

# THE LANCET

## Rheumatology

### Supplementary appendix

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**Table S1 Risk of gout on diagnosis of COVID-19 and death related to COVID-19 stratified by vaccination status**

	Unvaccinated/pre-vaccination		Vaccinated	
	OR (95% CI)	P	OR (95% CI)	P
Diagnosis of COVID-19				
Unadjusted	1.50 [ 1.40 ; 1.62 ]	< 0.0001	1.33 [ 0.81 ; 2.20 ]	0.26
Model 1	1.44 [ 1.34 ; 1.56 ]	< 0.0001	1.31 [ 0.78 ; 2.20 ]	0.30
Model 2	1.21 [ 1.11 ; 1.30 ]	< 0.0001	1.09 [ 0.65 ; 1.85 ]	0.53
Death with COVID-19				
Unadjusted	3.92 [ 3.27 ; 4.70 ]	< 0.0001	N/A	
Model 1	1.77 [ 1.46 ; 2.14 ]	< 0.0001	N/A	
Model 2	1.30 [ 1.07 ; 1.58 ]	0.0097	N/A	

**Table S2 Risk of diagnosis of COVID-19 (Analysis A)**

	Diagnosed / Not diagnosed	Unadjusted		Model 1*		Model 2	
		OR [95% CI]	P	OR [95% CI]	P	OR [95% CI]	P
All	16,898 / 442,939						
Gout	840 / 15,031	1.49 [ 1.39 ; 1.60 ]	<0.0001	1.41 [ 1.31 ; 1.51 ]	<0.0001	1.20 [ 1.11 ; 1.29 ]	<0.0001
Asthma	1,985 / 38,872	1.38 [ 1.32 ; 1.45 ]	<0.0001	1.30 [ 1.24 ; 1.37 ]	<0.0001	1.12 [ 1.06 ; 1.18 ]	<0.0001
Cancer	2,487 / 67,424	0.96 [ 0.92 ; 1.00 ]	0.073	1.13 [ 1.08 ; 1.18 ]	<0.0001	1.05 [ 1.00 ; 1.1 ]	0.040
Cerebrovascular diseases	1,031 / 14,434	1.93 [ 1.81 ; 2.06 ]	<0.0001	2.12 [ 1.98 ; 2.27 ]	<0.0001	1.52 [ 1.42 ; 1.63 ]	<0.0001
Chronic kidney disease	898 / 13,967	1.72 [ 1.61 ; 1.85 ]	<0.0001	1.85 [ 1.72 ; 1.99 ]	<0.0001	1.25 [ 1.16 ; 1.35 ]	<0.0001
Chronic obstructive pulmonary diseases	919 / 14,212	1.73 [ 1.62 ; 1.86 ]	<0.0001	1.81 [ 1.69 ; 1.95 ]	<0.0001	1.33 [ 1.23 ; 1.44 ]	<0.0001
Dementia	493 / 2,399	5.52 [ 5.00 ; 6.09 ]	<0.0001	6.78 [ 6.13 ; 7.51 ]	<0.0001	5.00 [ 4.5 ; 5.56 ]	<0.0001
Diabetes mellitus	1,958 / 31,512	1.71 [ 1.63 ; 1.80 ]	<0.0001	1.5 [ 1.42 ; 1.58 ]	<0.0001	1.17 [ 1.11 ; 1.24 ]	<0.0001
Heart Failure	766 / 10,214	2.01 [ 1.87 ; 2.17 ]	<0.0001	2.09 [ 1.93 ; 2.26 ]	<0.0001	1.41 [ 1.29 ; 1.54 ]	<0.0001
Hypertensive diseases	5,486 / 122,162	1.26 [ 1.22 ; 1.30 ]	<0.0001	1.36 [ 1.31 ; 1.41 ]	<0.0001	1.09 [ 1.04 ; 1.13 ]	0.00011
Immunodeficiencies	95 / 1,745	1.43 [ 1.16 ; 1.76 ]	0.00072	1.39 [ 1.13 ; 1.72 ]	0.0018	1.10 [ 0.89 ; 1.35 ]	0.40
