14

Real-Life Adventures of Statistics Users

Statistics: A Practitioner's View

by John H. Schlaf

Director of Campus Safety, Knox College, and former Chief of Police, Galesburg, Illinois. Used with permission.

Background. I grew up in northwestern Illinois in a town of approximately 35,000 persons. As many young people do, I had vowed to leave the area to seek my fame and fortune in larger and more exciting places, and I was able to talk my parents into giving me permission to join the Air Force at 17. I was fortunate enough to be trained as an intelligence analyst, which consisted of recognizing and gathering data from various sources (I feel I need to remain somewhat vague on this), analyzing the data, and then writing timely reports for "consumption" by other military and governmental "users." It was a great experience for a young person and provided a strong foundation on which to build a law enforcement career.

Upon my return from the Air Force (after traveling around the world during those 4 years) I learned that my hometown was really a pretty nice place to live after all. I worked briefly on the railroad (as my father, grandfather, and great-grandfather had) and then a steel building manufacturing company before I tested for the police department and subsequently was appointed as a police officer. As it turned out, I was able to seek my fame (guess it really wasn't fame) and fortune (wasn't really fortune either) in my hometown as a police officer and became one of those very fortunate persons who then (and now) went to work every day and enjoyed it; not that every day was a joy, but it was a career that could be loved and for that I will remain forever grateful.

I was able to work each patrol shift as an officer and supervisor and then as an investigator. I served in the other divisions (operations and administrative) as well, moving through ranks as a sergeant, lieutenant, and captain before becoming and then retiring as chief of police. After retirement, I was appointed as director of campus safety at a small (approximately 1,400 students) private college in our community. Some of my day-to-day experiences as a municipal police officer and my activities as director of campus safety, as well as the influences "statistics" had on these experiences and activities, are described below.

I'm not sure if this is a good thing or a bad thing, but I should probably report that my "official" exposure to statistics has been primarily as a consumer versus one who has had specific training or education as a statistician. Initially, when first asked to consider writing about my interaction over the years with statistics, I was concerned that the authors had, basically, asked the wrong guy. I noticed, however, while attempting to recall some real-life stories from nearly 45 years as a police officer and law enforcement executive, that statistics, in some form, had been a greater influence on my career than I originally suspected.

Over the years, various persons, generally young persons, tend to ask two questions about law enforcement as they consider a position in the criminal justice system. The first is generally, "What's it like to be a police officer?" As the years go by, the questions seem to change to correlate with the current assignment within the department, so from "What is it like to be a police officer?" the question becomes, "What's it like to be a detective?" and then "What's it like to be a chief of police?" To be honest, I'm not sure I can recall my answers to the first two questions, but in response to "What's it like to be a chief of police" I had to respond, "Being a chief of police is a little like being the guy who mows the grass in the cemetery. You've got a lot of people under you, but nobody listens." I'm not sure that response has anything specifically to do with statistics, but I wanted to share it with the readers in the event that they may have occasion to use it in the future. It can be used for any career field, so maybe someday, with a little tweaking, when someone asks you the question "What is it like to be a senior criminologist (or statistician)?" you can answer in the same way.

The other frequently asked question, though, has a stronger link to the topic of statistics: "What classes should I take if I want to become a police officer?" My response was always a recommendation to follow the course of study suggested by the school the student was considering, with an added personal suggestion of pursuing a philosophy course. That suggestion tended to result in a look from students indicating that they wished they had not asked the question or maybe that it should not have been asked of me.

In response to that look, I tried to explain that, although most books written on law enforcement as a career may not mention philosophy, it was my belief that that course of study tended to broaden a person's ability to consider life's circumstances differently and to think independently. I tried to explain that it was my belief—and still is—that the best police officers, on the street or in the office, are the ones who are not afraid to ask questions and who do not automatically accept the conventional or "approved" answers; they are free thinkers and they see and consider possibilities

that others have overlooked or rejected. Those philosophy classes generally aren't easy, and, no doubt, some of those who asked the question quietly elected to ignore my advice.

Making the decision to take a difficult class to become a police officer or to make a better police officer is tough but will not, in any fashion, compare with the difficult decisions that a police officer will make in the future. As a good friend, former partner on the street, and lieutenant in my command staff commented when he had apparently noted that my mood was down a bit, "You know, Chief, if this was easy, anyone could do it." It's the same way with being the best police officer that you can be—it might be tough, but if it was easy, anyone could do it.

As I noted earlier, during the recollection of the real-life stories for this chapter, I recognized that statistics, in some form, had played a significant and positive role in my law enforcement career. It was also interesting to note that, much in the same way that those asking about a recommendation for the best classes to take and in much the same way that philosophy may have been avoided because of the perceived degree of difficulty, statistics may have been considered a tough course by those considering a career in the criminal justice system.

I have not personally experienced the courses, so I can't confirm that suspicion, but I do believe that the same reasons I gave for taking a philosophy course would also apply to a statistics course. It would seem that taking a statistics course should also create a person willing to think openly and not accept a statement or concept "just because" someone else believes it to be so. In the case of statistics, however, I believe that the product of that expanded manner of thinking has been, or should have been, the result of some scientific fact rather than philosophical thought. These comments have reminded me of a lesson learned as a very young patrol officer as it relates to accepting information without sufficient study.

After responding to a report of a traffic crash at a local restaurant (I had been very close to the restaurant when the report came in), a man ran into the parking lot and called out to me that his vehicle had just been struck by a woman in another vehicle who was leaving the scene. He then pointed to a vehicle turning southbound onto a nearby street. He was clearly agitated that pursuit of the female was not immediately initiated, saying, "You're letting her get away!" It was tempting, but something just didn't seem quite right, and my hesitation gave enough time for a female to walk from the restaurant to say, "This guy just hit my car and tried to leave." I'm not sure about the philosophic lesson to be drawn from this incident, but there is clearly a statistical one, which is the very critical need to remain cautious and skeptical about accepting information without adequate analysis and seeking the details required for an accurate resolution. Those memories have caused me regret as it relates to those questions from young persons asking, "What classes should I take?" I realize now I should have said, "Philosophy and statistics—they're both tough, but if they were easy, anyone could do them."

Uniform Crime Reports/Clery Reports. The statistical report probably most familiar to persons both inside and outside of the criminal justice system is the Federal Bureau

of Investigation's (FBI's) annual Uniform Crime Reports (UCRs), which have compiled crime data submitted from various law enforcement agencies since 1930. The data are gathered daily by agencies across the country, and each agency is encouraged by the FBI to strive for complete accuracy to "generate a reliable set of crime statistics for use in Law Enforcement administration, operation and management." It is acknowledged that the data are critical to a wide range of users to assist with the understanding of crime, the formulation of policies, operational and strategic decision making, and for criminological research and analysis.

