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PERSONS DIAGNOSED WITH COVID IN ENGLAND IN THE CPRD: A COHORT DESCRIPTION

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Supplemental file 1, Table 1: COVID Cohort Definition

Medcode	Term
6874141000006113	SARS-CoV
6604671000006111	SARS-CoV infection
13053051000006117	2019-nCoV (novel coronavirus) antigen detection result positive
12990741000006116	2019-nCoV (novel coronavirus) detected
13483601000006110	2019-nCoV (novel coronavirus) detection result positive at the limit of detection
13483161000006118	2019-nCoV (novel coronavirus) ribonucleic acid detected
14168601000006119	Acute COVID-19
13486461000006118	Acute COVID-19 infection
14168611000006116	Acute disease caused by Severe acute respiratory syndrome coronavirus 2
13486471000006113	Acute disease caused by severe acute respiratory syndrome coronavirus 2 infection
13486571000006112	Asymptomatic COVID-19
13486561000006117	Asymptomatic SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) infection
12802201000006117	Confirmed 2019-nCoV (novel coronavirus) infection
13012431000006117	COVID-19
13483031000006114	COVID-19
13012441000006110	COVID-19 caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2)
13002281000006117	COVID-19 confirmed by laboratory test
13002311000006115	COVID-19 confirmed clinically
13002291000006119	COVID-19 confirmed using clinical diagnostic criteria
13483951000006118	COVID-19 detected
12990531000006116	Detection of 2019-nCoV (novel coronavirus) using polymerase chain reaction technique
13485771000006110	Detection of COVID-19
13485471000006115	Detection of ribonucleic acid of 2019 novel coronavirus in nasopharyngeal swab
13485711000006118	Detection of ribonucleic acid of COVID-19 using polymerase chain reaction
13485421000006116	Detection of ribonucleic acid of Severe acute respiratory syndrome coronavirus 2
13485461000006110	Detection of RNA (ribonucleic acid) of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) in nasopharyngeal swab
13485521000006117	Detection of RNA (ribonucleic acid) of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) in oropharyngeal swab
13485581000006118	Detection of RNA (ribonucleic acid) of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) in sputum
13485701000006116	Detection of RNA (ribonucleic acid) of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) using polymerase chain reaction
13485751000006117	Detection of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2)
13485381000006114	Detection of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) antigen
13012231000006116	Detection of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) using polymerase chain reaction technique

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13483041000006116	Disease caused by 2019 novel coronavirus
13483051000006119	Disease caused by 2019-nCoV
12991131000006119	Disease caused by 2019-nCoV (novel coronavirus)
13483061000006117	Disease caused by Severe acute respiratory syndrome coronavirus 2
12991141000006112	Disease caused by Wuhan 2019-nCoV (novel coronavirus)
13053041000006119	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) antigen detection result positive
13012301000006116	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) detected
13052351000006112	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) RNA (ribonucleic acid) detection result positive
13483141000006117	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) RNA (ribonucleic acid) detection result positive
13483591000006119	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) RNA (ribonucleic acid) detection result positive at the limit of detection
13483151000006115	Severe acute respiratory syndrome coronavirus 2 ribonucleic acid detected
12990751000006119	Wuhan 2019-nCoV (novel coronavirus) detected
13002301000006118	Probable COVID-19 confirmed using clinical diagnostic criteria
13483611000006113	SARS (severe acute respiratory syndrome) coronavirus 2 RNA
13484481000006118	SARS-CoV-2 - severe acute respiratory syndrome coronavirus 2
13039281000006117	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) detection result positive
13052381000006116	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) RNA (ribonucleic acid) qualitative existence in specimen
13483941000006115	Severe acute respiratory syndrome coronavirus 2 detected

Note: "SARS-CoV" or "SARS-CoV infection" may refer to the SARS illness of 2003. We allowed these terms, given the novelty of SARS-CoV-2 and potential for erroneous use of SARS-CoV terms, but required them to be used during the time period of COVID (August 2020 onwards).

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Supplemental file 1, Table 2: COVID Vaccination Definition

Product code	Term
13739441000033113	COVID-19 Vaccine AstraZeneca (ChAdOx1 S [recombinant]) 5x10,000,000,000 viral particles/0.5ml dose suspension for injection multidose vials (AstraZeneca UK Ltd)
13750541000033115	COVID-19 Vaccine Janssen (Ad26.COVS-S [recombinant]) 0.5ml dose suspension for injection multidose vials (Janssen-Cilag Ltd)
13860541000033111	COVID-19 Vaccine Medicago (CoVLP) 3.75micrograms/0.5ml dose emulsion for injection multidose vials (Medicago Inc)
13790341000033117	COVID-19 Vaccine Novavax (adjuvanted) 5micrograms/0.5ml dose suspension for injection multidose vials (Baxter Oncology GmbH)
13778941000033110	COVID-19 Vaccine Valneva (inactivated adjuvanted whole virus) 40antigen units/0.5ml dose suspension for injection multidose vials (Valneva UK Ltd)
13739541000033114	Comirnaty COVID-19 mRNA Vaccine 30micrograms/0.3ml dose concentrate for dispersion for injection multidose vials (Pfizer Ltd)
13764941000033111	Spikevax COVID-19 mRNA (nucleoside modified) Vaccine 0.1mg/0.5ml dose dispersion for injection multidose vials (Moderna, Inc)
Medical code	Term
12990501000006112	2019-nCoV (novel coronavirus) vaccination
13012221000006119	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) vaccination
13482981000006117	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) vaccination
13482991000006119	2019 novel coronavirus vaccination
13483001000006118	Severe acute respiratory syndrome coronavirus 2 vaccination
13483011000006115	COVID-19 vaccination
13483021000006111	2019-nCoV (novel coronavirus) vaccination
13483211000006110	Immunisation course to achieve immunity against SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2)
13483221000006119	Immunisation course to achieve immunity against 2019-nCoV (novel coronavirus)
13483231000006116	Administration of first dose of SARS- CoV-2 (severe acute respiratory syndrome coronavirus 2) vaccine
13483241000006114	Administration of first dose of 2019- nCoV (novel coronavirus) vaccine
13483251000006111	Administration of second dose of SARS- CoV-2 (severe acute respiratory syndrome coronavirus 2) vaccine
13483261000006113	Administration of second dose of 2019- nCoV (novel coronavirus) vaccine
13483531000006118	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) immunisation course started
13483541000006111	2019-nCoV (novel coronavirus) immunisation course started
14169101000006118	COVID-19 mRNA vaccine
14170191000006111	SARS-CoV-2 antigen vaccine or SARS- CoV-2 mRNA vaccine
14170301000006118	Administration of first dose of SARS- CoV-2 mRNA vaccine
14170341000006116	First COVID-19 mRNA vaccination
14170411000006113	Administration of second dose of SARS- CoV-2 mRNA vaccine
14170431000006119	Second COVID-19 mRNA vaccination

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14233631000006113	Immunisation course to maintain protection against SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2
14233641000006115	Booster course to maintain protection against SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2)
14233671000006111	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) immunisation course completed
14233841000006119	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) protection maintenance course started
14233871000006110	SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) protection maintenance course completed
14233881000006113	Severe acute respiratory syndrome coronavirus 2 protection maintenance course done
14283421000006117	Administration of fourth dose of SARS- CoV-2 (severe acute respiratory syndrome coronavirus 2) vaccine
14283481000006118	Administration of fifth dose of SARS- CoV-2 (severe acute respiratory syndrome coronavirus 2) vaccine
14283541000006113	Administration of third dose of SARS- CoV-2 (severe acute respiratory syndrome coronavirus 2) vaccine

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Supplemental file 1, Table 3: Search Terms for NHS Highest Risk Definition

Note: this list reflects the report “Defining the highest-risk clinical subgroups upon community infection with SARS-CoV-2 when considering the use of neutralising monoclonal antibodies (nMABs) and antiviral drugs: independent advisory group report” version published on May 30, 2022.

