Journal of Gambling Issues

Open Access Original Research

Comparisons of Minnesota Public School Youth Gambling between 2019 and 2022

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Citation: King, S.M., Adamyk, K., Weinburd, J., Stinchfield, R. (2025). Comparisons of Minnesota Public School Youth Gambling between 2019 and 2022. Journal of Gambling Issues.

Editor-in-Chief: Nigel Turner, Ph.D.

Received: 02/25/2025
Accepted: 10/28/2025
Published: 11/16/2025

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Abstract. Monitoring youth gambling rates in a changing landscape of gambling trends, legalization, and advances in technology is essential to prevention and early intervention. The current study examines changes in rates of gambling, frequent gambling, problem gambling from 2019 to 2022 by sex and grade in school. We examined the Minnesota Student Survey, a population-based survey administered in schools. The 2022 sample included public school students from 8th, 9th, and 11th grades (total N = 83,545). Students participated in an anonymous, self-administered online survey. Boys reported having gambled, gambled frequently, and endorsed problem gambling more often than girls. There was a slightly greater percentage of students gambling frequently in 2022 than in 2019 (8.0% versus 6.5%). Based on current data trends, there is benefit to addressing youth who are engaging in problematic gambling behaviors.

Keywords: Youth Gambling, Problem Gambling, Sex Differences, Video Gaming, Epidemiological Study.

Introduction

Youth gambling is an important public health issue, with 1-2 percent of youth engaging in high risk or problem gambling (Richard & King, 2023). Population-based rates of gambling disorder are 1 to 4 percent, and 12 to 21 percent evidence at-risk gambling (Calado et al., 2017; Shaffer et al., 2004). Past-year gambling rates among youth are high (80%; Winters, Stinchfield, Botzet & Anderson, 2002). In Minnesota, there are over 3,000 charitable gambling sites, 18 or more tribal casinos, two racetracks with card rooms, and private betting venues (Stinchfield, 2020). Monitoring youth rates gambling within video games and online gambling is essential as technology evolves (Messerlian et al., 2004). Shifts in youth gambling may signal changes in popularity and access to traditional gambling (King et al., 2014).

Significant changes have led to an expanded betting landscape of internet and in-person sites. The majority of U.S. states have legalized sports betting. Currently, Minnesota has not yet legalized sports betting, making it a unique environment to monitor rates of youth gambling. Youth may be drawn to sports betting for social needs or cultural norms. Sports fan culture may drive youth interest (Nyemcsok, Pitt, Kremer, & Thomas, 2022). Big wins reinforce increasing involvement in sports betting (Edson et al., 2023). Young men may be at greater risk for sports betting through exposure in groups (Marchica et al., 2017; Vinberg, Virdeej & Rosendahl, 2023). Marketing and advertising may be influential, and frequent involvement in video gaming may be a gateway to later gambling (Molde et al., 2019). Ads may portray gambling as a rewarding recreational activity. Emerging data suggest the "gamblification" of video games is an emerging risk for youth problem gambling (Brock & Johnson, 2021; Richard and King, 2023). Youth ages 18 to 24 are at high risk for developing problematic gambling behaviors (Blaszczynski, & Nower, 2022). Students may start gambling in high school, a critical period to monitor gambling in the population.

Gambling Types and Trends in Youth

Various gambling types may be perceived as exciting, or risky (Welte et al., 2009). In Minnesota, the legal age of gambling is 18, and opportunities have proliferated in online environments and video games. An emerging trend is novel betting, including loot boxes (loot boxes are defined as "virtual items embedded in video games that players can open with real-world money to get the chance of obtaining one or more virtual rewards," Primi et al., 2022), esports, social casino, fantasy football, and online (Brooks & Clark, 2023; Kristiansen, & Severin, 2020; Rockloff et al. 2021) and may involve social interaction online or in person. During middle and high school, gambling may coincide with a greater developmental emphasis on relationships and recreational activities. In a systematic review, early involvement with problematic forms of video gaming and novel betting predicted later development of problem gambling in youth (Richard &

King, 2023). Youth gambling may be perceived as normative and common (Richard & King, 2023). An expanded array of online gambling has created a new frontier for youth, extending its reach beyond traditional formats (for example, casino gambling or cards with friends), increasing the access. A certain small percentage will develop a gambling problem (Derevensky, 2012; Richard & King, 2020).

Epidemiological gambling data are rare, yet prevalence studies show trends change over time (Stinchfield, 2020) and tracking trends are important to prevention efforts. Stinchfield et al. (2020) reported that in the 2019 Minnesota Student Survey, 29.6% of high schoolers in Minnesota had gambled, .5% percent of the sample had a gambling problem, and 2.3% had subthreshold gambling problems. Few large-scale population studies in the United States track the prevalence of youth gambling (Stinchfield et al., 2020). Insights gleaned from substance use data may be useful for gambling research and policy. Monitoring the Future (MTF) is a large-scale population-based study of youth substance use (Johnston, O'Malley, Bachman, & Schulenberg, 2009; Stinchfield, 2020). In MTF studies, there have been varied effects of recreational cannabis legalization on youth use. Monitoring gambling trends may lead to data-driven insights for prevention, early identification, and treatment of gambling problems (David et al., 2017), policy, and legalization (Stinchfield, 2020).

Previous work has examined rates of gambling among eighth, tenth and twelfth graders and found rates of 20% or more among these groups (Stinchfield, 2020). Grade and age may be associated with type of gambling, and engaging in frequent gambling, with older age associated with more gambling overall, and this association may vary based on type of gambling (Stinchfield, 2020). In a published report on 2022 data, we reported the rates of frequent and problem gambling in the Minnesota Student survey by gambling type and sex. In this study, we found 7.9% of the 2022 sample were frequent gamblers (gambled at least one time a week or more) and frequent gambling was more common in male than female students (King, Adamyk, Weinburd, & Stinchfield, 2025). In the report, we found that frequent gamblers most often endorsed one or two forms of gambling (33.7 and 40.1% respectively; King et al., 2025). We also examined problem gambling patterns in the 2022 sample, and found a small percent of youth in our sample met criteria for problem gambling (.7%). Problem gamblers most often endorsed four or five types of gambling (21.3% and 40.9% respectively; King et al., 2025).

