Vilseledande statistik

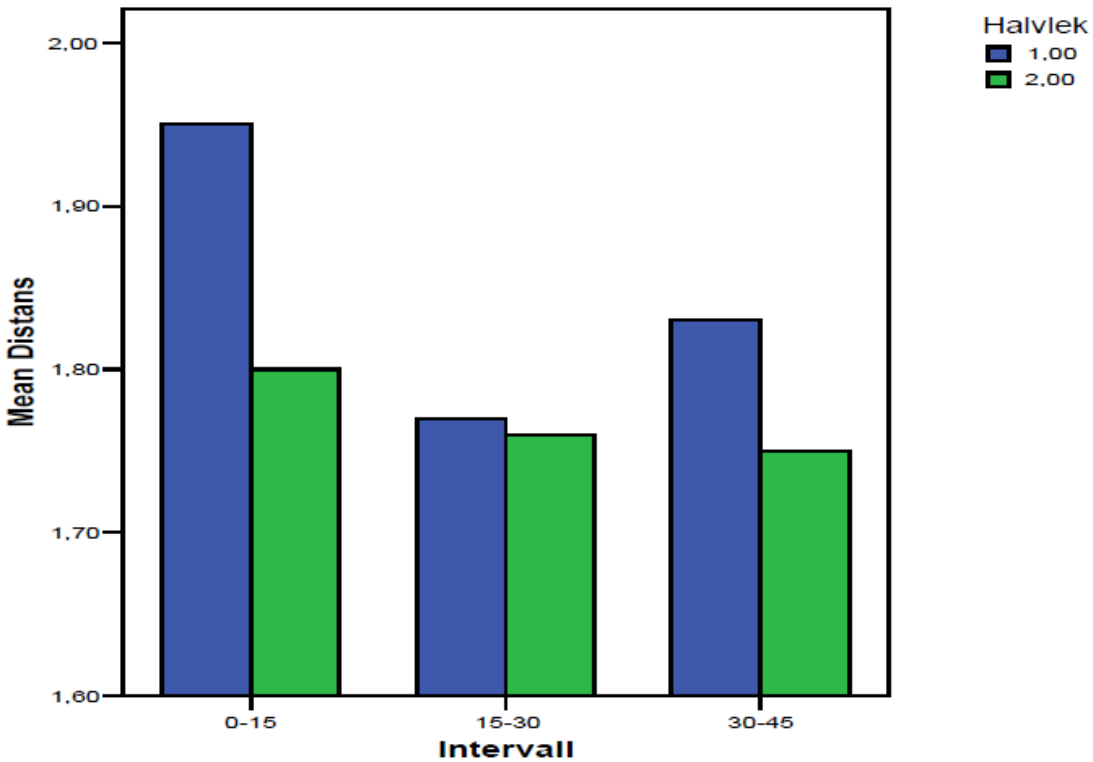
"Det finns tre sorters lögn; lögn, förbannad lögn och statistik"

