***AGAINST ALL ODDS***
**EPISODE 4 – "MEASURES OF CENTER"**
**TRANSCRIPT**

FUNDER CREDITS

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INTRO

**Pardis Sabeti**
Hello, I'm Pardis Sabeti and this is *Against All Odds,* where we make statistics count.

One number most people pay a lot of attention to is the one on their paycheck! Today's workforce is pretty evenly split between men and women, but are salaries as evenly distributed?

These histograms show the weekly wages for Americans, separated by gender. Both histograms are skewed to the right – with most people making moderate salaries while a few make much more. These pictures are helpful in comparing typical wages for men and women, but adding a few numbers could help us understand the situation even better. For comparison's sake, it would help to numerically describe the centers of these distributions.

A statistic called the median splits the distribution in half – half the values lie above it, and half lie below. The median weekly salary for men in 2011 was $865. Remember this means that half of all men made more than $865 and half earned less. The median wage for women was only $692, just 80% of what men make.

Simply using the median, we've identified a real disparity in wages, but it's much harder to figure out why it exists. Some of the difference can be accounted for by differences in education, age and years in the workforce. Another reason for the earnings gap is that women tend to be concentrated in lower paying jobs – but that begs the question… Are these jobs worth less in some sense? Or are these jobs lower paid because they're primarily held by women?

This is the central issue in the debate over comparable worth – the idea that men and women should be paid equally, not only for the same job but for different jobs of equal worth.

Back in 1988 the city of Colorado Springs was at the forefront of this debate. As part of its normal operation, the city government evaluated all municipal jobs with criteria like working conditions, necessary skills and accountability required. Each job got a numerical rank. It turned out that many clerical jobs – which are mostly filled by women – scored the same number of points as operations and maintenance jobs – which are mostly filled by men.

Guess where we're going with this? The median wage for the men's jobs was always higher than the corresponding median wage for the women. And remember these jobs were judged to be exactly equal in requirements and responsibility! A group of city clerical workers used this evidence to pressure the city for a more equitable pay structure.

**Betty Ketterson**
Once we had the statistics, then we could actually prove that the clerical employees were being underpaid.

**LaDonne Maez**
The hardest part was trying to convince City Council and the administration that this was something that was fair that needed to be done.

**Pardis Sabeti**
The numbers were hard to argue with and the clerical workers won. The city agreed to equalize the median salaries for jobs of comparable worth. And the plan had an unanticipated benefit – the relatively high turnover rate for jobs held by women decreased.

**Sari Constance**
Because you know that someone appreciates what you do and rewards you accordingly, you do your absolute best for them and you go the extra mile.

**Robert Isaac**
You pay fairly. You pay appropriately, no matter what the gender, and you find that you have high productivity, high morale, low turnover, and we have fewer employees per thousand people served than most cities. So I think it was a good business decision in addition to the fact that it was just basically fair.

**Pardis Sabeti**
Colorado Springs relied on the median statistic to identify the inequality in men's and women's salaries. Let's take a look at how to calculate this measure of center.

Here are the weekly salaries from a hypothetical small company that has 19 employees. If we place them in order from lowest to highest, you can see that paychecks range quite a bit, from $290 for the entry-level receptionist up to $2,000 for the president. So what's the typical wage? Here's how to find the median of this distribution.

Count up how many observations you have…. In this case it's 19… so that's our *n*. Add 1 and then divide it all by 2. This formula tells you where in the lineup the median falls. Remember, it doesn't tell you the actual value of the median, just its location. Count up ten spots and there's our median – $500. So nine salaries at the company are lower than that, and nine are higher.

Since we had an odd number of paychecks, it's easy to count up 10 places to the median. But if we had an even number to deal with – say 20 salaries – the formula would tell us to count up to 10.5 spaces. That puts us right in between the two middle values… so the median is actually halfway between those two salaries, at $525.

You probably already know another way to find the center of a distribution – taking the average. Statisticians call this number the mean. It's calculated by adding up all the values and dividing by the number of observations.

Back to our original company… to compute the mean weekly wage – or "*x*-bar" as it's called in statistics – add up all the paychecks and divide by the number of employees. So the mean wage in this case is $715. That's definitely higher than the $500 median we find for the same numbers.

You can think of the mean as the balancing point of all the values. That's easier to see if we make a histogram of the wages. The mean is the value of the pivot point that balances all the observations.

The mean is influenced much more by that one high salary going to the president of the company. The median, on the other hand, is what statisticians call resistant. That makes sense… the median doesn't depend on what the values are out there at the extremes of our distribution. If the president doubled his salary while everyone else stayed at the same wage, the mean would bump up to $821. But our median would hold steady at 500. The middle number is the middle number, no matter what the fat cat at the top pays himself!

The shape of a distribution can give you some hints about the relationship of the mean and the median. For a pretty symmetric distribution like this one showing heights of a bunch of 4 year olds, the mean and median are roughly the same – less than a quarter of a centimeter apart.

If a distribution is skewed to the right, like the scores on one brutally tough exam when lots of students struggled, the mean is larger than the median.

Likewise, if the distribution is skewed to the left, like the scores on one easy exam when everyone studied up and did well, the mean is smaller than the median. The mean is pulled toward the tail. Remember, it's influenced by the extremes.

This is one case where I'm sure my students would prefer to get a "typical" score rather than an "average" one!

For *Against All Odds*, I'm Pardis Sabeti. See you next time!

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