"Stunning in its clarity and efficiency."

— Dr. Sal Manuzza,
New York University School of Medicine

A computer program for statistical power analysis

CRT-POWER

POWER ANALYSIS FOR CLUSTER-RANDOMIZED TRIALS

- ***TWO, THREE, AND FOUR LEVEL DESIGNS***
- ***HIERARCHICAL AND RANDOMIZED-BLOCK DESIGNS***
- ***CONTINUOUS AND BINARY OUTCOMES***

☐ **BINARY** ☑ **CONTINUOUS** example shown

See our other CRT-Power brochure for binary outcome example

Assign a name to each level

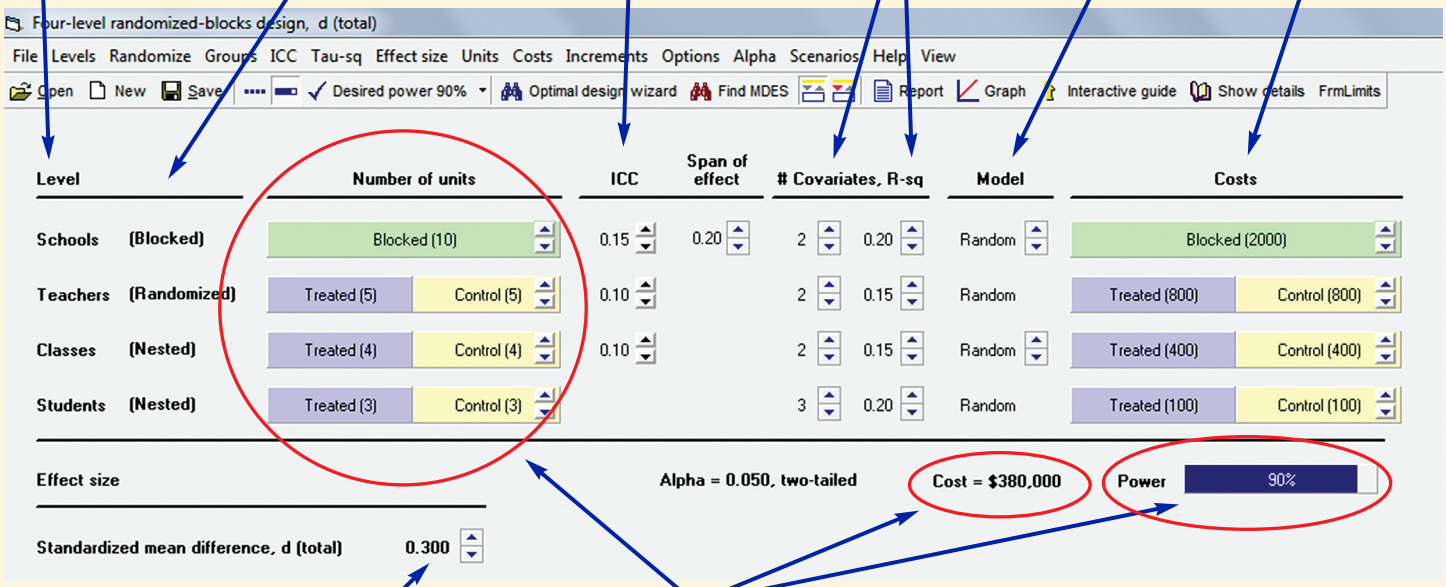
Randomize at any level

Enter the ICC *or* the span of means

Enter covariates

Fixed or random effects at each level

Set the cost per unit



Enter the effect size

The program finds the most cost-effective number of units at each level to yield the desired power

