

Chapter 1

The Statistics of Everyday Life

In This Chapter

- ▶ Encountering statistics in everyday life: what you see and how often you see it
- ▶ Discovering how statistics are used in the workplace

Today's society is completely taken over by numbers. Numbers appear everywhere you look, from billboards telling of the latest abortion statistics, to sports shows discussing the Las Vegas odds for the upcoming football game to the evening news, with stories focusing on crime rates, the expected life span of someone who eats junk food, and the president's approval rating. On a normal day, you can run into five, ten, or even twenty different statistics (with even more on Election Night). Just by reading a Sunday newspaper all the way through, you come across literally hundreds of statistics in reports, advertisements, and articles covering everything from soup (how much does an average person consume per year?) to nuts (how many nuts do you have to eat to increase your IQ?).

The purpose of this chapter is to show you how often statistics appear in your life and work and how statistics are presented to the general public. After reading this chapter, you begin to see just how often the media hits you with numbers and how important it is to be able to unravel what all those numbers mean. Because, like it or not, statistics are a big part of your life. So, if you can't beat 'em, and you don't want to join 'em, you should at least try to understand 'em.

Statistics and the Media Blitz: More Questions than Answers?

Open a newspaper and start looking for examples of articles and stories involving numbers. It doesn't take long before numbers begin to pile up. Readers are inundated with results of studies, announcements of breakthroughs, statistical reports, forecasts, projections, charts, graphs, and summaries. The extent to which statistics occur in the media is mind-boggling. You may not even be aware of how many times you're hit with numbers in

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today's information age. Here are just a few examples from one Sunday paper's worth of news. While you're reading this, you may find yourself getting nervous, wondering what you can and can't believe anymore. Relax! That's what this book is for, helping you sort out the good from the bad information. (Chapters 2 through 5 give you a great start.)

Probing popcorn problems

The first article I come across that deals with numbers is entitled, "Popcorn plant faces health probe." The subheading reads "Sick workers say flavoring chemicals caused lung problems." The article describes how the Centers for Disease Control (CDC) is expressing concern about a possible link between exposure to chemicals in microwave popcorn flavorings and some cases of fixed obstructive lung disease. Eight people from one popcorn plant alone contracted this lung disease, and four of them were awaiting lung transplants. According to the article, similar cases were reported at other popcorn factories. Now, you may be asking, "What about the folks who eat microwave popcorn?" According to the article, the CDC finds "no reason to believe that people who eat microwave popcorn have anything to fear." (Stay tuned.) They say that their next step is to evaluate employees more in-depth, including surveys to determine health and possible exposures to the said chemicals, checks of lung capacity, and detailed air samples. The question here is: How many cases of this lung disease constitute a real pattern, compared to mere chance or a statistical anomaly? (More about this in Chapter 14.)

Venturing into viruses

The second article I find discusses the most recent cyber attack — a worm-like virus that has made its way through the Internet, slowing down Web browsing and e-mail delivery across the world. How many computers were affected? The experts quoted in the article say that 39,000 computers were infected, affecting hundreds of thousands of other systems. How did they get that number? Wouldn't that be a hard number to get hold of? Did they check each computer out there to see whether it was affected? The fact that this article was written less than 24 hours after the attack would suggest that this number is a guess. Then why say 39,000 and not 40,000? To find out more on how to guesstimate with confidence (and how to evaluate someone else's numbers) see Chapter 11.

Comprehending crashes

Next in the paper appears an alert about the soaring number of motorcycle fatalities. Experts say that these fatalities are up more than 50% since 1997, and no one can figure out why. The statistics tell an interesting story. In 1997,

2,116 motorcyclists were killed; in 2001, the number was 3,181, as reported by the National Highway Traffic Safety Administration (NHTSA). In the article, many possible causes for the increased motorcycle death rate are discussed, including the fact that riders today tend to be older (the average age of motorcyclists killed in crashes increased from 29.3 years in 1990 to 36.3 years in 2001).

