11. Report of G. Douglas Lunsford dated March 31, 2008.

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The following report was prepared on behalf of Richard H. Anderson case number 87-8047. Data used for this report was collected from training exercises conducted by the Florida Department of Corrections (DOC) and past Florida lethal injection executions. Additional information for comparative purposes was obtained from a study which appeared in the New England Journal of Medicine in 2000 entitled "Clinical Problems with the Performance of Euthanasia and Physician-Assisted Suicide in the Netherlands."

Analysis of July Department of Corrections (DOC) Training

Data was gathered by a quality assurance expert hired as an independent system auditor during July 2007 on 5 Mock Executions. The first, fourth and fifth exercises were successful while the second and third were failures which represents 40% failure which is used to obtain an expected rate of future failures. Figure 1 graphically depicts an extrapolation of the expected failure rate.

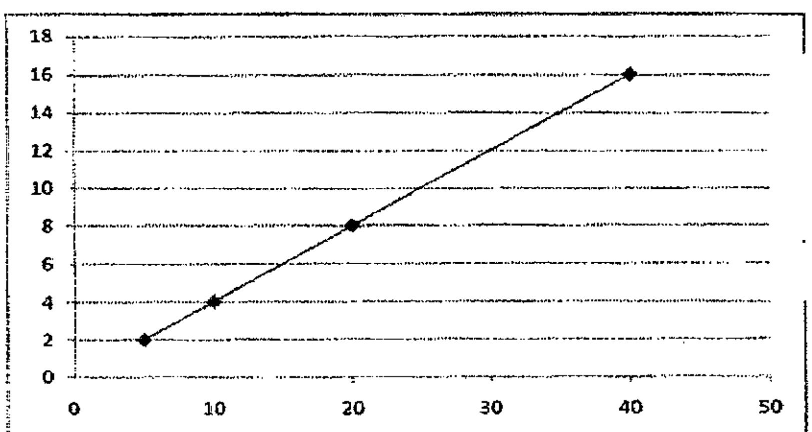


Figure 1: Expected number of failed exercises based on July failures

Table 1a: July 2007 Training Exercises
S = July 2007 Mock Executions (n=5)
A = Failed Exercises
B = Successful Exercises
Sets
S = {1,2,3,4,5}
A = {2,3}
B = {1,4,5}
Calculations
Probability of A occurring:
P(A) = 2/5 = .40 or 40%
Expected Value of x over n times where n=20 and p=.40
Expected number of failed exercises (x) for 20 mock executions (n=20) with a probability of .40 for a failure (p(x)=.40)
P(x)=np(x)=(20)(.40)=8
Thus we can expect 8 failed exercises out of 20 mock executions.
Expected Value of x over n times where n=40 and p=.40
P(x)=np(x)=(40)(.40)=16
Thus we can expect 16 failed exercises out of 40 mock executions.

The above table presents the formula for determining the past proportion of failures from which the expected projected failures can be obtained. From August 1, 2007, revised protocols came into effect with an extra step to "assess consciousness" added just prior to the injection of the second chemical.

Analysis of August DOC Training

Data was next gathered during August 2007 on 7 Mock Executions. The sixth, seventh, ninth, eleventh, and twelfth exercises were successful while the eighth and tenth were failures giving a 29% failure rate which is used to obtain an expected rate of future failures. Figure 2 graphically depicts an extrapolation of the expected failure rate.

