AGAINST ALL ODDS
EPISODE 16 – "CENSUS AND SAMPLING"
TRANSCRIPT

FUNDER CREDITS

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INTRO

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

Ever wondered what percentage of supermarket chicken is contaminated with salmonella bacteria?

Or what percentage of Americans smoke marijuana?

Or how many people are homeless in the US?

There's no experiment to be done to answer this kind of question. We could test every chicken on the market, or ask every person if they smoke pot, or count up every single homeless person. This is a census, a count of each and every item in a population. It seems like a census would be a straightforward way to get the most accurate, thorough information. But taking an accurate census isn't nearly as easy as you might think!

One of the more radical ideas put forward in the American Constitution is that of a nationwide census. Each resident is counted every ten years, and representatives to congress are apportioned according to each district's population. This system is fundamental to the one person/one vote concept of democracy.

The first census, directed by Thomas Jefferson in 1790, enumerated almost four million Americans. But counting everyone proved to be an impossible undertaking, and many people were missed. The census has been done every ten years since then, and overall accuracy has been improving. But the process still has its challenges.

> **Mario Matthews**
> Because the United States is such a dynamic country, with people—it's constantly changing with people moving from place to place. And our job is to count everyone, at a single point in time, on a certain day and where they live. It's the largest peacetime operation that the government does, every ten years.

Pardis Sabeti
In 2010, more than 308 million Americans were counted. But the Census Bureau knows that number's not one hundred percent accurate, and that flaw has serious repercussions.

Mario Matthews
Census statistics are the cornerstone for America's democracy. It gives people a voice in the community, it also gives them power in their area. So if a certain person or a certain group is missed in a particular area, they lose representation in Congress. That's a voice that's missed in the House that's not being heard. That's a certain part of the community that's not getting the resources that it deserves because of the fact that people don't know that that population is that large within a particular area.

Pardis Sabeti
Undercounted communities lose their fair share of the tens of billions of dollars of federal funds granted on the basis of census data. That's money used for hospitals, schools, social services, roads and other community infrastructures and programs. It's particularly problematic that not all groups are undercounted at the same rate.

Mario Matthews
There are populations that we recognize are difficult to reach. Minority populations like our Hispanic population, our African-American population, Indians living on reservations, and even this past census we had a hard time trying to reach renters.

Pardis Sabeti
The first step in the Census is mailing a questionnaire to every household in the country. In 2010, about three quarters of the questionnaires were mailed back before the deadline. A census taker must visit those households that do not respond by mail. It's here where people are often missed – sometimes because they don't want to be counted or don't understand the confidential nature of the process.

Mario Matthews
The information that we collect is not shared with any other government agency as well, that's something that the public does not realize. That information that we publish is statistical information, not any personally identifiable information.

Pardis Sabeti
The Census Bureau does retrace its steps and spot check how well its count matches reality – but it never changes the official headcount number. Experts propose using statistical adjustments to correct the undercount. It might seem counterintuitive but a technique called sampling could provide more accurate results for undercounted groups than going with the number actually counted.

But whether the census figures should be adjusted based on a smaller more closely scrutinized sample of the population is a politically thorny issue. For now the Census Bureau will continue to rely on community outreach in attempting to

achieve the goal of the founding fathers – full representation for everyone in the nation.

The alternative to a census is a sample. In statistics, a sample is a count of just a part we choose to represent the whole. The population – whether it's people, grapes, or marbles – is the entire group we want information about. The sample is the part we actually gather data from. Because a sample is only part of the population, we can study it more extensively than we can all of the members of the group. And then we can use the sample data to draw conclusions about the entire population.

For those conclusions to be valid, though, the sample must be representative of the population. To make sure it is, statisticians rely on what's called simple random sampling. That means the sample is chosen in such a way that each individual has an equal chance of being selected. This helps eliminate bias in the study design, which occurs if certain outcomes are systematically favored.

For instance, if we only choose marbles easily accessible on the top of our bowl, the sample wouldn't be representative of the whole population, because it would be more likely to overlook heavier marbles lurking at the bottom.

Sampling is a crucial technique for any food manufacturer. Frito-Lay potato chip fans count on consistent appearance and taste from their favorite brand and sampling is one way the company meets those expectations. When a truck pulls in, loaded with potatoes, the Frito-Lay receiving department must decide whether to accept the shipment.

From their point of view, this truckload of about 45,000 pounds of potatoes is the population. The inspectors can't look at every spud to make sure they're all up to snuff. And even if they could, it would produce too many mistakes due to human error. Frito-Lay can get better information by studying a 150 pound sample, taken by filling buckets at 5 different points down the length of the truck.

First, the inspector randomly selects 40 pounds of those potatoes and punches a hole through the core of each one. Those holes make it easy to spot the samples when they undergo a cooking test. Then the inspector searches for internal defects, green edges, mechanical damage and other flaws. Each defective potato is weighed, and if the sample percentage is too large, the whole lot must be rejected.

The cooking sample is peeled and tossed directly into the slicing machine. Then the sample chips with their telltale holes are plucked out and go to the mini laboratory on the plant floor. Once everything meets specs, Frito-Lay will accept the multi-ton shipment, based on the 150-pound sample. This lot of potatoes is on its way.

All along the production line, workers continue taking samples to ensure that the chip-making process stays on track.
Are the chips sliced to the correct thickness?
Are they cooked to the proper golden color?
Is the salt content just right?
Are the bags filled to a satisfactory weight?

If Frito-Lay waited until the end of the line to inspect the finished product, problems that were minor to begin with could be greatly compounded. Instead, sampling at key points catches problems early, before they get out of hand.

On all Frito-Lay products you'll find a list of ingredients. The only one missing may be the most essential: proper sampling!

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

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