

THE EXPERT EXTRAPOLATION MIRAGE

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Introduction.

Experts often create illusions that they want others to perceive as reality. The illusion may be nothing more than a mirage based upon what they want you to believe is true. This article discusses the use of statistics to separate valid opinions based upon scientifically proven methods from those based upon assumptions and unfounded beliefs. The discipline of “statistics” is an underappreciated tool that can be used to analyze the validity of expert opinions. Statistics are very valuable and can be used to determine whether an opinion given by an expert is *probably* a correct opinion.

How many times have you entered an appearance in a case after one or more expert witnesses have already opined that defects are present in a building; your client is responsible for plaintiff’s damages; no depositions have been taken; and you are scheduled for mediation? For instance, a plaintiff brings suit against a general contractor alleging water infiltration into a newly constructed hotel. The general contractor files third-party actions against the subcontractors on the project. The EIFS application subcontractor then hires an expert to test a window and determines it is defective and is the cause of water infiltration and damages. This same expert then prepares a report stating that all the water infiltration throughout the hotel is a result of defects in the design of the windows. The window manufacturer is then named as an additional third-party defendant. You are retained to represent the window manufacturer. Mediation has been set for three weeks from the time that you filed an answer and there is no time to perform your own testing. Problem: What can you do to defend the attacks against your client’s products? Solution: Prove the expert’s opinions are not reliable through the use of *statistics*.

Destructive Testing and *Extrapolation*.

Is an expert witness’ opinion always *reliable* when it is based upon destructive testing? In most construction defect lawsuits, the parties will retain expert witnesses to conduct destructive testing and record any defective conditions found. Destructive testing is expensive and disruptive to occupants and, therefore, usually limited to the areas of the building that show the greatest damage. Expert witnesses conducting this type of testing regularly take the findings from limited samplings of locations observed and extrapolate the same condition to the entire property. Once construction defects are identified, the expert reports the defects observed in the tested areas exist throughout the entire property. This article attempts to assist in determining whether this type of testing and *extrapolation* yield reliable results.

An interesting application of the use of statistics to invalidate an expert's opinion can be found in the opinion in *Soldo v. Sandoz*, which arose out of a products liability claim. *Soldo v. Sandoz Pharmaceuticals Corp.*, 244 F.Supp.2d 434 (W.D. Pa. 2003). In that case, a mother brought a products liability action alleging that a manufacturer's drug caused her to have a stroke. *Id.* The court held that in a products liability action alleging that the plaintiff was injured by a drug manufacturer's production, opinions of the plaintiff's expert witnesses must be based upon a reasonable degree of certainty. *Id.* at 525, 571-72. In its analysis, the court asserted that "[a] particular epidemiologic study's measurement of relative risk had no meaning by itself, but must be interpreted in conjunction with its statistical degree of confidence." *Id.* at 449. The court found the medical expert's hypothesis was not based on statistically significant epidemiologic studies showing that the use of the drug increased the risk of postpartum intracerebral hemorrhage or postpartum stroke of any kind. *Id.*

The United States Supreme Court has adopted the requirement that expert witnesses' opinions be statistically reliable. In *General Elec. Co. v. Joiner*, the plaintiff worked as an electrician. *General Electric Co. v. Joiner*, 522 U.S. 136, 139 (1997). This job required him to work with and around electrical transformers. *Id.* Plaintiff was exposed to fluid in transformers that were contaminated with polychlorinated biphenyls (PCBs). *Id.* Plaintiff was diagnosed with cancer and then brought suit against General Electric Company and Westinghouse Company, who manufactured the transformers, and Monsanto Company, who manufactured the PCBs. *Id.* Plaintiff alleged a casual connection between his development of cancer and his exposure to the PCBs. *Id.* at 139-40. The Federal District Court for the Northern District of Georgia granted summary judgment to the defendants because, in part, the testimony of the plaintiff's experts failed to show there was a link between the exposure to PCBs and the form of cancer developed by plaintiff. *Id.* at 140. The Court of Appeals for the Eleventh Circuit reversed the District Court. *Id.*

