Dealing with Artificially Dichotomized Variables in Meta-Analytic Structural Equation Modeling

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Electronic Supplementary Material 5

Tables with additional results of simulation study 2 (partial mediation)

Table 1

Simulation study 2 (partial mediation): Percentages estimation bias in the direct effects and their standard errors when the predictor variable X was not dichotomized at all and the Pearson product-moment correlation was used

Condition									
DICH	CO	ES	Converged	Bias in β_{MX}	Bias in *SE* of β_{MX}	Bias in β_{YM}	Bias in *SE* of β_{YM}	Bias in β_{YX}	Bias in *SE* of β_{YX}
25	.1	.16	2000	-0.280	0.161	0.094	-3.561	-0.372	-2.226
		.23	2000	-0.233	-3.172	-0.351	-2.501	-0.293	-3.631
		.33	2000	-0.151	-2.819	-0.209	-3.325	0.575	-3.430
	.5	.16	2000	-0.209	0.001	0.008	-1.901	-0.295	-2.244
		.23	2000	-0.269	-1.415	-0.024	-1.535	-0.107	-4.091
		.33	2000	-0.251	0.643	0.004	-2.581	-0.110	-0.714
75	.1	.16	2000	-0.059	-4.799	-0.240	-2.436	0.238	-3.304
		.23	2000	0.037	-1.451	0.032	-3.067	-0.408	1.403
		.33	2000	-0.262	-1.639	-0.195	-0.276	-0.014	3.094
	.5	.16	2000	0.026	0.065	-0.198	-2.038	-0.114	-2.442
		.23	2000	-0.041	-1.055	-0.401	-1.887	-0.037	0.313
		.33	1999	-0.012	-1.872	-0.217	-1.306	-0.096	1.857

Table 1 (Continued)

Condition									
DICH	CO	ES	Converged	Bias in β_{MX}	Bias in *SE* of β_{MX}	Bias in β_{YM}	Bias in *SE* of β_{YM}	Bias in β_{YX}	Bias in *SE* of β_{YX}
100	.1	.16	2000	-0.037	-1.754	-0.271	-2.602	-0.328	-1.934
		.23	2000	0.110	-2.138	-0.370	-2.061	-0.074	-1.959
		.33	2000	-0.196	0.773	-0.186	-0.857	-0.064	-3.614
	.5	.16	2000	-0.039	-1.444	0.124	-2.040	-0.369	0.040
		.23	2000	-0.045	-4.684	-0.110	-0.459	-0.303	-3.621
		.33	2000	-0.101	-1.124	0.259	-1.239	-0.386	-1.778

Note 1. DICH = percentage of primary studies in which X was artificially dichotomized; CO = cut-off point at which X was artificially dichotomized; ES = size of the systematically varied (standardized) path coefficient between X and M; Converged = number of datasets that converged in Stage 1 and Stage 2 of the random-effects TSSEM; Bias in β_{MX} = relative percentage bias in the path coefficient between X and M; Bias in *SE* of β_{MX} = relative percentage bias in the standard error of the path coefficient between X and M; Bias in β_{YM} = relative percentage bias in the path coefficient between M and Y; Bias in *SE* of β_{YM} = relative percentage bias in the standard error of the path coefficient between M and Y; Bias in β_{YX} = relative percentage bias in the path coefficient between X and Y; Bias in *SE* of β_{YX} = relative percentage bias in the standard error of the path coefficient between X and Y.
Note 2. DICH and CO are only labels because in this case X was not dichotomized at all.

