

Hate the Game ...Not the Player

A Statistical Analysis of the Characteristics of
Pathological Gambling

Abstract

The purpose of this thesis is to examine the determinants of pathological gambling, in particular, the relationship, if any, between gaming activities and gambling behavior. The significance of this topic derives from the rapid growth of the gaming industry and the assertion by Walker (1996) that poker, blackjack, and bridge players are the minorities within Gamblers Anonymous, because the games they play require a real element of skill. A better understanding, therefore, of the determinants of pathological gambling might help dictate how legislation can preserve gambling as a controlled form of entertainment and simultaneously limit or eliminate its negative social and economic effects.

By Cartier Stennis
Advisor: Linda A. Bell

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I. Introduction

The gaming industry has been one of the fastest growing sectors of the US economy since gambling was legalized, outside of Nevada, in 1976. In fact, the casino and gaming industry is 80 billion dollars by market capitalization today. Every single state, with the exception of Hawaii and Utah, has some form of legalized gambling, most of which resemble state lotteries or Native American casinos. (Gerstein *et al.* 1999) Amongst the many phenomena that have perpetuated the fast growth of this industry, however, is the resurgence of poker as an American pastime. Since the advent of the card table camera in 2002, the game of poker has transformed into one of the more popular televised spectator events. (Hellmuth 2004) Prior to 2002, televised poker tournaments and cash games lacked one of the most essential elements of any spectator event—partial omniscience. No one except for the players involved really had any sense of the intricate dynamics of the game. After the advent of the card table with imbedded cameras, spectators went from having the least amount of information about a given poker hand to the maximum amount of information. They could now understand why actions by certain players were taken (to a limited degree), because they could see each of the players cards. Once partial omniscience of the game played was provided to spectators, poker, and subsequently gambling, became mass popularized. For example, ESPN televised the World Series of Poker in Las Vegas, Nevada for the past two years, and similarly, the Travel Channel has televised the professional World Poker Tour and Celebrity Poker.

In some instances, the increased popularity of gambling has inspired college undergraduates to seek poker as an alternative source of income or alternative profession. The New York Times featured an article recently, which illustrates a Princeton

undergraduate, Mike Sandberg, who earned 120,000 dollars over the past year playing poker online and at Atlantic City casinos. That 120,000 dollars consisted of 30,000 dollars from live tables in Atlantic City, where “he plays high-stakes poker in his black hooded sweatshirt and dark aviator shades” and 90,000 dollars from playing at Partypoker.com, a popular online poker site. In stark contrast, however, last year, another Princeton student made 11,000 dollars playing blackjack in two hours, losing most of his winnings 15 minutes later. “I was playing recklessly,” he states, “I was definitely drunk.”

Elizabeth George, who is the chief executive of the North American Training institute, a nonprofit organization that specializes in the pathological gambling behavior of youth, suggests that televised poker has perpetuated the problem. She believes it has romanticized gaming activity and made heroes or superstars out of professional gamblers for young people. The New York Times, however, makes note that individuals like Mike Sandberg are the exception or extreme case of the gambling revolution on college campuses. Nevertheless, due to a rise in the popularity of tournaments and prize money, Sandberg says that poker has become a career option for him. He estimates that he could earn up to a half a million a year, simply by playing poker over the internet everyday. (NYT 2005)

Thus, the fast growth of the gaming industry and the resurgence of poker have brought gaming into the homes of many Americans. Another New York Times article illustrates that the gambling world has gained popularity amongst high school suburbanites as well. This relatively new phenomenon has created much concern for parents who may fear that their children will develop pathological gambling behaviors. Conversely, other parents, however, argue that poker, specifically, develops mathematical

fluency through the practice of probability and statistical calculations used for evaluation during game play. (NYT 2004)

Internet poker has also become another catalyst to the recent gaming revolution. In 2003, more than 40,000 people played real money online poker per hour each day. In addition, global revenues for internet poker nearly approached two billion dollars that year. As these numbers increase and general gaming popularity grows, concerned citizens and government officials debate whether online gambling should be legalized and regulated or outlawed. The debates concerning the economic and social benefit of live casino still continue. In light of these issues, the general purpose of this paper is to provide insight into the gaming industry and community in order to advance the debates concerning the regulation of gambling in America.

II. Literature Review

This thesis investigates the determinants of pathological gambling behavior and focuses particularly on the existence of a statistically significant relationship between gaming activities and gambling behavior. The literature related to this topic derives primarily from economic and psychological studies. The majority of economic literature concerning gambling in America has focused primarily on the economic impact that casinos have on local economies. This literature effectively contextualizes the purpose of this thesis and provides significance to the inquiries of its study. The psychology literature speaks to the focus of this study and offers the basis to its investigation.

The economic literature suggests that throughout the history of legalized gaming in the United States, casinos and other forms of gambling have been instituted with the

support of local authorities as a means to reinvigorate local economies. Many economic studies, however, have shown that the total effect of casinos and other gambling facilities are not all beneficial socially or economically.

Perhaps *the* foremost example of this phenomenon is Atlantic City. During the 1970's, the city became a case study for how casino gaming could spur economic growth. In November 1976, the state of New Jersey amended its constitution to legalize gambling in Atlantic City. State and city officials had high expectations for how casino gaming would revitalize the dying city and how the economic gains would resonate throughout the entire state. This short passage characterizes the tremendous enthusiasm felt at the time.

“The casino gaming industry was expected to transform a dying city core into an exciting resort and convention center. Employment in Atlantic City would swell. The city's tax base would broaden. Tourism would spread throughout the state. Welfare rolls would diminish. The cruel spectacle of a poverty-stricken community attempting to support its poor with inadequate local resources would be eliminated. Moreover, state taxes on casino gambling revenues were earmarked to provide a new source of needed money for state-sponsored programs to help the elderly.”

Even before the revenue from casino gaming in Atlantic City was realized, eight other states seriously considered the legalization of gambling within their jurisdictions. Like New Jersey officials, they hoped to rejuvenate old resort areas and localities in need of revenue. (Sternlieb and Hughes 1983)

Seven years after its legalization, the overall benefits of the industry as a means to provide economic growth to Atlantic City were not clear. Sternlieb and Hughes (1983) cite mixed reviews with respect to the city's balance sheet. For example, the total value of the taxable property wealth of the nine casino hotels in Atlantic City amounted to more than \$831 million—more than 50 percent of the total value for the entire community. As

a result, the casinos paid \$37 million in real-property taxes. However, while the city experienced significant gains in regards to taxable property wealth, with the inception of the casinos followed a mass array of land speculators who bid up the real-estate values in the area. The economic incidence of this effect fell on low income households and homeowners, who did not wish to sell their homes, but now experienced a considerable tax burden. (Sternlieb and Hughes 1983) These reviews suggested that the total effects of legalized gambling were not all positive, despite the revenue stream it generated for local economies.

City and state officials did not predict these negative effects, however, because of two principal problems with the cost-benefit analysis of casinos on local economies—lack of a legitimate framework and lack of complete and reliable information. (Grinols 2004) In one incidence, a gambling addiction specialist privately told Grinols (2004) that her office no longer took public positions on any type of gambling. The treatment specialist had once made statements that were opposed by the state’s casino industry. Subsequently, treatment funding was cut by the state legislature. Grinols (2004) states that it was made clear to them that additional funding cuts could be expected if similar events occurred. The point here is that the gambling industry makes no objections to funding gambling research and treatment, as long as they do not contradict the principal interest of the industry. (Grinols 2004)

Nevertheless, Grinols (2004) suggests that there is nothing *inherently* detrimental about gambling. If an individual desires to gamble, then he should be allowed to indulge that volition. There is little wrong with gambling as a controlled form of entertainment. It

is perhaps comparable to many other types of entertainment for which an individual pays, except there is the unique potential to win money.

There are, however, social costs or consequences (operating primarily through problem and pathological gamblers) that are *associated* with gaming activity and require further study of gambling behavior. Based on these findings, subsequent and appropriate regulation at the state or federal level should follow. Grinols (2004) suggests that gambling participation and interest are severely uneven. While most individuals perhaps enjoy gambling occasionally, few intensely miss it. Pathological gamblers, who comprise a tiny proportion of the gambling population, however, contribute a disproportionate amount of gaming revenue. This fact contextualizes the significance of this paper. It aims to investigate the determinants of pathological gambling in order to help negotiate the maintenance of gambling as a controlled form of entertainment and minimize the negative economic and social effects of pathological gamblers.

