

# 2008 UIC Emergency Medicine Residency Research Course

## Basic Statistics: Power Calculations

Edward P. Sloan, MD, MPH, FACEP

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### Basic Statistics for EM Research: *Power Calculations*

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### 2008 UIC Research Course

*UIC EM Residency Program  
Chicago, IL  
September 25, 2008*

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*Professor*

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**Attending Physician  
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### Disclosures

- FERNE Chairman and President
- ACEP Clinical Policy Committee
- ACEP Scientific Review Committee
  
- No individual financial disclosures

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### Power Calculations Made Easy

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**Associate Professor  
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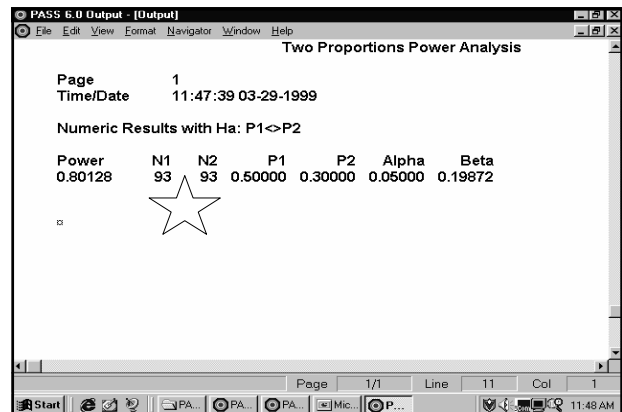
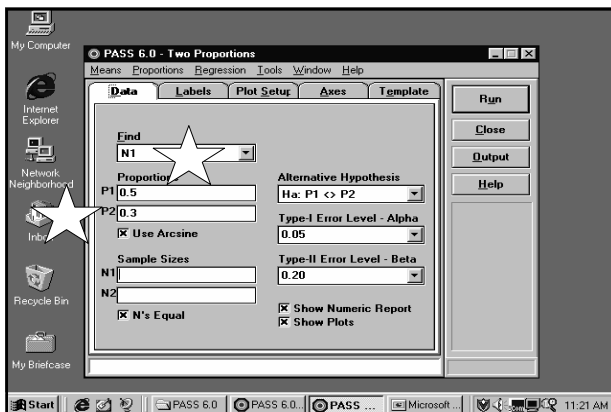
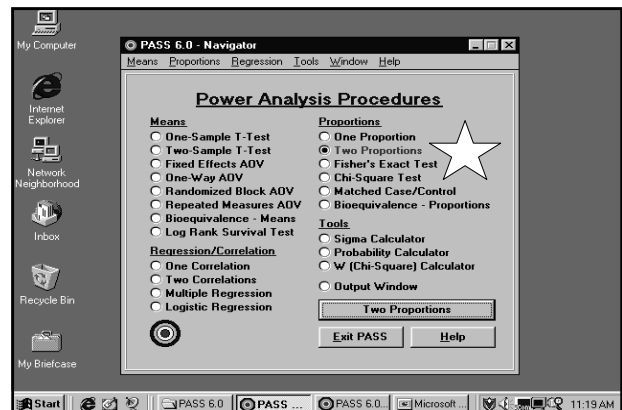
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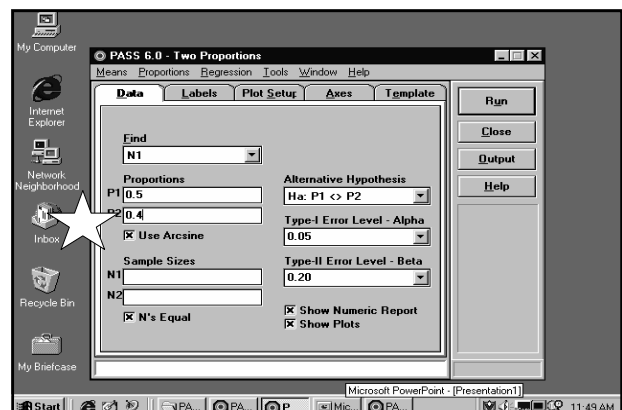
### A Question

- Current Rx: 50% admit rate
- New therapy: 30% admit rate?
- How many pts req'd to prove?
- Assume:  $p < .05$ , power 80%