Interstitial lung disease	140 / 1,873	1.97 [ 1.66 ; 2.34 ]	<0.0001	2.11 [ 1.77 ; 2.51 ]	<0.0001	1.51 [ 1.27 ; 1.81 ]	<0.0001
Ischemic heart diseases	2,141 / 44,489	1.30 [ 1.24 ; 1.36 ]	<0.0001	1.38 [ 1.32 ; 1.45 ]	<0.0001	1.00 [ 0.94 ; 1.06 ]	0.92
Lipoprotein disorders	2,990 / 60,923	1.35 [ 1.29 ; 1.40 ]	<0.0001	1.43 [ 1.37 ; 1.5 ]	<0.0001	1.13 [ 1.07 ; 1.18 ]	<0.0001
Liver failure	37 / 465	2.09 [ 1.49 ; 2.92 ]	<0.0001	1.88 [ 1.34 ; 2.64 ]	0.00024	1.31 [ 0.93 ; 1.84 ]	0.13
Osteoarthritis	3,522 / 77,526	1.24 [ 1.19 ; 1.29 ]	<0.0001	1.36 [ 1.30 ; 1.41 ]	<0.0001	1.20 [ 1.15 ; 1.25 ]	<0.0001
Pulmonary heart disease	353 / 6,753	1.38 [ 1.24 ; 1.54 ]	<0.0001	1.39 [ 1.25 ; 1.55 ]	<0.0001	1.05 [ 0.94 ; 1.17 ]	0.42
Sex - Male	8,040 / 198,107	1.12 [ 1.09 ; 1.16 ]	<0.0001	1.06 [ 1.02 ; 1.09 ]	0.00074	1.04 [ 1.01 ; 1.07 ]	0.015
Age, <60 years	5,273 / 81,772	1.00	-	1.00	-	1.00	-
Age, 60 - 69 years <sup>1</sup>	5,437 / 141,487	0.60 [ 0.57 ; 0.62 ]	<0.0001	0.60 [ 0.58 ; 0.62 ]	<0.0001	0.56 [ 0.54 ; 0.59 ]	<0.0001
Age, 70 - 74 years <sup>1</sup>	2,713 / 104,584	0.40 [ 0.38 ; 0.42 ]	<0.0001	0.41 [ 0.39 ; 0.43 ]	<0.0001	0.35 [ 0.33 ; 0.37 ]	<0.0001
Age, >74 years <sup>1</sup>	3,475 / 115,096	0.47 [ 0.45 ; 0.49 ]	<0.0001	0.47 [ 0.45 ; 0.5 ]	<0.0001	0.35 [ 0.33 ; 0.37 ]	<0.0001
White British	15,173 / 418,463	1.00	-	1.00	-	1.00	-
Black British ethnicity <sup>2</sup>	795 / 10,404	2.11 [ 1.96 ; 2.27 ]	<0.0001	1.80 [ 1.67 ; 1.94 ]	<0.0001	1.73 [ 1.60 ; 1.86 ]	<0.0001
Asian British ethnicity <sup>2</sup>	571 / 7,747	2.03 [ 1.86 ; 2.22 ]	<0.0001	1.35 [ 1.24 ; 1.48 ]	<0.0001	1.35 [ 1.23 ; 1.48 ]	<0.0001
Other ethnicities <sup>2</sup>	359 / 6,325	1.57 [ 1.41 ; 1.74 ]	<0.0001	1.23 [ 1.10 ; 1.37 ]	0.00018	1.23 [ 1.10 ; 1.37 ]	0.00023
Townsend deprivation index	-	1.07 [ 1.07 ; 1.07 ]	<0.0001	1.04 [ 1.04 ; 1.05 ]	<0.0001	1.04 [ 1.03 ; 1.04 ]	<0.0001
BMI (kg/m <sup>2</sup> )	-	1.04 [ 1.04 ; 1.04 ]	<0.0001	1.04 [ 1.03 ; 1.04 ]	<0.0001	1.03 [ 1.02 ; 1.03 ]	<0.0001
Non-Smoker	8,887 / 247,570	1.00	-	1.00	-	1.00	-
Current Smoker <sup>3</sup>	5,957 / 151,433	1.11 [ 1.08 ; 1.15 ]	<0.0001	1.18 [ 1.14 ; 1.22 ]	<0.0001	1.15 [ 1.11 ; 1.19 ]	<0.0001
Ex-smoker <sup>3</sup>	1,956 / 43,936	1.24 [ 1.18 ; 1.30 ]	<0.0001	1.10 [ 1.04 ; 1.15 ]	0.00048	1.02 [ 0.96 ; 1.07 ]	0.57