The actual statistics associated with pathological gambling are interesting. One third of the American population is considered non-bettors. More specifically, these persons are individuals who responded “no” to the question: “[h]ave you ever gambled in the past twelve months?” (Grinols 2004) The same proportions were found in Clark County, Nevada—home to Las Vegas. Within the same population, 46 percent of respondents gambled in casinos, and the remaining 21 percent participated in other forms of gambling. Of the total population and of the 46 percent who gambled in casinos, 29 percent gambled twice a month, 8 percent gambled once per week, and 9 percent gambled twice per week or more. These statistics suggests that most Americans are indifferent to gaming activity. (Grinols 2004) The reason why Grinols (2004) believes

that gambling participation and interest are disproportionate is that the top 10 percent of gamblers contribute approximately 61 percent of casino revenues with regards to table games and gaming machines. That unevenness is why greater attention must be focused on pathological gambling behavior. (Grinols 2004)

Psychologists have contributed much literature with respect to the actual pathos of pathological gambling. Castellani (2000) anecdotally classifies “[p]athological gambling” as a “silent addiction” that “[claims] the lives millions of people, [however] it seem[s] that nobody [is] doing anything about it.” For example, over 90 percent of pathological gamblers in Minnesota owe an average lifetime debt of 54,000 dollars. In addition, approximately 20 percent of pathological gamblers that seek treatment in the state are either on probation, parole, or somehow taking part in the judicial system due to gambling-related offenses, six months prior to treatment. And why has more attention not been paid to pathological gambling by the government or addiction specialist? The reasons of Castellani (2000) are similar to those of Grinols (2004)—“government and business [are] making too much money.” In 1995, 500 billion dollars were legally waged in the United States. Of that sum, eight percent were withheld as net winnings. That percentage amounts to 40 billion dollars, which is more than revenues generated from movies, books, recorded music and park and arcade attractions combined. (Castellani 2000)

In order to investigate this issue of pathological gambling, it is important to perhaps first understand the potential determinants of the behavior. Abt *et al.* (1985) suggests that there are two ways through which individuals learn particular gambling behavior. The first is a simple interaction with the formal structures and rules of the

gaming activity. The second is a social process, whereby the individual takes into account the activity of the others through an interchange of mutual responses. There are some incidences where gambling may become increasingly intense and the possibilities of gambling careers and personalities may be spoken about. In other words, the behavior is determined by the gaming activity itself, by the context in which the game is participated, by the personalities of the gamblers, and their interactions with particular characteristics of the game. Therefore, professional gamblers, such as poker and blackjack players, may be considered similar to professional athletes, because they exhibit their skills not for pleasure, but rather, to realize financial rewards. The activities of the professional gambler are means to long-term income, and therefore, are no longer a means of entertainment or pleasure, but rather work—both professional athletics and gaming lack the necessary psychological components to solicit spontaneous and voluntary behavior. (Abt *et al.* 1985)

Because gambling behavior, in part, is determined by the nature of the game played, it is conceivable that one particular type of gaming activity may yield a higher concentration of pathological gamblers than others. Walker (1996) delineates two types of gambling: games of skill and games of chance. He suggests that games such as bridge, poker, and blackjack are excellent examples of games of skill, whereas others games, such as slot machines, are simple games of chance. The relevance of this distinction is that the reason bridge, poker, and blackjack players are under represented in Gamblers Anonymous is that these games incorporate a real element of skill. Therefore, immersion and determination enable the gambler to play the game more effectively. Because the game is played more effectively, the risk of severe financial losses, a quality that

characterizes most members of Gamblers Anonymous, diminishes. The idea that actual games may influence gambling behavior is the reason why this study, which investigates the determinants of pathological gambling, focuses on the relationship between games and gambling behavior.

III. Data

The purpose of this study is to examine the determinants of pathological gambling and determine if there is a statistically significant relationship between gaming activities and gambling behavior. The data comes from the 1998 Gambling Impact and Behavior Study (ICPSR Study 2778). This study collected and analyzed five data sets, which inquired about gambling problems, behaviors, and attitudes across the United States. In particular, the data set that is used for this paper is a pooled sample of 2,947 adults: 2,317 interviewed at home by telephone and 530 adults intercepted at various gambling facilities and then interviewed.

This data set is ideal to examine the determinants of pathological gambling, in particular, the relationship, if any, between whether an individual plays games of skill or chance and his level of pathological gambling. The data set includes the results of a diagnostic survey which identifies the respondent's level of pathologic gambling, in addition, to a variable which allows the categorization of whether the individual plays games of skill or games of chance. Lastly, it includes demographic controls which will also allow an examination of other independent determinants such as age, education, and gender amongst other characteristics.

1. Dependent Variable

The key dependent variable of this study is gambling behavior. This variable is the result of a diagnostic survey, which tested the level of pathological gambling of the interviewees. Under guidelines specified by the National Gambling Impact Study Commission, the Diagnostic and Statistical Manual (DSM-IV) criterion was used to identify pathological gamblers in the sample population. The DSM-IV measure was constructed by the American Psychiatric Association in 1994 and briefly states that “[p]athological gambling is defined as persistent and recurrent maladaptive gambling behavior.” (Gerstein *et al.* 1998) Individuals are asked 17 questions, which are used to identify ten different aspects of pathological gambling as determined by the DSM-IV based diagnostic (see Table 1). The maximum score an individual may receive is ten.

There is also a time element placed into the results of the diagnostic test. Interviewees are tested twice; once with respect to their lifetime experiences and once with respect to their past year experiences. The Gambling Impact and Behavior Study implies, however, that the DSM-IV based survey best identifies pathological gambling behavior over a subject’s lifetime because of the nature of the survey questions. Therefore, the diagnostic test used in this study will be the lifetime experience data.

Classifications of pathological gambling are adopted from the Gambling Impact and Behavior Study and are a function of both the most amount of money lost during one day of gambling and results from the pathological gambling diagnostic survey. There are five classifications for respondents of the diagnostic survey: non-gambler, low-risk gambler, at-risk gambler, problem gambler, and pathological gambler. Pathological gamblers are individuals who have lost more than 100 dollars in a single day from

gambling and received a score of five or greater. Problem gamblers and at-risk gamblers also have lost more than 100 dollars in a single day from gambling and received a score of three or four and one or two, respectively. The classifications for non-gamblers and low-risk gamblers are more complex and require an assumption to be made about the data. According to the Gambling Impact and Behavior Study, low-risk gamblers have either gambled, but have not lost more than 100 dollars in a single day or have lost more than 100 dollars in a single day, but did not accumulate any DSM-IV based points. Non-gamblers are individuals who have simply never gambled.

However, these two definitions alone create a classification difficulty. There are no variables or questions that strictly identify respondents who have never gambled, and therefore, individuals that have gambled, but have not lost more than 100 dollars in a single day maybe classified as either a low-risk gambler or non-gambler. In other words, an individual may have gambled once, several times, or a million times, and though highly unlikely, may not have incurred any loses, in addition to receiving a zero in the DSM-IV based diagnostic test. Under this scenario, that individual maybe classified as either a non-gambler or low-risk gambler. Therefore, non/low-risk gamblers are grouped together in this study (see Table 2)

2. Independent Variables

The principal independent variable of this study is gaming activity. This measure is a 0-1 dummy variable (Chance=0 Skill=1) that identifies whether or not the individual primarily plays a game of skill or a game of chance. The dummy variable derives from what respondents stated as their favorite game, and, in particular, it is in response to the

question: “now thinking about all the kinds of gambling we have discussed, can you tell me which is your favorite kind of game or activity?”

What an individual cites as his or her favorite game, however, and what that individual primarily plays most often are not necessarily the same. A person may state that her favorite game is blackjack, but the game she most often plays is poker. Perhaps it is the case that poker is the only action that is consistently available to her, for reasons such as the nearest casino is six hours away. It is important to keep in mind, however, that the focus of this study centers on pathological gamblers who by definition have ruined significant relationships, employment, and finances in order to satisfy their addiction. Most individuals who cite a particular activity as their favorite activity attempt to perform that activity as much as possible. It seems, therefore, that there would be few circumstances under which the pathological gambler would not play his favorite game most often. This study then makes the assumption that what the individual cites as his favorite activity is the game that he plays most often.

In order to categorize the various responses into games of skill and games of chance, several definitions of games of skill and chance were adopted. Table 3 separates activities into games of skill and games of chance, according to the definition implemented.

The Definition (1) characterizes games of skill as activities where past information influences present action. A player may improve his chances of winning with appropriate action given past events and probabilities. For example, Stanford University and the University of Washington are set to play in the NCAA tournament. Suppose an individual wishes to bet on the outcome of this game. Given that Stanford had lost its

previous 3 encounters to the University of Washington, by an average margin of 10.4 points per game, that individual would likely bet against Stanford, assuming no other contradictory information and favorable odds (i.e. he receives “even-money”¹ on his bet). Conversely, in games of chance, an individual may not improve his chances of winning given past information. The Borgata, one of the newest casinos in Atlantic City, places video screens above each roulette table, which display the last winning numbers and colors. The only value that these screens offer, however, is the money the casino generates from individuals who believe that the information displayed on these screens is useful. Each roll of the roulette wheel is independent of previous and future rolls. The probability that the ball will land on black 22 is the same whether it landed on black 22 the last four times, the last 500 times, or not once the entire day. Each roll is independent; therefore, past information cannot help a player improve his chances of winning. These activities classify as games of chance under the first definition.

