Supplementary Tables for Clark and Barr (2017): Root Mean Squared Errors of Relative Risk Estimators in Simulation Study when $n = 1000$

Note that there are some very large root mean squared errors in some tables, for the logistic and other models, when the true relative risk is large. This is because the parameter estimates are effectively infinite in some samples. This can occur in binary regression when all of the $Y = 1$ instances occur at higher values of a covariate than all of the $Y = 0$ instances (Hosmer et. al 2013, section 4.4). This typically occurs only when the sample size is small and the covariates have strong predictive power.

Table 1: Root mean squared errors (RMSEs) of relative risk (RR) estimators for $x_1 = 1$ vs $x_1 = -1$ when logit$(P[Y = 1]) = \alpha + \beta_1 x_1 + \beta_2 x_2$. Sample size is 1000. $x_1 \sim$binary (values ± 1 with equal probability), $x_2 \sim N(0, 1)$. *Median prob* refers to the probability that $Y = 1$ when both covariates are at their median value. *Logit, log, poisson and log-logit* refer to binary regression with logit link (logistic regression) and log link, Poisson regression with log link and binary regression with blended log-logit link, respectively. *Prob.reject* is the simulation probability (%) of rejecting the null that the cutover probability is 0.8 in the blended log-logit model.

median prob.	true RR	rmse of estimated RR				prob.reject (%)
		logit	log	poisson	log-logit	
0.3	1.200	0.116	0.113	0.112	0.112	0.1
0.3	1.500	0.147	0.142	0.143	0.142	0.4
0.3	3.000	0.345	0.330	0.329	0.330	5.2
0.5	1.200	0.078	0.075	0.075	0.076	7.9
0.5	1.500	0.101	0.103	0.098	0.102	20.8
0.5	3.000	0.255	0.261	0.247	0.255	56.5

Table 2: Root mean squared errors (RMSEs) of relative risk (RR) estimators for $x_1 = 0.5$ vs $x_1 = -0.5$ when logit$(P[Y = 1]) = \alpha + \beta_1 x_1 + \beta_2 x_2$. Sample size is 1000. $x_1 \sim N(0,1)$, $x_2 \sim N(0,1)$. *Median prob* refers to the probability that $Y = 1$ when both covariates are at their median value. *Logit, log, poisson and log-logit* refer to binary regression with logit link (logistic regression) and log link, Poisson regression with log link and binary regression with blended log-logit link, respectively. *Prob.reject* is the simulation probability (%) of rejecting the null that the cutover probability is 0.8 in the blended log-logit model.

median prob.	true RR	rmse of estimated RR				prob.reject (%)
		logit	log	poisson	log-logit	
0.3	1.200	0.061	0.053	0.057	0.057	0.2
0.3	1.500	0.086	0.169	0.083	0.100	24.8
0.3	3.000	0.283	1.572	0.968	0.816	97.1
0.5	1.200	0.042	0.088	0.039	0.042	24.7
0.5	1.500	0.064	0.268	0.094	0.103	82.1
0.5	3.000	0.273	1.731	1.131	0.518	99.8

Table 3: Root mean squared errors (RMSEs) of relative risk (RR) estimators for $x_1 = 2$ vs $x_1 = 1$ when logit$(P[Y = 1]) = \alpha + \beta_1 x_1 + \beta_2 x_2$. Sample size is 1000. $x_1 \sim N(0,1)$, $x_2 \sim N(0,1)$. *Median prob* refers to the probability that $Y = 1$ when both covariates are at their median value. *Logit, log, poisson and log-logit* refer to binary regression with logit link (logistic regression) and log link, Poisson regression with log link and binary regression with blended log-logit link, respectively. *Prob.reject* is the simulation probability (%) of rejecting the null that the cutover probability is 0.8 in the blended log-logit model.

median prob.	true RR	rmse of estimated RR				prob.reject (%)
		logit	log	poisson	log-logit	
0.3	1.173	0.045	0.051	0.060	0.059	0.2
0.3	1.332	0.035	0.056	0.132	0.110	24.8
0.3	1.346	0.029	0.105	0.694	0.264	97.1
0.5	1.098	0.014	0.175	0.776	0.042	99.8
0.5	1.143	0.020	0.039	0.058	0.051	24.7
0.5	1.206	0.013	0.045	0.214	0.144	82.1

