

LIGHTNING AND THE INTEGRITY OF THE LOTTERY

STEPHEN WADE, PRINCIPAL, LOTTERY MANAGEMENT CONSULTING, LLC.



We have all heard the expression, 'Lightning doesn't strike twice in the same place.' This saying, repeated often enough, has the weight of a proverb. Yet it is obviously untrue. Mountaineers know that lightning strikes some places with dangerous regularity. Prudent flatlanders know to avoid tall trees in a thunderstorm. Lightning is, after all, a phenomenon that follows physical laws. Fortunately for us, it rarely strikes where we are.

This false proverb stays with us, because it expresses something we would like to be true.

Lightning is awe-inspiring. A word cloud about lightning would certainly include rare and random. We might be able to agree on what rare means, but humans notoriously have a hard time with random. We often use the word to mean the same thing as unpredictable, or even not deliberately chosen. Both of these senses apply to lightning.

But random has a far more rigorous definition that applies in the lottery context. We use random processes to determine winners. A key feature of a random process is that it has no memory; what happens next is not influenced by what just happened. The flipped coin does not remember how it landed last time. Consequently, it has no inhibition against landing that way again.

We know that an honest coin-flip process, over the very long run, produces heads about as often as tails. This is an expression of what statisticians call the 'the law of large numbers.' What we would like to be true is: Even over the short run, heads and tails should be equally abundant. This is a false expectation. It is so much part of our human cognition that psychologists have called it 'the law of small numbers.' The psychologists were being ironic¹. What they mean is: What we think is true in a grand sense, we expect

WE MIGHT BE ABLE TO AGREE ON WHAT RARE MEANS, BUT HUMANS NOTORIOUSLY HAVE A HARD TIME WITH RANDOM.

to be true in the smallest instance. We expect more regularity from the world than a truly random process will deliver. A truly random process will deliver patches of concentration and sparsity, while we intuitively expect evenness. An even distribution is in fact a reflection of order, not of randomness. Yet our natural cognitive bias is such that when we see

departures from evenness, we think there must be a cause.

Lottery wins can be awe-inspiring and, like lightning, evoke the words rare and random. And we expect that lottery wins are delivered by an unbiased and truly random process. Analysts know that a random process will result in areas of concentration and sparsity. Yet our human cognitive bias is such that we expect these wins to be somehow evenly distributed. This expectation of evenness is routinely contradicted by reality, leading some to question the integrity of the lottery.

And after all, why shouldn't people question the integrity of the lottery? It is possible to imagine various kinds of rigging and hacking that could happen. Recently, culprits have been convicted and are now serving time for corrupting lottery games. Our vigilance against such attacks may be higher now than ever before. However, the confidence of prospective players is not based on our vigilance. It is based on their belief that the games are

fundamentally honest. Unfortunately, it is also based on the false expectation that an honest game will result in an even distribution of wins.

'PEOPLE DON'T WIN THE LOTTERY TWICE.'

This is just as false as 'Lightning doesn't strike twice in the same place,' but any concentration of wins to a person, or even to a geographic area, tends to undermine public confidence in the integrity of the lottery.

Lottery managers and marketers might expect to feel some skepticism from the public when some players win repeatedly. People who play a lot can win a lot, and we generally do not know how much any player spends.

Unfortunately, there is another driver of winner concentrations that, although it has nothing to do with the integrity of the games, supports suspicion of the lottery: There are more people who are willing to play and win the lottery, than who are willing to identify themselves to the government and claim the prize. Winning lottery tickets are bearer instruments, and sometimes the payment is collected by someone other than the person to whom the lottery sold the ticket. Some lotteries (for instance, the North Carolina Education Lottery²) have addressed this issue in their communications to players.

Traffic in bearer instruments can result in concentrations of winners through what we might call network effects. Where does a player first learn that a ticket is a winner? Probably at a lottery retailer. Where does the player learn that the win is too big to be paid anonymously at retail? Again, probably at a retailer. Who sees that 'you need to go in to the office' is not a cause for joy? And who might have seen this scenario played out before? Probably, the person behind the counter at the lottery retailer.

