

Critical Thinking and Statistics

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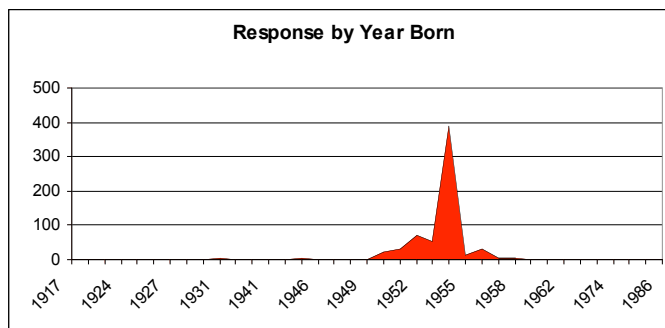


Are you up for solving a mystery?

- **Survey Effort: Enhancing Delaware Highways**
 - **Purpose:** to understand citizen response to roadside vegetation and management issues
 - Seek to ask citizens to rate different profiles of vegetation
- Sampling Strategy
 - **Sampling Frame** - Delaware Driver's License List obtained from DelDOT
 - Random Sample of 1,450 adults
- Used a Total Design methodology on a mail questionnaire
 - Incentive
 - Multiple mailings
 - **57% Response Rate**

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The respondent was asked, “In what year were you born?”



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Be a critical thinker when it comes to statistical analysis

- Ask questions and look for answers.
- Sometime failure to disclose key information is a clue to the weakness of a study.
- Questions to ask:
 - What is the population?
 - Is there a sample and how was it drawn?
 - What are the key variables and are any missing?
 - What level of measurement is being used?
 - What method was used to collect data?

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Shere Hite Report

- Shere Hite is a social historian.
- She began her work in the late 1960s and focused on the meaning of sexual experiences for individuals, especially for woman.
- Her work tended to be controversial, not only for her topics, but because of her methods of collecting and analyzing data.



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Women and Love: A Cultural Revolution in Progress

- Another report was even more controversial in 1987, Women and Love: A Cultural Revolution in Progress



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Key findings from Hite's 1988 Book

- 84% of woman were not emotionally satisfied with their relationship
- 95% reported emotional and psychological harassment from their partners
- 70% of women married for 5 years or more were having extra-martial affairs
- Only 13% of women married for more than two years were in love.

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Hite's Methodology

- Her survey was a mail survey seeking to represent the population of all women.
- Mailed to 100,000 women in the U.S. over 7 years
- The mailing list was a combination from a wide variety of organizations which were asked to circulate them to members. The groups tended to over-represent feminist groups and women in troubled circumstances

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Hite's Survey Methodology

- Hite's survey used 127 open-ended questions
- The instructions read:
 - *It is not necessary to answer every question! Feel free to skip around and answer those questions that you choose.*
- The questions involved a complex set of issues with sub-questions and follow-up

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Critiques of Hite's Methodology

- Sample was not random or representative of the population of all women
- Low response rate reflected a bias towards those most angry or eager to answer the survey
- Encouraging subjects to skip questions could also lead to bias
- Open ended questions are often difficult to summarize - what level of measurement are we dealing with?

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According to Joel Best, Sociologist, The University of Delaware

- Often well-intentioned people seek to further their cause with research and statistics
- The strategy is often three-fold
 - Present terrifying examples
 - explain the example is but one instance of a larger problem
 - give shocking statistics about the problem

Joel Best from "Lies, Calculations, and Constructions: Beyond How to Lie with Statistics," Statistical Science, Vol. 20, No. 3, August 2005

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Anorexia Deaths Example

- Someone estimated that 150,000 women suffer from anorexia each year in the U.S. and that it can lead to death.
- Another person took this idea and translated it into 150,000 deaths per year, and published this in a book on anorexia.
- This figure is repeated in other books and in the media
- Yet, the annual deaths from all causes for U.S. women aged 15 to 44 per year is about 55,000!
- It took a while before the statistic was exposed as being false
- Google: [150,000 anorexia deaths](#)

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Critical Thinking and Statistics

- Statistics involves making critical decisions about how a set of data are:
 - Sampled
 - Measured
 - Collected
 - Analyzed
 - Interpreted
- We have a responsibility to ask questions
- And as researchers, divulge information and limitations