

Chapter 1

Statistics and Variation

What's It About?

This chapter is about Statistics – what it is and why we care. It also describes the important features of the text.

Comments

Do expect your students to read the book. We've tried to make the book engaging. You can assign a few pages of reading along with some problems each night. Chapter 1 makes a good opening assignment.

This is the students' first look at the style of the book, and we do lay it on more heavily here than we will when discussing, say, confidence intervals. We want to shake things up. We want them to notice that this is not the same old math or science textbook they've seen before. And we'd like to get them on our side. That's the reason for the humor and self-deprecating remarks.

Every Statistics text starts with a definition of *Statistics*. We do too, but ours is different. And the difference matters. We say that Statistics is *a way of reasoning* and that the goal is *to help us understand the world*. We've found it helpful to reinforce this idea throughout the book, especially when we get into the methods sections of the course. This book is first and primarily about statistical thinking. Methods, definitions, and skills are all here, but each is presented with the purpose of understanding the world so we can make better business decisions. That's why every example follows the *Plan, Do, Report* pattern, starting with careful reasoning and concluding with a sentence or two telling what we've learned about the world.

It is easy to be drawn into a focus on definitions, on algorithms, and on getting the "right answer." Those are easier to teach and certainly easier to grade. Please resist the temptation. If you can help your students to stay focused on statistical thinking and understanding, this course can change the way they view the world.

A Note on Teaching

We don't spend an entire class period on this chapter; in fact, sometimes we just start right in on Chapter 2. Chapter 1 is meant to be read *by* students not *to* them. Discuss the important definitions, collect some data, and move on as fast as you can. We've got a lot to cover and can't afford a full class just to get moving.

Looking Ahead

Most of our own students actually do the reading. (Yes, we were surprised at first.) If you can hook students on reading the text, there are big benefits later on. As they read they learn that the book is a valuable resource to help them understand sticky concepts, to help lead them through writing complete and clear solutions, and to help them avoid common mistakes.

1-2 Part I Exploring and Collecting Data

Class Do's

One of our favorite definitions says “Statistics is the art of distilling meaning from data.” Data have a story to tell. Our objective is to uncover that story. Collect some data in class, and ask students to look for interesting facts hiding there. Or have students gather current economic or business data from the internet.

Encourage students to think about the concepts and definitions in this chapter. For example, why do we talk about “a statistic” when we don’t discuss “a mathematic” or “a physic”? Statistics is a whole that is made up of many parts, and each of those parts has its own meaning and its own story to tell.

The Importance of What You Don't Say

One of the reasons Statistics can be difficult to teach is that we often deal with vague concepts. Students and instructors both like clear definitions; they’re easier to teach, learn, and grade. But reasonable people can disagree about whether a histogram is symmetric or skewed, whether a straggling point is really an outlier or just the largest value, or whether the spread really is the same in two groups we want to compare. It is important to allow students their own opinions and insights into data.

Avoid the temptation to lead students in any particular direction or give them hints about how to examine the data you collected. They know some things to do—they’ll find percents and averages, maybe draw some simple graphs, and write a few sentences about what they see. Just let it happen. You’ll have plenty of chances to suggest, lead, and modify later on.

The motivation of hoping to understand the world is quite sufficient to justify thinking beyond the numbers at hand. This is not the time to introduce technical concepts of inference. We’d rather not see these ideas yet (and you won’t find them this early in the text). We all know that we’ll be heading that way eventually, but if we make reasoning about patterns in the data too formal too soon, we’ll stifle students’ interest and enthusiasm and burden them with a lot of terms they don’t have a context for just yet.

Class Examples

Take a quick class survey. Make sure that you have a good mix of quantitative and categorical variables. Some possible variables are gender, political leaning (Liberal, Moderate, Conservative), number of siblings, number of states visited, and shoe size. Start passing a survey sheet around at the very beginning of class; it can circulate quickly while you are introducing yourself and talking about the course, expectations, and so on. Passing out slips of paper with a list of states for each student to check off will speed things up, so we provide that, too. After you’ve entered the data into the computer, give the students the data file and ask them what story it tells about their class. You’ll find that a lot of important issues will surface during discussions. As new methods are introduced throughout the course, you can continue using the data for examples.

Hints: Data are rarely as simple as they seem. Suggest the variables above, and then pause for some discussion. Does touching down at an airport qualify as “visiting” a state? Does an only child count herself when counting siblings? Should shoe sizes be adjusted because men’s and women’s size 7 are different sizes? Give them a chance and they’ll find other issues—and they’ll be developing a healthy skepticism for data. That’s just what we want, so they’ll value the tools that

help them look at data more carefully.

If you don't specify units for height, you may get some values in centimeters. Alternatively, if you specify inches, you may get a "55" from someone who meant 5'5". Those outliers make for good class discussion.

Resources

*Decisions Through Data**

- Video Unit 1: What is Statistics

* *Decisions Through Data*; COMAP (1-800-77COMAP), 1992.

1-4 Part I Exploring and Collecting Data

An Example of a Survey Sheet

<i>Student #</i>	<i>Gender (F/M)</i>	<i>Politics (Lib/Mod/Con)</i>	<i># of Siblings</i>	<i># of States Visited</i>	<i>Shoe Size</i>	<i>Height (ft. ' in. ")</i>
1						
2						
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