\* The demographic and BMI estimates are derived from the model with gout as exposure.

**Table S3 Risk of death with COVID-19 in COVID-19 positive cohort (Analysis B)**

		Unadjusted		Model 1*		Model 2	
	Death with COVID-19 / remainder	OR [95% CI]	P	OR [95% CI]	P	OR [95% CI]	P
All	1,111 / 15,225						
Gout	136 / 682	2.97 [ 2.45 ; 3.62 ]	<0.0001	1.44 [ 1.16 ; 1.76 ]	0.0009	1.20 [ 0.96 ; 1.51 ]	0.11
Asthma	169 / 1,756	1.38 [ 1.16 ; 1.63 ]	0.00026	1.09 [ 0.9 ; 1.31 ]	0.38	0.88 [ 0.72 ; 1.07 ]	0.19
Cancer	314 / 2,100	2.46 [ 2.14 ; 2.83 ]	<0.0001	1.31 [ 1.13 ; 1.52 ]	0.00038	1.23 [ 1.05 ; 1.43 ]	0.0093
Cerebrovascular diseases	221 / 781	4.59 [ 3.9 ; 5.41 ]	<0.0001	1.98 [ 1.66 ; 2.36 ]	<0.0001	1.47 [ 1.21 ; 1.77 ]	<0.0001
Chronic kidney disease	212 / 665	5.16 [ 4.36 ; 6.11 ]	<0.0001	2.06 [ 1.72 ; 2.47 ]	<0.0001	1.41 [ 1.15 ; 1.73 ]	0.00089
Chronic obstructive pulmonary diseases	200 / 695	4.59 [ 3.87 ; 5.45 ]	<0.0001	1.81 [ 1.49 ; 2.19 ]	<0.0001	1.46 [ 1.18 ; 1.81 ]	0.00047
Dementia	151 / 331	7.08 [ 5.78 ; 8.67 ]	<0.0001	2.81 [ 2.25 ; 3.5 ]	<0.0001	2.40 [ 1.91 ; 3.02 ]	<0.0001
Diabetes mellitus	341 / 1,564	3.87 [ 3.37 ; 4.44 ]	<0.0001	1.77 [ 1.51 ; 2.07 ]	<0.0001	1.36 [ 1.14 ; 1.61 ]	0.00054
Heart Failure	187 / 560	5.30 [ 4.43 ; 6.33 ]	<0.0001	1.91 [ 1.57 ; 2.32 ]	<0.0001	1.24 [ 0.99 ; 1.55 ]	0.64
Hypertensive diseases	705 / 4,632	3.97 [ 3.50 ; 4.51 ]	<0.0001	1.52 [ 1.32 ; 1.75 ]	<0.0001	1.13 [ 0.96 ; 1.33 ]	0.14
Immunodeficiencies	18 / 75	3.33 [ 1.98 ; 5.58 ]	<0.0001	2.21 [ 1.26 ; 3.89 ]	0.0058	1.65 [ 0.91 ; 2.98 ]	0.097
Interstitial lung disease	49 / 89	7.85 [ 5.51 ; 11.18 ]	<0.0001	4.13 [ 2.8 ; 6.08 ]	<0.0001	3.34 [ 2.23 ; 5.01 ]	<0.0001
Ischemic heart diseases	331 / 1,753	3.26 [ 2.84 ; 3.74 ]	<0.0001	1.41 [ 1.22 ; 1.64 ]	<0.0001	1.02 [ 0.85 ; 1.21 ]	0.84
Lipoprotein disorders	419 / 2,498	3.08 [ 2.71 ; 3.51 ]	<0.0001	1.35 [ 1.17 ; 1.55 ]	<0.0001	0.96 [ 0.82 ; 1.14 ]	0.66