Sex Differences

Boys gamble more often than girls (Richard & King, 2023). Engagement with specific types of gambling vary by sex, with males typically gambling at higher rates (Stinchfield, 2020; Richard & King, 2023). Understanding sex differences in gambling is important to shaping prevention efforts. Social affiliation needs around gambling may differentially affect gambling behavior for the sexes. In addition, video

gaming popularity and exposure to video gaming environments may show sex-specific patterns (Richard & King, 2023).

The Current Study

To address the need to better monitor youth gambling behaviors, our study had four aims: 1) Examine the population-based rate of gambling engagement in the Minnesota Student Survey (MSS) of public school students and estimate the frequency of gambling types in male and female 8th, 9th, and 11th graders, 2) Compare 2022 data to previous data from the Minnesota Student Survey collected in 2019 and examine rates of problem gambling for 2022, 3) Examine grade and sex effects on gambling, and 4) Examine rates of problem and subclinical gambling in 8th, 9th, and 11th grade males and females. The MSS is one of the largest-scale population-based studies that can provide data on youth gambling in the U.S.

Method

Participants. We examined 2022 MSS data from 83,545 8th, 9th, and 11th grade students enrolled in Minnesota public, charter or tribal schools. Gambling data were drawn from the 2019 and 2022 sample with similar sampling techniques (details provided in Stinchfield, 2020). Demographics from 2022 (Table 1; King, Adamyk and Weinburd, 2025) and 2019 demographics (Table 1b) in a previous report (Stinchfield et al., 2020). Approximately 48.1% resided in Greater Minnesota and 51.9% were from the Minneapolis and St. Paul area. Demographic characteristics remained stable from 2019 to 2022. The legal age of gambling in Minnesota is 18 and 99.7% of the 2022 sample (N = 239) were underage at the time of the assessment (all of the 8th and 9th graders and most 11th graders).

Minnesota Student Survey Sampling and Protocol

The Minnesota Student Survey is a large-scale census-based school survey administered statewide every three years since 1989 (Minnesota Student Survey Interagency Team (MSSIT), 2010; Stinchfield, 2020). Participation rates for Minnesota districts in 2019 were 81%. Methodology varied some from the 2019 survey to the 2022 survey. The 2022 methodology is presented in a report (MSSIT, 2022). The 2019 survey was administered by paper and pencil or online format. The 2022 survey was exclusively online (MSSIT, 2022), details are provided in a separate report (MSSIT, 2019) and the Minnesota Student Survey Interagency Team conducts the study. Several state of Minnesota departments were involved in data collection and study design (Departments of Education, Health, Human Services and Public Safety). Rates of participation were lower in 2022 than 2019 (70% in 2022 versus 81% in 2019; MSSIT, 2019; MSSIT, 2022) and school participation in the MSS survey was optional. Formal ethics approval for this study was granted by a Human Research Ethics Committee. Participants provided written informed consent and were debriefed following their involvement; or, clients consented to their

deidentified data being used for research purposes when they created an account/at intake.

2022 Sample

Minnesota Student Survey Protocol. The MSS was an anonymous survey offered with paper and pencil in 2019 and online in 2022. The study included a variety of measures: demographics, students' activities, health, mental health, alcohol, drugs and nicotine use/problems.

Gambling Items. Gambling items were administered to 8th, 9th, and 11th graders. The survey defined gambling as: "....we mean you bet money or something else of value so that you can gain money or something else." Prompts for each gambling question are presented in Appendix 1. The 2022 MSS included five items measuring the degree of participation in gambling. "During the last 12 months, how often have you done the following gambling or betting activities?" The following prompts for gambling were used: 1) bet on informal games of personal skill such as playing cards, video games, pool, golf, etc., 2) bet on formal sports events or games including esports, 3) bought lottery tickets or scratch offs, 4) gambled in a casino, and 5) gambled for money online including loot boxes. Participants were asked to indicate frequency of engaging in the activity for each gambling type: (a) Not at all, (b) Less than once a month, (d) About once a week, (e) Two to six times a week and (f) Daily. In this study, *frequent gambling* is defined as weekly or daily gambling.

Problem Gambling

There were three screening questions on problems from the Brief Adolescent Gambling Screen (BAGS; Stinchfield, Wynne, Wiebe, & Tremblay, 2017). Items started with the following: "During the last twelve months, how often have you…?" and continued with one of: (A) hidden your gambling/betting from your parents, other family members or teachers? (B) felt that you might have a problem with gambling/betting, or (C) skipped hanging out with friends who do not gamble/bet to hang out with friends who do gamble/bet? Participants selected one of four options: (a) Never, (b) Sometimes, (c) Many times; and (d) All of the time. We created four separate groups based on the scale: 1) No gambling, 2) No Problem Gambling (students who gambled in the past year and scored a zero on the problem gambling screen, 3) Subclinical gambling problems (students who have gambled in the past year and score a 1, 2, or 3 on problem gambling screen) and 4) Problem Gambling (students who have gambled in the past year and score four or more on the problem gambling screen). Stinchfield (2019) reported reliability and validity data on the BAGS: Internal consistency as measured by Cronbach's (1951) coefficient alpha was .72.

Convergent Validity

Youth Gambling. BAGS estimates of classification accuracy include: hit rate = .95, sensitivity = .88, specificity = .98, false positive rate = .02, and false negative rate = .12 (Stinchfield, Wynne, Wiebe & Tremblay, 2017). BAGS Scores range from 0 to 9. A BAGS score of 4 or more reflected problem gambling. Students who did not engage in gambling in the past year did not take the BAGS.