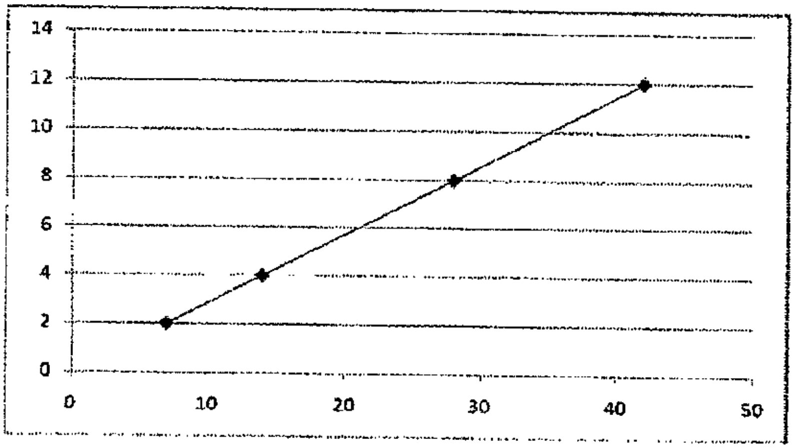


Figure 1b: Expected number of failed exercises based on August failures

Table 1b: August 2007 Training Exercises
S = August 2007 Mock Executions (n=7)
A = Failed Exercises
B = Successful Exercises
Sets
S = {6,7,8,9,10,11,12}
A = {8,10}
B = {6,7,9,11,12}
Calculations
Probability of A occurring:
P(A) = 2/7 = .29 or 29%
Expected Value of x over n times where n=20 and p=.29
Expected number of failed exercises (x) for 20 mock executions (n=20) with a probability of .29 for a failure (p(x)=.29)
P(x)=np(x)=(20)(.29)=6
Thus we can expect 6 failed exercises out of 20 mock executions.
Expected Value of x over n times where n=40 and p=.29
P(x)=np(x)=(40)(.29)=12
Thus we can expect 12 failed exercises out of 40 mock executions.

Combined Analysis of July and August DOC Training

Although the protocols for these two months are different, they are not significantly different, nor are the results of the training exercises so Figure 3 graphically depicts an extrapolation of the expected failure rate of .33 which is the combined rate for July and August (n=12).

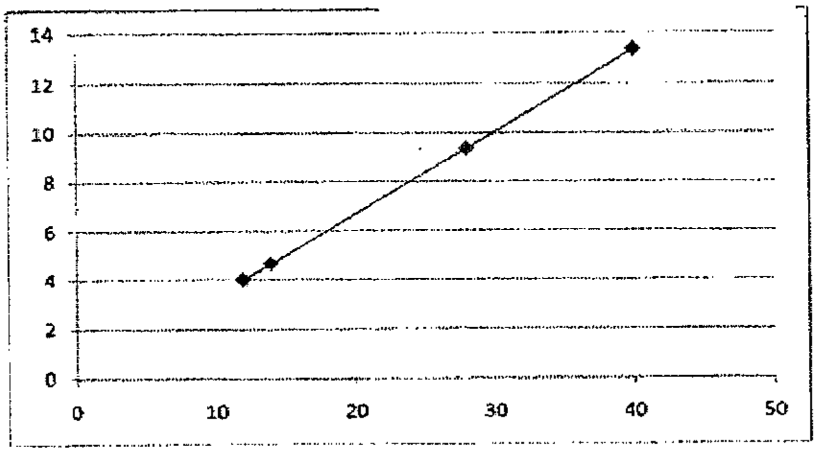


Figure 3: Expected number of failed exercises based on July and August failures

Table 1c: July and August 2007 Training Exercises
S = July and August 2007 Mock Executions (n=12)
A = Failed Exercises
B = Successful Exercises
Sets
S = {1,2,3,4,5,6,7,8,9,10,11,12}
A = {2,3,8,10}
B = {1,4,5,6,7,9,11,12}
Calculations
Probability of A occurring:
P(A) = 4/12 = .33 or 33%
Expected Value of x over n times where n=20 and p=.33
Expected number of failed exercises (x) for 20 mock executions (n=20) with a probability of .33 for a failure (p(x)=.33)
P(x)=np(x)=(20)(.33)=7
Thus we can expect 7 failed exercises out of 20 mock executions.
Expected Value of x over n times where n=40 and p=.33
P(x)=np(x)=(40)(.33)=13
Thus we can expect 13 failed exercises out of 40 mock executions.

Analysis of failed exercise during training vs. anomalies during real executions

The proportion of anomalies that occurred during the reported training period (n=12), was .33. The proportion of executions with two or more anomalies that occurred (n=20) was .40. Before accepting that it is acceptable to use the proportions of anomalies that occurred in the training as a reasonable estimate of the anomalies that would occur during real executions, it would be appropriate to test whether the difference between these two proportions is statistically significant ($\alpha > .05$).

