

GAMBLING: WHAT ARE THE ODDS?

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Many arguments against gambling have been made, and they generally center around the negative consequences that result from gambling, including greatly increased crime, the destruction of family and society, and the many problems that result from compulsive and pathological gamblers. Although these are serious issues, one that is seldom raised is people's misunderstanding of the basic nature of gambling: odds. Although most people believe they understand odds and the risks involved in gambling, in fact they do not. And their confusion about risks, along with other misunderstandings and biases, makes it easy for gambling providers to manipulate and defraud them.

1. BACKGROUND

It is well established that crime rates rise substantially in areas where gambling is legalized. One striking example comes from Atlantic City, New Jersey, where according to the FBI, larceny increased by 467% in the first nine years after gambling was legalized there.[1] The state of Illinois, when debating whether to permit casino gambling in Chicago, estimated that increased costs in law enforcement would easily require more than all of the one hundred million dollars in expected tax revenue that gambling was supposed to bring the state.[2] And some estimates placed the increase in law enforcement costs at ten times that number—over one billion dollars annually.[3]

Not only does legalized gambling increase local crime, it is also destructive to individuals and families. Gambling is often addictive, and many people who gamble develop into problem or compulsive gamblers. The American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders characterizes pathological gambling as a "chronic and progressive failure to resist impulses to gamble, a gambling behavior that compromises, disrupts, or damages personal, family, or vocational pursuits." [4] The number of compulsive gamblers and problem gamblers increases substantially when gambling is legalized. In 1974, when Nevada was the only state where gambling was permitted, the number of problem gamblers in the United States was much less than one percent of the country's population; whereas, in Nevada it exceeded 2.5%.[5] Currently, the number of compulsive gamblers is estimated at approximately 1% of the population in states where gambling is illegal, but close to 5% in states where gambling is legal.[6] And fully 10% of the entire population constitute problem gamblers.[7]

Compulsive and problem gambling leads to personal indebtedness and tends to destroy the gambler's family, emotionally as well as financially, as the family's income, belongings, and even groceries are sacrificed to the insatiable desire to win. Gamblers' debts frequently lead them to crime and other destructive behavior.[8] And this inflicts great costs not only on the gambler and his or her family, but

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also on society as a whole. It is currently estimated that each problem gambler costs the state \$52,000,[9] and in 1994, the state of Maryland put the cost of all compulsive gambling in that state at 1.5 billion dollars.[10] The national and global costs are huge, and this is only the financial cost of an immense problem that has many destructive aspects for society and our families.

Yet despite all of these facts, gambling is growing throughout the world. In the United States in the early 1970's, when the only legal gambling was in Nevada, the amount of money wagered legally in 1974 was about 17.3 billion dollars. By 1993, however, that number had ballooned to 394.3 billion dollars,[11] far more than the amount spent on all other forms of entertainment combined.[12] In the United States, the average gambling expenditure per person was \$200 during 1991, in Australia it was \$400, and in Minnesota it was \$500.[13] The problem is common in Europe, as well. Even Albania and Britain, the last European holdouts against state-run lotteries, finally succumbed to the temptation and instituted lotteries in 1993 and 1994, respectively.[14]

2. THE PROBLEM

Why is gambling becoming so popular in spite of its many destructive consequences? This is a difficult question which has been studied extensively, and for which there are few satisfactory answers. It seems that one of the biggest problems is simply misunderstanding. Although many people are aware of the moral and religious arguments against gambling, and some are also aware of the economic and social costs, there are three other issues which are less often discussed, and whose understanding is important. First, most of us do not understand just how bad the odds are; second, a variety of other misunderstandings interfere with our ability to use the odds; and third, casinos, lotteries, and other gambling providers manipulate these misunderstandings to entice and exploit gamblers. But by learning about the odds and examining the misunderstandings we can overcome all three of these problems. In fact, research shows that the more people learn, the less likely they are to gamble.[15]

2.1. Odds. Almost everyone has trouble understanding the huge and tiny numbers involved in gambling odds. But learning about these odds has convinced many people that gambling is not the harmless pastime they thought it was. The main thing to understand is that the odds always favor the house. For example, the house's take on a slot machine can be as high as 35%. This means that if you bet ten dollars, you can expect to walk away with only \$6.50; if you bet \$100, you can expect to keep only \$65, and so forth. The more you play, the more you lose. Although some gamblers are ahead temporarily, in the long run the odds will prevail, and the gambler will lose. This simple principle explains why the casinos take in so much money. The Foxwoods casino in Connecticut, for example, netted—and gamblers there lost—about \$500 million in 1994.[16]

These odds become clearer when we think of a simpler example, like an unfair coin. If a coin were weighted to come up heads sixty-five percent of the time, no one would be willing to play a game where they were forced to bet on tails. In fact, the person who designed the game would be considered a cheat and a fraud. But this is essentially what happens in the casino and the lottery. Somehow, when the rare win is called a "jackpot" and is accompanied by bells and lights, the odds become

obscured in our minds, and we suddenly think that this is a legitimate game we can win after all.