Differences and Similarities between 2019 and 2022 Gambling Assessments

Appendix 1 presents a summary of 2019 versus 2022 gambling assessments. Gambling participation questions differed from 2019 to 2022, but problem gambling questions did not. See note on Appendix 1 for details.

We examined a large-scale epidemiological data set on gambling (N = 83,545). Larger-scale samples allow greater power to detect rates of gambling and problem gambling behaviors in youth. The results are organized into three sets of findings: 1) Rates of gambling and problem gambling in 2022, 2) Rates of frequent gambling (weekly/daily) by grade and 3) Changes in reported gambling and problem gambling (increasing, decreasing or stable) by grade from 2019 to 2022.

Rates of Gambling in 2022

In 2022, rates of gambling participation among girls and boys across the three grades are presented in Table 2. Rates of endorsement of gambling and frequent gambling were estimated. In this study, "any gambling" refers to endorsement of any gambling in the past year. Frequent gambling was defined as playing any of the games or venues "about once a week" or more often. We selected this level of gambling because there is evidence that this frequency differentiates between individuals in treatment for problem gambling and those in the general public (Stinchfield & Winters, 2001). The estimate of frequent gambling provides a proportion of students at risk for gambling problems.

Gambling rates for all types of gambling are presented by sex and by grade in Table 2 for 2022. Gambling participation was 32.5% among all 8th, 9th, and 11th grade students for all informal and legal forms of gambling measured in the study. Approximately 67.5% of the sample had not gambled in the last year. The most common form of betting was on informal games of personal skill (24.2%). More students bet on informal games of personal skill (24.2%) or formal sports events or games (14.3%) than engage in lottery, casinos, and online gambling all combined (total = 13.5%). Fewer students report engaging in these three legal forms of gambling: 7.3% for lottery, 1.6% for casino, and 4.6% for online.

Gambling Participation by Sex and Gambling Type

Table 2 presents rates of gambling by type, year, and sex. There were sex differences in rates of any gambling, with rates of 42.3% for males and 23.2% for females. 17,021 out of 40,556 boys gambled in the past year,

whereas only about 9,915 out of 42,989 girls gambled. More males than females reported having gambled in the past year on informal games of personal skill (32.9% versus 15.9%). For betting on formal sports events or games, more males than females reported engaging in the behavior (20.6% versus 8.4%). There were no notable sex differences in lottery involvement, with 7.6% of males and 6.9% of females reporting lottery involvement. For casino betting, there were some differences observed between boys and girls (2.2% versus 1.0%). There were sex differences in rates of online gambling with 8.1% of males and 1.3% of females reporting online gambling.

Comparison of 2019 to 2022 Rates of Gambling Participation

We examined changes in rates of 2019 and 2022 samples and determined if rates changed or stayed the same. Because of methodological changes from 2019 to 2022, only some gambling types and assessments were considered comparable. See Appendix 1 for a summary of 2019 versus 2022 gambling assessments in the MSS. We define types of gambling differently than in 2019 (Stinchfield, 20 20) because the assessments of gambling differed between the years. We refer to the following types: any gambling, informal games of personal skill, formal sports events or games, lottery, casino, and online. For 2019, there was no distinction made between formal sports events or games and informal games of personal skill and the online betting question did not include the example of "loot boxes" present in 2022.

Due to different gambling assessments by year, some types are not comparable across time (informal games of personal skill and formal sports events or games) and others are comparable (casino, lottery and any gambling). In Table 2, we present comparisons between these years for the "any gambling" group. There was greater endorsement of having gambled (in the total sample) in 2022 compared to 2019 (32.5% versus 29.7%). It is unclear whether this is due to sample size or sampling error, differences in assessments, or true differences that are relatively small. No major differences were found in rates of gambling in 2019 compared to 2022 for lottery (7.5% for 2019 and 7.0% for 2022).

In 2019, the assessment included *games of skill*. Measurement changes reflected different gambling definitions and categories in the 2022 report. In 2022 *formal sports events or games* and *informal games of personal skill* were assessed. Rates of gambling on formal sports events or games and informal games of personal skill in 2022 are relatively high compared to other gambling types (24.2% for informal games of skill and 14.3% for formal sports events or games). While not directly comparable to 2022 data, 25.7% of the sample endorsed having engaged in betting on any games of skill in the past year in 2019. Rates of lottery and casino betting declined slightly from 2019 to 2022 (7.5% to 7.3% and 2.0% to 1.6%, respectively). Rates of online gambling increased from 2019 to 2022 (2.4% to 4.6%), but assessments were directly comparable for these two years

(findings may be influenced by inclusion of "loot boxes" as one example of online betting in 2022, which was not the case in 2019). In measuring the statistical significance (z-test) and meaningful size (Cohen's h) of these changes, we find that lottery gambling did not see a statistically significant change ($p > 0.05$) while casino and online gambling did ($p < 0.05$). However, the meaningful size of these changes measured below the threshold for "small" ($h < 0.2$) according to Cohen's *h*.

Examining sex comparisons by grade, 8th grade boys showed similar, but slightly greater increases in any gambling compared to girls from 2019 to 2022 (Table 2). Among 9th graders, males and females showed similar rates of gambling in 2019 and 2022 (Table 2). Among 11th graders, rates of any gambling were similar during the 2019 to 2022 assessments (see Table 2). Among 11th graders, males and females demonstrated similar stability in rates of any gambling from 2019 to 2022. There were no substantial changes observed in rates of casino or lottery engagement among any of the grades and they were similarly stable across sex and grade. There were larger increases in online betting from 2019 to 2022 in males relative to females and trends were similar across all grades. Again, the inclusion of the "loot boxes" as an example of online gambling in the 2022 assessment may have affected rates (assessments were not comparable from 2019 to 2022).

