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## **Statistical Literacy For Managers**

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by  
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*Paper: [www.StatLit.org/pdf/2013-Schild-MBAA.pdf](http://www.StatLit.org/pdf/2013-Schild-MBAA.pdf)*  
*Slides: [www.StatLit.org/pdf/2013-Schild-MBAA-6up.pdf](http://www.StatLit.org/pdf/2013-Schild-MBAA-6up.pdf)*

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## **The Problem in Business**

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Of all the core courses, **business statistics**

- has **the biggest gap** between what is taught and what is used in business,
- provides **the least perceived-value – and the least actionable value** – to students in management and marketing.

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## **The Problem Outside Business**

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Students typically see less value in studying inferential statistics after completing the course than when they started. (Schau, 2003)

Pomona students rated traditional statistics as being the least valuable core competency of the 10 available. (Taylor, 1999)

*Big data*: a data set so large that all associations are statistically significant. (Schield, 2012).

98% of world's data was created in last 2 years (IBM)

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## **My Thesis: Negative Form**

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Introductory statistics (Research Statistics) should NOT be a required course for business students majoring in Management or Marketing.

Replacing Research Statistics with an existing quantitative business course (Intermediate Microeconomics, Managerial Economics, Management Science, Operations Research or Cost Accounting) is NOT appropriate.

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## **Replacements are not designed for generalists**

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While all of these courses are valuable, most are for specialists – not for generalists.

While everyone in business needs to be aware of cost, that doesn't mean that every business major should spend a full course on cost accounting.

While everyone in business needs to be aware of risk, that doesn't mean that every business major should spend a full course on actuarial science.

These non-statistics courses leave out the valuable parts of a statistics course.

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## **My Thesis: Positive Form**

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Business students majoring in Management or Marketing should have the option of taking *Statistical Literacy for Managers*.

Management and marketing majors are primarily data consumers: they need to read and interpret data to make better business decisions.

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**What is “Statistical Literacy”?**

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Statistical literacy:

- is critical thinking about everyday statistics in graphs, tables, surveys and studies.
- focuses on statistics as numbers in context – where the context matters.

Statistical literacy for Managers:

- is critical thinking about numbers in business.



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**Statistical Literacy for Managers**

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Broaden the statistics course; more emphasis on

- Read and interpret everyday statistics in graphs, tables, statements and reports.
- Context: what is and is not taken into account by selection, comparisons, ratios or models
- Operational definitions of groups and measures
- How much support do the statistics provide for the conclusion? [Critical thinking]

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**Wired Magazine: Oct 2010**

COURSE LISTINGS

|    |                             |  |
|----|-----------------------------|--|
| 1. | <b>STATISTICAL LITERACY</b> | Making sense of today's data-driven world. |
|----|-----------------------------|--|

FALL SEMESTER 2011

**WIRED UNIVERSITY!**

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**1 Where do Statistics Come From?**

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Statistics are numbers with a context – where the context matters. So where they come from is critical. What group was being studied? Where? When? How were subgroups defined and quantities measured? What was taken into account by comparisons, ratios and comparisons of ratios? What was taken into account by models? What kinds of models with what assumptions?

*Where Do Statistics Come From?*

Setting the Table for Introductory Statistics

Marc Isaacson  
Dept. of Business Admin  
Augsburg College

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**Why not say “Statistics come from data”?**

- This is a common answer from students. What is wrong with this answer?
- Saying that “Statistics come from data” is like saying “Babies come from hospitals”.
- Both are true.  
Both leave out a whole lot of the story.

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### Hyatt: Close to the US Capital



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### StatLit: Take CARE Assembly

7 nanograms per gram = 7 parts in a billion



4/2010 National Geographic

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### Two Per Cent Milk



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### How Context Matters!

Bruce, a manufacturers rep, is selling foam packing to florists. His brand costs 25% more than his competitors But flowers in his foam last 2 to 4 days longer.

