

Jumping into Statistics: Introduction to Study Design and Statistical Analysis for Medical Research Using JMP Pro Statistical Software

WINTER/SPRING 2021

DR. CYNDI GARVAN & DR. TERRIE VASILOPOULOS

Meet the Instructors



CYNTHIA GARVAN, MA, PHD

Research Professor in Anesthesiology

cgarvan@anest.ufl.edu



TERRIE VASILOPOULOS, PHD

Research Assistant Professor in Anesthesiology
and Orthopaedics and Rehabilitation

tvasilopoulos@anest.ufl.edu

Course Objectives

- Review fundamentals of study design and research methodology
- Understand how to choose best statistical test for your research question
- Practice basic statistical analysis use JMP Pro Software

Course Topics

- Asking a Good Research Question
- Life Cycle of Research and Scientific Method
- Study Design
- Data types and Database Construction
- Descriptive Statistics
- Data Visualization
- Population and Sample, Probability, Statistical Inference
- How to Chose Correct Statistical Method and Run Some Analyses
 - T-tests, ANOVA, Non-Parametric
 - Chi-square, odds ratio, relative risk
 - Regression and Correlation
 - Survival Analysis
 - Test Diagnostics (e.g. sensitivity, specificity, etc.)
- Comparing Statistical Modeling and Machine Learning

Visualizing Your Data

Displaying Data: Frequency Tables

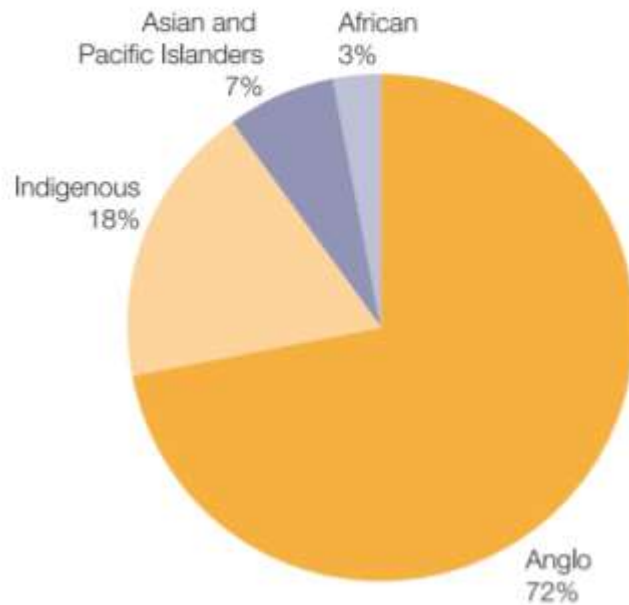
Table 5.5 Pressure ulcer prevalence across five specialty areas

	Spinal	Rehabilitation	Medical	Critical care	Surgical	Total
Number patients	23	1,101	3,053	483	1,645	6,305
Number patients with ulcers	14	264	569	72	232	1,151
Prevalence per specialty (%)	60.9%	23.9%	18.6%	14.9%	14.1%	18%
Total prevalence (%) n = 1,151	0.2%	23%	49.4%	6.3%	20.1%	100%

- Count data
- # within different categories of qualitative data
- % with categories

Pie Chart

Figure 5.6 Pie chart showing breakdown of ethnic group in a sample population (n=210)



Size of pie pieces relative to frequency or proportion of category.