Bigger bikes are listed as another possibility. The engine size of an average motorcycle has increased almost 25% — from 769 cubic centimeters in 1990 to 959 cubic centimeters in 2001. Another possibility may be that some states are weakening their helmet laws. The experts quoted in the article say that a more comprehensive causation study is needed, but such a study probably won't be done because it would cost between 2 and 3 million dollars. One issue that is not addressed in the article is the number of people riding motorcycles in 2001, compared to the number of riders in 1997. More people on the roads generally means more fatalities, if all the other factors remain the same. However, along with the article is a graph showing motorcycle deaths per 100 million vehicle miles traveled in the United States from 1997 to 2001; does that address the issue of more people on the roads? A bar graph is also included, comparing motorcycle deaths to deaths that occurred in other types of vehicles. This bar graph shows that motorcycle deaths occur at a rate of 34.4 deaths per 100 million vehicle miles traveled, compared to just 1.7 deaths for the same number of miles traveled in cars. This article has lots of numbers and statistics, but what does it all mean? The number and types of statistics can quickly get confusing. Chapter 4 helps you sort out graphs and charts and the statistics that go along with them.

Mulling malpractice

Further along in the newspaper is a report about a recent medical malpractice insurance study, which may affect you in terms of the fees your doctor charges and your ability to get the health care you need. So what's the extent of the problem? The article indicates that 1 in 5 Georgia doctors has stopped doing risky procedures (like delivering babies) because of the ever-increasing malpractice insurance rates in the state. This is described as a "national epidemic" and a "health crisis" around the country. Some brief details of the study are included, and the article states that of the 2,200 Georgia doctors surveyed, 2,800 of them — which they say represents about 18% of those sampled — were expected to stop providing high risk procedures. Wait a minute! Can that be right? Out of 2,200 doctors, 2,800 don't perform the procedures, and that is supposed to represent 18%? That's impossible! You can't have a bigger number on the top of a fraction, and still have the fraction be under 100%, right? This is one of many examples of errors in statistics that are reported in the media. So what's the real percentage? You can only guess. Chapter 5 nails down the particulars of calculating statistics, so that you can know what to look for and immediately tell when something's not right.

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Belaboring the loss of land

In the same Sunday paper is an article about the extent of land development and speculation across the country. Given the number of homes likely being built in your neck of the woods, this is an important issue to get a handle on. Statistics are given regarding the number of acres of farmland that are being lost to development each year and also translates those acres to square miles. To further illustrate how much land is being lost, the area is also listed in terms of the number of football fields. In this particular example, experts say that the mid-Ohio area is losing 150,000 acres per year, which is 234 square miles, or 115,385 football fields (including end zones). How do people come up with these numbers, and how accurate are they? And does it help to visualize land loss in terms of the corresponding number of football fields?

Scrutinizing schools

The next topic in the paper is school proficiency, specifically whether extra school sessions are helping students perform better. The article states that 81.3% of students in this particular district who attended extra sessions passed the writing proficiency test, while only 71.7% of those who didn't participate in the extra school sessions passed the proficiency test. But is this enough of a difference to account for the \$386,000 price tag per year? And what's happening in these sessions to account for an improvement? Are students in these sessions spending more time just preparing for those exams, rather than learning more about writing in general? And here's the big question: Were those who participated in these extra sessions student volunteers who may be more motivated than the average student to try to improve their test scores? No one knows. Studies like this are going on all the time, and the only way to know what to believe is to understand what questions to ask, and to be able to critique the quality of the study. That's all part of statistics! The good news is, with a few clarifying questions, you can quickly critique statistical studies and their results. Chapter 17 helps you to do just that.

**TIP**

Trying to win the big one

Do you ever imagine winning the Super Lotto, a 1 in 89 million chance, on average?

Don't hold your breath! To put 1 in 89 million into perspective, imagine 89 million lottery tickets in one giant pile, with yours among them somewhere. Suppose I said that you have one chance to reach into the pile and pull out your

own ticket — do you think you could do it? That is the same as your chance of winning one of those big lotteries. But with a bit of insider information, you can increase your jackpot if you do win. (I'd like a cut of your winnings if this turns out to work for you.) For more information on this and other gambling tips, see Chapter 7.



Studying surveys of all shapes and sizes

Surveys and polls are probably the biggest vehicle used by today's media to grab your attention. It seems that everyone wants to do a survey, including market managers, insurance companies, TV stations, community groups, and even students in high-school classes. Here are just a few examples of survey results that are part of today's news.