Among gambling types (lottery, casino, and online betting), the greatest observed changes from 2019 to 2022 were in online betting, however they were relatively small and may be driven by methodological differences in assessments. Eighth, ninth, and eleventh grade males showed the greatest changes in online gambling, however the 2022 online gambling assessment included "loot boxes" as online betting and this was not included in 2019 (3.6% to 7.2%, 4.1% to 8.2%, and 4.9% to 9.2%, respectively). Rates of online gambling in females were low, and there was not much change in the behavior over time, even with a slightly different assessment tool for each year. Lottery engagement stayed relatively stable and similar across time for both sexes.

Frequent Gambling (Weekly or Daily)

Rates of frequent gambling (weekly or more) for 2022 are presented in Table 3 under the column entitled 2022. Rates of frequent gambling by year and type are presented in Table 3. Around 8.0% (n=6,603) reported engaging in frequent gambling in 2022. Compared to the 6.5% (n=7,381) rate of frequent gambling reported in 2019, this represented a slight increase. The sex composition of the group who endorsed frequent gambling in the 2022 sample is presented in Figure 1. Around 72% of the participants who endorsed frequent gambling in the 2022 sample were male and 28% were female. Frequent gambling behavior in order of most to least commonly endorsed gambling types in the 2022 sample included: gambling on informal games of personal skill (5.8%), gambling on formal sports events or games (3.1%), online gambling (1.2%), lottery (0.9%) and casino

(.5%). Students were more likely to bet frequently on informal games (5.8%, n=4,831) than legal forms of gambling including using lottery products (0.9%, n=744) casino (.5%, n=379), or online (1.2%, n=1,015). Across all forms of gambling, all of the changes from 2019 to 2022 were statistically significant (z-test, $p < 0.05$) but the meaningful size of none measured above the threshold of for small ($h > 0.2$) according to Cohen's h.

Frequent Gambling by Sex, Year, and Type

Nearly three times more boys (11.9%, n=4,766) than girls (4.3%, n= 1,837; See Figure 1) gambled frequently. Frequent gambling by year and type is presented in Table 3. For both sexes, there were increases in frequent gambling from 2019 to 2022 (9.8% to 11.9% for males and 3.4% to 4.3% for females). We also examined grades together with sex for frequent gambling. Approximately 13.3% (n=2,031) of 8th grade boys, 10.8% (n=1,509) of 9th grade boys, and 11.2% (n=1,226) of 11th grade boys gambled frequently in 2022. Approximately 6.4% (n=1,026) of 8th grade girls, 3.6% (n=530) of 9th grade girls and 2.4% (n=281) of 11th grade girls gambled frequently in 2022. Sex differences in rates of frequent gambling were largest among 11th grades. Sex by grade data suggested a different proportion of frequent gambling for boys than girls. Interestingly, within both male and female students, 8th graders tended to endorse frequent gambling more often than 9th and 11th graders. From 2019 to 2022, rates of frequent gambling among males increased more than females (9.8% versus 11.9%; 3.4 versus 4.3%). The percentage increase for females was about 26% for females and about 21% for males.

Again we find both these changes from 2019 to 2022 to be statistically significant (z-test, $p < 0.5$) but not of even "small" meaningful size (Cohen's $h < 0.2$). Rates of frequent gambling by type (e.g., informal games of personal skill, formal sports events or games, online, casino, and lottery) tended to be stable and similar. There was no observed difference in this trend across grade levels.

Problem Gambling

We examined problem gambling by group, grade, and sex. Table 4 presents data on Problem Gambling in the last 12 months and change in proportion of problem gambling behaviors from 2019 to 2022 (with p-values and Cohen's h). The sample was subdivided into four categories: 1) no gambling, 2) no problem gambling (students who have gambled in the past year and score a 0 on the problem gambling screen), 3) sub-clinical gambling problems (students who have gambled in the past year and score 1, 2, or 3 on the problem gambling screen), and 4) problem gambling (those that have gambled in the past year and who score four or greater on the problem gambling screen). For all categories, changes between 2019 and 2022 were statistically significant (z-test, $p < 0.05$) but did not measure to be of even "small" meaningful size (Cohen's $h < 0.2$).

Figure 2 presents rates of no gambling, no problem gambling (but gambled), subclinical gambling problems, and problem gambling in 2022. Figure 3 presents the sex breakdown of the problem gambling group. Around 67.5% of the sample reported no gambling, 29.1% endorsed no problem gambling (but gambled), 2.8% endorsed subclinical problem gambling, and .7% endorsed problem gambling. Relatively more boys than girls reported problem gambling (1% versus .3%) and subclinical problem gambling (4.3% versus 1.3%). Problem gaming in 2022 was .7%, compared to .5% in 2019. Rates of subclinical problem gambling were relatively similar in 2019 and 2022 (2.3% versus 2.8%). Rates in the no problem gambling (but gambled) group went up slightly (26.0% to 29.1%) from 2019 to 2022. Rates of no gambling went down slightly from 2019 to 2022 (70.3% to 67.5%). Similar differences were observed across all grade levels. Eighth grade males and females had relatively low levels of problem gambling (.9% and .3%) and subclinical gambling problems were low, but were relatively more common (4.2% and 1.5%). Ninth grade males and females had low rates of problem gambling (.9% and .2%, respectively) and subclinical problem gambling (3.9% and 1.3%, respectively). Among 11th grade students, problem gambling rates were low among males and females (1.4% versus .3%) and subclinical problems were somewhat higher (5.1% for males and 1.0% for females). With the exception of 11th grade males, rates of subclinical and clinical gambling problems were relatively similar for 2019 and 2022 across most grades. In 11th grade males, rates of subclinical problem gambling were 3.8% in 2019 and 5.1% in 2022. Rates of problem gambling in this group were similar for both years (1.0% in 2019 and 1.4% in 2022).