Classification as defined by England's Deputy Chief Medical Officer	Concept as operationalized by Andersen et al	Search term
Down's syndrome and other genetic disorders	Down's syndrome or other chromosomal disorder known to affect immune competence	*down* *trisom* *mongol*
Solid cancer	We identified a code list “Clinical codelist – Cancer”, which did not separate solid from liquid (blood) cancers. We systematically excluded blood cancers from the list by excluding the following terms, and had the resulting list reviewed by a clinician:	leuk Lymphoma lymphatic Lymphoid lymphosarc myeloma myeloid myeloscler myelofib myelosis myeloprol myelody walden anem anaem raeb nodular scler mycosis sezary zary hodgk heavy plasma marrow haemato hemota erythraem erythrem heilmeyer lymphadenopathy polycyt erythrocyt erythrodys thrombocyt

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		franklin immunoprolif reticulosarc chloroma macroglob reticulosis kahler burkitt di guglielmo langer histiocytosis germinoblast letterer FAB Mastocytosis
Haematological diseases and recipients of haematological stem cell transplants	Amyloidosis Graft Versus Host disease	*amyloid* *GVHD* *Graft V* *Graft-V* *reject* *trans* *fail* *trans*
	Myelodysplastic syndrome	*MDS* *myelod* *preleuk*
	Chronic myelomonocytic leukaemia	*smouldering leuk* *CMML*
	Sickle cell disease	*chronic myelom* *sickl* *SCD*
	Myeloma	*myelom* *kahler*
	Myelofibrosis	*myelof* *PMF* *idiopath* *fibrosis* *myelod metaplasia*
	Rare inherited anemia	*anaem* *anem*
	Chronic lymphocytic leukaemia and Follicular lymphoma	*lymphoma* *NHL* * hodgk* *nodular scler* *mycosis fung* *sezary* *walden*
	Thalassaemia	*thalass* *cooley* *mediterr* *constant spring* *haemoglobin h*

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		hemoglobin h *hb h* *haemoglobin bart* *hemoglobin bart* *hb bart*
	Systemic anti-cancer treatments: Davidson, J, Warren-Gash, C and Mcdonald, H (2021). Clinical codelist - CPRD Aurum - Immunosuppressive conditions. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00002234 .	
Renal disease	Davidson, J, Warren-Gash, C, Mcdonald, H, Evans, D and Clay, S (2021). Clinical codelist - chronic kidney disease. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00002406 . CKD, stage 4 or 5	*CKD* *renal* *disease* *renal* *failure* *renal* *insufficiency* *renal* *disorder* *kidney* *disease* *kidney* *disorder* *kidney* *failure* *eGFR* *estimated* *glomerular* *filtration* *rate* *disease* *renal* *failure* *renal* *insufficiency* *renal* *disorder* *renal* *disease* *kidney* *disorder* *kidney* *failure* *kidney*
Liver disease Solid organ transplant recipients	Cirrhosis Solid organ transplant	*cirrhos* *transplant* *organ* *recipient* *heart* *recipient* *lung* *recipient* *pancreas* *recipient* *kidney* *recipient* *intestine* *recipient* *gland* *recipient* *stomach* *recipient* *spleen* *recipient* *liver* *recipient* *bladder* *recipient*
Immune-mediated	People who have received a B-cell depleting therapy in the last 12 months	Obinutuzumab Ocrelizumab

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inflammatory disorders		Ofatumumab Rituximab Cyclophosphamide
	People who have been treated with cyclophosphamide (IV or oral) in the 6 months prior	
	People who are on biologics or small molecule JAK-inhibitors (except anti-CD20 depleting monoclonal antibodies) or who have received these therapies within the last 6 months	Abatacept Adalimumab Baracitinib Belimumab Certolizumab pegol Etanercept Golimumab Infliximab Ixekizumab Sarilumab Secukinumab Tocilizumab Tofacitinib Upadacitinib Ustekinumab Vedolizumab
	People who are on corticosteroids (equivalent to greater than 10mg per day of prednisolone) for at least the 28 days prior	Betamethasone Cortisone Dexamethasone Hydrocortisone Methylprednisolone Prednisolone Prednisone Triamcinolone
	People who are on current treatment with: methotrexate (for interstitial lung disease) and/or ciclosporin	Mycophenolate Tacrolimus, oral Azathioprine with mercaptopurine Methotrexate Ciclosporin
	Giant cell arteritis	*giant cell arterit*
	Sarcoidosis	*sarcoid*
		Besnier
	Psoriatic arthritis or psoriasis	*arthr*
		psoria
	Autoimmune hepatitis	*autoimmune hep*
		hepatitis auto
		AIH
		lupoid hep
		autoimmune chron
		autoimmune act
		autoimmune agg
	Crohn's disease	*crohn*
		regional ent
		granulomatous ent
		ileocoli
		Jejunoileitis

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Type I diabetes	*granulomatous col* *type 1 dia* *type I dia* *diabetes mellitus juv* *diabetes mellitus *insulin dep* *juvenile onset dia* *juvenile-onset dia* *juvenile-onset *diabetes mellitus type 1* *diabetes mellitus type I* *diabetes type 1* *diabetes type I*
Ankylosing spondylitis	*ankylosing* *Bekhterev* *Rheumatoid arthritis of spine* *spine rheum* *rheumatoid arthritis of* *rheumatoid* *spine*
Rheumatoid arthritis	*rheumatoid* *felty* *caplan* *rheum.* *atrophic art* *chronic rheumatic art* *prolif* *art*
Systemic lupus erythematosus Scleroderma	*lupus* *scleroderma* *systemic sclero* *crest s* *morphea* *morphoea*
Ulcerative colitis	*ulcerative* *colitis* *ulcerative* *proctitis* *rectosigmoiditis* *inflam* *polyps* *left* *colitis* *ulcerative* *panc* *extensive* *colitis* *proctosigmoiditis* *backwash* *ileitis* *distal* *colitis* *inflam* *bowel*
Immunodeficiencies	*cvid*

