

Table S1

Summary of Data Generation Mechanisms and Corresponding Data Analytical Procedures

	Data generation	Fitted model	Estimation method (statistical test)
Count data	Negative binomial	Poisson	Laplace in R (Wald test) and pseudo likelihood in SAS (t test with Kenward-Roger)
		Negative binomial	
		OLRE	
	OLRE	Poisson	Laplace in R (Wald test) and pseudo likelihood in SAS (t test with Kenward-Roger)
		Negative binomial	
		OLRE	
Proportion data	Beta-binomial	Binomial	Laplace in R (Wald test) and pseudo likelihood in SAS (t test with Kenward-Roger)
		Beta-binomial ^a	
		OLRE	
	OLRE	Binomial	Laplace in R (Wald test) and pseudo likelihood in SAS (t test with Kenward-Roger)
		Beta-binomial ^a	
		OLRE	

Note. ^a Beta-binomial distribution is not available in the SAS GLIMMIX Procedure.

Table S2

Summary of Design Factors and Conditions for Simulated Count Data with Basic Models.

Parameter	Value	Rationale
Series length (I)	10 (start points of the treatment: 3, 4, 6, 7)	Typical SCED setting
	20 (start points of the treatment: 6, 8, 12, 14)	
Number of cases	4 or 8	Typical SCED setting
γ_{10}	log (1.00), log (1.50) or log (3.00)	Zero, medium, and large immediate treatment effects
σ_{u0}^2	0.1	Meta-analytical results of SCEDs with count data
σ_{u1}^2	0.1	
Negative binomial model		
$[\gamma_{00}, \theta]$	[log (5), Inf], [log (5), 10.00] [log (5), 5.00] or [log (5), 3.33]	Baseline level: $\exp(\gamma_{00}) = 5.00$ Dispersion ratio: 1.0, 1.5, 2.0, 2.5
OLRE model		
$[\gamma_{00}, \sigma_e^2]$	[log (5), 0], [log (4.77), 0.095], [log (4.57), 0.182] or [log (4.39), 0.262]	Baseline level: $\exp(\gamma_{00} + \sigma_e^2/2) = 5.00$ Dispersion ratio: 1.0, 1.5, 2.0, 2.5

Note. OLRE = observation-level random effects. In total, 48 conditions were generated based on the negative binomial and OLRE model, respectively.

Table S3*Summary of Design Factors and Conditions for Simulated Proportion Data with Basic Models*

Parameter	Value	Rationale
Series length (I)	10 (starting points of the intervention: 3, 4, 6, 7)	Typical SCED setting
	20 (starting points of the intervention: 6, 8, 12, 14)	
Number of cases	4 or 8	Typical SCED setting
γ_{10}	log (1.00), log (1.44) or log (4.27)	Zero, medium, and large immediate treatment effects
σ_{u0}^2	0.1	Meta-analytical results of SCEDs with proportion data
σ_{u1}^2	0.1	
Beta-binomial model		
$[\gamma_{00}, \theta]$	[log (0.33), 0], [log (0.33), 0.036], [log (0.33), 0.074] or [log (0.33), 0.115]	Baseline level: odds = $\exp(\gamma_{00}) = 0.33$, probability = 0.25 Dispersion ratio: 1.0, 2.0, 3.0, 4.0
OLRE model		
$[\gamma_{00}, \sigma_e^2]$	[log (0.33), 0], [log (0.33), 0.185], [log (0.33), 0.370] or [log (0.33), 0.555]	Baseline level: odds = $\exp(\gamma_{00}) = 0.33$, probability = 0.25 Dispersion ratio: 1.0, 2.0, 3.0, 4.0

Note. OLRE = observation-level random effects. In total, 48 conditions were generated based on the beta-binomial and OLRE model, respectively.

Table S4*Bias, Coverage Rate, and Hit Rate of Basic Models for Count Data*

Data generation mechanism	Performance	Dispersion ratio	Laplace approximation			Pseudo-likelihood		
			Poisson	Negative binomial	OLRE	Poisson	Negative binomial	OLRE
Count (Negative binomial)	Bias		−0.005	−0.003	<.001	−0.005	−0.003	−0.008
	Coverage rate		.866	.896	.864	.942	.948	.949
			Chi-squared	AIC	BIC			
	Hit rate	= 1.0	.969	.934	.983			
		> 1.0	.728	.956	.917			
			Poisson	Negative binomial	OLRE	Poisson	Negative binomial	OLRE
Count (OLRE)	Bias		−0.003	−0.001	0.002	−0.002	<.001	−0.005
	Coverage rate		.868	.895	.867	.942	.947	.947
			Chi-squared	AIC	BIC			
	Hit rate	= 1.0	.972	.936	.984			
		> 1.0	.704	.949	.906			

Note. OLRE = observation-level random effects.

Table S5

Type I Error Rates of Tests for Immediate Treatment Effect for Count Data with Basic Models

Data generation mechanism	Laplace approximation			Pseudo-likelihood		
	Poisson	Negative binomial	OLRE	Poisson	Negative binomial	OLRE
Count (Negative binomial)	.130	.102	.135	.057	.050	.051
Count (OLRE)	.129	.102	.132	.058	.053	.052

Note. OLRE = observation-level random effects.

Table S6*Bias, Coverage Rate, and Hit Rate of Basic Models for Proportion Data*

Data generation mechanism	Performance	Dispersion ratio	Laplace approximation		Pseudo-likelihood	
			Binomial	OLRE	Binomial	OLRE
Proportion (Beta-binomial)	Relative bias	1.0	<.001	0.002	<.001	<.001
		2.0	0.003	0.025	0.002	0.013
		3.0	0.001	0.048	<.001	0.030
		4.0	0.005	0.080	0.005	0.056
	Coverage rate	1.0	.887	.890	.949	.948
		2.0	.865	.892	.942	.946
		3.0	.847	.891	.937	.945
		4.0	.848	.887	.938	.940
	Hit rate		Chi-squared	AIC	BIC	
		= 1.0	.973	.941	.987	
		> 1.0	.932	.990	.979	
			Binomial	OLRE	Binomial	OLRE
Proportion (OLRE)	Relative bias	1.0	0.001	0.003	0.001	0.002
		2.0	−0.022	<.001	−0.022	−0.001
		3.0	−0.043	−0.002	−0.044	−0.012
		4.0	−0.060	−0.001	−0.060	−0.021
	Coverage rate	1.0	.885	.888	.949	.948
		2.0	.854	.899	.939	.946
		3.0	.843	.918	.931	.953
		4.0	.822	.915	.924	.949
	Hit rate		Chi-squared	AIC	BIC	
		= 1.0	.969	.938	.987	
		> 1.0	.921	.991	.980	
			Binomial	OLRE	Binomial	OLRE

Note. OLRE = observation-level random effects.

Table S7

Type I Error Rates of Tests for Immediate Treatment Effect for Proportion Data with Basic Models

Data generation mechanism	Laplace approximation		Pseudo-likelihood	
	Binomial	OLRE	Binomial	OLRE
Proportion (Beta-binomial)	.140	.101	.058	.053
Proportion (OLRE)	.139	.098	.060	.052

Note. OLRE = observation-level random effects.