Of course, even with an unfair coin there will be rare occasions when the victim might be slightly ahead, but the chances of being very far ahead are tiny indeed. Take craps, for example, where the odds, though poor, are actually much better than the slot machine. Even so, if the gambler bets one dollar at a time, the odds of winning a thousand dollars before losing a thousand dollars are one in two trillion.[17] (That's a two with twelve zeros after it.) If every person in the entire world played this way until they had won or lost a thousand dollars, and then they did this over again three hundred times, only one of them would ever win, and only once of all three hundred times.

The odds for lotteries are even worse than casinos. The Minnesota State Lottery, for example, pays out only 60% of the money it takes in—substantially worse than slot machines or any other type of casino gambling. And the chances of winning the \$5000 jackpot in the Minnesota scratch-off lottery are approximately one in 240,000. You are six times more likely to die from a lightning strike than to win this jackpot.[18] And bigger jackpots have still worse odds. The chances of winning the California Lotto Jackpot are approximately one in 18,000,000. If you have to drive ten miles to buy this ticket, you are three times more likely to be killed in an automobile accident on the way than to win the jackpot.[19] If all of the losers of this lottery were to stand in line, they would reach approximately 6800 miles, which is approximately than the distance from New York City to Japan. And to have a fifty-fifty chance of winning the jackpot of the British National Lottery, you would have to spend five pounds a week for the next 28,000 years.[20]

The worst odds are in the large multi-state lotteries like the Powerball, and they are almost non-existent. Chances of winning are worse than one in fifty-four million. Put in perspective, this means that if all of the losers for one drawing of this lottery were to line up, the line would stretch most of the way around the world. You are far more likely to be injured by a lightning strike this week than to win this jackpot.[21] And if you were to read aloud the names of the losing ticket holders for just one drawing, it would take about three and-a-half years.

The fact that 25% of all United States citizens have a weekly lottery habit[22] shows that far too few people understand these odds. In fact, research shows that most of us don't ask for the necessary information to figure the odds, nor do we know how to figure them even when we have that information.[23] Instead, we estimate them based on various false perceptions and misunderstandings. For example, many people wonder, "But what if you're that one?" even though they would never bet on the much more likely chance that they would be struck by lightning this week. The problem is, the worse the odds are, the less likely you are to be that one, and these odds are so small as to be essentially zero. Or, as Fran Lebowitz is reputed to have said, "As I figure it, you have the same chance of winning the lottery whether you play or not."

2.2. Misunderstandings, Biases, and Mistaken Beliefs. Even when we know what the odds are, we still have many misunderstandings, false ideas, and other biases that interfere with our ability to understanding how the odds apply to our situation. People often think they understand the odds, but mistakenly believe that they will be able to beat them in some way. The main problems seem to fall broadly into the following categories: 1. Misunderstanding: They misunderstand

principles of probability. Many have a betting "system" which they incorrectly believe will help them beat the odds; 2. Availability error: They focus only on good, unusual, or easily remembered experiences, forgetting the bad, common, or less available ones; and 3. Luck: Some think they are "luckier" than the average person, or that they are more experienced. Unfortunately for the gambler, systems, luck, and experience are not relevant to most gambles, and only marginally relevant to the rest.

2.2.1. *Misunderstanding of Probability.*

The Gambler's Fallacy. One of the easiest mistakes to make with gambling is thinking that past gambles influence future ones. This common mistake is sometimes called the "gambler's fallacy," and it often leads people to bet more money and to bet more often than they otherwise would. For example, many people know how to figure that there is only a one in sixteen chance that a fair coin will come up heads four times in a row.¹ But if the coin has already come up heads three times in a row, then the chances that it will do so a fourth time are the same as they would be if it had never been tossed before—one in two. However, it is easy to make the mistake of thinking that this coin has only a one in sixteen chance of coming up heads. It seems that the coin should make the average of past tosses "come out right." But in reality, the coin does not remember past tosses and feels no obligation to even out the number of heads and tails that have come up before. As we make more and more coin tosses, the ratio of heads to the total number of tosses will approach one half, but this does not mean that there will be exactly (or even close to) the same number of heads as tails, nor does this mean that in the course of a few tosses things will come up anywhere near even. Misunderstanding this fact leads gamblers to believe they have more information than they really do, and can cause them to be more willing to gamble than they otherwise would.