How can he make the sale?

He noted that this extra cost was less than 1% of the total cost of the finished product. Would florists pay 1% more to add 2 to 4 days of life to their flowers?

Thanks to Bruce Ecker (Waverly, Iowa) for this true story.

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### How Utility Matters!

A speaker at this conference argued that since the daily changes in the DJIA are random they should not be reported.

I investigated simulations on absolute changes from a normal distribution. I found that if a daily change is more than twice the average change then that daily change is statistically significant

This is statistical literacy for managers!

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### Association may be due to what is taken into account

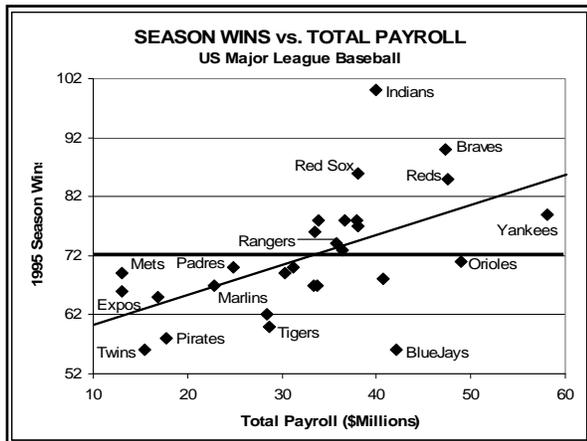
1996 auto death rates were

- 50% lower in Hawaii than Arkansas *per car*.
- 4 times higher in Hawaii than AK *per mile of road* Arkansas has many more miles of road *per car*.

The average cost of Halloween cards was

- \$.15 lower in 2011 than in 2010 *per card buyer*.
- \$.32 higher in 2011 than in 2010 *per adult*.

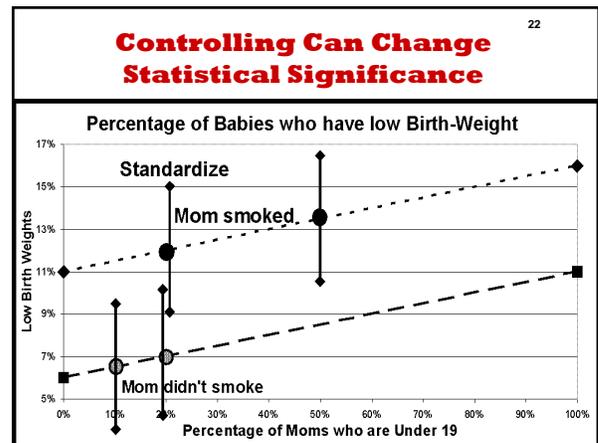
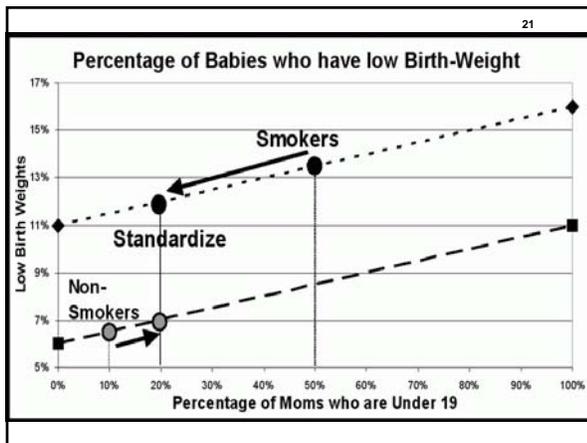
*Higher percentage of adults bought cards in 2011.*



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### SAT VERBAL SCORES: FLAT

| GROUP                  | 1981              | 2002              | CHANGE      |
|------------------------|-------------------|-------------------|-------------|
| White                  |                   |                   |             |
| Black                  |                   |                   |             |
| Asian                  |                   |                   |             |
| Mexican                |                   |                   |             |
| Puerto Rican           |                   |                   |             |
| American Indian        |                   |                   |             |
| <b>ALL Test takers</b> | <b>504 (100%)</b> | <b>504 (100%)</b> | <b>ZERO</b> |



