Supplementary Files

HSIC*CR*:a lightweight scoring criterion based on measuring the degree of causality for the detection of SNP interactions

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Table S1. Model with marginal effects when k=2.

$MAF = 0.1$, Prevalence $= 0.050$, $h^2 = 0.031$			
Model 1	AA	Aa	aa
BB	0.060	0.010	0.010
Bb	0.010	0.208	0.208
bb	0.010	0.208	0.208
$MAF = 0.1$, Prevalence $= 0.050$, $h^2 = 0.014$			
Model 2	AA	Aa	aa
BB	0.061	0.017	0.017
Bb	0.017	0.136	0.136
bb	0.017	0.136	0.136
$MAF = 0.1$, Prevalence $= 0.050$, $h^2 = 0.01$			
Model 3	AA	Aa	aa
BB	0.060	0.021	0.021
Bb	0.021	0.116	0.116
bb	0.021	0.116	0.116
$MAF = 0.1$, Prevalence $= 0.046$, $h^2 = 0.016$			
Model 4	AA	Aa	aa
BB	0.030	0.090	0.070
Bb	0.080	0.010	0.040
bb	0.090	0.010	0.000
$MAF = 0.1$, Prevalence $= 0.026$, $h^2 = 0.009$			
Model 5	AA	Aa	aa
BB	0.030	0.010	0.020
Bb	0.010	0.090	0.050
bb	0.020	0.050	0.070
$MAF = 0.1$, Prevalence $= 0.017$, $h^2 = 0.008$			
Model 6	AA	Aa	aa
BB	0.020	0.007	0.003
Bb	0.005	0.070	0.080
bb	0.020	0.001	0.090

Table S2. Models 1 to 10 without marginal effects when k=2 .

$h^2 = 0.2$, $MAF = 0.2$				$h^2 = 0.2$, $MAF = 0.4$			
Model 1	AA	Aa	aa	Model 6	AA	Aa	aa
BB	0.428	0.757	0.812	BB	0.356	0.891	0.809
Bb	0.788	0.132	0.044	Bb	0.955	0.508	0.611
bb	0.559	0.548	0.373	bb	0.617	0.755	0.63
$h^2 = 0.2$, $MAF = 0.2$				$h^2 = 0.2$, $MAF = 0.4$			
Model 2	AA	Aa	aa	Model 7	AA	Aa	aa
BB	0.507	0.842	0.605	BB	0.086	0.536	0.641
Bb	0.845	0.162	0.629	Bb	0.677	0.275	0.096
bb	0.581	0.678	0.729	bb	0.219	0.413	0.712
$h^2 = 0.2$, $MAF = 0.2$				$h^2 = 0.2$, $MAF = 0.4$			
Model 3	AA	Aa	aa	Model 8	AA	Aa	aa
BB	0.577	0.247	0.428	BB	0.855	0.339	0.772
Bb	0.227	0.928	0.578	Bb	0.513	0.651	0.607
bb	0.586	0.262	0.158	bb	0.25	0.999	0.154
$h^2 = 0.2$, $MAF = 0.2$				$h^2 = 0.2$, $MAF = 0.4$			
Model 4	AA	Aa	aa	Model 9	AA	Aa	aa
BB	0.340	0.637	0.654	BB	0.506	0.838	0.024
Bb	0.689	0.017	0.041	Bb	0.603	0.454	0.957
bb	0.242	0.866	0.403	bb	0.729	0.427	0.753
$h^2 = 0.2$, $MAF = 0.2$				$h^2 = 0.2$, $MAF = 0.4$			
Model 5	AA	Aa	aa	Model 10	AA	Aa	aa
BB	0.387	0.726	0.734	BB	0.393	0.764	0.664
Bb	0.749	0.090	0.034	Bb	0.850	0.398	0.733
bb	0.551	0.401	0.724	bb	0.406	0.927	0.147

Table S3. Models 11 to 20 without marginal effects when k=2.

