

dbSNP ID	Genomic position	Cochran-Armitage statistic		Secure GWAS
		Secure GWAS	Ground truth	<i>p</i> -value (adjusted)
rs2736100	chr5:1339516	0.011944	0.012012	7.99E-20
rs7086803	chr10:114488466	0.007988	0.007956	6.16E-12
rs7916159	chr10:114490367	0.007883	0.007871	9.99E-12
rs7911081	chr10:114458809	0.007066	0.007050	4.32E-10
rs3802554	chr10:114455760	0.006509	0.006507	5.63E-09
rs7090942	chr10:114464924	0.006027	0.006045	5.21E-08
rs11196072	chr10:114466456	0.005790	0.005834	1.56E-07
rs7088500	chr10:114448959	0.005568	0.005524	4.36E-07
rs4600802	chr3:190866124	0.003855	0.003920	1.24E-03
rs6790258	chr3:190826843	0.003532	0.003558	5.61E-03
rs4867308	chr5:31150347	0.003424	0.003406	9.30E-03
rs1038273	chr3:100269291	0.003421	0.003435	9.44E-03
rs1404100	chr3:100273457	0.003356	0.003353	1.28E-02
rs331385	chr5:91085207	0.003352	0.003559	1.30E-02
rs1022907	chr10:114384784	0.003039	0.003034	5.65E-02
rs6791928	chr3:29434543	0.002926	0.002942	9.60E-02
rs6881283	chr5:91091413	0.002912	0.002952	1.03E-01
rs2968019	chr5:58380905	0.002898	0.002888	1.10E-01
rs6774934	chr3:190864951	0.002873	0.002883	1.23E-01
rs331403	chr5:91073284	0.002861	0.002897	1.30E-01

Supplementary Table 1: Top 20 associations obtained by our secure GWAS protocol on lung cancer data set. Using our protocol, we securely performed GWAS on a published lung cancer data set including 378,492 SNPs over 9,098 individuals after quality control. The Cochran-Armitage trend test statistics securely computed by our protocol are compared to the ground truth computed in plaintext for top 20 associations. Reported *p*-values (one-sided) are based on our secure GWAS results and are adjusted for multiple hypothesis testing via Bonferroni correction.

dbSNP ID	Genomic position	Cochran-Armitage statistic		Secure GWAS
		Secure GWAS	Ground truth	<i>p</i> -value (adjusted)
rs4862110	chr4:183988023	0.014025	0.014486	8.79E-29
rs11245742	chr11:50478883	0.010311	0.011011	4.04E-20
rs1569899	chr14:36823161	0.009348	0.009356	7.15E-18
rs3856803	chr3:11648402	0.009202	0.009213	1.57E-17
rs829404	chr1:21856198	0.009143	0.009266	2.16E-17
rs1840812	chr19:33466407	0.009066	0.009108	3.27E-17
rs256938	chr5:114896236	0.008796	0.008724	1.40E-16
rs4742988	chr9:107935510	0.008714	0.008815	2.17E-16
rs7988924	chr13:99386211	0.008701	0.008767	2.33E-16
rs946577	chr1:155352755	0.008685	0.008538	2.54E-16
rs4736520	chr8:131718210	0.008588	0.008662	4.29E-16
rs1344	chr1:145585897	0.008578	0.008604	4.53E-16
rs12306932	chr12:36528296	0.008577	0.010201	4.55E-16
rs853943	chr10:120154241	0.008517	0.008587	6.27E-16
rs913357	chr9:88362302	0.008512	0.008522	6.45E-16
rs1515219	chr2:11286529	0.008504	0.008507	6.72E-16
rs6949235	chr7:138598718	0.008478	0.008477	7.76E-16
rs921322	chr2:11237111	0.008466	0.008438	8.28E-16
rs8996	chr2:11238328	0.008445	0.008414	9.25E-16
rs7642848	chr3:191110766	0.008426	0.008483	1.03E-15

Supplementary Table 2: Top 20 associations obtained by our secure GWAS protocol on bladder cancer data set. Using our protocol, we securely performed GWAS on a published bladder cancer data set including 389,868 SNPs over 10,678 individuals after quality control. The Cochran-Armitage trend test statistics securely computed by our protocol are compared to the ground truth computed in plaintext for top 20 associations. Reported *p*-values (one-sided) are based on our secure GWAS results and are adjusted for multiple hypothesis testing via Bonferroni correction.

dbSNP ID	Genomic position	Cochran-Armitage statistic		Secure GWAS
		Secure GWAS	Ground truth	<i>p</i> -value (adjusted)
rs3750847	chr10:124215421	0.092962	0.092970	<1E-300
rs36212732	chr10:124215198	0.092777	0.092819	<1E-300
rs10490924	chr10:124214448	0.092268	0.092593	<1E-300
rs3793917	chr10:124219275	0.090600	0.090786	<1E-300
rs11200638	chr10:124220544	0.088566	0.088700	<1E-300
rs11200643	chr10:124229203	0.080014	0.080019	<1E-300
rs3766405	chr1:196695161	0.074405	0.074400	<1E-300
rs1410996	chr1:196696933	0.074360	0.074368	<1E-300
rs7540032	chr1:196701284	0.074269	0.074390	<1E-300
rs2274700	chr1:196682947	0.074231	0.074231	<1E-300
rs1329428	chr1:196702810	0.074107	0.074148	<1E-300
rs10737680	chr1:196679455	0.074068	0.074253	<1E-300
rs12038333	chr1:196672454	0.072452	0.072441	<1E-300
rs1329424	chr1:196646176	0.072263	0.072328	<1E-300
rs572515	chr1:196646261	0.071822	0.072830	<1E-300
rs393955	chr1:196692470	0.071253	0.071265	<1E-300
rs395544	chr1:196698272	0.071207	0.071196	<1E-300
rs380390	chr1:196701051	0.070820	0.071235	<1E-300
rs1061147	chr1:196654324	0.070753	0.071978	<1E-300
rs203679	chr1:196682518	0.070610	0.070944	<1E-300

Supplementary Table 3: Top 20 associations obtained by our secure GWAS protocol on AMD data set. Using our protocol, we securely performed GWAS on a published AMD data set including 221,295 SNPs over 20,679 individuals after quality control. The Cochran-Armitage trend test statistics securely computed by our protocol are compared to the ground truth computed in plaintext for top 20 associations. Reported *p*-values (one-sided) are based on our secure GWAS results and are adjusted for multiple hypothesis testing via Bonferroni correction. All *p*-values shown were smaller than machine precision and thus could not be precisely determined.