Likewise, senior law enforcement officials expect to have contact from various media sources regarding the annual report. This is normally routine unless there has been a significant increase noted in a certain area. I made an effort personally to avoid the year-to-year comparisons that local reporters attempted to make and instead focused on the trends I noticed and those supported by the UCR data. The data were helpful when developing community programs, promoting departmental activities, and supporting budgetary requests. Likewise, the results of those studies have, over the years, impacted the manner in which the officer on the street performed or was expected to perform his or her duties.

Although there is no doubt that the data should be considered invaluable for those involved in longer term criminal and social studies, it seemed that the degree of interest from the local community, officers, and others in the criminal justice system was limited. The experience of other senior law enforcement officials may have been entirely different, but to me, the level of interest always seemed disappointingly low.

Additionally, the number of UCR inquiries from people interested in becoming a resident of and/or moving a new business to our community also seemed low. It is possible that the wider access of UCR data via the Internet and elsewhere may have contributed to the lack of contact with our police department about the UCR data, or it may have just been a circumstance unique to this area.

The publication of information similar to that available in the UCR, but for campus police and security departments, is the report originally known as the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act, and subsequently the Higher Education Opportunity Act. The Clery Act reports are required by the U.S. Department of Education. The act directs all public and private colleges and universities (postsecondary institutions) that participate in the federal government's Title IV student financial assistance programs to publish annual reports on criminal and fire incidents that have taken place on their respective campuses.

The Clery reporting guidelines utilize basically the same crime classification rules and definitions as those in the UCR and the National Incident-Based Reporting System (NIBRS) handbook. The Clery Act requires that institutions disclose three general categories of crime statistics: criminal offenses, hate crimes, and arrest/referrals for disciplinary action. Although the Clery crime categories and classifications are basically the same as those utilized within the UCR system, there are some significant differences, mainly those pertaining to reporting requirements for sexual assaults.

Within Clery, the reporting requirements have been drafted in such a manner as to restrict sexual assault reporting to two categories of "forcible and non-forcible" offenses. Within each category, the offenses have been restricted to four forcible and two non-forcible categories. The four forcible offenses consist of forcible rape, forcible sodomy, sexual assault with an object, and forcible fondling. The two non-forcible sex offenses consist of incest and statutory rape.

Under the Clery Act, a crime should be considered "reported" when it is brought to the attention of campus security authorities—those "authorities" include more than simply the campus security or police department—and may be reported by a victim, witness, other third-party person, or even the actual offender. In the event that they have accurately followed the Clery guidelines, campuses are actually reporting "alleged criminal incidents." Clery reporting actually does not require the report to have been investigated by the police or other campus security authority to be recorded. There is also no requirement that there be a finding of "guilt or responsibility" to disclose the information. As it relates to sexual assaults, the information, which has been restricted as outlined earlier, should be reported regardless of any investigation that may or may not have been done, even if the reporter has elected to share very little information with the campus police or security department. The only requirement for reporting is a reasonable belief that the information is not simply rumor or hearsay and that the report has been made in good faith.

Likewise, the report cannot be unfounded without a determination by sworn or commissioned personnel. Although the reasons for these guidelines are understood, it is also interesting to note the differences between the UCR and Clery reporting realities. I believe that the competition for students among colleges and universities has resulted in unrealistic reporting of major offenses—primarily sexual assaults. It is interesting to note that colleges and universities of similar size, demographic makeup, and location report major differences in the number of sexual assaults. Although I can't prove it, and although other campus security/law enforcement chief executives may disagree, I believe the lower numbers reported by some institutions are the result of the need to ensure that prospective students are not discouraged from attending those institutions rather than an accurate reflection of what is happening at those institutions as reported under the Clery guidelines. It is discouraging to see such decisions being made at the reporting and recording level. It is also discouraging that subtle (or not-so-subtle) pressure to reduce the Clery numbers may come from the executive levels within an institution's administration.

I have no doubt that more potential students and still more parents review the published reports during the college selection process than would others preparing to move to a community. Still, the number of inquiries from parents and prospective students regarding the Clery reports remains disappointingly low.

Prison Study. Our community was one of several under consideration for the construction of a state medium-security prison. The Illinois State Department of Corrections (DOC) conducted a series of hearings within each of the communities under consideration to determine the degree of public support for or opposition to the

construction of a prison. At the time of the hearings, the community had the good fortune of a strong economic foundation with several large factories that had been in the community for a long time, a large state mental health center, a major railroad yard, and a well-known and respected private college.

The hearings were painful to watch. The opposition was strong and based in large part on information that had been gathered by a well-organized group that strongly opposed the construction of a prison in the community. The group expressed concerns that the prison would change the general reputation and impression of the community and, more specifically, have a direct impact for the worse on the quality of life for local citizens.

The prediction of a negative local impact was based on data the opposition group had gathered about other communities with prisons throughout the state. The information confirmed that each of the communities had experienced an increase in the local crime rate, as well as specific increases in drug-related crimes; drug sales; increased gang activity. There was also evidence that prisoner families had moved into the community while the family member was in prison and that, once released, the prisoners and their families remained in the community. The information was credible and based on UCR data as well as interviews with various officials from the cities involved.

Based on the emotions stirred up by the opposition group and the statistical information presented, the prison proposal was rejected. The state DOC representatives, who had not received an "open arms" welcome in the first place, were encouraged to leave and not return to subject the community to the negative impact that the prison would cause.

But times and circumstances changed for our community. A major industry that had been a consistent part of our life for many years closed and relocated to Mexico and China. The state mental health center closed, too. The economic foundation of our community crumbled, and along with it, the strong opposition to the DOC prison system, which was still trying to find locations to build within the state. The data that had been used to argue against the prison were still being cited, however, and continued to cause fear and uncertainty regarding the possibility of placing a prison in the area. But the changed circumstances created a desire at least to verify the data that had been gathered. Because much of it was crime based, the Galesburg Police Department was asked to research the information.

Actually, the UCR data were confirmed as accurate. The communities that had agreed to build prisons had, in fact, noted an increase in crime as well as drug and gang activity. It was noted, however, that the interpretation of the data may have contributed to the goals of the opposition at the time. Although those increases had been noted and accurately reported in the various UCR documents, the same increases in drug and gang activity had been noted in communities that had *not* had prisons located there.

