

Trends in Gambling Behavior among College Student-Athletes: A Comparison of 2004 and 2008 NCAA Survey Data

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Abstract

Two large samples of National Collegiate Athletic Association (NCAA) student-athletes in 2004 ($N = 18,916$) and 2008 ($N = 17,675$) were surveyed about their gambling behavior. A cross-comparison highlighted gambling trends among college-student athletes across the four-year span. Overall, past-year and weekly gambling rates were lower in 2008 compared to 2004. There were no within-gender differences in the proportion of individuals at-risk or meeting criteria for a gambling problem between 2004 (4.0% males, 0.3% females) and 2008 (3.8% males, 0.4% females). Participation rates were higher in 2004 for all gambling activities, except for past-year Internet gambling and sports wagering, which increased in 2008 among males. Across sports, gambling participation was notably highest among golfers of both genders. Collectively, the results suggest that gambling activity among student-athletes is on a downward trend in spite of ongoing expansion of gambling opportunities.

Résumé

Deux échantillons importants d'étudiants-athlètes de la National Collegiate Athletic Association (NCAA) tirés de la cohorte de 2004 ($N = 18\ 916$) et de la cohorte de 2008 ($N = 17\ 675$) ont été sondés concernant leurs comportements de jeu compulsif. Une étude intercomparative a révélé les tendances de jeu compulsif chez les étudiants-athlètes de niveau collégial, sur une période de quatre ans. Dans l'ensemble, les taux de jeu compulsif relevés au cours de l'année écoulée et sur une base hebdomadaire étaient inférieurs en 2008 à ceux relevés en 2004. Il n'existait aucune différence sexospécifique quant aux taux d'individus à risque ou d'individus répondant aux critères indiquant la présence d'un problème de jeu compulsif entre 2004 (4,0 % d'hommes, 0,3 % de femmes) et 2008 (3,8 % d'hommes, 0,4 % de femmes). Les taux de participation étaient supérieurs en 2004 pour ce qui est de toutes les activités de jeu de hasard, à l'exception des activités de jeu en ligne et des

paris sportifs, qui ont augmenté en 2008 chez les hommes. Dans tous les sports, les activités de jeu les plus intensives ont notamment été relevées chez les golfeurs des deux sexes. Collectivement, les résultats suggèrent que les activités de jeu chez les étudiants-athlètes sont à la baisse, malgré le fait que les jeux de hasard sont de plus en plus accessibles.

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With the gambling industry continuing to expand on a global scale, there are currently more opportunities to gamble than ever before (American Gaming Association, 2012; Volberg, 2004). Much of this expansion has been the result of more relaxed attitudes among governmental bodies towards gambling, and general public acceptance of gambling as a socially acceptable recreational activity (Suissa, 2008). The omnipresence of gambling, along with an increasingly pro-gambling stance in society, have raised significant concern in the world of college and professional athletics (Huang, Jacobs, Derevensky, Gupta, & Paskus, 2007a, 2007b; Kerber, 2005; McCarthy, 2007). Despite ongoing efforts to address the inherent difficulties of mixing sports with gambling, the gambling activities of college student-athletes continue to present several challenges.

As evidenced by a 2004 national survey conducted by the NCAA, gambling is a common activity among college student-athletes (Ellenbogen, Jacobs, Derevensky, Gupta, & Paskus, 2008; Huang et al., 2007a, 2007b; Petr, Paskus, & Dunkle, 2004). The NCAA survey was groundbreaking in scope, polling student-athletes about their gambling activities on a national scale. Previous smaller-scale surveys, conducted regionally or at individual schools, yielded a range of estimates of gambling behavior and gambling-related problems among student-athletes (e.g., Butts, 2006; Cross, Basten, Hendrick, Kristofic, & Schaffer, 1998; Cross & Vollano, 1999; Cullen & Latessa, 1996; Engwall, Hunter, & Steinberg, 2004; Kerber, 2005; Rockey, Beason, & Gilbert, 2002). Surveys have shown that 25–37% of male student-athletes and 15% of female student-athletes admit to betting on sports (Cross & Vollano, 1999; Cross et al., 1998; Cullen & Latessa, 1996). Studies of problem gambling prevalence among student athletes have yielded estimates between approximately 17–26% among males and 5–14% among females (Butts, 2006; Engwall et al., 2004; Kerber, 2005; Rockey et al., 2002).

The 2004 NCAA survey aimed to gauge gambling activities among student-athletes on a national level while addressing methodological problems associated with earlier studies (e.g., small sample sizes, low response rates, and poor generalizability to other regions). The results revealed that a large proportion of student-athletes regularly participated in a wide range of gambling activities. Overall, 62.4% of males

and 42.8% of females reported gambling in some form of gambling during the past year, while 13.0% of males and 3.3% of females gambled weekly (Ellenbogen et al., 2008). With respect to problem and pathological gambling, 3.9% of males and 0.4% of females reported significant gambling problems. A significant proportion of student-athletes reported wagering on college and professional sports despite the NCAA's prohibition (e.g., almost 5% of males reported gambling on college sports using a bookie).

