

On Being an Ethical Statistical Expert in a Legal Case

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Abstract

In the Anglo-American legal system, courts rely heavily on experts who perform an essential social function in supplying information to resolve disputes. Experts are the vehicles through which facts of any technical complexity are brought out. The adversarial nature of this legal system places expert witnesses in a quandary. Enjoined to serve the court and their profession with unbiased, independent opinion, expert witnesses nevertheless do not work directly for the court: they are employed by advocates (lawyers) who aim to win a high stakes debate for their clients. The system is imperfect. Pressures (whether real or perceived) on experts to please their clients may cause truth to be the victim. We use examples from our experience, and reports of statisticians commenting on theirs, to show how statistical evidence can be honestly and effectively used in courts. We maintain it is vital for would-be experts to study the rules of the legal process and their role within it. (The present paper is a step towards that end.) We explain what the legal process looks for in an expert and present some ways in which an expert can maintain their independence and avoid being co-opted by the lawyer who sponsors them. Statisticians contribute in sometimes unique ways to the resolution of disputes, including in forums like negotiations, mediation, arbitration, and regulatory hearing, where the misuse and abuse of statistical procedures occur too often. It is a challenge for statisticians to improve that situation, but they can find professional opportunities and satisfaction in doing so. Because this discussion pertains generally to the application and communication of statistical thinking, statisticians in any sphere of application should find it useful.

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Keywords

Statistical consulting; ethics; expert witness; law

1. The Roles of the Statistician in the Adversary System

“Facts are stubborn things; and whatever may be our wishes, our inclinations, or the dictates of our passion, they cannot alter the state of facts and evidence.”

– John Adams (1770).

In this paper we address the reader who is, or might like to consider, engaging as an expert in a legal case. Consulting in a legal case may lead to giving testimony in a preliminary hearing such as a deposition, or in court or any other formal institution for dispute resolution including arbitration, mediation, and regulatory hearings. We will use the term “expert witness” to refer to someone who offers scientific or technical expertise in a legal case regardless of whether they end up testifying, since many of the same considerations apply in either case. Appearing as a witness applies to only a fraction of the legal cases one might consult on. The great majority of disputes settle outside formal institutions or never rise to the level of imminent or actual formal action.

Section 1 describes common views on expert witnesses; roles that statisticians play as experts in a legal case, some of them unique; and quandaries of the expert witness in the adversary system. Section 2 sets out six qualities the legal process looks for in a good expert and how you can embody them. Section 3 identifies ways in which a lawyer can influence the opinions of an expert and suggests methods to maintain independence and avoid being co-opted. Section 4 takes up two special issues: why experts disagree and why anyone should consider serving as an expert witness. Section 5, “Conclusion,” contains a brief afterward. Section 6 lists the references (including the law cases cited).

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1.1. Background

For centuries, experts as witnesses at trial have been criticized as being unreliable bearers of truth. Writing about the rise of expert witnesses in the American legal system in the nineteenth century, Golan (2008, pp 915-6) dryly relates how

... the growing deployment of men of science [and women, we would add] in divergent areas of litigation turned the American courts into a lucrative arena for scientific activity. And, as in England, this arena soon put on public display the curious spectacle of leading scientists disagreeing with each other from the witness stand, a view that served to cast doubts on the integrity of the experts and their science.

It seems little has changed in the ensuing century. Gertner and Sanders (2018, p. 138) claim that

The most frequently articulated problem [as identified by judges and attorneys] is that experts abandon objectivity and become advocates for the side that hired them. Several studies support this concern, suggesting that being involved in an adversarial process results in a skewed presentation of facts and opinion.

Peter Huber (1991, p. 13) captures the nadir of sentiment (though over a hundred years ago) in an 1884 decision by the New York Court of Appeals:

[T]welve jurors of common sense and common experience would do better on their own than with the help of hired experts, whose opinions cannot fail

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generally to be warped by a desire to promote the cause in which they are enlisted.

This indeed is a counsel of despair. We hope that the present paper will show ways in which it is possible for a statistical expert to aid in the determination of facts and in the resolution of disputes in an ethical and professional fashion.

The premise of the Anglo-American legal system is that the truth will best out when both sides forcefully present their views before a neutral factfinder. This is the “adversary system.” Perhaps the best argument in its favor is that two sides with vested interests will have the strongest incentives to ferret out the important evidence; and, further, as Judge Richard A. Posner (retired) has noted (Posner (1999, p. 14,889)), the greater the stakes, the more effort the parties will put in for that purpose (an important economic efficiency). While arguments can be mounted in favor of an alternative system such as the “inquisitorial” or “tribunal” system on the continent of Europe, where factfinding is entrusted to a neutral authority, in the United States (and British Commonwealth countries) we work within an adversary system. Jurists have considered reforms that address causes of the negative sentiments concerning expert testimony cited above. See, for example, Kaye, Bernstein and Mnookin (2011, pp. 16-34, pp. 473-474). Statisticians have also joined jurists in addressing such issues. See the report of the National Research Council panel, “Statistical Assessments as Evidence in the Court,” Fienberg and Straf (1991).

Judge Posner sees countervailing factors at work that can overcome problems with the adversary system. The system relies on intrinsic checks and balances to expose errors, of which cross-examination may be the most important. The legal evidence scholar John Henry Wigmore

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famously described cross-examination as “beyond any doubt the greatest legal engine ever invented for the discovery of truth.” (Wigmore 1923, p. 27). Further, witnesses who might veer towards partisanship are subject to being called out by judges in court or in written opinions, while witnesses who plan to testify more than once put their reputations on the line each time and thereby have incentives to maintain consistently high standards of conduct.

1.2. Roles of statisticians

Experts who are hired mainly for their statistical skills often find themselves in a few characteristic roles.

As the only statistician. Often a statistician testifies on behalf of one side, while no statistician testifies on behalf of the opposing side. In such cases the statistician can offer statistical insights that otherwise might not be heard in the courtroom.