Information presented by several sources (unconfirmed but believed to be U.S. Bureau of Justice and ABC News) indicated the movement of several large California-based gangs into the Midwest (especially Chicago) and that increasing drug and drug-related criminal activity could be expected to follow in smaller midwestern communities. As the data were analyzed locally, it appeared that gang and drug activity had

indeed increased over time along major transportation lines extending from Chicago and other major midwestern cities. Our community was on one of those major transportation lines.

We also learned that there had, in fact, been an increase in the number of persons from larger communities moving into low-income housing in our own as well as other outlying communities. It was ultimately learned that the increases in criminal activity were correlated with actions being taken within various low-income housing authorities and that the apparent correlation of these increases with the presence of prisons was spurious. The perception that the presence of a prison in a community caused many of the observed changes in drug and criminal activity was strong but frequently unfounded factually.

Our community now has a state prison. The issue remains emotional, and persons still attempt to correlate the negative influences of crime and gangs to the prison, but, in fact, the prison has been a positive asset, and for the most part, the benefits of its presence have been apparent to the local population.

In addition to the very specific manner in which the data were used, by design or simply misunderstanding, the police learned a very valuable lesson: It remains critical that law enforcement, at every level, remain sensitive to the accurate analysis of data to ensure that the proper problem or target has been identified. It was easy to blame the prison for the gang- and drug-related problems that had confronted our department. If the easy explanations had been accepted and measures to correct or suppress the problems had been limited to the prison system, the department would have missed the real reason and potentially failed to protect the safety and well-being of our citizens as we are expected and have personally sworn to do.

Low-Income Housing. During the efforts to analyze data regarding the prison system in the state and the impact that the prison would have on local communities, the department learned that low-income housing was an area that required some additional attention.

Efforts were made to determine who had moved into the area from elsewhere (generally larger cities) and to learn what was needed by the residents of the housing area (especially the younger residents) as well as department officers. Several actions were taken. Some, in cooperation with the local housing authority, were administratively specific, such as tighter controls on visitors and monitoring who was actually living in the units assigned. In an effort to involve the young residents more, officers and community services personnel (nonsworn but uniformed members of the department) were assigned to interact with younger residents on a daily basis, primarily after school.

The program continued for several years, and after initial strong interest and interaction with the department, the younger residents began to withdraw. After the early success of the program, it was disappointing to see the desire for interaction with the department diminish. In an effort to determine where the program had failed, an attempt was made to compare the number of persons participating in the current program with the number who had been involved initially. At the same time, interviews were completed with the younger residents as well as parents and friends of those involved. All the information combined revealed an interesting story.

The program with the youth had not failed. The program had done what it was supposed to do—create the feeling of a real neighborhood where the young residents could come home and simply play. They no longer felt the need for an organized, department-sponsored, after-school program. We learned that in addition to not knowing, for sure, what to do or what was going to work, we were having difficulty recognizing when we had been successful.

We had made a commitment to be willing to try anything new that we felt would be helpful and had pledged to stop a plan or program if it was not successful and then try something new. We were prepared for failure and vowed not to continue just because it was a popular idea. It was felt that we would clearly know when we had failed, but surprisingly, it was not as easy to recognize when we had been successful. The need to have a plan in place, gather information, and then correctly analyze the information was underscored by this effort. In hindsight, those suggestions all seem simple and obvious, but we didn't do it.

Luck Is Often Seat-of-the-Pants Statistics. It seemed that any time I had a conversation with an officer regarding a successful investigation, traffic stop, and subsequent drug arrest or pursuit, the frequent response was something to the effect of, "I was just lucky." That response often provided an opportunity to share my personal belief that the officer needed to take credit for the success and not to praise luck with the comment: "There is no such thing as luck. You make your own luck."

I sincerely believed in the truth of this statement, but honestly, it was without factual support. As the years passed, however, I became convinced that there may be some factual/scientific support for the idea that officers make their own luck. At their core, the best police officers have learned or sensed that the best predictor of future behavior is past behavior, and they have learned to recognize patterns in behavior, much as statistical analysis reveals patterns worth paying attention to.

Although that comment seems simple enough, I believe that scientific research consists of gathering, categorizing, and analyzing data of some activity or behavior. I believe that the best of the best among criminal justice practitioners understand this process, even if unconsciously. The street officer may not check a table, chart, or graph, yet daily, he or she relies on basically the same process, gathering and analyzing information in much the same manner as the criminologist-statistician-researcher.

The operational processes, however, may be dramatically different in several ways. One may be the result of focused conscious thought over an extended period of time, whereas the other may take place without conscious thought over a much shorter, even instantaneous, time frame, but the end result is the same: A decision to act, or not act, made as the result of an analysis of data gathered about some previous actions or behaviors.

One may involve a presentation to a city council, county board, or state appropriations committee and include a comment such as "Based on the statistical analysis of the number of calls for service within that particular area and the average response times by departmental personnel, it is proposed that two additional officers be hired to ensure adequate police service to the citizens who live in the patrol zone in question." The other

may consist of the brief comment, frequently made on a police radio channel, "Headquarters . . . I'm behind the suspect vehicle . . . eastbound on Main Street at Cherry." The actions may be dramatically different, but I believe they involve the same basic process.

In much the same way, officers and sometimes departments use a similar process to design operational stings using the study of past human behavior. We've seen it used successfully on the interstate highway system when signs have been posted to announce that "Vehicle Searches" will be conducted at some location several miles ahead. The signs may be posted in a remote area just before an exit. The searches may not be taking place as announced, but the fact that the driver of a vehicle has elected to exit at that remote location, seemingly to avoid the announced search, has resulted in some significant illegal drug seizures. Likewise, a similar investigative approach has been used at a local train station. Observations of the behavior of persons departing the train have been successful with the same drug enforcement effort. People who often observe the police presence near the train platform may react by attempting to avoid the officers and the police dog. Subsequent conversations or other interactions with officers have resulted in numerous successful arrests for the possession of illegal drugs.

It may explain why some officers always seem to be at the right place at the right time to clear a case, intercept the fleeing suspect, or make that critical arrest. Somewhere inside of those "lucky" officers, they have somehow learned that by using past behaviors and computing the odds, a valid prediction may be made. My comment that "we make our own luck" should more accurately be stated as "Statistically speaking, we make our own luck."