Sports wagering is among the most popular forms of gambling (e.g., LaPlante et al., 2009; Nelson et al., 2007) and remains a particular concern with regard to the gambling activity of college student-athletes given the potential for this type of activity to compromise the integrity of sporting events. Making this issue more complicated is a long history of sports and gambling being intrinsically connected. The competitive nature of sports promotes wagering, and punters can bet, either legally or illegally, on the outcome of virtually any sports contest in the world. In the United States (U.S.), bookmaker revenues have reportedly climbed steadily since the 1980s (Claussen & Miller, 2001). During 2009, gamblers wagered \$2.6 billion on sporting events in Nevada alone, the only U.S. state in which sports books can legally accept bets on collegiate and professional sports (American Gaming Association, 2010). Two sports accounted for 74% of this wagering: football (43%) and basketball (31%). Not coincidentally, football and basketball are generally considered the centerpiece of most college athletic programs in the U.S.

While the NFL championship game garners more bets than any other single-day sporting event (\$94 million was wagered on the 2012 Super Bowl in Nevada sports books; AGA, 2012), the NCAA Division I men's basketball tournament (i.e., "March Madness") generates the most gambling involvement among the public than any other sporting event when both legal and illegal wagers are accounted for. Although Nevada sports books take in between \$80 and \$90 million in legal wagers on March Madness each year, the Federal Bureau of Investigation (FBI) estimates that \$2.5 billion is illegally wagered annually on the tournament (Simon, 2010). Most of these illegal wagers take the form of office pools while a significant portion of March Madness bets are made via online sports books.

The advent of Internet-based gambling in the late 1990s and the subsequent growth of online sports books throughout the early part of the twenty-first century has made sports wagering accessible to millions of people outside of Nevada. Hundreds of offshore gambling sites accept wagers on collegiate and professional sports contests. Christiansen Capital Advisors (2007), which monitors Internet gambling, estimated that more than \$4.2 billion in online sports wagers were made in 2005, more than double the amount wagered in 2001. This expansion of the online sports wagering industry has made gambling in general and sports wagering in particular more accessible and easier than ever before (Lowry, 1999). Recently, the U.S. Department of Justice indicted several online gambling sites, including a few prominent online sports books (Richtel, 2011). While these indictments put the

legality of online sports wagering into question, betting on sports over the Internet continues unabated on many websites (“USA Friendly Online Betting Sites,” n.d.).

Athletes who gamble on the outcome of sports contests are at greater risk of compromising the integrity of their own sport (Udovicic, 1998). At the college level, athletes are particularly vulnerable as they are not paid for their participation, which gives them more incentive to profit from their situation. Although many college athletes receive compensation in the form of scholarships, fee waivers, meal plans, money for books, and coverage of a number of additional academic costs, they do not receive a salary, and gambling may be viewed as a convenient route to monetary gain. Athletes may use “inside information” to make educated bets and, in severe cases, they may try to influence the outcomes of their own games (Ellenbogen et al., 2008). There have been numerous instances of “point shaving” scandals in which players have intentionally played worse so that an opposing team would be more likely to cover a point spread (i.e., the handicap towards an underdog). In 1994, for example, Arizona State University student Benny Silman bribed two athletes to play poorly in several NCAA basketball games to bet against the point spreads of those games (Associated Press, 1998). More recently, allegations of point-shaving were levied against a player from Auburn University’s men’s basketball program for games played in early 2012 (Robinson, 2012). Because favoured teams can lose the point spread without losing the game, athletes can attempt to alter the outcome of a game without letting their teammates and coaches down. Student-athletes with financial difficulties are considered prime targets by organized gambling groups to affect the outcome of a game (McCarthy, 2007).

A secondary issue with sports wagering among college athletes involves its potential for participation in other forms of gambling. It is possible that an individual whose initial gambling experiences involve sports wagering may in turn become engaged in other forms of gambling, a shift which can escalate into serious problems. In some instances, growing gambling debts may lead student-athletes to become involved in illegal activities, some of which may undermine their sport. There have been numerous instances of student-athletes convicted of sports wagering offenses (e.g., accepting bribes to tamper with the outcome of a game) who have then served lengthy prison sentences (McCarthy, 2007). In this respect, sports wagering may serve as a gateway to heavier gambling involvement among student athletes, a change that can put their personal lives, academic progress, prospective athletic careers, and even freedom at risk.

While gambling on the outcome of NCAA competitions is legal in Nevada, the NCAA rules strictly prohibit all illegal forms of wagering on college sports. Even seemingly harmless low-stakes office pools (e.g., March Madness brackets) are frowned upon. Such illegal wagering is viewed as contributing to youth gambling and as encouraging gambling among student-athletes. To address the problem of student-athlete gambling, the NCAA has a strict policy that prohibits all forms of legal and illegal wagering on college sports among student-athletes, coaches, and

NCAA employees (www.ncaa.org). The NCAA's rules and regulations state that any student-athlete found to be involved in any college or professional sports wagering activity is ineligible to participate in NCAA competition for at least one year. Furthermore, student-athletes found to be involved in sports wagering involving their own institution are permanently banned from NCAA competition.

In addition, the NCAA implemented campus-level awareness programs and an enforcement group responsible for investigating cases of student-athlete gambling. An interactive website (www.dontbetonit.org) was created by the NCAA where student-athletes, coaches, and administrators can find educational materials about sports wagering. The website provides information about the NCAA's official position on sports wagering; data on the prevalence of sports wagering in intercollegiate athletics, as well as the potential risks and downsides; and resources for combating gambling-related problems within a sports program.

