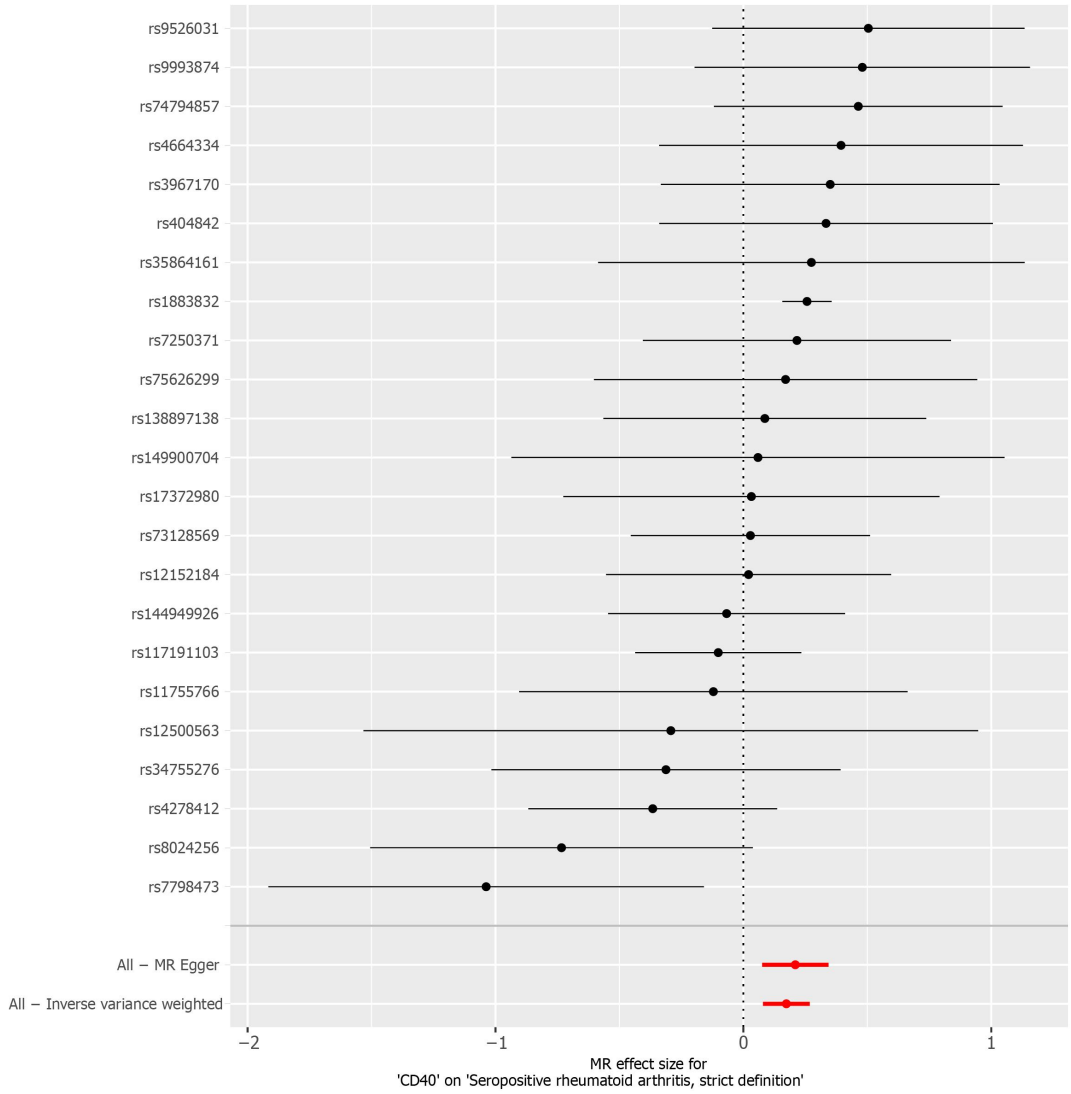
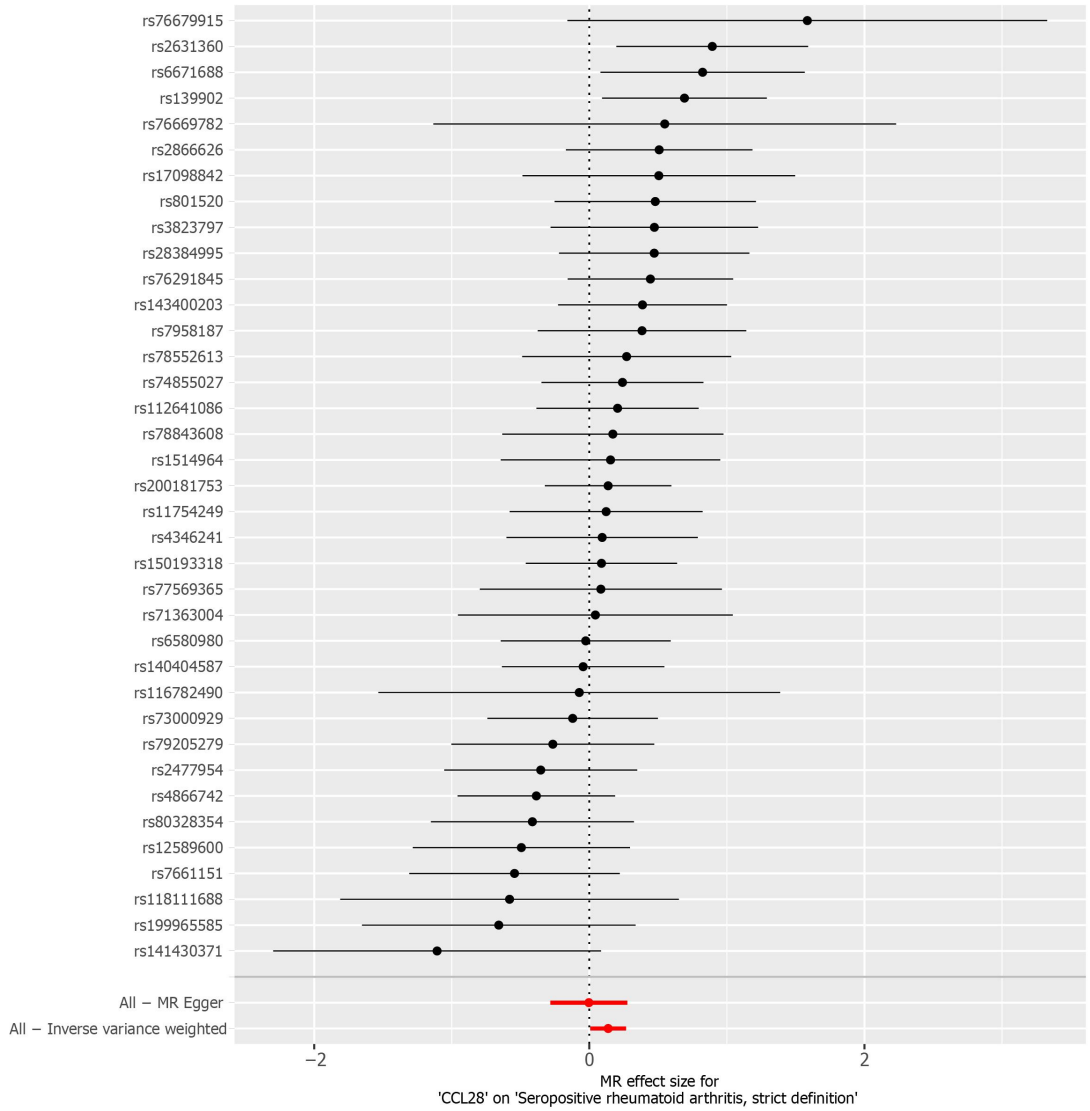
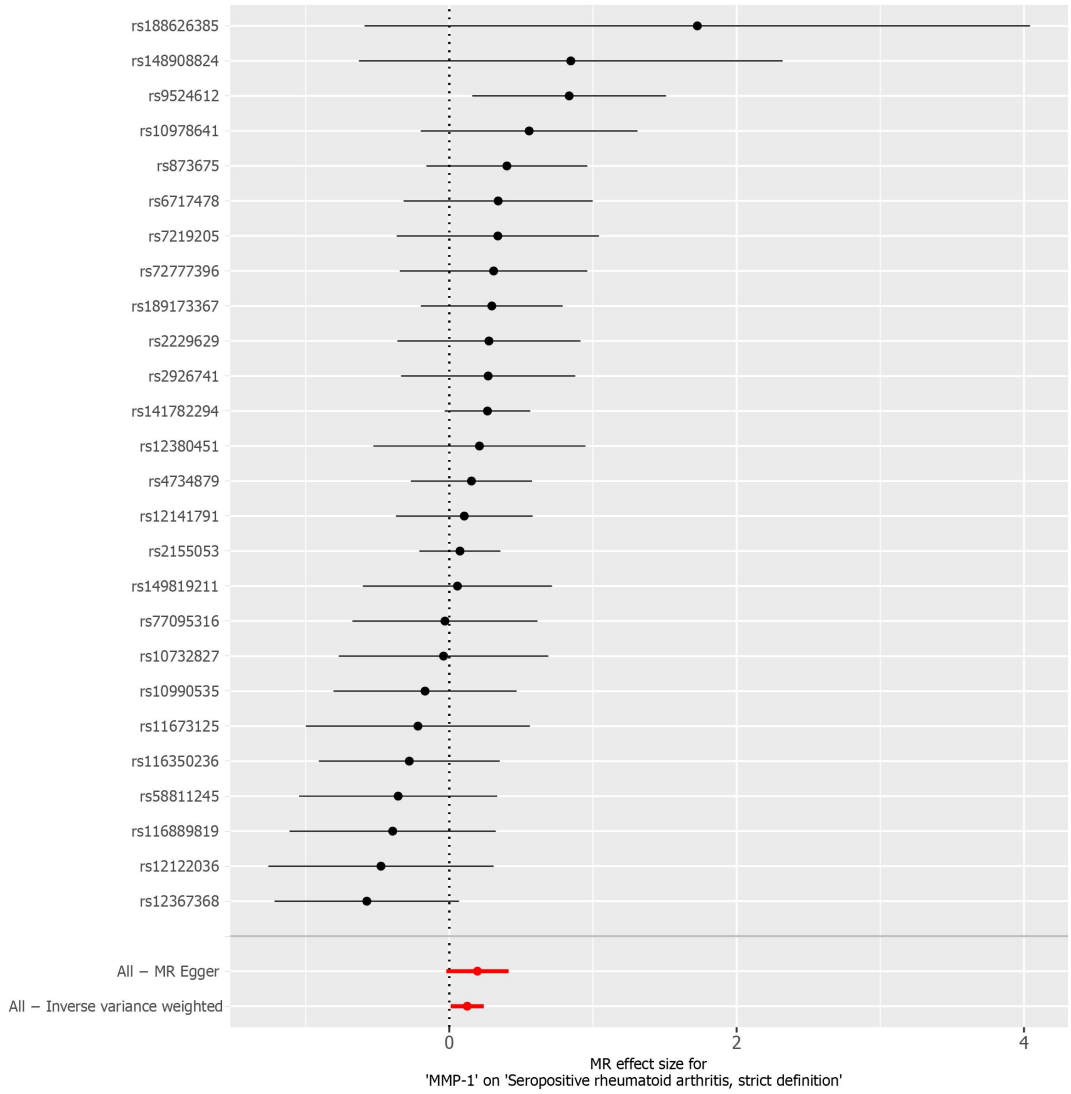


