

Supplementary Information

A population-based outcome-wide association study of the comorbidities and sequelae following COVID-19 infection

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Supplementary Table 1: Comorbidity categories and corresponding ICD-10 codes.

Comorbidity category	ICD-10 codes
Gastroenteritis and colitis	A099
Septicaemia	A415, A419
Infectious diseases	B370, B956, B962, B968
Blood cell disease	D509, D649, D696
Diabetes mellitus	E119
Hypoglycaemia	E162
Vitamin deficiency	E538, E559
Obesity	E668, E669
Hypercholesterolaemia	E780
Electrolyte imbalance	E833, E834, E835, E86, E870, E871, E872, E873, E875, E876, E877
Dementia	F019, F03
Delirium	F050, F051, F058, F059
Mental disease	F171, F329, F419
Sleep apnoea	G473
Hearing loss	H919
Hypertension	I10
Chronic ischaemic heart disease	I252, I259
Pulmonary embolism	I269
Other heart disease	I340, I350, I447, I451, I480, I489, I500, I509, I517, I518
Cerebrovascular diseases	I678
Vascular disease	I739, I802
Hypotension	I951, I959
Lower respiratory infection	J128, J181, J189, J22, J690
COPD/Emphysema	J439, J440
Asthma	J459
Other lung disease	J47, J841, J981
Pleural effusion	J90
Respiratory failure	J9600, J9690, J9691
Gastro-oesophageal reflux disease	K219
Diverticular disease of intestine	K579
Fecal abnormalities	K590, R15, R195
Fatty liver	K760
Cellulitis	L031
Rash and dermatitis	L248, R21
Decubitus ulcer	L890, L891, L899
Gout	M109
Osteoarthritis	M199, M549, M819
Renal failure	N179, N183, N189
Urinary tract infection	N390
Hyperplasia of prostate	N40
Arrhythmia	R000, R001
Cough	R05
Dyspnea and asphyxia	R060, R090
Nausea and vomiting	R11
Abnormalities of gait and mobility	R263, R268, R296
Urinary abnormality	R31, R32, R33
Disorientation	R410
Other cognitive symptoms	R418
Emotional state symptoms and signs	R451, R458
General symptoms and signs	R509, R51, R53, R55, R568, R600, R630, R638
Abnormal examining results	R798, R91, R945

ICD-10: international classification of disease, 10th revision.

Supplementary Table 2: Sequela categories and corresponding ICD-10 codes.

Sequela category	ICD-10 codes
Septicaemia	A419
Infectious diseases	B956, B968
Delirium	F050, F051
Lower respiratory infection	J128, J189
Interstitial pulmonary diseases	J841
Respiratory failure	J9691
Decubitus ulcer	L891
Fecal abnormalities	R15
Immobility	R263
Urinary abnormality	R32
Emotional state symptoms and signs	R458

ICD-10: international classification of disease, 10th revision.

Supplementary Table 3: ICD-10 codes and Charlson Comorbidity Index (CCI) scores.

Comorbidities	Score	ICD-10 codes
Age of the patient		
<50 years	0	/
50-59 years	1	/
60-69 years	2	/
70-79 years	3	/
80 years or more	4	/
Myocardial infarction		
Yes	1	I21, I22, I252
No	0	
Congestive heart failure		
Yes	1	I50
No	0	
Peripheral vascular disease		
Yes	1	I71, I790, I739, R02, Z958, Z959
No	0	
Cerebrovascular disease		
Yes	1	G450, G451, G452, G454, G458, G459, G46, I60, I61, I62, I63, I65, I66, I64, I670, I671, I672, I674, I675, I676, I677, I678, I679, I681, I682, I688, I69
No	0	
Dementia		
Yes	1	F00, F01, F02, F051
No	0	
Chronic pulmonary disease		
Yes	1	J40, J41, J42, J43, J44, J45, J46, J47, J67, J60, J61, J62, J63, J66, J64, J65
No	0	
Rheumatologic disease		
Yes	1	M32, M34, M332, M053, M058, M059, M060, M063, M069, M050, M052, M051, M353
No	0	
Peptic ulcer disease		
Yes	1	K25, K26, K27, K28
No	0	
Diabetes		
Yes, no complications	1	E109, E119, E139, E149, E101, E111, E131, E141, E105, E115, E135, E145
Yes, with chronic complications	2	E102, E112, E132, E142, E103, E113, E133, E143, E104, E114, E134, E144
No	0	
Hemiplegia or paraplegia		
Yes	2	G041, G81, G820, G821, G822
No	0	
Renal disease		
Yes	2	N03, N052, N053, N054, N055, N056, N072, N073, N074, N01, N18, N19, N25
No	0	
Malignancy		
Localized solid tumor	2	C0, C1, C2, C3, C40, C41, C43, C45, C46, C47, C48, C49, C5, C6, C70, C71, C72, C73, C74, C75, C76, C883, C887, C889, C900, C901, C96
Metastatic solid tumor	6	C77, C78, C79, C80
No	0	
Leukemia		
Yes	2	C91, C92, C93, C94, C95
No	0	
Lymphoma		
Yes	2	C81, C82, C83, C84, C85, C86, C884
No	0	
AIDS		
Yes	6	B20, B21, B22, B23, B24
No	0	
Liver disease		
Mild liver disease	1	K702, K703, K73, K717, K740, K742, K746, K743, K744, K745
Moderate or severe liver disease	3	K729, K766, K767, K721
No	0	

ICD-10: international classification of disease, 10th revision.

Supplementary Table 4: Characteristics of COVID-19-positive and negative patients.

Covariant		Total population (n=75057)	COVID-19-negative participants (n=58281)	COVID-19-positive participants (n=16776)	p value
Sex (%)	Female/Male	53.5/46.5	53.7/46.3	52.8/47.2	0.054
Age	Mean(SD)	65.5(8.3)	65.8(8.2)	64.6(8.6)	<0.001
	Median[Min,Max]	65.4[49.4, 85.2]	65.8[49.4, 85.2]	63.7[49.5, 82.9]	
TDI	Mean(SD)	-0.9(3.3)	-0.9(3.3)	-0.7(3.3)	<0.001
	Median[Min,Max]	-1.7[-6.3, 10.8]	-1.8[-6.3, 10.8]	-1.5[-6.3, 10.6]	
Ethnicity (%)	White/Non-white	93/7	93.8/6.2	90/10	<0.001
	Missing	N=440	N=339	N=101	
BMI (%)	Normal	29.1	30.1	25.5	<0.001
	Obese	28.2	27.2	31.8	
	Overweight	42.2	42.2	42.4	
	Underweight	0.5	0.5	0.4	
	Missing	N=548	N=404	N=144	
Smoking status (%)	Never	53.4	53.6	52.9	0.059
	Current	11.8	11.9	11.6	
	Previous	34.7	34.5	35.5	
	Missing	N=519	N=410	N=109	
CCI score	Mean(SD)	1.3(2.1)	1.3(2.1)	1.2(2.2)	0.003
	Median[Min,Max]	0[0, 19]	0[0, 19]	0[0, 19]	

COVID-19: corona virus disease 2019; TDI: Townsend deprivation index; BMI: body mass index; SD: standard deviation; CCI: Charlson Comorbidity index. Bold indicates p values less than 0.05.

Supplementary Table 5: The outcome-wide association analyses evaluating the hazards ratio (HR) for comorbidities (defined by three-digit ICD-10 codes) of COVID-19-positive participants compared to matched COVID-19-negative individuals.