Rapist Story. During conversations with young people interested in pursuing a criminal justice career, I often said that I thought our department was an ideal size for working as a police officer. The department consisted of 54 officers, 30 auxiliary/emergency police officers, and 32 civilian positions. I considered the department's size ideal because it was large enough that, over the course of 20 to 25 years, officers would likely be exposed to just about every criminal and noncriminal event they would care to experience (and some they would not care to experience), but it was small enough not to become lost within the organization. One of the cases investigated by the department was very painful for all involved because of the intimidation and brutality of the perpetrator.

It is generally acknowledged that virtually all sexual assaults are exercises of power and domination, but may be aggravated by the circumstances of the assault, including the age and location of the targeted victim. Every officer will comment that the most painful memories of any criminal case or serious accident are those in which the victim(s) are children or elderly citizens. In this case, the youngest rape victim was in her late 70s, and the oldest was nearly 90 years old.

Initially, the department was unaware of the actual criminal nature of the incidents. We noted that we had experienced a number of late evening calls from persons reporting that a man had come to their residence and had requested to use the telephone to call the police. The man usually stated that he had been involved in a traffic accident nearby and needed police assistance or that he had been the victim of a

criminal act and needed to contact the police. In fact, in several cases, residents actually made the call to the police department for the man, and when officers arrived, they found no accident or evidence of a problem in the neighborhood. In several other cases, the man was permitted to enter and make what appeared to be a call to the police department; generally, he was gone shortly thereafter without police contact observed by the resident. The cases received limited follow-up investigation and were believed to be pranks. The descriptions of the suspect were vague due to the darkness and inability of the resident to see the man's face clearly.

The true intentions of the man became clear when the department was contacted by a female in her 80s who wanted to report a "problem" with a man who had come to her door. She actually lived in a second-floor apartment in the city's downtown district. She had answered her doorbell and walked downstairs to find a man who said he was being pursued by some other males and requested to use her telephone to contact the police department for assistance. She agreed to let him and invited him to follow her to the upstairs apartment. Once inside, he moved to the telephone and then, as he lifted the handset, he turned and began to beat her about the face, head, and upper shoulders with the telephone receiver. He continued to beat her and threatened to kill her if she did not submit to his expressed intent to rape her, which he eventually succeeded in doing.

The victim's demeanor during our interviews was that of an embarrassed, subdued, sweet lady. She displayed no anger, she was calm, she was everyone's grandmother, but she was one more thing that we or perhaps her attacker had not counted on; she was as "sharp as a tack." She may have been in her 80s, but she was able to recall specific physical details about the assault, comments made by the perpetrator, smells, what he had touched, and what went on during the moments before he had entered her home. Her recollections proved essential as we intensified our investigations and built our case.

She noted that when she answered the doorbell, she walked to the door and turned on the light to more clearly see the face of the person there. She remembered that the light did not work, but also recalled that she knew that before the attack, it had been working properly. We checked and confirmed that the light did not work but that the reason it did not light was that it had been slightly unscrewed. That observation ultimately resulted in a possible correlation with other, similar cases that had been reported. As noted earlier, those cases had not involved any reported assault or attempted assault but had involved the request to use the telephone to call the police for help. The suspect's method was specifically designed to cause persons to drop their guard and placed him in the position of a victim, causing his potential victims to believe that they could trust him because a person who was asking for police assistance would not be expected to cause harm. They could not have been more wrong.

A detail noted in some of the brief reports written about similar past incidents was that the suspect's face was not identifiable due to the darkness. After follow-ups with those cases, however, it was noted that the homes' porch lightbulbs had been unscrewed or, in some cases, removed. The follow-ups also produced several of the bulbs, which had been dropped in bushes at or near each of the residences. Each of them was processed for fingerprints without success.

The follow-up interviews also produced more details regarding the suspect's conduct. Although always quiet and polite, he seemed to quickly depart when he learned that the person who answered the door was a younger female, a male, or a person who was not alone or appeared not to be alone. It also appeared that he had been targeting a specific age group, the older citizen, who he likely felt would respond in a trusting manner to a person in need who was requesting police assistance. We speculated that, in addition to a personal desire for elderly female victims and his effort to mask his identity by darkness, he also may have felt that the age of his victims would reduce their ability to provide an accurate description. He hadn't considered just how tough, determined, and sharp our grandmother was.

Unfortunately, the follow-up interviews produced more than additional details about the man and his behavior; they also produced more victims. Some had elected not to share all the details when the initial call was made requesting police assistance. Some victims had not called the police, but had shared the information regarding the man coming to their home with neighbors, who then contacted the police. During the follow-ups, officers were referred to the previously unknown victims, who ultimately shared all the details; some of those included either an actual rape or an attempt. As the follow-up investigations continued, so did the attempts. Internally, the department was now deeply aware of the operation of the suspect. Any reports of persons requesting to use a telephone to call the police, late night knocking on doors, or reports of lost/stolen lightbulbs were treated as felony crime in progress calls.

In addition to the crime scene investigations, fingerprinting, photographs, and interviews, an attempt was made to reconstruct every known case that correlated, in any way, to the methods known to have been used by the suspect. The reconstruction efforts were displayed on pin maps to try to identify some unique area in which the contacts and/or attacks were taking place. Likewise, days, dates, and times were displayed on charts in an attempt to identify some pattern in the data that would assist the investigation.

Interestingly, the map was initially disappointing and did not tell us what we had hoped to see. The contacts were not taking place in a specific area but were actually taking place from the north to the south side of the city in no concentrated area. Looking back, I now understand that we were hoping the map would tell us what we expected to see, and when it didn't, we felt that we had failed and the map would not be of help, but we were wrong. The contacts had taken place from the north to south side, but when we stopped looking for a small, concentrated area, the map showed us that contacts with victims had not strayed more than two blocks from a street that ran through the entire city. We tried to imagine why the suspect would limit his activities to persons within that strip. We speculated that because he appeared always to operate on foot (as noted on other charts), this strip was his comfort zone and he was unfamiliar with the city outside this area, which indicated he was not a longtime city resident.

These speculations led to others that were supported by other data we had gathered and charted, and a profile emerged. We developed a list of known businesses in the area that would be expected to transfer persons into our area from elsewhere, that would not include business vehicles as part of the transfer, that may have had a correlation to the north/south street in question, and that would be expected to work

the hours, days (and on the dates) of the incidents. Based on the entire effort, we believed that the suspect worked for the railroad. We believed that the suspect worked, in some fashion, on the tracks and/or track bed that paralleled the same north/south street that had seemed to act as his compass as he moved through the city. We felt that the man's job was likely to be a labor rather than a management position. We also felt that he lived on the south side of our city and concentrated our patrol and investigative efforts there. When he was finally apprehended, it was confirmed that he lived within two blocks of where we had predicted he would live.

