Statistics Using Simulation

Why use simulation-based statistical methods?

1. We can investigate the sampling dist'n of a statistic when the data don't fit the conditions to use the "usual" sampling dist'n of the statistic.

2. We can investigate the sampling dist'n of a "new" statistic, for which we have not found a mathematical description of the sampling dist'n.

3. We can teach people to quickly and easily see the general overview of how to solve a wide range of the usual types of statistical problems.

Why not write all of your own simulations?

1. In this overall program, you will have the opportunity to write many such programs.

2. In the statistics part of this course, we intend to review / teach many techniques of a basic applied statistics course. Having a coordinated set of tools to carry out each technique quickly help us focus on the overview instead of the details.

3. Using simulation-based tools rather than the traditional formula-based methods helps you think about the issues you will encounter when you write your own simulations.

Why StatKey?

- Reasonably comprehensive
- Independent of textbook
- Always freely available
- Many datasets with multiple variables and full descriptions and references
- Help available within it and some YouTube videos made by teachers

StatKey

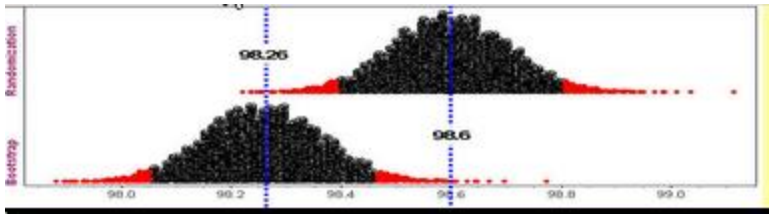
to accompany *Statistics: Unlocking the Power of Data*
by Lock, Lock, Lock, Lock, and Lock

Descriptive Statistics and Graphs	Bootstrap Confidence Intervals	Randomization Hypothesis Tests
One Quantitative Variable	CI for Single Mean, Median, St.Dev.	Test for Single Mean
One Categorical Variable	CI for Single Proportion	Test for Single Proportion
One Quantitative and One Categorical Variable	CI for Difference In Means	Test for Difference in Means
Two Categorical Variables	CI for Difference In Proportions	Test for Difference In Proportions
Two Quantitative Variables	CI for Slope, Correlation	Test for Slope, Correlation

Sampling Distributions	Mean	Proportion

Theoretical Distributions	Normal	t	χ^2	F

More Advanced Randomization Tests	χ^2 Goodness-of-Fit	χ^2 Test for Association	ANOVA for Difference in Means	ANOVA for Regression



Statistics: Unlocking the Power of Data

by Lock, Lock, Lock, Lock, and Lock

November 1, 2020

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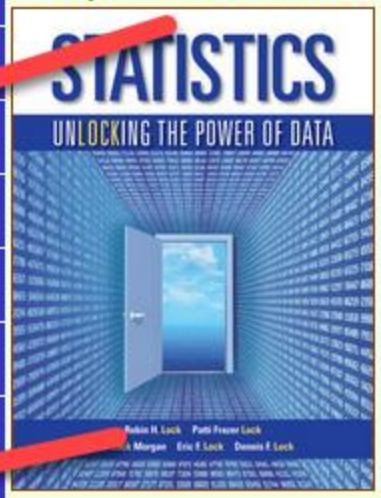

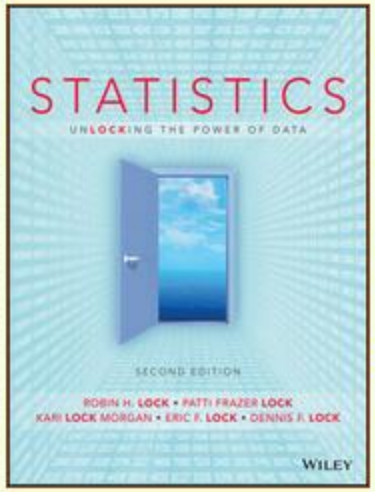

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Second Edition (2017)
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... or contact Michael MacDougald at Wiley.

Find an interactive unit from the text and more information about the approach at the Wiley showcase site.