### A Change in Outcome

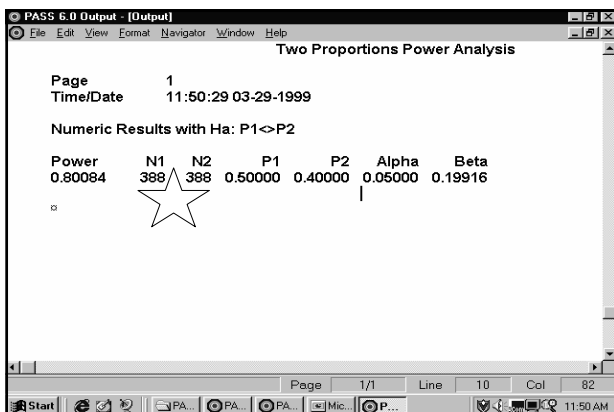
- Current Rx: 50% admit rate
- New therapy: 40% admit rate?
- How many pts req'd to prove?
- Did N change?



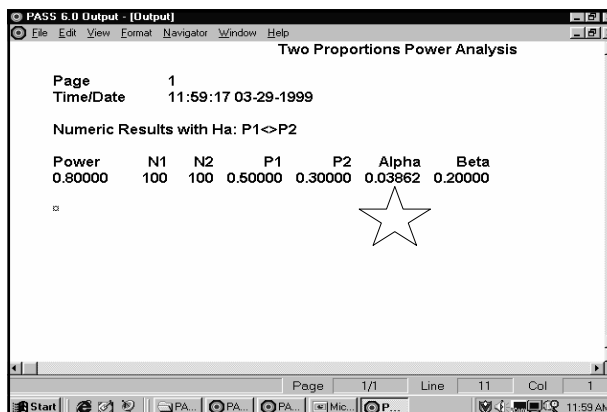
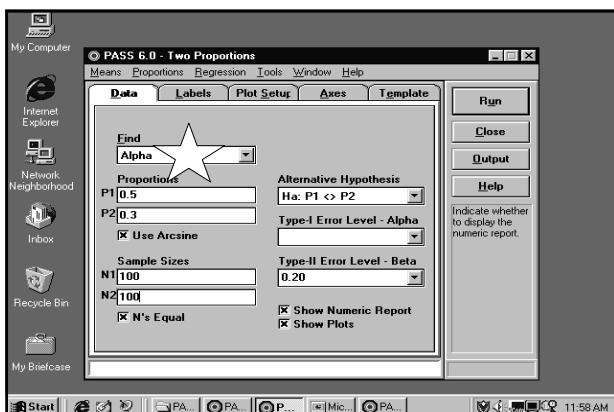
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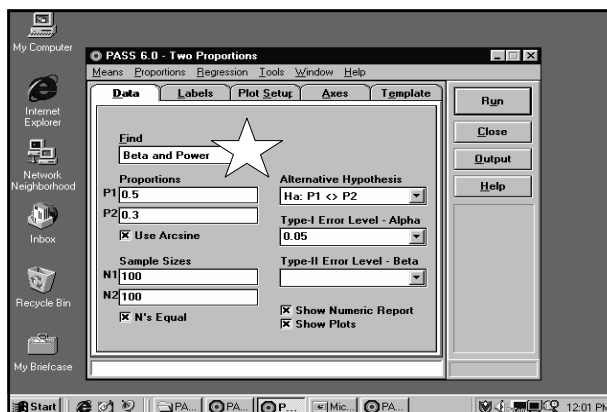
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- ### A Fixed Sample Size
- Current Rx: 50% admit rate
  - New therapy: 30% admit rate?
  - Can only include 200 patients
  - What kind of p value to expect?



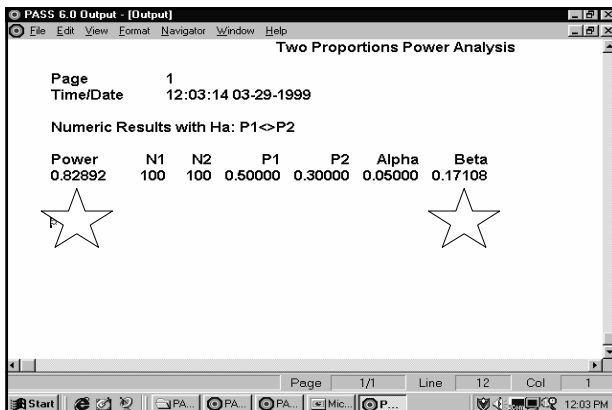
- ### What is the Power?
- Current Rx: 50% admit rate
  - New therapy: 30% admit rate?
  - Can only include 200 patients
  - What is the power?