As the default expert. Sometimes the nature of a dispute does not suggest any body of expertise from which to draw an expert. The statistician applies a general methodology for factual inquiry which may be applicable in such circumstances.

As a person who can overcome apparent disqualifiers to the use of statistics. Lay persons will see reasons not to use statistical analyses to understand facts and data: sample size too small; data unreliable, sloppy, or biased; data missing; results not statistically significant; data not numerical; data cut off (censored, truncated), and so on. Statisticians have tools to address such issues.

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As a superior authority on statistics. Some people who testify on statistical matters truly are experts, but many (who may be expert in some scientific or technical domain) are able only to exhibit calculations and cite textbooks. Few (non-statistician) expert witnesses have a good grasp of foundations—the principles and assumptions of statistical procedures—and are unable to perceive or critically evaluate the implicit assumptions on which the validity of these calculations rests.

As an interpreter and communicator of data or “translator” of statistical results into useful information. Even when one or both parties in a dispute hire expert witnesses, sometimes a statistician is needed to make their opinions and conclusions intelligible to the court. The statistician may translate technical conclusions into plain English and recommend (or even develop) effective methods to present data in tabular and graphical form.

As a referee on good fact evidence. In legal parlance a “fact” or “fact issue” is understood in a very broad sense as referring to any empirically connected matter, including choices of data, statistical methods, theory, etc. A trial is all about the facts. A judge handles questions of law. A jury is a “trier of fact,” and the judge can also take on that role. However, the methodology of inquiring into quantifiable facts—broadly speaking—is the subject of statistics, and therefore the statistician is well situated to act as a referee on what constitutes good fact evidence.

Some concrete examples of what a statistician might do in carrying out these roles are

- Identify, collect, and clean relevant data.
- Survey and summarize relevant literature.
- Attempt to replicate the opposing side’s analyses.

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- Critique the analyses of opposing experts.
- Carry out analysis.
- Create exhibits to present data.
- Assist with discovery requests to the opposing side.
- Help attorneys formulate questions for the other side's experts.
- Testify in deposition and/or trial.

The statistician sometimes is employed in a more strategic role, such as helping the client understand the data and how they are analyzed (that is, teaching the client); interpreting and critiquing analyses performed by other experts (both the client's and the opposing side's); recommending good methods to present the analysis and conclusions to clients and to the court; identifying points favorable to the opposing side as well as to the client's side; and presenting the statistical part of the case during negotiations. Sometimes the attorney will come to rely on the statistician to develop the technical basis of the case, coordinate the subject-matter experts, and advise them about carrying out and presenting statistical analyses. Although this is a rare circumstance, it makes good use of the statistician's ability to contribute to statistical analyses regardless of the subject.

1.3. Quandaries of the expert

Is an ethical expert witness a contradiction in terms? The expert is put in a catch-22 by virtue of the unique role in which they are placed within the adversarial system. The court (and henceforth "court" refers to any formal institution for dispute resolution) looks for objective, unbiased

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testimony from an independent expert; whereas the expert is hired by the client, not the court, and his or her testimony may be unduly influenced by that circumstance.

Experts, especially those from academic and research communities that value balance and nuance, can have qualms about representing only one side of a dispute. When you testify, you testify “on behalf of” a client but you do not “represent” them: that is what the lawyer does. However, appearing on behalf of someone does not mean that you should be an apologist for them, an advocate for their cause, or cheer them on in court. A neutral factfinder will find you less helpful if they perceive your analysis as tainted by your personal investment in one side’s victory. Whereas as statisticians we see ourselves as non-partisan pursuers of truth, being an expert in a legal case puts you in a different role—one that at times will feel, if not be, at odds with your self-image. Appearing on behalf of, or even on the opposite side of, a party you cannot stomach is especially soul-searching. We say more about that in Section 3.

Sometimes you may have qualms about the impact of your efforts on the outcome of a proceeding. You may see data or documents, for instance, that appear to incriminate your client or contradict their case. It is our experience that the impact of what you say is likely to be out of your control and indeed outside your responsibilities. You are participating for a narrow purpose, *viz.*, to address one or more specific factual issues and to do so in a professional way. To second-guess the role that your analysis will have on the outcome is poaching on the domain of the court and legal system. It is their responsibility, not yours, to weigh all the evidence, interpret the law, and arrive at a decision. There is a window of time in which you can choose not to participate, but once you do your role is defined. Unless your client or their attorney is acting unethically or in an obviously unlawful manner, you have a professional obligation to play that role.

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Navigating this ethical maze requires humility to realize we do not know everything and see only part of the picture. One of us (WAH) has repeatedly supported students who were defending against charges of cheating on high-stakes examinations. Commonly, the strongest evidence in such cases are statistics (based on comparing test responses) purporting to show there was virtually no chance cheating did not occur: only one in a million, or one in a billion, or even lower chances of innocence. In testimony before arbitrators and university honor councils we have sometimes been obliged to admit the correctness of those statistical calculations and have exited the arena believing our clients were defeated. Our role, however, was not to decide whether cheating occurred: it was only to explain the implicit assumptions and limitations of those probability calculations so the courts could understand them. In three cases where it looked to us the client had lost, the decision was in their favor and they were exonerated.

Experts who walk into a legal proceeding (and the run-up to it) unprepared for its inherent quandaries, its process, and the roles and behaviors of its several participants are at risk of discomfort, disillusionment, and even humiliation. Experts are often ill-prepared to testify, whether in deposition or court (the requirements differ). Without extensive experience or training in giving testimony, an expert can be baffled and unsettled both by the formal rules of law and evidence and the informal practices of lawyers. We expect that many people who might like to consult in legal cases are deterred by concerns about potential ethical ambiguities, uncertainties in how to conduct themselves, and lack of control over the process.

