HOW TO PRESENT STATISTICS TO EXPLAIN YOUR CASE (BUT FIRST YOU MUST UNDERSTAND STATISTICS)

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INTRODUCTION

- Why do we have statistics, why do we measure things and why do we count?
- Statistics: "a summary that quantitatively describes or summarizes features of a collection of information".
- Statistics are supposed to make something easier to understand.

INTRODUCTION

- If presented accurately, statistics will allow the user (trier of fact) to make effective and appropriate rulings
- Statistics often overcome the impossibility of addressing or measuring an entire population of data.
- A population is the collection of all items of interest in a particular study or issue
- A sample is a portion of the population selected to represent the whole population

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INTRODUCTION

- Statistics are also used in summarizing data in a more useful way to the user (trier of fact)
- Statistical analysis specifically summarized or analyzed, is known as "descriptive statistics" (describing circumstances or results).
- "Statistics, well done, are astounding. They tell us, clearly and completely, what is actually happening. Statistics are a consistent and reliable way to tell a story that is actually useful and resilient." - Seth Godin

HEURISTICS VS. STATISTICS

- A Heuristic - "A mental shortcut that allows people to solve problems and make judgments quickly and efficiently."
- A "rule of thumb" or an "intuitive analysis" shortens decision-making time.
- Rapid decision-making is a biological mandate:
  - If you can't immediately distinguish prey from non-prey, you will have no lunch.
  - If you can't immediately distinguish predator from non-predator, YOU will be lunch.
- Use of statistics can avoid the risks and traps of intuition.

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SYSTEMATIC VULNERABILITIES

- Randomness –
  - We see patterns when there is only random noise.
  - We see causal relationships where there are none.
- Regression to the mean
- Bias toward positive evidence
- Bias toward our prior beliefs
- Availability
- Social influences

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- "The real purpose of the scientific method is to make sure nature hasn't misled you into thinking you know something you actually don't know."

  -Robert Pirsig, *Zen and the Art of Motorcycle Maintenance.*

CAREFULLY SELECTED NUMBERS, THOUGH, CAN MISLEAD AND RUIN LIVES

- 1999 Example of British lawyer, Sally Clark
- Convicted of murdering her two babies – SIDS
- Expert Testimony: "One in 73,000,000" = chance of two children in the same family dying of SIDS

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Two Main Problems in the Clark Case:

- The "ecological fallacy":
  - The figure of 1 in 73,000,000 was calculated as 8,543 x 8,543;
    - As if the chances of two SIDS episodes in this one family were <u>independent</u> of each other.

- The "prosecutor's fallacy":
  - If we really want to play with statistics, we need to know which is relatively more rare:
    - Double murder or double SIDS?

- Independent Event - An *independent* event has no connection to another event's chances of happening *or* not happening (e.g., flipping a coin).

- Dependent Event - Two events are *dependent* if the outcome or occurrence of the first has a connection with the outcome or occurrence of the second.

SUDDEN INCOME DEFICIENCY SYNDROME ("DISSO SIDS")

- Harold accused Wanda of having fraudulently reduced her business profit
- Harold pointed to the business' "suspicious" loss of three long-term customers during the post-separation year
- Harold contended that since there was only a 10% chance of the business' losing a single long-term customer in any given year, there was only a (10% times 10% times 10% equals) .1% chance of losing three long-term customers in a single year
- Wanda defeated the accusation by showing that all three customers had taken their business to Competitor A – who had developed a more lucrative product line

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"Anyone who is going to trade in numbers, and use them, and think with them, and persuade with them, let alone [take away people's children with them], also has a responsibility to understand them."

-- Ben Goldacre, Bad Science

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STATISTICS – THE BASICS

- The "mean" is the most common intuitive "average"
- The "median" is an average, but describes the central location of data
- The "mode" is an average, but describes the data which occurs most frequently

These terms are often misused and they are not the same, but they all describe a type of "average" – location and dispersion

STATISTICS – THE BASICS

- The Data: 2, 2, 3, 4, 4, 7, 7, 7, 9
- So:
  - The Mean is 5
  - The Median is 4
  - The Mode is 7

If you want to use these terms it is best that they are understood and explainable.