Benjamin Disraeli

Brittisk premiärminister på 1800-talet

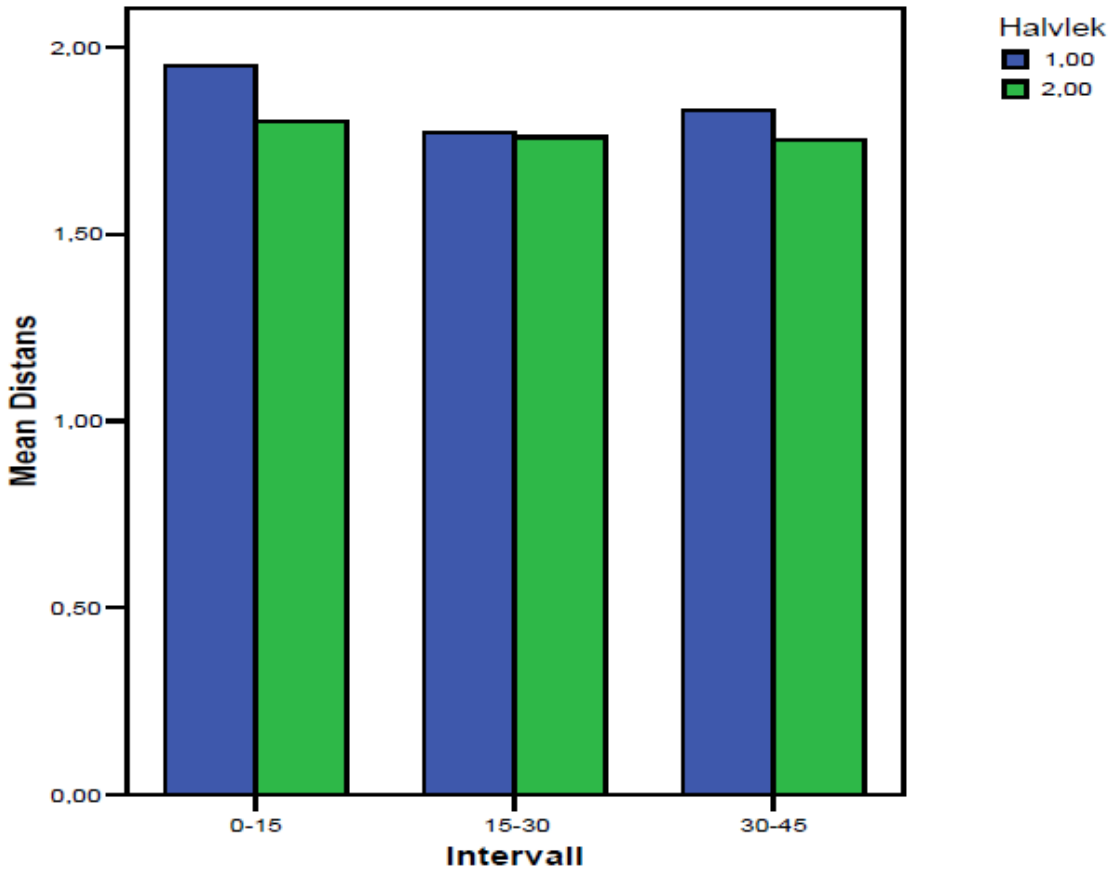
Vilseledande statistik - Exempel 1

Löpdistanser i första och andra halvlek för ett antal elitspelare. Halvlekarna är indelade i 15-minuters perioder.

