

**Table S1.** Empirical statistical power of HWD detection for the new method compared with the exact method ( $f = 0.1$ ).

Allele frequency $p_1$	Sample size $n$	Method		
		GLM(Wald)	GLM(LRT)	EXACT
0.1	50	0.192	0.193	0.171
	100	0.238	0.217	0.223
	200	0.379	0.365	0.369
	300	0.432	0.406	0.410
	500	0.579	0.561	0.580
0.2	50	0.169	0.149	0.149
	100	0.247	0.211	0.207
	200	0.343	0.290	0.287
	300	0.477	0.419	0.419
	500	0.584	0.553	0.544
0.3	50	0.173	0.122	0.105
	100	0.277	0.216	0.213
	200	0.360	0.283	0.270
	300	0.469	0.372	0.368
	500	0.647	0.584	0.588
0.4	50	0.187	0.091	0.093
	100	0.219	0.171	0.162
	200	0.373	0.307	0.307
	300	0.465	0.390	0.400
	500	0.659	0.588	0.592
0.5	50	0.172	0.070	0.102
	100	0.264	0.173	0.143
	200	0.401	0.308	0.31
	300	0.451	0.370	0.376
	500	0.689	0.643	0.658

**Table S2.** Empirical statistical power of HWD detection for the new method compared with the exact method ( $f = 0.3$ ).

Allele frequency $p_1$	Sample size $n$	Method		
		GLM(Wald)	GLM(LRT)	EXACT
0.1	50	0.500	0.502	0.486
	100	0.725	0.704	0.722
	200	0.932	0.926	0.932
	300	0.986	0.985	0.986
	500	0.997	0.997	0.998
0.2	50	0.587	0.553	0.549
	100	0.856	0.829	0.840
	200	0.978	0.969	0.974
	300	1.000	0.999	1.000
	500	1.000	1.000	1.000
0.3	50	0.645	0.544	0.536
	100	0.907	0.860	0.862
	200	0.990	0.987	0.986
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000
0.4	50	0.735	0.525	0.551
	100	0.883	0.850	0.820
	200	0.991	0.986	0.986
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000
0.5	50	0.692	0.526	0.572
	100	0.916	0.861	0.839
	200	0.995	0.990	0.990
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000

**Table S3.** Empirical statistical power of HWD detection for the new method compared with the exact method ( $f = 0.4$ ).

Allele frequency $p_1$	Sample size $n$	Method		
		GLM(Wald)	GLM(LRT)	EXACT
0.1	50	0.661	0.665	0.663
	100	0.881	0.873	0.882
	200	0.986	0.986	0.987
	300	0.997	0.997	0.998
	500	1.000	1.000	1.000
0.2	50	0.787	0.771	0.761
	100	0.959	0.947	0.958
	200	0.999	0.998	0.998
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000
0.3	50	0.855	0.797	0.812
	100	0.986	0.981	0.982
	200	1.000	1.000	1.000
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000
0.4	50	0.908	0.790	0.798
	100	0.986	0.981	0.980
	200	1.000	1.000	1.000
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000
0.5	50	0.905	0.797	0.828
	100	0.993	0.981	0.977
	200	1.000	1.000	1.000
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000

**Table S4.** Empirical statistical power of HWD detection for the new method compared with the exact method ( $f = 0.5$ ).

Allele frequency $p_1$	Sample size $n$	Method		
		GLM(Wald)	GLM(LRT)	EXACT
0.1	50	0.779	0.784	0.798
	100	0.949	0.948	0.961
	200	0.998	0.998	1.000
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000
0.2	50	0.904	0.899	0.898
	100	0.996	0.996	0.996
	200	1.000	1.000	1.000
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000
0.3	50	0.949	0.928	0.936
	100	0.996	0.996	0.996
	200	1.000	1.000	1.000
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000
0.4	50	0.982	0.939	0.946
	100	0.996	0.996	0.996
	200	1.000	1.000	1.000
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000
0.5	50	0.982	0.950	0.963
	100	1.000	0.999	0.999
	200	1.000	1.000	1.000
	300	1.000	1.000	1.000
	500	1.000	1.000	1.000

**Table S5.** Empirical statistical power (locus X) and Type I error (locus Y) of HWD detection for the new method ( $f = 0.1$ ).

LD ( $r$ )	Sample size ( $n$ )	Conditional		Marginal	
		X	Y	X	Y
0.1	50	0.1620	0.0320	0.1430	0.0320
	100	0.2020	0.0330	0.1980	0.0350
	200	0.3770	0.0440	0.3790	0.0360
	300	0.4610	0.0460	0.4570	0.0430
	500	0.6730	0.0430	0.6730	0.0430
0.2	50	0.1570	0.0470	0.1500	0.0460
	100	0.2170	0.0360	0.2170	0.0390
	200	0.3050	0.0370	0.3120	0.0370
	300	0.4760	0.0410	0.4690	0.0400
	500	0.6530	0.0410	0.6520	0.0460
0.3	50	0.1760	0.0420	0.1480	0.0370
	100	0.2110	0.0330	0.1980	0.0380
	200	0.3670	0.0470	0.3680	0.0480
	300	0.4730	0.0540	0.4670	0.0570
	500	0.6280	0.0490	0.6280	0.0560
0.4	50	0.1740	0.0400	0.1350	0.0420
	100	0.2350	0.0470	0.2230	0.0580
	200	0.3460	0.0480	0.3350	0.0580
	300	0.4660	0.0470	0.4610	0.0680
	500	0.6660	0.0440	0.6580	0.0590
0.5	50	0.1970	0.0630	0.1320	0.0590
	100	0.2480	0.0560	0.2260	0.0610
	200	0.3530	0.0540	0.3410	0.0800
	300	0.4660	0.0540	0.4700	0.0820
	500	0.6320	0.0590	0.6350	0.1040

**Table S6.** Empirical statistical power (locus X) and Type I error (locus Y) of HWD detection for the new method ( $f = 0.3$ ).