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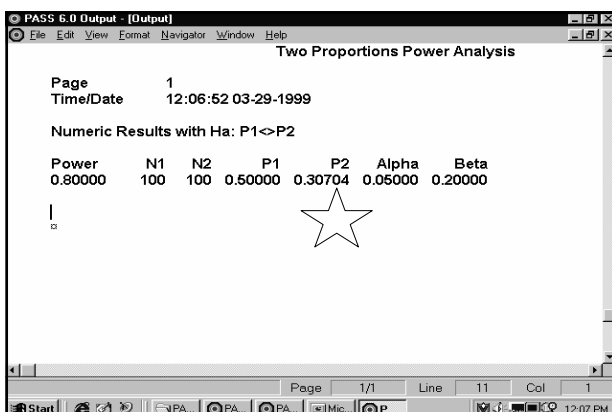
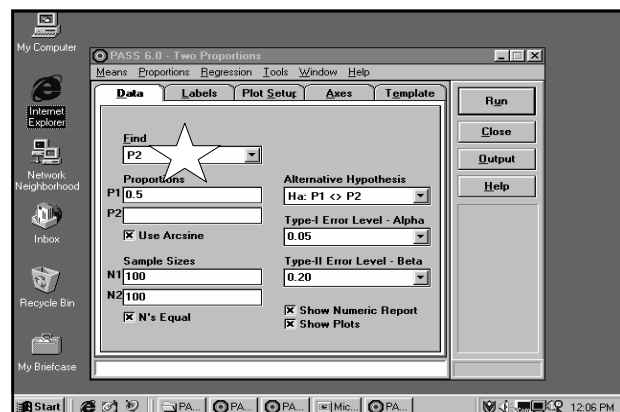


### What Does an 83% Power Mean?

- There is an 83% chance that a difference of 20% (between groups) will be detected with this sample size.
- A difference of less than 20% could occur, and we won't know it!

### What New Rx Proportion?

- Current Rx: 50% admit rate
- Can only include 200 patients
- New therapy: what admit rate?



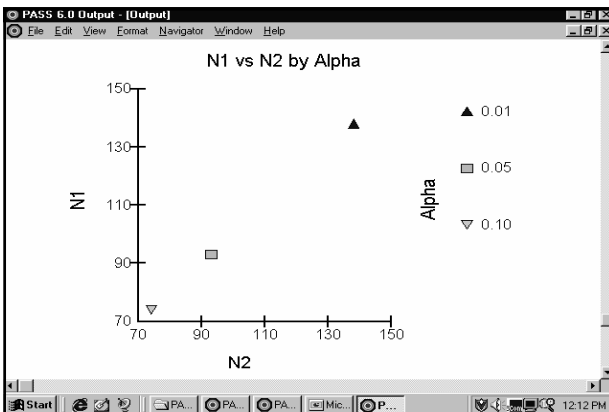
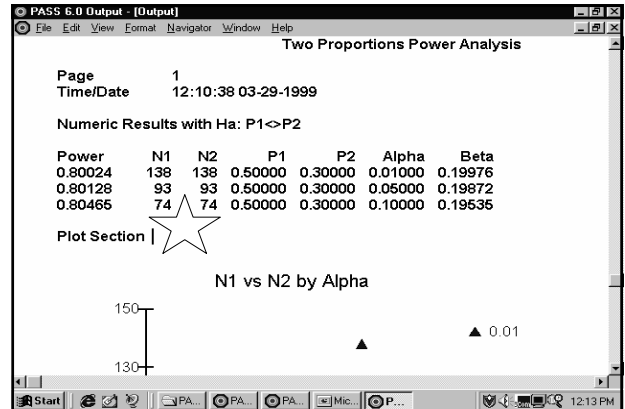
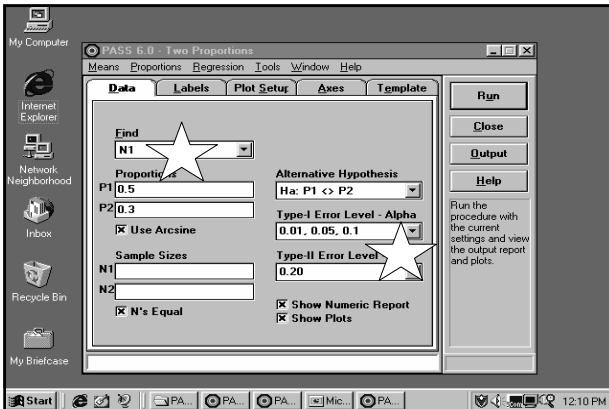
### Multiple Levels of Confidence

- Current Rx: 50% admit rate
- New therapy: 30% admit rate
- How much confidence that the result is "real"?