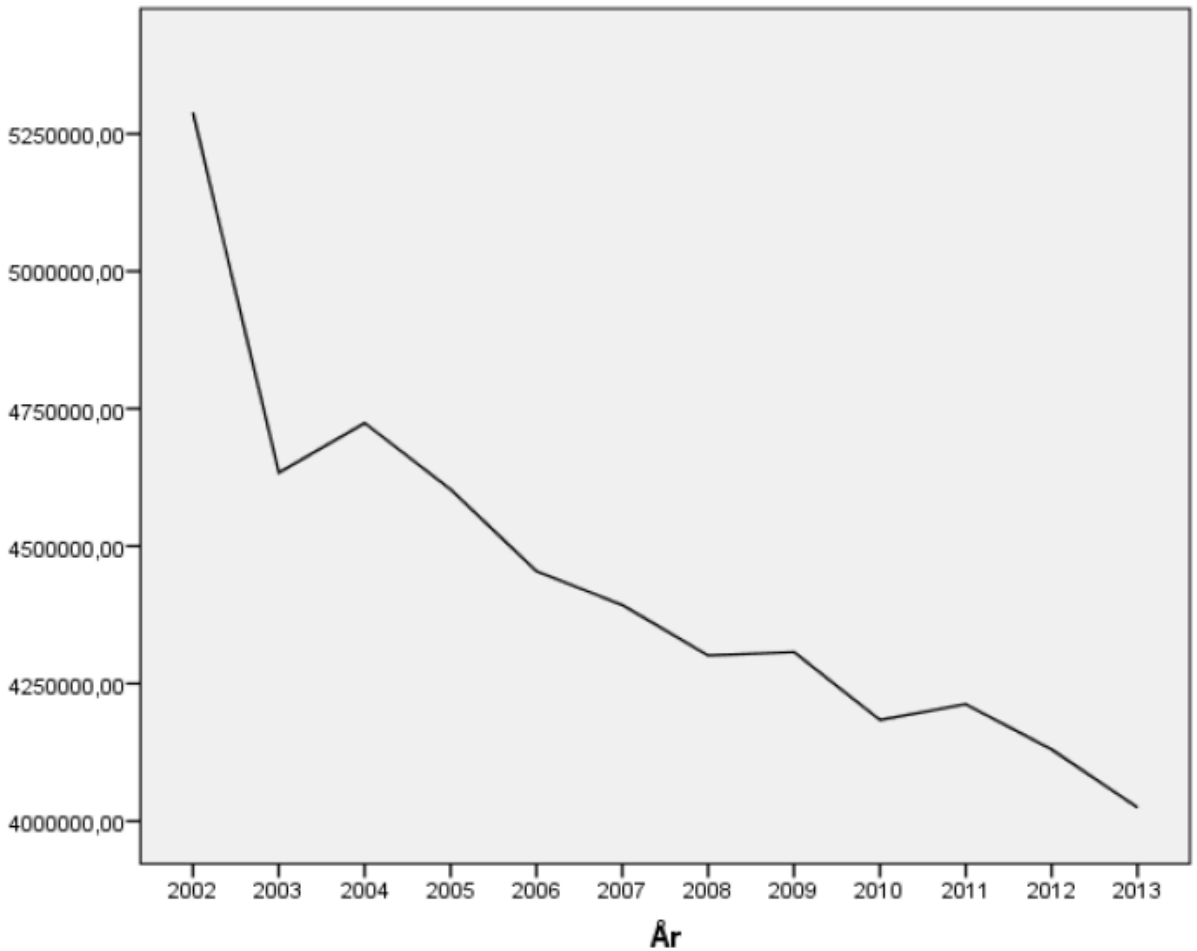


Vilseledande statistik - Exempel 1

Samma data utan stympad Y-axel.

