

Challenging Statistical Claims in the Media: Course and Gender Effects

Rose Martinez-Dawson, Ph.D.
Department of Mathematical Sciences
Clemson University
Clemson, S.C. USA



What questions might you have concerning Allstate's claim that there are "6 million car accidents every year in America?" Explain why each question is important to ask.

Introduction

- In today's data driven world, information (especially of a statistical nature) is readily available and easily obtained.
- Some of the information may be misleading or inaccurate.
- Misconception: If a statistic appears in print or on news, it must be true.

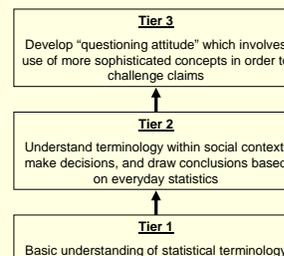
Introduction

- "...to move students from a situation where they automatically believe everything they read in the media to one where they intelligently question data and claims..." (Watson, 1997, p.110)
- Goal: Informed citizenry

Statistical Literacy

Statistical literacy involves the ability to critically evaluate statistics encountered in everyday life.

Statistical Literacy: The Hierarchical Model (Watson, 1997)



Statistics in Everyday Life (SIEL)

- Developed to promote statistical literacy
- Sophomore level course
- Follows traditional introductory statistics course topic sequence
- Emphasis on concepts rather than formulas
- Statistical concepts couched within everyday life modules
- In-class activities

Theoretical Basis of SIEL

- David Ausubel’s Meaningful Reception Theory
 - Prior knowledge
 - Advance Organizer
 - Meaningful Learning

New information is meaningful if it can be “anchored” to prior knowledge.

(Ausubel, D.P., Novak, J.D., & Hanesian, H,1978)

Outline for SIEL

Everyday Life Module	Producing Data	Basic Probability	Descriptive Statistics	Inferential Statistics
Society	X			
Government	X		X	
Survey & Polls	X		X	X
Lottery		X		
Sports		X	X	
Education	X		X	X
Liberal Arts	X		X	
Environment	X	X	X	X
Court room	X	X	X	
Advertising	X		X	X
Medicine	X		X	

Martinez-Dawson (2010)

Inspiration for Research

“Statistical literacy is more about questions than answers. It doesn’t have many answers, but it should help one to ask better questions and thereby make better judgments and decisions...Statistical literacy helps one answer the question asked of most statistics: ‘What does this mean?’”

Schiold, M. “Statistical literacy: Thinking critically about statistics” <http://www.augsburg.edu/ppages/schiold>

Research Questions

What areas of concern did students raise when viewing media that make statistical claims?

1. Before taking the course focused on statistical literacy, what topic categories were observed?
2. After taking the course focused on statistical literacy, what topic categories were observed?
3. Was there a change in topic categories observed from pre-course to post-course?
4. Were these topic categories different for males and females?

Method

- Two advertisements and article
 - Given the second day of class and on the final exam during spring 2009 semester
 - 144 students (58.33% Female, 41.67% Male)
 - Asked to provide questions concerning claims in media articles
 - Real-world examples
 - Quantitative and categorical examples
 - Open-ended format
- Pre-course and post-course responses were matched by student.
- Statistical significance at 5% level

Pre-Course and Post-Course Challenges

- **Pre-course**
- **Post-course**

Definition or type of accident?	58.33%
Source of 6 million?	29.17%
How was information obtained?	20.14%
Factors affecting accidents?	18.06%
Unreported accidents included?	15.97%
Effect of definition of car accident on 6 million?	15.97%

Definition or type of accident?	84.72%
How was information obtained?	60.42%
Source of 6 million?	39.58%
Unreported accidents included?	30.56%
Which years was study conducted?	15.28%
Location of accidents?	15.28%

Challenges with significant change in response patterns

- Definition or type of accident?
- How was information obtained?
- MOE or CI included?
- Effect of definition of car accident on 6 million?
- Unreported accidents included?
- Definition of "car"?
- Lurking variable?
- "Too many" definition?
- Source of 6 million?
- Location of accidents?