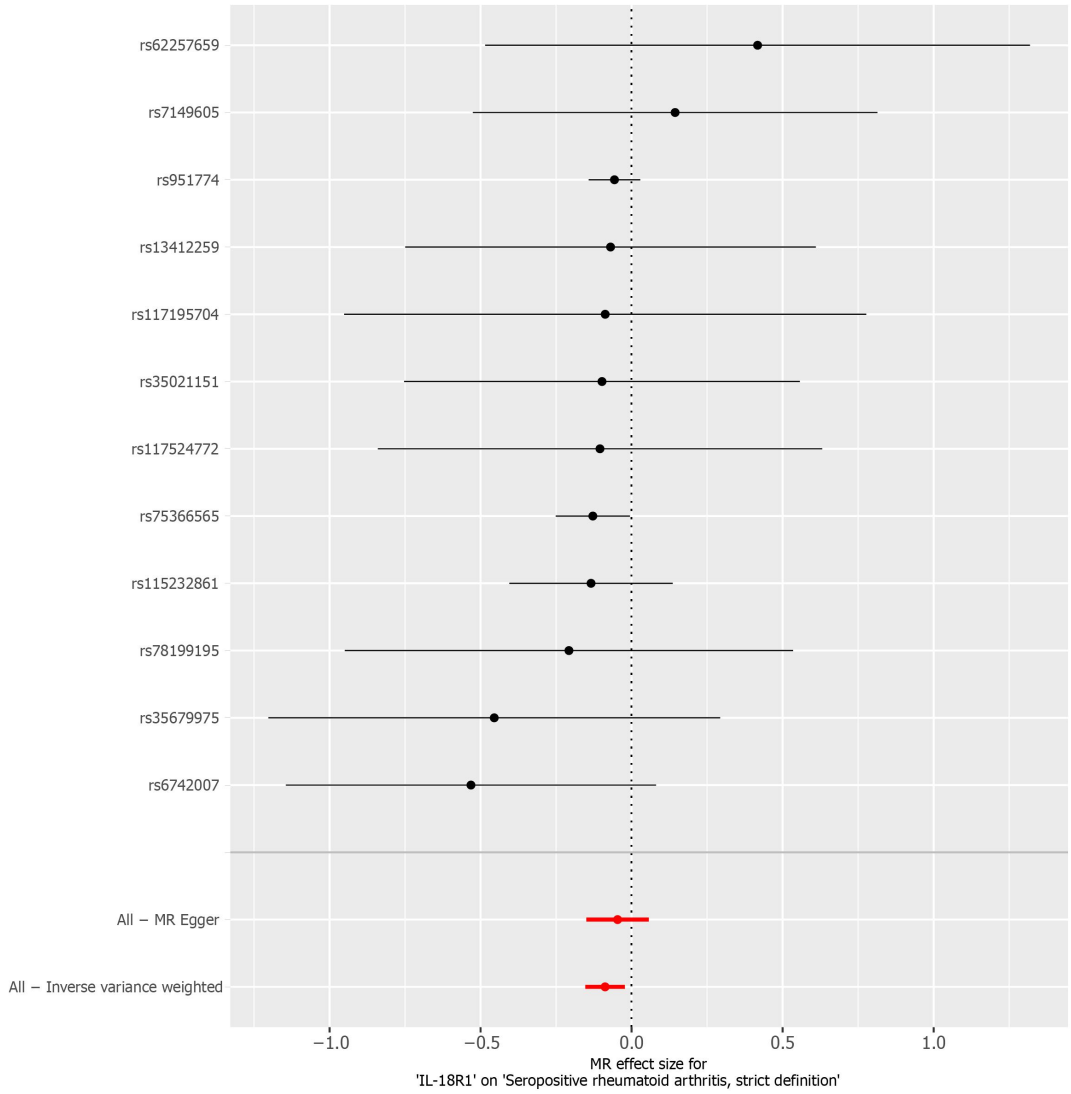
Supplementary Figure 1 CD40 forest.



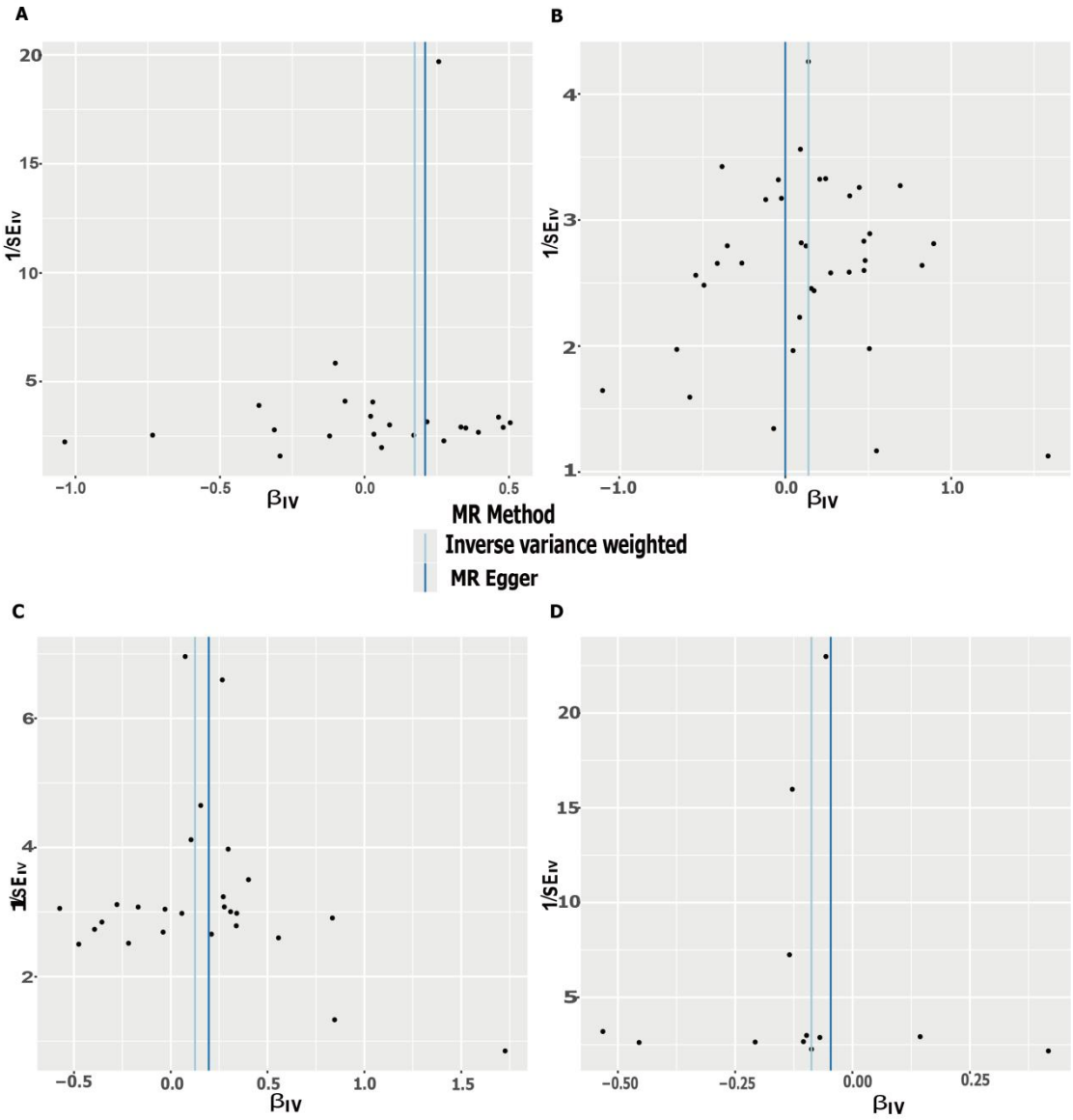
Supplementary Figure 2 CCL28 forest.



