The Analysis Factor offers statistics workshops on a variety of topics at the basic, intermediate, and advanced levels to you on site at your establishment.

Each workshop includes instruction on the statistical topics listed in the workshop description, examples using real research data sets, demonstrations of how to implement in SPSS or SAS software, and a hands-on section with practice exercises and guidance from the instructor. Individual one-on-one consulting sessions to participants' current statistical challenges can be added as well.

The focus of our workshops is giving you an intuitive understanding of what the statistical methods mean for answering research questions, how to implement them in software, the meaning of the results, and the issues to consider as you make the many decisions necessary in any data analysis.

Participants will leave each workshop with understanding of the concepts, the skills to implement analyses using relevant statistical tools, and the knowledge to interpret the results.

Access to a computer lab or personal laptops with relevant software pre-installed will be required for the hands-on section. Specific requirements are listed in each workshop description.

Please contact our office at 877-272-8096 x1 to discuss availability or ask questions about any of our workshops. Specific topics can be customized and combined to suit your needs.

About the Instructor:

Karen Grace-Martin is a statistical trainer and consultant and an expert on statistical modeling, data analysis, SAS, and SPSS.

She has guided thousands of researchers through their statistical analysis for over 15 years. She helps statistics practitioners gain an intuitive understanding of how statistics is applied to real data in research studies.

She has developed over a dozen applied statistics workshops and seminars, which she has taught to well over three thousand students. She is well regarded for her ability to explain complicated statistical concepts in a friendly, concrete, and non-threatening manner that is accessible to applied researchers.

Karen has written hundreds of informational articles on statistical analysis, has research published in peer-reviewed journals, and is co-author of the book: *Data Analysis with SPSS: A First Course in Applied Statistics*.

> What our students say:
>
> "Karen has a gift for explaining and teaching applied statistics. I really appreciate her patient, pleasant, down-to-earth manner. My previous statistics professors were knowledgeable, but un-engaging, and not easy to understand. I wish I would have had a teacher like Karen in my grad program. "
>
> *Joanne Basta*
>
> "Karen has a talent of giving explanations that make tricky concepts very clear."
>
> *Kim Bennett*

Introduction to SPSS
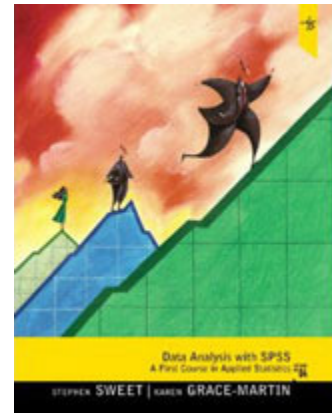
One day workshop
Level: Introductory
Software: SPSS

This workshop gives an overview of working with data in the SPSS environment. Everything is shown in both menus and syntax. This is a good introduction for anyone learning SPSS for the first time or for SPSS users who are comfortable with menus who want to learn the syntax.

Topics Include:

- Research Questions, Designs, Variables, and Units of Observation
- An Overview of the SPSS environment
- Opening & Importing Data Sets
- Saving and Subsetting Data; Keep, Drop, and Rename Variables
- Sorting, Selecting, and Splitting Data
- Entering Data
- Defining Variables: Variable Types, Levels of Measurement, Missing Values
- Defining Variable and Value Labels
- Working with Date Variables
- Working with String Variables: Recode and Substrings
- Working with Numerical Variables: Compute, Recode, and Count functions
- Merging and Aggregating Data
- Checking data manipulations: Case Summaries, Frequencies, and Crosstabs

*Each participant will receive a copy of the instructor's book, **Data Analysis with SPSS**, coauthored with Stephen Sweet; a binder with handouts, exercises, and resource listings. Data sets and exercises will be provided.*

Introduction to Statistics in SPSS

Two day workshop
Level: Introductory
Software: SPSS

This workshop will teach you how to perform beginning to intermediate data analysis in SPSS. Everything is shown in both menus and syntax. This is a good introduction for anyone learning statistics in SPSS for the first time or for SPSS users who are comfortable with menus who want to learn the syntax.

