24.8)	178 (24.3)	897 (24.2)
DMARD therapies													
Methotrexate/Leflunomide	1237 (100)	203 (100)	199 (29.9)	96 (43.2)	10 (3)	306 (38.1)	41 (49.4)	61 (31.6)	32 (35.6)	30 (25.9)	61 (45.5)	0	1404 (37.7)
Sulfasalazine	75 (6.1)	24 (11.8)	39 (5.9)	222 (100)	5 (1.5)	48 (6)	1 (1.2)	6 (3.1)	5 (5.6)	3 (2.6)	11 (8.2)	0	222 (6)
Antimalarials	177 (14.3)	33 (16.3)	665 (100)	39 (17.6)	108 (32)	41 (5.1)	10 (12)	29 (15)	7 (7.8)	2 (1.7)	14 (10.4)	0	665 (17.8)
Immunosuppressants	9 (0.7)	1 (0.5)	108 (16.2)	5 (2.3)	338 (100)	17 (2.1)	2 (2.4)	27 (14)	0	1 (0.9)	2 (1.5)	0	338 (9.1)
bDMARDs	424 (34.3)	63 (31)	109 (16.4)	64 (28.8)	59 (17.5)	804 (100)	83 (100)	193 (100)	90 (100)	116 (100)	1 (0.7)	0	1331 (35.7)
tsDMARDs	52 (4.2)	12 (5.9)	14 (2.1)	12 (5.4)	3 (0.9)	0	0	1 (0.5)	0	1 (0.9)	134 (100)	0	147 (3.9)
Further therapies													
Glucocorticoids (#)	410 (33.5) (N=1223)	83 (42.3) (N=196)	252 (38.3) (N=658)	66 (30.6) (N=216)	66 (30.6) (N=335)	130 (16.3) (N=796)	34 (41) (N=83)	100 (52.6) (N=190)	35 (38.9) (N=90)	16 (13.8) (N=116)	48 (36.9) (N=130)	290 (39.8) (N=729)	1273 (34.6) (N=3682)
0 mg/d < GC ≤ 10mg/d	351 (29.2) (N=1203)	75 (38.9) (N=193)	192 (30) (N=640)	52 (24.4) (N=213)	52 (24.4) (N=323)	102 (12.9) (N=789)	30 (36.6) (N=82)	67 (37) (N=181)	30 (33.7) (N=89)	14 (12.1) (N=116)	44 (33.8) (N=130)	202 (28.4) (N=712)	983 (27.2) (N=3617)
GC > 10 mg/d	38 (3.2) (N=1203)	5 (2.6) (N=193)	42 (6.6) (N=640)	11 (5.2) (N=213)	11 (5.2) (N=323)	20 (2.5) (N=789)	3 (3.7) (N=82)	22 (12.2) (N=181)	4 (4.5) (N=89)	2 (1.7) (N=116)	4 (3.1) (N=130)	70 (9.8) (N=712)	220 (6.1) (N=3617)

Supplementary table 4. Multivariable logistic regression analysis of factors associated with COVID-19-related death in patients with rheumatic diseases (excluding patients reported from France)																
	All				Patients with inflammatory joint diseases (IJDs)				Only patients with rheumatoid arthritis				Patients with connective tissue diseases (CTDs) or vasculitis			
N deaths/patients (%)	324 / 2921 (11.1%)				186 / 1818 (10.2%)				146 / 1124 (13.0 %)				113 / 932 (12.1%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Age, years																
Age ≤ 65	108 / 2018	1	[Reference]		52 / 1259	1	[Reference]		38 / 692	1	[Reference]		49 / 657	1	[Reference]	
65 years < Age ≤ 75	97 / 516	3.18	2.26	4.47	67 / 351	3.58	2.41	5.33	53 / 259	3.33	1.80	6.18	24 / 139	2.43	1.43	4.13
Age > 75	119 / 387	5.77	4.03	8.28	67 / 208	7.22	4.89	10.66	55 / 173	6.31	3.77	10.54	40 / 136	4.34	2.11	8.91
Male sex (vs. female)	131 / 919	1.39	1.00	1.95	74 / 603	1.39	1.01	1.91	50 / 279	1.27	0.85	1.89	44 / 232	1.38	0.91	2.08
Ever smoked (vs. never)	135 / 873	1.12	0.85	1.49	85 / 576	1.15	0.79	1.67	71 / 373	1.27	0.87	1.86	39 / 234	1.13	0.70	1.82
Comorbidities																
Hypertension alone or CVD alone	125 / 954	1.08	0.85	1.38	67 / 568	1.03	0.69	1.54	54 / 375	1.05	0.70	1.59	53 / 337	1.40	0.95	2.08
Hypertension and CVD	72 / 253	1.77	1.20	2.62	48 / 146	2.45	1.22	4.92	34 / 102	2.09	0.99	4.42	18 / 82	1.15	0.61	2.18
Chronic lung disease	122 / 610	1.74	1.26	2.40	73 / 342	1.67	1.15	2.41	61 / 258	1.62	1.13	2.32	44 / 241	2.17	1.41	3.35
Chronic kidney disease	58 / 214	1.40	0.81	2.43	21 / 97	0.83	0.45	1.56	16 / 75	0.76	0.36	1.59	30 / 97	2.34	1.16	4.73
Diabetes mellitus	79 / 433	1.26	0.76	2.08	47 / 267	1.23	0.86	1.77	32 / 182	1.00	0.63	1.58	21 / 126	1.01	0.52	1.96
Rheumatic disease																
Rheumatoid arthritis	140 / 1079	1	[Reference]		146 / 1126	1	[Reference]							n.a.		
Systemic lupus erythematosus	34 / 341	1.28	0.71	2.29									30 / 328	1	[Reference]	
Vasculitis	49 / 254	0.75	0.54	1.05									43 / 233	0.65	0.40	1.08
Other connective tissue diseases	42 / 384	0.73	0.54	0.98									40 / 371	0.77	0.36	1.64

Psoriasis arthritis	16 / 355	0.72	0.49	1.05	16 / 363	0.75	0.50	1.13										
Spondyloarthritis	14 / 231	0.96	0.50	1.87	14 / 232	1.02	0.52	2.00										
Other inflammatory arthritis or non-systemic JIA	9 / 92	0.75	0.45	1.26	10 / 97	0.71	0.41	1.23										n.a.
Other rheumatic diseases (not IJDs / CTDs / vasculitis)	20 / 185	0.53	0.36	0.80		n.a.												
High/moderate/severe disease activity (DA) vs. remission/low DA	96 / 585	1.91	1.24	2.95	50 / 365	1.65	1.11	2.45	40 / 233	1.67	1.00	2.81	43 / 189	2.59	1.46	4.58		
Medication																		
Methotrexate	38 / 444	1	[Reference]		33 / 366	1	[Reference]			27 / 273	1	[Reference]		5 / 69	1	[Reference]		
No DMARD therapy	94 / 578	1.91	1.29	2.84	30 / 188	1.99	1.18	3.36	19 / 90	2.01	1.16	3.49	49 / 266	2.76	1.32	5.78		
Leflunomide	12 / 82	1.53	0.83	2.81	10 / 75	1.40	0.65	3.01	9 / 62	1.46	0.68	3.15						n.a.
Antimalarials	26 / 380	0.92	0.58	1.46	17 / 158	1.15	0.61	2.14	17 / 133	1.28	0.68	2.41	10 / 234	1.16	0.33	4.03		
Sulfasalazine	33 / 138	3.19	1.39	7.32	31 / 132	3.10	1.25	7.70	21 / 84	2.41	1.07	5.39						n.a.
Immunosuppressants	36 / 252	1.98	1.20	3.24		n.a.				n.a.			30 / 227	1.87	0.75	4.65		
TNF inhibitors	26 / 574	0.76	0.45	1.28	23 / 544	0.73	0.36	1.46	15 / 235	0.85	0.37	1.96	3 / 34	1.22	0.19	7.68		
Abatacept	8 / 62	1.22	0.55	2.68	8 / 57	1.43	0.60	3.45	8 / 51	1.57	0.64	3.85						n.a.
Rituximab	32 / 146	3.56	1.94	6.53	19 / 73	4.75	2.21	10.20	18 / 69	4.35	1.91	9.91	15 / 78	2.60	0.80	8.44		
Belimumab	1 / 25	0.62	0.15	2.53		n.a.				n.a.			1 / 25	0.80	0.15	4.33		
IL-6 inhibitors	4 / 61	0.94	0.36	2.43	1 / 49	0.33	0.03	3.39	1 / 44	0.33	0.03	3.25						n.a.
IL-17/IL-23/IL-12+23 inhibitors	1 / 77	0.29	0.03	2.41	1 / 75	0.31	0.04	2.43		n.a.								
tsDMARDs	13 / 120	1.50	0.81	2.77	13 / 117	1.77	0.97	3.23	11 / 97	1.54	0.71	3.32						n.a.
Glucocorticoids (GCs)																		

No GCs	148 / 1885	1	[Reference]		103 / 1301	1	[Reference]		76 / 700	1	[Reference]		31 / 465	1	[Reference]	
GCs 1-10mg/d	137 / 856	1.33	0.85	2.07	75 / 467	1.18	0.61	2.28	63 / 390	1.10	0.51	2.38	57 / 372	1.92	1.21	3.03
GCs > 10 mg/d	40 / 180	1.73	1.10	2.71	9 / 50	1.07	0.48	2.36	7 / 34	0.97	0.42	2.22	28 / 111	2.40	1.32	4.38

Missing values imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.

CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.

Supplementary table 5. Multivariable logistic regression analysis of factors associated with COVID-19-related death in patients with rheumatic diseases in patients with no missing values (complete case analysis)																
	All				Patients with inflammatory joint diseases (IJDs)				Only patients with rheumatoid arthritis				Patients with connective tissue diseases (CTDs) or vasculitis			
N deaths/patients (%)	207 / 2081 (9.9%)				113 / 1232 (9.1%)				87 / 770 (11.3%)				74 / 699 (10.6%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Age, years																
Age ≤ 65	69 / 1476	1	[Reference]		33 / 868	1	[Reference]		24 / 493	1	[Reference]		33 / 518	1	[Reference]	
65 years < Age ≤ 75	58 / 357	3.03	1.99	4.62	37 / 236	2.81	1.78	4.44	28 / 172	2.52	1.31	4.85	15 / 100	2.12	1.06	4.26
Age > 75	80 / 248	6.71	4.91	9.17	43 / 128	7.17	3.65	14.09	35 / 105	5.93	2.47	14.22	26 / 81	5.60	2.89	10.86
Male sex (vs. female)	81 / 614	1.30	0.96	1.76	45 / 385	1.57	1.05	2.35	29 / 175	1.35	0.79	2.32	26 / 163	1.07	0.65	1.75
Ever smoked (vs. never)	85 / 597	1.16	0.84	1.60	50 / 377	1.20	0.80	1.80	42 / 247	1.44	1.02	2.03	27 / 172	1.35	0.69	2.63
Comorbidities																
Hypertension alone or CVD alone	82 / 687	1.14	0.93	1.41	41 / 387	1.11	0.74	1.66	33 / 258	1.17	0.76	1.82	37 / 260	1.67	1.09	2.55
Hypertension and CVD	48 / 168	2.04	1.58	2.63	34 / 97	3.24	1.73	6.08	24 / 67	3.05	1.33	6.96	10 / 53	1.06	0.61	1.84
Chronic lung disease	83 / 453	1.76	1.37	2.27	42 / 232	1.39	1.02	1.90	34 / 175	1.32	0.95	1.83	37 / 194	2.80	1.88	4.16
Chronic kidney disease	38 / 135	1.59	0.94	2.69	17 / 55	1.49	0.97	2.31	13 / 42	1.53	1.03	2.29	16 / 61	2.04	0.77	5.41
Diabetes mellitus	48 / 302	1.13	0.73	1.73	32 / 185	1.24	0.91	1.69	21 / 125	0.88	0.59	1.30	10 / 89	0.69	0.28	1.70
Rheumatic disease																
Rheumatoid arthritis	84 / 772	1	[Reference]		87 / 770	1	[Reference]								n.a.	
Systemic lupus erythematosus	19 / 265	0.99	0.409	2.37			n.a.				n.a.		16 / 256	1	[Reference]	

Vasculitis	31 / 163	1.02	0.59	1.77									26 / 146	1.03	0.49	2.20
Other connective tissue diseases	33 / 307	0.88	0.55	1.43									32 / 297	1.14	0.55	2.39
Psoriasis arthritis	11 / 230	0.80	0.53	1.20	11 / 236	0.69	0.45	1.06						n.a.		
Spondyloarthritis	9 / 157	1.11	0.56	2.18	9 / 156	1.06	0.52	2.13								
Other inflammatory arthritis or non-systemic JIA	5 / 68	0.87	0.42	1.81	6 / 70	0.79	0.41	1.55								
Other rheumatic diseases (not IJDs / CTDs / vasculitis)	15 / 119	0.70	0.39	1.26		n.a.										
High/moderate/severe disease activity (DA) vs. remission/low DA	65 / 422	2.03	1.33	3.10	34 / 240	1.96	1.24	3.09	27 / 159	1.98	1.13	3.48	28 / 145	2.73	1.93	3.86
Medication																
Methotrexate	24 / 302	1	[Reference]		22 / 252	1	[Reference]		17 / 182	1	[Reference]		2 / 46	1	[Reference]	
No DMARD therapy	58 / 385	1.56	1.09	2.23	17 / 122	1.54	0.90	2.62	11 / 54	1.64	0.81	3.32	30 / 184	4.23	1.55	11.53
Leflunomide	7 / 51	1.35	0.76	2.41	5 / 47	0.87	0.48	1.60	4 / 41	0.76	0.41	1.40		n.a.		
Antimalarials	19 / 296	1.02	0.67	1.54	12 / 117	1.00	0.56	1.79	12 / 96	1.09	0.59	2.05	8 / 190	2.40	0.73	7.93
Sulfasalazine	16 / 90	2.77	0.88	8.69	15 / 87	2.43	0.78	7.53	11 / 51	2.16	0.72	6.46		n.a.		
Immunosuppressants	26 / 193	1.99	1.08	3.68		n.a.				n.a.			21 / 173	3.25	1.18	9.00
TNF inhibitors	19 / 447	0.75	0.43	1.31	17 / 425	0.65	0.33	1.29	10 / 188	0.68	0.24	1.94	2 / 24	2.26	0.12	42.16
Abatacept	6 / 49	1.17	0.43	3.19	6 / 46	1.12	0.35	3.61	6 / 40	1.21	0.35	4.20		n.a.		
Rituximab	17 / 104	2.43	1.64	3.58	8 / 45	2.99	1.36	6.55	7 / 42	2.60	1.16	5.81	10 / 62	3.48	1.23	9.88
Belimumab	1 / 21	0.95	0.26	3.52		n.a.				n.a.			1 / 21	2.11	0.32	13.96
IL-6 inhibitors	3 / 50	0.78	0.338	1.81		n.a.				n.a.				n.a.		
tsDMARDs	11 / 101	1.58	0.86	2.90	11 / 98	1.76	1.01	3.05	9 / 83	1.41	0.74	2.70		n.a.		

Glucocorticoids (GCs)																		
No GCs	93 / 1394	1	[Reference]			59 / 917	1	[Reference]			41 / 511	1	[Reference]			22 / 373	1	[Reference]
GCs 1-10mg/d	90 / 561	1.63	1.14	2.33	47 / 282	1.44	0.66	3.15	41 / 237	1.54	0.63	3.77	37 / 248	2.32	1.30	4.11		
GCs > 10 mg/d	24 / 126	1.58	0.91	2.74	7 / 33	1.54	0.48	4.98	5 / 22	1.35	0.48	3.80	15 / 78	2.06	1.04	4.09		
Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.																		
CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.																		