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Immune deficiencies		*common* *immunodeficienc* *antibody* *deficienc* Hyper* *igm* *higm* *good* *syndrom* *thymom* *deficienc* *severe* *combin* *immunodeficienc* *SCID* *aps-1* *pas-2* * polygland* *autoimmune* *autoimmune* *polygland* *polyendocrinopath* *ectodermal dystroph* *apeced* *ifn* *signal* *interferon* *signal* *gammaglobulinaemi*
HIV/AIDS	HIV	*HIV* *immunodeficiency vir*
Rare neurological and severe complex life-limiting neurodisability conditions	Multiple sclerosis Motor neurone disease Huntington's disease	*Multiple sclerosis* *sclerosis multiple* *encephalomyelit* *disseminat* * ms* *motor* *neurone* disease* *kennedy* *amyotrophic* *lateral **sclerosis* *ALS* *primary* *lateral* *sclerosis* *progressive* *bulbar* *palsy* *progressive* *spinal* muscular* *atrophy* *huntington* *huntington* *disease* *Huntington* *chorea*

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Myasthenia gravis

myasthenia *gravis*

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Supplemental file 1, Table 4: Search Terms for PANORAMIC Eligibility Criteria Definition

Inclusion criteria as in PANORAMIC protocol	Concept as operationalized by Andersen et al	Search term
Chronic respiratory disease (including chronic obstructive pulmonary disease (COPD), cystic fibrosis and asthma requiring at least daily use of preventative and/or reliever medication)	Davidson, J, Warren-Gash, C and McDonald, H (2021). Clinical codelist - CPRD Aurum - chronic respiratory disease. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00002214 . We also included product codes for asthma medications, using all drugs classified by the British National Formulary under the following categories: Short-acting beta agonists (SABA) Short-acting muscarinic antagonists (SAMA) Inhaled corticosteroids (ICS) Long-acting beta agonists (LABA) Long-acting muscarinic antagonist (LAMA) Methylxanthine PDE-4 inhibitor	
Chronic heart or vascular disease	Atherosclerosis/Arteriosclerosis Stenosis Cerebrovascular disease (not including stroke/TIA - included in PANORAMIC) Pulmonary embolism Systolic/diastolic dysfunction Chronic arrhythmias Myocardial infarction Hypertension Venous thromboembolism/DVT Heart failure Atrial fibrillation Ischaemic and peripheral heart disease Congenital heart/cardiac disease Various	*athero*; *arterioscl*; *ASVD*; *obliter*; *endart* *steno* *aort*; *steno* *vasc*; *steno* *heart*; *steno* *card*; *strict* *aort*; *strict* *vasc*; *heart* *stict*; *card* *strict*; *cerebro* *disea*; *subarac* *haem*; *vasc* *demen*; *arterio* *demen*; *infar* *demen* *pul* *embo*; *syst* *dys*; *dia* *dys*; *dys* *syst* *AFL*; *atria* *flut*; *arrhyth*; *dysrhy* *myo* *infarc*; *heart* *att*; *AMI* *hyperten*; *high* *blood**pres*; *bp*; *bp*; *bp* *HBP*; *HTN* *VTE*; *thrombo*; *DVT*; *blood* *clot*; *pulmon* *embolis*; *pe* *pe*; *pe*; *CCF*; *CHF*; *hear* *fail*; *card* *fail*; *fibrilla*; *fibrilla*; *af* *af*; *Afib* *hear* *diseas*; *artero* *diseas*; *vasc* *diseas*; *CAD*; *ihd*; *myocard* *isch*; *chd* *congen* *hear*; *congen* *card*; *CHD* *Aneurysm* *May-Thurner* *Thoracic* *outlet* *Fibromuscular* *Klippel*

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		lymphedema
		hypoten
		Telangiect
		Vasculit
		body *tumour*
		Claudication
		Varicose
		Venous *insufficiency*
		artery *dissection*
Renal disease: mild kidney disease (CKD) stage 2 and 3, with an eGFR measurement in the past 6 months	Renal disease, stage 2 or greater	*CKD*
		renal *disease*
		renal *failure*
		renal *insufficiency*
		renal *disorder*
		kidney *disease*
		kidney *disorder*
		kidney *failure*
		eGFR
		estimated *glomerular* *filtration* *rate*
		disease *renal*
		failure *renal*
		insufficiency *renal*
		disorder *renal*
		disease *kidney*
		disorder *kidney*
		failure *kidney*
Chronic liver disease	Chronic liver disease	*biliary c*
		destructive *chol*
		cirrhos
		sclero *cholangit*
		recurr *cholangit*
		chron *cholangit*
		chron *hepat*
		hepat *chron*
		acute *yellow* *atroph*
		hepat *notif*
		granul *hepat*
		alpha *hepat*
		hepat *tox*
		toxop *hepat*
		acute hepatitis c
		alcoh *hepat*
		subacute *hepat*
		nonspec *hepat*
		nonalco *liver* *dis*
		hepat *malaria*
		malaria *hepat*
		autoimm *hepat*
		hepatitis c without

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		<pre> **toxic* *hepat* **hepatitis C* **sequelae* *viral* *hep* **chron* *liver* *dis* **oesoph* *varices* **varices* *oesoph* **hepat* *coma* **coma* *hepat* **enceph* *hepat* 'hepat* *enceph* **sequelae* *liver* **liver* *sequelae* **portal* *hyperten* **hepatoren* *syndro* **syndro* *hepatoren* **eosophag* *varices* </pre>
Chronic neurological disease (including dementia, stroke, epilepsy)	<p>Davidson, J and Warren-Gash, C (2022). Clinical codelist - CPRD Aurum - chronic neurological disease. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00002817.</p> <p>PANORAMIC criteria details epilepsy and stroke as chronic neurological conditions which were not reflected in the existing code list, and were added using the following search terms</p> <p>Epilepsy Stroke</p>	<pre> *epilep* *stroke* *stroke* *cerebr* *inforc* *cerebr* *acc* *CVA* *Tran* *ischemic* </pre>
Severe and profound learning disability	<p>Severe and profound learning disability (including terms that 'definitely' indicate a learning disability)</p> <p>Angelman syndrome Coffin-Lowry syndrome Cornelia de lange syndrome Cri du chat syndrome</p> <p>Dubowitz's syndrome Edward's syndrome</p> <p>Hurler's syndrome</p> <p>Laurence-Moon Syndrome Mowat-Wilson syndrome Patau syndrome</p>	<pre> *learning* *dis* *learning* *diff* *retard* *angelman* *Coffin-lowry* *cornelia* *lange* *cri du chat* *5p Deletion* *cat* *cry* *dubowitz* *edwards* *synd* *Trisomy* *18* *hurler* *mucopolysacc* *laurence-moon* *Mowat-Wilson* *Patau* *Trisomy* *13* </pre>

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	Rett syndrome	*rett *
	Smith-Magenis syndrome	*Smith-Magenis*
	Wolff - Hirschorn syndrome	*Chromosome* *deletion*
		wolf *Hirs*
Down's syndrome	Down's syndrome	*down*
		trisom
		mongol
Diabetes mellitus (Type I or Type II)	Type I	*type 1 dia*
		type I dia
		diabetes mellitus juv
		*diabetes mellitus
		insulin dep
		juvenile onset dia
		juvenile-onset dia
		*juvenile-onset
		diabetes mellitus type 1
		diabetes mellitus type I
		diabetes type 1
		diabetes type I
	Type II	*type 2 dia*
		type II dia
		adult onset dia
		adult-onset dia
		non-insulin dep
		noninsulin dep
		non-insulin-dep
		NIDDM
		T2D
		diabetes type 2
		diabetes mellitus type 2
		diabetes type II
		diabetes mellitus type II
		type 2*
		type II*
		diabetes mellitus adult
Immunosuppression: primary (e.g., inherited immune disorders resulting from genetic mutations, usually present at birth and diagnosed in childhood) or secondary due to disease or treatment (e.g., sickle cell, HIV, cancer, chemotherapy)	Forbes, H (2020). Therapy Code List - Immunosuppression Aurum Therapy Codes. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00001589 .	We filtered among therapy codes for moderate immunosuppression for those drugs classified as chemotherapy.