ICD-10 code	COVID-19-negative		COVID-19-positive		HR(95%CI)	p value	ICD-10 disease	Category
	No. negative participants	No. case	No. positive participants	No. case				
A099	55405	52	15963	105	7.38(5.25-10.38)	<0.001	Gastroenteritis and colitis of unspecified origin	Gastroenteritis and colitis
A415	57991	4	16654	13	12.4(4.04-38.06)	<0.001	Septicaemia due to other Gram-negative organisms	Septicaemia
A419	56948	28	16261	55	8.04(5-12.91)	<0.001	Septicaemia, unspecified	
B370	57968	6	16634	34	21.48(9.01-51.22)	<0.001	Candidal stomatitis	Infectious diseases
B956	57621	12	16585	11	3.19(1.4-7.27)	0.006	Staphylococcus aureus as the cause of diseases classified to other chapters	
B962	57180	18	16338	27	6.27(3.38-11.66)	<0.001	Escherichia coli [E. coli] as the cause of diseases classified to other chapters	
B968	57102	8	16379	23	11.62(4.97-27.15)	<0.001	Other specified bacterial agents as the cause of diseases classified to other chapters	
D509	55644	45	16085	24	2.18(1.3-3.66)	0.003	Iron deficiency anaemia, unspecified	Blood cell disease
D649	54425	63	15664	49	2.88(1.96-4.22)	<0.001	Anaemia, unspecified	
D696	57866	9	16635	26	10.77(5.04-23.02)	<0.001	Thrombocytopenia, unspecified	
E119	52643	66	14897	76	4.24(2.98-6.01)	<0.001	Non-insulin-dependent diabetes mellitus with renal complications	Diabetes mellitus
E162	57822	16	16595	36	8.25(4.57-14.89)	<0.001	Hypoglycaemia, unspecified	Hypoglycaemia
E538	57789	9	16571	14	6.74(2.83-16.08)	<0.001	Deficiency of other specified B group vitamins	Vitamin deficiency
E559	57402	27	16484	45	6.36(3.89-10.39)	<0.001	Vitamin D deficiency, unspecified	
E668	57408	16	16520	15	3.46(1.68-7.11)	<0.001	Other obesity	Obesity
E669	52782	114	15132	88	2.7(2.02-3.61)	<0.001	Obesity, unspecified	
E780	48823	119	14049	92	3.21(2.38-4.32)	<0.001	Pure hypercholesterolaemia	Hypercholesterolaemia
E833	58055	14	16685	32	10.28(5.29-19.97)	<0.001	Disorders of phosphorus metabolism	Electrolyte imbalance
E834	57900	25	16617	32	5.39(3.13-9.3)	<0.001	Disorders of magnesium metabolism	
E835	57776	23	16567	30	4.84(2.81-8.36)	<0.001	Disorders of calcium metabolism	
E86	57024	35	16261	129	15.33(10.35-22.7)	<0.001	Volume depletion	
E870	58153	6	16656	55	35.28(15.18-81.97)	<0.001	Hyperosmolality and hypernatraemia	
E871	57230	31	16399	73	9.9(6.36-15.4)	<0.001	Hypo-osmolality and hyponatraemia	
E872	57871	22	16605	44	7.62(4.52-12.84)	<0.001	Acidosis	
E873	58200	3	16716	23	27.26(8.16-91.09)	<0.001	Alkalosis	
E875	57860	15	16594	38	9.39(5.15-17.1)	<0.001	Hyperkalaemia	
E876	57344	37	16394	82	8.97(5.98-13.46)	<0.001	Hypokalaemia	
E877	57927	23	16609	20	3.31(1.8-6.09)	<0.001	Fluid overload	
F019	58143	5	16598	16	12.64(4.63-34.51)	<0.001	Vascular dementia, unspecified	Dementia
F03	57935	15	16433	28	8.77(4.46-17.27)	<0.001	Unspecified dementia	
F050	58191	4	16679	27	25.88(9.05-74)	<0.001	Delirium not superimposed on dementia, so described	Delirium
F051	58186	7	16637	33	21.56(9.03-51.47)	<0.001	Delirium superimposed on dementia	
F058	58200	4	16702	21	20.78(7.13-60.55)	<0.001	Other delirium	
F059	57744	23	16411	86	15.31(9.49-24.7)	<0.001	Delirium, unspecified	
F171	54579	34	15855	19	2.09(1.16-3.77)	0.014	Harmful use due to use of tobacco	Mental disease
F329	53468	67	15408	48	2.44(1.66-3.58)	<0.001	Depressive episode, unspecified	
F419	55448	80	15979	46	2.02(1.39-2.93)	<0.001	Anxiety disorder, unspecified	
G473	56518	18	16336	17	3.22(1.63-6.35)	<0.001	Sleep apnoea	Sleep apnoea
H919	56811	34	16385	17	1.89(1.05-3.42)	0.034	Hearing loss, unspecified	Hearing loss
I10	38523	218	11404	142	2.69(2.09-3.45)	<0.001	Essential (primary) hypertension	Hypertension
I252	55533	45	15993	22	2.02(1.19-3.43)	0.009	Old myocardial infarction	Chronic ischaemic heart disease
I259	54256	66	15673	48	2.64(1.8-3.86)	<0.001	Chronic ischaemic heart disease, unspecified	
I269	57289	43	16496	112	11.27(7.74-16.43)	<0.001	Pulmonary embolism without mention of acute cor pulmonale	Pulmonary embolism
I340	57416	22	16560	16	2.83(1.47-5.43)	0.002	Mitral (valve) insufficiency	Other heart disease
I350	57553	14	16565	14	4(1.88-8.52)	<0.001	Aortic (valve) stenosis	
I447	57569	21	16559	17	3.05(1.59-5.84)	<0.001	Left bundle-branch block, unspecified	
I451	57495	31	16532	17	2.52(1.36-4.68)	0.003	Other and unspecified right bundle-branch block	
I480	57145	35	16495	22	2.34(1.37-4.02)	0.002	Paroxysmal atrial fibrillation	
I489	54930	100	15785	96	4.07(3.03-5.47)	<0.001	Atrial fibrillation and atrial flutter, unspecified	
I500	57442	24	16411	27	4.96(2.81-8.79)	<0.001	Congestive heart failure	
I509	57394	32	16447	30	3.88(2.33-6.47)	<0.001	Heart failure, unspecified	
I517	56868	47	16329	36	3.2(2.03-5.03)	<0.001	Cardiomegaly	
I518	57389	29	16458	22	2.84(1.62-4.97)	<0.001	Other ill-defined heart diseases	
I678	57595	39	16434	19	1.89(1.08-3.3)	0.026	Other specified cerebrovascular diseases	Cerebrovascular diseases
I739	57447	12	16511	12	3.71(1.63-8.45)	0.002	Peripheral vascular disease, unspecified	Vascular disease
I802	57544	11	16544	14	5.47(2.43-12.32)	<0.001	Phlebitis and thrombophlebitis of other deep vessels of lower extremities	Hypotension
I951	57466	26	16424	28	4.79(2.74-8.39)	<0.001	Orthostatic hypotension	
I959	56751	38	16256	85	8.53(5.77-12.62)	<0.001	Hypotension, unspecified	
J128	58256	3	15896	1016	3714.24(522.68-26393.82)	<0.001	Other viral pneumonia	Lower respiratory infection
J181	56277	53	16023	58	4.4(2.99-6.47)	<0.001	Lobar pneumonia, unspecified	
J189	56903	29	16218	67	9.63(6.07-15.26)	<0.001	Pneumonia, unspecified	
J22	55911	30	15953	39	4.94(3.04-8.04)	<0.001	Unspecified acute lower respiratory infection	
J690	58042	7	16633	23	12.08(5.17-28.22)	<0.001	Pneumonitis due to food and vomit	COPD/Emphysema
J439	57683	16	16576	25	5.82(3.1-10.92)	<0.001	Emphysema, unspecified	
J440	57439	9	16391	70	29.18(14.57-58.45)	<0.001	Chronic obstructive pulmonary disease with acute lower respiratory infection	
J459	51511	67	14821	46	2.44(1.64-3.61)	<0.001	Asthma, unspecified	Asthma
J47	57525	19	16569	21	4.4(2.34-8.27)	<0.001	Bronchiectasis	Other lung disease
J841	57975	10	16658	23	10.88(4.86-24.37)	<0.001	Other interstitial pulmonary diseases with fibrosis	
J981	57085	37	16368	43	4.62(2.94-7.25)	<0.001	Pulmonary collapse	Pleural effusion
J90	56560	61	16194	50	3.51(2.37-5.19)	<0.001	Pleural effusion, not elsewhere classified	
J9600	58246	2	16703	45	81.26(19.69-335.32)	<0.001	Acute respiratory failure; Type I [hypoxic]	Respiratory failure
J9690	58037	8	16497	275	123.04(60.9-248.59)	<0.001	Respiratory failure, unspecified; Type I [hypoxic]	
J9691	58112	7	16684	25	13.34(5.76-30.88)	<0.001	Respiratory failure unspecified; Type II [hypercapnic]	
K219	51996	105	15210	65	2.32(1.68-3.2)	<0.001	Gastro-oesophageal reflux disease without oesophagitis	Gastro-oesophageal reflux disease
K579	55837	63	16110	38	2.54(1.68-3.86)	<0.001	Diverticular disease of intestine, part unspecified, without perforation or abscess	Diverticular disease of intestine

K590	54181	67	15477	86	4.81(3.46-6.69)	<0.001	Constipation	
R15	57641	12	16494	16	4.93(2.32-10.45)	<0.001	Faecal incontinence	Fecal abnormalities
R195	57483	25	16573	16	2.38(1.27-4.47)	0.007	Other fecal abnormalities	
K760	57178	43	16440	28	2.17(1.34-3.52)	0.002	Fatty (change of) liver, not elsewhere classified	Fatty liver
L031	56592	17	16167	12	2.9(1.36-6.22)	0.006	Cellulitis of other parts of limb	Cellulitis
L248	58188	3	16730	21	27.7(8.26-92.88)	<0.001	Irritant contact dermatitis due to other agents	
R21	57643	8	16580	20	8.85(3.88-20.14)	<0.001	Rash and other nonspecific skin eruption	Rash and dermatitis
L890	58211	5	16737	15	14.35(4.76-43.33)	<0.001	Stage I decubitus ulcer and pressure area	
L891	58086	12	16618	37	14.19(7.05-28.57)	<0.001	Stage II decubitus ulcer	Decubitus ulcer
L899	58170	4	16689	19	23.27(6.88-78.72)	<0.001	Decubitus ulcer and pressure area, unspecified	
M109	57206	33	16439	19	2.06(1.17-3.63)	0.013	Gout, unspecified	Gout
M199	54344	109	15666	83	3.11(2.3-4.19)	<0.001	Arthrosis, unspecified	
M549	56947	20	16404	17	3.46(1.78-6.73)	<0.001	Dorsalgia, unspecified	Osteoarthritis
M819	56394	29	16270	26	3.56(2.09-6.07)	<0.001	Osteoporosis, unspecified	
N179	55619	85	15611	235	11.01(8.49-14.3)	<0.001	Acute renal failure, unspecified	
N183	56635	45	16235	44	3.69(2.42-5.63)	<0.001	Chronic kidney disease, stage 3	Renal failure
N189	56918	29	16264	37	5.96(3.54-10.04)	<0.001	Chronic renal failure, unspecified	
N390	54434	61	15389	68	4.31(3.01-6.15)	<0.001	Urinary tract infection, site not specified	Urinary tract infection
N40	54705	73	15862	37	2.04(1.35-3.08)	<0.001	Hyperplasia of prostate	Hyperplasia of prostate
R000	57424	21	16504	29	6.37(3.5-11.61)	<0.001	Tachycardia, unspecified	
R001	57184	23	16466	28	4.67(2.65-8.24)	<0.001	Bradycardia, unspecified	Arrhythmia
R05	57096	18	16345	74	15.34(9.04-26.03)	<0.001	Cough	Cough
R060	56025	51	16046	98	7.42(5.2-10.59)	<0.001	Dyspnea	
R090	58191	1	16728	18	68.17(9.09-510.94)	<0.001	Asphyxia	Dyspnea and asphyxia
R11	54538	64	15772	43	2.24(1.51-3.31)	<0.001	Nausea and vomiting	Nausea and vomiting
R263	58130	9	16652	17	8.12(3.5-18.84)	<0.001	Immobility	
R268	57032	30	16172	62	8.54(5.43-13.44)	<0.001	Other and unspecified abnormalities of gait and mobility	Abnormalities of gait and mobility
R296	56792	61	15904	63	4.57(3.15-6.62)	<0.001	Tendency to fall involving the nervous and musculoskeletal systems, not elsewhere classified	
R31	54888	34	15914	17	1.96(1.07-3.6)	0.030	Unspecified haematuria	
R32	57331	23	16303	40	6.92(4.07-11.76)	<0.001	Unspecified urinary incontinence	Urinary abnormality
R33	55785	46	16019	42	3.56(2.31-5.46)	<0.001	Retention of urine	
R410	57407	32	16297	48	5.83(3.69-9.22)	<0.001	Disorientation, unspecified	Disorientation
R418	57933	11	16584	15	5.04(2.31-11)	<0.001	Other and unspecified symptoms and signs involving cognitive functions and awareness	Other cognitive symptoms
R451	58165	6	16703	19	10.99(4.36-27.67)	<0.001	Restlessness and agitation	
R458	58026	8	16684	15	7.66(3.1-18.9)	<0.001	Other symptoms and signs involving emotional state	Emotional state symptoms and signs
R509	57020	21	16364	61	10.21(6.21-16.79)	<0.001	Fever, unspecified	
R51	55732	34	16071	19	2.06(1.16-3.67)	0.014	Headache	
R53	57078	25	16336	71	10.6(6.66-16.86)	<0.001	Malaise and fatigue	
R55	55477	43	15938	22	2.02(1.19-3.45)	0.009	Syncope and collapse	
R568	57664	11	16551	10	3.33(1.41-7.87)	0.006	Other and unspecified convulsions	General symptoms and signs
R600	57655	14	16547	24	6.46(3.33-12.5)	<0.001	Localised oedema	
R630	57951	11	16658	19	6.34(3.01-13.35)	<0.001	Anorexia	
R638	58113	14	16669	27	8.03(4.14-15.57)	<0.001	Other symptoms and signs concerning food and fluid intake	
R798	56138	49	16176	34	2.39(1.54-3.71)	<0.001	Other specified abnormal findings of blood chemistry	
R91	57506	21	16533	16	2.98(1.54-5.75)	0.001	Abnormal findings on diagnostic imaging of lung	Abnormal examing results
R945	57035	31	16364	75	9.37(6.1-14.41)	<0.001	Abnormal results of liver function studies	

ICD-10: international classification of disease 10th revision; COVID-19, corona virus disease 2019; CI: confidence interval. Bold indicates p values less than 0.05.

Supplementary Table 6: Adjusted risk of death for COVID-19-positive participants compared with matched COVID-19-negative comparisons.

