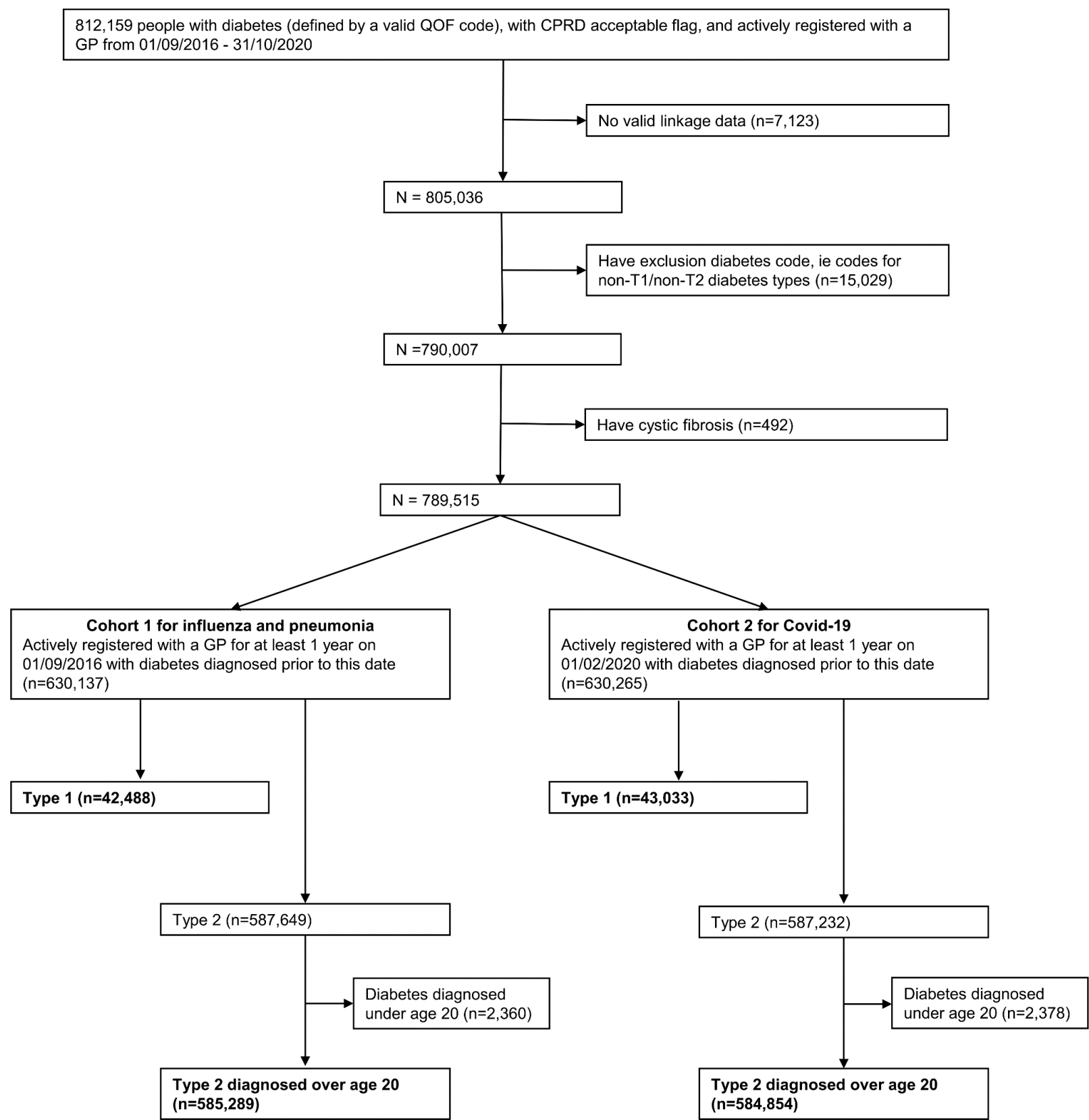


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Supplemental figure 1. Flow diagram of study participants and exclusions.



Supplemental table 1. ICD-10 codes used to define Covid-19, influenza, and pneumonia hospitalisation and mortality outcomes.

Infection	ICD-10 codes
Covid-19	U07.1, U07.2
Influenza	J09-J11
Pneumonia	J12-J18

Supplemental table 2. Definitions of exposure variables.

Variable	Definition	Data source	Categories	Missing data method
Sex	Sex recorded in CPRD	Primary care	Male, or female	No missing data
Age	Age at baseline date, calculated from date of birth	Primary care	<40, 40-49, 50-59, 60-69, 70-79, 80-89 or 90+ years for type 2 diabetes cohorts, and <18, 18-39, 40-49, 50-59, 60-69, 70-79 or 80+ years for type 1 diabetes cohorts	No missing data
Ethnicity	Major UK ethnic group based on a previous study [1]	Primary care and HES	White, south Asian, black, mixed, other, or unknown	Missing indicator method
Deprivation	Index of Multiple Deprivation (official national measure) [2]	Linked Index of Multiple Deprivation dataset	1, 2, 3, 4, 5, or missing (Quintile of national distribution)	Missing indicator method
Smoking status	Smoking status at baseline date	Primary care	Non-smoker, active smoker, ex-smoker, or unknown	Missing indicator method
Region	UK strategic health region based on GP practice location	Primary care	East Midlands, East of England, London, North East, North West, South Central, South East Coast, South West, West Midlands, Yorkshire and the Humber, or missing	Missing indicator method
HbA1c	Latest recorded HbA1c measurement in the last two years prior to baseline date	Primary care	<48 mmol/ mol (<6.5%), 48-53 mmol/mol (6.5-7%), 53-64 mmol/mol (7-8%), 64-75 mmol/mol (8-9%), 75-86 mmol/mol (9-10%), >86 mmol/mol (>10%), or missing	Missing indicator method
BMI	Latest recorded BMI measurement in the last two years prior to baseline date, grouped using the World Health Organisation classification [3]	Primary care	<18.5 kg/m², 18.5-24.9 kg/m², 25-29.9 kg/m², 30-34.5 kg/m², 35-39.9 kg/m², 40+ kg/m², or missing	Missing indicator method
Diabetes duration	Years since diabetes diagnosis, with diagnosis date defined using an algorithm adapted from a previous study [4] taking the earliest date of first diabetes clinical code, first HbA1c measurement of 48 mmol/mol (6.5%) or above, first oral hypoglycaemic agent (OHA) prescription or first insulin prescription	Primary care	<1 year, 1-2 years, 3-5 years, 6-9 years, 10-14 years, 15-19 years or 20+ years for the type 2 diabetes cohorts, and <5 years, 5-9 years, 10-14 years, 15-19 years, 20-24 years, 25-29 years or 30+ years for type 1 diabetes cohorts	No missing data
Microvascular complications	Total number of coded microvascular complications (diabetic nephropathy, neuropathy, and retinopathy) recorded prior to baseline date	Primary care and HES	0, 1, 2, or 3 complications	Non by definition
Diabetes treatment	Diabetes treatment recorded within last 6 months prior to baseline date	Primary care	Insulin prescription, oral hypoglycaemic agent (OHA) prescriptions only, or no treatment	Non by definition
Comorbidities	Record of comorbidity with diagnosis date prior to baseline date. Comorbidities studied covered cardiovascular (hypertension, atrial fibrillation, angina, previous myocardial infarction, previous cardiac revascularisation, other ischaemic heart disease, heart failure, peripheral vascular disease), respiratory (asthma, chronic obstructive pulmonary disease), neurological (previous transient ischaemic attack, previous stroke, dementia, or other neurological condition), oncological (haematological cancer, solid cancer), and other conditions (chronic liver disease, solid organ transplant)	Primary care and HES	Yes, or no	Non by definition
Chronic kidney disease stage	Stage defined from estimated glomerular filtration rate (eGFR), stage 5 also ascertained by coded record prior to baseline [5]	Primary care and HES	Stage 1, stage 2, stage 3a, stage 3b, stage 4, stage 5, or missing	Missing indicator method
Albumin creatinine ratio	Defined from latest albumin creatinine ratio measurement prior to baseline	Primary care	A1, A2, A3, or missing	Missing indicator method
Recent hospitalisation for respiratory infection	A hospitalisation recorded with a code for respiratory infection in the 2 years prior to baseline	HES	Yes, or no	Non by definition
Recent hospitalisation for other causes	A hospitalisation recorded for any other cause (excluding respiratory infection) in the 2 years prior to baseline	HES	Yes, or no	Non by definition
Additional respiratory infections	Respiratory conditions previously included in the 2020 QCOVID risk prediction algorithm [6] (pulmonary fibrosis, pulmonary hypertension, bronchiectasis) with diagnosis occurring before the baseline date	Primary care and HES	Yes, or no	Non by definition
Other medications	Medications previously included in 2020 QCOVID risk prediction algorithm [6] (immunosuppressants, leukotrienes, long acting β agonists, oral steroids) with a prescription issued within 6 months prior to baseline	Primary care	Yes, or no	Non by definition

Supplemental table 3. Frequency of ICD-10 codes recorded in hospitalisation outcomes in type 2 diabetes for Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019).

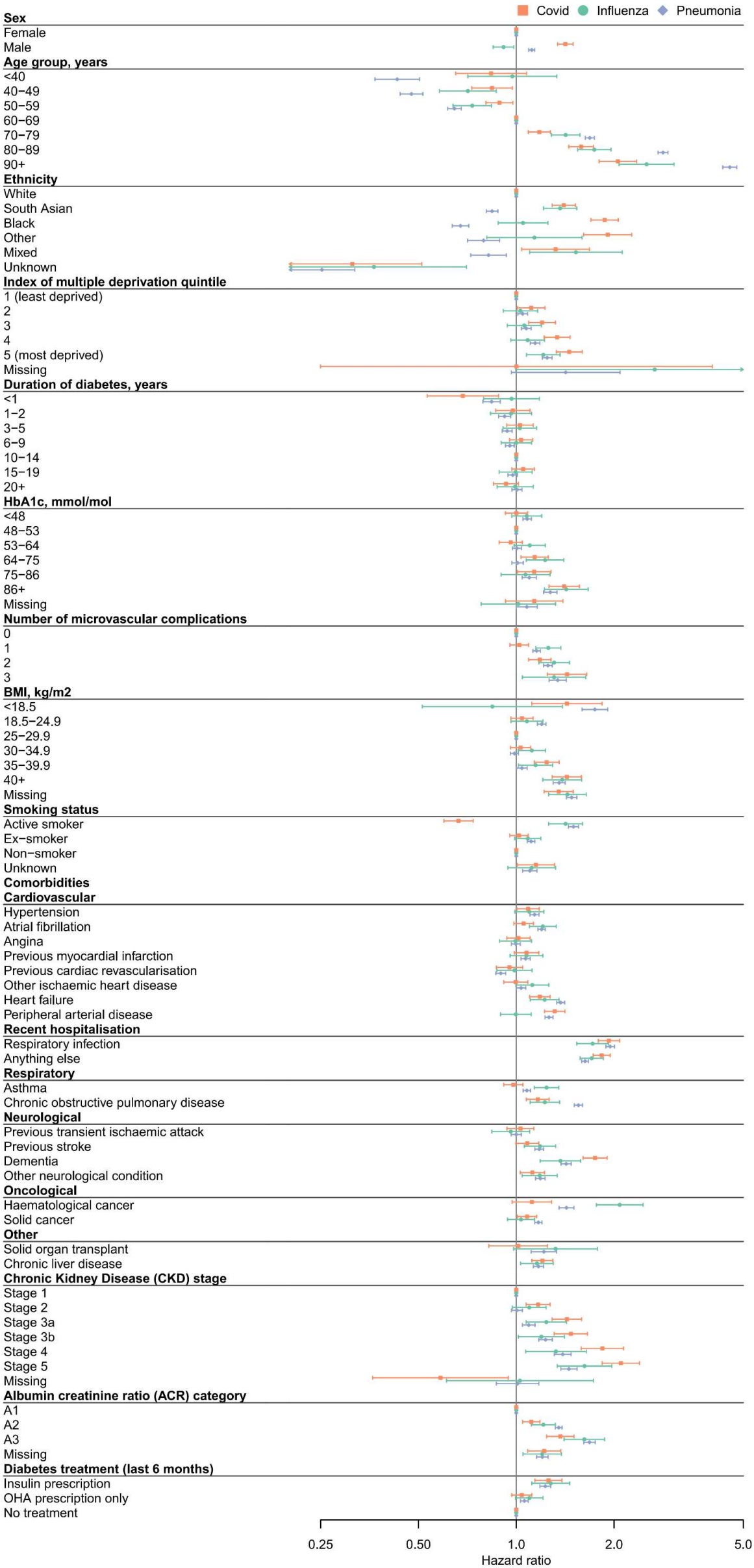
Covid-19		
ICD10 code	Description	Frequency
U07.1	COVID-19, confirmed by lab testing	4972
U07.2	COVID-19, not confirmed by lab testing (includes clinically-epidemiologically diagnosed, probable and suspected)	1073
Influenza		
ICD10 code	Description	Frequency
J10.1	Influenza with other respiratory manifestations, seasonal influenza virus identified	1645
J10.0	Influenza with pneumonia, seasonal influenza virus identified	1158
J11.1	Influenza with other respiratory manifestations, virus not identified	250
J10.8	Influenza with other manifestations, seasonal influenza virus identified	134
J11.0	Influenza with pneumonia, virus not identified	101
J09	Influenza due to identified zoonotic or pandemic influenza virus	11
J11.8	Influenza with other manifestations, virus not identified	10
Pneumonia		
ICD10 code	Description	Frequency
J18.1	Lobar pneumonia, unspecified	20367
J18.9	Pneumonia, unspecified	16382
J18.0	Bronchopneumonia, unspecified	885
J13	Pneumonia due to Streptococcus pneumoniae	407
J14	Pneumonia due to Haemophilus influenzae	138
J15.0	Pneumonia due to Klebsiella pneumoniae	137
J15.1	Pneumonia due to Pseudomonas	116
J15.2	Pneumonia due to staphylococcus	88
J15.4	Pneumonia due to other streptococci	73
J12.1	Respiratory syncytial virus pneumonia	71
J15.6	Pneumonia due to other Gram-negative bacteria	53
J15.9	Bacterial pneumonia, unspecified	53
J12.3	Human metapneumovirus pneumonia	46
J15.5	Pneumonia due to Escherichia coli	43
J17.2	Pneumonia in mycoses	41
J12.2	Parainfluenza virus pneumonia	35
J12.9	Viral pneumonia, unspecified	34
J17.3	Pneumonia in parasitic diseases	34
J18.8	Other pneumonia, organism unspecified	29
J15.8	Other bacterial pneumonia	24
J18.2	Hypostatic pneumonia, unspecified	22
J12.8	Other viral pneumonia	21
J15.3	Pneumonia due to streptococcus, group B	14
J15.7	Pneumonia due to Mycoplasma pneumoniae	14
J17.1	Pneumonia in viral diseases classified elsewhere	9
J12.0	Adenoviral pneumonia	6
J17.0	Pneumonia in bacterial diseases classified elsewhere	2
J16.0	Chlamydial pneumonia	1
J16.8	Pneumonia due to other specified infectious organisms	1

Supplemental table 4. Full baseline characteristics and Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019) hospitalisations in type 2 diabetes.