Table 2

Simulation study 2 (partial mediation): Percentages estimation bias in the indirect effect and the coverage percentages of the 95% likelihood-based confidence interval when the predictor variable X was not dichotomized at all and the Pearson product-moment correlation was used

Condition					
DICH	CO	ES	Converged	Bias in indirect	Coverage
25	.1	.16	2000	-0.243	94.650
		.23	2000	-0.609	93.950
		.33	2000	-0.389	94.200
	.5	.16	2000	-0.293	94.950
		.23	2000	-0.335	94.500
		.33	2000	-0.284	94.400
75	.1	.16	2000	-0.378	93.850
		.23	2000	-0.001	94.350
		.33	2000	-0.495	94.650
	.5	.16	2000	-0.234	94.650
		.23	2000	-0.511	95.200
		.33	1999	-0.263	94.947
100	.1	.16	2000	-0.373	93.900
		.23	2000	-0.316	94.650
		.33	2000	-0.417	94.400
	.5	.16	2000	0.004	94.850
		.23	2000	-0.218	95.100
		.33	2000	0.123	94.750

Note 1. DICH = percentage of primary studies in which X was artificially dichotomized; CO = cut-off point at which X was artificially dichotomized; ES = size of the systematically varied (standardized) path coefficient between X and M; Converged = number of datasets that converged in Stage 1 and Stage 2 of the random-effects TSSEM; Bias in indirect = relative percentage bias in the indirect effect of X on Y ($\beta_{MX} * \beta_{YM}$); Coverage = percentage of confidence intervals that includes the population parameter of the indirect effect of X on Y.
Note 2. DICH and CO are only labels because in this case X was not dichotomized at all.

Table 3

Simulation study 2 (partial mediation): Coverage percentages of the 95% likelihood-based confidence intervals of the direct effects

Condition			Converged			Coverage β_{MX}			Coverage β_{YM}			Coverage β_{YX}		
DICH	CO	ES	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b
25	.1	.16	2000	2000	2000	94.500	85.000	94.300	93.600	91.950	92.300	93.650	83.300	94.100
		.23	2000	2000	2000	94.300	78.000	92.800	93.850	92.100	92.400	93.250	84.850	93.450
		.33	2000	2000	2000	93.700	63.250	93.450	93.550	90.450	93.050	93.700	85.950	93.850
	.5	.16	2000	2000	2000	94.900	92.150	94.500	93.850	91.950	92.350	93.900	92.200	94.000
		.23	2000	2000	2000	93.950	89.900	93.900	93.650	91.450	92.000	93.500	91.450	94.200
		.33	2000	2000	2000	94.800	83.900	93.500	94.000	91.950	92.600	94.050	92.550	94.000
75	.1	.16	2000	1999	1999	93.350	16.808	93.447	93.400	88.844	92.696	93.850	16.008	94.347
		.23	2000	1999	2000	93.600	2.551	93.150	93.300	85.043	93.450	95.200	15.258	95.100
		.33	2000	1999	2000	94.450	0.050	93.950	94.700	77.789	94.050	94.900	13.507	95.050
	.5	.16	2000	2000	2000	93.850	72.300	94.000	93.900	91.550	92.400	93.700	70.250	92.950
		.23	2000	2000	2000	93.450	51.150	93.100	94.550	90.700	93.200	94.500	70.950	95.000
		.33	1999	1999	2000	94.197	22.811	94.450	94.597	89.095	92.400	94.347	70.135	94.250
100	.1	.16	2000	1990	2000	93.550	0.603	93.650	94.300	87.588	92.550	94.000	0.101	94.350
		.23	2000	1993	2000	93.450	0.000	93.050	94.050	81.234	93.250	94.000	0.351	94.850
		.33	2000	1992	2000	95.300	0.000	94.300	93.800	70.131	92.450	93.600	0.100	92.850

Table 3 (continued)

Condition			Converged			Coverage β_{MX}			Coverage β_{YM}			Coverage β_{YX}		
DICH	CO	ES	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b
	.5	.16	2000	2000	2000	94.400	53.900	93.150	93.600	90.050	92.050	94.950	47.300	94.500
		.23	2000	1998	1998	93.650	24.725	92.893	94.650	88.038	91.992	94.050	48.899	93.093
		.33	2000	1999	2000	93.700	2.201	93.250	93.450	85.243	92.550	94.000	49.275	94.650

