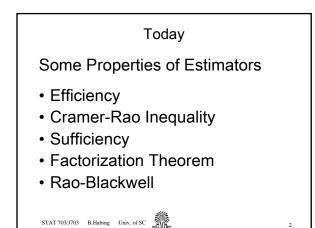
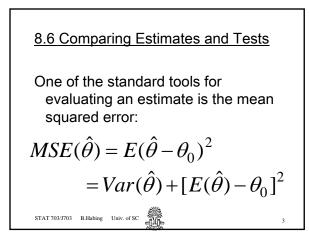


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If two estimators are unbiased, then
the efficiency of
$$\hat{\theta}$$
 relative to $\tilde{\theta}$ is
 $eff(\hat{\theta}, \tilde{\theta}) = \frac{\operatorname{var}(\tilde{\theta})}{\operatorname{var}(\hat{\theta})}$

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For two tests T_1 and T_2 of the same H_0 and H_A with the same α -level, the relative efficiency of T_1 to T_1 is the ratio n_2/n_1 required so that they have the same power.

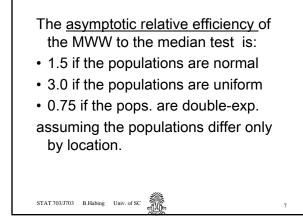
The <u>asymptotic relative efficiency</u> of the MWW to the *t*-test is:

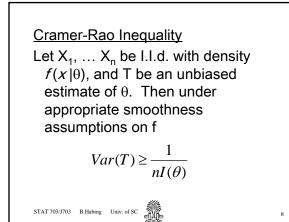
- 0.955 if the populations are normal
- 1.0 if the populations are uniform
- 1.5 if the pops. are double-exp.
- 0.864 to infinity in general

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assuming the populations differ only by location.





Recall that under smoothness conditions that the $1/n I(\theta)$ is the asymptotic variance of the MLE!

So, why isn't the MLE always best?

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8.7 Sufficiency One of the key concepts in advanced mathematical statistics is that of sufficiency. Does a statistic summarize all of the information in the data about a parameter, or do we lose something by summarizing.

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 $\begin{array}{l} \underline{Defn} \ A \ statistic \ T(X_1, \ \ldots \ X_n) \ is \\ sufficient \ for \ \theta \ if \ the \ conditional \\ distribution \ of \ X_1, \ \ldots \ X_n \ given \ T=t \\ does \ not \ depend \ on \ \theta \ for \ any \ value \\ of \ t. \end{array}$

<u>Example:</u> Consider a Poisson Distribution with parameter λ and a sample size of 2.

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A) Consider T= $X_1 + X_2$

B) Consider $T=X_1 + 2X_2$

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