

Estimator	Relationship					
	FS	HS	C1	C2	C3	IN
$\hat{\Phi}_D$	1.40	2.87	6.10	24.76	101.21	5.49
$\hat{\Phi}_G$	1.31	2.25	4.36	17.24	72.83	4.83
$\hat{\Phi}_R$	1.21	2.22	4.49	18.49	78.06	4.85
$\hat{\Phi}_T$	1.11	2.14	4.32	17.32	72.89	4.82
$\hat{\Phi}_W$	1.40	2.24	4.26	15.14	63.24	4.79
$\hat{\Phi}_H$	2.39	4.46	7.60	22.59	81.02	5.55

**Table S7** Estimation accuracies from simulation study (European ancestry) as measured by the ratio ( $\times 10^2$ ) of the square root of MSE and the average realized kinship.