Definition (2) of games of skill and games of chance is simpler than the first definition. Walker (1996) in reference to games of skill cites poker, blackjack, and bridge as skillful activities. Poker, blackjack, and bridge hold the same principles as Definition (1), but also have a psychological advantage to the other activities. These card games are also skillful because players, particularly professional players, can be spoken of in the same language as professional athletes. There exists World Championships of poker, blackjack, and bridge, and therefore, there are World Champions—legends that are repeat champions or players who consistently place highly in these events, beyond the probability of chance. (Walker 1996) The games these individuals play consume their

¹ Even money suggests that the odds of a particular outcome are equal to the bet and payout. For example, the odds of the University of Washington winning are 6:1, in order receive even money on the bet, the payout must at least be 6:1.

lives much in the same fashion as sports consume the lives of professional athletes. They direct concentrated efforts to practice and improve their play in order to realize long-term economics gains. Like many professional athletes, enjoyment is no longer a predominant factor or prerequisite to play. The games they play become jobs and the entertainment factor is significantly reduced. (Abt et al. 1985) In addition, persistent play and augmented expertise diminish the severe financial losses, which characterize individuals from Gamblers Anonymous. (Walker 1996) Therefore, card games such as poker, blackjack, and bridge are characterized as games of skill under the second definition for this study. It is also important to note for this definition that individuals who stated that their favorite games are “games of skill” are considered missing data. Due to the ambiguous nature of the response, “games of skill” cannot be characterized as a card game or any other activity, which might follow under the heading, games of chance.

Definition (3) is very similar to Definition (2). The only difference between the two classifications is that respondents who cited their favorite game as a “game of skill” are also included in the games of skill category. While these activities might not necessarily be card games, these games are in the spirit of what Walker (1996) classified as games of skill for the obvious reason that they are called games of skill.

However, despite established yet broad and flexible definitions of games of skill and chance, there are several games which cannot satisfy any of the set forth definitions. Charitable games, internet gambling, table games, other, and no favorite, with the exception of the last category, were too ambiguous of an identification of a favorite game in order classify them as either a game of skill or a game of chance. For example, an individual may play roulette or card games at a charity event. That individual may then

cite charitable games as his favorite type of gambling, but without clarification as to whether he played roulette or cards at the charity event, it is not possible to classify charitable games either way. The same logic applies to internet gambling and table games. These broad categories, depending on the particular game played, can either be a game of skill or a game of chance, and therefore, cannot be classified definitively as either one.

The remaining independent variables fall into two categories: general demographics and gambling history. General demographics consist of numerous dummy variables, which include the following categories: gender, age, race (where non-white individuals are classified as minorities), highest education level attained, employment status, and recorded house hold income. Gambling history simply includes whether or not the individual considers himself or herself a professional gambler.

3. Descriptive Statistics

Robustness of Games of Skill/Chance—Definition (1)

Table 4 exhibits the demographics of respondents according to gaming activity under the first definition of games of skill and chance. Most notably, the table shows that women are statistically significantly more likely to play games of chance than men, and similarly, men are statistically significantly more likely to play games of skill than women. The degree to which men play games of skill is more keen, however, than the extent to which women play games of chance. The table shows that of the individuals who play games of chance, women make up roughly 59 percent of the sample population, while men occupy the remaining 41 percent. Conversely, of the individuals who play games of skill, men are approximately 69 percent of the sample population, while women

make up the remaining 31 percent. In other words, men are more likely to play games of skill, than women are more likely to play games of chance. These descriptive statistics make intuitive sense. In general, men are more likely to gamble than women. Individuals who do not gamble are more likely to play games of chance because they are simple activities. These games do not require any skill, time, or effort in order to play the game effectively—an individual's effectiveness or ability to win is left simply to chance. Moreover, it is for this reason that of the people who gamble, most individuals do not play games of chance. Most people may frequent different gaming areas, such as Las Vegas, Nevada or Atlantic City, New Jersey, and play a simple game such as slots. Thus, the fact that most individuals are likely to play games of chance and women are less likely to gamble, in general, accounts for the discrepancy between the percentage of women who play games of chance and the percentage of men who play games of skill. Men are most likely to gamble, and if those who are more likely to gamble are more likely to play games of skill, then men would be most likely to play games of skill.

With respect to age, Table 4 illustrates that people 50 years old or greater are statistically significantly more likely to play games of chance, than they are likely to play games of skill. 40.67 percent of individuals 50 years old or more play games of chance, whereas 34.31 percent of persons from the same group play games of skill. It appears that middle aged adults occupy most of the participation lost by older individuals with respect to games of skill. The participation of middle aged adults increases from games of chance to games of skill by approximately four percent from 42.87 percent to 46.90 percent, respectively. These statistically significant means, in part, demonstrate the popular idea that the lottery and casinos of whom the majority of their revenue comes from slot

machines, which is the most represented activity of the games of chance, lottery games being the second most represented activity, derive significant portion of their funds from elderly people.

The picture that Table 4 portrays of individuals who play games of skill appear to resemble persons of higher social and economic status. The demographics with respect to race, education, and household income are all statistically significant and follow this trend. The majority of individuals who play games of skill and games of chance are white individuals. However, the discrepancy between white and non-white minorities is more keen within games of skill than within games of chance. Likewise, individuals who play games of skill appear to be more concentrated within the higher education and income levels.

Statistics with respect to the gambling history of respondents contradict some of the logic which Walker (1996) presents in his article. Each of the means is statistically significant with the exception of the final category within the largest amount of money lost in a single day variable. A greater percentage of individuals who play games of skill have lost more than one-hundred dollars in a single day, which is one of the criteria that define the threshold between low-risk and at risk gamblers. In addition, the percentages of individuals who consider themselves professional gamblers are statistically equivalent—both means fit into the others confidence interval. Walker (1996) suggests that one of the defining characteristics of individuals from Gamblers Anonymous is severe financial losses. However, individuals within this sample appear to lose more than persons who play games of chance. What is perhaps missing in the logic of Walker (1996) and may explain what is observed in the data is that these descriptive statistics and

Walker (1996) speak of absolute losses instead of relative losses. One-hundred dollars does not mean the same for everyone, particularly experienced gamblers, who play higher stakes in order to receive greater returns. In other words, they may play high stakes games, and lose more than one-hundred dollars, but not play beyond their wealth or means.

The percentages of professionals who play games of chance and skill are statistically significant and also contradict the article of Walker (1996). If it is the goal of the professional gambler, like the professional football player to realize long-term financial gains through their respective games, then why would a professional gambler leave his economic future in the hands of chance?

There are three potential answers to this question. The first is a matter of sample size. There are a greater percentage of self-proclaimed professionals who play games of skill than who play games of chance. The significance of that discrepancy may be strengthened given a larger sample size. The second suggestion maybe a flaw in the assumption that the game respondents claim as their favorite is the game they play most often. A professional poker play may play poker all the time, but state that his favorite activity is roulette. Poker has become a job, and therefore, the joy of playing has significantly diminished. Unlike poker, roulette does not require much, if any, skill. The professional poker play may then cite roulette as his favorite activity, because it is one of the forms of gambling that requires little or no skill, and therefore, he is able to receive enjoyment from the activity. The third option may be illustrated by the individual who may pick numbers at the roulette table according to the screens above the table at the Borgotta. He presumes his intelligence and “skill” affected the outcomes, when in fact his

winnings were the product of chance. The idea is that some individuals may irrationally believe that their actions may influence the outcomes of random events.

The groups with the highest concentration of individuals who play games of chance are non/low-risk gamblers and pathological gamblers. Both categories exhibit statistically significant means and suggest that non/low risk gamblers, in addition to pathological gamblers, are more likely to play games of chance than games of skill. 71.34 percent and 72 percent of non/low risk gamblers and pathological gamblers play games of chance, respectively.

Robustness of Games of Skill/Chance—Definition (2)

The patterns observed under Definition (1) continue in Definition (2). However, the split between the percentages of individuals who play games of chance with respect to gender moves a little closer to fifty-fifty. Table 5 illustrates the demographic statistics with respect to Definition (2). The means with regards to the participation rates of men and women who play games of skill are also statistically significant, but less pronounced. While the effect is less keen (only 67.58 percent of men play games of skill under Definition (2) compared to 68.61 percent under Definition (1)), Definition (2) allows the reader to observe the effect in an isolated incidence, since only card games constitute games of skill under this definition.

The greatest observable difference with respect to the age of the respondents is seen in the participation rates of middle and older individuals. The participation of older respondents decline by approximately nine percent with regards to games of skill, while concurrently, the participation of middle aged individuals rises by roughly six percent.

Again, the activity of respondents who play games of skill seems primarily occupied by more upper class individuals and the means, which describe these persons, are statistically significant. In other words, the demographics of individuals who play games of chance, in both Definition (1) and Definition (2), suggest the following characteristics: middle aged white educated males who are mostly full-time employed and whose household incomes earn between 24,000 and 99,999 dollars.

The descriptive statistics for the gambling history of interviewees are similar to the statistics under Definition (1). A greater percentage of individuals who play games of skill loss more than one-hundred dollars in a single day under Definition (2) than under Definition (1). In addition, each of the means are statistically significant with the exception of the group of individuals who have lost between 10,000 and 50,000 dollars. Because the largest amount of money lost in a single day statistics help determine the level of pathological gambling one might expect more pathological gamblers under Definition (2). More precisely, however, one may expect a greater percentage of respondents to traverse the one-hundred dollar loss threshold between non/low-risk gamblers and at-risk gamblers.

