Analysis Summary: Migraine

Phenotype Description

Migraine cases were defined as saying "Yes" or reporting migraines to at least one of the following questions:

- Headaches ("Has a doctor or other medical professional ever diagnosed you with migraines?")
- Your Medical History ("Have you ever been diagnosed by a doctor with migraine headaches with aura?")
- Your Medical History ("have you ever been diagnosed by a doctor with migraine headaches without aura?")
- Roots into the Future: Health History ("Has a doctor ever told you that you have any of these conditions?")
- Your Health Profile ("Have you ever been diagnosed or treated for any of the following conditions?")
- Research Snippet ("Have you ever suffered from migraines?")
- Your Profile and Health History ("Have you ever been diagnosed with migraines?")

Controls were defined as saying "No" or not reporting migraines to at least one of the questions above. Respondents with discordant answers were removed.

Phenotype Statistics

The following table shows demographics of unrelated, European individuals included in the GWAS.

Phenotype	Group	Total	M	F	(0,30]	(30,45]	(45,60]	(60,Inf]
migraine_diagnosis	case	53109	15919	37190	6331	15835	16378	14565
	control	230876	136087	94789	32204	66587	61262	70823

The following table shows the phenotypic distribution across 23andMe genotyping platforms for individuals included in the GWAS.

Phenotype	Group	Total	v1/v2	v3	v4
migraine_diagnosis	case	53109	2927	39121	11061
	control	230876	14299	170530	46047

Null Model with Covariates

The following table shows results of fitting a model for the trait based on just the covariates. Principal coordinates have been standardized, so these effect sizes are in units of standard deviations.

	Estimate	Std. Error	z value	Pr(>|z|)	LRT	Pr(>Chi)
age	−0.00371	0.000307	−12.1	9.9×10^{-34}	146.8	8.6×10^{-34}
sexF	1.21394	0.010403	116.7	0.0	14785.7	0.0
pc.0	0.02773	0.005122	5.4	6.2×10^{-8}	29.7	5.0×10^{-8}
pc.1	−0.06721	0.005193	−12.9	2.6×10^{-38}	172.8	1.8×10^{-39}
pc.2	−0.05422	0.005207	−10.4	2.2×10^{-25}	110.2	8.9×10^{-26}
pc.3	0.01750	0.005010	3.5	0.00048	12.2	0.00048
pc.4	0.01950	0.005137	3.8	0.00015	14.7	0.00013

SNP-level QC information

The following table shows results for QC filters on the genotyped data:

	failed	passed
no filters	0	1030430
not V1-only, chrM, chrY	4790	1025640
parent-offspring test	2129	1023511
MAF > 0%	3203	1020494
HWE > 1e-20	48225	972832
gt.rate > 90%	30775	952826
batch effects	28267	945446

The following table shows results for QC filters on the imputed dosage data:

	failed	passed
no filters	0	13733809
MAF > 0%	0	13733809

imputation quality	0	13733809
batch effects	2168	13731641

The following table shows results for QC filters on the merged association test results:

	passed	total
imputed only	12833621	12833621
both passed	898002	13731623
genotyped only	47444	13779067
no test result	−2274	13776793
failed to converge	−13720	13763073

Genetic Association Tests

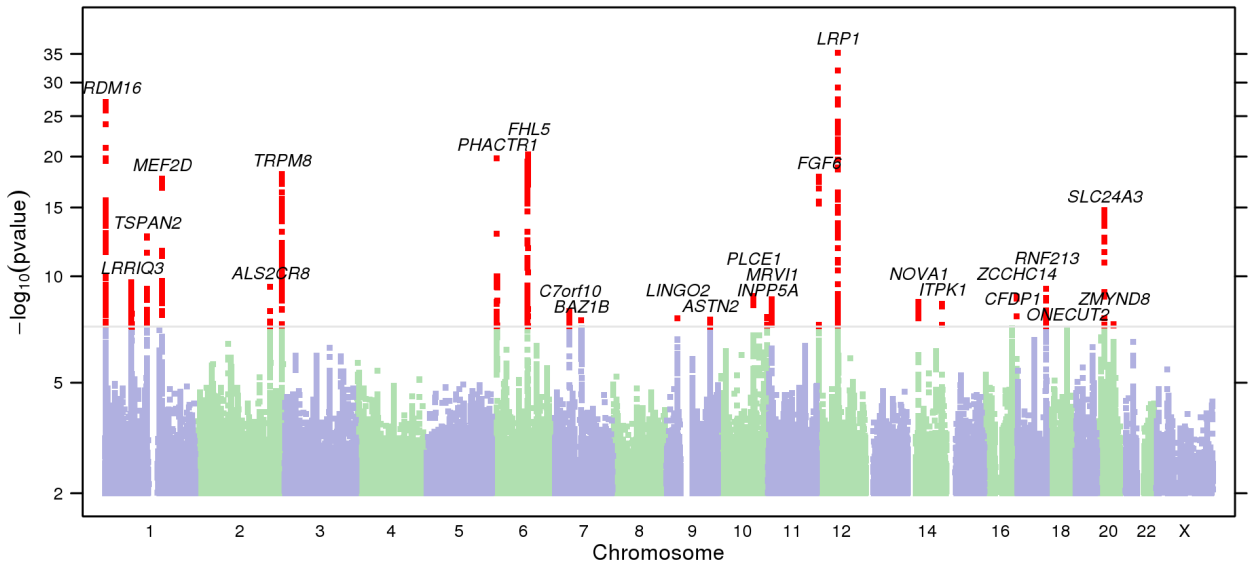
We performed logistic regression assuming an additive model for allelic effects, using the model:

migraine_diagnosis ~ age + sex + pc.0 + pc.1 + pc.2 + pc.3 + pc.4 + genotype

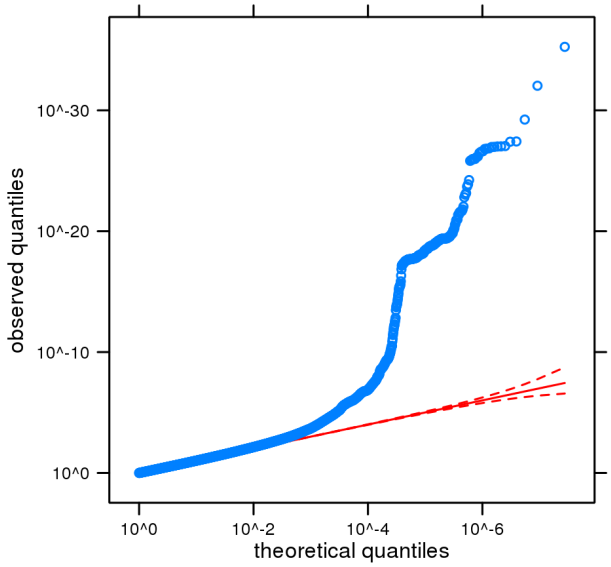
This genome-wide association analysis includes data from 53109 cases and 230876 controls of European ancestry, filtered to remove close relatives.

The results in this report have been adjusted for a genomic control inflation factor λ=1.167. The equivalent inflation factor for 1000 cases and 1000 controls λ_{1000}= 1.002 , and for 10000, λ_{10000}= 1.019 .

Manhattan Plot



Q-Q Plot of GWAS Results



Index SNPs for Strongest Associations

cytoband	assay.name	scaffold	position	alleles	src	pvalue	OR	95% CI	gene.context
12q13.3	rs11172113	chr12	57527283	C/T	I	5.6×10^{-36}	1.102	[1.086,1.120]	[LRP1]
1p36.32	rs2075968	chr1	3081241	C/T	I	9.0×10^{-28}	1.102	[1.083,1.122]	[PRDM16]
6q16.1	rs9486719	chr6	97060124	A/G	I	5.7×10^{-21}	0.916	[0.900,0.933]	[FHL5]
6p24.1	rs9349379	chr6	12903957	A/G	I	1.5×10^{-20}	0.931	[0.917,0.945]	[PHACTR1]
2q37.1	rs1965629	chr2	234824731	A/G	I	7.3×10^{-19}	0.918	[0.900,0.935]	MSL3P1--[]-TRPM8
12p13.32	rs140668749	chr12	4528671	D/I	I	1.3×10^{-18}	1.070	[1.054,1.086]	FGF23--[]--FGF6
1q22	rs2274319	chr1	156450873	C/T	I	2.2×10^{-18}	1.072	[1.056,1.089]	[MEF2D]
20p11.23	rs6081613	chr20	19465907	A/G	I	1.8×10^{-15}	0.935	[0.920,0.951]	[SLC24A3]
1p13.2	rs12134493	chr1	115677946	A/C	I	2.1×10^{-13}	0.918	[0.897,0.939]	TSPAN2--[]---NGF
1p31.1	rs1923243	chr1	73868386	A/C	I	2.2×10^{-10}	1.049	[1.034,1.065]	[]---LRRIQ3
2q33.2	rs149163995	chr2	203777226	C/T	I	4.4×10^{-10}	0.924	[0.902,0.948]	[ALS2CR8]
17q25.3	rs7220465	chr17	78260011	A/G	I	5.2×10^{-10}	0.945	[0.929,0.962]	[RNF213]
10q23.33	rs11187838	chr10	96038686	A/G	I	1.3×10^{-9}	1.047	[1.032,1.063]	[PLCE1]
16q24.2	rs8052831	chr16	87578039	A/G	I	1.5×10^{-9}	1.049	[1.033,1.066]	ZCCHC14--[]--JPH3
11p15.4	rs4910165	chr11	10674044	C/G	I	2.1×10^{-9}	1.050	[1.033,1.067]	MRVI1[]--CTR9
14q12	rs1245465	chr14	27660859	A/T	I	2.9×10^{-9}	1.046	[1.031,1.062]	NOVA1---[]
14q32.12	rs11624776	chr14	93595591	A/C	I	3.5×10^{-9}	0.953	[0.938,0.968]	ITPK1--[]--MOAP1
7p14.1	rs61693171	chr7	40417731	D/I	I	8.7×10^{-9}	1.073	[1.047,1.098]	[C7orf10]
10q26.3	rs3793683	chr10	134568387	G/T	I	1.7×10^{-8}	1.046	[1.030,1.063]	[INPP5A]
9p21.1	rs10156578	chr9	29372501	C/G	I	2.0×10^{-8}	0.957	[0.943,0.972]	LINGO2---[]
9q33.1	rs7030607	chr9	119245183	A/G	I	2.3×10^{-8}	1.046	[1.029,1.062]	[ASTN2]
7q11.23	rs202203062	chr7	72857717	D/I	I	2.5×10^{-8}	1.061	[1.039,1.083]	[BAZ1B]
20q13.12	rs910187	chr20	45841052	A/G	I	3.9×10^{-8}	1.045	[1.029,1.061]	[ZMYND8]
16q23.1	rs200914569	chr16	75442144	D/I	I	5.7×10^{-8}	0.957	[0.942,0.972]	[CFDP1]
18q21.31	rs10871745	chr18	55178810	A/G	I	6.2×10^{-8}	1.045	[1.029,1.062]	ONECUT2--[]--FECH

Quality Statistics for Index SNPs

assay.name	is.v2	is.v3	is.v4	gt.rate	hw.p.value	p.date	freq.b	avg.rsqr	min.rsqr	p.batch	dose.b	qc.mask
rs11172113	TRUE	TRUE	TRUE	0.9993	0.92	0.95	0.5989	0.9887	0.9853	0.12	0.6022	v2v3v4
rs2075968	FALSE	FALSE	FALSE					0.9849	0.9777	0.86	0.2353	v2v3v4
rs9486719	FALSE	FALSE	FALSE					0.9954	0.9919	0.30	0.7947	v2v3v4
rs9349379	TRUE	TRUE	TRUE	0.9997	0.94	0.56	0.4068	0.9935	0.9913	0.65	0.4074	v2v3v4
rs1965629	FALSE	FALSE	FALSE					0.9995	0.9969	1.0	0.1915	v2v3v4
rs140668749	FALSE	FALSE	FALSE					0.9688	0.9502	0.035	0.4685	v2v3v4
rs2274319	FALSE	FALSE	FALSE					0.9972	0.9937	0.64	0.3359	v2v3v4
rs6081613	FALSE	TRUE	FALSE	0.7932	0.0	0.0	0.7692	0.9924	0.9870	5.1×10^{-5}	0.7147	v2v3v4
rs12134493	FALSE	FALSE	TRUE	1.0000	0.18	0.32	0.8849	0.9979	0.9952	0.40	0.8850	v2v3v4
rs1923243	FALSE	FALSE	FALSE					0.9937	0.9928	0.73	0.4711	v2v3v4
rs149163995	FALSE	FALSE	FALSE					0.8344	0.8223	0.034	0.1248	v2v3v4
rs7220465	TRUE	FALSE	FALSE	0.9935	0.62	0.54	0.7167	0.8519	0.8269	0.0058	0.7132	v2v3v4
rs11187838	FALSE	FALSE	FALSE					0.9931	0.9897	0.11	0.5478	v2v3v4
rs8052831	FALSE	FALSE	FALSE					0.9938	0.9782	0.013	0.3374	v2v3v4
rs4910165	FALSE	FALSE	FALSE					0.9975	0.9932	0.080	0.6783	v2v3v4
rs1245465	FALSE	FALSE	FALSE					0.9975	0.9960	0.55	0.4640	v2v3v4
rs11624776	FALSE	FALSE	FALSE					0.9780	0.9578	0.032	0.3231	v2v3v4
rs61693171	FALSE	FALSE	FALSE					0.9905	0.9736	0.74	0.1060	v2v3v4
rs3793683	FALSE	FALSE	FALSE					0.9568	0.9006	0.049	0.6265	v2v3v4
rs10156578	FALSE	FALSE	FALSE					0.9557	0.9455	0.68	0.5594	v2v3v4
rs7030607	TRUE	TRUE	TRUE	0.9977	0.16	0.48	0.6544	0.9998	0.9994	0.24	0.6560	v2v3v4
rs202203062	FALSE	FALSE	FALSE					0.9212	0.8858	3.3×10^{-6}	0.8346	v2v3v4

rs910187	FALSE	TRUE	FALSE	0.9995	0.038	0.52	0.6343	0.9761	0.9028	0.19	0.6344	v2v3v4
rs200914569	FALSE	FALSE	FALSE					0.8653	0.8482	0.083	0.5496	v2v3v4
rs10871745	FALSE	FALSE	FALSE					0.9309	0.9157	0.085	0.6390	v2v3v4

SNP Statistics in the GWAS Sample

assay.name	AA.0	AB.0	BB.0	im.num.0	dose.b.0	AA.1	AB.1	BB.1	im.num.1	dose.b.1
rs11172113	37929	111010	81762	230876	0.5967	7784	25198	20091	53109	0.6173
rs2075968				230876	0.2306				53109	0.2473
rs9486719				230876	0.7980				53109	0.7849
rs9349379	80570	111653	38595	230876	0.4100	19491	25459	8150	53109	0.3942
rs1965629				230876	0.1937				53109	0.1821
rs140668749				230876	0.4662				53109	0.4840
rs2274319				230876	0.3339				53109	0.3491
rs6081613	13046	34668	86732	230876	0.7192	3206	8041	19283	53109	0.7078
rs12134493	639	9308	36099	230876	0.8862	167	2407	8487	53109	0.8772
rs1923243				230876	0.4687				53109	0.4803
rs149163995				230876	0.1263				53109	0.1197
rs7220465	1347	6789	8671	230876	0.7143	282	1489	1760	53109	0.7038
rs11187838				230876	0.5480				53109	0.5618
rs8052831				230876	0.3365				53109	0.3475
rs4910165				230876	0.6756				53109	0.6866
rs1245465				230876	0.4616				53109	0.4714
rs11624776				230876	0.3248				53109	0.3133
rs61693171				230876	0.1050				53109	0.1112
rs3793683				230876	0.6251				53109	0.6348
rs10156578				230876	0.5619				53109	0.5531
rs7030607	27744	104478	98186	230876	0.6525	6074	23716	23232	53109	0.6617
rs202203062				230876	0.8328				53109	0.8379
rs910187	22947	79581	67923	230876	0.6311	4955	18179	15968	53109	0.6402
rs200914569				230876	0.5516				53109	0.5420
rs10871745				230876	0.6390				53109	0.6489

