simulation summary

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Simulation study

Investigate bias from model misspecification when estimating NDE and NIE.

Simulation scenarios

Table 1: Variables used for simulations

variable	type	true model
X(additional covariate)	continous	$X \sim gamma(8, 4.5)$
Z(exposure)	binary	$Z = I(Y* > 0)$ where $Z* \sim U_0 + U_1 X + N(0,1)$
M(mediator)	continous	$M \sim B_0 + B_1 Z + B_2 X + N(0,1)$
Y(outcome)	continous	$Y \sim \theta_0 + \theta_1 Z + \theta_2 M + \theta_3 ZM + \theta_4 X + N(0,1)$

Coefficient values used(Only positive effects. Maybe test with negatives?):

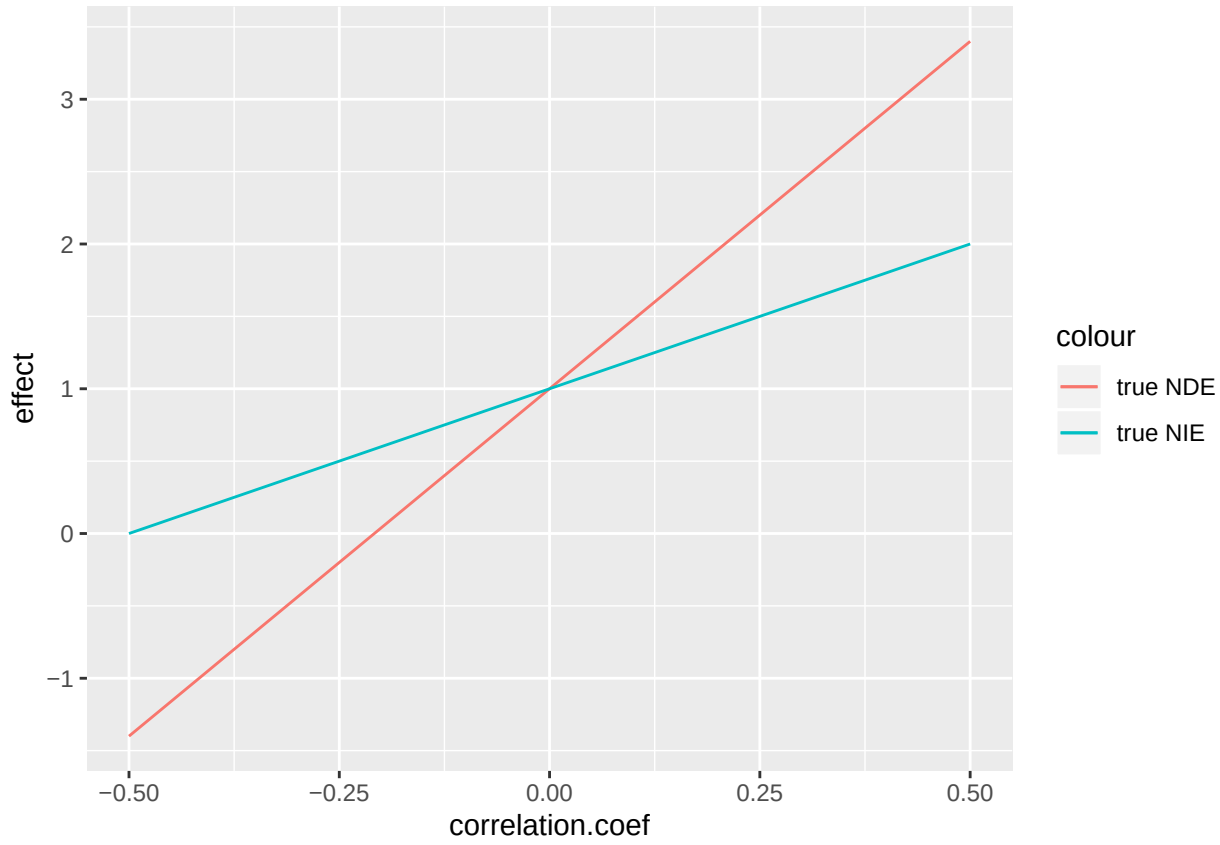
- $U_0 = -0.4$
- $U_1 = 0.01$
- $B_0 = 3$
- $B_1 = 2$
- $B_2 = 0.05$
- $\theta_0 = 5$
- $\theta_1 = 1$
- $\theta_2 = 0.5$
- $\theta_3 =$ varied[-0.5, 0.5]
- $\theta_4 = 0.05$