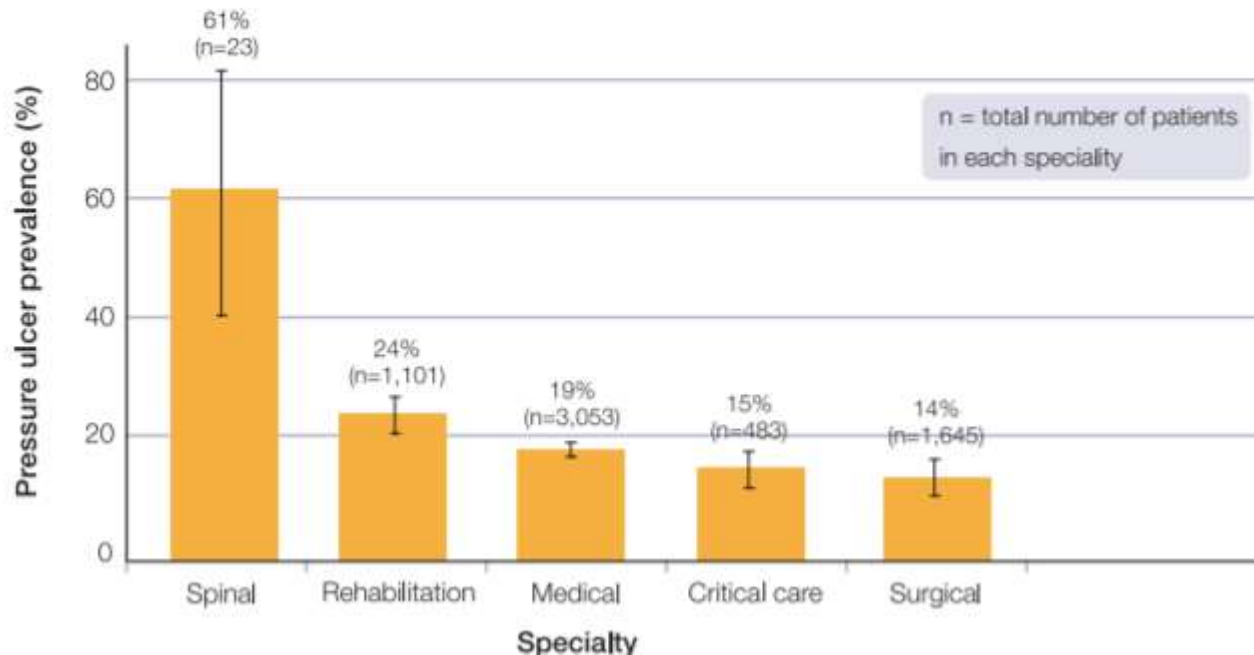
Sum to 100%

Bar Graphs

X-axis → Qualitative data: Different categories (nominal or ordinal)

Y-axis → Counts, %, means....for some estimates, need to report error

Figure 5.7 Bar graph showing prevalence of pressure ulcers per speciality (n=6,305)

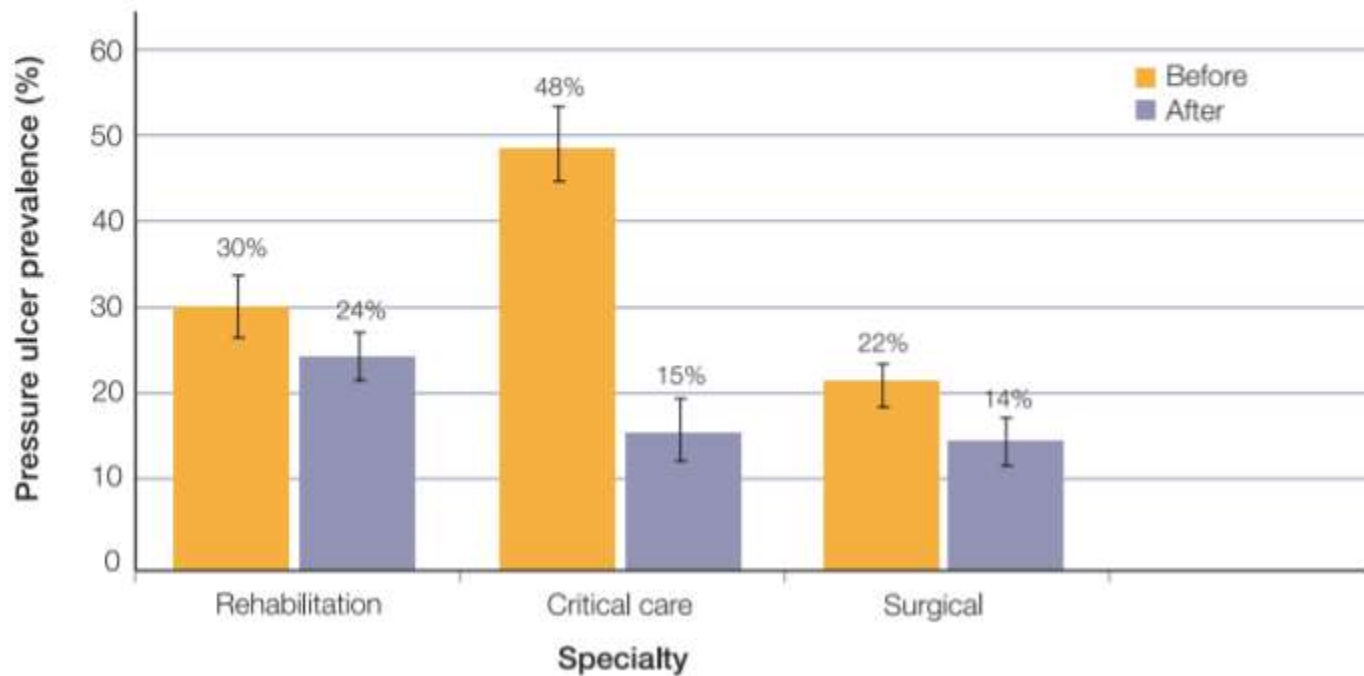


Bar Graphs

Also, can use to visual comparisons

Figure 5.9 Using bar charts to make comparisons before and after a quality intervention

