

---

## BEST PRACTICES FOR PROBABILITIES AND PREDICTIONS

When a well-respected lawyer carefully reviews and analyzes relevant law, documents, and witnesses, his assessment—that “liability is shaky,” “summary judgment is highly likely,” or “damages will be sky high”—deserves to be given weight in decision-making. The opposite is true for an assessment by a lawyer who wasn’t present at the depositions, hasn’t reviewed case law specific to these circumstances, or is unfamiliar with the assigned judge’s or local juries’ proclivities. That assessment was made without basis or care and should not be relied upon.

The same may be said for numerical probabilities and predictions: when “thrown out there” or constructed from thin air, they have little value. However, the well-respected lawyer’s rigorous analysis still merits attention as derived from law, evidence, and experience, whether expressed in adjectival or numerical probabilities.<sup>1</sup> Fundamentally, insights from psychology and expert elicitation research lead us to conclude that the assignments of percentages should be an iterative process, involving much discussion, questions phrased in alternative ways, and examination of various perspectives on the issue under consideration.<sup>2</sup>

---

<sup>1</sup> It should be mentioned that some decision analysts suggest using influence diagrams (sometimes referred to as dependency diagrams) to formulate decision tree structures and predictions. Creating an influence diagram involves following prescribed conventions for arranging facts, legal issues, and uncertainties within certain shaped boxes and circles (etc.), and using arrows and lines to depict their relationships. Indeed, earlier versions of the TreeAge software would convert a property constructed influence diagram into a tree. Victor, Calihan, and Dent display the use of influence diagrams in their article, “The Role of Risk Analysis in Dispute and Litigation Management,” American Bar Association, Forum on Franchising (2004):19. At one point, I introduced my students to influence diagramming through an assignment in my Advanced Decision Analysis course. Some may have derived value from the exercise. However, I hereby admit that the technical aspects of working with the diagrams seemed to outweigh their value to me. Having said that, I applaud the idea of scribbling, drawing lines, circles—whatever the lawyer needs to clarify in his or her own mind how the pieces of a case fit together, and what factors influence its various uncertainties. For descriptions and examples of the formal and thorough use of influence diagrams, see Clemen, Robert, *Making Hard Decisions: An Introduction to Decision Analysis* (1996, or subsequent editions). Of course, the method may be used for estimating damages ranges as well as subjective probabilities.

<sup>2</sup> See Raiffa, Howard, “Decision Analysis: A Personal Account of How I Got Started and Evolved,” *Operations Research* 50, no. 1 (2002): 10. “We told our experts to expect incoherencies in their responses to our hypothetical questions and those incoherencies should only prompt them to think even more deeply about their expertise. We learned not to ask questions one way or another way, but to ask both ways and to confront resulting incoherencies in an open manner.”

## Probability Percentages

What probability percentages to assign to tree branches are, or should be, among the most carefully considered decisions in decision tree analysis. Unfortunately, just as there's no magic way to determine whether a case is "very strong," "excellent," "virtually unassailable," or "awfully shaky," there's no magic way to determine whether its chances of success are more accurately described as 70%, 80%, 90% or a pessimistic 40%. These judgments can only be based on thorough knowledge, research, experience, and thoughtful deliberation.<sup>3</sup>

Even where the analysis is thorough and sound, we must accept that probability estimates are imperfect and their accuracy untestable. When the lawyer estimates the likelihood of success on an evidentiary motion at 35%, he knows that cannot be proven or disproven. The evidentiary motion on the same facts, in the same case, will not be ruled upon a hundred times, or even ten times. Nevertheless, the lawyer's obligation is a probability estimate that is as fully informed, well-reasoned, and intelligent as possible.

The pages that follow contain advice on best practices for formulating probability percentages along the path of a decision tree in a legal case. As you will see, this advice begins with the essential linkage between probabilities and particular locations on the tree's branches. It derives from psychology's insight into our common foibles and biases and their effect on estimation, prediction and confidence even among experts. Best practices for assessing numerical probabilities can help expose and counter-act those foibles and biases.

We can no doubt agree that our clients are best served by the rigorous lawyer's clearest thinking, undistorted by psychology's tricks and traps.

## Location, Location, Location—Take Note of Where This Branch Is

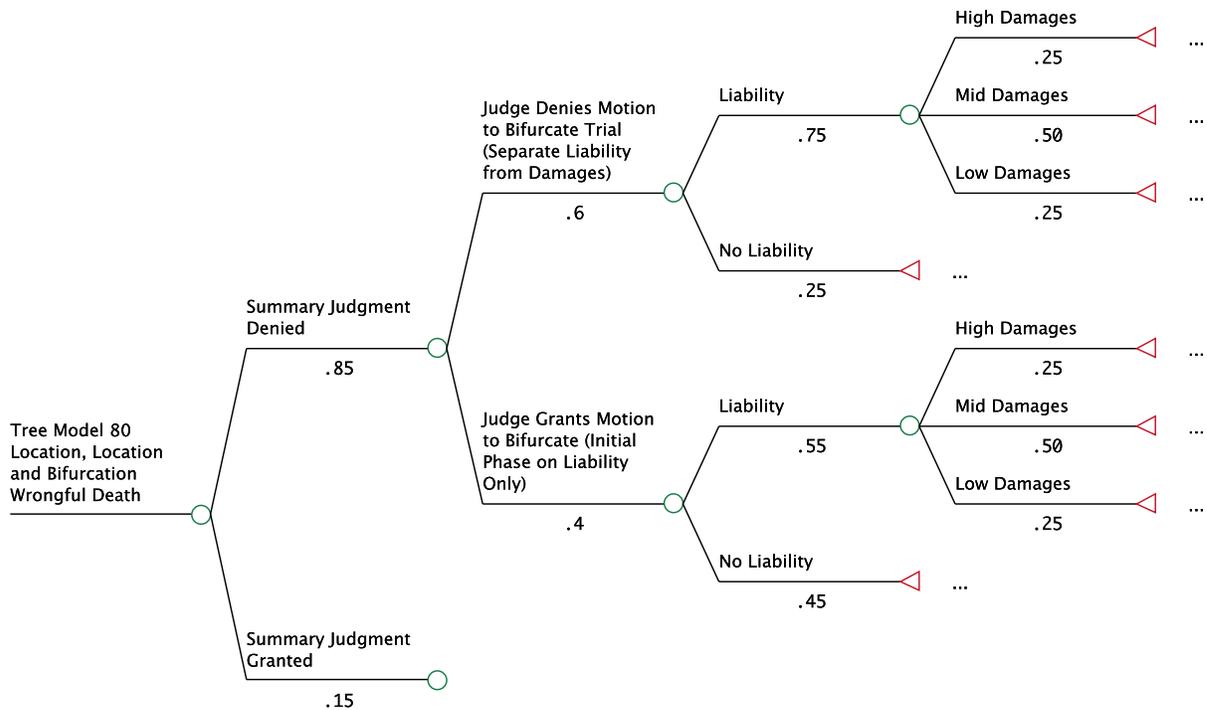
You have estimated an 85% likelihood of surviving summary judgment. You are aware that the defense plans to file a motion to bifurcate the trial, separating liability from damages. You estimate a 60% chance that your opposition to the motion will succeed. Whichever way that goes, the next branches on the tree are the all-important "liability—no liability" branches. What's your estimate of the likelihood of a plaintiff's verdict?

---

Another good resource on expert elicitation is "Subjective Probability and Expert Elicitation," Chapter I-6 in *Best Practices in Dam and Levee Safety Risk Analysis*, produced by the U.S. Department of the Interior Bureau of Reclamation and U.S. Army Corps of Engineers Version 4.0 July 2015, at pages I-6-9—I-6-10, observing the benefits of discussion of experts' subjective probabilities and concluding, "[O]verall, it is better to make the process iterative." This report is accessible at [www.usbr.gov/ssle/damsafety/risk/BestPractices/Chapters/I-0-20150612.pdf](http://www.usbr.gov/ssle/damsafety/risk/BestPractices/Chapters/I-0-20150612.pdf)

<sup>3</sup> Bayes' Theorem and the "base rate fallacy" are acknowledged truths in probability theory. Their application may be an essential element of best practice for estimating probabilities in some legal cases, where sets of directly relevant and reliable statistics are available for particular questions. Because that is not often true, this text provides only a quick summary explanation of Bayes' Theorem and the base rate fallacy. If you believe your case presents an issue and reliable statistical data for Bayesian analysis, I recommend consulting a statistics text or, believe it or not, Wikipedia. This author has taken quite a while to understand Bayes' Theorem and, in that process, has read quite a few texts. I found Wikipedia's treatment of the topic and its examples to be quite well done. Any text on statistics will cover the topic. A useful text for lawyers is also: Blumenthal, Jeremy; Faigman, David; Mnookin, Jennifer; Murphy, Erin; and Sanders, Joseph, *Modern Scientific Evidence: The Law and Science of Expert Testimony* (2014), which includes a discussion of Bayes' Theorem in legal practice.