Ultimately, we confirmed that, not only did he live within the predicted area, but he was a railroad worker who had been transferred (in and out) as part of a track repair crew. He was from Winslow, Arizona; we weren't able to predict *that*, but the maps, graphs, and charts were all a critical part of the investigation effort. Although statistics like these may not make it into television or the movies on a regular basis, they can be a key part of the life of a street officer.

I'd really like to leave it all right there, but unfortunately, I can't. At this point, it may appear that this was a major case solved with the statistics as noted above, but it wasn't. Please don't misunderstand; everything I noted about the case, including the follow-up interviews, other investigative efforts, and statistical analysis, is accurate, as were the assumptions, speculations, and predictions. But the preceding explanation may be misleading. The perpetrator was apprehended, but not as a *direct* result of the investigative efforts or the statistics or the good guesses.

As noted, we became aware of the seriousness of the cases regarding the man knocking on doors asking to use the telephone and the pranks regarding the missing light bulbs only after the report by the woman raped on the second floor of her downtown apartment. There had been months of previous reports filed away before we really moved into the statistical investigative mode. We had elected to keep some of the speculations we had made regarding the incident confidential. Details of the rape as well as the possible number of previous cases were not known to the media. As more information became available through the investigative efforts and more victims became known, the decision was made to release the information to the public and request any additional details regarding the mode of operation of the suspect, and any additional incidents of a similar nature that had been unreported, as well as anything else that might assist the investigation.

We received a call from a woman who stated that she had some information that might be related to the case and requested to speak with an investigator who had spoken with her at her residence months before our first report of this man's activities. The woman did not fit the victim profile that had been developed by the suspect. She was young, and she lived outside the two-block strip that we had identified during our data analysis. His mode was also different. He had not come to her door and asked to use the telephone. He had entered her home as she slept on a couch in her front room. He attempted to attack her, but she fought back, and for whatever reason, thankfully, he departed without causing her any harm.

She had not reported the matter at the time, but when she read about the attacks elsewhere in the city, she felt that she should call and report her experience even though

the circumstances were not the same as those reported in the newspaper. She also said, if we thought it would be helpful, that she had the man's wallet, which he had apparently dropped during the attack. The wallet contained his Arizona driver's license and information that took us directly to his home within that two-block area that we had predicted. We again speculated that after his unsuccessful attack of the younger woman, outside his comfort zone, he altered his area of activities, victims of choice, and approach. Sadly, these changes contributed to his success during his subsequent attacks.

The standard investigative efforts coupled with the statistical analysis of the data may not have led to the actual arrest of the suspect, but they made the case basically airtight. I remain confident that, eventually, the data would have led to the apprehension of the suspect, but the reality is, it did not. This story illustrates the case that data gathering, analysis, and interpretation are all critical for criminal investigations, but so is sharing the statistics with others. In this case, sharing the data led to a quicker apprehension of a brutal serial rapist.

Statistics: A Researcher's View

by Jerry Fitzgerald

Former alcohol and drug abuse researcher (for 30 years), most of them in the Department of Psychiatry, University of Iowa, and co-author of this text. Used with permission.

When applied appropriately, statistics are an invaluable tool in almost any endeavor, and statisticians have developed procedures that can help us better understand the increasingly complex world in which we live. Still, every statistic you encounter should be approached with at least some skepticism. I tried to practice this tenet through 30-some years of doing research in the social sciences. When it comes to statistics, I have seen my share of the good (the appropriate application and interpretation of statistics); the bad (the uninformed, unintentional, and inappropriate application or interpretation of statistics); and the ugly (the informed, intentional, and inappropriate application or interpretation of statistics). By sharing some of my more memorable experiences with you sniffing out the bad and ugly, I hope you can gain a better appreciation of the good and a better nose for sniffing out the bad.

First, a bit about myself. I am a born and raised Iowa farm boy (some affectionately call us clod kickers). Upon finishing high school, I went to Cornell College (not University) in Mt. Vernon, Iowa. After graduating from Cornell with a sociology degree, I entered graduate school in the Sociology Department at the University of Iowa. A fellow sociologist (tenured professor in the Psychiatry Department) and clod kicker (PhD Harold A. Mulford) took me under his wing as a graduate research assistant in my first year of graduate school, and except for an all-expenses-paid 2-year stint in the U.S. Army, I worked with my mentor for the next 30 years. Until a colleague from the Psychiatry Department pointed out that Iowa was a terrible place to raise kids (because they grow up trusting everybody, and I did), I thought I could not have asked for a better childhood and educational preparation for the research career that

followed, especially because all I really wanted to be was as good a mechanic as my dad and as good a farmer as my grandfather.

The Cornell College Years. Like most first-year college students, when I entered Cornell, I was not sure what I wanted to be when I grew up (and I'm still not entirely sure today that I know what I want to be when I grow up). Social science research, however, was definitely not on my radar. At first, I thought I might pursue a career teaching math in high school, then along came calculus and I decided there might be something I was better at. Biology looked good, but I still was not satisfied. I did have this older brother who was getting a graduate degree in sociology, and he said that was pretty interesting. Though younger brothers generally make it a practice to ignore any older brother's advice, I decided to give it a try. It was interesting, and it turned out I was good at it.

I was not so sure about the elementary statistics to which I was exposed in a combined statistics and methods course at Cornell, but the methods material was very interesting, and the prospect of being a scientist seemed pretty fascinating. Still, though a sociology degree looked appealing, I must admit I did wonder what I was ever going to do with it (maybe a social science literate mechanic would be better than a social science illiterate mechanic). Then, after my junior year at Cornell, I got a summer job with the chairman of the Department of Sociology at the University of Iowa doing some community surveying in Iowa. True to my upbringing, I trusted everyone and was soon completing more surveys than expected (turned out I was out on the streets trying to get interviews at night in areas where I was subsequently told I should not be). Still, I thoroughly enjoyed it, and it felt good to be a part of the scientific enterprise. I was so enthused, I went on in my senior year to take advanced independent studies in social science research methods and analyses (with just enough statistics to not persuade me to abandon this ship).

The Graduate School Statistics Course Years. First, let me begin by assuring you that I approached my first real statistics class with at least as much trepidation as you may have approached your first class. I hope your experience was similar to mine in that I soon found out it really wasn't as bad or difficult as I thought it might be (even though I did not have quite as good a textbook as this one). However, as I progressed through that course and text, I quickly substituted one unhelpful image of statistics—fear and awe—with another unhelpful image—impractical and mostly useless. That is, I found statistics were difficult, but not impossible, to either compute or comprehend. However, given all the caveats and assumptions associated with each statistic, I became convinced that statistics really weren't of very much practical use either, and probably, for the most part, could be safely ignored. Perhaps at least some of you are nodding your heads at this point.