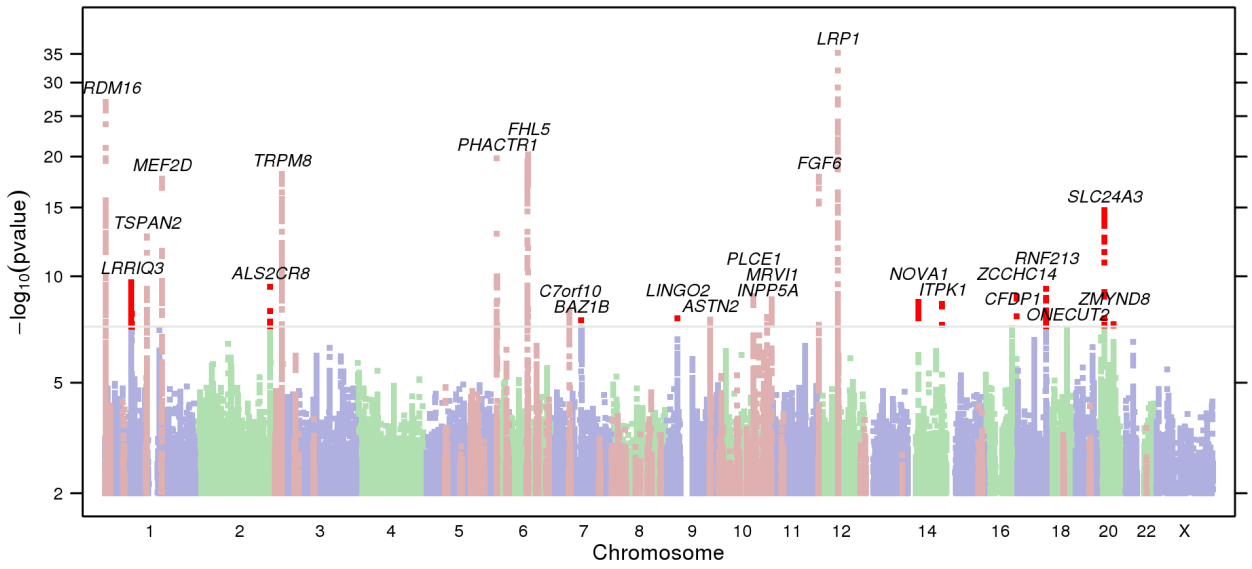
Annotations from NHGRI GWAS Catalog

The following table shows, for each index SNP, all entries in the NHGRI GWAS Catalog that are within 500kb and in at least moderate linkage disequilibrium ($r^2 > 0.5$).

region	position	our.name	our.pval	dist	rsqr	assay.name	pvalue	pubmed.id	trait	genes
12q13.3	57527283	rs11172113	5.6×10^{-36}	0	1.000	rs11172113	1.0×10^{-10}	23793025	Migraine without aura	LRP1
12q13.3	57527283	rs11172113	5.6×10^{-36}	0	1.000	rs11172113	1.0×10^{-6}	23793025	Migraine - clinic-based	LRP1
12q13.3	57527283	rs11172113	5.6×10^{-36}	0	1.000	rs11172113	4.0×10^{-19}	23793025	Migraine	LRP1
12q13.3	57527283	rs11172113	5.6×10^{-36}	0	1.000	rs11172113	8.0×10^{-6}	23284291	Pulmonary function (interaction)	LRP1
12q13.3	57527283	rs11172113	5.6×10^{-36}	0	1.000	rs11172113	3.0×10^{-8}	22683712	Migraine	LRP1
12q13.3	57527283	rs11172113	5.6×10^{-36}	0	1.000	rs11172113	1.0×10^{-8}	21946350	Pulmonary function	LRP1
12q13.3	57527283	rs11172113	5.6×10^{-36}	0	1.000	rs11172113	4.0×10^{-9}	21666692	Migraine	LRP1
12q13.3	57527283	rs11172113	5.6×10^{-36}	7187	0.595	rs1466535	5.0×10^{-10}	22055160	Abdominal aortic aneurysm	LRP1
6q16.1	97060124	rs9486719	5.7×10^{-21}	−175238	0.855	rs11757063	6.0×10^{-8}	22683712	Migraine	FHL5
6q16.1	97060124	rs9486719	5.7×10^{-21}	5088	0.783	rs11759769	2.0×10^{-12}	23793025	Migraine without aura	FHL5
6q16.1	97060124	rs9486719	5.7×10^{-21}	5088	0.783	rs11759769	4.0×10^{-7}	23793025	Migraine - clinic-based	FHL5
6q16.1	97060124	rs9486719	5.7×10^{-21}	5088	0.783	rs11759769	1.0×10^{-11}	23793025	Migraine	FHL5
6p24.1	12903957	rs9349379	1.5×10^{-20}	0	1.000	rs9349379	3.0×10^{-10}	23793025	Migraine without aura	TBC1D7,PHACTR1,TSC1
6p24.1	12903957	rs9349379	1.5×10^{-20}	0	1.000	rs9349379	2.0×10^{-6}	23793025	Migraine - clinic-based	PHACTR1
6p24.1	12903957	rs9349379	1.5×10^{-20}	0	1.000	rs9349379	5.0×10^{-8}	23793025	Migraine	PHACTR1, TBC1D7
6p24.1	12903957	rs9349379	1.5×10^{-20}	0	1.000	rs9349379	2.0×10^{-9}	22751097	Coronary heart disease	PHACTR1
6p24.1	12903957	rs9349379	1.5×10^{-20}	0	1.000	rs9349379	8.0×10^{-10}	22745674	Coronary heart disease	PHACTR1
6p24.1	12903957	rs9349379	1.5×10^{-20}	0	1.000	rs9349379	3.0×10^{-8}	22683712	Migraine	PHACTR1
6p24.1	12903957	rs9349379	1.5×10^{-20}	0	1.000	rs9349379	4.0×10^{-22}	22144573	Coronary artery calcification	PHACTR1
6p24.1	12903957	rs9349379	1.5×10^{-20}	0	1.000	rs9349379	9.0×10^{-26}	21846871	Coronary heart disease	PHACTR1
6p24.1	12903957	rs9349379	1.5×10^{-20}	0	1.000	rs9349379	9.0×10^{-26}	21378988	Coronary heart disease	PHACTR1
2q37.1	234824731	rs1965629	7.3×10^{-19}	−10672	0.991	rs10187654	9.0×10^{-6}	22424883	Pulmonary function decline	Intergenic
2q37.1	234824731	rs1965629	7.3×10^{-19}	362	1.000	rs10166942	1.0×10^{-12}	22683712	Migraine	TRPM8
2q37.1	234824731	rs1965629	7.3×10^{-19}	362	1.000	rs10166942	6.0×10^{-12}	21666692	Migraine	TRPM8
12p13.32	4528671	rs140668749	1.3×10^{-18}	−5215	0.958	rs10849061	2.0×10^{-6}	23793025	Migraine without aura	Intergenic
12p13.32	4528671	rs140668749	1.3×10^{-18}	−5215	0.958	rs10849061	1.0×10^{-6}	23793025	Migraine - clinic-based	Intergenic
12p13.32	4528671	rs140668749	1.3×10^{-18}	−5215	0.958	rs10849061	2.0×10^{-7}	23793025	Migraine	Intergenic
1q22	156450873	rs2274319	2.2×10^{-18}	−4631	0.988	rs2274316	1.0×10^{-7}	23793025	Migraine - clinic-based	MEF2D, APOA1BP
1q22	156450873	rs2274319	2.2×10^{-18}	−4631	0.988	rs2274316	1.0×10^{-8}	23793025	Migraine	MEF2D, APOA1BP
1q22	156450873	rs2274319	2.2×10^{-18}	5428	0.994	rs3790455	7.0×10^{-11}	22683712	Migraine	MEF2D
1p13.2	115677946	rs12134493	2.1×10^{-13}	0	1.000	rs12134493	5.0×10^{-8}	23793025	Migraine without aura	TSPAN2
1p13.2	115677946	rs12134493	2.1×10^{-13}	0	1.000	rs12134493	5.0×10^{-14}	23793025	Migraine	TSPAN2
1p31.1	73868386	rs1923243	2.2×10^{-10}	−43477	0.519	rs10789369	4.0×10^{-10}	23974872	Schizophrenia	Intergenic
2q33.2	203777226	rs149163995	4.4×10^{-10}	−31341	0.539	rs6725887	1.0×10^{-9}	21378990	Coronary heart disease	WDR12
2q33.2	203777226	rs149163995	4.4×10^{-10}	−31341	0.539	rs6725887	1.0×10^{-8}	19198609	Myocardial infarction (early onset)	WDR12
10q23.33	96038686	rs11187838	1.3×10^{-9}	−24981	0.508	rs9419788	4.0×10^{-8}	21368711	Personality dimensions	PLCE1
10q23.33	96038686	rs11187838	1.3×10^{-9}	19612	0.522	rs3765524	3.0×10^{-10}	22001756	Dengue shock syndrome	PLCE1
10q23.33	96038686	rs11187838	1.3×10^{-9}	19612	0.522	rs3765524	2.0×10^{-9}	20729852	Esophageal cancer and gastric cancer	PLCE1,NOC3L

10q23.33	96038686	rs11187838	1.3×10^{-9}	27655	0.608	rs2274223	4.0×10^{-20}	21642993	Esophageal cancer	PLCE1
11p15.4	10674044	rs4910165	2.1×10^{-9}	−4816	0.963	rs7940646	1.0×10^{-6}	20526338	Platelet aggregation	MRVI1
11p15.4	10674044	rs4910165	2.1×10^{-9}	−305	0.994	rs4909945	2.0×10^{-7}	23793025	Migraine	Intergenic
14q32.12	93595591	rs11624776	3.5×10^{-9}	0	1.000	rs11624776	3.0×10^{-6}	23408906	Thyroid hormone levels	ITPK1
7p14.1	40417731	rs61693171	8.7×10^{-9}	48469	0.969	rs4379368	6.0×10^{-8}	23793025	Migraine without aura	c7orf10
7p14.1	40417731	rs61693171	8.7×10^{-9}	48469	0.969	rs4379368	7.0×10^{-7}	23793025	Migraine - clinic-based	c7orf10
7p14.1	40417731	rs61693171	8.7×10^{-9}	48469	0.969	rs4379368	1.0×10^{-9}	23793025	Migraine	c7orf10
9q33.1	119245183	rs7030607	2.3×10^{-8}	4156	0.977	rs7852872	1.0×10^{-7}	22504421	Hippocampal volume	ASTN2
7q11.23	72857717	rs202203062	2.5×10^{-8}	−1448	0.588	rs2240466	1.0×10^{-6}	21490707	Caffeine consumption	
7q11.23	72857717	rs202203062	2.5×10^{-8}	−1448	0.588	rs2240466	1.0×10^{-12}	19060911	Triglycerides	MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	−1287	0.863	rs1178979	2.0×10^{-12}	20864672	Triglycerides	BAZ1B, BCL7B, …
7q11.23	72857717	rs202203062	2.5×10^{-8}	−668	0.863	rs1178977	1.0×10^{-12}	23263486	Urate levels	BAZ1B, MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	7152	0.588	rs714052	3.0×10^{-6}	20657596	Hypertriglyceridemia	MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	7152	0.588	rs714052	3.0×10^{-7}	20139978	Triglycerides	MIXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	7152	0.588	rs714052	3.0×10^{-15}	19060906	Triglycerides	MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	47093	0.863	rs17145713	3.0×10^{-8}	20802025	Protein C levels	BAZ1B
7q11.23	72857717	rs202203062	2.5×10^{-8}	113514	0.545	rs13233571	4.0×10^{-9}	21300955	C-reactive protein	BCL7B
7q11.23	72857717	rs202203062	2.5×10^{-8}	120181	0.531	rs12539316	6.0×10^{-10}	21909109	Gamma glutamyl transpeptidase	TBL2
7q11.23	72857717	rs202203062	2.5×10^{-8}	125157	0.572	rs17145738	9.0×10^{-59}	20686565	Triglycerides	MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	125157	0.572	rs17145738	1.0×10^{-9}	20686565	HDL cholesterol	MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	125157	0.572	rs17145738	7.0×10^{-22}	18193044	Triglycerides	BCL7B, TBL2, MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	125157	0.572	rs17145738	2.0×10^{-12}	18193043	Triglycerides	MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	129637	0.514	rs2286276	2.0×10^{-6}	23505323	Hypertriglyceridemia	VPS37D,TBL2,MLXIPL,BCL7B,BAZ1B
7q11.23	72857717	rs202203062	2.5×10^{-8}	129637	0.514	rs2286276	1.0×10^{-15}	21909109	Triglycerides	TBL2, MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	152725	0.788	rs13247874	8.0×10^{-14}	22286219	Lipid metabolism phenotypes	MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	159288	0.766	rs13226650	2.0×10^{-11}	22399527	Metabolic syndrome	MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	162620	0.544	rs3812316	1.0×10^{-10}	18193046	Triglycerides	MLXIPL
7q11.23	72857717	rs202203062	2.5×10^{-8}	168661	0.613	rs17145750	3.0×10^{-9}	22001757	Liver enzyme levels (gamma-glutamyl transferase)	MLXIPL
16q23.1	75442144	rs200914569	5.7×10^{-8}	−51828	0.808	rs2865531	2.0×10^{-8}	23284291	Pulmonary function (interaction)	CFDP1
16q23.1	75442144	rs200914569	5.7×10^{-8}	−51828	0.808	rs2865531	2.0×10^{-11}	21946350	Pulmonary function	CFDP1

Replication of GWAS Catalog Results



The following table shows, for each GWAS Catalog result for similar traits, our association test result for our best available proxy (distance < 100kb, $r^2 > 0.8$).

region	position	our.name	our.pval	dist	rsqr	assay.name	pvalue	pubmed.id	trait	genes
1p36.32	3083712	rs2651899	3.4×10^{-14}	0	1.000	rs2651899	4.0×10^{-14}	23793025	Migraine	PRDM16
1p36.32	3083712	rs2651899	3.4×10^{-14}	0	1.000	rs2651899	4.0×10^{-9}	21666692	Migraine	PRDM16
1p36.21	15548636	rs10737909	7.5×10^{-5}	0	1.000	rs10737909	2.0×10^{-7}	23793025	Migraine	Intergenic
1p32.3	54668278	rs1890566	0.32	0	1.000	rs1890566	8.0×10^{-7}	23793025	Migraine	Intergenic
1p13.2	115677946	rs12134493	2.1×10^{-13}	0	1.000	rs12134493	5.0×10^{-14}	23793025	Migraine	TSPAN2
1q22	156446242	rs2274316	5.2×10^{-18}	0	1.000	rs2274316	1.0×10^{-8}	23793025	Migraine	MEF2D, APOA1BP
1q22	156456301	rs3790455	2.8×10^{-18}	0	1.000	rs3790455	7.0×10^{-11}	22683712	Migraine	MEF2D
2q35	217208571	rs6756590	0.11	0	1.000	rs6756590	1.0×10^{-6}	22683712	Migraine	MARCH4
2q37.1	234825093	rs10166942	7.5×10^{-19}	0	1.000	rs10166942	1.0×10^{-12}	22683712	Migraine	TRPM8
2q37.1	234825093	rs10166942	7.5×10^{-19}	0	1.000	rs10166942	6.0×10^{-12}	21666692	Migraine	TRPM8
2q37.1	234827661	rs6741751	9.2×10^{-12}	0	1.000	rs6741751	9.0×10^{-14}	23793025	Migraine	TRPM8
3p24.1	30462403	rs7640543	4.2×10^{-5}	0	1.000	rs7640543	1.0×10^{-9}	22683712	Migraine	TGFBR2