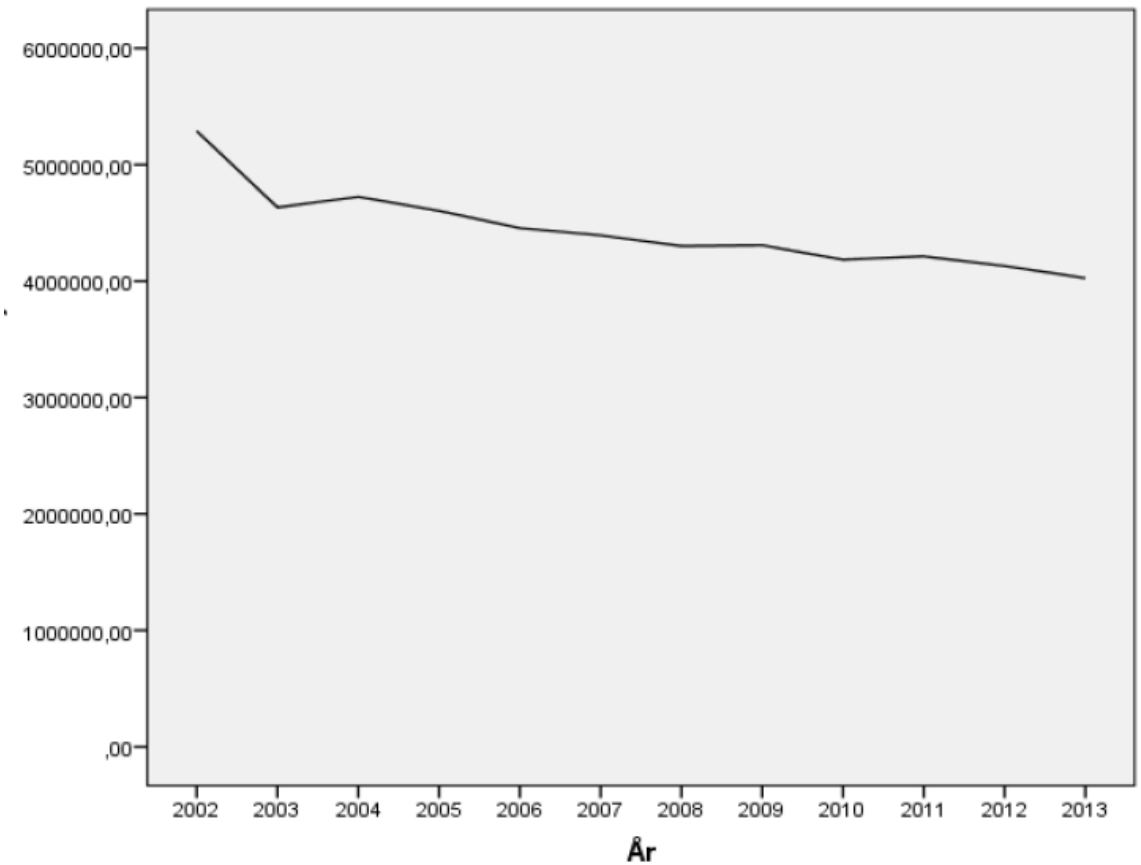


Vilseledande statistik - Exempel 2



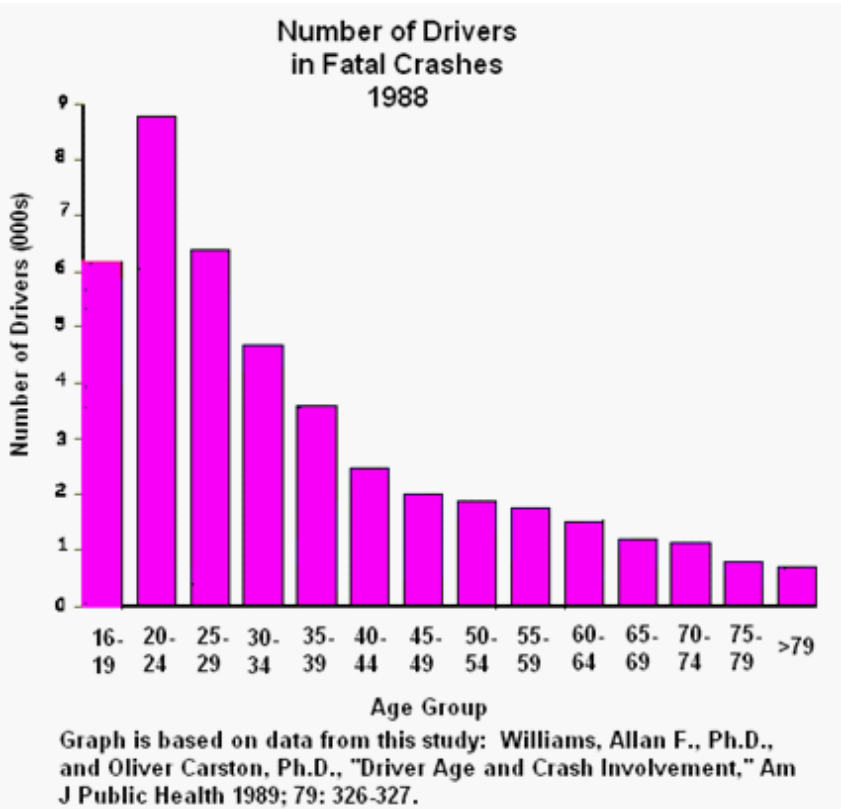
Vilseledande statistik - Exempel 2

Samma data utan stympad Y-axel.