All COVID-19 patients compared with matched negative patients					
Test result	Number	Death case	Death rate	HR(95% CI)	P value
COVID-19-negative	57336	522	0.91%	reference	<0.001
COVID-19-positive	16483	1169	7.09%	10.6(9.28-12.11)	
Mild COVID-19 patients compared with matched negative patients					
Test result	Number	Death case	Death rate	HR(95% CI)	P value
COVID-19-negative	47462	381	0.80%	reference	<0.001
Mild COVID-19	13903	205	1.47%	2.11(1.7-2.6)	
Severe COVID-19 patients compared with matched negative patients					
Test result	Number	Death case	Death rate	HR(95% CI)	P value
COVID-19-negative	9874	141	1.43%	reference	<0.001
Severe COVID-19	2580	964	37.36%	44.15(34.14-57.11)	

Note: Analyses were adjusted for ethnicity, BMI, smoking status, and Charlson Comorbidity index. COVID-19, corona virus disease 2019; HR: hazards ratio; CI: confidence interval. Bold indicates p values less than 0.05.

Supplementary Table 7: Characteristics of mild (non-hospitalized) and severe (hospitalized) COVID-19 patients.

Covariates		All COVID-19 patients (n=16776)	Mild COVID-19 patients (n=14106)	Severe COVID-19 patients (n=2670)	p value
Sex (%)	Female/Male	52.8/47.2	55.2/44.8	40.3/59.7	<0.001
Age	Mean(SD)	64.6(8.6)	63.5(8.3)	70.2(8)	<0.001
	Median[Min,Max]	63.7[49.5, 82.9]	62.2[49.5, 82.7]	72.4[49.7, 82.9]	
TDI	Mean(SD)	-0.7(3.3)	-0.8(3.2)	0(3.5)	<0.001
	Median[Min,Max]	-1.5[-6.3, 10.6]	-1.6[-6.3, 10.6]	-0.8[-6.3, 10]	
Ethnicity (%)	White/Non-white	90/10	90.3/9.7	88.9/11.1	0.033
	Missing	N=101	N=75	N=26	
BMI (%)	Normal	25.5	27.5	14.6	<0.001
	Obese	31.8	29.3	45	
	Overweight	42.4	42.8	40	
	Underweight	0.4	0.4	0.3	
	Missing	N=144	N=95	N=49	
Smoking status (%)	Never	52.9	54.9	42.7	<0.001
	Current	11.6	11.2	13.4	
	Previous	35.5	33.9	43.9	
	Missing	N=109	N=73	N=36	
CCI score	Mean(SD)	1.2(2.2)	0.9(1.8)	2.7(2.9)	<0.001
	Median[Min,Max]	0[0, 19]	0[0, 19]	2[0, 18]	

COVID-19: corona virus disease 2019; TDI: Townsend deprivation index; BMI: body mass index; CCI: Charlson Comorbidity index. Bold indicates p values less than 0.05.

Supplementary Table 8: Adjusted hazards ratios (HRs) of clinical comorbidities for severe COVID-19 patients (hospitalized) compared with mild COVID-19 patients (non-hospitalized).

Comorbidity	Mild COVID-19			Severe COVID-19			HR (95% CI)	P
	No. mild participants	No. case	Incidence	No. severe participants	No. case	Incidence		
Gastroenteritis and colitis	13612	13	0.10%	2351	92	3.91%	49.28(26.89-90.31)	<0.001
Septicaemia	13815	13	0.09%	2372	53	2.23%	20.84(10.79-40.28)	<0.001
Infectious diseases	13470	12	0.09%	2297	70	3.05%	25.37(13.38-48.07)	<0.001
Blood cell disease	13036	15	0.12%	2148	63	2.93%	22.7(12.55-41.07)	<0.001
Diabetes mellitus	12933	6	0.05%	1964	70	3.56%	112.2(47.96-262.46)	<0.001
Hypoglycaemia	14034	8	0.06%	2561	28	1.09%	14.68(6.42-33.56)	<0.001
Vitamin deficiency	13801	14	0.10%	2501	41	1.64%	18.9(9.9-36.08)	<0.001
Obesity	12930	10	0.08%	2120	81	3.82%	95.18(48.34-187.44)	<0.001
Hypercholesterolaemia	12249	16	0.13%	1800	76	4.22%	36.02(20.43-63.53)	<0.001
Electrolyte imbalance	13376	37	0.28%	1938	269	13.88%	48.23(33.62-69.2)	<0.001
Dementia	13854	7	0.05%	2472	28	1.13%	11.66(4.94-27.56)	<0.001
Delirium	13841	19	0.14%	2356	123	5.22%	27.86(16.67-46.56)	<0.001
Mental disease	12346	15	0.12%	2055	66	3.21%	43.19(23.54-79.22)	<0.001
Sleep apnoea	13825	2	0.01%	2511	15	0.60%	52.82(11.51-242.39)	<0.001
Hearing loss	13841	2	0.01%	2544	15	0.59%	36.9(8.37-162.65)	<0.001
Hypertension	10317	22	0.21%	1087	120	11.04%	56.82(35.53-90.89)	<0.001
Chronic ischaemic heart disease	13288	7	0.05%	2133	37	1.73%	27.48(11.83-63.86)	<0.001
Pulmonary embolism	13950	17	0.12%	2546	95	3.73%	33.79(19.72-57.91)	<0.001
Other heart disease	12944	27	0.21%	1859	129	6.94%	28.45(18.45-43.87)	<0.001
Cerebrovascular diseases	13924	4	0.03%	2510	15	0.60%	14.58(4.54-46.79)	<0.001
Vascular disease	13833	6	0.04%	2467	18	0.73%	16.11(5.98-43.45)	<0.001
Hypotension	13653	16	0.12%	2316	91	3.93%	31.86(18.3-55.48)	<0.001
Lower respiratory infection	13141	41	0.31%	1323	816	61.68%	364.28(264.7-501.32)	<0.001
COPD/Emphysema	13923	6	0.04%	2364	66	2.79%	47.24(19.95-111.85)	<0.001
Asthma	12667	4	0.03%	2154	42	1.95%	132.33(46.31-378.11)	<0.001
Other lung disease	13788	10	0.07%	2317	63	2.72%	38.56(19.22-77.36)	<0.001
Pleural effusion	13787	6	0.04%	2407	44	1.83%	40.4(16.62-98.21)	<0.001
Respiratory failure	14023	8	0.06%	2335	323	13.83%	305.3(150.45-619.53)	<0.001
Gastro-oesophageal reflux disease	12964	20	0.15%	2246	45	2.00%	16.83(9.54-29.7)	<0.001
Diverticular disease of intestine	13672	10	0.07%	2438	28	1.15%	16.32(7.56-35.23)	<0.001
Fecal abnormalities	13058	20	0.15%	2090	84	4.02%	21(12.57-35.09)	<0.001
Fatty liver	13887	4	0.03%	2553	24	0.94%	39.15(12.96-118.24)	<0.001
Cellulitis	13733	3	0.02%	2434	9	0.37%	15.09(3.8-59.95)	<0.001
Rash and dermatitis	13966	8	0.06%	2574	32	1.24%	21.03(9.26-47.76)	<0.001
Decubitus ulcer	13995	8	0.06%	2535	58	2.29%	33.45(15.55-71.95)	<0.001
Gout	13911	2	0.01%	2528	17	0.67%	33.93(7.83-147.03)	<0.001
Osteoarthritis	12992	23	0.18%	2100	82	3.90%	24.51(14.99-40.08)	<0.001
Renal failure	13331	28	0.21%	1860	202	10.86%	44.33(29.44-66.75)	<0.001
Urinary tract infection	13243	20	0.15%	2146	48	2.24%	11.46(6.52-20.13)	<0.001
Hyperplasia of prostate	13514	4	0.03%	2348	33	1.41%	31.75(11.22-89.87)	<0.001
Arrhythmia	13764	6	0.04%	2449	46	1.88%	54.16(22.44-130.71)	<0.001
Cough	13882	13	0.09%	2463	61	2.48%	34.73(18.44-65.4)	<0.001
Dyspnea and asphyxia	13688	19	0.14%	2324	90	3.87%	37.68(22.39-63.43)	<0.001
Nausea and vomiting	13431	16	0.12%	2341	27	1.15%	12.96(6.63-25.3)	<0.001
Abnormalities of gait and mobility	13471	19	0.14%	2096	89	4.25%	23.84(14.2-40.04)	<0.001
Urinary abnormality	12908	13	0.10%	2088	64	3.07%	24.64(13.19-46.02)	<0.001
Disorientation	13863	16	0.12%	2434	32	1.31%	8.63(4.48-16.62)	<0.001
Other cognitive symptoms	14003	3	0.02%	2581	12	0.46%	12.01(3.21-44.92)	<0.001
Emotional state symptoms and signs	14008	7	0.05%	2607	25	0.96%	17.12(6.98-42.01)	<0.001
General symptoms and signs	12540	33	0.26%	1893	130	6.87%	27.12(18.07-40.71)	<0.001
Abnormal examing results	13383	16	0.12%	2233	93	4.16%	35.53(20.39-61.88)	<0.001

Note: Analyses were adjusted for age, sex, TDI, ethnicity, BMI, smoking status, and CCI. COVID-19: corona virus disease 2019; TDI: Townsend deprivation index; BMI: body mass index; CCI: Charlson Comorbidity index; CI: confidence interval; COPD: chronic obstructive pulmonary disease. Bold indicates p values less than 0.05.

Supplementary Table 9: The adjusted risk of clinical comorbidity in COVID-19-positive participants compared with matched COVID-19-negative participants in females and males, respectively.