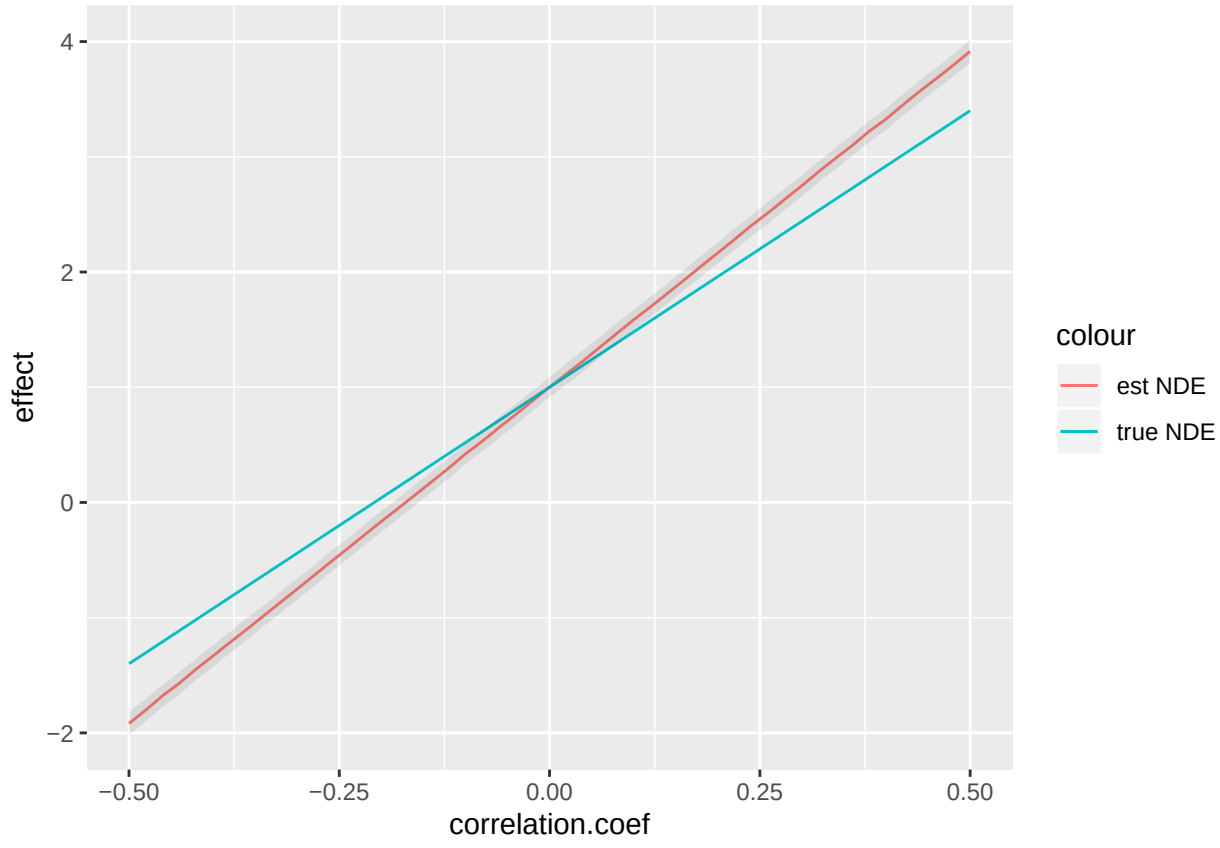
Estimated mediator model was set to the correct one. Estimated outcome model was linear but misspecified without ZM interaction: $Y \sim Z + M + X$.