If the Median and Mean diverge significantly, the data may be highly dispersed, have outliers, and may have less meaning.

STATISTICS – THE BASICS

Three statisticians went out hunting, and came across a large deer. The first statistician fired, but missed, by a meter to the left. The second statistician fired, but also missed, by a meter to the right. The third statistician didn't fire, but shouted in triumph, "On the average we got it!"

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STATISTICS – THE BASICS

- Another Caution! The Simple and Weighted Average

	At Bats	Hits	Average
The month of April	10	7	0.700
The month of May	22	16	0.727
The month of June	60	18	0.300
The month of July	80	7	0.088
The month of August	90	4	0.044
Simple Average (Hall of Fame numbers!)			**0.372**
Weighted Average (look for a new job numbers)	262	52	**0.198**

- Be wary of averages!

THE "FLAW" OF AVERAGES

- Averages do not measure dispersion
- Averages do not measure trends
- Averages may not provide a single meaningful conclusion

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UNDERSTANDING THE PERCENTILE

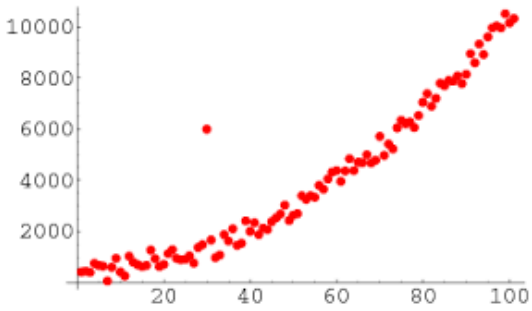
- Provides information on where data lies within a set of data so it explains how the data relates to the population of data
- 75th percentile means that 75% of the data in the population falls below this data point. This is also the third or "upper quartile"
- The 50th percentile is the median
- 25th percentile means that 25% of the data in the population falls below this data point. This is also the first or "lower quartile"

UNDERSTANDING AVERAGES

- Reversion to the mean - Also referred to regression to the mean, is the statistical phenomenon stating that the greater the deviation of a random observation is from the average, the greater the likelihood that the next observation will be closer to the mean.
- Over time the observations will get closer to the mean; that is, extreme observations are likely to be followed by a less extreme observations.

UNDERSTANDING OUTLIERS

- An *outlier* is an observation that lies an extreme or abnormal distance from other values in a random sample from a population



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OTHER MEASURES OF DISPERSION

- Standard Deviation.
- Refers to how much the data you are looking at tends to spread-out from the average
- The Standard deviation is merely adding up the squared differences between all data points and the mean (and then taking the square root and dividing by the total data points)
- 1 standard deviation and the bell curve
- Coefficient of Variation
  - All relative to the mean, or average

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OTHER STATISTICAL ISSUES

- Voir Dire and The Trial Court's Gatekeeper Role
- Does the expert truly understand the statistical conclusions?
- Does the expert have the requisite background?
- Is the expert using invalid statistical analysis or analysis based upon poor sample sizes?
- *Sargon Enterprises, Inc. v. USC* (2012) 55 Cal.4th 747.

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OTHER STATISTICAL ISSUES

- The Prosecutor's Fallacy. We need to know which is more rare: double murder or double SIDS?
  - Fact: 2:1 in favor of double SIDS

CROSS EXAMINATION

The two best evidentiary objections:

- Assumes facts not in evidence
- Lacks foundation
- More from the next panel

CUSTODY TRIALS

- Why would Math be involved in my custody trial?

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CUSTODY TRIALS

- Know Your Judge
- Is she a math person?
- Which way is it best to introduce the math?
- How will the evidence build up the math?
- Start the explanation in the opening statement

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CUSTODY TRIALS

- Timeshare
  - The evidence will show that Father's timeshare is 47%.
  - The evidence will show that Father has an almost equal timeshare.
  - This example is familiar because we insert the number in the DissoMaster.

CUSTODY TRIALS

- "The evidence will show that 67.4% of move-away cases involve allegations of domestic violence"
- "The evidence will show that about 2/3 of move-away cases involve allegations of domestic violence"

This example shows that using the fraction instead of the % may have more impact even though the % is greater than the fraction.

