



Occupation and risk of severe COVID-19: prospective cohort study of 120 075 UK Biobank participants

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Supplementary Material

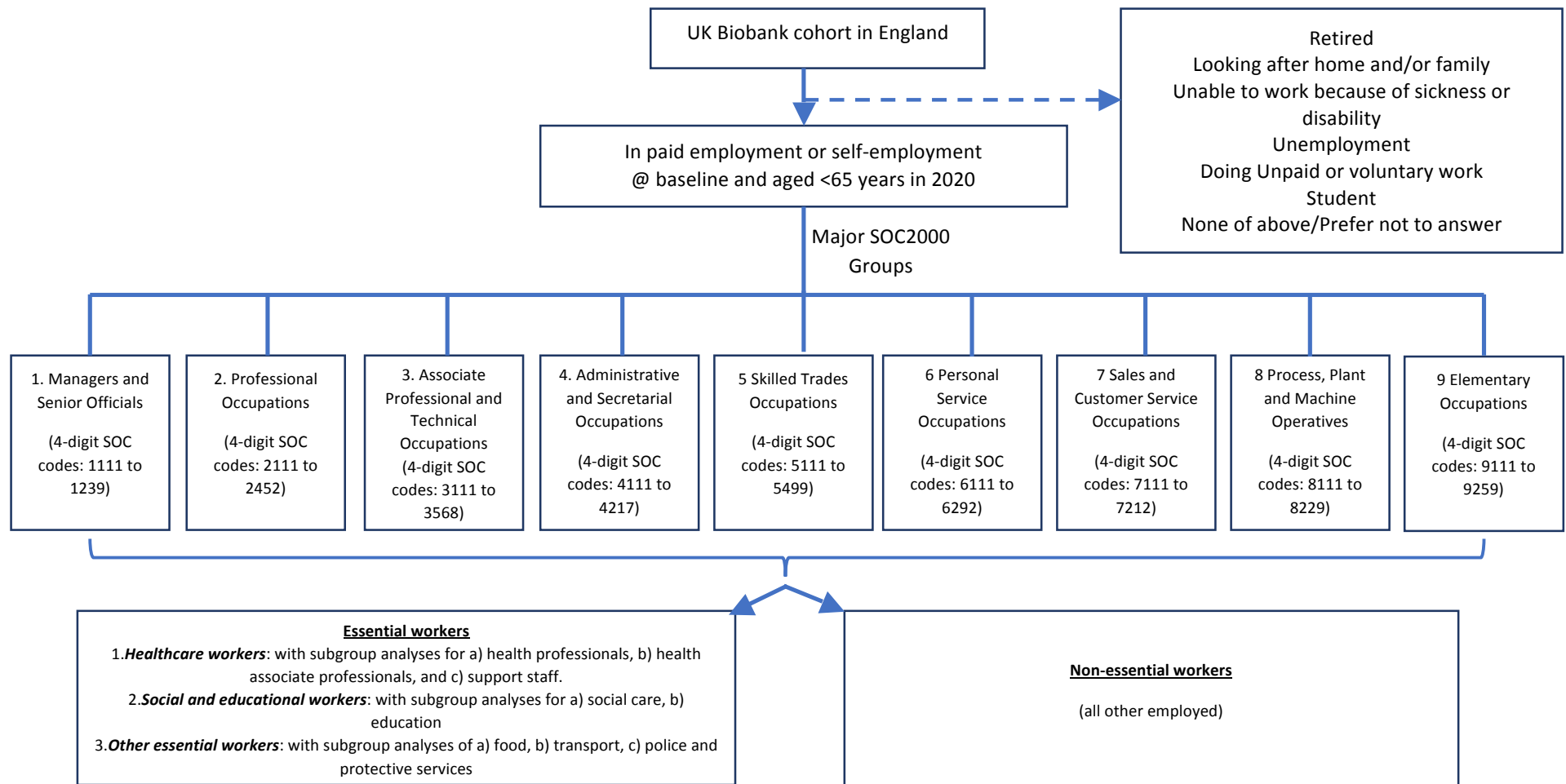
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Figure S1: Occupational groupings by (a) SOC2000 codes and (b) essential worker groups



Essential workers

1. **Healthcare workers:** with subgroups for a) health professionals, b) health associate professionals, and c) support staff.
2. **Social and educational workers:** with subgroups for a) social care, b) education
3. **Other essential workers:** with subgroups for a) food, b) transport workers, c) police and protective services

Healthcare workers

a) Health professionals

2211 Medical practitioners
2212 Psychologists
2213 Pharmacists/pharmacologists

b) Health associate professionals

321 Health Associate Professionals
3211 Nurses
3212 Midwives
3213 Paramedics
3214 Medical radiographers
3215 Chiropodists
3216 Dispensing opticians
3217 Pharmaceutical dispensers
3218 Medical and dental technicians
1181 Hospital and health service managers
1182 Pharmacy managers
1183 Healthcare practice managers
322 Therapists
3221 Physiotherapists
3222 Occupational therapists
3223 Speech and language therapists
3229 Therapists n.e.c.

c) support staff

4211 Medical secretaries
6111 Nursing auxiliaries and assistants
6112 Ambulance staff (excluding paramedics)
9221 Hospital porters

Social and educational workers

a) Social care

1184 Social services managers
1185 Residential and day care managers
2442 Social workers
2444 Clergy
323 Social Welfare Associate Professionals
3231 Youth and community workers
3232 Housing and welfare officers
6114 Houseparents and residential wardens
6115 Care assistants and home carers
6232 Caretakers
6291 Undertakers and mortuary assistants
9229 Elementary personal services occupations n.e.c.

a) Education

231 Teaching Professionals
2314 Secondary education teaching professionals
2315 Primary and nursery education teaching professionals
2316 Special needs education teaching professionals
6121 Nursery nurses
6124 Educational assistants

Other essential workers

a) Food

1234 Shopkeepers and wholesale/retail dealers
543 Food Preparation Trades
5431 Butchers, meat cutters
5432 Bakers, flour confectioners
5433 Fishmongers, poultry dressers
7111 Sales and retail assistants
7112 Retail cashiers and check-out operators
925 Elementary Sales Occupations
9251 Shelf fillers
9259 Elementary sales occupations n.e.c.
116 Managers In Distribution, Storage And Retailing
1162 Storage and warehouse managers
1163 Retail and wholesale managers
8111 Food, drink and tobacco process operatives
1211 Farm managers
1219 Managers in animal husbandry, forestry and fishing n.e.c.
5111 Farmers
5112 Horticultural trades
5119 Agricultural and fishing trades n.e.c.
9111 Farm workers
9119 Fishing and agriculture related occupations n.e.c.

b) Transport workers

1161 Transport and distribution managers
3514 Train drivers
6215 Rail travel assistants
8211 Heavy goods vehicle drivers
8212 Van drivers
8213 Bus and coach drivers
8214 Taxi, cab drivers and chauffeurs
8216 Rail transport operatives
9211 Postal workers, mail sorters,

c) Police & Protective Services (including sanitary workers)

1172 Police officers (inspectors and above)
1173 Senior officers in fire, ambulance, prison and related services
1174 Security managers
331 Protective Service Occupations
3311 NCOs and other ranks
3312 Police officers (sergeant and below)
3313 Fire service officers (leading fire officer and below)
3314 Prison service officers (below principal officer)
3319 Protective service associate professionals n.e.c.
2443 Probation officers
9231 Window cleaners
9232 Road sweepers
9233 Cleaners, domestics
9235 Refuse and salvage occupations
9239 Elementary cleaning occupations n.e.c.