Supplementary table 6. Multivariable logistic regression analysis of factors associated with COVID-19-related death in patients with rheumatic diseases with a confirmed or highly likely COVID-19 diagnosis																
	All				Patients with inflammatory joint diseases (IJDs)				Only patients with rheumatoid arthritis				Patients with connective tissue diseases (CTDs) or vasculitis			
N deaths/patients (%)	345 / 2968 (11.6%)				184 / 1619 (10.2%)				143 / 946 (13.1%)				139 / 999 (13.9%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Age, years																
Age ≤ 65	107 / 1971	1	[Reference]		48 / 1204	1	[Reference]		35 / 627	1	[Reference]		53 / 666	1	[Reference]	
65 years < Age ≤ 75	98 / 545	2.87	1.92	4.29	62 / 358	3.43	2.43	4.84	48 / 267	2.90	1.61	5.23	32 / 161	2.37	1.27	4.43
Age > 75	140 / 452	5.40	3.58	8.14	74 / 241	7.16	4.81	10.66	60 / 195	5.91	3.76	9.29	54 / 172	3.82	1.80	8.12
Male sex (vs. female)	146 / 962	1.47	1.12	1.94	71 / 607	1.27	0.90	1.81	47 / 282	1.16	0.76	1.75	60 / 261	1.70	0.99	2.93
Ever smoked (vs. never)	119 / 740	1.13	0.85	1.50	69 / 468	1.20	0.85	1.70	58 / 310	1.33	0.98	1.79	39 / 213	0.99	0.64	1.52
Comorbidities																
Hypertension alone or CVD alone	138 / 962	1.16	0.87	1.54	67 / 553	1.00	0.72	1.37	55 / 369	1.09	0.74	1.62	63 / 357	1.45	0.96	2.19
Hypertension and CVD	80 / 271	1.83	1.34	2.51	47 / 151	2.16	1.17	3.98	34 / 108	2.05	1.00	4.19	27 / 96	1.46	0.75	2.83
Chronic lung disease	122 / 602	1.68	1.23	2.29	66 / 334	1.47	0.95	2.27	55 / 246	1.43	0.92	2.23	51 / 243	2.08	1.48	2.93
Chronic kidney disease	69 / 233	1.57	0.97	2.57	24 / 95	1.18	0.61	2.29	18 / 71	1.08	0.51	2.28	38 / 116	2.07	1.18	3.62
Diabetes mellitus	90 / 461	1.36	0.89	2.08	50 / 274	1.29	0.92	1.81	35 / 188	1.07	0.70	1.63	31 / 147	1.28	0.61	2.69
Rheumatic disease																
Rheumatoid arthritis	137 / 1055	1	[Reference]		143 / 1091	1	[Reference]							n.a.		
Systemic lupus erythematosus	35 / 336	1.31	0.77	2.23		n.a.			n.a.				31 / 326	1	[Reference]	

Vasculitis	63 / 284	0.92	0.67	1.26									60 / 277	0.81	0.49	1.35
Other connective tissue diseases	50 / 407	0.83	0.62	1.12									48 / 396	0.80	0.40	1.61
Psoriasis arthritis	17 / 324	0.76	0.60	0.97	17 / 331	0.85	0.61	1.17						n.a.		
Spondyloarthritis	14 / 291	0.77	0.38	1.58	14 / 292	0.92	0.46	1.83								
Other inflammatory arthritis or non-systemic JIA	9 / 84	0.86	0.57	1.31	10 / 89	0.90	0.57	1.44								
Other rheumatic diseases (not IJDs / CTDs / vasculitis)	20 / 187	0.49	0.35	0.70		n.a.										
High/moderate/severe disease activity (DA) vs. remission/low DA	97 / 575	1.77	1.15	2.73	47 / 337	1.63	1.06	2.50	37 / 206	1.63	0.98	2.71	47 / 204			
Medication																
Methotrexate	45 / 476	1	[Reference]		39 / 387	1	[Reference]		32 / 279	1	[Reference]		6 / 80	1	[Reference]	
No DMARD therapy	109 / 620	1.88	1.31	2.68	28 / 187	1.58	1.01	2.46	17 / 88	1.55	0.92	2.61	64 / 309	3.22	1.58	6.56
Leflunomide	10 / 75	1.38	0.79	2.40	8 / 68	1.15	0.60	2.20	7 / 56	1.12	0.56	2.26		n.a.		
Antimalarials	24 / 360	0.86	0.52	1.43	15 / 138	1.02	0.51	2.03	15 / 116	1.09	0.54	2.18	10 / 231	1.30	0.43	3.88
Sulfasalazine	28 / 119	3.16	1.36	7.37	26 / 113	2.91	1.14	7.43	18 / 75	2.25	0.98	5.17		n.a.		
Immunosuppressants	36 / 238	1.99	1.27	3.13		n.a.				n.a.			31 / 213	2.46	1.11	5.42
TNF inhibitors	29 / 575	0.92	0.57	1.49	25 / 544	0.83	0.45	1.54	15 / 229	0.87	0.37	2.05	4 / 34	2.09	0.33	13.30
Abatacept	8 / 68	1.06	0.57	1.96	8 / 62	1.14	0.57	2.29	8 / 56	1.21	0.57	2.58		n.a.		
Rituximab	35 / 160	3.28	1.89	5.69	19 / 72	5.32	2.54	11.13	18 / 68	4.80	2.24	10.29	19 / 89	3.29	1.04	10.43
Belimumab	1 / 23	0.66	0.19	2.31		n.a.				n.a.			1 / 23	1.09	0.22	5.39
IL-6 inhibitors	5 / 66	0.91	0.43	1.90	1 / 47	0.29	0.03	2.80	1 / 42	0.29	0.03	2.79	4 / 21	2.72	0.91	8.09

IL-17/IL-23/IL-12+23 inhibitors	1 / 89	0.30	0.04	2.36	1 / 87	0.31	0.04	2.29		n.a.			n.a.			
tsDMARDs	14 / 114	1.66	0.85	3.21	14 / 111	1.80	0.96	3.34	12 / 91	1.54	0.66	3.60	n.a.			
Glucocorticoids (GCs)																
No GCs	148 / 1884	1	[Reference]		97 / 1298	1	[Reference]		67 / 681	1	[Reference]		36 / 467	1	[Reference]	
GCs 1-10mg/d	151 / 883	1.39	0.93	2.06	76 / 454	1.32	0.71	2.46	67 / 371	1.38	0.64	3.00	70 / 406	1.74	1.14	2.67
GCs > 10 mg/d	46 / 200	1.68	1.11	2.56	11 / 51	1.41	0.68	2.90	9 / 38	1.38	0.59	3.22	33 / 126	2.16	1.21	3.88
Missing values imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.																
CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, systemic lupus erythematosus; TNF; tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.																

Supplementary table 7. Multivariable logistic regression analysis of factors associated with COVID-19-related death or invasive ventilation in patients with rheumatic diseases														
	All			Patients with inflammatory joint diseases (IJDs)			Only patients with rheumatoid arthritis			Patients with connective tissue diseases (CTDs) or vasculitis				
N deaths or invasive ventilations (IV) /patients (%)	451 / 3075 (14.7%)			248 / 1970 (12.6%)			188 / 1148 (16.4%)			170 / 925 (18.4%)				
	N deaths or IVs / patients	OR	95% CI	N deaths or IVs / patients	OR	95% CI	N deaths or IVs/patients	OR	95% CI	N deaths or IVs / patients	OR	95% CI		
Age, years														
Age ≤ 65	168 / 2173	1	[Reference]	81 / 1425	1	[Reference]	51 / 721	1	[Reference]	80 / 638	1	[Reference]		
65 years < Age ≤ 75	120 / 507	2.55	2.00 3.26	78 / 339	2.95	2.14 4.06	62 / 253	3.09	1.96 4.88	90 / 287	1.54	1.14 2.09		
Age > 75	163 / 395	5.19	3.35 8.03	89 / 206	7.22	3.90 13.35	75 / 174	7.11	3.65 13.85	58 / 146	3.21	2.08 4.96		
Male sex (vs. female)	184 / 977	1.50	1.12 2.00	92 / 652	1.29	0.91 1.83	61 / 287	1.20	0.74 1.96	72 / 242	1.76	1.18 2.60		
Ever smoked (vs. never)	161 / 821	0.98	0.74 1.30	96 / 541	0.99	0.70 1.39	78 / 344	1.10	0.74 1.63	51 / 222	1.01	0.65 1.58		
Comorbidities														
Hypertension alone or CVD alone	184 / 927	1.33	1.02 1.74	94 / 560	1.22	0.86 1.72	74 / 371	1.15	0.80 1.66	79 / 323	1.53	1.13 2.06		
Hypertension and CVD	95 / 252	1.90	1.25 2.88	57 / 144	2.33	1.20 4.53	41 / 101	1.96	0.93 4.15	30 / 82	1.55	0.74 3.22		
Chronic lung disease	158 / 590	1.80	1.38 2.35	91 / 328	1.87	1.26 2.78	74 / 234	1.76	1.21 2.56	62 / 233	2.11	1.52 2.93		
Chronic kidney disease	86 / 211	2.00	1.24 3.22	30 / 93	1.13	0.61 2.11	23 / 69	1.01	0.48 2.11	46 / 98	3.16	1.69 5.90		
Diabetes mellitus	108 / 393	1.44	0.97 2.14	62 / 246	1.30	1.02 1.67	44 / 171	1.17	0.80 1.71	35 / 114	1.42	0.61 3.31		
Rheumatic disease														
Rheumatoid arthritis	180 / 1107	1	[Reference]	188 / 1150	1	[Reference]			n.a.			n.a.		