Any Gambling, Frequent Gambling and Problem Gambling by Sex

Table 5 presents differences in any gambling (by type) by sex. Results suggest statistically significant differences (z-test, $p < 0.05$)for each type of gambling across all categories, although only two effects reached a "small" magnitude (per Cohen's *h*). Informal games of personal skill ($h = .20$, $p < .001$) had a small effect magnitude, such that boys were more likely to bet on informal games than girls. Boys were more likely to engage in any gambling than girls, with significance and small effect size, ($h = .21$, $p < .001$). Table 6 presents differences in frequent and problem gambling by sex. Results suggest that while both effects were statistically significant ($p < .001$), neither reached a meaningful effect size per Cohen's *h* (frequent gambling $h = .14$, problem gambling $h = .05$).

Discussion

Our study had four specific aims. First, we examined the population based rate of gambling. Gambling participation was 32.5% among all grades for all informal and legal forms of gambling. This differs slightly from the 29.7% rate of gambling participation in 2019. Changes may reflect differences in gambling access and opportunity, including effects of the

pandemic. For some types of gambling, there were also differences in assessments (for example the online gambling question included "loot boxes" in 2022). Findings are consistent with 2019 and indicate similar levels of engagement in gambling among youth (Stinchfield, 2020). Betting on informal games of personal skill (24.2%) was the most common form of gambling. More students bet on informal games of personal skill (24.2%) or formal sports events or games (14.3%) than engaged in lottery, casinos, and online gambling (7.3% for lottery, 1.6% for casino, and 4.6% for online; total=13.5%), consistent with previous research on youth (Stinchfield, 2020; Richard & King, 2023). Cultural normalization of the lottery may cause youth to see it as less harmful (Zhai et al., 2021).

The popularity of gambling on sports and games suggest that this is an important prevention area for youth. Middle and high schoolers in our sample reported that sports and games were the most popular form of gambling suggesting that this may be an entry point to gamble on other games. In published report from 2022 on frequent and problematic gambling, we found that those who developed problems with gambling in our sample reported engaging in more types of gambling (most endorsing four or five types of gambling), whereas the frequent gamblers in our sample tended to gamble on one or two types of gambling (most often sports and games; King et al., 2025) These findings coupled with the current results, suggest that sports and games are very popular among youth and provide an entry point for later engagement with gambling. Gambling is a popular activity among youth, despite it being an illegal activity at this age (8th, 9th and 11th grade). The data suggest that this is an important area for prevention among youth, and that focusing prevention and harm minimization efforts on gambling on sports, games and video games may be an essential area for prevention of gambling related harms or problems. Despite Minnesota not having a legalized sports betting environment, youth report that they are engaging in gambling in sports and games, suggesting that gambling behaviors in youth are widely accessible and available.

We observed increases in reported rates of online gambling from 2019 (Stinchfield et al., 2019) to 2022 (King et al., 2025), and cannot determine if methodological changes affected the results (in 2022, the online gambling item included "loot boxes"). National data reflect an increasing variety of online betting options for youth, including inside video games and these trends may drive greater engagement in online gambling (King et al., 2020). Popular online options include social casino gaming, video gaming, loot boxes, and skins (Veselka et al., 2018; Wardle & Zendle, 2021). These may be one gateway to more problematic forms of gambling (Richard & King, 2023). While changes were observed over time for several forms of gambling, most effects were not of a large magnitude, therefore it is difficult to conclude that these reflect major shifts in population changes in the gambling environments for youth. The data were collected during the pandemic era shifts, and the role of pandemic related online behavioral shifts is also unclear. Other studies have documented

pandemic era shifts in online behaviors, despite a paucity of population based large scale data on youth gambling collected at that time. In a review of gambling during the pandemic era focused on adults, data suggested that gambling among those already engaging generally stayed stable or decreased during the pandemic era (Brodeur, Audette-Chapdelaine, Savard, & Kairouz, 2021).

We found sex differences in gambling, with a rate of 42.3% for males and 23.2% for females. For informal games of personal skill, more males than females reported having gambled (32.9% versus 15.9%). More males than females reported betting on formal sports events or games (20.6% versus 8.4%). Differences of less than one percentage point were also observed for lottery betting (7.6% of males versus 6.9% of females) and casino betting (2.2% versus 1.0%). While all these differences were statistically significant ($p < 0.001$), only the differences in overall gambling and informal games of skill had a (small) meaningful effect size, as measured by Cohen's h ($h=0.206$ and $h=0.201$, respectively).

Previous work suggests boys are at higher risk for gambling. Evidence suggests that mixed-modes of gambling may lead to more problematic engagement in gambling in youth (Gonzales-Roz et al., 2017). Males may be drawn to gambling to socialize around sports or games. These findings highlight the importance of early and targeted inventions for gamblers at risk for frequent engagement in a variety of gambling environments.

Rates across gambling types by sex and grade were relatively similar. For most gambling types, rates were similar to 2019. We observed larger increases in online betting from 2019 to 2022 for males compared to females across all grades and including"loot boxes" in 2022 may have affected rates. Online gambling may be stable or increasing, and may warrant future monitoring. In a ubiquitous online environment, there may be blurred boundaries between online gambling and various gaming environments. Future studies should include youth perceptions of online wagering or betting behaviors and more standardized definitions of gambling behaviors. Frequent gambling (weekly or more) was relatively common, with . around 8.0% (n=6,603) endorsing frequent gambling in 2022. Compared to the 6.5% (n=7,381) rate of frequent gambling reported in 2019, there was a slight increase. Definitions of gambling may have affected changes in frequent gambling or trends may reflect a minor increase in the population. Early and frequent gambling relates to later risk of problem gambling (Kang et al., 2019) and examining predictors of frequent gambling in youth will assist in prevention efforts.

Frequent gambling types in 2022 in order of most to least commonly endorsed were: informal games of personal skill (5.8%), formal sports events or games (3.1%), online gambling (1.2%), lottery (0.9%) and casino (.5%). There was greater likelihood to bet frequently on informal games (5.8%, n=4,831) than legal forms of gambling including using lottery products (0.9%, n=744), casino (.5%, n=379), or online (1.2%, n=1,015).

