VA Hospital Monitors

- Each hospital, one year: \( n \) patients, \( y \) “successes” really failures

- e.g., Hospital 21/1992: \( y = 306, n = 651 \)
  1993: \( y = 300, n = 705 \)

- Hospital 34/1992: \( y = 9, n = 25 \)
  1993: \( y = 14, n = 34 \)

- Issues: changes in “success rates” year-to-year?
  Comparisons across hospitals?

- Assumptions for binomial model?
BINOMIAL MODEL

Review:

- Independent Bernoulli trials $x_i, (i = 1, \ldots, n)$
- “Success” probability $\theta : p(x_i|\theta) = \theta^{x_i}(1 - \theta)^{1-x_i}$
- $y =$ number of successes $= \sum_{i=1}^{n} x_i$
- $y \sim Bin(n, \theta)$
  $$p(y|n, \theta) = \binom{n}{y} \theta^y (1 - \theta)^{n-y}$$
  on $y = 0, 1, \ldots, n$
- Usually (not always) drop conditioning on $n$ in notation
- $E(y|\theta) = n\theta, V(y|\theta) = n\theta(1 - \theta)$
- R and S-Plus: dbinom, pbinom, qbinom, rbinom
Assumptions → sampling model $y \sim Bin(n, \theta)$

Better notation: $(y|\theta) \sim Bin(n, \theta)$

INFERENceland for $\theta$ : a probability to be estimated based on observed proportion $t = y/n$ (and $n$ of course)

Common point estimate: proportion $t = y/n$

Sampling distribution:

- $E(t|\theta) = \theta$
- $V(t|\theta) = \theta(1 - \theta)/n$

more precise for large $n$ and small/high $\theta$