Since courts, and the need to appeal to facts in the settlement of disputes, are not going away, we think it is important that statisticians understand what is required of them in court and what obstacles they face when they seek independence as witnesses—the better to overcome them and

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supply needed expertise. Perhaps the Federal Judicial Center, the research and education arm of the U.S. Government’s judicial branch, could create training programs for would-be experts. The American Statistical Association—which in 2019 inaugurated a short course in becoming a statistical expert witness (“StatXW”)—could do even more by encouraging mentoring or some kind of apprenticeship or other more thoroughgoing training efforts. From our own experience, we believe it is possible to contribute honestly and effectively when you understand sufficiently the goals and constraints that govern factfinding in a legal case and learn effective ways to create and deliver reports and testimony. The present paper is intended to be one step towards fulfilling those conditions.

One thing that statisticians can consider is doing *pro bono* or reduced fee service as an expert witness for those in need. Large law firms often have a partner who directs their *pro bono* representation, and they welcome volunteers.

2. What the Judicial Process Looks for

2.1. Characteristics of a good expert

It is often said that the first duty of an expert is to the court. While apparently not codified in law, this is understood. We find it useful to analyze what the court wants of an expert in six broad qualities and comment briefly on ways in which you, an expert, can embody them.

2.1.1. Qualified

By “qualified” we mean not only by virtue of credentials but also including that you have expertise adequate for informing the court on the subject at hand and you follow professional

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standards in the field of statistics. An immediate corollary is that in testifying you must stay within your areas of expertise. For guidance on professional standards, the American Statistical Association's (2018) "Ethical Guidelines for Statistical Practice" are comprehensive and go beyond what one might think of as "ethical" to encompass good professional practice in the field of statistics.

2.1.2. *Unbiased*

A biased opinion is one that is driven or molded from a partisan point of view. You might be drawn to testify because you feel strongly about an issue. However, as an expert you are not being asked to espouse your personal beliefs and it greatly detracts from your credibility to be seen as promoting them. Perhaps counter-intuitively, however, it is important for you to understand the legal theories relied upon by both sides. Only then can you see how the fact issues are accurately framed and therefore how statistical thinking and analysis can treat them.

Avoid testifying about legal claims and value judgments. Do not testify to judgments concerning which party deserves to prevail. Your goal is to perform an independent investigation. Ask retaining lawyers for information, including data, to which they have access. The most important documents to get right away are the formal Complaint and any response to the Complaint. Further, gather for yourself other information and data you see as relevant, not just that which the lawyer supplies. (This may require you to negotiate an adequate budget for research.) Mann (2000, pp. 252-253) remarks,

Testifying experts are often asked by opposing counsel whether there is any information they would have liked to have had that was not provided to them. ...

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The testifying expert who states that relevant information was not requested [or dug up themselves] will look at least foolish, if not biased.

Structure your commitment to work on a case so that you do not get into a situation later where your opinions would have to be biased to be acceptable to your client. It is helpful to begin with a limited budget and short time during which you can learn the fact questions at issue in relation to the opposing legal theories, and, armed with that knowledge, decide whether you can work on behalf of the client. Distinguish your role as a consultant from your potential role as an expert witness. That is, make a final agreement to be named as a witness only when you have adequate information to believe your testimony will be consistent with the facts. Peter Huber quotes Melvin Belli, the self-styled “King of Torts,” as saying: “If I got myself an impartial witness, I’d think I was wasting my money” (Huber *op. cit.*, p. 18). Would part of your contract with Belli commit you to be a “partisan” witness? If you are not careful it might, so frame your relationship with the retaining lawyer to be consistent with your professional duties.

A common strategy to establish a lack of bias and deflect criticism is to provide “conservative” estimates of quantities critical to a case. This means the values are believed to be biased in a direction that disfavors the side on which the expert is testifying. Such claims are often disingenuous, and the “conservative” value is not truly conservative; or conservative values are combined with other values to produce a statistic that still favors the expert’s side. Furthermore, contending that a value is conservative characterizes it according to how it might favor one side or the other. That is the business of the lawyer, not the expert. We have also made the mistake of putting forth a self-described conservative value early in a case only to find later that the use of that value (rather than an unbiased estimate) changed an important conclusion. Many courtroom

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procedures and rules of evidence make it difficult or impossible to retract what has been said: it can be too late to correct such a value.

2.1.3. *Relevant*

“Relevance” refers to opinions that tend “to prove or disprove a matter in issue.” Garner (2014, p. 1481). If your analysis is not relevant to the fact issues at hand, a judge will stop you in your tracks. An aspect of a case may attract your scholarly interest, but it has no place if it is not relevant to the issues in the case. Also, introducing irrelevant analyses into your work is an opening for unwelcome attacks from opposing experts and lawyers that you only brought upon yourself. To aid relevance and as good practice anywhere, make your treatment focused, succinct, and as simple as possible.

2.1.4. *Reliable*

“Reliability” is a broad term for the kind of evidence favored by the courts. Subsumed in its many meanings are accuracy, reproducibility, falsifiability (of theories), and citing uncertainties (rates of error). In *Daubert v. Merrell Dow Pharmaceuticals, Inc. (1993)*, the United States Supreme Court set out a new standard for admitting expert testimony in federal courts which emphasized elements of “reliability,” including those we have listed. The importance of reliability is manifest in its repeated use in the Federal Rules of Evidence. Here is Rule 702 governing “Testimony by Expert Witnesses”:

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

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- a) *the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;*
- b) *the testimony is based on sufficient facts or data;*
- c) *the testimony is the product of reliable principles and methods; and*
- d) *the expert has reliably applied the principles and methods to the facts of the case.*

Writing a report—preferably with a documented technical section or appendix—is an important way to promote reliability. The technical section or appendix is where you can set down a careful, documented statement of the science. The body of the report is where you interpret the science. We have a motto: “First get the science right; then work on the presentation.” Zabell (2013, p. 19) explains why you should *always* write a report, even when one is not required.