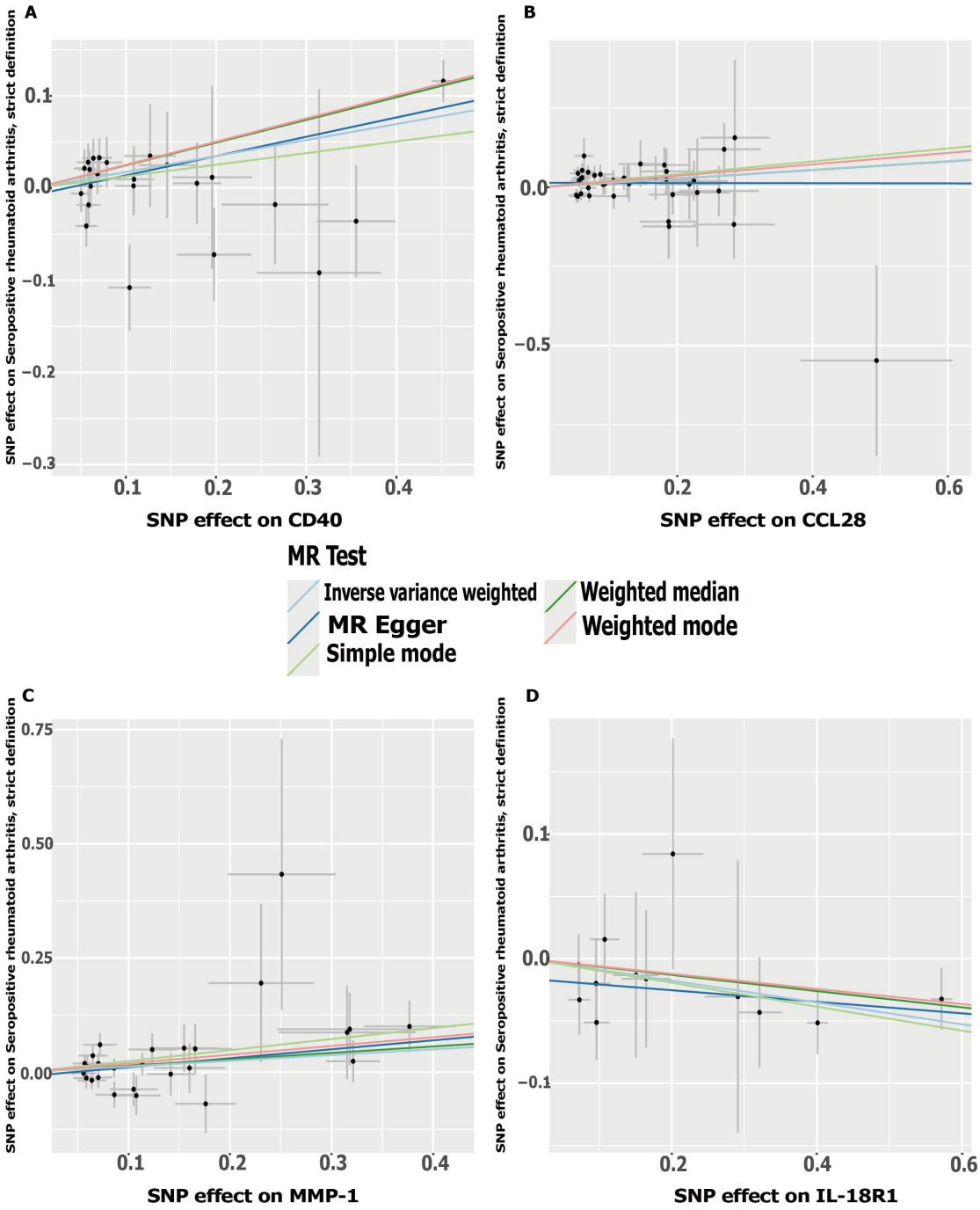
Supplementary Figure 3 MMP-1 forest.



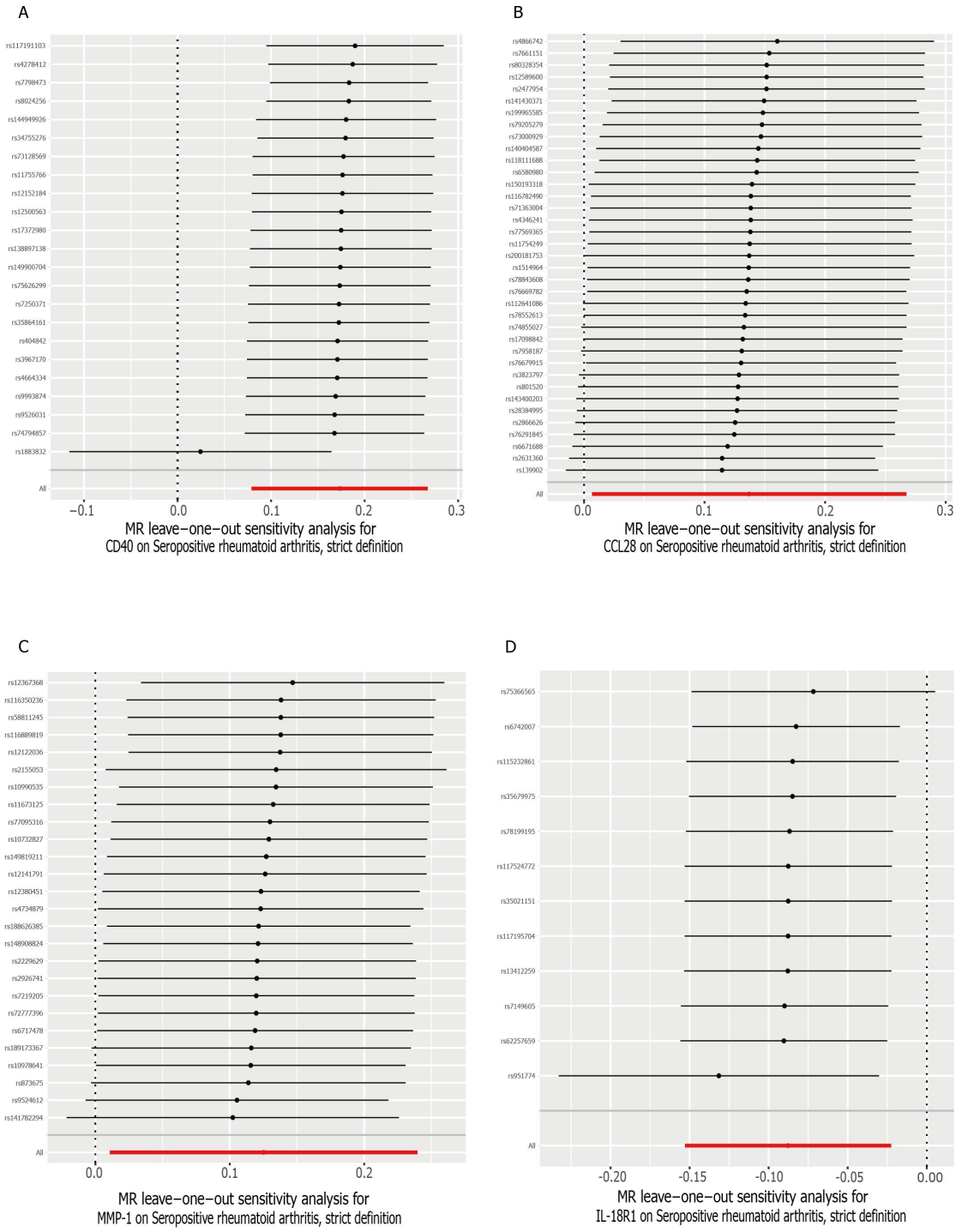
Supplementary Figure 4 IL-18R1 forest.



Supplementary Figure 5.



Supplementary Figure 6.



Supplementary Figure 7.