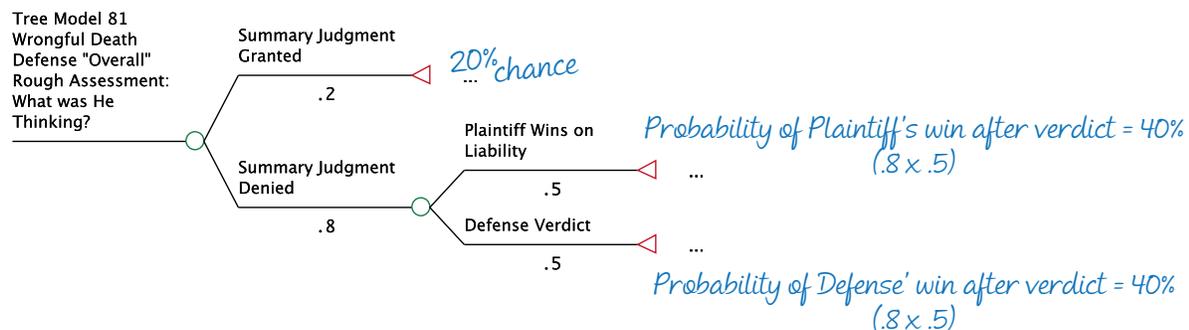
That last one is a trick question, of course. There is no *single* likelihood of a liability finding; each likelihood depends upon its location on the tree. Assume we agree that if the jury hears heart-wrenching damages evidence along with liability evidence, a plaintiff’s verdict is more likely. But, if the jury has no sense of how shattered the plaintiff’s life was after the event, they may be more dispassionate when analyzing the liability question. If your gut says this is true, then you would assign a different probability percentage to the “liability” branch that follows “bifurcation” than to the “liability” branch that follows “no bifurcation,” as reflected on the next tree.



What if this case (bifurcated or not) involves an infant’s wrongful death, and parents’ pain and suffering, emotional distress, and loss of consortium claims arising from a full-term infant’s death during the birthing process. Would the bifurcation decision also impact the range of damages, and the likelihood of punitive damages? Our strong intuition has to be yes. Let’s assume the liability evidence reflects the doctor’s and nursing staff’s inattention to the fetal monitor and inaction until long after the monitor reflected the baby’s distress. Despite defense experts rambling about the standard of care, plaintiff’s experts were unequivocal and effective. Some of that liability evidence may have made the jury’s blood boil (no doubt another reason the defense sought bifurcation). Because of that, when the tree-builder reaches the damages end of the tree, and begins to assign probabilities to punitive damages or award ranges, he must be aware of his location on the tree’s pathways. The probability of punitive damages on a post NO-bifurcation path will no doubt be different than the probability on the bifurcation path. This will depend, of course, on how much evidence the jury will be permitted to hear regarding what happened prior to the infant’s death.

We find a more common example of the importance of remembering your location on the tree when assigning probability to liability AFTER denial of summary judgment. Assume that BEFORE the summary judgment motion was filed, someone asked the defense counsel, “What are the overall chances the plaintiff will win this case?” Let’s assume defense counsel responded, “Only 40%; I think we have some pretty darned strong defenses here. In fact, I see the supporting facts as entirely undisputed. That’s why I’m planning to file a motion for summary judgment.” Now, let’s further assume that the defense loses their motion for summary judgment. Defense counsel has learned some decision analysis in the meanwhile. Would he be wise to stick with that initial, overall 40% assessment as the likelihood of the jury’s liability finding?

The answer, of course, is “it depends.” Did defense counsel’s initial “overall” 40% *include* the chances of the plaintiff getting by summary judgment and the chances of the plaintiff winning at trial? If so, then theoretically, he might have been thinking as shown in the following tree.



Using this construction, plaintiff has an 80% chance of surviving summary judgment and, if that happens, then a 50% chance at trial—his overall chances of winning the entire action would be 40%. If so, then post-summary judgment denial, the plaintiff’s chances would be at 50%.

Of course, if defense counsel initially thought plaintiff’s chances *at trial* were only 40%, he might legitimately stick with that estimate. It’s possible that his summary judgment motion was an after-thought or based on some highly technical grounds.

On the other hand, post-summary judgment denial, we know that a neutral judge has looked at arguments and evidence upon which the defense was relying. If the judge was not impressed, and those arguments and evidence will also be put to the jury, should defense counsel *now* be less confident of escaping liability? It’s entirely possible that, from the hearing on oral argument and reading judge’s opinion, counsel will have gained additional insight into judge’s reactions to the evidence—beyond the mere fact of the motion’s denial. If so, counsel may be wise to re-adjust the probability assigned to liability yet again, in whatever direction indicated. That adjustment would represent counsel’s better-informed estimate of a potential jury’s reaction. Of course, it’s also possible that, the lawyer’s original estimate of the likelihood of the jury finding liability took into account the legal and factual weaknesses, and the possibility that a jury will be sympathetic to the plaintiff. If so, no adjustment is required.

It’s important to remember that, as soon as a summary judgment motion is decided, it should no longer remain as an uncertainty on the tree. Any original estimate of the chances of summary judgment must be removed from a cumulative probability calculation. In essence, once the motion is denied, the

original estimate of the probability of denial must shift to 100%. It's done. The tree should be recalculated without that uncertainty.

### **Affirming the Bedrock of Probability Theory**

A bedrock rule of probability theory is that cumulative probability must be built on independent events. Assume a case in which we estimate an 80% chance of surviving summary judgment, a 60% chance of a liability finding, and a 30% chance that the jury will find fraud as well as breach of contract. In that case, the cumulative probability of the plaintiff winning the case and collecting fraud damages would be  $.80 \times .60 \times .30 = 14.4\%$ .

Using a summary judgment example, some have expressed concern that the overall strength of the plaintiff's evidence may impact both the likelihood of a judge's summary judgment denial and (to the right on the tree) the likelihood of a liability finding.<sup>4</sup> They question whether these two probabilities are independent and thus, whether it is consistent with accepted rules of probability theory to multiply the two numbers to arrive at a cumulative probability.

The short answer is yes, because the likelihood of the judge's ruling does not operate on the jury's liability deliberations. It merely sets the stage, or not.

When a decision analyst constructs a tree *before* any preliminary ruling, he must separately consider the probability of the ruling, and then the probability of post-ruling events. In other words, their probabilities should reflect their location in a separate future world in which the judge has reviewed some evidence and rejected his arguments.

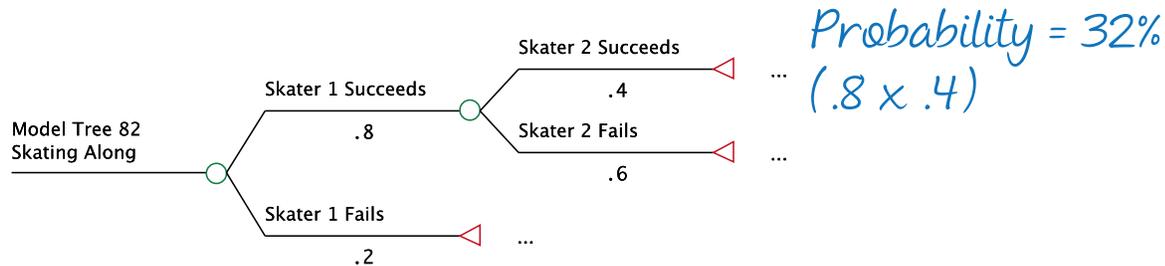
I offer the following abstract physical example to clarify how cumulative probability applies to successive uncertain events, even where common underlying conditions are present that also impact probabilities. Imagine an ice skating rink that is rutted, scratched, and unevenly firm.

- Let's first make a bet on whether an intermediate skater can circle the rink three times, at a minimum speed, without falling. If that skater falls, it's game over.
- But, if the first skater maintains minimum speed and stays upright, we will have the chance to bet on the likelihood of a middle-aged, uncoordinated, novice skater accomplishing the same task.
- If both skaters are successful, we will win. If not, we lose. What are the chances of *both* skaters succeeding?

---

<sup>4</sup> This point and the discussion that follows, including the ice skating rink analogy, can be found in Aaron, Marjorie and Brazil, Wayne, "Shaking Decision Trees for Risks and Rewards," *Dispute Resolution Magazine* 22, no. 1 (2015): 12-18.

Here's what the tree would look like.



The conditions of the rink affect both skaters, no doubt. But, let's also assume that both skaters have skated on this or a similarly imperfect rink before, and we have empirical evidence to the effect that the first skater succeeds 80% of the time, and the second skater succeeds only 40% of the time. What's the likelihood of both skaters succeeding? It still has to be 80% (.80) x 40% (.40), or 32%.

That the conditions of the rink might affect both skaters does not change the independent probabilities of their separate loops around the rink. Probability theory applies: before the game starts, the cumulative probability of both succeeding is 32%.

What if a referee circles the ice rink *before* the game begins, and reports that the ice conditions have deteriorated within the last hour; the surface is even more rutted and bumpy than during the skaters' practice times? We might be prudent to adjust the likelihood for our first skater to 60% and for our second skater to 20%. In that case, the cumulative probability of both skaters' succeeding would be 12%.

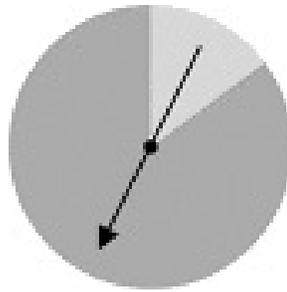
Of course, just as in our motion for summary judgment, if I learn something new about the condition of the ice from the first skater (*after* taking her turn and successfully skating three times around), then I might adjust my estimate for the second skater. The first skater might say: "You know, this rink isn't quite as bad as it was during our practice data gathering runs." At that point, the tree must be modified to take *out* any uncertainty about the first skater's performance. She did it! And perhaps we should adjust our middle-aged skater's probability of success to 40% or 50%, just as our estimated liability chances should perhaps change in the other direction based on a judge's unexpectedly critical evaluation.

