

Table S2: Performance summary for family history, including shared environment.

Disease	K	$h^2_{L_i}$	f_{SNPs}	1				S1A				S1B				S1C			
				complete				complete				complete				complete			
				restricted	complete	restricted	complete	restricted	complete	restricted	complete	restricted	complete	restricted	complete	restricted	complete	restricted	complete
Coronary artery disease	0.402	0.49	6.9%	0.706	0.684	0.649	0.649	0.649	0.649	0.649	0.709	0.708	0.702	0.684	0.684	0.684	0.702	0.684	0.684
Type 2 diabetes	0.339	0.30	13.0%	0.663	0.638	0.606	0.606	0.606	0.606	0.606	0.663	0.662	0.657	0.638	0.638	0.638	0.657	0.638	0.638
Atrial fibrillation	0.245	0.62	6.1%	0.737	0.712	0.672	0.672	0.672	0.672	0.672	0.740	0.739	0.732	0.712	0.712	0.712	0.732	0.712	0.712
Stroke	0.190	0.17	1.9%	0.632	0.600	0.571	0.571	0.571	0.571	0.571	0.625	0.625	0.623	0.600	0.600	0.600	0.623	0.600	0.600
Prostate cancer	0.165	0.42	11.9%	0.650	0.613	0.573	0.573	0.573	0.573	0.573	0.639	0.639	0.643	0.613	0.613	0.613	0.643	0.613	0.613
Alzheimer disease	0.132	0.79	10.0%	0.774	0.742	0.698	0.698	0.698	0.698	0.698	0.776	0.775	0.768	0.742	0.742	0.742	0.775	0.768	0.742
Breast cancer	0.123	0.25	10.5%	0.611	0.576	0.546	0.546	0.546	0.546	0.546	0.597	0.597	0.603	0.576	0.576	0.576	0.603	0.576	0.576
Lung cancer	0.069	0.08	2.3%	0.601	0.563	0.539	0.539	0.539	0.539	0.539	0.587	0.587	0.589	0.563	0.563	0.563	0.589	0.589	0.563
Bipolar disorder	0.051	0.60	1.1%	0.722	0.674	0.623	0.623	0.623	0.623	0.623	0.718	0.717	0.709	0.674	0.674	0.674	0.709	0.709	0.674
Colorectal cancer	0.051	0.13	8.6%	0.608	0.567	0.540	0.540	0.540	0.540	0.540	0.594	0.594	0.594	0.567	0.567	0.567	0.594	0.594	0.567
Age-related macular degeneration	0.047	0.71	25.9%	0.743	0.695	0.642	0.642	0.642	0.642	0.642	0.740	0.740	0.731	0.695	0.695	0.695	0.731	0.695	0.695
Bladder cancer	0.024	0.08	16.2%	0.580	0.542	0.524	0.524	0.524	0.524	0.524	0.564	0.564	0.566	0.542	0.542	0.542	0.566	0.542	0.542
Multiple sclerosis	0.020	0.51	6.1%	0.671	0.619	0.575	0.575	0.575	0.575	0.575	0.663	0.663	0.654	0.619	0.619	0.619	0.654	0.619	0.619
Melanoma	0.020	0.21	19.7%	0.603	0.561	0.535	0.535	0.535	0.535	0.535	0.590	0.590	0.588	0.561	0.561	0.561	0.588	0.561	0.561
Type 1 diabetes	0.018	0.87	4.5%	0.746	0.696	0.642	0.642	0.642	0.642	0.642	0.746	0.746	0.732	0.696	0.696	0.696	0.732	0.696	0.696
Parkinson disease	0.016	0.27	6.0%	0.610	0.566	0.538	0.538	0.538	0.538	0.538	0.599	0.599	0.595	0.567	0.567	0.567	0.595	0.567	0.567
Pancreatic cancer	0.015	0.36	1.7%	0.625	0.579	0.546	0.546	0.546	0.546	0.546	0.615	0.615	0.609	0.579	0.579	0.579	0.609	0.579	0.579
Ovarian cancer	0.014	0.22	2.0%	0.553	0.530	0.516	0.516	0.516	0.516	0.516	0.542	0.542	0.546	0.530	0.530	0.530	0.546	0.530	0.530
Thyroid cancer	0.010	0.53	4.3%	0.645	0.598	0.559	0.559	0.559	0.559	0.559	0.640	0.640	0.629	0.598	0.598	0.598	0.629	0.598	0.598
Ulcerative colitis	0.009	0.53	9.2%	0.642	0.596	0.558	0.558	0.558	0.558	0.558	0.637	0.637	0.626	0.596	0.596	0.596	0.626	0.596	0.596
Schizophrenia	0.007	0.66	0.4%	0.660	0.613	0.571	0.571	0.571	0.571	0.571	0.658	0.658	0.644	0.613	0.613	0.613	0.658	0.644	0.613
Celiac disease	0.007	0.75	12.6%	0.677	0.630	0.584	0.584	0.584	0.584	0.584	0.678	0.678	0.661	0.630	0.630	0.630	0.661	0.630	0.630
Crohn disease	0.005	0.56	13.5%	0.624	0.583	0.549	0.549	0.549	0.549	0.549	0.621	0.621	0.609	0.583	0.583	0.583	0.609	0.583	0.583

f_{SNPs} provides the proportion of heritability explained by known SNP associations. The last eight columns indicate the AUC achieved by complete and restricted family history models, assuming 10% of the variance in liability is due to shared environment across all individuals in the family, using either the test pedigree in Figure 1 or the additional pedigrees in parts (A), (B), and (C) of Figure S1. Bold entries indicate situations where the SNP-based model (see accuracies in Table 2) based on currently known associations outperforms family history. Note that the performance of models shown here reflects only currently known genetic factors for European populations and will change as more associations are discovered.