Comorbidity	Male								Female							
	COVID-19 negative			COVID-19 positive			HR (95% CI)	P value	COVID-19 negative			COVID-19 positive			HR (95% CI)	P value
	No. negative participants	No. case	Incidence	No. positive participants	No. case	Incidence			No. negative participants	No. case	Incidence	No. positive participants	No. case	Incidence		
Gastroenteritis and colitis	25787	20	0.08%	7536	51	0.68%	53.57(9.28-309.36)	<0.001	29618	32	0.11%	8427	54	0.64%	5.55(2.88-10.7)	<0.001
Septicaemia	26164	16	0.06%	7578	40	0.53%	18.45(5.18-65.7)	<0.001	30580	13	0.04%	8609	26	0.30%	97.91(6.64-1444.38)	<0.001
Infectious diseases	25645	21	0.08%	7435	51	0.69%	12.12(4.79-30.67)	<0.001	29755	16	0.05%	8332	31	0.37%	9.71(3.27-28.8)	<0.001
Blood cell disease	24536	39	0.16%	7210	47	0.65%	5.42(2.73-10.78)	<0.001	28004	53	0.19%	7974	31	0.39%	1.57(0.87-2.84)	0.134
Diabetes mellitus	23654	41	0.17%	6762	45	0.67%	3.08(1.37-6.92)	0.006	28989	25	0.09%	8135	31	0.38%	4.16(1.55-11.22)	0.005
Hypoglycaemia	26742	9	0.03%	7801	17	0.22%	NA	0.993	31080	7	0.02%	8794	19	0.22%	20.37(1.71-243.14)	0.017
Vitamin deficiency	26483	14	0.05%	7714	26	0.34%	6.98(2.36-20.62)	<0.001	30494	19	0.06%	8588	29	0.34%	8.45(3.17-22.53)	<0.001
Obesity	24290	55	0.23%	7098	43	0.61%	2.34(1.1-5)	0.028	28147	65	0.23%	7952	48	0.60%	1.63(0.8-3.34)	0.181
Hypercholesterolaemia	21400	66	0.31%	6299	49	0.78%	2.73(1.44-5.19)	0.002	27423	53	0.19%	7750	43	0.55%	3.03(1.73-5.29)	<0.001
Electrolyte imbalance	25060	69	0.28%	7126	179	2.51%	16.22(9.3-28.27)	<0.001	29333	68	0.23%	8188	127	1.55%	9.49(5.82-15.47)	<0.001
Dementia	26774	9	0.03%	7701	22	0.29%	8.37(2.51-27.95)	<0.001	31062	9	0.03%	8625	13	0.15%	14.03(1.5-130.87)	0.020
Delirium	26602	20	0.08%	7580	87	1.15%	18.3(7.65-43.78)	<0.001	30959	15	0.05%	8617	55	0.64%	16.07(6.08-42.45)	<0.001
Mental disease	23316	47	0.20%	6926	40	0.58%	2.67(1.39-5.13)	0.003	26250	71	0.27%	7475	41	0.55%	2(1.17-3.39)	0.011
Hypertension	16410	105	0.64%	4966	97	1.95%	2.77(1.74-4.41)	<0.001	22113	113	0.51%	6438	45	0.70%	1.45(0.84-2.49)	0.184
Pulmonary embolism	26463	22	0.08%	7766	81	1.04%	32.17(11.08-93.39)	<0.001	30826	21	0.07%	8730	31	0.36%	5.22(2.44-11.18)	<0.001
Other heart disease	22829	94	0.41%	6691	100	1.49%	3.67(2.37-5.68)	<0.001	28722	68	0.24%	8112	56	0.69%	4.35(2.48-7.61)	<0.001
Cerebrovascular diseases	26632	21	0.08%	7722	10	0.13%	4.74(1.2-18.77)	0.027	30963	18	0.06%	8712	9	0.10%	1.79(0.46-6.97)	0.400
Vascular disease	26045	15	0.06%	7606	15	0.20%	3.53(1.05-11.93)	0.042	30689	7	0.02%	8694	9	0.10%	4.11(0.61-27.55)	0.146
Hypotension	25864	34	0.13%	7464	58	0.78%	11.15(5.04-24.67)	<0.001	30205	23	0.08%	8505	49	0.58%	12.7(4.96-32.54)	<0.001
Lower respiratory infection	24433	49	0.20%	6624	517	7.80%	107.04(48.83-234.66)	<0.001	28967	39	0.13%	7840	340	4.34%	40.4(23.03-70.88)	<0.001
COPD/Emphysema	26343	8	0.03%	7633	49	0.64%	1732.86(2.07-1448251.4)	0.030	30705	9	0.03%	8654	23	0.27%	NA	0.997
Asthma	24307	27	0.11%	7098	18	0.25%	4.94(1.8-13.54)	0.002	27204	40	0.15%	7723	28	0.36%	2.49(1.21-5.1)	0.013
Other lung disease	25963	30	0.12%	7551	40	0.53%	4.33(2.16-8.7)	<0.001	30229	30	0.10%	8554	33	0.39%	6.69(2.83-15.82)	<0.001
Pleural effusion	26040	35	0.13%	7563	23	0.30%	2.22(0.98-5.02)	0.055	30520	26	0.09%	8631	27	0.31%	5.91(2.42-14.4)	<0.001
Respiratory failure	26773	12	0.04%	7664	223	2.91%	906.77(67.42-12195.04)	<0.001	31079	5	0.02%	8694	108	1.24%	64.43(17.57-236.32)	<0.001
Gastro-oesophageal reflux disease	24311	55	0.23%	7215	30	0.42%	1.81(0.98-3.35)	0.057	27685	50	0.18%	7995	35	0.44%	3.53(1.82-6.84)	<0.001
Diverticular disease of intestine	25947	36	0.14%	7615	16	0.21%	1.69(0.72-3.97)	0.228	29890	27	0.09%	8495	22	0.26%	3.35(1.44-7.78)	0.005
Fecal abnormalities	24907	45	0.18%	7195	66	0.92%	7.08(3.7-13.56)	<0.001	28191	48	0.17%	7953	38	0.48%	3.71(1.96-7.02)	<0.001
Rash and dermatitis	26654	5	0.02%	7792	24	0.31%	33.8(2.8-407.91)	0.006	30902	5	0.02%	8748	16	0.18%	NA	0.994
Decubitus ulcer	26825	10	0.04%	7769	40	0.51%	NA	0.990	31119	8	0.03%	8761	26	0.30%	16.91(3.45-82.9)	<0.001
Osteoarthritis	24821	53	0.21%	7306	45	0.62%	3.24(1.83-5.73)	<0.001	27251	81	0.30%	7786	60	0.77%	2.46(1.5-4.03)	<0.001
Renal failure	24612	65	0.26%	7006	140	2.00%	8.06(4.96-13.11)	<0.001	29349	49	0.17%	8185	90	1.10%	9.63(5.42-17.12)	<0.001
Urinary tract infection	25324	36	0.14%	7300	35	0.48%	8.24(3.29-20.61)	<0.001	29110	25	0.09%	8089	33	0.41%	8.52(3.64-19.94)	<0.001
Arrhythmia	25942	21	0.08%	7569	31	0.41%	10.02(3.15-31.81)	<0.001	30434	21	0.07%	8644	21	0.24%	3.84(1.61-9.18)	0.002
Cough	26455	12	0.05%	7694	44	0.57%	31.7(6.78-148.13)	<0.001	30641	6	0.02%	8651	30	0.35%	270.52(2.23-32745.97)	0.022
Dyspnea and asphyxia	25945	26	0.10%	7541	62	0.82%	20.18(6.9-59.03)	<0.001	30014	25	0.08%	8471	47	0.55%	9.54(4.06-22.43)	<0.001
Nausea and vomiting	25705	28	0.11%	7524	16	0.21%	2.91(0.92-9.24)	0.070	28833	36	0.12%	8248	27	0.33%	3.1(1.56-6.15)	0.001
Abnormalities of gait and mobility	25884	45	0.17%	7278	64	0.88%	4.86(2.71-8.72)	<0.001	30038	34	0.11%	8289	44	0.53%	6.23(3.14-12.38)	<0.001
Urinary abnormality	23420	49	0.21%	6879	46	0.67%	3.02(1.65-5.54)	<0.001	28808	34	0.12%	8117	31	0.38%	8.29(3.37-20.41)	<0.001
Disorientation	26507	21	0.08%	7640	32	0.42%	15.81(4.27-58.6)	<0.001	30900	11	0.04%	8657	16	0.18%	95.17(2.03-4459.31)	0.020
Emotional state symptoms and signs	26807	8	0.03%	7820	19	0.24%	24.02(3.21-179.82)	0.002	31111	5	0.02%	8795	13	0.15%	16.54(1.08-252.35)	0.044
General symptoms and signs	23479	60	0.26%	6788	96	1.41%	7.19(4.08-12.66)	<0.001	27177	64	0.24%	7645	67	0.88%	4.45(2.71-7.31)	<0.001
Abnormal examining results	24641	60	0.24%	7221	69	0.96%	7.49(4.16-13.47)	<0.001	29718	34	0.11%	8395	40	0.48%	5.63(2.79-11.38)	<0.001

Note: Analyses were adjusted for ethnicity, BMI, smoking status and CCI. COVID-19: corona virus disease 2019; BMI: body mass index; CCI: Charlson Comorbidity index; COPD: chronic obstructive pulmonary disease; HR: hazards ratio; CI: confidence interval. Bold indicates p values less than 0.05.

Supplementary Table 10: The adjusted risk of clinical comorbidity in COVID-19-positive participants compared with matched COVID-19-negative participants stratified by BMI.

