

Teaching Statistics Using the News Media

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Abstract

This article discusses the use of news media to teach statistics; undergraduate students at a large urban university are the audience. However, this approach would also benefit secondary school students as well as offer an alternative approach for introducing graduate students to statistical concepts via journal articles. The rewards and challenges of this approach will be discussed as well as students' reactions to this methodology.

Key Words: teaching, media, statistical thinking

1. Introduction

In this age of the internet and social media, society is continuously bombarded with information 24 hours a day. Recently, much emphasis has been placed on teaching students statistical concepts and how to apply them to the understanding of the real world instead of regurgitating and manipulating statistical methods. Using stories from everyday life affords the instructor the opportunity to introduce students to statistical concepts from a platform that may be less intimidating than the use of mathematical equations. For students who suffer from mathematical anxiety, the news media is a particularly valuable source for teaching statistics to students in non-quantitative majors such as criminal justice and journalism. The media offers a multitude of interesting topics that span subjects from world news to travel. This article focuses on the use of statistical thinking concepts to help students critically analyze information in the media in areas such as health, science, and politics. It also discusses the challenges of teaching statistics in a manner that deemphasizes quantitative methods, while highlighting other issues such as the distinction between propaganda and information.

2. Methodology and Evaluation

The undergraduate statistics course is taught at a large urban university to students who primarily have non-quantitative majors. The students are from diverse backgrounds and encompass a broad age range. The teacher supplies articles from the course text, news media, and the internet, and the students contribute articles. The course text is *Seeing Through Statistics*, by Jessica Utts.¹ Some of the news media/internet sources used are journals, newspapers, magazines, twitter, Facebook, and blogs. The platform used to teach to the course is lecture and discussion. Lectures are given on the critical components and statistical concepts necessary to analyze media information. Students evaluate the articles in groups during class and individually as homework assignments. Group assignments entail evaluation of the articles and verbally presenting findings to the class for discussion. Group discussion is very beneficial because it offers the students an opportunity to be exposed to different perspectives and gain the insight of others on the

necessary components that comprise a good article. Final grades are based on homework assignments, two exams and a final. Currently, in class group activities are not graded.

Schiold states that “Statistical literacy is the ability to read and interpret summary statistics in the everyday media: in graphs, tables, statements, surveys and studies”.² When evaluating an article it is imperative that students can identify the question of interest, the target population, and the critical ingredients for a well written article. Utts offers seven critical components that can be used to help evaluate information, and they are: 1) what is the source of the research and who is paying for it; 2) who are the investigators who had contact with the participants; 3) researchers or entities studies and how were they chosen; 4) exactly how were the measurements made and the exact questions asked; 5) the setting in which the measurements were taken; 6) differences in the groups being contrasted, in addition to the question of interest; and 7) the extent or size of any claimed effects or differences.¹ These components as well as other concepts such as bias, complexity of questions in surveys and the use of statistics, e.g. mean or proportion, without any reference to the variation in the measurement must also be considered. It is important to note that all components and statistical concepts taught are not present in every article. However, it is imperative for students to ascertain when a critical piece of information is missing as well as when erroneous information is given.

All seven critical components are presented to the students. The measurement component is the most difficult for the students to apply. Therefore, a lot of time is spent on this component. In addition, how to determine the question of interest, choose a good sample and interpret graphs is emphasized.

3. Examples

Two typical media examples for classroom discussion are presented. The first is an article entitled “Study Finds No Statin, Cancer Link” from Reuters.³ The second example focuses on the June, 2011 unemployment report as presented during July 8, 2011, the Rachel Maddow Show on MSNBC.⁴

1.1 Study Finds No Statin, Cancer Link

Reuters Health July 20, 2011 presented the findings published in the Journal of the American College of Cardiology on July 18, 2011.⁵ The researcher claim that users of cholesterol-lowering statins appear no more likely to develop cancer than non-users. The researchers used a database with electronic records for approximately 11 million Americans. The data used were from patients in the “real world” as opposed to clinical trial patients. The study was designed such that each statin user in the study was matched with another patient who never used statins with similar characteristics such as weight, age, cholesterol levels, and medical condition. It was found that the patients on statins were no more likely to develop cancer than non-users over five years and that there was no statistical difference in risk. The article states that the findings are important because they contradict a widely publicized 2008 clinical trial report that found heart patients on the statin Vytorin had higher cancer risk than placebo. The researchers say the findings in the 2008 clinical report are likely by chance.

