Table 1: Robustness of GMeta Estimation

Setting	Study-I	Study-II	Study-III	Reference	β_i^*	Bias	SD (ESD)	RMSE	CR	AL
	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	β_1^*	.010	.076 (.075)	.077	.941	.288
I	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	β_2^*	.011	.064 (.061)	.065	.947	.237
	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	β_3^*	.006	.066 (.064)	.066	.954	.246
	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_h}$	$\boldsymbol{\mu_m}$	$\boldsymbol{\mu_b}$	β_1^*	.010	.079 (.072)	.079	.930	.272
	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	β_2^*	.002	.056 (.054)	.056	.948	.211
	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	β_3^*	-.002	.062 (.058)	.062	.945	.222
	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	β_1^*	.032	.088 (.088)	.094	.930	.339
II	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_h^2}$	$\boldsymbol{\sigma_l^2}$	$\boldsymbol{\sigma_b^2}$	β_2^*	-.002	.062 (.057)	.062	.941	.221
	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	β_3^*	-.005	.074 (.074)	.074	.967	.286
	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_h}$	$\boldsymbol{\mu_m}$	$\boldsymbol{\mu_b}$	β_1^*	.021	.079 (.077)	.081	.929	.294
	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_h^2}$	$\boldsymbol{\sigma_l^2}$	$\boldsymbol{\sigma_b^2}$	β_2^*	.0005	.055 (.055)	.055	.956	.213
	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	β_3^*	-.008	.065 (.064)	.065	.954	.246
	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	β_1^*	-.062	.107 (.118)	.124	.934	.382
	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	β_2^*	.021	.070 (.065)	.073	.930	.250
	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_h}$	β_3^*	.030	.087 (.096)	.092	.956	.322
	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	β_1^*	.039	.072 (.069)	.081	.891	.264
	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	β_2^*	.023	.065 (.062)	.069	.932	.240
	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_l}$	β_3^*	.018	.061 (.058)	.064	.930	.224
	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	β_1^*	.053	.079 (.075)	.095	.866	.290
III	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	β_2^*	.019	.065 (.063)	.067	.942	.242
	$\boldsymbol{\rho_l}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_h}$	$\boldsymbol{\rho_l}$	β_3^*	.012	.068 (.064)	.069	.935	.249
	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	β_1^*	.032	.089 (.084)	.095	.912	.322
	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	β_2^*	.010	.062 (.062)	.063	.946	.240
	$\boldsymbol{\rho_l}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_h}$	$\boldsymbol{\rho_b}$	β_3^*	-.009	.073 (.071)	.073	.942	.273
	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	β_1^*	-.025	.113 (.108)	.116	.954	.407
	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	β_2^*	.017	.065 (.064)	.067	.951	.248
	$\boldsymbol{\rho_l}$	$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_h}$	$\boldsymbol{\rho_h}$	β_3^*	-.002	.091 (.091)	.091	.965	.347
			$\boldsymbol{\mu_b}$	$\boldsymbol{\mu_b}$	β_1^*	.007	.096 (.104)	.096	.968	.365
IV	$X_1 > -0.5, X_2 < 0.5$	$X_2 > 0$	$\boldsymbol{\sigma_b^2}$	$\boldsymbol{\sigma_b^2}$	β_2^*	.242	.353 (.117)	.428	.572	.401
			$\boldsymbol{\rho_b}$	$\boldsymbol{\rho_b}$	β_3^*	-.015	.067 (.081)	.068	.971	.283

Biases, standard deviation (SD), estimated standard deviation (ESD), square roots of mean square errors (RMSE), coverage rates (CR), and average lengths (AL) of 95% confidence intervals of the GMeta estimates using the study covariance estimators in the setting of logistic regression. In setting (I), data are simulated in ideal setting where the covariate distribution is a log-normal distribution with the natural logarithm of the covariates being characterized by mean, sd and correlation of normal variates and are assumed to same across all populations. In setting (II)-(IV), the assumption is violated by creating variations in mean/sd, correlations of the underlying normal distribution and selection criterion across the studies and reference sample. The vector of log-transformed covariate means, variances and correlations are denoted by denoted by $\boldsymbol{\mu_*} = (\mu_1, \mu_2, \mu_3)$, $\boldsymbol{\sigma_*^2} = (\sigma_1^2, \sigma_2^2, \sigma_3^2)$ and $\boldsymbol{\rho_*} = (\rho_{12}, \rho_{23}, \rho_{13})$ for $* \in \{b, l, m, h\}$, where $\boldsymbol{\mu_b} = (0, 0, 0)$, $\boldsymbol{\mu_m} = (0.5, 0.5, 0.5)$, $\boldsymbol{\mu_h} = (1, 1, 1)$; $\boldsymbol{\sigma_b^2} = (1, 1, 1)$, $\boldsymbol{\sigma_l^2} = (0.5, 0.5, 0.5)$, $\boldsymbol{\sigma_h^2} = (2, 2, 2)$ and $\boldsymbol{\rho_b} = (0.3, 0.6, 0.1)$, $\boldsymbol{\rho_h} = (0.4, 0.8, 0.2)$, $\boldsymbol{\rho_l} = (0.2, 0.4, 0)$. Estimated standard deviation are obtained by the asymptotic formula (**??**) and used to construct 95% confidence interval.