3p22.2	38886413	rs3923518	0.060	0	1.000	rs3923518	8.0×10^{-6}	23793025	Migraine	Intergenic
3p12.2	80368463	rs10511112	0.019	0	1.000	rs10511112	5.0×10^{-6}	23793025	Migraine	Intergenic
5q11.2	53380555	rs273218	0.70	0	1.000	rs273218	2.0×10^{-6}	23793025	Migraine	Intergenic
5q15	92464416	rs12519773	0.15	0	1.000	rs12519773	2.0×10^{-6}	23793025	Migraine	Intergenic
5q23.2	122264736	rs2447820	0.0035	0	1.000	rs2447820	4.0×10^{-6}	23793025	Migraine	Intergenic
5q31.3	142899801	rs12153243	0.31	0	1.000	rs12153243	6.0×10^{-6}	23793025	Migraine	Intergenic
5q33.3	159367971	rs11750092	0.27	0	1.000	rs11750092	7.0×10^{-6}	23793025	Migraine	Intergenic
6p24.1	12903957	rs9349379	1.5×10^{-20}	0	1.000	rs9349379	5.0×10^{-8}	23793025	Migraine	PHACTR1, TBC1D7
6p24.1	12903957	rs9349379	1.5×10^{-20}	0	1.000	rs9349379	3.0×10^{-8}	22683712	Migraine	PHACTR1
6p21.2	39183470	rs10456100	5.2×10^{-7}	0	1.000	rs10456100	5.0×10^{-7}	23793025	Migraine	Intergenic
6p21.1	44424800	rs543844	0.26	0	1.000	rs543844	3.0×10^{-6}	23793025	Migraine	Intergenic
6q16.1	96884886	rs11757063	2.0×10^{-18}	0	1.000	rs11757063	6.0×10^{-8}	22683712	Migraine	FHL5
6q16.1	97065212	rs11759769	1.5×10^{-19}	0	1.000	rs11759769	1.0×10^{-11}	23793025	Migraine	FHL5
6q22.31	121816879	rs9490306	5.6×10^{-6}	0	1.000	rs9490306	7.0×10^{-6}	23793025	Migraine	Intergenic
6q24.3	148923789	rs13196614	0.47	0	1.000	rs13196614	5.0×10^{-6}	23793025	Migraine	Intergenic
6q25.2	153265210	rs13218732	0.55	0	1.000	rs13218732	3.0×10^{-6}	23793025	Migraine	Intergenic
7p14.1	40466200	rs4379368	3.0×10^{-8}	0	1.000	rs4379368	1.0×10^{-9}	23793025	Migraine	c7orf10
7q31.32	123376560	rs9649465	0.78	0	1.000	rs9649465	1.0×10^{-6}	23793025	Migraine	Intergenic
7q36.3	155285135	rs1861960	0.59	0	1.000	rs1861960	6.0×10^{-6}	23793025	Migraine	Intergenic
8p22	12811152	rs2946505	0.12	0	1.000	rs2946505	9.0×10^{-6}	23793025	Migraine	Intergenic
8p12	29982518	rs12681963	0.63	0	1.000	rs12681963	2.0×10^{-7}	23793025	Migraine	Intergenic
8q12.2	62054463	rs12681792	0.22	0	1.000	rs12681792	9.0×10^{-7}	23793025	Migraine	Intergenic
8q13.3	72447418	rs13263568	0.14	0	1.000	rs13263568	2.0×10^{-6}	23793025	Migraine	Intergenic
8q22.1	98166913	rs1835740	0.13	0	1.000	rs1835740	2.0×10^{-11}	20802479	Migraine	MTDH,PGCP
8q22.3	103639941	rs6998277	0.72	0	1.000	rs6998277	2.0×10^{-6}	23793025	Migraine	Intergenic
8q24.21	131033496	rs16904191	0.027	0	1.000	rs16904191	2.0×10^{-7}	23793025	Migraine	Intergenic
9q33.1	118424987	rs12006166	0.36	0	1.000	rs12006166	9.0×10^{-7}	23793025	Migraine	Intergenic
9q33.1	119181794	rs17303101	0.0029	0	1.000	rs17303101	4.0×10^{-7}	23793025	Migraine	Intergenic
9q33.1	119252629	rs6478241	7.0×10^{-7}	0	1.000	rs6478241	4.0×10^{-8}	22683712	Migraine	ASTN2
10p15.3	759268	rs7916968	0.79	0	1.000	rs7916968	7.0×10^{-6}	23793025	Migraine	Intergenic
10p15.3	1246883	rs4880487	0.27	0	1.000	rs4880487	3.0×10^{-6}	23793025	Migraine	Intergenic
10p14	6924444	rs11816922	0.18	0	1.000	rs11816922	5.0×10^{-6}	23793025	Migraine	Intergenic
10p14	8719269	rs827382	8.9×10^{-5}	0	1.000	rs827382	9.0×10^{-8}	23793025	Migraine	Intergenic
10p13	13790265	rs10906466	0.75	0	1.000	rs10906466	8.0×10^{-6}	23793025	Migraine	Intergenic
10p13	14945406	rs11594111	0.76	0	1.000	rs11594111	1.0×10^{-7}	23793025	Migraine	Intergenic
10p13	16634299	rs7068341	0.43	0	1.000	rs7068341	2.0×10^{-6}	23793025	Migraine	Intergenic
10p11.22	33503179	rs2506155	0.042	0	1.000	rs2506155	3.0×10^{-6}	23793025	Migraine	Intergenic
10q11.23	52789355	rs6479874	0.13	0	1.000	rs6479874	3.0×10^{-7}	23793025	Migraine	Intergenic
10q21.1	53681794	rs11000137	0.74	0	1.000	rs11000137	3.0×10^{-6}	23793025	Migraine	Intergenic
10q22.3	80515081	rs7900239	0.93	0	1.000	rs7900239	9.0×10^{-6}	23793025	Migraine	Intergenic
10q23.33	96534263	rs6583954	0.66	0	1.000	rs6583954	4.0×10^{-6}	23793025	Migraine	Intergenic
10q24.2	100291176	rs577969	0.59	0	1.000	rs577969	4.0×10^{-6}	23793025	Migraine	Intergenic
10q24.32	104748718	rs1890185	0.053	0	1.000	rs1890185	4.0×10^{-7}	23793025	Migraine	Intergenic
10q24.33	105033015	rs1712517	0.023	0	1.000	rs1712517	9.0×10^{-6}	22683712	Migraine	INA
10q25.2	114202526	rs12355831	0.20	0	1.000	rs12355831	2.0×10^{-6}	23793025	Migraine	Intergenic
10q26.13	125251675	rs705162	0.0018	0	1.000	rs705162	3.0×10^{-6}	23793025	Migraine	Intergenic
10q26.3	132168065	rs11017221	0.50	0	1.000	rs11017221	1.0×10^{-7}	23793025	Migraine	Intergenic
11p15.4	10673739	rs4909945	2.2×10^{-9}	0	1.000	rs4909945	2.0×10^{-7}	23793025	Migraine	Intergenic
11p12	43236061	rs12365397	0.62	0	1.000	rs12365397	9.0×10^{-6}	23793025	Migraine	Intergenic
12p13.32	4523456	rs10849061	3.2×10^{-18}	0	1.000	rs10849061	2.0×10^{-7}	23793025	Migraine	Intergenic
12q13.3	57377347	rs4759042	7.8×10^{-14}	0	1.000	rs4759042	3.0×10^{-6}	23793025	Migraine	Intergenic
12q13.3	57527283	rs11172113	5.6×10^{-36}	0	1.000	rs11172113	4.0×10^{-19}	23793025	Migraine	LRP1
12q13.3	57527283	rs11172113	5.6×10^{-36}	0	1.000	rs11172113	3.0×10^{-8}	22683712	Migraine	LRP1
12q13.3	57527283	rs11172113	5.6×10^{-36}	0	1.000	rs11172113	4.0×10^{-9}	21666692	Migraine	LRP1
12q24.23	118272871	rs2723279	0.072	0	1.000	rs2723279	5.0×10^{-6}	23793025	Migraine	Intergenic
12q24.33	132325239	rs6598163	0.0093	0	1.000	rs6598163	5.0×10^{-7}	22683712	Migraine	MMP17
13q32.2	98827035	rs285098	0.41	0	1.000	rs285098	7.0×10^{-6}	23793025	Migraine	Intergenic
15q25.3	87695511	rs11636768	0.65	0	1.000	rs11636768	5.0×10^{-7}	21448238	Migraine	AGBL1
15q26.2	96647793	rs4984499	0.27	0	1.000	rs4984499	8.0×10^{-6}	23793025	Migraine	Intergenic
15q26.2	96809782	rs1437588	0.50	0	1.000	rs1437588	3.0×10^{-6}	23793025	Migraine	Intergenic
18q21.1	44860264	rs9947662	0.0015	0	1.000	rs9947662	3.0×10^{-6}	23793025	Migraine	Intergenic
19q13.2	41851509	rs4803455	0.19	0	1.000	rs4803455	8.0×10^{-7}	23793025	Migraine	Intergenic
22q11.23	23922983	rs140174	0.28	0	1.000	rs140174	8.0×10^{-6}	21448238	Migraine	IGLL1

Nearby Nonsynonymous SNPs

region	position	our.name	our.pval	dist	rsqr	assay.name	gene	aa.chg
6q16.1	97060124	rs9486719	5.7×10^{-21}	−1571	0.503	rs2273621	FHL5	R204G
2q33.2	203777226	rs149163995	4.4×10^{-10}	−11470	0.539	rs35212307	WDR12	I75V
2q33.2	203777226	rs149163995	4.4×10^{-10}	69591	0.539	rs72932557	ALS2CR8	Y571F
10q23.33	96038686	rs11187838	1.3×10^{-9}	911	1.000	rs2274224	PLCE1	R1575P
10q23.33	96038686	rs11187838	1.3×10^{-9}	19612	0.522	rs3765524	PLCE1	T1777I
10q23.33	96038686	rs11187838	1.3×10^{-9}	27655	0.608	rs2274223	PLCE1	H1927R
11p15.4	10674044	rs4910165	2.1×10^{-9}	−305	0.994	rs4909945	MRVI1	I11V
7q11.23	72857717	rs202203062	2.5×10^{-8}	154325	0.569	rs35332062	MLXIPL	A358V
7q11.23	72857717	rs202203062	2.5×10^{-8}	162620	0.544	rs3812316	MLXIPL	Q241H

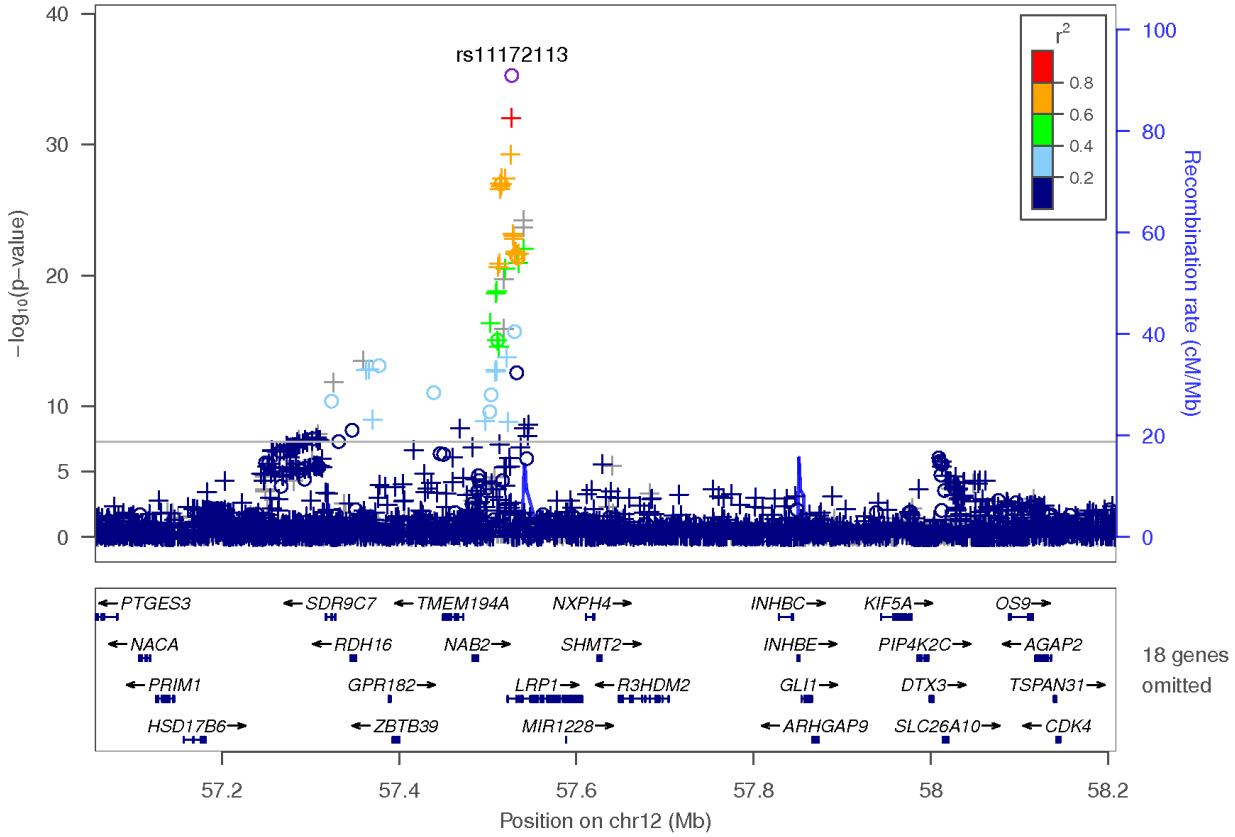
Nearby Expression QTLs

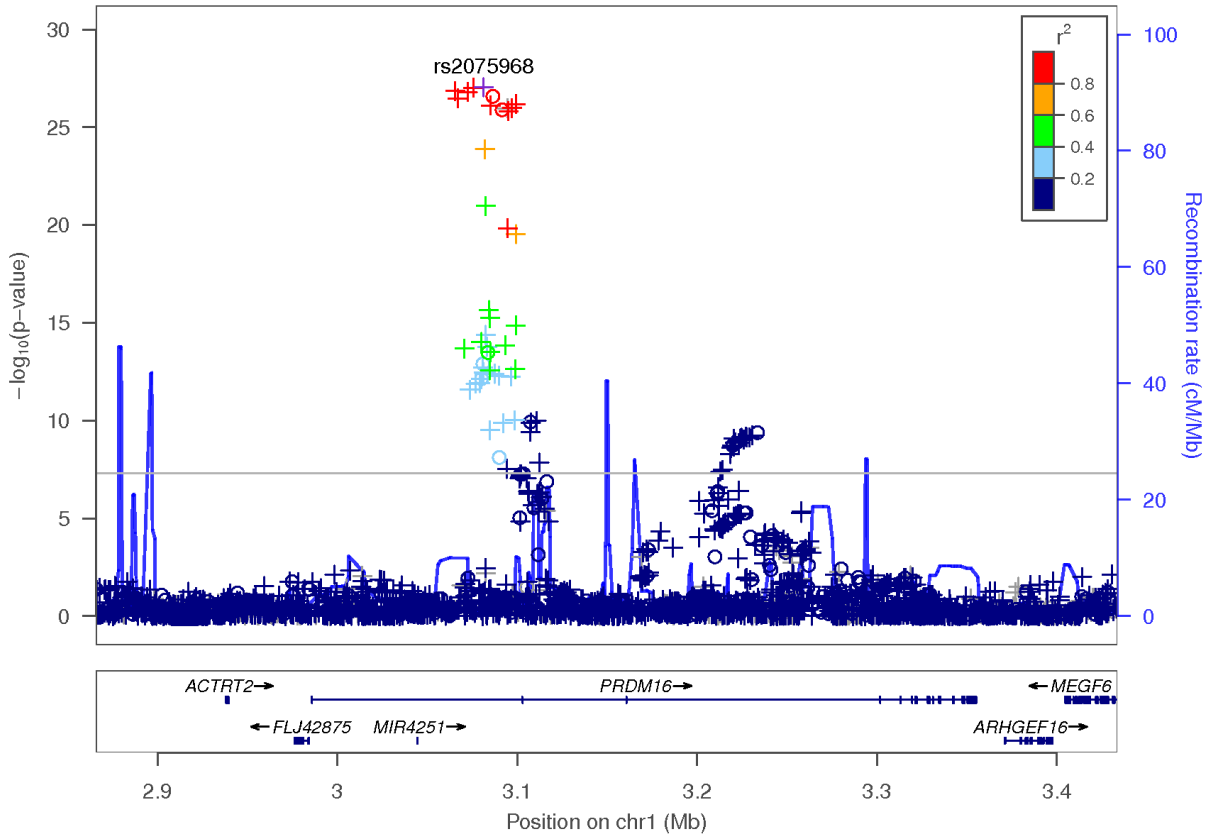
region	position	our.name	our.pval	dist	rsqr	assay.name	eqtl.dist	eqtl.gene	eqtl.pval	eqtl.rsqr	tissue	pubmed.id
12q13.3	57527283	rs11172113	5.6×10^{-36}	6407	0.642	rs4759277	550082	RBMS2	4.9×10^{-6}	0.016	Monocyte	20502693
2q33.2	203777226	rs149163995	4.4×10^{-10}	−31341	0.539	rs6725887	111405	ALS2CR13	7.6×10^{-30}	0.083	Monocyte	20502693
10q23.33	96038686	rs11187838	1.3×10^{-9}	−27897	0.502	rs7919066	687626	CYP2C9	2.0×10^{-5}	0.222	Lymphoblastoid	19644074
10q26.3	134568387	rs3793683	1.7×10^{-8}	−17505	0.559	rs2803992	51163	LOC644276	0.00023	0.047	Monocyte	22446964