The Reuters article gives detailed information about the participants in the study as well as the findings. The original source of the research is given and the reader may refer to the journal article for additional details. The article tells the reader the differences in the groups being contrasted, in addition to clearly stating the question of interest. The size of

the claimed effect is also given. The challenge to students is to note what key pieces of information are missing. For example, the article states that there is no statistically difference in the risk between the two groups but does not give the definition of statistical difference. In addition, no reference is given for the 2008 clinical trial report that is cited.

1.2 June 2011 Jobs Report

The June 2011 jobs report showed that job growth in the United States is still sluggish. From February 2011 to April 2011 there was an average of more than 200,000 new jobs created per month and it seemed as though the unemployment picture was improving. However, the June 2011 jobs report caused some to revisit their optimism. This section looks at an article published in the New York Times, graphs presented on the Rachel Maddow Show and some additional graphs on the jobs data.

The New York Times reported that 18,000 new non-farm payroll jobs were created in June with the private sector gaining 57,000 jobs and the public sector losing 39,000 jobs.⁶ The article states that in a separate survey of households it was revealed that more people were looking for jobs in June and this is a possible reason for the uptick in the unemployment rate from 9.1% in May to 9.2% in June. The article does not provide information on the number of households surveyed, their characteristics, what questions were asked, nor how the households were selected.

Graphical displays are very useful for getting information across to an audience. On July 8, 2011, Rachel Maddow displayed a couple of graphs related to job data. Using the data from the Bureau of Labor Statistics, the figures were reconstructed.⁷ Figure 1 is a graph displaying the number of government jobs per month since President Obama's inauguration. The chart is entitled "Over 500,000 Government Jobs Lost Since President Obama's Inauguration". The challenge to students is to offer another way of displaying the data such as monthly change in the number of government jobs and to comment on the fact that since the government did a lot of hiring for the 2010 census in April 2010, this depiction of the decline in government jobs may be exaggerated. Figure 2 is a graphical representation constructed by Steve Benen showing private job deterioration from January 2008 to June 2011⁸. The red bars represent President Bush's administration and the blue bars represent President Obama's administration. The students would be expected to ask about job growth in President Bush's administration prior to 2008 and to note that it may be helpful to have month/year displayed on the x axis. Only job losses occurred during the time period shown in President Bush's administration.