Univariate Descriptives
>	Exploring distributions with measures of central tendency and spread
>	Exploring distributions of categorical variables with frequency tables

Univariate Graphs
>	Using Legacy Dialogs and Chart Builder to Create Graphs
>>		Histograms and Box Plots for numerical values
>>		Bar Charts
>	Using the Chart Editor to customize graphs
>	Creating and Using Chart templates to simplify formatting

Bivariate Statistics
- Cross-tabulations, chi-square tests, and exact tests for two categorical variables
- Correlations and simple linear regression for two continuous variables
- Comparing Group Means with Two-sample t-tests, paired-t tests, and one-way ANOVA
- Comparing distributions with nonparametric tests: Wilcoxan Rank Sum, Wilcoxan Sign Rank, Mann-Whitney U, and Friedman's tests

Bivariate Graphs
- Grouped Bar Charts
- Line Graphs
- Scatter plots

*Each participant will receive a copy of the instructor's book, **Data Analysis with SPSS**, coauthored with Stephen Sweet; a binder with handouts, exercises, and resource listings. Data sets and exercises will be provided.*

Introduction to Statistics in SAS

Two day workshop
Level: Introductory
Software: SAS

This workshop will teach you how to perform beginning to intermediate data analysis in SAS. This is a good introduction for anyone learning statistics in SAS for the first time.

Univariate Descriptives
>   Exploring distributions with measures of central tendency and spread
>   Exploring distributions of categorical variables with frequency tables

Univariate Graphs
>   Using proc gplot to Create and Customize Graphs
>>   Histograms and Box Plots for numerical values
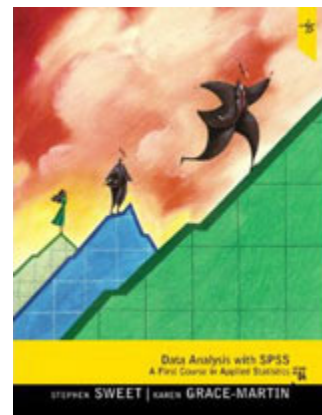>>   Bar Charts

Bivariate Statistics
- Cross-tabulations, chi-square tests, and exact tests for two categorical variables
- Correlations and simple linear regression for two continuous variables
- Comparing Group Means with Two-sample t-tests, paired-t tests, and one-way ANOVA
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Bivariate Graphs
- Grouped Bar Charts
- Line Graphs
- Scatter plots

Linear Models

4 Day workshop
Level: Intermediate
Software: SPSS or SAS

This comprehensive workshop will give you a deep and thorough understand of the concepts, steps, issues, and implementation of linear models with real data.

The four-day workshop includes the following. Each of these can also be a stand-alone workshop.

1. An Overview of the 13 Steps to Running Linear Models (One hour)

We start with this overview of the steps, as implemented in linear regression. This gives you the big picture of what decisions need to be made before even collecting the data, the initial data exploration, and the building, testing, and interpreting the model.

2. Interpreting (Even Tricky) Regression Coefficients (One and a half days)

Although interpreting results is the last of the 13 steps, we start with understanding what the model can tell you about your data. We'll explore different types of variables that can be included as predictors, and ways to code them to get the right information to answer your research question and reflect the real relationships between those predictors and the outcome variable.

- Introduction and Review of Simple and Multiple Regression with Continuous Predictors
- Scaling of Variables: Centering, Standardized Coefficients, and Transformations
- Quadratic and Interaction Terms for Continuous Predictor Variables
- Dummy Coding Binary Predictors: Main Effects and Interactions
- Dummy Coding Multi-Category Predictors: Main Effects and Interactions
- Putting it all together: Each Term in the Context of the Full Model

3. Running Linear Models in SPSS GLM and Regression (Half day)

Now that we know what information we can get from the parts of the model, we turn to the software and how to make it work. This half-day workshop thoroughly examines the GLM and Regression procedures in SPSS. In it, we dig through each button, option, and bit of output to see what it does, when it is useful, and what it means.