Supplementary Table 1

SNP	effect_allele.exposure	other_allele.exposure	effect_allele.outcome	other_allele.outcome	beta.exposure	beta.outcome	eaf.exposure	pval.outcome	se.exposure	
rs117191103	T	C	T	C	0.3553	-0.0360204	0.0208	0.553372	reported	80.6505103092005
rs11755766	T	C	T	C	-0.0504	0.0060997	0.5049	0.76207	reported	80.6505103092005
rs12152184	A	G	A	G	0.1085	0.0022721	0.8849	0.943097	reported	80.6505103092005
rs12500563	T	G	T	G	0.3143	-0.0919643	0.9875	0.643622	reported	80.6505103092005
rs138897138	A	G	A	G	0.109	0.0094347	0.914	0.794497	reported	80.6505103092005
rs144949926	A	G	A	G	-0.2655	0.0179516	0.9784	0.781604	reported	80.6505103092005
rs149900704	A	G	A	G	-0.1956	-0.011518	0.0203	0.907622	reported	80.6505103092005
rs17372980	T	C	T	C	-0.0611	-0.0019710	0.7421	0.933572	reported	80.6505103092005
rs18838	T	C	T	C	-0.4519	-0.115955	0.2575	4.36375e-	reporte	80.6505103

32								07	d	92005
rs34755276	A	G	A	G	0.0587	-0.0183338	0.3475	0.384804	reported	80.6505103092005
rs35864161	T	G	T	G	-0.1269	-0.0348141	0.9543	0.531978	reported	80.6505103092005
rs3967170	A	G	A	G	0.0789	0.0276415	0.1353	0.314797	reported	80.6505103092005
rs404842	A	G	A	G	-0.0599	-0.0199721	0.6433	0.331532	reported	80.6505103092005
rs4278412	C	G	C	G	0.1978	-0.0723246	0.0203	0.153384	reported	80.6505103092005
rs4664334	T	C	T	C	0.0541	0.0213079	0.5003	0.292715	reported	80.6505103092005
rs7250371	T	C	T	C	0.0686	0.0148195	0.3648	0.495689	reported	80.6505103092005
rs73128569	A	T	A	T	-0.1788	-0.00507877	0.9406	0.908154	reported	80.6505103092005
rs74794857	T	C	T	C	0.0707	0.0327704	0.4128	0.118584	reported	80.6505103092005

rs75626299	C	G	C	G	0.1458	0.0248148	0.9638	0.666104	reported	80.6505103092005
rs7798473	A	C	A	C	-0.1041	0.108026	0.0609	0.0205925	reported	80.6505103092005
rs8024256	A	G	A	G	-0.0562	0.0412279	0.3092	0.0624698	reported	80.6505103092005
rs9526031	A	C	A	C	0.064	0.0322611	0.4882	0.116859	reported	80.6505103092005
rs9993874	A	G	A	G	-0.0582	-0.0279209	0.4883	0.164538	reported	80.6505103092005
rs112641086	T	C	T	C	-0.1056	-0.0216997	0.0895	0.494461	reported	23.035207529601
rs116782490	A	C	A	C	0.2298	-0.0167874	0.9815	0.921895	reported	23.035207529601
rs11754249	A	G	A	G	0.0934	0.0114199	0.1058	0.73258	reported	23.035207529601
rs118111688	A	T	A	T	0.1874	-0.108663	0.9776	0.35593	reported	23.035207529601
rs12589600	A	G	A	G	0.051	-0.0251922	0.5556	0.220133	reported	23.035207529601

rs139902	A	C	A	C	0.0684	0.0473142	0.3659	0.0235548	reported	23.035207529601
rs140404587	T	G	T	G	-0.2617	0.0117392	0.0119	0.881609	reported	23.035207529601
rs141430371	A	G	A	G	-0.4948	0.54751	0.9936	0.068748	reported	23.035207529601
rs143400203	T	C	T	C	0.1812	0.0700408	0.0244	0.217183	reported	23.035207529601
rs150193318	A	G	A	G	0.2249	0.019881	0.0212	0.752794	reported	23.035207529601
rs15149 64	T	C	T	C	-0.1263	-0.0194817	0.9486	0.704787	reported	23.035207529601
rs17098842	A	G	A	G	0.1458	0.0736565	0.9674	0.31776	reported	23.035207529601
rs199965585	CT	C	CT	C	0.188	-0.123762	0.0278	0.194337	reported	23.035207529601
rs200181753	T	TG	T	TG	-0.1842	-0.0251898	0.9713	0.560214	reported	23.035207529601
rs2477954	T	C	T	C	-0.058	0.0204834	0.6211	0.323506	reported	23.035207529601

rs2631360	A	G	A	G	0.0597	0.0533611	0.5481	0.0119418	reported	23.035207529601
rs28384995	A	T	A	T	-0.0866	-0.0408632	0.8668	0.18143	reported	23.035207529601
rs2866626	C	G	C	G	-0.0597	-0.0303135	0.6079	0.142035	reported	23.035207529601
rs3823797	A	G	A	G	-0.058	-0.0274273	0.7423	0.218999	reported	23.035207529601
rs4346241	A	G	A	G	0.0907	0.00847631	0.9021	0.792224	reported	23.035207529601
rs4866742	T	C	T	C	0.0702	-0.0270244	0.4126	0.18729	reported	23.035207529601
rs6580980	A	G	A	G	-0.0688	0.00179783	0.4015	0.933925	reported	23.035207529601
rs6671688	T	C	T	C	0.0534	0.0439743	0.5411	0.0297324	reported	23.035207529601
rs71363004	C	G	C	G	0.2181	0.00963239	0.9802	0.930942	reported	23.035207529601
rs73000929	A	G	A	G	-0.1935	0.0234012	0.0347	0.702089	reported	23.035207529601

rs74855027	T	C	T	C	0.1215	0.0292869	0.0639	0.422291	reported	23.035207529601
rs76291845	A	G	A	G	0.2696	0.119733	0.9859	0.147773	reported	23.035207529601
rs7661151	T	C	T	C	0.0531	-0.0288739	0.6323	0.163686	reported	23.035207529601
rs76669782	A	C	A	C	-0.2853	-0.156423	0.0176	0.52289	reported	23.035207529601
rs76679915	T	C	T	C	0.0624	0.0988903	0.7035	0.07486	reported	23.035207529601
rs77569365	T	G	T	G	0.129	0.0108147	0.9561	0.851896	reported	23.035207529601
rs78552613	T	C	T	C	-0.1844	-0.0500092	0.0271	0.484097	reported	23.035207529601
rs78843608	A	G	A	G	-0.1684	-0.0288035	0.0376	0.676625	reported	23.035207529601
rs79205279	A	G	A	G	0.1063	-0.0282002	0.0645	0.48079	reported	23.035207529601
rs7958187	A	G	A	G	-0.055	-0.0210692	0.3872	0.321881	reported	23.035207529601

rs801520	A	C	A	C	0.0779	0.0373514	0.1364	0.199083	reported	23.035207529601
rs80328354	A	T	A	T	-0.2841	0.117544	0.9884	0.271901	reported	23.035207529601
rs10732827	A	G	A	G	0.0558	-0.00221623	0.3498	0.91497	reported	32.3546150587735
rs10978641	A	T	A	T	0.0649	0.0360919	0.7462	0.14831	reported	32.3546150587735
rs10990535	T	C	T	C	0.0703	-0.0118495	0.253	0.604032	reported	32.3546150587735
rs116350236	A	T	A	T	0.0639	-0.0177804	0.3845	0.385991	reported	32.3546150587735
rs11673125	T	C	T	C	-0.0585	0.0127594	0.296	0.583238	reported	32.3546150587735
rs116889819	A	G	A	G	-0.176	0.0693059	0.0455	0.282118	reported	32.3546150587735
rs12122036	A	T	A	T	-0.1077	0.0511878	0.0741	0.234614	reported	32.3546150587735
rs12141	A	G	A	G	0.0859	0.0089738	0.6981	0.666943	reporte	32.3546150

791						1			d	87735
rs12367368	T	G	T	G	0.0861	-0.049404	0.1146	0.0795353	reported	32.3546150587735
rs12380451	T	C	T	C	-0.0593	-0.0124554	0.7098	0.57689	reported	32.3546150587735
rs141782294	A	G	A	G	0.3767	0.100174	0.9777	0.079378	reported	32.3546150587735
rs148908824	A	G	A	G	-0.2306	-0.195077	0.0214	0.26061	reported	32.3546150587735
rs149819211	A	G	A	G	-0.1601	-0.00914602	0.0417	0.864882	reported	32.3546150587735
rs188626385	T	C	T	C	-0.2509	-0.433219	0.0177	0.143835	reported	32.3546150587735
rs189173367	T	C	T	C	0.3179	0.0941689	0.0131	0.2391	reported	32.3546150587735
rs2155053	T	C	T	C	-0.3212	-0.0239082	0.9461	0.604469	reported	32.3546150587735
rs2229629	A	G	A	G	-0.3153	-0.0871029	0.0135	0.395005	reported	32.3546150587735

rs2926741	T	C	T	C	-0.0704	-0.0190626	0.3436	0.380921	reported	32.3546150587735
rs4734879	A	G	A	G	0.1136	0.0175539	0.7422	0.472348	reported	32.3546150587735
rs58811245	T	C	T	C	-0.1051	0.037387	0.9266	0.311784	reported	32.3546150587735
rs6717478	A	T	A	T	0.1548	0.0526917	0.966	0.310395	reported	32.3546150587735
rs7219205	A	G	A	G	0.0569	0.019241	0.5023	0.346163	reported	32.3546150587735
rs72777396	A	G	A	G	0.1657	0.0511642	0.9671	0.353574	reported	32.3546150587735
rs77095316	T	G	T	G	-0.1416	0.00423481	0.0705	0.927481	reported	32.3546150587735
rs873675	T	C	T	C	0.1234	0.0495001	0.0684	0.160194	reported	32.3546150587735
rs9524612	T	C	T	C	-0.072	-0.060083	0.177	0.0152799	reported	32.3546150587735
rs115232861	T	C	T	C	-0.3209	0.0430965	0.9616	0.330471	reported	219.834923021361