Table S1: Occupation agreement between baseline and follow-up (first imaging visit only) by broad essential worker groups

	Follow-up				
Baseline	Non-essential workers	Healthcare workers	Social and education workers	Other essential workers	Total
Non-essential workers (N)	7,913	160	235	258	8,566
(%)	92.38	1.87	2.74	3.01	100
Healthcare workers (N)	136	1,295	42	11	1,484
(%)	9.16	87.26	2.83	0.74	100
Social and education workers (N)	225	55	1,120	23	1,423
(%)	15.81	3.87	78.71	1.62	100
Other essential workers (N)	229	15	29	546	819
(%)	27.96	1.83	3.54	66.67	100
Total (N)	8,503	1,525	1,426	838	12,292
(%)	69.18	12.41	11.6	6.82	100

Table S2: Occupation agreement between baseline and follow-up (first imaging visit only) by narrow essential worker groups

	Follow-up									
Baseline	Non-essential workers	Healthcare professionals	Medical support staff	Health associate professionals	Social care workers	Education workers	Food workers	Transport workers	Police and protective service workers	Total
Non-essential workers (N)	7,913	17	38	105	122	113	126	70	62	8,566
(%)	92.38	0.2	0.44	1.23	1.42	1.32	1.47	0.82	0.72	100
Healthcare professionals (N)	23	282	0	9	3	0	2	0	0	319
(%)	7.21	88.4	0	2.82	0.94	0	0.63	0	0	100
Medical support staff (N)	21	1	65	11	3	1	2	1	0	105
(%)	20	0.95	61.9	10.48	2.86	0.95	1.9	0.95	0	100
Health associate professionals (N)	92	25	18	884	25	10	5	0	1	1,060
(%)	8.68	2.36	1.7	83.4	2.36	0.94	0.47	0	0.09	100
Social care workers (N)	125	1	13	23	249	14	2	4	4	435
(%)	28.74	0.23	2.99	5.29	57.24	3.22	0.46	0.92	0.92	100
Education workers (N)	100	2	0	16	18	839	6	2	5	988
(%)	10.12	0.2	0	1.62	1.82	84.92	0.61	0.2	0.51	100
Food workers (N)	124	0	1	5	9	2	167	5	0	313
(%)	39.62	0	0.32	1.6	2.88	0.64	53.35	1.6	0	100
Transport workers (N)	43	0	3	1	2	1	4	145	2	201
(%)	21.39	0	1.49	0.5	1	0.5	1.99	72.14	1	100
Police and protective service workers (N)	62	0	2	3	13	2	7	4	212	305
(%)	20.33	0	0.66	0.98	4.26	0.66	2.3	1.31	69.51	100
Total (N)	8,503	328	140	1,057	444	982	321	231	286	12,292
(%)	69.18	2.67	1	8.6	3.61	7.99	3	1.88	2.33	100

Table S3: Occupation agreement between baseline and follow-up (first imaging visit only) by SOC major occupational groups

	Follow-up									
Baseline	Managers and Senior Officials	Professional Occupations	Associate Professional and Technical Occupations	Administrative and Secretarial Occupations	Skilled Trades Occupations	Personal Service Occupations	Sales and Customer Service Occupations	Process, Plant and Machine Operatives	Elementary Occupations	Total
Managers and Senior Officials (N)	1,515	276	310	204	71	46	35	33	45	2,535
(%)	59.76	10.89	12.23	8.05	2.8	1.81	1.38	1.3	1.78	100
Professional Occupations (N)	248	2,626	239	175	52	40	15	39	17	3,451
(%)	7.19	76.09	6.93	5.07	1.51	1.16	0.43	1.13	0.49	100
Associate Professional and Technical Occupations (N)	253	229	1,766	194	44	75	37	27	28	2,653
(%)	9.54	8.63	66.57	7.31	1.66	2.83	1.39	1.02	1.06	100
Administrative and Secretarial Occupations (N)	148	91	175	1,077	16	32	51	17	36	1,643
(%)	9.01	5.54	10.65	65.55	0.97	1.95	3.1	1.03	2.19	100
Skilled Trades Occupations (N)	41	58	42	4	381	9	7	30	30	602
(%)	6.81	9.63	6.98	0.66	63.29	1.5	1.16	4.98	4.98	100
Personal Service Occupations (N)	26	63	52	29	2	377	11	8	17	585
(%)	4.44	10.77	8.89	4.96	0.34	64.44	1.88	1.37	2.91	100
Sales and Customer Service Occupations (N)	27	9	23	35	5	16	115	3	18	251
(%)	10.76	3.59	9.16	13.94	1.99	6.37	45.82	1.2	7.17	100
Process, Plant and Machine Operatives (N)	15	23	15	12	23	4	6	189	23	310

(%)	4.84	7.42	4.84	3.87	7.42	1.29	1.94	60.97	7.42	100
Elementary Occupations (N)	17	4	18	15	25	16	11	20	136	262
(%)	6.49	1.53	6.87	5.73	9.54	6.11	4.2	7.63	51.91	100
Total (N)	2,290	3,379	2,640	1,745	619	615	288	366	350	12,292
(%)	18.63	27.49	21.48	14.2	5.04	5	2.34	2.98	2.85	100

Table S4: Cohort characteristics by broad essential worker groups

	Occupation (broad groups of essential workers)									
	Non-essential workers	Non-essential workers	Healthcare workers	Healthcare workers	Social and education workers	Social and education workers	Other essential workers	Other essential workers	Total	Total
	N	%	N	%	N	%	N	%	N	%
Age group (current)										
Under 55	18,510	73.1	2,049	8.1	2,454	9.7	2,302	9.1	25,315	100
55-59	31,806	71.1	4,016	9.0	4,728	10.6	4,184	9.4	44,734	100
60+	34,632	69.2	4,683	9.4	6,294	12.6	4,417	8.8	50,026	100
Sex										
Female	41,199	63.3	8,908	13.7	10,736	16.5	4,220	6.5	65,063	100
Male	43,749	79.5	1,840	3.3	2,740	5.0	6,683	12.1	55,012	100
UK Biobank assessment centre										
Manchester	2,578	70.8	369	10.1	398	10.9	296	8.1	3,641	100
Oxford	2,572	74.2	326	9.4	336	9.7	234	6.7	3,468	100
Stoke	3,363	69.1	383	7.9	563	11.6	561	11.5	4,870	100
Reading	6,238	77.4	580	7.2	714	8.9	529	6.6	8,061	100
Bury	4,506	68.6	588	9.0	794	12.1	676	10.3	6,564	100
Newcastle	6,470	67.7	971	10.2	1,178	12.3	942	9.9	9,561	100
Leeds	8,534	69.8	1,065	8.7	1,490	12.2	1,141	9.3	12,230	100

College or University degree	33,507	69.5	5,546	11.5	7,545	15.7	1,591	3.3	48,189	100
A levels/AS levels or equivalent	12,534	75.4	1,462	8.8	1,341	8.1	1,292	7.8	16,629	100
O levels/GCSEs/ CSEs or equivalent	29,083	73.2	2,113	5.3	2,976	7.5	5,558	14.0	39,730	100
Other	6,437	63.4	1,538	15.1	1,385	13.6	797	7.8	10,157	100
None of the above	3,387	63.1	89	1.7	229	4.3	1,665	31.0	5,370	100
Deprivation quartile										
Quartile 1 (most advantaged)	20,677	72.6	2,719	9.5	3,059	10.7	2,033	7.1	28,488	100
Quartile 2	20,523	71.7	2,671	9.3	3,087	10.8	2,345	8.2	28,626	100
Quartile 3	22,404	70.4	2,827	8.9	3,658	11.5	2,913	9.2	31,802	100
Quartile 4 (least advantaged)	21,344	68.5	2,531	8.1	3,672	11.8	3,612	11.6	31,159	100
Shiftwork										
No	78,949	73.7	8,253	7.7	11,971	11.2	7,899	7.4	107,072	100
Yes	5,999	46.1	2,495	19.2	1,505	11.6	3,004	23.1	13,003	100
Manual occupation										
Non-manual	74,849	72.2	9,097	8.8	12,211	11.8	7,477	7.2	103,634	100
Manual	10,099	61.4	1,651	10.0	1,265	7.7	3,426	20.8	16,441	100
Job tenure										
<=10	49,625	70.0	6,212	8.8	8,853	12.5	6,206	8.8	70,896	100
11-20	19,420	70.5	2,631	9.5	3,055	11.1	2,446	8.9	27,552	100

