Numbers for Lawyers: Statistics & Adverse Impact Discrimination

Most law students and lawyers that I have met share a common fear: numbers. The problem is that lawyers must confront numbers in many areas of the law, whether they are calculating child support for their client, advising a client on tax matters, negotiating a contract in a commercial transaction, or trying to prove an adverse impact under Title VII or the ADEA. So, to help those that have an aversion to statistics, this paper walks through a statistical analysis engaged in by the Supreme Court in *Castaneda*[1] to substantiate a plaintiff's claim of adverse impact in grand jury selection procedures. Along the way, the concept of standard deviation is explored and explained in detail within the context of that case, and other cases involving discrimination. While it is true, at least for trial lawyers, that a statistician is responsible for presenting the numbers in court, lawyers should at least have some idea about statistics because, to get to trial, the lawyer is the one that must explain the adverse impact claim, including the actual evidence that is the basis for the charge, and perhaps may need to refute the statistics that may be offered by the other side. With that in mind, let's turn to the standard deviation.

Fundamental to a claim of adverse impact is the assertion that, had things been fair, the distribution of persons in one protected class would be similar to a random sample of persons generally. For example, let's hypothesize that you have a client who is Asian, a protected class. Your client attempted to get a job at the defendant employer. Your client was qualified for the job, but her application was denied without an interview, and the employer hired someone of another race. This would probably constitute a prima facie case case under *McDonnell Douglas*, except the employer did not know the race of your client based on the client's application for employment, so you can't prove intentional discrimination. Now, let's do some hypothetical

[1] *Castenada v. Partida,* 430 U.S. 482 (1977).

discovery with the employer with regards to the other applicants for the position. The employer admits that there were one hundred applicants for the position. All of these applicants were qualified for the job. You followed up and identified the race of the applicants, as described in table 1.

Table 1: Hypothetical Distribution of Applicants by Race

Applicant Race	**Number**	**% to All**
White	60	60%
African American	20	20%
Asian	5	5%
Latino	12	12%
Unknown	3	2%
Total	**100**	**100%**

If all other variables were the same among the applicants, Asians who applied for the job had a 5% chance of being employed, while whites had a 60% chance – twelve times as likely. Adverse impact? Not yet. The statistics above still require a context, in this case, the distribution of similarly qualified persons within the applicable job market. Compare the distributions of qualified persons in Tables 2a and 2b.

Table 2a: Hypothetical Distribution of Qualified Persons by Race

Qualfied Person's Race	**Number**	**% to All**
White	6,000	60%
African American	2,000	20%
Asian	500	5%
Latino	1,200	12%
Unknown	300	3%
Total	**10,000**	**100%**

Table 2b: Alternate Hypothetical Distribution of Qualified Persons by Race

Qualfied Person's Race	**Number**	**% to All**
White	100	1%
African American	5,000	50%
Asian	4,500	45%

Latino	100	1%
Unknown	300	3%
Total	**10,000**	**100%**

If the relevant job market was distributed as in table 2a, the employer's applicant pool exactly matches the relevant job market's racial distribution. In other words, your client's chances of being employed by the employer were 1/12th a white applicant's generally, and we would say that the applicant pool in this instance was a fair representation of the relevant job market generally. However, if the relevant job market was distributed as in table 2b, the employer's applicant pool is way out of whack with the larger market. One might ask what the chance would be that 60% of the total white job market would apply for this particular position, or what the chance would be that white applicants would outnumber asian applicants 12 to 1, when asians outnumbered whites 45 to 1 in the relevant job market. The answer is generally: the chance is quite small.

The empirical rule, when dealing with normally distributed data, is that about 68% of a measured sample will be within one standard deviation of the mean, 95% will be within two standard deviations, and 99.7% will be within three standard deviations.[2] The Court in *Castenada* directly acknowledges that in sufficiently large samples, a standard deviation of more than two or three from the mean for the observed sample will be suspicious, and bolsters an adverse impact claim.[3] Based on the empirical rule, this makes good sense. If the standard deviation is greater than three, the observed sample represents 0.3% or less of the total sample. The odds decrease that the observed sample occurred by chance as the standard deviation of the

[2] *See* http://www.robertniles.com/stats/stdev.shtml (May 30, 2009)
[3] *Castenada*, 430 U.S. at 496 (n. 17).

sample increases. This rule is also true even for random samples that may not follow the "empirical rule" described above.[4]

