How to Lie with Statistics

Malcolm Farrow
(based partly on the book by Darrell Huff)

September 2010
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- In 1897 **Leonard Courtney** became President of the Royal Statistical Society.
THOMPSON

AND THIS ONE’S FOR MANIPULATING STATISTICS
Percentages

**THREADNEEDLE**

**Comic Strip**

**Panel 1:** Do you know, almost ninety percent of employees here haven’t a clue in simple maths.

**Panel 2:** Ninety percent? Eh?

**Panel 3:** That’s almost half!
Percentages

... of what?
Percentages

...of what?

- Pay: £1000 per month.

"Sorry guys. You have to have a 10% pay cut."

Pay: £900 per month.

"Now I can give you a 10% pay rise."

Pay: £990 per month.
Percentages

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“A separate opinion poll yesterday suggested that 50% of obese people earn less than the national average income.”

*The Guardian* 3 November 2009
“40% rise in swine flu deaths in 48 hours as two more die.”
“The number of swine flu deaths in Scotland has soared by 40% in just 48 hours, after the Scottish Government confirmed that a further two people died after contracting the virus. Their deaths take the total swine flu fatalities to 14, . . .”

_Glasgow Herald, 13 October 2009_
"I must write again about the misleading adverts by GMPTE in the papers re the Congestion Charge. In their latest round of propaganda they state there will be a 10 per cent increase in bus services. With 10 councils in Greater Manchester this works out at a one per cent increase per council. If Stockport’s bus companies run 200 buses in the morning peak, a one per cent increase will give two extra buses; is that what you want?"

Letter to *Stockport Express*, 26 November 2008
Percentages

- “85% fat free!”
Percentages

- “85% fat free!”
- “15% fat!”
Percentages

“Guaranteed minimum return of up to 6%”

Advert for Stanley Gibbons (Guernsey) Ltd. in *The Spectator* 15 November 2008
“People who have personalised number plates on their cars are most likely to live in Scotland, a survey has found.”

*BBC News Scotland 11 January 2009*
• More than 90% of cold-sufferers treated with Farrow's Cold Cure had relief from symptoms within seven days.
• More road accidents occur in clear weather than in foggy weather.
• Flying is the safest means of transport.

The "Prosecutor's Fallacy."
The wrong proportions

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• The “Prosecutor’s Fallacy.”
Misleading Relationships

- “Lurking variables”.
- Storks and babies.
- Simpson’s Paradox.
Graphs

Annual yield currently produced by the fund

1.5 %
Average Building Society

7.5 %
JPMK UK Corporate Bond Fund

Promotional publication, 2002
JP Morgan Fleming Asset Management
Graphs

Barnetts
Solicitors
Our results speak for themselves


Southport Midweek Visitor
21 January 2000
Graphs

2001 Review
Royal Horticultural Society
Graphs

The Times
1 February 2003
Graphs

Steel capacity added

Some of these diagrams are real works of art and fantasy.

1930s
10 million tons

1940s
14½ million tons

Adapted by courtesy of Steelways.
Graphs
Graphs

bottle label
‘Head & Shoulders’ shampoo
Graphs

Time
Share Price

5 10 15 20 25
135 140 145 150
Time
Share Price
Graphs

Growth in Degrees (Excluding Foundation Degrees)

Growth in the number of degree programmes since 2000*

Source: UCAS. *Not including foundation degrees.
Graphs
Surveys

• Whom did they ask?
• How were they chosen?
• How many did they ask?
• How many of them answered?
• What did they ask?
• How did they ask it?
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Surveys: The 1936 US Presidential Election

- *Literary Digest*:
  - Huge sample of telephone subscribers and car owners.
  - Predicted easy win for Landon (Republican).

- *Gallup*:
  - Very much smaller random sample.
  - Predicted Roosevelt (Democrat) win.

Roosevelt won.
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Surveys: Questions

• Are they ambiguous?
• Are they loaded?
• Will the subject understand the question in the way intended?
• Will you understand the subject's response?
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Survey Questions: Examples

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- “Joining the European Monetary Union would have many benefits for Britain in terms of jobs and prosperity. Do you believe that Britain should join?”
Survey Questions: Examples

• “Do you feel that Britain should join the European Monetary Union immediately or only after a period of three to five years?”
• “Joining the European Monetary Union would have many benefits for Britain in terms of jobs and prosperity. Do you believe that Britain should join?”
• “Do you believe that Britain should scrap the pound and hand over control of our economy to bureaucrats in Brussels and German bankers?”
Survey Questions: Examples

• “When driving a car, how often do you break the speed limit?
  • All the time
  • Very often
  • Fairly often
  • Only sometimes
  • Never”

• “Which of these magazines do you usually read? . . . ”

• “Which of these magazines have you read in the last month? . . . ”

• “How many times a day do you clean your teeth?”
Averages

• What kind of average?
• Average of what?
• Who was counted?
• E.g. “average family”: what counts as a “family”?
• Has the population changed?
• Hardly anyone is average!
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Histogram of Income

Frequency

Income (thousands)

0 50 100 150

0 100 200 300 400 500

Averages
Averages

Mean income: £28720.
Median income: £24042.
Modal income: around £14300.
How to talk back to a statistic.
How to talk back to a statistic.

- Who says so?
How to talk back to a statistic.

- Who says so?
- How do they know?
How to talk back to a statistic.

- Who says so?
- How do they know?
- What’s missing?
How to talk back to a statistic.

- Who says so?
- How do they know?
- What’s missing?
- Did somebody change the subject?
How to talk back to a statistic.

- Who says so?
- How do they know?
- What’s missing?
- Did somebody change the subject?
- Does it make sense?
Hope for the future?

- Office for National Statistics (ONS)
- National Statistician (Head of ONS)