Online Supplementary Material

Table 5: Empirical type I error fractions at a nominal type I error fraction of 5 %.

| | | Normality assumptions | | | | | | | | | | | Violation of normality assumptions | | | | | | | | |
| | | Random selection | | | Single selection | | | Double selection | | | Random selection | | | Single selection | | | Double selection | | |
Methods	Sibships	Dom	Add	Rec	Dom	Add	Rec	Dom	Add	Rec	Dom	Add	Rec	Dom	Add	Rec	Dom	Add	Rec
Gh.HE.Trad	Independ.	5.1	5.1	5.1	5.1	5.1	5.0	5.1	5.1	5.1	5.0	5.2	5.1	5.0	5.1	5.0	5.2	5.1	5.1
Sage.HE		5.1	5.0	5.0	5.1	5.0	5.0	5.0	5.0	5.0	4.9	5.1	5.0	5.0	5.0	4.9	5.1	5.1	5.0
rHE		4.9	5.0	5.0	5.1	5.1	4.9	4.9	4.9	5.0	5.0	4.9	4.9	5.0	5.0	5.0	5.2	4.9	5.0
Merlin-Regress		5.0	5.0	5.1	5.2	5.1	4.8	5.0	5.0	5.1	5.0	5.0	5.0	5.0	4.8	4.9	5.2	5.0	5.0
Solar.VC		6.1	5.4	6.1	5.1	4.0	2.8	7.5	7.4	7.5	14.1	13.3	12.7	3.5	2.8	1.6	12.8	13.0	11.9
Npar		5.1	4.9	5.0	5.0	5.1	5.0	4.9	5.0	5.0	4.9	5.0	5.0	5.1	4.9	5.1	5.0	5.1	5.0
Merlin.K&C		4.6	4.6	4.5	4.5	4.6	4.4	4.4	4.4	4.5	4.5	4.5	4.6	4.6	4.6	4.5	4.6	4.6	4.5
Merlin.W&H		3.7	3.7	3.6	3.6	3.6	3.6	3.5	3.5	3.6	3.6	3.6	3.7	3.6	3.7	3.6	3.7	3.7	3.6
Mlbqt.Cat		5.1	5.3	5.1	5.2	5.2	5.1	4.9	4.9	5.0	5.1	5.2	5.1	5.0	5.1	5.0	5.1	5.1	5.0
Linkage		4.9	2.0	4.0	5.2	4.3	5.2	5.1	4.9	5.2	5.3	2.1	4.8	5.3	4.7	5.6	5.3	4.7	5.6
Gh.HE.Trad	Depend.	5.2	5.2	5.3	5.2	5.3	5.3	5.2	5.2	5.2	5.2	5.1	5.3	5.3	5.2	5.3	5.2	5.2	5.2
Sage.HE		5.3	5.3	5.4	5.1	5.2	5.2	5.1	5.1	5.2	4.5	4.2	4.7	3.5	3.4	3.7	4.6	4.2	4.7
rHE		6.0	5.9	5.9	5.7	5.5	5.7	5.3	5.2	5.2	6.2	6.1	6.2	5.6	5.4	5.4	5.6	5.4	5.4
Merlin-Regress		5.5	5.5	5.4	5.3	5.4	5.5	5.3	5.3	5.2	5.5	5.5	5.5	5.5	5.4	5.5	5.5	5.5	5.5
Solar.VC		5.9	5.2	5.9	5.4	4.9	5.2	5.7	5.3	5.7	11.3	10.5	10.4	6.7	6.5	5.6	10.1	9.7	9.4
Npar		5.2	5.3	5.2	5.1	5.2	5.3	5.3	5.2	5.2	5.3	5.2	5.2	5.3	5.2	5.3	5.2	5.2	5.2
Merlin.K&C		4.5	4.6	4.5	4.5	4.6	4.6	4.5	4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.6	4.6	4.6
Merlin.W&H		3.8	3.9	3.8	3.7	3.8	3.9	3.7	3.8	3.8	3.8	3.8	3.8	3.7	3.8	3.7	3.9	3.8	3.9
Mlbqt.Cat		4.9	5.1	4.9	4.8	5.0	5.1	4.9	4.9	4.9	4.9	5.0	5.0	4.9	5.1	4.9	4.8	5.0	5.0
Linkage		4.6	2.0	3.8	5.0	3.7	4.9	5.1	3.6	4.9	4.8	2.0	4.5	5.1	3.9	5.4	5.1	3.4	5.1