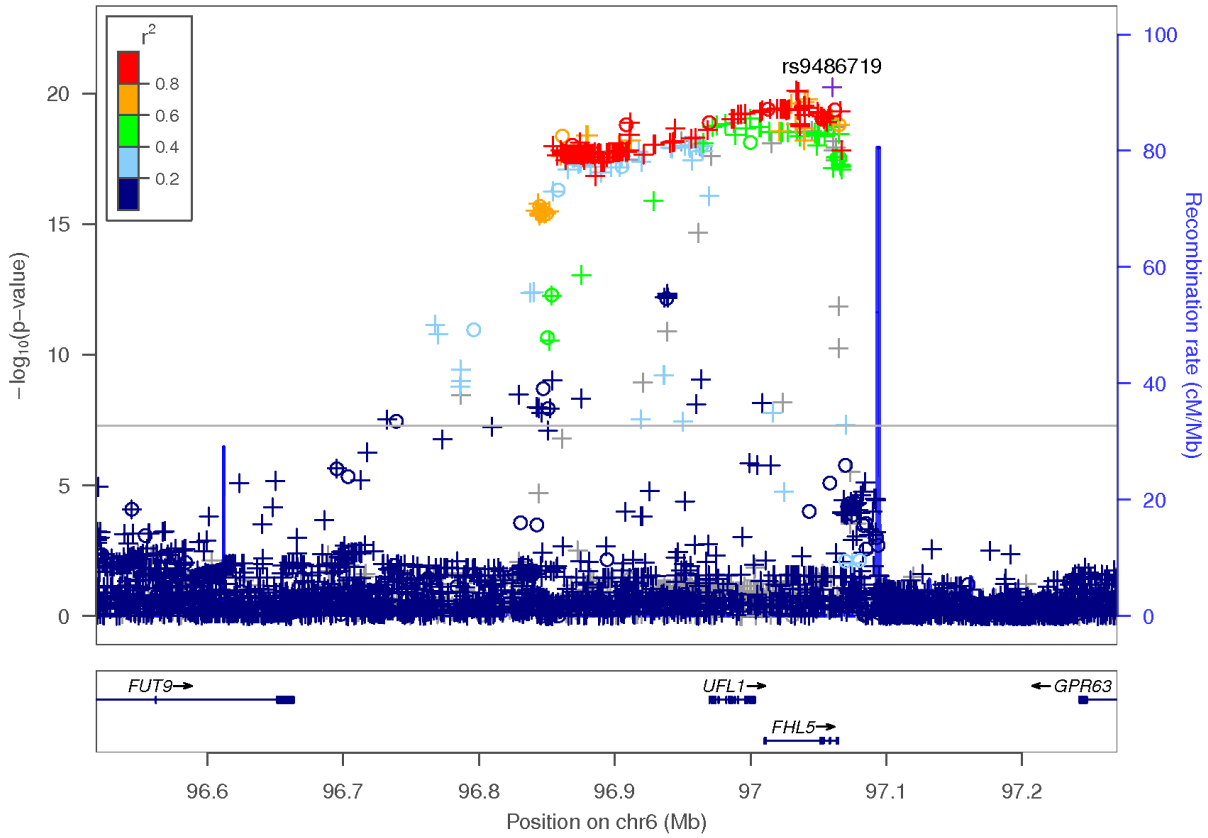
Nearby Clinical Variants

no hits were found for clinical variants

Regional Association Plots




rs2075968
r²
0.8
0.6
0.4
0.2
−log10(p−value)
Recombination rate (cM/Mb)
ACTRT2
PRDM16
MEGF6
FLJ42875
MIR4251
ARHGEF16
Position on chr1 (Mb)


rs9486719
r²
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0.6
0.4
0.2
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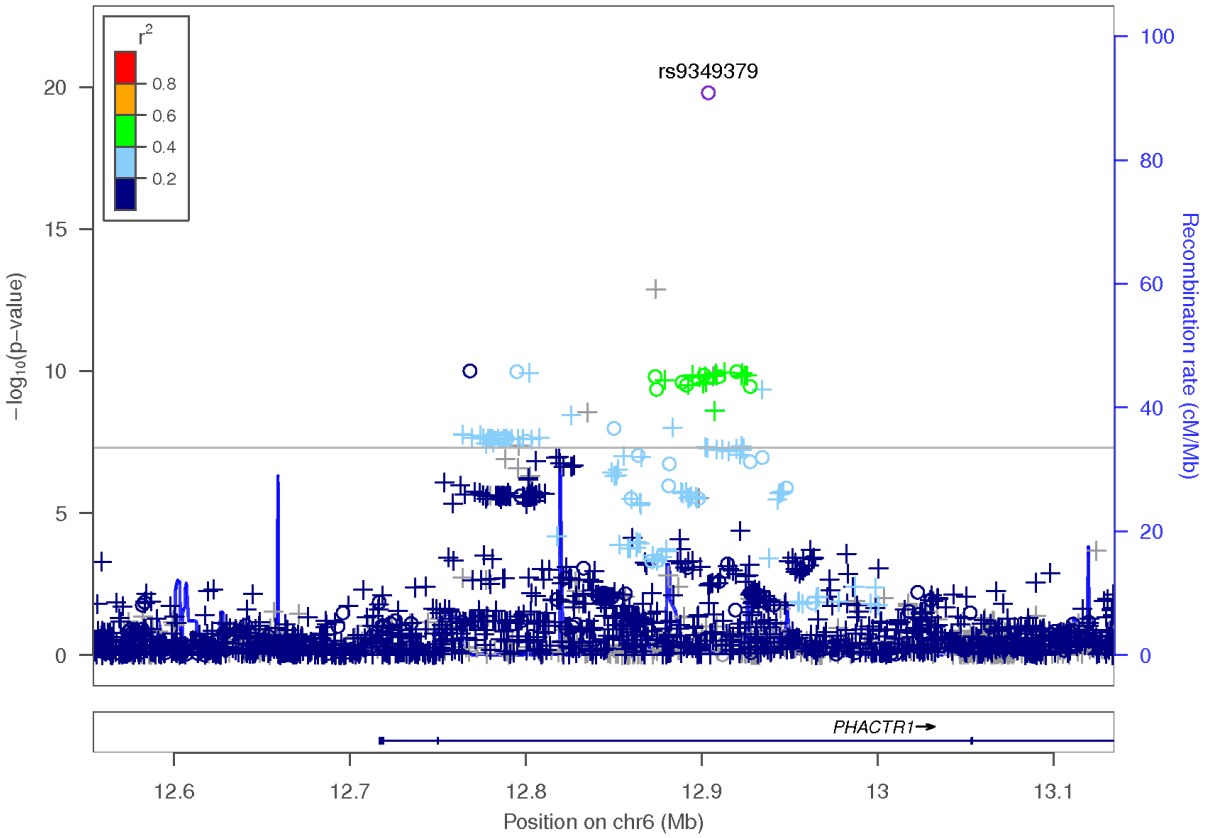
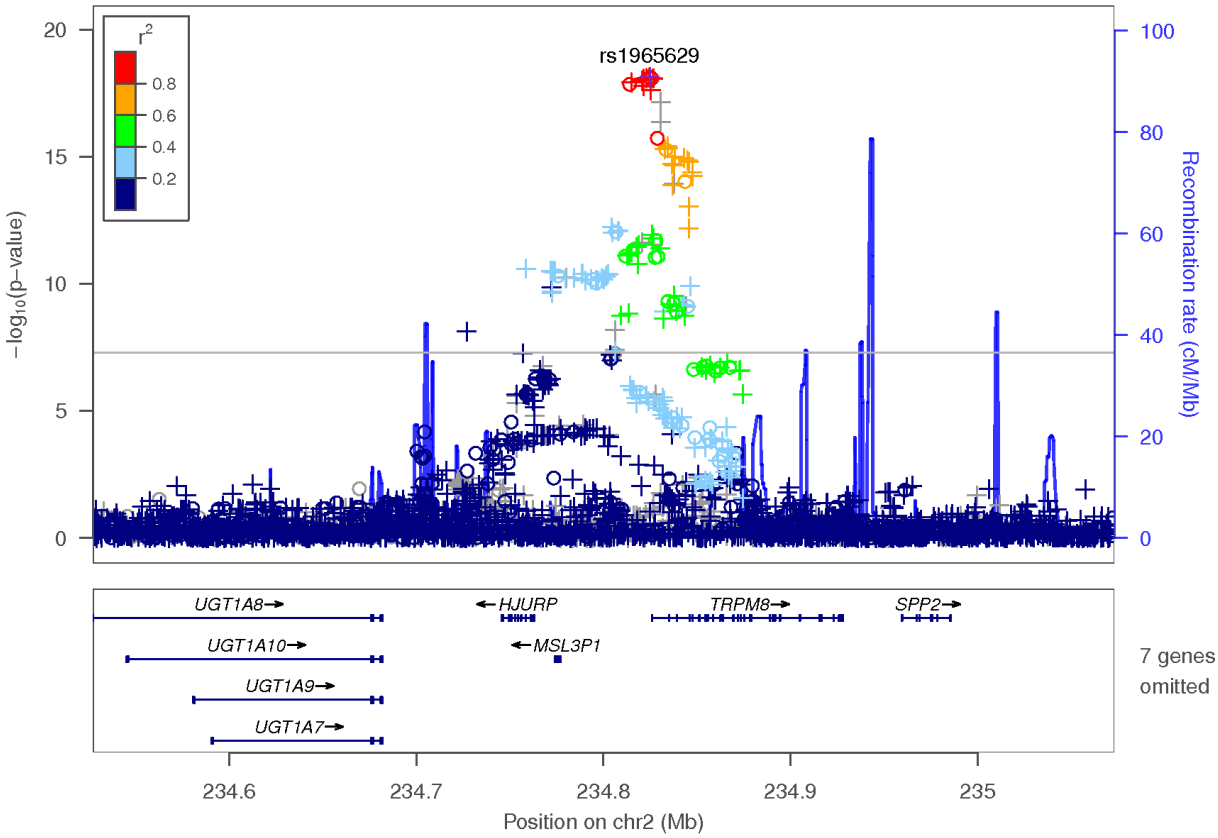
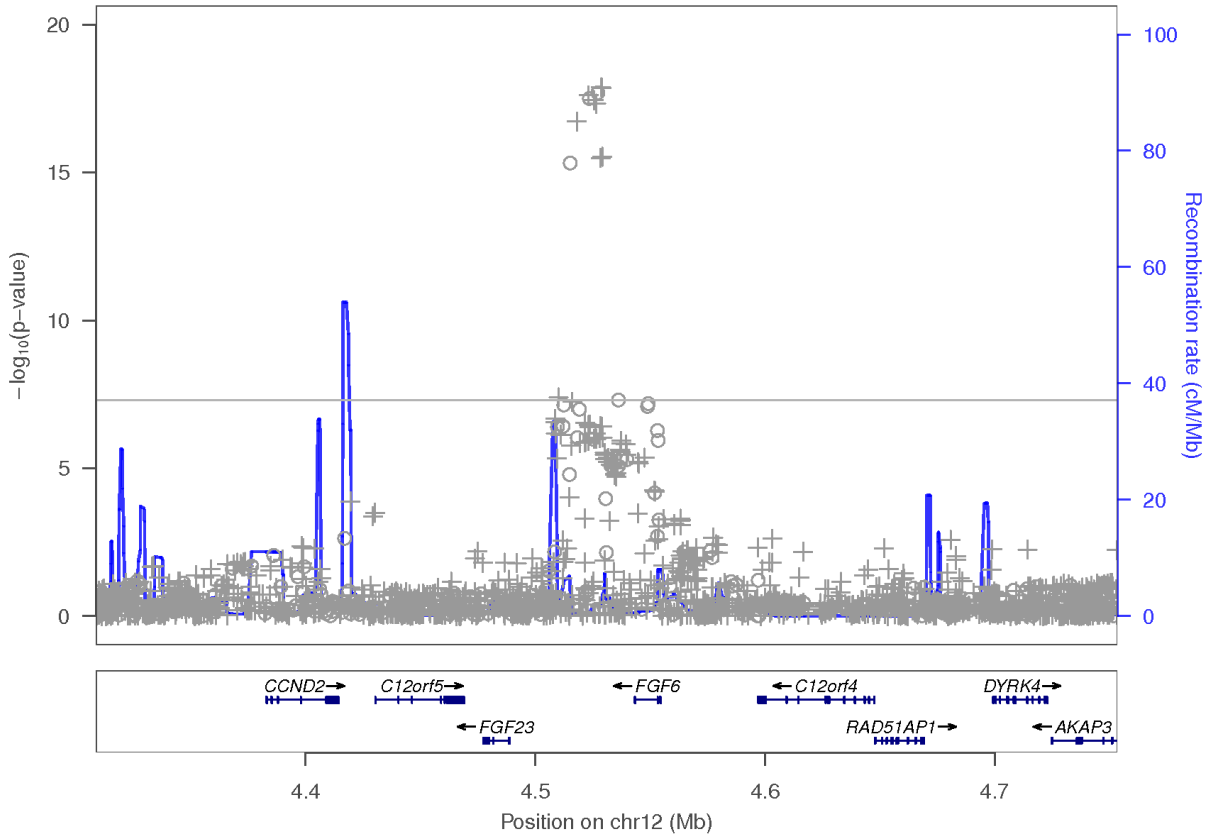
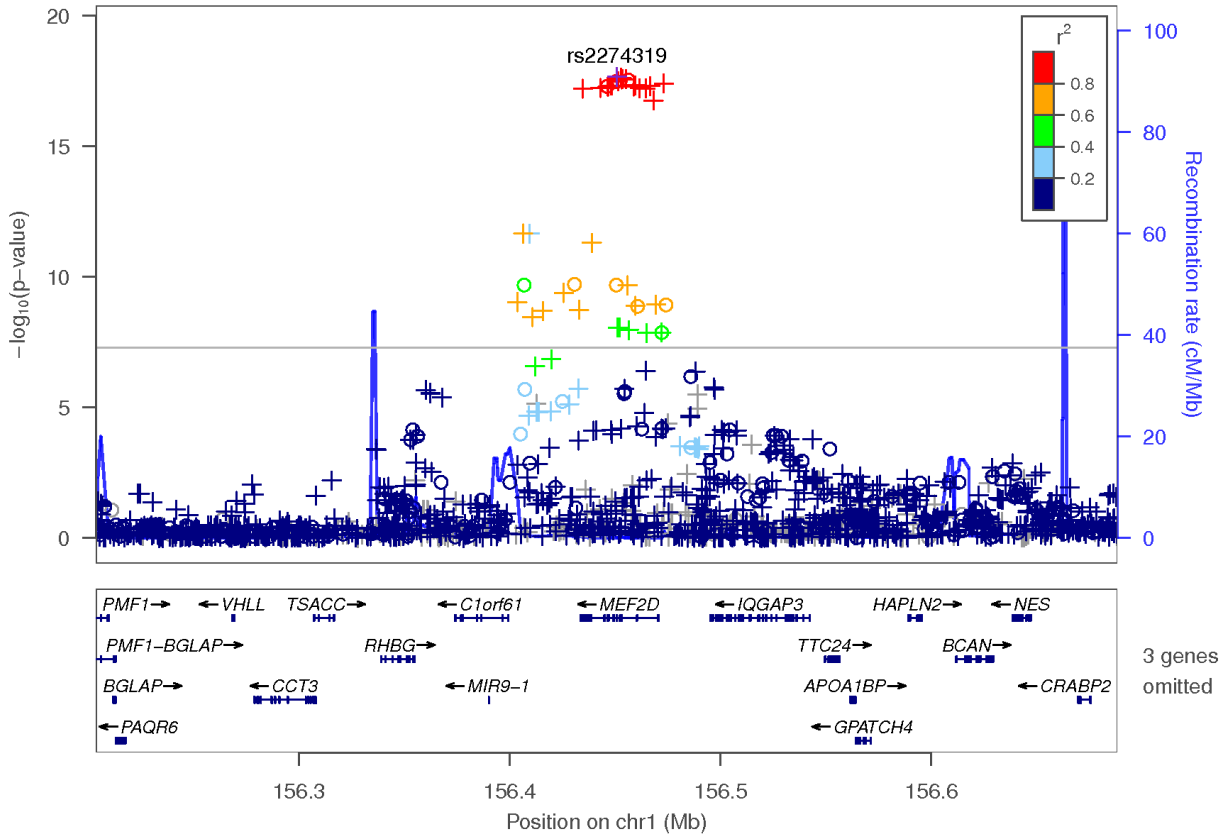
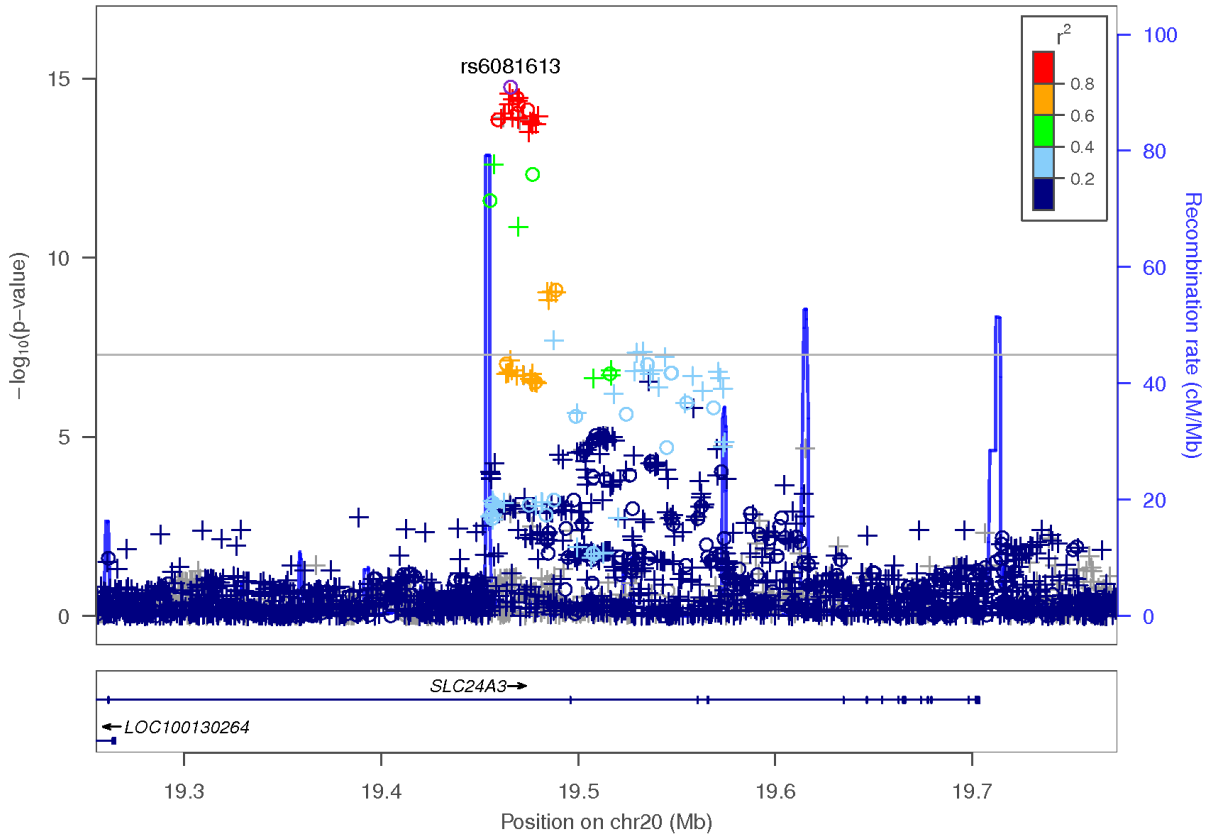
Recombination rate (cM/Mb)
FUT9
UFL1
GPR63
FHL5
Position on chr6 (Mb)