	2020 cohort	Covid-19 hospitalisations (in 2020 cohort)	2016 cohort	Influenza hospitalisations (in 2016 cohort)	Pneumonia hospitalisations (in 2016 cohort)
Number of individuals	584854	5965	585289	3226	38088
Mean (SD) follow-up, days		265.0 (38.3)		915.2 (224.8)	897.4 (246.3)
Sex					
Female	253360 (43.3)	2317 (38.8)	256656 (43.9)	1581 (49.0)	17140 (45.0)
Male	331494 (56.7)	3648 (61.2)	328633 (56.1)	1645 (51.0)	20948 (55.0)
Age group, years					
<40	12898 (2.2)	70 (1.2)	13468 (2.3)	46 (1.4)	164 (0.4)
40-49	46075 (7.9)	258 (4.3)	49649 (8.5)	128 (4.0)	717 (1.9)
50-59	114537 (19.6)	729 (12.2)	113285 (19.4)	329 (10.2)	2495 (6.6)
60-69	151493 (25.9)	1198 (20.1)	153782 (26.3)	679 (21.0)	6068 (15.9)
70-79	155424 (26.6)	1660 (27.8)	152401 (26.0)	1078 (33.4)	12073 (31.7)
80-89	89871 (15.4)	1671 (28.0)	88492 (15.1)	811 (25.1)	13324 (35.0)
90+	14556 (2.5)	379 (6.4)	14212 (2.4)	155 (4.8)	3247 (8.5)
Ethnicity					
White	445160 (76.1)	4200 (70.4)	457714 (78.2)	2586 (80.2)	33206 (87.2)
South Asian	77253 (13.2)	891 (14.9)	71050 (12.1)	403 (12.5)	2935 (7.7)
Black	35144 (6.0)	645 (10.8)	33175 (5.7)	156 (4.8)	1324 (3.5)
Other	9886 (1.7)	144 (2.4)	8178 (1.4)	35 (1.1)	306 (0.8)
Mixed	6267 (1.1)	69 (1.2)	5654 (1.0)	37 (1.1)	246 (0.6)
Unknown	11144 (1.9)	16 (0.3)	9518 (1.6)	9 (0.3)	71 (0.2)
Index of multiple deprivation quintile					
1 (least deprived)	102950 (17.6)	761 (12.8)	103184 (17.6)	502 (15.6)	6296 (16.5)
2	106968 (18.3)	921 (15.4)	109006 (18.6)	548 (17.0)	6923 (18.2)
3	113454 (19.4)	1088 (18.2)	113661 (19.4)	601 (18.6)	7264 (19.1)
4	127048 (21.7)	1446 (24.2)	125492 (21.4)	698 (21.6)	8199 (21.5)
5 (most deprived)	134146 (22.9)	1747 (29.3)	133563 (22.8)	873 (27.1)	9380 (24.6)
Missing	288 (0.0)	2 (0.0)	383 (0.1)	4 (0.1)	26 (0.1)
Duration of diagnosed diabetes, years					
<1	14311 (2.4)	67 (1.1)	36503 (6.2)	146 (4.5)	1401 (3.7)
1-2	60219 (10.3)	397 (6.7)	77510 (13.2)	306 (9.5)	3324 (8.7)
3-5	105094 (18.0)	796 (13.3)	111199 (19.0)	491 (15.2)	5218 (13.7)
6-9	128817 (22.0)	1116 (18.7)	125083 (21.4)	621 (19.2)	7088 (18.6)
10-14	124471 (21.3)	1250 (21.0)	126421 (21.6)	771 (23.9)	9620 (25.3)
15-19	89704 (15.3)	1225 (20.5)	62373 (10.7)	465 (14.4)	5764 (15.1)
20+	62238 (10.6)	1114 (18.7)	46200 (7.9)	426 (13.2)	5673 (14.9)
HbA1c, mmol/mol					
<48	167739 (28.7)	1679 (28.1)	175659 (30.0)	934 (29.0)	12271 (32.2)
48-53	116015 (19.8)	1054 (17.7)	116131 (19.8)	557 (17.3)	7015 (18.4)
53-64	147209 (25.2)	1352 (22.7)	142662 (24.4)	791 (24.5)	8912 (23.4)
64-75	66071 (11.3)	767 (12.9)	62291 (10.6)	412 (12.8)	4062 (10.7)
75-86	33970 (5.8)	408 (6.8)	32257 (5.5)	184 (5.7)	2191 (5.8)
86+	39727 (6.8)	580 (9.7)	37470 (6.4)	270 (8.4)	2646 (6.9)
Missing	14123 (2.4)	125 (2.1)	18819 (3.2)	78 (2.4)	991 (2.6)
Number of microvascular complications					
0	264011 (45.1)	1889 (31.7)	281811 (48.1)	1077 (33.4)	11930 (31.3)
1	216115 (37.0)	2140 (35.9)	204550 (34.9)	1256 (38.9)	14444 (37.9)
2	96948 (16.6)	1621 (27.2)	91671 (15.7)	789 (24.5)	10288 (27.0)
3	7780 (1.3)	315 (5.3)	7257 (1.2)	104 (3.2)	1426 (3.7)
BMI, kg/m2					
<18.5	3026 (0.5)	66 (1.1)	2801 (0.5)	16 (0.5)	497 (1.3)
18.5-24.9	86199 (14.7)	1009 (16.9)	79018 (13.5)	476 (14.8)	6985 (18.3)
25-29.9	184626 (31.6)	1747 (29.3)	178501 (30.5)	885 (27.4)	10950 (28.7)
30-34.9	151732 (25.9)	1350 (22.6)	151161 (25.8)	809 (25.1)	8249 (21.7)
35-39.9	74766 (12.8)	752 (12.6)	75339 (12.9)	405 (12.6)	3976 (10.4)
40+	48455 (8.3)	517 (8.7)	48685 (8.3)	302 (9.4)	2877 (7.6)
Missing	36050 (6.2)	524 (8.8)	49784 (8.5)	333 (10.3)	4554 (12.0)
Smoking status					
Active smoker	87220 (14.9)	556 (9.3)	90218 (15.4)	548 (17.0)	6259 (16.4)
Ex-smoker	336719 (57.6)	3847 (64.5)	316723 (54.1)	1852 (57.4)	22587 (59.3)
Non-smoker	138840 (23.7)	1288 (21.6)	149524 (25.5)	651 (20.2)	7305 (19.2)
Unknown	22075 (3.8)	274 (4.6)	28824 (4.9)	175 (5.4)	1937 (5.1)
Comorbidities					
Cardiovascular					
Hypertension	425278 (72.7)	5055 (84.7)	419645 (71.7)	2692 (83.4)	33013 (86.7)
Atrial fibrillation	70633 (12.1)	1413 (23.7)	63872 (10.9)	727 (22.5)	10486 (27.5)
Angina	87970 (15.0)	1526 (25.6)	91026 (15.6)	883 (27.4)	10973 (28.8)
Previous myocardial infarction	63738 (10.9)	1249 (20.9)	60576 (10.3)	645 (20.0)	8239 (21.6)
Previous cardiac revascularisation	57332 (9.8)	949 (15.9)	54961 (9.4)	497 (15.4)	5926 (15.6)
Other ischaemic heart disease	121776 (20.8)	2102 (35.2)	121753 (20.8)	1170 (36.3)	14645 (38.5)

	2020 cohort	Covid-19 hospitalisations (in 2020 cohort)	2016 cohort	Influenza hospitalisations (in 2016 cohort)	Pneumonia hospitalisations (in 2016 cohort)
Heart failure	61014 (10.4)	1573 (26.4)	53579 (9.2)	735 (22.8)	10402 (27.3)
Peripheral arterial disease	50045 (8.6)	1157 (19.4)	48489 (8.3)	481 (14.9)	7700 (20.2)
Recent hospitalisation					
Respiratory infection	25535 (4.4)	1049 (17.6)	21353 (3.6)	436 (13.5)	6127 (16.1)
Anything else	96421 (16.5)	2426 (40.7)	95232 (16.3)	1195 (37.0)	15007 (39.4)
Respiratory					
Asthma	125582 (21.5)	1567 (26.3)	118207 (20.2)	1063 (33.0)	11229 (29.5)
Chronic obstructive pulmonary disease	65615 (11.2)	1273 (21.3)	60108 (10.3)	806 (25.0)	10948 (28.7)
Neurological					
Previous transient ischaemic attack	31024 (5.3)	598 (10.0)	29997 (5.1)	294 (9.1)	4200 (11.0)
Previous stroke	49873 (8.5)	987 (16.5)	47721 (8.2)	504 (15.6)	6839 (18.0)
Dementia	20629 (3.5)	718 (12.0)	19548 (3.3)	226 (7.0)	3710 (9.7)
Other neurological condition	35000 (6.0)	741 (12.4)	33569 (5.7)	352 (10.9)	4967 (13.0)
Oncological					
Haematological cancer	11751 (2.0)	212 (3.6)	10352 (1.8)	155 (4.8)	1499 (3.9)
Solid cancer	79179 (13.5)	1130 (18.9)	72001 (12.3)	544 (16.9)	7887 (20.7)
Other					
Solid organ transplant	3682 (0.6)	99 (1.7)	3013 (0.5)	49 (1.5)	509 (1.3)
Chronic liver disease	69136 (11.8)	860 (14.4)	48011 (8.2)	333 (10.3)	3387 (8.9)
Chronic Kidney Disease (CKD) stage					
Stage 1	165845 (28.4)	933 (15.6)	147798 (25.3)	448 (13.9)	3873 (10.2)
Stage 2	286696 (49.0)	2438 (40.9)	290821 (49.7)	1399 (43.4)	15243 (40.0)
Stage 3a	72539 (12.4)	1079 (18.1)	80222 (13.7)	642 (19.9)	8056 (21.2)
Stage 3b	33246 (5.7)	699 (11.7)	37256 (6.4)	372 (11.5)	5844 (15.3)
Stage 4	9006 (1.5)	301 (5.0)	10490 (1.8)	143 (4.4)	2323 (6.1)
Stage 5	12871 (2.2)	496 (8.3)	13365 (2.3)	205 (6.4)	2543 (6.7)
Missing	4651 (0.8)	19 (0.3)	5337 (0.9)	17 (0.5)	206 (0.5)
Albumin creatinine ratio (ACR) category					
A1	402847 (68.9)	3284 (55.1)	388839 (66.4)	1812 (56.2)	19926 (52.3)
A2	121002 (20.7)	1719 (28.8)	106879 (18.3)	845 (26.2)	11550 (30.3)
A3	21899 (3.7)	614 (10.3)	18817 (3.2)	252 (7.8)	3219 (8.5)
Missing	39106 (6.7)	348 (5.8)	70754 (12.1)	317 (9.8)	3393 (8.9)
Diabetes treatment (last 6 months)					
Insulin prescription	79286 (13.6)	1490 (25.0)	78755 (13.5)	742 (23.0)	8481 (22.3)
OHA prescription only	362651 (62.0)	3167 (53.1)	349629 (59.7)	1739 (53.9)	19713 (51.8)
No treatment	142917 (24.4)	1308 (21.9)	156905 (26.8)	745 (23.1)	9894 (26.0)

Supplemental figure 2. Association of potential risk factors with hospitalisation for Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019) in type 2 diabetes.

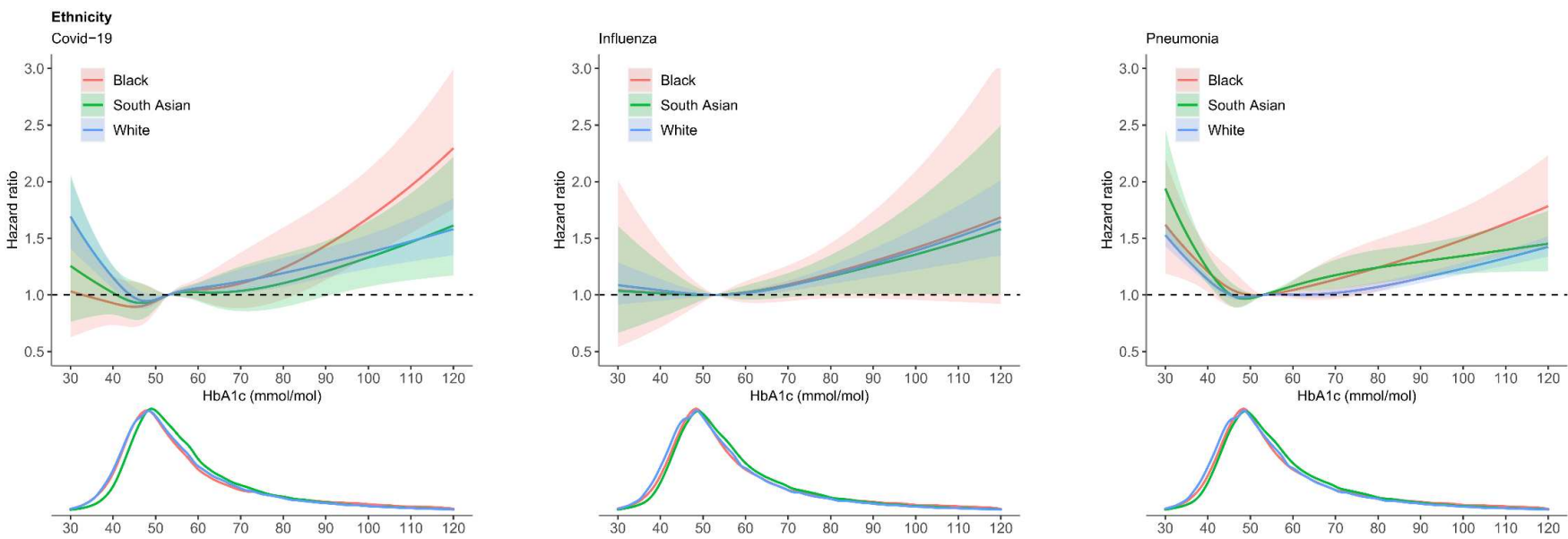


Supplemental table 5. Hazard ratio (HR) values and 95% confidence intervals (95% CI) for the association of potential risk factors with hospitalisation for Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019) in type 2 diabetes.