Table 7B illustrates statistically significant means of individuals who play games of skill and games of chance with respect to gambling behavior. Within the group of pathological gamblers, the means are just barely statistically significant (95% confidence interval: 0.0138753 to 0.1861247) Overall the percentages of individuals who play games of skill have decreased significantly from Definition (1) to Definition (2). The most notable changes between Definition (1) and Definition (2) lie in the middle categories: at-risk and problem gambling. Under Definition (1) the discrepancy between respondents

who play games of skill instead of games of chance was closer to fifty-fifty. Now that the definition of games of skill has isolated card games as games of skill, the discrepancies are more keen. The most significant change between Definition (1) and (2) is the disparity of individuals who play games of skill and games of chance who are also pathological gamblers. Of the population of pathological gamblers, individuals who play games of skill account for only ten percent under Definition (2), opposed to twenty-eight percent under Definition (1). This discrepancy provides evidence for the belief that individuals who participate in games of skill are a minority within the population of pathological gamblers.

Non/low-risk gamblers hold the second largest concentration of individuals who play games of chance under the second definition. While the discrepancy between people who play games of skill and games of chance is more keen for non/low-risk gamblers, the rank of the category remains the same—second to the pathological gambler group.

Game of Skill/Chance—Definition (3)

Definition (3) adds 12 observations to the games of skill category. The effect that these additions have on the demographics of individuals who play games of skill and games of chance is small. In fact, the statistics with respect to games of chance remain identical to those figures under Definition (2), because no games were added or subtracted from the category. The majority of the demographics and gambling history statistics remain inline with regards to magnitude and statistical significance with the figures under Definition (2).

Table 7C identifies the breakdown of individuals who play games of skill and games of chance by gambling behavior according to Definition (3). The addition of games of skill only affected the non/low-risk gambler category. It increased the number of respondents who play games of skill by 12 observations and created an 18.19 percent and 81.81 percent split between individuals who play games of skill and games of chance, respectively. This change also decreases the significance of the percentages on non/low-risk gamblers with respect to games of skill and chance, particularly with respect to the equivalent statistics on pathological gamblers. Nevertheless, the means for each gambler type remain statistically significant.

IV. Methodology

The principal purpose of this study is to determine whether or not the type of game in which an individual participates has a statistically significant effect on his level of pathological gambling. The hypothesis of this thesis paper is that individuals who play games of skill are less likely to be pathological gamblers. Similarly, it is important to note that individuals who play games of skill are less likely to be non/low-risk gamblers. If these hypotheses are correct, then one would expect that a probability model would illustrate statistically significant negative coefficients on the 0-1 independent variable gaming activity with gambling behavior as the dependent variable.

This study implements dprobit probability models to test the significance of the key independent variable. Models are developed in three parts. The construction of this

study builds the model is illustrated in the following manner:

- 1) $0-1 \text{ (Dependent Variable)} = \beta_1 \text{ (game of chance/game of skill)} + \beta_2$
- 2) $0-1 \text{ (Dependent Variable)} = \beta_1 \text{ (game of chance/game of skill)} + \beta_2 \text{ (Demographic}_1\text{)} + \beta_3 \text{ (Demographic}_2\text{)} + \beta_4 \text{ (Demographic}_3\text{)} + \dots + \beta_7 \text{ (Demographic}_6\text{)} + \beta_8$
- 3) $0-1 \text{ (Dependent Variable)} = \beta_1 \text{ (game of chance/game of skill)} + \beta_2 \text{ (Demographic}_1\text{)} + \beta_3 \text{ (Demographic}_2\text{)} + \beta_4 \text{ (Demographic}_3\text{)} + \dots + \beta_7 \text{ (Demographic}_6\text{)} + \beta_8 \text{ (Professional)} + \beta_9$

Each definition of games of skill and games of chance has a model built in this fashion. Lastly, it is important to note that only the variable under the Gambling History heading is the independent variable profession, which identifies whether or not the individual considers himself a professional gambler. The variable which dictates the largest amount lost in a single day by a particular respondent is excluded from the list of independent variables because it already part of the level of pathological gambling diagnostic.

V. Analysis

Definition (1)

Table 8 exhibits the probability model under Definition (1). Without controlling for demographics or gambling history, the model shows that there is a negative statistically significant relationship between gaming activity and whether not the individual is a non/low-risk problem gambler. The nature of the relationship remains consistent as demographic and gambling history independent variables are added to the model. Moreover, the magnitude of the coefficient on the key independent variable increases. The complete model suggests that individuals who play games of skill are approximately 7.5 percentage points less likely to be non/low-risk gamblers compared to

the most restricted model that suggests that players of games of skill are 5.6 percentage points less likely to be non/low-risk gamblers.

The model further illustrates that the only other statistically significant factors include gender, race, and whether or not the respondent considers himself a professional gambler. Each of these coefficients exhibits the same negative relationship to the dependent variable. The negative correlation between gender and whether or not the individual is a non/low-risk problem gambler seems intuitive. Men are much more likely to gamble than women. In addition, the more an individual gambles, the more likely they are to demonstrate a higher risk of problem gambling. Given these circumstances, men are less likely to be non/low-risk gamblers with respect to women, because they are more likely to gamble, and the more an individual gambles, the more they are apt to show greater levels of problem gambling.

The complete picture that this model portrays is slightly more complex than the illustrations of individuals who play games of skill and games of chance. Although not statistically significant, the education coefficients suggest that more educated individuals are more likely to be non/low-risk gamblers relative to less educated people. In fact, the magnitude of each education dummy variable increases with the corresponding level of education. Income demographics suggests that there is a positive relationship between various household income levels, relative to the highest income bracket (the left out dummy variable), and the probability of being a non/low-risk gambler. The nature of this relationship is perhaps a function of the descriptive statistics with respect to games of skill. These statistics depicted individuals of high social economic status. Since these individual primarily play games of skill and people who play games of skill are most

represented within the at-risk to problem gambling category, individuals from households with greater income are therefore less likely to be non/low-risk gamblers.

The results under Definition (1) which model the probability that an individual is a pathological gambler are not as strong as the non/low-risk gambler model. Table 9 shows that the direction of the relationship between gaming activity and pathological gambling behavior is negative, but the magnitude or significance of that relationship is weak—even without demographic and gambling history controls. In fact, the coefficients are statistically insignificant and turn positive when the model includes only demographics. It reverts back to a negative coefficient, however, when the professional independent variable is added.

The only statistically significant result in the complete model is the independent variable professional. The nature and magnitude of the relationship between whether or not the individual considers himself a professional gambler and whether or not that person is a pathological gambler is strong. It suggests that there is a positive and statistically relationship, such that if the individual is a professional gambler he is roughly 21 percent more likely to be a pathological gambler. This result seemingly contradicts Abt. Et al. (1985) who submits that professional gamblers are not considered pathological gamblers because gambling is no longer a sheer joy, but rather, a job. However, a close look at the pathological gambling diagnostic reveals that virtually all professional gamblers would qualify as pathological gamblers, because of the nature of the questions and the fact that gambling is their profession. For example, one of the diagnostic factors seeks to discover if the interviewee has a preoccupation with gambling such that he spends time thinking about his next gambling venture or ways to receive money with

which to gamble. These are qualities, however, that are required by a professional gambler, because of the very fact that gaming his profession. In order to earn an income the professional must gamble, which requires him to plan his next gambling venture. In addition, the individual must also be preoccupied with ways to receive money with which to gamble because the professional gambles to earn his income, and therefore, needs money in order to gamble. Under these circumstances, Abt. Et al. (1985) is not necessarily incorrect; rather, there is perhaps a psychological difference between the pathological gambler and the professional gambler that is not captured within the DSM-IV based diagnostic survey.

Many of the other demographic variables move in the opposite direction of the coefficients from Table 8. This model suggests that minority males with lower levels of income are more likely to exhibit pathological gambling behavior. The coefficients with respect to household income maintain the same positive relationship, which suggests that relative to the highest income bracket, lower income levels occupy the gambling behavior extremes: non/low-risk gambling and pathological gambling. Coefficients with respect to unemployment and full-time employment are both positive. This particular characteristic of the model perhaps illustrates two types of pathological gamblers: individuals who are unemployed because of their gambling behavior and those who are currently employed and fund their habit with their earned income.

Definition (2)

The direction of the relationship between individuals who play games of skill and non/low-risk gamblers remains negative as it was under Definition (1). Table 10 exhibits

the probabilities model where non/low-risk gambler is the dependent variable and games of skill and games of chance are characterized by Definition (2). While the nature of the relationship between the key dependent and independent variable remain negative, the strength of that relationship is weaker. The gaming activity variable is no longer statistically significant. Other similarities between the results under Definition (1) and (2) involve race, gender, and whether the individual is a self-proclaimed professional gambler. These variables also yield strong negative statistically significant results and suggest that white male professional gamblers are less likely to be non/low-risk gamblers. The remaining dependent variables follow the same trends found under Definition (1) probability models.

With respect to pathological gamblers, Table 11 shows the probability models under Definition (2). These results are comparatively stronger than those under Definition (1). Better isolation of what constitutes games of skill exhibits more precisely the argument of Walker (1996). A quick comparison between Tables 7A and 7B, specifically with respect to pathological gamblers, it is easy to realize that under Definition (2) the discrepancy between pathological gamblers who play games of chance and games of skill is more keen. Under Definition (1) only 72 percent of pathological gamblers play games of chance, compared to 90 percent of pathological gamblers who play chance according to Definition (2). The probabilities models in Tables 10 and 11 reflect that change.