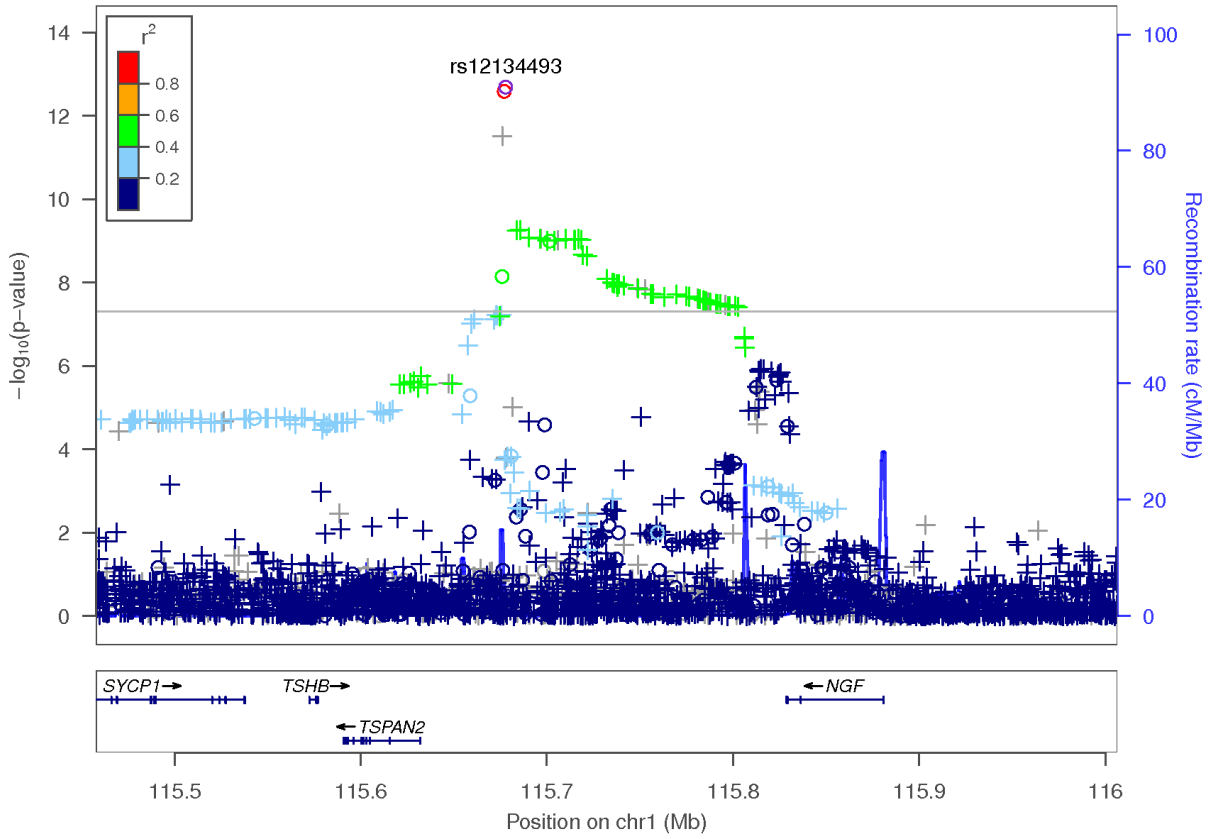

r²
0.8
0.6
0.4
0.2
rs9349379
−log₁₀(p−value)
Recombination rate (cM/Mb)
PHACTR1
12.6
12.7
12.8
12.9
13
13.1
Position on chr6 (Mb)

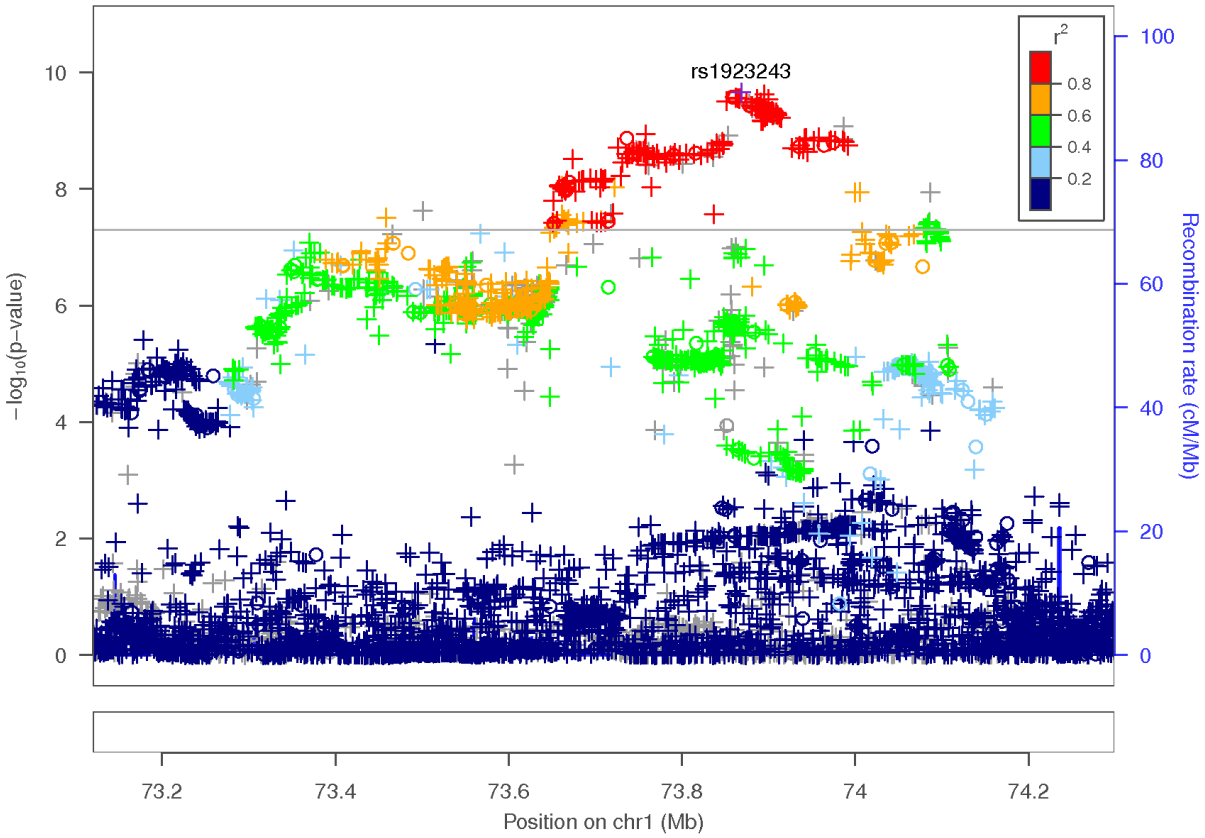

r²
0.8
0.6
0.4
0.2
rs1965629
−log₁₀(p−value)
Recombination rate (cM/Mb)
UGT1A8
UGT1A10
UGT1A9
UGT1A7
HJURP
MSL3P1
TRPM8
SPP2
7 genes
omitted
234.6
234.7
234.8
234.9
235
Position on chr2 (Mb)

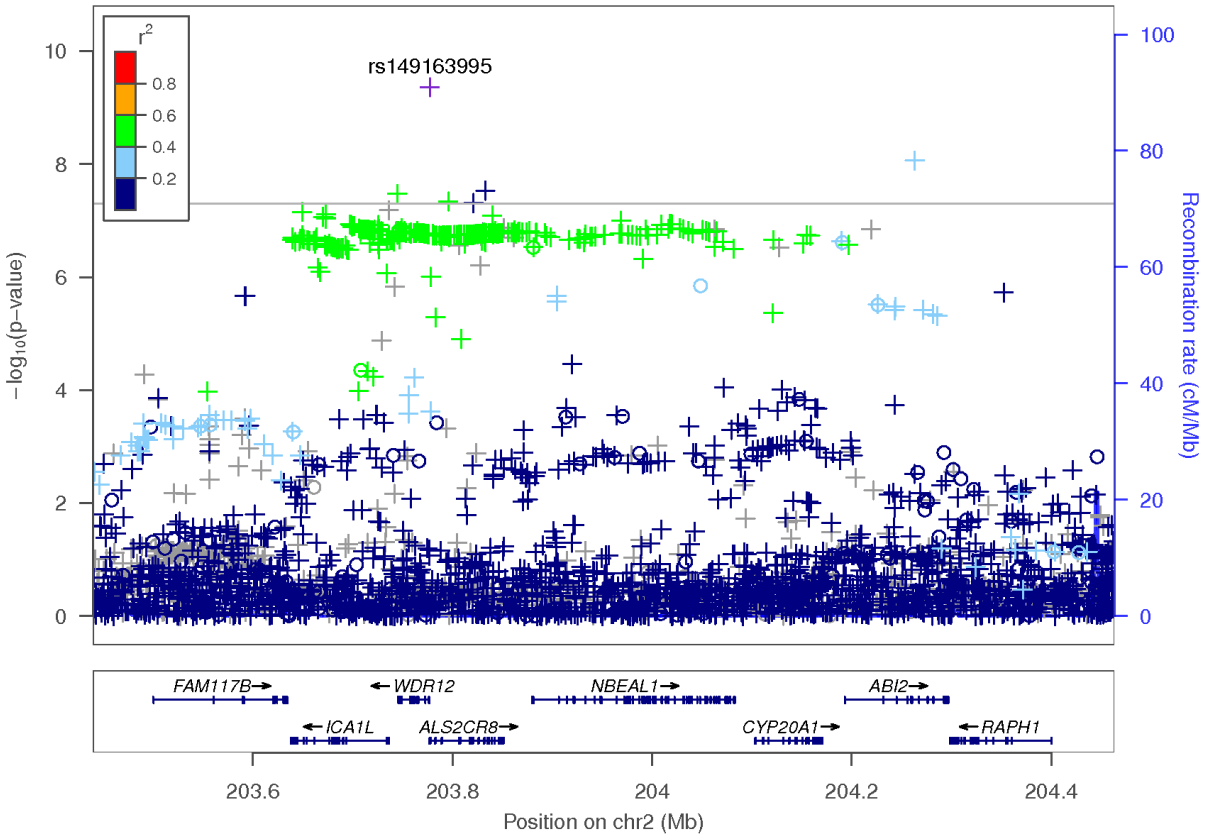

20
15
10
5
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
CCND2
C12orf5
FGF6
C12orf4
DYRK4
FGF23
RAD51AP1
AKAP3
4.4
4.5
4.6
4.7
Position on chr12 (Mb)