Find the most cost-effective design AUTOMATICALLY

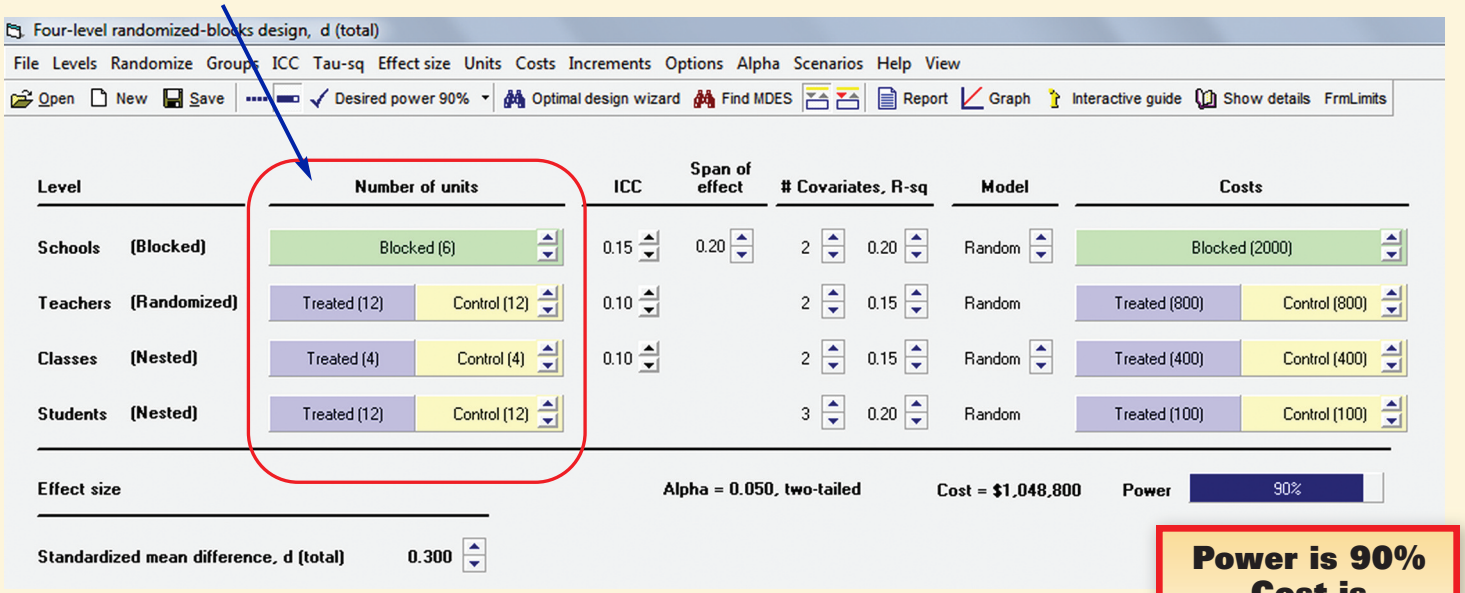
FIND OUT HOW

Step 1. Specify the design and parameters

Reduce the study cost by 50% or more. With one click.

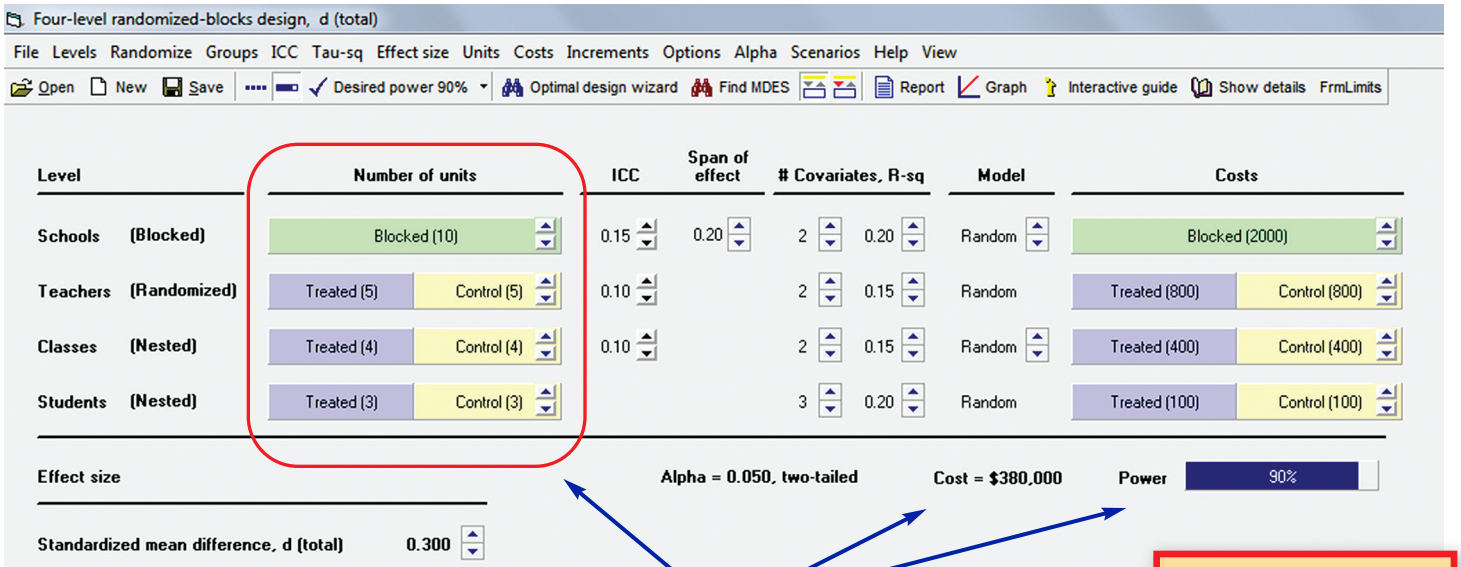
Suppose you are planning the study outlined in the screen-shot below. Schools include both conditions. Teachers are randomized to either treated or control. Classes are nested within teachers. Students are nested within classes. The ICCs, covariates, and costs for each level are shown in the picture.