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Solid organ, bone marrow and stem cell transplant recipients	Forbes, H (2020). Clinical Code List - Moderate Immunosuppression OPCS Codes. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00001587	
	Any transplant	*transplant*
	Solid organ transplant	*organ* *recipient* *heart* *recipient* *lung* *recipient* *pancreas* *recipient* *kidney* *recipient* *intestine* *recipient* *gland* *recipient* *stomach* *recipient* *spleen* *recipient* *liver* *recipient* *bladder* *recipient*
	Bone marrow transplant	*marrow* *graft* *graft* *marrow*
	Stem cell transplant	*stem* *transplant* *transplant* *stem* *stem* graft* *graft* *stem*
Morbid obesity (BMI > 35)		*obes* *BMI*
Severe mental illness	Severe mental illness, unspecified	*severe* *ment* *acute* *ment* *severe* *psy* *acute* *psy* *nervous break*
	Schizophrenia	*schiz* *psycot* *psychosis* *mania* mania* *manic*
	Bipolar disorder	*bipo*
	Self-harm	*self harm* *cutt* *self* *in* *self-i* *self-h*
	Obsessive-compulsive disorder	*OCD* *obsess*
	Eating disorder	*anor* *bulimia* *eating dis*
	Medicines for severe mental illness	Agomelatine Amoxapine Clomipramine hydrochloride Dosulepin hydrochloride Doxepin hydrochloride Imipramine hydrochloride

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	Isocarboxazid Lofepamine hydrochloride Loxapine succinate Moclobemide Nefazodone hydrochloride Phenelzine sulfate Reboxetine mesilate Tranylcypromine sulfate Trazodone hydrochloride Trimipramine maleate Venlafaxine hydrochloride Vortioxetine hydrobromide
Community and care home resident	*nursing home* *home* *nursing* *care* *home* *home* *care* *residen* *care* *care* *resident*
Judged by recruiting medically qualified professional, research nurse, nurse prescriber, prescribing pharmacist, dependent on the ISA for the specific IMP involved, to be clinically vulnerable	Unable to define, given nature of secondary database research.

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Supplemental file 1, Table 5: Search Terms for UK Health Security Agency Clinical Risk Group Definition

Classification as written in Green Book	Concept as written in Green Book	Search terms	
Chronic respiratory disease – individuals with a severe lung condition	Poorly controlled asthma	Asthma with an oral corticosteroid use in the past 24 months	
	Chronic obstructive pulmonary disease (COPD), including chronic bronchitis and emphysema	Davidson, J, Warren-Gash, C and Mcdonald, H (2021). Clinical codelist - CPRD Aurum - chronic respiratory disease. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00002214 .	
		bronchiec	
	Bronchiectasis	Davidson, J, Warren-Gash, C and Mcdonald, H (2021). Clinical codelist - CPRD Aurum - chronic respiratory disease. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00002214 .	
	Cystic fibrosis	*pulmon* *fibros*	
	Interstitial lung fibrosis	*lung* *fibros*	
Pneumoconiosis	Pneumoconiosis	*fibros* *lung*	
		ipf	
		pneumocon	
Bronchopulmonary dysplasia (BPD)	Bronchopulmonary dysplasia (BPD)	*asbestosis*	
		silicos	
Chronic heart disease and vascular disease	Congenital heart disease	*broncho* *dysplas*	
		BDP	
	Hypertension with cardiac complications	Hypertension with cardiac complications	*congen* *hear*
			congen *card*
	Chronic heart failure	Chronic heart failure	*CHD*
			hyperten
high *blood* *pres*			
* bp *			
Individuals requiring regular medication and/or follow-up for ischaemic heart disease (includes individuals with atrial	Individuals requiring regular medication and/or follow-up for ischaemic heart disease (includes individuals with atrial	*bp*	
		HBP	
		HTN	
		CCF	
		CHF	
		hear *fail*	
Individuals requiring regular medication and/or follow-up for ischaemic heart disease (includes individuals with atrial	Individuals requiring regular medication and/or follow-up for ischaemic heart disease (includes individuals with atrial	*card* *fail*	
		hear *diseas*	
		artero *diseas*	
		vasc *diseas*	
Individuals requiring regular medication and/or follow-up for ischaemic heart disease (includes individuals with atrial	Individuals requiring regular medication and/or follow-up for ischaemic heart disease (includes individuals with atrial	*CAD*	
		ihd	

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	fibrillation, peripheral vascular disease or a history of venous thromboembolism)	*myocard* *isch* *chd* *fibrilla* *afib* *VTE* *thrombo* *DVT* *blood* *clot* *pulmon* *embolis* *pe*
Chronic kidney disease	At stage 3, 4 or 5 Chronic kidney failure	*CKD* *renal* *disease* *renal* *failure* *renal* *insufficiency* *renal* *disorder* *kidney* *disease* *kidney* *disorder* *kidney* *failure* *eGFR* *estimated* *glomerular* *filtration* *rate* *disease* *renal* *failure* *renal* *insufficiency* *renal* *disorder* *renal* *disease* *kidney* *disorder* *kidney* *failure* *kidney*
	Nephrotic syndrome Kidney transplantation	*nephro* Davidson, J, Warren-Gash, C, Mcdonald, H, Evans, D and Clay, S (2021). Clinical codelist - chronic kidney disease. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00002406 .
		We selected transplant-specific codes.
Chronic liver disease	Chronic hepatitis	*chron* *hepat** *hepat* *chron** *acute* *yellow* *atroph** *hepat* *notif** *granul* *hepat** *alpha* *hepat** *hepat* *tox** *toxop* *hepat** *acute hepatitis c** *alcoh* *hepat** *subacute* *hepat**

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		nonspec *hepat* *nonalco* *liver* *dis* *hepat* *malaria* *malaria* *hepat* *autoimm* *hepat* *hepatitis c without* *toxic* *hepat* *hepatitis C* *sequelae* *viral* *hep* *chron* *liver* *dis* *oesoph* *varices* *varices* *oesoph* *hepat* *coma* **coma* *hepat* *enceph* *hepat* hepat* *enceph* *sequelae* *liver* *liver* *sequelae* *portal* *hyperten* *hepatoren* *syndro* *syndro* *hepatoren* *oesophag* *varices* *cirrhos* *biliary c* *destructive* *chol* *sclero* *cholangit* *recurr* *cholangit* *chron* *cholangit*
	Cirrhosis	
	Biliary atresia	
Chronic neurological disease	Stroke	*stroke* *cerebr* *infarc* *cerebr* *acc* *CVA* *tran* *ischemic*
	Transient ischaemic attack (TIA)	
	Conditions in which respiratory function may be compromised due to neurological or neuromuscular disease (e.g. polio syndrome sufferers)	*polio* *infant* *parlay* *heine* *dis*
	Cerebral palsy	*cereb* *palsy* *cereb palsy* *cp*
	Severe or profound and multiple learning disabilities (PMLD) including all those on the learning disability register	*learning* *dis* *learning* *diff* *retard* *angelman* *Coffin-lowry* *cornelia* *lange*

