

Pros And Cons Of Statistical Sampling

Law360, New York (March 22, 2011) -- Done correctly, statistical sampling can be a powerful tool in various types of litigation. For a relatively low cost, parties in litigation can learn a great deal about a particular situation. One can quantify concepts that otherwise would be known vaguely or not at all. However, statistical sampling also has limitations: results can be presented only as a range of values, the science behind statistical sampling can be difficult to explain, and implementing a sample is not always easy.

This article explores arguments in support of, and against, the use of sampling in business litigation contexts. This information will help litigators using sample results to better understand what makes a sample's results more easily defended, and those facing samples collected by adversaries understand the drawbacks and pitfalls of sampling used in litigation.

What is Sampling?

In litigation, there is often a population of items containing information that one party wishes to quantify. For example, in Medicare fraud cases, there is a population of claims, or patients, or hospital stays, from a particular facility or provider. Often we want to know how many claims (or patients, or stays) were submitted inappropriately, and how much Medicare paid on those claims. Because the cost of examining every patient file for every claim (or element) in the population is typically prohibitive, courts have allowed extrapolated estimates from random samples.

For example, the U.S. Department of Justice brought suit against a large group of specialist physicians, alleging that the physicians had been billing Medicare for more involved procedures and examinations that were actually performed for a particular class of patient visit.

The DOJ hired a statistician to collect a random sample of patient claims, extrapolate the results (estimate a quantity in the population based on a quantity in a sample), and provide estimates of the amount by which Medicare had overpaid for services.

Benefits of Sampling

One benefit of sampling is the relatively low cost of gathering information. In addition, when sampling is done correctly, conclusions drawn from the sample have a scientifically-supported basis, and many courts recognize the validity of those results.

Accepted by Many Courts

Several courts have addressed various issues that provide guidance about what is accepted, particularly in the context of claims submitted for payment by government programs. In *Illinois Physicians Union et al. v. Jeffrey Miller et al.*, the court decided that the use of statistical samples is reasonable where large numbers render a claim-by-claim review impractical.

In *Chaves County Home Health Service et al. v. Louis W. Sullivan*, the judge observed that the U.S. Department of Health and Human Services, by relying on results from a sample, had not suspended individualized determinations. It had only supplemented its individualized determinations with a post-payment review.

Further, the judge found that the private interest at stake was easily outweighed by the government interest in minimizing administrative burden. In *Rattanasen v. State of California Department of Health Services*, the judge agreed that sampling was acceptable, but only if the aggrieved party has an opportunity to rebut sampling evidence. Citing an earlier case, the judge also ruled that there is no case law stating what fraction of the population should be sampled.

Scientific Basis, Replicable

If we could collect information about every element in a population, we could calculate an exact result. For example, all invoice records from a particular year would show exactly how many units of a particular product were sold during that year.

However, use of a sample permits us to calculate a range — not a single, precise number — which we are confident includes the true exact value. Statisticians have shown that by selecting a sample randomly we can know what such a range will be. This makes random sampling a scientifically supported method for learning about a population. It also means that, given the right information, another party could replicate the method and arrive at the same result — sometimes a beneficial feature in litigation.

Cost, Accuracy Known

Another benefit of sampling is its low cost compared to examining every element of the population (a census). The trade-off for this low cost is lower precision than with a census of the population. However, it is important to remember that lower precision does not mean results from a sample are inaccurate.

They are known with a “level of confidence,” or the probability that a range includes the true value, and this level of confidence can be very high. Taking a census may lead to less reliable results if, for example, (in the context of interviewing people) one must increase the number of interviewers used, and use less-qualified interviewers to collect information from every respondent.

The cost of collecting a particular sample tends to decrease as we include fewer elements in the sample. Cost concerns suggest selecting the smallest sample possible. But how small can a sample be and still provide useful results? The answer depends on each particular situation, but some general observations are worth noting.

First, intuition might suggest that as sample size increases as a fraction of the population size, it becomes more accurate. In most contexts, however, what matters for the result — for example, for an extrapolated value — is the absolute size of a sample, not its size relative to the population.

The appropriate sample size can depend on particulars of the situation. In one instance, one party proposed conducting a survey of customers and asking them to confirm product defects alleged in the lawsuit. One expert stated that a relatively small sample would provide results with adequate precision. This expert failed to take into account data showing that the defect occurred only very rarely. In order to estimate the occurrence of such rare events with adequate precision, an impractically large sample would be required for hundreds of thousands of customers.