Yet, despite a more targeted and specific definition the coefficient on gaming activities is only significant in the complete model. Why do the models not more strongly illustrate the greater disparity between the participation of pathological gamblers within games of skill and games of chance? More specifically, these models illustrate the

probability that an individual will be a pathological gambler with respect to the left out variables, which include at-risk, problem, *and* non/low-risk gamblers. The latter group also has a high concentration of individuals who play games of chance. So while pathological gamblers have a higher participation rate, which is statistically significant, of individuals who play games of chance compared to at-risk and problem gamblers, the participation rates of non/low-risk gamblers understate that significance. This effect also works in the opposite direction. The reason why the coefficient on the key independent variable was not statistically significant with respect to non/low-risk gamblers, despite a strong percentage in favor of people who play games of chance, particularly with the majority of the observations in this category, is that, although there were only fifty pathological gamblers, the percentage of pathological gamblers who play games of chance was strong enough to partially offset the desired results for non/low-risk gamblers.

Definition (3)

Tables 12 and 13 exhibit the probability models for the final definition. The nature or direction of most relationships remains inline with the coefficients from Tables 10 and 11. With respect to non/low-risk gamblers, Table 12 demonstrates that the independent variable remains statistically insignificant just as in Definition (2). The only statistically significant results again derive from gender, race, and whether or not the respondent considers himself a professional gambler. These coefficients illustrate the same qualities as under Definition (2). The model suggests that white non-professional gambling males are less likely to be non/low-risk gamblers with respect to the relevant

left out variables. The complete model in Table 13, however, illustrates that there exists a negative statistically significant relationship such that an individual who plays a game of skill is 1.84 percentage points less likely to be a pathological gambler. The other statistically significant variables include gender and whether an individual considers himself a professional gambler. These coefficients submit that gambling professional males are more likely to be pathological gamblers.

VI. Conclusion

Conclusion

The purpose of this study was to investigate the determinants of pathological gambling and specifically focus on the relationship, if any, between gambling behavior and particular gaming activities. With various definitions, however, to categorize games of skill and chance some results were weaker than others. Definition (1) attempted to investigate the problem with the most generalized characterization of games of skill and chance. There were fundamental problems, however, with the nature of this definition. While in a rational or mathematical sense games of skill and chance were rightly categorized, the definition conflicted with some of the psychological aspects of games of chance and skill that trigger pathological gambling behavior. For example, handicapping or track betting is a real skill. There are individuals who can frequently determine the outcomes of certain races, beyond the probability of chance with the vast sums of information available prior to the race. These individuals, however, are often known as the greatest sources of pathological gamblers. There is some social and psychological

aspect of the activity that triggers pathological gambling behavior for some individuals that is not captured in this mathematical definition.

Definition (3) produced the best results with respect to the exhibition of statistically significant coefficients on the key independent variable and dependant variable—pathological gambling. It built upon the foundation of Definition (2) by adding 12 more observations to the games of skill category, and expanded on, in spirit, the assertions of Walker (1996). While it produced the best or most desired results with respect to probability models of pathological gambling behavior, on these grounds alone, one cannot justify it as the best definition. The improvements were slight and the fact that it only, in spirit, followed the observations of Walker (1996) suggests that it is perhaps not scientific enough to submit that the results statistically prove there is a significant relationship between gambling behavior and gaming activities. While the words “games of skill” are the same, this vocabulary is perhaps too ambiguous to carefully categorize it as a game of skill. For example, a respondent may have generalized all of his handicapping activity as games of skill. Under these circumstances, observations may have been falsely identified as games of skill.

Therefore, it seems that Definition (2), which simply identifies card games as games of skill, is the best definition. The second definition demonstrated the strongest results. It is the most conservative definition, the most selective definition, and adheres closest to the examples Walker (1996) cites in his argument. These qualities strengthen the results for this definition relative to the others, because despite limited numbers, the complete probability model produced a negative statistically significant coefficient on gaming activity.

These results were in fact consistent with the initial hypothesis of this study. Based on the research of Walker (1996), the supposition of this paper suggested that individuals who play games of skill are less likely to demonstrate pathological gambling behavior. Moreover, Table 7B exhibited statistically significant means surrounding individuals who play games of skill and pathological gamblers (95 percent confidence interval: 0.0138753 and 0.1861247). The table also suggested that individuals who play games of skill are less likely to be pathological gamblers.

Despite these figures that are almost inline with the hypothesis of this paper, the results must be understood with a bit of caution. The data was not quite ideal enough to rigorously investigate the nature of the relationship between particular gaming activities and gambling behavior. First, there were relatively few observations. For any given test, there were only a maximum of approximately 1,800 plus observations. Second, this lack of observations translated into a lack of pathological gambler respondents. Within the entire sample population of 2,947 observations, only 60 respondents qualified as pathological gamblers. While that number is reflective of the percentage of pathological gamblers within the American population, for the purposes of this paper, it does not offer very robust results with respect to pathological gambling. Finally, the u-shaped nature of the data makes the predictive ability of the probability models weak. The corollary to the hypothesis of this paper suggested that non/low-risk gamblers were also less likely to play games of skill. This hypothesis also turned out to prove true. The second highest concentration of individuals who played games of skill was non/low-risk gamblers. Probability models, however, predict the nature of a relationship with respect to left out variables. Therefore, these models predict that an individual is a pathological gambler

with respect to at-risk, problem, *and* non/low-risk gamblers. So while pathological gamblers may have higher participation rates of individuals who play games of chance compared to at-risk and problem gamblers, the means of non/low-risk gamblers understates that significance. This effect also works in the opposite direction. A probability test that presents similar results on both extremes of a continuum is not particularly strong because it does not really isolate the particular group that requires investigation.

Nevertheless, these results do suggest that there might exist a relationship between gaming activity and gambling behavior. In addition, the test illustrated some interesting results with respect to the demographics of various gambling behaviors. Each definition exhibited statistically significant means that suggested individuals who play games of skill are well educated white males who operate in the higher income brackets. In addition, the probability test suggested that lesser educated minority males in the lower income brackets are more likely to be pathological gamblers. These results seem to resonate with the ideas of popular literature in regards to the individuals who are most negatively affected by gaming institutions and facilities, such as state lotteries and casinos.

These results imply potentially major policy changes. The principal incentive of casinos and state lotteries are the revenues that local economies and state governments generate from these facilities. The idea then is that revenue is redirected to the public in the form of better schools or social programs. However, if casinos and lotteries generate a disproportionate bulk of their revenue from pathological gamblers and lesser educated minority males are most likely to exhibit this behavior, then the system is counter

productive. These gaming facilities essentially place an added tax or economic burden on poor individuals, and at the very least, they are *no* better off than they were before the institution of the gaming facility or activity.

Perhaps then a gaming structure that catered more towards the preferences of higher social and economic classes would provide a more progressive system. Tables 4 through 6 suggest that these individuals are statistically significantly more likely to play games of skill. Governments then should focus less on state lotteries and restrict casinos, for example, with respect to the ratio of card tables to slot machines. Currently, many casinos only have one table for every ten slot machines. Again, prohibition is not necessarily the answer, because there is nothing inherently wrong with gambling as a controlled form of entertainment. The question is how to filter out the negative social and economic effects of pathological gambling. It is the suggestion of this paper that governments should significantly limit the availability of games of chance, such as lotteries and slot machines, because whether there exist a relationship between gaming activities and gambling behavior, or if the gaming industry can satisfy the preferences of upper class individuals with respect to the predominance of games of skill, if psychological studies are correct, “problems with gambling might be lessened by raising the real skill level of the gambler” (Walker 1996) or the available games.

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Tables and Charts

Table 1. DSM-IV Criteria for Pathological Gambling

Preoccupation	Is preoccupied with gambling (e.g., preoccupied with reliving past gambling experiences, handicapping or planning the next venture, or thinking of ways to get money with which to gamble).
Tolerance	Needs to gamble with increasing amounts of money in order to achieve the desired excitement.
Withdrawal	Is restless or irritable when attempting to cut down or stop gambling.
Escape	Gambles as a way of escaping from problems or relieving dysphoric mood (e.g., feelings of helplessness, guilt, anxiety, or depression).
Chasing	After losing money gambling, often returns another day in order to get even (“chasing one’s losses”).
Lying	Lies to family members, therapists, or others to conceal the extent of involvement with gambling.
Loss of control	Has made repeated unsuccessful efforts to control, cut back, or stop gambling.
Illegal Acts	Has committed illegal acts (e.g. forgery, fraud, theft, or embezzlement) in order to finance gambling.
Risked Significant Relationship	Has jeopardized or lost a significant relationship, job, or educational or career opportunity because of gambling.
Bailout	Has relied on others to provide money to relieve a desperate financial situation caused by gambling.

