

# Where Do Statistics Come From?

## Setting the Table for Introductory Statistics

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### AUDIENCE

Educators teaching Introductory Statistics

### BACKGROUND

Many introductory statistics textbooks begin with the near-biblical premise “There is Data” as if they are pre-existing facts and then concentrate on the language, mechanics and science of statistical calculations. Most of these same textbooks completely ignore the fundamental question about the origin of statistics and the critical yet often subjective decisions (i.e. choices of population, sample, measures, definitions, categories, etc.) that can greatly impact the data and values eventually calculated.

### CONTEXT IS KEY

Statistics is often described as numbers within context. For new students who ascribe to be statistically literate producers or consumers of statistics, they must be provided the necessary tools and thought processes to incorporate context into their work with numbers.

From GAISE Guidelines, Students should know:

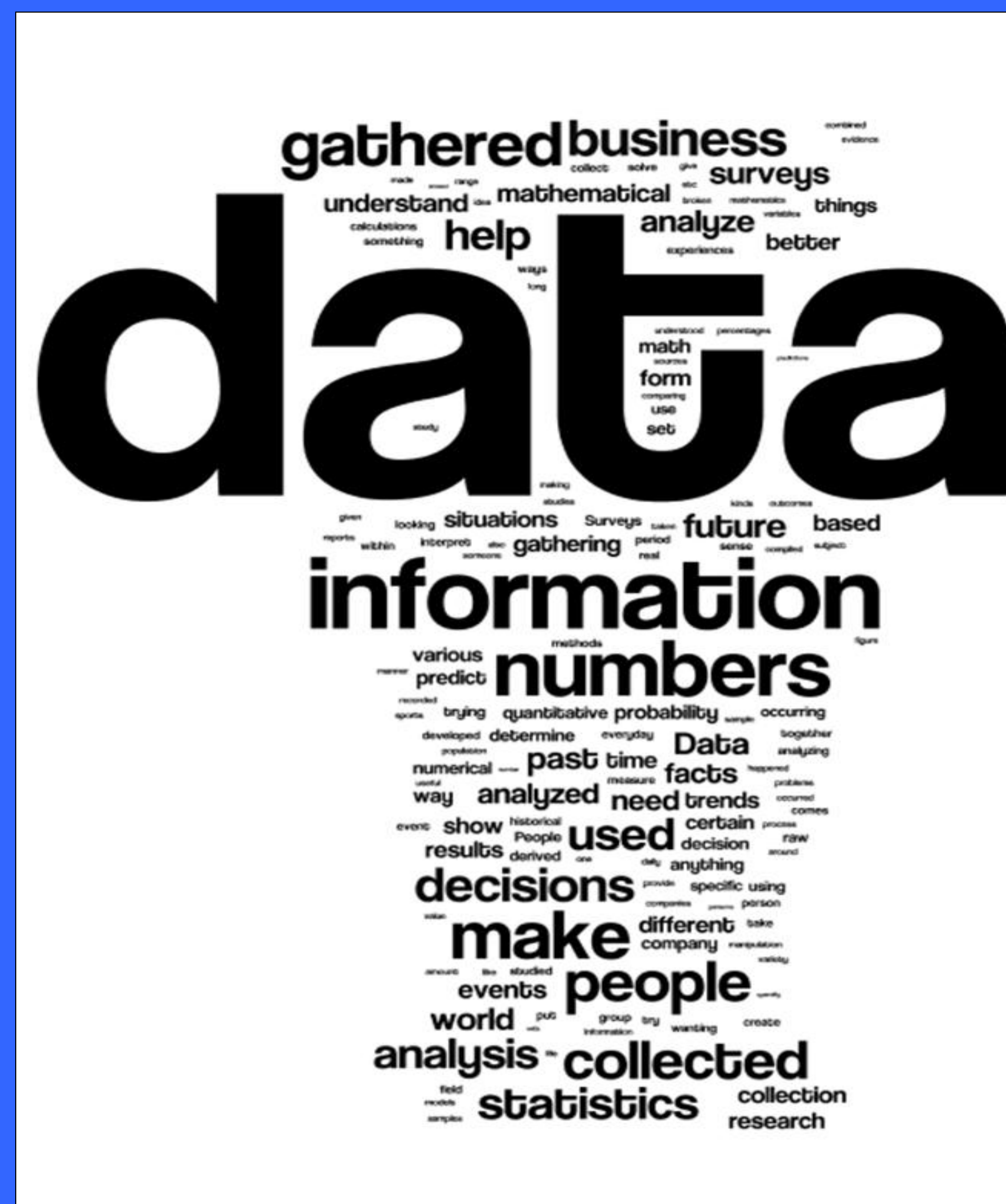
- How to interpret statistical results in context
- How to critique news stories and journal articles that include statistical information, including identifying what’s missing in the presentation and the flaws in the studies or methods used to generate the information