LD ( $r$ )	Sample size ( $n$ )	Conditional		Marginal	
		X	Y	X	Y
0.1	50	0.6560	0.0390	0.6560	0.0380
	100	0.8880	0.0270	0.8960	0.0300
	200	0.9920	0.0390	0.9950	0.0320
	300	1.0000	0.0400	1.0000	0.0390
	500	1.0000	0.0440	1.0000	0.0500
0.2	50	0.6490	0.0440	0.6500	0.0560
	100	0.9020	0.0310	0.9000	0.0460
	200	0.9900	0.0470	0.9910	0.0460
	300	1.0000	0.0390	1.0000	0.0440
	500	1.0000	0.0640	1.0000	0.0740
0.3	50	0.6610	0.0440	0.6450	0.0590
	100	0.8830	0.0430	0.8840	0.0670
	200	0.9960	0.0490	0.9970	0.0800
	300	0.9990	0.0590	0.9990	0.0900
	500	1.0000	0.0580	1.0000	0.1060
0.4	50	0.6530	0.0570	0.6350	0.0880
	100	0.8910	0.0480	0.8930	0.0860
	200	0.9950	0.0510	0.9960	0.1160
	300	1.0000	0.0590	1.0000	0.1590
	500	1.0000	0.0730	1.0000	0.2240
0.5	50	0.6190	0.0640	0.6010	0.1010
	100	0.9120	0.0590	0.9110	0.1550
	200	0.9930	0.0750	0.9930	0.2200
	300	1.0000	0.0860	1.0000	0.3010
	500	1.0000	0.1110	1.0000	0.4410

**Table S7.** Empirical statistical power (locus X) and Type I error (locus Y) of HWD detection for the new method ( $f = 0.4$ ).

LD ( $r$ )	Sample size ( $n$ )	Conditional		Marginal	
		X	Y	X	Y
0.1	50	0.8730	0.0250	0.8800	0.0310
	100	0.9880	0.0320	0.9880	0.0390
	200	0.9990	0.0560	0.9990	0.0500
	300	1.0000	0.0440	1.0000	0.0480
	500	1.0000	0.0460	1.0000	0.0460
0.2	50	0.8620	0.0340	0.8610	0.0440
	100	0.9920	0.0410	0.9940	0.0630
	200	1.0000	0.0450	1.0000	0.0460
	300	1.0000	0.0390	1.0000	0.0540
	500	1.0000	0.0630	1.0000	0.0760
0.3	50	0.8710	0.0440	0.8710	0.0680
	100	0.9910	0.0450	0.9940	0.0730
	200	1.0000	0.0540	1.0000	0.0870
	300	1.0000	0.0660	1.0000	0.1280
	500	1.0000	0.0620	1.0000	0.1340
0.4	50	0.8920	0.0510	0.8900	0.0910
	100	0.9880	0.0590	0.9880	0.1130
	200	1.0000	0.0900	1.0000	0.1920
	300	1.0000	0.0940	1.0000	0.2510
	500	1.0000	0.1020	1.0000	0.3110
0.5	50	0.8750	0.0890	0.8760	0.1520
	100	0.9880	0.0900	0.9870	0.2120
	200	1.0000	0.1230	1.0000	0.3410
	300	1.0000	0.1310	1.0000	0.4730
	500	1.0000	0.1700	1.0000	0.6420

**Table S8.** Empirical statistical power (locus X) and Type I error (locus Y) of HWD detection for the new method ( $f = 0.5$ ).

LD ( $r$ )	Sample size ( $n$ )	Conditional		Marginal	
		X	Y	X	Y
0.1	50	0.9640	0.0200	0.9760	0.0330
	100	0.9990	0.0450	1.0000	0.0520
	200	1.0000	0.0490	1.0000	0.0460
	300	1.0000	0.0440	1.0000	0.0450
	500	1.0000	0.0450	1.0000	0.0540
0.2	50	0.9690	0.0330	0.9800	0.0450
	100	1.0000	0.0500	1.0000	0.0690
	200	1.0000	0.0500	1.0000	0.0580
	300	1.0000	0.0510	1.0000	0.0680
	500	1.0000	0.0650	1.0000	0.0890
0.3	50	0.9690	0.0410	0.9690	0.0700
	100	1.0000	0.0610	1.0000	0.0940
	200	1.0000	0.0600	1.0000	0.1120
	300	1.0000	0.0780	1.0000	0.1560
	500	1.0000	0.0770	1.0000	0.1840
0.4	50	0.9710	0.0710	0.9800	0.1200
	100	1.0000	0.0660	1.0000	0.1620
	200	1.0000	0.0980	1.0000	0.2430
	300	1.0000	0.1170	1.0000	0.3250
	500	1.0000	0.1570	1.0000	0.4530
0.5	50	0.9740	0.0940	0.9700	0.1990
	100	1.0000	0.1260	1.0000	0.3050
	200	1.0000	0.1520	1.0000	0.4770
	300	1.0000	0.2110	1.0000	0.6520
	500	1.0000	0.3100	1.0000	0.8380