Impact of a pressure ulcer prevention intervention

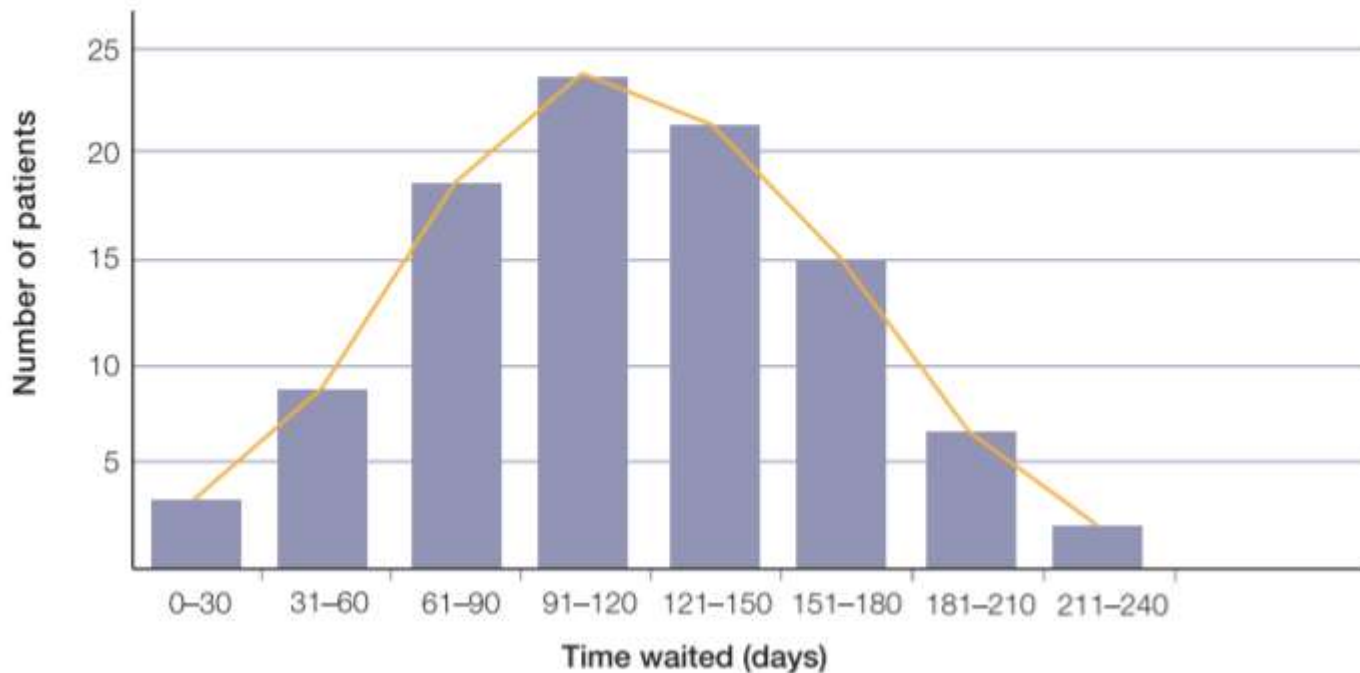


Histograms

For quantitative data. Height of bars represent number of observances of that value in data. Helps visualize distribution of data.