Comorbidity	Overweight or obesity								Normal or underweight							
	COVID-19-negative			COVID-19-positive			HR (95% CI)	P value	COVID-19-negative			COVID-19-positive			HR (95% CI)	P value
	No. negative participants	No. case	Incidence	No. positive participants	No. case	Incidence			No. negative participants	No. case	Incidence	No. positive participants	No. case	Incidence		
Gastroenteritis and colitis	38088	34	0.09%	11692	97	0.83%	11.68(7-19.49)	<0.001	17317	18	0.10%	4271	8	0.19%	925.27(0.01-67614845.2)	0.232
Septicaemia	39028	23	0.06%	11840	53	0.45%	15.56(6.92-35)	<0.001	17716	6	0.03%	4347	13	0.30%	NA	0.996
Infectious diseases	37987	28	0.07%	11534	69	0.60%	7.97(4.72-13.46)	<0.001	17413	9	0.05%	4233	13	0.31%	NA	0.998
Blood cell disease	35996	68	0.19%	11115	58	0.52%	2.58(1.7-3.91)	<0.001	16544	24	0.15%	4069	20	0.49%	1.92(0.65-5.65)	0.237
Diabetes mellitus	35091	61	0.17%	10617	75	0.71%	3.98(2.54-6.22)	<0.001	17552	5	0.03%	4280	1	0.02%	NA	1.000
Hypoglycaemia	39811	12	0.03%	12169	28	0.23%	12.01(3.67-39.27)	<0.001	18011	4	0.02%	4426	8	0.18%	NA	0.999
Vitamin deficiency	39199	26	0.07%	11966	46	0.38%	6.62(3.66-11.98)	<0.001	17778	7	0.04%	4336	9	0.21%	4.08(0.7-23.58)	0.117
Obesity	34514	117	0.34%	10646	88	0.83%	2.56(1.82-3.58)	<0.001	17923	3	0.02%	4404	3	0.07%	NA	1.000
Hypercholesterolaemia	32462	85	0.26%	10036	79	0.79%	3.82(2.57-5.69)	<0.001	16361	34	0.21%	4013	13	0.32%	3.23(0.99-10.61)	0.053
Electrolyte imbalance	37336	104	0.28%	11197	262	2.34%	10.74(7.92-14.56)	<0.001	17057	33	0.19%	4117	44	1.07%	4.74(2.06-10.95)	<0.001
Dementia	39845	9	0.02%	11989	28	0.23%	19.88(5.71-69.23)	<0.001	17991	9	0.05%	4337	7	0.16%	NA	0.997
Delirium	39624	26	0.07%	11874	120	1.01%	17.33(10.1-29.75)	<0.001	17937	9	0.05%	4323	22	0.51%	11.97(1.14-125.88)	0.039
Mental disease	33839	79	0.23%	10528	70	0.66%	2.87(1.91-4.31)	<0.001	15727	39	0.25%	3873	11	0.28%	0.48(0.12-1.92)	0.298
Sleep apnoea	38558	16	0.04%	11916	16	0.13%	3.26(1.19-8.94)	0.022	17960	2	0.01%	4420	1	0.02%	NA	1.000
Hearing loss	39059	24	0.06%	12013	15	0.12%	2.28(1.03-5.03)	0.041	17752	10	0.06%	4372	2	0.05%	0.94(0.12-7.51)	0.954
Hypertension	24054	168	0.70%	7788	128	1.64%	3.13(2.25-4.35)	<0.001	14469	50	0.35%	3616	14	0.39%	0.43(0.12-1.54)	0.194
Chronic ischaemic heart disease	36118	58	0.16%	11183	39	0.35%	2.39(1.45-3.92)	<0.001	17209	11	0.06%	4238	5	0.12%	9.45(0.61-145.12)	0.107
Pulmonary embolism	39376	34	0.09%	12097	96	0.79%	11.57(6.92-19.34)	<0.001	17913	9	0.05%	4399	16	0.36%	18.54(1.81-189.71)	0.014
Other heart disease	34801	135	0.39%	10687	139	1.30%	4.05(2.99-5.47)	<0.001	16750	27	0.16%	4116	17	0.41%	2.21(0.58-8.33)	0.243
Vascular disease	38955	14	0.04%	11940	22	0.18%	8.69(3-25.2)	<0.001	17779	8	0.04%	4360	2	0.05%	NA	0.999
Hypotension	38559	39	0.10%	11713	90	0.77%	8.69(5.49-13.75)	<0.001	17510	18	0.10%	4256	17	0.40%	6.81(1.38-33.68)	0.019
Lower respiratory infection	36491	67	0.18%	10480	748	7.14%	64.13(42.74-96.23)	<0.001	16909	21	0.12%	3984	109	2.74%	34.23(9.81-119.4)	<0.001
COPD/Emphysema	39302	8	0.02%	11962	61	0.51%	1849.55(8.1-422489.31)	0.007	17746	9	0.05%	4325	11	0.25%	NA	0.999
Asthma	35052	45	0.13%	10772	42	0.39%	2.72(1.66-4.45)	<0.001	16459	22	0.13%	4049	4	0.10%	0.02(0-1.55)	0.076
Other lung disease	38619	37	0.10%	11805	57	0.48%	5.98(3.55-10.07)	<0.001	17573	23	0.13%	4300	16	0.37%	13.48(1.45-125.08)	0.022
Pleural effusion	38904	46	0.12%	11859	39	0.33%	4.58(2.61-8.06)	<0.001	17656	15	0.08%	4335	11	0.25%	34.65(1.31-919.12)	0.034
Respiratory failure	39849	12	0.03%	11987	293	2.44%	146.76(54.9-392.36)	<0.001	18003	5	0.03%	4371	38	0.87%	NA	0.997
Gastro-oesophageal reflux disease	35325	78	0.22%	11050	55	0.50%	2.57(1.71-3.85)	<0.001	16671	27	0.16%	4160	10	0.24%	1.53(0.36-6.56)	0.565
Diverticular disease of intestine	38185	51	0.13%	11782	33	0.28%	2.63(1.56-4.43)	<0.001	17652	12	0.07%	4328	5	0.12%	NA	0.999
Fecal abnormalities	36536	69	0.19%	11075	80	0.72%	3.9(2.66-5.73)	<0.001	16562	24	0.14%	4073	24	0.59%	2.56(1.13-5.79)	0.025
Fatty liver	39185	39	0.10%	12026	27	0.22%	2.66(1.46-4.85)	0.001	17993	4	0.02%	4414	1	0.02%	NA	1.000
Cellulitis	38787	16	0.04%	11820	12	0.10%	3.15(1.3-7.65)	0.011	17805	1	0.01%	4347	0	0.00%	NA	1.000
Rash and dermatitis	39638	8	0.02%	12136	34	0.28%	19.7(6.26-62.02)	<0.001	17918	2	0.01%	4404	6	0.14%	1.72(0.11-27.88)	0.703
Decubitus ulcer	39933	13	0.03%	12148	51	0.42%	87.23(15.4-494.09)	<0.001	18011	5	0.03%	4382	15	0.34%	NA	0.999
Osteoarthritis	35628	90	0.25%	11009	90	0.82%	2.98(2.13-4.17)	<0.001	16444	44	0.27%	4083	15	0.37%	1.31(0.51-3.32)	0.573
Renal failure	36663	95	0.26%	11000	198	1.80%	9.06(6.51-12.62)	<0.001	17298	19	0.11%	4191	32	0.76%	22.01(2.66-182.27)	0.004
Urinary tract infection	37305	48	0.13%	11234	54	0.48%	4.1(2.6-6.48)	<0.001	17129	13	0.08%	4155	14	0.34%	5.82(1.17-28.92)	0.031
Hyperplasia of prostate	37353	61	0.16%	11571	32	0.28%	2.22(1.3-3.79)	0.004	17352	12	0.07%	4291	5	0.12%	NA	1.000
Arrhythmia	38737	31	0.08%	11888	43	0.36%	5.87(3.21-10.71)	<0.001	17639	11	0.06%	4325	9	0.21%	4.8(0.56-41.47)	0.154
Cough	39273	15	0.04%	11991	64	0.53%	15.34(7.47-31.51)	<0.001	17823	3	0.02%	4354	10	0.23%	3.57(0.66-19.33)	0.139
Dyspnea and asphyxia	38329	41	0.11%	11694	92	0.79%	9.63(5.8-15.99)	<0.001	17630	10	0.06%	4318	17	0.39%	7.76(1.59-37.88)	0.011
Nausea and vomiting	37477	46	0.12%	11562	35	0.30%	2.8(1.66-4.74)	<0.001	17061	18	0.11%	4210	8	0.19%	3.47(0.2-59.06)	0.389
Abnormalities of gait and mobility	38394	58	0.15%	11396	91	0.80%	5.71(3.84-8.47)	<0.001	17528	21	0.12%	4171	17	0.41%	5.14(0.9-29.29)	0.065
Urinary abnormality	35623	60	0.17%	10936	62	0.57%	3.67(2.41-5.61)	<0.001	16605	23	0.14%	4060	15	0.37%	1.76(0.6-5.15)	0.302
Disorientation	39542	19	0.05%	11959	34	0.28%	12.32(5.22-29.09)	<0.001	17865	13	0.07%	4338	14	0.32%	6.89(1.12-42.33)	0.037
Other cognitive symptoms	39919	7	0.02%	12183	12	0.10%	18.24(1.89-175.94)	0.012	18014	4	0.02%	4401	3	0.07%	NA	1.000
Emotional state symptoms and signs	39902	10	0.03%	12215	22	0.18%	8.2(2.99-22.47)	<0.001	18016	3	0.02%	4400	10	0.23%	NA	0.998
General symptoms and signs	34671	88	0.25%	10544	137	1.30%	6.13(4.32-8.71)	<0.001	15985	36	0.23%	3889	26	0.67%	1.49(0.46-4.77)	0.506
Abnormal examing results	37204	72	0.19%	11393	85	0.75%	4.58(3.12-6.74)	<0.001	17155	22	0.13%	4223	24	0.57%	4.43(1.03-18.99)	0.045

Note: Analyses were adjusted for ethnicity, smoking status, and CCI. COVID-19: corona virus disease 2019; BMI: body mass index; CCI: Charlson Comorbidity index; COPD: chronic obstructive pulmonary disease; HR: hazards ratio; CI: confidence interval. Bold indicates p values less than 0.05.

Supplementary Table 11: The adjusted risk of clinical comorbidity in COVID-19-positive participants compared with matched COVID-19-negative participants stratified by smoking status.

Comorbidity	Current/ex-smoker								Never-smoker							
	COVID-19-negative			COVID-19-positive			HR (95% CI)	P value	COVID-19-negative			COVID-19-positive			HR (95% CI)	P value
	No. negative participants	No. case	Incidence	No. positive participants	No. case	Incidence			No. negative participants	No. case	Incidence	No. positive participants	No. case	Incidence		
Gastroenteritis and colitis	25409	26	0.10%	7403	58	0.78%	8.07(3.94-16.57)	<0.001	29609	26	0.09%	8459	45	0.53%	5.14(2.56-10.33)	<0.001
Septicaemia	26022	16	0.06%	7494	44	0.59%	36.47(8.34-159.4)	<0.001	30336	13	0.04%	8589	21	0.24%	11.67(3.04-44.75)	<0.001
Infectious diseases	25374	25	0.10%	7267	50	0.69%	7.22(3.65-14.3)	<0.001	29652	12	0.04%	8401	30	0.36%	NA	0.998
Blood cell disease	24068	55	0.23%	6993	40	0.57%	2.01(1.09-3.71)	0.025	28118	37	0.13%	8098	37	0.46%	3.05(1.57-5.94)	0.001
Diabetes mellitus	23779	32	0.13%	6810	38	0.56%	1.84(0.9-3.75)	0.095	28532	34	0.12%	8002	37	0.46%	4.49(1.83-11.06)	0.001
Hypoglycaemia	26640	12	0.05%	7733	17	0.22%	14.49(1.5-139.87)	0.021	30785	4	0.01%	8754	19	0.22%	NA	0.997
Vitamin deficiency	26210	15	0.06%	7591	23	0.30%	8.71(2.95-25.67)	<0.001	30367	18	0.06%	8609	32	0.37%	7.2(3.02-17.17)	<0.001
Obesity	23868	59	0.25%	6922	46	0.66%	2.63(1.29-5.35)	0.008	28209	61	0.22%	8034	44	0.55%	1.79(0.91-3.55)	0.093
Hypercholesterolaemia	21651	60	0.28%	6280	47	0.75%	3.56(1.89-6.71)	<0.001	26855	56	0.21%	7687	43	0.56%	2.74(1.61-4.65)	<0.001
Electrolyte imbalance	24786	72	0.29%	7018	177	2.52%	12.75(7.89-20.58)	<0.001	29240	64	0.22%	8202	126	1.54%	9.32(5.65-15.36)	<0.001
Dementia	26625	9	0.03%	7600	20	0.26%	11.07(2.45-49.94)	0.002	30810	8	0.03%	8625	15	0.17%	16.56(2.58-106.43)	0.003
Delirium	26458	22	0.08%	7515	89	1.18%	21.98(9.52-50.72)	<0.001	30701	13	0.04%	8578	50	0.58%	15.35(5.21-45.28)	<0.001
Mental disease	21130	64	0.30%	6323	47	0.74%	2.31(1.37-3.9)	0.002	28113	54	0.19%	7993	33	0.41%	3.47(1.73-6.95)	<0.001
Hypertension	16671	113	0.68%	5018	68	1.36%	1.32(0.82-2.12)	0.253	21634	99	0.46%	6328	74	1.17%	2.72(1.63-4.55)	<0.001
Chronic ischaemic heart disease	23914	38	0.16%	7006	23	0.33%	1.62(0.73-3.62)	0.236	29064	31	0.11%	8324	21	0.25%	2.75(1.07-7.08)	0.035
Pulmonary embolism	26372	24	0.09%	7696	72	0.94%	9.86(5.06-19.23)	<0.001	30517	19	0.06%	8695	40	0.46%	14.89(5.48-40.47)	<0.001
Other heart disease	23244	95	0.41%	6717	92	1.37%	4.21(2.71-6.54)	<0.001	27962	65	0.23%	8005	64	0.80%	3.59(2.17-5.93)	<0.001
Cerebrovascular diseases	26518	24	0.09%	7653	17	0.22%	3.71(1.41-9.74)	0.008	30677	14	0.05%	8680	2	0.02%	1.57(0.25-9.97)	0.634
Vascular disease	25911	16	0.06%	7531	13	0.17%	2.55(0.89-7.27)	0.080	30430	6	0.02%	8662	10	0.12%	12.01(1.31-110.45)	0.028
Hypotension	25698	28	0.11%	7377	58	0.79%	14.02(5.91-33.24)	<0.001	29981	29	0.10%	8490	49	0.58%	6.45(3.15-13.17)	<0.001
Lower respiratory infection	24099	48	0.20%	6509	453	6.96%	56.74(30.89-104.25)	<0.001	28944	36	0.12%	7882	398	5.05%	53.63(28.3-101.65)	<0.001
COPD/Emphysema	25810	15	0.06%	7420	58	0.78%	18.05(6.69-48.69)	<0.001	30843	1	0.00%	8770	14	0.16%	NA	0.997
Asthma	23635	25	0.11%	6905	25	0.36%	2.68(1.24-5.78)	0.012	27527	42	0.15%	7829	21	0.27%	1.32(0.64-2.72)	0.450
Other lung disease	25696	32	0.12%	7456	38	0.51%	3.97(1.85-8.49)	<0.001	30103	27	0.09%	8550	34	0.40%	7.88(3.37-18.43)	<0.001
Pleural effusion	25928	29	0.11%	7493	28	0.37%	5.83(2.5-13.62)	<0.001	30238	29	0.10%	8604	21	0.24%	3.1(1.34-7.17)	0.008
Respiratory failure	26579	13	0.05%	7588	175	2.31%	115.63(28.94-462.09)	<0.001	30866	3	0.01%	8667	152	1.75%	244.27(29.59-2016.41)	<0.001
Gastro-oesophageal reflux disease	23666	49	0.21%	6997	36	0.51%	3.38(1.78-6.41)	<0.001	27974	55	0.20%	8124	29	0.36%	1.51(0.84-2.71)	0.169
Diverticular disease of intestine	25528	39	0.15%	7468	19	0.25%	2.09(0.97-4.49)	0.058	29921	24	0.08%	8538	19	0.22%	3.19(1.32-7.73)	0.010
Fecal abnormalities	24280	50	0.21%	6969	65	0.93%	5.93(3.25-10.83)	<0.001	28455	42	0.15%	8090	39	0.48%	2.88(1.65-5.03)	<0.001
Rash and dermatitis	26513	6	0.02%	7720	22	0.28%	24.88(3.67-168.8)	0.001	30640	4	0.01%	8714	18	0.21%	11.67(2.61-52.17)	0.001
Decubitus ulcer	26684	13	0.05%	7692	43	0.56%	59.81(6.58-543.51)	<0.001	30852	5	0.02%	8732	23	0.26%	NA	0.997
Gout	26252	16	0.06%	7631	12	0.16%	5.82(1.49-22.67)	0.011	30550	17	0.06%	8704	7	0.08%	2.21(0.62-7.85)	0.220
Osteoarthritis	23698	66	0.28%	6924	56	0.81%	3.47(2.08-5.78)	<0.001	28025	68	0.24%	8077	48	0.59%	2.18(1.3-3.64)	0.003
Renal failure	24545	55	0.22%	6924	139	2.01%	12.03(7.06-20.48)	<0.001	29056	58	0.20%	8174	85	1.04%	6.44(3.83-10.84)	<0.001
Urinary tract infection	24931	37	0.15%	7096	39	0.55%	3.47(1.91-6.31)	<0.001	29149	24	0.08%	8199	28	0.34%	9.1(3.15-26.33)	<0.001
Hyperplasia of prostate	24878	39	0.16%	7313	22	0.30%	2.38(1.21-4.71)	0.012	29456	33	0.11%	8448	14	0.17%	2.13(0.87-5.24)	0.100
Arrhythmia	25892	20	0.08%	7531	27	0.36%	7.89(3.02-20.62)	<0.001	30093	21	0.07%	8581	24	0.28%	4.36(1.86-10.2)	<0.001
Cough	26256	9	0.03%	7601	39	0.51%	NA	0.993	30443	9	0.03%	8643	33	0.38%	12.87(3.9-42.47)	<0.001
Dyspnea and asphyxia	25687	33	0.13%	7397	60	0.81%	13.34(5.64-31.55)	<0.001	29889	17	0.06%	8515	47	0.55%	11.03(4.37-27.83)	<0.001
Abnormalities of gait and mobility	25603	45	0.18%	7145	58	0.81%	5.37(2.97-9.72)	<0.001	29945	34	0.11%	8332	50	0.60%	6.46(3.13-13.31)	<0.001
Urinary abnormality	23741	40	0.17%	6887	39	0.57%	2.89(1.59-5.24)	<0.001	28137	43	0.15%	8016	38	0.47%	3.66(2.03-6.58)	<0.001
Disorientation	26415	22	0.08%	7577	25	0.33%	3.29(1.47-7.36)	0.004	30594	10	0.03%	8624	22	0.26%	5.74(1.86-17.68)	0.002
Other cognitive symptoms	26704	5	0.02%	7732	11	0.14%	5(1.03-24.17)	0.045	30826	6	0.02%	8744	4	0.05%	NA	0.999
Emotional state symptoms and signs	26670	6	0.02%	7756	18	0.23%	41.61(2.98-582)	0.006	30841	7	0.02%	8755	13	0.15%	18.61(1.71-202.15)	0.016
General symptoms and signs	23167	68	0.29%	6659	87	1.31%	4.71(2.93-7.57)	<0.001	27156	54	0.20%	7692	74	0.96%	5.16(2.96-8.99)	<0.001
Abnormal examing results	24784	60	0.24%	7171	54	0.75%	3.19(1.92-5.32)	<0.001	29190	34	0.12%	8347	54	0.65%	6.72(3.49-12.95)	<0.001