Table 4: Root mean squared errors (RMSEs) of relative risk (RR) estimators for $x_1 = -1$ vs $x_1 = -2$ when logit$(P[Y = 1]) = \alpha + \beta_1 x_1 + \beta_2 x_2$. Sample size is 1000. $x_1 \sim N(0, 1)$, $x_2 \sim N(0, 1)$. *Median prob* refers to the probability that $Y = 1$ when both covariates are at their median value. *Logit, log, poisson and log-logit* refer to binary regression with logit link (logistic regression) and log link, Poisson regression with log link and binary regression with blended log-logit link, respectively. *Prob.reject* is the simulation probability (%) of rejecting the null that the cutover probability is 0.8 in the blended log-logit model.

median prob.	true RR	rmse of estimated RR				prob.reject (%)
		logit	log	poisson	log-logit	
0.3	1.224	0.075	0.065	0.064	0.065	0.2
0.3	1.634	0.125	0.299	0.198	0.221	24.8
0.3	4.583	0.576	3.154	2.549	2.392	97.1
0.5	1.260	0.067	0.145	0.080	0.089	24.7
0.5	1.865	0.148	0.632	0.451	0.459	82.1
0.5	8.200	1.373	6.931	6.329	5.685	99.8

Table 5: Root mean squared errors (RMSEs) of relative risk (RR) estimators for $x_1 = 0.5$ vs $x_1 = -0.5$ when logit$(P[Y = 1]) = \alpha + \beta_1 x_1 + \beta_2 x_2$. Sample size is 1000. $x_1 \sim t_4/\sqrt{2}$, $x_2 \sim N(0, 1)$. *Median prob* refers to the probability that $Y = 1$ when both covariates are at their median value. *Logit, log, poisson and log-logit* refer to binary regression with logit link (logistic regression) and log link, Poisson regression with log link and binary regression with blended log-logit link, respectively. *Prob.reject* is the simulation probability (%) of rejecting the null that the cutover probability is 0.8 in the blended log-logit model.

median prob.	true RR	rmse of estimated RR				prob.reject (%)
		logit	log	poisson	log-logit	
0.3	1.200	0.063	0.082	0.055	0.057	2.5
0.3	1.500	0.090	0.315	0.145	0.126	39.1
0.3	3.000	0.302	1.779	1.333	0.805	96.2
0.5	1.200	0.044	0.139	0.043	0.045	29.4
0.5	1.500	0.071	0.389	0.171	0.109	77.5
0.5	3.000	0.276	1.860	1.423	0.526	99.4

Table 6: Root mean squared errors (RMSEs) of relative risk (RR) estimators for $x_1 = 2$ vs $x_1 = 1$ when logit$(P[Y = 1]) = \alpha + \beta_1 x_1 + \beta_2 x_2$. Sample size is 1000. $x_1 \sim t_4/\sqrt{2}$, $x_2 \sim N(0,1)$. *Median prob* refers to the probability that $Y = 1$ when both covariates are at their median value. *Logit, log, poisson and log-logit* refer to binary regression with logit link (logistic regression) and log link, Poisson regression with log link and binary regression with blended log-logit link, respectively. *Prob.reject* is the simulation probability (%) of rejecting the null that the cutover probability is 0.8 in the blended log-logit model.

median prob.	true RR	rmse of estimated RR				prob.reject (%)
		logit	log	poisson	log-logit	
0.3	1.173	0.045	0.061	0.054	0.053	2.5
0.3	1.332	0.035	0.155	0.082	0.090	39.1
0.3	1.346	0.029	0.143	0.369	0.229	96.2
0.5	1.098	0.015	0.062	0.503	0.049	99.4
0.5	1.143	0.020	0.084	0.048	0.049	29.4
0.5	1.206	0.012	0.103	0.145	0.133	77.5

Table 7: Root mean squared errors (RMSEs) of relative risk (RR) estimators for $x_1 = -1$ vs $x_1 = -2$ when logit$(P[Y = 1]) = \alpha + \beta_1 x_1 + \beta_2 x_2$. Sample size is 1000. $x_1 \sim t_4/\sqrt{2}$, $x_2 \sim N(0,1)$. *Median prob* refers to the probability that $Y = 1$ when both covariates are at their median value. *Logit, log, poisson and log-logit* refer to binary regression with logit link (logistic regression) and log link, Poisson regression with log link and binary regression with blended log-logit link, respectively. *Prob.reject* is the simulation probability (%) of rejecting the null that the cutover probability is 0.8 in the blended log-logit model.

