APPENDIX E

VARIANCE AND POWER TABLES

In these tables, we assume 80 percent power and various sample and subgroup sizes, and different assumptions about the impact of weighting and clustering on the variance of estimates from the child assessments. We assume an intracluster correlation of .05 and, for the change over time estimates, an average correlation between measures at baseline and age 3 of 0.5. We also adjust the nominal sample size for design effects due to clustering and unequal weighting according to the oversampling design, using a stratified variance formula, to yield the effective sample sizes in the table.

As depicted in Table E.3, at the child level, if we compared normalized assessment scores (mean of 100, standard deviation of 15) of perinatal cohort children at age 3 for two approximately equal-sized program-defined subgroups (that is, each having about half the programs, 45 out of 90, and about half the total sample, or about 184 children), this design would allow us to detect a minimum difference of 4.4 points with 80 percent power (or an effect size of .29). Table E.4 shows comparable minimum differences for subgroups defined at the child level, where all 90 programs would be included. One would use Table E.3 to get sense of what size differences in program-level variables (for example, home- vs. center-based or average teacher education level) would need to be observed to be significant predictors of child-level assessment outcomes in a regression model. Table E.4 gives a sense of what size differences in child-level variables (for example, attendance rate) would need to be observed to be significant predictors of child-level assessment outcomes. Classroom-level predictors (for example, classroom quality or teacher qualifications) would fall somewhere in between.

TABLE E.1

HALF-CONFIDENCE INTERVALS (95 PERCENT)—CHILD ASSESSMENTS

				Half-Confidence Intervals	
Cohort	Time Period	Nominal Sample Size	Effective Sample Size (Accounting for Sample Design)	Proportion[a] p = 0.50 Std. Dev. = 0.50	Normalized Variable Mean=100 Std. Dev. = 15
Perinatal	Age 1	869	546	.042	1.258
	Age 3	509	368	.051	1.533
Age 1	Age 1	851	547	.042	1.257
	Age 3	498	368	.051	1.533

Note: Two-sided α = .05.
These values would be used for estimating confidence intervals around descriptive statistics.

[a]We show the most conservative situation here—an estimated proportion of 0.5 has the largest variance among all proportions. Proportions that are higher or lower than 0.5 will have a smaller variance and, therefore, a smaller margin of error than shown here. The same holds for Table 8. For Tables 6A, 6B, 9A, and 9B, the smaller variance for other proportions will allow for the detection of smaller differences between subgroups. For Tables 7 and 10, the smaller variance for other proportions will allow for the detection of smaller changes over time.

TABLE E.2

QUALITY MEASURES HALF-CONFIDENCE INTERVALS (95 PERCENT)

				Half-Confidence Intervals	
Cohort	Time Period	Nominal Sample Size	Effective Sample Size (Accounting for Sample Design)	Proportion p = 0.50 Std. Dev. = 0.50	Quality Variable Mean = 5 Std. Dev. = 1
Perinatal	Age 1	435	310	.056	.111
	Age 3	254	200	.069	.139
Age 1	Age 1	426	310	.056	.111
	Age 3	249	200	.069	.139

Note: Two-sided α = .05.
These values would be used for calculating confidence intervals around descriptive statistics.

TABLE E.3

CHILD ASSESSMENT MINIMUM DETECTABLE DIFFERENCES AND EFFECT SIZES COMPARING TWO PROGRAM-DEFINED SUBGROUPS AT A POINT-IN-TIME

			Effective Sample Sizes		Minimum Detectable Differences Between Subgroups		
Cohort			Subgroup 1	Subgroup 2	Proportion p = .50 Std. Dev. = 0.50	Normalized Variable Mean = 100 Std. Dev. = 15	Effect Size (ES)
Perinatal	Age 1	1/2, 1/2	273.0	273.0	.120	3.595	.24
		1/3, 2/3	182.0	264.0	.127	3.813	.25
	Age 3	1/2, 1/2	184.0	184.0	.146	4.379	.29
		1/3, 2/3	122.7	245.3	.155	4.644	.31
Age 1	Age 1	1/2, 1/2	273.5	273.5	.120	3.592	.24
		1/3, 2/3	182.3	364.7	.127	3.809	.25
	Age 3	1/2, 1/2	184.0	184.0	.146	4.379	.29
		1/3, 2/3	122.7	245.3	.155	4.644	.31
					.097		
Combined	Age 1	1/2, 1/2	415.0	415.0		2.916	.19
		1/3, 2/3	276.7	553.3	.103	3.093	.21
	Age 3	1/2, 1/2	303.5	303.5	.114	3.409	.23
		1/3, 2/3	202.3	404.7	.121	3.616	.24

Note: Two-sided $\alpha = .05$. Power = .80.
An example would be comparing average child cognitive outcomes for children in center-based versus other program options (most closely represented by the 1/3, 2/3 rows).

