Supplementary Tables for Clark and Barr (2017): Standard Deviations of Relative Risk Estimators in Simulation Study when $n = 500$

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: Standard deviations (SDs) 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 ∼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	bias of estimated RR				prob.reject
		logit	log	poisson	log-logit	
0.3	1.200	0.168	0.163	0.164	0.163	0.0
0.3	1.500	0.212	0.204	0.205	0.204	0.0
0.3	3.000	0.498	0.475	0.476	0.475	0.9
0.5	1.200	0.112	0.104	0.107	0.105	2.8
0.5	1.500	0.146	0.136	0.138	0.137	9.3
0.5	3.000	0.359	0.332	0.330	0.335	28.9

Table 2: Standard deviations (SDs) 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	bias of estimated RR				prob.reject
		logit	log	poisson	log-logit	
0.3	1.200	0.086	0.070	0.079	0.078	0.4
0.3	1.500	0.123	0.074	0.090	0.089	11.5
0.3	3.000	0.424	0.085	0.114	0.198	86.4
0.5	1.200	0.060	0.039	0.052	0.050	9.2
0.5	1.500	0.090	0.046	0.057	0.070	53.8
0.5	3.000	0.383	0.049	0.082	0.280	93.4

Table 3: Standard deviations (SDs) 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	bias of estimated RR				prob.reject
		logit	log	poisson	log-logit	
0.3	1.173	0.062	0.070	0.079	0.078	0.4
0.3	1.332	0.049	0.074	0.090	0.089	11.5
0.3	1.346	0.040	0.085	0.114	0.098	86.4
0.5	1.098	0.020	0.049	0.082	0.029	93.4
0.5	1.143	0.028	0.039	0.052	0.050	9.2
0.5	1.206	0.018	0.046	0.057	0.037	53.8

Table 4: Standard deviations (SDs) 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	bias of estimated RR				prob.reject
		logit	log	poisson	log-logit	
0.3	1.224	0.107	0.070	0.079	0.078	0.4
0.3	1.634	0.180	0.074	0.090	0.089	11.5
0.3	4.583	0.860	0.085	0.114	0.198	86.4
0.5	1.260	0.096	0.039	0.052	0.050	9.2
0.5	1.865	0.213	0.046	0.057	0.070	53.8
0.5	8.200	1.999	0.049	0.082	0.280	93.4

Table 5: Standard deviations (SDs) 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	bias of estimated RR				prob.reject
		logit	log	poisson	log-logit	
0.3	1.200	0.092	0.063	0.078	0.079	0.2
0.3	1.500	0.128	0.083	0.093	0.095	15.6
0.3	3.000	0.437	0.101	0.198	0.228	76.3
0.5	1.200	0.063	0.038	0.052	0.055	11.1
0.5	1.500	0.100	0.057	0.075	0.082	51.0
0.5	3.000	0.375	0.060	0.156	0.271	92.7

Table 6: Standard deviations (SDs) 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	bias of estimated RR				prob.reject
		logit	log	poisson	log-logit	
0.3	1.173	0.066	0.063	0.078	0.079	0.2
0.3	1.332	0.050	0.083	0.093	0.095	15.6
0.3	1.346	0.042	0.101	0.198	0.114	76.3
0.5	1.098	0.021	0.060	0.156	0.027	92.7
0.5	1.143	0.030	0.038	0.052	0.054	11.1
0.5	1.206	0.018	0.057	0.075	0.039	51.0

Table 7: Standard deviations (SDs) 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	bias of estimated RR				prob.reject
		logit	log	poisson	log-logit	
0.3	1.224	0.114	0.063	0.078	0.079	0.2
0.3	1.634	0.189	0.083	0.093	0.095	15.6
0.3	4.583	0.926	0.101	0.198	0.228	76.3
0.5	1.260	0.101	0.038	0.052	0.055	11.1
0.5	1.865	0.237	0.057	0.075	0.082	51.0
0.5	8.200	2.101	0.060	0.156	0.271	92.7

Table 8: Standard deviations (SDs) 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	bias of estimated RR				prob.reject
		logit	log	poisson	log-logit	
0.3	1.200	0.087	0.081	0.082	0.081	0.0
0.3	1.500	0.116	0.092	0.098	0.095	2.8
0.3	3.000	0.388	0.101	0.150	0.172	84.3
0.5	1.200	0.057	0.047	0.052	0.051	8.6
0.5	1.500	0.085	0.056	0.066	0.067	46.7
0.5	3.000	0.363	0.049	0.099	0.260	96.0

Table 9: Standard deviations (SDs) 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	bias of estimated RR				prob.reject
		logit	log	poisson	log-logit	
0.3	1.173	0.062	0.081	0.082	0.081	0.0
0.3	1.332	0.046	0.092	0.098	0.095	2.8
0.3	1.346	0.038	0.101	0.150	0.084	84.3
0.5	1.098	0.019	0.049	0.099	0.031	96.0
0.5	1.143	0.027	0.047	0.052	0.051	8.6
0.5	1.206	0.017	0.056	0.066	0.035	46.7

Table 10: Standard deviations (SDs) 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	bias of estimated RR				prob.reject
		logit	log	poisson	log-logit	
0.3	1.224	0.107	0.081	0.082	0.081	0.0
0.3	1.634	0.170	0.092	0.098	0.095	2.8
0.3	4.583	0.774	0.101	0.150	0.172	84.3
0.5	1.260	0.092	0.047	0.052	0.051	8.6
0.5	1.865	0.201	0.056	0.066	0.067	46.7
0.5	8.200	1.884	0.049	0.099	0.260	96.0