Never	52,308	70.3	7,154	9.6	8,688	11.7	6,236	8.4	74,386	100
Previous	22,660	71.5	2,733	8.6	3,395	10.7	2,896	9.1	31,684	100
Current	9,980	71.3	861	6.1	1,393	9.9	1,771	12.6	14,005	100
Alcohol consumption										
Daily or almost daily	15,272	76.1	1,473	7.3	1,765	8.8	1,570	7.8	20,080	100
Three or four times a week	22,155	74.0	2,747	9.2	2,976	9.9	2,064	6.9	29,942	100
Once or twice a week	25,038	71.0	3,033	8.6	3,866	11.0	3,336	9.5	35,273	100
One to three times a month	10,686	67.7	1,522	9.6	1,969	12.5	1,602	10.2	15,779	100
Special occasions only	7,558	63.1	1,214	10.1	1,819	15.2	1,394	11.6	11,985	100
Never (former drinker)	1,902	63.8	283	9.5	423	14.2	371	12.5	2,979	100
Never	2,337	57.9	476	11.8	658	16.3	566	14.0	4,037	100
Total	84,948	70.7	10,748	9.0	13,476	11.2	10,903	9.1	120,075	100

Table S5: Descriptive statistics for severe COVID-19 by broad race/occupation groups

	Severe COVID-19					
	No		Yes		Total	Total
	N	%	N	%	N	%
White (non-essential worker)	78,902	99.9	92	0.1	78,994	100
Non-white (non-essential worker)	5,934	99.7	20	0.3	5,954	100
White (essential worker)	31,541	99.6	129	0.4	31,670	100
Non-white (essential worker)	3,427	99.1	30	0.9	3,457	100
Total	119,804	99.8	271	0.2	120,075	100

Table S6: Risk of severe COVID-19 according to broad essential worker groups

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Severe COVID-19	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]
Occupation: Non-essential workers	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Healthcare workers	7.43 ^{***} [5.52,10.00]	8.45 ^{***} [6.22,11.47]	7.57 ^{***} [5.50,10.41]	8.44 ^{***} [6.21,11.46]	8.53 ^{***} [6.29,11.58]	7.69 ^{***} [5.58,10.60]
Social and education workers	1.84 ^{**} [1.21,2.82]	2.00 ^{**} [1.30,3.08]	1.90 ^{**} [1.22,2.94]	1.99 ^{**} [1.29,3.06]	1.97 ^{**} [1.28,3.03]	1.88 ^{**} [1.21,2.91]
Other essential workers	1.60 [*] [1.05,2.45]	1.30 [0.85,1.98]	1.17 [0.76,1.80]	1.30 [0.85,1.98]	1.27 [0.83,1.94]	1.15 [0.75,1.77]
Age group (current): Under 55	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
55-59	1.06 [0.79,1.43]	1.05 [0.78,1.42]	1.08 [0.80,1.46]	1.05 [0.77,1.41]	1.05 [0.78,1.42]	1.08 [0.80,1.45]
60+	0.64 ^{**} [0.46,0.89]	0.63 ^{**} [0.45,0.88]	0.67 [*] [0.48,0.94]	0.62 ^{**} [0.45,0.87]	0.62 ^{**} [0.45,0.86]	0.65 [*] [0.47,0.91]
Sex: Female	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Male	1.38 [*] [1.05,1.80]	1.41 [*] [1.08,1.84]	1.35 [*] [1.01,1.79]	1.41 [*] [1.08,1.85]	1.36 [*] [1.04,1.79]	1.31 [0.98,1.75]
Assessment centre: Manchester	0.73 [0.39,1.37]	0.74 [0.39,1.40]	0.75 [0.40,1.41]	0.74 [0.39,1.40]	0.75 [0.39,1.42]	0.77 [0.40,1.46]
Oxford	0.70 [0.35,1.40]	0.78 [0.39,1.56]	0.78 [0.39,1.55]	0.78 [0.39,1.57]	0.81 [0.40,1.62]	0.81 [0.41,1.63]
Stoke	0.63 [0.33,1.20]	0.66 [0.35,1.25]	0.65 [0.35,1.23]	0.67 [0.35,1.26]	0.66 [0.35,1.24]	0.65 [0.35,1.23]
Reading	0.41 ^{**} [0.22,0.77]	0.50 [*] [0.27,0.95]	0.50 [*] [0.27,0.95]	0.51 [*] [0.27,0.96]	0.51 [*] [0.27,0.96]	0.51 [*] [0.27,0.97]
Bury	0.49 [*] [0.27,0.90]	0.50 [*] [0.27,0.92]	0.50 [*] [0.27,0.92]	0.51 [*] [0.28,0.93]	0.50 [*] [0.27,0.92]	0.51 [*] [0.27,0.93]
Newcastle	1.00	1.00	1.00	1.00	1.00	1.00

	-	-	-	-	-	-
Leeds	0.38*** [0.22,0.65]	0.41*** [0.24,0.69]	0.41** [0.24,0.70]	0.41** [0.24,0.70]	0.41*** [0.24,0.69]	0.41** [0.24,0.70]
Bristol	0.24*** [0.13,0.45]	0.27*** [0.14,0.50]	0.27*** [0.14,0.50]	0.27*** [0.14,0.50]	0.27*** [0.14,0.51]	0.27*** [0.14,0.51]
Barts	0.20** [0.07,0.55]	0.18** [0.06,0.50]	0.19** [0.07,0.53]	0.18** [0.06,0.51]	0.19** [0.07,0.53]	0.19** [0.07,0.55]
Nottingham	0.30*** [0.15,0.58]	0.32*** [0.17,0.63]	0.33*** [0.17,0.63]	0.32*** [0.17,0.63]	0.33** [0.17,0.64]	0.33** [0.17,0.64]
Sheffield	0.80 [0.50,1.28]	0.83 [0.52,1.32]	0.84 [0.53,1.34]	0.83 [0.52,1.32]	0.83 [0.52,1.33]	0.85 [0.53,1.36]
Liverpool	0.86 [0.54,1.37]	0.87 [0.55,1.38]	0.88 [0.55,1.40]	0.87 [0.55,1.39]	0.85 [0.53,1.36]	0.87 [0.55,1.39]
Middlesborough	0.45* [0.23,0.87]	0.47* [0.24,0.92]	0.48* [0.25,0.93]	0.47* [0.24,0.92]	0.46* [0.24,0.90]	0.47* [0.24,0.92]
Hounslow	0.37** [0.21,0.68]	0.37** [0.20,0.67]	0.37** [0.20,0.69]	0.37** [0.20,0.68]	0.37** [0.20,0.69]	0.39** [0.21,0.71]
Croydon	0.36*** [0.20,0.64]	0.36*** [0.20,0.64]	0.37*** [0.21,0.67]	0.36*** [0.20,0.65]	0.36*** [0.20,0.64]	0.37** [0.21,0.67]
Birmingham	0.40** [0.22,0.72]	0.39** [0.21,0.70]	0.40** [0.22,0.73]	0.39** [0.21,0.70]	0.38** [0.21,0.69]	0.40** [0.22,0.72]
Ethnicity: White British	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
White Irish	1.54 [0.82,2.89]	1.58 [0.84,2.96]	1.59 [0.85,2.97]	1.58 [0.84,2.95]	1.58 [0.84,2.98]	1.59 [0.85,2.98]
White Other	1.19 [0.60,2.35]	1.25 [0.63,2.49]	1.27 [0.64,2.52]	1.25 [0.63,2.48]	1.23 [0.62,2.44]	1.24 [0.62,2.46]
Mixed	1.44 [0.46,4.49]	1.37 [0.44,4.29]	1.36 [0.43,4.25]	1.38 [0.44,4.30]	1.33 [0.43,4.12]	1.32 [0.42,4.11]
South Asian	3.94*** [2.24,6.93]	3.78*** [2.14,6.70]	3.80*** [2.14,6.76]	3.77*** [2.12,6.71]	3.94*** [2.24,6.94]	4.00*** [2.26,7.07]
Black	3.57*** [2.14,5.96]	3.01*** [1.80,5.04]	2.93*** [1.74,4.92]	3.00*** [1.79,5.01]	2.78*** [1.65,4.68]	2.73*** [1.61,4.62]
Other	1.49 [0.60,3.66]	1.38 [0.56,3.45]	1.32 [0.53,3.28]	1.39 [0.56,3.45]	1.42 [0.57,3.49]	1.36 [0.55,3.36]
Country of birth: UK & Ireland	1.00	1.00	1.00	1.00	1.00	1.00