Despite longstanding efforts by the NCAA to curb sports wagering among college student-athletes, studies conducted over the past two decades suggest there remain significant concerns (e.g., Cross et al., 1998). In a sample of 648 male student-athletes playing Division I football or basketball, 25% admitted to betting on sports (Cullen & Latessa, 1996). In a similar sample of male football and basketball players, 37% reported betting on sports (Cross et al., 1998). Significant proportions of female student-athletes (15.1%) have also reported high rates of sports wagering (Cross & Vollano, 1999). Given these findings, it is crucial to continually monitor the prevalence of all gambling activities among student-athletes. Examining the extent of gambling involvement among student-athletes on an ongoing basis allows stakeholders to discern trends in gambling involvement—especially sports wagering—and identify which subgroups across the broad range of student-athletes require more attention.

Given the changing landscape of gambling since the NCAA's 2004 study (e.g., increasing number of casinos, expansion of Internet gambling), a follow-up study was conducted in 2008 to examine changes in the gambling behaviors among student-athletes. The purpose of the current study is to compare results of the 2004 and 2008 NCAA national surveys. Particular attention was paid towards shifts in overall gambling participation, sports wagering, and problem gambling rates. In addition, because of the rapidly changing face of Internet gambling between 2004 and 2008 and its connection to sports wagering, changes in Internet gambling activities as well as sports wagering were also examined closely.

Methods

Participants

Data were drawn from surveys administered by the NCAA to U.S. college student-athletes in 2004 and 2008. The NCAA consists of 1281 colleges and universities in

the U.S. Ethics approval was obtained from ethics review committees of respective institutions where the surveys were administered.

A total of 20,587 surveys were administered in 2004 and 19,942 were administered in 2008. Approximately 62% of participants were male in both the 2004 and 2008 samples, which marginally overrepresented the proportion of males in the two samples compared to gender proportions in the student-athlete population reported by the NCAA (58% males) (NCAA, 2009). Among respondents in 2004 who reported their race/ethnicity, 75% identified themselves as White, 15% as Black, and the remaining 10% as another racial/ethnic group. In the 2008 survey, 72% identified themselves as White, 17% as Black, and 11% as another racial/ethnic group. For both samples, ethnic/racial group proportions approximated those observed in the overall population of student-athletes. In 2004, approximately 33% of the respondents were freshmen, 26% were sophomores, 23% were juniors, and 19% were seniors. In 2005, approximately 35% were freshmen, 27% were sophomores, 23% were juniors, and 15% were seniors.

Survey Administration

A multi-stage cluster sampling design was incorporated in both the 2004 and 2008 studies. Faculty Athletics Representatives (FARs) of all NCAA member colleges were approached to participate. Each school was informed that all members of between one and three teams would be surveyed. Teams were selected based on a stratified random sampling procedure to ensure that all sports in each of the three NCAA divisions would be represented in the total sample. All students and FARs were assured that participation would remain anonymous at the student and institution level. Student-athletes from each team were surveyed at the same time without coaches or other team personnel present. Completed surveys were not handled by FARs. Rather, one student-athlete assumed responsibility for collecting the completed surveys, placing them into a sealed package, and mailing the package to an independent third-party vendor that compiled and entered the data.

As survey responses were submitted anonymously, institutional response rates could not be calculated absolutely. The response rate was estimated to be greater than 60% based upon previous surveys conducted in this manner and the total number of completed surveys received.

Survey Content

The 2004 and 2008 surveys differed somewhat in content (Paskus, Petr, Vicente, & Derevensky, 2009). The 2004 survey collected information on multiple health-risk behaviors (e.g., substance use, sexual activity, and criminal activity) in addition to gambling behavior and demographic information. The 2008 survey was significantly modified and streamlined with most items related to health-risk behaviors removed and with a focus on gambling behaviors. In both the 2004 and 2008 surveys, athletes

provided demographic information, details about the college sport they played, and experiences with gambling, including extensive questions related to sports wagering. All gambling questions referred to participants' behavior during the previous 12 months. Participants were initially categorized as non-gamblers or gamblers based on their responses to the Gambling Activities Questionnaire (GAQ) (Gupta & Derevensky, 1996) portion of the survey which queries frequency of participation for 14 gambling activities over the past 12 months (“daily”, “at least once a week”, “at least once a month”, “less than once a month”, and “not at all”). All individuals who reported not gambling in any form in the past year were categorized as non-gamblers.