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		cri du chat
		5p Deletion
		cat *cry*
		dubowitz
		edwards *synd*
		Trisomy *18*
		hurler
		mucopolysacc
		laurence-moon
		Mowat-Wilson
		Patau
		Trisomy *13*
		*rett *
		Smith-Magenis
		Chromosome *deletion*
		wolf *Hirs*
	Down's syndrome	*down*
		trisomy
		mongol
	Multiple sclerosis	*multiple sclerosis*
		sclerosis multiple
		encephalomyelit *disseminat*
		ms
	Epilepsy	*epilep*
	Dementia	*demen*
		senil
	Parkinson's disease	*parkinson*
		hypo *rigid*
		parlay *agit*
		shak *pals*
		*pd *
	Motor neurone disease and related or similar conditions, hereditary and degenerative disease of the nervous system or muscles, severe neurological disability	*motor* *neurone* *disease*
		kennedy
		amyotrophic *lateral* *sclerosis*
		ALS
		primary *lateral* *sclerosis*
		progressive *bulbar* *palsy*
		progressive *spinal* *muscular* *atrophy*
		myo
Diabetes mellitus and other endocrine disorders	Type I	*type 1 dia*
		type I dia
		diabetes mellitus juv
		*diabetes mellitus
		insulin dep
		juvenile onset dia
		juvenile-onset dia
		*juvenile-onset
		diabetes mellitus type 1
		diabetes mellitus type I
		diabetes type 1

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	Type II	<ul style="list-style-type: none"> *diabetes type I* *type 2 dia* *type II dia* *adult onset dia* *adult-onset dia* *non-insulin dep* *noninsulin dep* *non-insulin-dep* *NIDDM* *T2D* *diabetes type 2* *diabetes mellitus type 2* *diabetes type II* *diabetes mellitus type II* type 2* type II* *diabetes mellitus adult*
	Addison's disease	<ul style="list-style-type: none"> *Addison* *adren* *insuff* *hypocort* *hypoadren*
Immunosuppression due to disease or treatment	Patients undergoing chemotherapy leading to immunosuppression	<p>Forbes, H (2020). Therapy Code List - Immunosuppression Aurum Therapy Codes. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00001589.</p>
	Patients undergoing radical radiotherapy	<p>We filtered among therapy codes for moderate immunosuppression for those drugs classified as chemotherapy. Davidson, J, Warren-Gash, C and Mcdonald, H (2021). Clinical codelist - CPRD Aurum - Immuosuppressive conditions. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00002234.</p>
	Solid organ transplant recipients	<p>We filtered for radiotherapy-specific codes.</p> <ul style="list-style-type: none"> *transplant* *organ* *recipient** *heart* *recipient** *lung* *recipient** *pancreas* *recipient** *kidney* *recipient** *intestine* *recipient** *gland* *recipient** *stomach* *recipient** *spleen* *recipient** *liver* *recipient**

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Bone marrow or stem cell transplant recipients	*bladder* *recipient* LSHTM - Forbes, H (2020). Clinical Code List - Moderate Immunosuppression OPCS Codes. [Data Collection]. London School of Hygiene & Tropical Medicine, London, United Kingdom. https://doi.org/10.17037/DATA.00001587 .
HIV infection at all stages	*HIV* *immunodeficiency vir*
Multiple myeloma or genetic disorders affecting the immune system (e.g. IRAK-4, NEMO, complement disorder, SCID)	*myelom* *kahler* *NEMO* *nuclear* *fact* *IKBKG* *mut* *NFKB* *complement* *SCID* *combin* *immune* *alympho* *glanz* *synd* *immunodef* *synd*
Individuals who are receiving immunosuppressive or immunomodulating biological therapy including, but not limited to, anti-TNF, alemtuzumab, ofatumumab, rituximab, patients receiving protein kinase inhibitors or PARP inhibitors, and individuals treated with steroid sparing agents such as cyclophosphamide and mycophenolate mofetil	Adalimumab Etanercept Infliximab Golimumab Certolizumab pegol Abatacept Olaparib Rucaparib Niraparib Afatinib Axitinib Bosutinib Cetuximab Cobimetinib Crizotinib Cabozantinib Dacomitinib Dasatinib Entrectinib Erlotinib Fostamatinib Gefitinib Ibrutinib Imatinib Lapatinib Nilotinib Paxopanib Pegaptanib Ruxolitinib Sorafenib

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	Individuals treated with or likely to be treated with systemic steroids for more than a month at a dose equivalent to prednisolone at 20mg or more per day for adults	Sunitinib Vandetanib Vemurafenib Betamethasone Cortisone Dexamethasone Hydrocortisone Methylprednisolone Prednisolone
	Anyone with a history of haematological malignancy, including leukaemia, lymphoma, and myeloma	*CMML* *chronic myelom* *lymph* *leuk* *CLL* *follic* *lymph* * fl *
	Those who require long term immunosuppressive treatment for conditions including but not limited to: systemic lupus erythematosus, rheumatoid arthritis, inflammatory bowel disease, scleroderma, psoriasis	Using drugs listed above
Asplenia or dysfunction of the spleen. This includes conditions that may lead to splenic dysfunction	Asplenia	*asplen* *heterotax* *situs* *ambig*
	Homozygous sickle cell disease	*sickl* *SCD*
	Thalassemia major	*thal*
	Coeliac syndrome	*coelia* *celia* *sprue* *glut* *entero*
Morbid obesity (adults with a BMI >40kg/m ²)	Obesity with specification of BMI >40kgm ²	*obes* *BMI* Measured values using height and weight which calculate to >40 kgm/2
Severe mental illness	Schizophrenia	*schiz* *psycot* *psychosis* * mania* mania* *manic*
	Bipolar disorder	*bipo* *severe* *ment*

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	Any mental illness that causes severe functional impairment	*acute* *ment* *severe* *psy* *acute* *psy* *nervous break* *self harm* *cutt* *self* *in* *self-i* *self-h* *OCD* *obsess* *anor* *bulimia* *eating dis*
Pregnancy (all stages (first, second and third trimester))	Pregnancy	*pregnan* *trimest* *gestat*
	End of pregnancy	*birth* *deliver* *abortio*

