How randomness rules our lives:
Statistics is more important than you think!

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"The really unusual day would be one where nothing unusual happens"
-Persi Diaconis

Many people in their daily lives associate events that they don't (immediately) understand to superficial beliefs and/or entities like 'miracles', 'gods' etc. In many cases they further go ahead and claim that not only is the event associated with a god, it is also 'caused' by it. I believe that the origin of such illogical behaviors lies in the extreme need for an immediate 'closure'. The need for immediate 'closure' is what I think to be one of the major things that plague the mind and in doing so it enslaves the subject into believing things for which there isn't any evidence in the scientific world.

The Law of Truly Large Numbers states that given a large enough sample size; any outrageous, unusual thing is likely to happen. Given that, we should expect unusual things more often than we think such that a truly unusual day would be the one where nothing unusual happens.

So, next time you hear of a person getting hit by lightning thrice in the last 2 months, don't get alarmed (also don't look for closure). It might be that he is a fisherman, working 8 hours a day over the Catatumbo River in Venezuela.

The Catatumbo River is a river rising in northern Colombia, flowing into Lake Maracaibo in Venezuela. The "Relámpago del Catatumbo" (Catatumbo lightning) is a phenomenon that occurs over the marshlands at the Lake Maracaibo mouth of the river, where lightning storms occur for about 10 hours a night, 140 to 160 nights a year, for a total of about 1.2 million lightning discharges per year. The light from this storm activity can be seen up to 40 kilometers (25 mi) away and has been used for ship navigation; it is also known as the "Maracaibo Beacon" for this reason.

Is it not likely that a fisherman working 8 hours a day in such an environment got hit by lightning thrice in last 2 months? Anyone without a degree in Statistics can tell you that it is very likely. When presented with a context, the unlikely event became very likely. If you happen to be a family member of such a fisherman, this might not come as a surprise to you as you already had the context.

So, thinking in terms of potential contexts aids us in laying down logical explanations of events for which we do not have an explanation right away.

As Sherlock Holmes puts it,

"If you eliminate the impossible, whatever remains, though improbable, must be the truth"

Most people fall for delusional/impossible explanations as they are not willing to put in the effort to think through the pool of possibilities (even if they are improbable). Once someone decides to explain some unexplained phenomenon, the only constraint they face is that of 'time' and 'willingness".

Now some questions, why is it the case that people choose to invent superficial entities (for which they have no basis or evidence), when there is a much simpler explanation right in front of them?; Where and When did such behaviors originate?; How does one go about quantifying the effects of such behaviors on the society's development?, Are these behaviors (to some extent) genetically determined?, Is a 6 year old kid more logical in perceiving the world than an average 35 year old priest?, What if children are taught statistics (e.g. anecdotes of various laws like the law of large numbers, law of near enough, Law of the probability lever etc.) from very early on? Will this lead us towards a less delusional future society as a whole?

To answer these questions, one can begin by asking: If the world is governed by these statistical laws, is formal education in Probability theory and Statistics necessary to make wise decisions? The short answer is NO. The formal part is not necessary, but at the least some informal understanding is necessary. One important point to note is that, with the formal part in your tool kit you can do things much more efficiently and accurately compared to if you just had the informal part.

For example, people can learn to drive a car without knowing how an internal combustion engine works. The engine is crucial for the car to function, but given the fact that it is functioning, it is not necessary for the driver to know how it works to drive the car from point A to point B.[1]

In the same way, in order to make wise decisions it is not necessary for people to formally know what a confidence interval means or what a t value computes.