$h^2 = 0.1$, $MAF = 0.2$				$h^2 = 0.1$, $MAF = 0.4$			
Model 11	AA	Aa	aa	Model 16	AA	Aa	aa
BB	0.463	0.703	0.431	BB	0.137	0.484	0.187
Bb	0.653	0.277	0.806	Bb	0.482	0.166	0.365
bb	0.830	0.008	0.129	bb	0.193	0.361	0.430
$h^2 = 0.1$, $MAF = 0.2$				$h^2 = 0.1$, $MAF = 0.4$			
Model 12	AA	Aa	aa	Model 17	AA	Aa	aa
BB	0.319	0.507	0.569	BB	0.469	0.198	0.754
Bb	0.553	0.105	0.045	Bb	0.337	0.502	0.141
bb	0.203	0.777	0.280	bb	0.339	0.453	0.285
$h^2 = 0.1$, $MAF = 0.2$				$h^2 = 0.1$, $MAF = 0.4$			
Model 13	AA	Aa	aa	Model 18	AA	Aa	aa
BB	0.627	0.393	0.335	BB	0.478	0.311	0.864
Bb	0.396	0.779	0.953	Bb	0.387	0.579	0.263
bb	0.174	0.842	0.106	bb	0.634	0.436	0.138
$h^2 = 0.1$, $MAF = 0.2$				$h^2 = 0.1$, $MAF = 0.4$			
Model 14	AA	Aa	aa	Model 19	AA	Aa	aa
BB	0.297	0.54	0.441	BB	0.068	0.299	0.017
Bb	0.541	0.072	0.278	Bb	0.289	0.044	0.285
bb	0.434	0.293	0.228	bb	0.048	0.262	0.174
$h^2 = 0.1$, $MAF = 0.2$				$h^2 = 0.1$, $MAF = 0.4$			
Model 15	AA	Aa	aa	Model 20	AA	Aa	aa
BB	0.332	0.562	0.573	BB	0.539	0.120	0.258
Bb	0.583	0.112	0.147	Bb	0.165	0.378	0.325
bb	0.399	0.496	0.033	bb	0.123	0.426	0.276

Table S4. Models 21 to 30 without marginal effects when k=2

$h^2 = 0.05$, *MAF* = 0.2				$h^2 = 0.05$, *MAF* = 0.4			
Model 21	AA	Aa	aa	Model 26	AA	Aa	aa
BB	0.492	0.664	0.481	BB	0.002	0.155	0.214
Bb	0.642	0.330	0.746	Bb	0.199	0.071	0.022
bb	0.656	0.396	0.000	bb	0.081	0.122	0.135
$h^2 = 0.05$, *MAF* = 0.2				$h^2 = 0.05$, *MAF* = 0.4			
Model 22	AA	Aa	aa	Model 27	AA	Aa	aa
BB	0.499	0.639	0.765	BB	0.188	0.020	0.171
Bb	0.666	0.389	0.083	Bb	0.032	0.174	0.059
bb	0.543	0.527	0.953	bb	0.134	0.087	0.092
$h^2 = 0.05$, *MAF* = 0.2				$h^2 = 0.05$, *MAF* = 0.4			
Model 23	AA	Aa	aa	Model 28	AA	Aa	aa
BB	0.212	0.350	0.116	BB	0.005	0.179	0.251
Bb	0.336	0.054	0.495	Bb	0.211	0.100	0.026
bb	0.227	0.273	0.495	bb	0.156	0.098	0.156
$h^2 = 0.05$, *MAF* = 0.2				$h^2 = 0.05$, *MAF* = 0.4			
Model 24	AA	Aa	aa	Model 29	AA	Aa	aa
BB	0.805	0.683	0.638	BB	0.174	0.321	0.154
Bb	0.657	0.936	0.989	Bb	0.223	0.254	0.245
bb	0.850	0.564	0.866	bb	0.448	0.025	0.424
$h^2 = 0.05$, *MAF* = 0.2				$h^2 = 0.05$, *MAF* = 0.4			
Model 25	AA	Aa	aa	Model 30	AA	Aa	aa
BB	0.638	0.488	0.383	BB	0.098	0.219	0.302
Bb	0.464	0.765	0.957	Bb	0.302	0.126	0.121
bb	0.580	0.562	0.719	bb	0.053	0.308	0.136

Table S5. Models 31 to 35 without marginal effects when k=2

$h^2 = 0.025, MAF = 0.2$			
Model 31	AA	Aa	aa
BB	0.495	0.415	0.657
Bb	0.429	0.616	0.121
bb	0.552	0.331	0.419
$h^2 = 0.025, MAF = 0.2$			
Model 32	AA	Aa	aa
BB	0.592	0.691	0.743
Bb	0.712	0.493	0.419
bb	0.580	0.746	0.504
$h^2 = 0.025, MAF = 0.2$			
Model 33	AA	Aa	aa
BB	0.108	0.194	0.186
Bb	0.196	0.037	0.045
bb	0.172	0.073	0.130
$h^2 = 0.025, MAF = 0.2$			
Model 34	AA	Aa	aa
BB	0.112	0.186	0.128
Bb	0.193	0.024	0.138
bb	0.079	0.236	0.251
$h^2 = 0.025, MAF = 0.2$			
Model 35	AA	Aa	aa
BB	0.272	0.192	0.185
Bb	0.172	0.367	0.390
bb	0.345	0.069	0.005

Models 1 to 8, when k=3 that, can be found in files of m1_Models.txt to

m8_Models.txt.