IN THIS CHAPTER

- Raising questions about statistics you see in everyday life
- Encountering statistics in the workplace

Chapter 1
The Statistics of Everyday Life

Today's society is completely taken over by numbers. Numbers are everywhere you look, from billboards showing the on-time statistics for a particular airline, to sports shows discussing the Las Vegas odds for upcoming football games. The evening news is filled with stories focusing on crime rates, the expected life span of junk-food junkies, and the president's approval rating. On a normal day, you can run into 5, 10, or even 20 different statistics (with many 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 (almonds are known to have positive health effects — what about other types of nuts?).

In this chapter we discuss the statistics that often appear in your life and work, and talk about how statistics are presented to the general public. After reading this chapter, you'll realize just how often the media hits you with numbers and how important it is to be able to unravel the meaning of those numbers. Like it or not, statistics are a big part of your life. So, if you can't beat 'em, join 'em. And if you don't want to join 'em, at least try to understand 'em.

Statistics and the Media: More Questions than Answers?

Open a newspaper and start looking for examples of articles and stories involving numbers. It doesn't take long before those 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 nowadays.

This section looks at just a few examples from one Sunday paper's worth of news that I read the other day. When you see how frequently statistics are reported in the news without providing all the information you need, you may find yourself getting nervous, wondering what you can and can't believe anymore. Relax! That's what this book is for — to help you sort out the good information from the bad (the chapters in Unit 2 give you a great start on that).

Probing popcorn problems

The first article I came across that dealt with numbers was "Popcorn plant faces health probe," with the subheading: "Sick workers say flavoring chemicals caused lung problems." The article describes how the Centers for Disease Control (CDC) expressed 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 factory 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 wondering, what about the folks who eat microwave popcorn? According to the article, the CDC found "no reason to believe that people who eat microwave popcorn have anything to fear." (Stay tuned.) The next step is to evaluate employees in more depth, including conducting surveys to determine health and possible exposures to the flavoring 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? (You find out more about this in Chapter 15.)

Venturing into viruses

A second article discussed a recent cyber attack: A wormlike virus made its way through the Internet, slowing down web browsing and email delivery around the world. How many computers were affected? The experts quoted in the article said that 39,000 computers were infected, and they in turn affected hundreds of thousands of other systems.

Questions: How did the experts get that number? Did they check each computer out there to see whether it was affected? The fact that the article was written less than 24 hours after the attack suggests the number is a guess. Then why say 39,000 and not 40,000 — to make it seem less like a guess? To find out more on how to guesstimate with confidence (and how to evaluate someone else's numbers), see Chapter 14.

Comprehending crashes

Next in the paper was an alert about the soaring number of motorcycle fatalities. Experts said that the *fatality rate* — the number of fatalities per 100,000 registered vehicles — for motorcyclists has been steadily increasing, as reported by the National Highway Traffic Safety Administration (NHTSA). In the article, many possible causes for the increased motorcycle death rate were discussed, including age, gender, size of engine, whether the driver had a license, alcohol use, and state helmet laws (or lack thereof). The report was very comprehensive, showing various tables and graphs with the following titles:

- Motorcyclists killed and injured, and fatality and injury rates by year, per number of registered vehicles, and per millions of vehicle miles traveled
- Motorcycle rider fatalities by state, helmet use, and blood alcohol content
- Occupant fatality rates by vehicle type (motorcycles, passenger cars, light trucks), per 10,000 registered vehicles and per 100 million vehicle miles traveled
- Motorcyclist fatalities by age group
- Motorcyclist fatalities by engine size (displacement)
- Previous driving records of drivers involved in fatal traffic crashes by type of vehicle (including previous crashes, DUI convictions, speeding convictions, and license suspensions and revocations)

This article was very informative and provided a wealth of detailed information regarding motorcycle fatalities and injuries in the U.S. However, the onslaught of so many tables, graphs, rates, numbers, and conclusions can be overwhelming and confusing and lead you to miss the big picture. With a little practice, and help from Unit 2, you'll be better able to sort out graphs, tables, and charts and all the statistics that go along with them. For example, some important statistical issues come up when you see rates versus counts (such as death rates versus number of deaths). As I address in Chapter 2, counts can give you misleading information if they're used when rates would be more appropriate.

Mulling malpractice

Further along in the newspaper was a report about a recent medical malpractice insurance study: Malpractice cases affect people in terms of the fees doctors charge and the ability to get the healthcare they need. The article indicates that one in five Georgia doctors have stopped doing risky procedures (such as 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 represent about 18 percent of those sampled — were expected to stop providing high-risk procedures.