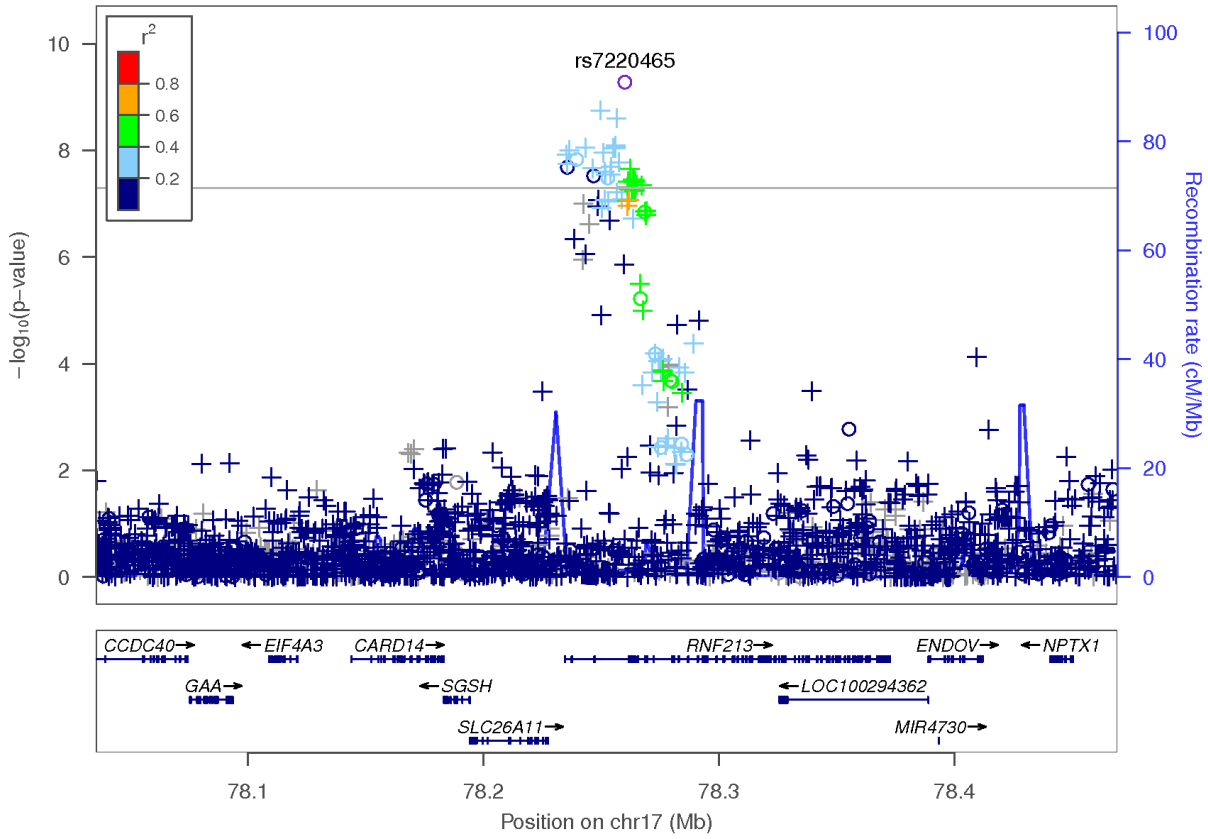

rs2274319
r2
0.8
0.6
0.4
0.2
20
15
10
5
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
PMF1
VHLL
TSACC
C1orf61
MEF2D
IQGAP3
HAPLN2
NES
PMF1−BGLAP
RHBG
TTC24
BCAN
BGLAP
CCT3
MIR9−1
APOA1BP
CRABP2
PAQR6
GPATCH4
3 genes
omitted
156.3
156.4
156.5
156.6
Position on chr1 (Mb)

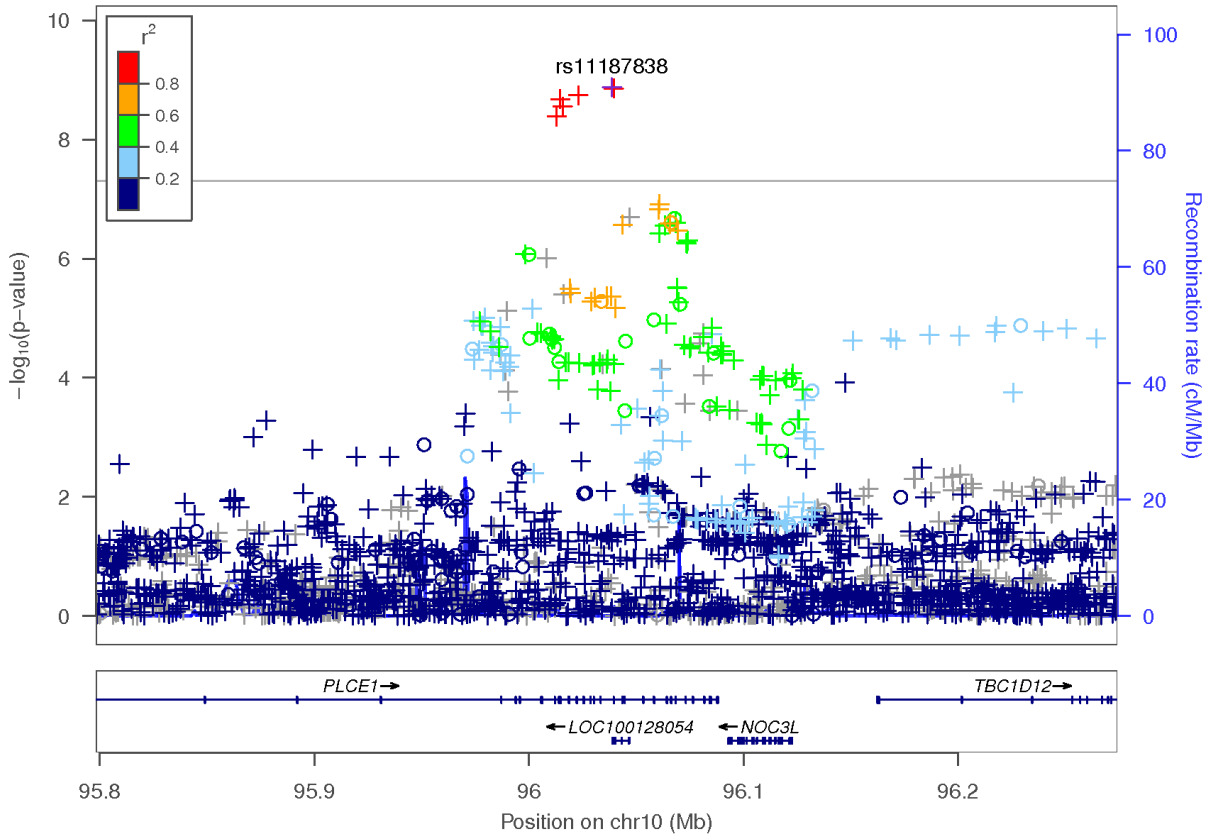

rs6081613
r²
0.8
0.6
0.4
0.2
−log10(p−value)
Recombination rate (cM/Mb)
SLC24A3
LOC100130264
19.3
19.4
19.5
19.6
19.7
Position on chr20 (Mb)

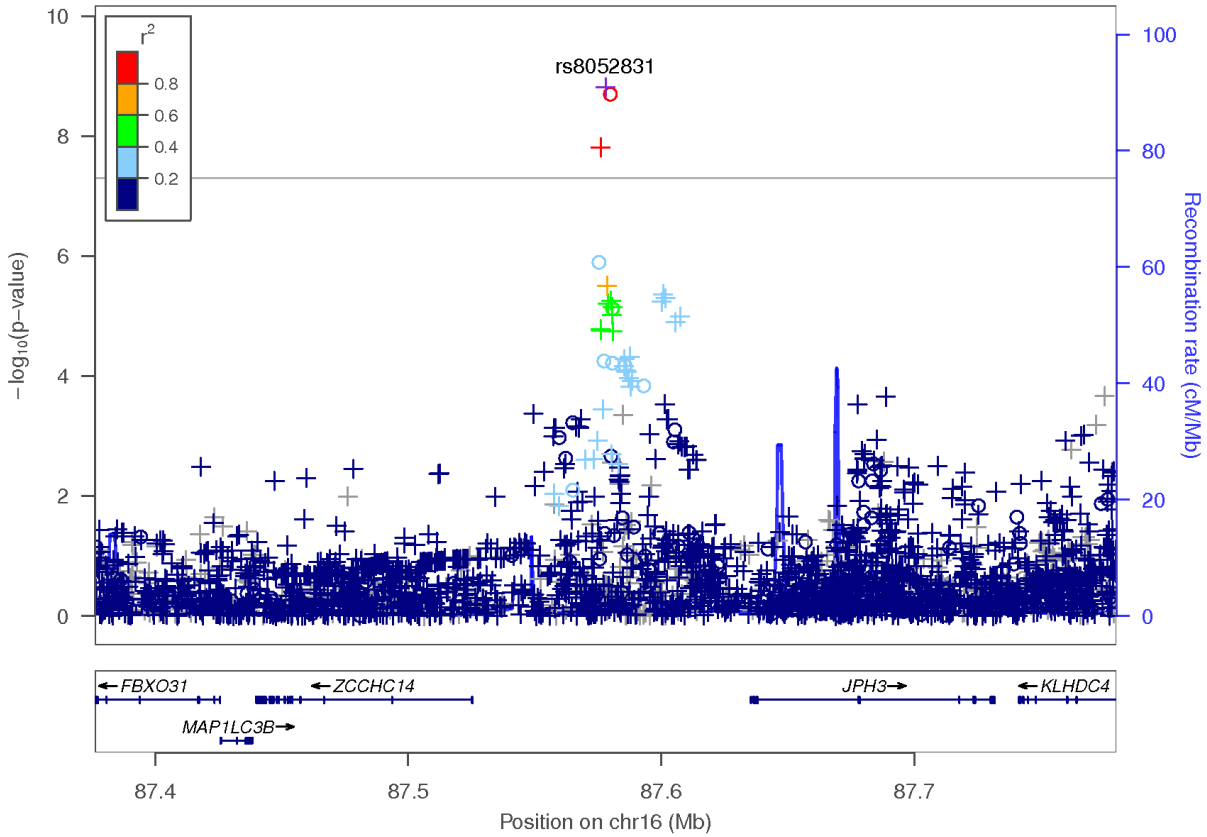

rs12134493
r²
0.8
0.6
0.4
0.2
−log10(p−value)
Recombination rate (cM/Mb)
SYCP1
TSHB
NGF
TSPAN2
115.5
115.6
115.7
115.8
115.9
116
Position on chr1 (Mb)

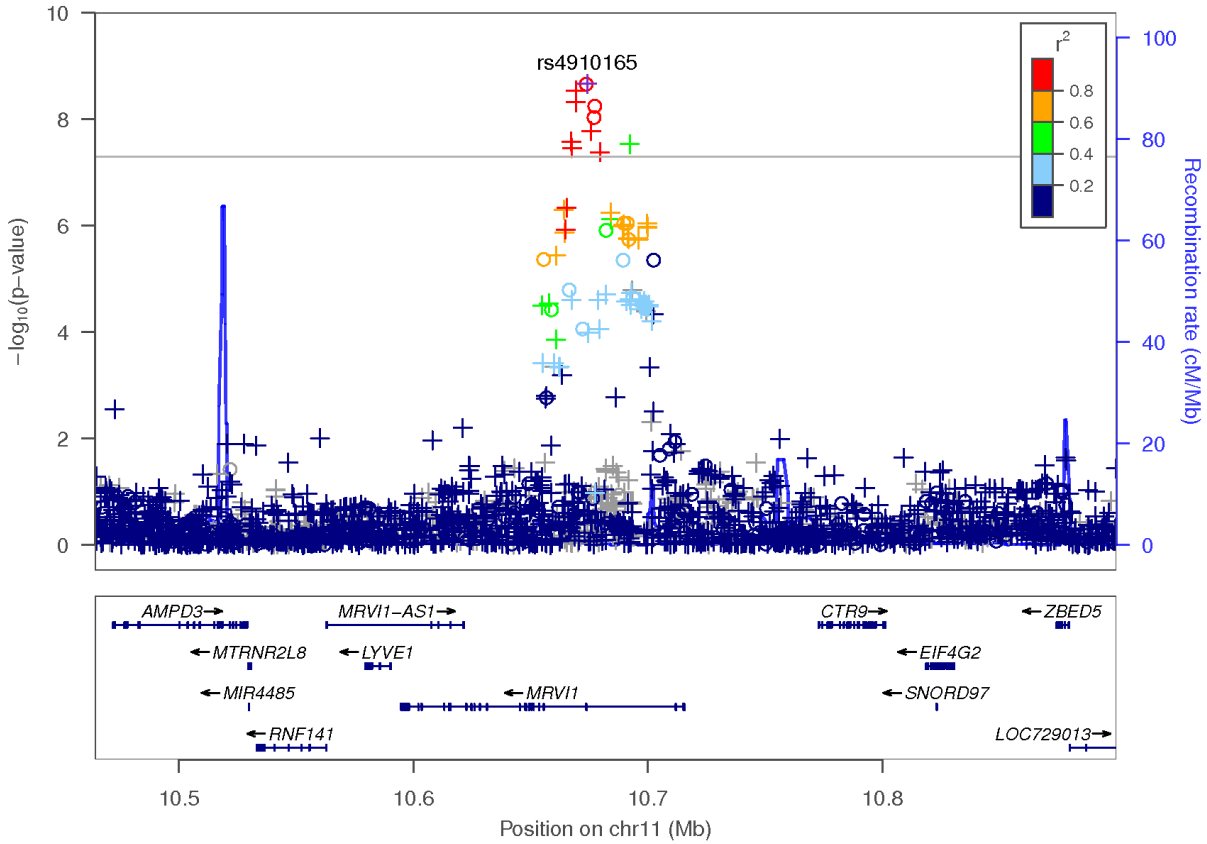

rs1923243
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
Recombination rate (cM/Mb)
Position on chr1 (Mb)
73.2
73.4
73.6
73.8
74
74.2

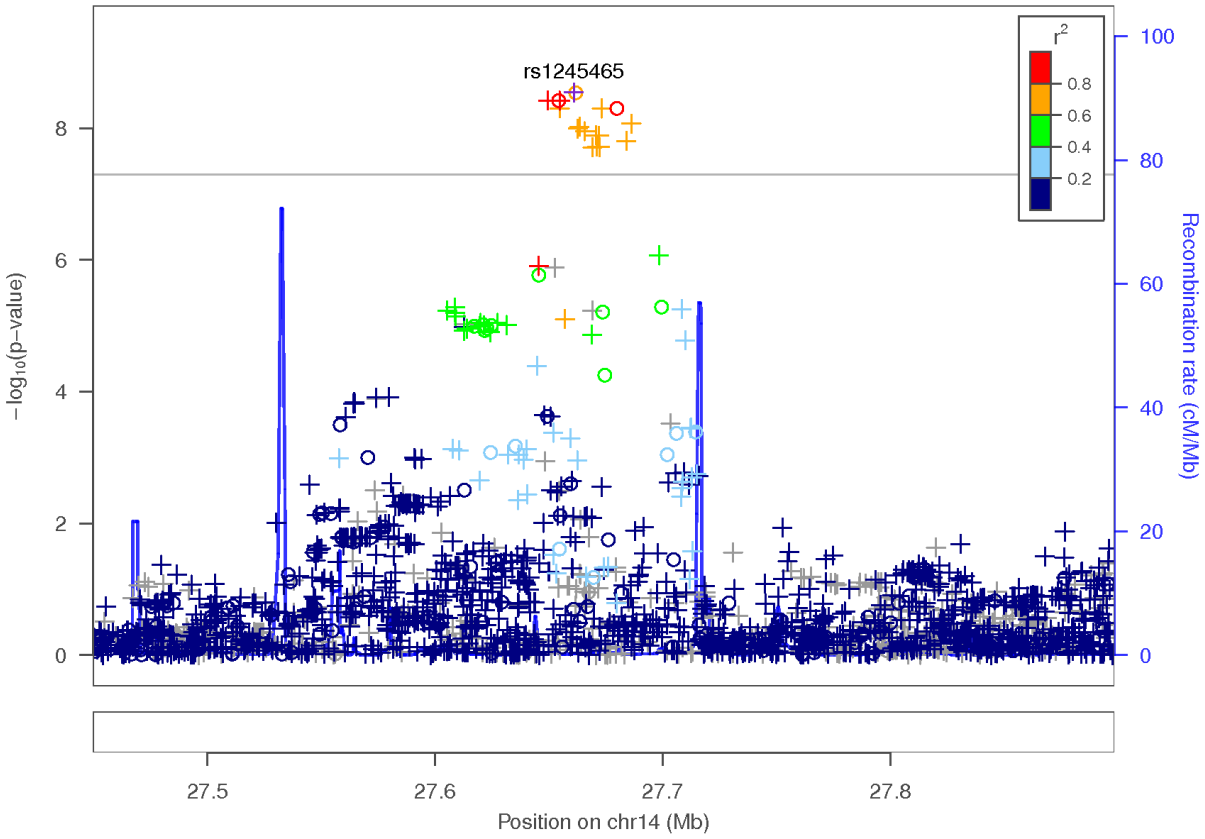

rs149163995
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
Recombination rate (cM/Mb)
FAM117B
WDR12
NBEAL1
ABI2
ICA1L
ALS2CR8
CYP20A1
RAPH1
Position on chr2 (Mb)
203.6
203.8
204
204.2
204.4

