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 θ : $p(x_i|\theta) = \theta^{x_i}(1-\theta)^{1-x_i}$
- 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 $\rightarrow$ sampling model $y \sim Bin(n, \theta)$

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

INFERENCE for θ : 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 θ