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Penn State University

Eric F. Lock
University of Minnesota

Dennis F. Lock
Iowa State University and Buffalo Bills

Overview

Overview of

Statistics: UnLocking the Power of Data

By Lock, Lock, Lock, Lock, and Lock

Sir R.A. Fisher said of simulation and permutation methods in 1936:

> "Actually, the statistician does not carry out this very simple and very tedious process, but his conclusions have no justification beyond the fact that they agree with those which could have been arrived at by this elementary method."

These methods, too 'tedious' to apply in 1936, are now readily accessible. As George Cobb (2007) wrote i article for the journal *Technology Innovations in Statistical Education*,

> "... despite broad acceptance and rapid growth in enrollments, the consensus curriculum is still an unwitting prisoner of history. What we teach is largely the technical machinery of numerical approximations based on the normal distribution and its many subsidiary cogs. This machinery was

Videos

Videos

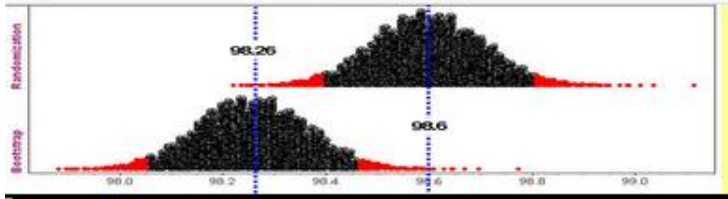
Introductory Camtasia Videos

Watch *"Overview of Randomization Tests"* (Kari - 20 minutes)

Watch *"Overview of Bootstrap Confidence Intervals"* (Patti - 20 minutes)

Watch *"Introduction to StatKey"* (Robin - 21 minutes)

https://www.lock5stat.com/index.html



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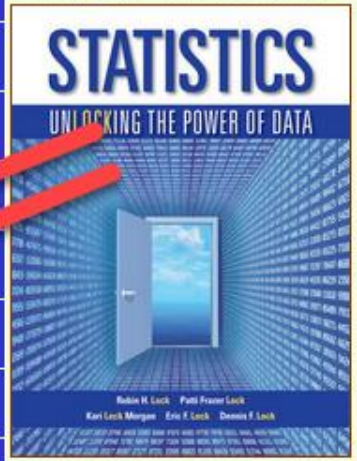