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CUSTODY TRIALS

For example ...

- Here is a chart from a confidential psychological report showing father's T Scores on the Parent Child Inventory

CUSTODY TRIALS

Scales/Child:	___
Parental Support	62
Satisfaction with Parenting	59
Involvement	32 *
Communication	42
Limit Setting	51
Autonomy	67
Role Orientation	57

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CUSTODY TRIALS

The evaluator wrote:

- "Parent-Child Relationship Inventory results contain one low score, marked by an asterisk(*), suggesting that he has a ***relatively low interest in spending time with [child] and being involved in his activities***." (Emphasis added).

CUSTODY TRIALS

What is a T Score?

Websearch:

- Psychometric Conversion Table Percentile Rank

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Custody Trials

Scales/Child	T Score	% of Sample with a lower Score
Parental Support	62	88%
Satisfaction with Parenting	59	82%
Involvement	32*	4%
Communication	42	21 %
Limit Setting	51	50%
Autonomy	67	95%
Role Orientation	57	75%

* "Relatively low interest in spending time with [child] and being involved in his activities".

Custody Trials

PROSECUTOR'S FALLACY - THESE FACTS ARE MADE UP

Assume the following is true:

- Studies have shown that a female child who is the age of 10, of divorced parents, who moves to a new home more than 500 miles from the non-custodial parent, has a 60% chance of becoming pregnant before she reaches the age of 18.

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Custody Trials

You want to argue that the move away request should be denied.

Why?

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Custody Trials

Because this child has a 60% chance of pregnancy before she reaches age 18.

PROBLEMS WITH YOUR ARGUMENT ....

- 1. Who was sampled in the study?
- 2. Other variables:
  - a. Geography
  - b. Race
  - c. Ethnicity
  - d. Education
  - e. Family income
  - f. Domestic Violence
  - g. Siblings
  - h. Etc.
- 3. Can one conclude that this particular child has a 60% chance of pregnancy?

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MISUSE OF STATISTICS
MARRIAGE OF WHEALON – ACTUAL TIMESHARE

- Look back at the past 24 months to figure out actual timeshare?
- Trying to establish a new level of support … so we need the data.
- There are 30 months left until Johnny graduates high school.
- Assume Johnny's time with Dad will not change.
- Can we just apply the % established over the past 24 months to figure out what will occur in the next 30 months?

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HISTORICALLY ... THE PAST 24 MONTHS ESTABLISHED A 20% TIMESHARE, OR SO WE THOUGHT.

As Johnny was a teenager and his Dad had certain obligations, the timeshare varied for each month.

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MONTHLY AVERAGES:

2014

- Jan., Mar., Apr., May, Sep., Oct. = 20% each month
- Feb., Jul., Aug., Dec. = 10% each month
- Nov. = 25%
- Jun.= 0%

2015

- Jan., Mar., Apr., May, Sep., Oct. = 20% each month
- Feb. = 0%
- Jun. & Jul. = 10% each month
- Nov. = 35%
- Aug. & Dec. = 30% each month

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MONTHLY AVERAGES:

- Mean = 17.5% (rounds up to 18%)
- Median = 20%
- Mode = 20%

THE "PROJECTED" TIMESHARE IS 17%

- The 30 months remaining includes 6 more months of sample than the trailing 24 months used.
- In those 6 months are included some of Dad's lower timeshare months and they will repeat 3 times as opposed to the other 6 months being repeated only twice.
- The timeshare (use the mean – the others were a misuse of statistics) is 18%, but the "Projected" timeshare is 17%.
- A long way to go to get some more child support? Not really – it takes about 5 minutes to compute.