Liver failure	17 / 20	11.81 [ 6.17 ; 22.62 ]	<0.0001	9.99 [ 4.75 ; 21 ]	<0.0001	7.18 [ 3.34 ; 15.43 ]	<0.0001
Osteoarthritis	375 / 3,056	2.03 [ 1.78 ; 2.31 ]	<0.0001	1.05 [ 0.91 ; 1.21 ]	0.49	0.87 [ 0.75 ; 1.01 ]	0.072
Pulmonary heart disease	77 / 265	4.2 [ 3.24 ; 5.46 ]	<0.0001	2.06 [ 1.55 ; 2.74 ]	<0.0001	1.51 [ 1.11 ; 2.06 ]	0.0079
Sex - Male	712 / 7,083	2.05 [ 1.81 ; 2.33 ]	<0.0001	1.74 [ 1.52 ; 2.00 ]	<0.0001	1.65 [ 1.43 ; 1.91 ]	<0.0001
Age, <60 years	33 / 5,014	1.00	-	1.00	-	1.00	-
Age, 60 - 69 years <sup>1</sup>	168 / 5,097	5.01 [ 3.44 ; 7.29 ]	<0.0001	4.86 [ 3.34 ; 7.09 ]	<0.0001	4.30 [ 2.94 ; 6.28 ]	<0.0001
Age, 70 - 74 years <sup>1</sup>	220 / 2,407	13.89 [ 9.60 ; 20.09 ]	<0.0001	13.71 [ 9.45 ; 19.89 ]	<0.0001	10.29 [ 7.04 ; 15.03 ]	<0.0001
Age, >74 years <sup>1</sup>	690 / 2,707	38.73 [ 27.23 ; 55.09 ]	<0.0001	38.76 [ 27.13 ; 55.38 ]	<0.0001	23.99 [ 16.59 ; 34.69 ]	<0.0001
White British	1,012 / 13,656	1.00	-	1.00	-	1.00	-
Black British ethnicity <sup>2</sup>	42 / 719	0.99 [ 0.71 ; 1.38 ]	0.14	1.36 [ 0.96 ; 1.92 ]	0.085	1.37 [ 0.96 ; 1.95 ]	0.085
Asian British ethnicity <sup>2</sup>	38 / 519	0.79 [ 0.57 ; 1.08 ]	0.94	1.46 [ 1.01 ; 2.13 ]	0.046	1.42 [ 0.97 ; 2.09 ]	0.071
Other ethnicities <sup>2</sup>	19 / 331	0.77 [ 0.49 ; 1.24 ]	0.28	1.10 [ 0.67 ; 1.83 ]	0.70	1.05 [ 0.62 ; 1.76 ]	0.87
Townsend deprivation index	-	1.05 [ 1.04 ; 1.07 ]	<0.0001	1.05 [ 1.03 ; 1.07 ]	<0.0001	1.04 [ 1.02 ; 1.06 ]	0.00014
BMI (kg/m <sup>2</sup> )	-	1.07 [ 1.05 ; 1.08 ]	<0.0001	1.06 [ 1.05 ; 1.08 ]	<0.0001	1.05 [ 1.04 ; 1.06 ]	<0.0001
Non-Smoker	420 / 8,146	1.00	-	1.00	-	1.00	-
Current Smoker <sup>3</sup>	527 / 5,344	1.91 [ 1.67 ; 2.18 ]	<0.0001	1.17 [ 1.01 ; 1.35 ]	0.036	1.10 [ 0.95 ; 1.28 ]	0.21
Ex-smoker <sup>3</sup>	164 / 1,735	1.83 [ 1.52 ; 2.21 ]	<0.0001	1.82 [ 1.48 ; 2.23 ]	<0.0001	1.51 [ 1.21 ; 1.88 ]	0.00023

\* The demographic and BMI estimates are derived from the model with gout as exposure.