1   Table 6: Empirical type I error fractions at a nominal type I error fraction of 0.1 %.

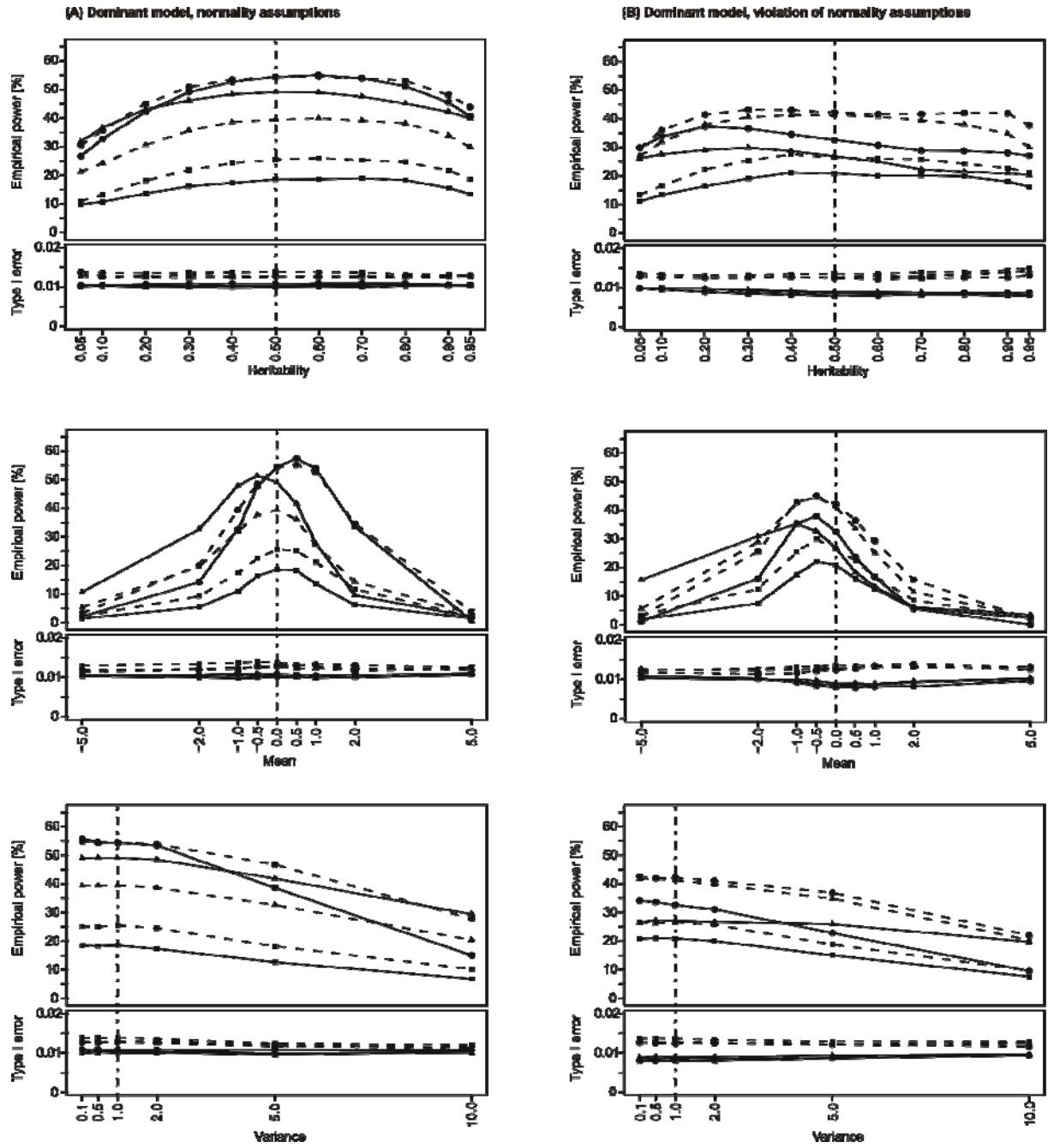|		Normality assumptions									Violation of normality assumptions								
		Random selection			Single selection			Double selection			Random selection			Single selection			Double selection		
Methods	Sibships	Dom	Add	Rec	Dom	Add	Rec	Dom	Add	Rec	Dom	Add	Rec	Dom	Add	Rec	Dom	Add	Rec
Gh.HE.Trad	Independ.	0.09	0.10	0.10	0.10	0.09	0.09	0.12	0.10	0.11	0.03	0.03	0.05	0.03	0.04	0.04	0.04	0.05	0.03
Sage.HE		0.08	0.10	0.10	0.10	0.09	0.09	0.12	0.09	0.10	0.03	0.03	0.05	0.03	0.04	0.04	0.04	0.05	0.03
rHE		0.09	0.09	0.10	0.07	0.10	0.09	0.11	0.10	0.11	0.10	0.08	0.09	0.09	0.07	0.07	0.08	0.09	0.08
Merlin-Regress		0.07	0.09	0.09	0.10	0.09	0.09	0.10	0.11	0.11	0.06	0.05	0.06	0.07	0.05	0.06	0.06	0.07	0.06
Solar.VC		0.17	0.13	0.16	0.02	0.00	0.00	0.36	0.33	0.34	2.01	1.80	1.33	0.02	0.02	0.01	1.82	2.01	1.39
Npar		0.09	0.11	0.11	0.10	0.09	0.10	0.11	0.10	0.12	0.11	0.09	0.10	0.08	0.10	0.09	0.08	0.09	0.10
Merlin.K&C		0.10	0.10	0.09	0.10	0.11	0.08	0.09	0.10	0.11	0.10	0.10	0.11	0.11	0.08	0.09	0.10	0.08	0.11
Merlin.W&H		0.06	0.06	0.05	0.06	0.06	0.04	0.04	0.06	0.06	0.05	0.05	0.07	0.07	0.05	0.05	0.06	0.04	0.06