A lawyer for the opposing side will jump on any error, no matter how small or irrelevant, in an attempt to discredit a witness. Bruce Weir had this experience in testifying about DNA statistics in the O. J. Simpson trial. He had been asked to do elaborate calculations overnight about DNA probabilities when there is more than one contributor to a blood sample. In the limited time available he had been unable to adequately check the calculations. Errors were found which severely embarrassed him, even though they “...did not alter the overwhelming evidentiary strength of the matching DNA profiles in all those bloodstains which came from only one person.” Ruefully he wrote: “I believe that it is possible to convey the essential features of the statistical analysis of DNA profiles to a lay audience. I do not believe that statisticians should agree to perform detailed analysis in hotel rooms [as Judge Ito had requested], especially if they are going to be on national TV the next day” (Weir 1996, p. 17).

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2.1.5. *Credible*

Credibility refers to being believed. Credibility as a witness arises from several things. Important ones are being authoritative, prepared, clear, reasonable, honest, and sincere; able to defend one's analysis; putting forward fair characterizations of the claims of both sides; and being responsive to the judge and cross-examining lawyer. Imagine the world's greatest experts arrayed on the opposing side: what you say should stand up to them. You can also be your own authority. If you have published something you can quote, that enhances your *bona fides*.

You can count on finding anything you say being attacked and your motives questioned. Unless you can defend your claims, your credibility drops and your carefully constructed analysis is rejected.

It is a great help to have consulted with other experts. You might be asked if anyone agrees with what you say. You might be asked to show publications in your field that support your contentions. Make a practice of using a second expert with whom you consult and from whom you receive comments and searching criticism. They should be able to take on the role of the devil's advocate, because you very well may have to respond to difficult and challenging questions during your testimony. The cost of such a person is minor within a budget of any size, while the benefits in quality control are potentially great. Franklin Fisher (1986, p. 285) recommended that an expert have a staff "with the appropriate technical training" to act as a source of criticism. You may be a solo operator and such a staff is not in the picture. Reach out to colleagues and cultivate experts who can help you in this limited but valuable way.

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You may like the idea of creating novel methods, seeking to be original. However, standard methods are more credible because they have the authority of widespread acceptance and having withstood the test of time. Little is more dismissive of an error than to cite it as a “textbook” example. Of course, sometimes novel methods are needed. A case in which a textbook error was made is described in Fairley, Izenman, and Crunk (2001). An engineering firm estimated the total damaged bricks in a large apartment complex near the Bronx Zoo by selecting 20 vertical wall segments on which to count damaged bricks from scaffolds. The wall segments were not selected randomly and in fact were wildly unrepresentative.

2.1.6. Persuasive and differentially persuasive

It is possible to say things that are believable but that do not persuade the listener. A judge wants to hear a cogent, persuasive argument addressing the key fact issues—not simply an argument that is a series of credible, true statements. The trier of facts weighs one argument against the other. The persuasive argument will win out.

To be persuasive, be a good teacher. Avoid doing a “snow job” on the audience, *i.e.*, using technical language and explanations that do not convey understanding but that befuddle and impress—whether knowingly or not. Such experts will most likely alienate the audience and are not persuasive. Although you are hired by the lawyer and accepted by the court for your expertise, that does not give you license to propound as an authority *ex cathedra* and merely assert (what you believe to be) the truth: you need to make yourself understood and you need to show how your opinion is supported by facts and legitimate methodologies.

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It is persuasive to begin with the simplest data and the simplest analysis. (Finkelstein 1973, p. 1462). Talk in plain English. Use simple, memorable analogies. Start with the questions that a lay person would naturally ask and show how far the most straightforward analysis could go in answering them. Then, as useful, add complexities to get to a well-supported answer. If you have a valid point but it is too broad or too nuanced, re-phrase it until you can make the most forceful, warranted one that you can without exaggeration or distortion.

Perhaps the most persuasive analysis is a graph. One of us (WBF) helped in the settlement of a dispute between a parking meter collection company and the City of New York, which accused their collectors of stealing from the meters. A simple graph showed revenues dropping precipitously when the company took over the collection and rising when they had left. The company settled on the spot. Ironically, the same analysis had been put forward years earlier in court, in which the City won a judgment using the same statistical analysis. See Fairley and Glen (1986) for a discussion including a counter-analysis by the statistician for the company.

Persuasiveness is not only a quality valued by the judicial process in testimony: it is also a critical quality lawyers want if the expert is involved in preparing for settlement and, especially, if the expert is involved in negotiations. Another example of an out-of-court settlement involved a graphic that was persuasive to the opposing side. This case concerned charges of discrimination and claims for unpaid wages by a former county employee. The county was able to retrieve extensive but erratic electronic information about the employee's activities during a two-year period, such as cell phone calls, logs of keypad access to protected building areas, and timecards. Planning to conduct extensive analysis, one of us (WAH) constructed a dataset of this information and then, to review it, plotted a detailed graphical timeline of all the events. At a

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glance it clearly showed how the plaintiff's claims were inconsistent with the data. The plaintiff settled the suit as soon as her lawyer was shown this graphic.

The judicial process wants you to be persuasive not only about the case presented by “your” side, *i.e.*, the side which sponsors your testimony, but also about what is wrong with the opposing side's case—what could be termed “differential persuasiveness.” Deciding between the two cases is, after all, what judge and jury must do. Show you understand the opposing side's arguments. You are most convincing when you can show that what you say is premised on all the facts you have demonstrated or assumed—especially facts that are, or might appear to be, favorable to the opposing side. You can be even-handed while still putting forward your own analysis. Establishing a conclusion from differing perspectives is powerful evidence: it is a way to demonstrate the *reliability* required by the Federal Rules of Evidence. (In environmental work this is commonly known as a “multiple lines of evidence” approach.)

The evidence in a fraud case was strengthened with this approach. The Bandolene Fuel Company delivered fuel oil to city-owned “*in rem*” buildings in New York City. Fraud was alleged by the City via a scam of running a truck's hose directly from the rear back up and into the top of the tank, where the oil ran through the meter, recording a delivery when none had been made. To determine the amount of the fraud the statistician for the City (WBF) compared deliveries made to the subject buildings to 1) deliveries to other buildings matched for similar expected usage, and to 2) deliveries to the subject buildings in the periods before and after the contractor's deliveries. The estimates of delivery shortfalls in cases 1) and 2) closely agreed, representing a “triangulation” of the evidence. See Salzberg (1999).