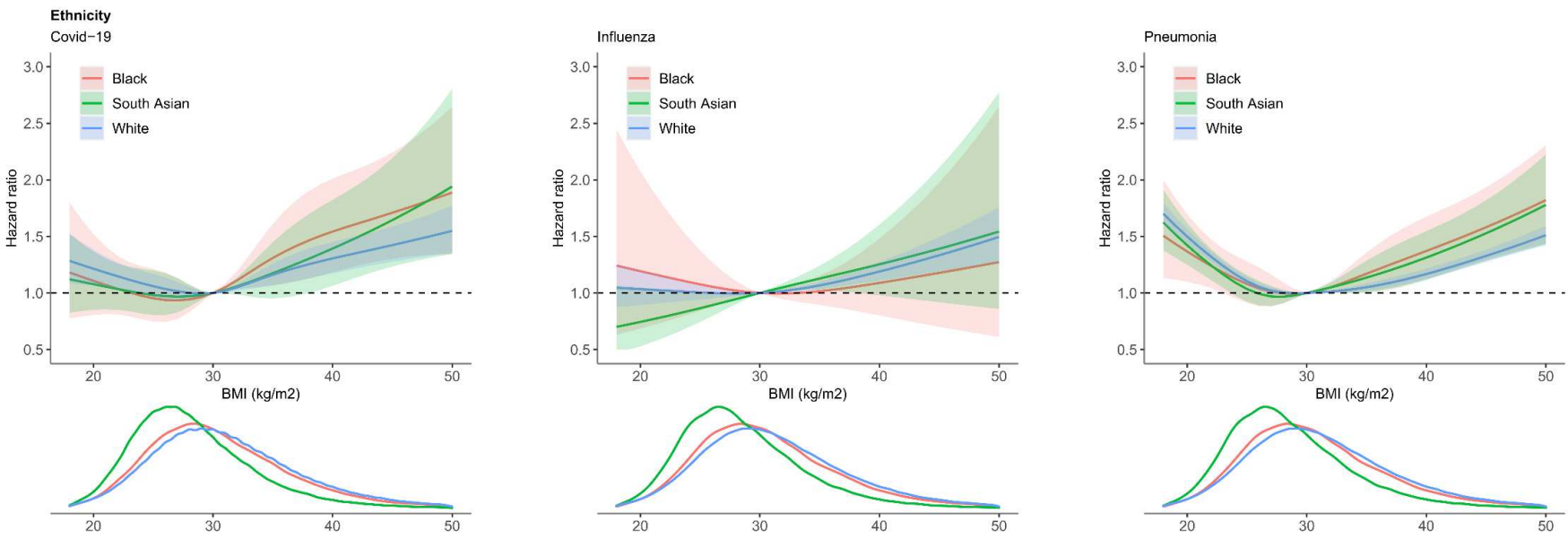
	Covid-19		Influenza		Pneumonia	
	HR (95% CI)	p value	HR (95% CI)	p value	HR (95% CI)	p value
Sex						
Female	1 (ref)		1 (ref)		1 (ref)	
Male	1.42 (1.34-1.5)	<0.001	0.91 (0.85-0.98)	0.016	1.12 (1.09-1.14)	<0.001
Age group, years						
<40	0.84 (0.65-1.08)	0.165	0.97 (0.71-1.33)	0.862	0.43 (0.37-0.5)	<0.001
40-49	0.84 (0.73-0.97)	0.019	0.71 (0.58-0.87)	<0.001	0.48 (0.44-0.52)	<0.001
50-59	0.89 (0.81-0.98)	0.014	0.73 (0.64-0.84)	<0.001	0.65 (0.62-0.68)	<0.001
60-69	1 (ref)		1 (ref)		1 (ref)	
70-79	1.18 (1.09-1.27)	<0.001	1.42 (1.28-1.57)	<0.001	1.68 (1.63-1.74)	<0.001
80-89	1.58 (1.45-1.73)	<0.001	1.74 (1.54-1.96)	<0.001	2.83 (2.73-2.93)	<0.001
90+	2.05 (1.8-2.35)	<0.001	2.52 (2.07-3.06)	<0.001	4.54 (4.32-4.77)	<0.001
Ethnicity						
White	1 (ref)		1 (ref)		1 (ref)	
South Asian	1.4 (1.29-1.52)	<0.001	1.36 (1.21-1.54)	<0.001	0.84 (0.81-0.88)	<0.001
Black	1.87 (1.7-2.06)	<0.001	1.05 (0.88-1.25)	0.593	0.67 (0.64-0.71)	<0.001
Other	1.91 (1.61-2.27)	<0.001	1.14 (0.81-1.59)	0.456	0.79 (0.71-0.89)	<0.001
Mixed	1.32 (1.04-1.68)	0.023	1.53 (1.1-2.12)	0.011	0.82 (0.72-0.93)	0.002
Unknown	0.31 (0.19-0.51)	<0.001	0.36 (0.19-0.7)	0.003	0.25 (0.2-0.32)	<0.001
Index of multiple deprivation quintile						
1 (least deprived)	1 (ref)		1 (ref)		1 (ref)	
2	1.11 (1.01-1.23)	0.031	1.03 (0.91-1.16)	0.637	1.05 (1.01-1.08)	0.009
3	1.2 (1.09-1.32)	<0.001	1.06 (0.94-1.19)	0.357	1.07 (1.04-1.11)	<0.001
4	1.34 (1.22-1.46)	<0.001	1.08 (0.96-1.22)	0.185	1.14 (1.1-1.18)	<0.001
5 (most deprived)	1.46 (1.33-1.6)	<0.001	1.21 (1.08-1.36)	0.002	1.25 (1.2-1.29)	<0.001
Missing	1 (0.25-4.01)	0.999	2.67 (1-7.14)	0.051	1.42 (0.97-2.09)	0.075
Duration of diagnosed diabetes, years						
<1	0.68 (0.53-0.88)	0.003	0.97 (0.79-1.18)	0.739	0.84 (0.79-0.89)	<0.001
1-2	0.98 (0.86-1.1)	0.693	0.96 (0.83-1.11)	0.619	0.92 (0.88-0.96)	<0.001
3-5	1.03 (0.93-1.13)	0.585	1.03 (0.91-1.15)	0.683	0.94 (0.9-0.97)	<0.001
6-9	1.04 (0.95-1.12)	0.408	1 (0.9-1.11)	0.992	0.96 (0.93-0.99)	0.004
10-14	1 (ref)		1 (ref)		1 (ref)	
15-19	1.05 (0.97-1.14)	0.232	1 (0.89-1.12)	0.935	0.97 (0.94-1.01)	0.135
20+	0.93 (0.85-1.02)	0.108	0.99 (0.87-1.13)	0.906	1.01 (0.97-1.04)	0.774
HbA1c, mmol/mol						
<48	1 (0.93-1.08)	0.975	1.08 (0.97-1.2)	0.172	1.08 (1.05-1.11)	<0.001
48-53	1 (ref)		1 (ref)		1 (ref)	
53-64	0.96 (0.89-1.04)	0.349	1.1 (0.99-1.23)	0.09	1 (0.97-1.04)	0.776
64-75	1.14 (1.03-1.25)	0.009	1.23 (1.07-1.4)	0.003	1.01 (0.97-1.05)	0.642
75-86	1.13 (1.01-1.28)	0.037	1.07 (0.9-1.27)	0.457	1.1 (1.04-1.15)	<0.001
86+	1.4 (1.26-1.56)	<0.001	1.43 (1.22-1.66)	<0.001	1.27 (1.21-1.33)	<0.001
Missing	1.14 (0.93-1.39)	0.22	1.01 (0.78-1.32)	0.913	1.08 (1-1.16)	0.048
Number of microvascular complications						
0	1 (ref)		1 (ref)		1 (ref)	
1	1.02 (0.96-1.09)	0.527	1.26 (1.15-1.37)	<0.001	1.16 (1.13-1.19)	<0.001
2	1.18 (1.09-1.28)	<0.001	1.31 (1.17-1.46)	<0.001	1.25 (1.21-1.29)	<0.001
3	1.43 (1.25-1.65)	<0.001	1.31 (1.04-1.64)	0.019	1.34 (1.26-1.43)	<0.001
BMI, kg/m2						
<18.5	1.43 (1.12-1.84)	0.005	0.84 (0.51-1.39)	0.504	1.75 (1.59-1.91)	<0.001
18.5-24.9	1.04 (0.96-1.13)	0.312	1.08 (0.96-1.21)	0.19	1.2 (1.16-1.23)	<0.001
25-29.9	1 (ref)		1 (ref)		1 (ref)	
30-34.9	1.03 (0.96-1.11)	0.397	1.12 (1.01-1.23)	0.025	0.99 (0.96-1.02)	0.383
35-39.9	1.24 (1.14-1.35)	<0.001	1.15 (1.02-1.29)	0.026	1.04 (1-1.08)	0.035
40+	1.43 (1.29-1.59)	<0.001	1.39 (1.21-1.59)	<0.001	1.35 (1.3-1.41)	<0.001
Missing	1.35 (1.22-1.5)	<0.001	1.44 (1.26-1.64)	<0.001	1.48 (1.43-1.54)	<0.001
Smoking status						
Active smoker	0.66 (0.6-0.74)	<0.001	1.42 (1.26-1.6)	<0.001	1.5 (1.45-1.55)	<0.001
Ex-smoker	1.02 (0.96-1.09)	0.552	1.09 (0.99-1.19)	0.083	1.11 (1.08-1.14)	<0.001
Non-smoker	1 (ref)		1 (ref)		1 (ref)	
Unknown	1.15 (1.01-1.31)	0.039	1.12 (0.94-1.32)	0.204	1.1 (1.05-1.16)	<0.001
Comorbidities						
Cardiovascular						
Hypertension	1.09 (1.01-1.18)	0.037	1.1 (0.99-1.22)	0.077	1.14 (1.1-1.17)	<0.001
Atrial fibrillation	1.05 (0.98-1.13)	0.139	1.21 (1.1-1.33)	<0.001	1.2 (1.17-1.23)	<0.001
Angina	1.02 (0.93-1.1)	0.714	0.99 (0.89-1.11)	0.927	1 (0.97-1.03)	0.836
Previous myocardial infarction	1.08 (0.99-1.17)	0.099	1.08 (0.96-1.21)	0.221	1.07 (1.03-1.1)	<0.001
Previous cardiac revascularisation	0.95 (0.87-1.05)	0.315	0.99 (0.87-1.12)	0.841	0.9 (0.86-0.93)	<0.001
Other ischaemic heart disease	1 (0.92-1.09)	0.938	1.12 (1-1.26)	0.057	1.03 (1-1.07)	0.041
Heart failure	1.18 (1.1-1.27)	<0.001	1.22 (1.1-1.35)	<0.001	1.37 (1.33-1.41)	<0.001
Peripheral arterial disease	1.31 (1.22-1.41)	<0.001	1 (0.89-1.11)	0.957	1.26 (1.23-1.3)	<0.001
Recent hospitalisation						
Respiratory infection	1.93 (1.79-2.08)	<0.001	1.72 (1.54-1.92)	<0.001	1.95 (1.89-2.01)	<0.001
Anything else	1.83 (1.73-1.95)	<0.001	1.71 (1.57-1.85)	<0.001	1.63 (1.59-1.67)	<0.001

		Covid-19		Influenza		Pneumonia	
		HR (95% CI)	p value	HR (95% CI)	p value	HR (95% CI)	p value
Respiratory							
	Asthma	0.98 (0.92-1.05)	0.547	1.24 (1.14-1.35)	<0.001	1.08 (1.05-1.11)	<0.001
	Chronic obstructive pulmonary disease	1.16 (1.07-1.26)	<0.001	1.22 (1.1-1.36)	<0.001	1.55 (1.51-1.6)	<0.001
Neurological							
	Previous transient ischaemic attack	1.03 (0.94-1.13)	0.543	0.96 (0.84-1.1)	0.568	1 (0.96-1.04)	0.991
	Previous stroke	1.08 (1-1.17)	0.06	1.18 (1.06-1.32)	0.003	1.18 (1.14-1.21)	<0.001
	Dementia	1.75 (1.61-1.9)	<0.001	1.37 (1.19-1.58)	<0.001	1.42 (1.37-1.48)	<0.001
	Other neurological condition	1.12 (1.03-1.22)	0.009	1.18 (1.04-1.34)	0.009	1.19 (1.15-1.23)	<0.001
Oncological							
	Haematological cancer	1.12 (0.97-1.29)	0.121	2.08 (1.76-2.46)	<0.001	1.43 (1.35-1.5)	<0.001
	Solid cancer	1.08 (1.01-1.15)	0.027	1.03 (0.94-1.14)	0.49	1.17 (1.14-1.2)	<0.001
Other							
	Solid organ transplant	1.01 (0.82-1.25)	0.897	1.32 (0.98-1.78)	0.066	1.22 (1.11-1.33)	<0.001
	Chronic liver disease	1.2 (1.12-1.3)	<0.001	1.16 (1.03-1.3)	0.013	1.17 (1.13-1.21)	<0.001
Chronic Kidney Disease (CKD) stage							
	Stage 1	1 (ref)		1 (ref)		1 (ref)	
	Stage 2	1.17 (1.07-1.27)	<0.001	1.1 (0.97-1.24)	0.132	1 (0.97-1.04)	0.827
	Stage 3a	1.43 (1.29-1.59)	<0.001	1.24 (1.07-1.43)	0.004	1.09 (1.04-1.14)	<0.001
	Stage 3b	1.47 (1.31-1.66)	<0.001	1.19 (1.01-1.41)	0.033	1.23 (1.17-1.29)	<0.001
	Stage 4	1.84 (1.58-2.14)	<0.001	1.33 (1.07-1.64)	0.01	1.39 (1.31-1.48)	<0.001
	Stage 5	2.1 (1.84-2.39)	<0.001	1.62 (1.34-1.97)	<0.001	1.45 (1.37-1.54)	<0.001
	Missing	0.58 (0.36-0.95)	0.029	1.03 (0.61-1.73)	0.921	1.01 (0.87-1.17)	0.903
Albumin creatinine ratio (ACR) category							
	A1	1 (ref)		1 (ref)		1 (ref)	
	A2	1.11 (1.05-1.18)	<0.001	1.21 (1.11-1.32)	<0.001	1.35 (1.32-1.38)	<0.001
	A3	1.37 (1.24-1.51)	<0.001	1.62 (1.4-1.87)	<0.001	1.68 (1.61-1.75)	<0.001
	Missing	1.22 (1.08-1.37)	<0.001	1.2 (1.05-1.38)	0.008	1.2 (1.15-1.25)	<0.001
Diabetes treatment (last 6 months)							
	Insulin prescription	1.26 (1.14-1.38)	<0.001	1.28 (1.12-1.46)	<0.001	1.23 (1.18-1.28)	<0.001
	OHA prescription only	1.04 (0.97-1.12)	0.286	1.1 (1-1.21)	0.062	1.06 (1.03-1.09)	<0.001
	No treatment	1 (ref)		1 (ref)		1 (ref)	

Supplemental figure 3A. Association of continuous HbA1c with hospitalisation for Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019) in type 2 diabetes by ethnicity subgroup. Density plots show the distribution of HbA1c in each group.