Note: Analyses were adjusted for ethnicity, BMI and CCI. COVID-19: corona virus disease 2019; BMI: body mass index; CCI: Charlson Comorbidity index; COPD: chronic obstructive pulmonary disease; HR: hazards ratio; CI: confidence interval. Bold indicates p values less than 0.05.

Supplementary Table 12: The adjusted risk of clinical comorbidity in COVID-19-positive participants compared with matched COVID-19-negative participants stratified by CCI score.

Comorbidity	CCI high								CCI low							
	COVID-19-negative			COVID-19-positive			HR (95% CI)	P value	COVID-19-negative			COVID-19-positive			HR (95% CI)	P value
	No. negative participants	No. case	Incidence	No. positive participants	No. case	Incidence			No. negative participants	No. case	Incidence	No. positive participants	No. case	Incidence		
Gastroenteritis and colitis	24329	36	0.15%	6440	73	1.13%	7.89(4.26-14.61)	<0.001	31076	16	0.05%	9523	32	0.34%	4.92(2.05-11.81)	<0.001
Septicaemia	25099	23	0.09%	6510	47	0.72%	25.45(7.77-83.32)	<0.001	31645	6	0.02%	9677	19	0.20%	22.26(2.84-174.35)	0.003
Infectious diseases	24196	31	0.13%	6232	61	0.98%	10.96(5.38-22.3)	<0.001	31204	6	0.02%	9535	21	0.22%	7.25(1.66-31.58)	0.008
Blood cell disease	22106	68	0.31%	5834	56	0.96%	3.1(1.89-5.1)	<0.001	30434	24	0.08%	9350	22	0.24%	5.55(2.25-13.72)	<0.001
Diabetes mellitus	20835	34	0.16%	5183	25	0.48%	2.25(0.79-6.43)	0.131	31808	32	0.10%	9714	51	0.53%	5.36(2.51-11.45)	<0.001
Hypoglycaemia	26049	14	0.05%	6886	35	0.51%	12.04(4.3-33.69)	<0.001	31773	2	0.01%	9709	1	0.01%	NA	1.000
Vitamin deficiency	25464	20	0.08%	6663	41	0.62%	8.85(3.89-20.17)	<0.001	31513	13	0.04%	9639	14	0.15%	5.17(1.51-17.72)	0.009
Obesity	22130	60	0.27%	5771	45	0.78%	2.49(1.17-5.32)	0.018	30307	60	0.20%	9279	46	0.50%	0.78(0.4-1.53)	0.473
Hypercholesterolaemia	19147	57	0.30%	4923	37	0.75%	3.07(1.58-5.98)	<0.001	29676	62	0.21%	9126	55	0.60%	3.02(1.86-4.92)	<0.001
Electrolyte imbalance	23199	98	0.42%	5768	214	3.71%	9.75(6.74-14.11)	<0.001	31194	39	0.13%	9546	92	0.96%	7.43(4.35-12.7)	<0.001
Dementia	26074	11	0.04%	6651	27	0.41%	16.71(3.83-73.01)	<0.001	31762	7	0.02%	9675	8	0.08%	22.8(1.06-491.66)	0.046
Delirium	25840	26	0.10%	6535	105	1.61%	16.94(8.48-33.84)	<0.001	31721	9	0.03%	9662	37	0.38%	26.11(5.66-120.36)	<0.001
Mental disease	20361	56	0.28%	5414	47	0.87%	3.36(1.72-6.57)	<0.001	29205	62	0.21%	8987	34	0.38%	2.05(1.18-3.57)	0.011
Sleep apnoea	25134	7	0.03%	6734	13	0.19%	10.15(0.99-104.08)	0.051	31384	11	0.04%	9602	4	0.04%	NA	0.998
Hearing loss	25385	21	0.08%	6749	15	0.22%	3.97(1.46-10.81)	0.007	31426	13	0.04%	9636	2	0.02%	0.24(0.03-2.11)	0.197
Hypertension	12327	79	0.64%	3145	51	1.62%	2.98(1.37-6.5)	0.006	26196	139	0.53%	8259	91	1.10%	2.31(1.58-3.38)	<0.001
Chronic ischaemic heart disease	21932	50	0.23%	5797	32	0.55%	3.13(1.52-6.46)	0.002	31395	19	0.06%	9624	12	0.12%	1.63(0.63-4.2)	0.311
Pulmonary embolism	25734	27	0.10%	6834	67	0.98%	15.09(6.65-34.23)	<0.001	31555	16	0.05%	9662	45	0.47%	11.84(4.35-32.23)	<0.001
Other heart disease	20935	92	0.44%	5345	91	1.70%	5.6(3.29-9.54)	<0.001	30616	70	0.23%	9458	65	0.69%	4.05(2.44-6.74)	<0.001
Cerebrovascular diseases	25787	20	0.08%	6720	15	0.22%	18.06(1.87-174.11)	0.012	31808	19	0.06%	9714	4	0.04%	0.42(0.08-2.21)	0.306
Vascular disease	25117	19	0.08%	6645	16	0.24%	5.96(1.97-18.08)	0.002	31617	3	0.01%	9655	8	0.08%	NA	0.998
Hypotension	24620	39	0.16%	6357	81	1.27%	9.94(5.38-18.38)	<0.001	31449	18	0.06%	9612	26	0.27%	6.05(2.16-16.96)	<0.001
Lower respiratory infection	22404	62	0.28%	5157	501	9.71%	41.85(25.53-68.6)	<0.001	30996	26	0.08%	9307	356	3.83%	47.17(25.78-86.3)	<0.001
COPD/Emphysema	25240	12	0.05%	6573	60	0.91%	40.12(8.08-199.06)	<0.001	31808	5	0.02%	9714	12	0.12%	NA	0.998
Asthma	19703	21	0.11%	5107	16	0.31%	3.42(1.19-9.77)	0.022	31808	46	0.14%	9714	30	0.31%	1.71(0.96-3.04)	0.070
Other lung disease	24585	42	0.17%	6447	50	0.78%	6.08(3.18-11.63)	<0.001	31607	18	0.06%	9658	23	0.24%	7.38(2.62-20.8)	<0.001
Pleural effusion	24993	43	0.17%	6552	33	0.50%	3.9(1.98-7.67)	<0.001	31567	18	0.06%	9642	17	0.18%	9.09(2.58-31.95)	<0.001
Respiratory failure	26075	12	0.05%	6704	204	3.04%	146.96(31.86-677.84)	<0.001	31777	5	0.02%	9654	127	1.32%	143.95(17.63-1175.14)	<0.001
Gastro-oesophageal reflux disease	22069	55	0.25%	5966	39	0.65%	4.83(2.42-9.66)	<0.001	29927	50	0.17%	9244	26	0.28%	1.46(0.81-2.63)	0.208
Diverticular disease of intestine	24660	40	0.16%	6542	28	0.43%	3.33(1.74-6.35)	<0.001	31177	23	0.07%	9568	10	0.10%	4.62(1.15-18.64)	0.031
Fecal abnormalities	22845	60	0.26%	5834	70	1.20%	5.42(3.22-9.12)	<0.001	30253	33	0.11%	9314	34	0.37%	2.75(1.51-5.03)	0.001
Fatty liver	25585	25	0.10%	6794	17	0.25%	4.34(0.98-19.2)	0.053	31593	18	0.06%	9646	11	0.11%	1.01(0.37-2.76)	0.984
Cellulitis	25211	11	0.04%	6582	7	0.11%	1.22(0.31-4.88)	0.778	31381	6	0.02%	9585	5	0.05%	2.01(0.38-10.54)	0.409
Rash and dermatitis	25899	8	0.03%	6867	28	0.41%	25.01(5.12-122.17)	<0.001	31657	2	0.01%	9673	12	0.12%	NA	0.996
Decubitus ulcer	26168	18	0.07%	6836	51	0.75%	34.44(9.61-123.41)	<0.001	31776	0	0.00%	9694	15	0.15%	NA	0.999
Gout	25607	21	0.08%	6790	13	0.19%	2.86(0.97-8.43)	0.057	31599	12	0.04%	9649	6	0.06%	1.63(0.28-9.31)	0.584
Osteoarthritis	21836	71	0.33%	5734	73	1.27%	4.92(2.97-8.15)	<0.001	30236	63	0.21%	9358	32	0.34%	1.45(0.83-2.53)	0.191
Renal failure	22460	77	0.34%	5576	146	2.62%	9.48(5.78-15.55)	<0.001	31501	37	0.12%	9615	84	0.87%	7.89(4.38-14.2)	<0.001
Urinary tract infection	23587	43	0.18%	5947	50	0.84%	5.73(3.11-10.54)	<0.001	30847	18	0.06%	9442	18	0.19%	1.9(0.72-5)	0.194
Hyperplasia of prostate	23953	45	0.19%	6394	19	0.30%	1.53(0.74-3.2)	0.253	30752	28	0.09%	9468	18	0.19%	1.56(0.61-4)	0.352
Arrhythmia	24997	30	0.12%	6606	27	0.41%	7.52(2.77-20.39)	<0.001	31379	12	0.04%	9607	25	0.26%	17.66(3.95-79)	<0.001
Cough	25543	14	0.05%	6720	38	0.57%	11.19(4.16-30.11)	<0.001	31553	4	0.01%	9625	36	0.37%	NA	0.996
Dyspnea and asphyxia	24647	40	0.16%	6437	63	0.98%	6.17(3.43-11.08)	<0.001	31312	11	0.04%	9575	46	0.48%	327.23(8.85-12101.73)	0.002
Nausea and vomiting	23781	36	0.15%	6325	29	0.46%	5.07(2.07-12.41)	<0.001	30757	28	0.09%	9447	14	0.15%	1.28(0.55-2.96)	0.571
Abnormalities of gait and mobility	24469	50	0.20%	5969	74	1.24%	7.63(4.24-13.71)	<0.001	31453	29	0.09%	9598	34	0.35%	3.58(1.82-7.06)	<0.001
Urinary abnormality	22333	46	0.21%	5765	56	0.97%	7.23(3.83-13.62)	<0.001	29895	37	0.12%	9231	21	0.23%	2.01(0.97-4.18)	0.062
Disorientation	25734	18	0.07%	6634	37	0.56%	17.84(5.84-54.45)	<0.001	31673	14	0.04%	9663	11	0.11%	3.11(1.03-9.39)	0.044
Other cognitive symptoms	26183	10	0.04%	6882	14	0.20%	6.75(1.76-25.91)	0.005	31750	1	0.00%	9702	1	0.01%	NA	1.000
Emotional state symptoms and signs	26176	12	0.05%	6922	25	0.36%	18.02(3.27-99.23)	<0.001	31742	1	0.00%	9693	7	0.07%	NA	0.999
General symptoms and signs	21009	76	0.36%	5315	94	1.77%	6.59(3.94-11.02)	<0.001	29647	48	0.16%	9118	69	0.76%	5.43(3.13-9.42)	<0.001
Abnormal examing results	23421	53	0.23%	6124	66	1.08%	7.2(3.89-13.31)	<0.001	30938	41	0.13%	9492	43	0.45%	2.55(1.46-4.44)	<0.001