Mlbqt.Cat		0.11	0.11	0.11	0.10	0.11	0.11	0.09	0.11	0.09	0.11	0.09	0.10	0.09	0.09	0.11	0.11	0.07	0.12
Linkage		0.00	0.00	0.00	0.06	0.00	0.01	0.07	0.00	0.04	0.00	0.00	0.00	0.06	0.00	0.05	0.06	0.00	0.03
Gh.HE.Trad	Depend.	0.12	0.14	0.12	0.13	0.12	0.15	0.12	0.12	0.11	0.07	0.06	0.09	0.08	0.09	0.10	0.09	0.10	0.09
Sage.HE		0.17	0.15	0.18	0.15	0.14	0.17	0.15	0.14	0.12	0.20	0.16	0.20	0.09	0.11	0.10	0.19	0.16	0.18
rHE		0.29	0.26	0.28	0.24	0.21	0.23	0.19	0.19	0.15	0.38	0.38	0.37	0.24	0.19	0.00	0.27	0.24	0.21
Merlin-Regress		0.18	0.14	0.17	0.17	0.17	0.16	0.17	0.15	0.15	0.14	0.17	0.17	0.14	0.13	0.14	0.16	0.13	0.17
Solar.VC		0.17	0.10	0.16	0.10	0.05	0.05	0.17	0.13	0.15	1.43	1.19	0.98	0.17	0.14	0.11	1.24	1.24	0.93
Npar		0.14	0.11	0.14	0.12	0.13	0.14	0.13	0.13	0.13	0.13	0.13	0.14	0.15	0.14	0.15	0.13	0.13	0.13
Merlin.K&C		0.10	0.10	0.11	0.08	0.10	0.10	0.10	0.12	0.09	0.10	0.09	0.09	0.09	0.09	0.10	0.10	0.09	0.10
Merlin.W&H		0.07	0.06	0.07	0.05	0.06	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.06	0.05
Mlbqt.Cat		0.10	0.09	0.10	0.07	0.11	0.09	0.09	0.10	0.08	0.08	0.10	0.09	0.09	0.10	0.08	0.10	0.11	0.09
Linkage		0.01	0.00	0.00	0.04	0.00	0.02	0.02	0.00	0.01	0.01	0.00	0.00	0.04	0.00	0.02	0.03	0.00	0.01