	-	-	-	-	-	-
Elsewhere	0.90 [0.59,1.37]	0.91 [0.59,1.40]	0.85 [0.55,1.33]	0.92 [0.60,1.41]	0.91 [0.59,1.41]	0.87 [0.56,1.36]
Socioeconomic deprivation: Quartile 1 (most advantaged)		1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Quartile 2		1.35 [0.89,2.03]	1.33 [0.88,2.02]	1.34 [0.89,2.03]	1.33 [0.88,2.01]	1.32 [0.87,2.00]
Quartile 3		1.64* [1.11,2.44]	1.60* [1.08,2.38]	1.63* [1.10,2.42]	1.58* [1.07,2.34]	1.54* [1.04,2.29]
Quartile 4 (least advantaged)		2.01*** [1.36,2.96]	1.87** [1.26,2.77]	1.98*** [1.34,2.92]	1.89** [1.29,2.79]	1.77** [1.20,2.63]
Education level: College or University degree		1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
A levels/AS levels or equivalent		1.10 [0.72,1.69]	1.05 [0.68,1.60]	1.09 [0.71,1.68]	1.05 [0.69,1.61]	1.00 [0.66,1.54]
O levels/GCSEs/CSEs or equivalent		1.67*** [1.24,2.25]	1.51** [1.12,2.04]	1.67*** [1.24,2.24]	1.56** [1.16,2.10]	1.42* [1.05,1.93]
Other		1.29 [0.85,1.94]	1.13 [0.74,1.72]	1.28 [0.85,1.92]	1.20 [0.80,1.81]	1.07 [0.70,1.62]
None of the above		2.22** [1.31,3.74]	1.88* [1.10,3.23]	2.19** [1.30,3.70]	2.03** [1.20,3.46]	1.74* [1.01,3.01]
Shiftwork: No			1.00 -			1.00 -
Yes			1.43* [1.06,1.92]			1.38* [1.02,1.86]
Occupation: Non-manual			1.00 -			1.00 -
Manual			1.39* [1.02,1.89]			1.41* [1.04,1.91]
Job tenure (years): <=10			1.00 -			1.00 -
11-20			1.21 [0.91,1.59]			1.22 [0.93,1.61]
>20			0.71 [0.48,1.05]			0.72 [0.49,1.06]
Working hours/week: <40			1.00			1.00

			-			-
40-45			0.98 [0.73,1.32]			0.97 [0.72,1.30]
>45			1.10 [0.77,1.56]			1.08 [0.76,1.54]
Number of chronic conditions: 0				1.00 -		1.00 -
1				1.27 [0.97,1.66]		1.23 [0.93,1.61]
2				0.98 [0.64,1.50]		0.92 [0.60,1.41]
3				1.03 [0.52,2.04]		0.93 [0.46,1.86]
4+				1.48 [0.64,3.43]		1.31 [0.56,3.05]
Long-standing illness/disability: No				1.00 -		1.00 -
Yes				1.08 [0.79,1.47]		1.06 [0.77,1.45]
Body Mass Index category: Underweight (<18.5)					1.15 [0.17,8.00]	1.15 [0.17,7.87]
Normal weight (18.5-24.9)					1.00 -	1.00 -
Overweight (25.0-29.9)					1.46* [1.08,1.95]	1.44* [1.07,1.94]
Obese (>=30.0)					1.75*** [1.28,2.41]	1.72** [1.24,2.38]
Smoking status: Never					1.00 -	1.00 -
Previous					1.32* [1.00,1.74]	1.31 [0.99,1.73]
Current					1.00 [0.66,1.51]	0.96 [0.64,1.45]
Alcohol consumption: Daily or almost daily					1.00 -	1.00 -
Three or four times a week					0.88	0.88

					[0.57,1.35]	[0.57,1.35]
Once or twice a week					0.97 [0.65,1.46]	0.96 [0.64,1.44]
One to three times a month					1.40 [0.91,2.17]	1.38 [0.89,2.14]
Special occasions only					1.07 [0.65,1.77]	1.03 [0.62,1.71]
Never (former drinker)					0.48 [0.17,1.38]	0.46 [0.16,1.32]
Never					1.07 [0.58,1.99]	1.02 [0.55,1.88]
Observations	120075	120075	120075	120075	120075	120075

CI=confidence interval; RR=risk ratio; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Model 1: Adjusted for age group, sex, ethnicity, country of birth; Model 2: Model 1 + socioeconomic deprivation quartile, education level; Model 3: Model 2 + shift work, manual work, job tenure, working hours; Model 4: Model 2 + number of chronic conditions, long-standing illness/disability; Model 5: Model 2 + BMI category, smoking status, alcohol consumption; Model 6: All covariates

Table S7: Risk of severe COVID-19 according to narrow essential worker groups

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Severe COVID-19	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]
Occupation: Non-essential workers	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Healthcare professionals	6.19*** [3.68,10.43]	8.62*** [4.98,14.94]	8.26*** [4.77,14.28]	8.70*** [5.02,15.06]	9.33*** [5.40,16.14]	8.99*** [5.20,15.54]
Medical support staff	8.70*** [4.87,15.55]	7.43*** [4.17,13.25]	6.48*** [3.62,11.58]	7.39*** [4.13,13.19]	7.33*** [4.13,13.02]	6.42*** [3.60,11.45]
Health associate professionals	7.53*** [5.44,10.43]	8.54*** [6.13,11.90]	7.61*** [5.33,10.87]	8.52*** [6.11,11.88]	8.54*** [6.12,11.92]	7.65*** [5.34,10.95]
Social care workers	2.46*** [1.47,4.14]	2.38** [1.42,4.00]	2.19** [1.29,3.72]	2.36** [1.40,3.97]	2.31** [1.37,3.88]	2.13** [1.25,3.63]
Education workers	1.36 [0.75,2.48]	1.61 [0.88,2.96]	1.59 [0.86,2.92]	1.61 [0.88,2.95]	1.62 [0.88,2.96]	1.59 [0.87,2.91]
Food workers	1.12 [0.52,2.42]	0.93 [0.43,1.98]	0.85 [0.40,1.83]	0.93 [0.43,1.98]	0.92 [0.43,1.96]	0.84 [0.39,1.80]
Transport workers	2.20** [1.21,4.00]	1.66 [0.91,3.01]	1.48 [0.81,2.70]	1.66 [0.91,3.01]	1.58 [0.87,2.90]	1.43 [0.78,2.63]
Police and protective service workers	1.55 [0.72,3.32]	1.36 [0.63,2.93]	1.21 [0.56,2.64]	1.35 [0.62,2.92]	1.32 [0.61,2.86]	1.19 [0.55,2.58]
Age group (current): Under 55	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
55-59	1.06 [0.78,1.43]	1.05 [0.78,1.42]	1.08 [0.80,1.46]	1.05 [0.77,1.41]	1.05 [0.78,1.42]	1.08 [0.80,1.45]
60+	0.64** [0.46,0.89]	0.63** [0.46,0.88]	0.67* [0.48,0.94]	0.62** [0.45,0.87]	0.62** [0.45,0.86]	0.65* [0.47,0.91]
Sex: Female	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Male	1.35* [1.03,1.78]	1.37* [1.04,1.80]	1.31 [0.99,1.75]	1.37* [1.04,1.80]	1.32* [1.00,1.74]	1.28 [0.95,1.71]
Assessment centre: Manchester	0.73	0.74	0.75	0.74	0.75	0.77