Researchers should determine if commonly endorsed forms of gambling continue to be the most frequent forms of betting across time from high school to young adulthood. This may lead to improved identification of characteristics and types of play that could lead to problematic gambling.

About .7% of the sample met criteria for problem gambling in 2022, whereas .5% met criteria in 2019. Data suggest the rate of problem gambling in youth was relatively similar in 2019 and 2022. Meeting criteria for problem gambling is rare in youth, particularly due to the fact many have not reached the legal age for gambling. Our findings suggest a small, yet significant minority of youth met criteria for problem gambling. It is especially important that youth and families have access to services, treatment and harm reduction.

In 2022, around 2.8% of students endorsed subclinical gambling problems, and this estimate was 2.3% in 2019. Subclinical gambling problems were similar in 2022 compared to 2019. There was a small, but significant group of youth exhibiting gambling problems at subclinical levels and rates of subclinical gambling problems are similar to other samples. Subclinical level youth problem gambling may signal risk for developing a full-blown problem gambling diagnosis. Youth problem gambling measurement may benefit from a different threshold, as youth have not passed through the window of risk for a full-blown gambling disorder during high school (Fisher, 2000).

Our data suggest boys have a 3-4 times greater likelihood of problem gambling or subclinical gambling problems, similar to findings in larger-scale studies of youth problem gambling. Future studies should track problem gambling to determine if rates of problem gambling in boys and girls continue to be similar or different over time. Past work has found that problem gambling was higher in males than females at various points in development, there are few studies that track these effects longitudinally (Richard & King, 2023). Specific gambling types may be more popular among boys compared to girls. A sizable proportion of the sample never gambled and/or reported no problems with their gambling at this time. Around 29.1% gambled but reported no problems and 67.5% did not gamble. We know little about youth who do not gamble or those who do not develop problems. Understanding what differentiates various groups of gamblers and non-gamblers may inform prevention.

Limitations

This is one the few large-scale U.S. studies aimed at monitoring rates of youth gambling in an epidemiological sample over time; yet there are several limitations. First, changes to the assessment may have affected our findings and interpretation of the data over time. Second, we examined Minnesota data, a unique gambling environment where sports betting is not yet legalized. Future studies should aim to compare, contrast or combine youth samples to create a fuller picture of the landscape of gambling behaviors across the United States. Future work should integrate gambling

measures assessing various emerging novel gambling types (loot boxes, social casino games, skins, and video gaming). Examining psychological, demographic and social correlates of gambling offers more information about early risk factors, intervention and prevention.

Future Research

Future work should examine in experimenter/user groups and identify key psychological characteristics of gambling. What factors may be associated with *not* progressing to more frequent or problematic forms of gambling? Does early experimentation with gambling a risk factor for problems, and what factors predict who progresses to problematic gambling? Do trends shift with increasing variety of online gambling? Do some gambling types predict later problems? Answering these scientific questions may lead to better prevention and intervention in youth. It will be essential to use data-driven decision tools guiding policy, treatment, and education for youth and families to prevent gambling-related harms.

Table 1: *Demographics of 2022 Sample*

	Grade 8, N = 31,761	**Grade 9**, N = 28,925	**Grade 11**, N = 22,859	**Total**
Biological Sex				
Female	16,261 (51.20%)	14,976 (51.78%)	11,752 (51.41%)	42,989 (51.46%)
Male	15,500 (48.80%)	13,949 (48.22%)	11,107 (48.59%)	40,556 (48.54%)
Age				
12	34 (0.11%)	0 (0.00%)	0 (0.00%)	34 (0.04%)
13	12,437 (39.16%)	41 (0.14%)	0 (0.00%)	12,478 (14.94%)
14	18,992 (59.80%)	11,880 (41.07%)	0 (0.00%)	30,872 (36.95%)
15	295 (0.93%)	16,727 (57.83%)	28 (0.12%)	17,050 (20.41%)
16	3 (0.01%)	257 (0.89%)	9,505 (41.58%)	9,765 (11.69%)
17	0 (0.00%)	20 (0.07%)	13,087 (57.25%)	13,107 (15.69%)
18	0 (0.00%)	0 (0.00%)	226 (0.99%)	226 (0.27%)
19-20	0 (0.00%)	0 (0.00%)	13 (0.06%)	13 (0.02%)
Race				
American Indian or Alaskan Native	391 (1.23%)	334 (1.15%)	138 (0.60%)	863 (1.03%)
Asian or Asian American	2,150 (6.77%)	1,888 (6.53%)	1,355 (5.93%)	5,393 (6.46%)
Black, African or African American	2,520 (7.93%)	1,799 (6.22%)	1,280 (5.60%)	5,599 (6.70%)
Hispanic or Latino/a	2,050 (6.45%)	1,772 (6.13%)	1,291 (5.65%)	5,113 (6.12%)
Middle Eastern or North African	147 (0.46%)	120 (0.41%)	84 (0.37%)	351 (0.42%)
Multiple Races	3,229 (10.17%)	2,899 (10.02%)	2,140 (9.36%)	8,268 (9.90%)
Native Hawaiian or Other Pacific Islander	49 (0.15%)	50 (0.17%)	34 (0.15%)	133 (0.16%)
No answer	295 (0.93%)	159 (0.55%)	100 (0.44%)	554 (0.66%)
White	20,930 (65.90%)	19,904 (68.81%)	16,437 (71.91%)	57,271 (68.55%)
Region				
Greater Minnesota	14,847 (46.75%)	14,126 (48.84%)	11,206 (49.02%)	40,179 (48.09%)
Minneapolis/Saint Paul Metro Area	16,914 (53.25%)	14,799 (51.16%)	11,653 (50.98%)	43,366 (51.91%)