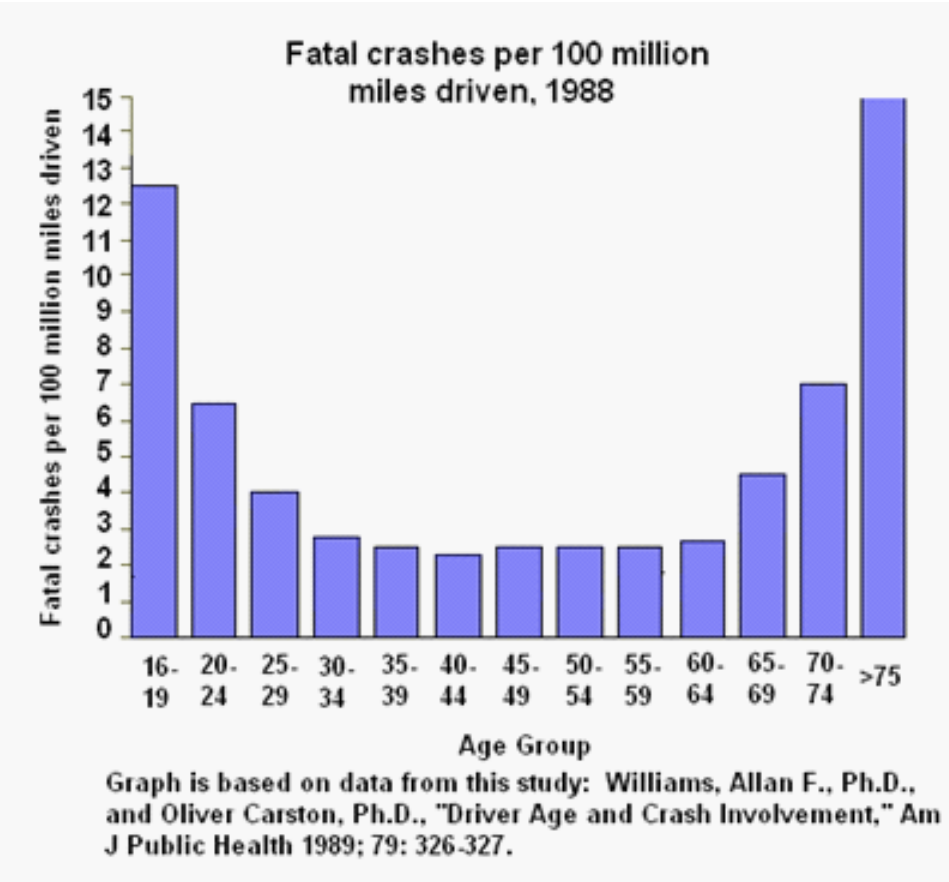
Vilseledande statistik - Exempel 3

The following statistics suggest that 16-year-olds are safer drivers than people in their twenties, and that octogenarians are very safe. Is this true?



Vilseledande statistik - Exempel 3

Solution: No. As the following graph shows, the reason 16-year-old and octogenarians appear to be safe drivers is that they don't drive nearly as much as people in other age groups.