rs117195704	A	G	A	G	-0.1505	0.0131555	0.0389	0.842888	reported	219.834923021361
rs117524772	A	C	A	C	0.2911	-0.0304616	0.0232	0.780371	reported	219.834923021361
rs13412259	C	G	C	G	-0.0716	0.00498363	0.2682	0.84092	reported	219.834923021361
rs35021151	A	G	A	G	-0.1646	0.0161262	0.0317	0.769449	reported	219.834923021361
rs35679975	T	C	T	C	0.0726	-0.0330147	0.8161	0.233332	reported	219.834923021361
rs62257659	A	G	A	G	-0.2015	-0.0840724	0.9745	0.364553	reported	219.834923021361
rs6742007	A	C	A	C	0.0962	-0.0511626	0.1233	0.0889426	reported	219.834923021361
rs714960 5	A	G	A	G	0.1075	0.0154924	0.0957	0.673231	reported	219.834923021361
rs75366565	T	C	T	C	-0.401	0.0514574	0.1988	0.040333	reported	219.834923021361
rs78199195	A	G	A	G	-0.0956	0.0198322	0.8928	0.583644	reported	219.834923021361

rs951774	A	C	A	C	0.5719	-0.0324199	0.1798	0.192656	reported	219.834923021361

Supplementary Table 2

id	method	nsnp	b	se	pval	lo_ci	up_ci	or	or_lci95	or_uci95	reportedTrait	symbol	efoTraits	samples	ancestry
GCST90074772	Inverse variance weighted	23	0.173374163444736	0.048090389854602498848	0.000311945344798487151	0.079116999932971591	0.267631327559756	1.189311018551235123	1.082330946657965796	1.306865245990569056	CD40L receptor levels	CD40	CD40 measurement	14736	European
GCST90074769	Inverse variance weighted	37	0.136995444204633	0.066557369923509	0.039560753681020999155522	0.006542999154547118931793	0.267447889223852	1.146822923817933132	1.006564451335225388	1.306625538831323132	C-C motif chemokine 28 levels	CCL28	C-C motif chemokine 28 measurement	14734	European
GCST90074826	Inverse variance weighted	26	0.125168598269573	0.058413168565281852818	0.032127977722123887621	0.010678787881621	0.239658408657526	1.133339516041174189	1.010736009641894189	1.270814976677677671	Matrix metalloproteinase-1 levels	MMP-1	matrix metalloproteinase 1 measurement	14744	European
GCST902	Inverse variance	12	-0.0877	0.03328141503	0.0083866094210	-0.15296	-0.0225	0.916005424460129349	0.858160129349	0.977749849749	interleukin-18 receptor 1	IL-18	interleukin-18 receptor 1	1474	Euro

74804	weighted	32992	61774	5362	4566	01419	06775	57308	52433	levels	R1	measurement	3	pean

Supplementary Table 3

id	method	nsnp	b	se	pval	lo_ci	up_ci	or	or_lci95	or_uci95	symbol
GCST90274772	MR Egger	23	0.209531928	0.068171147	0.005762523	0.075916479	0.343147376	1.233100744	1.078872462	1.409376455	CD40
GCST90274772	Weighted median	23	0.246256238	0.049464729	6.41E-07	0.149305337	0.343207106	1.279227318	1.161027478	1.409460639	CD40
GCST90274772	Inverse variance weighted	23	0.173374163	0.048090309	0.000311945	0.079116999	0.267631328	1.189311019	1.082330947	1.306865246	CD40
GCST90274772	Simple mode	23	0.126035631	0.164545129	0.451838337	-0.196472823	0.448544085	1.134322585	0.821623661	1.566030517	CD40
GCST90274772	Weighted mode	23	0.251362859	0.050486364	5.55E-05	0.152409584	0.350316133	1.285776555	1.164637156	1.419516234	CD40
GCST90274769	MR Egger	37	-0.003000592	0.142780896	0.983352756	-0.282851147	0.276849963	0.997003905	0.75363196	1.318968463	CCL28
GCST90274	Weighted median	37	0.1359904	0.0881296	0.1228133	-	0.3087245	1.1456708	0.9639231	1.3616872	CCL2

769			01	73	92	0.036743759	6	96		56	8
GCST90274769	Inverse variance weighted	37	0.136995444	0.06655737	0.039560754	0.006542999	0.267447889	1.146822924	1.006564451	1.306625539	CCL28
GCST90274769	Simple mode	37	0.203950849	0.185933725	0.279968086	-0.160479253	0.568380955	1.226237881	0.851735494	1.765406456	CCL28
GCST90274769	Weighted mode	37	0.180500562	0.153858314	0.24843526	-0.121061734	0.482062857	1.197816794	0.885979263	1.619411574	CCL28
GCST90274826	MR Egger	26	0.196388873	0.1105436	0.088318069	-0.020276583	0.413054328	1.217000071	0.979927605	1.511427137	MMP-1
GCST90274826	Weighted median	26	0.140674765	0.080117046	0.079111359	-0.016354645	0.297704175	1.151050226	0.983778367	1.346763323	MMP-1
GCST90274826	Inverse variance weighted	26	0.125168598	0.058413169	0.032127978	0.010678788	0.239658409	1.133339516	1.010736001	1.270814977	MMP-1
GCST90274826	Simple mode	26	0.241425254	0.127019751	0.068932203	-0.007533466	0.490383966	1.273062295	0.992494847	1.632943094	MMP-1

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GCST90274826	Weighted mode	26	0.191330928	0.105632488	0.082128873	-0.015708749	0.398370605	1.210860093	0.984413989	1.489395906	MMP-1
GCST90274804	MR Egger	12	-0.046344884	0.052685882	0.399696525	-0.149609212	0.056919444	0.95471264	0.861044397	1.058570532	IL-18R1
GCST90274804	Weighted median	12	-0.065003986	0.037645171	0.084211678	-0.138788521	0.008780549	0.937063728	0.870412083	1.008819211	IL-18R1
GCST90274804	Inverse variance weighted	12	-0.087732992	0.033281415	0.008386609	-0.152964566	-0.022501419	0.916005424	0.858160129	0.97774985	IL-18R1
GCST90274804	Simple mode	12	-0.096276627	0.078933308	0.248077167	-0.250985911	0.058432656	0.908212745	0.778033334	1.060173587	IL-18R1
GCST90274804	Weighted mode	12	-0.060642227	0.033527175	0.097875665	-0.126355491	0.005071036	0.941159901	0.881301497	1.005083915	IL-18R1

Supplementary Table 4

exposure	outcome	b	se	p	lo_ci	up_ci	or	or_lci95	or_uci95	
GCST90274772.csv	Seropositive rheumatoid arthritis	rs117191103	-0.101380242	0.171044188010132	0.553372737993053	-0.436626851	0.233866366450887	0.903589384876158	0.646212520274017	1.263475638
GCST90274772.csv	Seropositive rheumatoid arthritis	rs11755766	-0.121027183	0.399742063492064	0.762070337240676	-0.904521627	0.662467261904762	0.886009875266947	0.404735453319857	1.939571867577 82
GCST90274772.csv	Seropositive rheumatoid arthritis	rs12152184	0.020940184331797 2	0.293371428571429	0.943097139482393	-0.554067816	0.595948184331797	1.021160968385 01	0.57460765186627	1.814750847758 82
GCST90274772.csv	Seropositive rheumatoid arthritis	rs12500563	-0.292600382	0.632459433662106	0.643623169562529	-1.532220872	0.947020108176901	0.746320324297458	0.216055302974659	2.578015993084 84
GCST902	Seropositi	rs13889	0.0865575	0.3323055	0.79449682	-	0.73787631	1.090414089733	0.568495849815349	2.091489

74772.csv	ve rheumatoid arthritis	7138	229357798	04587156	4616374	0.564761266	1926605	44		12428368
GCST90274772.csv	Seropositive rheumatoid arthritis	rs144949926	-0.067614313	0.243894161958569	0.781604972095078	-0.54564687	0.410418244821092	0.934620875550431	0.579466822341294	1.50744813565904
GCST90274772.csv	Seropositive rheumatoid arthritis	rs149900704	0.058885480572597 1	0.507464212678937	0.907621881658013	-0.935744376	1.053515337423 31	1.060653768322 59	0.392293742664247	2.86771440354012
GCST90274772.csv	Seropositive rheumatoid arthritis	rs17372980	0.032259247135842 9	0.387026186579378	0.933571981907146	-0.726312079	0.790830572831424	1.032785217211 35	0.483689513784725	2.20522726768276
GCST90274772.csv	Seropositive rheumatoid arthritis	rs1883832	0.256594379287453	0.050786899756583 3	4.363536737901 1e-07	0.157052055764 55	0.356136702810356	1.292520747230 47	1.17005652050237	1.42780271956771
GCST902	Seropositi	rs34755	-	0.3593816	0.38480469	-	0.39205744	0.731739652669	0.361780200426161	1.480022