Supplemental figure 3B. Association of continuous BMI with hospitalisation for Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019) in type 2 diabetes by ethnicity subgroup. Density plots show the distribution of BMI in each group.

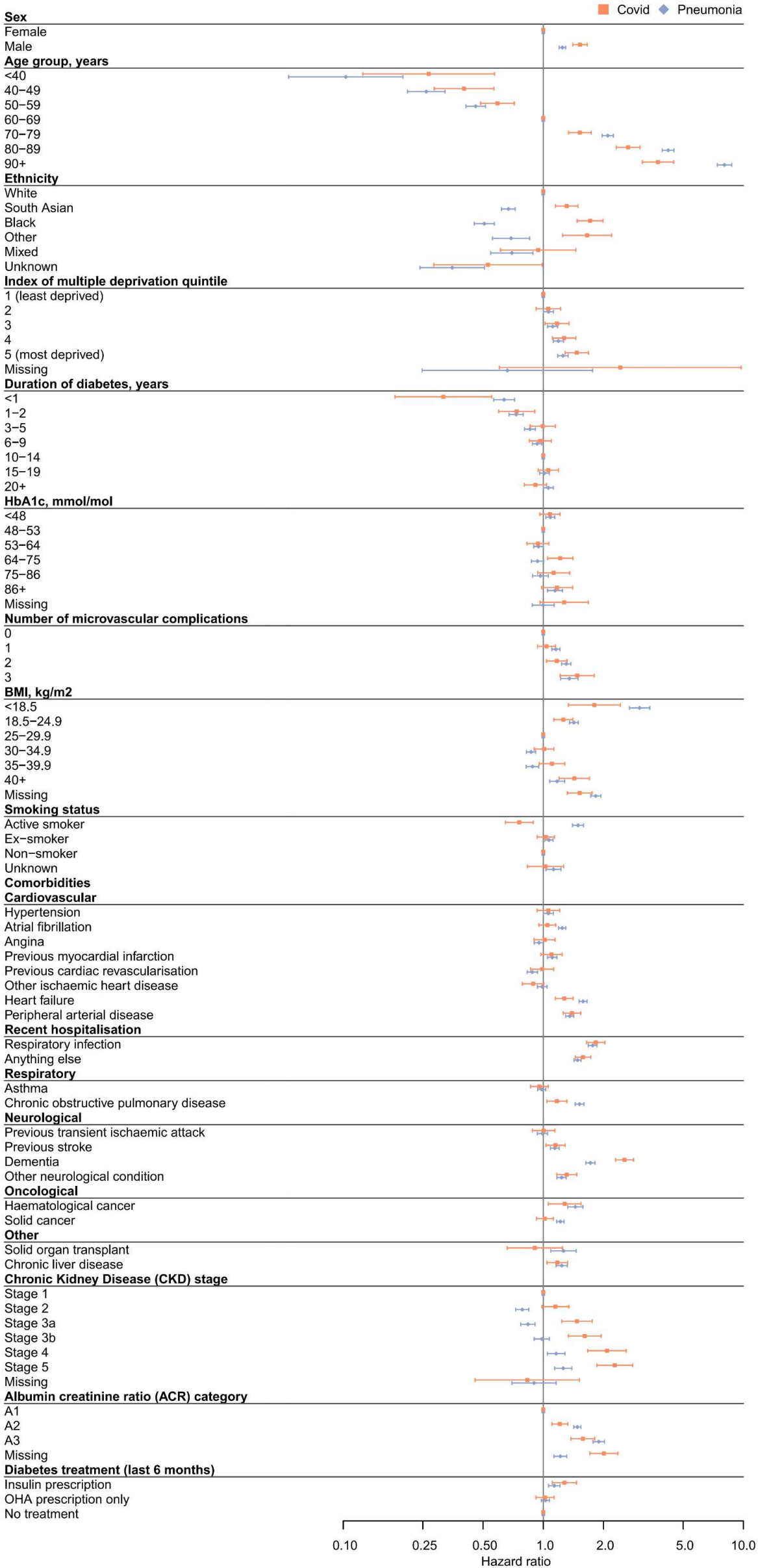


Supplemental table 6. Baseline characteristics and Covid-19 (2020) and pneumonia (2016-2019) deaths in type 2 diabetes.

	2020 cohort	Covid-19 deaths (in 2020 cohort)	2016 cohort	Pneumonia deaths (in 2016 cohort)
Number of individuals	584854	2635	585289	12652
Mean (SD) follow-up, days		266.1 (35.5)		917.0 (223.2)
Sex				
Female	253360 (43.3)	1023 (38.8)	256656 (43.9)	5499 (43.5)
Male	331494 (56.7)	1612 (61.2)	328633 (56.1)	7153 (56.5)
Age group, years				
<40	12898 (2.2)	7 (0.3)	13468 (2.3)	9 (0.1)
40-49	46075 (7.9)	38 (1.4)	49649 (8.5)	91 (0.7)
50-59	114537 (19.6)	150 (5.7)	113285 (19.4)	404 (3.2)
60-69	151493 (25.9)	381 (14.5)	153782 (26.3)	1401 (11.1)
70-79	155424 (26.6)	729 (27.7)	152401 (26.0)	3667 (29.0)
80-89	89871 (15.4)	1047 (39.7)	88492 (15.1)	5370 (42.4)
90+	14556 (2.5)	283 (10.7)	14212 (2.4)	1710 (13.5)
Ethnicity				
White	445160 (76.1)	1944 (73.8)	457714 (78.2)	11398 (90.1)
South Asian	77253 (13.2)	341 (12.9)	71050 (12.1)	748 (5.9)
Black	35144 (6.0)	267 (10.1)	33175 (5.7)	326 (2.6)
Other	9886 (1.7)	52 (2.0)	8178 (1.4)	86 (0.7)
Mixed	6267 (1.1)	21 (0.8)	5654 (1.0)	66 (0.5)
Unknown	11144 (1.9)	10 (0.4)	9518 (1.6)	28 (0.2)
Index of multiple deprivation quintile				
1 (least deprived)	102950 (17.6)	371 (14.1)	103184 (17.6)	2177 (17.2)
2	106968 (18.3)	418 (15.9)	109006 (18.6)	2378 (18.8)
3	113454 (19.4)	488 (18.5)	113661 (19.4)	2481 (19.6)
4	127048 (21.7)	607 (23.0)	125492 (21.4)	2708 (21.4)
5 (most deprived)	134146 (22.9)	749 (28.4)	133563 (22.8)	2904 (23.0)
Missing	288 (0.0)	2 (0.1)	383 (0.1)	4 (0.0)
Duration of diagnosed diabetes, years				
<1	14311 (2.4)	13 (0.5)	36503 (6.2)	331 (2.6)
1-2	60219 (10.3)	120 (4.6)	77510 (13.2)	845 (6.7)
3-5	105094 (18.0)	315 (12.0)	111199 (19.0)	1553 (12.3)
6-9	128817 (22.0)	438 (16.6)	125083 (21.4)	2294 (18.1)
10-14	124471 (21.3)	562 (21.3)	126421 (21.6)	3349 (26.5)
15-19	89704 (15.3)	604 (22.9)	62373 (10.7)	2112 (16.7)
20+	62238 (10.6)	583 (22.1)	46200 (7.9)	2168 (17.1)
HbA1c, mmol/mol				
<48	167739 (28.7)	838 (31.8)	175659 (30.0)	4411 (34.9)
48-53	116015 (19.8)	453 (17.2)	116131 (19.8)	2370 (18.7)
53-64	147209 (25.2)	567 (21.5)	142662 (24.4)	2862 (22.6)
64-75	66071 (11.3)	349 (13.2)	62291 (10.6)	1269 (10.0)
75-86	33970 (5.8)	168 (6.4)	32257 (5.5)	642 (5.1)
86+	39727 (6.8)	189 (7.2)	37470 (6.4)	756 (6.0)
Missing	14123 (2.4)	71 (2.7)	18819 (3.2)	342 (2.7)
Number of microvascular complications				
0	264011 (45.1)	706 (26.8)	281811 (48.1)	3447 (27.2)
1	216115 (37.0)	957 (36.3)	204550 (34.9)	4804 (38.0)
2	96948 (16.6)	804 (30.5)	91671 (15.7)	3868 (30.6)
3	7780 (1.3)	168 (6.4)	7257 (1.2)	533 (4.2)
BMI, kg/m2				
<18.5	3026 (0.5)	47 (1.8)	2801 (0.5)	319 (2.5)
18.5-24.9	86199 (14.7)	587 (22.3)	79018 (13.5)	2900 (22.9)
25-29.9	184626 (31.6)	755 (28.7)	178501 (30.5)	3616 (28.6)
30-34.9	151732 (25.9)	526 (20.0)	151161 (25.8)	2236 (17.7)
35-39.9	74766 (12.8)	246 (9.3)	75339 (12.9)	968 (7.7)
40+	48455 (8.3)	166 (6.3)	48685 (8.3)	656 (5.2)
Missing	36050 (6.2)	308 (11.7)	49784 (8.5)	1957 (15.5)
Smoking status				
Active smoker	87220 (14.9)	234 (8.9)	90218 (15.4)	1937 (15.3)
Ex-smoker	336719 (57.6)	1742 (66.1)	316723 (54.1)	7553 (59.7)
Non-smoker	138840 (23.7)	551 (20.9)	149524 (25.5)	2478 (19.6)
Unknown	22075 (3.8)	108 (4.1)	28824 (4.9)	684 (5.4)
Comorbidities				
Cardiovascular				
Hypertension	425278 (72.7)	2334 (88.6)	419645 (71.7)	11173 (88.3)
Atrial fibrillation	70633 (12.1)	769 (29.2)	63872 (10.9)	4175 (33.0)
Angina	87970 (15.0)	749 (28.4)	91026 (15.6)	3842 (30.4)
Previous myocardial infarction	63738 (10.9)	633 (24.0)	60576 (10.3)	3064 (24.2)
Previous cardiac revascularisation	57332 (9.8)	462 (17.5)	54961 (9.4)	2035 (16.1)
Other ischaemic heart disease	121776 (20.8)	1022 (38.8)	121753 (20.8)	5196 (41.1)
Heart failure	61014 (10.4)	848 (32.2)	53579 (9.2)	4195 (33.2)
Peripheral arterial disease	50045 (8.6)	635 (24.1)	48489 (8.3)	3060 (24.2)

	2020 cohort	Covid-19 deaths (in 2020 cohort)	2016 cohort	Pneumonia deaths (in 2016 cohort)
Recent hospitalisation				
Respiratory infection	25535 (4.4)	563 (21.4)	21353 (3.6)	2387 (18.9)
Anything else	96421 (16.5)	1171 (44.4)	95232 (16.3)	5409 (42.8)
Respiratory				
Asthma	125582 (21.5)	683 (25.9)	118207 (20.2)	3395 (26.8)
Chronic obstructive pulmonary disease	65615 (11.2)	642 (24.4)	60108 (10.3)	3755 (29.7)
Neurological				
Previous transient ischaemic attack	31024 (5.3)	334 (12.7)	29997 (5.1)	1597 (12.6)
Previous stroke	49873 (8.5)	570 (21.6)	47721 (8.2)	2591 (20.5)
Dementia	20629 (3.5)	572 (21.7)	19548 (3.3)	1831 (14.5)
Other neurological condition	35000 (6.0)	447 (17.0)	33569 (5.7)	1974 (15.6)
Oncological				
Haematological cancer	11751 (2.0)	119 (4.5)	10352 (1.8)	550 (4.3)
Solid cancer	79179 (13.5)	555 (21.1)	72001 (12.3)	2965 (23.4)
Other				
Solid organ transplant	3682 (0.6)	41 (1.6)	3013 (0.5)	193 (1.5)
Chronic liver disease	69136 (11.8)	322 (12.2)	48011 (8.2)	1034 (8.2)
Chronic Kidney Disease (CKD) stage				
Stage 1	165845 (28.4)	239 (9.1)	147798 (25.3)	988 (7.8)
Stage 2	286696 (49.0)	968 (36.7)	290821 (49.7)	4481 (35.4)
Stage 3a	72539 (12.4)	553 (21.0)	80222 (13.7)	2787 (22.0)
Stage 3b	33246 (5.7)	415 (15.7)	37256 (6.4)	2279 (18.0)
Stage 4	9006 (1.5)	186 (7.1)	10490 (1.8)	999 (7.9)
Stage 5	12871 (2.2)	261 (9.9)	13365 (2.3)	1043 (8.2)
Missing	4651 (0.8)	13 (0.5)	5337 (0.9)	75 (0.6)
Albumin creatinine ratio (ACR) category				
A1	402847 (68.9)	1271 (48.2)	388839 (66.4)	6044 (47.8)
A2	121002 (20.7)	845 (32.1)	106879 (18.3)	4334 (34.3)
A3	21899 (3.7)	322 (12.2)	18817 (3.2)	1281 (10.1)
Missing	39106 (6.7)	197 (7.5)	70754 (12.1)	993 (7.8)
Diabetes treatment (last 6 months)				
Insulin prescription	79286 (13.6)	682 (25.9)	78755 (13.5)	2772 (21.9)
OHA prescription only	362651 (62.0)	1289 (48.9)	349629 (59.7)	6309 (49.9)
No treatment	142917 (24.4)	664 (25.2)	156905 (26.8)	3571 (28.2)