TABLE E.4

CHILD ASSESSMENT MINIMUM DETECTABLE DIFFERENCES AND EFFECT SIZES COMPARING TWO CHILD-DEFINED SUBGROUPS AT A POINT-IN-TIME, BY COHORT

			Effective Sample Sizes		Minimum Detectable Differences Between Subgroups		
Cohort			Subgroup 1	Subgroup 2	Proportion p = .50 Std. Dev. = 0.50	Normalized Variable Mean = 100 Std. Dev. = 15	Effect Size (ES)
Perinatal	Age 1	1/2, 1/2	324.4	324.4	.110	3.298	.22
		1/3, 2/3	230.8	407.0	.116	3.461	.23
	Age 3	1/2, 1/2	206.0	206.0	.138	4.138	.28
		1/3, 2/3	143.0	264.2	.146	4.360	.29
Age 1	Age 1	1/2, 1/2	325.1	325.1	.110	3.294	.21
		1/3, 2/3	231.3	407.9	.115	3.457	.23
	Age 3	1/2, 1/2	206.0	206.0	.138	4.138	.28
		1/3, 2/3	143.0	264.2	.146	4.360	.29

Note: Two-sided $\alpha = .05$. Power = .80.
An example would be comparing average child cognitive outcomes for children receiving higher intensity services to those receiving lower intensity services.

TABLE E.5

CHILD ASSESSMENT MINIMUM DETECTABLE DIFFERENCES AND EFFECT SIZES FOR COMPARISONS OVER TIME (AGE 1 TO AGE 3)

	Effective Sample Size		Minimum Detectable Differences Over Time		
Cohort	Time 1 (Age 1)	Time 2 (Age 3)	Proportion p = .50 Std. Dev. = 0.50	Normalized Variable Mean = 100 Std. Dev. = 15	Effect Size (ES)
Perinatal	546	368	.077	2.307	.15
Age 1	547	368	.077	2.307	.15

Note: Two-sided $\alpha = .05$. Power = .80.
Assume correlation over time = 0.5.

TABLE E.6

QUALITY MEASURES MINIMUM DETECTABLE DIFFERENCES AND EFFECT SIZES COMPARING TWO PROGRAM-DEFINED SUBGROUPS AT A POINT–IN-TIME

Cohort	Time Period	Subgroups	Effective Sample Size: Subgroup 1	Effective Sample Size: Subgroup 2	Minimum Detectable Differences Between Subgroups for a Proportion p = .50	Minimum Detectable Differences Between Subgroups for Quality Variable with Mean = 5 and Std. Dev. = 1
Perinatal	Age 1	1/2, 1/2	155.0	155.0	.160	.318
		1/3, 2/3	103.3	206.7	.169	.337
	Age 3	1/2, 1/2	100.0	100.0	.199	.396
		1/3, 2/3	66.7	133.3	.211	.420
Age 1	Age 1	1/2, 1/2	155.0	155.0	.160	.318
		1/3, 2/3	103.3	206.7	.169	.337
	Age 3	1/2, 1/2	100.0	100.0	.199	.396
		1/3, 2/3	66.7	133.3	.211	.420
Combined	Age 1	1/2, 1/2	253.0	253.0	.125	.249
		1/3, 2/3	168.7	337.3	.132	.264
	Age 3	1/2, 1/2	175.0	175.0	.150	.299
		1/3, 2/3	116.7	233.3	.159	.317

Note: Two-sided $\alpha = .05$. Power = .80.
An example would be comparing average program quality for children in programs with higher average staff education to those in programs with lower average staff education.

TABLE E.7

QUALITY MEASURES MINIMUM DETECTABLE DIFFERENCES AND EFFECT SIZES COMPARING TWO CHILD-DEFINED SUBGROUPS AT A POINT–IN-TIME

Cohort	Time Period	Subgroups	Effective Sample Size: Subgroup 1	Effective Sample Size: Subgroup 2	Minimum Detectable Differences Between Subgroups for a Proportion p = .50	Minimum Detectable Differences Between Subgroups for Quality Variable with Mean = 5 and Std. Dev. = 1
Perinatal	Age 1	1/2, 1/2	174.7	174.7	.150	.300
		1/3, 2/3	121.6	223.4	.158	.316
	Age 3	1/2, 1/2	107.8	107.8	.192	.381
		1/3, 2/3	73.8	140.1	.203	.403
Age 1	Age 1	1/2, 1/2	174.7	174.7	.150	.300
		1/3, 2/3	121.6	223.4	.158	.316
	Age 3	1/2, 1/2	107.8	107.8	.192	.381
		1/3, 2/3	73.8	140.1	.203	.403

Note: Two-sided $\alpha = .05$. Power = .80.
An example would be comparing average program quality for children receiving higher intensity services to those receiving lower intensity services.

TABLE E.8

QUALITY MEASURES MINIMUM DETECTABLE DIFFERENCES AND EFFECT SIZES FOR COMPARISONS OVER TIME (AGE 1 TO AGE 3)

Cohort	Effective Sample Size: Time 1 (Age 1)	Effective Sample Size: Time 2 (Age 3)	Minimum Detectable Pre-Post Differences for a Proportion p=.50	Minimum Detectable Pre-Post Differences for Quality Variable with Mean = 5 and Std. Dev. = 1
Perinatal	310	200	.105	.209
Age 1	310	200	.105	.209

Note: Two-sided α = .05. Power = .80.
Assume correlation over time = 0.5)