### A Note on Round Numbers

One concern with choosing numerical percentages is that people generally prefer round numbers, divisible by 5 or 10. We tend to record a 10% or a 20%, or even a 15% on the Summary Judgment branch, but we're unlikely to record a 13% or a 17% chance. We tend to think first in round numbers. Then, if we feel that 20% might be a "smidge" too high, multiplying by 18% seems much harder than by 20% (even though it doesn't matter for a computer or calculator). When assigning percentages toward the left hand side of a tree—on probabilities of dispositive motions, or even liability—the EMV may be greatly impacted by a two or three percentage point shift from the "actual" internal assessment to a "rounded" number ending in 5 or 0. As we move toward the right hand side of the tree, a round estimate of 20% vs. 22% won't greatly impact the tree's EMV, and may not be cause for concern *unless* the case presents a very wide array of possible outcomes. Imagine a case in which an award of \$30 million (with trebling,

and under a particular damages theory) is possible, but most other awards would fall in the \$2 million to \$5 million range. Applying a probability of 7% vs. 5% or 10% would have a significant impact on the EMV.

The probability wheel is a visual aid that has proven helpful for people seeking to quantify their opinions as to probability.<sup>5</sup> Simply described, it's a pie shaped wheel that allows you to move a pointer so that the wheel shows different colors, until those colors reach the proportion that reflects your subjective probability estimate. It can be particularly helpful for allocating perceived probabilities across more than two branches. Not surprisingly, the TreeAge software includes a probability wheel option. Once you've decided that the pie chart seems right, the software tells you the numerical proportion of the different colors, whether it's 7%, 23.2% or exactly 50%.



PROBABILITY WHEEL<sup>6</sup>

### Prescriptions for Best Practices Premised in Psychology

Earlier in this text, the chapter “Important Interlude: Psychology’s Pernicious Impact on Predictions of Probability and Payoffs” described psychological tendencies toward partisan biases, anchoring and (insufficient) adjustment, and the representative heuristic. These motivate the practical prescriptions set forth below for the decision analyst, whether a consultant or a lawyer applying the method in a client’s case. Their primary goals are to reduce partisan biases, avoid anchoring to biased or inapplicable reference points, and diminish or eliminate the impact of the representative heuristic when estimating probabilities or dollar consequences at any location on the tree.

### And/Or, With the Opposite First

An important and practical way to diminish partisan perception bias when estimating probabilities or dollars is to deliberately and separately list the factors—facts and legal arguments—that cut against and in support of the desired outcome at key chance nodes.<sup>7</sup>

<sup>5</sup> See discussion of probability wheels and other visual aids in Garthwaite, Paul; Kadane, Joseph; and O’Hagan, Anthony, “Statistical Methods for Eliciting Probability Distributions,” *Journal of the American Statistical Association* 100 (2005):680-701, which references earlier research discussing “some success” with probability rules.

<sup>6</sup> See Victor, Marc; Glidden, Craig; Lea, Clyde; and Whitworth, J. Bryan, “Evaluating Legal Risks and Costs with Decision Tree Analysis,” *Successful Partnering Between Inside and Outside Counsel* (2000): 10.

<sup>7</sup> Victor, Glidden, Lea, and Whitworth, 12-8—12-9. See also DeGroot, John, “Advanced Decision Tree Analysis in Litigation: An Interview with Marc Victor, Part I” *Settlement Perspectives* (2009), [www.settlementperspectives.com/2009/07/advanced-decision-tree-analysis-in-litigation-an-interview-with-marc-victor-part-i/](http://www.settlementperspectives.com/2009/07/advanced-decision-tree-analysis-in-litigation-an-interview-with-marc-victor-part-i/).

Marc Victor, founder of Litigation Risk Analysis, Inc., strongly suggests (and this author agrees) that such lists be drawn out at an early stage of the problem and ideally even before determining probabilities for a decision tree. Below is his example of a chart listing factors that would affect the chance of a jury finding a “breach of covenant of good faith and fair dealing” (in a hypothetical lawsuit between Joe and Larry).

**Will jury find Larry breached implied covenant of good faith and fair dealing  
by opening all those franchises?<sup>8</sup>**

Reasons Jury <b>Does</b> Find Breach	Reasons Jury Does <b>NOT</b> Find Breach
<ul style="list-style-type: none"> <li>• thinks Larry was outrageously greedy</li> <li>• thinks he was far more interested in his own personal profit than the health or survival of any of his franchisees</li> <li>• as a result, he killed the goose that laid the golden eggs</li> <li>• no single franchisee would have ever anticipated having to compete with so many other franchisees <i>on the same block</i></li> <li>• especially given the sizeable investment Joe had to make to get into the business</li> <li>• Larry does not make a good witness— comes off as arrogant, someone who can do no wrong</li> <li>• judge’s explanation of an “implied covenant of good faith and fair dealing” will sound pro-plaintiff</li> <li>• might think this is a compromise: less severe than saying Larry defrauded Joe, but Joe didn’t end up with the business he expected at the outset</li> </ul>	<ul style="list-style-type: none"> <li>• nothing in the agreement said Larry couldn’t open as many locations as he wanted</li> <li>• if Larry can show that other franchisees with similar competition continued to profit after Joe began to struggle</li> <li>• Larry will testify that it was having an outlet on every street corner that made the system successful for everyone</li> <li>• if it weren’t possible to make a profit with so much competition, there would not have been the continued demand for additional franchises in locations already served by several</li> <li>• the real problem was that Joe was a bad manager to begin with, and then paid little attention to the franchise after coming into his inheritance</li> <li>• to get to this part of the tree, the jury didn’t believe Larry committed fraud, so must not have hated Larry</li> </ul>

The next two trees, also by Marc Victor,<sup>9</sup> reflect the way these positive and negative factors might be listed and arranged under each branch following a chance node.<sup>10</sup> The first tree analyzes factors potentially impacting a liability finding and thus the lawyer’s estimate of the likelihood of liability. The next tree depicts various ways damages might unfold, with a list of positive and negative factors at the chance node.

<sup>8</sup> This chart can be found in Victor, Calihan, and Dent, “The Role of Risk Analysis in Dispute and Litigation Management,” 19.

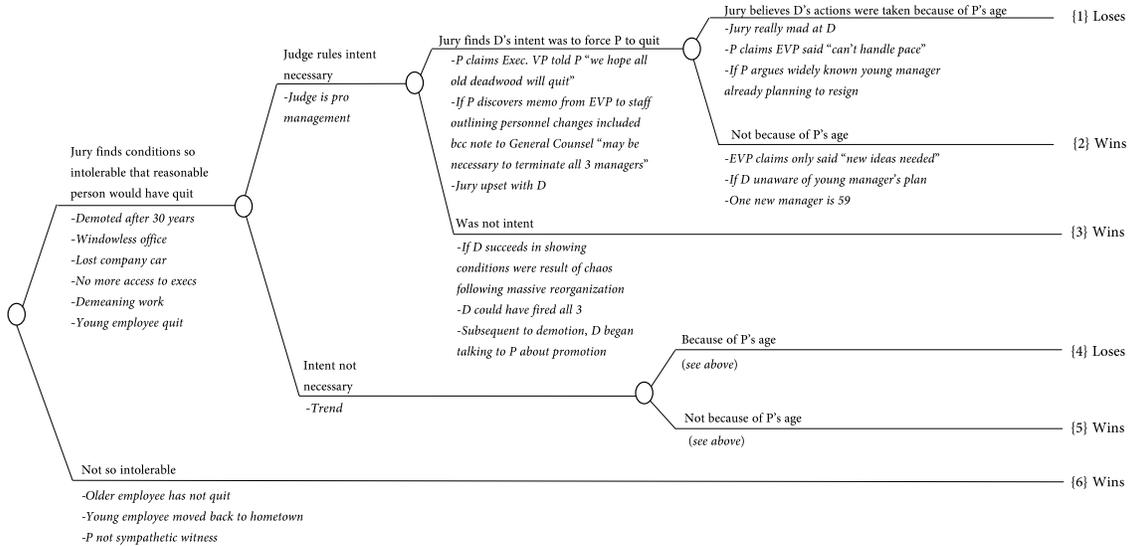
<sup>9</sup> These trees can be found in Victor, Marc “Litigation Risk Analysis and ADR,” *Donovan Leisure Newton & Irvine ADR Practice Book*. (1990): Figures 17-3 and 17-4 at 314-315.

<sup>10</sup> In fact, the TreeAge decision analysis software includes an option to create a list of plus and minus factors at each chance node.