2.2. *Things not expected of an expert*

You are not an advocate for “your” side. You are not responsible for the client’s entire legal and fact case. We find that few lawyers will encourage you to be an advocate in this way, because it runs the risk of tarring everything you say as untrustworthy. In court your opinion will be relentlessly attacked, whether merited or not. This is one situation where they are definitely “out to get you.” If the opposing lawyer can paint you as a *naïf* and a slave to whatever your client wants you to say, they will. You are there to present an analysis and to defend it against criticism. You must be an effective advocate for your analysis. Only in this narrow but important sense are you an advocate for “your” side.

You are not a “Yes man (or woman).” The lawyer who already knows exactly what they want you to say may only want you to put an imprimatur of science on their case. If you agree with their analysis, this need not be problematic in the simplest cases, but outside of these it is likely to be.

You are not responsible for winning or losing the case. Avoid the temptation to crow over having “won” a case when a decision favors the side on behalf of which you testify. By that logic it would be you that “lost” a case when the decision goes the other way. However, we think what you can say is that you want to win the technical case on the technical merits. (For this reason we do not indicate who won or lost the cases referenced in this paper whenever the outcome is not relevant. In some of these cases our clients lost and in others they won.)

You are not responsible for the facts. The facts are what they are. Occasionally a lawyer will see facts unfavorable to their case as somehow your fault. Indeed, you may well uncover

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unexpected and sometimes unwelcome patterns in the data. If the lawyer's reaction is to shoot the messenger, this is not the kind of lawyer by whom you want to be engaged. The lawyers you want are ones who follow the facts. If there is unwelcome news, they want to find that out because a change in their case may be necessary. In any event they want to be prepared against the case made by the opposing side.

You don't have to take the case. Here are some questions to ask before finally accepting a case. Do you have the expertise required? Does the schedule allow enough time to do a good job? Can you write down a "charge" for your mission that you and the lawyer can agree on? Does the client have a budget that permits you to do a good job? Are necessary data available or can you direct their acquisition? Does the case seem to be a reasonable one to you? Can you comfortably work with the client? Does the client seem likely to pay their bills? Does the lawyer seem like someone who will pay close attention to your findings, or are they fixated on an answer already? Are you likely to be able to support the bottom-line conclusion of a case, such as that the action of a government agency was "arbitrary and unreasonable" or that a professional did not take "reasonable care"?

3. Maintaining Your Independence and Avoiding Undue Influence

3.1. *Some ethical considerations*

The lawyer can influence your expert opinions in several ways. In Sections 3.2 – 3.6 we discuss five specific modes of influence, which, in and of themselves, are normal and legitimate; they are among the ways lawyers represent clients. What you would like to avoid is "undue" influence

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(some would say “co-option”). This we would define as being led, by virtue of being retained by one side, to espouse opinions that you know to be mistaken or at which you would not have arrived in other circumstances. Being unduly influenced is at bottom a disservice not only to the court but also to the lawyer and your mutual client. Without your accurate professional input, the lawyer cannot well determine or support his or her position in representing the client.

It is obvious that the side retaining you has a point of view. They are in a high-stakes debate and their objective is to win it. To this end, each side attempts (within the legal rules) to keep out of view facts that do not fit well with their case. This situation is sometimes presented as a binary choice for the would-be expert witness: you either agree with the facts of the case or not; and if you do not, then you do not testify (see “Selecting the Expert” below). However, the situation is more nuanced. The evidence presented in a debate is selected from an impracticably large pool of potentially relevant facts. If you take on the case early enough, you can influence it through the facts uncovered by your research and the analytical, statistical perspective you bring.

Sometimes the expert can even help frame the question. One of us (WBF) worked with a client to advise them, and later testify, concerning a system to control rates of errors made by social workers in approving benefits for food stamps, welfare, and Medicaid programs. Benefit determinations made by social workers were estimated with a double sampling scheme: first by the states and then sub-sampled by the federal government. The law required withholding federal aid to states in proportion to the gap between the error rates and “target” rates defined by the federal government. States were penalized when their error rates exceeded the target—but were not rewarded for a rate below the target, even when they could be attributed to sampling error. The client was surprised to learn that the unfairness of the penalizing regime could be framed in

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statistical terms, to which an expert could testify; namely, that the expected value of the penalty was positive (and potentially very large) even for states exactly meeting their targets. This “penalty bias,” as we called it, became an important basis for coalitions of states to litigate for relief. See Fairley, Izenman, and Bagchi (1990).

Helping your side is a legitimate role within the adversary system. The challenge for the ethical expert is to recognize the threshold where helping crosses over into advocacy. Certainly, you should not lie, cheat, or steal—but just how far is an expert allowed to go and what can be considered within the bounds of ethical and professional mores?

Many experts or would-be experts believe they would be violating their own principles to work on behalf of certain clients no matter how they undertook the assignment. Others take the view (that lawyers typically take) that everyone deserves a hearing. The legal system itself does not identify any party as unworthy of representation no matter how unsavory or despicable they are seen. We understand the purpose of a trial is to adjudicate specific issues between the sides and to decide those issues based on facts presented, not the personalities of the litigants. If that goal is to be achieved then, perforce, qualified people must be enlisted to assist the decision makers to understand fact questions requiring specialized expertise.