In short, I went from fear and awe (unquestioned faith in the scientific integrity of statistics and their producers) before even cracking open the statistics book to "just about anybody can do this but why bother" at the end of that first class. Please note that, at least in my mind, either set of misconceptions about statistics produced a

convenient justification for not having to pursue any further statistics classes. Funny how that worked out or didn't work out, actually. I had to take more courses, and in the ensuing years, I found out I could get over the fear and awe stuff, but perhaps I carried the skepticism a bit too far, at least initially.

I learned to appreciate statistics for what they are—tools that have the potential to produce a high-quality product or a disaster (i.e., useful or misleading results). Like the use of any tool, it was up to me to identify the tool that was most appropriate for the task at hand. Not only that, once I applied the appropriate tool to a specific task, I needed to carefully evaluate the results. Whether I was presenting my own statistical results or interpreting others', I needed to make sure the most appropriate statistic was applied and then determine whether the results were more likely to be useful than misleading. I sincerely hope that is where you are right now, and whether you decide to pursue more statistics classes or not, we think if you share this view of statistics, you are in a good position to both appreciate statistics and carefully assess each application you encounter.

Please note that I still believe skepticism is a good thing to have when you encounter statistics. Just don't let that skepticism blind you to the potential benefits that can be derived from an appropriate statistical application: a complete and accurate description of the data being analyzed; a good description of the analytic strategies (including specific statistical tests used); a comprehensive report of the results of those analyses; and a critique of the research, which lets others know the strengths and weaknesses of the entire research project, including the statistics.

The Graduate Student Research Years. I started my research career as a graduate student research assistant. I was lucky or unlucky enough, depending on your perspective, to be working on a research project at a university that was testing the first versions of the Statistical Package for the Social Sciences (SPSS). The research office in which I was working had just completed a large general population survey that included hundreds of participants and questions—an ideal data set to test this new, fast, and economical means of producing statistics from large data sets.

Because we were getting free computer time, my faculty supervisor was quite excited about giving it a try—a state of mind I did not exactly share. I was one of several research assistants from various departments who were "volunteering" to do SPSS testing, and at the time I often wondered, Why me? It dawned on me later that because I was a relative newcomer to both statistics and computers, I was an ideal guinea pig. If I could master this new software, anyone could.

All our data were stored on paper IBM punch cards (you can probably find some of these in a museum somewhere). Each morning usually meant writing an SPSS program, using those same IBM punch cards, and carrying the program cards and data cards over to the computer center to be read into a card reader so that the analysis could be done. Sometimes, if we were lucky, we might get results late that afternoon, but usually it was not until the next day or later that you received any analysis output, assuming there was any analysis that actually ran. Because this was a trial period for SPSS, glitches of various kinds were common and the process had to be repeated, which often was quite frustrating.

Though computer glitches are more common in the beta versions (testing phases) of new software, they sometimes do not entirely disappear. New software, even after extensive testing, may still contain errors. In addition, there are user errors: entering the wrong variable name, a comma instead of a period, an "and" instead of an "or," and the list goes on.

Exactly how that software and hardware all works eludes me to this day, and I remain in awe of all those 12-year-olds who do seem to know. I also learned early on in my SPSS testing days to have a great deal of respect for computer professionals. I had written an SPSS program that simply would not run, and I could find no reason for it not to. I finally decided I just had to take the risk of making a fool of myself and asked the computer center's SPSS expert what was wrong. He looked over my program, inserted one card in the program that said "stop giving this error message," and told me to resubmit my program. It ran, and I was pretty much convinced that guy could walk on water if the need ever arose.

Computer professionals can, of course, correct many problems that the average user would have no clue as to how to fix. On the other hand, it is often the average software and hardware user that is best at identifying computer-related glitches. Some of us believe there are gremlins inside computers who, ironically, behave randomly. In any event, when users are well acquainted with their data, research design, and analyses, they can often identify a problem that may well be missed by someone who is unfamiliar with the data being analyzed. If something looks funny, check it out. Review carefully what you did, and if that doesn't satisfy you, try looking at some simple frequency distributions or scattergrams. Use a different software package, a different computer, or a statistic that is similar to the one producing results that just do not seem right given what you know about the data being analyzed. In my case, nearly all the problems so identified turned out to be "user error"—a euphemism for "I made some kind of dumb mistake when instructing the computer which data to look at or what to do with the data once it found them." I have reason to believe this still happens to many who use computers for purposes of statistical analysis. And some things did happen in some analyses for which I was never able to identify a satisfying explanation. I was never able to verify that a gremlin was responsible, though. But maybe you will get lucky. I'm still holding out hope their existence will be confirmed.

On one of those days when nothing seemed to be working with SPSS, I was looking for some sympathy from my older faculty supervisor and mentor. Instead of giving me a shoulder to cry on, he shared a story of statistical analyses and computers that he had witnessed in previous years. He remembered that it was not all that long ago that the chi-square statistic (you know the one we discussed in Chapter 8) was first introduced. Prior to the advent of computers, it was, of course, necessary to compute chi square by hand using paper and pencil. As a result, chi-square analyses were completed fairly infrequently and, even then, generally under only the best of circumstances. Once computers and research assistants were created, however, calculating chi squares was easy, and it was not long before the halls of his campus building were ringing excitedly with the words "I got one."

Now those of you who fish would know what an excited "I got one" means, but might be a little puzzled about its application in the halls of academia. My supervisor

was similarly puzzled but he soon learned it meant that after many hours or even months of making every comparison faculty members or their research assistants could possibly make from whatever data resource they could lay their hands on, they had found a significant ($p \leq .05$) chi square. Why so excited? Given a significant chi square, there was the potential for an article to be published. Professional journals, then and unfortunately now, are more likely to publish only those manuscripts with statistically significant results. Given that bias, such manuscripts were more likely to be published, and publications are often a prerequisite for promotions and tenure in most large universities.

This statistical strategy—trying all the possible combinations—is sometimes called *data mining*. It can and certainly has been used, and sometimes may be helpful in terms of identifying what subsequent studies might focus on. When statistics are used in this way, however, that should be clearly stated, including the warning that the results are highly susceptible to Type I errors.