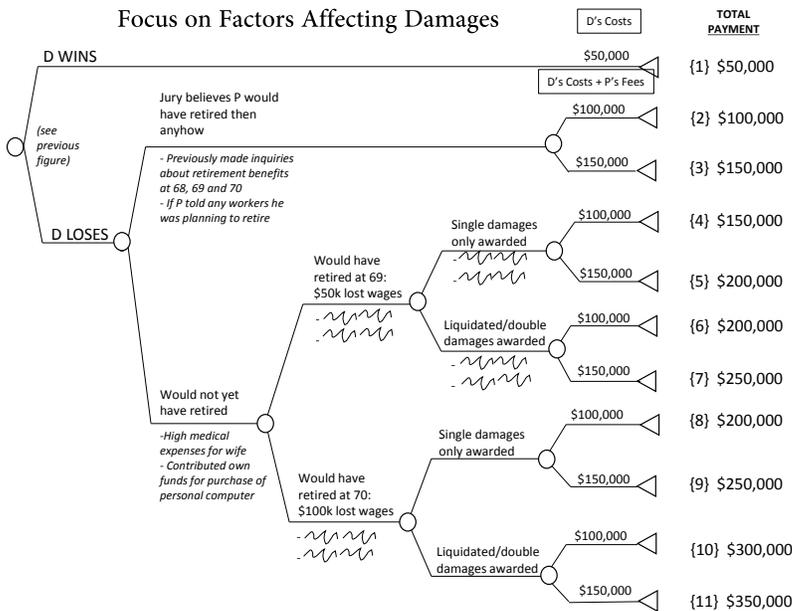
Realistic Evaluation of Weaknesses as Well as Strengths

[Focus on Factors Affecting Liability]

EMPLOYER



Focus on Factors Affecting Damages



Order does matter. Research strongly supports the practice of FIRST creating a list of factors that cut against your desired outcome—the minuses (-)—and NEXT the factors that favor—the pluses (+). Partisan biases are mitigated when one is forced to list and consider unwelcome realities that might otherwise be forgotten, ignored, or discounted.<sup>11</sup>

After listing first the unfavorable and then the favorable factors, estimate the probability of the most undesirable result, with the remainder (from 100%) left applied to more desirable results. For the visual among us, this also works very well on the probability wheel.

### Avoiding Biased Anchors and the Representativeness Heuristic

As discussed above and in the “Interlude on Psychology,” we know that partisan biases often lead us to be over-confident, and to miss or discount information or argument that cuts against our desired result. When undertaking decision tree analysis in a legal case, we are also expected to estimate probabilities that reflect the discovery of facts, documents, and arguments as the case develops. Unfortunately, anchoring is a powerful force. We know there’s a strong tendency to anchor on original assessments (that may have been biased in the first place) or even on circumstances—other case outcomes—that are largely irrelevant. And, we know that our probability estimates tend to be influenced by the “representative heuristic”—similarity of our case and its characters to certain well-known types. The following prescriptions for best practices in estimating probabilities are aimed at reducing or eliminating tendencies toward over confidence, bias, biased anchoring and the representativeness heuristic.

- Introduce external NON-biased anchors in the form of “base rates” (as discussed in the next section).
- Introduce multiple anchors and numerical information, to offset or balance biased anchors when assigning values to the tree (even if research suggests that multiple anchors aren’t as effective as we might hope).<sup>12</sup>
- Encourage initial selective information processing from the perspective *opposite* to that of the lawyer’s natural bias. In other words, focus first on evidence and arguments that support the other side. (Yes, this same advice was offered for reducing partisan biases in the first place—not just anchoring to biased reference points).<sup>13</sup>
- Consider and discuss the widest possible range of outcomes.
- Refresh your awareness and educate your client with some thoroughness regarding the power of anchoring. Research suggests that comprehensive awareness of anchoring may reduce but not

<sup>11</sup> See Koriat, Asher; Lichtenstein, Sarah; and Fischhoff, Baruch, “Reasons for confidence,” *Journal of Experimental Psychology: Human Learning and Memory* 6 (1980):107-118; cited in Lichtenstein, Sarah; Fischhoff, Baruch; and Phillips, Lawrence, “Calibration of probabilities: The state of the art to 1980,” in Kahneman, Daniel; Slovic, Paul; Tversky, Amos (eds.), *Judgment under uncertainty: Heuristics and biases* (1982): 321.

<sup>12</sup> Unfortunately, a study in a negotiation setting indicated that availability of more appropriate anchors did not significantly limit the influence of less reliable anchors, regardless of the level of experience for both individual and group-based decision making. Whyte, Glen and Sebenius, James, “The Effect of Multiple Anchors on Anchoring In Individual and Group Judgment,” *Organizational Behavior and Human Decision Processes* 69, no. 1 (1997): 74-85.

<sup>13</sup> See Flannelly, Laura, and Flannelly, Kevin. “Reducing People’s Judgment Bias About their Level of Knowledge,” *The Psychological Record* 50 (2000): 592.

completely eliminate its influence; a simple warning alone is unlikely to overcome it.<sup>14</sup> Hence this text's somewhat lengthy discussion of the topic!

- Spend adequate time thinking through your judgment. Rushing causes us to fall into an "estimation trap" and enhances our tendency to anchor.<sup>15</sup>
- Take care to differentiate irrelevant anchors from more appropriate ones.<sup>16</sup>

In service of this advice, the next section is an elaboration on base rates, for those eager to adopt the first bullet point suggestion. Further explanation and discussion of how these various prescriptions may play out in practice are set forth after that.

### Elaboration and Ode to Probability Base Rates—Even if Elusive<sup>17</sup>

If anchoring to a starting point is inevitable, it makes sense to seek a neutral, unbiased one.

Therefore, when possible, a best practice for the decision-analyst lawyer is to start with the "base rate" when assigning probabilities—the average % of success for this type of motion or this type of jury trial. Assume you are working on a decision tree in an employment case, and you are seeking to estimate the likelihood of summary judgment for the defense. The base rate might be the percent of summary judgment motions decided for the defense in all employment cases in that federal circuit, in that federal district court, or by the assigned judge over a certain period of time. It makes sense to narrow the research to the decision-maker—the judge. The danger, however, is that the judge's total summary judgment rulings in employment cases might be too small to have any substantial predictive value. As we know, all cases are different. If the judge had heard and ruled upon, say thirty or forty plus similar cases, the overall percentage would have more meaning.

From a statistical perspective, the question of what is a sufficient number of summary judgment rulings or jury verdicts from which to derive a reasonable base rate is not as straightforward as one might think. The "Law of Large Numbers"<sup>18</sup> confirms what we intuit: larger numbers in the data pool would

<sup>14</sup> George, Joey; Duffy, Kevin; and Manju, Ahuja, "Countering the Anchoring and Adjustment Bias with Decision Support Systems," *Decision Support Systems* 29, no. 2 (2000):195–206.

<sup>15</sup> Smith, Andrew and Windschitl, Paul, "Biased Calculations: Numeric Anchors Influence Answers To Math Equations," *Judgment and Decision Making* 6, no. 1 (2011):139–46.

<sup>16</sup> As suggested by Whyte and Sebenius, "The Effect of Multiple Anchors on Anchoring in Individual and Group Judgment," 74-85.

<sup>17</sup> As discussed herein, most people ignore overall probabilities or "base rates" when estimating probabilities. Yet, Bayes' Theorem establishes quite clearly and mathematically that accurate probabilities are dramatically affected by base rates. Thus, probability estimates of those who ignore base rates are inevitably inaccurate. Their estimates will be far from what would be mathematically, accurately derived using Bayes' Theorem.

Explanations of the base rate fallacy and Bayes' Theorem abound in the literature of quantitative analysis, statistics, and to some degree psychology which offers the representativeness heuristic as an explanation for our flawed probability assessments. See Chapter Nine for discussion of the representativeness heuristic. Wikipedia contains quite a clear explanation of base rate fallacy, also called base rate neglect or base rate bias, as a formal fallacy. When presented with related base rate information (i.e. generic, general information) and specific information (information only pertaining to a certain case), the mind tends to ignore the former and focus on the latter. Wikipedia's drunk driving and breathalyzer example for base rates, used in this text, are at [www.wikipedia.org/wiki/Base\\_rate](http://www.wikipedia.org/wiki/Base_rate).

<sup>18</sup> Some would say that 25 cases would be sufficient. Explanations of the "Law of Large Numbers" and other concepts in statistics that bear on this discussion are readily available in just about any introductory statistics text.

be better. In truth, the “Law of Large Numbers is directed at circumstances where the means (averages) from each of many relatively small samples can be predicted to follow a “normal distribution curve.” The minimum number of samples required is generally said to be about thirty. At that point, the means of all of the sample means would be about the same as the mean of the entire larger data pool. We can use this idea to find out whether a particular judge’s percentage of summary judgment denial is predictably and significantly different than the rulings of a larger group of judges. Assume that available data tells you that only 20% of 150 summary judgment motions filed in age discrimination cases in the Sixth Circuit were granted. If your assigned judge granted 40% or even 30% of those motions in the thirty such cases assigned to her, it’s fair to conclude that this variance is not a matter of chance.

This author does not claim expertise in statistics or data science. For the decision analysts of similar ilk, my practical advice to take base rates from the largest data pool that is relevant and accessible. A lawyer with an age discrimination case might check all age discrimination cases in that federal court, or in the Circuit. He might also look to all employment discrimination cases heard by the particular judge, if the question is the likelihood of summary judgment. However, if the assigned judge has heard summary judgment motions in fewer than twenty-five or thirty age discrimination cases, it’s not wise to put too much weight on the percentage of motions granted or denied. Instead, we might note that the judge has heard sixty or more employment discrimination cases (of all types), and granted summary judgment in 50% of those, in a Circuit where the overall summary judgment rate is only 25%. It would then be fair to assume a higher likelihood of this judge granting summary judgment. We might use 50% as our base rate on summary judgment for this judge. On the other hand, if the entire Circuit’s rate for summary judgment over 150 age discrimination cases is only 15% (lower than the 25% for all employment cases), we might adjust our 50% base rate down by an equal proportion.