Table 2: Change in percentage of any gambling by type from 2019 to 2022

	2019, N = 113,707	**2022****, N = 83,545	**p-value**[1]	**Difference**[1]	**95% CI**[1,2]	**Cohen's h**
All Students						
Sports/Games	25.7%	NA				
Informal Sports/Game	NA	24.2%				
Formal Sports/Games	NA	14.3%				
Lottery	7.5%	7.3%	0.058	-0.23%	-0.46%, 0.01%	0.004
Casino	2.0%	1.6%	<0.001	-0.41%	-0.53%, -0.29%	0.015
Online	2.4%	4.6%	<0.001	2.2%	2.0%, 2.4%	0.061
Any Gambling	29.7%	32.5%	<0.001	2.8%	2.4%, 3.2%	0.030
Male						
Sports/Games	34.7%	NA				
Informal Sports/Game	NA	32.9%				
Formal Sports/Games	NA	20.6%				
Lottery	8.4%	7.6%	<0.001	-0.78%	-1.1%, -0.43%	0.015
Casino	3.0%	2.2%	<0.001	-0.79%	-0.99%, -0.59%	0.025
Online	4.2%	8.1%	<0.001	4.0%	3.6%, 4.3%	0.082
Any Gambling	38.8%	42.3%	<0.001	3.5%	2.9%, 4.2%	0.036
Female						
Sports/Games	17.1%	NA				
Informal Sports/Game	NA	15.9%				
Formal Sports/Games	NA	8.4%				
Lottery	6.6%	6.9%	0.064	0.30%	0.02%, 0.62%	0.006
Casino	1.0%	1.0%	0.5	-0.05%	-0.17%, -0.08%	0.000
Online	0.8%	1.3%	<0.001	0.52%	0.39%, 0.66%	0.025
Any Gambling	21.1%	23.2%	<0.001	2.1%	1.6%, 2.6%	0.025
Male, Grade 8						
Sports/Games	34.8%	NA				
Informal Sports/Game	NA	33.4%				
Formal Sports/Games	NA	21.5%				
Lottery	9.1%	8.5%	0.035	-0.65%	-1.2%, -0.05%	0.011
Casino	2.6%	2.3%	0.088	-0.29%	-0.62%, 0.04%	0.010
Online	3.6%	7.2%	<0.001	3.6%	3.1%, 4.1%	0.081
Any Gambling	38.9%	43.3%	<0.001	4.4%	-5.4%, -3.4%	0.045
Female, Grade 8						
Sports/Games	20.5%	NA				
Informal Sports/Game	NA	20.2%				
Formal Sports/Games	NA	11.0%				
Lottery	8.1%	8.8%	0.036	0.61%	0.04%, 1.2%	0.013

Table 2: Change in percentage of any gambling by type from 2019 to 2022

	2019, N = 113,707	**2022****, N = 83,545	**p-value**[1]	**Difference**[1]	**95% CI**[1,2]	**Cohen's h**
Casino	1.1%	1.3%	0.3	0.13%	-0.10%, 0.36%	0.009
Online	0.9%	1.4%	<0.001	0.51%	0.29%, 0.74%	0.024
Any Gambling	25.2%	28.7%	<0.001	3.5%	2.6, 4.4%%	0.039
Male, Grade 9						
Sports/Games	34.2%	NA				
Informal Sports/Game	NA	32.2%				
Formal Sports/Games	NA	20.4%				
Lottery	7.7%	6.7%	<0.001	-1.0%	-1.6%, -0.43%	0.019
Casino	2.8%	1.8%	<0.001	-1.0%	-1.3%, -0.68%	0.034
Online	4.1%	8.2%	<0.001	4.1%	3.6%, 4.6%	0.087
Any Gambling	38.0%	41.7%	<0.001	3.7%	2.6%, 4.7%	0.038
Female, Grade 9						
Sports/Games	16.7%	NA				
Informal Sports/Game	NA	15.0%				
Formal Sports/Games	NA	7.9%				
Lottery	6.1%	6.4%	0.4	0.23%	-0.28%, 0.75%	0.006
Casino	1.0%	0.7%	0.030	-0.22%	-0.42%, -0.02%	0.016
Online	0.9%	1.2%	0.001	0.35%	0.13%, 0.57%	0.015
Any Gambling	20.5%	22.2%	<0.001	1.7%	0.85%, 2.6%	0.021
Male, Grade 11						
Sports/Games	35.3%	NA				
Informal Sports/Game	NA	33.0%				
Formal Sports/Games	NA	19.8%				
Lottery	8.2%	7.5%	0.027	-0.75%	-1.4%, -0.09%	0.013
Casino	3.7%	2.5%	<0.001	-1.2%	-1.6%, -0.77%	0.035
Online	4.9%	9.2%	<0.001	4.3%	3.7%, 4.9%	0.085
Any Gambling	39.5%	41.6%	<0.001	2.1%	0.94%, 3.4%	0.021
Female, Grade 11						
Sports/Games	13.0%	NA				
Informal Sports/Game	NA	11.4%				
Formal Sports/Games	NA	5.4%				
Lottery	5.3%	5.2%	0.7	-0.12%	-0.66%, 0.41%	0.002
Casino	1.0%	1.0%	0.6	-0.07%	-0.32%, 0.17%	0.000
Online	0.6%	1.4%	<0.001	0.77%	0.51%, 1.0%	0.041
Any Gambling	16.6%	17.1%	0.3	0.52%	-0.38%, 1.4%	0.007

[1]Two sample test for equality of proportions

Table 2: Change in percentage of any gambling by type from 2019 to 2022

	2019, N = 113,707	**2022****, N = 83,545	**p-value**[1]	**Difference**[1]	**95% CI**[1,2]	**Cohen's h**

[2]CI = Confidence Interval

Table 3: Change in percentage of **frequent** gambling by type from 2019 to 2022**