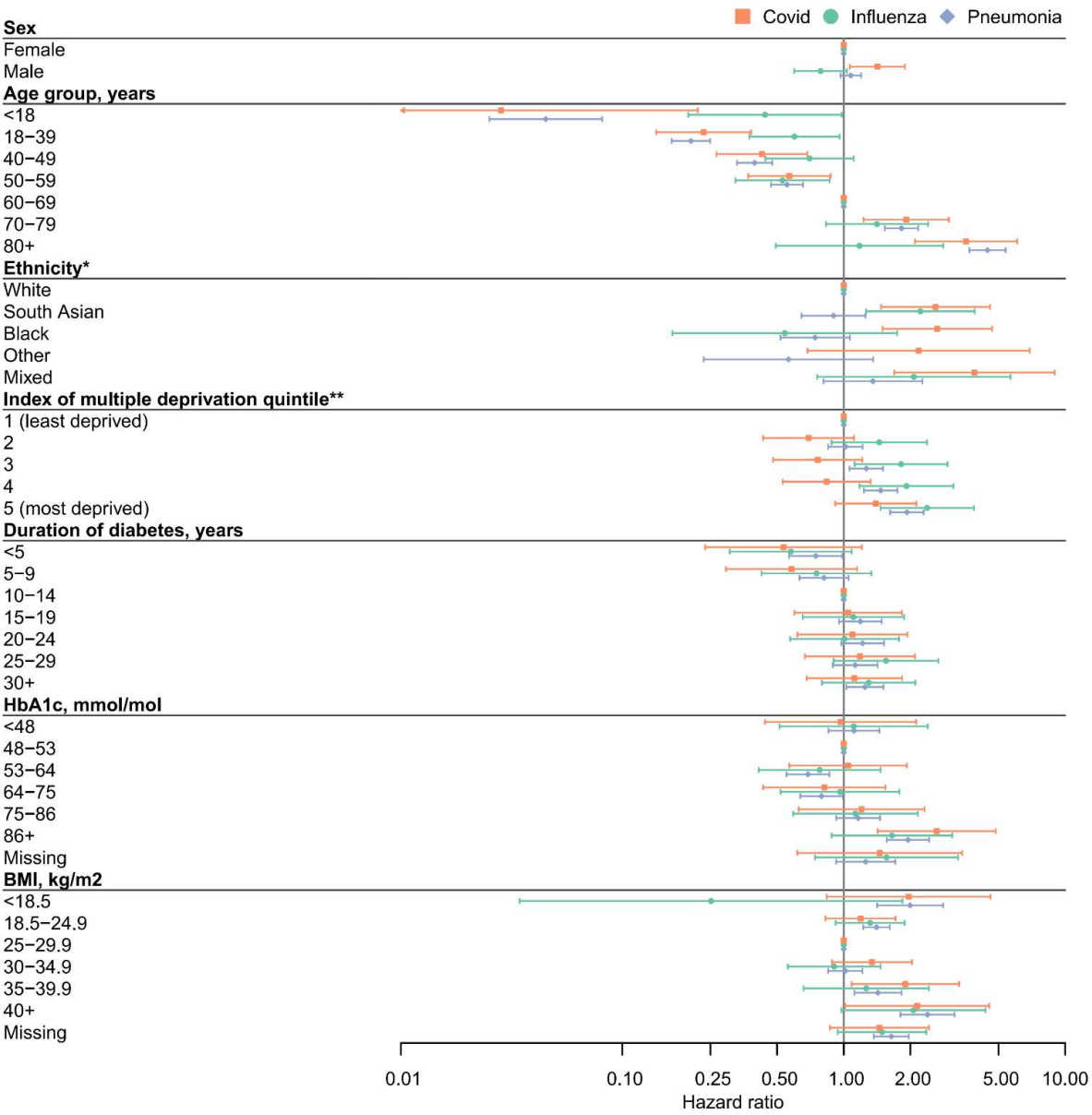
Supplemental figure 4. Association of potential risk factors with Covid-19 (2020), and pneumonia (2016-2019) mortality in type 2 diabetes.



Supplemental table 7. Baseline characteristics and Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019) hospitalisations in type 1 diabetes.

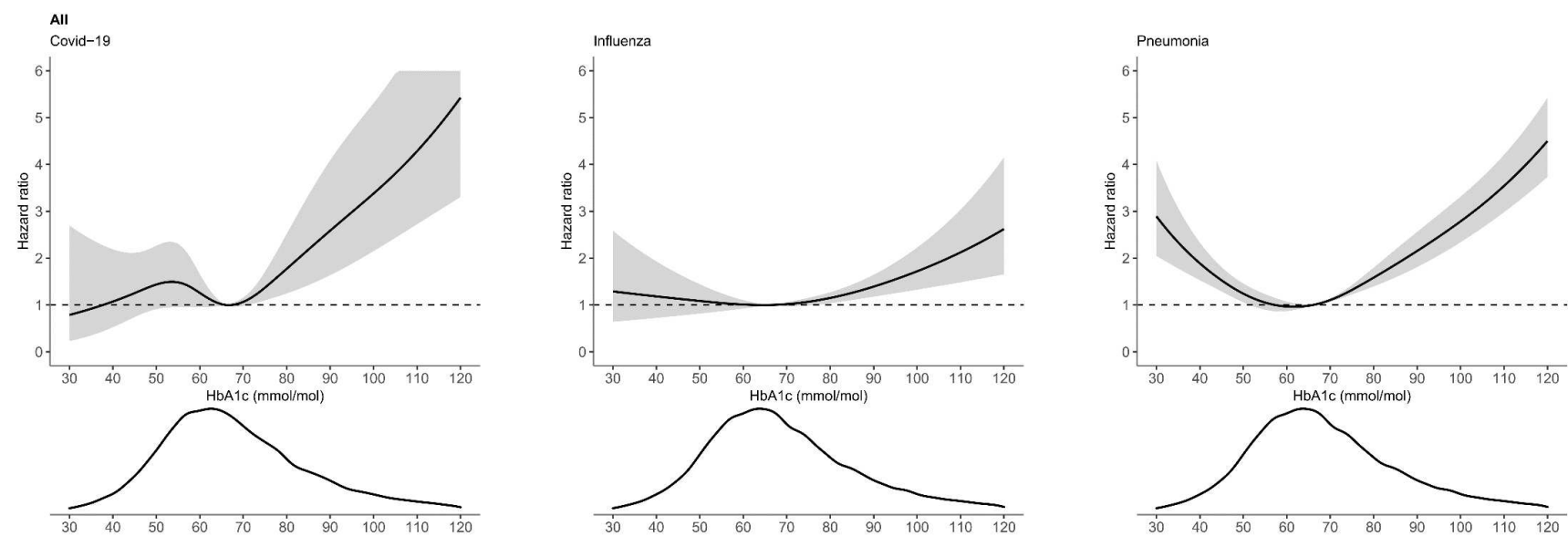
	2020 cohort	Covid-19 hospitalisations (in 2020 cohort)	2016 cohort	Influenza hospitalisations (in 2016 cohort)	Pneumonia hospitalisations (in 2016 cohort)
Number of individuals	43033	209	42488	208	1401
Mean (SD) follow-up, days		267.0 (33.2)		917.3 (223.0)	907.1 (236.2)
Sex					
Female	18172 (42.2)	76 (36.4)	17889 (42.1)	103 (49.5)	611 (43.6)
Male	24861 (57.8)	133 (63.6)	24599 (57.9)	105 (50.5)	790 (56.4)
Age, years					
<18	4458 (10.4)	1 (0.5)	4502 (10.6)	12 (5.8)	13 (0.9)
18-39	14454 (33.6)	34 (16.3)	13996 (32.9)	59 (28.4)	191 (13.6)
40-49	7480 (17.4)	31 (14.8)	7995 (18.8)	43 (20.7)	208 (14.8)
50-59	8056 (18.7)	42 (20.1)	7911 (18.6)	31 (14.9)	283 (20.2)
60-69	5079 (11.8)	43 (20.6)	4731 (11.1)	34 (16.3)	281 (20.1)
70-79	2689 (6.2)	37 (17.7)	2460 (5.8)	23 (11.1)	239 (17.1)
80+	817 (1.9)	21 (10.0)	893 (2.1)	6 (2.9)	186 (13.3)
Ethnicity					
White	38478 (89.4)	170 (81.3)	38337 (90.2)	187 (89.9)	1311 (93.6)
South Asian	1576 (3.7)	14 (6.7)	1494 (3.5)	14 (6.7)	37 (2.6)
Black	1385 (3.2)	16 (7.7)	1253 (2.9)	3 (1.4)	33 (2.4)
Other	464 (1.1)	3 (1.4)	373 (0.9)	0 (0.0)	5 (0.4)
Mixed	525 (1.2)	6 (2.9)	476 (1.1)	4 (1.9)	15 (1.1)
Unknown	605 (1.4)	0 (0.0)	555 (1.3)	0 (0.0)	0 (0.0)
Index of multiple deprivation quintile					
1 (least deprived)	9395 (21.8)	43 (20.6)	9251 (21.8)	28 (13.5)	254 (18.1)
2	8710 (20.2)	30 (14.4)	8652 (20.4)	37 (17.8)	237 (16.9)
3	8334 (19.4)	33 (15.8)	8347 (19.6)	44 (21.2)	276 (19.7)
4	8444 (19.6)	38 (18.2)	8342 (19.6)	45 (21.6)	292 (20.8)
5 (most deprived)	8128 (18.9)	65 (31.1)	7864 (18.5)	54 (26.0)	342 (24.4)
Missing	22 (0.1)	0 (0.0)	32 (0.1)	0 (0.0)	0 (0.0)
Duration of diagnosed diabetes, years					
<5	5655 (13.1)	8 (3.8)	6556 (15.4)	17 (8.2)	81 (5.8)
5-9	6194 (14.4)	13 (6.2)	6077 (14.3)	21 (10.1)	101 (7.2)
10-14	5609 (13.0)	23 (11.0)	5899 (13.9)	28 (13.5)	144 (10.3)
15-19	5466 (12.7)	27 (12.9)	5355 (12.6)	28 (13.5)	174 (12.4)
20-24	4621 (10.7)	25 (12.0)	4612 (10.9)	22 (10.6)	176 (12.6)
25-29	4101 (9.5)	27 (12.9)	3747 (8.8)	27 (13.0)	149 (10.6)
30+	11387 (26.5)	86 (41.1)	10242 (24.1)	65 (31.2)	576 (41.1)
HbA1c, mmol/mol					
<48	3104 (7.2)	12 (5.7)	2796 (6.6)	13 (6.2)	109 (7.8)
48-53	3232 (7.5)	13 (6.2)	2967 (7.0)	13 (6.2)	111 (7.9)
53-64	10995 (25.6)	50 (23.9)	10340 (24.3)	37 (17.8)	263 (18.8)
64-75	9951 (23.1)	36 (17.2)	10098 (23.8)	46 (22.1)	283 (20.2)
75-86	5891 (13.7)	30 (14.4)	5979 (14.1)	32 (15.4)	228 (16.3)
86+	6097 (14.2)	57 (27.3)	6351 (14.9)	45 (21.6)	327 (23.3)
Missing	3763 (8.7)	11 (5.3)	3957 (9.3)	22 (10.6)	80 (5.7)
BMI, kg/m2					
<18.5	1462 (3.4)	6 (2.9)	1267 (3.0)	1 (0.5)	37 (2.6)
18.5-24.9	13478 (31.3)	61 (29.2)	13132 (30.9)	70 (33.7)	465 (33.2)
25-29.9	12966 (30.1)	57 (27.3)	12606 (29.7)	54 (26.0)	372 (26.6)
30-34.9	6258 (14.5)	37 (17.7)	5704 (13.4)	24 (11.5)	181 (12.9)
35-39.9	1934 (4.5)	16 (7.7)	1735 (4.1)	11 (5.3)	78 (5.6)
40+	949 (2.2)	8 (3.8)	782 (1.8)	8 (3.8)	57 (4.1)
Missing	5986 (13.9)	24 (11.5)	7262 (17.1)	40 (19.2)	211 (15.1)

Supplemental figure 5. Association of potential risk factors with hospitalisation for Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019) in type 1 diabetes.

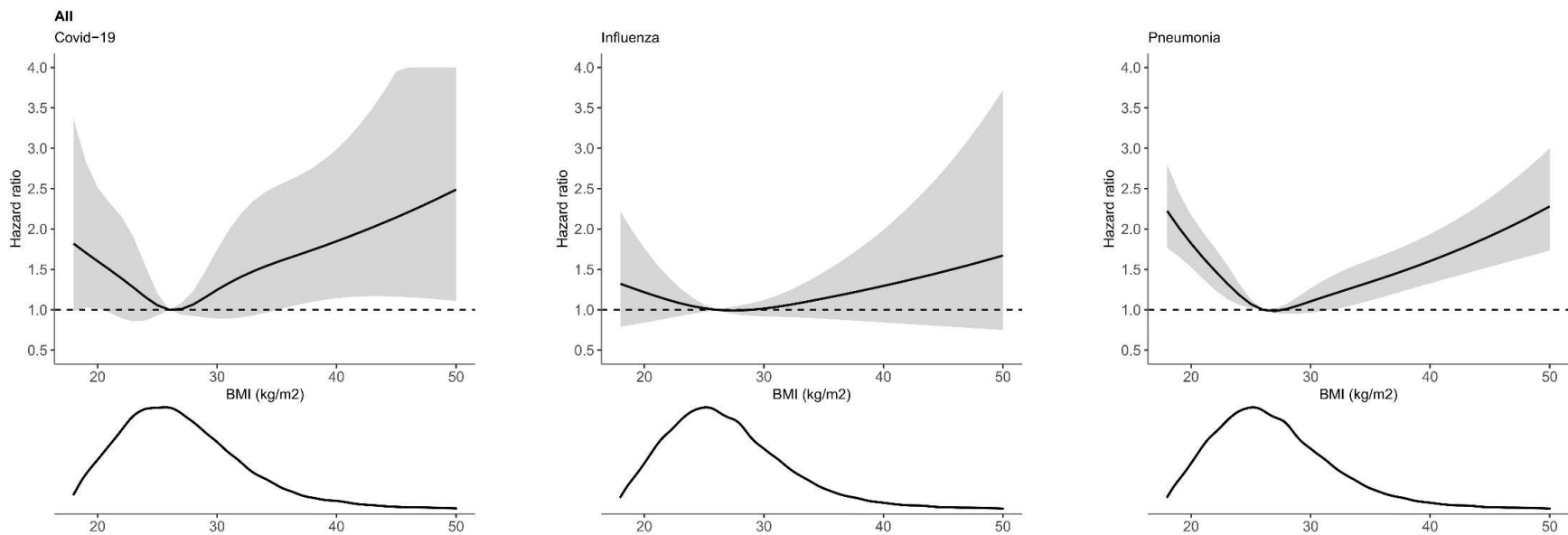


*No influenza hospitalisations occurred in other ethnicity group. No Covid-19, influenza or pneumonia hospitalisations occurred in unknown ethnicity group. ** No Covid-19, influenza or pneumonia hospitalisations occurred in missing IMD group.

Supplemental figure 6A. Association of continuous HbA1c with hospitalisation for Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019) in type 1 diabetes. Density plots show the distribution of HbA1c in each group.