Another statistic that might serve as a neutral anchor is the overall percentage of summary judgment motions granted in the jurisdiction. The database would inevitably be larger than that generated by a single judge. But it may be less predictive, as it encompasses several judges, all of whom may have different judicial philosophies regarding dispositive motions. Or, the decision analyst might seek to find and use the overall percentage of summary judgment motions granted by so called “conservative” or “liberal” judges—if the assigned judge clearly falls into either category.

### **Data Sources for Deriving Base Rates<sup>19</sup>**

Most federal and state courts publish data online regarding case filings and settlements. The data are organized in different ways, but are often searchable for percentages of motions granted, liability verdicts,

---

One text that seeks to discuss statistics for lawyers is Jackson, Howell; Kaplow, Louis; Shavell, Steven; Viscusi, W. Kip; and Cope, David, *Analytical Methods for Lawyers* (2003): Chapters 8 and 9. [Note that this text does contain a chapter on decision tree analysis for lawyers. However, it’s fair to say that their approach to the topic is more of an introductory overview than that in this text.]

<sup>19</sup> Once again, Professors Heather Heavin and Michaela Keet at the University of Saskatchewan College of Law’s excellent article: “A Spectrum of Tools to Support Litigation Risk Assessment,” *Canadian Journal of Law and Technology* 15, no.2 (2017):265-293, has been invaluable here. Their article confirmed some sources we had found and alerted me to others; their assessments of the various database sources has been integrated into the discussion here, with much appreciation.

and so forth.<sup>20</sup> FedStats is a portal to statistics collected by the federal government. It contains relevant statistics on legal cases for state and federal courts, jury and bench trials and appeals, beginning in 2005.

Free access to a database of U.S. cases is available through the “Caselaw Access Project,” originally a collaboration between Harvard Law School and Ravel Law, which has digitized Harvard’s entire collection of U.S. case law.<sup>21</sup>

Not surprisingly given our recent global focus on data, a number of for-profit companies have developed products that capture and offer searchable data on court outcomes and judicial decisions.

Legal data analytic software and database products include<sup>22</sup>:

- LexisNexis’ Legal Analytics Suite, including the MedMal Navigator, the Lexis-Nexis Verdict & Settlement Analyzer, Ravel Law, and Lex Machina, all of which fall under Lexis Litigation Profile Suite® and Lexis Advance®

It seems fair to say that LexisNexis is seeking to establish itself as the market leader for legal “data analytics,” including data bases responsive to a wide array of questions. They began in 1990 with the LexisNexis Verdict and Settlement Analyzer.<sup>23</sup> This widely accessible research tool enables users to derive useful “base rates” in most civil cases and to see verdict and settlement data for (only) U.S. state and federal cases and to find averages or medians by jurisdiction or type of case over lengths of time.

LexisNexis expanded its Legal Analytics Suite of Products by purchasing the two<sup>24</sup> significant “start-up” litigation data analytics companies and their products: Lex Machina and Ravel Law. Originally created for IP users, Lex Machina’s Legal Analytics program<sup>25</sup> offers data bases and search capabilities in U.S. based securities, copyright, trademark, and antitrust litigation,

---

<sup>20</sup> PACER contains court documents and record from U.S. federal courts, USPTO from the U.S. Patent and Trademark Office, and EDIS documents relating to U.S. International Trade Commission investigations.

<sup>21</sup> See the description of the Case Law Access project at Harvard’s Library Innovation Lab at: <http://etseq.law.harvard.edu/2017/01/caselaw-access-project-scanning-now-complete/> as well as the blog announcement of completion of the digitization project at: <http://etseq.law.harvard.edu/2017/01/caselaw-access-project-scanning-now-complete/> Note also that Ravel Law is now under the Lexis Nexis umbrella.

<sup>22</sup> At some point, your author aspires to a full blown set of product reviews of these various databases and search engines from the perspective of a decision tree analysis. Given the very current changes, mergers and likely new entries into the field, it makes little sense to attempt this within a static text. This would be more appropriate for a future, web-based platform of this project.

<sup>23</sup> In 2015-16, University of Cincinnati College of Law Senior Research Librarian James Hart as well as the author’s Research Assistant, Mrs. Lindsay Stueve at the College of Law, investigated various on-line verdict data sources and concluded that LexisNexis’s Verdict Settlement Analyzer had the most robust and easily searchable database at the time. This is likely to have been advanced by the LexisNexis acquisitions described above. As Ms. Stueve noted, “extrapolating base rates from LexisNexis’s tool can provide, at first, a visible starting line, and at least, a security blanket.” James Hart gets full credit for the broader, updated search for and evaluation of other data offerings.

<sup>24</sup> It is fair to predict that this discussion of available databases and search and analytic platforms will be incomplete and possibly inaccurate by the time the reader encounters it. New providers entered the for-profit market and new, publicly accessible data bases became available or expanded as this manuscript was being written; no doubt others will be added and some may fail as time goes by. Thus, readers in search of data bases and analytical services are encouraged to look beyond the resources listed here.

<sup>25</sup> Lex Machina’s website, prior to its purchase by LexisNexis, offered access to and presumably, analysis of motions and arguments that have been successful (or less so) before particular judges.

and, more recently, bankruptcy commercial transactions, employment and product liability. Lex Machina operates as a stand-alone entity within LexisNexis Legal & Professional offerings.

With the acquisition and integration of Ravel Law's original "Court Analytics" program, LexisNexis Litigation Profile suite of products enables users to "identify patterns in language and case outcomes" to evaluate millions of court decisions.<sup>26</sup> At the time of this writing, Ravel is a premium feature (and subscription) within LexisNexis' available products. Ravel users can search case law by court, motion types, keywords, and topics; predicting outcomes based on courts' and judges' past rulings, identifying key cases, standards, and language more salient for particular courts, and analyzing a judge's responses to certain types of motions<sup>27</sup> and data. Ravel's product description claims that it offers enhanced capacity to predict the type and style of motion likely to succeed before a judge, the litigation behavior patterns of law firms, lawyers, and parties, and potential damages ranges.

- Docket Navigator describes itself as a "professionally curated litigation intelligence platform."<sup>28</sup> Originally focused only on patent litigation, it has expanded to cover trademark, copyright and antitrust litigation. It claims to have the most extensive patent litigation database available, and to track significant events "in every case, every day" in all "patent infringement case in the U.S. district courts, patent infringement investigations in the ITC, and every IPR and CBM proceeding in the PTAB." It claims to be organized to enable "data-driven decisions" and comparisons of "outcomes of litigation strategies across different types of proceedings and different judges or courts," including "factors that influence judicial decision-making, behavior patterns of companies in litigation, and events that impact the litigation schedule and budget."
- Bloomberg Law's new Litigation Analytics Solution offers searchable data from federal cases only and appears focused on judicial behavior, from decisions on various types of motions, responses to different companies, law firms, and docket timing.
- Westlaw Case Evaluator (and its Report Builder) is also a credible source for averages, medians and range. However, Westlaw's data collection began at different times in different states and does not come from consistent sources. On the other hand, Westlaw Next offers a Litigation Quantum service (also available in Canada) featuring data from trial and appellate decisions.
- Loom Analytics, a Canadian company founded in 2016, also offers statistical information on motion and trial outcomes, narrowed to jurisdiction, court, and judges in Canada.

---

<sup>26</sup> The text describing Ravel Law's Court Analytics and Case Law Access Project is quoted or largely paraphrased from its website, prior to its purchase by LexisNexis: [www.ravellaw.com](http://www.ravellaw.com) and December 5, 2016 press release, by Marketwired citing Ravel Law as its source: [www.marketwired.com/press-release/ravel-law-launches-new-analytics-for-us-court-system-2180699.htm](http://www.marketwired.com/press-release/ravel-law-launches-new-analytics-for-us-court-system-2180699.htm).

<sup>27</sup> While your author is determined against product endorsements, the ability to quickly see how a judge or court has decided different types of motions would be quite helpful for considering probability percentages for a decision tree. In my limited experience with a few of these databases, certain types of litigation data are easier to find than others.

<sup>28</sup> The language in this paragraph is either directly quoted or paraphrased from the company's website, [docketnavigator.com](http://docketnavigator.com). Full credit for reference to this resource is due to the author's former student and patent attorney, John Bennett, who uses decision analysis in his practice and uses Docket Navigator's data to determine the base rates for estimating probabilities.

For readers who represent a large repeat player in litigation: it does appear that some large organizations track data from their litigation experience over time and in different jurisdictions. Indeed, years ago, working as a mediator with a large insurance company and with a self-insured railroad, I learned that they tracked data on settlements and verdicts. As data tracking and analysis are more easily accomplished, it makes sense for a business to do so for the purpose of predicting future outcomes.

### **Caveat and Advice for Using LexisNexis Verdict and Settlement Analyzer**

For the reader who might plan to start with the widely accessible *LexisNexis Verdict and Settlement Analyzer* (or a similar database), a word of caution is in order. Note that this Analyzer only provides straight percentages of plaintiff or defense verdicts within the broader array of percentages of case outcomes including settlement, mediation, or “other verdicts.” The decision tree analyst, at least for pure litigation risk analysis, must set aside “settlement, mediation, or other verdicts.” The question for which the decision analyst lawyer seeks a base rate is, “When and only when similar cases have gone to trial, what have been the percentages of jury verdicts for the defendants and plaintiffs?” Thus, the base rate for liability must be the percentage liability as a proportion of total plaintiffs’ and defense verdict percentages.