Those who reported having gambled at least once on any of the activities in the previous year (i.e., gamblers) were further divided into three categories based upon their responses to a questionnaire format of the DSM-IV-TR (American Psychiatric Association, 2000) criteria for pathological gambling. This instrument contains 10 items that query the presence of various symptoms and diagnostic criteria associated with pathological gambling, including: preoccupation with gambling; need to increase the amount of gambling to achieve the same level of excitement (tolerance); loss of control; withdrawal symptoms; escape; chasing of losses; lying to family; engaging in illegal activities to pay for gambling; disruptions to family or job; and borrowing money to pay for gambling debts. Standard cut-off scores for problem gambling categorization were used to form three DSM categories of problem gambling. Participants who reported 0–2 symptoms were categorized as Social Gamblers, those who endorsed 3–4 symptoms were categorized as At-Risk Gamblers, and those who endorsed 5 or more symptoms were categorized as Probable Pathological Gamblers (PPGs). A similar system of categorization has been used in other studies (e.g., Gupta, Derevensky, & Nower, 2009; Shead, Derevensky, Fong, & Gupta, 2012; Temcheff, Derevensky, & Paskus, 2011). This questionnaire format has been shown to have strong internal consistency (.92) and a good agreement rate (87%) with another measure of problem gambling severity (Stinchfield, Govoni, & Frisch, 2005).

Data Preparation

Rigorous data cleaning procedures were implemented to eliminate, as much as possible, invalid data resulting from dubious responses to the surveys. Included in these cleaning procedures were a series of validity checks and Item Response Theory techniques to identify questionable patterns of responding. Cases revealing strong evidence of insincere responses (e.g., statistically unlikely combination of responses, inconsistent responding, responses in some portions of the survey that contradict responses elsewhere) were excluded from analyses. These cleaning procedures were applied to both the 2004 and 2008 survey data to enhance comparability. Because these cleaning procedures were applied retroactively to the 2004 survey data, the results reported in this paper are not identical to those previously reported for the same 2004 data (e.g., Ellenbogen et al., 2008).

After data cleaning procedures were applied to exclude insincere respondents, a series of steps were applied to account for differences in sampling strategies and survey content between the 2004 and 2008 surveys. These procedures were aimed at making more accurate comparisons across samples. To account for differences in sampling strategies, a filter was applied to both samples such that respondents participating in one of 22 sports (11 men's sports; 11 women's sports) were adequately sampled in each of the three NCAA divisions in 2004 and 2008. Furthermore, these data were weighted to the NCAA's estimate of 2008 participation rates within the 22 sports to account for differences in sampling proportions within each cohort and to scale the results from both years in relation to current national participation figures.

To account for differences in survey content, an additional set of filters was applied to both samples. Given the present study's main goal of examining changes in problem gambling severity rates in the four-year span, the basis for filtering was implemented to ensure that problem gambling severity rates were comparable. Participants in both samples were categorized as either (1) non-gamblers, (2) social gamblers, (3) at-risk gamblers, or (4) probable pathological gamblers, based on responses to the GAQ and DSM-IV-TR questionnaire. However, differences in formatting of the surveys necessitated survey-specific methods of filtering out certain participants with missing data. In the 2004 survey, the GAQ immediately preceded the DSM-IV-TR. The DSM-IV-TR contained the instruction, "If you have not gambled, bet or wagered in any way during the past 12 months, please skip [this section]." Despite this instruction, certain of those participants who reported gambling on the GAQ skipped the DSM-IV-TR, ostensibly because they did not believe themselves to have gambling problems suggesting they should be categorized as "social gamblers." Accordingly, the following four guidelines were employed to filter out and categorize respondents: (1) those who missed the GAQ and DSM-IV-TR were categorized as "missing" and excluded from further analyses (1.5%), (2) those who indicated "no gambling" in the past year on the GAQ were categorized as "non-gamblers" whether or not they completed or skipped the DSM-IV-TR, (3) those who indicated any gambling participation on the GAQ in the past year but skipped the DSM-IV-TR were categorized as "social gamblers," and (4) all others who indicated gambling participation on the GAQ and who completed the DSM-IV-TR were categorized according to their scores on the DSM-IV-TR.

Whereas the 2004 survey placed the DSM-IV-TR immediately following the GAQ, the 2008 survey placed the DSM-IV-TR several sections after the GAQ. This gap between the GAQ and DSM-IV-TR in the 2008 survey raises the possibility that some participants might be incorrectly categorized if the 2004 guidelines were applied. For example, a participant might have endorsed gambling in the past year on the GAQ but then stopped completing the survey before reaching the DSM-IV-TR. In such a case, the participant would be categorized as a "social gambler" according to 2004 survey guidelines; however, they would be more appropriately filtered out given the possibility that they are actually an at-risk or pathological

gambler. Alternatively, a participant might have endorsed gambling on the GAQ but validly skipped the DSM-IV-TR, believing that questions about problem gambling do not apply to him or her. Therefore, the section preceding the DSM-IV-TR was examined to determine if individuals who missed the DSM-IV-TR had done so purposely or had terminated the survey by that point. The following guidelines were employed to filter out and categorize participants in the 2008 sample: (1) those participants who missed the GAQ and DSM-IV-TR were categorized as “missing” and excluded from further analyses (0.4%), (2) those who missed the section preceding the DSM-IV-TR and did not complete the DSM-IV-TR were categorized as “missing” and excluded from further analysis (8.0%), (3) those identified as non-gamblers on the GAQ, did not skip the section preceding the DSM-IV-TR, but skipped the DSM-IV-TR were categorized as “non-gamblers,” (4) those who indicated any gambling participation on the GAQ in the past year but skipped the DSM-IV-TR, were categorized as “social gamblers,” and (5) all others who indicated any gambling participation on the GAQ and who completed the DSM-IV-TR were categorized according to their scores on the DSM-IV-TR.