People are already applying these statistical laws phenomenally in their everyday life. An example goes as follows, looking two or more times to your left and right while crossing a road (in a country like India with crazy traffic and not many formal zebra crossings rules). People are essentially taking a decision informed by plenty of evidence. In formal statistics jargon: Statistically speaking, people are significantly more likely to likely to live longer in a country like India, if they crossed a road by looking 2 or more

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[1] I would like to mention that I am not encouraging people to not take up the formal part. Rather, my theory intends to convey the following: Get people started by informing them about the hidden 'endowment of Knowledge' they already possess and how to make the most of it (this is supposed to take less effort, hence likely to be practiced). Later on, when people are comfortable with the earlier exercise, we inform and educate them about the power of formalism and generalizability and teach them to adapt what they learnt informally into a formal framework (at this point they are supposed to be much more comfortable in taking up the formal stuff). The main idea is to not throw heaps of information on people, rather take relatively small and easy steps and work our way up.

times to their left and right compared to the alternative in which they look zero times to their left and right.

People intuitively understand the underlying mechanics of probability theory and Statistics which is evident from the fact that they are living their lives day in, day out in a world that is governed by these laws. What is stopping us from being a society in which 'everyone' practices evidence-based decision making?[2]

Maybe what we need to do is to get information into people's ear more often than it is getting in now. These intuitive understandings need to become more explicit and come out of people's subconscious mind into their conscious minds. Once it becomes so important that it is in their conscious minds, the brain chemistry will take care of activating it at the moment if any concern or clashes arise.

How do we get more information into people's head?[3] Narratives or Anecdotes seem to draw people's attention especially if there are some quirky details in it. Below, I provide an example of how one might convey the ideas (Borel's law) of probability theory in an anecdotal form which can be read to people of a treatment group in context of an RCT, here it goes:

> Émile Borel was an eminent French Mathematician, born in 1871. He had several mathematical objects and concepts named after him – such as Borel measure, Borel sets, Heine-Borel theorem. In 1943 he wrote a non-mathematical introduction to probability called 'Les probabilités et la vie'. In it he introduced what is now known as the Borel's law which says,
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> "Events with a sufficiently small probability never occur"
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> He explained this by the example of monkeys, who by randomly hitting the keys of the typewriter happen by chance to produce the complete works of Shakespeare. Borel said, such is the sort of event which, though its impossibility may not be rationally demonstrable, is, however, so unlikely that no sensible person will hesitate to declare it actually impossible. If anyone claims to have observed such an event, we would be sure that he is deceiving us or has himself been a victim of fraud.

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[2] A lot of factors stop us from being a society in which 'everyone practices evidence-based decision making'. Some of them include: Peer pressure, religious values, not willing to put in time required to tease out causality, superstitions, external validation, etc. I will not investigate these above, rather I will look at: How Informing people more about these ideas in a specific informal manner (e.g. anecdotes) may lead to a significant increase in understanding of these basic laws of Nature.

[3] I discuss the anecdote method which will be used to disperse information on how statistics and probability works. In order to figure out the causal effect of the anecdote method on people's future earnings/cognitive test scores/etc. a Randomized Control trial need to be performed in which we randomly assign a treatment group to take the intervention (e.g. hearing anecdotes over the summer holidays in school) and a control group to not take it. I plan to do such a trial when I pursue my post-graduate degree in the coming years.

Such anecdotes followed by open discussion sessions for a few months might be the treatment of a RCT. Whether such an RCT would detect an effect on future cognitive test scores/ earnings is a matter of speculation.[4] But, the underlying idea is clear, such quirky stories do stick in people's minds. That is precisely what we need to make these ideas more explicit such that they are at people's disposal whenever they need them.

Learning Statistics and Probability theory is fun and extremely useful. It helps us model all random and non-random phenomenon in the world. This combination is so powerful that once you realize its true potential, you view everything in the world from a statistical point of view. It is like getting a pair of glasses that upon wearing are able to decode the world for you and provide you the best ways to perform any task ranging from the right method of tying your shoe laces to cracking the stock market and beyond. Who wouldn't want that, I would for sure! Go ahead and learn it and then the world is your oyster.

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[4] I plan to do a randomized control trial of this nature when I pursue my post-graduate degree in the coming years.