By way of illustration, assume that we want to know the base rate for liability findings among age discrimination cases<sup>29</sup> that have gone to trial in federal courts within a certain time period (from January 1998 to December 2017). The *LexisNexis Verdict and Settlement Analyzer* tells us that 25.73% of these cases ended in a plaintiff’s verdict, 29.01% in a defense verdict, and 10% in “other” verdicts. The balance was coded as ending in “arbitration,” “mediation,” “settlement” (presumably direct settlement) or “unknown.”

To derive the base rate for liability verdicts among age discrimination cases that went to trial (and not counting “other”), one would find percentage for:

$$\begin{array}{r} \text{plaintiff verdict (25.73\%)} \\ \text{defense verdict (29.01\%)} + \text{plaintiff's verdict (25.73\%)} = \end{array} \begin{array}{r} \underline{.2573} \\ .5774 \\ \hline .2573 \div .5774 = 47\% \end{array}$$

Theoretically, when the probability to be estimated is the likelihood of a jury verdict on liability in an employment case, the average percentage within the jurisdiction makes more sense—either the circuit or the district. Where the states within a circuit are vastly different—more or less rural or conservative—and have very different liability percentage findings, it would make sense to look to data within the district or state. And of course, you might want to limit your search to the past few years.

Unfortunately, narrowing a search by using more filters in the Verdict and Settlement Analyzer (or similar program) creates a smaller data pool. As discussed earlier, the smaller the data pool, the less statistically reliable your results.

Users should be aware of the fact that if you are also using the dollar verdict outcomes to get a sense of “high, medium and low” ranges, smaller data pools are more susceptible to undue influence from outliers or extreme verdicts. On the other hand, it’s not necessarily wise to completely discount the very

<sup>29</sup> Based on filtering the data from federal courts applying the search term “(age w/3 discrimination).”

high end or low numbers, as even a small data pool reflect a potential reality. After all, at least one jury handed down this very high or very low verdict. However, that fact provides little reliable insight into the likelihood of its future recurrence.

While jury verdict and settlements are also available through various on-line providers, it is important to determine whether these are comprehensive, or whether they rely on self-reports by counsel. Fortunately, while self-reported results were often the norm twenty years ago, more robust databases of case results have become widely available in recent years.

### **Prescriptions in Practice, First With and Then Beyond Base Rate Advice**

Assume that the decision analyst lawyer is working on an employment discrimination case, assigned to a highly experienced federal district judge with long tenure on the bench. He has ruled on more than 100 summary judgment motions in employment discrimination cases over the past ten years. He has rarely been reversed; the last time was seven years ago. Overall, he grants the defense's summary judgment motions 20% of the time. It makes sense for a decision analyst to take on that 20% as a neutral anchor. He might put it "in pencil" on the tree, and begin with it when asking his defense counsel colleague and client what their best estimates are of the likelihood of summary judgment.

The dialog might be:

Decision analyst: "Let's consider your best estimate of the percent likelihood of summary judgment here. We know that this judge has granted 20% of the summary judgment motions in employment discrimination cases before him. Of course, all cases are different. And this case may be stronger or weaker than average as to the arguments on summary judgment—how clear the facts are, what factual disputes the plaintiff's attorney will raise. The question is how much?"

Lawyer: "Well, this one is really strong. The plaintiff's lawyer will try to blow some smoke to conjure a factual dispute, but they'll be hard pressed to find materiality."

Decision analyst: "Just as usual. And yet, 'usual' gets us a 20% chance with this judge? So how much stronger?"

Lawyer: "This one is almost twice as strong, well not quite... say 45% - 50% or 55% chance of summary judgment instead of the usual 20%."

Decision analyst: "I can see that you're saying this case is far better than average. Do you really think it's more than twice as strong? Remember that lawyers who file motions for summary judgment are saying, in good faith, that they believe summary judgment is warranted, based on the facts and the law. Where material facts are plainly in dispute, the motion isn't filed. Yet, even where the moving parties' lawyers have put forward what they see as credible good faith arguments for summary judgment, it's granted only 20% of the time.

If the 'base rate' or the average is 20%, would you say this case is twice as strong as the average—moving it from 20% to 40%? Or is it half again as strong as the average case—which would be a 30% chance? If you think about it in those terms, what's your best gut estimate?"

Lawyer: "I see your point. If the average is 20%, then 45% - 55% may be more optimistic than realistic. Let's go with a 30-35% estimate for the decision tree, at least for now. Though, at some point, I may be interested to see what happens if we go back to 45% or a bit higher."

It's easy to imagine how, without the neutral anchor at 20%, this dialogue might have been quite different, ending with a very different estimate. We'll never know, but the confident lawyer might have said, "I think we have an 80% chance of summary judgment—the facts are so strong." After some discussion of the issues, perhaps an adjustment would be made to 60% or 65%.

Perhaps the dialogue would have sounded like this:

Decision analyst: "What do you think are the chances that the judge will grant your summary judgment motion?" [Note the open question—without initial reference to any % number.]

Lawyer: "We have a VERY strong argument that any so-called disputes over facts are illusory, and more important, irrelevant under the legal standards. I'd say we have an 80% chance."

The decision analyst might then have simply put 80% on the tree. Or, suspicious that partisan perception bias was running strong, he might have attempted to persuade the lawyer to adjust his estimate, as follows:

Decision analyst: "Yes, I've read the draft brief, but I wonder whether the judge might just decide to throw this one to the jury, if there's any doubt. He may not want to risk reversal. And, given his political leanings, he may favor giving the plaintiff a shot, or pressuring us to settle higher by denying our motion. Yes, the plaintiff is blowing lots of smoke. But what about their second argument regarding the experts' disagreement?"

Lawyer: "Yes, I suppose, 80% may overstate it, but it's still a strong motion. Let's say 65%."

The 80% figure has become an anchor, and while discussion and reconsideration may prompt adjustment from the anchor, research indicates that these adjustments are unlikely to be sufficient. They will not get to the same 35%-40% or so as the decision analyst and his lawyer client who began with 20% as the anchor."

Speculation in a fictional case? Yes. But it sounds all too plausible. Of course, the same anchoring and insufficient adjustment occurs with damages estimates as well. Here too, best practice is to check the base rates for damages awards as neutral anchors, where available, and take adequate time and care when performing calculations. Do remember to try to check your own biases in the process.<sup>30</sup>

The critical reader might concede the research finding that we tend to adjust insufficiently from anchors, and then push the question: "Who is to say that starting at 20% and ending at 35% or 40% is superior to starting at 80% and ending with a 60% or 65% estimate of success on the motion? Do we really *know* that the lower % is more accurate for this case? What gives our 20% anchor privileged status?"

The response goes back to research regarding partisan perception bias. We operate under the assumption that the lawyer's 80% estimate was affected by his partisan bias. The base rate may not be perfectly applicable, but it is not colored by bias. Indeed, it captures what a neutral decision maker—judge or jury—has done, on average and over time, in somewhat similar circumstances. It seems wiser to make adjustments made from a well-chosen base rate to legitimately account for differences in the cases.

### Challenges of Choosing or Deriving the Base Rate

Obviously, the decision analyst should avoid biased selection of more favorable base rates. Imagine a pending summary judgment motion against an age discrimination claim. Assume that, in a particular circuit, overall summary judgment rates are 15%. However, summary judgment rates in all employment

<sup>30</sup> Smith and Windschitl, 139–46.

discrimination cases are 25% and in age discrimination cases, 30%. Examining the data more carefully, the decision analyst finds that the assigned judge has granted summary judgment in all cases at the rate of 17%—close to the 15% overall percentage. However, in the last five years, over sixty cases, he has granted summary judgment against the plaintiffs in discrimination cases 50% of the time, including 40% of fifteen age discrimination cases. Which base rate should be used as the anchor?

As discussed earlier, the problem with the 40% statistic is that it's based on a small number of cases. As matter of statistics, it might make sense to use 50%, as that derives from a larger data set. On the other hand, one could argue that 40% makes sense; perhaps it indicates that this judge “disfavors” other types of discrimination claims. Or perhaps it would make sense to imagine the base rate is 45%. Or, because the data set is larger, perhaps the overall summary judgment rate of 25% in employment cases or 30% in all age discrimination cases makes sense.

In short, finding “best” base rate is far from an exact science, and it's even more challenging with imperfect access to imperfect data.<sup>31</sup> Let's remember that the base rate merely begins the discussion. Its purpose is to reduce bias in a lawyer's necessarily subjective assessments. Base rates become reference points, or neutral anchors for discussion. Counsel will and should consider ways that the particular case is “above average” or “less certain than usual” and adjust accordingly.<sup>32</sup>

Back to the practical: How can a decision analyst legitimately use a base rate in building a tree or discuss his analysis with a client? You might simply insert it into discussion when seeking to estimate a probability, as an unbiased anchor. In other words, when considering the chances of dismissal on summary judgment in *this* age discrimination case, you might first reference the base rate of X%, for summary judgment in this Circuit for the last five years, and Y% for your assigned judge. Nowhere is it written that you must use either of these numbers in the decision tree for this case. Every case is different. But you would be advised to consider the reasons this case is “better than average,” and how much better. Force yourself to justify movement away from the unbiased anchor.