This means that it is reasonable to assume (in this case with 98% certainty) that the number of anomalies that will occur in actual executions will be not be significantly lower or higher in the future real executions than the .33 that was observed in the training exercises.

Analysis of Florida Technical Anomalies

Of the 20 actual executions by lethal injection conducted in Florida between 2000 and 2006, post-execution investigative reports were only available from the medical examiner on 17. Six of these reports found technical anomalies including 1) irregular IV placements, along with evidence of iatrogenic manipulation, 2) surgical incisions for IV access, 3) recent multiple needle puncture marks indicating failure to gain IV access at the initial site, and 4) one instance indicating subcutaneous IV insertion. This is an error rate of .35. In simple terms, this suggests that, unless training is improved, 35% of future executions would also show similar anomalies.

Figure 3 graphically depicts an extrapolation of the expected failure rate of .35

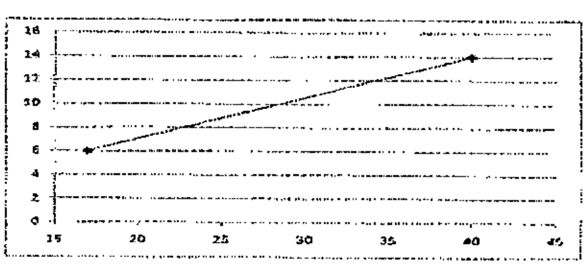


Table 2: Florida Technical Anomalies
S = Prior Lethal Injection Executions (n=17)
A = Medical Examiner Reports with Technical Anomalies
Sets
S = {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,20}
A = {2,3,4,7,10,20}
Calculations
Probability of A occurring:
P(A) = 6/17 = .35 or 35%
Expected Value of x over n times where n=40 and p=.35
Expected number of technical anomalies (x) for 40 executions (n=40) with a probability of .35 for a failure (p(x)=.35)
P(x)=np(x)=(40)(.35)=14
Thus we can expect 14 technical anomalies out of 40 executions.

Analysis of duration issues, Florida

In addressing the issue of duration of the execution process in Florida, it is necessary to examine the testimony of the state's expert, Dr. Dershwitz. Evidence about the mechanics of lethal injection and the pharmacological and pharmacokinetic properties of the chemicals was obtained from the *Lightbourne* record through the testimony of the state's expert Dr. Dershwitz. The sum of the times in this witness's statement came to 11 minutes. A time of one minute was utilized to account for pharmacokinetic variances.

It is appropriate to collect data to demonstrate with a reasonable level of confidence that the statement positing 11 minutes is supported or not. The statistical procedure would be to establish that data from a collected sample is normally distributed and, if so, to compare the mean of that sample with the claim of 11 minutes by carrying out a statistical test called a "Student's t-test."

Table 3a: Florida Historical Lethal Injections Times
S = Prior Lethal Injection Executions (n=19)
A = Dr. Dershwitz Execution Time
B = A with +/- 1
C = S Event Greater than B
Sets
S = {6,7,8,9,9,11,12,12,12,13,13,13,14,14,17,18,19,21,34}
A = {11}
B = {10, 11, 12}
C = {13,13,13,14,14,17,18,19,21,34}
Calculations
Probability of C occurring:
P(C) = 10/19 = .53 or 53%
Expected Value of x over n times where n=40 and p=.53
Expected number of technical anomalies (+/-1) calculated execution time (x) for 40 executionsd (n=40) with a probability of .53 for a failure (p(x)=.53)
P(x)=np(x)=(40)(.53)=21.2 or 21 events over B
Thus we can expect 21 executions to involve a lingering death out of 40 executions.
Mean of event S
Σ(S)/size(S)=262/19=13.8
Note: See hypothesis test below.

The hypothesis t-test starts with the basic statistical premise, which is that the claim is correct and is called the null hypothesis (H_0:μ=11minutes). Because the concern is not that this number is too high but only that it is understating the case, the alternative hypothesis of this analysis will only look at whether the data collected provides evidence that the true mean is significantly higher than 11 minutes (H_a:μ>11minutes).

The mean and standard deviation for the set of data were calculated as 13.79 ($\overline{X}$) and 6.33 (s). Based on the skew formula, the population distribution from which this sample was taken is normally distributed (see formula 1).