	[0.39,1.37]	[0.39,1.40]	[0.40,1.41]	[0.39,1.40]	[0.39,1.42]	[0.40,1.46]
Oxford	0.71 [0.35,1.42]	0.78 [0.39,1.57]	0.78 [0.39,1.56]	0.79 [0.39,1.58]	0.81 [0.40,1.63]	0.82 [0.41,1.64]
Stoke	0.63 [0.33,1.19]	0.67 [0.35,1.26]	0.66 [0.35,1.24]	0.67 [0.35,1.26]	0.66 [0.35,1.25]	0.65 [0.35,1.24]
Reading	0.41 ^{**} [0.22,0.77]	0.51 [*] [0.27,0.96]	0.51 [*] [0.27,0.96]	0.51 [*] [0.27,0.97]	0.51 [*] [0.27,0.97]	0.52 [*] [0.27,0.98]
Bury	0.49 [*] [0.26,0.89]	0.50 [*] [0.27,0.93]	0.51 [*] [0.28,0.93]	0.51 [*] [0.28,0.93]	0.50 [*] [0.27,0.93]	0.51 [*] [0.28,0.94]
Newcastle	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Leeds	0.38 ^{***} [0.22,0.65]	0.41 ^{***} [0.24,0.69]	0.41 ^{**} [0.24,0.70]	0.41 ^{**} [0.24,0.70]	0.41 ^{***} [0.24,0.69]	0.41 ^{**} [0.24,0.70]
Bristol	0.24 ^{***} [0.13,0.45]	0.27 ^{***} [0.14,0.50]	0.27 ^{***} [0.14,0.50]	0.27 ^{***} [0.14,0.50]	0.27 ^{***} [0.14,0.51]	0.27 ^{***} [0.14,0.51]
Barts	0.20 ^{**} [0.07,0.55]	0.18 ^{**} [0.06,0.50]	0.19 ^{**} [0.07,0.53]	0.18 ^{**} [0.06,0.51]	0.19 ^{**} [0.07,0.53]	0.19 ^{**} [0.07,0.55]
Nottingham	0.30 ^{***} [0.15,0.58]	0.32 ^{***} [0.17,0.63]	0.33 ^{***} [0.17,0.63]	0.33 ^{***} [0.17,0.63]	0.33 ^{**} [0.17,0.64]	0.33 ^{**} [0.17,0.64]
Sheffield	0.80 [0.50,1.28]	0.83 [0.52,1.32]	0.84 [0.53,1.34]	0.83 [0.52,1.32]	0.84 [0.52,1.34]	0.85 [0.53,1.37]
Liverpool	0.86 [0.54,1.37]	0.87 [0.55,1.39]	0.88 [0.55,1.41]	0.87 [0.55,1.39]	0.86 [0.54,1.37]	0.88 [0.55,1.40]
Middlesborough	0.45 [*] [0.23,0.87]	0.47 [*] [0.24,0.92]	0.48 [*] [0.25,0.93]	0.47 [*] [0.24,0.92]	0.46 [*] [0.24,0.90]	0.47 [*] [0.24,0.93]
Hounslow	0.37 ^{**} [0.20,0.67]	0.37 ^{**} [0.20,0.67]	0.38 ^{**} [0.21,0.69]	0.37 ^{**} [0.20,0.68]	0.38 ^{**} [0.20,0.69]	0.39 ^{**} [0.21,0.71]
Croydon	0.36 ^{***} [0.20,0.64]	0.36 ^{***} [0.20,0.65]	0.37 ^{**} [0.21,0.67]	0.36 ^{***} [0.20,0.66]	0.36 ^{***} [0.20,0.65]	0.38 ^{**} [0.21,0.68]
Birmingham	0.40 ^{**} [0.22,0.72]	0.39 ^{**} [0.21,0.70]	0.41 ^{**} [0.23,0.73]	0.39 ^{**} [0.22,0.71]	0.38 ^{**} [0.21,0.70]	0.40 ^{**} [0.22,0.73]
Ethnicity: White British	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
White Irish	1.54 [0.82,2.90]	1.56 [0.83,2.94]	1.57 [0.84,2.95]	1.56 [0.83,2.93]	1.57 [0.84,2.96]	1.58 [0.84,2.96]
White Other	1.21	1.25	1.26	1.25	1.22	1.23

	[0.61,2.40]	[0.63,2.48]	[0.63,2.50]	[0.63,2.47]	[0.62,2.42]	[0.62,2.43]
Mixed	1.42 [0.45,4.46]	1.37 [0.44,4.27]	1.35 [0.43,4.23]	1.37 [0.44,4.28]	1.32 [0.42,4.11]	1.31 [0.42,4.09]
South Asian	4.02 ^{***} [2.26,7.15]	3.78 ^{***} [2.12,6.73]	3.77 ^{***} [2.11,6.74]	3.77 ^{***} [2.11,6.73]	3.91 ^{***} [2.20,6.92]	3.94 ^{***} [2.21,7.02]
Black	3.42 ^{***} [2.04,5.74]	2.95 ^{***} [1.76,4.95]	2.89 ^{***} [1.72,4.87]	2.94 ^{***} [1.76,4.93]	2.74 ^{***} [1.62,4.61]	2.70 ^{***} [1.59,4.57]
Other	1.47 [0.60,3.62]	1.38 [0.55,3.42]	1.31 [0.53,3.27]	1.38 [0.55,3.43]	1.40 [0.57,3.46]	1.36 [0.55,3.35]
Country of birth: UK & Ireland	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Elsewhere	0.90 [0.59,1.37]	0.91 [0.59,1.39]	0.85 [0.55,1.32]	0.92 [0.60,1.41]	0.91 [0.59,1.40]	0.87 [0.56,1.36]
Socioeconomic deprivation: Quartile 1 (most advantaged)		1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Quartile 2		1.35 [0.89,2.03]	1.34 [0.88,2.02]	1.34 [0.89,2.03]	1.33 [0.88,2.02]	1.32 [0.88,2.00]
Quartile 3		1.64 [*] [1.11,2.43]	1.60 [*] [1.08,2.38]	1.63 [*] [1.10,2.41]	1.58 [*] [1.07,2.34]	1.54 [*] [1.04,2.29]
Quartile 4 (least advantaged)		1.99 ^{***} [1.35,2.93]	1.87 ^{**} [1.26,2.76]	1.97 ^{***} [1.33,2.90]	1.89 ^{**} [1.28,2.78]	1.78 ^{**} [1.20,2.63]
Education level: College or University degree		1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
A levels/AS levels or equivalent		1.09 [0.71,1.68]	1.05 [0.69,1.62]	1.09 [0.71,1.68]	1.06 [0.69,1.63]	1.02 [0.67,1.57]
O levels/GCSEs/CSEs or equivalent		1.67 ^{***} [1.23,2.27]	1.53 ^{**} [1.12,2.09]	1.67 ^{**} [1.23,2.27]	1.58 ^{**} [1.17,2.15]	1.45 [*] [1.06,1.99]
Other		1.27 [0.83,1.93]	1.13 [0.74,1.74]	1.26 [0.83,1.92]	1.20 [0.79,1.83]	1.08 [0.70,1.65]
None of the above		2.20 ^{**} [1.28,3.78]	1.89 [*] [1.09,3.29]	2.18 ^{**} [1.27,3.74]	2.05 [*] [1.19,3.53]	1.76 [*] [1.01,3.09]
Shiftwork: No			1.00 -			1.00 -
Yes			1.41 [*] [1.04,1.91]			1.37 [*] [1.01,1.86]
Occupation: Non-manual			1.00			1.00

			-			-
Manual			1.41 [*] [1.03,1.91]			1.42 [*] [1.05,1.93]
Job tenure (years): ≤10			1.00			1.00
			-			-
11-20			1.21 [0.91,1.59]			1.22 [0.93,1.61]
>20			0.71 [0.48,1.05]			0.72 [0.49,1.06]
Working hours/week: <40			1.00			1.00
			-			-
40-45			0.98 [0.73,1.31]			0.96 [0.72,1.29]
>45			1.08 [0.75,1.54]			1.05 [0.74,1.51]
Number of chronic conditions: 0				1.00		1.00
				-		-
1				1.27 [0.97,1.66]		1.23 [0.94,1.61]
2				0.98 [0.64,1.49]		0.92 [0.60,1.41]
3				1.03 [0.52,2.03]		0.92 [0.46,1.85]
4+				1.48 [0.64,3.43]		1.31 [0.56,3.06]
Long-standing illness/disability: No				1.00		1.00
				-		-
Yes				1.08 [0.78,1.47]		1.06 [0.77,1.45]
Body Mass Index category: Underweight (<18.5)					1.15 [0.17,8.02]	1.15 [0.17,7.88]
Normal weight (18.5-24.9)					1.00	1.00
					-	-
Overweight (25.0-29.9)					1.46 [*] [1.09,1.96]	1.45 [*] [1.07,1.95]
Obese (≥30.0)					1.75 ^{***}	1.72 ^{**}