After applying all data cleaning and filtering procedures, comparative data were available for 18,916 student-athletes from the 2004 survey and 17,675 student-athletes from the 2008 survey. Participants excluded from further analysis represent 8.1% of the total surveys received in 2004 and 11.4% of the total surveys from 2008.

Data Analysis

The large sample sizes and number of statistical analyses employed greatly increased the possibility of spurious findings. Accordingly, the threshold probability for reporting statistical significance was set at .0005 rather than the conventional .05. Pearson chi-square tests were conducted using SPSS software. The Phi coefficient, a simplified calculation of the Pearson correlation between two dichotomous variables (Calkins, 2005), was provided as an index of the strength of association between variables.

Results

In 2004, 62.8% (70.7% males, 48.9% females) of the sample reported some form of gambling in the past year. Participation rates were relatively lower in 2008 with 54.8% (65.6% males, 38.5% females) of the sample reporting past year gambling. Within gender comparisons revealed that the associations between survey and past year gambling participation were significant (males, $\chi^2(1, 22709) = 67.8, p < .0005$; females $\chi^2(1, 13913) = 155.06, p < .0005$). Weekly gambling rates also decreased across samples. In 2004, 17.6% of males and 4.3% of females reported gambling on a weekly basis whereas in 2008, 11.1% of males and 1.5% of females were weekly gamblers (males, $\chi^2(1, 22681) = 192.6, p < .0005$; females $\chi^2(1, 13910) = 101.1, p < .0005$).

Overall, 37.9% of the 2004 respondents were categorized as non-gamblers versus 45.2% categorized as non-gamblers in 2008; 59.5% were categorized as social gamblers in 2004 versus 52.4% social gamblers in 2008, 1.9% were at-risk gamblers in 2004 versus 1.2% at-risk gamblers in 2008, and 0.7% were PPGs in 2004 versus 1.3% PPGs in 2008. When at-risk and PPGs were combined into a single group (i.e., at-risk/PPGs) and compared to a group composed of non-gamblers and social gamblers (i.e., non/social gamblers), there were no appreciable differences across years as 2.6% in 2004 were at-risk/PPGs and 2.5% in 2008 were at-risk/PPGs, $\chi^2(1, 36591) = 1.80, p = .180$. Table 1 presents rates of problem gambling severity across the two samples, separated by gender.

Differences between the 2004 and 2008 samples in terms of past year and weekly participation rates with respect to different types of gambling among males are presented in Table 2. Differences among females are presented in Table 3. Among males, the 2004 sample generally reported higher rates of past year and weekly gambling participation in different activities with a few exceptions. There were no differences in past year or weekly participation in horse/dog race wagering, playing the stock market, or bingo. There was also no difference in past year participation in card games (e.g., poker); however, weekly poker playing in 2008 (3.9%) was less than half the weekly participation rate in 2004 (8.4%). The only two activities that showed an increase in past year participation across the four-year span were Internet gambling, which was almost doubled from 6.8% in 2004 to 12.1% in 2008 (12.1%), and sports wagering, which increased from 23.5% in 2004 to 29.3% in 2008. Despite these increases in past year participation, weekly participation in Internet gambling did not differ between years, and weekly participation in sports wagering was actually higher in 2004 (4.7%) compared to 2008 (2.4%).

Table 1
Differences in Problem Gambling Severity between 2004 and 2008 Separated by Gender

DSM-IV-TR Category	Males			Females		
	2004	2008	Phi	2004	2008	Phi
Non-gambler	29.3	33.7	.048*	51.1	61.4	.105*
Social gambler	66.7	62.5	.044*	48.6	38.2	.105*
At-risk gambler	2.9	1.8	.036*	0.3	0.2	.013
Probable pathological gambler	1.1	2.0	.035*	0	0.2	.022
At-risk / PPG (combined)	4.0	3.8	.006	0.3	0.4	.003

Note. Weighted percentages are presented. 2x2 Pearson chi-square tests ($df = 1$) compared the 2004 and 2008 sampling distributions of respondents in a given DSM-IV-TR category (row) versus those in all other categories. The Phi statistic provides an estimate of effect size.

* $p < .0005$.

Table 2
Differences in Male Participation in Different Gambling Activities between 2004 and 2008

Gambling activity	Gambling in past year			Weekly gambling		
	2004	2008	Phi	2004	2008	Phi
Lottery tickets	36.2	31.4	.051*	3.0	2.0	.034*
Card games (e.g., poker)	46.8	46.1	.007	8.4	3.9	.094*
Bet on games of personal skill	39.7	32.7	.072*	5.8	4.1	.038*
Horse/dog races	9.8	8.5	.022	0.5	0.4	.010
Played the stock market	10.2	9.3	.015	2.2	2.1	.004
Bingo	6.5	6.9	.006	0.3	0.4	.008
Internet gambling	6.8	12.1	-.092*	1.4	2.0	-.022
Shot dice	13.4	10.8	.039*	1.5	0.9	.024*
Slot machines	19.8	15.3	.059*	0.9	0.3	.037*
Sports wagering	23.5	29.3	-.066*	4.7	2.4	.060*

Note. Weighted percentages are presented. 2x2 Pearson chi-square tests ($df = 1$) compared the 2004 and 2008 sampling distributions of respondents in a given DSM-IV-TR category (row) versus those in all other categories. The Phi statistic provides an estimate of effect size.