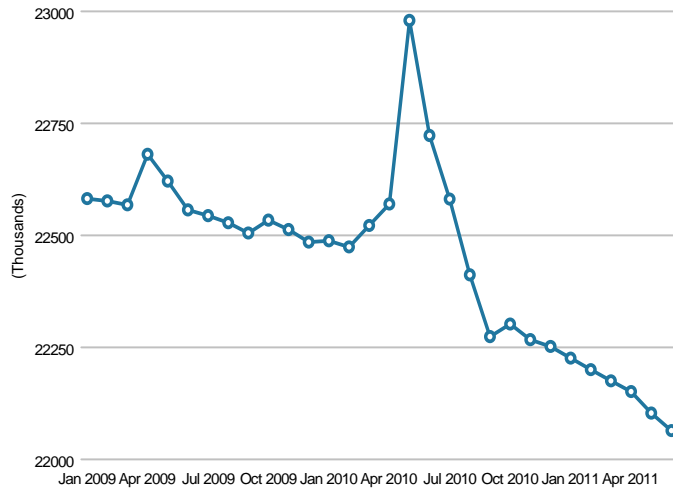


Figure 1: Over 500,000 Jobs Lost Since Obama’s Inauguration

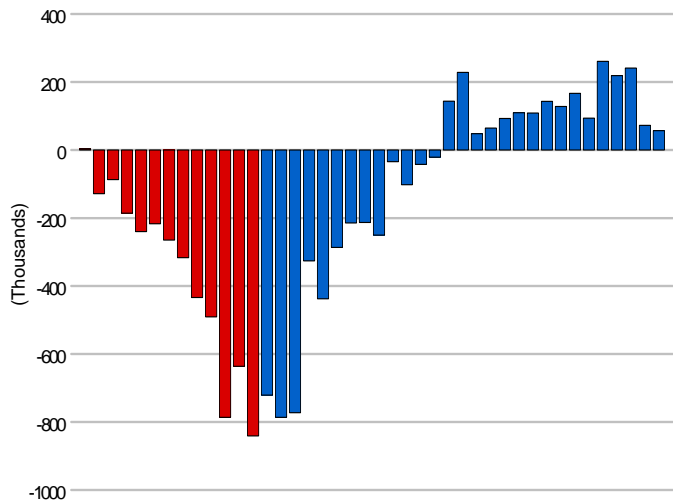


Figure 2: Change in Number of Private Sector Jobs January 2008 to June 2011

Using data from the Bureau of Labor Statistics I constructed three additional graphs. Figure 3 shows the change in the number of non-farm payroll jobs in the private and government sectors as well as in total from January 2009 to June 2011. The students are expected to make observations about the three sectors and compare the depiction of government jobs in this Figure 1 to that in Figure 3. Figure 4 displays change in non-farm payroll from January 2008 to June 2011 for government versus private and total. The students would be expected to comment on the spike of the graph for government and the base of the graph which presents private versus total non-farm payroll. In addition it would be interesting to compare the Figure 3 three dimensional plot to the Figure 2 two dimensional plot. For example, the April, 2010 increase in jobs is more noticeable in Figure 4 than Figure 3. Figure 5 presents a box-plot of the change in private, government, and total non-farm payroll from January 2008 to June 2011. The students would comment on the differences between the three box-plots and offer explanations of how this graphical display compares to the others.

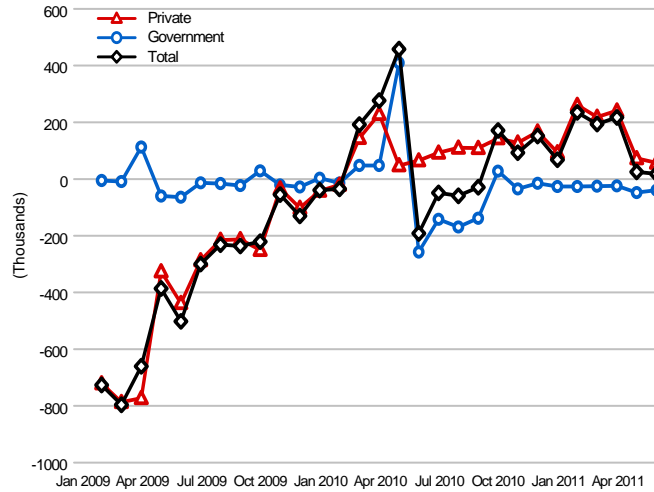


Figure 3: Change in Number of Jobs January 2009 to June 2011

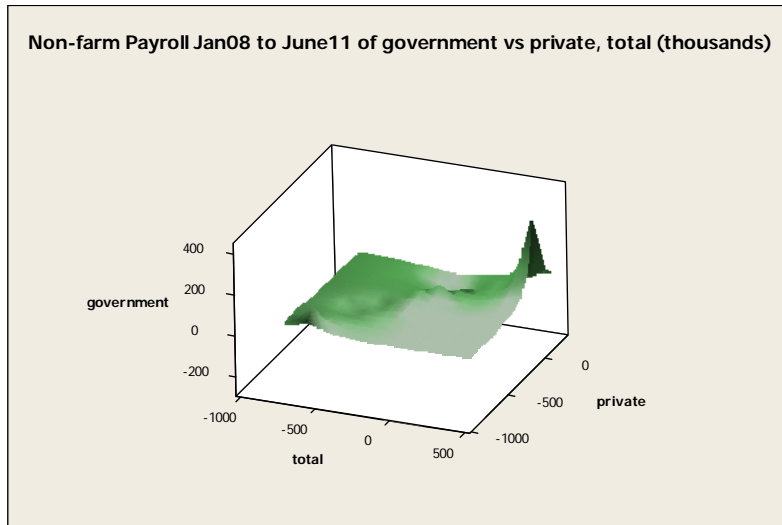


Figure 4: Change in Non-farm Payroll January 2008 to June 2011 of Government versus private, total (thousands)