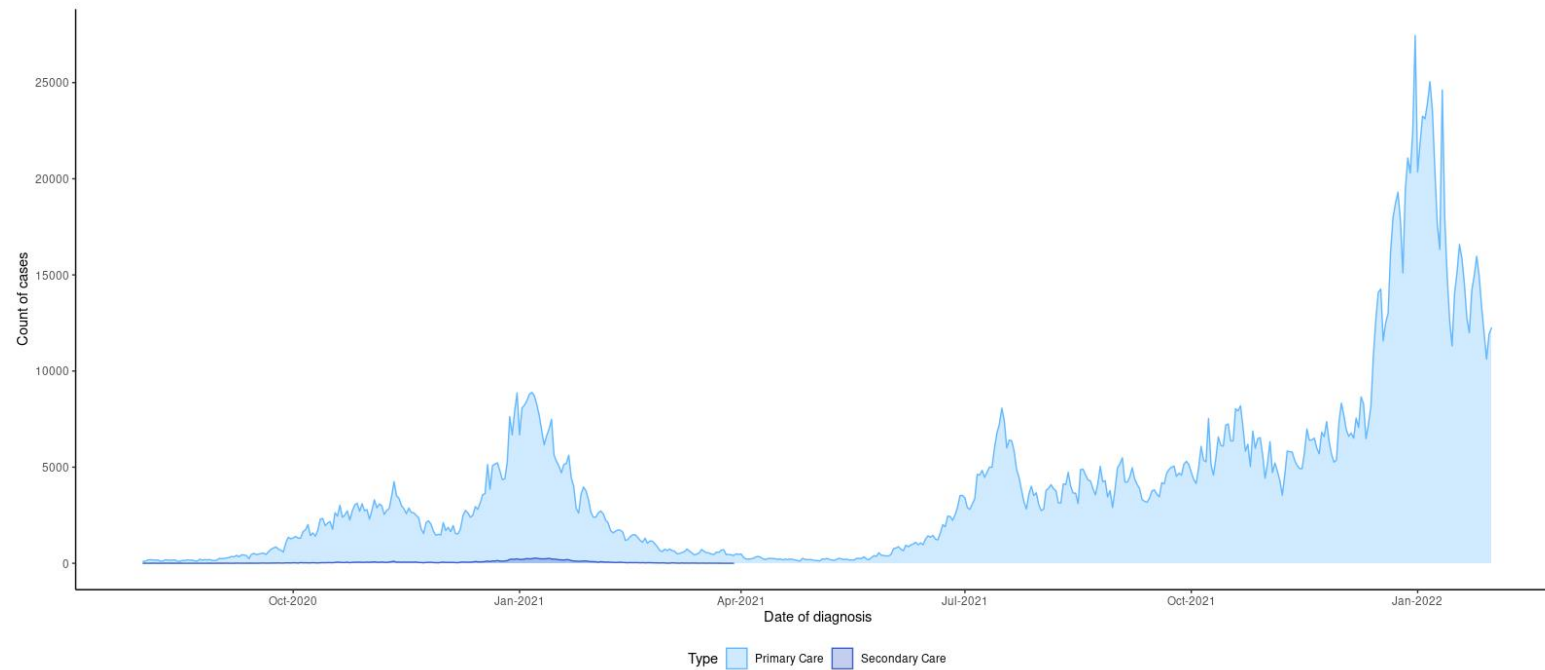
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Supplemental file 1, Table 6: Cohort Attrition

	Unique person ID's
Persons of any age diagnosed with COVID from August 1, 2020 through January 31, 2022 using the May 2022 CPRD Aurum data release.	2,631,267
Files of "acceptable research quality", as defined by CPRD.	2,631,267
Continuously registered with CPRD GP practice for at least 365 days prior to COVID diagnosis, and did not have a registration end date, practice last collection date or death date prior to COVID diagnosis.	2,322,875
Hospital Episode Statistics (HES) Admitted Patient Care (APC) linkage eligible.	2,289,708
Once ONS data were received, 42 persons were noted that should have been excluded from the final cohort because ONS death data preceded index date.	2,289,666
Excluded persons who were admitted to the hospital on or before their primary care recorded date of COVID diagnosis. Due to mandatory GP reporting guidelines, this may be lagged from the date of true test collection and therefore not accurately reflect date of diagnosis.	2,271,072

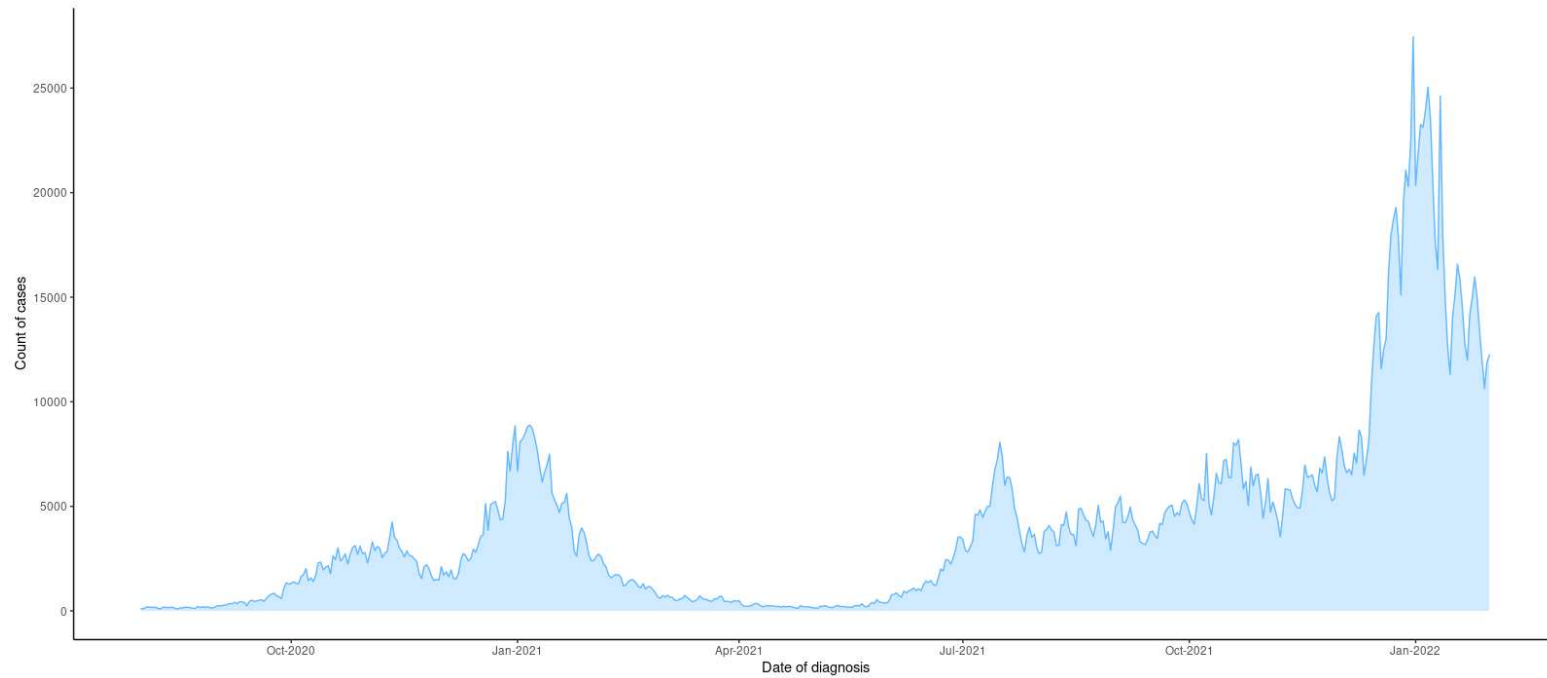
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Supplemental file 1, Figure 1: Date of Diagnosis for 2,271,072 COVID Cases in CPRD Aurum, By Care Setting, August 1, 2020 through January 31, 2022