You are considering the option shown on the screen—6 schools, 12 teachers per school, 4 classes per teacher, 12 students per class. This will yield power of 90% at a cost of $ 1,048,800.



Power is 90%
Cost is
$1,048,800

Step 2. Click 'Optimal design wizard' (see back page). The program shows the most cost-effective number of units at each level.



Power is 90%
Cost is
$380,000

By simply increasing the number of schools and decreasing the number of teachers and students, we can cut the study's cost by more than half, while keeping power at 90%. You may also explore other options, such as randomizing at another level, or adding covariates.

Step 3. Create a report (an excerpt is shown here)

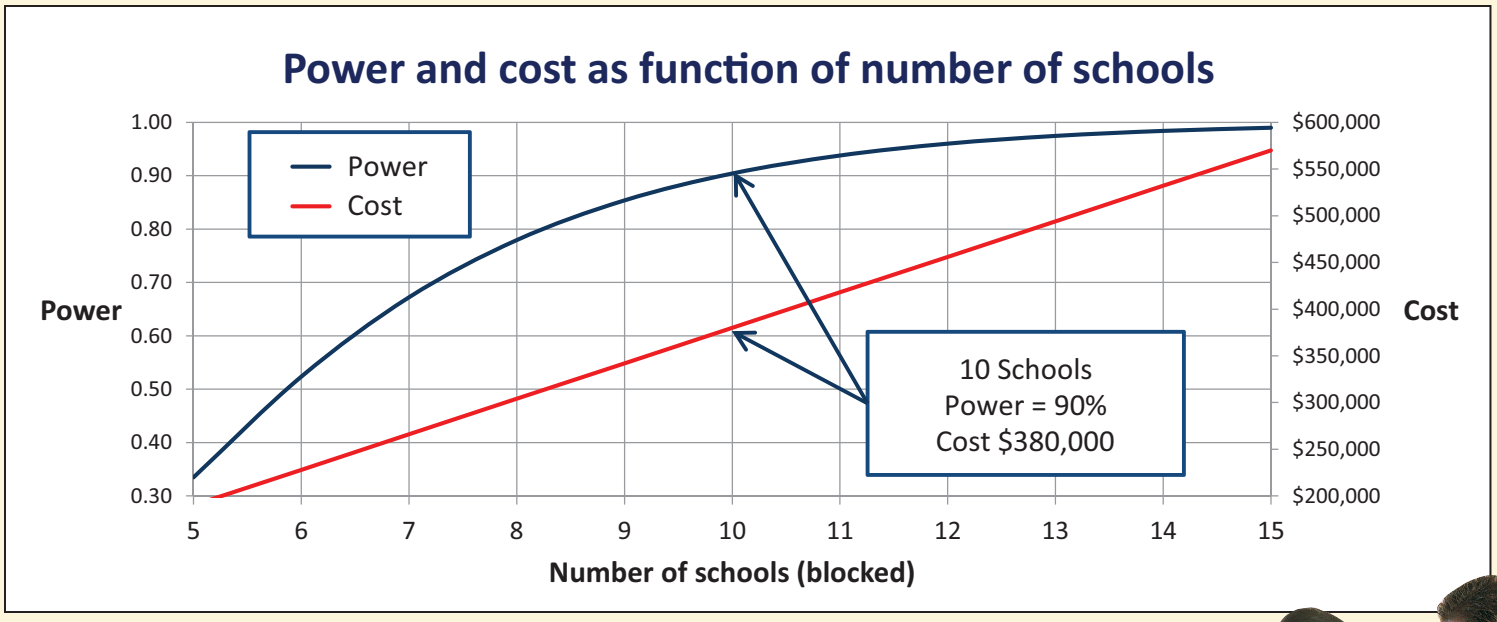
Design

The study will employ a four-level randomized block design, using students, within classes, within teachers, within schools. Schools are blocked, teachers are randomized, classes are nested within teachers, and students are nested within classes (see table).

		Units		ICC	Span of d	Cov	R-sq	Cost	
		Treated	Control					Treated	Control
Schools	Blocked	10		.15	.20	2	.20	2000	
Teachers	Randomized	5	5	.10		2	.15	800	800
Classes	Nested	4	4	.10		2	.15	400	400
Students	Nested	3	3			3	.20	100	100

The ICC for schools, teachers, and classes are 0.15, 0.10, and 0.10. Equivalently, the control group means will span 48 points across schools, 40 points across teachers within a school, and 40 points across classes within a teacher. — Continues —

Step 4. Create a table and graph.