Figure 5.11 Sample histogram and histogram

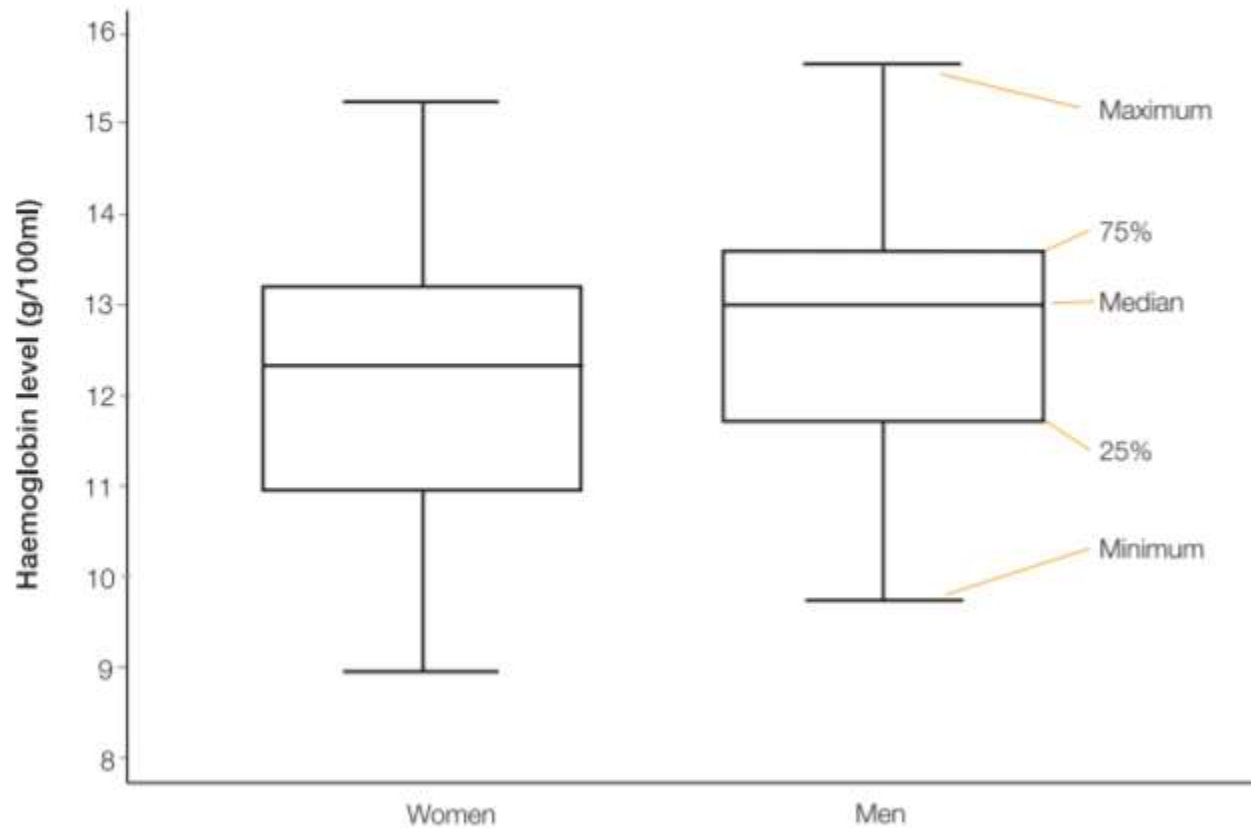
Histogram and histogram - Waiting time for elective surgery (n= 96)