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### Association (correlation) is not Causation

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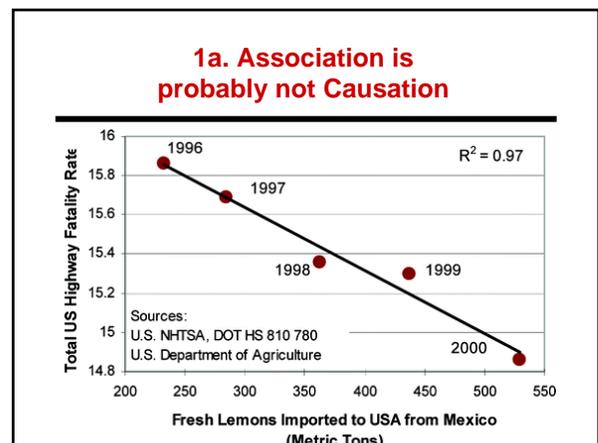
What does this mean? Association ...

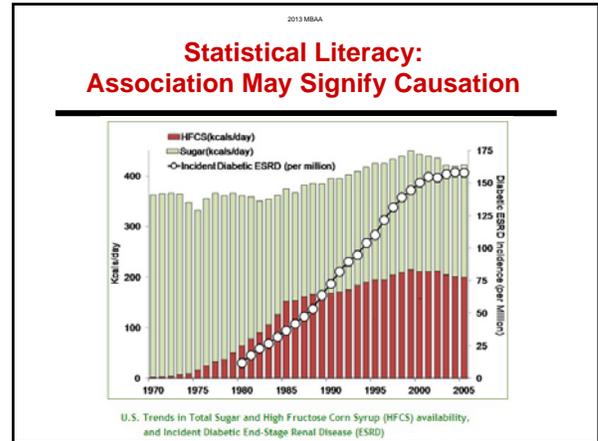
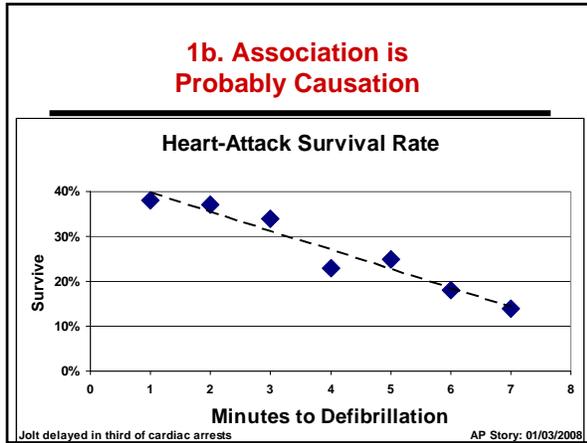
1. is never causation
2. is seldom causation
3. does not guarantee causation

Can these both be true?

A) Association is not causation.  
B) Association is often a sign of causation.

**YES!**





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**Mgmt-Marketing Majors need StatLit for Managers**

This course should focus on all types of influence on a statistic. It should show

- how coincidences can become more likely (even expected) as data sets get larger.
- that statistical significance can be influenced by confounders in observational studies.
- how ordinary English is used to distinguish association from causation and to form comparisons, descriptions of ratios and comparisons of ratios.

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**Invitation**

Check out [www.StatLit.org](http://www.StatLit.org)

Check out some Statistical Literacy papers.

- *Statistical Literacy and Liberal Education at Augsburg*
- *Presenting Confounding & Standardization Graphically*
- *Epidemiological Models and Spotty Statistics*
- *Teaching Statistical Literacy as Quantitative Rhetoric*
- *The Social Construction of Rankings*

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