Still, is there anything about this that bothers you? I hope so, because if it doesn't, then we have failed to make some important points when it comes to inferential statistics in general. Although the results obtained from the analyses described may well have been very beneficial in terms of faculty advancement, they likely added little to the valid cumulative knowledge about whatever variables were being subjected to a chi-square analysis. In these cases, the cart was put before the horse. Researchers treated the statistic as the end rather than as a means to an end. In short, the statistics proclaimed in those halls were more the consequence of a new statistic's availability and the machines to compute it, than of building a good case for using the statistic with appropriate data to test hypotheses. As a result, they were likely to produce some misleading results.

Why? Well, inferential statistics are all about probability, and the more statistical analyses you perform, the more likely you are to commit a Type I error, rejecting a null hypothesis that is true (see Chapter 8). In short, given enough chi-square analyses, you are bound to find at least one or two significant ones by chance alone (about 5 in 100 chances, actually, when the significance level is $p = .05$). Just because you have a statistical tool, even the one that is currently the most popular and easiest to use, it does not mean that tool is appropriate in every possible application.

Events like that witnessed by my faculty supervisor may be rarer today, or at least not as public, but they have not completely disappeared. As is often the case, individuals who use tools that they do not fully understand are likely to misapply them. Applying the statistic du jour to everything you can get your hands on is, in general, not a wise or helpful thing to do.

Make sure that as a producer of statistics, you provide enough information to judge whether or not a particular statistic was appropriately applied. As a consumer of statistics, you must look for and accept nothing less than a full disclosure of the process that produced any particular statistical result. Perhaps some of those hallway "statisticians" actually described how they got their one significant chi square and appropriately documented the accompanying precautions, but I am sure some did not, and the scientific body of knowledge involved was likely the worse off because of it.

After working with SPSS for a year or so, I began to learn about the existence of several other statistical software packages. At my university, a dichotomy of sorts developed between the various statistical packages and their users: SPSS, for dummies like me in the social sciences, and others, like biomedical statistics packages, for the real scientists. These latter statistical software packages tended to be more complex or sophisticated (usually meaning lots more calculations and a bit harder to understand and use unless you had a mathematics and/or computer degree). The SPSS package was deemed more appropriate for the soft data (and some even thought soft minds) we social scientists were often left to deal with.

Most social scientists were content to leave well enough alone, but some of us dummies, being brutes for punishment, were brave enough (OK, I was forced) to take it upon ourselves to venture into these "sophisticated" software packages to see exactly what was there. As a result, it became clear to me that just because a particular statistical procedure might be more difficult to explain and take more computer time to calculate, that does not necessarily mean any specific application of that statistic and its concomitant results are more valid and useful than any other statistic. More sophisticated statistics often come with more assumptions about the data and/or presume more control of the research design than social scientists can typically aspire to. My point here is not that you can just ignore the more "sophisticated" statistics, but that such statistics may or may not be more appropriately applied than others under all conditions.

The Research Practitioner Years. As I progressed in my career and began to publish research results of my own, it was not uncommon to have to defend the statistics applied and the results reported. This is a good thing and all a part of the process of accumulating a scientifically valid body of knowledge. It has been my experience, however, that these exchanges can be very rewarding and also very frustrating. Critiques are, of course, always a blow to one's ego (especially if they are valid). When they are not valid, they are just plain frustrating. With regard to the latter, I would like to share some of the lessons I learned from such encounters.

First, when someone challenges your statistical results because a better statistic is available, make sure that is the case. To do that, you will need to know how it is better and whether it is applicable to the data and research question at hand. Perhaps the alternative statistic is better, but its assumptions may not be consistent with the data or research design. If it does not fit, no matter how new or sophisticated it is, you should not accept its results over those obtained from an older and perhaps less sophisticated statistic that does fit. The results obtained from a more sophisticated analysis may or may not be better than those obtained from a more simple procedure that you do understand and is applicable to the data and question at hand.

Given that statisticians are constantly developing new and revising old statistical procedures, you may find yourself in the position of feeling unqualified to make such an applicability assessment. If you don't feel comfortable making such an assessment, do not be afraid to ask for help from a statistician. I will warn you, however, that you will find there are statisticians who are good at explaining and willing to take the time

to do so, and others who are not. Find a good one. I was fortunate to be able to find a university statistician who was patient and explained things well—an invaluable asset to anyone doing quantitative research who is not a professional statistician. If you are lucky enough to find a good resource, buy him or her a beer once in a while!

Whoever you seek help from, you should expect that person to be able to explain, in a manner that you can understand, what this new super-duper statistic does, how it does it, and why it is better than the older alternatives. This does not mean you have to understand all the mathematical derivatives, but at least you should feel comfortable that you know enough to tell whether this new and unfamiliar statistic was applied appropriately. Keep asking for help until you feel comfortable. The only dumb questions are those that are not asked.

Once you have settled the applicability question to your satisfaction, the next thing you need to turn your attention to is the data. When there are differences in results between statistical procedures that are equally applicable to the data, you need to carefully assess the databases that were used to calculate that statistic. Do not fall prey to that old schoolyard argument that goes something like, my statistic is more sophisticated than yours and therefore my results are more valid. Although this may indeed be the case, it is not necessarily so. It is also possible that a careful reading of the methods will indicate that those differences in results can alternatively be attributed to differences in the data that were used to calculate the different statistics. If you are not using equivalent data, you are not likely to produce similar statistical results. When the databases are different, the question of the validity of the results is less dependent on the sophistication of the statistic than it is on which data set is most applicable to the question (hypothesis) at hand.

Furthermore, no statistical sophistication can compensate for bad data or an ugly research design. Remember, garbage in-garbage out. There are those, however, who will at least implicitly attempt to "wow" the consumers of their statistics into forgetting about the ugly reasoning and/or bad data that were used to generate them. Over the years, I have found one clue that often characterizes the "wow" statistical practitioners: They are long on documenting the sophistication and novelty of a particular statistical procedure, but often short on the documentation of their research design, data collection methods, and description of the data used.

In short, there is nothing inherently wrong with simple when it comes to statistics. In fact, I have often found that when simple is appropriate, it is often a good indication of the quality of the research design and the data collected. Generally, it has been my experience that if you have a good research design and data collection methods, you will often need nothing more than the most basic statistical procedures to assess the results of your research.

It is even often the case that simple visual aids such as graphs and scattergrams, which can be produced before any statistic is calculated, give you some of the most useful insights into your research results. You will note we have encouraged you to produce and examine such visual aids throughout this text, and I want to emphasize them again. Those basic visual aids are often the best means of identifying potential problems with your data (such as outliers), the fit of the assumptions about your data

that a particular statistic requires, and the nature (such as linear vs. curvilinear) and strength of any relationship that might exist. The summary statistic is a necessary, but not sufficient, means of adequately describing your data or results.

