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# Difficulties Reading Bar Graphs in USA Today

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***ASA JSM 2006***
***Seattle Washington***
***6 August 2006***
*www.StatLit.org/pdf/2006SchieldASA6up.pdf*

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# GAISE: "Emphasize statistical literacy"

*GAISE: Statistical literacy includes*
*"**being able to read statistical graphs**"*

GAISE: Assess students *"interpreting …*
*articles in the news and **graphs in media.**"*

USA Today is the leading newspaper in the US.
USA Today is well-known for its use of graphs.
We will use 'graph' and 'chart' interchangeably.

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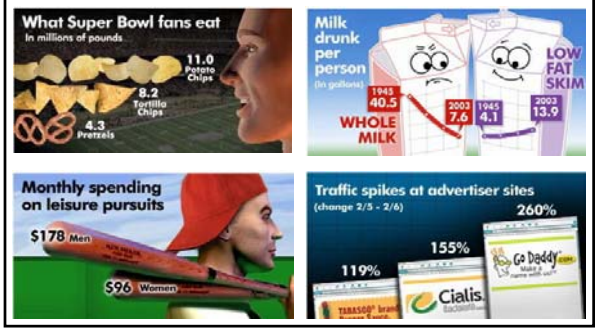
# Non-Percentage Graphs (~30% of all)

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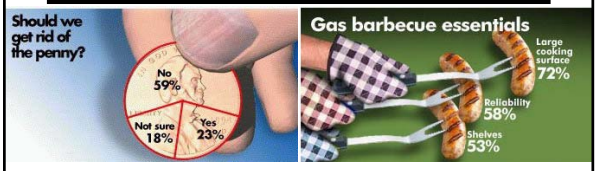
# Percentage Graphs




**Pies (29%):** Automatically the components are parts with a 100% sum and are exclusive and exhaustive.

**Bars (70%):** Need not sum to 100%; need not be exclusive or exhaustive; can be either parts or wholes.

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# Percentage Bar Graphs by Sum and Composition

We first investigate bars that are parts:
* 100%, ~100%, < 100% and > 100%.
We then investigate bars that are wholes.

| % Bar Graphs | ALL | Parts | Wholes |
|---|---|---|---|
| %Sum \ ALL | 87 | 76 | 11 |
| = 100% | 11 | 11 | |
| ~100% | 11 | 10 | 1 |
| < 95% | 36 | 31 | 5 |
| > 105% | 29 | 24 | 5 |

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# Percentage Bars Sum = 100%

These are ~15% of all percentage bar charts.

100% bar charts are ~ 25% of all 100% charts



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## Percentage Bars Sum ~100%

These are ~15% of all percentage bar charts.

If the bars are parts, exclusive and exhaustive, one explanation is that either rounding or that some answers were not helpful (No response).

Note that the sum of the right graph is 101%.



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## Percentage Bars Sum < 95%

These are ~40% of all percentage bar charts.

If the bars are parts and exclusive, then one explanation is that the bars are not exhaustive.

Note that the bars may not be exclusive (right)



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## Percentage Bars Sum > 105%

These are ~30% of all percentage bar charts.

If the bars are parts then one explanation is that they are non-exclusive: respondents can select multiple answers.

Superlatives may not force exclusivity.



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## Percentage Bars Bars are Wholes

These are ~10% of all percentage bar charts.
Bars are wholes if they are exclusive:

- exhaustive and add to less than 95%
- and add to more than 105%



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## Percentage Bars Parts or Wholes???


Exclusive bars
Sum: 92%
Age 35+ omitted
Non-exhaustive
Could sum to 100%


Exclusive bars
Sum: 98%
No group omitted
Rounding error?
Could sum to 100%

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## Conclusions

Journalists need *guidelines* on how to make percentage bar charts that are unambiguous.

Students need *training* in reading percentage bar charts: in forming descriptions and comparisons using ordinary English.

To meet the GAISE challenge, statistical educators must *focus more on statistical literacy*: helping students read and understand the stories and graphs that use statistics in the every day media.