Skew=3($\overline{X}$ -median)/s=3(13.79-13)/6.33=0.37 (above .5 indicates skew) formula 1

Because the sample is normally distributed, it is appropriate to use the statistics in the student's t formula which returns the following observed t value (see formula 2) which can be compared to a one-tailed critical value of $t_{(n-1,\alpha=.05)}=1.734$:

$$t=(\bar{X}-\mu)/(s/\sqrt{n})=(13.79-11)/(6.33/\sqrt{19})=1.92 \qquad \text{formula 2}$$

Based on the observed t value, there is sufficient evidence to conclude that the mean of the population is statistically significantly higher than 11 minutes, which is the sum of the various steps of the lethal injection described in Dr. Derschwitz's testimony ($t=1.92$, $p=.035$).

Using generally accepted principles of statistics, one would conclude with 95% confidence that the mean duration of an execution would be 13.79 minutes plus or minus 2.9 minutes. The information infers that 95% of the durations would occur between 1.13 and 26.45 minutes.

Because the distribution of durations in the sample provide evidence that the population of durations is normally distributed, it is reasonable to use a z distribution as a basis of estimating the probabilities for durations of future executions (see Figure 4).

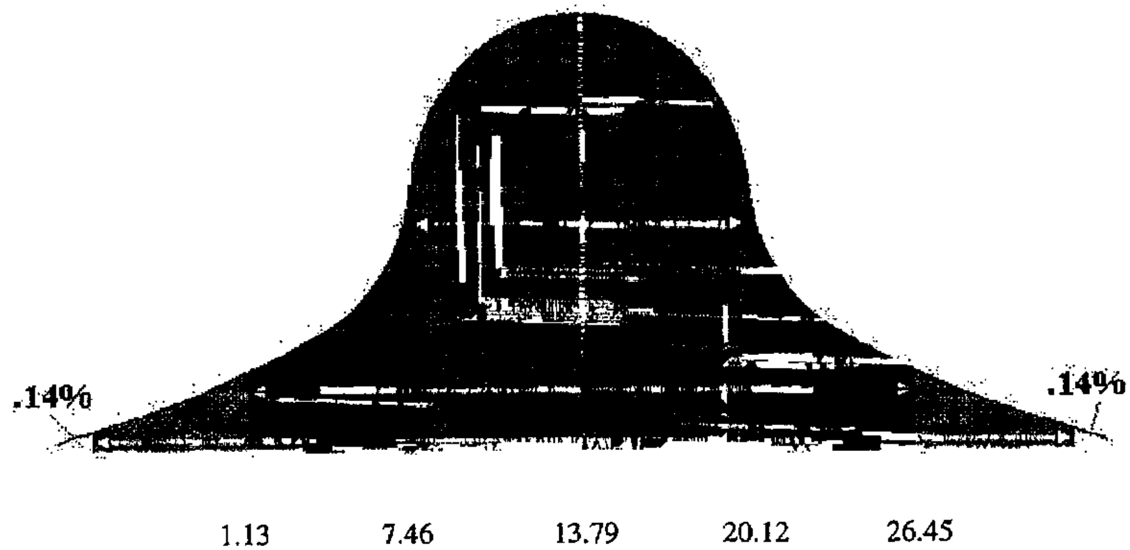
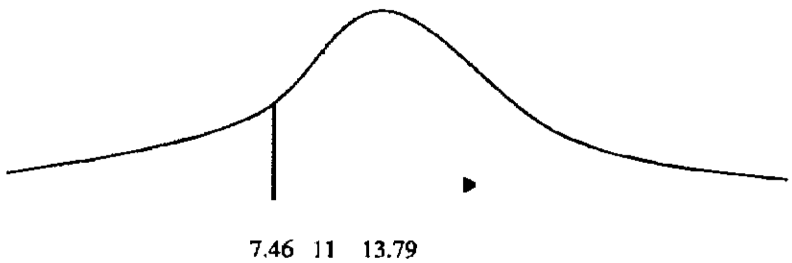


Figure 4: z chart showing the durations at the mean and at 1 and 2 standard deviations away from the mean.