*p < .0005.

Among females, the pattern of differences between samples for different gambling activities was more consistent. Past year participation rates were higher in 2004 for all activities except bingo, Internet gambling, and sports wagering for which there

Table 3
Differences in Female Participation in Different Gambling Activities between 2004 and 2008

Gambling activity	Gambling in past year			Weekly gambling		
	2004	2008	Phi	2004	2008	Phi
Lottery tickets	29.7	24.0	.065*	1.2	0.6	.030*
Card games (e.g., poker)	19.0	10.7	.117*	1.3	0.3	.058*
Bet on games of personal skill	14.0	7.1	.113*	0.7	0.1	.042*
Horse/dog races	4.8	3.1	.042*	0.1	0	.018
Played the stock market	3.5	2.0	.045*	0.6	0.2	.026
Bingo	7.3	6.9	.008	0.2	0.1	.014
Internet gambling	2.1	1.8	.012	0.4	0	.028
Shot dice	3.5	2.2	.039*	0.3	0	.034*
Slot machines	14.3	9.9	.068*	0.2	0.1	.028
Sports wagering	6.7	6.5	.003	0.6	0.1	.040*

Note. Weighted percentages are presented. 2x2 Pearson chi-square tests ($df = 1$) compared the 2004 and 2008 sampling distributions of respondents in a given DSM-IV-TR category (row) versus those in all other categories. The Phi statistic provides an estimate of effect size.

*p < .0005.

were no differences observed. The prevalence of weekly participation in all activities was low overall (1.3% or less) and generally higher in 2004 compared to 2008.

Within each sport, past year and weekly gambling rates were generally lower in 2008 compared to 2004. As shown in Figure 1, among males, past year and weekly gambling rates were higher in 2004 within every sport, except for past year gambling among baseball players, in which it was higher in 2008, albeit not significantly higher ($\chi^2(1, 3550) = 4.90, p = .03$). The relative prevalence of gambling across sports indicated the highest past year and weekly gambling rates among golfers for both years. In 2008, weekly gambling among golfers (31.7%) was more than twice as prevalent as the next highest sport (baseball, 14.3%). Basketball players reported the lowest past year gambling rates in 2008 and the second lowest in 2004; wrestlers reported the lowest weekly gambling rates in 2008 and track athletes reported the lowest weekly rates in 2004.

Prevalence rates for at-risk/PPGs across men’s sports also suggested higher problem severity among male golfers (Figure 2). In 2008, golfers consisted of the highest proportion of at-risk/PPGs (7.1%) compared to other sports; albeit, the proportion within golfers dropped off from 2004 (11.1%) when golfers consisted of, by far, the highest proportion of at-risk/PPGs across sports. There were slight decreases across years in the proportion of at-risk/PPGs within hockey (2004: 7.8%; 2008: 5.9%) and tennis (2004: 5.4%; 2008: 3.6%). Meanwhile, slight increases took place in the proportion of at-risk/PPGs within lacrosse (2004: 3.0%; 2008: 4.6%), swimming (2004: 2.3%; 2005: 3.5%), and wrestling (2004: 3.3%; 2008: 4.6%). Proportions within all other sports stayed relatively stable.

Among females (Figure 3), there were also generally lower rates of past year and weekly gambling in 2008 versus 2004 across sports. Only softball players reported

Figure 1. Past year and weekly gambling participation rates among male student-athletes across different sports

