Simulation Summary

Simulation: 1
Study Design: (1) RYGB vs. VSG
Missingness: (1) M-Bias
True ATE: -0.273

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−0.276	−0.004	1.4%	−0.278	−0.006	2.1%	1.000
Y ~ A	–	$R \sim L^{R,A}$	Estimation	−0.276	−0.004	1.3%	−0.278	−0.005	1.9%	1.079
Y ~ A	–	$R \sim L^{R,Y}$	Estimation	−0.288	−0.016	5.7%	−0.290	−0.017	6.4%	1.238
Y ~ A	–	$R \sim L^{R}$	Estimation	−0.274	−0.002	0.7%	−0.274	−0.002	0.7%	1.380
Y ~ A	–	$R \sim L^{R} + A$	Estimation	−0.274	−0.002	0.7%	−0.274	−0.002	0.6%	1.380

IPWR Usage:

Estimation: Weights used in estimation of analysis outcome model

Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 2
Study Design: (1) RYGB vs. VSG
Missingness: (2) Treatment Heterogeneity
True ATE: -0.311

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−0.273	0.038	−12.3%	−0.275	0.036	−11.5%	1.000
Y ~ A	–	$R \sim L^{R,A}$	Estimation	−0.273	0.038	−12.4%	−0.273	0.038	−12.2%	1.006
Y ~ A	–	$R \sim L^{R,Y}$	Estimation	−0.312	−0.001	0.3%	−0.315	−0.004	1.3%	1.139
Y ~ A	–	$R \sim L^{R}$	Estimation	−0.311	0.000	0.1%	−0.313	−0.002	0.6%	1.147
Y ~ A	–	$R \sim L^{R} + A$	Estimation	−0.311	0.000	0.1%	−0.313	−0.002	0.6%	1.147

IPWR Usage:

Estimation: Weights used in estimation of analysis outcome model

Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 3
Study Design: (1) RYGB vs. VSG
Missingness: (3) M-Bias w/ Mediator
True ATE: -0.124

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−0.097	0.027	−21.7%	−0.095	0.029	−23.5%	1.000
Y ~ A	–	$R \sim L^{R,A}$	Estimation	−0.096	0.028	−22.6%	−0.096	0.028	−22.6%	1.019
Y ~ A	–	$R \sim L^{R,Y}$	Estimation	−0.120	0.003	−2.8%	−0.122	0.002	−1.8%	1.234
Y ~ A	–	$R \sim L^{R}$	Estimation	−0.121	0.003	−2.6%	−0.121	0.003	−2.3%	1.261
Y ~ A	–	$R \sim L^{R} + A$	Estimation	−0.121	0.003	−2.6%	−0.121	0.003	−2.2%	1.261

IPWR Usage:

Estimation: Weights used in estimation of analysis outcome model

Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 4
Study Design: (1) RYGB vs. VSG
Missingness: (4) MNAR
True ATE: -0.316

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−0.358	−0.041	13.0%	−0.358	−0.042	13.3%	1.000

IPWR Usage:

Estimation: Weights used in estimation of analysis outcome model

Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 5
Study Design: (2) Surgery vs. No Surgery
Missingness: (1) M-Bias
True ATE: -0.325

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−0.928	−0.602	185.3%	−0.926	−0.601	185.0%	1.000
Y ~ A	C ~ L^{A}	–	–	−0.927	−0.601	185.0%	−0.925	−0.600	184.4%	1.007
Y ~ A	–	R ~ $L^{R,A}$	Estimation	−0.930	−0.605	186.0%	−0.929	−0.604	185.8%	1.038
Y ~ A	C ~ L^{A}	R ~ $L^{R,A}$	Estimation	−0.937	−0.612	188.3%	−0.936	−0.611	188.0%	1.034
Y ~ A	–	R ~ $L^{R,Y}$	Estimation	−0.896	−0.571	175.6%	−0.894	−0.569	175.1%	1.217
Y ~ A	C ~ L^{A}	R ~ $L^{R,Y}$	Estimation	−0.895	−0.570	175.3%	−0.892	−0.567	174.4%	1.225
Y ~ A	–	R ~ L^{R}	Estimation	−0.893	−0.568	174.8%	−0.892	−0.567	174.5%	1.277
Y ~ A	C ~ L^{A}	R ~ L^{R}	Estimation	−0.902	−0.577	177.4%	−0.900	−0.575	176.7%	1.268
Y ~ A	–	R ~ L^{R} + A	Estimation	−0.893	−0.568	174.8%	−0.892	−0.567	174.4%	1.278
Y ~ A	C ~ L^{A}	R ~ L^{R} + A	Estimation	−0.902	−0.577	177.4%	−0.900	−0.575	176.7%	1.268