					[1.27,2.40]	[1.24,2.39]
Smoking status: Never					1.00	1.00
					-	-
Previous					1.31	1.31
					[1.00,1.74]	[0.99,1.73]
Current					1.00	0.96
					[0.66,1.51]	[0.64,1.45]
Alcohol consumption: Daily or almost daily					1.00	1.00
					-	-
Three or four times a week					0.88	0.88
					[0.57,1.35]	[0.57,1.35]
Once or twice a week					0.97	0.96
					[0.65,1.46]	[0.64,1.44]
One to three times a month					1.40	1.38
					[0.90,2.17]	[0.89,2.14]
Special occasions only					1.08	1.04
					[0.65,1.78]	[0.63,1.72]
Never (former drinker)					0.48	0.46
					[0.17,1.38]	[0.16,1.32]
Never					1.08	1.03
					[0.58,2.00]	[0.55,1.90]
Observations	120075	120075	120075	120075	120075	120075

CI=confidence interval; RR=risk ratio; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Model 1: Adjusted for age group, sex, ethnicity, country of birth; Model 2: Model 1 + socioeconomic deprivation quartile, education level; Model 3: Model 2 + shift work, manual work, job tenure, working hours; Model 4: Model 2 + number of chronic conditions, long-standing illness/disability; Model 5: Model 2 + BMI category, smoking status, alcohol consumption; Model 6: All covariates

Table S8: Risk of severe COVID-19 according to SOC2000 major occupational groups

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Severe COVID-19	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]
Occupation: Managers and Senior Officials	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Professional Occupations	1.36 [0.85,2.18]	1.47 [0.91,2.36]	1.49 [0.92,2.41]	1.47 [0.91,2.36]	1.51 [0.94,2.43]	1.53 [0.95,2.48]
Associate Professional and Technical Occupations	3.19*** [2.10,4.85]	3.11*** [2.05,4.72]	2.73*** [1.77,4.23]	3.10*** [2.04,4.71]	3.15*** [2.08,4.79]	2.78*** [1.79,4.29]
Administrative and Secretarial Occupations	1.24 [0.73,2.12]	1.14 [0.67,1.95]	1.22 [0.71,2.11]	1.14 [0.67,1.94]	1.17 [0.68,2.00]	1.24 [0.72,2.15]
Skilled Trades Occupations	0.82 [0.39,1.74]	0.67 [0.31,1.44]	0.49 [0.22,1.06]	0.68 [0.32,1.45]	0.69 [0.32,1.49]	0.50 [0.23,1.09]
Personal Service Occupations	2.73*** [1.56,4.76]	2.31** [1.32,4.03]	1.75 [0.99,3.10]	2.29** [1.32,4.00]	2.33** [1.34,4.06]	1.77 [1.00,3.13]
Sales and Customer Service Occupations	1.36 [0.59,3.17]	1.09 [0.46,2.57]	0.91 [0.38,2.18]	1.08 [0.46,2.55]	1.08 [0.46,2.56]	0.90 [0.38,2.16]
Process, Plant and Machine Operatives	2.39** [1.31,4.36]	1.82 [0.99,3.34]	1.25 [0.66,2.36]	1.81 [0.99,3.33]	1.81 [0.99,3.34]	1.26 [0.67,2.37]
Elementary Occupations	1.76 [0.92,3.34]	1.29 [0.65,2.53]	0.87 [0.43,1.75]	1.28 [0.65,2.52]	1.31 [0.67,2.59]	0.89 [0.44,1.79]
Age group (current): Under 55	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
55-59	1.08 [0.80,1.46]	1.08 [0.80,1.46]	1.11 [0.82,1.51]	1.07 [0.79,1.45]	1.08 [0.80,1.46]	1.11 [0.82,1.50]
60+	0.66* [0.48,0.92]	0.66* [0.47,0.92]	0.70* [0.50,0.98]	0.65* [0.47,0.90]	0.65* [0.47,0.90]	0.68* [0.49,0.95]
Sex: Female	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Male	1.02 [0.78,1.33]	1.02 [0.78,1.32]	1.00 [0.76,1.32]	1.02 [0.78,1.33]	0.98 [0.75,1.29]	0.97 [0.74,1.29]
Assessment centre: Manchester	0.69	0.68	0.70	0.68	0.69	0.72

	[0.36,1.30]	[0.36,1.29]	[0.37,1.34]	[0.36,1.30]	[0.36,1.32]	[0.38,1.37]
Oxford	0.66 [0.33,1.32]	0.71 [0.36,1.43]	0.73 [0.37,1.46]	0.71 [0.36,1.43]	0.74 [0.37,1.48]	0.76 [0.38,1.53]
Stoke	0.59 [0.31,1.12]	0.63 [0.33,1.19]	0.63 [0.33,1.19]	0.63 [0.34,1.20]	0.63 [0.33,1.19]	0.63 [0.34,1.19]
Reading	0.37** [0.20,0.69]	0.43** [0.23,0.81]	0.44* [0.23,0.84]	0.43** [0.23,0.82]	0.44* [0.23,0.82]	0.45* [0.24,0.86]
Bury	0.46* [0.25,0.85]	0.48* [0.26,0.88]	0.49* [0.27,0.90]	0.48* [0.26,0.88]	0.48* [0.26,0.88]	0.49* [0.27,0.91]
Newcastle	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Leeds	0.36*** [0.21,0.61]	0.37*** [0.22,0.63]	0.38*** [0.22,0.65]	0.37*** [0.22,0.64]	0.37*** [0.22,0.64]	0.39*** [0.23,0.66]
Bristol	0.23*** [0.12,0.42]	0.25*** [0.13,0.47]	0.26*** [0.14,0.48]	0.25*** [0.13,0.47]	0.25*** [0.13,0.47]	0.26*** [0.14,0.49]
Barts	0.16*** [0.06,0.46]	0.14*** [0.05,0.40]	0.15*** [0.05,0.44]	0.14*** [0.05,0.41]	0.15*** [0.05,0.42]	0.16*** [0.06,0.46]
Nottingham	0.29*** [0.15,0.56]	0.30*** [0.16,0.59]	0.31*** [0.16,0.61]	0.30*** [0.16,0.59]	0.31*** [0.16,0.60]	0.32*** [0.16,0.61]
Sheffield	0.81 [0.50,1.29]	0.83 [0.52,1.33]	0.85 [0.53,1.37]	0.83 [0.52,1.33]	0.84 [0.52,1.34]	0.86 [0.54,1.38]
Liverpool	0.85 [0.53,1.36]	0.85 [0.53,1.36]	0.87 [0.55,1.39]	0.85 [0.53,1.36]	0.84 [0.52,1.34]	0.86 [0.54,1.37]
Middlesborough	0.45* [0.23,0.88]	0.47* [0.24,0.92]	0.48* [0.25,0.93]	0.47* [0.24,0.92]	0.46* [0.24,0.91]	0.47* [0.24,0.93]
Hounslow	0.30*** [0.16,0.55]	0.29*** [0.16,0.53]	0.30*** [0.17,0.56]	0.29*** [0.16,0.54]	0.30*** [0.16,0.55]	0.31*** [0.17,0.58]
Croydon	0.31*** [0.17,0.56]	0.30*** [0.17,0.54]	0.32*** [0.18,0.58]	0.30*** [0.17,0.55]	0.30*** [0.17,0.55]	0.33*** [0.18,0.59]
Birmingham	0.37** [0.20,0.67]	0.36*** [0.20,0.65]	0.38** [0.21,0.69]	0.36*** [0.20,0.65]	0.36*** [0.20,0.65]	0.38** [0.21,0.69]
Ethnicity: White British	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
White Irish	1.80 [0.96,3.39]	1.78 [0.95,3.35]	1.76 [0.94,3.30]	1.78 [0.95,3.34]	1.78 [0.95,3.36]	1.75 [0.93,3.29]
White Other	1.16	1.14	1.17	1.14	1.12	1.14