- A detailed examination of the GLM procedure
- A comparison to the regression procedure and demonstration of a linear regression in both
- More details on buttons and options that are unique to ANOVA and ANCOVA models, and a demonstration of both

4. Building Models with Hierarchical Regression (Half day)

Model building is often the hardest part of regression. How do you know which predictor variables (and in which form) to include? Hierarchical Regression is a process for building a model by adding terms in sets to choose the best set of predictor variables and higher order terms.

- The descriptive and bivariate statistics that help you understand the variables you have
- Building the initial model
- Carefully checking overall model fit and changes in individual coefficients to

## 5. Assumptions of Linear Models (One day)

Now that the model is built, it's time to check it. You will have gotten clues along the way if something wasn't quite right, but now we explicitly check and resolve any issues with assumptions. There are many misconceptions and misinformation about how to check assumptions.

- What are the Assumptions: Explicit and Implicit
- Checking Assumptions: Plots and Tests
- What to do if assumptions are not met: transformations and weighted least squares

6. Data Issues in Linear Models (Half Day)
- Diagnosing and Resolving Multicollinearity
- Outliers and Influential Points
- Options for Dealing with Missing Data

*Each participant will receive a copy of the instructor's book, **Data Analysis with SPSS**, coauthored with Stephen Sweet (SPSS option); a binder with handouts, exercises, and resources. Data sets and exercises will be provided.*
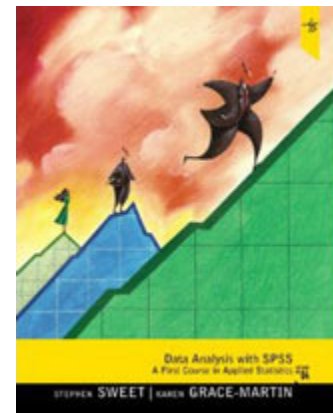
What our students say:

"Karen, I would like to thank you for the wonderful job with the workshop. I got a lot from it. You are a great presenter (very understandable, given the complexity of some of the presented concepts)."

Anna Nadirova
Educational Researcher, Edmonton, Alberta, Canada

"I would recommend this workshop with enthusiasm. Karen is deeply knowledgable and experienced and she is an excellent instructor as well. Her presentation is clear and well-paced, and her responses to questions are always enormously helpful and delivered in a friendly, unintimidating manner."

Sheryl Kopel

"Karen's command of the topic and her skill in communicating and teaching the material was most helpful. The illustration and practice of concepts through SPSS is also very helpful. The materials, technology, organization, and topic selection are all excellent."

Jason Hurwitz

"This workshop delivers a lot useful material. It is professionally oriented, not academic without theory and with interpretation."

Ales Korosec

"The overview of the GLM features was excellent!!! I've already recommended the workshop to colleagues."

Shani Shenhar-Tsarfaty

"It is one of the easiest and most friendly ways of explaining regression to non-statisticians that I have ever followed. Very useful."

- David Arteta

Modern Approaches to Missing Data

2 day workshop
Level: Intermediate
Software: SPSS or SAS

Missing Data is one area of statistics that has blossomed in the past 10 years. Multiple Imputation and Maximum Likelihood solutions that give unbiased results for most missing data problems are now available in mainstream software. There isn't a reason (or an excuse) to keep struggling with outdated methods that lead to bias and lack of power.

> Introduction and Overview
> > 1. What is Missing Data?
> > 2. Missing Data Mechanisms
> > 3. The Four Main Approaches
> Traditional Approaches: Complete Case Analysis and Single Imputation
> Multiple Imputation: The Approach
> Multiple Imputation: Special Cases
> Full Information Maximum Likelihood
> Missing Data Diagnosis: Issues and Steps

Each participant will receive a binder with detailed written workshop notes, handouts, and listings of further readings and resources. Data sets and exercises will be provided. This workshop can be taught using either SAS or SPSS. SPSS users will need to have the Missing Data add-on Module.

What our students say:

"I struggled with trying on my own to connect the dots of what I learned in statistical courses, to applying it to my dissertation. The workshop was, in a word, Excellent! It provided me with knowledge and skills that have increased my ability to conduct a missing data analysis."