Note: Analyses were adjusted for ethnicity, BMI, and smoking status. COVID-19: corona virus disease 2019; CCI: Charlson Comorbidity index; BMI: body mass index; COPD: chronic obstructive pulmonary disease; HR: hazards ratio; CI: confidence interval.

Bold indicates p values less than 0.05.

Supplementary Table 13: The outcome-wide association analyses evaluating the hazards ratio (HR) for sequelae (defined by three-digit ICD-10 codes) of COVID-19-positive participants compared to matched COVID-19-negative participants.

ICD-10 code	COVID-19-negative		COVID-19-positive		HR(95%CI)	P value	ICD-10 disease	Category
	No. negative participants	No. case	No. positive participants	No. case				
A419	56822	141	15404	48	1.55(1.1-2.18)	0.012	Septicaemia, unspecified	Septicaemia
B956	57490	25	15637	12	2.13(1.03-4.42)	0.041	Staphylococcus aureus as the cause of diseases classified to other chapters	Infectious diseases
B968	56984	29	15448	15	2.01(1.06-3.81)	0.032	Other specified bacterial agents as the cause of diseases classified to other chapters	
F050	58064	23	15707	12	2.42(1.17-5)	0.017	Delirium not superimposed on dementia, so described	Delirium
F051	58060	37	15677	17	2.05(1.14-3.69)	0.017	Delirium superimposed on dementia	
J128	58129	12	14475	14	6.45(2.69-15.43)	<0.001	Other viral pneumonia	Lower respiratory infection
J189	56772	107	15329	46	1.9(1.33-2.73)	<0.001	Pneumonia, unspecified	
J841	57846	30	15704	19	2.6(1.43-4.71)	0.002	Other interstitial pulmonary diseases with fibrosis	Interstitial pulmonary diseases
J9691	57987	28	15722	14	2.04(1.06-3.91)	0.032	Respiratory failure unspecified; Type II [hypercapnic]	Respiratory failure
L891	57958	64	15671	26	2.02(1.25-3.26)	0.004	Stage II decubitus ulcer	Decubitus ulcer
R15	57511	48	15557	20	2.37(1.35-4.16)	0.003	Faecal incontinence	Fecal abnormalities
R263	58001	22	15706	15	4.17(1.98-8.8)	<0.001	Immobility	Immobility
R32	57190	94	15397	33	1.88(1.23-2.87)	0.003	Unspecified urinary incontinence	Urinary abnormality
R458	57897	25	15709	12	2.27(1.1-4.68)	0.027	Other symptoms and signs involving emotional state	Emotional state symptoms and signs

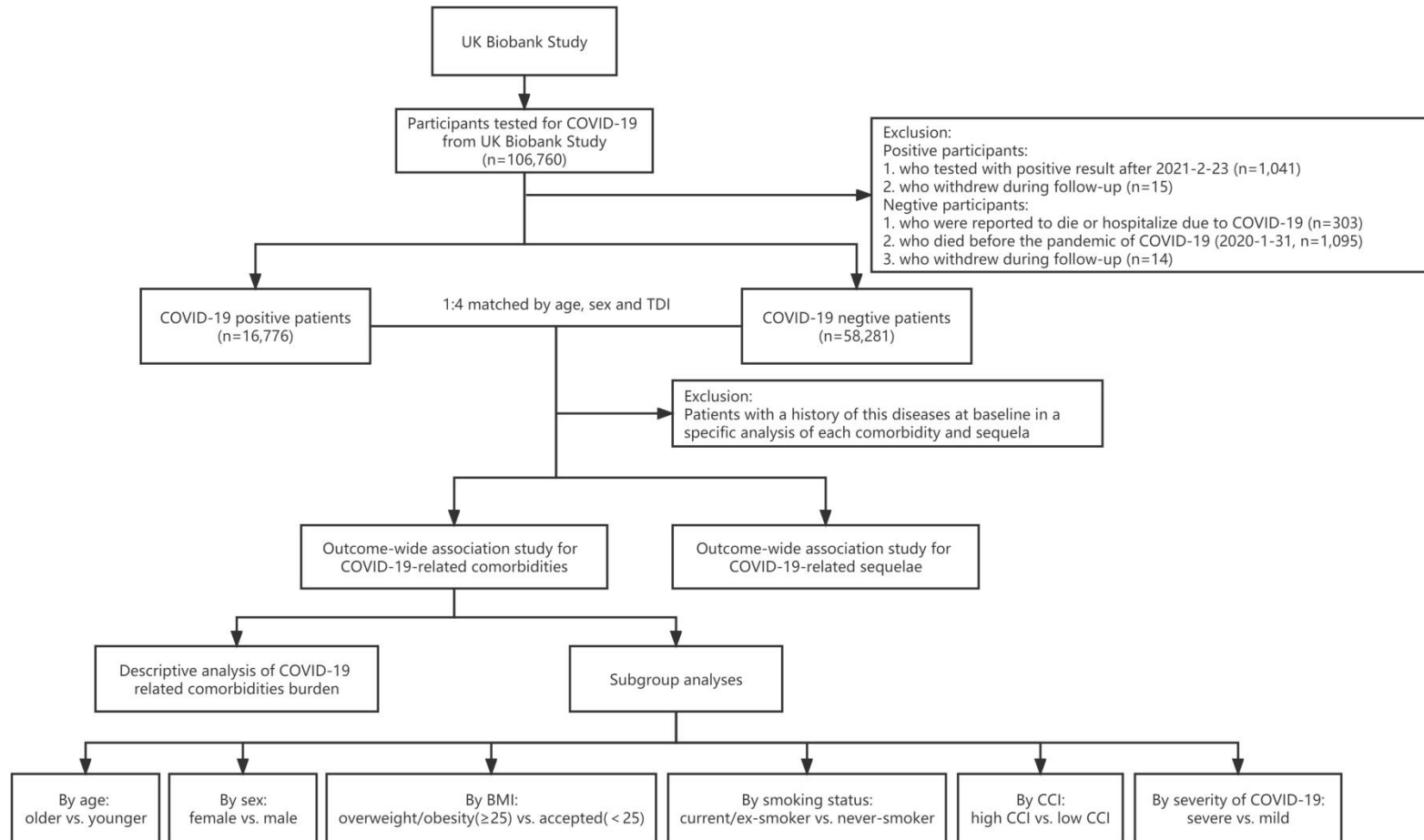
ICD-10: international classification of disease 10th revision; COVID-19, corona virus disease 2019; CI: confidence interval. Bold indicates p values less than 0.05.

Supplementary Table 14: Adjusted hazards ratios (HRs) of sequelae of COVID-19-positive participants compared with matched COVID-19-negative participants.

