**File S1:** List of variables and data field codes utilized in the UK Biobank analyses

A. Anthropometry

Standing height (50); weight (21002); body mass index (21001); waist circumference (48); hip circumference (49); systolic blood pressure, automated reading (4080); diastolic blood pressure, automated reading (4079)

B. Hematological data

Haemoglobin concentration (30020)

C. Serum biochemistry markers

Cholesterol (30690); glucose (30740); glycated haemoglobin (30750); HDL cholesterol (30760); LDL cholesterol (30780); triglycerides (30870); urate (30880)

D. Socio-demographic data

Sex (31); genetic sex (22001); age when attended assessment centre (21003); ethnic background (21000); country of birth (1647); pregnant (3140); had menopause (2724); age at menopause (3581); qualifications (6138)

E. Health-related outcomes

Number of self-reported cancers (134); non-cancer illness code, self-reported (20002): 1192 - renal/kidney failure, 1193 - renal failure requiring dialysis, 1194 - renal failure not requiring dialysis, 1451 - hereditary/genetic haematological disorder, 1339 - sickle cell disease, 1340 - thalassemia, 1445 - clotting disorder/excessive bleeding, 1327 - low platelets/platelet disorder, 1328 - haemophilia, 1546 - essential thrombocytosis, 1439 - hiv/aids, 1440 - tuberculosis (tb), 1441 - malaria, 1443 - schistosomiasis/bilharzia, 1065 - hypertension, 1072 - essential hypertension, 1220 - diabetes, 1223 - type 2 diabetes, 1473 - high cholesterol, 1466 - gout; vascular/heart problems diagnosed by doctor (6150); diabetes diagnosed by doctor (2443); main ICD9 diagnoses (41203); secondary ICD9 diagnoses (41205); main ICD10 diagnoses (41202); secondary ICD10 diagnoses (41204)

F. Medications

Medication for cholesterol, blood pressure or diabetes (6177); medication for cholesterol, blood pressure, diabetes, or take exogenous hormones (6153); treatment/medication, prescription medications via verbal interview (20003)

G. Lifestyle

Smoking status (20116); current tobacco smoking (1239); alcohol drinker status (20117); alcohol intake frequency (1558); physical activity, IPAQ activity group (22032)

H. Others

Fasting time (74)

**File S2:** Disease definitions used in the UK Biobank analyses

|  |  |  |  |
| --- | --- | --- | --- |
| **Metabolic Outcome** | **ICD-9 Codes** | **ICD-10 Codes** | **Self-reported Fields** |
| Obesity | 278  2780, 2781, 2788 | E66  E660, E661, E662, E668, E669 | - |
| Hypertension | 401-405  4010, 4011, 4019  4020, 4021, 4029  4030, 4031, 4039  4040, 4041, 4049  4050, 4051, 4059 | I10-I13, I15, O10  I110, I119  I120, I129  I130, I131, I132, I139  I150, I151, I152, I158, I159  O100, O101, O102, O103, O104, O109 | 6150 (4), 6177 (2), 6153 (2), 20002 (1065, 1072) |
| Diabetes mellitus, type 2 | 250  2500, 25000, 25001, 25009  2501, 25010, 25011, 25019  2502, 25020, 25021, 25029  2503, 2504, 2505, 2506, 2507  2509, 25090, 25091, 25099 | E11-E14  E110, E111, E112, E113, E114, E115, E116, E117, E118, E119  E120, E121, E122, E123, E124, E125, E126, E127, E128, E129  E130, E131, E132, E133, E134, E135, E136, E137, E138, E139  E140, E141, E142, E143, E144, E145, E146, E147, E148, E149 | 2443 (1), 6177 (3), 6153 (3), 20002 (1220, 1223) |
| Dyslipidemia | 2720, 2721, 2722, 2723, 2724  27200, 27201, 27202, 27203, 27209  27240, 27248, 27249 | E780, E781, E782, E783, E784, E785 | 6177 (1), 6153 (1),  20002 (1473) |
| Gout | 274  2740, 2741, 2748, 2749 | M10  M100, M101, M102, M103, M104, M109  M1000, M1001, M1002, M1003, M1004, M1005, M1006, M1007, M1008, M1009  M1010, M1011, M1012, M1013, M1014, M1015, M1016, M1017, M1018, M1019  M1020, M1021, M1022, M1023, M1024, M1025, M1026, M1027, M1028, M1029  M1030, M1031, M1032, M1033, M1034, M1035, M1036, M1037, M1038, M1039  M1040, M1041, M1042, M1043, M1044, M1045, M1046, M1047, M1048, M1049  M1090, M1091, M1092, M1093, M1094, M1095, M1096, M1097, M1098, M1099 | 20002 (1466) |