As we have also emphasized throughout this text, you should never be satisfied as a producer or consumer of statistics with just the report of a particular statistical result. The reporting of statistical results in the absence of a clear and adequate description of the research design and data that were used should raise a red flag—accept these findings at your own risk. Beware of what you do not know or are not told. Good and adequate statistical reports should include a detailed description of the research design and data collected, including the applicability of the statistic used and then, of course, the results of the statistical procedure.

Unfortunately, it has also been my experience that the guidelines of those who often bear the ultimate decision of what to include in a research report (journal editors and administrators) often interfere with good research project reports. Professional journal editors (due ostensibly to space limitations) and administrators (ostensibly because they are so busy) often demand that methods be given short shrift, and the bottom-line results (such as statistical significance or correlation coefficient) are all that can be included in research project reports. The bottom line is all well and good, except that the "real" bottom line (like the devil) is often in the details nobody wants to print or look at.

As a producer of statistics, you should resist any effort on the part of colleagues or publication editors to omit or radically reduce your attempts to adequately describe your research design, data collection methods, missing data and how they were dealt with, and statistical results. In spite of their power, editors, supervisors, and administrators do compromise, at least sometimes. As a consumer of statistics, you should expect a complete description of the research design, data collection, and statistical results. If that is not presented, you should ask for it, and if it is not produced, you should ignore the results presented. As has been observed, it is not so much the things we all agree that we do not know as it is the things we think we know, but do not, that cause the most problems.

If you, as a consumer, are confronted with reports that provide only the results (e.g., even if it is $p \leq .0001$), you need to be especially cautious about accepting those results as valid or useful. You need to demand the details. As a producer of statistics, when you devote the time and space necessary to adequately describe your research design and data collection, you not only help others to better assess your results, but also set the stage for others to replicate your study. And, if we are ever going to build a body of scientifically based knowledge in the social sciences, we will need replication studies.

The replication of a study can take many forms. Others can use the exact same data as yours but use a different statistic. Alternatively, a new sample can be drawn with equivalent data collected and the same statistic applied to see if the statistical result is the same. However the replication is designed, a careful review of all the research design, data collection procedures, and statistics applied must be thoroughly analyzed before an appropriate interpretation of the results can be reached. Replication is the backbone of any science and the only way to help ensure that Type I error is not the

cause of the results for any one investigation. Whatever our findings are in any one instance, it is only through replication that we can become more and more confident that our findings are not the result of chance.

However, replication studies and their results must be appropriately interpreted. It is not uncommon, for example, for some to argue that because one particular study finding is inconsistent with the findings of several others, the inconsistent study results must be in error. That interpretation may or may not be true, and the validity of the inconsistent study should be based on the validity of its results, not the observation that it is different. The answer to the question of whether the result of any one study is valid cannot be determined by simply noting that its result is different from similar studies.

One final thought I want to share with you based on my experiences. I was involved in several evaluations of intervention programs (in my particular instance, evaluations of alcoholism treatment centers). Such evaluations can, of course, produce results that indicate the program has been a success or a failure. Obviously, if the evaluation results are positive, everyone will be happy, but if the results are negative, a common by-product is a high level of antagonism between the evaluators and the program staff. Those individuals within the program being assessed have their reputations and their livelihoods put in peril based on a negative outcome for an evaluation study. Politicians may seize on this opportunity to stop funding, not only for the program being assessed but also for all intervention programs in general. The program staff may hold the researchers responsible for everything bad that is happening to them and further accuse the researcher of being insensitive to the plight of those who need interventions. Although these may be the consequences of a negative evaluation result, they are not what good evaluators want and what they should make every effort to avoid.

If the potential that the analysis will indicate the program has failed to achieve its goal is not addressed early on, it can mean not only a nasty fight with respect to the validity of the results for this one study, but also the end of any hope for the program staff and others like them to cooperate in any future study. Just like any other research project, the validity of the results of an evaluation study should be based on the quality of the data, the research design, and the applicability of the statistics employed. With respect to avoiding all the other potential problems that might accompany a valid finding of no program impact, the only thing that seemed to work for us was involving the program staff in the development of the research design and data collection, and making it plain that we viewed the evaluation as part of an ongoing process with the goal of identifying the best interventions possible.

In short, we approached our evaluations from the perspective of a process, with evaluation and intervention activities interacting so that they would, in time, produce the best interventions possible. Program development and research needed to proceed hand in hand if the goal was to have the best intervention possible. Although this approach did not always work, it was the best one we could muster, and we feel it should be a prerequisite for any evaluation study. Progress can be made only when the program provider and evaluator work together to eliminate what does not work, develop new strategies, test them, and then start the process all over again, depending on the results of the evaluation. If everyone involved is on board with this process

perspective, negative evaluation results can be seen as a positive contribution to the ongoing process of identifying what may have gone wrong with the program and designing better interventions.

Reflections on a Research Career. Over the years, I feel very fortunate to have been able to lead some interesting and important research projects with my mentor and others, participate in many others, and have the opportunity to make some useful contributions to the growing body of cumulative knowledge in the social sciences. Should you decide to pursue a career, or just participate in a research project, you will find it will not be all fun and games, and you will almost undoubtedly be embroiled in arguments over this or that. My colleagues and I were not always in agreement with each other, let alone all the others in our field of endeavors, but that should be expected. The give and take of conversation and criticism are an essential part of building a useful body of scientific knowledge.

As far as statistics are concerned, what you should expect from yourselves and others is an honest effort to make an informed decision about the appropriateness of whatever statistic is chosen and provide enough of a description of the research methods (design and data collection) to allow others to judge whether or not an appropriate choice of statistics and interpretation of the results was made. And, of course, this information is essential if others wish to replicate the study.

I found research to be a very rewarding experience, definitely not so much in terms of income earned, but more in terms of some satisfaction that I had made a contribution, however small it might have been, to the ongoing accumulation of a scientifically based body of knowledge in the social sciences. Should you find yourself interested in pursuing a research career in the criminal justice field, you are going to have to deal with statistics, as well as with those who use them appropriately and ethically and those who do not. Do your best to keep your own ethical bearings and weigh in when you see something that just isn't right. Scientific advancements—maybe even lives—depend on it. Best wishes for a successful career!

Student Study Site

Visit the open-access student study site at **www.sagepub.com/fitzgerald** for access to several study tools including eFlashcards, web quizzes, and additional appendices as well as links to SAGE journal articles and audio, video and web resources.