IPWR Usage:
Estimation: Weights used in estimation of analysis outcome model
Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 5
Study Design: (2) Surgery vs. No Surgery
Missingness: (1) M-Bias
True ATE: -0.325

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	R ~ $L^{R,A}$ Stratified by A	Estimation	−0.927	−0.602	185.3%	−0.928	−0.603	185.3%	1.004
Y ~ A	C ~ L^{A}	R ~ $L^{R,A}$ Stratified by A	Estimation	−0.935	−0.610	187.7%	−0.934	−0.609	187.4%	1.001
Y ~ A	–	R ~ $L^{R,Y}$ Stratified by A	Estimation	−0.331	−0.006	1.8%	−0.330	−0.005	1.6%	1.072
Y ~ A	C ~ L^{A}	R ~ $L^{R,Y}$ Stratified by A	Estimation	−0.330	−0.005	1.5%	−0.329	−0.004	1.2%	1.080
Y ~ A	–	R ~ L^{R} Stratified by A	Estimation	−0.325	0.001	−0.2%	−0.323	0.002	−0.7%	1.092
Y ~ A	C ~ L^{A}	R ~ L^{R} Stratified by A	Estimation	−0.333	−0.008	2.4%	−0.332	−0.007	2.1%	1.082

IPWR Usage:
Estimation: Weights used in estimation of analysis outcome model
Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 6
Study Design: (2) Surgery vs. No Surgery
Missingness: (2) Treatment Heterogeneity
True ATE: -0.307

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−0.415	−0.108	35.3%	−0.415	−0.108	35.2%	1.000
Y ~ A	C ~ L^A	–	–	−0.415	−0.108	35.3%	−0.415	−0.108	35.3%	1.013
Y ~ A	–	R ~ $L^{R,A}$	Estimation	−0.415	−0.108	35.4%	−0.417	−0.110	36.0%	1.018
Y ~ A	C ~ L^A	R ~ $L^{R,A}$	Estimation	−0.415	−0.109	35.4%	−0.417	−0.110	35.9%	1.020
Y ~ A	–	R ~ $L^{R,Y}$	Estimation	−0.447	−0.141	45.8%	−0.448	−0.141	46.0%	1.090
Y ~ A	C ~ L^A	R ~ $L^{R,Y}$	Estimation	−0.447	−0.140	45.8%	−0.449	−0.143	46.5%	1.103
Y ~ A	–	R ~ L^R	Estimation	−0.446	−0.140	45.6%	−0.446	−0.139	45.4%	1.122
Y ~ A	C ~ L^A	R ~ L^R	Estimation	−0.447	−0.140	45.8%	−0.448	−0.141	45.9%	1.122
Y ~ A	–	R ~ L^R + A	Estimation	−0.446	−0.140	45.6%	−0.446	−0.139	45.4%	1.122
Y ~ A	C ~ L^A	R ~ L^R + A	Estimation	−0.447	−0.140	45.8%	−0.448	−0.141	46.0%	1.122

IPWR Usage:
Estimation: Weights used in estimation of analysis outcome model
Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 6
Study Design: (2) Surgery vs. No Surgery
Missingness: (2) Treatment Heterogeneity
True ATE: -0.307

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	R ~ $L^{R,A}$ Stratified by A	Estimation	−0.415	−0.108	35.4%	−0.415	−0.108	35.4%	0.995
Y ~ A	C ~ L^A	R ~ $L^{R,A}$ Stratified by A	Estimation	−0.415	−0.109	35.5%	−0.415	−0.108	35.2%	0.997
Y ~ A	–	R ~ $L^{R,Y}$ Stratified by A	Estimation	−0.307	0.000	0.0%	−0.309	−0.002	0.7%	1.011
Y ~ A	C ~ L^A	R ~ $L^{R,Y}$ Stratified by A	Estimation	−0.307	0.000	−0.0%	−0.308	−0.001	0.4%	1.023
Y ~ A	–	R ~ L^R Stratified by A	Estimation	−0.306	0.001	−0.2%	−0.307	−0.001	0.2%	1.012
Y ~ A	C ~ L^A	R ~ L^R Stratified by A	Estimation	−0.307	0.000	0.0%	−0.308	−0.001	0.3%	1.012

IPWR Usage:
Estimation: Weights used in estimation of analysis outcome model
Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 7
Study Design: (2) Surgery vs. No Surgery
Missingness: (3) M-Bias w/ Mediator
True ATE: -0.816