Systemic lupus erythematosus	46 / 322	1.26	0.83	1.91		n.a.							42 / 310	1	[Reference]	
Vasculitis	72 / 267	0.77	0.59	1.02		n.a.							65 / 246	0.74	0.50	1.09
Other connective tissue diseases	66 / 381	0.89	0.62	1.28		n.a.							63 / 369	0.95	0.54	1.65
Psoriasis arthritis	27 / 362	0.74	0.51	1.07	27 / 369	0.78	0.51	1.18						n.a.		
Spondyloarthritis	18 / 357	0.67	0.35	1.27	18 / 358	0.72	0.37	1.41								
Other inflammatory arthritis or non-systemic JIA	13 / 88	1.04	0.72	1.49	15 / 93	1.13	0.83	1.54								
Other rheumatic diseases (not IJDs / CTDs / vasculitis)	29 / 191	0.55	0.36	0.83		n.a.										
High/moderate/severe disease activity (DA) vs. remission/low DA	119 / 592	1.57	1.13	2.19	60 / 380	1.35	0.96	1.89	48 / 235	1.32	0.88	1.98	53 / 182	1.98	1.21	3.24
Medication																
Methotrexate	56 / 468	1	[Reference]		48 / 390	1	[Reference]		39 / 289	1	[Reference]		8 / 70	1	[Reference]	
No DMARD therapy	139 / 622	1.96	1.26	3.06	41 / 208	1.93	1.15	3.23	25 / 92	2.00	1.18	3.40	75 / 287	2.77	1.48	5.19
Leflunomide	15 / 71	1.83	0.96	3.48	13 / 66	1.72	0.81	3.69	12 / 56	1.86	0.92	3.78		n.a.		
Antimalarials	35 / 357	1.02	0.67	1.56	20 / 142	1.13	0.61	2.10	19 / 117	1.25	0.67	2.31	17 / 225	1.53	0.67	3.48
Sulfasalazine	37 / 120	3.67	1.85	7.26	35 / 113	3.67	1.75	7.70	24 / 70	3.04	1.43	6.45		n.a.		
Immunosuppressants	45 / 231	1.80	1.19	2.72		n.a.				n.a.			38 / 209	1.70	0.91	3.18
TNF inhibitors	39 / 692	0.86	0.53	1.37	34 / 657	0.83	0.48	1.43	22 / 254	0.98	0.52	1.86	6 / 37	1.73	0.33	9.04
Abatacept	11 / 65	1.28	0.61	2.71	11 / 62	1.40	0.63	3.12	11 / 58	1.55	0.71	3.42		n.a.		
Rituximab	46 / 144	4.31	2.48	7.49	25 / 72	5.99	3.00	11.96	24 / 69	6.04	3.01	12.09	23 / 75	3.15	1.12	8.90
Belimumab	3 / 22	1.84	0.58	5.87		n.a.				n.a.			3 / 22	2.25	0.73	6.98

IL-6 inhibitors	5 / 77	0.75	0.34	1.63	1 / 60	0.22	0.02	2.09	1 / 55	0.22	0.02	2.14		n.a.		
IL-17/IL-23/IL-12+23 inhibitors	6 / 92	1.42	0.59	3.43	6 / 89	1.58	0.63	3.96		n.a.						
tsDMARDs	17 / 125	1.45	0.81	2.59	17 / 122	1.67	0.94	2.97	14 / 99	1.51	0.76	3.02				
Glucocorticoids (GCs)																
No GCs	202 / 2032	1	[Reference]		136 / 1450	1	[Reference]		90 / 722	1	[Reference]		45 / 452	1	[Reference]	
GCs 1-10mg/d	191 / 860	1.45	1.03	2.04	99 / 468	1.31	0.72	2.38	87 / 389	1.37	0.68	2.73	86 / 362	2.02	1.44	2.84
GCs > 10 mg/d	58 / 183	2.11	1.44	3.11	13 / 53	1.47	0.58	3.74	11 / 37	1.74	0.56	5.40	39 / 111	2.51	1.47	4.27
<p>Living patients with missing values for invasive ventilation excluded from the model (dependent variable unknown). Missing values in other variables imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.</p> <p>CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.</p>																

Supplementary table 8. Multivariable logistic regression analysis of factors associated with COVID-19-related death in all patients with a reduced number of regressor variables																
	All				Patients with inflammatory joint diseases (IJDs)				Only patients with rheumatoid arthritis				Patients with connective tissue diseases (CTDs) or vasculitis			
N deaths/patients (%)	384/3705 (10.4%)				211/2348 (9.0%)				166/1371 (12.1%)				147/1157 (12.7%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Age, years																
Age ≤ 65	118 / 2565	1	[Reference]		55 / 1657	1	[Reference]		40 / 840	1	[Reference]		56 / 779	1	[Reference]	
Age > 65	266 / 1140	4.10	3.06	5.49	156 / 691	5.00	3.63	6.88	126 / 531	4.40	2.74	7.08	91 / 378	3.15	1.91	5.18
Male sex (vs. female)	161 / 1188	1.41	1.08	1.86	82 / 788	1.27	0.94	1.72	55 / 345	1.14	0.77	1.70	63 / 296	1.64	0.97	2.77
Ever smoked (vs. never)	140 / 922	1.18	0.89	1.56	84 / 607	1.21	0.88	1.66	71 / 385	1.38	1.00	1.92	42 / 248	1.07	0.63	1.81
Comorbidities																
Hypertension alone or CVD alone	155 / 1150	1.23	0.91	1.66	79 / 690	1.08	0.77	1.51	66 / 454	1.16	0.78	1.74	69 / 406	1.58	1.06	2.35
Hypertension and CVD	89 / 301	2.13	1.42	3.18	53 / 168	2.66	1.54	4.60	38 / 118	2.48	1.34	4.56	28 / 106	1.65	0.80	3.43
Chronic lung disease	136 / 721	1.63	1.21	2.20	76 / 406	1.51	1.01	2.26	63 / 293	1.45	0.96	2.20	54 / 285	1.92	1.37	2.69
Chronic kidney disease	76 / 259	1.84	1.07	3.19	27 / 111	1.25	0.59	2.64	21 / 83	1.17	0.50	2.75	41 / 124	2.46	1.41	4.30
Diabetes mellitus	96 / 508	1.35	0.87	2.10	55 / 313	1.27	0.93	1.73	39 / 213	1.06	0.71	1.57	32 / 154	1.37	0.65	2.89
Rheumatic disease																
Rheumatoid arthritis	160 / 1326	1	[Reference]		166 / 1373	1	[Reference]							n.a.		
Systemic lupus erythematosus	36 / 391	1.10	0.67	1.81									32 / 378	1	[Reference]	
Vasculitis	67 / 325	0.85	0.64	1.11		n.a.				n.a.						
Other connective tissue diseases	53 / 473	0.75	0.57	0.97									115 / 479	0.89	0.53	1.49
Psoriasis arthritis	19 / 429	0.66	0.49	0.90	19 / 437	0.73	0.52	1.04						n.a.		

Spondyloarthritis	15 / 423	0.66	0.32	1.35	15 / 424	0.76	0.39	1.48								
Other inflammatory arthritis or non-systemic JIA	10 / 109	0.73	0.44	1.22	11 / 114	0.70	0.40	1.23								
Other rheumatic diseases (not IJDs / CTDs / vasculitis)	24 / 229	0.52	0.36	0.74		n.a.										
High/moderate/severe disease activity (DA) vs. remission/low DA	109 / 722	1.84	1.31	2.59	54 / 453	1.49	1.09	2.02	44 / 274	1.49	0.99	2.23	51 / 230	2.54	1.63	3.95
Medication																
Methotrexate	47 / 595	1	[Reference]		41 / 487	1	[Reference]		34 / 354	1	[Reference]		6 / 94	1	[Reference]	
No DMARD therapy	124 / 739	2.20	1.55	3.12	38 / 239	2.14	1.44	3.17	25 / 110	2.12	1.36	3.29	67 / 353	3.43	1.72	6.85
Leflunomide	12 / 90	1.47	0.81	2.66	10 / 83	1.27	0.62	2.61	9 / 68	1.32	0.63	2.73		n.a.		
Antimalarials	27 / 426	0.96	0.64	1.43	17 / 167	1.07	0.59	1.93	17 / 141	1.15	0.63	2.10	11 / 271	1.46	0.50	4.23
Sulfasalazine	33 / 144	3.49	1.64	7.45	31 / 137	3.22	1.44	7.23	21 / 85	2.43	1.17	5.04		n.a.		
Immunosuppressants	38 / 276	2.18	1.44	3.32		n.a.				n.a.			32 / 247	2.54	1.15	5.63
Rituximab	42 / 192	3.77	2.23	6.36	22 / 90	4.91	2.60	9.25	21 / 86	4.57	2.35	8.92	22 / 104	3.68	1.24	10.92
TNF inhibitors	30 / 803	0.82	0.52	1.29	26 / 764	0.73	0.41	1.29	16 / 292	0.77	0.37	1.60	9 / 89	2.04	0.60	6.92
Belimumab						n.a.				n.a.						
IL-6 inhibitors																
Abatacept	16 / 313	0.82	0.47	1.42	11 / 255	0.69	0.35	1.36	10 / 131	0.89	0.40	1.98				
IL-17/IL-23/IL-12+23 inhibitors									n.a.			n.a.				
tsDMARDs	15 / 145	1.38	0.80	2.36	15 / 142	1.45	0.85	2.47	13 / 118	1.28	0.66	2.49				
Glucocorticoids (GCs)																
No GCs	165 / 2417	1	[Reference]		109 / 1721	1	[Reference]		78 / 863	1	[Reference]		38 / 551	1	[Reference]	

Glucorticoids	219 / 1288	1.50	1.07	2.10	102 / 627	1.46	0.86	2.47	88 / 508	1.44	0.74	2.80	109 / 606	1.77	1.28	2.46
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Missing values imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.

CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.

Supplementary table 9. Multivariable logistic regression analysis of factors associated with COVID-19 death in patients from the six countries providing the largest number of patients, considering country effects, with an otherwise reduced number of regressor variables																
	All				Patients with inflammatory joint diseases (IJDs)				Only patients with rheumatoid arthritis				Patients with connective tissue diseases (CTDs) or vasculitis			
N deaths/patients (%)	306 / 2974 (10.3%)				170 / 1903 (8.9%)				134 / 1102 (12.2%)				117 / 927 (12.6%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Age, years																
Age ≤ 65	76 / 2015	1	[Reference]		36 / 1321	1	[Reference]		25 / 658	1	[Reference]		36 / 597	1	[Reference]	
Age > 65	230 / 959	4.57	3.24	6.45	134 / 582	5.83	3.63	9.37	109 / 444	5.15	3.03	8.75	28 / 160	2.76	1.59	4.80
Male sex (vs. female)	141 / 951	1.68	1.26	2.24	71 / 640	1.41	0.95	2.08	47 / 283	1.24	0.77	1.98	56 / 239	2.03	1.28	3.21
Ever smoked (vs. never)	118 / 745	1.15	0.82	1.60	73 / 500	1.10	0.71	1.70	61 / 323	1.22	0.73	2.03	36 / 207	1.09	0.59	2.03
Comorbidities																
Hypertension alone or CVD alone	130 / 941	1.41	1.01	1.96	68 / 572	1.25	0.79	1.98	56 / 369	1.41	0.85	2.35	56 / 326	1.94	1.13	3.33
Hypertension and CVD	73 / 259	2.16	1.41	3.31	43 / 141	2.58	1.43	4.68	32 / 100	2.60	1.34	5.04	26 / 100	2.09	1.07	4.11
Lung disease	115 / 614	1.58	1.16	2.16	63 / 344	1.46	0.94	2.25	53 / 245	1.43	0.89	2.30	47 / 250	1.83	1.12	2.99
Chronic kidney disease	59 / 212	1.73	1.12	2.67	24 / 97	1.32	0.68	2.57	19 / 72	1.28	0.63	2.62	30 / 96	2.08	1.09	3.96
Diabetes mellitus	78 / 410	1.26	0.89	1.79	46 / 258	1.31	0.84	2.06	35 / 181	1.23	0.74	2.04	25 / 122	1.09	0.57	2.07
Rheumatic disease																
Rheumatoid arthritis	128 / 1058	1	[Reference]		134 / 1103	1	[Reference]							n.a.		
Systemic lupus erythematosus	18 / 299	0.78	0.39	1.55									15 / 288	1	[Reference]	
Vasculitis	60 / 272	0.81	0.50	1.30			n.a.				n.a.					
Other connective tissue diseases	47 / 384	0.93	0.58	1.47									102 / 639	1.33	0.65	2.73
Psoriasis arthritis	17 / 353	0.70	0.38	1.30	17 / 360	0.81	0.43	1.54						n.a.		

Spondyloarthritis	10 / 340	0.57	0.27	1.20	10 / 340	0.70	0.33	1.50								
Other inflammatory arthritis or non-systemic JIA	8 / 95	0.68	0.30	1.58	9 / 100	0.66	0.28	1.57								
Other rheumatic diseases (not IJDs / CTDs / vasculitis)	18 / 173	0.60	0.30	1.17		n.a.										
High/moderate/severe disease activity (DA) vs. remission/low DA	87 / 569	1.84	1.26	2.69	48 / 370	1.64	1.04	2.60	39 / 220	1.62	0.98	2.69	36 / 170	2.21	1.18	4.13
Medication																
Methotrexate	34 / 477	1	[Reference]		28 / 387	1	[Reference]		23 / 278	1	[Reference]		6 / 77	1	[Reference]	
No DMARD therapy	101 / 602	2.61	1.61	4.26	32 / 198	2.75	1.46	5.16	21 / 94	2.40	1.14	5.06	56 / 302	2.82	1.22	6.49
Leflunomide	10 / 64	2.32	0.98	5.50	8 / 59	1.78	0.71	4.45	8 / 48	2.16	0.81	5.76		n.a.		
Antimalarials	18 / 312	1.15	0.59	2.22	14 / 125	1.32	0.61	2.85	14 / 105	1.33	0.59	3.02	4 / 197	0.90	0.24	3.37
Sulfasalazine	27 / 93	5.07	2.64	9.74	26 / 88	5.10	2.55	10.20	18 / 51	3.96	1.72	9.12		n.a.		
Immunosuppressants	28 / 212	2.94	1.53	5.63		n.a.				n.a.			23 / 192	2.59	1.02	6.58
Rituximab	35 / 159	4.38	2.37	8.10	16 / 74	4.65	2.02	10.71	15 / 70	4.45	1.84	10.77	21 / 89	4.17	1.56	11.09
TNF inhibitors	24 / 660	1.10	0.61	2.00	21 / 631	0.99	0.52	1.91	13 / 244	1.04	0.49	2.20				
Belimumab						n.a.				n.a.			7 / 71	2.13	0.65	6.93
IL-6 inhibitors																
Abatacept	14 / 268	1.25	0.62	2.51	10 / 216	1.05	0.46	2.40	9 / 109	1.38	0.56	3.41		n.a.		
IL-17/IL-23/IL-12+23 inhibitors										n.a.				n.a.		
tsDMARDs	15 / 136	2.32	1.08	4.99	15 / 133	2.32	1.05	5.12	13 / 110	1.97	0.87	4.51				
Glucocorticoids (GCs)																
No GCs	120 / 1959	1	[Reference]		80 / 1406	1	[Reference]		55 / 701	1	[Reference]		30 / 454	1	[Reference]	

Glucorticoids	186 / 1015	1.92	1.40	2.63	90 / 497	1.99	1.33	2.98	79 / 401	2.16	1.38	3.36	87 / 473	1.74	1.02	2.94
Countries																
USA	68 / 1001	1	[Reference]		36 / 568	1	[Reference]		31 / 380	1	[Reference]		27 / 380	1	[Reference]	
France	60 / 784	1.24	0.82	1.89	25 / 530	0.95	0.52	1.72	20 / 247	0.95	0.49	1.83	31 / 209	1.80	0.91	3.56
UK	90 / 433	2.71	1.79	4.10	57 / 303	2.38	1.39	4.07	45 / 185	2.34	1.27	4.31	24 / 103	3.08	1.48	6.40
Italy	52 / 312	1.87	1.15	3.02	29 / 196	1.65	0.84	3.24	21 / 103	1.67	0.75	3.71	22 / 110	2.11	0.97	4.61
Spain	21 / 246	1.02	0.55	1.86	10 / 156	0.68	0.29	1.62	7 / 88	0.50	0.19	1.31	10 / 84	1.53	0.62	3.76
Germany	15 / 198	1.02	0.54	1.94	13 / 150	1.30	0.60	2.79	10 / 99	0.99	0.43	2.28	3 / 41	0.76	0.22	2.59
<p>Missing values imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.</p> <p>CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.</p>																