	[0.58,2.31]	[0.57,2.29]	[0.58,2.35]	[0.57,2.28]	[0.56,2.25]	[0.57,2.29]
Mixed	1.36 [0.43,4.25]	1.28 [0.41,4.00]	1.26 [0.40,3.94]	1.28 [0.41,4.00]	1.24 [0.40,3.88]	1.23 [0.39,3.86]
South Asian	4.41 ^{***} [2.47,7.89]	4.12 ^{***} [2.31,7.37]	4.10 ^{***} [2.29,7.35]	4.08 ^{***} [2.28,7.31]	4.14 ^{***} [2.32,7.37]	4.19 ^{***} [2.34,7.51]
Black	3.95 ^{***} [2.40,6.52]	3.39 ^{***} [2.05,5.59]	3.22 ^{***} [1.94,5.37]	3.37 ^{***} [2.04,5.55]	3.12 ^{***} [1.88,5.20]	3.01 ^{***} [1.80,5.05]
Other	1.57 [0.64,3.85]	1.48 [0.60,3.66]	1.38 [0.56,3.43]	1.47 [0.60,3.64]	1.50 [0.61,3.68]	1.42 [0.58,3.50]
Country of birth: UK & Ireland	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Elsewhere	1.01 [0.66,1.53]	1.01 [0.66,1.55]	0.92 [0.59,1.43]	1.02 [0.67,1.56]	1.01 [0.66,1.55]	0.94 [0.60,1.46]
Socioeconomic deprivation: Quartile 1 (most advantaged)		1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
Quartile 2		1.34 [0.88,2.02]	1.32 [0.87,2.00]	1.33 [0.88,2.02]	1.32 [0.87,1.99]	1.31 [0.86,1.98]
Quartile 3		1.61 [*] [1.09,2.39]	1.57 [*] [1.06,2.34]	1.61 [*] [1.08,2.38]	1.56 [*] [1.06,2.31]	1.52 [*] [1.03,2.25]
Quartile 4 (least advantaged)		1.92 ^{**} [1.30,2.84]	1.81 ^{**} [1.22,2.68]	1.90 ^{**} [1.29,2.81]	1.83 ^{**} [1.23,2.70]	1.72 ^{**} [1.16,2.55]
Education level: College or University degree		1.00 -	1.00 -	1.00 -	1.00 -	1.00 -
A levels/AS levels or equivalent		0.89 [0.58,1.36]	0.87 [0.56,1.33]	0.88 [0.57,1.36]	0.86 [0.56,1.32]	0.84 [0.55,1.29]
O levels/GCSEs/CSEs or equivalent		1.33 [0.97,1.82]	1.22 [0.89,1.67]	1.32 [0.96,1.82]	1.25 [0.91,1.71]	1.15 [0.84,1.58]
Other		1.32 [0.86,2.02]	1.15 [0.75,1.77]	1.31 [0.86,2.01]	1.25 [0.82,1.91]	1.09 [0.71,1.68]
None of the above		1.70 [0.97,2.98]	1.52 [0.87,2.67]	1.69 [0.96,2.96]	1.58 [0.90,2.79]	1.42 [0.81,2.50]
Shiftwork: No			1.00 -			1.00 -
Yes			1.78 ^{***} [1.31,2.42]			1.74 ^{***} [1.28,2.36]
Occupation: Non-manual			1.00			1.00

			-			-
Manual			1.79*** [1.29,2.50]			1.82*** [1.31,2.53]
Job tenure (years): <=10			1.00			1.00
			-			-
11-20			1.20 [0.91,1.58]			1.22 [0.92,1.61]
>20			0.72 [0.49,1.07]			0.73 [0.49,1.08]
Working hours/week: <40			1.00			1.00
			-			-
40-45			0.91 [0.68,1.23]			0.90 [0.67,1.22]
>45			1.11 [0.77,1.58]			1.09 [0.76,1.56]
Number of chronic conditions: 0				1.00		1.00
				-		-
1				1.26 [0.96,1.65]		1.22 [0.93,1.60]
2				1.00 [0.66,1.52]		0.94 [0.61,1.44]
3				1.04 [0.53,2.07]		0.95 [0.47,1.91]
4+				1.51 [0.65,3.50]		1.34 [0.57,3.14]
Long-standing illness/disability: No				1.00		1.00
				-		-
Yes				1.07 [0.78,1.47]		1.05 [0.77,1.44]
Body Mass Index category: Underweight (<18.5)					1.06 [0.15,7.45]	1.08 [0.15,7.55]
Normal weight (18.5-24.9)					1.00	1.00
					-	-
Overweight (25.0-29.9)					1.44* [1.07,1.93]	1.42* [1.05,1.91]
Obese (>=30.0)					1.68**	1.65**

					[1.23,2.31]	[1.19,2.29]
Smoking status: Never					1.00	1.00
					-	-
Previous					1.29 [0.98,1.71]	1.29 [0.97,1.70]
Current					0.96 [0.64,1.45]	0.93 [0.62,1.40]
Alcohol consumption: Daily or almost daily					1.00	1.00
					-	-
Three or four times a week					0.90 [0.58,1.38]	0.89 [0.58,1.36]
Once or twice a week					0.97 [0.65,1.46]	0.96 [0.64,1.45]
One to three times a month					1.44 [0.92,2.23]	1.39 [0.89,2.16]
Special occasions only					1.09 [0.66,1.80]	1.03 [0.62,1.70]
Never (former drinker)					0.51 [0.18,1.46]	0.49 [0.17,1.39]
Never					1.14 [0.61,2.11]	1.06 [0.57,1.96]
Observations	120075	120075	120075	120075	120075	120075

CI=confidence interval; RR=risk ratio; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Model 1: Adjusted for age group, sex, ethnicity, country of birth; Model 2: Model 1 + socioeconomic deprivation quartile, education level; Model 3: Model 2 + shift work, manual work, job tenure, working hours; Model 4: Model 2 + number of chronic conditions, long-standing illness/disability; Model 5: Model 2 + BMI category, smoking status, alcohol consumption; Model 6: All covariates

Table S9: Risk of severe COVID-19 according to broad race/occupation groups

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Severe COVID-19	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]	RR [95% CI]
Race/occupation group:	1.00	1.00	1.00	1.00	1.00	1.00
White (non-essential worker)	-	-	-	-	-	-
Non-white (non-essential worker)	3.27*** [1.90,5.62]	3.04*** [1.77,5.20]	2.98*** [1.73,5.13]	3.03*** [1.77,5.18]	2.98*** [1.73,5.11]	2.95*** [1.71,5.09]
White (essential worker)	3.47*** [2.63,4.59]	3.40*** [2.58,4.48]	3.01*** [2.27,3.99]	3.39*** [2.58,4.46]	3.36*** [2.55,4.43]	2.99*** [2.25,3.96]
Non-white (essential worker)	8.34*** [5.17,13.47]	7.37*** [4.56,11.92]	6.36*** [3.89,10.40]	7.34*** [4.53,11.88]	7.08*** [4.40,11.41]	6.19*** [3.80,10.09]
Age group (current): Under 55	1.00	1.00	1.00	1.00	1.00	1.00
55-59	-	-	-	-	-	-
60+	1.06 [0.78,1.43]	1.06 [0.78,1.43]	1.08 [0.80,1.47]	1.05 [0.78,1.42]	1.06 [0.78,1.43]	1.08 [0.80,1.46]
	0.63** [0.45,0.87]	0.63** [0.45,0.88]	0.67* [0.48,0.93]	0.62** [0.45,0.87]	0.62** [0.45,0.87]	0.65* [0.46,0.90]
Sex: Female	1.00	1.00	1.00	1.00	1.00	1.00
Male	-	-	-	-	-	-
	1.13 [0.88,1.44]	1.10 [0.86,1.41]	1.06 [0.81,1.39]	1.10 [0.86,1.42]	1.06 [0.82,1.36]	1.03 [0.78,1.36]
Assessment centre: Manchester	0.75 [0.40,1.41]	0.74 [0.39,1.40]	0.75 [0.40,1.42]	0.74 [0.39,1.40]	0.75 [0.39,1.42]	0.77 [0.40,1.46]
Oxford	0.72 [0.36,1.45]	0.78 [0.39,1.56]	0.79 [0.39,1.58]	0.78 [0.39,1.57]	0.81 [0.40,1.62]	0.82 [0.41,1.65]
Stoke	0.60 [0.31,1.13]	0.63 [0.33,1.18]	0.62 [0.33,1.18]	0.63 [0.33,1.19]	0.62 [0.33,1.17]	0.62 [0.33,1.18]
Reading	0.41** [0.22,0.76]	0.48* [0.25,0.90]	0.48* [0.26,0.91]	0.48* [0.25,0.91]	0.48* [0.25,0.91]	0.49* [0.26,0.93]
Bury	0.48* [0.26,0.89]	0.50* [0.27,0.91]	0.50* [0.27,0.92]	0.50* [0.27,0.91]	0.50* [0.27,0.92]	0.50* [0.27,0.93]
Newcastle	1.00	1.00	1.00	1.00	1.00	1.00