Note 1. DICH = percentage of primary studies in which X was artificially dichotomized; CO = cut-off point at which X was artificially dichotomized; ES = size of the systematically varied (standardized) path coefficient between X and M; Converged = number of datasets that converged in Stage 1 and Stage 2 of the random-effects TSSEM; Coverage β_{MX} = percentage of confidence intervals that includes the population parameter of the direct effect between X and M; Coverage β_{YM} = percentage of confidence intervals that includes the population parameter of the direct effect between M and Y; Coverage β_{YX} = percentage of confidence intervals that includes the population parameter of the direct effect between X and Y; *r* = Pearson product-moment correlation; r_{pb} = point-biserial correlation; r_b = biserial correlation.
Note 2. For *r*, DICH and CO are only labels because in this case X was not dichotomized at all.

Table 4

Simulation study 2 (partial mediation): Coverage percentages of the 95% Wald confidence intervals of the direct effects

Condition			Converged			Coverage β_{MX}			Coverage β_{YM}			Coverage β_{YX}		
DICH	CO	ES	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b
25	.1	.16	2000	2000	2000	94.500	85.000	94.300	93.600	91.950	92.300	93.700	83.350	94.200
		.23	2000	2000	2000	94.300	78.000	92.800	93.850	92.050	92.400	93.200	85.050	93.450
		.33	2000	2000	2000	93.700	63.250	93.450	93.600	90.450	93.050	93.650	86.350	93.950
	.5	.16	2000	2000	2000	94.900	92.150	94.500	93.950	91.950	92.400	93.800	92.200	94.050
		.23	2000	2000	2000	93.950	89.900	93.900	93.700	91.550	92.000	93.550	91.650	94.150
		.33	2000	2000	2000	94.800	83.900	93.500	94.000	91.950	92.600	94.050	92.500	94.050
75	.1	.16	2000	1999	1999	93.350	16.808	93.447	93.400	88.844	92.596	93.850	16.108	94.147
		.23	2000	1999	2000	93.600	2.551	93.150	93.350	85.043	93.450	95.200	15.508	95.050
		.33	2000	1999	2000	94.450	0.050	93.950	94.700	77.739	94.000	94.800	13.757	95.100
	.5	.16	2000	2000	2000	93.800	72.300	94.000	93.900	91.550	92.450	93.650	70.300	93.000
		.23	2000	2000	2000	93.450	51.100	93.100	94.600	90.700	93.200	94.450	71.450	95.100
		.33	1999	1999	2000	94.197	22.811	94.450	94.597	89.045	92.450	94.297	70.985	94.150
100	.1	.16	2000	1990	2000	93.550	0.603	93.650	94.300	87.588	92.500	94.100	0.101	94.350
		.23	2000	1993	2000	93.450	0.000	93.050	94.000	81.234	93.300	94.000	0.351	94.750
		.33	2000	1992	2000	95.300	0.000	94.300	93.850	70.131	92.450	93.650	0.100	92.900

Table 4 (continued)

Condition			Converged			Coverage β_{MX}			Coverage β_{YM}			Coverage β_{YX}		
DICH	CO	ES	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b	*r*	r_{pb}	r_b
	.5	.16	2000	2000	2000	94.400	53.900	93.150	93.650	90.050	92.050	94.950	47.550	94.400
		.23	2000	1998	1998	93.650	24.725	92.893	94.700	88.038	92.092	94.100	49.249	93.143
		.33	2000	1999	2000	93.700	2.201	93.250	93.450	85.243	92.550	94.150	49.475	94.650

Note 1. DICH = percentage of primary studies in which X was artificially dichotomized; CO = cut-off point at which X was artificially dichotomized; ES = size of the systematically varied (standardized) path coefficient between X and M; Converged = number of datasets that converged in Stage 1 and Stage 2 of the random-effects TSSEM; Coverage β_{MX} = percentage of confidence intervals that includes the population parameter of the direct effect between X and M; Coverage β_{YM} = percentage of confidence intervals that includes the population parameter of the direct effect between M and Y; Coverage β_{YX} = percentage of confidence intervals that includes the population parameter of the direct effect between X and Y; *r* = Pearson product-moment correlation; r_{pb} = point-biserial correlation; r_b = biserial correlation.
Note 2. For *r*, DICH and CO are only labels because in this case X was not dichotomized at all.