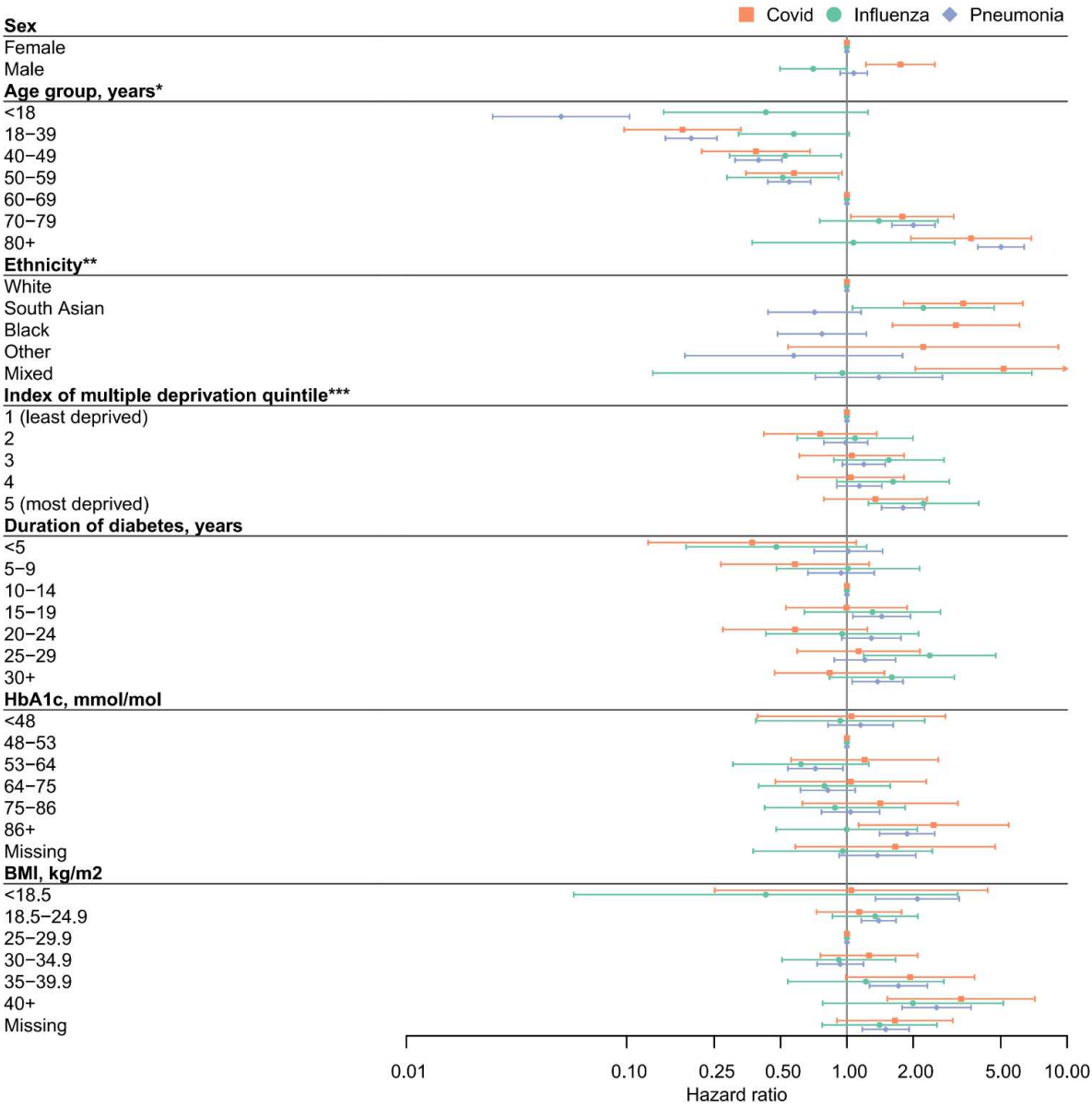
Supplemental figure 6B. Association of continuous BMI with hospitalisation for Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019) in type 1 diabetes. Density plots show the distribution of BMI in each group.



Supplemental table 8. Baseline characteristics and Covid-19, influenza, and pneumonia hospitalisations in type 1 diabetes, restricting hospitalisation definition to primary diagnosis in HES.

	2020 cohort	Covid-19 hospitalisations (in 2020 cohort)	2016 cohort	Influenza hospitalisations (in 2016 cohort)	Pneumonia hospitalisations (in 2016 cohort)
Number of individuals	43033	142	42488	130	803
Mean (SD) follow-up, days		267.2 (32.6)		917.9 (222.4)	912.1 (230.3)
Sex					
Female	18172 (42.2)	45 (31.7)	17889 (42.1)	68 (52.3)	353 (44.0)
Male	24861 (57.8)	97 (68.3)	24599 (57.9)	62 (47.7)	450 (56.0)
Age, years					
<18	4458 (10.4)	0 (0.0)	4502 (10.6)	6 (4.6)	9 (1.1)
18-39	14454 (33.6)	20 (14.1)	13996 (32.9)	35 (26.9)	102 (12.7)
40-49	7480 (17.4)	21 (14.8)	7995 (18.8)	22 (16.9)	115 (14.3)
50-59	8056 (18.7)	31 (21.8)	7911 (18.6)	21 (16.2)	154 (19.2)
60-69	5079 (11.8)	31 (21.8)	4731 (11.1)	25 (19.2)	157 (19.6)
70-79	2689 (6.2)	24 (16.9)	2460 (5.8)	17 (13.1)	148 (18.4)
80+	817 (1.9)	15 (10.6)	893 (2.1)	4 (3.1)	118 (14.7)
Ethnicity					
White	38478 (89.4)	111 (78.2)	38337 (90.2)	121 (93.1)	754 (93.9)
South Asian	1576 (3.7)	12 (8.5)	1494 (3.5)	8 (6.2)	17 (2.1)
Black	1385 (3.2)	12 (8.5)	1253 (2.9)	0 (0.0)	20 (2.5)
Other	464 (1.1)	2 (1.4)	373 (0.9)	0 (0.0)	3 (0.4)
Mixed	525 (1.2)	5 (3.5)	476 (1.1)	1 (0.8)	9 (1.1)
Unknown	605 (1.4)	0 (0.0)	555 (1.3)	0 (0.0)	0 (0.0)
Index of multiple deprivation quintile					
1 (least deprived)	9395 (21.8)	26 (18.3)	9251 (21.8)	22 (16.9)	157 (19.6)
2	8710 (20.2)	20 (14.1)	8652 (20.4)	21 (16.2)	143 (17.8)
3	8334 (19.4)	28 (19.7)	8347 (19.6)	27 (20.8)	163 (20.3)
4	8444 (19.6)	29 (20.4)	8342 (19.6)	26 (20.0)	141 (17.6)
5 (most deprived)	8128 (18.9)	39 (27.5)	7864 (18.5)	34 (26.2)	199 (24.8)
Missing	22 (0.1)	0 (0.0)	32 (0.1)	0 (0.0)	0 (0.0)
Duration of diagnosed diabetes, years					
<5	5655 (13.1)	4 (2.8)	6556 (15.4)	7 (5.4)	55 (6.8)
5-9	6194 (14.4)	10 (7.0)	6077 (14.3)	14 (10.8)	58 (7.2)
10-14	5609 (13.0)	18 (12.7)	5899 (13.9)	14 (10.8)	72 (9.0)
15-19	5466 (12.7)	21 (14.8)	5355 (12.6)	17 (13.1)	105 (13.1)
20-24	4621 (10.7)	11 (7.7)	4612 (10.9)	11 (8.5)	95 (11.8)
25-29	4101 (9.5)	22 (15.5)	3747 (8.8)	22 (16.9)	83 (10.3)
30+	11387 (26.5)	56 (39.4)	10242 (24.1)	45 (34.6)	335 (41.7)
HbA1c, mmol/mol					
<48	3104 (7.2)	8 (5.6)	2796 (6.6)	9 (6.9)	67 (8.3)
48-53	3232 (7.5)	8 (5.6)	2967 (7.0)	11 (8.5)	66 (8.2)
53-64	10995 (25.6)	35 (24.6)	10340 (24.3)	25 (19.2)	159 (19.8)
64-75	9951 (23.1)	28 (19.7)	10098 (23.8)	32 (24.6)	167 (20.8)
75-86	5891 (13.7)	22 (15.5)	5979 (14.1)	21 (16.2)	117 (14.6)
86+	6097 (14.2)	33 (23.2)	6351 (14.9)	22 (16.9)	179 (22.3)
Missing	3763 (8.7)	8 (5.6)	3957 (9.3)	10 (7.7)	48 (6.0)
BMI, kg/m2					
<18.5	1462 (3.4)	2 (1.4)	1267 (3.0)	1 (0.8)	23 (2.9)
18.5-24.9	13478 (31.3)	39 (27.5)	13132 (30.9)	45 (34.6)	267 (33.3)
25-29.9	12966 (30.1)	40 (28.2)	12606 (29.7)	35 (26.9)	215 (26.8)
30-34.9	6258 (14.5)	24 (16.9)	5704 (13.4)	16 (12.3)	95 (11.8)
35-39.9	1934 (4.5)	11 (7.7)	1735 (4.1)	7 (5.4)	53 (6.6)
40+	949 (2.2)	8 (5.6)	782 (1.8)	5 (3.8)	35 (4.4)
Missing	5986 (13.9)	18 (12.7)	7262 (17.1)	21 (16.2)	115 (14.3)

Supplemental figure 7. Association of potential risk factors with hospitalisation for Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019) in type 1 diabetes, restricting hospitalisation definition to primary diagnosis in HES.



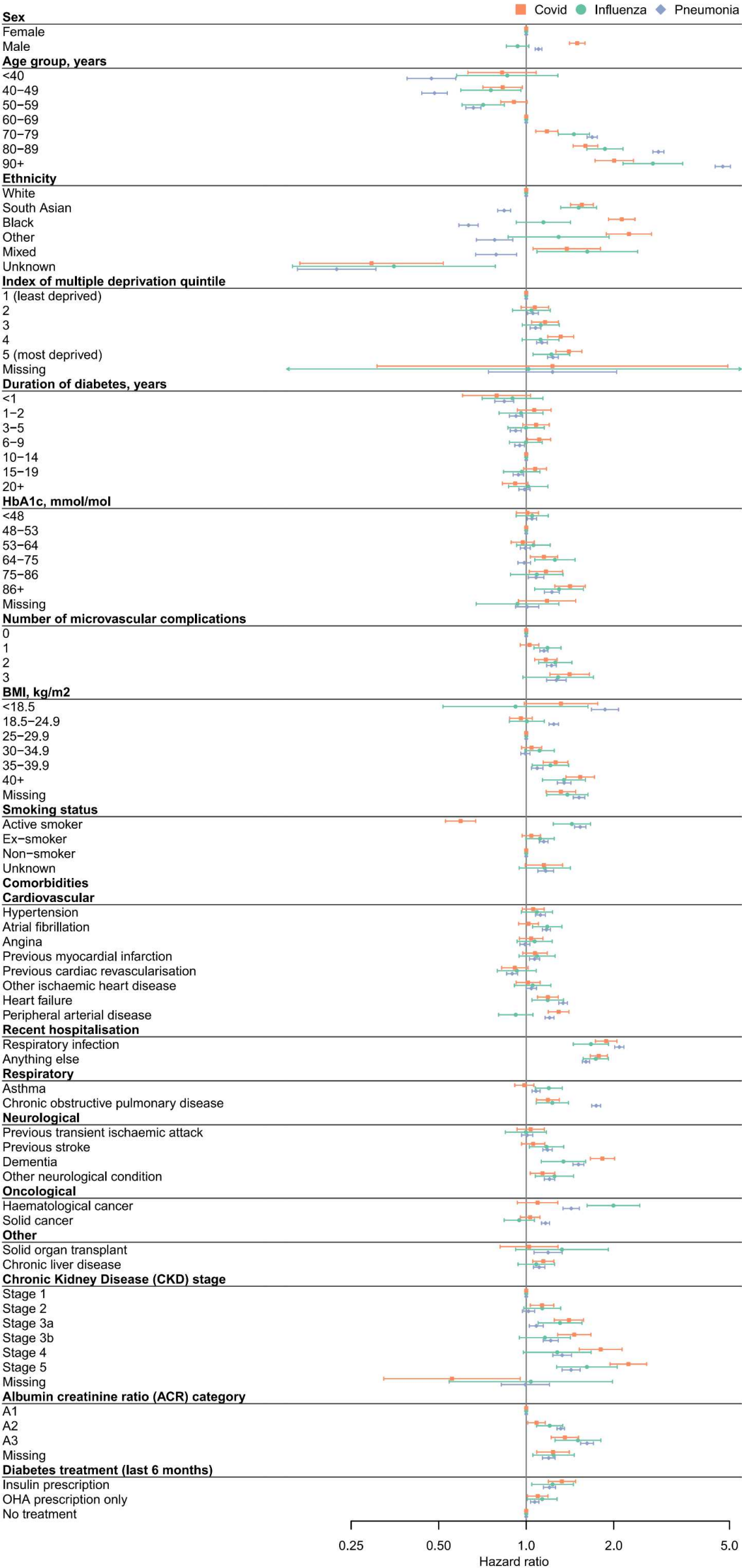
*No Covid-19 hospitalisations occurred in <18 group. **No influenza hospitalisation occurred in Black or other ethnicity groups. No Covid-19, influenza or pneumonia hospitalisation occurred in the unknown ethnicity group. *** No Covid-19, influenza or pneumonia hospitalisations occurred in missing IMD group.

Supplemental table 9. Baseline characteristics and Covid-19, influenza, and pneumonia hospitalisations in type 2 diabetes, restricting hospitalisation definition to primary diagnosis in HES.