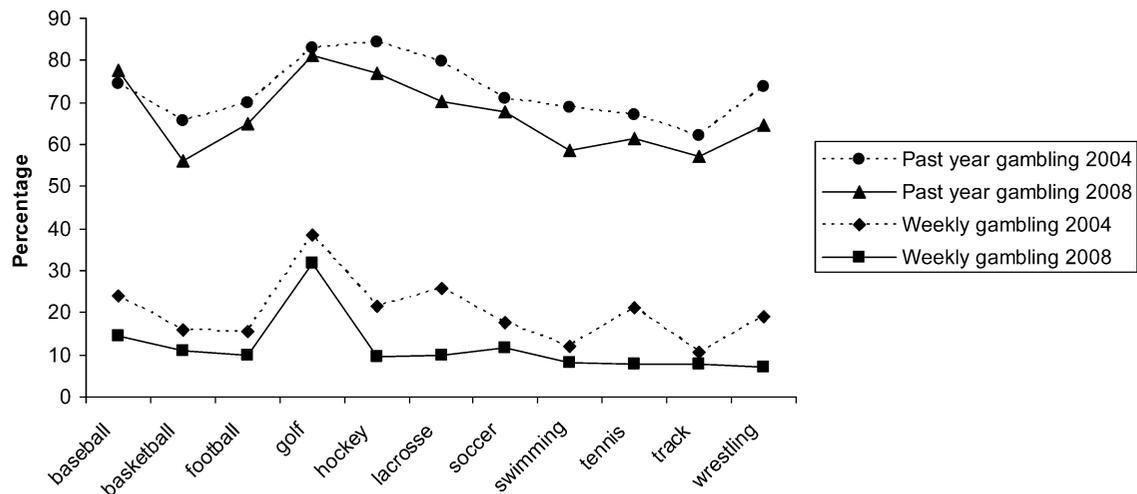
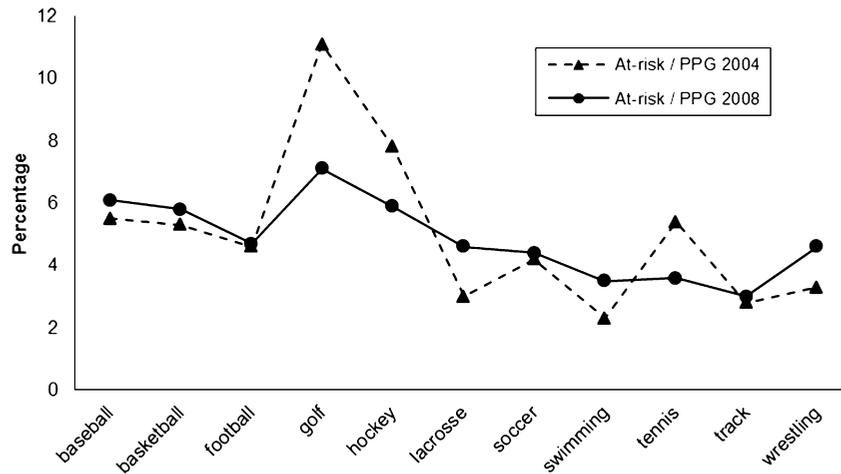
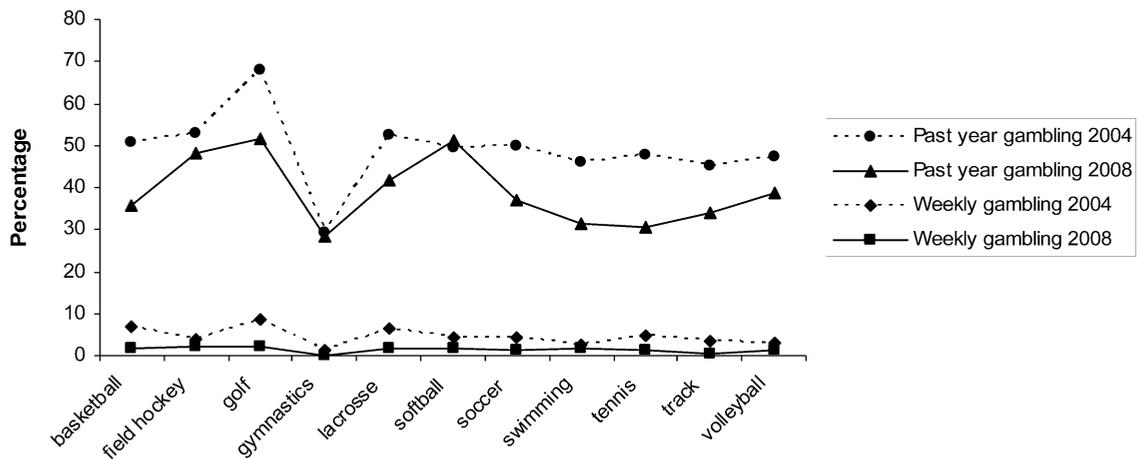


Figure 2. Proportion of at-risk gamblers and probable pathological gamblers (PPGs) among male student-athletes across different sports



higher past year gambling rates in 2008 compared to 2004, but again this difference was not significant ($\chi^2(1, 1826) = 0.55, p = .46$). Consistent with the observation among males, female golfers in both years reported the highest rates of past year and weekly gambling. The lowest past year and weekly gambling rates were reported by gymnasts. Whereas among males there was a general decline in gambling participation between years, such a clear pattern did not emerge with females. In 2004, past year gambling rates among women ranged between 45% and 53% across sports except for golf (68.0%) and gymnastics (29.3%). In 2008 there were noticeably sharper drops in past year gambling in several sports (basketball, golf, lacrosse, soccer, swimming, tennis, track, volleyball) but not in others (field hockey, gymnastics, softball). Relative to males, the proportion of at-risk/PPGs among

Figure 3. Past year and weekly gambling participation rates among female student-athletes across different sports



females was extremely low which prevented statistically reliable comparisons within sports between 2004 and 2008.

Discussion

As mentioned earlier, the NCAA has made concerted efforts to address gambling among its athletes through awareness programs, enforcement groups, and a website aimed specifically at disseminating relevant information on gambling. Although the current method precludes a direct examination of the effects of these initiatives, several findings in the current study suggest the NCAA may be moving in the right direction towards helping curb gambling activity among student-athletes. Overall, past year and weekly gambling rates were lower in 2008 compared to 2004 among males and females. Changes in gambling severity categorization between 2004 and 2008 indicated an overall increase in the proportion of non-gamblers along with a corresponding drop in the proportion of social gamblers. Meanwhile, the 2008 survey revealed fewer at-risk gamblers and more probable pathological gamblers compared to 2004. However, when at-risk gamblers and probable pathological gamblers were collapsed into a single group and compared to non-gamblers and social gamblers, no differences were found between samples in the proportion of individuals at-risk of having a gambling problem or meeting criteria for a gambling problem. Taken together, these findings suggest a promising trend in gambling activity among college student-athletes with lower gambling participation overall in 2008 compared to 2004. However, college athletics departments still need to be vigilant, as the rate of problem gambling among student-athletes has remained unchanged.