74772.csv	ve rheumatoid arthritis	276	0.312330494	01362862	623584	1.016718433	4633731	105		72832392
GCST90274772.csv	Seropositive rheumatoid arthritis	rs35864161	0.274342789598109	0.438956658786446	0.531978716683467	-0.586012262	1.13469784081954	1.31566572147301	0.55654221025768	3.11023361526818
GCST90274772.csv	Seropositive rheumatoid arthritis	rs3967170	0.350335868187579	0.348522179974651	0.314798658791053	-0.332767605	1.03343934 09379	1.41954424828851	0.716936787635419	2.81071624110006
GCST90274772.csv	Seropositive rheumatoid arthritis	rs404842	0.333424040066778	0.343368948247078	0.331529728266916	-0.339579098	1.00642717863105	1.39573902227185	0.712069971017675	2.7358089760592
GCST90274772.csv	Seropositive rheumatoid arthritis	rs4278412	-0.365645096	0.256111729019211	0.153384544408424	-0.867624085	0.136333892821031	0.693748971769515	0.419948125967322	1.14606449242427
GCST902	Seropositi	rs46643	0.3938613	0.3743271	0.29271476	-	1.12754262	1.482694985213	0.7118985319057	3.088058

74772.csv	ve rheumatoid arthritis	34	67837338	71903882	2854497	0.339819889	476895	86		64972557
GCST90274772.csv	Seropositive rheumatoid arthritis	rs7250371	0.216027696793003	0.317086005830904	0.495687666654587	-0.405460875	0.837516268221574	1.2411367540324	0.666669488987705	2.31062088134422
GCST90274772.csv	Seropositive rheumatoid arthritis	rs73128569	0.028404753914988	0.246210290827741	0.908153554276103	-0.454167416	0.510976923937360	1.0288120158510	0.634976419066464	1.66691885269636
GCST90274772.csv	Seropositive rheumatoid arthritis	rs74794857	0.463513437057991	0.296981612446959	0.118583237360342	-0.118570523	1.045597397454030	1.5896493177912	0.888189175382564	2.84509767017296
GCST90274772.csv	Seropositive rheumatoid arthritis	rs75626299	0.170197530864198	0.394431412894376	0.666104159259761	-0.602888038	0.943283100137174	1.1855390087378	0.547228933562731	2.56839990548139
GCST902	Seropositi	rs77984	-	0.4481825	0.02059203	-	-	0.354263696852	0.147172270565912	0.852760

74772.csv	ve rheumatoid arthritis	73	1.037713737	16810759	5149738	1.91615147	0.159276004	098		961183293
GCST90274772.csv	Seropositive rheumatoid arthritis	rs8024256	-0.733592527	0.393779359430605	0.0624688477474049	-1.505400071	0.038215017793594 4	0.480180825278746	0.22192848887781	1.0389546025897
GCST90274772.csv	Seropositive rheumatoid arthritis	rs9526031	0.504079688	0.321460938	0.116860125601936	-0.12598375	1.134143125	1.65546127747157	0.881629173141078	3.10850879791528
GCST90274772.csv	Seropositive rheumatoid arthritis	rs9993874	0.479740549828179	0.345144329896907	0.164537736107887	-0.196742337	1.156223436426 12	1.61565516579994	0.821402251205785	3.17790900979685
GCST90274772.csv	Seropositive rheumatoid arthritis	All - Inverse variance weight	0.173374163444736	0.0480903898546024	0.000311945344798848	0.079116999329715 1	0.267631327559756	1.18931101855123	1.08233094665796	1.30686524599056

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GCST90274772.csv	Seropositive rheumatoid arthritis	All - MR Egger	0.209531927602746	0.068171147338334 2	0.0057625229171572 2	0.075916478819611 4	0.343147376385881	1.23310074443305	1.0788724616927	1.40937645542986
GCST90274769.csv	Seropositive rheumatoid arthritis	rs112641086	0.205489583333333	0.300761363636364	0.4944606850041 19	-0.384002689	0.794981856060606	1.22812618791411	0.681129595351278	2.21440081848533
GCST90274769.csv	Seropositive rheumatoid arthritis	rs116782490	-0.073052219	0.745069625761532	0.9218945699666 37	-1.533388686	1.387284247171 45	0.92955228816893 2	0.215803137829124	4.00396150460184
GCST90274769.csv	Seropositive rheumatoid arthritis	rs11754249	0.122268736616702	0.357830835117773	0.7325810044419 17	-0.5790797	0.823617173447537	1.13005774887406	0.560413878088447	2.27872750072894
GCST90274769.csv	Seropositive rheumatoid	rs118111688	-0.579845251	0.628121664887 94	0.3559334080295 1	-1.810963714	0.651273212379936	0.55998501709384 7	0.163496496995097	1.91798127258347

	d arthritis									
GCST90274769.csv	Seropositive rheumatoid arthritis	rs12589600	-0.493964706	0.402850980392157	0.220133849665692	-1.283552627	0.295623215686274	0.610202319263072	0.277051290008144	1.34396367698951
GCST90274769.csv	Seropositive rheumatoid arthritis	rs139902	0.691728070175439	0.305491228070175	0.023554807997946	0.092965263157894 8	1.290490871719298	1.997163792152 97	1.09742361357518	3.63457024557051
GCST90274769.csv	Seropositive rheumatoid arthritis	rs140404587	-0.04485747	0.301199847153229	0.881609452441201	-0.635209171	0.545494230034 39	0.956133749496088	0.529824652876381	1.72546094630056
GCST90274769.csv	Seropositive rheumatoid arthritis	rs141430371	-1.106527899	0.607958771220695	0.068748253013757 7	-2.298127082	0.085071301535973 9	0.330705214828847	0.100446796306026	1.08879469666503
GCST90274769.csv	Seropositive rheumatoid	rs143400203	0.386538631346578	0.313226821192053	0.217182997317659	-0.227385938	1.000463201	1.471877256568 52	0.79661327946833	2.71954123065782

	d arthritis									
GCST90274769.csv	Seropositive rheumatoid arthritis	rs150193318	0.088399288572699	0.280670075589151	0.752793535364629	-0.46171406	0.638512636727434	1.09242422746701	0.630202514551496	1.89366222000274
GCST90274769.csv	Seropositive rheumatoid arthritis	rs1514964	0.154249406175772	0.407134600158353	0.704787466842673	-0.64373441	0.952233222486144	1.16678185309247	0.525326970060595	2.59149057690466
GCST90274769.csv	Seropositive rheumatoid arthritis	rs17098842	0.505188614540466	0.505657750342935	0.317759704138548	-0.485900576	1.496277805212622	1.65729808149992	0.615142964166316	4.46503835846253
GCST90274769.csv	Seropositive rheumatoid arthritis	rs199965585	-0.658308511	0.507226595744681	0.194335853188961	-1.652472638	0.335855617021277	0.51772632283368	0.191575625268831	1.39913699865 92
GCST90274769.csv	Seropositive rheumatoid	rs200181753	0.136752442996743	0.234757871878393	0.560212781047085	-0.323372986	0.596877871878393	1.14654427831918	0.723703872692001	1.81643878352701

	d arthritis									
GCST90274769.csv	Seropositive rheumatoid arthritis	rs2477954	-0.353162069	0.357712068965517	0.323505258905199	-1.054277724	0.347953586206896	0.702463336644885	0.348444009136601	1.41616651855483
GCST90274769.csv	Seropositive rheumatoid arthritis	rs2631360	0.893820770519263	0.355557788944724	0.011941947890693	0.196927504187605	1.590714036850922	2.444451519892	1.21765576256232	4.90725163615152
GCST90274769.csv	Seropositive rheumatoid arthritis	rs28384995	0.471861431870677	0.353092378752887	0.181428950127663	-0.22019963	1.163922494226333	1.602975247055	0.802358606735687	3.20247034318616
GCST90274769.csv	Seropositive rheumatoid arthritis	rs2866626	0.507763819095477	0.345827470686767	0.142034257999739	-0.170058023	1.185585661641546	1.661571463121	0.843615865672751	3.27260289831036
GCST90274769.csv	Seropositive rheumatoid	rs3823797	0.472884482758621	0.384712068965517	0.219000329171946	-0.281151172	1.226920137931033	1.604616011454	0.754914204651185	3.41070883068891

	d arthritis									
GCST90274769.csv	Seropositive rheumatoid arthritis	rs4346241	0.093454355016538	0.354769570011025	0.792224802707589	-0.601894002	0.788802712238148	1.09796048580928	0.54777316938465	2.20075990533234
GCST90274769.csv	Seropositive rheumatoid arthritis	rs4866742	-0.384962963	0.291940170940171	0.187290667660557	-0.957165698	0.187239772079772	0.68047583854671	0.383979659440006	1.20591639547041
GCST90274769.csv	Seropositive rheumatoid arthritis	rs6580980	-0.026131255	0.315181686046512	0.933924272124983	-0.643887355	0.591624854651163	0.97420721652093	0.525246630325039	1.80692201705798
GCST90274769.csv	Seropositive rheumatoid arthritis	rs6671688	0.823488764044944	0.378853932584270	0.029732836205623	0.080935056179775 3	1.566042471910110	2.27843490947803	1.084300475664920	4.78766333985488
GCST90274769.csv	Seropositive rheumatoid	rs71363004	0.044165016047684 5	0.509637780834480	0.930942074777325	-0.954725034	1.043055066483260	1.04515480797492	0.384917969208255	2.83787367703297

