

Supplementary file S1: Performance of different methods for estimating the treatment effects (n=100)

Outcome /Method	Scenario 1 (small and blocked confounding paths)				Scenario 2 (medium and blocked confounding paths)				Scenario 3 (one large unblocked confounding path)			
	Bias	RMSE	Coverage	Width	Bias	RMSE	Coverage	Width	Bias	RMSE	Coverage	Width
Outcome Y_a												
Raw	-0.807	0.913	0.545	1.711	-1.116	1.235	0.437	2.029	-1.482	1.564	0.168	1.978
GC	-0.011	0.499	0.950	1.968	0.001	0.605	0.934	2.301	-0.456	0.747	0.862	2.296
PS_IPTW	-0.105	0.628	0.828	1.678	-0.176	0.739	0.824	1.997	-0.645	0.955	0.665	1.950
PS_OW	-0.016	0.508	0.894	1.642	-0.002	0.617	0.883	1.950	-0.476	0.767	0.776	1.910
PS_SMR	-0.097	0.701	0.776	1.642	-0.166	0.817	0.773	1.954	-0.666	1.094	0.604	1.919
TMLE	-0.064	0.601	0.905	2.009	-0.088	0.709	0.886	2.268	-0.568	0.896	0.769	2.259
Outcome Y_b												
Raw	-0.259	0.514	0.899	1.737	-0.329	0.545	0.874	1.688	-0.434	0.605	0.819	1.658
GC	0.023	0.513	0.931	2.031	0.020	0.505	0.920	1.936	-0.128	0.515	0.923	1.931
PS_IPTW	0.041	0.636	0.855	1.767	0.015	0.620	0.851	1.728	-0.176	0.646	0.816	1.696
PS_OW	0.061	0.561	0.887	1.747	0.063	0.557	0.889	1.717	-0.110	0.550	0.877	1.689
PS_SMR	0.008	0.713	0.796	1.737	-0.028	0.730	0.776	1.717	-0.215	0.796	0.728	1.700
TMLE	0.039	0.618	0.973	2.753	0.024	0.608	0.975	2.722	-0.168	0.628	0.965	2.695
Outcome Y_c												
Raw	0.170	0.297	0.892	0.952	0.203	0.317	0.848	0.942	0.240	0.343	0.801	0.931
GC	-0.011	0.272	0.926	1.057	-0.011	0.276	0.922	1.062	0.048	0.288	0.924	0.061
PS_IPTW	0.011	0.340	0.919	1.170	0.011	0.338	0.923	1.171	0.065	0.343	0.905	0.152
PS_OW	-0.040	0.305	0.939	1.135	-0.042	0.310	0.940	1.150	0.019	0.315	0.930	0.145
PS_SMR	-0.016	0.327	0.923	1.138	-0.022	0.338	0.919	1.149	0.051	0.358	0.901	0.154
TMLE	0.130	0.419	0.920	1.749	0.131	0.398	0.934	1.711	0.180	0.410	0.924	0.654

GC, g-computation; RMSE, root mean squared error; PS-, propensity score-based; IPTW, inverse probability of treatment weighting; SMR, standardized mortality or morbidity ratio; OW, overlap weighting; TMLE, targeted maximum likelihood estimation. Bias was the average difference between the true value (simulated) and its estimate across the simulation replicates. RMSE was the square root of the mean squared error (MSE) that is the average squared difference between the true value and its estimate across the simulation replicates. Coverage was the proportion of times the 95% confidence interval of the estimate contained the true value. Width was the average difference between the upper and lower bounds of 95% confidence interval of estimate.