The
HIDDEN
TRUTH
behind
STATISTICS

What statistics tell you is rarely obvious, says author STEVEN LANDSBURG

When a university admits 46 percent of its male applicants and only 30 percent of its (equally qualified) female applicants, can we infer gender discrimination?

Several high-powered attorneys thought so, which is why they brought a suit against the University of California at Berkeley in 1973.

They managed to run up a lot of bills before someone observed that not a single one of Berkeley's individual departments appeared to be discriminating.

Instead, women were being disproportionately rejected because women were disproportionately applying to the most selective departments.

Here are the actual admissions statistics. See Table 1 below (The numbers are part of the public record, but the names of the departments are not, so they are referred to here simply as Departments A, B, C, D, E, and F).

As you can see, four out of six departments admitted women at a higher rate than men, and the other two (Departments C and E) admitted men at only a slightly higher rate than women.

When this was pointed out in court, the lawsuit against Berkeley collapsed – but not before a lot of lawyers had spoken a lot of nonsense.

The mistake those lawyers made was to focus on the aggregate statistics – that is, the numbers in the "total" column – without breaking things down.

That's what created the illusion of discrimination where none existed.

But exactly the same mistake can just as easily create the opposite illusion, by creating the illusion of nondiscrimination where discrimination does exist. For example:

JURY SELECTION: A political activist complains that African Americans are systematically underrepresented on American juries. An investigation reveals that exactly 25 percent of white Americans have served on juries and exactly 25 percent of African Americans have served on juries. Can we dismiss the activist's complaint?

SOLUTION: Not at all. Those aggregate statistics tell us practically nothing. Suppose, for example, that African Americans live primarily in cities, where it's very common to be called for jury duty, while White Americans live disproportionately in rural areas, where jury service is rare.

In that case, you'd expect to see a much bigger fraction of African Americans than White Americans serving on juries. If you don't see that bigger fraction, you're right to suspect discrimination – no matter what the aggregate statistics seem to show. Here's a concrete (though hypothetical) example: Table 2 tells us, for example, that there are 100 urban White Americans, 50 of whom have served on juries.

If you prefer a more realistic (though equally hypothetical) example, just tack a few zeroes onto all the numbers in the table, which won't affect the percentages. What you can see here is that even though 25 percent of African Americans and 25 percent of White Americans have served on juries, African Americans are apparently being discriminated against in both the urban and rural areas.

In the case of the Berkeley lawsuit, a focus on aggregate statistics created the illusion of discrimination where in fact there was none.

In the jury example, a focus on aggregate statistics creates the illusion that discrimination is absent when it is in fact pervasive.

	Urban	Rural	Total
White Americans	50/100 (50%)	50/300 (17%)	100/400 (25%)
African Americans	10/30 (33%)	0/10 (0%)	10/40 (25%)

Table 2

	Dept. A	Dept. B	Dept. C	Dept.D	Dept. E	Dept. F	Total
MEN	512/825 (62%)	353/560 (63%)	120/325 (37%)	138/417 (33%)	53/191 (28%)	16/272 (6%)	1192/2590 (46%)
WOMEN	89/108 (82%)	17/25 (68%)	202/593 (34%)	131/375 (35%)	94/393 (24%)	24/341 (7%)	557/1835 (30%)

Table 1

EA

The moral, then, is not that discrimination is always either more or less a problem than it appears. The moral is to beware of aggregate statistics.

Here's another example, where aggregate statistics mislead in a slightly different way:

INCOME TRENDS: In a recent 25-year period, the median income of all American workers increased by a paltry 3 percent.

Over the same period, the median income of white male American workers increased by a much heftier 15 percent. Can you conclude that for at least one other demographic group (white females, nonwhite males, or nonwhite females), the increase must have been even less than 3 percent?

SOLUTION: You can conclude nothing of the kind. The period in question is 1980-2005. Here's what happened to median incomes (after correcting for inflation) for each demographic group over that period: (See Table 3)

That's right. White American males had 15 percent growth, and every other group had even larger growth - as high as 75 percent for White American women - even though the aggregate growth was only 3 percent.

That's possible partly because the sizes of the groups changed. In 1980 the median worker was a white man. By 2005, enough women had entered the workforce that the median worker was a woman.

Women do indeed earn less than men, which is why the income of the median worker came down. But that tells us exactly nothing about income growth for men, or for women, or for White Americans, or for nonwhites, or for anyone else.
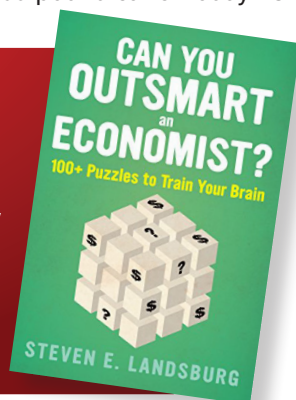
Similarly, the average maths scores of seventeen-year-olds have dropped slightly over the past twenty years or so

This is an excerpt from Steven Landsburg's forthcoming book *Can You Outsmart an Economist? 100+ Puzzles to Train Your Brain* (Mariner Books, Boston, 2018).

– even though the scores of the average White American student, the average African American student, and the average Hispanic student have all increased (by 1.3 percent, 12.6 percent, and 8.7 percent).

How can this be? It's simple: African Americans and Hispanics, who on average score lower than White Americans, now make up a larger percentage of the population. If you focus on the grim-looking aggregate statistic, you'll miss the fact that every group has improved.

ANIMAL FARM: A farmer keeps both goats and cows. Ten years ago, his median animal weighed 1,000 pounds. Then he adopted a new feeding technique, and today his median animal weighs 300 pounds. Should we conclude that his new feeding technique was a failure?

SOLUTION: Here's what I left out: Ten years ago, the farmer had ten 100-pound goats and twenty 1,000-pound cows. Today he has fifty 300-pound goats and forty 3,000-pound cows. His median goat and his median cow have both tripled in size – but his median animal, which used to be a 1,000-pound cow, is now a 300-pound goat.

An unscrupulous rival might point to that reduction as proof that the farmer's techniques have failed – when in fact they proved to be a great success for both the goats and the cows.

Likewise, an unscrupulous politician might point to the paltry 3 percent growth rate in median income as proof that the American economy wasn't working very well – when in fact it worked quite well for every demographic group•

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	1980 Median	2005 Median	% Increase
All workers	25,000	25,700	3%
White men	30,700	35,200	15%
Nonwhite men	19,300	22,300	16%
White women	11,200	19,600	75%
Nonwhite women	10,200	16,500	62%

Table 3

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