	d arthritis									
GCST90274769.csv	Seropositive rheumatoid arthritis	rs73000929	-0.120936434	0.316172093023256	0.702089101561668	-0.740633736	0.498760868217054	0.886090282921495	0.476811646839003	1.64667955301227
GCST90274769.csv	Seropositive rheumatoid arthritis	rs74855027	0.241044444444444	0.300385185185185	0.422292021419914	-0.347710519	0.829799407407408	1.27257759305552	0.706303308351375	2.29285876364793
GCST90274769.csv	Seropositive rheumatoid arthritis	rs76291845	0.444113501483680	0.306826038575668	0.147772616435888	-0.157265534	1.045492537091990	1.559107436586	0.854477135852839	2.84479934784259
GCST90274769.csv	Seropositive rheumatoid arthritis	rs7661151	-0.543764595	0.390416195856874	0.163685765760064	-1.308980339	0.221451148775895	0.580558565384994	0.270095321692576	1.24788628595912
GCST90274769.csv	Seropositive rheumatoid	rs76669782	0.548275499474238	0.858159831756046	0.522890123642117	-1.133717771	2.230268769716090	1.730266597908 31	0.321834522514223	9.30236593777748

	d arthritis									
GCST90274769.csv	Seropositive rheumatoid arthritis	rs76679915	1.58478044871795	0.889665064102564	0.0748597711942574	-0.158963077	3.32852397435897	4.87822024142414	0.853027854800767	27.8971344135043
GCST90274769.csv	Seropositive rheumatoid arthritis	rs77569365	0.08383488372093002	0.449034108527132	0.851895479518204	-0.796271969	0.963941736434109	1.08744932339828	0.451007202747248	2.62201140858962
GCST90274769.csv	Seropositive rheumatoid arthritis	rs78552613	0.271199566160521	0.387578091106291	0.484096665194194	-0.488453492	1.030852624728 85	1.31153678262936	0.613574558536908	2.80345511113022
GCST90274769.csv	Seropositive rheumatoid arthritis	rs78843608	0.17104216152019	0.410102137767221	0.676625668415683	-0.632758029	0.974842351543943	1.18654077432995	0.531124921416662	2.65074929150809
GCST90274769.csv	Seropositive rheumatoi	rs79205279	-0.265288805	0.376277516462841	0.480788477708909	-1.002792738	0.472215126999059	0.76698440884844	0.366853483729374	1.60354231186898

	d arthritis									
GCST90274769.csv	Seropositive rheumatoid arthritis	rs7958187	0.383076363636364	0.386712727272727	0.321882534372182	-0.374880582	1.14103330909091	1.46679003521265	0.687371358527837	3.13000095320674
GCST90274769.csv	Seropositive rheumatoid arthritis	rs801520	0.479478818998716	0.373377406931964	0.199083646664741	-0.252340899	1.21129853658537	1.61523235436653	0.776979821592652	3.35784210360133
GCST90274769.csv	Seropositive rheumatoid arthritis	rs80328354	-0.41374164	0.376575149595213	0.271900653465602	-1.151828933	0.324345652939106	0.661171749357581	0.316058191044316	1.383125306
GCST90274769.csv	Seropositive rheumatoid arthritis	All - Inverse variance weighted	0.136995444204633	0.066557369923509	0.039560753681020 9	0.006542999154555 22	0.267447889254711	1.14682292381793	1.0065644513352	1.30662553883132
GCST902	Seropositi	All -	-	0.1427808	0.98335275	-	0.27684996	0.997003905340	0.753631959700265	1.318968

74769.csv	ve rheumatoid arthritis	MR Egger	0.003000592	95568752	6341076	0.282851147	337899	929		46261723
GCST90274826.csv	Seropositive rheumatoid arthritis	rs10732827	-0.039717384	0.371982078853047	0.914969620248451	-0.768802258	0.689367491039426	0.96106101246254	0.463567970728431	1.99245488902988
GCST90274826.csv	Seropositive rheumatoid arthritis	rs10978641	0.556115562403698	0.384714946070878	0.148310118567821	-0.197925732	1.310156850670262	1.74388531295422	0.820430782714574	3.70675509599381
GCST90274826.csv	Seropositive rheumatoid arthritis	rs10990535	-0.168556188	0.325014224751067	0.604031530971639	-0.805584068	0.468471692745377	0.84488378995 1945	0.44682687292761	1.59755077810463
GCST90274826.csv	Seropositive rheumatoid arthritis	rs116350236	-0.278253521	0.320971830985915	0.385991612229973	-0.907358331	0.350851267605634	0.75710485510 5651	0.403588974058339	1.42027606914 18
GCST902	Seropositi	rs11673	-	0.3975299	0.58323769	-	0.56104923	0.804037473780	0.368885849338044	1.752510

74826.csv	ve rheumatoid arthritis	125	0.218109402	14529914	8614826	0.997268034	0769231	674		3237321
GCST90274826.csv	Seropositive rheumatoid arthritis	rs116889819	-0.393783523	0.366114772727273	0.282117830177943	-1.111368477	0.323801431818182	0.67450005436946	0.329108275573701	1.38237278461423
GCST90274826.csv	Seropositive rheumatoid arthritis	rs12122036	-0.475281337	0.399881151346332	0.234614238640989	-1.259048394	0.308485719591458	0.6217101217684	0.283924081935182	1.36136206860227
GCST90274826.csv	Seropositive rheumatoid arthritis	rs12141791	0.104468102444703	0.242753201396973	0.666943271301723	-0.371328172	0.580264377182771	1.11011998318791	0.689817525409751	1.78651068098206
GCST90274826.csv	Seropositive rheumatoid arthritis	rs12367368	-0.573797909	0.327250871080139	0.079535346023154	-1.215209617	0.067613797909407	0.56338169775936	0.296647825430792	1.06995201097226
GCST902	Seropositi	rs12380	0.2100404	0.3764620	0.57689037	-	0.94790610	1.233727990601	0.589886484230802	2.580301

74826.csv	ve rheumatoid arthritis	451	72175379	57335582	7282751	0.52782516	455312	94		1180693
GCST90274826.csv	Seropositive rheumatoid arthritis	rs141782294	0.265925139368198	0.151583753650119	0.0793771269752032	-0.031179018	0.563029296522432	1.30463738905195	0.96930203523896	1.75598384717379
GCST90274826.csv	Seropositive rheumatoid arthritis	rs148908824	0.845954032957502	0.751990459670425	0.260608889565077	-0.627947268	2.31985533391154	2.33019984190479	0.533686192103136	10.1742023375485
GCST90274826.csv	Seropositive rheumatoid arthritis	rs149819211	0.057126920674578 4	0.335720174890693	0.864882491182815	-0.600884622	0.715138463460337	1.05879018423233	0.548326359860554	2.04446974701677
GCST90274826.csv	Seropositive rheumatoid arthritis	rs188626385	1.726660023391391	1.181303308090087	0.143835278470862	-0.588694466	4.042014507772029	5.621845686254 9	0.555051453821767	56.9409352996876
GCST902	Seropositi	rs18917	0.2962217	0.2516240	0.23910001	-	0.78940499	1.344768350153	0.821222282955702	2.202085

74826.csv	ve rheumatoid arthritis	3367	67851526	95627556	6791416	0.19696146	5281535	8		78494322
GCST90274826.csv	Seropositive rheumatoid arthritis	rs2155053	0.07443399750934	0.14369956413449	0.604469809103918	-0.207217148	0.356085143212951	1.07727423839287	0.812843123405577	1.42772910453211
GCST90274826.csv	Seropositive rheumatoid arthritis	rs2229629	0.27625404376784	0.32478591817316	0.395006745444891	-0.360326356	0.912834443387255	1.31818269759351	0.697448672469579	2.49137419400665
GCST90274826.csv	Seropositive rheumatoid arthritis	rs2926741	0.27077556818181	0.30903409090909	0.380921496415266	-0.33493125	0.876482386363636	1.31098081155816	0.71538726753658	2.40243399102125
GCST90274826.csv	Seropositive rheumatoid arthritis	rs4734879	0.15452376760563	0.21501584507042	0.472349057892499	-0.266907289	0.575954823943662	1.16710201694832	0.765744061277128	1.77882818404501
GCST902	Seropositi	rs58811	-	0.3516888	0.31178454	-	0.33358230	0.700663260035	0.351678434596832	1.395959

74826.csv	ve rheumatoid arthritis	245	0.355727878	67745005	2061718	1.045038059	2568982	102		93290241
GCST90274826.csv	Seropositive rheumatoid arthritis	rs6717478	0.340385658914729	0.335556201550388	0.310395551759155	-0.317304496	0.998075813953488	1.40548952562095	0.728109014994972	2.71305637747644
GCST90274826.csv	Seropositive rheumatoid arthritis	rs7219205	0.338154657293497	0.358952548330404	0.346162179363389	-0.365392337	1.041701652021 09	1.40235737143036	0.69392434496661	2.83403545569466
GCST90274826.csv	Seropositive rheumatoid arthritis	rs72777396	0.308776101388051	0.332847917923959	0.353573983636043	-0.343605818	0.961158020519 01	1.36175744076722	0.709208430338289	2.61472262336245
GCST90274826.csv	Seropositive rheumatoid arthritis	rs77095316	-0.02990685	0.328593926553672	0.927480976796964	-0.673950946	0.614137245762712	0.97053593448 6167	0.509690833285151	1.84806148868281
GCST902	Seropositi	rs87367	0.4011353	0.2856231	0.16019337	-	0.96095675	1.493519376165	0.853264161671663	2.614196