Wait a minute! That can't be right. Out of 2,200 doctors, 2,800 don't perform the procedures, and that is supposed to represent 18 percent? That's impossible! You can't have a bigger number on the top of a fraction, and still have the fraction be under 100 percent, right? This is one

of many examples of errors in media reporting of statistics. So what's the real percentage? There's no way to tell from the article. Chapter 4 nails down the particulars of calculating these kinds of statistics so you can know what to look for and immediately tell when something's not right.

Belaboring the loss of land

In the same Sunday paper was an article about the extent of land development and speculation across the United States. Knowing how many homes are likely to be built in your neck of the woods is an important issue to get a handle on. Statistics are given regarding the number of acres of farmland being lost to development each year. To further illustrate how much land is being lost, the area is also listed in terms of football fields. In this particular example, experts said 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? I discuss the accuracy of data collected in more detail in Chapter 17.

Scrutinizing schools

The next topic in the paper was school proficiency — specifically, whether extra school sessions help students perform better. The article stated that 81.3 percent of students in this particular district who attended extra sessions passed the writing proficiency test, whereas only 71.7 percent of those who didn't participate in the extra school sessions passed it. 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 cause 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 the participants in the extra sessions student volunteers who may be more motivated than the average student to try to improve their test scores? The article didn't say.

Studies like this appear 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 18 helps you do just that.

Scanning sports

The sports section is probably the most numerically jam-packed section of the newspaper. Beginning with game scores, the win/loss percentages for each team, and the relative standing for each team, the specialized statistics reported in the sports world are so deep that they require wading boots to get through. For example, basketball statistics are broken down by team, by quarter, and by player. For each player, you get minutes played, field goals, free throws, rebounds, assists, personal fouls, turnovers, blocks, steals, and total points.

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

STUDYING SURVEYS OF ALL SHAPES AND SIZES

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

With the aging of the American workforce, 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 percent of human resource managers polled said that planning for succession had become more important in the past five years than it had been in the past. The survey also says that 88 percent 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'll find numerous examples in the news of surveys based on far fewer participants than 210. (To be fair, however, 210 can actually be a good number of subjects in some situations. The issues of what sample size is large enough and what percentage of respondents is big enough are addressed in full detail in Chapter 17.)

Some surveys are based on current interests and trends. For example, a Harris-Interactive survey found that nearly half (47 percent) of U.S. teens say their social lives would end or be worsened without their cellphones, and 57 percent go as far as to say that their cellphones are the key to their social life. The study also found that 42 percent of teens say that they can text while blindfolded (how do you really test this?). Keep in perspective, though, that the study did not tell you what percentage of teens actually have cellphones or what demographic characteristics those teens have compared to teens who do *not* have cellphones. And remember that data collected on topics like this aren't always accurate, because the individuals who are surveyed may tend to give biased answers (who wouldn't want to say they can text blindfolded?). For more information on how to interpret and evaluate the results of surveys, see Chapter 17.

Fantasy sports have also made a huge impact on the sports money-making machine. Fantasy sports are games where participants act as owners to build their own teams from existing players in a professional league. The fantasy team owners then compete against each other. What is the competition based on? Statistical performance of the players and teams involved, as measured by rules set up by a "league commissioner" and an established point system. According to the Fantasy Sports Trade Association, the number of people age 12 and up who are involved in fantasy sports is more than 30 million, and the amount of money spent is $3 to 4 billion per year. (And even here, you can ask how the numbers were calculated — the questions never end, do they?)

Banking on business news

The business section of the newspaper provides statistics about the stock market. In one week, the market went down 455 points; is that decrease a lot or a little? You need to calculate a percentage to really get a handle on that.

The business section of my paper contained reports on the highest yields nationwide on every kind of certificate of deposit (CD) imaginable. (By the way, how do they know those yields are the highest?) I also found reports about 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 read these statistics, she might increase her cushy rates).

Finally, I saw numerous ads for those beloved credit cards — ads listing the interest rates, the annual fees, and the number of days in the billing cycle. How do you compare all 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? Chapters 17 and 18 help you start tearing apart these numbers and making decisions about them.

Touring the travel news

You can't even escape the barrage of numbers by heading to the travel section. For example, there I found 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 email 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?" *This* can refer to anything from an animal to a wedding dress 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 a 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.)