Reference: Gambling Impact and Behavior Study 1998

Table 2. Classification Criteria of Gambler Type

Non-gambler	Never gambled
Low-risk gambler	Gambled, but never lost more than \$100 in a single day—Reported DSM-IV criteria Lost at least \$100 in a single day—Reported no DSM-IV criteria
<i>Lost at least \$100 in a single day</i>	
At-risk gambler	One or two DSM-IV criteria
Problem gambler	Three or Four DSM-IV criteria
Pathological gambler	Five or more DSM-IV criteria

Reference: Gambling Impact and Behavior Study 1998

Table 3. Definitions of Games of Chance and Games of Skill

Definition		
(1)		
Games of Chance	Games of Skill	Unclassifiable Game
Bingo	Book-Type Betting	Charitable Games
Dice	Card Games	Internet/WWW Gambling
Pull-Tabs	Games of Skill	Table Games (In General)
Instant Lottery Games	Off-Track Betting	Other
Live Keno	Outcome of Sports Events	No Favorite
Lottery Games (Not Instant)	Pari-Mutuel Sportns	
Roulettes	Sports Pools	
Slot Machines		
Video Machine Games		
(2)		
Games of Chance	Games of Skill	Unclassifiable Game
Bingo	Card Games	Charitable Games
Dice		Internet/WWW Gambling
Pull-Tabs		Table Games (In General)
Instant Lottery Games		Other
Live Keno		No Favorite
Lottery Games (Not Instant)		Games of Skill
Roulettes		
Slot Machines		
Video Machine Games		
Book-Type Betting		
Off-Track Betting		
Outcome of Sports Events		
Pari-Mutuel Sportns		
Sports Pools		
(3)		
Games of Chance	Games of Skill	Unclassifiable Game
Bingo	Card Games	Charitable Games
Dice	Games of Skill	Internet/WWW Gambling
Pull-Tabs		Table Games (In General)
Instant Lottery Games		Other
Live Keno		No Favorite
Lottery Games (Not Instant)		
Roulettes		
Slot Machines		
Video Machine Games		
Book-Type Betting		
Off-Track Betting		
Outcome of Sports Events		
Pari-Mutuel Sportns		
Sports Pools		

Reference: Gambling Impact and Behavior Study 1998

Table 4. Demographics of Game Type--Definition (1)¹

Demographics	Game of Chance			Game of Skill		
	Frequency	Percent	Std. Error	Frequency	Percent	Std. Error
Gender						
<i>Female</i>	748	58.62%	0.0137931	172	31.39%	0.0198419
<i>Male</i>	528	41.38%	0.0137931	376	68.61%	0.0198419
Age						
<i>Younger (18-29)</i>	210	16.46%	0.0103844	103	18.80%	0.0167042
<i>Middle (30-49)</i>	547	42.87%	0.0138596	257	46.90%	0.0213373
<i>Older (50+)</i>	519	40.67%	0.0137571	188	34.31%	0.0202981
Race						
<i>White</i>	912	71.59%	0.0126406	443	81.28%	0.0167227
<i>Non-white</i>	362	28.41%	0.0126406	102	18.72%	0.0167227
Education						
<i>No High School</i>	39	3.06%	0.0048207	11	2.01%	0.0059967
<i>Some High School</i>	118	9.25%	0.0081132	26	4.74%	0.0090897
<i>High School Graduate</i>	418	32.76%	0.0131440	138	25.18%	0.0185591
<i>Some College</i>	401	31.43%	0.0130008	174	31.75%	0.0199038
<i>College Graduate</i>	170	13.32%	0.0095169	114	20.80%	0.0173549
<i>Graduate School</i>	130	10.19%	0.0084715	85	15.51%	0.0154784
Household Income						
<i>Less than \$24,000</i>	407	32.56%	0.0132593	133	25.14%	0.0188799
<i>\$24,000-\$49,999</i>	418	33.44%	0.0133493	167	31.57%	0.0202274
<i>\$50,000-\$99,999</i>	324	25.92%	0.0123990	160	30.25%	0.0199894
<i>More than \$100,000</i>	101	8.08%	0.0077113	69	13.04%	0.0146565
Employment Status						
<i>Unemployed</i>	409	32.10%	0.0130854	142	26.06%	0.0188192
<i>Part-time employed</i>	129	10.13%	0.0084550	40	7.34%	0.0111810
<i>Full-time employed</i>	736	57.77%	0.0138435	363	66.61%	0.0202206
Gambling History						
Largest Amount Lost in 1 Day						
<i>Never Lost Any Money</i>	45	3.53%	0.0051777	14	2.56%	0.0067584
<i>Under \$100</i>	794	62.37%	0.0135833	286	52.29%	0.0213757
<i>\$100 to \$500</i>	372	29.22%	0.0127515	198	36.20%	0.0205666
<i>\$501 to \$1,000</i>	29	2.28%	0.0041835	28	5.12%	0.0094315
<i>\$1,001 to \$5,000</i>	27	2.12%	0.0040399	19	3.47%	0.0078363
<i>\$5,001 to \$10,000</i>	4	0.31%	0.0015692	0	0.00%	0.0000000
<i>\$10,001 to \$50,000</i>	2	0.16%	0.0011105	2	0.37%	0.0025830
Professional Gambler						
<i>No</i>	1111	98.14%	0.0040123	439	97.77%	0.0069718
<i>Yes</i>	21	1.86%	0.0040123	10	2.23%	0.0069718

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (1): Games of Skill: Activities where past history and probabilities can and improve future plays

Games of Chance: Past, future, current events are independent. Outcomes are based purely on chance.

Table 5. Demographics of Game Type--Definition (2)¹

Demographics	Game of Chance			Game of Skill		
	Frequency	Percent	Std. Error	Frequency	Percent	Std. Error
Gender						
<i>Female</i>	810	54.66%	0.0129360	107	32.42%	0.0258067
<i>Male</i>	672	45.34%	0.0129360	223	67.58%	0.0258067
Age						
<i>Younger (18-29)</i>	245	16.53%	0.0096526	62	18.79%	0.0215353
<i>Middle (30-49)</i>	637	42.98%	0.0128639	163	49.39%	0.0275639
<i>Older (50+)</i>	600	40.49%	0.0127551	105	31.82%	0.0256788
Race						
<i>White</i>	1076	72.85%	0.0115759	270	81.82%	0.0212640
<i>Non-white</i>	401	27.15%	0.0115759	60	18.18%	0.0212640
Education						
<i>No High School</i>	43	2.90%	0.0043615	7	2.12%	0.0079440
<i>Some High School</i>	128	8.64%	0.0072994	14	4.24%	0.0111121
<i>High School Graduate</i>	471	31.78%	0.0120993	81	24.55%	0.0237263
<i>Some College</i>	462	31.17%	0.0120364	109	33.03%	0.0259297
<i>College Graduate</i>	217	14.64%	0.0091865	66	20.00%	0.0220527
<i>Graduate School</i>	161	10.86%	0.0080861	53	16.06%	0.0202426
Household Income						
<i>Less than \$24,000</i>	463	31.93%	0.0122475	72	22.71%	0.0235693
<i>\$24,000-\$49,999</i>	479	33.03%	0.0123559	102	32.18%	0.0262795
<i>\$50,000-\$99,999</i>	381	26.28%	0.0115624	101	31.86%	0.0262111
<i>More than \$100,000</i>	127	8.76%	0.0074264	42	13.25%	0.0190716
Employment Status						
<i>Unemployed</i>	468	31.62%	0.0120911	82	25.08%	0.0240068
<i>Part-time employed</i>	140	9.46%	0.0076098	25	7.65%	0.0147169
<i>Full-time employed</i>	872	58.92%	0.0127928	220	67.28%	0.0259864
Gambling History						
Largest Amount Lost in 1 Day						
<i>Never Lost Any Money</i>	49	3.31%	0.0046554	9	2.74%	0.0090067
<i>Under \$100</i>	907	61.33%	0.0126677	166	50.46%	0.0276067
<i>\$100 to \$500</i>	440	29.75%	0.0118913	128	38.91%	0.0269197
<i>\$501 to \$1,000</i>	43	2.91%	0.0043702	13	3.95%	0.0107568
<i>\$1,001 to \$5,000</i>	34	2.30%	0.0038982	11	3.34%	0.0099261
<i>\$5,001 to \$10,000</i>	4	0.27%	0.0013509	0	0.00%	0.0000000
<i>\$10,001 to \$50,000</i>	2	0.14%	0.0009559	2	0.61%	0.0042920
Professional Gambler						
<i>No</i>	1282	98.01%	0.0038609	259	98.11%	0.0084053
<i>Yes</i>	26	1.99%	0.0038609	5	1.89%	0.0084053

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (2): Games of Skill: Card games.

Games of Chance: All other activities.