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DENOMINATOR DEVIATION: SALARY CHANGES

- Harold usually grossed $100k per year
- Unfortunately, in January he suffered a 20% salary decrease
- Fortunately, in July he received a 10% salary increase
- Wanda told Judge Wise after the salary increase Harold had recovered 50% his salary decrease
- Had he?
- No!
- Wanda misused statistics with Denominator Deviation

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DENOMINATOR DEVIATION: SALARY CHANGES

- Harold's $20k January decrease was 20% when calculated with a **$100k denominator**
- $20k/$100k = 20% decrease
- Harold's $8k July increase was 10% when calculated with a mere **$80k denominator**
- **$8k/$80k = 10% increase**
- In order to have recovered 50% his salary decrease, Harold would have needed a **$10k raise**
- But Harold received only an **$8k raise**

DENOMINATOR DEVIATION: PROFIT MARGIN V. MARK-UP

- Wanda's manufacturing company purchases a component part from her brother Brad
- Brad buys the component for $50k and sells it to Wanda for $80k
- Harold (referencing Brad's "outrageous profit margin") accused Wanda of fraudulently overpaying Brad in order to reduce profit
- Using Brad's **$50k cost** as denominator, Harold told Judge Wise that Brad had a profit margin of ($30k/$50k =) **60%**
- Using Brad's **$80k revenue** as denominator, Wanda told Judge Wise that Brad had a profit margin of ($30k/$80k =) **37.5%**
- Wanda's 37.5% figure is Brad's correct "profit margin"
- (Harold's 60% figure is Brad's "mark-up")

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DENOMINATOR DEVIATION: FC 4057(B)(3)

- Harold and Wanda have one child: their daughter Katie
- Harold's NDI is $90k per month
- Wanda NDI is $10k per month
- You represent Harold
- This morning Judge Wise ruled, pursuant to Section 4057(b)(3), that:
  - Harold has an extraordinarily high income, and
  - Harold's guideline-formula child support would exceed Katie's needs
- Congratulations!

DENOMINATOR DEVIATION: FC 4057(B)(3)

- Judge Wise indicated that Harold's child support payment will equal Katie's reasonable monthly expense amount – an amount the Judge will determine at next week's hearing
- Katie's share of Wanda's household expenses total $10k per month
- Using the parents' combined $10k monthly NDI as denominator, you compute Harold's expense percentage as ($9k/$10k =) 90%
- Thus, you compute Harold's share of Katie's monthly expense at Wanda's house at (90% x $10k =) $9k

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DENOMINATOR DEVIATION: FC 4057(B)(3)

- But then you think: "Wait a minute! What about Katie's $6k monthly cost at Harold's own house. Shouldn't Harold be credited for paying that entire expense?"
- Can you think of a statute that requires consideration of **both parents'** child-related expenses?
- Of course – the add-on Sections!
  - Section 4062 defines **both parents'** add-on expenses
  - Section 4061 prorates **both parents'** add-on expenses
- You decide to add Harold's $6k expense to the Katie expense denominator

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DENOMINATOR DEVIATION: FC 4057(B)(3)

- **Now** the Katie expense to be divided totals (Wanda's $10k + Harold's $6k =) $16k
- **So** Harold's share of the monthly expenses now totals (90% x $16,000 =) $14,400
- **But** since Harold already pays a $6,000 portion directly, his child support obligation to Wanda is only ($14,400 - $6,000 =) $8,400

STATISTICS AND FINANCIAL REPORTS

Reasonable Compensation

- Charting and Regression Analysis.
- What is it measuring?
- Is it effective?

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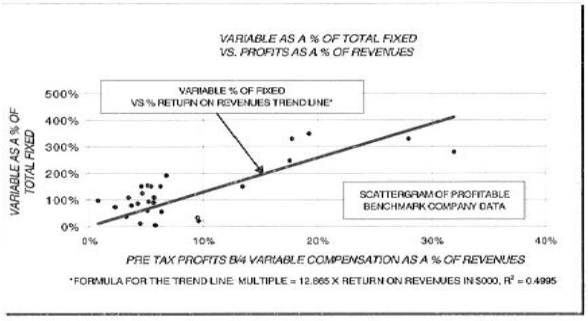
REASONABLE COMPENSATION

TOP THREE EXECUTIVE OFFICER
VARIABLE COMPENSATION AS A % OF FIXED COMPENSATION
VS. PRE-TAX RETURN ON REVENUES
PROFITABLE BENCHMARK COMPANIES



IS THERE A TRUE CORRELATION BETWEEN THE VARIABLES? THE CORRELATION COEFFICIENT IS RELEVANT

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STATISTICS AND FINANCIAL REPORTS