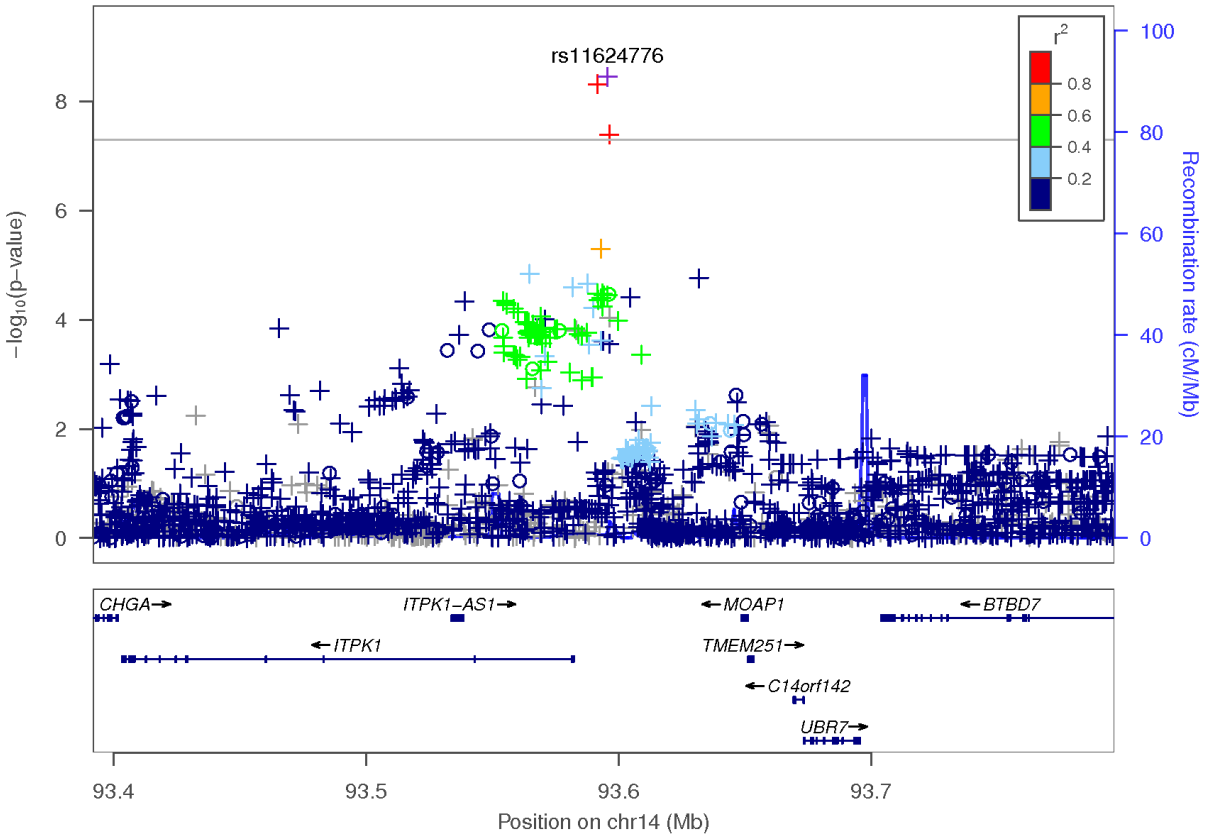

rs7220465
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
Recombination rate (cM/Mb)
CCDC40
EIF4A3
CARD14
RNF213
ENDOV
NPTX1
GAA
SGSH
LOC100294362
SLC26A11
MIR4730
78.1
78.2
78.3
78.4
Position on chr17 (Mb)

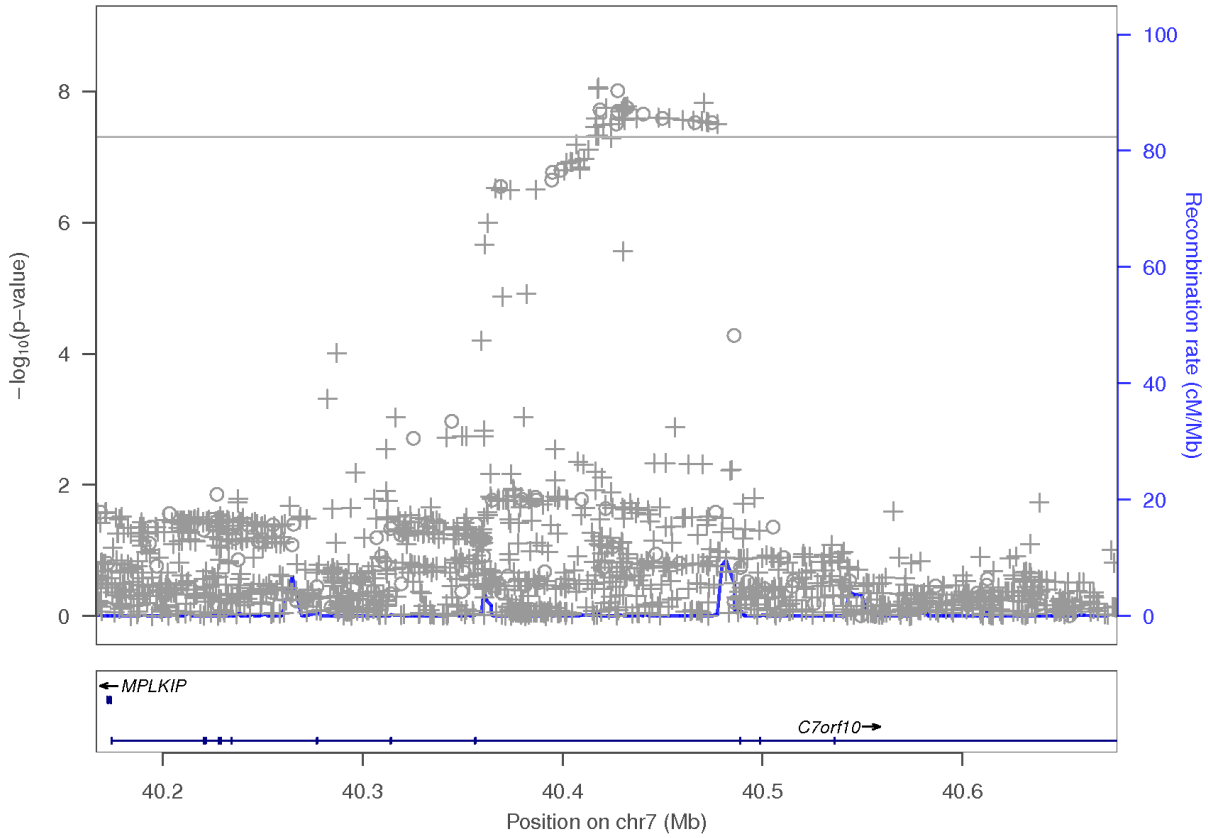

rs11187838
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
Recombination rate (cM/Mb)
PLCE1
TBC1D12
LOC100128054
NOC3L
95.8
95.9
96
96.1
96.2
Position on chr10 (Mb)

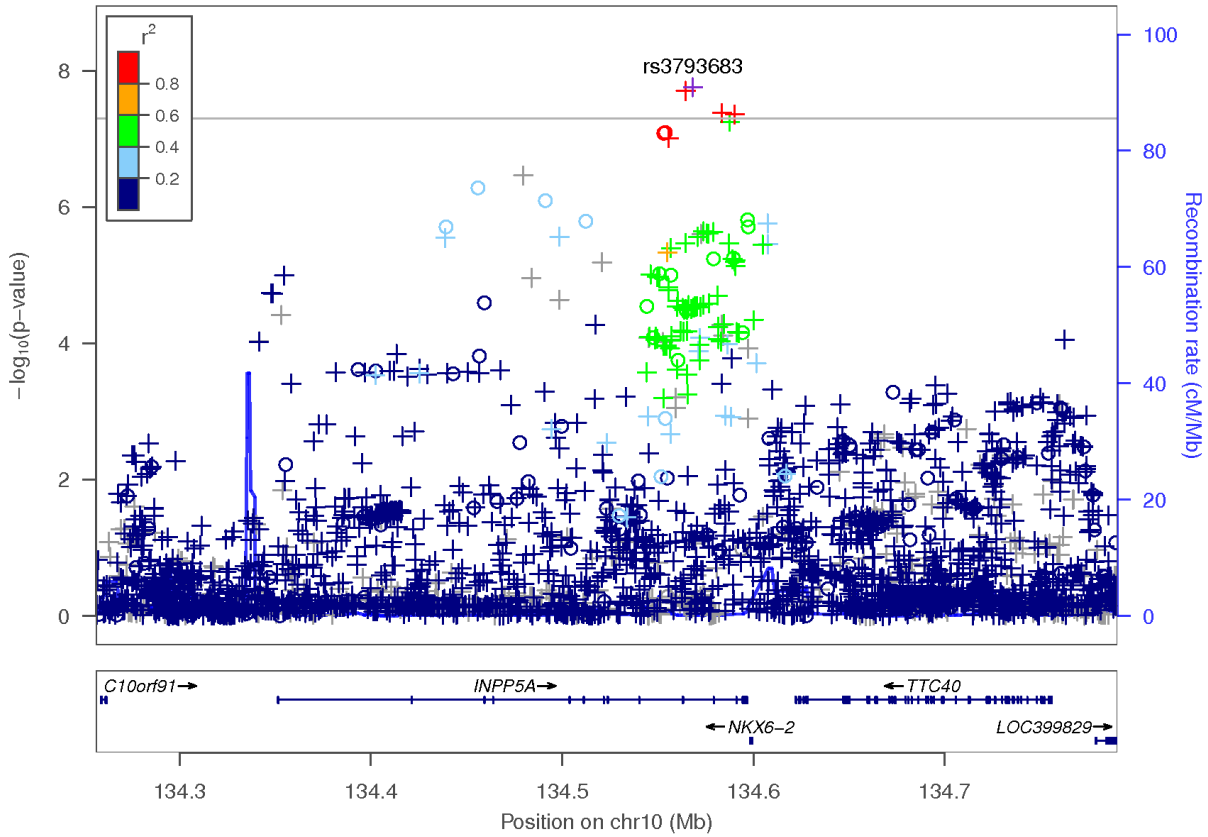

rs8052831
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
Recombination rate (cM/Mb)
FBXO31
ZCCHC14
JPH3
KLHDC4
MAP1LC3B
87.4
87.5
87.6
87.7
Position on chr16 (Mb)

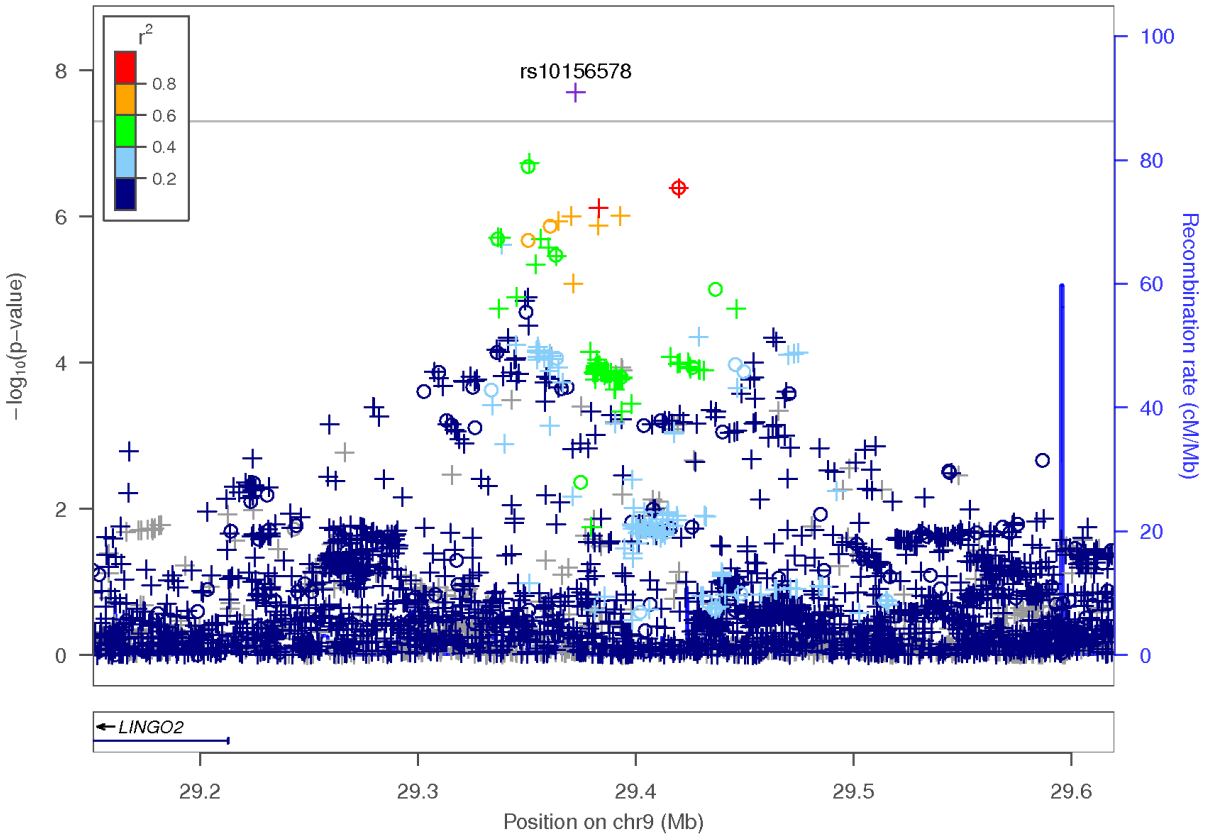

rs4910165
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
Recombination rate (cM/Mb)
AMPD3
MRVI1−AS1
CTR9
ZBED5
MTRNR2L8
LYVE1
EIF4G2
MIR4485
MRVI1
SNORD97
RNF141
LOC729013
10.5
10.6
10.7
10.8
Position on chr11 (Mb)

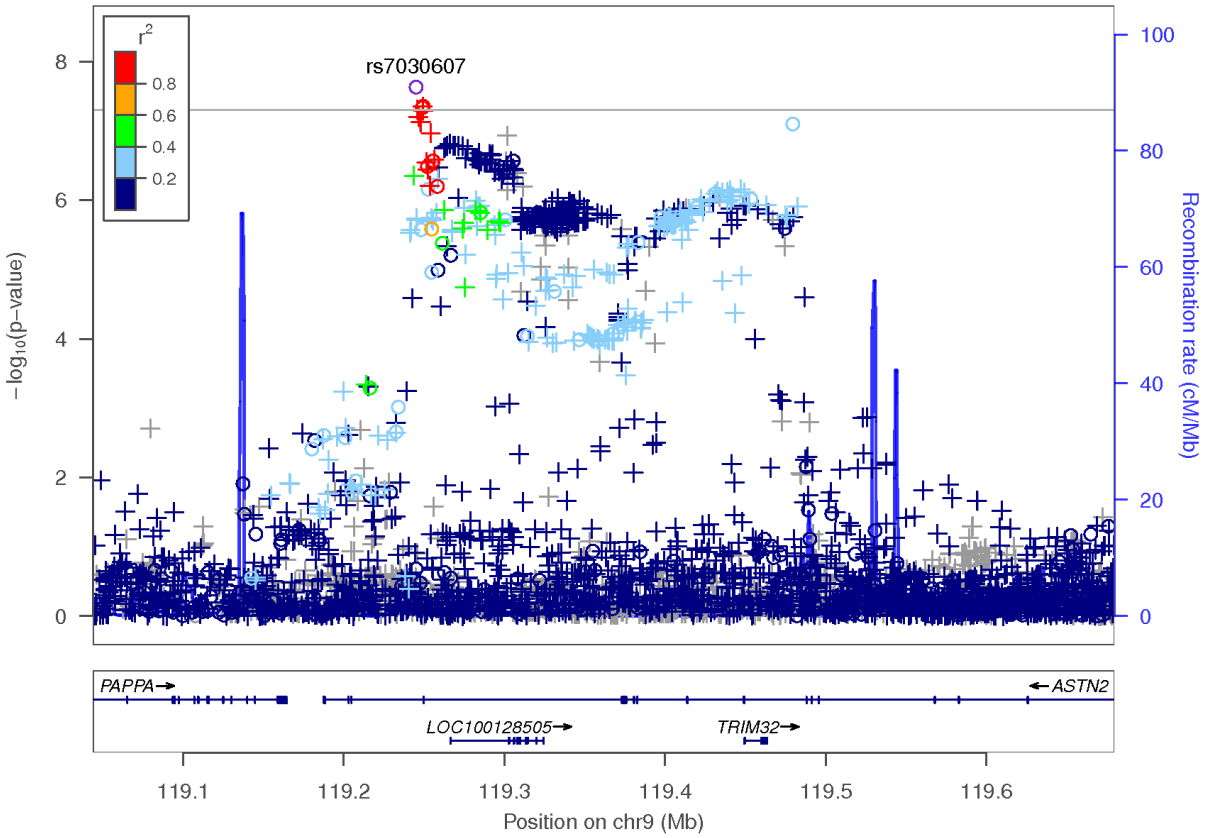

rs1245465
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
Recombination rate (cM/Mb)
0
2
4
6
8
0
20
40
60
80
100
27.5
27.6
27.7
27.8
Position on chr14 (Mb)