Proctor (2011, pp. 439 – 441), reciting the immense numbers of deaths attributed to cigarette smoking, castigates as unethical a long list of named statisticians (many of them prominent) for testifying on behalf of tobacco companies or for having consulted or been employed by them. Rubin (2002), citing egregious errors in statistics by experts in suits against that industry, strongly defends such testimony. Rubin’s view does find some support in two of the “Ethical

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Guidelines for Statistical Practice” (American Statistical Association, 2018), which we reproduce below. They state a duty for statisticians to expose errors in statistical analysis:

- *Statisticians are expected to ... support sound statistical analysis and expose incompetent or corrupt statistical practice.*
- *The ethical statistician ... avoids, and acts to discourage, retaliation against or damage to the employability of those who responsibly call attention to possible scientific error.*

Where you come out on a fraught issue like working for a tobacco company is of course a personal decision. But would it be *unethical* to identify and testify to “incompetent or corrupt statistical practice” or “scientific error” committed by a party opposing an opprobrious company in litigation? If your side (the one opposing the opprobrious company) is in the wrong, the legal system should be able to determine that using reliable data and advice and your statistical analysis will not be able to save the day for your client. If you are appearing on behalf of the company, *not* informing the court of the errors of another party would perversely tilt the court towards unfair or incorrect decisions. But what if you do get involved, only to discover that the report of an expert working for *your* side contains statistical solecisms? Because you are on the case (rather than having turned it down in the first place) you can make a difference. You should inform counsel for your side: that’s partly what they engaged you for. In extreme cases, sharing that information may cause counsel to remove you as a testifying expert (and even fire you outright).

You need a clearly stated scope of work, in writing, understood by you and the client. Something that cross-examining lawyers like to do is ask your opinion about questions that are favorable to that lawyer’s side but might be outside your scope. You want to be responsive to every question;

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but when asked to offer opinions outside that scope, you can honestly (and sometimes with relief) explain that such testimony is beyond your purview.

Three examples illustrate some of the ethical issues that arise when statistical errors are encountered in court cases—which, unfortunately, is not uncommon.

(1) One of us (WAH) identified striking examples of statistical mistakes in a high-stakes contest. In *New Mexico v. General Electric, et al.* (2002), the state of New Mexico sought five billion dollars compensation for damage to groundwater allegedly contaminated by industrial facilities at the South Valley Superfund Site in Albuquerque. We were hired with the charge of evaluating a geostatistical analysis performed by an adverse expert. Our investigation revealed he had quietly inserted artificial records into the dataset (unsupported by any data) depicting “contamination” at unsampled locations in order to create the appearance of a large monolithic plume of contamination. Some might feel there are ethical difficulties in helping defend big industry and major polluters who have (in other places, at least) damaged the environment and harmed human health. Would the ethical action have been to refuse work and perhaps, by not discovering this statistical deception, result in having the defendant pay for contamination it did not cause? Would your opinion change upon learning that our client was the U.S. government, which was potentially liable for WW II industrial activities near this site?

(2) A man convicted of killing another person in a drug deal gone wrong appealed his death sentence in an Alabama trial court. One of us (WBF) appeared as a *pro bono* expert on behalf of the defendant. The conviction relied on a match between fragments of glass found at the scene and on his clothing. The match was accomplished through use of an FBI database of glass. Our

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testimony pointed out there were no data on the frequencies of glass of different descriptions; consequently the “match” relied entirely on the judgment of a glass expert, while no supporting data on the reliability of that judgment was given. Opponents of the death penalty might laud this appearance on behalf of the defendant, but supporters might not. Was it ethical or unethical to testify on behalf of this man? On behalf of the prosecution? Would it change your view to learn that the victim was a drug dealer too?

(3) An age discrimination suit was brought by high-ranking New York City Police Department officers who had been passed over for promotion by a new Commissioner (*Courtney v. City of N.Y.*, 1998). Based on a significant chi-squared statistic in a table of age and promotion status, the officers’ expert concluded that promotion was “related” to age, essentially asserting statistical association proves causation. An alternative explanation is that higher ability officers were promoted faster through the ranks. Given an accusation of discrimination—especially against a large organization—some are inclined to give the benefit of doubt to the plaintiff. Would it be ethical to appear on behalf of the Department, as one of us (WBF) did? Would it be unethical not to challenge a statistically misleading claim?

Our involvement in these cases indicates how we have answered these questions in our practice, but we do not suppose all experts would resolve them in the same way, nor do we suppose that all cases offer such clear contrasts between the consequences of participating or not. One common theme of these examples (and we could offer many more but for the limited space) is the statistician’s natural desire to serve the profession by promoting correct statistical reasoning and its appropriate application.

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In the following sections we discuss five ways in which trial attorneys influence the opinions of expert witnesses. These follow Easton's (2000) classification.

3.2. *Selecting the expert*

The first way lawyers can influence the opinions expressed by an expert witness is by picking only testifying experts who agree with their case. Typically, lawyers will consider more than one expert before settling on one to testify. Clients with large resources may talk with several experts and select one (or more) whose opinions are best aligned with their own theory of the case and view of the facts. This practice is called “expert witness shopping.”

However, good lawyers seek experts who can genuinely inform them about the facts and thereby can positively influence the case that they bring. This has been true in almost all the cases on which we have been employed. Nevertheless, in the adversarial system lawyers cannot be indifferent to the views of the experts they hire. Lawyers have a duty to represent their clients. At some point in their representation—after having reviewed the evidence, including consulting with experts—they will adopt a “position;” that is, a legal theory and a view of the facts, that constitutes the foundation of their case. At this point they will not be taking on any expert who disagrees with their view.

There is little we, as statisticians, can do about this risk of what might be called a selection bias. Because the courts are aware of it [Easton 2000; Easton 2018], we hope they counter it effectively. We like to think that we experience this bias firsthand in the form of the opposing expert. (One of us once opposed a witness who was retained just before a trial, evidently after much shopping by the other side. Based on a career teaching accounting, he testified that the *only*

data from which one can draw valid inferences are simple random samples.) However, we know that in many cases where we have been retained, our clients had interviewed other potential experts or had used experts previously but dropped them. Thus, *we* were the source of the potential selection bias! Awareness of this fact can at least put us on our guard and ensure our work is as careful, thorough, and well-reviewed as possible.

3.3. *Employing the expert*

Employing an expert imparts an incentive for the expert to embrace the facts as seen from the perspective of the side that employs them. The incentive may not work, but it is unquestionably there, and the courts are aware of it. For example, think of the “hungry statistician” who sorely needs or wants the work: to retain that work, they may avoid—perhaps unconsciously—coming to conclusions that are averse to their side’s position.