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−0.834	−0.019	2.3%	−0.835	−0.019	2.3%	1.000
Y ~ A	C ~ L^{A}	–	–	−0.832	−0.016	2.0%	−0.833	−0.017	2.1%	1.000
Y ~ A	–	R ~ $L^{R,A}$	Estimation	−0.837	−0.022	2.7%	−0.834	−0.019	2.3%	1.022
Y ~ A	C ~ L^{A}	R ~ $L^{R,A}$	Estimation	−0.835	−0.020	2.4%	−0.835	−0.019	2.3%	1.021
Y ~ A	–	R ~ $L^{R,Y}$	Estimation	−0.895	−0.079	9.7%	−0.892	−0.077	9.4%	1.117
Y ~ A	C ~ L^{A}	R ~ $L^{R,Y}$	Estimation	−0.892	−0.077	9.4%	−0.889	−0.074	9.0%	1.116
Y ~ A	–	R ~ L^{R}	Estimation	−0.900	−0.084	10.3%	−0.898	−0.082	10.1%	1.155
Y ~ A	C ~ L^{A}	R ~ L^{R}	Estimation	−0.897	−0.082	10.0%	−0.893	−0.078	9.6%	1.154
Y ~ A	–	R ~ L^{R} + A	Estimation	−0.900	−0.084	10.3%	−0.898	−0.082	10.1%	1.155
Y ~ A	C ~ L^{A}	R ~ L^{R} + A	Estimation	−0.897	−0.082	10.0%	−0.894	−0.078	9.6%	1.154

IPWR Usage:

Estimation: Weights used in estimation of analysis outcome model

Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 7
Study Design: (2) Surgery vs. No Surgery
Missingness: (3) M-Bias w/ Mediator
True ATE: -0.816

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	R ~ $L^{R,A}$ Stratified by A	Estimation	−0.839	−0.023	2.9%	−0.836	−0.021	2.6%	1.001
Y ~ A	C ~ L^{A}	R ~ $L^{R,A}$ Stratified by A	Estimation	−0.837	−0.021	2.6%	−0.836	−0.021	2.5%	1.000
Y ~ A	–	R ~ $L^{R,Y}$ Stratified by A	Estimation	−0.812	0.003	−0.4%	−0.813	0.002	−0.3%	1.007
Y ~ A	C ~ L^{A}	R ~ $L^{R,Y}$ Stratified by A	Estimation	−0.810	0.006	−0.7%	−0.811	0.004	−0.5%	1.006
Y ~ A	–	R ~ L^{R} Stratified by A	Estimation	−0.816	−0.001	0.1%	−0.818	−0.003	0.4%	1.008
Y ~ A	C ~ L^{A}	R ~ L^{R} Stratified by A	Estimation	−0.814	0.001	−0.2%	−0.815	0.000	−0.0%	1.008

IPWR Usage:

Estimation: Weights used in estimation of analysis outcome model

Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 8
Study Design: (2) Surgery vs. No Surgery
Missingness: (4) MNAR
True ATE: -0.392

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−1.225	−0.833	212.8%	−1.221	−0.830	211.9%	1.000
Y ~ A	$C \sim L^A$	–	–	−1.222	−0.831	212.1%	−1.219	−0.828	211.4%	1.000

IPWR Usage:

Estimation: Weights used in estimation of analysis outcome model

Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 9
Study Design: (3) Surgery vs. No Surgery (Diabetic)
Missingness: (1) M-Bias
True ATE: -0.322

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−0.343	−0.021	6.7%	−0.345	−0.023	7.2%	1.000
Y ~ A	$C \sim L^A$	–	–	−0.342	−0.020	6.3%	−0.343	−0.022	6.7%	1.002
Y ~ A	–	$R \sim L^{R,A}$	Estimation	−0.334	−0.012	3.8%	−0.330	−0.009	2.7%	1.042
Y ~ A	$C \sim L^A$	$R \sim L^{R,A}$	Estimation	−0.342	−0.020	6.2%	−0.340	−0.018	5.7%	1.042
Y ~ A	–	$R \sim L^{R,Y}$	Estimation	−0.332	−0.010	3.2%	−0.338	−0.016	5.1%	1.315
Y ~ A	$C \sim L^A$	$R \sim L^{R,Y}$	Estimation	−0.331	−0.009	2.9%	−0.338	−0.016	5.0%	1.318
Y ~ A	–	$R \sim L^R$	Estimation	−0.311	0.011	−3.4%	−0.311	0.011	−3.3%	1.371
Y ~ A	$C \sim L^A$	$R \sim L^R$	Estimation	−0.319	0.002	−0.7%	−0.320	0.002	−0.5%	1.370
Y ~ A	–	$R \sim L^R + A$	Estimation	−0.311	0.011	−3.4%	−0.311	0.011	−3.3%	1.371
Y ~ A	$C \sim L^A$	$R \sim L^R + A$	Estimation	−0.319	0.002	−0.7%	−0.322	0.000	−0.0%	1.370