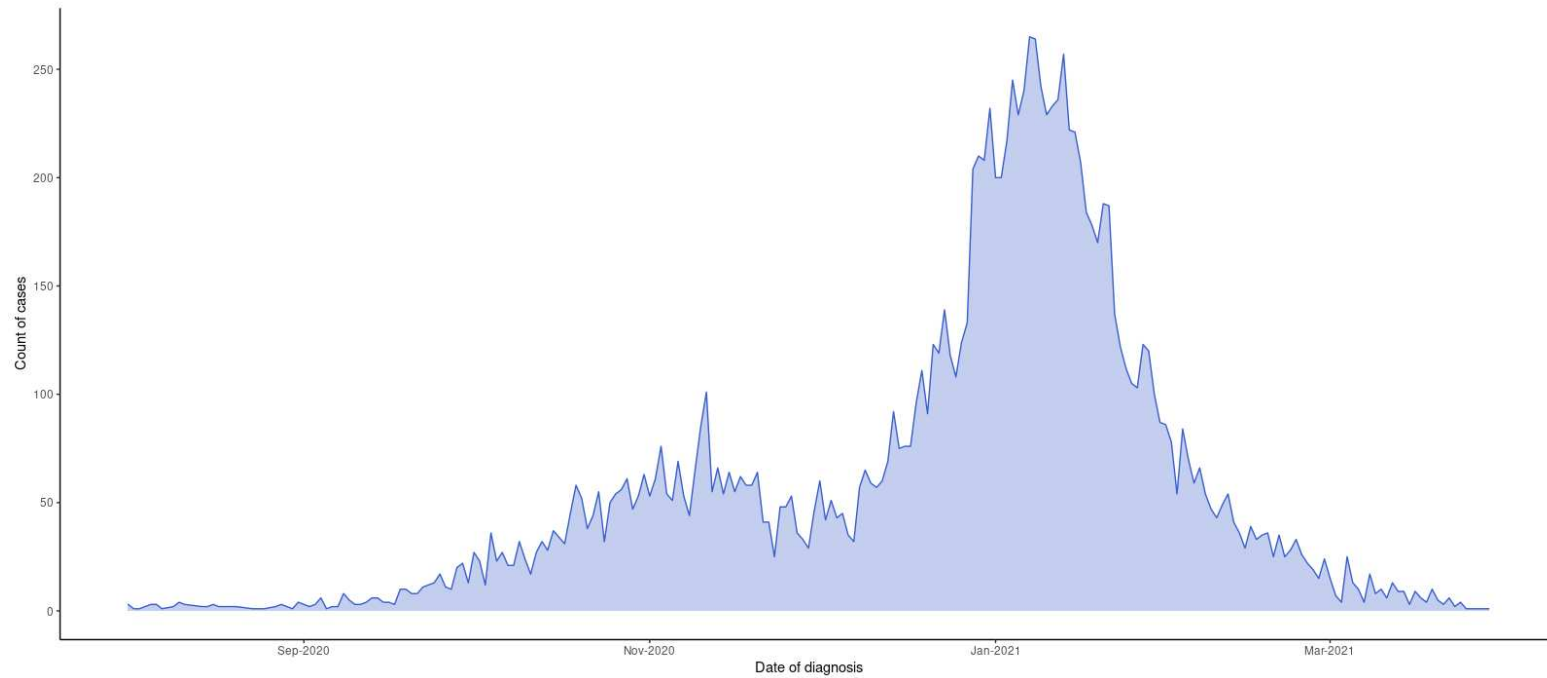
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Supplemental file 1, Figure 2: Date of Diagnosis for 2,257,907 Primary Care COVID Cases in CPRD Aurum, August 1, 2020 through January 31, 2022

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Supplemental file 1, Figure 3: Date of Primary Care Recorded Diagnosis in CPRD Aurum-HES Linked Data for 13,165 Hospitalised COVID Cases, August 1, 2020 through March 31, 2021

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Supplemental file 1, Table 7: Reference National Case Counts and Census Distributions for England

	All COVID Cases (n = 20,386,786)	COVID Admissions (n = 954,124)	Population of England (n = 56,489,800)
Age groups in years			
0-4	454,587 (2%)	--	3,077,000 (5%)
5-9	1,146,248 (6%)	--	3,348,600 (6%)
10-14	1,626,090 (8%)	--	3,413,100 (6%)
15-19	1,396,404 (7%)	--	3,218,900 (6%)
20-24	1,567,499 (8%)	--	3,414,400 (6%)
25-29	1,735,467 (9%)	--	3,715,400 (7%)
30-34	1,795,926 (9%)	--	3,952,600 (7%)
35-39	1,714,241 (8%)	--	3,795,400 (7%)
40-44	1,637,287 (8%)	--	3,580,400 (6%)
45-49	1,477,924 (7%)	--	3,602,600 (6%)
50-54	1,431,931 (7%)	--	3,907,700 (7%)
55-59	1,241,556 (6%)	--	3,806,300 (7%)
60-64	929,614 (5%)	--	3,256,100 (6%)
65-69	626,179 (3%)	--	2,767,500 (5%)
70-74	523,000 (3%)	--	2,796,600 (5%)
75-79	391,839 (2%)	--	2,038,800 (4%)
80-84	277,529 (1%)	--	1,427,900 (2%)
85-89	277,112 (1%)	--	872,200 (2%)
90+	192,353 (1%)	--	498,200 (< 1%)
0-5	--	20,400 (2%)	--
6-17	--	13,942 (1%)	--
18-64	--	335,675 (35%)	--
65-84	--	379,584 (40%)	--
85+	--	199,497 (21%)	--
Unknown	--	5,026 (1%)	--
Sex			
Male	9,245,295 (45%)	--	27,656,300 (49%)
Female	11,141,491 (55%)	--	28,833,500 (51%)
Region			
North East	948,543 (5%)	--	2,647,100 (5%)
North West	2,582,413 (13%)	--	7,417,300 (13%)
Yorkshire and The Humber	1,825,820 (9%)	--	5,480,800 (10%)
East Midlands	1,623,157 (8%)	--	4,880,200 (9%)
West Midlands	1,942,370 (10%)	--	5,950,800 (11%)
East of England	2,101,467 (10%)	--	6,334,500 (11%)
London	2,914,578 (14%)	--	8,799,800 (16%)
South East	3,125,838 (15%)	--	9,278,100 (16%)
South West	1,834,854 (9%)	--	5,701,200 (10%)
Unknown	1,487,746 (7%)	--	--

Note: coronavirus.data.gov.uk no longer publishes case counts by age, sex or region at the day level. It was not possible to limit to the study period of August 1, 2020 – January 31, 2022, and therefore the results

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above reflect the figures as accessed on January 31, 2023 of the total number of cases since the start of the pandemic.