An alternative (and interesting) way to use the base rates would be to construct a tree using base rates wherever available, typically on the question of summary judgment and overall liability, and simply “plug-in” 50% for any other significant uncertainty point. Roll back the tree to find the EMV and the cumulative probabilities of each outcome. This exercise would theoretically describe the hypothetical, “plain vanilla” average case of its type. That might serve as an anchor, a neutral reference point against which lawyer and client could compare this real case's estimated probabilities, predicted outcomes, and roll back analysis.

### **Squaring Statistics With Sensible Simplification and Slimmer Trees**

As indicated earlier, logically and visually, it makes sense to simplify a tree by merging different possible paths that all lead to the same results. Imagine that the lawyer sees three distinct and independent theo-

---

<sup>31</sup> As discussed in Chapter 9, statisticians utilize Bayes' Theorem which mathematically adjusts from a base rate of probability, accounting for the new evidence or unique conditions of a particular case, to estimate the probability of the same result occurring in that case. Edward K. Cheng, a Professor of Law at Vanderbilt Law School, discusses Bayes' Theorem in Chapter 8 of his as yet unpublished textbook on statistical concepts for lawyers and additionally stresses the importance of considering reliable base rates, when available, in estimating probabilities.

<sup>32</sup> Fischhoff, Slovic, and Lichtenstein, “Fault Trees: Sensitivity of Estimated Failure Probabilities to Problem Representation,” 330-334; cited in Garthwaite, Kadane, and O'Hagan, 682.

ries or findings by which a judge or jury could arrive at the same liability and damages award. Logically, all the tree builder needs to know and the lawyer needs to assess is their joint probability—what is the likelihood that at least one of these theories will prevail? He need not think about which theory it will be.

The field of psychology advises caution and a different approach. Research indicates that when people are asked to assess the chances that X could happen as a result of A, B, or C (all possible, but independent), they tend to provide a lower aggregate probability than if asked to separately assess—disaggregate—the probabilities of A, B, or C. In the classic study<sup>33</sup> of the effect of disaggregation, expert car mechanics were asked to assess the probability that a car would not start for *any* reason other than battery, engine, or fuel system. The average probability assessed was 22%. However, when they were asked to assess specific possible reasons: failure of ignition system, failure of the starting system, etc., and those probabilities were combined, the average total probability was 44%. In fact, a generous body of research establishes that “the sum of separate probability assessments for constituent hypotheses generally give a much larger probability than a single probability assessment of the combined hypothesis that they form.”<sup>34</sup> Thus, decision analysis scholars seem to agree that “disaggregation of an elicitation problem holds the potential for significantly improved performance on many assessment tasks.”<sup>35</sup>

For our purposes, this finding offers a way to use best practices in assessing probabilities as well as constructing trees. When mapping a legal case that involves multiple separate and independent ways to get to exactly the same point—be it a ruling on a motion, or a finding on liability and damages—the tree builder and lawyer should separately assess their probabilities, and add them. If it is useful, a chart or set of branches might be created showing each separate path to encourage “disaggregated” discussion. However, on the main decision tree, these should still be represented by one branch that encompasses them all, provided that all would lead to the same outcome.

One note of caution: it’s important not to apply this logic to possible theories that are not independent or sufficient to bring about the next step. Thus, the probability that “the plaintiff will be sympathetic” should not be added to the probability that “causation will be found,” if you are seeking to assess the overall likelihood of a liability verdict. These are neither independent nor sufficient for liability. Presumably, whether or not the plaintiff is found to be sympathetic will impact the probability of a causation finding. To add these probabilities would be misleading as it would greatly inflate the result.

A better example might be the question of whether a judge will dismiss a claim where there are alternative motions for dismissal—one based on the statute of limitations and the other on lack of jurisdiction (or standing, or any other independent grounds). Rather than first asking: “What are the overall chances that the judge will knock out the case on the motion to dismiss?”, it would be better to consider the chances of the judge’s rulings on each separate ground, and add them (assuming their complete independence).

---

<sup>33</sup> Fischhoff, Slovic, and Lichtenstein, “Fault Trees: Sensitivity of Estimated Failure Probabilities to Problem Representation,” 330-334; cited in Garthwaite, Kadane, and O’Hagan, 682.

<sup>34</sup> Garthwaite, Kadane, and O’Hagan, 680-701.

<sup>35</sup> Morgan, Granger; Henrion, Max; and Small, Mitchell, *Uncertainty: A Guide to Dealing with Uncertainty in Quantitative Risk and Policy Analysis* (1992):116; cited in Garthwaite, Kadane, and O’Hagan, 682.

## Finding Probabilities in Vagary: Deconstructing Present and Future Uncertainties

Every so often, we must acknowledge that our probability estimate for a future uncertain twist in the case is just plain too uncertain. We lack the basis for a gut sense, for any adjectival description, so how can we responsibly name a percentage number, or even a range? Sometimes, we're completely at a loss because the factors upon which a reasonable assessment would be based are also uncertain; they have yet to occur.

Consider a not-completely-hypothetical case in which a second story porch railing collapsed when plaintiff was pushed into it. The plaintiff fell to the ground, sustaining serious injuries. Your client is the manufacturer of the railing. Assume that causation—what caused the railing to collapse—is a much contested issue in a case. (To make it simple, assume that the contractor who installed the railing is now bankrupt). Under the applicable law of joint and several liability, if your client bears any liability, he takes it all.

It's hard enough to estimate the chance of successfully avoiding liability *after* seeing the plaintiff's expert's reports and deposition testimony on the causation issue. How can you estimate probability before the reports have been exchanged or the experts deposed? In our hypothetical, another issue is the plaintiff's responsibility. We know that he is 6'5" and weighed 400 lbs at the time of his fall. If he was drunk, carousing, and involved in reckless horseplay, then a jury might find him 50% or more responsible. If so, your client is off the hook. The plaintiff's testimony during his deposition was entirely self-serving; he'd have you believe he had a mere sip of beer and "lightly" leaned on the railing. Yet to be deposed is the older upstairs neighbor who witnessed the event, and is not a friend of the plaintiff. The chances of your client's escaping liability will no doubt be affected by the neighbor's deposition testimony.

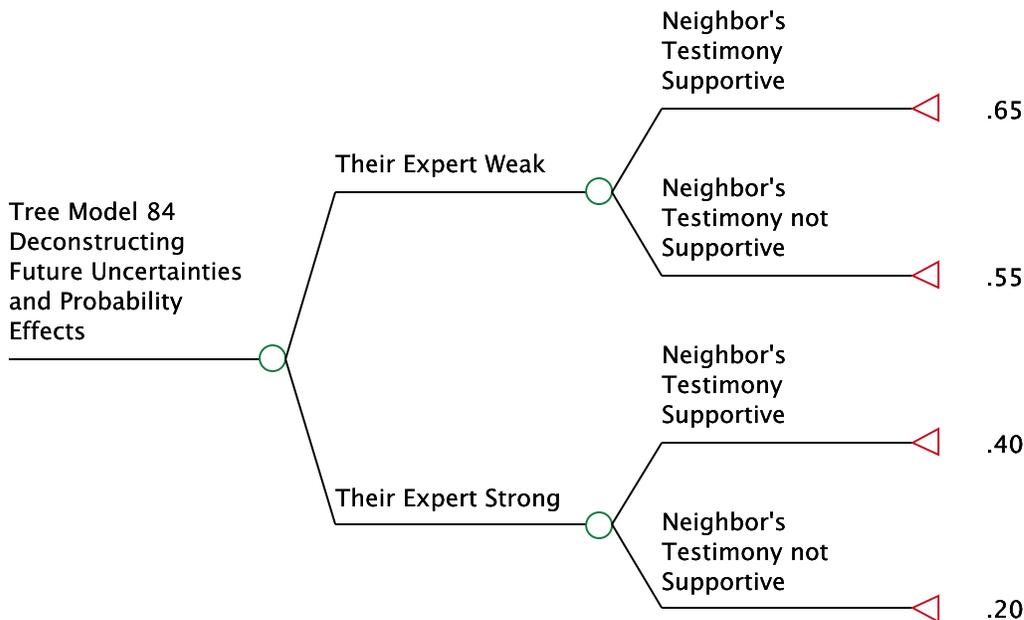
Plaintiff's counsel has suggested settlement negotiations, and at a recent status conference, the court strongly urged both counsel to mediate if direct negotiations are unsuccessful. You could suggest waiting until after receipt of plaintiff's expert's report and more depositions, but you understand the motivation to save costs. And, if these factors don't go your way, the case value may go up in plaintiff's counsel's eyes. Before negotiating or mediating, you owe your client a reasoned case assessment and, of course, you want to feel that your analysis is sound.

As a thought exercise, it can be useful to deconstruct the assessment task, using the ultimate liability percentage as the payoff, and the factors of their expert's and the neighbor witness as future uncertainties. Consider four simple possible ways these factors may play out:

- 1) Their expert is weak (good for your case); and the neighbor's testimony supports plaintiff's fault (good for your case). If that happens, what's your estimate of the overall chance of liability?
- 2) Their expert is strong (bad for your case); and the neighbor's testimony supports plaintiff's fault (good for your case). If that happens, what's your estimate of the overall chance of liability?
- 3) Their expert is weak (good for your case); and the neighbor's testimony absolves the plaintiff (bad for your case). If that happens, what's your estimate of the overall chance of liability?
- 4) Their expert is strong (bad for your case); and the neighbor's testimony absolves the plaintiff (bad for your case). If that happens, what's your estimate of the overall chance of liability?