Systems. Similar misunderstandings about numbers and odds are used to devise schemes and systems for picking lottery numbers, roulette numbers, or other gambles, and for deciding when and how much to bet. Most of the systems use impressive-sounding, but incorrect mathematics. One elaborate system depends on a faulty argument about distributing even and odd numbers. Other systems try to reproduce the techniques of lottery drawings, or figure odds from past numbers (the gambler's fallacy again). Although these systems sound impressive, surprisingly, none of them really improve a gambler's chances.² In fact, it is mathematically easier to show that by their very nature, all such systems must fail, than it is to devise a new one. These systems not only encourage gambling by making people believe falsely that their odds of winning are higher, but they also encourage gamblers to waste additional money buying the systems themselves.

¹Simply multiply the odds of getting heads with each toss $1/2 \times 1/2 \times 1/2 \times 1/2 = 1/16$.

²There is one exception to this rule—strict card counting in Blackjack, which if done correctly does give the card-counter a tiny advantage over the house (.05 to .2 percent advantage if done perfectly—which means that if you bet \$100 per hour, you will win only 50 cents per hour); however, card counting can lead to immense losses if done incorrectly. Many casinos encourage people to try because they make a lot of money when you fail. The only people I know that have been able to master this system are professional mathematicians. Moreover, every card counter I know insists that it is too much work for too little benefit—they much prefer to make their money at an easy job, like solving problems in advanced mathematics or theoretical physics. (For the odds, see Willem A. Wagenaar, *Paradoxes of Gambling Behaviour*, London: Lawrence Erlbaum, 1988, p. 20.)

2.2.2. *Availability error.* The second major mistake that people make, and which increases their tendency to gamble, is called "availability error" by psychologists.[24] This is the common tendency we all have to focus only on good, unusual, or easily remembered experiences, forgetting the bad, common, or less available ones. For example, hearing that someone has won the lottery sticks in our mind more than hearing that someone has lost the same lottery. We remember winners more than losers, and mistakenly think that the chances match our memory. This explains why people put more money into slot machines that are in large groups, where they can hear and see signs that others are winning, rather than into lone machines, where they have no recent memory of someone's winning. And people consistently do this, despite the fact that the odds are just as bad for the group as for the lone machine. Memories of winners are simply more available for the large groups than the loners.

We may also think that if we know or have heard of a winner it must not be very hard to win. Many people have a story about how their Aunt Velda or their brother-in-law's boss's friend once won the jackpot in the lottery or a slot machine. But there are several things that are omitted from such stories. Most important is the fact that Aunt Velda lost thousands of dollars in the slot machines and lotteries both before and after winning her hundred-dollar "jackpot." Many so-called "jackpots" are really only small prizes that barely cover the cost of playing, and which serve to entice people to continue playing and losing more money. They take advantage of our tendency toward availability error and exploit our memory of the one "win" while encouraging us to forget the many losses.

Moreover, when we hear the story of our brother-in-law's boss' friend's win, we tend to assume that because we have heard of this person and have some connection to him or her, however remote, and winning must be more likely than we had thought. But we never hear the story of our co-worker's Uncle Mack who lost a thousand dollars in the lottery. And if we wanted to hear all the stories of the times that our relatives' acquaintances' friends or our friends' acquaintance's relatives lost money while gambling, we would have no time for anything else. Indeed, by such a chain of associations you can hear the story of essentially every other person in the entire United States.[25]

2.2.3. *Luck.* The last in the list of mistakes and misunderstandings is the gambler's mistaken belief in "luck." A disturbing result of the research of psychologist Willem Wagenaar shows that many people believe that chance and luck are different things.[26] People trust a lucky number, a lucky rabbit's foot, or some other lucky thing to make them rich. Wagenaar and his associates found that people believed "You should wait until luck happens, and in that sense it is much like chance. On the other hand you can lose your luck easily by using it unwisely. You can also fail to utilise it, when it happens, for instance by not even noticing that this is your lucky day, or lucky deck, or lucky dealer. In this sense, the utilisation of luck is more like a skill." [27] Many also believe that luck is more important than skill and more than twice as important as chance in determining the outcome of a gamble. In reality, most gambles are determined entirely by chance, with no influence of skill or luck. Yet greed makes us believe that there are moments when the universe or some cosmic force wants to make us richer.