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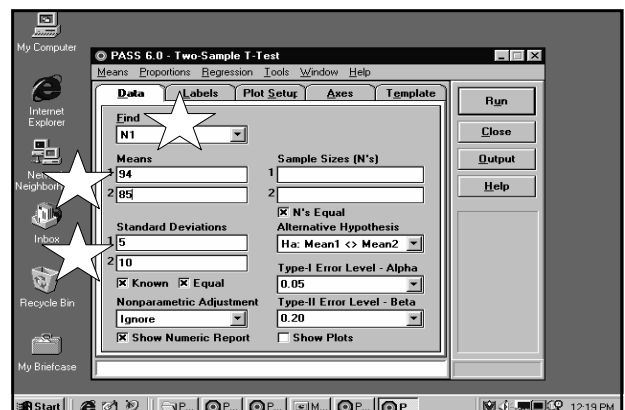
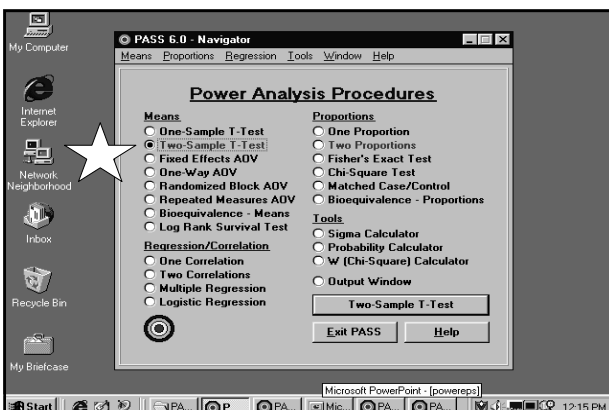
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### A Question

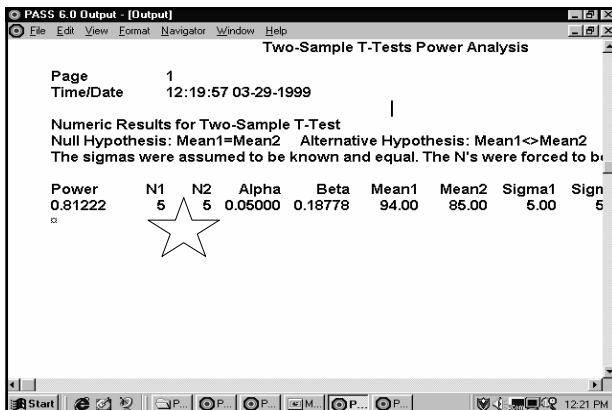
- URI:  $pO_2 = 94 \pm 5$
- PE :  $pO_2 = 85 \pm 10$
- How many pts req'd to prove?
- Assume:  $p < .05$ , power 80%



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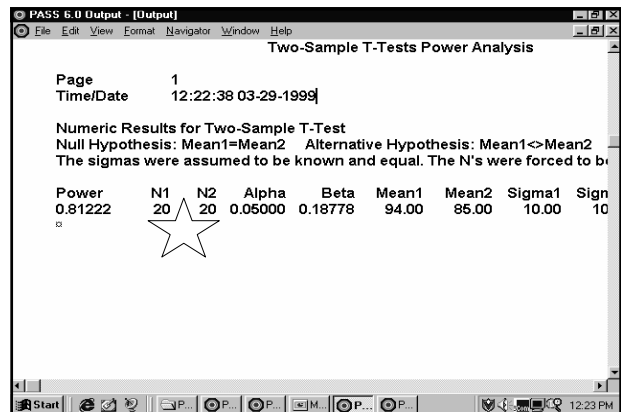
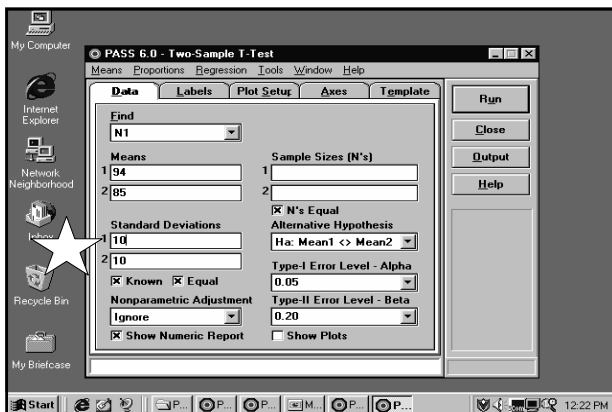
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### A Bigger Standard Deviation