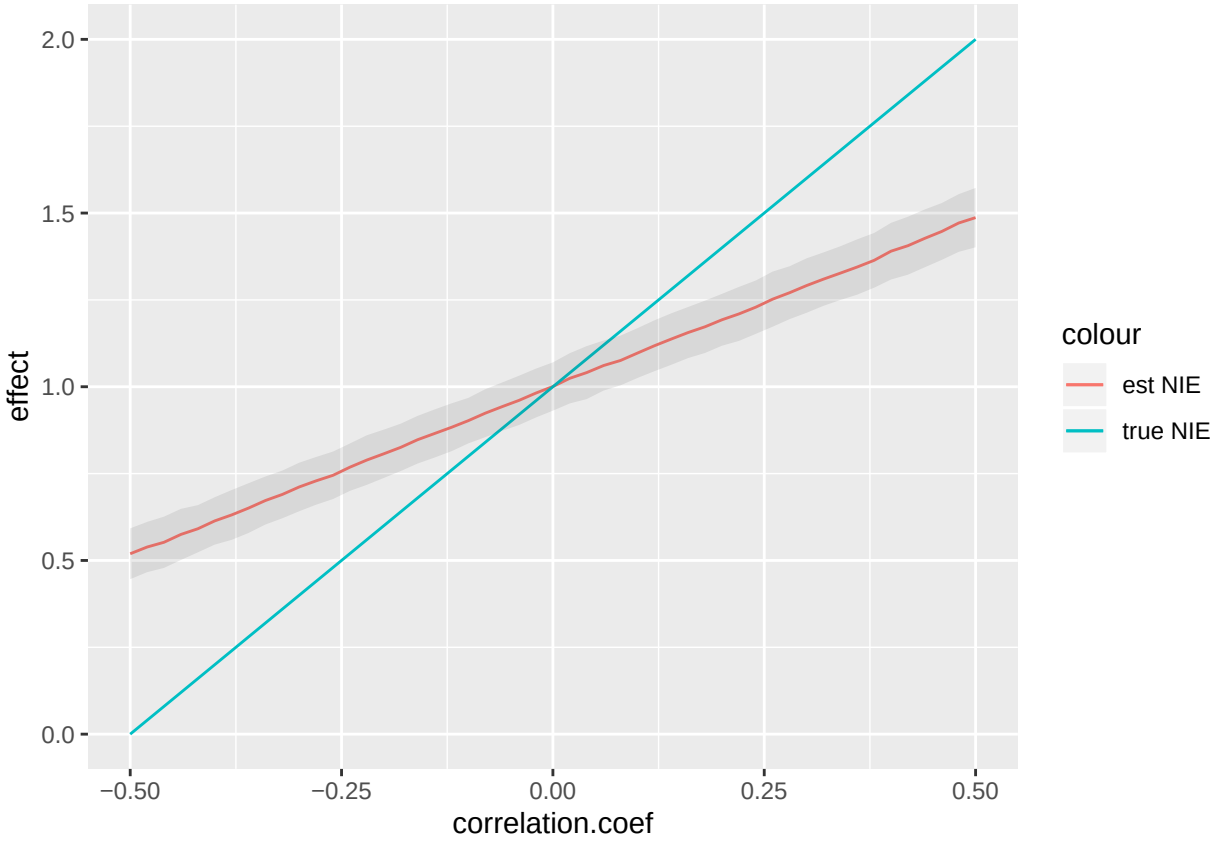
Results

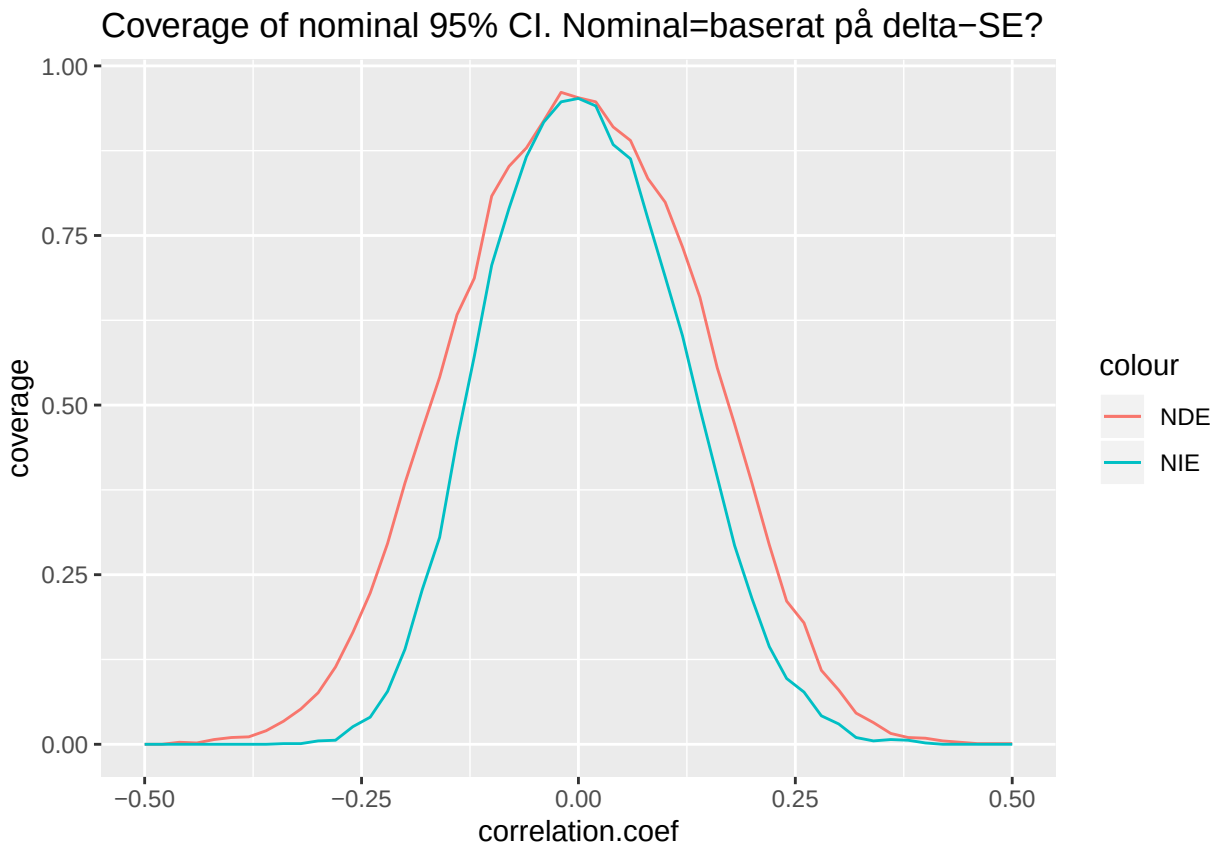
interaction.coefficient	true.nde	true.nie	est.nde	est.nie	nde.emp.SE	nie.emp.SE	nde.coverage	nie.cov
-0.50	-1.3999687	0.00	-1.9183934	0.5192634	0.0983610	0.0731042	0.000	
-0.48	-1.3039799	0.04	-1.8017319	0.5386205	0.0986049	0.0724076	0.000	
-0.46	-1.2080985	0.08	-1.6769787	0.5523938	0.0956447	0.0737777	0.003	
-0.44	-1.1120050	0.12	-1.5683793	0.5749264	0.0970610	0.0735970	0.002	
-0.42	-1.0161317	0.16	-1.4455852	0.5912402	0.0923648	0.0679858	0.007	
-0.40	-0.9200497	0.20	-1.3316795	0.6138369	0.0937202	0.0681869	0.010	
-0.38	-0.8239437	0.24	-1.2151736	0.6310165	0.0923313	0.0717141	0.011	
-0.36	-0.7280290	0.28	-1.1011248	0.6507935	0.0956556	0.0716062	0.020	
-0.34	-0.6320130	0.32	-0.9846334	0.6726070	0.0906024	0.0691355	0.034	
-0.32	-0.5359864	0.36	-0.8674340	0.6901144	0.0936811	0.0686955	0.052	