When participation rates in various gambling activities were compared between 2004 and 2008, the 2004 sample reported higher rates of past year and weekly gambling participation in almost all activities. The only two activities that the 2008 sample as a whole reported higher past year participation rates were Internet gambling and sports wagering. Higher rates of Internet gambling involvement was expected given the expansion and increasing popularity of Internet-based gambling since 2004. However, weekly Internet gambling participation rates did not differ between the samples, suggesting that more student-athletes are likely trying out Internet gambling but not necessarily becoming overly involved. In addition, Internet gambling participation rates (8.1% past year, 1.3% weekly in 2008, genders combined) are still relatively low compared to other forms of gambling such as card games (32.1% past year, 2.5% weekly in 2008, genders combined). At first glance these findings do not seem to support the notion that the growth of Internet gambling poses a significant risk to student-athletes in terms of leading to more gambling involvement. Whereas some researchers have postulated that college students are particularly prone to problems related to Internet gambling (Shead et al., 2012), this does not appear to be the current case among student-athletes. Perhaps involvement in their sporting pursuits (e.g., training, practice, traveling to games, fear of losing eligibility) buffers them from becoming too involved in Internet

gambling. Alternatively, it may be that implementation of awareness programs and stricter NCAA policies are moderating the risk posed by Internet gambling expansion.

Meanwhile, similar factors may contribute to more involvement in other forms of gambling that have higher prevalence rates among student-athletes, such as betting on games of personal skill, sports wagering, and card games. The athlete culture of competitiveness and camaraderie is likely to foster participation in these activities, particularly among teammates. Among males, weekly poker playing dropped by more than half from 2004 (8.4%) to 2008 (3.9%). This decline in frequent poker participation is likely explained by the flattening out of poker's popularity since the peak of the poker boom in 2005 (American Gaming Association, 2010).

Among males, despite the fact that the 2008 sample reported higher rates of overall past year sports wagering (29.3%) compared to the 2004 sample (23.5%), weekly sports wagering was almost twice as high in the 2004 sample (4.7% versus 2.4%). This conflicting finding suggests that more student-athletes may be willing to try their hand at sports wagering but are actually doing so less frequently than they were several years ago.

Across sports, gambling participation and problem severity was notably highest among golfers of both genders. Strikingly, weekly gambling rates in 2008 among male golfers (31.7%) were more than double the weekly gambling rates observed in all other sports. Meanwhile, female gymnasts reported the lowest rates of gambling participation, suggesting that involvement in gymnastics is related to a lack of gambling involvement. The finding that gambling participation and problem severity is most prevalent among golfers is perhaps unsurprising given the strong connection between gambling and golf (LeCompte, 2005). A long history exists of money being wagered on golf, which is highly amenable to gambling action. Golf typically involves a round of 18 holes in which four players spend several hours with each other. The inherent competition among a foursome encourages players to place wagers to "make things more interesting." Whereas most other sports involve a continuous flow of action that precludes in-game wagering, golf is characterized by long pauses between shots during which players have ample time to bet on the outcome of an entire round, nine holes, a single hole, or even a single shot. Because gambling is entrenched in the culture of golf, gambling on the golf course has the potential to easily carry over into other gambling activities off the course. Golfers who view gambling as a regular activity during practices and competitions may be more likely to seek other gambling opportunities when they are not golfing. A question that remains is whether individuals who have an affinity for gambling are more likely to become golfers or whether the culture of gambling in golf leads golfers to be more likely to participate in gambling activities.

The current study is subject to limitations associated with using self-report data without corroboration. In both the 2004 and 2008 surveys, student-athletes were

assured that all responses were confidential. However, given the seriousness of some of the questions asked (e.g., items pertaining to serious violations of NCAA rules that could result in loss of eligibility and, in some cases, criminal charges), some participants might have been wary of reporting their actual gambling activities. Although data cleaning procedures were implemented to try to eliminate dubious responses, such methods are more effective in identifying and removing anomalies of commission whereas purposefully omitted data would remain undetected. We are also uncertain regarding the comparability of responses across the two samples given the change in survey format, the general cohort shifts, and the educational efforts by the NCAA since the 2004 survey.

Despite the limitations in making comparison across surveys, the results strongly suggest a drop in gambling rates among student-athletes from 2004 to 2008. Gambling participation within gender, gambling activities, and sports generally remained steady or decreased across the four-year span despite a general expansion of gambling opportunities during that time period. Although it is plausible that prevention initiatives implemented by the NCAA task force are responsible for the observed decrease in gambling participation and problem gambling severity rates, other factors must be taken into consideration. For example, there may be a cohort effect in which certain forms of gambling typically enjoyed by younger people have simply declined in popularity between 2004 and 2008, a trend that is evidenced by the leveling out of the poker boom since its peak in 2005. Also, campus-wide initiatives that are not specific to student-athletes may have been effective in raising awareness about gambling among college students. Follow-up research is needed to examine the impact of specific intervention strategies implemented by the NCAA to address gambling among student-athletes.

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