Supplementary table 10. Multivariable logistic regression analysis of factors associated with COVID-19-related death stratified by age (> 65 years vs. ≤ 65 years)								
	> 65 years				≤ 65 years			
N deaths/patients (%)	266 / 1140 (23.3%)				118 / 2565 (4.6%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Male sex (vs. female)	121 / 437	1.43	1.09	1.87	40 / 751	1.32	0.74	2.33
Ever smoked (vs. never)	105 / 388	1.04	0.75	1.44	35 / 534	1.63	1.02	2.60
Comorbidities								
Hypertension alone or CVD alone	103 / 544	0.85	0.53	1.36	52 / 627	2.04	1.38	3.01
Hypertension and CVD	77 / 210	1.81	0.99	3.31	12 / 91	2.16	1.09	4.31
Chronic lung disease	102 / 320	1.62	1.09	2.40	35 / 401	1.79	1.31	2.45
Chronic kidney disease	53 / 158	1.43	0.75	2.75	23 / 100	3.78	2.24	6.37
Diabetes mellitus	75 / 251	1.39	0.91	2.12	21 / 257	1.21	0.66	2.21
Rheumatic disease								
Rheumatoid arthritis	129 / 537	1	[Reference]		40 / 850	1	[Reference]	
Systemic lupus erythematosus	8 / 47	0.54	0.26	1.11	28 / 344	1.24	0.66	2.34
Vasculitis	55 / 192	0.77	0.55	1.09	12 / 133	0.91	0.46	1.78
Other connective tissue diseases	32 / 147	0.66	0.51	0.85	21 / 326	0.75	0.37	1.54
Psoriasis arthritis	12 / 85	0.73	0.52	1.03	7 / 344	0.58	0.24	1.37
Spondyloarthritis	9 / 38	0.81	0.37	1.76	6 / 385	0.59	0.21	1.71
Other inflammatory arthritis or non-systemic JIA	8 / 33	0.71	0.36	1.39	2 / 76	0.67	0.31	1.44
Other rheumatic diseases (not IJDs / CTDs / vasculitis)	17 / 83	0.45	0.29	0.69	7 / 146	0.58	0.25	1.33
High/moderate/severe disease activity (DA) vs. remission/low DA	59 / 191	1.53	0.98	2.41	50 / 531	2.20	1.38	3.50

Medication								
Methotrexate	41 / 242	1	[Reference]		6 / 353	1	[Reference]	
No DMARD therapy	96 / 352	2.07	1.45	2.96	28 / 387	3.82	1.42	10.27
Leflunomide	7 / 38	0.98	0.38	2.55	5 / 52	3.90	1.12	13.61
Antimalarials	13 / 113	0.68	0.38	1.21	14 / 313	2.13	0.71	6.39
Sulfasalazine	28 / 61	3.89	1.60	9.48	5 / 83	3.22	1.14	9.06
Immunosuppressants	18 / 55	2.74	1.51	4.97	20 / 221	1.90	0.70	5.20
Rituximab	24 / 52	3.84	1.93	7.66	18 / 140	5.29	1.34	20.85
Other b/tsDMARDs	39 / 234	0.92	0.61	1.38	22 / 1026	1.27	0.46	3.48
Glucocorticoids (GCs)								
No GCs	118 / 606	1	[Reference]		47 / 1811	1	[Reference]	
GCs 1-10mg/d	117 / 443	1.19	0.84	1.70	54 / 619	2.10	1.19	3.71
GCs > 10 mg/d	32 / 91	1.35	0.79	2.31	17 / 135	2.24	1.32	3.79
<p>Missing values imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.</p> <p>CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.</p>								

Supplementary table 11. Multivariable logistic regression analysis of factors associated with COVID-19-related death stratified by sex								
	Male sex				Female sex			
N deaths/patients (%)	161 / 1188 (13.6%)				223 / 2517 (8.9%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Age, years								
Age ≤ 65	40 / 751	1	[Reference]		78 / 1814	1	[Reference]	
65 years < Age ≤ 75	55 / 252	3.81	1.96	7.41	54 / 392	2.65	1.62	4.32
Age > 75	66 / 185	6.80	2.88	16.07	91 / 311	6.21	4.50	8.56
Ever smoked (vs. never)	72 / 399	1.08	0.62	1.91	67 / 523	1.34	0.93	1.94
Comorbidities								
Hypertension alone or CVD alone	66 / 385	1.16	0.89	1.50	89 / 765	1.24	0.83	1.85
Hypertension and CVD	43 / 145	1.87	1.19	2.95	46 / 156	2.06	1.36	3.13
Chronic lung disease	53 / 232	1.41	0.74	2.68	84 / 489	1.95	1.47	2.60
Chronic kidney disease	30 / 104	1.26	0.59	2.71	46 / 155	2.03	1.13	3.64
Diabetes mellitus	46 / 193	1.80	1.14	2.86	50 / 315	1.12	0.66	1.90
Rheumatic disease								
Rheumatoid arthritis	55 / 347	1	[Reference]		114 / 1040	1	[Reference]	
Systemic lupus erythematosus	10 / 47	1.91	0.81	4.50	26 / 344	0.99	0.51	1.92
Vasculitis	35 / 138	0.95	0.33	2.69	32 / 187	0.69	0.39	1.24
Other connective tissue diseases	21 / 121	0.96	0.55	1.68	32 / 352	0.66	0.44	1.01
Psoriasis arthritis	13 / 200	0.95	0.50	1.83	6 / 229	0.43	0.27	0.70
Spondyloarthritis	10 / 202	0.82	0.29	2.31	5 / 221	0.53	0.17	1.64
Other inflammatory arthritis or non-systemic JIA	3 / 35	0.41	0.07	2.31	7 / 74	1.19	0.55	2.58

Other rheumatic diseases (not IJDs / CTDs / vasculitis)	16 / 112	0.49	0.30	0.79	8 / 117	0.50	0.29	0.89
High/moderate/severe disease activity (DA) vs. remission/low DA	34 / 204	1.69	1.18	2.42	75 / 518	1.99	1.16	3.41
Medication								
Methotrexate	23 / 206	1	[Reference]		24 / 389	1	[Reference]	
No DMARD therapy	61 / 280	2.25	1.16	4.37	63 / 459	2.19	1.13	4.24
Leflunomide	5 / 28	1.57	0.82	3.02	7 / 62	1.79	0.82	3.89
Antimalarials	61 / 280	0.86	0.36	2.04	63 / 459	1.19	0.66	2.15
Sulfasalazine	16 / 52	4.71	1.92	11.54	17 / 92	3.26	0.93	11.40
Immunosuppressants	14 / 79	2.02	1.15	3.54	24 / 197	2.41	1.20	4.82
Rituximab	16 / 60	3.09	1.03	9.30	26 / 132	5.40	3.06	9.52
Other b/tsDMARDs	19 / 425	0.64	0.37	1.10	42 / 835	1.34	0.75	2.39
Glucocorticoids (GCs)								
No GCs	76 / 781	1	[Reference]		89 / 1636	1	[Reference]	
GCs 1-10mg/d	65 / 319	1.07	0.61	1.87	105 / 744	1.71	1.17	2.52
GCs > 10 mg/d	20 / 88	1.20	0.67	2.17	29 / 138	2.23	1.34	3.73
Missing values imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.								
CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.								

Supplementary table 12. Multivariable logistic regression analysis of factors associated with COVID-19-related death stratified by smoking habits								
	Ever smoked				Never smoked			
N deaths/patients (%)	140 / 922 (15.2%)				244 / 2783 (8.8%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Age, years								
Age ≤ 65	35 / 534	1	[Reference]		83 / 2031	1	[Reference]	
65 years < Age ≤ 75	47 / 226	2.79	1.70	4.58	62 / 418	3.18	2.06	4.91
Age > 75	58 / 162	6.43	3.33	12.42	99 / 334	6.33	4.32	9.27
Male sex (vs. female)	72 / 399	1.30	0.72	2.35	89 / 789	1.46	1.14	1.88
Comorbidities								
Hypertension alone or CVD alone	57 / 338	1.01	0.67	1.50	98 / 812	1.32	0.94	1.86
Hypertension and CVD	36 / 124	1.53	0.84	2.79	52 / 177	2.08	1.32	3.27
Chronic lung disease	62 / 271	1.49	0.78	2.84	74 / 450	1.93	1.45	2.58
Chronic kidney disease	21 / 87	0.74	0.38	1.42	55 / 172	2.72	1.56	4.73
Diabetes mellitus	39 / 158	1.48	0.80	2.74	57 / 350	1.33	0.79	2.22
Rheumatic disease								
Rheumatoid arthritis	71 / 388	1	[Reference]		98 / 999	1	[Reference]	
Systemic lupus erythematosus	11 / 62	1.30	0.60	2.84	26 / 329	1.12	0.64	1.94
Vasculitis	18 / 90	0.42	0.19	0.92	49 / 235	0.96	0.67	1.37
Other connective tissue diseases	16 / 103	0.71	0.34	1.48	37 / 370	0.68	0.42	1.10
Psoriasis arthritis	6 / 111	0.60	0.24	1.54	13 / 318	0.70	0.44	1.12
Spondyloarthritis	3 / 80	0.32	0.08	1.29	12 / 343	0.82	0.37	1.85
Other inflammatory arthritis or non-systemic JIA	5 / 27	0.65	0.21	2.02	5 / 82	0.84	0.44	1.58