**Table S4 Risk of death with COVID-19 in total cohort (Analysis C)**

	Deceased / remaining population	Unadjusted		Model 1*		Model 2	
		OR [95% CI]	P	OR [95% CI]	P	OR [95% CI]	P
All	1,111 / 458,726						
Gout	136 / 15,735	3.93 [ 3.28 ; 4.70 ]	<0.0001	1.76 [ 1.46 ; 2.12 ]	<0.0001	1.29 [ 1.06 ; 1.56 ]	0.011
Asthma	169 / 40,688	1.84 [ 1.56 ; 2.17 ]	<0.0001	1.48 [ 1.25 ; 1.75 ]	<0.0001	0.98 [ 0.82 ; 1.17 ]	0.83
Cancer	314 / 69,597	2.20 [ 1.93 ; 2.51 ]	<0.0001	1.50 [ 1.31 ; 1.71 ]	<0.0001	1.26 [ 1.10 ; 1.44 ]	0.00098
Cerebrovascular diseases	221 / 15,244	7.22 [ 6.23 ; 8.38 ]	<0.0001	3.75 [ 3.22 ; 4.37 ]	<0.0001	1.94 [ 1.64 ; 2.3 ]	<0.0001
Chronic kidney disease	212 / 14,653	7.15 [ 6.15 ; 8.31 ]	<0.0001	3.23 [ 2.76 ; 3.77 ]	<0.0001	1.53 [ 1.28 ; 1.83 ]	<0.0001
Chronic obstructive pulmonary diseases	200 / 14,931	6.53 [ 5.59 ; 7.61 ]	<0.0001	2.94 [ 2.49 ; 3.46 ]	<0.0001	1.75 [ 1.45 ; 2.1 ]	<0.0001
Dementia	151 / 2,741	26.17 [ 21.95 ; 31.19 ]	<0.0001	12.09 [ 10.06 ; 14.52 ]	<0.0001	7.02 [ 5.77 ; 8.56 ]	<0.0001
Diabetes mellitus	341 / 33,129	5.69 [ 5.01 ; 6.47 ]	<0.0001	2.55 [ 2.22 ; 2.94 ]	<0.0001	1.59 [ 1.37 ; 1.86 ]	<0.0001
Heart Failure	187 / 10,793	8.40 [ 7.17 ; 9.84 ]	<0.0001	3.43 [ 2.90 ; 4.05 ]	<0.0001	1.58 [ 1.30 ; 1.92 ]	<0.0001
Hypertensive diseases	705 / 126,943	4.54 [ 4.02 ; 5.13 ]	<0.0001	2.13 [ 1.87 ; 2.43 ]	<0.0001	1.30 [ 1.11 ; 1.51 ]	0.00077
Immunodeficiencies	18 / 1,822	4.13 [ 2.59 ; 6.59 ]	<0.0001	3.34 [ 2.08 ; 5.36 ]	<0.0001	1.99 [ 1.22 ; 3.23 ]	0.0055
Interstitial lung disease	49 / 1,964	10.73 [ 8.03 ; 14.34 ]	<0.0001	5.27 [ 3.92 ; 7.08 ]	<0.0001	2.83 [ 2.07 ; 3.87 ]	<0.0001
Ischemic heart diseases	331 / 46,299	3.78 [ 3.32 ; 4.3 ]	<0.0001	1.78 [ 1.56 ; 2.04 ]	<0.0001	0.92 [ 0.78 ; 1.07 ]	0.29
Lipoprotein disorders	419 / 63,494	3.77 [ 3.34 ; 4.26 ]	<0.0001	1.83 [ 1.61 ; 2.08 ]	<0.0001	1.08 [ 0.93 ; 1.25 ]	0.33
Liver failure	17 / 485	14.68 [ 9.02 ; 23.9 ]	<0.0001	9.90 [ 6.01 ; 16.29 ]	<0.0001	5.20 [ 3.10 ; 8.72 ]	<0.0001