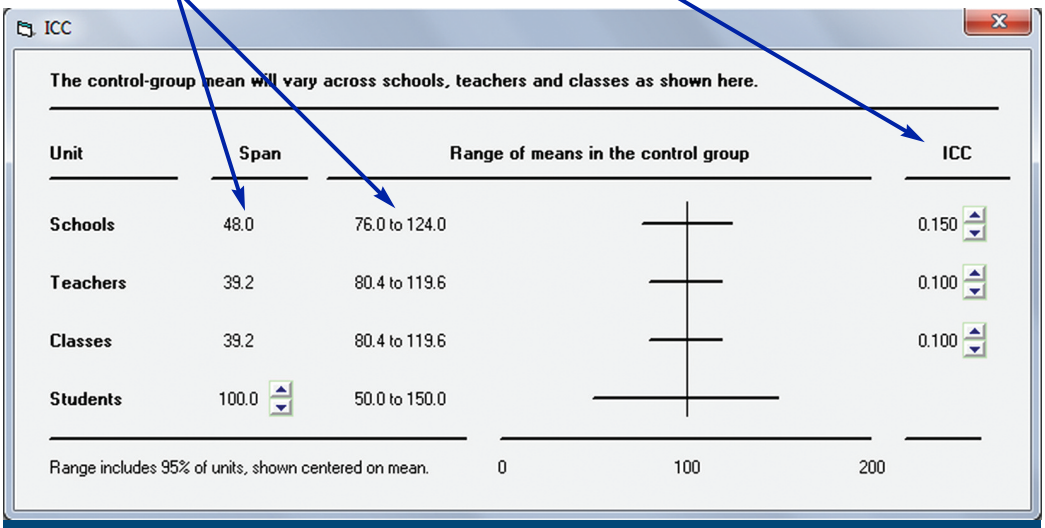


- ***Use these graphs at meetings to develop an appropriate study plan***
- ***Include the graphs in your reports and grant applications***

Tools and Features

CRT-POWER

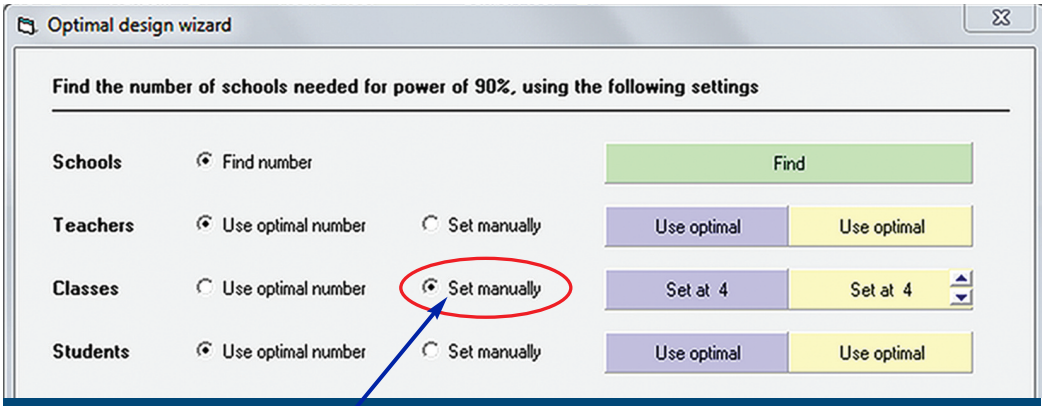
Enter either the span of means *or* the ICC.



The program translates the ICC into a span of means (or vice versa).

Use this feature to ensure that the ICCs are both plausible and transparent.

Automatically find the optimal (most cost-effective) number of units at each level



The program allows you to constrain the number of units at one or more levels, and will then adjust the remaining levels.

Features

Number of levels
Two, three, or four levels. For example, students within classes, teachers, schools. Or patients within wards, hospitals, cities.

Hierarchical and randomized block designs
Randomize at level 4, 3, 2, or 1

Covariates
Allowed at all levels simultaneously

Costs
May be set separately for each group

Number of units
May be set separately for each group

Effect size
Standardized mean difference d, risk differ-ence, odds ratio

Statistical models
Random effects of fixed effect at each level, subject to logical constraints

Reports
Create a detailed text report with tables, and export to Word

Tables and Graphs
Power and cost as a function of any two factors.

Find the optimal design

Find the minimum detectable effect size

Program developed with funding from the National Institutes of Health (NIDA/SBIR)
Program official at NIDA—Dr. Augie Diana
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Developed by Michael Borenstein and Larry V. Hedges

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