We have found it valuable to frame an engagement in ways that help protect independence, with attention to severing compensation issues from performance. Because this is an important issue, we reproduce pertinent text from our standard engagement to give concrete, tested examples of how this can be accomplished. Each should be self-explanatory.

Fee Schedule. *Should testimony be agreed upon, payment in full of outstanding bills, including an estimated amount for the testimony, is due prior to appearance.*

Retainer. *Client agrees to pay a refundable retainer. Upon receipt work will begin. A retainer of \$ _____ is requested. This is not a cost estimate.*

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Stop Work. We reserve the right to stop work if Client's outstanding balance exceeds a retainer, or payment is in arrears. Payments not received by the due date on the invoice are in arrears.

Not Contingent. Compensation is not contingent on the outcome of the analysis or the outcome of any project in which the analysis is to be used.

Supervision of Work. We will decide on the methods and staff and/or consultants used in undertaking its work.

Independent Opinion. We will render professional opinions as independent statisticians and analysts with no pre-conditions on their findings. We will decide if communication with other experts who are not retained by parties to litigation is necessary.

Notice. Either party may terminate this Agreement immediately at any time upon notice to the other party. Amounts owed to us for outstanding work performed will be due at that time.

3.4. Directing the flow of information to the expert

A lawyer's selection of documents or data to give to an expert may bias the expert's opinions, even if unintentionally. It is important for you to obtain information on both sides of the fact issues. A good lawyer will respond to your requests for such information, especially when reminded of the value of your independence.

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An insidious form of influence by lawyers, although generally inadvertent, occurs when you become acquainted with details of a case (including datasets) which turn out to be erroneous, misleading, or one-sided, often because the data were collected or processed by the law firm itself or its client. This is a risk that is likely inherent in the situation, but, as in so many other contexts, awareness of the danger is the first step towards prevention. When you are aware that your only authority for a fact is the lawyer, you can give it in your opinion only the weight that it can bear, or you can state simply that: “It is my understanding from [named lawyer] that [such and such is true].” With experience we have learned to bring up these issues as early as possible during our work, to give the lawyer an opportunity to supply better information.

3.5. Making the expert a member of the trial team

It is likely you will come to be on familiar terms with the lawyer who hires you. Particularly if there are other experts or lawyers involved, a clubby atmosphere may develop. You should not be shocked when the lawyer talks to you in confidential tones about their case and how much better it is than the opposing side’s. You will be treated as part of a “team.” You may well come to feel a desire to “win,” just as the lawyer does. You will probably come to a sympathetic view of the case. It is difficult to over-estimate the extent to which this can put a warm glow on the facts favorable to the client.

We think that such feelings are for the most part impossible to avoid, but they, in and of themselves, need not be a problem. A problem arises if you allow such feelings to determine what you say in testimony or in a written report. Feelings “are.” What you do with them is what counts. The trick is to keep the human interaction with the client from clouding your judgment. It

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requires a sometimes-difficult balancing act. Your testimony will go on record and follow you for the rest of your career. Bearing this in mind can be a good antidote to these feelings by reminding you of your duties to the profession, to the facts, and to yourself, all of which will outlast your involvement in the case. Apropos the dangers of “undue influences” discussed above, Paul Meier (1986, p. 274) quotes Downton (1977):

As in any other consulting situation, a certain amount of identification with the aims of the client is inevitable... It cannot...be denied that a conscious change of attitude was needed to effect the change-over from helpful consultant to objective expert witness... This ambiguity of roles did create a conflict, which presumably can only be resolved by individual witnesses in their own way.

We think “Forewarned is forearmed.”

Franklin Fisher (1986) and Meier (*op cit.*) both observe that the problem of the lawyer’s influence on the expert is not the rare event of being asked directly to change one’s opinion in a way favorable to their client when your evidence points the other way. The danger lies in shading what you say in favor of the client or limiting your analysis; for example, by omitting qualifications or assumptions. The pressure to do so can be great. You might draft a complete and thorough initial report for the lawyer’s review. In response the lawyer may ask you to omit assumptions because they are unfounded or cast a bad light on other parts of their case; or you may be asked to eliminate some conclusions altogether.

We would like to put forward the following counterstrategy for expert witnesses and the lawyers who hire them. Enter the role of expert witness with the goal of being intellectually honest. The

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lawyer should think of you as a “package” of independence and integrity. The price of accepting that package—of retaining its integrity—is to avoid steering you to favor the client beyond what your analysis can support. The benefit of that acceptance is a witness who will be credible to the trier of fact because they are sincerely following a goal of good conduct. This sincerity becomes manifest naturally in your reports and your testimony. It seems psychologically difficult for an expert to embody that package while simultaneously making points that stretch the truth or mislead the court. In fact, making appropriate qualifications—qualifications that clarify and illuminate an opinion, even though they may narrow its scope—is part and parcel of being a credible witness. Most, but not every, lawyer will accept the tradeoff involved in accepting this “package.”

Where there is more than one expert witness on your side you may or may not be asked to learn about their testimony; or sometimes you will be permitted to learn only parts of their testimony. Their opinions are not yours, but they will be compared to yours and any discordances will be brought out on cross-examination. Preventing discordances is ultimately the lawyer’s responsibility, though to the extent that you can identify them, your help will be appreciated.

3.6. Deciding whether the expert will testify

The lawyer will not knowingly put on the stand someone whose opinions are opposed to their case. The easy circumstance for both lawyer and expert is where the expert’s work itself has created much of the fact case. Often the legal team will delay identifying a testifying expert until that expert has been able to form a definite set of opinions. If your initial work reaches

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conclusions that do not help the case, then you are unlikely to be named as a testifying expert.

You might continue to be retained as a consultant.

For more detail on what courts and lawyers look for in an expert witness two useful sources are Lubet and Boals (2014) and SEAK (2015).