With the aging of the American work force, companies are planning for their future leadership. (How do they know that the American workforce is aging, and if it is, by how much is it aging?) A recent survey shows that nearly 67% of human resources managers polled said that planning for succession had become more important in the past five years than it had been in the past. Now if you're thinking you want to quit your day job and apply to be a CEO, hold on. The survey also says that 88% of the 210 respondents said they usually or often fill senior positions with internal candidates. (But how many

managers did *not* respond, and is 210 respondents really enough people to warrant a story on the front page of the business section?) Believe it or not, when you start looking for them, you find numerous examples in the news of surveys based on far fewer participants than this.

Some surveys are based on lighter fare. For example, which device do Americans find most crucial today, their toothbrushes, bread machines, computers, cars, or cellphones? In a survey of 1,042 adults and 400 teens (how did they decide on those numbers?) 42% of adults and 34% of teens ranked the toothbrush as more important to them than cars, computers, or cellphones. Is this really big news? Since when should something as critical to daily hygiene as a toothbrush be lumped in with cellphones and bread machines? (The car came in second. But did you really need a survey to tell you that?) For more information on surveys, see Chapter 16.

Studying sports

The sports section is probably the most numerically jam-packed section of the newspaper. Besides the scores of the last game, the win/lose percentages for each team in the league, and the relative standing for each team, the specialized statistics reported in the sports world are so thick that they require wading boots to get through. For example, the basketball statistics are broken down by team, by quarter, and even by player. And you need to be a basketball junkie to interpret all of this, because everything is abbreviated (with no legend provided if you're out of the loop):

- ✓ MIN: Minutes played
- ✓ FG: Field goals
- ✓ FT: Free throws
- ✓ RB: Rebounds
- ✓ A: Assists

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- ✓ PF: Personal fouls
- ✓ TO: Turnovers
- ✓ B: Blocks
- ✓ S: Steals
- ✓ TP: Total points

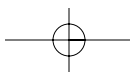
Who needs to know this, besides the players' mothers? Statistics are something that sports fans can never get enough of and that players can't stand to hear about. Stats are the substance of water-cooler debates and the fuel for armchair quarterbacks around the world.

Banking on business news

In the business section of the newspaper, you find statistics about the stock market. It was a bad week last week, with the stock market going down 455 points; is that decrease a lot or a little? You need to calculate a percentage to really get a handle on that. In the same business section, you also find reports on the highest yields nationwide on every kind of CD imaginable. (By the way, how do they know they're the highest?) You also see reports about loan rates: rates on 30-year fixed loans, 15-year fixed loans, 1-year adjustable rate loans, new car loans, used car loans, home equity loans, and loans from your grandmother (well actually no, but if grandma knew how to read these statistics, she may consider increasing the cushy rates she lets you have on her money!). Finally, you see numerous ads for those beloved credit cards — ads listing the interest rates, the annual fees, and the number of days in the billing cycle for the credit cards. How do you compare all of the information about investments, loans, and credit cards in order to make a good decision? What statistics are most important? The real question is, are the numbers reported in the paper giving the whole story, or do you need to do more detective work to get at the truth? Chapter 3 helps you start tearing apart these numbers and making decisions about them.

Taking in the travel news

You can't even escape the barrage of numbers by escaping to the travel section. In that section, I find that the most frequently asked question coming in to the Transportation Security Administration's response center (which receives about 2,000 telephone calls, 2,500 e-mail messages, and 200 letters per week on average — would you want to be the one counting all of those?) is, "Can I carry this on a plane?" where "this" can refer to anything from an animal to a giant tin of popcorn. (I wouldn't recommend the tin of popcorn.



You have to put it in the overhead compartment horizontally, and because things shift during flight, the cover will likely open; and when you go to claim your tin at the end of the flight, you and your seatmates will be showered. Yes, I saw it happen once.)

This leads to an interesting statistical question: How many operators will you need at various times of the day to field those calls that will come in? Estimating the number of anticipated calls is your first step, and being wrong can cost you money (if you overestimated it) or a lot of bad PR (if you underestimated it).