**File S3:** Prescription medication codes (data field 20003) in the UK Biobank analyses

A. Anti-hypertensive drugs

1140888578 - antihypertensive, 1140860470 - methyldopa, 1140860558 - metalpha 250mg tablet, 1140860478 - aldomet 125mg tablet, 1140910606 - alpha methyldopa, 1141164148 - imidapril hydrochloride, 1141164154 - tanatril 5mg tablet, 1140860882 - cilazapril, 1140860892 - vascace 250micrograms tablet, 1140860728 - quinapril, 1140881706 - accupro 5mg tablet, 1140860736 - accuretic tablet, 1140860750 - captopril, 1140860758 - capoten 12.5mg tablet, 1140860764 - captopril+hydrochlorothiazide 25mg/12.5mg tablet, 1141150560 - kaplon 12.5mg tablet, 1140881714 - capozide tablet, 1140851692 - capozide 50mg tablets x28, 1140888552 - enalapril, 1140860776 - innovace 2.5mg tablet, 140860784 - innozide tablet, 1140860790 - enalapril maleate+hydrochlorothiazide 20mg/12.5mg tablet, 1140881712 - renitec 5mg tablet, 1140860696 - lisinopril, 1140864952 - lisinopril+hydrochlorothiazide 10mg/12.5mg tablet, 1140860706 - carace 2.5mg tablet, 1140864910 - carace 10 plus tablet, 1140860714 - zestril 2.5mg tablet, 1140864618 - zestoretic 10 tablet, 1140888560 – perindopril, 1140860802 - coversyl 2mg tablet, 1141180592 - perindopril+indapamide, 1140860806 - ramipril, 1141165470 - felodipine+ramipril, 1141165476 - triapin mite 2.5mg/2.5mg tablet, 1141188408 - tritace 1.25mg tablet, 1141199940 - lopace 2.5mg capsule, 1140888556 - fosinopril, 1140860878 - staril 10mg tablet, 1140864176 - monozide 10 tablet, 1140860904 - trandolapril, 1140860912 - gopten 500micrograms capsule, 1140923712 - moexipril, 1141145658 - angiotensin ii receptor antagonist, 1140866758 - vasaten 50mg tablet, 1141171336 - eprosartan, 1141171344 - teveten 300mg tablet, 1141156836 - candesartan cilexetil, 1141156846 - amias 2mg tablet, 1141152998 - irbesartan, 1141153006 - aprovel 75mg tablet, 1141172682 - irbesartan+hydrochlorothiazide 150mg/12.5mg tablet, 1141172686 - coaprovel 150mg/12.5mg tablet, 1140916356 - losartan, 1140916362 - cozaar half strength 25mg tablet, 1141151018 - cozaar-comp 50mg/12.5mg tablet, 1141179974 - cozaar 25mg tablet, 1141151016 - losartan potassium+hydrochlorothiazide 50mg/12.5mg tablet, 1141145660 - valsartan, 1141145668 - diovan 40mg capsule, 1141201038 - valsartan+hydrochlorothiazide 80mg/12.5mg tablet, 1141201040 - co-diovan 80mg/12.5mg tablet, 1141193282 - olmesartan, 1141193346 - olmetec 10mg tablet, 1141166006 - telmisartan, 1141187790 - micardisplus 40mg/12.5mg tablet, 1141172492 - micardis 20mg tablet, 1141187788 - telmisartan+hydrochlorothiazide 40mg/12.5mg tablet, 1140872568 - nimodipine, 1140872472 - nimotop 30mg tablet, 1141153026 - lercanidipine, 1141153032 - zanidip 10mg tablet, 1140879802 - amlodipine, 1140861202 - istin 5mg tablet, 1141200400 - amlostin 5mg tablet, 1140888646 - felodipine, 1141190160 - vascalpha 5mg m/r tablet, 1141187094 - cabren 2.5mg m/r tablet, 1141199858 - cardioplen xl 5mg m/r tablet, 1141188836 - felendil xl 5mg m/r tablet, 1141188576 - felogen xl 5mg m/r tablet, 1141188152 - felotens xl 5mg m/r tablet, 1141188920 - keloc sr 5mg m/r tablet, 1141200782 - neofel xl 5mg m/r tablet, 1140868036 - parmid 10mg tablet, 1141201814 - parmid xl 5mg m/r tablet, 1140928212 - plendil 2.5mg m/r tablet, 1141150500 - slofedipine 20mg m/r tablet, 1140861088 - nifedipine, 1140860358 - tenif capsule, 1140926188 - unipine xl 30mg m/r tablet, 1140923572 - adipine mr 10 m/r tablet, 1140861090 - adalat 5mg capsule, 1140881702 - adalat 10mg capsule, 1140861106 - calcilat 10mg capsule, 1140861120 - coracten sr 10mg m/r capsule, 1140860426 - atenolol+nifedipine 50mg/20mg m/r capsule, 1140860356 - beta-adalat capsule, 1141173766 - calchan mr 10mg m/r tablet, 1141145870 - fortipine la40 m/r tablet, 1141157140 - nifedipress mr 10 m/r tablet, 1141150538 - nifedotard 20mr m/r tablet, 1141169730 - nifopress retard 20mg m/r tablet, 1140927940 - tensipine mr 10 m/r tablet, 1140861276 - lacidipine, 1140861282 - motens 2mg tablet, 1140879806 - diltiazem, 1140861128 - tildiem 60mg m/r tablet, 1140861136 - angiozem 60mg m/r tablet, 1140861138 - adizem-60 m/r tablet, 1140926780 - adizem-xl plus m/r capsule, 1140861166 - dilzem sr 60mg long acting m/r capsule, 1140926778 - diltiazem hcl+hydrochlorothiazide 150mg/12.5mg m/r capsule, 1140917428 - angitil sr 90 m/r capsule, 1141175224 - bi-carzem sr 60mg m/r capsule, 1141157136 - dilcardia sr 60mg m/r capsule, 1140911698 - slozem 120mg m/r capsule, 1141151474 - viazem xl 120mg m/r capsule, 1141174684 - zemret 180 xl m/r capsule, 1141167832 - zemtard 120 xl m/r capsule, 1140888510 – verapamil, 1141169710 - vertab sr 240 m/r tablet, 1141150926 - verapress mr 240 m/r tablet, 1141187774 - vera-til sr 120mg m/r tablet, 1140881692 - univer 120mg m/r capsule, 1141153328 - trandolapril+verapamil hydrochloride, 1141153316 - tarka 2mg/180mg m/r capsule, 1140866466 - securon 40mg tablet, 1140866460 - half securon sr 120mg m/r tablet, 1140866554 - cordilox 40mg tablet, 1140851730 - calcicard 60mg tablet, 1140860338 - viskaldix tablet, 1140879810 - nicardipine, 1140861176 - cardene 20mg capsule, 1140861190 - isradipine, 1140881894 - diuretic, 1140866092 - metolazone, 1140866094 - metenix-5 tablet, 1140866090 - methyclothiazide, 1140909708 - furosemide, 1140866116 - frusemide, 1140866412 - lasilactone capsule, 1140866506 - frusemide+potassium 20mg/10mmol m/r tablet, 1141195258 - furosemide+potassium 20mg/10mmol m/r tablet, 1140866332 - triamterene+frusemide 50mg/40mg tablet, 1140866194 - frusid 40mg tablet, 1140851414 - frumax 40mg tablet, 1140866406 - frumil tablet, 1140866408 - frusene tablet, 1140866418 - fru-co tablet, 1140866248 - lasix 20mg tablet, 1140888496 - torasemide, 1140864874 - torem 2.5mg tablet, 1140866122 - bendrofluazide, 1140910442 - bzt – bendrofluazide, 1140860340 - timolol maleate+bendrofluazide 10mg/2.5mg tablet, 1140866450 - bendrofluazide+potassium 2.5mg/7.7mmol m/r tablet, 1141146126 - atenolol+bendrofluazide, 1141194794 - bendroflumethiazide, 1141194800 - bendroflumethiazide+potassium 2.5mg/7.7mmol m/r tablet, 1140860312 - nadolol+bendroflumethiazide 40mg/5mg tablet, 1141194808 - timolol maleate+bendroflumethiazide 10mg/2.5mg tablet, 1141194810 - atenolol+bendroflumethiazide, 1140866136 - neo-naclex 5mg tablet, 1140866446 - neo-naclex k m/r tablet, 1140866162 - hydrochlorothiazide, 1140888686 - hydralazine, 1140866156 - cyclopenthiazide, 1140866158 - navidrex 500mcg tablet, 1140909706 - chlortalidone, 1140866144 - chlorthalidone, 1140866410 - kalspare tablet, 1140866146 - hygroton 50mg tablet, 1141180778 - atenolol+chlortalidone, 1140851484 - paritane 20mg tablet, 1140866108 - xipamide, 1140866110 - diurexan 20mg tablet, 1140866078 - indapamide, 1141180592 - perindopril+indapamide, 1141180598 - coversyl plus 4mg/1.25mg tablet, 1141201244 - eplerenone, 1141201250 - inspra 25mg tablet, 1141146378 - natrilix sr 1.5mg m/r tablet, 1140888922 - nindaxa 2.5mg tablet, 1140888512 - amiloride, 1140866352 - navispare tablet, 1140923276 - co-amilozide, 1140866422 - amiloride hcl+cyclopenthiazide 2.5mg/250micrograms tablet, 1140866426 - amiloride hydrochloride+bumetanide 5mg/1mg tablet, 1140866416 - moduret 25 tablet, 1140866420 - moduretic tablet, 1140927174 - amilamont 5mg/ml s/f oral solution, 1140866226 - berkamil 5mg tablet, 1140866280 - bumetanide, 1140866448 - bumetanide+potassium 500micrograms/7.7mmol m/r tablet, 1140866282 - burinex 1mg tablet, 1140866438 - burinex k m/r tablet, 1140866356 - burinex a tablet, 1140866388 - triamterene, 1140866328 - triam-co tablet, 1140866402 - dyazide tablet, 1140866236 - spironolactone, 1140866244 - aldactone 25mg tablet, 1140866312 - spiroctan 25mg tablet, 1140866318 - spirolone 25mg tablet, 1140923282 - co-flumactone, 1140866396 - aldactide 25 tablet, 1140916342 - beta-blocker, 1140866692 - beta-adrenoceptor blocking drug, 1140879854 - sotalol, 1140860304 - beta-cardone 40mg tablet, 1140860362 - sotacor 80mg tablet, 1140860332 - sotalol hydrochloride+hydrochlorothiazide 80mg/12.5mg tablet, 1140860292 - pindolol, 1140860294 - visken 5mg tablet, 1140910614 - prindolol, 1141164276 - nebivolol, 1141164280 - nebilet 5mg tablet, 1140860192 - nadolol, 1141194804 - nadolol+bendroflumethiazide 40mg/5mg tablet, 1140860194 - corgard 40mg tablet, 1140875808 - metipranolol, 1140860278 - mepranix 50mg tablet, 1140909368 - carvedilol, 1141168498 - eucardic 3.125 tablet, 1140866724 - acebutolol, 1140866726 - sectral 100mg capsule, 1140866738 - atenolol, 1140866756 - tenormin 25 tablet, 1140922930 - atenix 25mg tablet, 1140860348 - atenixco 50mg/12.5mg tablet, 1141146124 - atenolol+chlorthalidone, 1140923336 - co-tenidone, 1140860324 - tenoret 50 tablet, 1140860328 - tenoretic tablet, 1141146128 - atenolol+co-amilozide, 1140879760 - bisoprolol, 1140860434 - monocor 5mg tablet, 1140860492 - emcor 10mg tablet, 1140864950 - bisoprolol fumarate+hydrochlorothiazide 10mg/6.25mg tablet, 1141171152 - cardicor 1.25mg tablet, 1141182904 - soloc 5mg tablet, 1140879762 - celiprolol, 1140860498 - celectol 200mg tablet, 1140879818 - metoprolol, 1140860308 - metoprolol tartrate+chlorthalidone 100mg/12.5mg tablet, 1140860404 - metoprolol tartrate+hydrochlorothiazide 100mg/12.5mg tablet, 1140860266 - betaloc 50mg tablet, 1140860274 - lopresor 50mg tablet, 1141182968 - tensomex 100mg tablet, 1140879824 - labetalol, 1140860250 - trandate 50mg tablet, 1140879830 - oxprenolol, 1140860334 - trasidrex tablet, 1140860220 - slow-trasicor 160mg m/r tablet, 1140860222 - trasicor 20mg tablet, 1140879842 - propranolol, 1141156754 - half propatard la 80mg m/r capsule, 1140866704 - angilol 10mg tablet, 1140860418 - propranolol hydrochloride+bendrofluazide 80mg/2.5mg capsule, 1140866712 - cardinol 10mg tablet, 1140866764 - apsolol 10mg tablet, 1140866804 - inderal 10mg tablet, 1140866800 - half-inderal la 80mg m/r capsule, 1140851556 - bedranol 10mg tablet, 1140866782 - beta-prograne 160mg m/r capsule, 1140866802 - half beta-prograne 80mg m/r capsule, 1141152076 - half propanix la 80mg m/r capsule, 1140866766 - propanix 10mg tablet, 1141187048 - rapranol sr 80mg m/r capsule, 1140860336 - timolol maleate+co-amilozide 10mg/2.5mg/25mg tablet, 1140879778 - doxazosin, 1140860690 - cardura 1mg tablet, 1141194372 - doxadura 1mg tablet