Other rheumatic diseases (not IJDs / CTDs / vasculitis)	12 / 73	0.59	0.26	1.31	12 / 156	0.40	0.25	0.66
High/moderate/severe disease activity (DA) vs. remission/low DA	32 / 171	1.45	0.85	2.45	77 / 551	2.11	1.31	3.40
Medication								
Methotrexate	15 / 145	1		[Reference]	33 / 450	1		[Reference]
No DMARD therapy	43 / 221	2.35	1.15	4.83	82 / 518	2.18	1.43	3.30
Leflunomide	5 / 21	1.41	0.39	5.12	8 / 69	1.52	0.68	3.39
Antimalarials	13 / 93	1.52	0.68	3.38	14 / 334	0.75	0.46	1.21
Sulfasalazine	21 / 56	6.15	2.23	16.94	12 / 89	2.16	0.81	5.73
Immunosuppressants	12 / 55	3.89	1.53	9.85	26 / 221	1.76	0.96	3.23
Rituximab	12 / 46	3.95	1.29	12.10	30 / 146	4.14	2.16	7.93
Other b/tsDMARDs	20 / 289	1.04	0.48	2.26	41 / 971	0.90	0.59	1.35
Glucocorticoids (GCs)								
No GCs	67 / 604	1		[Reference]	98 / 1813	1		[Reference]
GCs 1-10mg/d	57 / 260	1.52	0.91	2.53	114 / 802	1.35	0.88	2.05
GCs > 10 mg/d	16 / 57	2.53	1.33	4.80	33 / 168	1.48	0.93	2.35
Missing values imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.								
CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.								

Supplementary table 13. Multivariable logistic regression analysis of factors associated with COVID-19-related death stratified by heart disease (hypertension and/or cardiovascular disease)								
	Heart disease				No heart disease			
N deaths/patients (%)	242 / 1439 (16.8%)				384 / 3705 (10.4%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Age, years								
Age ≤ 65	63 / 711	1	[Reference]		53 / 1833	1	[Reference]	
65 years < Age ≤ 75	58 / 367	1.68	1.12	2.52	49 / 270	5.98	3.72	9.63
Age > 75	121 / 361	4.77	3.08	7.40	36 / 134	7.65	5.24	11.16
Male sex (vs. female)	108 / 525	1.59	1.23	2.06	51 / 655	1.25	0.76	2.05
Ever smoked (vs. never)	93 / 458	1.13	0.82	1.56	46 / 457	1.48	0.94	2.34
Comorbidities								
Chronic lung disease	84 / 352	1.56	1.15	2.12	51 / 362	2.39	1.77	3.24
Chronic kidney disease	58 / 190	1.58	0.94	2.67	18 / 67	2.83	1.04	7.71
Diabetes mellitus	75 / 358	1.33	0.84	2.12	20 / 145	1.85	1.38	2.48
Rheumatic disease								
Rheumatoid arthritis	105 / 572	1	[Reference]		63 / 805	1	[Reference]	
Systemic lupus erythematosus	24 / 154	1.16	0.55	2.46	11 / 235	1.04	0.54	2.02
Vasculitis	39 / 168	0.61	0.36	1.01	27 / 155	1.12	0.69	1.81
Other connective tissue diseases	36 / 201	0.79	0.60	1.02	16 / 264	0.59	0.31	1.12
Psoriasis arthritis	13 / 152	0.70	0.45	1.10	6 / 273	0.60	0.30	1.19
Spondyloarthritis	6 / 87	0.51	0.17	1.51	9 / 336	0.87	0.43	1.74
Other inflammatory arthritis or non-systemic JIA	8 / 34	1.30	0.66	2.55	2 / 73	0.48	0.14	1.70

Other rheumatic diseases (not IJDs / CTDs / vasculitis)	16 / 100	0.45	0.30	0.68	8 / 128	0.54	0.19	1.51
High/moderate/severe disease activity (DA) vs. remission/low DA	66 / 283	1.92	1.01	3.63	42 / 432	1.92	1.31	2.83
Medication								
Methotrexate	14 / 352	1	[Reference]	[Reference]	33 / 238	1	[Reference]	[Reference]
No DMARD therapy	91 / 372	2.14	1.37	3.35	32 / 361	2.09	1.10	3.97
Leflunomide	5 / 40	0.79	0.24	2.61	7 / 49	3.49	1.23	9.89
Antimalarials	20 / 168	1.10	0.62	1.96	6 / 254	0.64	0.25	1.69
Sulfasalazine	18 / 64	2.78	1.08	7.15	14 / 77	4.82	1.92	12.08
Immunosuppressants	21 / 117	1.82	1.02	3.23	17 / 158	2.25	0.79	6.38
Rituximab	19 / 68	2.49	1.25	4.96	22 / 121	5.86	2.34	14.68
Other b/tsDMARDs	35 / 377	0.96	0.59	1.54	26 / 877	1.08	0.53	2.20
Glucocorticoids (GCs)								
No GCs	96 / 816	1	[Reference]	[Reference]	69 / 1584	1	[Reference]	[Reference]
GCs 1-10mg/d	114 / 510	1.62	1.02	2.56	53 / 541	1.16	0.65	2.07
GCs > 10 mg/d	32 / 112	1.84	1.20	2.82	17 / 112	1.62	0.91	2.87
Missing values imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.								
CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, Glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, Systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.								

Supplementary table 14. Multivariable logistic regression analysis of factors associated with COVID-19-related death stratified by chronic lung disease								
	Chronic lung disease				No chronic lung disease			
N deaths/patients (%)	136 / 721 (18.9%)				248 / 2984 (8.3%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Age, years								
Age ≤ 65	35 / 401	1	[Reference]		84 / 2164	1	[Reference]	
65 years < Age ≤ 75	48 / 189	3.58	2.40	5.33	61 / 456	3.08	2.18	4.36
Age > 75	54 / 131	8.34	6.29	11.05	103 / 365	5.82	3.43	9.90
Male sex (vs. female)	53 / 232	1.02	0.47	2.22	108 / 956	1.60	1.24	2.07
Ever smoked (vs. never)	62 / 271	1.23	0.68	2.24	77 / 651	1.24	0.93	1.66
Comorbidities								
Hypertension alone or CVD alone	51 / 260	0.92	0.67	1.27	104 / 890	1.43	1.05	1.94
Hypertension and CVD	34 / 97	1.51	0.84	2.73	55 / 204	2.21	1.50	3.27
Chronic kidney disease	21 / 64	0.96	0.32	2.82	55 / 194	2.04	1.22	3.43
Diabetes mellitus	38 / 140	1.40	0.61	3.21	58 / 368	1.44	1.05	1.96
Rheumatic disease								
Rheumatoid arthritis	65 / 298	1	[Reference]		104 / 1089	1	[Reference]	
Systemic lupus erythematosus	5 / 58	0.55	0.18	1.66	31 / 333	1.42	0.81	2.50
Vasculitis	18 / 66	0.87	0.44	1.72	49 / 259	0.75	0.57	1.00
Other connective tissue diseases	35 / 169	1.21	0.66	2.19	19 / 304	0.46	0.30	0.71
Psoriasis arthritis	4 / 44	1.19	0.45	3.14	15 / 385	0.54	0.40	0.75
Spondyloarthritis	4 / 49	0.81	0.43	1.55	11 / 374	0.60	0.26	1.35
Other inflammatory arthritis or non-systemic JIA	4 / 16	1.61	0.53	4.85	6 / 94	0.55	0.26	1.19

Other rheumatic diseases (not IJDs / CTDs / vasculitis)	6 / 40	0.73	0.24	2.21	18 / 189	0.40	0.24	0.69
High/moderate/severe disease activity (DA) vs. remission/low DA	43 / 173	1.70	1.01	2.87	66 / 549	1.97	1.27	3.04
Medication								
Methotrexate	16 / 110	1		[Reference]	31 / 485	1		[Reference]
No DMARD therapy	35 / 138	2.28	1.31	3.95	89 / 601	2.17	1.39	3.39
Leflunomide	5 / 23	2.21	1.21	4.03	7 / 67	1.44	0.68	3.07
Antimalarials	12 / 78	2.03	0.68	6.06	15 / 348	0.73	0.38	1.41
Sulfasalazine	10 / 33	2.97	1.19	7.39	23 / 111	4.20	1.83	9.65
Immunosuppressants	17 / 93	2.74	1.99	3.78	21 / 183	1.68	0.86	3.28
Rituximab	20 / 65	4.95	1.59	15.39	23 / 127	4.08	1.99	8.39
Other b/tsDMARDs	21 / 183	1.22	0.69	2.16	40 / 1077	0.90	0.52	1.54
Glucocorticoids (GCs)								
No GCs	52 / 406	1		[Reference]	113 / 2012	1		[Reference]
GCs 1-10mg/d	68 / 258	1.95	1.30	2.91	103 / 804	1.23	0.77	1.95
GCs > 10 mg/d	17 / 58	1.70	0.96	3.00	32 / 168	1.65	0.93	2.92
Missing values imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.								
CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.								