Table 6. Demographics of Game Type--Definition (3)¹

Demographics	Game of Chance			Game of Skill		
	Frequency	Percent	Std. Error	Frequency	Percent	Std. Error
Gender						
<i>Female</i>	810	54.66%	0.0129360	110	32.16%	0.0252951
<i>Male</i>	672	45.34%	0.0129360	232	67.84%	0.0252951
Age						
<i>Younger (18-29)</i>	245	16.53%	0.0096526	68	19.88%	0.0216136
<i>Middle (30-49)</i>	637	42.98%	0.0128639	167	48.83%	0.0270691
<i>Older (50+)</i>	600	40.49%	0.0127551	107	31.29%	0.0251086
Race						
<i>White</i>	1076	72.85%	0.0115759	279	81.58%	0.0209927
<i>Non-white</i>	401	27.15%	0.0115759	63	18.42%	0.0209927
Education						
<i>No High School</i>	43	2.90%	0.0043615	7	2.05%	0.0076678
<i>Some High School</i>	128	8.64%	0.0072994	16	4.68%	0.0114358
<i>High School Graduate</i>	471	31.78%	0.0120993	85	24.85%	0.0234031
<i>Some College</i>	462	31.17%	0.0120364	113	33.04%	0.0254714
<i>College Graduate</i>	217	14.64%	0.0091865	67	19.59%	0.0214932
<i>Graduate School</i>	161	10.86%	0.0080861	54	15.79%	0.0197465
Household Income						
<i>Less than \$24,000</i>	463	31.93%	0.0122475	77	23.40%	0.0233783
<i>\$24,000-\$49,999</i>	479	33.03%	0.0123559	106	32.22%	0.0258031
<i>\$50,000-\$99,999</i>	381	26.28%	0.0115624	103	31.31%	0.0256059
<i>More than \$100,000</i>	127	8.76%	0.0074264	43	13.07%	0.0186116
Employment Status						
<i>Unemployed</i>	468	31.62%	0.0120911	83	24.48%	0.0233884
<i>Part-time employed</i>	140	9.46%	0.0076098	29	8.55%	0.0152132
<i>Full-time employed</i>	872	58.92%	0.0127928	227	66.96%	0.0255837
Gambling History						
Largest Amount Lost in 1 Day						
<i>Never Lost Any Money</i>	49	3.31%	0.0046554	10	2.93%	0.0091500
<i>Under \$100</i>	907	61.33%	0.0126677	173	50.73%	0.0271134
<i>\$100 to \$500</i>	440	29.75%	0.0118913	130	38.12%	0.0263402
<i>\$501 to \$1,000</i>	43	2.91%	0.0043702	14	4.11%	0.0107608
<i>\$1,001 to \$5,000</i>	34	2.30%	0.0038982	12	3.52%	0.0099930
<i>\$5,001 to \$10,000</i>	4	0.27%	0.0013509	0	0.00%	0.0000000
<i>\$10,001 to \$50,000</i>	2	0.14%	0.0009559	2	0.59%	0.0041412
Professional Gambler						
<i>No</i>	1282	98.01%	0.0038609	268	98.17%	0.0081303
<i>Yes</i>	26	1.99%	0.0038609	5	1.83%	0.0081303

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (3): Games of Skill: Card games & 'Games of Skill.'

Games of Chance: All other activities.

Table 7A. Prevalence of Games of Skill and Chance according to Gambling Behavior--Definition (1)¹

Type of Game	Gambler Type											
	Non/Low-risk gambler			At-risk gambler			Problem gambler			Pathological gambler		
	Freq.	Percent	Std. Error	Freq.	Percent	Std. Error	Freq.	Percent	Std. Error	Freq.	Percent	Std. Error
Game of Chance	1110	71.34%	0.0114671	110	61.45%	0.0364803	20	51.28%	0.081084	36	72.00%	0.0641427
Game of Skill	446	28.66%	0.0114671	69	38.55%	0.0364803	19	48.72%	0.081084	14	28.00%	0.0641427

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (1): Games of Skill: Activities where past history and probabilities can and improve future plays

Games of Chance: Past, future, current events are independent. Outcomes are based purely on chance.

Table 7B Prevalence of Games of Skill and Chance according to Gambling Behavior--Definition (2)¹

Type of Game	Gambler Type											
	Non/Low-risk gambler			At-risk gambler			Problem gambler			Pathological gambler		
	Freq.	Percent	Std. Error	Freq.	Percent	Std. Error	Freq.	Percent	Std. Error	Freq.	Percent	Std. Error
Game of Chance	1273	82.45%	0.0096843	135	75.42%	0.0322723	29	74.36%	0.0708341	45	90.00%	0.0428571
Game of Skill	271	17.55%	0.0096843	44	24.58%	0.0322723	10	25.64%	0.0708341	5	10.00%	0.0428571

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (2): Games of Skill: Card games.

Games of Chance: All other activities.

Table 7C. Prevalence of Games of Skill and Chance according to Gambling Behavior--Definition (3)¹

Type of Game	Gambler Type											
	Non/Low-risk gambler			At-risk gambler			Problem gambler			Pathological gambler		
	Freq.	Percent	Std. Error	Freq.	Percent	Std. Error	Freq.	Percent	Std. Error	Freq.	Percent	Std. Error
Game of Chance	1273	81.81%	0.0097821	135	75.42%	0.0322723	29	74.36%	0.0708341	45	90.00%	0.0428571
Game of Skill	283	18.19%	0.0097821	44	24.58%	0.0322723	10	25.64%	0.0708341	5	10.00%	0.0428571

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (3): Games of Skill: Card games & 'Games of Skill.'

Games of Chance: All other activities.

Table 8. Probit Model: Non/low-risk Gambler (0-1)--Definition (1)¹

	1		2		3	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Game of Chance/Game of Skill (0-1)	-0.0560373	0.0191082	-0.0628878	0.0206039	-0.0747872	0.0236083
Demographics						
Gender						
Female	-	-	-	-	-	-
Male	-	-	-0.072005	0.0174244	-0.0388394	0.0193937
Age						
Younger (18-29)	-	-	-	-	-	-
Middle (30-49)	-	-	-0.0200563	0.0248684	-0.0290554	0.0280894
Older (50+)	-	-	-0.0256072	0.0270918	-0.0372442	0.0304713
Race						
White	-	-	-	-	-	-
Non-white	-	-	-0.0727353	0.0218248	-0.0657632	0.0239975
Education						
No High School	-	-	-	-	-	-
Some High School	-	-	-0.0600837	0.06445	-0.0474338	0.0704215
High School Graduate	-	-	0.0108166	0.0481824	0.0117873	0.0555473
Some College	-	-	0.0398761	0.0464408	0.0387146	0.0540379
College Graduate	-	-	0.0686213	0.0403101	0.0663526	0.0481397
Graduate School	-	-	0.0691821	0.0395106	0.0536395	0.0507031
Household Income						
Less than \$24,000	-	-	0.0532372	0.0301243	0.0481947	0.0340306
\$24,000-\$49,999	-	-	0.0484864	0.0288638	0.0487475	0.03229
\$50,000-\$99,999	-	-	0.030893	0.0289496	0.0351935	0.0320653
More than \$100,000	-	-	-	-	-	-
Employment Status						
Unemployed	-	-	-0.040234	0.0366966	-0.0399511	0.0407135
Part-time employed	-	-	-	-	-	-
Full-time employed	-	-	-0.0244988	0.031844	-0.02079	0.0356045
Gambling History						
Professional						
Yes	-	-	-	-	-0.3155095	0.0925473
No	-	-	-	-	-	-
<i>n</i> =		1824		1773		1539
<i>L</i> =		-756.60688		-721.3475		-653.23789

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (1): Games of Skill: Activities where past history and probabilities can and improve future plays

Games of Chance: Past, future, current events are independent. Outcomes are based purely on chance.

Table 9. Probit Model: Pathological gambler (0-1)--Definition (1)¹

	1		2		3	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Game of Chance/ Game of Skill (0-1)	-0.0026657	0.0081802	0.0003109	0.0073829	-0.0044873	0.0072951
Demographics						
Gender						
<i>Female</i>	-	-	-	-	-	-
<i>Male</i>	-	-	0.0126138	0.006911	0.0133504	0.0071849
Age						
<i>Younger (18-29)</i>	-	-	-	-	-	-
<i>Middle (30-49)</i>	-	-	-0.004996	0.0087872	0.0011242	0.0097339
<i>Older (50+)</i>	-	-	-0.0013181	0.0096294	0.0032426	0.0107397
Race						
<i>White</i>	-	-	-	-	-	-
<i>Non-white</i>	-	-	0.0137993	0.0088216	0.0133501	0.009257
Education						
<i>No High School</i>	-	-	-	-	-	-
<i>Some High School</i>	-	-	0.0059645	0.0196132	-0.0022735	0.015798
<i>High School Graduate</i>	-	-	-0.0104191	0.0132399	-0.01121	0.0136307
<i>Some College</i>	-	-	-0.0201569	0.01239	-0.0224607	0.0127657
<i>College Graduate</i>	-	-	-0.0236212	0.0076335	-0.0213679	0.008079
<i>Graduate School</i>	-	-	-0.0253634	0.0060466	-0.0229392	0.0063211
Household Income						
<i>Less than \$24,000</i>	-	-	0.0093073	0.0190792	0.0088244	0.0194453
<i>\$24,000-\$49,999</i>	-	-	0.0108758	0.0184838	0.0138886	0.0192765
<i>\$50,000-\$99,999</i>	-	-	0.0111309	0.019571	0.009187	0.0190932
<i>More than \$100,000</i>	-	-	-	-	-	-
Employment Status						
<i>Unemployed</i>	-	-	0.0050621	0.0152806	0.008953	0.0179619
<i>Part-time employed</i>	-	-	-	-	-	-
<i>Full-time employed</i>	-	-	0.0114877	0.0124373	0.01481	0.0132155
Gambling History						
Professional						
Yes	-	-	-	-	0.2137388	0.0764286
No	-	-	-	-	-	-
<i>n=</i>		1824		1773		1539
<i>L=</i>		-229.0948		-211.6596		-179.831

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (1): Games of Skill: Activities where past history and probabilities can and improve future plays

Games of Chance: Past, future, current events are independent. Outcomes are based purely on chance.