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Supplemental file 1, Table 8: Regional Distribution of CPRD COVID cohorts, CPRD Practices, COVID Cases and Population of England

Region	CPRD Aurum			England	
	Primary Care COVID Cases (n = 2,257,907)	Hospitalized COVID Cases (n = 13,165)	All CPRD Aurum Patients	All COVID Cases (n = 20,386,786)	Population (n = 56,489,800)
North East	4%	4%	5%	5%	5%
North West	21%	22%	17%	13%	13%
Yorkshire and The Humber	3%	3%	4%	9%	10%
East Midlands	2%	2%	3%	8%	9%
West Midlands	17%	16%	18%	10%	11%
East of England	4%	3%	5%	10%	11%
London	19%	23%	16%	14%	16%
South East	20%	20%	20%	15%	16%
South West	10%	8%	14%	9%	10%
Unknown	< 1%	0		7%	--

All CPRD Aurum patients refers figures published in “Data resource profile: Clinical Practice Research Datalink (CPRD) Aurum” by Wolf et al (International Journal of Epidemiology 2019). We were unable to find more recent distributions by ONS region of all CPRD Aurum patients.

For all COVID cases, coronavirus.data.gov.uk no longer publishes case counts by region at the day level. It was not possible to limit to the study period of August 1, 2020 – January 31, 2022, and therefore the results above reflect the figures as accessed on January 31, 2023 of the total number of cases since the start of the pandemic.

For the population of England, we used ONS 2021 Census figures.

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Supplemental file 1, Table 9: Characteristics of Primary Care COVID Cases in CPRD Aurum, by High Risk Definitions

	All (n = 2,257,907)	Meeting NHS Highest Risk Conditions (n = 249,972)	Meeting PANORAMIC Criteria (n = 691,593)	Meeting UKHSA Clinical Risk (n = 225,051)
Cases meeting definition	--	11%	31%	10%
Age, mean (SD)	34 (19)	53 (18)	55 (15)	49 (21)
Sex				
Male	1,046,275 (46%)	37%	45%	42%
Female	1,211,592 (54%)	63%	55%	58%
Unknown	40 (< 1%)	< 1%	< 1%	< 1%
General Practitioner Practice Region				
North East	83,834 (4%)	12,776 (5%)	29,115 (4%)	9,678 (4%)
North West	471,195 (21%)	60,632 (23%)	157,317 (23%)	53,930 (24%)
Yorkshire and The Humber	71,429 (3%)	8,563 (3%)	23,079 (3%)	7,532 (3%)
East Midlands	49,651 (2%)	5,472 (2%)	14,001 (2%)	4,678 (2%)
West Midlands	377,125 (17%)	43,550 (17%)	118,027 (17%)	38,817 (17%)
East of England	95,139 (4%)	10,394 (4%)	28,546 (4%)	7,824 (3%)
London	424,908 (19%)	45,690 (18%)	118,663 (17%)	40,268 (18%)
South East	448,536 (20%)	45,430 (17%)	130,283 (19%)	38,808 (17%)
South West	235,785 (10%)	27,437 (11%)	72,473 (10%)	23,480 (10%)
Unknown	305 (< 1%)	28 (< 1%)	89 (< 1%)	36 (< 1%)
Non-immunocompromised	2,193,241 (100%)	218,912 (100%)	648,474 (100%)	196,621 (100%)
Unvaccinated	1,170,509 (53%)	82,484 (38%)	236,106 (36%)	96,498 (49%)
1 COVID vaccine dose	173,853 (8%)	9,527 (4%)	28,711 (5%)	12,469 (6%)
2 COVID vaccine doses	598,367 (27%)	73,907 (34%)	234,570 (36%)	54,869 (28%)
First booster	250,512 (12%)	52,994 (24%)	149,087 (23%)	32,785 (17%)
Immunocompromised	64,666 (100%)	41,060 (100%)	43,119 (100%)	28,430 (100%)
Unvaccinated	1,306 (2%)	832 (2%)	791 (2%)	675 (2%)
1 COVID vaccine dose	6,033 (9%)	3,556 (9%)	3,105 (7%)	2,661 (9%)
2 COVID vaccine doses	33,953 (53%)	20,928 (51%)	21,636 (50%)	14,416 (51%)
3 COVID vaccine doses	23,108 (36%)	15,544 (38%)	17,388 (40%)	10,542 (37%)
First booster	266 (< 1%)	200 (< 1%)	199 (< 1%)	136 (< 1%)

SD: standard deviation. Where necessary, to fulfill CPRD suppression rules of cells with 10 or fewer persons, categories are presented as percentages to prevent back-calculation.

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Supplemental file 1, Table 10: Characteristics of Hospitalized COVID Cases in CPRD Aurum-HES Linked Data, by High Risk Definitions

	All (n = 13,165)	Meeting NHS Highest Risk Conditions (n = 4,333)	Meeting PANORAMIC Criteria (n = 11,011)	Meeting UKHSA Clinical Risk (n = 5,353)
Hospitalized cases meeting definition	--	33%	84%	41%
Age, mean (SD)	60 (16)	66 (14)	65 (14)	66 (16)
Sex				
Male	7,537 (57%)	2,242 (52%)	6,280 (57%)	2,804 (52%)
Female	5,628 (43%)	2,091 (48%)	4,731 (43%)	2,549 (48%)
Unknown	0	0	0	0
General Practitioner Practice Region				
North East	467 (4%)	172 (4%)	397 (4%)	200 (4%)
North West	2,886 (22%)	962 (22%)	2,510 (23%)	1,263 (24%)
Yorkshire and The Humber	340 (3%)	126 (3%)	282 (3%)	156 (3%)
East Midlands	214 (2%)	73 (2%)	182 (2%)	97 (2%)
West Midlands	2,065 (16%)	708 (16%)	1,739 (16%)	891 (17%)
East of England	414 (3%)	147 (3%)	358 (3%)	175 (3%)
London	2,984 (23%)	943 (22%)	2,387 (22%)	1,105 (21%)
South East	2,682 (20%)	832 (19%)	2,235 (20%)	1,022 (19%)
South West	1,113 (8%)	370 (9%)	921 (8%)	444 (8%)
Unknown	0	0	0	0
Non-immunocompromised	12,984	4,179	10,832	5,208
Unvaccinated	12,744 (98%)	4,107 (98%)	10,602 (98%)	5,070 (97%)
1 COVID vaccine dose	240 (2%)	72 (2%)	230 (2%)	138 (3%)
2 COVID vaccine doses	0	0	0	0
First booster	0	0	0	0
Immunocompromised	181	154	179	145
Unvaccinated	102 (56%)	89 (58%)	100 (56%)	79 (54%)
1 COVID vaccine dose	79 (44%)	65 (42%)	79 (44%)	66 (46%)
2 COVID vaccine doses	0	0	0	0
3 COVID vaccine doses	0	0	0	0
First booster	0	0	0	0

SD: standard deviation.