This belief in luck indicates a failure of parents and schools to teach the basic truths and facts necessary to avoid fraud and deception. Gamblers' belief in

luck and in the influence of skill in using their luck makes them susceptible to deception and manipulation by lotteries, casinos, racetracks and other gambling establishments.

2.3. Manipulation. Although gambling is trying to make itself over as a harmless form of entertainment for the whole family, and to tell legislators it is a legitimate industry, in reality it is a manipulative and destructive method for exploiting people's weaknesses and misunderstandings. Gambling providers, including state-run lotteries, manipulate people's misunderstandings about gambling to lead them to wager and lose more money.

Casinos have done extensive research into every conceivable technique they might apply to induce the gambler to stay longer and to bet more. One casino found that they could substantially increase the amount wagered in slot machines by blowing certain perfumes into the air around the machines.[28] Others carefully track which colors of slot machines are most likely to attract players initially, and then which colors people prefer as they become more engaged, locating the different colored machines in such a way as to encourage people to gradually move into the center where they will stay longer. They also found that placing one or two machines with more generous odds than the rest in a large group of machines motivated people to search madly for the "good" machines by playing every machine they could. And similar principles in psychology have taught them to make each machine have many small payoffs, often less than was originally bet, in order to encourage players to continue trying for the big win, and to make them feel like they are close.[29] "It's like eating popcorn. It's very hard to stop playing," says one senior casino management consultant.[30]

Gambling chips themselves are a subtle manipulation to make gamblers feel like they are not losing actual money, and to make them feel more like it's just a game. One casino manager points out that the average person thinks of cash in terms of what it will buy, but the equivalent number of chips are just "betting units." And they have carefully studied the effect of the denomination of chips on how much a gambler bets, and now all dealers are instructed to give change in smallest denomination possible, as those have been shown to be most likely to encourage more betting.[31]

Gambling establishments also try to make it easy for gamblers to play by offering check-cashing services, allowing them to post-date checks or buy back their checks if they happen to win, or neglecting to do credit checks to keep gamblers from going into substantial debt.[32] Casinos are in the business of making money, and will manipulate gamblers in order to do so.

Unfortunately, government lotteries are doing some of the same things; not only do they promote gambling, they even sink to the same sorts of tricks that casinos use to manipulate the ignorance and misunderstandings of the gamblers. One especially reprehensible trick used by casinos in Nevada to exploit gamblers' misunderstanding was the "near miss" slot machine, which made the losing combinations appear to be close to a large jackpot, giving the illusion that the gambler had almost won. This trick was eventually banned by Nevada gambling authorities[33], yet almost every lottery employs a similar trick. Namely, you would rarely think you were close to winning if you were supposed to pick a number between one and eighteen million, so instead lotteries have players choose many small numbers. They then give small prizes for partial matches, thereby strengthening the illusion that players are close

to winning, and encouraging them to try again. In reality, their being close last time has absolutely nothing to do with how they will do in the future, but the lottery encourages them to think it does. State governments, whose duty is to protect citizens from exploitation and fraud, are actually taking part in it by promoting their own lotteries.

3. CONCLUSION

One of the main arguments used in favor of legalization of gambling and institution of lotteries is that the resulting tax revenue can be used for good purposes that otherwise would be underfunded—schools, for example. The most obvious flaw with this argument is that in many cases, the indirect costs of gambling to the state such as increased crime and lost productivity, actually cost the state more than it gains in increased tax revenue (see footnote 2). A second flaw with the argument is that funding worthy programs using gambling money creates perverse incentives and conflicts of interest for those causes. A significant example of this is the funding of public education with lottery revenues. Public educators' duty is to teach citizens, among other things, about mathematics, including probability. But if they had taught their students well, there would be no lottery revenues because no one would play. So we are rewarding them for failing to teach effectively.

But the most important flaw in the argument for legalized gambling is the simple fact that we cannot let good ends justify dishonest or immoral means to that end. No legitimate government would legalize theft or fraud in order to increase tax revenues; why, then, do they permit gambling?

We know that gambling's philosophy of something-for-nothing undermines the framework of our society. But we also need to remember that gambling's something-for-nothing is a lie. Both the gamblers and the communities that vainly hope to benefit from it will find instead that gambling is nothing-for-something. Gambling gives nothing of value, but steals money and time, and corrupts the morals of our society. We have an obligation not only to avoid gambling ourselves, but also to teach the truth about gambling to others, and to use what we know to change attitudes, perceptions, and laws about gambling in our communities and nations.³

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³More information about gambling and related topics can be found at the author's web-site <http://www.math.byu.edu/~jarvis/gambling.html>.

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