By asking “Where Do Statistics Come From?” students must learn to develop their skills in *hypothetical thinking* about what was done (or might have been done differently) to influence the presented results.

### FIRST DAY ACTIVITY

“Based on your current knowledge of statistics and quantitative decision making, I’d like you to write a very brief (1-2 sentence) answer to the following question. We’ll discuss the question later in the course... **Where do Statistics come from?”**

- Conducted in undergraduate introductory business statistics course and MBA quantitative decision making courses between ‘08 – ‘11.
- The Wordle word cloud of results below shows the overwhelming mention of data / numbers / information in student answers.



### SUMMARY OF RESULTS

These 242 open-ended responses were each classified into a single category.

- The majority (53+%) denoted data, information or numbers as the focus of their answer.
- 15% indicated a form of mathematical calculation
- Over 7% stated a method of data collection (sample, survey, data mining, etc.)
- Only 7% indicated a person, group or organization with a question of interest.
- Remaining 18% split among 4 categories

### WHY NOT START WITH DATA?

Saying that “Statistics Come from Data” seems to be a common answer from both beginning introductory statistics students and their textbook authors. What is wrong with starting with data?

To say that “Statistics Come from Data” is similar to saying “Babies Come from Hospitals”. While it is generally true and an appropriate answer for some audiences, it leaves out a whole lot of the interesting part of the story.

As educated, statistically literate citizens of our society, students must learn to consume and critique the statistics others present to us in their efforts to sell, persuade and convince. Focusing on the question “Where Do Statistics Come From?” gives the student a set of tools to develop their critical thinking regarding numbers and statistics.

### SET THE (COURSE) TABLE

Like many good intellectual questions, there are many possible “correct” answers to the query “Where Do Statistics Come From?”

Students must start with the idea that all statistics come from someone with a need for information or a research question. With this premise, students can begin to understand and inquire about all of the relevant influences on the resulting reported statistics that they encounter in the news or workplace as a statistical consumer.

By introducing a framework that demonstrates the life cycle of a set of statistics, students can form a mental model from which to hang the traditional content of an introductory statistics course.

### PROPOSAL: CHAPTER Ø

Promoting the theme “Where Do Statistics Come From?”, I propose the addition of a chapter that introduces students to the research method process. Students would be exposed to the idea that:

- Statistics are the result of questions of interest by individuals / organizations
- Decisions are made in the collection of the relevant data which can have profound impacts on the resulting conclusions. (definitions, sampling, categorization)
- Statistics are the product of selected mathematical formulas / analysis.
- Necessary choices are made in the presentation and summary of those calculations both in numerical and written format.
- Summary reports in the news media are also created with necessary decisions regarding content, length, amount of detail, etc.

Students must be properly equipped to ask and understand the answers to this important question in order to make an educated, statistically literate conclusion about a set of reported statistics.

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### REINFORCE THEME THROUGH FOLLOW-UP ACTIVITIES

This first-day activity is a starting point which can be connected to further activities during the course. Currently I use a version of Roxy Peck’s Red Book activity, a simulated survey course project and several other activities to reinforce the theme of “Where Do Statistics Come From?” and the related issues that arise from that question.