Supplementary table 15. Multivariable logistic regression analysis of factors associated with COVID-19-related death stratified by disease activity								
	Moderate / severe disease activity				Low disease activity / remission			
N deaths/patients (%)	109 / 722 (15.1%)				275 / 2983 (9.2%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Age, years								
Age ≤ 65	50 / 531	1	[Reference]		69 / 2035	1	[Reference]	
65 years < Age ≤ 75	30 / 120	2.52	1.22	5.23	80 / 524	3.47	2.40	5.01
Age > 75	30 / 72	3.92	1.99	7.74	127 / 424	7.50	4.65	12.08
Male sex (vs. female)	34 / 204	1.18	0.62	2.22	127 / 984	1.50	1.15	1.97
Ever smoked (vs. never)	32 / 171	1.09	0.64	1.86	108 / 751	1.25	0.92	1.70
Comorbidities								
Hypertension alone or CVD alone	43 / 227	1.32	0.70	2.49	112 / 923	1.17	0.88	1.55
Hypertension and CVD	24 / 59	3.26	1.33	8.03	65 / 242	1.71	1.08	2.73
Chronic lung disease	43 / 173	1.78	1.20	2.64	93 / 548	1.69	1.16	2.46
Chronic kidney disease	30 / 61	3.62	1.81	7.25	47 / 197	1.18	0.58	2.39
Diabetes mellitus	25 / 115	0.85	0.39	1.84	71 / 393	1.57	1.03	2.39
Rheumatic disease								
Rheumatoid arthritis	46 / 283	1	[Reference]		123 / 1104	1	[Reference]	
Systemic lupus erythematosus	17 / 77	1.42	0.59	3.41	19 / 315	0.96	0.57	1.59
Vasculitis	18 / 52	1.32	0.59	2.92	49 / 273	0.68	0.44	1.04
Other connective tissue diseases	21 / 108	1.17	0.59	2.29	32 / 365	0.63	0.45	0.88
Psoriasis arthritis	5 / 79	0.53	0.16	1.77	15 / 350	0.72	0.41	1.27
Spondyloarthritis	3 / 79	0.45	0.15	1.34	12 / 344	0.77	0.30	1.97
Other inflammatory arthritis or non-systemic JIA	1 / 19	0.68	0.10	4.50	9 / 90	0.77	0.40	1.49

Other rheumatic diseases (not IJDs / CTDs / vasculitis)	1 / 45	0.01	0.00	1834.66	23 / 184	0.64	0.46	0.88
Medication								
Methotrexate	5 / 92	1		[Reference]	42 / 503	1		[Reference]
No DMARD therapy	27 / 134	4.64	1.64	13.15	97 / 605	1.93	1.33	2.78
Leflunomide	6 / 19	6.96	2.64	18.39	6 / 71	0.96	0.41	2.25
Antimalarials	8 / 60	2.28	0.88	5.92	19 / 366	0.96	0.57	1.60
Sulfasalazine	6 / 25	7.44	1.35	40.89	27 / 119	3.27	1.59	6.72
Immunosuppressants	19 / 83	3.95	1.24	12.59	19 / 193	1.98	1.09	3.58
Rituximab	12 / 52	3.50	1.11	11.07	30 / 140	5.16	3.00	8.89
Other b/tsDMARDs	25 / 261	2.76	1.14	6.70	36 / 999	0.76	0.49	1.20
Glucocorticoids (GCs)								
No GCs	28 / 336	1		[Reference]	136 / 2081	1		[Reference]
GCs 1-10mg/d	51 / 266	1.61	0.86	3.02	119 / 797	1.44	0.94	2.19
GCs > 10 mg/d	30 / 120	1.71	0.94	3.10	19 / 105	1.69	0.80	3.59
Missing values imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.								
CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, Glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, Systemic lupus erythematosus; TNF; tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.								

Supplementary table 16. Multivariable logistic regression analysis of factors associated with COVID-19-related death stratified by glucocorticoid use								
	Glucocorticoids				No glucocorticoids			
N deaths/patients (%)	219 / 1288 (17.0%)				165 / 2417 (6.8%)			
	N deaths/patients	OR	95% CI		N deaths/patients	OR	95% CI	
Age, years								
Age ≤ 65	71 / 754	1	[Reference]		47 / 1811	1	[Reference]	
65 years < Age ≤ 75	52 / 265	1.80	1.21	2.68	57 / 379	5.54	3.17	9.70
Age > 75	97 / 269	4.67	3.25	6.71	61 / 227	8.75	4.48	17.10
Male sex (vs. female)	85 / 407	1.16	0.86	1.57	76 / 781	1.71	1.16	2.51
Ever smoked (vs. never)	73 / 318	1.25	0.94	1.65	67 / 604	1.12	0.74	1.69
Comorbidities								
Hypertension alone or CVD alone	94 / 474	1.43	0.92	2.23	61 / 676	0.95	0.67	1.36
Hypertension and CVD	54 / 154	1.87	1.09	3.22	35 / 147	1.86	1.28	2.71
Chronic lung disease	84 / 316	2.03	1.43	2.89	52 / 406	1.47	0.89	2.44
Chronic kidney disease	51 / 151	1.79	0.99	3.22	25 / 108	1.58	0.71	3.49
Diabetes mellitus	55 / 215	1.32	0.76	2.31	41 / 293	1.51	0.97	2.35
Rheumatic disease								
Rheumatoid arthritis	91 / 516	1	[Reference]		78 / 871	1	[Reference]	
Systemic lupus erythematosus	26 / 198	1.20	0.63	2.31	10 / 193	1.11	0.40	3.07
Vasculitis	58 / 240	0.95	0.51	1.76	9 / 85	0.57	0.11	3.11
Other connective tissue diseases	31 / 181	0.84	0.56	1.25	22 / 292	0.59	0.37	0.95
Psoriasis arthritis	4 / 53	0.52	0.11	2.50	15 / 376	0.68	0.41	1.15
Spondyloarthritis	3 / 38	0.69	0.27	1.76	12 / 385	0.68	0.28	1.68
Other inflammatory arthritis or non-systemic JIA	5 / 24	1.04	0.27	3.96	5 / 85	0.58	0.26	1.30

Other rheumatic diseases (not IJDs / CTDs / vasculitis)	7 / 69	0.48	0.17	1.33	17 / 160	0.51	0.28	0.91
High/moderate/severe disease activity (DA) vs. remission/low DA	80 / 386	1.95	1.30	2.92	28 / 336	1.74	0.98	3.08
Medication								
Methotrexate	18 / 212	1	[Reference]	[Reference]	29 / 383	1	[Reference]	[Reference]
No DMARD therapy	74 / 296	3.11	2.12	4.57	50 / 444	1.72	0.94	3.17
Leflunomide	9 / 43	3.40	1.83	6.34	3 / 47	0.52	0.17	1.63
Antimalarials	18 / 137	1.81	1.19	2.77	9 / 289	0.59	0.26	1.33
Sulfasalazine	11 / 48	3.17	1.22	8.27	22 / 96	4.00	1.72	9.28
Immunosuppressants	24 / 176	2.27	1.61	3.19	14 / 100	3.26	1.45	7.31
Rituximab	30 / 99	5.52	2.13	14.33	12 / 94	3.41	1.57	7.41
Other b/tsDMARDs	35 / 289	1.78	1.13	2.81	26 / 971	0.62	0.35	1.08

Missing values imputed via multiple imputation, patient numbers may thus be rounded. Effects significant at level $\alpha=0.05$ are marked in bold. Patients were excluded from a particular analysis if the medication they received provided ≤ 20 patients for that analysis or if there were no deaths reported for that specific medication.

CI, confidence interval; CTD, connective tissue diseases; CVD, cardiovascular disease; DA, disease activity; DMARD, disease modifying antirheumatic drugs; GC, glucocorticoids; IJD, inflammatory joint diseases; IL, interleukin; JIA, juvenile idiopathic arthritis; N, number; OR, odds ratio; SLE, systemic lupus erythematosus; TNF, tumour necrosis factor; tsDMARD, targeted synthetic disease modifying antirheumatic drugs.