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STAT 607 — HW 2

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### Exercise 2.12

The percentage of patients overdue for a vaccination is often of interest for a medical clinic. Some clinics examine every record to determine that percentage; in a large practice, though, taking a census can be time consuming. Cullen (1994) took a sample of the 580 children served by an Auckland family practice to estimate the proportion of interest.

- a What sample size in an SRS (without replacement) would be necessary to estimate the proportion with 95% confidence and margin of error 0.10?

For  $\alpha = .05$  and  $e = .10$ , we need

$$n_0 = \frac{z_{\alpha/2}^2 S^2}{e^2} = \frac{1.96^2 \cdot 1/2 \cdot (1 - 1/2)}{.10^2}$$

```
(n_0 <- (1.96^2 * 0.5^2)/0.1^2)
```

```
## [1] 96.04
```

The final calculation is

$$n = \frac{n_0}{1 + \frac{n_0}{N}},$$

which is

```
N <- 580  
(n <- n_0/(1 + n_0/N))
```

```
## [1] 82.4
```

- b Cullen actually took a SRSWR of size 120, of which 27 were *not* overdue for vaccination. Give a 95% CI for the proportion of children not overdue for vaccination.

the sample proportion is  $\hat{p} = 27/120$

```
(p.hat <- 27/120)
```

```
## [1] 0.225
```

The standard error for  $\hat{p}$  is

$$\sqrt{\left(1 - \frac{n}{N}\right) \frac{\hat{p}(1 - \hat{p})}{n - 1}}$$

```
(se <- sqrt((1 - n/N) * (p.hat * (1 - p.hat)/(n - 1))))
```

```
## [1] 0.04287
```

The left and right end points of the CI:

```
p.hat - 1.96 * se
```

```
## [1] 0.141
```

```
p.hat + 1.96 * se
```

```
## [1] 0.309
```