Anthony Brown
PhD Student, Walden University

"Thank you so much. I learned so much in this workshop and it will change the way I examine (and design) my data sets from now on! I think the homework is an excellent part of the workshop. All of the resources provided for this workshop were outstanding."

Prudence Plummer-D'Amato, PhD

Logistic Regression for Binary, Multinomial, and Ordinal Outcomes

2 day workshop
Level: Intermediate
Software: SPSS or SAS

The Binary Logistic Regression Model
- A Review of Linear Regression
- How logistic regression is the same as and different than linear regression
- The logit link function and what it means
- Model Assumptions
- Probability, Odds, Odds Ratios and Risk Ratios
- Confidence intervals for logistic regression
- Interpreting interactions for odds ratios
- Demonstration: SPSS and SAS

Assessing Fit and Model Testing
- Wald Statistics for individual coefficients
- Deviance and the Likelihood Ratio test
- Pseudo R-square values and Information Criteria
- Using the ROC Curve to assess how well the model predicts
- Hosmer-Lemeshow goodness of fit tests

Multinomial and Ordinal Logistic Regression
- Multinomial Logistic Regression for unordered categories
- Proportional Odds Model for ordered categories
- Generalized Ordered Logistic Regression for ordered categories

Each participant will receive a binder with detailed written workshop notes, handouts, and listings of further readings and resources. Data sets and exercises will be provided.

What our students say:

"Karen is a fantastically knowledgeable and patient person. There are no wrong or stupid questions when working with her, and everyone is encouraged to participate. Fantastic workshop!"

Danijela Gasevic
Simon Fraser University

Analyzing Repeated Measures Data: GLM and Mixed Model Approaches

Four Day Workshop
Level: Advanced
Software: SPSS or SAS

1. **The Issues and Approaches to Repeated Measures Data**
    Approaches for accounting for non-independence
    The Roles of Subjects, Time, and Predictor Variables
    - Factors and Covariates
    - Crossed and Nested Factors
    - Fixed and Random Factors
    - Random Factors and Random Effects

2. **The GLM Repeated Measures Approach**
    The Multivariate and Univariate Models
    The Concepts (Unstructured and Compound symmertry covariance structures, sphericity)
    How to Run It in GLM and Understand the Output

3. **Transitioning to the Mixed Model**
    Stacking and unstacking the data set using the Restructure Commands
    Graphing the data
    Maximum Likelihood Estimation and Model Fit

4. **The Marginal Model for Repeated Measures**
    Choosing a Covariance Structure for the Residuals
    The Advantages over the GLM Marginal Model
    How to run it in Mixed and Understand the Output

5. **The Random Intercept Model**
    How Random Intercepts Account for Correlations among Observations
    Intraclass Correlations
    Variance Components
    The General Specification of Mixed Models and a Comparison to Marginal Models

6. **The Random Slope Model for Repeated Measures**
    The Model and Concepts
        Random Slopes
        Covariance structures for random effects
        Missing Data & Centering
    How to run it in Mixed and Understand the Output

7. Mixed Model Extensions, Refinements, and Assumptions
1. Model Extensions

     The three-level model

     Random curvature
2. Model Refinements: The residual covariance structure
3. Model Assumptions: Bayes Estimates

8. Steps to Building and Choosing the model
1. The Top-Down Strategy
2. The Step-Up Strategy

Each participant will receive a binder with detailed written workshop notes, handouts, and listings of further readings and resources. Data sets and exercises will be provided.

What our students say:

"If you analyse repeated measures data this is arguably the best resource presently available for learning how to approach this using traditional and modern analyses."

Dr Adrian Midgley, University of Hull, Hull, England

"The Workshop is absolutely and exactly what I had been searching for a long time. I am glad I finally found your website."

Abdul Aziz Farooq
Graduate Student
University of Newcastle

"Thank you so much for offering this workshop! I feel that for the amount of live instruction time given and the exercises, the rate was an excellent value. I think this covered nearly as much as a full quarter-length college course but cost lots less and was so much more convenient! Compared to the cost of sending someone to a training in a hotel, etc. this was very good value."