Second, there is no minimum size required for the results from a sample to be meaningful, but a smaller sample suffers from two potential problems. The first is that it becomes less precise as it shrinks. The second is that if the population is highly “skewed” — meaning a plot of the distribution of values in the population has a longer right tail (“right skew”) or a longer left tail (“left skew”) than a standard, bell-shaped normal curve — then a sample needs to be larger for the results from statistical theory to work.

The Limitations of Sampling

There are several reasons why sampling can be a limited tool for use in litigation. The results from a sample provide answers in terms of ranges of numbers. Conducting a sample and calculating these ranges can be a complex undertaking requiring careful explanation. Finally, sampling is not accepted in all legal contexts.

Not Absolutely Precise

The main deficiencies in sampling occur because results are being presented as a range of values, and not one figure that is “the answer.”

For example, results from a random sample may show that a medical provider overcharged Medicare by between \$4.5 million and \$6.5 million. We may be highly confident that the true, actual, amount of overcharge lies in this range, but we cannot point to a particular value — say, \$5.5 million — as the exact amount. This deficiency is by no means fatal, but it means we must explain how to interpret the results.

Additionally, if the information used in a review of sampled items is missing some elements, the results of the sample may not necessarily include the true value one would obtain from examining the entire population. Researchers frequently face this problem with surveys, because survey respondents may not answer particular questions or even respond at all.

Similar nonresponse issues crop up on nonsurvey contexts, too. For example, suppose I selected a sample of title insurance policy files for the purpose of estimating how much policyholders were over- or under-charged for title insurance. If some sample elements are missing, and those files were all created by one title officer who we know, based on other evidence, always overcharged her customers, then the sample results will not reflect information for that one officer and would be biased.

In a construction case involving defective windows installed in a new housing development, the plaintiff hired an expert who identified all the windows that readily showed signs of defect, and examined a random sample of these windows. The expert then extrapolated his results to all windows, not just those with signs of defect. This was inappropriate, because the sample included only the windows that were known to (very likely) be defective. Extrapolation to the entire population overstated the true rate of defect among windows.

It can be difficult to explain what the results from a sample mean. Such an explanation inevitably requires describing normal distributions, levels of confidence, probability, variance and margins of error, and may obscure the overall message that we have quantified something useful.

Finally, sampling is not accepted in all contexts. The Supreme Court rejected the use of sampling by the U.S. Census Bureau when counting population for purposes of reallocating congressional seats. In the *Corbell et al. v. Gale Norton et al.* case decision, the judge ruled that an “accounting” of funds due Native Americans from the individual Indian trust was required, and sampling would not provide such an accounting.

In the *McLaughlin v. American Tobacco Co.* case, a class of smokers of light cigarettes was decertified on the grounds that the Racketeer Influenced and Corrupt Organizations Act requires each plaintiff to prove injury, and as a result, extrapolation based on a sample was not adequate proof. Depending on the context, there may be case decisions in similar situations suggesting that sampling is not permitted in a particular new situation.

Many Potential Pitfalls

There are several steps in the sampling process that might be done incorrectly and lead to invalid results. A crucial feature of a sample is random selection, which can be implemented using most statistical software packages. Sometimes however, a practitioner may select observations out of convenience instead of randomly.

One construction defect expert relied on haphazard selection when testing for defective concrete in home foundations. The opposing expert used a statistical test to examine whether the pattern of test locations within homes was random. The test confirmed that samples tended to be near edges of rooms, in closets, or in garages where access to the concrete floor was more convenient and less disruptive.

An important feature of a sample is its size. Statistical theory relies on a sample being large, and how large depends on the skewness in the population we are trying to measure. Sometimes, one can find a proxy and measure this variable’s skewness to obtain an idea of the magnitude of the problem. Often, though, one can obtain a measure of skewness only from taking a sample – either a smaller sample taken before the main sample is collected, or through review of the main sample itself.

Another crucial feature of a sampling method is the sampling “frame” used to select the sample. If the frame does not match the population, then a sample drawn from that frame cannot be used to extrapolate to the entire population.

For example, suppose a population includes gas stations in the U.S., but the frame excludes stations in California and Texas. Any extrapolation would produce only a total for all gas stations in the U.S. except those two states — a serious deficiency when trying to analyze gas stations throughout the country.

Conclusion

Sampling can be a useful tool in litigation, but must be executed with care. By understanding the strengths and weaknesses of statistical sampling, you can bring this tool to bear in the appropriate circumstances and defend its use, or critique poorly conducted sampling efforts.

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