Appendix H

Calculation of Minimum Detectable Effects for District-Level Proportions Using the IDEA National Implementation Study (IDEA NAIS) District Sample

Let P represent the population proportion of some characteristic of interest associated with school districts. We want to estimate P. Assume that we select a simple random sample of n school districts. Let the sample proportion based on n districts be p. The standard error (standard deviation) of p is given by

$$s.e.(p) = \sqrt{\frac{(N - n)}{N - 1}\frac{p(1 - p)}{n}} \quad \text{where}$$

N is the population size of school districts.

Assuming that the sample proportion p has a normal distribution with P as the mean and s.e.(p) as the standard deviation, a 95% confidence interval for P is given by

$$p \pm 1.96 \text{ s.e.}(p).$$

Since we do not have a simple random sample, we assume a design effect of 1.6. This is the ratio of the variance of p under the sampling design used for the survey to the variance under simple random sampling. The effective sample size is

$$n^* = \frac{n}{1.6}.$$

If we have a sample of 1,200 school districts and we have a response rate of 80%, then we have 960 schools in the sample. The effective sample size is

$$n^* = \frac{960}{1.6} = 600.$$

Let p =0.5

The variance of p is $= \frac{13988 - 600}{13988 - 1}\frac{0.5(1 - .5)}{600}$

= (0.95718) 0.25/600 = 0.000399.

Therefore s.e.(p)= 0.019975, assuming that the population of school districts is 13,988.

95% confidence interval for P is $0.50 \pm 1.96 \times 0.019975$ which is

$$0.50 \pm 0.0391.$$

In percentages, a 95% confidence interval for the population percentage P in this case is

50 ± 3.9 percentage points.