Use Box Plot to Display Median and IQR

Figure 5.10 Sample box plot

Haemoglobin levels of women and men



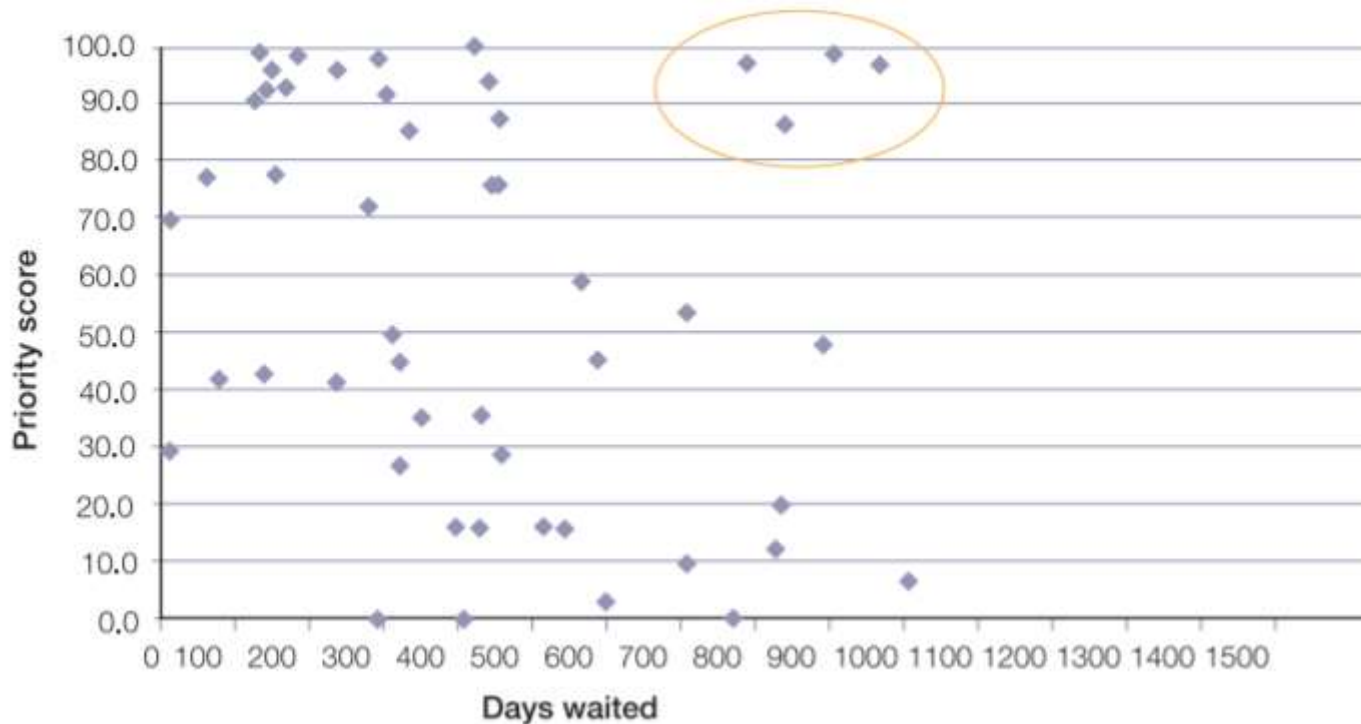
Scatterplots

X-axis → Quantitative data: e.g. time, dose

Y-axis → counts, %, mean

Each dot is one patient or observation

Figure 5.12 Scatter plot of patient priority score vs time waited for surgery (n=50)

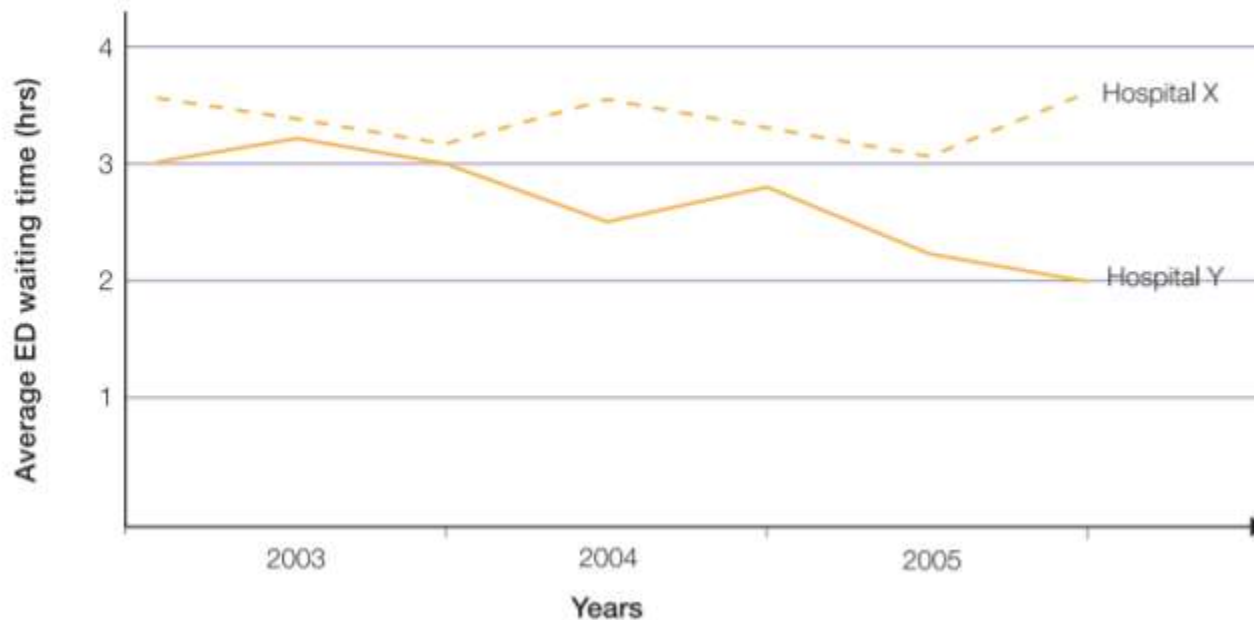


Line Graphs

X-axis → Quantitative data: e.g. time, dose

Y-axis → counts, %, mean

Figure 5.13 Line graph representing waiting times in the emergency department of two hospitals



JMP Demo