Table 5

Simulation study 2 (partial mediation): Percentage estimation bias in the pooled correlations at Stage 1 of the random-effects TSSEM

Condition			Converged			Bias in pooled ES_{MX}			Bias in pooled ES_{YM}			Bias in pooled ES_{YX}		
DICH	CO	ES	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r
25	.1	.16	2000	2000	2000	-10.552	-0.134	-0.280	-0.260	-0.259	0.008	-10.868	-0.529	-0.348
		.23	2000	2000	2000	-10.502	-0.172	-0.233	-0.408	-0.408	-0.396	-10.696	-0.330	-0.372
		.33	2000	2000	2000	-10.660	-0.299	-0.151	0.053	0.048	-0.108	-10.181	0.430	0.265
	.5	.16	2000	2000	2000	-5.093	-0.015	-0.209	0.009	0.009	-0.058	-5.074	-0.063	-0.295
		.23	2000	2000	2000	-5.249	-0.209	-0.269	-0.021	-0.020	-0.089	-5.181	-0.159	-0.164
		.33	2000	2000	2000	-5.417	-0.361	-0.251	-0.166	-0.167	-0.076	-5.304	-0.248	-0.166
75	.1	.16	1999	1999	2000	-31.490	-0.424	-0.059	0.034	0.036	-0.221	-30.954	0.161	0.123
		.23	1999	2000	2000	-31.300	-0.163	0.037	0.328	0.329	-0.038	-31.232	-0.034	-0.307
		.33	1999	2000	2000	-31.200	-0.069	-0.262	0.035	0.044	-0.227	-31.223	0.016	-0.169
	.5	.16	2000	2000	2000	-15.078	0.060	0.026	-0.335	-0.335	-0.208	-15.129	0.028	-0.136
		.23	2000	2000	2000	-15.200	-0.068	-0.041	0.018	0.019	-0.370	-15.123	-0.002	-0.155
		.33	1999	2000	1999	-15.184	0.002	-0.012	-0.376	-0.376	-0.211	-15.135	-0.058	-0.150
100	.1	.16	1990	2000	2000	-41.399	0.207	-0.037	-0.495	-0.469	-0.299	-41.464	0.043	-0.337
		.23	1993	2000	2000	-41.450	0.008	0.110	-0.292	-0.291	-0.331	-41.696	-0.362	-0.135
		.33	1992	2000	2000	-41.680	-0.326	-0.196	-0.136	-0.134	-0.215	-41.591	-0.108	-0.178

Table 5 (continued)

Condition			Converged			Bias in pooled ES_{MX}			Bias in pooled ES_{YM}			Bias in pooled ES_{YX}		
DICH	CO	ES	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r
	.5	.16	2000	2000	2000	-19.999	0.247	-0.039	0.107	0.107	0.054	-20.373	-0.205	-0.299
		.23	1998	1998	2000	-20.201	0.010	-0.045	-0.138	-0.137	-0.163	-20.425	-0.269	-0.282
		.33	1999	2000	2000	-20.472	-0.336	-0.101	-0.012	-0.012	0.106	-20.207	-0.009	-0.222

Note 1. DICH = percentage of primary studies in which X was artificially dichotomized; CO = cut-off point at which X was artificially dichotomized; ES = size of the systematically varied (standardized) path coefficient between X and M; Converged = number of datasets that converged in Stage 1 and Stage 2 of the random-effects TSSEM; r_{pb} = point-biserial correlation; r_b = biserial correlation; r = Pearson product-moment correlation; Bias in pooled ES_{MX} = relative percentage bias in the pooled correlation between X and M at Stage 1; Bias in pooled ES_{YM} = relative percentage bias in the pooled correlation between M and Y at Stage 1; Bias in pooled ES_{YX} = relative percentage bias in the pooled correlation between X and Y at Stage 1.
Note 2. For r, DICH and CO are only labels because in this case X was not dichotomized at all.