Osteoarthritis	375 / 80,673	2.39 [ 2.11 ; 2.7 ]	<0.0001	1.41 [ 1.24 ; 1.61 ]	<0.0001	1.04 [ 0.91 ; 1.19 ]	0.58
Pulmonary heart disease	77 / 7,029	4.79 [ 3.79 ; 6.04 ]	<0.0001	2.65 [ 2.09 ; 3.35 ]	<0.0001	1.54 [ 1.20 ; 1.98 ]	0.00075
Sex - Male	712 / 205,435	2.20 [ 1.95 ; 2.49 ]	<0.0001	1.90 [ 1.67 ; 2.16 ]	<0.0001	1.72 [ 1.51 ; 1.96 ]	<0.0001
Age, <60 years	33 / 87,012	1.00	-	1.00	-	1.00	-
Age, 60 - 69 years <sup>1</sup>	168 / 146,756	3.02 [ 2.08 ; 4.38 ]	<0.0001	3.20 [ 2.20 ; 4.65 ]	<0.0001	2.69 [ 1.85 ; 3.91 ]	<0.0001
Age, 70 - 74 years <sup>1</sup>	220 / 107,077	5.42 [ 3.76 ; 7.81 ]	<0.0001	6.13 [ 4.24 ; 8.86 ]	<0.0001	4.14 [ 2.85 ; 6.00 ]	<0.0001
Age, >74 years <sup>1</sup>	690 / 117,881	15.43 [ 10.88 ; 21.89 ]	<0.0001	17.55 [ 12.33 ; 24.98 ]	<0.0001	8.88 [ 6.18 ; 12.75 ]	<0.0001
White British	1,012 / 432,624	1.00	-	1.00	-	1.00	-
Black British ethnicity <sup>2</sup>	42 / 1,1157	1.61 [ 1.18 ; 2.19 ]	0.0026	2.28 [ 1.66 ; 3.12 ]	<0.0001	1.98 [ 1.43 ; 2.73 ]	<0.0001
Asian British ethnicity <sup>2</sup>	38 / 8,280	1.96 [ 1.42 ; 2.71 ]	<0.0001	2.01 [ 1.43 ; 2.81 ]	<0.0001	1.83 [ 1.30 ; 2.59 ]	0.0006
Other ethnicities <sup>2</sup>	19 / 6,665	1.22 [ 0.77 ; 1.92 ]	0.39	1.34 [ 0.84 ; 2.11 ]	0.22	1.29 [ 0.81 ; 2.06 ]	0.28
Townsend deprivation index	-	1.12 [ 1.10 ; 1.14 ]	<0.0001	1.11 [ 1.09 ; 1.12 ]	<0.0001	1.07 [ 1.06 ; 1.09 ]	<0.0001
BMI (kg/m <sup>2</sup> )	-	1.10 [ 1.09 ; 1.11 ]	<0.0001	1.09 [ 1.08 ; 1.11 ]	<0.0001	1.06 [ 1.05 ; 1.07 ]	<0.0001
Non-Smoker	420 / 256,037	1.00	-	1	-	1.00	-
Current Smoker <sup>3</sup>	527 / 156,961	2.05 [ 1.80 ; 2.33 ]	<0.0001	1.40 [ 1.23 ; 1.6 ]	<0.0001	1.27 [ 1.11 ; 1.46 ]	0.00054
Ex-smoker <sup>3</sup>	164 / 45,728	2.19 [ 1.82 ; 2.62 ]	<0.0001	2.04 [ 1.69 ; 2.46 ]	<0.0001	1.59 [ 1.31 ; 1.94 ]	<0.0001

\* The demographic and BMI estimates are derived from the model with gout as exposure

**Figure S1 Forest plots of data presented in Table 3.** Analysis A is on the left, Analysis B in the middle, Analysis C on the right. Unadjusted is top, Model 1 is middle, Model 2 is bottom.