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Figure 1: Effect of model misspecifications on type I error fractions and power for a dominant genetic model and (A) normally distributed vs. (B) non-normally distributed trait for the Merlin-Regress method. Type I error was calculated at a nominal Type I error fraction of 0.01 and power was calculated at an empirical Type I error fraction of 0.01. The solid lines represent the nuclear family structure with two offspring. The dotted lines represent the family structure with more than two offspring as described in detail in the material and methods. Three selection schemes are shown: ■ random selection, ● single proband selection, ▲ double proband selection. In each case, the real trait model has a mean of 0, a variance of 1 and a heritability of 0.5 as indicated by the vertical lines.
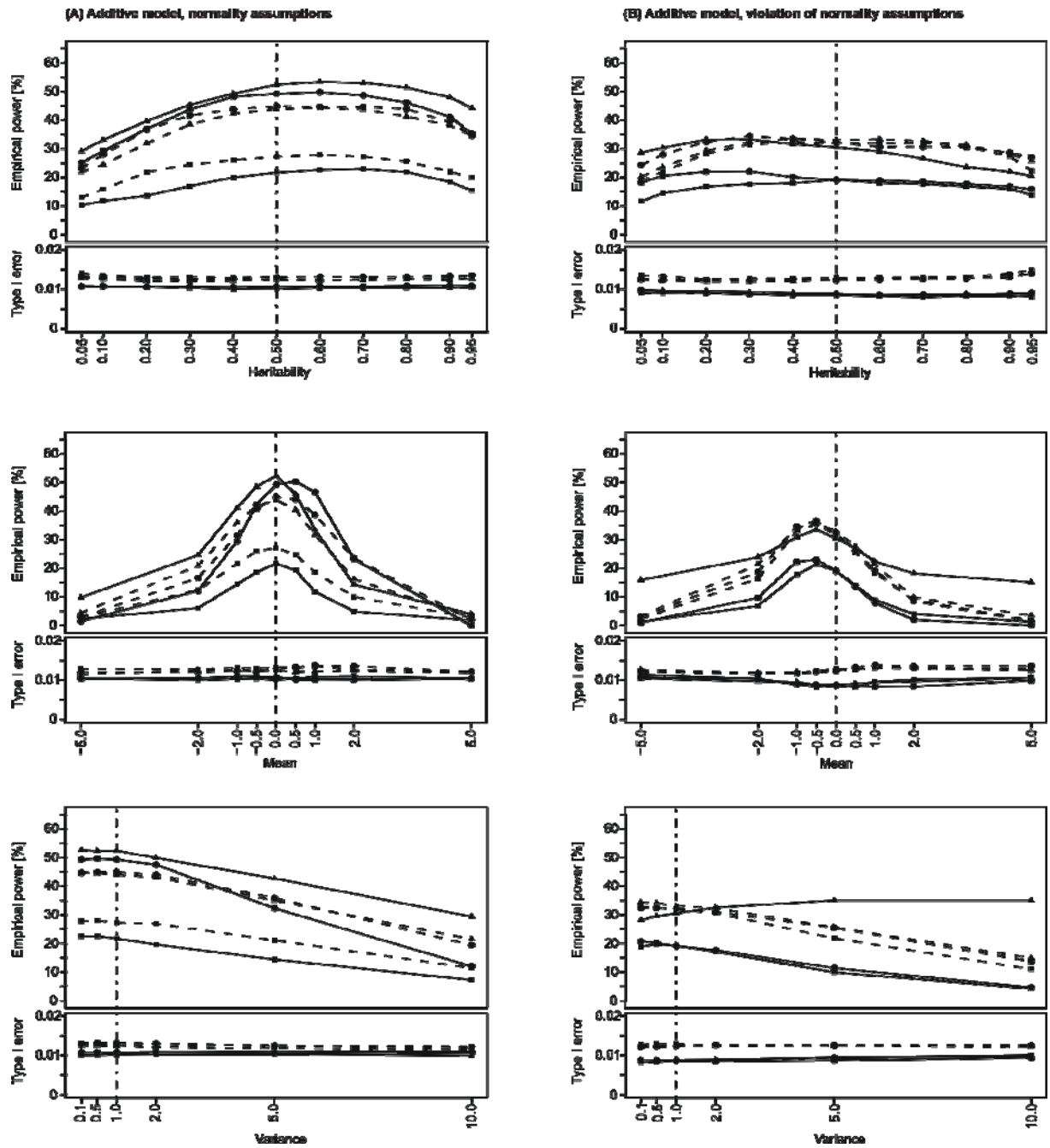
Figure 2: Effect of model misspecifications on type I error fractions and power for an additive genetic model and (A) normally distributed vs. (B) non-normally distributed trait for the Merlin-Regress method. Type I error was calculated at a nominal Type I error fraction of 0.01 and power was calculated at an empirical Type I error fraction of 0.01. The solid lines represent the nuclear family structure with two offspring. The dotted lines represent the family structure with more than two offspring as described in detail in the material and methods. Three selection schemes are shown: ■