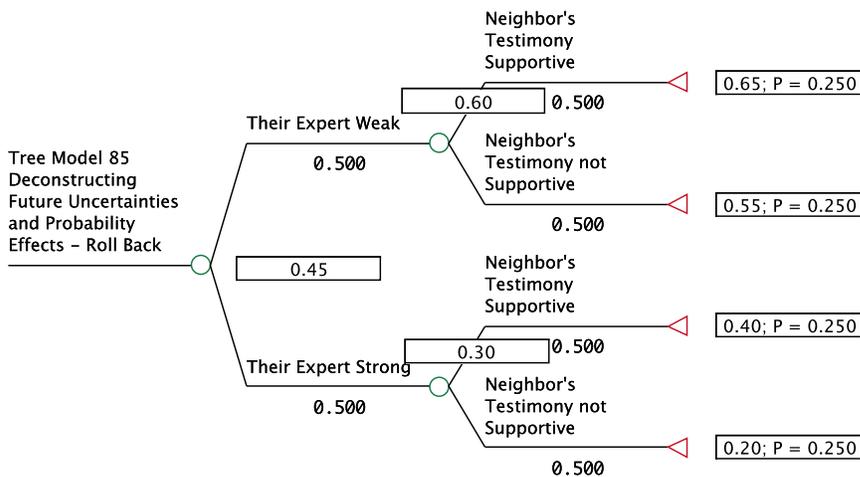
After imagining the four scenarios (admittedly simplified—they don't ask how "good" or how "strong"), let's say your guestimates are 65% for #1, 55% for #2, 40% for #3, and 20% for #4. Hmm... this suggests that you believe the expert's report is a little bit less important than the neighbor's testimony. Is that what you believe? If so, fine. If not, then think on it more and adjust.

Now, you could structure a tree, with the different probability percentages as payoffs.



Just as with any tree, the next step is to assign percentage likelihoods to each of those uncertainties along the path. At this point, it would be perfectly legitimate to throw up your hands and say: "I have no idea what will happen with their expert or with the neighbor! That's why I'm so confounded." If so, then it would also be legitimate just to assign 50% odds to each branch and see what it yields.

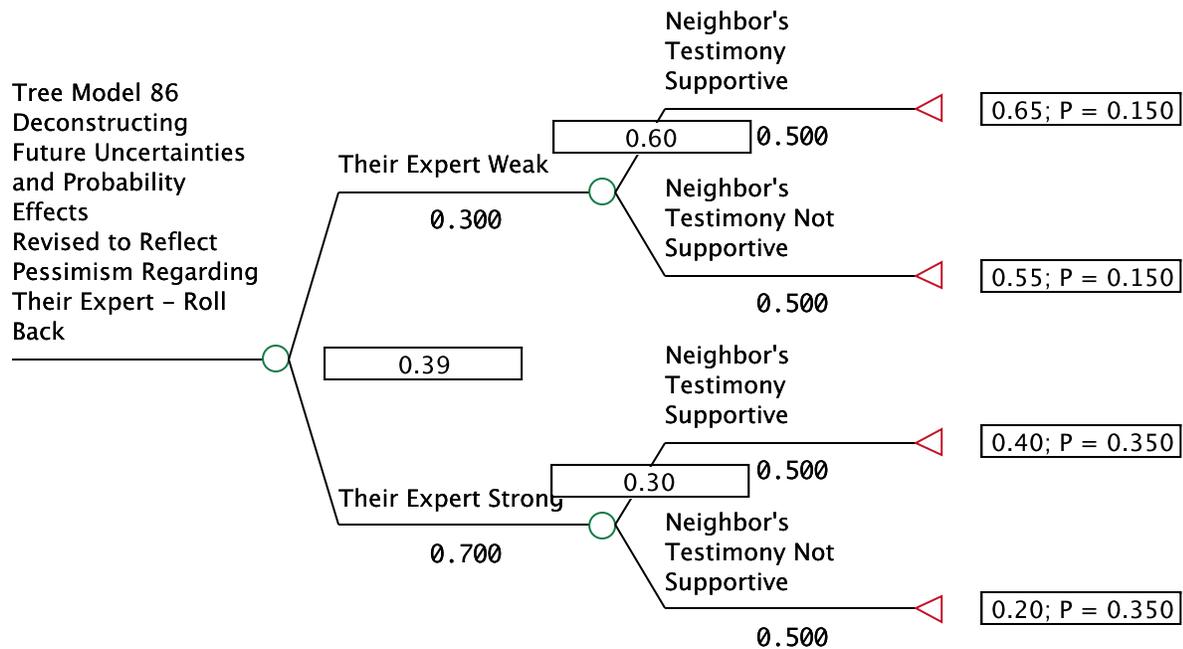
Next is the tree with .50 at each branch, and then rolled back.



The EMV of .45 means that, factoring these uncertainties into the mix you believe the overall probability of a favorable verdict is 45%.

On the other hand, you might go with the intuition that their expert's report and testimony are likely to be reasonably strong (bad for your case). Plaintiff's counsel has suggested that. You know their expert's credentials are impeccable. And, while your expert has explained why the railing's design is reasonable and up to code, you see some vulnerability in the manufacturer's installation instructions. Thus, at this point, you might believe it 70% likely that their expert will be highly problematic.

Here's how the tree would look, based on that intuition.



With this added pessimism regarding their expert, your “overall” estimate of the probability of a favorable verdict is reduced to 39%.

Having completed this little probability deconstruction exercise, it's fair to ask how it could be useful in practice. At minimum, its value may merely be in making us think more carefully about factors affecting liability. We may start to reconsider which are important. Maybe what matters most is the jury's attitude toward the plaintiff. He may have been a hard partying 400 pounder then, but now he's thin, subdued, still young, and in a wheelchair. Does the neighbor witness matter so much?

Setting aside any new insights gained, the exercise yields other potentially beneficial products:

- 1) A liability probability to insert as a placeholder into your main tree, unless and until you have seen the expert's deposition and report or the neighbor's deposition.
- 2) A defined range of probabilities you could try on the tree. Using decision analysis software (or Excel), you could perform a formal sensitivity analysis, using that probability range. That will show you the way the discounted value varies along that range of liability percentages. Or, you could simply draw and calculate the tree using the top probability and the bottom probability

- in the range. You (and your client) might also take a look at the way it affects the distribution of possible outcomes.
- 3) Assume that your client is not pleased with the discounted value number at the top of the range, or even with the discounted value using the liability percentage generated by your analysis of the uncertainties. Your client's financial VP states that he will be guided by the discounted value in approving a settlement number, but he is queasy about paying close to the top or even the value using the yielded probability. You could decide that it's essential to obtain a copy of plaintiff's expert report, or to attempt an informal interview of the neighbor before any negotiations.
  - 4) In the future, if their expert proves to be unassailable and the unbiased witness vouches for the plaintiff as choir boy, you have a sound basis for changing your evaluation of the case. At that point, an important benefit of this mini-deconstruction is that you and your client aren't driven to hit the panic button and just go up, up, up on the dollar offer. You had already laid the groundwork for thinking about how much these factors—the expert and the neighbor—affect your evaluation of the case, and how much they do not.

Some skepticism about this “mini-deconstruction of probabilities” is understandable, particularly for those not yet comfortable with the method. It is no doubt true that many, perhaps most, clients would not be eager to see yet more of these funny little trees.

On the other hand, some clients will press the question of how you arrived at various probability estimates, and it's good to be able to show them how you thought about it. As discussed earlier, even when the evidence is pretty much in, there's still uncertainty, and you will want to be able to discuss the known factors that weigh for and against your client along that path. For such factors, you will want to list what's favorable and what's not, as recommended. I am proposing this further deconstruction to derive probabilities particularly where you don't yet know what those factors will look like by the time of trial.

### **Two Final Comments for the Astute and the Strongly Tree-Inclined**

As you may have thought, it would be possible to simply include these future uncertainties—for example, the strong or weak expert, the wild card neighbor—on the main tree. If so, instead of one “liability-no liability” chance node on the tree, there would have to be four such nodes. That will be one complicated tree—perhaps too complicated to be comprehensible.<sup>36</sup>

You may have also noted that there's no end to how far such deconstruction could be taken. That's true. After all, we never know how the future may unfold, and we know that unfolding has impact. For some, the act of scratching out little trees is not a burden; it helps our thinking, even if we don't formalize a calculation. How far you take it will depend on your own inclination, your client's eagerness to dig into the weeds, and the significance of what may yield only minute adjustments to the overall analysis.

---

<sup>36</sup> Note that I am assuming neither of these uncertainties affects any other important variables further along on the tree. If so, then it may worthwhile to break that out separately or at least discuss its impact. In our example, the neighbor's testimony might also impact the likelihood of a significant contributory negligence finding (even if the jury finds sufficient fault for a plaintiff's verdict). At the least, after the witness' interview or deposition, the deconstruction exercise will facilitate adjustment of probabilities at the “contrib-no contrib” branches of the tree.