Sequelae category	Sequelae	COVID-19-negative			COVID-19-positive			HR(95% CI)	P value
		No. negative participants	No. case	Incidence	No. positive participants	No. case	Incidence		
Respiratory system	Lower respiratory infection	58112	14	0.02%	14461	15	0.10%	8.33(2.76-25.08)	< 0.001
	Interstitial pulmonary disease	57846	30	0.05%	15704	19	0.12%	2.4(1.16-4.95)	0.018
Skin	Decubitus ulcer	57958	64	0.11%	15671	26	0.17%	1.96(1.11-3.46)	0.020
Symptoms	Fecal abnormalities	57511	48	0.08%	15557	20	0.13%	2.24(1.21-4.17)	0.011
	Immobility	58001	22	0.04%	15706	15	0.10%	4.82(1.86-12.51)	0.001
	Urinary incontinence	57190	94	0.16%	15397	33	0.21%	1.81(1.15-2.85)	0.010

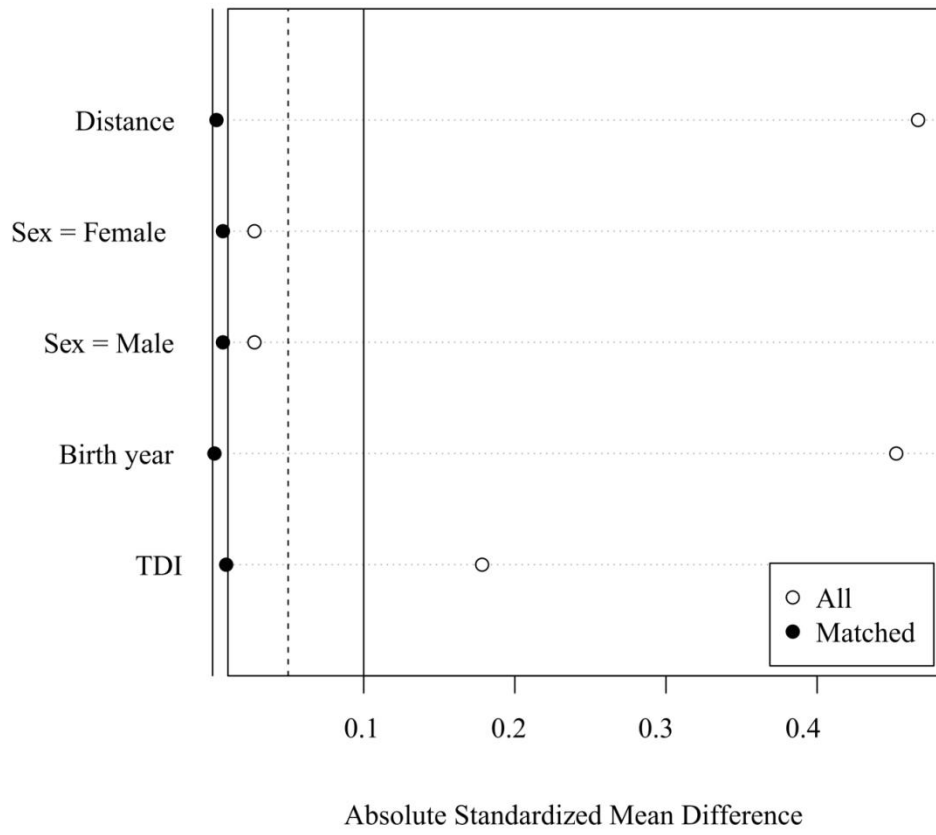
Note: Analyses were adjusted for ethnicity, BMI, smoking status, and CCI score. COVID-19: corona virus disease 2019; BMI: body mass index; CCI: Charlson Comorbidity index; CI: confidence interval; COPD: chronic obstructive pulmonary disease. Bold indicates p values less than 0.05.

Supplementary Figure 1: Flowchart of the study design.

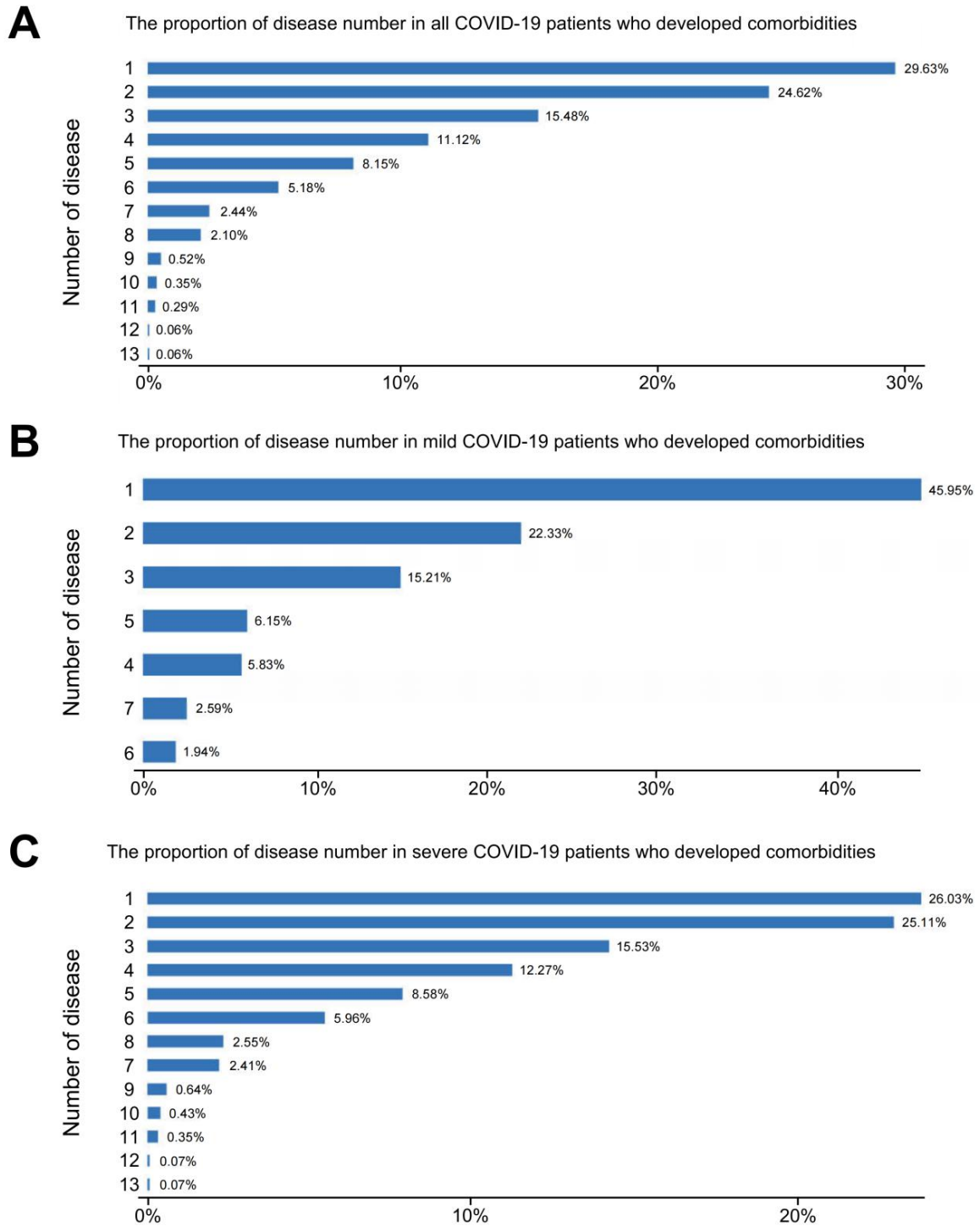


COVID-19: corona virus disease 2019; BMI: body mass index; CCI: Charlson Comorbidity index.

Supplementary Figure 2: The absolute standardized mean difference in all patients and matched patients.

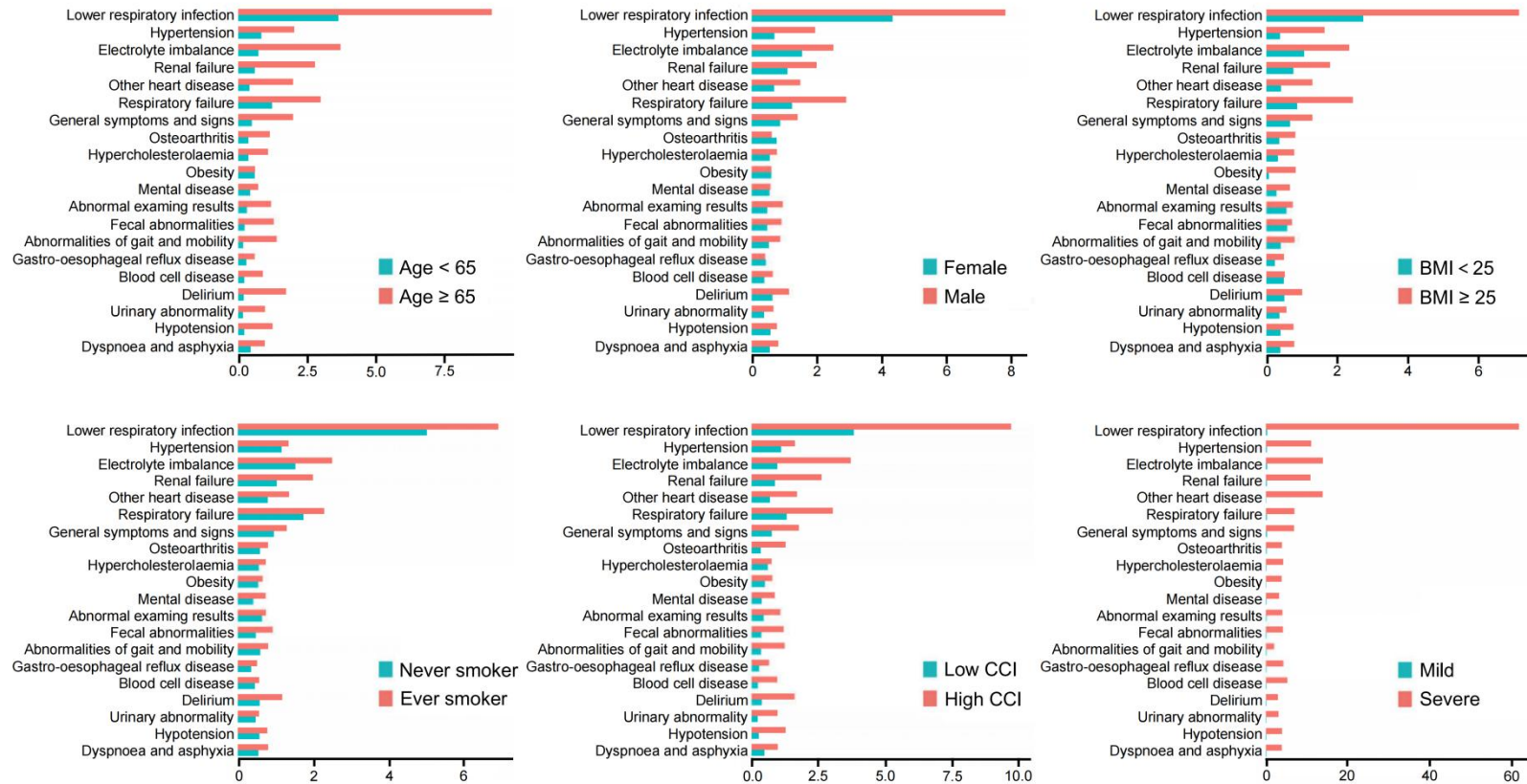


Supplementary Figure 3: The distribution of (A) all, (B) mild (non-hospitalized), and (C) severe (hospitalized) COVID-19 patients with different numbers of comorbidities, respectively.



COVID-19: corona virus disease 2019.

Supplementary Figure 4: The proportion of COVID-19-positive participants with different comorbidities, stratified by age, sex, BMI, smoking status, CCI and severity, respectively.



Note: Only the top 20 comorbidities in terms of incidence were shown. COVID-19: corona virus disease 2019; BMI: body mass index; CCI: Charlson Comorbidity index.