	2020 cohort	Covid-19 hospitalisations (in 2020 cohort)	2016 cohort	Influenza hospitalisations (in 2016 cohort)	Pneumonia hospitalisations (in 2016 cohort)
Number of individuals	584854	4781	585289	2189	24944
Mean (SD) follow-up, days		265.3 (37.7)		915.7 (224.3)	903.4 (239.5)
Sex					
Female	253360 (43.3)	1802 (37.7)	256656 (43.9)	1068 (48.8)	11337 (45.4)
Male	331494 (56.7)	2979 (62.3)	328633 (56.1)	1121 (51.2)	13607 (54.6)
Age group, years					
<40	12898 (2.2)	61 (1.3)	13468 (2.3)	28 (1.3)	111 (0.4)
40-49	46075 (7.9)	220 (4.6)	49649 (8.5)	93 (4.2)	453 (1.8)
50-59	114537 (19.6)	625 (13.1)	113285 (19.4)	216 (9.9)	1599 (6.4)
60-69	151493 (25.9)	976 (20.4)	153782 (26.3)	456 (20.8)	3900 (15.6)
70-79	155424 (26.6)	1312 (27.4)	152401 (26.0)	732 (33.4)	7893 (31.6)
80-89	89871 (15.4)	1309 (27.4)	88492 (15.1)	559 (25.5)	8788 (35.2)
90+	14556 (2.5)	278 (5.8)	14212 (2.4)	105 (4.8)	2200 (8.8)
Ethnicity					
White	445160 (76.1)	3240 (67.8)	457714 (78.2)	1746 (79.8)	21923 (87.9)
South Asian	77253 (13.2)	766 (16.0)	71050 (12.1)	282 (12.9)	1871 (7.5)
Black	35144 (6.0)	575 (12.0)	33175 (5.7)	105 (4.8)	771 (3.1)
Other	9886 (1.7)	132 (2.8)	8178 (1.4)	25 (1.1)	190 (0.8)
Mixed	6267 (1.1)	56 (1.2)	5654 (1.0)	25 (1.1)	149 (0.6)
Unknown	11144 (1.9)	12 (0.3)	9518 (1.6)	6 (0.3)	40 (0.2)
Index of multiple deprivation quintile					
1 (least deprived)	102950 (17.6)	607 (12.7)	103184 (17.6)	332 (15.2)	4085 (16.4)
2	106968 (18.3)	715 (15.0)	109006 (18.6)	368 (16.8)	4559 (18.3)
3	113454 (19.4)	861 (18.0)	113661 (19.4)	422 (19.3)	4765 (19.1)
4	127048 (21.7)	1186 (24.8)	125492 (21.4)	477 (21.8)	5330 (21.4)
5 (most deprived)	134146 (22.9)	1410 (29.5)	133563 (22.8)	589 (26.9)	6190 (24.8)
Missing	288 (0.0)	2 (0.0)	383 (0.1)	1 (0.0)	15 (0.1)
Duration of diagnosed diabetes, years					
<1	14311 (2.4)	60 (1.3)	36503 (6.2)	98 (4.5)	953 (3.8)
1-2	60219 (10.3)	337 (7.0)	77510 (13.2)	216 (9.9)	2247 (9.0)
3-5	105094 (18.0)	652 (13.6)	111199 (19.0)	334 (15.3)	3429 (13.7)
6-9	128817 (22.0)	927 (19.4)	125083 (21.4)	428 (19.6)	4686 (18.8)
10-14	124471 (21.3)	967 (20.2)	126421 (21.6)	526 (24.0)	6378 (25.6)
15-19	89704 (15.3)	972 (20.3)	62373 (10.7)	302 (13.8)	3652 (14.6)
20+	62238 (10.6)	866 (18.1)	46200 (7.9)	285 (13.0)	3599 (14.4)
HbA1c, mmol/mol					
<48	167739 (28.7)	1327 (27.8)	175659 (30.0)	634 (29.0)	8049 (32.3)
48-53	116015 (19.8)	840 (17.6)	116131 (19.8)	392 (17.9)	4701 (18.8)
53-64	147209 (25.2)	1093 (22.9)	142662 (24.4)	532 (24.3)	5861 (23.5)
64-75	66071 (11.3)	618 (12.9)	62291 (10.6)	289 (13.2)	2606 (10.4)
75-86	33970 (5.8)	335 (7.0)	32257 (5.5)	127 (5.8)	1422 (5.7)
86+	39727 (6.8)	467 (9.8)	37470 (6.4)	165 (7.5)	1676 (6.7)
Missing	14123 (2.4)	101 (2.1)	18819 (3.2)	50 (2.3)	629 (2.5)
Number of microvascular complications					
0	264011 (45.1)	1550 (32.4)	281811 (48.1)	761 (34.8)	7915 (31.7)
1	216115 (37.0)	1718 (35.9)	204550 (34.9)	836 (38.2)	9536 (38.2)
2	96948 (16.6)	1261 (26.4)	91671 (15.7)	526 (24.0)	6617 (26.5)
3	7780 (1.3)	252 (5.3)	7257 (1.2)	66 (3.0)	876 (3.5)
BMI, kg/m2					
<18.5	3026 (0.5)	48 (1.0)	2801 (0.5)	12 (0.5)	362 (1.5)
18.5-24.9	86199 (14.7)	752 (15.7)	79018 (13.5)	310 (14.2)	4694 (18.8)
25-29.9	184626 (31.6)	1418 (29.7)	178501 (30.5)	614 (28.0)	7025 (28.2)
30-34.9	151732 (25.9)	1100 (23.0)	151161 (25.8)	551 (25.2)	5329 (21.4)
35-39.9	74766 (12.8)	612 (12.8)	75339 (12.9)	289 (13.2)	2674 (10.7)
40+	48455 (8.3)	441 (9.2)	48685 (8.3)	195 (8.9)	1857 (7.4)
Missing	36050 (6.2)	410 (8.6)	49784 (8.5)	218 (10.0)	3003 (12.0)
Smoking status					
Active smoker	87220 (14.9)	403 (8.4)	90218 (15.4)	364 (16.6)	4168 (16.7)
Ex-smoker	336719 (57.6)	3124 (65.3)	316723 (54.1)	1266 (57.8)	14903 (59.7)
Non-smoker	138840 (23.7)	1035 (21.6)	149524 (25.5)	436 (19.9)	4558 (18.3)
Unknown	22075 (3.8)	219 (4.6)	28824 (4.9)	123 (5.6)	1315 (5.3)
Comorbidities					
Cardiovascular					
Hypertension	425278 (72.7)	4017 (84.0)	419645 (71.7)	1818 (83.1)	21575 (86.5)
Atrial fibrillation	70633 (12.1)	1078 (22.5)	63872 (10.9)	473 (21.6)	6940 (27.8)
Angina	87970 (15.0)	1215 (25.4)	91026 (15.6)	596 (27.2)	7284 (29.2)
Previous myocardial infarction	63738 (10.9)	983 (20.6)	60576 (10.3)	422 (19.3)	5472 (21.9)
Previous cardiac revascularisation	57332 (9.8)	742 (15.5)	54961 (9.4)	317 (14.5)	3853 (15.4)
Other ischaemic heart disease	121776 (20.8)	1669 (34.9)	121753 (20.8)	766 (35.0)	9695 (38.9)

	2020 cohort	Covid-19 hospitalisations (in 2020 cohort)	2016 cohort	Influenza hospitalisations (in 2016 cohort)	Pneumonia hospitalisations (in 2016 cohort)
Heart failure	61014 (10.4)	1243 (26.0)	53579 (9.2)	469 (21.4)	6932 (27.8)
Peripheral arterial disease	50045 (8.6)	895 (18.7)	48489 (8.3)	301 (13.8)	4970 (19.9)
Recent hospitalisation					
Respiratory infection	25535 (4.4)	817 (17.1)	21353 (3.6)	280 (12.8)	4469 (17.9)
Anything else	96421 (16.5)	1890 (39.5)	95232 (16.3)	794 (36.3)	10039 (40.2)
Respiratory					
Asthma	125582 (21.5)	1275 (26.7)	118207 (20.2)	701 (32.0)	7866 (31.5)
Chronic obstructive pulmonary disease	65615 (11.2)	1022 (21.4)	60108 (10.3)	534 (24.4)	8088 (32.4)
Neurological					
Previous transient ischaemic attack	31024 (5.3)	463 (9.7)	29997 (5.1)	203 (9.3)	2812 (11.3)
Previous stroke	49873 (8.5)	763 (16.0)	47721 (8.2)	341 (15.6)	4574 (18.3)
Dementia	20629 (3.5)	573 (12.0)	19548 (3.3)	149 (6.8)	2611 (10.5)
Other neurological condition	35000 (6.0)	584 (12.2)	33569 (5.7)	240 (11.0)	3309 (13.3)
Oncological					
Haematological cancer	11751 (2.0)	162 (3.4)	10352 (1.8)	97 (4.4)	990 (4.0)
Solid cancer	79179 (13.5)	855 (17.9)	72001 (12.3)	341 (15.6)	5206 (20.9)
Other					
Solid organ transplant	3682 (0.6)	82 (1.7)	3013 (0.5)	32 (1.5)	332 (1.3)
Chronic liver disease	69136 (11.8)	670 (14.0)	48011 (8.2)	210 (9.6)	2142 (8.6)
Chronic Kidney Disease (CKD) stage					
Stage 1	165845 (28.4)	790 (16.5)	147798 (25.3)	299 (13.7)	2502 (10.0)
Stage 2	286696 (49.0)	1940 (40.6)	290821 (49.7)	971 (44.4)	10121 (40.6)
Stage 3a	72539 (12.4)	841 (17.6)	80222 (13.7)	453 (20.7)	5273 (21.1)
Stage 3b	33246 (5.7)	544 (11.4)	37256 (6.4)	237 (10.8)	3818 (15.3)
Stage 4	9006 (1.5)	230 (4.8)	10490 (1.8)	88 (4.0)	1473 (5.9)
Stage 5	12871 (2.2)	421 (8.8)	13365 (2.3)	130 (5.9)	1629 (6.5)
Missing	4651 (0.8)	15 (0.3)	5337 (0.9)	11 (0.5)	128 (0.5)
Albumin creatinine ratio (ACR) category					
A1	402847 (68.9)	2655 (55.5)	388839 (66.4)	1252 (57.2)	13184 (52.9)
A2	121002 (20.7)	1339 (28.0)	106879 (18.3)	565 (25.8)	7450 (29.9)
A3	21899 (3.7)	495 (10.4)	18817 (3.2)	153 (7.0)	2033 (8.2)
Missing	39106 (6.7)	292 (6.1)	70754 (12.1)	219 (10.0)	2277 (9.1)
Diabetes treatment (last 6 months)					
Insulin prescription	79286 (13.6)	1190 (24.9)	78755 (13.5)	468 (21.4)	5380 (21.6)
OHA prescription only	362651 (62.0)	2584 (54.0)	349629 (59.7)	1215 (55.5)	12993 (52.1)
No treatment	142917 (24.4)	1007 (21.1)	156905 (26.8)	506 (23.1)	6571 (26.3)

Supplemental figure 8. Association of potential risk factors with hospitalisation for Covid-19 (2020), influenza (2016-2019), and pneumonia (2016-2019) in type 2 diabetes, restricting hospitalisation definition to primary diagnosis in HES.

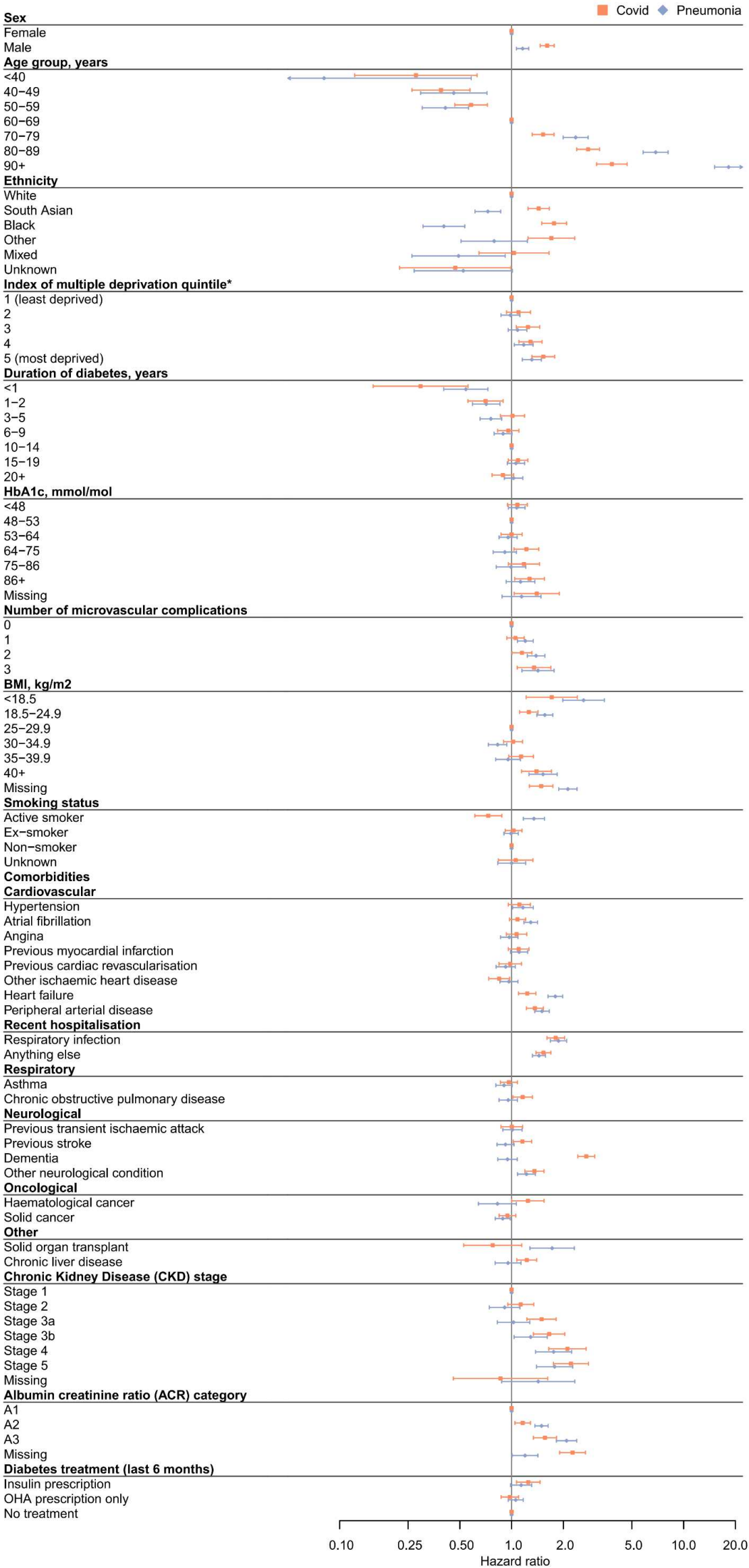


Supplemental table 10. Baseline characteristics and Covid-19 and pneumonia deaths in type 2 diabetes, restricting mortality definition to primary cause in ONS.