Table 6

Simulation study 2 (partial mediation): Percentage estimation bias in the standard errors of the pooled correlations at Stage 1 of the random-effects TSSEM

Condition			Converged			Bias in *SE* of pooled ES_{MX}			Bias in *SE* of pooled ES_{YM}			Bias in *SE* of pooled ES_{YX}		
DICH	CO	ES	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r
25	.1	.16	2000	2000	2000	0.967	-0.193	0.161	-5.724	-5.716	-4.008	-2.141	-5.145	-3.506
		.23	2000	2000	2000	0.715	-4.349	-3.172	-4.627	-4.629	-2.578	0.595	-4.171	-2.806
		.33	2000	2000	2000	5.625	-2.604	-2.819	-4.451	-4.430	-2.998	2.982	-2.505	-2.894
	.5	.16	2000	2000	2000	-0.537	-1.059	0.001	-6.124	-6.119	-1.471	-2.511	-3.862	-2.738
		.23	2000	2000	2000	-0.237	-1.699	-1.415	-7.482	-7.476	-2.425	-3.711	-4.450	-5.108
		.33	2000	2000	2000	1.479	-0.373	0.643	-5.689	-5.626	-1.996	-0.106	-1.707	-0.519
75	.1	.16	1999	1999	2000	-2.142	-4.435	-4.799	-3.965	-3.920	-2.111	3.075	-2.460	-2.438
		.23	1999	2000	2000	2.734	-2.228	-1.451	-3.468	-3.503	-2.896	6.127	0.946	1.024
		.33	1999	2000	2000	11.733	-1.323	-1.639	-2.999	-2.997	-1.408	8.215	1.299	2.576
	.5	.16	2000	2000	2000	-1.447	-1.982	0.065	-6.339	-6.339	-2.180	-2.159	-2.898	-1.909
		.23	2000	2000	2000	-1.002	-2.605	-1.055	-2.558	-2.566	-0.643	2.119	0.205	0.715
		.33	1999	2000	1999	-0.056	-1.666	-1.872	-5.164	-5.167	-1.946	0.329	-1.649	1.415
100	.1	.16	1990	2000	2000	-2.694	-2.929	-1.754	-4.564	-4.481	-2.830	-2.646	-2.699	-1.975
		.23	1993	2000	2000	-3.123	-2.784	-2.138	-4.330	-4.418	-2.210	-2.546	-2.307	-2.354
		.33	1992	2000	2000	-0.554	-0.987	0.773	-5.053	-5.054	-0.371	-5.600	-4.794	-3.971

Table 6 (continued)

Condition			Converged			Bias in *SE* of pooled ES_{MX}			Bias in *SE* of pooled ES_{YM}			Bias in *SE* of pooled ES_{YX}		
DICH	CO	ES	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r
	.5	.16	2000	2000	2000	-1.204	-1.007	-1.444	-8.092	-8.094	-2.752	-2.186	-2.274	-0.958
		.23	1998	1998	2000	-5.508	-5.169	-4.684	-6.318	-6.323	-0.057	-4.431	-4.420	-3.465
		.33	1999	2000	2000	-2.937	-2.883	-1.124	-4.540	-4.520	-0.413	-0.837	-0.863	-1.564

Note 1. DICH = percentage of primary studies in which X was artificially dichotomized; CO = cut-off point at which X was artificially dichotomized; ES = size of the systematically varied (standardized) path coefficient between X and M; Converged = number of datasets that converged in Stage 1 and Stage 2 of the random-effects TSSEM; r_{pb} = point-biserial; r_b = biserial correlation; r = Pearson product-moment correlation; Bias in *SE* of pooled ES_{MX}= relative percentage bias in the standard error of the pooled correlation between X and M at Stage 1; Bias in *SE* of pooled ES_{YM}= relative percentage bias in the standard error of the pooled correlation between M and Y at Stage 1; Bias in *SE* of pooled ES_{YX}= relative percentage bias in the standard error of the pooled correlation between X and Y at Stage 1.
Note 2. For *r*, DICH and CO are only labels because in this case X was not dichotomized at all.