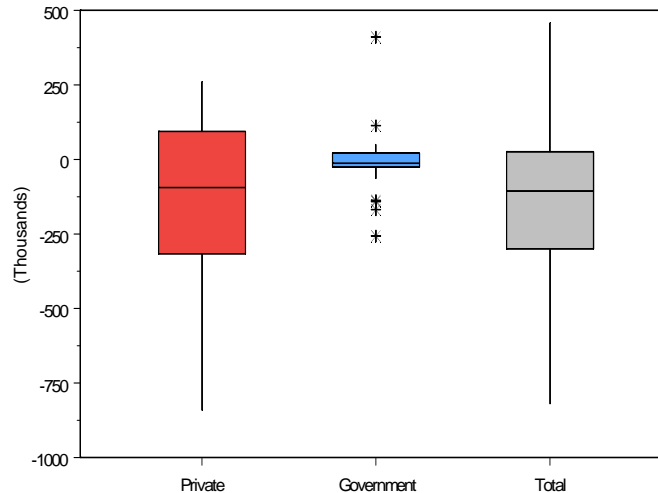


Figure 5: Box-plots of Change in Non-farm Payroll January 2008 to June 2011

Additional questions concerning the graphs may reveal other ways to depict the data to obtain a better understanding of the employment picture. For example, giving consideration to the number of layoffs each month and the resulting effect on the job creation numbers, or a display of the number of private jobs lost since President Obama's inauguration. In addition, emphasize that it is always possible to mine the data from the Bureau of Labor in order to obtain more information.

4. Concluding Remarks

An abundance of material that covers a broad array of interesting topics to students is necessary to teach a course using the media. Assembling a cornucopia of interesting articles can be a daunting task as noted by Boersma, et. al.⁹ Another challenge is engaging the students in discussion and ensuring all members participate in group analyses. It is important to emphasize the limitations of the internet and news media to present information due to limited time and space.

Statistical concepts are more readily understood when presented to students via stories or situations relevant to everyday life rather than mathematical equations. This approach can be challenging for the teacher as it may be difficult to find articles that are not too technical covering particular statistical concepts. In addition, it may not be easy for teachers to translate some statistical concepts without the support of quantitative language. Students verbally expressed positive feedback regarding the use of news media in teaching statistical concepts, and it was noted that some of their mathematics anxiety dissipated. Students claim they feel comfortable enough to apply some of the concepts taught in this course to their future coursework and everyday life. In the future I plan to design a survey to assess student attitudes towards this course. In addition, more real life situations can be used to assess whether the students are grasping the concepts. For example, students could be asked, "If you were a juror, which critical components would you apply to information presented by the prosecutor to ascertain guilt or innocence in a criminal case?" Providing students with the knowledge to critically analyze information is a giant step towards statistical literacy.

References

1. Utts, Jessica M, *Seeing Through Statistics*, 3rd Edition, Thomson Brooks/Cole, 2005
2. Schield, Milo, Assessing Statistical Literacy: Take Care, Chapter 11 in *Assessment Methods in Statistical Education*, Wiley 2010
3. Study Finds no Statin, Cancer Link Reuters Health July 20, 2011
4. Rachel Maddow Show: MSNBC July 8, 2011
5. bit.ly/oHo6vQ Journal of the American College of Cardiology, online July 18, 2011.
6. *Job Growth Falters Badly, Clouding Hope for Recovery* (The New York Times Motoko Rich July 8, 2011)
7. Bureau of Labor Statistics Data, <http://data.bls.gov/cgi-bin/surveymost>
8. *Private sector job creation deteriorating, too*, Blog, Political Animal, Steve Benen July 8, 2011
9. Boersma, Diefenderfer, Dingman, and Madison “Teaching Quantitative Reasoning with the News”, supported by the National Science Foundation DUE-0715039