Pre-Course and Post-Course Significant Challenges by Sex

- **Pre-course**
- **Post-course**

Correlation? (F>M)	Definition of "America"? (M>F)
	Question if could count all accidents? (F>M)

Significant Change in Response Pattern by Sex

- **Both Male & Female**
- **Male only**
- **Female only**

Definition or type of accident?	Definition of "America"?
MOE or CI?	Location of accidents?

- Dark figure?
- Effect of definition of car accident on 6 million?
- How was information obtained?
- Population or population size?
- Question if could count all accidents?
- Source of 6 million?
- "Too many" definition?
- Unreported accidents included?

Conclusions

- After SIEL, increase in percentage of responses to important topic categories and change in response patterns
- Gender differences were observed
 - Percentage of topic categories
 - Changes in response patterns

Considerations

- Non-random sample
- Focused on one University and course
- Pertained to three specific media articles
- May have had difficulty expressing challenges in writing
 - Link with communication skills & general literacy
- Fatigue
- Open format versus prompts

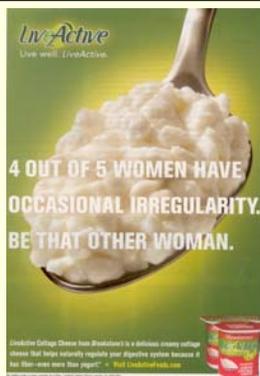
Overall Importance of Study

- Provide insight into statistical literacy of college students
 - Think at higher level about statistics
 - Relevance of Statistics in their lives
 - Incentive to take more Statistics courses
- Building block for other research concerning questioning attitude
- May influence development of courses on statistical literacy
 - Use of media articles
 - Everyday life modules

Implications of Research

- Statistical literacy takes time to develop.
 - Need more than one course
 - Promote statistical literacy from elementary school through higher education
- Promote culture of questioning

Article #2



What questions might you have concerning LiveActive's claim that "4 out of 5 women have occasional irregularity?" Explain why each question is important to ask.

Article #3

Depression Hits 1 in 10 Teen Girls Each Year

Teen Girls Twice as Likely to Suffer Depression as Boys

By Daniel Culligan, WebMD Medical News
Reviewed By Deborah Nazario, MD, Wednesday, February 04, 2004

Feb. 4, 2004 – About one in 10 teen girls suffer a major depression each year, a Canadian study shows.

The study, led by University of Alberta researcher Nancy L. Galambos, PhD, analyzed four years of data from 1,322 boys and girls. At the start of the study, the teens ranged in age from 12 to 19 years old.

Not surprisingly, more than one in five girls admitted to having been depressed sometime in her life. Only one in 10 boys said they'd ever been depressed.

But more probing questions showed that during each year of the study, nearly one in 10 teen girls had a major depressive episode – about twice the rate of boys.

"This is a substantial number of young Canadian women who should be identified as depressed and treated," Galambos says in a news release.

"Very substantial proportions of young people will experience a major depressive episode at some point as they move through adolescence," Galambos and colleagues write in the January issue of the *International Journal of Behavioral Development*. "About twice as many females as males will be so affected."

Galambos notes that depression puts teen girls at risk of anxiety, eating disorders, conduct problems, academic failure, and trouble with relationships.

What questions might you have concerning the above article? Explain why each question is important to ask.

References

Ausubel, D.P., Novak, J.D., & Hanesian, H. (1978). *Educational Psychology: A Cognitive View* (2nd ed.). New York: Holt, Rinehart, and Winston, Inc.

Martinez-Dawson, R. (2010). The effects of a course on statistical literacy upon students' challenges to statistical claims made in the media. (Dissertation) Clemson University, Clemson, SC.

Schild, M. "Statistical literacy: Thinking critically about statistics" <http://www.augsburg.edu/ppages/schild>

Wallman, K.K. (1993). Enhancing statistical literacy: Enriching our society. *Journal of the American Statistical Association*, 88, 1-8.

Watson, J.M. (1997). Assessing statistical thinking using the media. In *The Assessment Challenge in Statistics Education*, IOS Press.

Questions?

Contact Information

Rose Martinez-Dawson
Department of Mathematical Sciences
Clemson University
Clemson, South Carolina 29634
USA
864-934-7856