Vilseledande statistik - Exempel 4

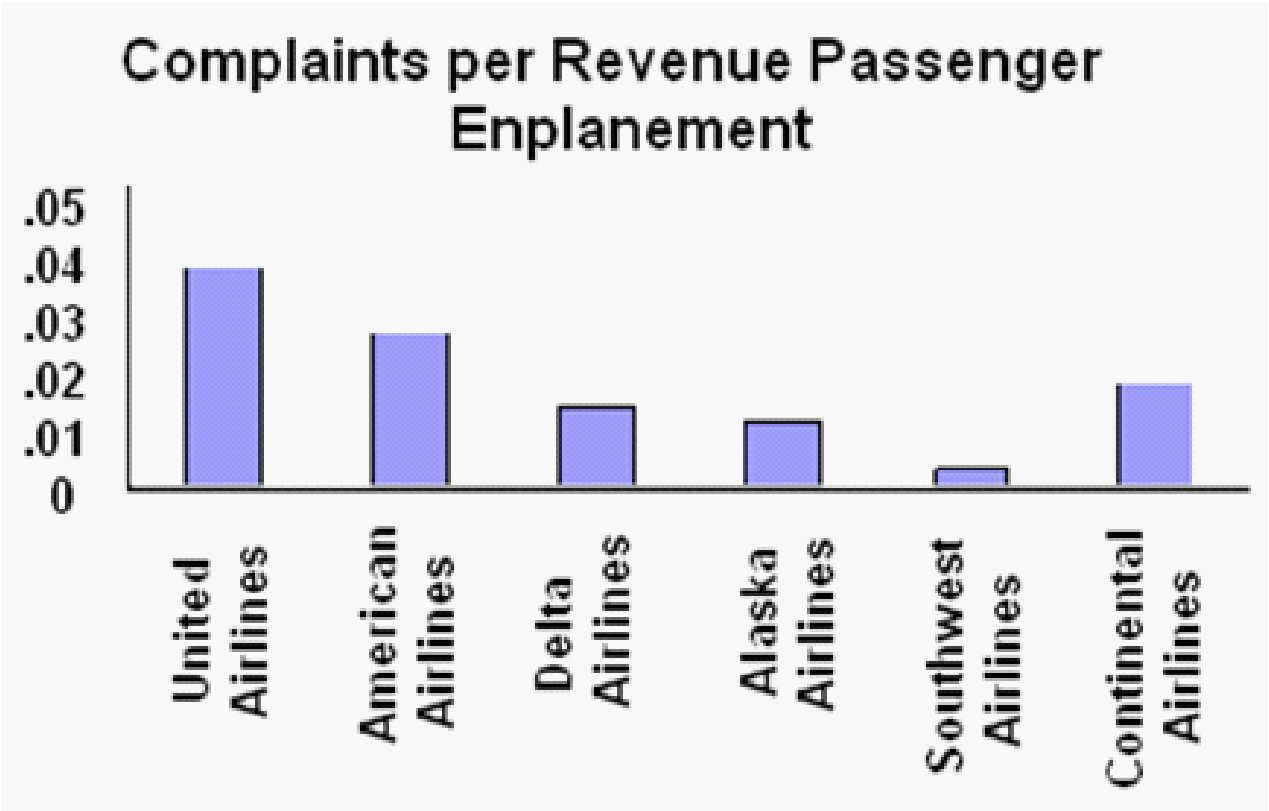
Consider these complaints about airlines published in US News and World Report on February 5, 2001:

Most complaints, Nov. '00	
United Airlines	252
American Airlines	162
Delta Air Lines	119
Fewest	
Alaska Airlines	13
Southwest Airlines	22
Continental Airlines	60

Can we conclude that United, American, and Delta are the worst airlines and Alaska, Southwest, and Continental are the best?

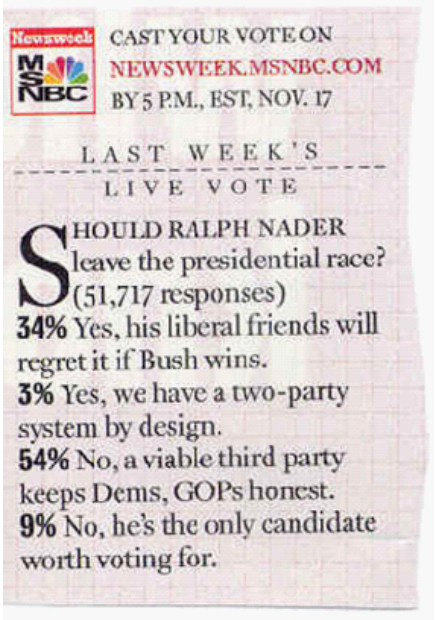
Vilseledande statistik - Exempel 4

Solution: No. The airlines that had the most complaints also had the most passengers. As the following graph shows, rates and percentages are often more informative than raw numbers.