Talking sex (and statistics) with Dr. Ruth

On the accent page of the Sunday paper, you can read about Dr. Ruth's latest research on people's sex lives. She reports that sex doesn't stop at age 60 or even age 70. That's nice to know, but how did she determine this, and to what extent are people having sex at these ages? She doesn't say (maybe some statistics are better left unsaid, huh?). However, Dr. Ruth does recommend that folks in this age group disregard the surveys that report how many times a week, month, or year a couple has sex. In her view, this is just people bragging. She may be right about this. Think about it, if someone conducted a survey by calling people on the phone asking for a few minutes of their time to discuss their sex lives, who is going to be the most likely to want to talk about it? And what are they going to say in response to the question, "How many times a week do you have sex?" Are they going to report something that is the honest truth, or are they going to exaggerate a little? Self-reported surveys can be a real source of bias, and can lead to misleading statistics. So, don't be too hard on Dr. Ruth (who, by the way, is the author of *Sex For Dummies*, 2nd Edition, published by Wiley Publishing, Inc.). How would you recommend she go about finding out more about this very personal subject? Sometimes, research is more difficult than it seems. Chapter 2 has more examples of how statistics can go wrong, and what to look for.

Whetting your appetite for weather

The weather report provides another mass of statistics, with its forecasts of the next day's high and low temperatures (how do they decide on 16 degrees and not 15 degrees?) and reports of the day's UV factor, pollen count, pollution standard index, and water quality and quantity. (How do they get these numbers, by taking samples? How many samples do they take, and where do they take them?) You can even get a forecast looking ahead 3 days, a week, or even a month or a year! How accurate are weather reports these days? Given the number of times you get rained on when they told you it was going to be sunny, you could say they still have work to do on those forecasts!

The Las Vegas odds

When looking at how numbers are used (and abused) in everyday life, you can't ignore the world of sports betting, a multi-billion-dollar-a-year business that includes the casual bettor as well as the professional gambler and the compulsive gambler. What kinds of topics can you bet on? Pretty much anything that's got two outcomes. The crazy wagers that a person can make in Las Vegas have no limit (no pun intended).

Here is a sampling of some of the burning issues regarding the Super Bowl that one can wager on at a sports book (a betting place) in Las Vegas:

- ✓ Which team will have the most penalty yards?

- ✓ Which team will score last in the first half?
- ✓ Will a 2-point conversion be attempted?
- ✓ What will happen first, a score or a punt?
- ✓ What will the total net yards by both teams be (over 675 or under 675)?
- ✓ Will both teams make a 33-yard or longer field goal?

Hmm. Why not throw in the number of pounds of guacamole consumed by the Super Bowl TV viewers versus the number of blades of grass (or turf) on the field? Gamblers, start counting.

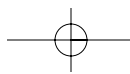


Probability and computer modeling do play an important role in forecasting today's weather, though, and are especially helpful regarding major events such as hurricanes, earthquakes, and volcano eruptions. Of course computers are only as smart as the people who program them, so scientists still have much work to do before tornados can be predicted before they even begin (wouldn't that be great, though?). For more on modeling and statistics, see Chapter 6.

Musing about movies

Moving on to the arts section of the newspaper, you see several ads for current movies. Each movie ad contains quotes from certain movie critics, some of which read, "Two thumbs up!" "The supreme adventure of our time," "Absolutely hilarious," or "One of the top ten films of the year!" Do you pay attention to the critics? How do you determine which movies to go to? Experts say that while the popularity of a movie may be affected by the critics' comments (good or bad) in the beginning of a film's run, word of mouth is the most important determinant of how well a film is going to do in the long run.

Studies also show that the more dramatic a movie is, the more popcorn is sold. Yes, the entertainment business even keeps tabs on how much crunching you do at the movies. How do they collect all of this information, and how does it impact the types of movies that are made? This, too, is part of statistics:



designing and carrying out studies to help pinpoint an audience and find out what they like, and then using the information to help guide the making of the product. So the next time someone with a clipboard asks if you have a minute, you may want to stand up and be counted.