IPWR Usage:

Estimation: Weights used in estimation of analysis outcome model

Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 10
Study Design: (3) Surgery vs. No Surgery (Diabetic)
Missingness: (2) Treatment Heterogeneity
True ATE: -0.305

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−0.270	0.036	−11.7%	−0.265	0.040	−13.3%	1.000
Y ~ A	$C \sim L^A$	–	–	−0.270	0.036	−11.7%	−0.266	0.039	−12.9%	1.004
Y ~ A	–	$R \sim L^{R,A}$	Estimation	−0.271	0.035	−11.4%	−0.271	0.034	−11.1%	1.038
Y ~ A	$C \sim L^A$	$R \sim L^{R,A}$	Estimation	−0.271	0.034	−11.2%	−0.270	0.035	−11.6%	1.040
Y ~ A	–	$R \sim L^{R,Y}$	Estimation	−0.311	−0.005	1.7%	−0.307	−0.002	0.6%	1.141
Y ~ A	$C \sim L^A$	$R \sim L^{R,Y}$	Estimation	−0.311	−0.005	1.7%	−0.307	−0.001	0.4%	1.145
Y ~ A	–	$R \sim L^R$	Estimation	−0.309	−0.004	1.3%	−0.302	0.003	−1.0%	1.187
Y ~ A	$C \sim L^A$	$R \sim L^R$	Estimation	−0.310	−0.005	1.6%	−0.302	0.003	−1.1%	1.188
Y ~ A	–	$R \sim L^R + A$	Estimation	−0.309	−0.004	1.3%	−0.302	0.003	−1.1%	1.188
Y ~ A	$C \sim L^A$	$R \sim L^R + A$	Estimation	−0.310	−0.005	1.6%	−0.302	0.003	−1.1%	1.188

IPWR Usage:

Estimation: Weights used in estimation of analysis outcome model

Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 11
Study Design: (3) Surgery vs. No Surgery (Diabetic)
Missingness: (3) M-Bias w/ Mediator
True ATE: -0.822

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−0.786	0.036	−4.4%	−0.766	0.056	−6.9%	1.000
Y ~ A	$C \sim L^A$	–	–	−0.787	0.035	−4.3%	−0.764	0.058	−7.0%	1.001
Y ~ A	–	$R \sim L^{R,A}$	Estimation	−0.791	0.031	−3.7%	−0.766	0.056	−6.8%	1.027
Y ~ A	$C \sim L^A$	$R \sim L^{R,A}$	Estimation	−0.792	0.029	−3.6%	−0.769	0.053	−6.5%	1.028
Y ~ A	–	$R \sim L^{R,Y}$	Estimation	−0.850	−0.028	3.4%	−0.817	0.005	−0.6%	1.130
Y ~ A	$C \sim L^A$	$R \sim L^{R,Y}$	Estimation	−0.851	−0.029	3.5%	−0.819	0.003	−0.4%	1.131
Y ~ A	–	$R \sim L^R$	Estimation	−0.860	−0.038	4.6%	−0.822	0.000	−0.0%	1.159
Y ~ A	$C \sim L^A$	$R \sim L^R$	Estimation	−0.861	−0.039	4.7%	−0.823	−0.001	0.1%	1.160
Y ~ A	–	$R \sim L^R + A$	Estimation	−0.860	−0.038	4.6%	−0.822	0.000	−0.0%	1.158
Y ~ A	$C \sim L^A$	$R \sim L^R + A$	Estimation	−0.861	−0.039	4.7%	−0.823	−0.001	0.1%	1.160

IPWR Usage:

Estimation: Weights used in estimation of analysis outcome model

Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution

Simulation Summary

Simulation: 12
Study Design: (3) Surgery vs. No Surgery (Diabetic)
Missingness: (4) MNAR
True ATE: -0.385

Analysis Mechanism				Mean			Median			
Outcome Model	IPWC Model	IPWR Model	IPWR Usage	Estimated ATE	Bias	% Bias	Estimated ATE	Bias	% Bias	Relative Efficiency
Y ~ A	–	–	–	−0.395	−0.009	2.5%	−0.395	−0.010	2.6%	1.000
Y ~ A	$C \sim L^A$	–	–	−0.395	−0.010	2.6%	−0.395	−0.010	2.7%	1.002

IPWR Usage:

Estimation: Weights used in estimation of analysis outcome model

Marginalization: Weights used in marginalization of estimated individual treatment effects over baseline covariate distribution