Table 7

Simulation study 2 (partial mediation): Percentage estimation bias in the between-studies variances at Stage 1 of the random-effects TSSEM

Condition			Converged			Bias in τ^2_{MX}			Bias in τ^2_{YM}			Bias in τ^2_{YX}		
DICH	CO	ES	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r
25	.1	.16	2000	2000	2000	-13.433	7.262	-2.994	-10.424	-10.442	-3.529	-9.445	6.836	-3.658
		.23	2000	2000	2000	-6.412	5.071	-4.103	-10.453	-10.473	-3.359	-6.894	7.326	-2.712
		.33	2000	2000	2000	10.720	3.758	-4.029	-10.267	-10.258	-2.702	-5.499	6.225	-3.617
	.5	.16	2000	2000	2000	-13.431	-2.900	-3.509	-10.550	-10.572	-3.886	-12.219	-2.705	-3.794
		.23	2000	2000	2000	-10.778	-2.264	-3.366	-9.750	-9.768	-2.559	-10.182	-1.154	-2.542
		.33	2000	2000	2000	-8.477	-4.101	-2.933	-10.898	-10.904	-3.099	-10.172	-1.763	-2.345
75	.1	.16	1999	1999	2000	-45.33	33.719	-2.669	-8.294	-8.279	-2.539	-40.730	32.026	-3.041
		.23	1999	2000	2000	-37.104	32.046	-2.315	-10.332	-10.471	-3.533	-39.119	33.027	-2.804
		.33	1999	2000	2000	-20.683	28.932	-2.783	-9.893	-9.947	-2.497	-37.036	31.420	-2.445
	.5	.16	2000	2000	2000	-31.031	4.010	-3.589	-9.866	-9.859	-3.812	-28.273	6.294	-3.150
		.23	2000	2000	2000	-29.279	3.690	-3.183	-11.278	-11.252	-3.395	-27.807	5.774	-3.284
		.33	1999	2000	1999	-26.795	1.381	-3.807	-11.379	-11.392	-3.965	-27.947	4.621	-3.772
100	.1	.16	1990	2000	2000	-69.341	43.081	-3.818	-9.343	-9.435	-2.332	-68.462	46.320	-3.138
		.23	1993	2000	2000	-69.259	43.572	-3.522	-11.035	-11.105	-3.659	-68.565	45.641	-2.455
		.33	1992	2000	2000	-70.787	38.545	-4.102	-10.840	-10.883	-3.611	-69.684	42.185	-3.965

Table 7 (continued)

Condition			Converged			Bias in τ^2_{MX}			Bias in τ^2_{YM}			Bias in τ^2_{YX}		
DICH	CO	ES	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r	r_{pb}	r_b	r
	.5	.16	2000	2000	2000	-40.812	8.948	-3.885	-12.063	-12.058	-4.681	-40.442	9.515	-4.010
		.23	1998	1998	2000	-41.709	7.494	-4.097	-9.759	-9.757	-2.730	-40.850	8.602	-4.161
		.33	1999	2000	2000	-42.483	5.995	-2.782	-11.020	-11.034	-2.877	-40.909	8.566	-3.866

Note 1. DICH = percentage of primary studies in which X was artificially dichotomized; CO = cut-off point at which X was artificially dichotomized; ES = size of the systematically varied (standardized) path coefficient between X and M; Converged = number of datasets that converged in Stage 1 and Stage 2 of the random-effects TSSEM; r_{pb} = point-biserial correlation; r_b = biserial correlation; r = Pearson product-moment correlation; Bias in τ^2_{MX} = relative percentage bias in the between-study variance of the correlation coefficient between X and M at Stage 1; Bias in τ^2_{YM} = relative percentage bias in the between-study variance of correlation coefficient between M and Y at Stage 1; Bias in τ^2_{YX} = relative percentage bias in the between-study variance of correlation coefficient between X and Y at Stage 1.
Note 2. For r, DICH and CO are only labels because in this case X was not dichotomized at.