Highlighting horoscopes

Those horoscopes: You read them, but do you believe them? Should you? Can people predict what will happen more often than just by chance? Statisticians have a way of finding out, by using something they call a hypothesis test (see Chapter 14). So far they haven't found anyone that is able to read minds, but people still keep trying!

Using Statistics at Work

Take a break from the Sunday newspaper, which you read in the comfort of your home, and move on to the daily grind of the workplace. If you're working for an accounting firm, of course numbers are part of your daily life. But what about nurses, portrait studio photographers, store managers, newspaper reporters, office workers, or even construction workers? Do numbers play a role if that's your job? You bet. This section gives you a few examples of how statistics creep into every workplace.



You don't have to go very far to see the tracks of statistics and how it weaves its way in and out of your life and your work. The secret is being able to determine what it all means and what you can believe, and to be able to make sound decisions based on the real story behind those numbers so that you can handle and even become accustomed to the statistics of everyday life.

Delivering babies — and information

Sue works as a nurse during the night shift in the labor and delivery unit at a university hospital. She has several patients that she has to take care of in a given evening, and she does her best to accommodate everyone. Her nursing manager has told her that each time she comes on shift she should identify herself to the patient, write her name on the whiteboard in the patient's room, and ask the patient whether she has any questions. Why does she do this? Because after each mother comes home from the hospital, she receives a phone call a few days later asking about the quality of care, what was missed, what the hospital can do to improve its service and quality of care,

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and what the hospital staff can do to ensure that the hospital is chosen more often than the other hospitals in town. Quality service is important, and for new moms staying in the hospital, with nurses coming and going every eight hours, knowing the names of their nurses is important, because this helps them get their questions answered in a timely manner. Sue's raises depend on her ability to follow through with the needs of new mothers.

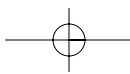
Posing for pictures

Carol recently started her job as a photographer for a department store portrait studio; one of her strengths is working with babies. Based on the number of photos purchased by customers over the years, this store has found that people will buy more of the posed pictures than the natural-looking ones. As a result, the store managers will encourage their photographers to take posed shots.

A mother comes in with her baby and has a special request, "Could you please not pose my baby too deliberately? I just like his pictures to look natural." What does Carol say? "Can't do that, sorry. My raises are based on my ability to pose a child well." Wow! You can bet that the mother making the request is going to fill out that survey on quality service after this session — and not just to get \$2.00 off her next sitting (if she ever comes back to that studio).

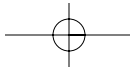
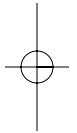
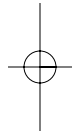
Poking through pizza data

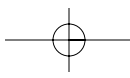
Terry is a store manager at a local pizzeria that sells pizza by the slice. He is in charge of determining how many workers to have on staff at a given time, how many pizzas to make ahead of time to accommodate the demand, and how much cheese to order and grate, all with minimal waste of wages and ingredients. It's Friday night at 12 midnight and the place is dead. Terry has five workers left and has 5 pans of pizza he could throw in the oven, making about 40 slices of pizza. Should he send two of his workers home? Should he put more pizza in the oven or hold off? Terry knows what is most likely to happen because the store owner has been tracking the demand for weeks now, and he knows that every Friday night things slow down between 10 and 12, but then the bar crowd starts pouring in around midnight, and the crowd doesn't let up until the doors close at 2:30 in the morning. So Terry keeps the workers on, puts in the pizzas starting at 30 minute intervals from 12:00 on, and is rewarded with a good night money-wise, with satisfied customers and with a happy boss. For more information on how to make good estimates using statistics, see Chapter 11.



Working in the office of statistics

Take DJ, the administrative assistant for a computer company. How can statistics creep into her office workplace? Easy. Every office is filled with people who want to know answers to questions, and they want someone to “Crunch the numbers” to “Tell me what this means” to “Find out if anyone has any hard data on this” or to simply say, “Does this number make any sense?” They need to know everything from customer satisfaction figures to changes in inventory during the year; from the percentage of time employees spend on e-mail to the cost of supplies for the last three years. Every workplace is filled with statistics, and DJ’s marketability and value as an employee could go up if she’s the one the head honchos turn to for help. Every office needs a resident statistician — why not let it be you?





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