In *Castaneda*, the Court outlines the data available from the Texas census and the grand jury pool as described in table 3. The Court notes that during this period, 870 grand jurors were called, of which 339 were Latino (using a Spanish surname as a proxy for race). The Court also notes that in the 1970 census, Hidalgo County had 181,535 residents, of which 143,611 had a Spanish surname or spoke Spanish. The Court assumes that all of these persons were Mexican-Americans, and therefore comprised about 79% of the total population. If we also assume that all of the citizens in the county were qualified to be a grand juror, and we assumed a sufficiently random selection device for finding prospective jurors, we would expect that the jurors who actually served on the grand jury to roughly reflect the total population when examining the race of the jurors. Table 3 below is taken from the Court's opinion of observed assumed Latino grand jurors from 1962 to 1972.

Table 3: Latino Grand Jury Members by Year, 1962-1972[5]

Year Served	Avg No Spanish surnamed	% to All
1962	6	37.5%
1963	5.75	35.9%
1964	4.75	29.7%
1965	5	30.9%
1966	7.5	37.5%
1967	7.25	35.8%
1968	6.6	33%
1969	10	50%
1970	8	40%
1971	9.4	47%
1972	10.5	52.5%
Total	80.75	39.4%

[4] Chebyshev's inequality, where even 7 standard deviations will usually comprise about 98% of the total sample.
[5] *Castenada*, 430 U.S. at 487 (n. 7).

On the average, Hidalgo County needs about eighty grand jurors each year. For simplicity, I've rounded up the percentage of the population that is Latino to eighty percent. Each time a juror is selected using our random selection device, the juror has an eighty percent chance of being Latino, and a twenty percent chance of not being Latino. On average then it stands to reason that on average sixty-four of Hidalgo jurors should be Latino, which is eighty percent of eighty total jurors. So let's work this out based on the actual observations noted in Table 3 above.

Table 4: Grand Jury Analysis by Year, 1962-1972[6]

Year Served	Total Jurors	Expected Latino	Observed Latino	Variance
1962	68	54	25	-29
1963	68	54	24	-30
1964	68	54	20	-34
1965	69	55	21	-34
1966	85	68	32	-36
1967	86	69	31	-38
1968	85	68	28	-40
1969	85	68	42	-24
1970	85	68	34	-34
1971	85	68	40	-28
1972	85	68	44	-24
Total[7]	~866	~693	~342	-351
Mean	79	63	31	-32

As you can see, the observed number of Latino jurors in Hidalgo was on average thirty-two less than the average expected number over the eleven year period. The calculated standard deviation of the number of expected Latino jurors during the period is 6.8, which means that we would expect +/- 6.8 jurors of the mean of sixty-three within one standard deviation, and +/- 13.6

[6] *Castenada*, 430 U.S. at 487 (n. 7).
[7] These figures will be slightly off because of rounding when completing the calculations from the Court's percentages above.

jurors within two standard deviations. The observed Latino average of thirty-one is within 4.7 standard deviations from the expected number. In the estimated population above, having thirty-one jurors serve on a grand jury who are Latino would occur less than 0.1% of the time if our population was distributed according to the empirical rule.

A separate question is what are the chances that this result would occur at random, given the starting data that about 80% of the eligible population to serve on grand juries is Latino in Hidalgo. As a starting point, let's assume that we have created a die with five sides, four of which are marked with an L for Latino, and one side is marked with an N for Non-Latino. And let's assume that the person in charge of picking grand jurors will roll the die once for each juror to be selected, and will go through the Hidalgo phone book to find a Latino if he rolls an L, and a non-Latino if he rolls an N. In our hypothetical, it stands to reason that there are four chances out of five that he will roll an L – an eighty percent probability that a Latino will be selected. Now, let's say that our die roller throws the die sixty-seven more times in order to select all of the jurors for 1962. Each time he throws the die, the chance of getting an L is the same, eighty percent. In a sufficiently long enough run of throwing the die, we would expect the distributions of L's to N's to be about eighty to twenty when employing a fair die as marked above.

So, our question is, what is the chance that, after rolling the die sixty-eight times, the selector got an L only twenty-seven times, and got this same result more or less eleven times in a row? Using the chi-squares formula, the chance of this occurring at random is about 1 in 4.7×10^{-35}, which, when considered that a chi-square of 0 means it was impossible, most mortals would say the probability here was well nigh impossible to have occurred by chance. It should

probably come as no surprise then that the Supreme Court found the State of Texas' "key man" grand jury selection process was a violation of the equal protection clause.[8]

[8] *Castaneda*, 430 U.S. at 501.