random selection, ● single proband selection, ▲ double proband selection. In each case, the real trait

model has a mean of 0, a variance of 1 and a heritability of 0.5 as indicated by the vertical lines.
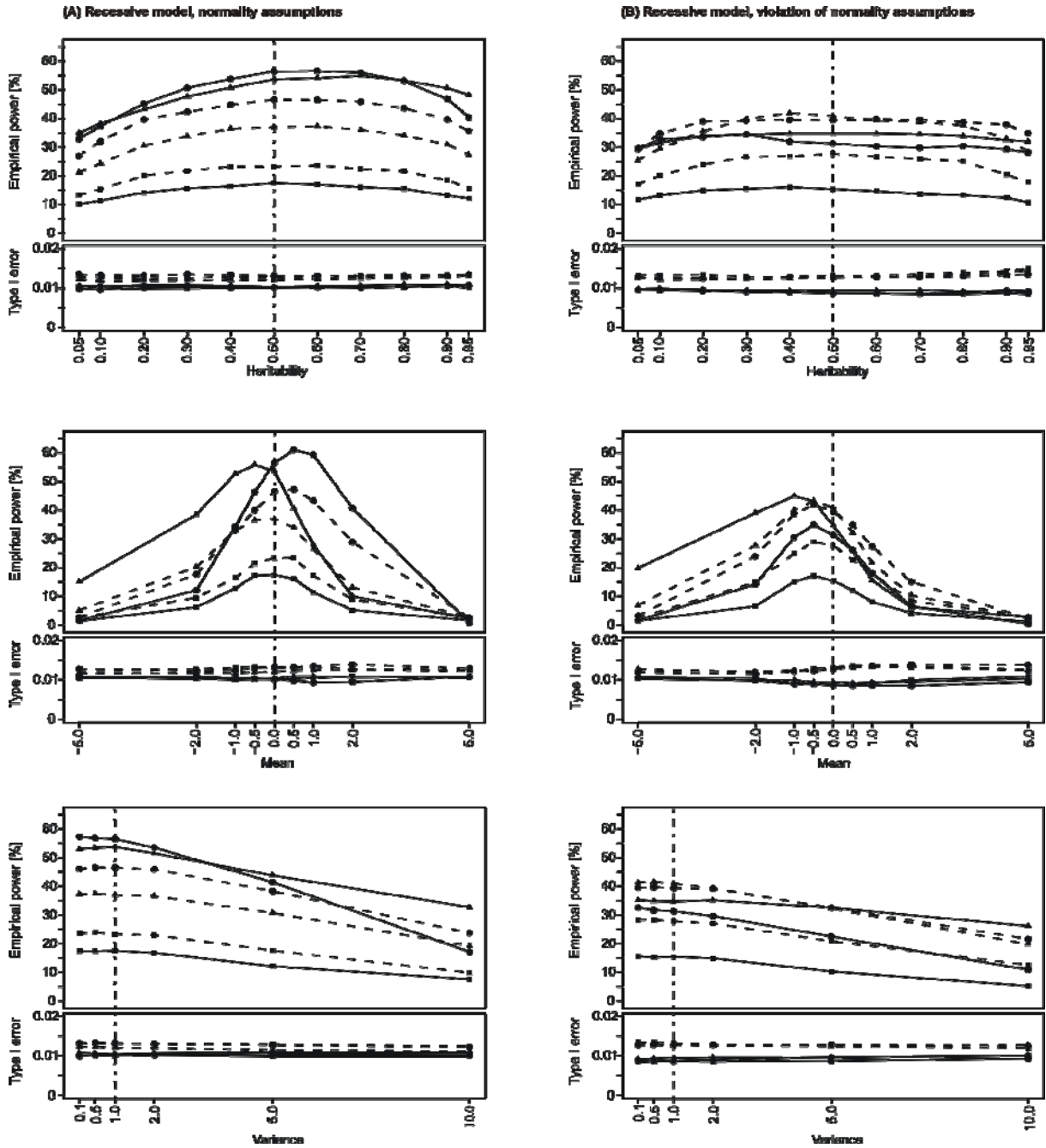

Figure 3: Effect of model misspecifications on type I error fractions and power for a recessive genetic

model and (A) normally distributed vs. (B) non-normally distributed trait for the Merlin-Regress

method. Type I error was calculated at a nominal Type I error fraction of 0.01 and power was

calculated at an empirical Type I error fraction of 0.01. The solid lines represent the nuclear family

structure with two offspring. The dotted lines represent the family structure with more than two

offspring as described in detail in the material and methods. Three selection schemes are shown: ■ random selection, ● single proband selection, ▲ double proband selection. In each case, the real trait model has a mean of 0, a variance of 1 and a heritability of 0.5 as indicated by the vertical lines.