	-	-	-	-	-	-
Leeds	0.38*** [0.22,0.64]	0.39*** [0.23,0.67]	0.40*** [0.23,0.68]	0.39*** [0.23,0.67]	0.39*** [0.23,0.67]	0.40*** [0.23,0.68]
Bristol	0.24*** [0.13,0.45]	0.26*** [0.14,0.49]	0.26*** [0.14,0.50]	0.26*** [0.14,0.49]	0.26*** [0.14,0.49]	0.27*** [0.14,0.50]
Barts	0.19** [0.07,0.54]	0.17*** [0.06,0.48]	0.18** [0.06,0.51]	0.17*** [0.06,0.49]	0.18** [0.06,0.50]	0.19** [0.07,0.53]
Nottingham	0.30*** [0.15,0.58]	0.31*** [0.16,0.61]	0.32*** [0.16,0.62]	0.32*** [0.16,0.61]	0.32*** [0.16,0.61]	0.32*** [0.17,0.62]
Sheffield	0.81 [0.50,1.30]	0.83 [0.52,1.33]	0.85 [0.53,1.35]	0.83 [0.52,1.33]	0.84 [0.52,1.34]	0.85 [0.53,1.37]
Liverpool	0.86 [0.54,1.36]	0.85 [0.53,1.36]	0.87 [0.54,1.38]	0.85 [0.54,1.36]	0.84 [0.52,1.34]	0.86 [0.54,1.37]
Middlesborough	0.44* [0.22,0.86]	0.45* [0.23,0.88]	0.45* [0.23,0.88]	0.45* [0.23,0.88]	0.44* [0.23,0.87]	0.45* [0.23,0.88]
Hounslow	0.37** [0.20,0.68]	0.36** [0.19,0.66]	0.37** [0.20,0.68]	0.36** [0.19,0.67]	0.37** [0.20,0.68]	0.38** [0.20,0.70]
Croydon	0.36*** [0.20,0.65]	0.35*** [0.19,0.63]	0.36*** [0.20,0.66]	0.35*** [0.19,0.64]	0.34*** [0.19,0.63]	0.36*** [0.20,0.66]
Birmingham	0.41** [0.23,0.75]	0.40** [0.22,0.72]	0.42** [0.23,0.76]	0.40** [0.22,0.73]	0.40** [0.22,0.71]	0.41** [0.23,0.75]
Country of birth: UK & Ireland	1.00	1.00	1.00	1.00	1.00	1.00
	-	-	-	-	-	-
Elsewhere	1.06 [0.71,1.58]	1.07 [0.71,1.60]	0.99 [0.65,1.51]	1.07 [0.72,1.61]	1.07 [0.71,1.62]	1.02 [0.67,1.55]
Socioeconomic deprivation: Quartile 1 (most advantaged)		1.00	1.00	1.00	1.00	1.00
		-	-	-	-	-
Quartile 2		1.34 [0.89,2.03]	1.32 [0.87,2.00]	1.34 [0.88,2.02]	1.32 [0.88,2.00]	1.31 [0.86,1.98]
Quartile 3		1.60* [1.08,2.37]	1.55* [1.04,2.29]	1.59* [1.07,2.35]	1.55* [1.05,2.29]	1.50* [1.01,2.22]
Quartile 4 (least advantaged)		1.86** [1.26,2.73]	1.72** [1.17,2.55]	1.84** [1.25,2.70]	1.77** [1.20,2.61]	1.65* [1.11,2.45]
Education level: College or University degree		1.00	1.00	1.00	1.00	1.00
		-	-	-	-	-
A levels/AS levels or equivalent		0.99	0.92	0.98	0.95	0.89

		[0.65,1.51]	[0.60,1.40]	[0.65,1.50]	[0.62,1.45]	[0.58,1.35]
O levels/GCSEs/CSEs or equivalent		1.29 [0.97,1.71]	1.12 [0.83,1.51]	1.29 [0.97,1.71]	1.21 [0.91,1.61]	1.06 [0.79,1.43]
Other		1.33 [0.89,2.00]	1.12 [0.74,1.71]	1.33 [0.88,2.00]	1.25 [0.83,1.89]	1.06 [0.70,1.62]
None of the above		1.32 [0.79,2.21]	1.11 [0.65,1.89]	1.31 [0.79,2.20]	1.24 [0.73,2.09]	1.04 [0.60,1.79]
Shiftwork: No			1.00 -			1.00 -
Yes			1.68*** [1.25,2.24]			1.63** [1.22,2.19]
Occupation: Non-manual			1.00 -			1.00 -
Manual			1.38* [1.02,1.87]			1.40* [1.03,1.89]
Job tenure (years): <=10			1.00 -			1.00 -
11-20			1.25 [0.94,1.65]			1.26 [0.96,1.67]
>20			0.78 [0.53,1.15]			0.78 [0.53,1.16]
Working hours/week: <40			1.00 -			1.00 -
40-45			0.91 [0.68,1.22]			0.90 [0.67,1.21]
>45			0.98 [0.69,1.39]			0.96 [0.67,1.36]
Number of chronic conditions: 0				1.00 -		1.00 -
1				1.26 [0.96,1.65]		1.22 [0.93,1.60]
2				0.99 [0.65,1.50]		0.93 [0.61,1.43]
3				1.05 [0.53,2.07]		0.95 [0.48,1.91]
4+				1.49		1.34

				[0.64,3.48]		[0.57,3.13]
Long-standing illness/disability: No				1.00		1.00
				-		-
Yes				1.07 [0.78,1.47]		1.05 [0.77,1.44]
Body Mass Index category: Underweight (<18.5)					1.05 [0.15,7.50]	1.03 [0.15,7.30]
Normal weight (18.5-24.9)					1.00	1.00
					-	-
Overweight (25.0-29.9)					1.44* [1.07,1.93]	1.43* [1.06,1.92]
Obese (>=30.0)					1.66** [1.21,2.28]	1.62** [1.17,2.25]
Smoking status: Never					1.00	1.00
					-	-
Previous					1.28 [0.97,1.69]	1.27 [0.96,1.68]
Current					0.93 [0.62,1.40]	0.89 [0.60,1.34]
Alcohol consumption: Daily or almost daily					1.00	1.00
					-	-
Three or four times a week					0.91 [0.60,1.40]	0.90 [0.59,1.39]
Once or twice a week					0.96 [0.64,1.44]	0.94 [0.63,1.41]
One to three times a month					1.38 [0.89,2.13]	1.33 [0.86,2.06]
Special occasions only					1.03 [0.62,1.69]	0.97 [0.59,1.60]
Never (former drinker)					0.48 [0.17,1.36]	0.45 [0.16,1.29]
Never					1.15 [0.62,2.12]	1.08 [0.59,2.00]
Observations	120075	120075	120075	120075	120075	120075

CI=confidence interval; RR=risk ratio; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Model 1: Adjusted for age group, sex, country of birth; Model 2: Model 1 + socioeconomic deprivation quartile, education level; Model 3: Model 2 + shift work, manual work, job tenure,

working hours; Model 4: Model 2 + number of chronic conditions, long-standing illness/disability; Model 5: Model 2 + BMI category, smoking status, alcohol consumption; Model 6: All covariates

Figure S2: Risk of severe COVID-19 by broad race/occupation groups