The Supreme Court granted the defendants' petition for writ of *certiorari* and held that the district court did not abuse its discretion in finding that the plaintiff's experts' opinions, which had indicated an increase in the incidence of cancer among workers exposed to PCBs, were not statistically significant. *Id.* at 141, 146-47. In its opinion, the court acknowledged that trained experts commonly extrapolate from existing data, but found that "nothing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the *ipse dixit* [he himself said it] of the expert." *Id.* at 146. Courts may conclude that there is simply too great an analytical gap between existing relevant data and an expert witness' opinion. *Id.* This same reasoning was previously applied in *Turpin v. Merrell Dow, Inc.*, 959 E.2d 1349, 1360 (6th Cir. 1992), *cert denied*, 506 U.S. 826 (1992).

How Reliable Is an Expert's Opinion?

A party offering expert testimony bears the burden to prove that the witness is qualified. Federal Rules of Evidence 702 requires an expert witness be qualified and his or her opinions to be reliable. Courts have also held that in determining whether an expert witness should be allowed to testify, it must also be examined whether the testimony is "helpful" to the finder of fact. For example, in *Quiet Tech. DC-8 v. Hurel-Dubois UK, Ltd.*, 326 F.3d 1333, 1341 (11th Cir. 2003),

the court noted “[A]lthough there is some overlap among the inquiries into an expert’s qualifications, the reliability of his proffered opinion and the helpfulness of that opinion...are distinct concepts...” In other words, an expert must make an effort to tie pertinent facts of the case to the scientific principles that are the subject of his testimony. See *Quiet Tech.*, 326 F.3d at 1341. The relevant inquiry, pursuant under Rule 702, is whether the expert’s testimony took into account enough of the pertinent facts to be of assistance to the trier of fact on a fact in issue. *Id.* at 1347. (Note: as the focus of this article is on the reliability of expert testimony, relevancy of the testimony will not be addressed here.)

Even the opinions of a *qualified* expert must be reliable. See *E.I. du Pont de Nemours & Co. v. Robinson*, 923 S.W.2d 549, 554 (Tex. 1995). In determining whether an expert witness’ opinion is reliable, the courts will generally consider the following:

- Whether there is a basis for the expert asserting a conclusion, *i.e.*, whether the expert witness’ opinions are directly supported by the facts, connected to or tied to the underlying data;
- Whether the expert witness has excluded other possibilities that would contradict his/her explanation of events;
- Whether the expert can show why other explanations for the underlying facts are not at least as consistent with his/her own opinions;
- Whether the expert witness can show that what he/she believes could have happened actually did happen;
- Whether the specific methodology used by the expert witness to form his/her opinion is acceptable:
 - Is it the generally accepted methodology used within the industry or profession?
 - Whether other experts have used the same methods to determine the same type of issues;
 - Are there neutral treatises or commonly accepted professional periodicals that support the expert witness’ conclusions and methodology?
- The extent to which the opinion offered relies upon the subjective interpretation by the expert witness of any facts or data.

Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 591-95 (1993) (in *Daubert*, the Supreme Court stated that Rule 702 of the Federal Rules of Evidence requires expert testimony to be *reliable*). The factors cited in *Daubert* supplanted the D.C. Circuit Court’s holding in *Frye v. United States*, 293 F. 1013, 1014 (D.C.Cir. 1923). *Id.* at 589 n.6. The *Frye* court held that expert opinion based on a scientific technique is inadmissible unless the technique is “generally accepted” as *reliable* in the relevant scientific community. *Id.* at 584. *Daubert* rejected *Frye*, holding that the Federal Rules of Evidence, not *Frye*, provide the standard for admitting expert scientific testimony in a federal trial. *Id.* at 588-89, 591.

Using Probability, *i.e.*, Statistics, to Attack Reliability

The qualifications of experts are routinely challenged. However, the reliability of such opinions, based on the potential rate of error for the methodology used in reaching those opinions, is often not challenged. Statistical probability can be defined as an experimental method of assigning probabilities to events by measuring the relative frequency of an occurrence. Not only must an expert witness' opinion be likely to be true based upon existing data, but the underlying data relied upon by the expert in forming his or her opinion must also be likely to be correct. This is where counsel can make use of probability measurements through statistics. Even when an expert witness relies upon previously published scientific studies, the results of such studies should be analyzed from a statistical approach to determine whether they are scientifically reliable.