- URI:  $pO_2 = 94 \pm 10$
- PE :  $pO_2 = 85 \pm 10$

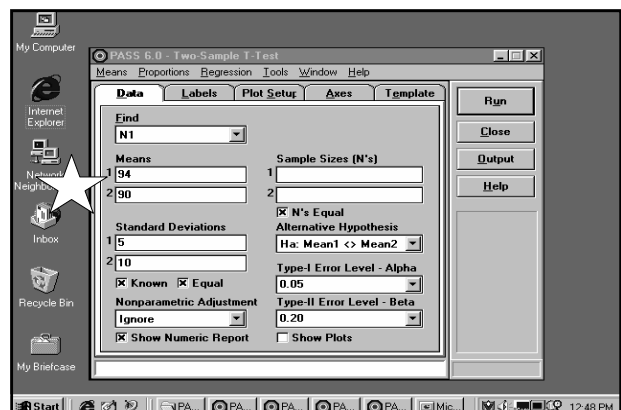
- How many pts req'd to prove?
- Assume:  $p < .05$ , power 80%



### Closer Mean Values

- URI:  $pO_2 = 94 \pm 5$
- PE :  $pO_2 = 90 \pm 10$

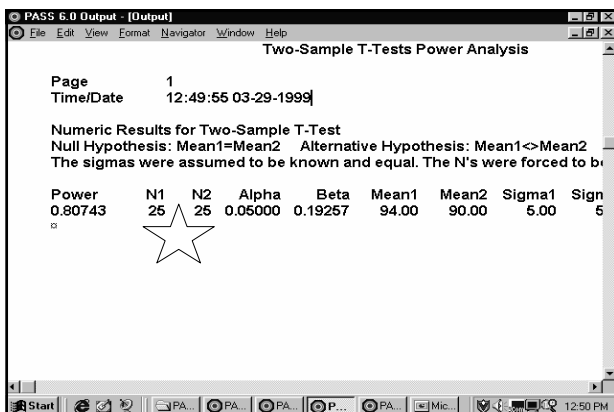
- How many pts req'd to prove?
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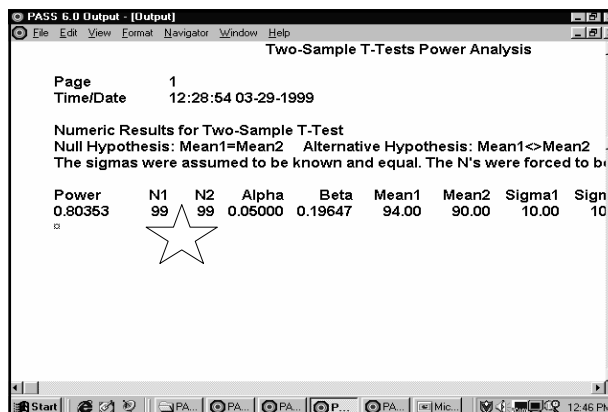
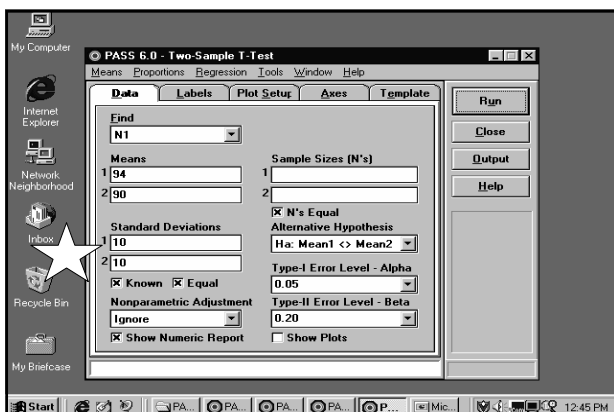


### Closer Means, Bigger SD

- URI:  $pO_2 = 94 \pm 10$
- PE:  $pO_2 = 90 \pm 10$

• How many pts req'd to prove?

• Assume:  $p < .05$ , power 80%



### Conclusions

- Know your assumptions up front
- Base them on the med literature
- Know your design constraints
- The power calculations are easy!
- Include the stats in the methods
- Discuss the clinical relevance!!!

**Thank you.**

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