B. Anti-hyperglycemic drugs

1140883066 - insulin product, 1140884600 - metformin, 1141189090 - rosiglitazone 1mg / metformin 500mg tablet, 1141189094 - avandamet 1mg / 500mg tablet, 1140874686 - glucophage 500mg tablet, 1140874744 - gliclazide, 1140874746 - diamicron 80mg tablet, 1140874646 - glipizide, 1141157284 - glipizide product, 1140874652 - minodiab 2.5mg tablet, 1140874658 - gliquidone, 1140874664 - tolazamide, 1141152590 - glimepiride, 1141156984 - amaryl 1mg tablet, 1140874718 - glibenclamide, 1140874674 - tolbutamide, 1140874706 - chlorpropamide, 1140874716 - glymese 250mg tablet, 1141168660 - repaglinide, 1141168668 - novonorm 0.5mg tablet, 1141173882 - nateglinide, 1141173786 - starlix 60mg tablet, 1141171646 - pioglitazone, 1141171652 - actos 15mg tablet, 1141177600 - rosiglitazone, 1141177606 - avandia 4mg tablet, 1140874826 - glucagon product, 1140868902 - acarbose, 1140868908 - glucobay 50mg tablet

C. Triglyceride-lowering drugs

1140861924 - bezafibrate, 1141157260 - bezafibrate product, 1140861926 - bezalip 200mg tablet, 1140861928 - bezalip-mono 400mg m/r tablet, 1141201306 - fibrazate xl 400mg m/r tablet, 1140861954 - fenofibrate, 1140862026 - ciprofibrate, 1140862028 - modalim 100mg tablet, 1140861944 - clofibrate, 1140861856 - gemfibrozil (lopid), 1141157262 - gemfibrozil product, 1140861858 - lopid 300 capsule, 1140910670 - niacin, 1141188546 - niaspan 500mg m/r tablet, 1140861868 - nicotinic acid, 1193 - omega-3/fish oil supplement, 1141181868 - omacor 1g capsule

D. Cholesterol-lowering drugs

1140861958 - simvastatin, 1140881748 - zocor 10mg tablet, 1141200040 - zocor heart-pro 10mg tablet, 1141188146 - simvador 10mg tablet, 1140888594 - fluvastatin, 1140864592 - lescol 20mg capsule, 1140888648 - pravastatin, 1140861970 - lipostat 10mg tablet, 1141146234 - atorvastatin, 1141146138 - lipitor 10mg tablet, 1141192410 - rosuvastatin, 1141192414 - crestor 10mg tablet, 1140910632 - eptastatin, 1140910654 - velastatin, 1141192736 - ezetimibe, 1141192740 - ezetrol 10mg tablet, 1140861936 - questran 4g/sachet powder, 1140865576 - cholestyramine, 1141157416 - cholestyramine product, 1140861942 - cholestyramine+aspartame 4g/sachet powder, 1140909780 - colestyramine, 1141180734 - colestyramine product, 1141180722 - colestyramine+aspartame 4g/sachet powder, 1140888590 - colestipol, 1140861848 - colestid 5g/sachet granules

E. Anti-hyperuricemic drugs

1140875408 - allopurinol, 1140875476 - zyloric 100mg tablet, 1140875478 - zyloric 300mg tablet, 1140875496 - sulphinpyrazone, 1140909890 - sulfinpyrazone, 1140875496 - sulphinpyrazone, 1140875498 - anturan 100mg tablet, 1140875490 - probenecid, 1140875486 - colchicine