4. A Perspective on Being an Expert in a Legal Case

4.1. *Why and how do experts disagree?*

Trials are sometimes described as involving “dueling experts” or the “battle of the experts.” The very fact of disagreement among experts in court is put forward as evidence of corruption, and articles with pejorative titles like “Damned Liars and Expert Witnesses” (Meier 1986) are oft cited. Surely disagreement between experts can arise when experts on one or both sides are unduly influenced by respective counsel, but the presence of disagreement does not imply such influence exists. There are many reasons why experts might disagree without suggesting they are simply at war or are corrupt. The first point is to look at a control. Compared to what is there expert disagreement? Disagreement is not uncommon in science and everyday life. A disagreement in the courtroom could merely reflect alternative equally valid approaches to understanding data. This is especially the case in statistics, a field that offers a cornucopia of flexible methods of wide applicability. Other ways in which disagreement can arise with no undue influence, from our experience, include:

- Experts make mistakes.
- The law is so broad or unsettled that many conflicting findings are consistent with it.
- The field of knowledge itself is not settled.

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- Nothing escapes all criticism.
- Fact issues are close; *i.e.*, judges would find them difficult to choose between.
- The argument is never joined—two sides are like ships passing in the night, each framing and answering a different question.

Even in a seemingly straightforward, purely accounting setting there can be scope for substantial differences. More than 35 parking collectors were arrested at the Philadelphia International Airport for fraud and theft. The scam was this: a collector would step outside the booth to take a ticket and cash from a driver. Back inside the booth, they would substitute a counterfeit ticket of a lower amount for the real one, pay that, and pocket the difference. The airport hired an expert to estimate the amount of lost monies and lodge a claim against its insurer. The insurer retained a consultant (WBF) to verify the amount. Our approach to estimation was broadly consistent with that of the airport's expert but exceeded that estimate by over a million dollars. The insurer decided not to contest the airport's calculation, knowing that a substantially larger claim could be supported.

In addition to cynicism about expert disagreement, one can despair over the likelihood that good evidence can be sorted from bad when interests clash and lines are drawn. Here, too, the reality is not so stark. There are mechanisms in the law, trial procedure, and attempts at settlement that promote good evidence and discourage bad. Important ones that have long been discussed in the legal literature (for example in Sanders 2007) include:

- Cross-examination.
- The adversary system promoting a zealous search for facts.

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- Neutral factfinding incorporated into evidence via stipulations to facts by both parties.
- Discovery, where each side gets to review evidence of the opposing side.
- The potential for damage to a case and to an expert's reputation when bad evidence is exposed.
- Legal evidence standards such as the Supreme Court's trilogy of Daubert opinions.
- Experts' publications that fence in opinion.
- Settlement discussions that require strong evidence to convince opponents.

Why participate? One challenge for statisticians serving as experts in a legal case is educating clients, judges, and juries about how statistics can assist in appraising evidence. The statistician is not infrequently seen in a narrow role, as was described by one lawyer in objecting to an answer by a statistical expert (WBF) (*Sanderson et al. v. City of New York et al.* 1997):

Your Honor, I object. This is beyond the scope of this witness's expertise. He has no experience in employment selection or assessment devices. He is a statistician. You give him numbers and he plots them. He can't tell you whether the data is any good or how you should obtain the data.

Showing, by example, that a statistician is much more than a number plotter is a worthy endeavor. There are important positive aspects to service as an expert witness. Courts rely on experts to inform the debates within their halls. Without experts, disputes involving factual issues—that is, almost all disputes—would be settled without recourse to a factual record or by means of ill-informed examination of technical facts. Trial by physical battle was once a norm; it is no longer. The battle now is intellectual. Participating in the legal process can be personally

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and professionally rewarding. Stephen Fienberg (1997, p. 322), commenting on the difficulties inherent in the “game” of the expert at court, nevertheless avers that “...the statistician can participate while preserving a measure of personal independence and professional respectability.” Fisher (1986, p. 277) observes that serving as an expert gives you “an opportunity to use [your] tools on problems that people really care about.” Kadane (2008b, pp. 81-83) recounts the personal rewards of serving as a statistical expert witness:

Testifying in court is among the most demanding work that I do, both technically and ethically. It requires thinking through not just the details of the case, but also how I stand philosophically about statistics, and how I stand ethically and morally. And this is why I find it a welcome challenge.

Yet, more than one person has reported frustrating or disagreeable experiences when participating in legal cases. The legal milieu is by nature a contentious one. Each lawyer is out to win and truth can be, or can seem to be, the victim. If the lawyer on the other side can paint you as ignorant, naïve, self-serving, mistaken, and biased they will have no qualms in doing so (see Easton (2018), an encyclopedic list of methods to accomplish this.) You may wonder why evidence you know to be important and valid is ruled out of court. You may be asked to appear on behalf of a party whom you find unattractive, unsavory, even odious; or to oppose such a party. The social function of courts is not limited to resolving disputes among reasonable, or even law-respecting, persons. In our view, in serving as a scientific expert within legal institutions you are not endorsing the actions of the litigants, nor are you condoning aspects of those institutions that you think should be reformed.

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One response to the difficulties in serving as an expert witness is to throw up your hands in disgust and walk away. Our view is that justice is better served when statisticians participate and bring to bear their expertise despite trying circumstances. Not everyone has to participate, but justice will suffer unless enough professionally qualified people can be induced to take part. At any point in time we serve within the institutions we have. Paul Meier (1986, p. 276) wrote, with evident hope, “The sorry state of expert testimony might lead one to conclude that no honest person should participate in such a scam, but I feel strongly that this conclusion is wrong.”

5. Conclusion

A critical institution of society is the set of mechanisms it affords for resolving disputes. Eschewing actual “trials by battle”—settlement by violence—we prefer to use the facts. Yet, it is not unusual for fundamental errors in statistics to be put forward in court. We do not want ignorance and chicanery to go unchallenged. We do not want statistical issues to be dealt with in amateurish fashion. The conclusion is ineluctable: if not us, who? Despite imperfections in our adversarial system, there are meaningful opportunities available to the statistician willing to participate.

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