If that person's network of acquaintances includes someone who has claimed winners from the lottery before, might it be helpful to put the uncomfortable winner in touch with that experienced winner? That is just the sort of personal service that gives a human touch to playing the lottery.

It may happen that, as a result of this referral, the winning lottery ticket changes hands at some price agreed upon by the uncomfortable and the experienced winner. The legality of this transaction

may vary from one jurisdiction to another. Regardless of whether the experienced winner (and eventual claimant) has broken a law, this kind of transaction tends to concentrate wins in a way that defies even the best-informed expectations about our games of chance. The experienced player may buy lots of tickets legitimately, but 'just lucky' only goes so far in explaining the record of claims.

A LOTTERY WITH 'INCREDIBLY LUCKY' WINNERS FACES A DILEMMA WITH REGARD TO PUBLIC STATEMENTS.

A lottery with 'incredibly lucky' winners faces a dilemma with regard to public statements. It is essential to convey that the games are, in fact, honest and that no one has hacked them. Otherwise, the lottery risks fundamental loss of public trust in its operational controls – this is the first horn of the dilemma. It may be desirable to acknowledge that winning tickets do sometimes change hands. Perhaps this can be done without impugning the honesty of the 'just very lucky' players. However, speculation about why someone would sell a winning ticket may lead to a conclusion that those winners are shady characters, probably not fully responsible citizens. The perception that there is something illegitimate about those players may then extend to lottery players in general – the 'lottery players are not like me' dreaded by the marketing department. That is the second horn of the dilemma.

Of course, 'lottery winners have something to hide' leads to 'lottery players are not like me' more reliably in some settings than in others. It is a fact that in some places, wanting to avoid the attention of the government may ring more as 'like me' than 'not like me.' Thus, while there is an urgent need to reassure players that there is zero tolerance for interfering with the games, there is less clarity about how to publicly address 'very lucky players.' Perhaps these players should be addressed privately and personally.

In order for a lottery to address these 'very lucky players' personally, it must

identify them. If referrals through the retailer network happen as speculated above, then there may be a statistical rationale for deciding whom to contact. That is, a retailer or group of retailers may, over a sufficient period of time, account for a volume of sales (say millions of dollars) sufficient for the 'law of large numbers' to predict the number of winners due to their sales. For example, we would expect that \$10 million of sales in the Pick 4 game would produce about 1,000 wins of the top prize. One thousand wins, and how many individual winners? Across the whole state, we may find that 1,000 wins go to 990 winners on average. If, in a particular group of retailers, we see 1,000 wins going to 100 winners, we have identified a group of 100 people that probably includes some players who have redeemed tickets originally purchased by someone else. It may be worthwhile to winnow this list of players and contact any who account for a big share of the total. Note that here, we have confidence in the statistical approach to take us as far as what to expect from \$10 million in sales, not from \$10 thousand. Likewise, we are more comfortable saying that 100 is different from 990, than saying 1 is different from 9. A statistical approach is useful just as long as it sticks to 'law of large numbers' territory.

To summarize: Any concentration of wins in a lottery game potentially erodes public confidence in the integrity of the lottery. This is partly because humans lack an intuitive understanding of what 'random' looks like, and mistake legitimate patchiness of wins for the result of some manipulation of the game. However, if winning tickets change hands before being claimed, concentrations of wins far beyond what might be expected from a random process can result. Maintaining public confidence in the lottery may require identifying and communicating directly with players who appear to be claiming wins far more often than would be consistent with their own good luck. If networks of acquaintance involving lottery retailers facilitate traffic in winning tickets, a statistical approach may help focus this communication effort. ■

Notes:

1. Kahneman, Daniel. *Thinking, Fast and Slow*. Farrar, Straus and Giroux, 2011. See chapter 10.

2. <https://www.nclottery.com/News/2016/9/21/Some-facts-and-information-on-players-who-beat-the-odds>