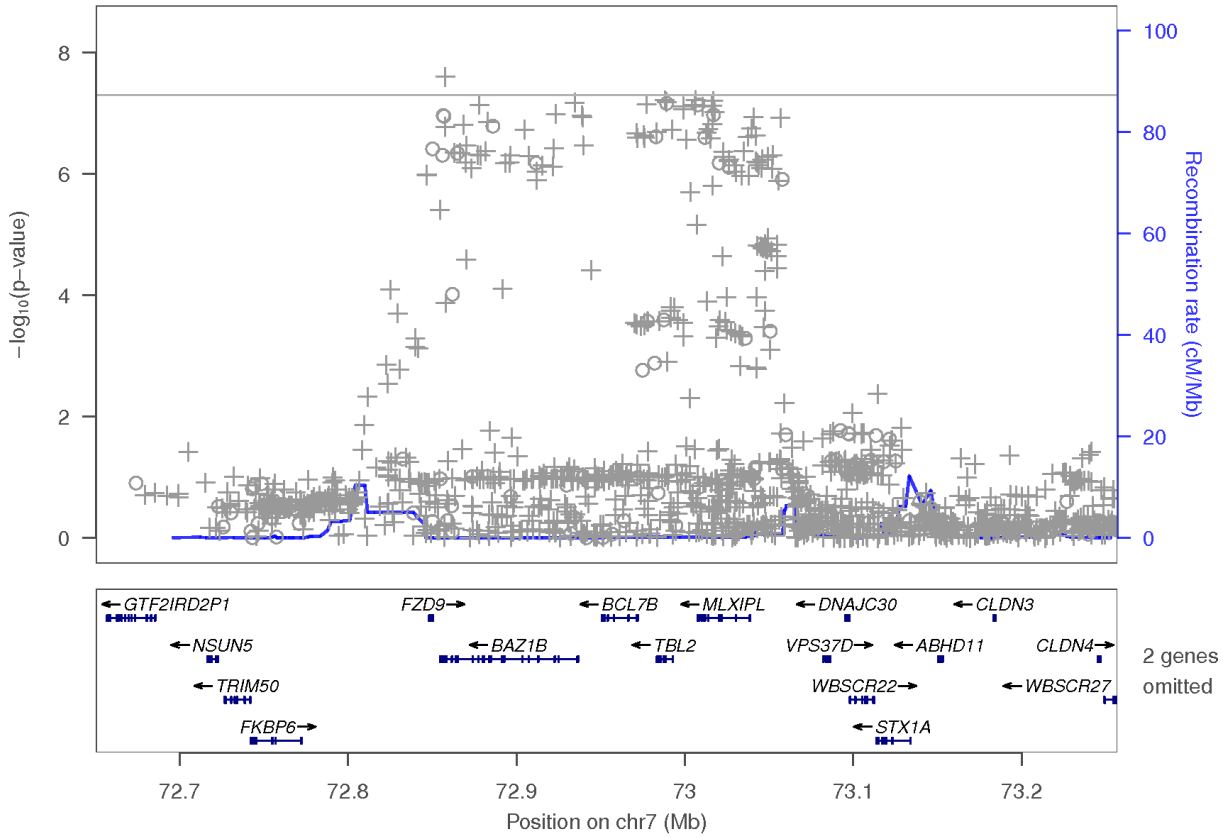

rs11624776
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
Recombination rate (cM/Mb)
0
2
4
6
8
0
20
40
60
80
100
CHGA
ITPK1−AS1
MOAP1
BTBD7
ITPK1
TMEM251
C14orf142
UBR7
93.4
93.5
93.6
93.7
Position on chr14 (Mb)

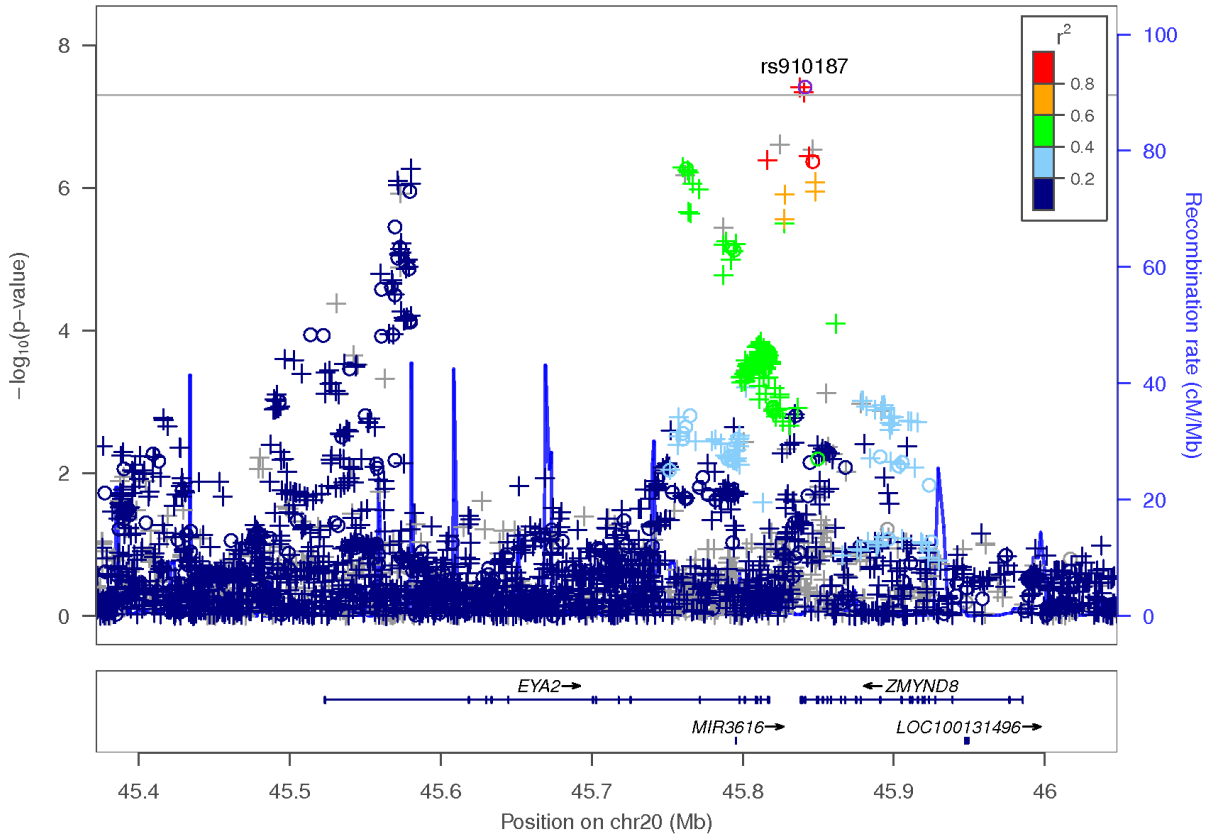

−log10(p−value)
Recombination rate (cM/Mb)
MPLKIP
C7orf10
Position on chr7 (Mb)

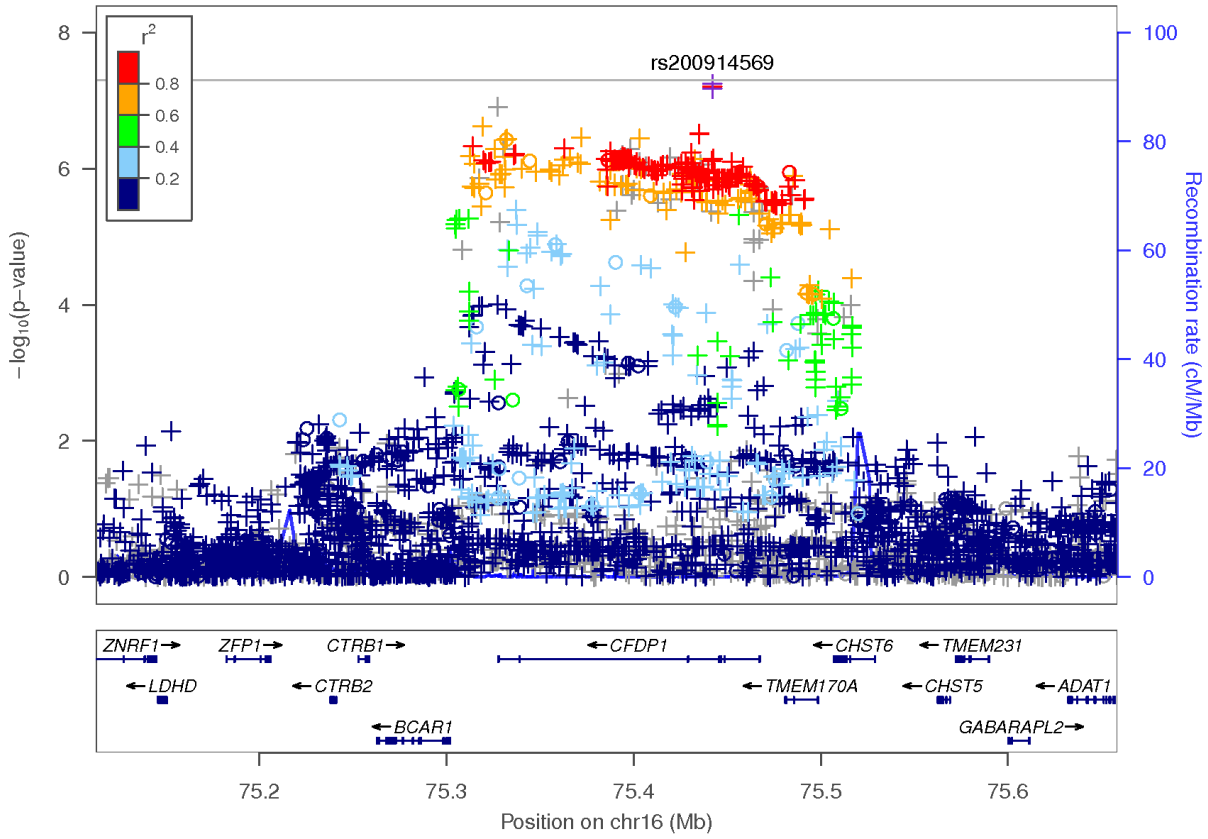

r2
0.8
0.6
0.4
0.2
rs3793683
−log10(p−value)
Recombination rate (cM/Mb)
C10orf91
INPP5A
TTC40
NKX6−2
LOC399829
Position on chr10 (Mb)

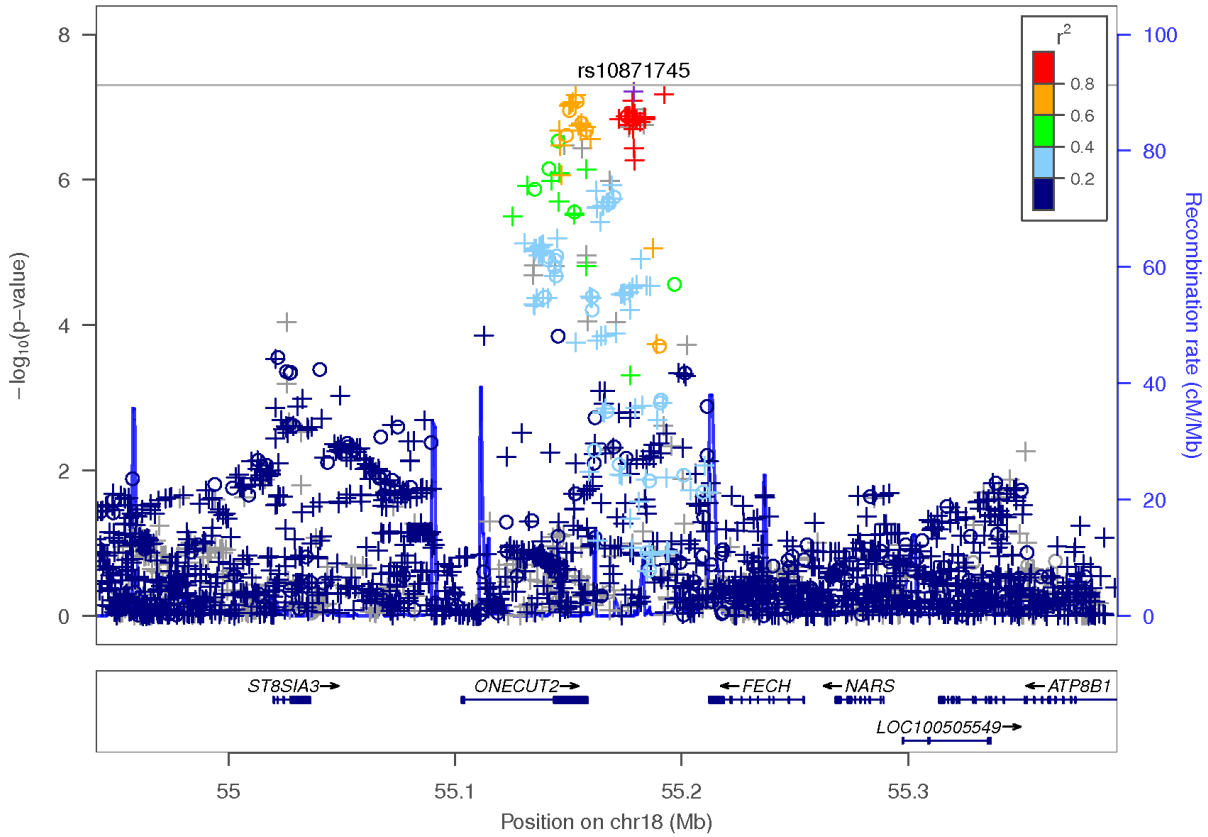

r²
0.8
0.6
0.4
0.2
rs10156578
−log₁₀(p−value)
Recombination rate (cM/Mb)
LINGO2
29.2
29.3
29.4
29.5
29.6
Position on chr9 (Mb)


r²
0.8
0.6
0.4
0.2
rs7030607
−log₁₀(p−value)
Recombination rate (cM/Mb)
PAPPA
ASTN2
LOC100128505
TRIM32
119.1
119.2
119.3
119.4
119.5
119.6
Position on chr9 (Mb)


−log10(p−value)
Recombination rate (cM/Mb)
GTF2IRD2P1
FZD9
BCL7B
MLXIPL
DNAJC30
CLDN3
NSUN5
BAZ1B
TBL2
VPS37D
ABHD11
CLDN4
TRIM50
WBSCR22
WBSCR27
FKBP6
STX1A
2 genes omitted
Position on chr7 (Mb)


rs910187
r2
0.8
0.6
0.4
0.2
−log10(p−value)
Recombination rate (cM/Mb)
EYA2
ZMYND8
MIR3616
LOC100131496
Position on chr20 (Mb)


rs200914569
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
Recombination rate (cM/Mb)
ZNRF1
ZFP1
CTRB1
CFDP1
CHST6
TMEM231
LDHD
CTRB2
TMEM170A
CHST5
ADAT1
BCAR1
GABARAPL2
75.2
75.3
75.4
75.5
75.6
Position on chr16 (Mb)


rs10871745
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
Recombination rate (cM/Mb)
ST8SIA3
ONECUT2
FECH
NARS
ATP8B1
LOC100505549
55
55.1
55.2
55.3
Position on chr18 (Mb)