Table 10. Probit Model: Non/low-risk Gambler (0-1)--Definition (2)¹

	1		2		3	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Game of Chance/ Game of Skill (0-1)	-0.377622	0.0022949	-0.038905	0.024053	-0.0485882	0.0279389
Demographics						
Gender						
<i>Female</i>	-	-	-	-	-	-
<i>Male</i>	-	-	-0.0575991	0.0173446	-0.0498929	0.0192795
Age						
<i>Younger (18-29)</i>	-	-	-	-	-	-
<i>Middle (30-49)</i>	-	-	-0.017965	0.0251552	-0.0278578	0.0283995
<i>Older (50+)</i>	-	-	-0.0221424	0.0273885	-0.034988	0.0308215
Race						
<i>White</i>	-	-	-	-	-	-
<i>Non-white</i>	-	-	-0.0679875	0.0217681	-0.0603152	0.0238924
Education						
<i>No High School</i>	-	-	-	-	-	-
<i>Some High School</i>	-	-	-0.062177	0.0651298	-0.0446595	0.0701219
<i>High School Graduate</i>	-	-	0.0073314	0.048847	0.0093298	0.0560954
<i>Some College</i>	-	-	0.0364948	0.0471297	0.0353924	0.0547121
<i>College Graduate</i>	-	-	0.0635157	0.0418723	0.0607985	0.0498404
<i>Graduate School</i>	-	-	0.06461	0.0411844	0.048978	0.0523829
Household Income						
<i>Less than \$24,000</i>	-	-	0.0527912	0.0305682	0.0482115	0.0345053
<i>\$24,000-\$49,999</i>	-	-	0.0494744	0.0292328	0.0498718	0.0326742
<i>\$50,000-\$99,999</i>	-	-	0.0328461	0.0292185	0.0375415	0.0323361
<i>More than \$100,000</i>	-	-	-	-	-	-
Employment Status						
<i>Unemployed</i>	-	-	-0.036366	0.0368797	-0.0401225	0.0410654
<i>Part-time employed</i>	-	-	-	-	-	-
<i>Full-time employed</i>	-	-	-0.0224834	0.0323229	-0.0225495	0.0358914
Gambling History						
Professional						
Yes	-	-	-	-	-0.3208334	0.0923975
No	-	-	-	-	-	-
<i>n=</i>		1812		1761		1530
<i>L=</i>		-757.8603		-722.909		-655.6241

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (2): Games of Skill: Card games.

Games of Chance: All other activities.

Table 11. Probit Model: Pathological Gambler (0-1)--Definition (2)¹

	1		2		3	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Game of Chance/ Game of Skill (0-1)	-0.0152129	0.008068	-0.110278	0.0070796	-0.0183038	0.0058633
Demographics						
Gender						
Female	-	-	-	-	-	-
Male	-	-	0.0139092	0.0068215	0.0139342	0.0068043
Age						
Younger (18-29)	-	-	-	-	-	-
Middle (30-49)	-	-	-0.0055355	0.0087012	0.0009871	0.0092126
Older (50+)	-	-	-0.0021366	0.0094827	0.0027283	0.0101364
Race						
White	-	-	-	-	-	-
Non-white	-	-	0.0123404	0.0085647	0.0112655	0.0086017
Education						
No High School	-	-	-	-	-	-
Some High School	-	-	0.0062497	0.0196379	-0.0024921	0.014715
High School Graduate	-	-	-0.0101915	0.0131282	-0.0103491	0.0129341
Some College	-	-	-0.0194462	0.012333	-0.0204003	0.0121997
College Graduate	-	-	-0.023083	0.007656	-0.0195995	0.007844
Graduate School	-	-	-0.0248041	0.0060934	-0.0212818	0.0061289
Household Income						
Less than \$24,000	-	-	0.0089958	0.0189527	0.0070311	0.0180938
\$24,000-\$49,999	-	-	0.0106964	0.0184133	0.0133334	0.0184186
\$50,000-\$99,999	-	-	0.0108092	0.0194434	0.0084154	0.0181073
More than \$100,000	-	-	-	-	-	-
Employment Status						
Unemployed	-	-	0.0040318	0.0149428	0.0089708	0.0172446
Part-time employed	-	-	-	-	-	-
Full-time employed	-	-	0.0107149	0.0124117	0.0145042	0.0125317
Gambling History						
Professional						
Yes	-	-	-	-	0.2104327	0.0765687
No	-	-	-	-	-	-
n=		1812		1761		1530
L=		-227.4718		-210.2995		-176.9485

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (2): Games of Skill: Card games.

Games of Chance: All other activities.

Table 12. Probit Model: Non/low-risk Gambler (0-1)--Definition (3)¹

	1		2		3	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Game of Chance/ Game of Skill (0-1)	-0.031489	-0.031489	-0.0319792	0.0233628	-0.0421453	0.027254
Demographics						
Gender						
<i>Female</i>	-	-	-	-	-	-
<i>Male</i>	-	-	-0.0563777	0.0172439	-0.0488864	0.0191888
Age						
<i>Younger (18-29)</i>	-	-	-	-	-	-
<i>Middle (30-49)</i>	-	-	-0.0201421	0.0249943	-0.0293384	0.028226
<i>Older (50+)</i>	-	-	-0.0243634	0.0272264	-0.0362369	0.0306191
Race						
<i>White</i>	-	-	-	-	-	-
<i>Non-white</i>	-	-	-0.0586449	0.0216226	-0.0598703	0.0237471
Education						
<i>No High School</i>	-	-	-	-	-	-
<i>Some High School</i>	-	-	-0.0586449	0.0642791	-0.0442448	0.0698705
<i>High School Graduate</i>	-	-	0.0085806	0.0485363	0.010495	0.0557952
<i>Some College</i>	-	-	0.0368462	0.0468851	0.036066	0.0544409
<i>College Graduate</i>	-	-	0.0630763	0.0416777	0.0604929	0.0496262
<i>Graduate School</i>	-	-	0.0643793	0.0409542	0.0490397	0.0520919
Household Income						
<i>Less than \$24,000</i>	-	-	0.0522746	0.0303458	0.0476426	0.0342428
<i>\$24,000-\$49,999</i>	-	-	0.0490859	0.0290115	0.0494153	0.0324383
<i>\$50,000-\$99,999</i>	-	-	0.0321961	0.0290425	0.0367766	0.0321498
<i>More than \$100,000</i>	-	-	-	-	-	-
Employment Status						
<i>Unemployed</i>	-	-	0.0368558	0.0368558	-0.0420313	0.0409311
<i>Part-time employed</i>	-	-	-	-	-	-
<i>Full-time employed</i>	-	-	0.0318857	0.0318857	-0.0242997	0.0355644
Gambling History						
Professional						
Yes	-	-	-	-	-0.3225126	0.0924285
No	-	-	-	-	-	-
<i>n=</i>		1824		1773		1539
<i>L=</i>		-760.1778		-725.4435		-657.4861

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (3): Games of Skill: Card games & 'Games of Skill.'

Games of Chance: All other activities.

Table 13. Probit Model: Pathological Gambler (0-1)--Definition (3)¹

	1		2		3	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Game of Chance/ Game of Skill (0-1)	-0.0157445	0.0078734	-0.011693	0.0068562	-0.0184626	0.0057832
Demographics						
Gender						
<i>Female</i>	-	-	-	-	-	-
<i>Male</i>	-	-	0.0136839	0.0067523	0.013748	0.006727
Age						
<i>Younger (18-29)</i>	-	-	-	-	-	-
<i>Middle (30-49)</i>	-	-	-0.0052988	0.0086236	0.0009948	0.0091131
<i>Older (50+)</i>	-	-	-0.0019156	0.0094045	0.0027043	0.0100251
Race						
<i>White</i>	-	-	-	-	-	-
<i>Non-white</i>	-	-	0.0122248	0.0084903	0.0111413	0.0085155
Education						
<i>No High School</i>	-	-	-	-	-	-
<i>Some High School</i>	-	-	0.0059153	0.0193147	-0.0024637	0.0145595
<i>High School Graduate</i>	-	-	-0.0102197	0.0130045	-0.0102646	0.0127967
<i>Some College</i>	-	-	-0.0193541	0.0122305	-0.0202172	0.0120971
<i>College Graduate</i>	-	-	-0.0228779	0.0075766	-0.0193686	0.0077601
<i>Graduate School</i>	-	-	-0.0245933	0.0060337	-0.0210446	0.0060709
Household Income						
<i>Less than \$24,000</i>	-	-	0.0089762	0.0187841	0.0069636	0.0178927
<i>\$24,000-\$49,999</i>	-	-	0.0106634	0.0182608	0.0131917	0.0182199
<i>\$50,000-\$99,999</i>	-	-	0.0108865	0.0193419	0.0083795	0.0179369
<i>More than \$100,000</i>	-	-	-	-	-	-
Employment Status						
<i>Unemployed</i>	-	-	0.0046851	0.0149529	0.0089495	0.0170918
<i>Part-time employed</i>	-	-	-	-	-	-
<i>Full-time employed</i>	-	-	0.0111927	0.0122382	0.0143721	0.0123826
Gambling History						
Professional						
Yes	-	-	-	-	0.2095664	0.0764082
No	-	-	-	-	-	-
<i>n=</i>		1824		1773		1539
<i>L=</i>		-227.6518		-210.5589		-177.0104

Reference: ICPSR Study No. 2778 (Gambling Impact and Behavior Study 1998)

¹Definition (3): Games of Skill: Card games & 'Games of Skill.'

Games of Chance: All other activities.