Vilseledande statistik - Exempel 5

On November 13, 2000, Newsweek published the following poll results:


Newsweek MSNBC

CAST YOUR VOTE ON
NEWSWEEK.MSNBC.COM
BY 5 P.M., EST, NOV. 17

LAST WEEK'S
LIVE VOTE

SHOULD RALPH NADER leave the presidential race? (51,717 responses)

34% Yes, his liberal friends will regret it if Bush wins.

3% Yes, we have a two-party system by design.

54% No, a viable third party keeps Dems, GOPs honest.

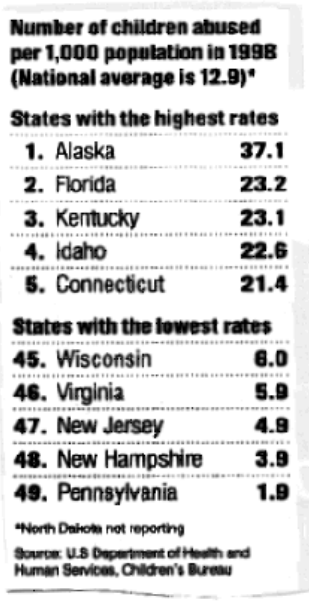
9% No, he's the only candidate worth voting for.

Since 9% said that Nader was the only candidate worth voting for, one would have expected him to get at least 9% of the vote in the 2000 election. He only got about 3%. What happened?

Solution: There was a biased statistic because the sample wasn't randomly drawn from the population. A disproportionate number of Nader supporters participated in the poll in order to make him appear more viable as a candidate.

Vilseledande statistik - Exempel 6

This clipping from US News and World Report on 1/29/01 suggests that Alaskans are terrible parents. Is this true?



Number of children abused per 1,000 population in 1998 (National average is 12.9)*

States with the highest rates	
1. Alaska	37.1
2. Florida	23.2
3. Kentucky	23.1
4. Idaho	22.6
5. Connecticut	21.4
States with the lowest rates	
45. Wisconsin	6.0
46. Virginia	5.9
47. New Jersey	4.9
48. New Hampshire	3.9
49. Pennsylvania	1.9

*North Dakota not reporting

Source: U.S Department of Health and Human Services, Children's Bureau

Solution: The difference in the abuse rates probably stems from different definitions for abuse in the various states. For example, Alaska (the "worst" state) says that a child is abused if his or her health or welfare is harmed or threatened. Pennsylvania (the "best" state) defines it as a recent act or failure to act.

Vilseledande statistik - Exempel 7

The following statistics about motorcycle helmet use seem to suggest that helmets cause more injuries and fatalities. Is it really safer to go without helmets?

	Registrations	Reported Accidents	Fatalities	Accidents Per 10,000 Registrations	Fatalities Per 100 Accidents
Mandatory Helmet Use	2,352,293	52,270	1,557	222.21	2.98
Voluntary Helmet Use	1,497,923	29,062	844	194.02	2.9
Total	3,850,216	81,331	2,401	211.24	2.95

Solution: Correlation doesn't prove causation. The statistics suggest that helmets cause accidents and fatalities, but it's possible that a high number of motorcycle accidents and fatalities in high-risk states caused them to adopt mandatory helmet laws.

Vilseledande statistik - Exempel 8

Researchers (Arthur Kellermann et. al., "Gun Ownership as a Risk Factor for Homicide in the Home," The New England Journal of Medicine, October 7, 1993, pp. 1084-1091), found that gun owners are 2.7 times more likely to be murdered than non-owners. Does this mean it's safer to not have guns in the house?

Solution: Perhaps, but correlation does not imply causation. It may be true that guns cause murders, but it might also be true that having a greater risk of being murdered causes people to own guns.

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Materialet i Statistisk översiktskurs har tagits fram av Ulf Högnäs och Anders Fredriksson, med inspiration och ibland direkt användande av material från andra kurser och personer, bland annat kurserna Statistik och dataanalys 1-3, med material av Michael Carlson, Ellinor Fackle Fornius, Jessica Franzén, Oskar Gustafsson, Oscar Oelrich, Mona Sfaxi, Karl Sigfrid, Mattias Villani, med flera.