- Seasonality and those pesky stub periods (How to index and defeat their use under IRMO Riddle)

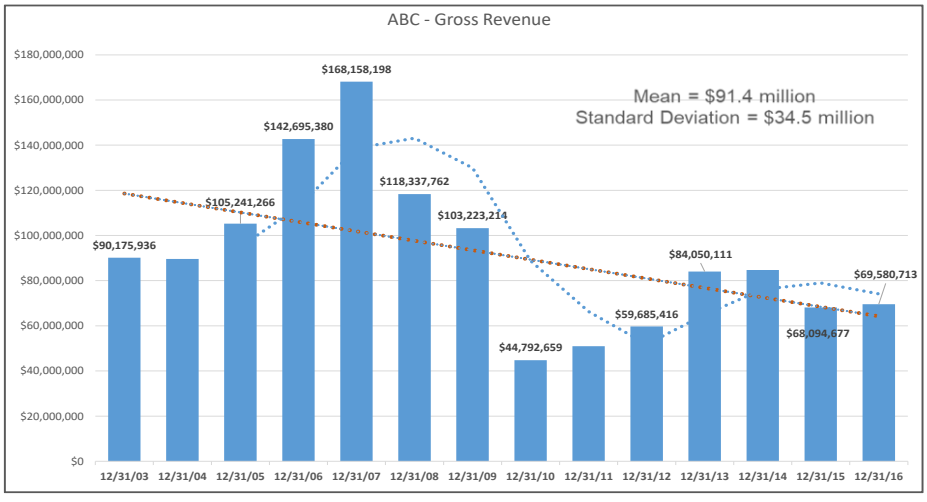
Cash Flow by Quarter

Stub Period Analysis

	Q1	Q2	Q3	Q4	Annual
2014	43,024	55,250	60,300	57,250	53,956
2015	41,130	49,750	49,800	47,630	47,078
2016	45,000	52,630	52,000	48,130	49,440
2017	42,516	55,940	55,690	51,000	51,287
2018	37,000	46,750	46,880	47,000	44,408
Average	41,734	52,064	52,934	50,202	49,234
Quarter Index	**84.8**	**105.7**	**107.5**	**102.0**	**100.0**

STATISTICS AND FINANCIAL REPORTS

- Cyclicality and Standard Deviations (the more cyclical, the higher the standard deviation)



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STATISTICS AND FINANCIAL REPORTS

- Variability and risks.
  - The greater the variability, the greater perceived risks, the higher the cost of equity/Capitalization rates.
  - This is a factor that should specifically be analyzed by the appraisal expert
- This is what drives the value of a stock option
  - As the Standard deviation of the stock price increases, so does the option

STATISTICS AND FINANCIAL REPORTS

- Common Size Financial statements
  - As to the P&L, all items are stated as a percentage of Revenue.
  - What does this show year over year? A change in expense items relative to a change in revenue (business activity)
  - It isolates potential non-recurring items (*County of Placer v. Andrade*)
  - It isolates extraordinary activity
  - It may predict advancing expenses and deferring revenue

PROBABILITIES AND SETTLEMENT

- Use Expected Value Theory
- Expected Value - a predicted value of result which is calculated as adding up all of the possible values/outcomes for when considering the probability (likelihood) of its occurrence.

PROBABILITIES AND SETTLEMENT

- For each balance sheet issue, you can prepare the following:

Issue #1	Value	Likelihood	Weighted Outcome
H's Value of Business	1,000,000	75.0%	750,000
W's Value of Business	1,800,000	25.0%	450,000
			1,200,000

Issue #2	Value	Likelihood	Weighted Outcome
H's estimated of H's Credits/ Reimb.	(225,000)	80.0%	(180,000)
W's estiamted of H's Credits/ Reimb.	(25,000)	20.0%	(5,000)
			(185,000)

Best Case for H, Net Charges to H ($1,000,000-225,000)	775,000
Best Case for W, Net Charges to H ($1,800,000-25,000)	1,775,000
Expected Value, Net Charges to H ($1,400,000-185,000)	**1,015,000**

Assessing the likelihood/probability is a matter of judgment of the forensic as to the financial issues and as to assessing the legal aspects by the attorney.