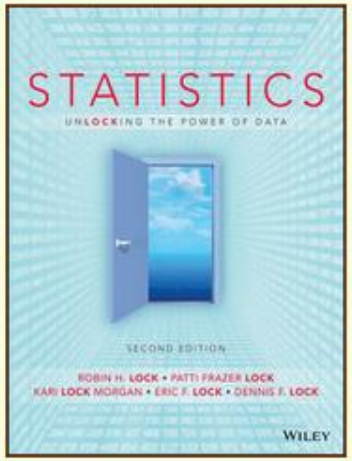

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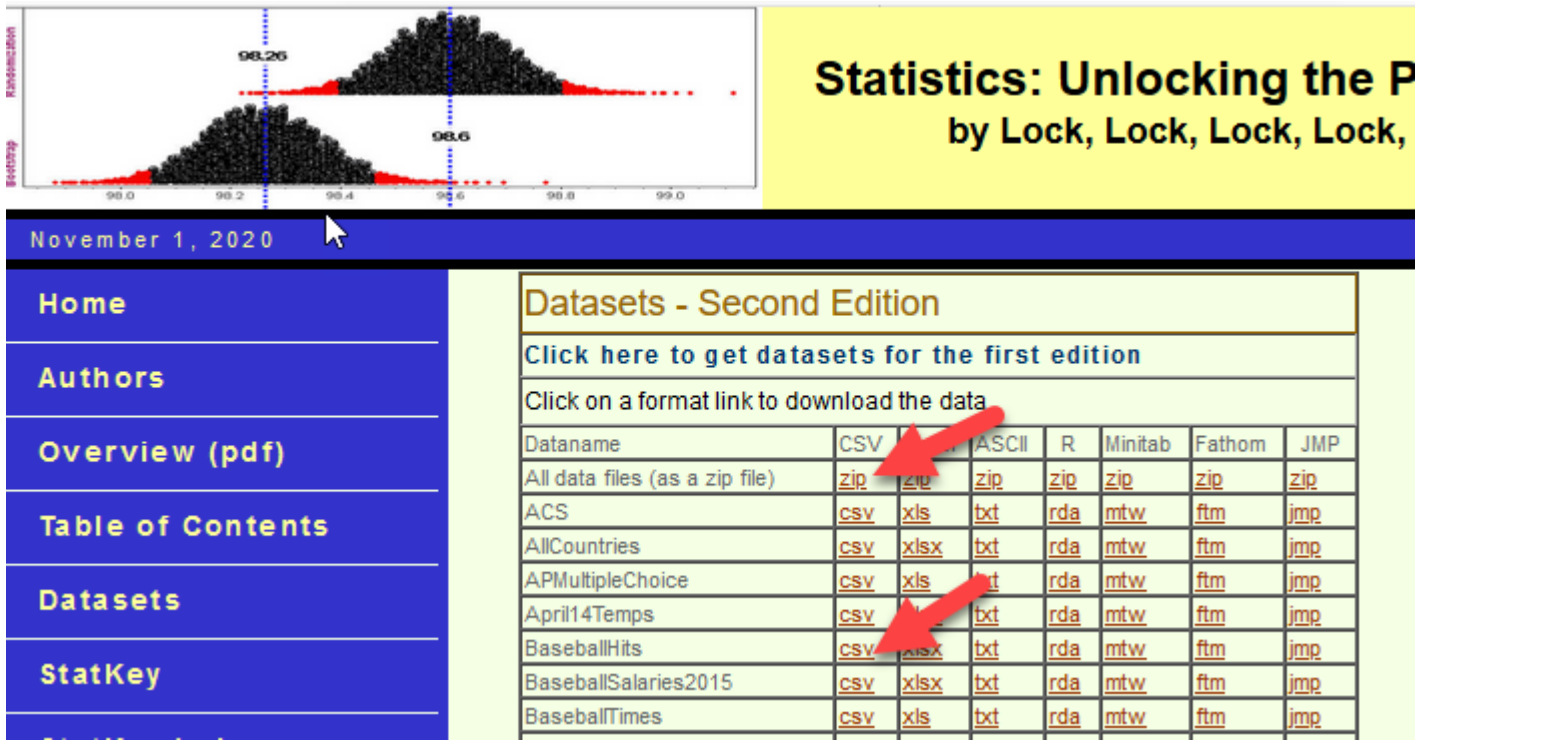
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Click on a format link to download the data
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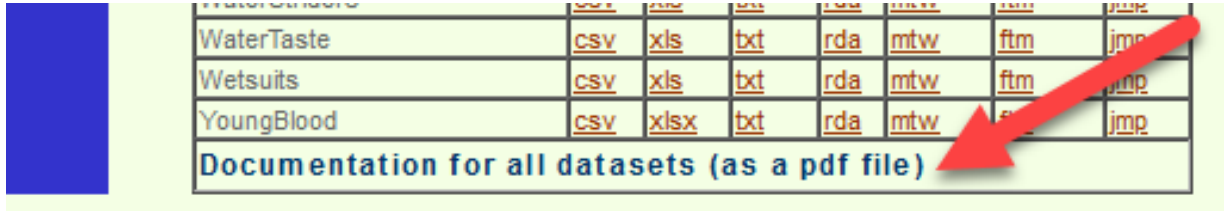
ACS | csv | xls | txt | rda | mtw | ftm | jmp
AllCountries | csv | xlsx | txt | rda | mtw | ftm | jmp
APMultipleChoice | csv | xls | txt | rda | mtw | ftm | jmp
April14Temps | csv | txt | rda | mtw | ftm | jmp
BaseballHits | csv | txt | rda | mtw | ftm | jmp
BaseballSalaries2015 | csv | xlsx | txt | rda | mtw | ftm | jmp
BaseballTimes | csv | xls | txt | rda | mtw | ftm | jmp


WaterTaste | csv | xls | txt | rda | mtw | ftm | jmp
Wetsuits | csv | xls | txt | rda | mtw | ftm | jmp
YoungBlood | csv | xlsx | txt | rda | mtw | jmp
Documentation for all datasets (as a pdf file)