74826.csv	ve rheumatoid arthritis	5	32252836	76661264	0172903	0.158686094	8508914	64		43198438
GCST90274826.csv	Seropositive rheumatoid arthritis	rs9524612	0.834486111111111	0.344022222222222	0.0152799460463817	0.160202555555556	1.50876966666667	2.30362993423423	1.1737485962137	4.52116483122405
GCST90274826.csv	Seropositive rheumatoid arthritis	All - Inverse variance weighted	0.125168598269573	0.058413168565281 8	0.0321279777221238	0.010678787881621	0.239658408657526	1.13333951604117	1.01073600964189	1.27081497677671
GCST90274826.csv	Seropositive rheumatoid arthritis	All - MR Egger	0.196388872612954	0.110543599759298	0.0883180687290736	-0.020276583	0.413054328141178	1.21700007132541	0.979927604588364	1.51142713673038
GCST90274804.csv	Seropositive rheumatoi	rs115232861	-0.134298847	0.138001869741352	0.330470375957617	-0.404782512	0.136184817700218	0.87432873504328 8	0.667121886296157	1.14589365545568

	d arthritis									
GCST902 74804.csv	Seropositive rheumatoid arthritis	rs11719 5704	-0.0874119 6	0.4410272 42524917	0.84288794 7680684	-0.9518253 55	0.77700143 5215947	0.916299538989 5	0.38603572751107	2.174940 77702508
GCST902 74804.csv	Seropositive rheumatoid arthritis	rs11752 4772	-0.1046430 78	0.3752868 43009275	0.78037151 2222919	-0.8402052 9	0.63091913 4318104	0.900645925587 947	0.431621906552002	1.879337 14893695
GCST902 74804.csv	Seropositive rheumatoid arthritis	rs13412 259	-0.0696037 71	0.3467765 36312849	0.84092026 0973424	-0.7492857 82	0.61007824 0223464	0.932763334625 095	0.472704045884996	1.840575 40017883
GCST902 74804.csv	Seropositive rheumatoid arthritis	rs35021 151	-0.0979720 53	0.3342667 07168894	0.76944918 8782284	-0.7531348	0.55719069 2588092	0.906674241805 163	0.470888096843208	1.745761 2249364
GCST902 74804.csv	Seropositive rheumatoi	rs35679 975	-0.4547479 34	0.3815578 51239669	0.23333218 5878117	-1.2026013 22	0.29310545 4545454	0.634607910940 382	0.300411726877032	1.340584 15367042

	d arthritis									
GCST90274804.csv	Seropositive rheumatoid arthritis	rs62257659	0.417232754342432	0.460154342431762	0.364553034826379	-0.484669757	1.319135265508681	1.5177557360647	0.615900560139944	3.74018571087821
GCST90274804.csv	Seropositive rheumatoid arthritis	rs6742007	-0.531835759	0.312660083160083	0.088942412200862 3	-1.144649522	0.080978004158004 3	0.587525424100337	0.318335467873721	1.08434704517817
GCST90274804.csv	Seropositive rheumatoid arthritis	rs7149605	0.144115348837209	0.341732093023256	0.673229210994569	-0.525679553	0.813910251162791	1.1550173307473 1	0.591153507412506	2.25671507924545
GCST90274804.csv	Seropositive rheumatoid arthritis	rs75366565	-0.128322693	0.062586533665835 4	0.040332791025586 6	-0.250992299	-0.005653087	0.879569502188448	0.778028362936349	0.99436286134895 9
GCST90274804.csv	Seropositive rheumatoid	rs78199195	-0.207449791	0.378509414225941	0.583643591912814	-0.949328243	0.534428661087866	0.8126540434622 58	0.387000906848306	1.70647298925948

	d arthritis									
GCST902 74804.csv	Seropositive rheumatoid arthritis	rs951774	-0.056688057	0.043513726175904 9	0.192655804752456	-0.141974961	0.028598845952089 5	0.944888774504321	0.86764298142374	1.029011 71945082
GCST902 74804.csv	Seropositive rheumatoid arthritis	All - Inverse variance weighted	-0.087732992	0.033281415036177 4	0.008386600942105362	-0.152964566	-0.022501419	0.916005424406775	0.858160129357308	0.977749 84975243 3
GCST902 74804.csv	Seropositive rheumatoid arthritis	All - MR Egger	-0.046344884	0.052685881516545 9	0.399696525073152	-0.149609212	0.056919443671971 2	0.954712640194908	0.861044396613381	1.058570 53240566

Supplementary Table 5

id.exposure	id.outcome	outcome	exposure	method	Q	Q_df	Q_pval
cirtr6	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274772.csv	MR Egger	29.937994869506521	0.09324108662147571
cirtr6	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274772.csv	Inverse variance weighted	30.752374147693222	0.10129498003703322
oJsOIx	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274769.csv	MR Egger	42.297865670455935	0.18497139829895535
oJsOIx	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274769.csv	Inverse variance weighted	43.779674630620436	0.17479148767605
nY2c9m	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274826.csv	MR Egger	25.900414846243124	0.35823729514636705
nY2c9m	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274826.csv	Inverse variance weighted	26.526051356054744	0.37996833817169205
9dqOke	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274804.csv	MR Egger	4.7296476712965604	0.9084908510716604
9dqOke	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274804.csv	Inverse variance weighted	5.7565193578898104	0.8891059022645415

Supplementary Table 6

id.exposure	id.outcome	outcome	exposure	egger_intercept	se	pval	
cirtr6	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274772.csv	-0.007293809	0.00965034261626012	0.458158917357403
oJsOIx	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274769.csv	0.0139629107563677	0.0126097088358482	0.275710377020659
nY2c9m	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274826.csv	-0.00881578	0.0115783709625936	0.453834914148503
9dqOke	cTBCQQ	Seropositive rheumatoid arthritis	strict definition	GCST90274804.csv	-0.01603765	0.0158264183435887	0.334784954472052

Supplementary Table 7

CD40

[[1]]

[[1]]$`Main MR results`

	Exposure	MR Analysis	Causal Estimate	Sd	T-stat	P-value
1	beta.exposure	Raw	0.1733742	0.04809039	3.605173	0.001571762
2	beta.exposure	Outlier-corrected	NA	NA	NA	NA

[[1]]$`MR-PRESSO results`

[[1]]$`MR-PRESSO results`$`Global Test`

[[1]]$`MR-PRESSO results`$`Global Test`$RSSobs

[1] 50.0136

[[1]]$`MR-PRESSO results`$`Global Test`$Pvalue

[1] 0.163

attr(id.exposure)

[1] "cirtr6"

attr(id.outcome)

[1] "cTBCQQ"

attr(exposure)

[1] "GCST90274772.csv"

attr(outcome)

[1] "Seropositive rheumatoid arthritis strict definition"

CCL28

[[1]]

[[1]]$`Main MR results`

	Exposure	MR Analysis	Causal Estimate	Sd	T-stat	P-value
1	beta.exposure	Raw	0.1369954	0.06655737	2.058306	0.04685492

2 beta.exposure Outlier-corrected NA NA NA
NA

[[1]]$`MR-PRESSO results`
[[1]]$`MR-PRESSO results`$`Global Test`
[[1]]$`MR-PRESSO results`$`Global Test`$RSSobs
[1] 46.06062

[[1]]$`MR-PRESSO results`$`Global Test`$Pvalue
[1] 0.171

attr(id.exposure)
[1] "oJsOIx"
attr(id.outcome)
[1] "cTBCQQ"
attr(exposure)
[1] "GCST90274769.csv"
attr(outcome)
[1] "Seropositive rheumatoid arthritis strict definition"

MMP-1
[[1]]
[[1]]$`Main MR results`
Exposure MR Analysis Causal Estimate Sd T-stat P-value
1 beta.exposure Raw 0.1251686 0.05841317 2.142815
0.04205104
2 beta.exposure Outlier-corrected NA NA NA
NA

[[1]]$`MR-PRESSO results`
[[1]]$`MR-PRESSO results`$`Global Test`
[[1]]$`MR-PRESSO results`$`Global Test`$RSSobs
[1] 28.21595

[[1]]$`MR-PRESSO results`$`Global Test`$Pvalue
[1] 0.404

attr(id.exposure)
[1] "nY2c9m"
attr(id.outcome)
[1] "cTBCQQ"
attr(exposure)
[1] "GCST90274826.csv"
attr(outcome)
[1] "Seropositive rheumatoid arthritis strict definition"

IL-18R1
[[1]]
[[1]]$`Main MR results`
Exposure MR Analysis Causal Estimate Sd T-stat P-value
1 beta.exposure Raw -0.08773299 0.02407606 -3.643993 0.003861043
2 beta.exposure Outlier-corrected NA NA NA NA

[[1]]$`MR-PRESSO results`
[[1]]$`MR-PRESSO results`$`Global Test`
[[1]]$`MR-PRESSO results`$`Global Test`$RSSobs
[1] 8.69843

[[1]]$`MR-PRESSO results`$`Global Test`$Pvalue
[1] 0.828

attr(id.exposure)
[1] "9dqOke"
attr(id.outcome)

[1] "cTBCQQ"

attr(exposure)

[1] "GCST90274804.csv"

attr(outcome)

[1] "Seropositive rheumatoid arthritis strict definition"