The number of reported responses in this case leads to an interesting statistical question: How many operators are needed at various times of the day to field those calls, emails, and letters coming in? Estimating the number of anticipated calls is your first step, and being wrong can cost you money (if you overestimate it) or a lot of bad PR (if you underestimate it). These kinds of statistical challenges are tackled in Chapter 14.

Surveying sexual stats

In today's age of info-overkill, it's very easy to find out what the latest buzz is, including the latest research on people's sex lives. An article in my paper reported that married people have 6.9 more sexual encounters per year than people who have never been married. That's nice to know, I guess, but how did someone come up with this number? The article I'm looking at doesn't say (maybe some statistics are better left unsaid?).

If someone conducts a survey by calling people on the phone asking for a few minutes of their time to discuss their sex lives, who will 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 the honest truth, tell you to mind your own business, or exaggerate a little? Self-reported surveys can be a real source of bias and can lead to misleading statistics. But how would you recommend people go about finding out more about this very personal subject? Sometimes, research is more difficult than it seems. (Chapter 17 discusses biases that come up when collecting certain types of survey data.)

Breaking down weather reports

Weather reports provide another mass of statistics, with forecasts of the next day's high and low temperatures (how do they decide it'll be 16 degrees and not 15 degrees?) along with 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 find out what the weather is right now anywhere in the world. You can get a forecast looking ahead three days, a week, a month, or even a year! Meteorologists collect and record tons and tons of data on the weather each day. Not only do these numbers help you decide whether to take your umbrella to work, but they also help weather researchers to better predict longer-term forecasts and even global climate changes over time.

Even with all the information and technologies available to weather researchers, how accurate are weather reports these days? Given the number of times you get rained on when you were told it was going to be sunny, it seems they still have work to do on those forecasts. What the abundance of data really shows, though, is that the number of variables affecting weather is almost overwhelming, not just to you, but for meteorologists, too.

REMEMBER

Statistical computer models play an important role in making predictions about major weather-related events, such as hurricanes, earthquakes, and volcano eruptions. Scientists still have some work to do before they can predict tornados before they begin to form, or tell you exactly where and when a hurricane is going to hit land, but that's certainly their goal, and they continue to get better at it. For more on modeling and statistics, see Chapter 19.

Using Statistics at Work

Now let's put down the Sunday newspaper 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 people like nurses, portrait studio photographers, store managers, newspaper reporters, office staff, or construction workers? Do numbers play a role in those jobs? You bet. This section gives you a few examples of how statistics creep into *every* workplace.

REMEMBER

You don't have to go far to see how statistics weaves its way in and out of your life and 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 numbers so you can handle and become used 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 takes care of several patients 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 whether the patient has any questions. Why? Because a few days after each mother leaves with her baby, the hospital gives her a phone call asking about the quality of care, what was missed, what it could do to improve its service and quality of care, and what the staff could do to ensure that the hospital is chosen over other hospitals in town. For example, surveys show

that patients who know the names of their nurses feel more comfortable, ask more questions, and have a more positive experience in the hospital than those who don't know the names of their nurses. Sue's salary raises depend on her ability to follow through with the needs of new mothers. No doubt the hospital has also done a lot of research to determine the factors involved in quality of patient care well beyond nurse–patient interactions. (See Chapter 18 for in-depth info concerning medical studies.)

Posing for pictures

Carol works 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 buy more posed pictures than natural-looking ones. As a result, store managers 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." If Carol says, "Can't do that, sorry. My raises are based on my ability to pose a child well," you can bet that the mother 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). Instead, Carol should show her boss the information in Chapter 17 about collecting data on customer satisfaction.

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. Friday night at midnight, the place is dead. Terry has five workers left and has five large pans of pizza he could throw in the oven, making about 40 slices of pizza each. Should he send two of his workers home? Should he put more pizza in the oven or hold off?

The store owner has been tracking the demand for weeks now, so Terry knows that every Friday night things slow down between 10 p.m. and 12 a.m., but then the bar crowd starts pouring in around midnight and doesn't let up until the doors close at 2:30 a.m. So Terry keeps the workers on, puts in the pizzas in 30-minute intervals from midnight on, and is rewarded with a profitable night, with satisfied customers and a happy boss. For more information on how to make good estimates using statistics, see Chapter 14.

Statistics in the office

D.J. is an 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 email to the cost of supplies for the last three years. Every workplace is filled with statistics, and D.J.'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?