The probability of an expert's opinion being correct will be, at least in part, a function of whether a sample tested by an expert witness was *randomly* selected. The probability of the expert's opinion being reliable will also be based upon the size of the sample, which refers to the number of areas being tested (*i.e.*, *sample size*). The greater the sample size, the greater the information that the sample contains, which provides more confidence in the results. For an expert witness' opinion to be reliable, all testing *bias* must be removed, as well as confounding *variables* (*i.e.*, a variable that makes a causal relation between testing results and reliability of the results suspect). Parties usually do not address the *statistical* reliability of the underlying facts or assertions of opposing expert witnesses. This article suggests that it is reasonable and prudent to establish: (a) the rate of error of an expert witness' opinion, and (b) the rate of error of the data relied upon by the expert.

An Example:

Plaintiff is the owner of a large, 300-plus-unit apartment property and has received complaints by tenants of water infiltration through the exterior cladding with subsequent mold colonization. Plaintiff retains a forensic expert in the area of building envelopes to conduct destructive and water testing. The protocol may read something like the following:

- Water test windows using accepted ASTM spray bar techniques;
- Observe and photograph all conditions around windows tested;
- Remove stucco from a 2 ft. radius around each window, photograph and record observations of water intrusion;
- Water test windows a second time with stucco removed and observe and photograph all conditions;
- Remove all lath and substrate;
- Photograph and observe all conditions of lath and substrate;
- Remove all insulation from interstitial walls spaces and examine condition of wood framing;
- Reinstall all insulation, substrate, lath, and stucco;
- Apply finish coat to match color of existing stucco;
- Clean area of all debris and return landscaping to same condition as prior to the testing.

This testing procedure will present numerous challenges to the owner of the property. Any testing at occupied units will require the permission of the tenants. The sight of scaffolding and groups of attorneys, clients, and expert witnesses gathering around different locations on a commercial property could impact tenant relations and raise issues as to the suitability of the property for occupation by residents even where their particular units are not being tested. This type of testing is also, of course, costly! These facts alone may influence an owner's decision as to how many units are to be tested and the period of time in which the testing must be conducted.

Further, the testing of occupied units must necessarily be completed in one day in order for the units to be habitable by the resident. This type of testing on the second or third floor of the property will also be considerably more expensive than testing on the first floor. Obviously, the owner will prefer that testing be conducted only at unoccupied units so as to minimize the disturbance to residents. Given the many costs and business factors that the owner must consider, it is eventually determined that only five units within the entire complex will be tested. It is also determined that only first-floor units will be tested. There are two unoccupied units at the ground level available for testing. The owner decides to test these vacant units and the remaining three units to be tested will be locations where there have been complaints of water infiltration by the current residents.

The owner's expert then conducts the testing according to the proposed protocol on these particular five units, which happen to all be on the west side of the property, the side subjected to the most severe weather. After the testing is complete, the expert states that water infiltration and mold colonization were observed at each location tested and reports that the same condition exists throughout the entire property, including all elevations on all sides of the property. It is claimed by the owner that, based upon this limited testing, the entire exterior cladding for the property must be removed; the structure must be remediated; and new cladding must be installed.

Is the Owner's Expert's Opinion Reliable?

The first question to be presented is whether the sample size of units tested is sufficient and representative of the units not tested. An expert statistician will be able to determine if the sample is representative of the property by first evaluating whether the sample was selected randomly. A statistical model will require that any samples be selected on a random basis in order to extrapolate the conditions observed during testing to the remainder of the property. Next, a statistician can provide an analysis based upon accepted statistical calculations of how many randomly selected units (sample size) must be tested to form the basis of a reliable opinion. In our above case, the sample was selected based upon the ease of access, cost factors, the presence of a known condition, and only included on 1.6 percent of the units. This is not an example of random selection, nor of sufficient sample size.