median prob.	true RR	rmse of estimated RR				prob.reject (%)
		logit	log	poisson	log-logit	
0.3	1.224	0.078	0.103	0.067	0.069	2.5
0.3	1.634	0.133	0.447	0.270	0.251	39.1
0.3	4.583	0.657	3.361	2.911	2.378	96.2
0.5	1.260	0.071	0.198	0.092	0.093	29.4
0.5	1.865	0.171	0.754	0.530	0.462	77.5
0.5	8.200	1.518	7.060	6.618	5.691	99.4

Table 8: Root mean squared errors (RMSEs) of relative risk (RR) estimators for $x_1 = 0.5$ vs $x_1 = -0.5$ when logit$(P[Y = 1]) = \alpha + \beta_1 x_1 + \beta_2 x_2$. Sample size is 1000. $x_1 \sim U(-\sqrt{3}, -\sqrt{3})$, $x_2 \sim N(0, 1)$. *Median prob* refers to the probability that $Y = 1$ when both covariates are at their median value. *Logit, log, poisson and log-logit* refer to binary regression with logit link (logistic regression) and log link, Poisson regression with log link and binary regression with blended log-logit link, respectively. *Prob.reject* is the simulation probability (%) of rejecting the null that the cutover probability is 0.8 in the blended log-logit model.

median prob.	true RR	rmse of estimated RR				prob.reject (%)
		logit	log	poisson	log-logit	
0.3	1.200	0.059	0.056	0.056	0.056	0.4
0.3	1.500	0.082	0.080	0.075	0.079	10.0
0.3	3.000	0.266	0.958	0.668	0.760	98.1
0.5	1.200	0.041	0.047	0.039	0.041	22.3
0.5	1.500	0.061	0.129	0.069	0.087	76.6
0.5	3.000	0.241	1.348	0.850	0.510	99.8

Table 9: Root mean squared errors (RMSEs) of relative risk (RR) estimators for $x_1 = 2$ vs $x_1 = 1$ when logit$(P[Y = 1]) = \alpha + \beta_1 x_1 + \beta_2 x_2$. Sample size is 1000. $x_1 \sim U(-\sqrt{3}, -\sqrt{3})$, $x_2 \sim N(0, 1)$. *Median prob* refers to the probability that $Y = 1$ when both covariates are at their median value. *Logit, log, poisson and log-logit* refer to binary regression with logit link (logistic regression) and log link, Poisson regression with log link and binary regression with blended log-logit link, respectively. *Prob.reject* is the simulation probability (%) of rejecting the null that the cutover probability is 0.8 in the blended log-logit model.

median prob.	true RR	rmse of estimated RR				prob.reject (%)
		logit	log	poisson	log-logit	
0.3	1.173	0.043	0.059	0.061	0.060	0.4
0.3	1.332	0.033	0.140	0.157	0.144	10.0
0.3	1.346	0.028	0.703	1.000	0.279	98.1
0.5	1.098	0.014	0.556	1.057	0.034	99.8
0.5	1.143	0.020	0.042	0.060	0.053	22.3
0.5	1.206	0.012	0.177	0.249	0.150	76.6

Table 10: Root mean squared errors (RMSEs) of relative risk (RR) estimators for $x_1 = -1$ vs $x_1 = -2$ when logit$(P[Y = 1]) = \alpha + \beta_1 x_1 + \beta_2 x_2$. Sample size is 1000. $x_1 \sim U(-\sqrt{3}, -\sqrt{3})$, $x_2 \sim N(0, 1)$. *Median prob* refers to the probability that $Y = 1$ when both covariates are at their median value. *Logit, log, poisson and log-logit* refer to binary regression with logit link (logistic regression) and log link, Poisson regression with log link and binary regression with blended log-logit link, respectively. *Prob.reject* is the simulation probability (%) of rejecting the null that the cutover probability is 0.8 in the blended log-logit model.

median prob.	true RR	rmse of estimated RR				prob.reject (%)
		logit	log	poisson	log-logit	
0.3	1.224	0.073	0.063	0.062	0.063	0.4
0.3	1.634	0.120	0.191	0.176	0.187	10.0
0.3	4.583	0.530	2.540	2.246	2.336	98.1
0.5	1.260	0.065	0.098	0.079	0.086	22.3
0.5	1.865	0.142	0.489	0.418	0.441	76.6
0.5	8.200	1.200	6.548	6.048	5.683	99.8