	2020 cohort	Covid-19 deaths (in 2020 cohort)	2016 cohort	Pneumonia deaths (in 2016 cohort)
Number of individuals	584854	2086	585289	2653
Mean (SD) follow-up, days		266.1 (35.5)		917.0 (223.2)
Sex				
Female	253360 (43.3)	796 (38.2)	256656 (43.9)	1268 (47.8)
Male	331494 (56.7)	1290 (61.8)	328633 (56.1)	1385 (52.2)
Age group, years				
<40	12898 (2.2)	6 (0.3)	13468 (2.3)	1 (0.0)
40-49	46075 (7.9)	30 (1.4)	49649 (8.5)	23 (0.9)
50-59	114537 (19.6)	118 (5.7)	113285 (19.4)	52 (2.0)
60-69	151493 (25.9)	299 (14.3)	153782 (26.3)	199 (7.5)
70-79	155424 (26.6)	563 (27.0)	152401 (26.0)	566 (21.3)
80-89	89871 (15.4)	847 (40.6)	88492 (15.1)	1227 (46.2)
90+	14556 (2.5)	223 (10.7)	14212 (2.4)	585 (22.1)
Ethnicity				
White	445160 (76.1)	1514 (72.6)	457714 (78.2)	2399 (90.4)
South Asian	77253 (13.2)	289 (13.9)	71050 (12.1)	160 (6.0)
Black	35144 (6.0)	216 (10.4)	33175 (5.7)	55 (2.1)
Other	9886 (1.7)	42 (2.0)	8178 (1.4)	20 (0.8)
Mixed	6267 (1.1)	18 (0.9)	5654 (1.0)	10 (0.4)
Unknown	11144 (1.9)	7 (0.3)	9518 (1.6)	9 (0.3)
Index of multiple deprivation quintile				
1 (least deprived)	102950 (17.6)	281 (13.5)	103184 (17.6)	493 (18.6)
2	106968 (18.3)	330 (15.8)	109006 (18.6)	490 (18.5)
3	113454 (19.4)	397 (19.0)	113661 (19.4)	525 (19.8)
4	127048 (21.7)	475 (22.8)	125492 (21.4)	550 (20.7)
5 (most deprived)	134146 (22.9)	602 (28.9)	133563 (22.8)	595 (22.4)
Missing	288 (0.0)	1 (0.0)	383 (0.1)	0 (0.0)
Duration of diagnosed diabetes, years				
<1	14311 (2.4)	10 (0.5)	36503 (6.2)	53 (2.0)
1-2	60219 (10.3)	93 (4.5)	77510 (13.2)	157 (5.9)
3-5	105094 (18.0)	257 (12.3)	111199 (19.0)	267 (10.1)
6-9	128817 (22.0)	343 (16.4)	125083 (21.4)	452 (17.0)
10-14	124471 (21.3)	443 (21.2)	126421 (21.6)	732 (27.6)
15-19	89704 (15.3)	490 (23.5)	62373 (10.7)	498 (18.8)
20+	62238 (10.6)	450 (21.6)	46200 (7.9)	494 (18.6)
HbA1c, mmol/mol				
<48	167739 (28.7)	655 (31.4)	175659 (30.0)	913 (34.4)
48-53	116015 (19.8)	351 (16.8)	116131 (19.8)	498 (18.8)
53-64	147209 (25.2)	462 (22.1)	142662 (24.4)	612 (23.1)
64-75	66071 (11.3)	266 (12.8)	62291 (10.6)	259 (9.8)
75-86	33970 (5.8)	134 (6.4)	32257 (5.5)	135 (5.1)
86+	39727 (6.8)	156 (7.5)	37470 (6.4)	150 (5.7)
Missing	14123 (2.4)	62 (3.0)	18819 (3.2)	86 (3.2)
Number of microvascular complications				
0	264011 (45.1)	564 (27.0)	281811 (48.1)	641 (24.2)
1	216115 (37.0)	772 (37.0)	204550 (34.9)	1009 (38.0)
2	96948 (16.6)	629 (30.2)	91671 (15.7)	884 (33.3)
3	7780 (1.3)	121 (5.8)	7257 (1.2)	119 (4.5)
BMI, kg/m2				
<18.5	3026 (0.5)	36 (1.7)	2801 (0.5)	55 (2.1)
18.5-24.9	86199 (14.7)	466 (22.3)	79018 (13.5)	664 (25.0)
25-29.9	184626 (31.6)	597 (28.6)	178501 (30.5)	726 (27.4)
30-34.9	151732 (25.9)	418 (20.0)	151161 (25.8)	395 (14.9)
35-39.9	74766 (12.8)	197 (9.4)	75339 (12.9)	183 (6.9)
40+	48455 (8.3)	125 (6.0)	48685 (8.3)	138 (5.2)
Missing	36050 (6.2)	247 (11.8)	49784 (8.5)	492 (18.5)
Smoking status				
Active smoker	87220 (14.9)	179 (8.6)	90218 (15.4)	320 (12.1)
Ex-smoker	336719 (57.6)	1377 (66.0)	316723 (54.1)	1566 (59.0)
Non-smoker	138840 (23.7)	441 (21.1)	149524 (25.5)	630 (23.7)
Unknown	22075 (3.8)	89 (4.3)	28824 (4.9)	137 (5.2)
Comorbidities				
Cardiovascular				
Hypertension	425278 (72.7)	1853 (88.8)	419645 (71.7)	2402 (90.5)
Atrial fibrillation	70633 (12.1)	612 (29.3)	63872 (10.9)	946 (35.7)
Angina	87970 (15.0)	599 (28.7)	91026 (15.6)	812 (30.6)
Previous myocardial infarction	63738 (10.9)	497 (23.8)	60576 (10.3)	650 (24.5)
Previous cardiac revascularisation	57332 (9.8)	363 (17.4)	54961 (9.4)	435 (16.4)
Other ischaemic heart disease	121776 (20.8)	799 (38.3)	121753 (20.8)	1099 (41.4)
Heart failure	61014 (10.4)	658 (31.5)	53579 (9.2)	965 (36.4)

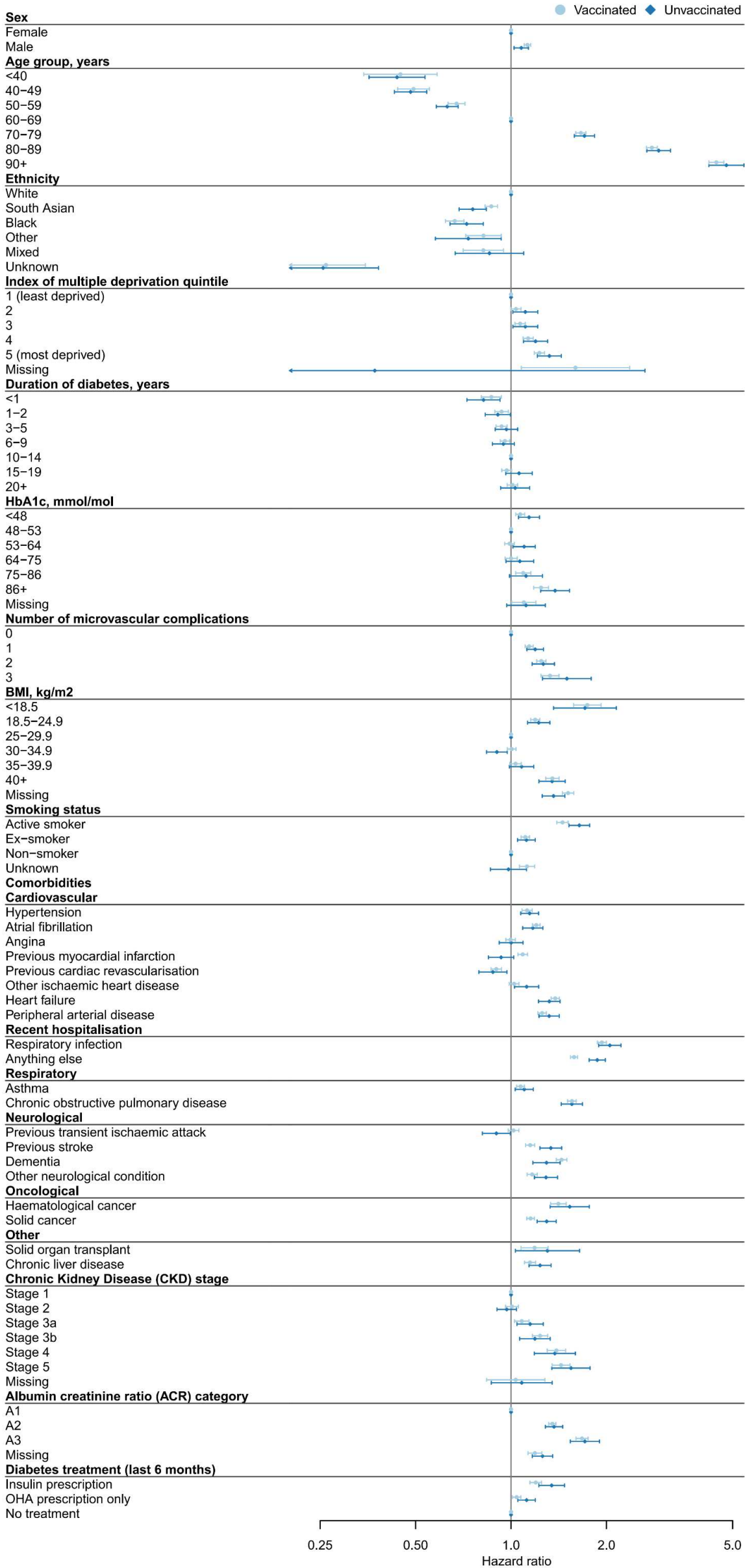
	2020 cohort	Covid-19 deaths (in 2020 cohort)	2016 cohort	Pneumonia deaths (in 2016 cohort)
Peripheral arterial disease	50045 (8.6)	492 (23.6)	48489 (8.3)	693 (26.1)
Recent hospitalisation				
Respiratory infection	25535 (4.4)	439 (21.0)	21353 (3.6)	483 (18.2)
Anything else	96421 (16.5)	911 (43.7)	95232 (16.3)	1117 (42.1)
Respiratory				
Asthma	125582 (21.5)	543 (26.0)	118207 (20.2)	507 (19.1)
Chronic obstructive pulmonary disease	65615 (11.2)	502 (24.1)	60108 (10.3)	458 (17.3)
Neurological				
Previous transient ischaemic attack	31024 (5.3)	265 (12.7)	29997 (5.1)	325 (12.3)
Previous stroke	49873 (8.5)	457 (21.9)	47721 (8.2)	476 (17.9)
Dementia	20629 (3.5)	477 (22.9)	19548 (3.3)	274 (10.3)
Other neurological condition	35000 (6.0)	362 (17.4)	33569 (5.7)	395 (14.9)
Oncological				
Haematological cancer	11751 (2.0)	89 (4.3)	10352 (1.8)	62 (2.3)
Solid cancer	79179 (13.5)	412 (19.8)	72001 (12.3)	488 (18.4)
Other				
Solid organ transplant	3682 (0.6)	27 (1.3)	3013 (0.5)	47 (1.8)
Chronic liver disease	69136 (11.8)	261 (12.5)	48011 (8.2)	140 (5.3)
Chronic Kidney Disease (CKD) stage				
Stage 1	165845 (28.4)	191 (9.2)	147798 (25.3)	128 (4.8)
Stage 2	286696 (49.0)	760 (36.4)	290821 (49.7)	791 (29.8)
Stage 3a	72539 (12.4)	445 (21.3)	80222 (13.7)	595 (22.4)
Stage 3b	33246 (5.7)	336 (16.1)	37256 (6.4)	561 (21.1)
Stage 4	9006 (1.5)	147 (7.0)	10490 (1.8)	295 (11.1)
Stage 5	12871 (2.2)	195 (9.3)	13365 (2.3)	260 (9.8)
Missing	4651 (0.8)	12 (0.6)	5337 (0.9)	23 (0.9)
Albumin creatinine ratio (ACR) category				
A1	402847 (68.9)	1013 (48.6)	388839 (66.4)	1197 (45.1)
A2	121002 (20.7)	647 (31.0)	106879 (18.3)	961 (36.2)
A3	21899 (3.7)	251 (12.0)	18817 (3.2)	314 (11.8)
Missing	39106 (6.7)	175 (8.4)	70754 (12.1)	181 (6.8)
Diabetes treatment (last 6 months)				
Insulin prescription	79286 (13.6)	536 (25.7)	78755 (13.5)	581 (21.9)
OHA prescription only	362651 (62.0)	1012 (48.5)	349629 (59.7)	1307 (49.3)
No treatment	142917 (24.4)	538 (25.8)	156905 (26.8)	765 (28.8)

Supplemental figure 9. Association of potential risk factors with Covid-19 (2020), and pneumonia (2016-2019) mortality in type 2 diabetes, restricting mortality definition to primary cause in ONS.

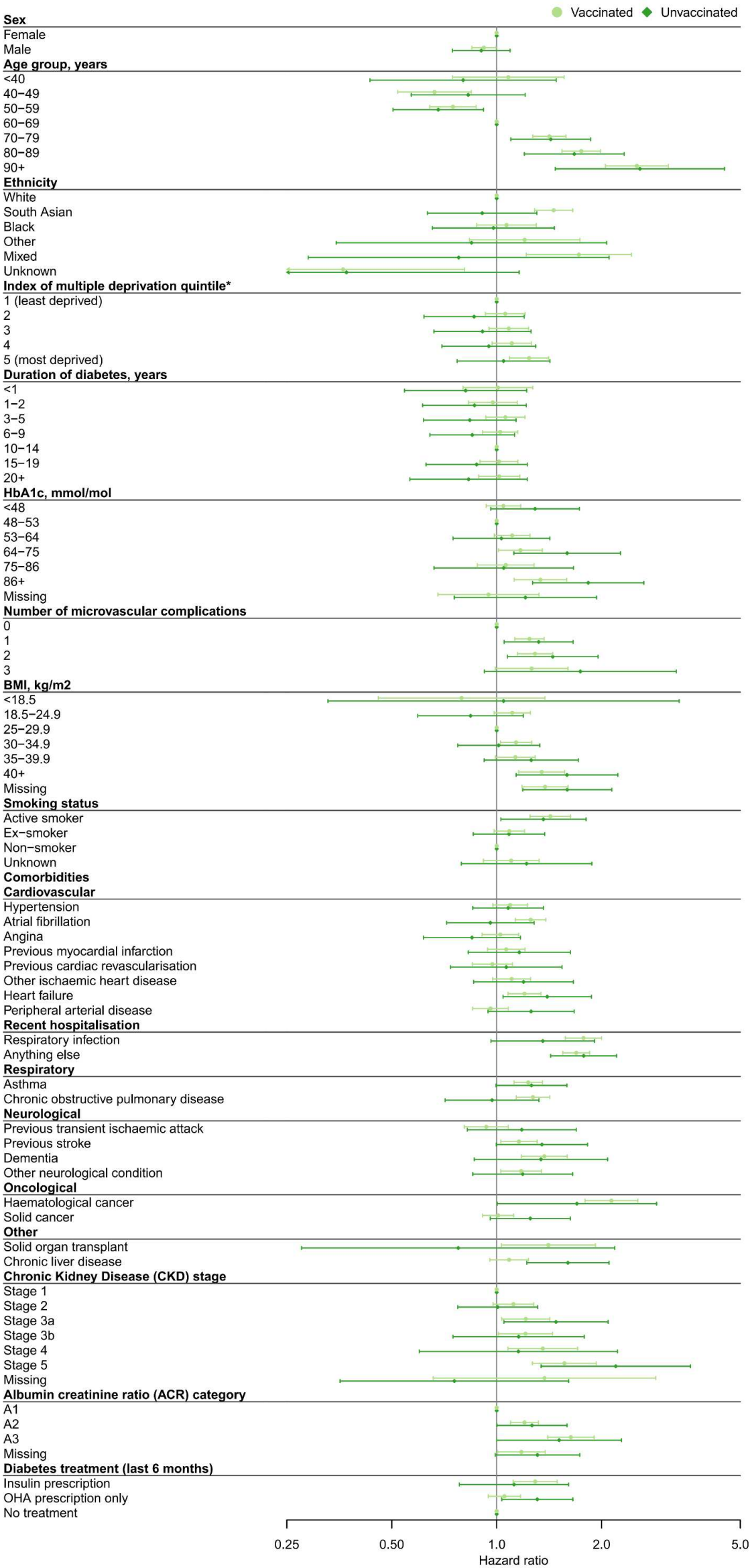


* No pneumonia deaths occurred in missing IMD group. 1 Covid-19 death occurred in missing IMD group.

Supplemental figure 10. Association of potential risk factors with pneumonia hospitalisation (2016-2019) in those with a pneumococcal vaccination and those without.



Supplemental figure 11. Association of potential risk factors with influenza hospitalisation (2016-2019) in those with an influenza vaccination and those without.



* No influenza hospitalisations occurred in the missing IMD group.

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