As stated, the reliability of an opinion based upon testing a sample of units will also be based upon whether the sample size is large enough to render reliable results. A forensic statistician will be able to utilize methods and formulas accepted within the world of statistics to provide an opinion as to whether the testing of only five units could lead to a reliable and

significant opinion, which is sufficient for extrapolation. The statistician can then offer an opinion as to the scientific reliability of the testing expert's opinion.

Another means of attacking the extrapolation of observed conditions to the entire property is the determination of the existence of any *confounding variables* that were not considered during the testing. Sample questions to be asked of plaintiff's experts are: (1) whether the units were all occupied at the time of testing; (2) were samples taken from all elevations of the property; (3) was there more than one subcontractor installing the windows and exterior cladding; (4) were samples taken from north, south, east, and west sides of the property; (5) were all the units tested constructed at the same approximate time during the construction process; (6) were there weather events which could have influenced the results of the testing; etc.

The forensic statistician can be called to testify regarding the likelihood of the results obtained from the sample tested occurring at the units not tested. If after performing a statistical analysis, it is determined that there is no more than a 50 percent chance of the observed condition existing at untested locations, then the testing expert's opinion is not precise or reliable. The forensic statistician can then be called upon to determine the level of confidence that must be obtained in order for the testing expert's opinions to be reliable. The usual degree of certainty applied by statisticians to obtain statistically significant testing results is .95-.99 percent reliability findings.

Statistics Have Broad Application

Although this article focuses on expert opinions in mainly a construction defect context, statistics can be applied to a broad range of expert disciplines, *e.g.*, products liability, personal injuries and pharmacology cases. There is an interesting case where the opinion of an expert statistician himself was held not to be admissible because the statistician did not conduct a proper statistical analysis and his opinions were, therefore, not reliable. In *Sheehan v. Daily Racing Form, Inc.*, 104 F.3d 940 (7th Cir. 1997), an employee brought an age discrimination suit against a former employer. The plaintiff attempted to proffer a statistical analysis regarding employee retention related to age by the former employer. *Id.* at 941. The court held that the expert's statistical analysis was not admissible, finding that omissions from the sample were arbitrary, that the expert failed to correct for any explanatory variables other than age, and that the expert completely ignored the more than remote possibility that age was correlated with a legitimate job-related qualification. *Id.* at 942.

Conclusions

Any time an opinion is expressed by any witness regarding the existence of a condition not observed or identified, but based upon the presence of such a condition at another location, that witness' opinion should be analyzed for its reliability and precision. An expert statistician will be able to provide the technical expertise to identify the information needed in order to test the extrapolation of another witness's opinion. Further, a forensic statistician may also be able to offer an opinion as to the percentage chance that the testing expert's opinion is *unreliable*. The expert statistician will be able to test the hypothesis of the witness performing the destructive test in our hypothetical. For example, the "Chi-Square random variable" is a test that is useful in

hypothesis testing and determining confidence intervals. There are numerous other statistical models that can be used for determining probability, but this area lies best with the forensic expert himself. The use of statistics is a powerful tool and should be considered when analyzing extrapolation mirages created by expert witnesses concerning liability or damages.

There are also various resources available for further research on statistics. Internet resources and references pertaining to statistical analysis and consulting services include:

- Science Ops, at <http://www.scienceops.com>;
- “Statistics on the Web” at <http://my.execpc.com/~helberg/statistics.html> (providing references for statisticians and publishers, as well as other educational resources, professional organizations and institutes);
- Statistica, at <http://www.statsoft.com>;
- Statistically Significant Consulting, LLC be located at <http://statisticallysignificantconsulting.com> (providing consulting services);
- Rimkus Consulting Group, at http://rimkus.com/public_home.jsp (providing consulting services);
- Most major universities also have statistics departments where experts in the field of mathematics and statistics can be contacted for assistance as consultants. World Wide Web Virtual Library, at <http://www.stat.ufl.edu/vlib/statistics.html> provides a listing of universities throughout the United States with Statistical Departments that can be located at a website provided by the university.