Cassandra Vaughn

"The workshop did a great job of understanding the practical and theoretical nature of this analysis. People talk about this stuff in every which way so this shed light on this, as I have been working on this topic for a year or so."

Becca Lewis

One-hour Seminars

These seminars can be added on to any of the workshops described above or serve as a stand-alone presentation.

Approaches to Missing Data: The Good, the Bad, and the Unthinkable

You've probably heard about many different approaches to dealing with missing data, and you've probably gotten different opinions about which one you should use. In this seminar, you'll get an overview of:

- the three types of missing data, and how they affect the approach to take
- the common approach that is generally worse than any other
- the easy, common, seemingly bad approach that often isn't so bad, and the situations when it doesn't work
- the approach that gives unbiased results, is very easy to implement, but only works in limited situations
- the approach that gives unbiased results, is harder to implement well, but works with any statistical analysis

Random Intercept and Random Slope Models

Most scientific fields now recognize the extraordinary usefulness of mixed models, but they're a tough nut to crack for someone who didn't receive training in their methodology.

But it turns out that mixed models are actually an extension of linear models. If you have a good foundation in linear models, the extension to mixed models is more of a step than a leap. (Okay, a large step, but still).

This seminar will outline and demonstrate one of the core concepts of mixed modeling—the random intercept and the random slope. You'll learn what they mean, what they do, and how to decide if one or both are needed. It's the first step in understanding mixed modeling.

An Overview of Binary, Multinomial, and Ordinal Logistic Regression

When your outcome variable is categorical, there is no way to make linear models work. Luckily, there are a number of alternative models. The most common one is logistic regression, and it has variations for different types of categorical variables.

This seminar is an overview of:

- how these regression models differ from Ordinary Linear Regression
- the type of data for which each is appropriate
- how to interpret the coefficients and odds ratios from each

An Overview of Poisson and Negative Binomial Regression Models for Count Data

Ever discover that your data are not normally distributed, no matter what transformation you try? It may be that they follow another distribution altogether.

Although they are numerical, discrete count data often follow a Poisson or Negative Binomial distribution, not a normal one.

Examples of discrete counts include:

- Number of tagged fish that return to a reef each month
- Number of months of unemployment
- Number of arrests in a neighborhood

This seminar will give you an overview of Poisson and Negative Binomial regression models, including:

- how these regression models differ from Ordinary Linear Regression
- the type of data for which each is appropriate
- how to interpret the output from each

Principal Component Analysis

Principal Component Analysis is a variable reduction procedure--it allows you summarize the common variation in many variables into just a few. It's similar to Factor Analysis, but has different underlying assumptions and means of the components.

This seminar will summarize what it is, when to use it, how it differs from Factor Analysis, and briefly demonstrate the 5 steps to conducting a Principal Component Analysis.

Understanding Mediation and Path Analysis

Path Analysis is a system of regression equations used to determine if a third variable (a mediator) is driving the relationship between an independent and dependent variable. It is one of the simplest forms of structural equation models (SEM), but you don't need specialized SEM software to run it.

This seminar will give an overview of the concepts, terminology, and steps involved in detecting mediation using three regression equations.

"Teriffic job! I learned a lot. Thanks. Way to reduce a challenging topic to managable bite-size pieces. The graphical representations of the models helped me understand the random slope and random intercept terminology in a way I never got before."

Rob Baer

"I found it a great example and clear explanation, an hour is much better spent watching this than reading through a text book as an intro to this form of modeling."

Matt Cooper

" Just terrific. Clear, at the right level for me, extremely helpful."

Amy D'Andrade

"The seminar was well presented. The speaking was clear and easily undersood. The presentation was paced well. I found many of the questions and answers at the end to be *very* useful."

Andrew McLachlan

"The handouts will be a great resource in the future. I will review the material before my defense in a couple of months. I always learn a lot from Karen's workshops!"

Glenys Webster
PhD Candidate, School of Environmental Health
University of British Columbia

"Karen, I can't wait until your next seminar. Many thanks for your presentations. They are in top class."

Tim Constantin