

**Supplementary Table 1.** Posterior distribution of the precision parameters  $\sigma_g^{-2}$  and  $\rho_g^{-2}$  under INLA default (0.1,0.1) and alternative (0.01,0.01) parameterization for selected simulated examples:  $(a, b)$  refers to the parameterization of the precision densities while  $r$ ,  $\lambda$ ,  $s_0$ ,  $\Delta meth$  and  $\delta$  refer to the number of replicates, the average read depth, the level of noise, the methylation probability difference and the level of random perturbation (see Methods for further details about the parameters used in the simulations).

Parameters simulations						Posterior density					
$(a, b)$	$r$	$\lambda$	$s_0$	$\Delta meth$	$\delta$	$g=2$	Mean	Standard deviation	2.5% quantile	50% quantile	97.5% quantile
(0.1,0.1)	1	30	0.2	0.3	0.05	$\sigma_g^{-2}$	9.0729	0.6758	7.8368	9.0400	10.4911
						$\rho_g^{-2}$	1880.7466	100.6382	1689.5549	1878.6136	2084.5644
(0.1,0.1)	2	30	0.2	0.3	0.05	$\sigma_g^{-2}$	8.6061	0.4644	7.7401	8.5890	9.5655
						$\rho_g^{-2}$	1632.7565	78.6897	1481.9587	1631.5982	1790.8550
(0.1,0.1)	3	30	0.2	0.3	0.05	$\sigma_g^{-2}$	9.2996	0.5599	8.2602	9.2775	10.4607
						$\rho_g^{-2}$	1671.8780	82.8469	1514.0137	1670.3027	1839.2332
(0.1,0.1)	1	30	0.2	0.5	0.05	$\sigma_g^{-2}$	8.3296	0.6129	7.2066	8.3002	9.6136
						$\rho_g^{-2}$	1617.9111	85.0787	1456.0105	1616.1979	1790.1218
(0.1,0.1)	2	30	0.2	0.5	0.05	$\sigma_g^{-2}$	9.6289	0.5638	8.5684	9.6119	10.7827
						$\rho_g^{-2}$	1635.3649	77.6139	1487.8252	1633.6680	1792.5946
(0.1,0.1)	3	30	0.2	0.5	0.05	$\sigma_g^{-2}$	9.6923	0.5909	8.5810	9.6750	10.9025
						$\rho_g^{-2}$	1638.4463	78.6457	1489.5000	1636.4900	1798.3660
(0.1,0.1)	1	30	0.2	0.7	0.05	$\sigma_g^{-2}$	5.7587	0.3663	5.0799	5.7444	6.5169
						$\rho_g^{-2}$	1151.5099	58.9534	1039.3727	1150.2486	1270.9486
(0.1,0.1)	2	30	0.2	0.7	0.05	$\sigma_g^{-2}$	5.8216	0.2811	5.2898	5.8144	6.3947
						$\rho_g^{-2}$	1350.8436	65.9308	1225.7229	1349.3751	1484.6081
(0.1,0.1)	3	30	0.2	0.7	0.05	$\sigma_g^{-2}$	6.8412	0.3049	6.2625	6.8340	7.4611
						$\rho_g^{-2}$	1382.2827	62.8940	1262.7061	1380.9600	1509.7034

Parameters simulations						Posterior density					
$(a, b)$	$r$	$\lambda$	$s_0$	$\Delta meth$	$\delta$	$g=2$	Mean	Standard deviation	2.5% quant	50% quant	97.5% quant
(0.01,0.01)	1	30	0.2	0.3	0.05	$\sigma_g^{-2}$	8.8469	0.6533	7.6596	8.8112	10.2276
						$\rho_g^{-2}$	1651.3671	84.8279	1489.6199	1649.9041	1822.5088
(0.01,0.01)	2	30	0.2	0.3	0.05	$\sigma_g^{-2}$	10.0552	0.5782	8.9752	10.0348	11.2487
						$\rho_g^{-2}$	1679.0064	76.4557	1532.5270	1677.8633	1832.4442
(0.01,0.01)	3	30	0.2	0.3	0.05	$\sigma_g^{-2}$	10.2526	0.5182	9.2755	10.2378	11.3132
						$\rho_g^{-2}$	1593.9606	70.6807	1459.0608	1592.7067	1736.4999
(0.01,0.01)	1	30	0.2	0.5	0.05	$\sigma_g^{-2}$	8.9345	0.6855	7.7005	8.8926	10.3932
						$\rho_g^{-2}$	1466.6565	73.4093	1328.4237	1464.4492	1617.0846
(0.01,0.01)	2	30	0.2	0.5	0.05	$\sigma_g^{-2}$	9.2826	0.4510	8.4315	9.2700	10.2048
						$\rho_g^{-2}$	1576.0755	70.7379	1441.3941	1574.7220	1719.0315
(0.01,0.01)	3	30	0.2	0.5	0.05	$\sigma_g^{-2}$	8.6662	0.4332	7.8520	8.6525	9.5555
						$\rho_g^{-2}$	1443.9412	67.0582	1315.8399	1442.7964	1578.9243
(0.01,0.01)	1	30	0.2	0.7	0.05	$\sigma_g^{-2}$	6.1100	0.3056	5.5347	6.1007	6.7367
						$\rho_g^{-2}$	1286.7485	63.4107	1166.3553	1285.3732	1415.2569
(0.01,0.01)	2	30	0.2	0.7	0.05	$\sigma_g^{-2}$	6.1109	0.2637	5.6098	6.1051	6.6460
						$\rho_g^{-2}$	1352.3358	62.3716	1233.9427	1350.9429	1478.9524
(0.01,0.01)	3	30	0.2	0.7	0.05	$\sigma_g^{-2}$	7.4169	0.3634	6.7317	7.4065	8.1605
						$\rho_g^{-2}$	1395.5104	65.6492	1270.7397	1394.1411	1528.4495