interaction.coefficient	true.nde	true.nie	est.nde	est.nie	nde.emp.SE	nie.emp.SE	nde.coverage	nie.cov
-0.30	-0.4400434	0.40	-0.7518270	0.7116174	0.0916313	0.0699086	0.076	
-0.28	-0.3440628	0.44	-0.6333832	0.7292138	0.0923153	0.0686754	0.114	
-0.26	-0.2479304	0.48	-0.5152214	0.7451851	0.0903696	0.0683289	0.165	
-0.24	-0.1519789	0.52	-0.4001531	0.7685826	0.0897833	0.0682280	0.223	
-0.22	-0.0560352	0.56	-0.2812982	0.7891098	0.0879507	0.0713754	0.296	
-0.20	0.0400014	0.60	-0.1650797	0.8070624	0.0920058	0.0695182	0.385	
-0.18	0.1359322	0.64	-0.0508508	0.8255216	0.0895853	0.0682172	0.464	
-0.16	0.2320231	0.68	0.0645032	0.8476008	0.0921924	0.0686082	0.541	
-0.14	0.3280086	0.72	0.1801182	0.8654183	0.0870777	0.0692223	0.633	
-0.12	0.4240023	0.76	0.2976225	0.8832305	0.0901558	0.0688900	0.687	
-0.10	0.5199996	0.80	0.4205810	0.9025098	0.0878575	0.0655206	0.808	
-0.08	0.6160063	0.84	0.5316364	0.9239317	0.0873183	0.0690122	0.852	
-0.06	0.7119907	0.88	0.6500014	0.9427653	0.0916800	0.0695595	0.879	
-0.04	0.8080023	0.92	0.7651123	0.9608890	0.0901561	0.0709372	0.919	
-0.02	0.9039983	0.96	0.8840952	0.9819242	0.0871650	0.0703512	0.961	
0.00	1.0000000	1.00	1.0008698	1.0006576	0.0890854	0.0695023	0.953	
0.02	1.0959953	1.04	1.1152559	1.0243371	0.0908437	0.0723217	0.947	
0.04	1.1919831	1.08	1.2283032	1.0407796	0.0939265	0.0762579	0.910	
0.06	1.2879836	1.12	1.3481767	1.0611095	0.0892616	0.0720229	0.890	
0.08	1.3839910	1.16	1.4670288	1.0756302	0.0925172	0.0716331	0.834	
0.10	1.4799757	1.20	1.5853750	1.0968861	0.0877519	0.0717030	0.799	
0.12	1.5759998	1.24	1.6972301	1.1179204	0.0879218	0.0732167	0.733	
0.14	1.6720136	1.28	1.8137561	1.1372421	0.0891530	0.0741251	0.659	
0.16	1.7679868	1.32	1.9299313	1.1560890	0.0871196	0.0735399	0.555	
0.18	1.8640142	1.36	2.0491267	1.1726797	0.0918190	0.0753918	0.472	
0.20	1.9599359	1.40	2.1656095	1.1927456	0.0898850	0.0746192	0.385	
0.22	2.0560570	1.44	2.2834619	1.2095663	0.0949088	0.0777478	0.294	
0.24	2.1519222	1.48	2.4041431	1.2290620	0.0914131	0.0768046	0.211	
0.26	2.2480337	1.52	2.5149378	1.2521998	0.0958240	0.0794154	0.179	
0.28	2.3440360	1.56	2.6328613	1.2707149	0.0931823	0.0761139	0.109	
0.30	2.4401444	1.60	2.7491262	1.2912096	0.0910834	0.0784252	0.080	
0.32	2.5360126	1.64	2.8713507	1.3097090	0.0904322	0.0768821	0.046	
0.34	2.6319537	1.68	2.9868552	1.3270294	0.0945643	0.0773729	0.032	
0.36	2.7279861	1.72	3.0989000	1.3447077	0.0906211	0.0796505	0.016	
0.38	2.8241733	1.76	3.2216736	1.3638585	0.0937107	0.0787715	0.010	
0.40	2.9199727	1.80	3.3273032	1.3902770	0.0927025	0.0815806	0.009	
0.42	3.0159251	1.84	3.4498962	1.4060228	0.0944640	0.0834200	0.005	
0.44	3.1119678	1.88	3.5684511	1.4272470	0.0960759	0.0832255	0.003	
0.46	3.2079675	1.92	3.6797412	1.4470165	0.0955651	0.0818425	0.001	
0.48	3.3039411	1.96	3.7953907	1.4713378	0.0961068	0.0830373	0.001	
0.50	3.3999945	2.00	3.9150481	1.4868448	0.0985832	0.0854119	0.001	


effect
3
2
1
0
−1
−0.50
−0.25
0.00
0.25
0.50
correlation.coef
colour
true NDE
true NIE


effect
4
2
0
−2
−0.50
−0.25
0.00
0.25
0.50
correlation.coef
colour
est NDE
true NDE


2.0
1.5
1.0
0.5
0.0
effect
−0.50
−0.25
0.00
0.25
0.50
correlation.coef
colour
est NIE
true NIE


Coverage of nominal 95% CI. Nominal=baserat på delta−SE?
coverage
1.00
0.75
0.50
0.25
0.00
−0.50
−0.25
0.00
0.25
0.50
correlation.coef
colour
NDE
NIE