Based on the evidence that the distribution of durations follows a normal curve, the above chart shows that 50% of future executions will last longer than 13.79 minutes, and that nearly 16% will last longer than 20 minutes. Actuarial tables relied upon by the statistical community were used to assess that the probability that the execution duration will be greater than 11 minutes is .83. This means that it is reasonable to a degree of statistical certainty to predict that 83% of future events will take longer than 11 minutes.

The estimation is based on the z distribution rather than merely using probabilities based on a single sample. When data follow the z distribution, estimation of the probabilities may be based upon z scores computed using the mean and standard deviation of that population (estimated from the available sample) The z formula is as follows:

$z=(X- \bar{X})= 11- 13.79/6.33=-.44$ $\quad$ $p(\geq .44)$ is .83



Further computations can be carried out showing that 61% will take longer than 12 minutes.

Florida Myoclonic or Other Observable Movements

Certain involuntary movements by the prisoner termed myoclonus include spasms, convulsions or other involuntary movements and may be witnessed during the injection of the lethal chemicals during the first and second steps of the proposed standard. Although the first drug administered is not, according to *Lightbourne*, supposed to produce these movements while the second drug is administered for the primary purpose of arresting these movements, the prior twenty lethal injection executions in Florida had seven, or 35%, with observable myoclonic events. This is shown in Table 4.

Table 4: Myoclonic or Other Observable Movements
S = All Lethal Injection Executions in Florida (n=20)
A = Lethal Injection Executions with Observable Myoclonic Events or Movements During the Sequence
Sets
S = {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20}
A = {2,4,6,7,9,19,20}
Calculations
***Probability of A occurring*:**
P(A) = 7/20 = .35 or 35%
Expected Value of x over n times where n=40 and p=.35
Expected number of executions with myoclonic events (x) for 40 executions (n=40) with a probability of .35 for a failure (p(x)=.35)
P(x)=np(x)=(40)(.35)= 14

Thus we can expect 14 executions with observable myoclonic events during the injection sequence out of 40 executions

Combined Data

Table 5 shows that, taken together, the data reveal that 40% of Florida's prior lethal injection executions had at least two shared areas of concern. Six executions had at least two anomalies. Two executions had all three present (one of which was the execution of Angel Diaz).

Table 5: Florida Executions with the Presence of Two or More Anomalies
S = All Lethal Injection Executions in Florida (n=20)
A = Executions with Two Anomalies
B = Executions with Three Anomalies
C = A U B
Sets
S = {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20}
A = {2,3,4,9,10,19}
B = {7,20}
C = {2,3,4,7,9,10,19,20}
Calculations
Probability of C occurring:
P(C) = 8/20 = .40 or 40%

In combining the data sets to calculate which executions had two or more errors in it, again, in set "S" all lethal injections are numbered sequentially. Set "A" are those executions where we found at least two of three errors (technical errors, duration errors and myoclonic errors) occurred. Set "B" is where all three errors occurred. Set "C" is the combination (or "union" in probability terms) of the two sets.

The Netherlands study

Discussed during both *Lightbourne* and at the *Baze* oral argument was a study from the Netherlands summarizing experience with euthanasia and physician assisted suicide ("EAS"). The Dutch study found that in EAS cases, there was a technical issue error rate of 5%, a duration issue error rate of 7%, and a myoclonic issue error rate of 4%. As noted above, Florida lethal injection executions have a technical issue error rate of 35%, a duration issue error rate of 53%, and a myoclonic issue error rate of 35%. While Dutch EAS practices are done in a clinical setting, the difference between the EAS practices and the Florida lethal injection executions are both statistically and practically significant.

The probability of success for the three events according to the Dutch EAS practices would be calculated as .95*.93*.96=.848 which gives a familywise error of .152. The probability of success for all three events according to the Florida figures would be calculated as .65*.47*.65=.199 which gives a familywise error of .801. A t-test of the differences between these two rates shows that the Florida rate is significantly higher than the Dutch EAS rate. This may be interpreted as saying that, based on empirically obtained data, in a Dutch EAS practice, there is a probability of .20 or (20%) that something will go wrong during one of the three events and that for Florida there is a probability of .80 (or 80%) that something will go wrong during one of the three events.

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