	2019, N = 113,707	**2022**, N = 83,545	**p-value**[1]	**Difference**[1]	**95% CI**[1,2]	**Cohen's h**
All Students						
Sports/Games	5.3%	NA				
Informal Sports/Games	NA	5.8%				
Formal Sports/Games	NA	3.1%				
Lottery	1.1%	0.9%	<0.001	-0.18%	-0.26%, -0.09%	0.010
Casino	0.9%	0.5%	<0.001	-0.44%	-0.52%, -0.37%	0.024
Online	0.8%	1.2%	<0.001	0.44%	0.35%, 0.53%	0.020
Frequent Gambling	6.5%	8.0%	<0.001	1.4%	1.2%, 1.7%	0.029
Male						
Sports/Games	8.0%	NA				
Informal Sports/Games	NA	8.7%				
Formal Sports/Games	NA	4.8%				
Lottery	1.5%	1.3%	0.002	-0.24%	-0.39%, -0.09%	0.009
Casino	1.4%	0.7%	<0.001	-0.68%	-0.81%, -0.55%	0.035
Online	1.3%	2.2%	<0.001	0.84%	0.66%, 1.0%	0.035
Frequent Gambling	9.8%	11.9%	<0.001	2.0%	1.6%, 2.4%	0.034
Female						
Sports/Games	2.7%	NA				
Informal Sports/Games	NA	3.1%				
Formal Sports/Games	NA	1.4%				
Lottery	0.7%	0.5%	0.026	-0.11%	-0.21%, -0.01%	0.013
Casino	0.4%	0.2%	<0.001	-0.22%	-0.28%, -0.15%	0.019
Online	0.3%	0.3%	0.050	0.07%	0.00%, 0.14%	0.000
Frequent Gambling	3.4%	4.3%	<0.001	0.91%	0.66%, 1.2%	0.023
Male, Grade 8						
Sports/Games	8.7%	NA				
Informal Sports/Games	NA	10.0%				
Formal Sports/Games	NA	5.5%				
Lottery	1.5%	1.4%	0.3	-0.14%	-0.40%, 0.11%	0.004
Casino	1.2%	0.8%	<0.001	-0.41%	-0.62%, -0.20%	0.020
Online	1.2%	2.0%	<0.001	0.77%	0.49%, 1.0%	0.032

Table 3: Change in percentage of **frequent** gambling by type from 2019 to 2022**

	2019, N = 113,707	**2022**, N = 83,545	**p-value**[1]	**Difference**[1]	**95% CI**[1,2]	**Cohen's h**
Frequent Gambling	10.4%	13.3%	<0.001	2.9%	2.2%, 3.6%	0.045
Female, Grade 8						
Sports/Games	3.6%	NA				
Informal Sports/Games	NA	4.7%				
Formal Sports/Games	NA	2.2%				
Lottery	0.7%	0.7%	0.8	0.03%	-0.15%, 0.21%	0.000
Casino	0.4%	0.2%	0.008	-0.15%	-0.26%, -0.04%	0.019
Online	0.3%	0.4%	0.2	0.07%	-0.05%, 0.20%	0.008
Frequent Gambling	4.4%	6.4%	<0.001	2.0%	1.5%, 2.5%	0.044
Male, Grade 9						
Sports/Games	7.7%	NA				
Informal Sports/Games	NA	8.2%				
Formal Sports/Games	NA	4.1%				
Lottery	1.5%	1.0%	<0.001	-0.53%	-0.77%, -0.29%	0.023
Casino	1.6%	0.6%	<0.001	-0.93%	-1.2%, -0.71%	0.049
Online	1.2%	2.1%	<0.001	0.86%	0.57%, 1.2%	0.036
Frequent Gambling	9.6%	10.9%	<0.001	1.3%	0.61%, 2.0%	0.021
Female, Grade 9						
Sports/Games	2.5%	NA				
Informal Sports/Games	NA	2.5%				
Formal Sports/Games	NA	1.1%				
Lottery	0.7%	0.4%	0.006	-0.23%	-0.39%, -0.07%	0.020
Casino	0.5%	0.2%	<0.001	-0.33%	-0.45%, -0.21%	0.026
Online	0.3%	0.3%	0.7	-0.03%	-0.15%, 0.10%	0.000
Frequent Gambling	3.3%	3.6%	0.2	0.27%	-0.12%, 0.66%	0.008
Male, Grade 11						
Sports/Games	7.6%	NA				
Informal Sports/Games	NA	7.6%				
Formal Sports/Games	NA	4.6%				
Lottery	1.5%	1.5%	>0.9	-0.02%	-0.32%, 0.29%	0.000

Table 3: Change in percentage of **frequent** gambling by type from 2019 to 2022**

	2019, N = 113,707	**2022**, N = 83,545	**p-value**[1]	**Difference**[1]	**95% CI**[1,2]	**Cohen's h**
Casino	1.5%	0.8%	<0.001	-0.72%	-0.99%, -0.46%	0.033
Online	1.6%	2.5%	<0.001	0.91%	0.55%, 1.3%	0.032
Frequent Gambling	9.4%	11.2%	<0.001	1.7%	0.96%, 2.5%	0.030
Female, Grade 11						
Sports/Games	1.6%	NA				
Informal Sports/Games	NA	1.5%				
Formal Sports/Games	NA	0.8%				
Lottery	0.5%	0.4%	0.077	-0.16%	-0.32%, 0.01%	0.007
Casino	0.4%	0.2%	0.028	-0.15%	-0.28%, -0.02%	0.019
Online	0.2%	0.4%	0.003	0.19%	0.06%, 0.32%	0.019
Frequent Gambling	2.3%	2.4%	0.4	0.15%	-0.22%, 0.52%	0.003

[1]Two sample test for equality of proportions

[2]CI = Confidence Interval

** Rates of problem and frequent gambling in the 2022 MSS sample were published reported in King et al., 2025 in *JAMA Pediatrics* and 2022 rates of frequent and problem gambling in 2025 are reported in this table only for the purposes of reporting the results of the primary analysis of the change score analysis from 2019 to 2022 (the focus of the current analysis and scientific question). To cite rates of frequent or problem gambling in our 2022 sample, please cite the original King et al., 2025 *JAMA Pediatrics* article cited in this paper.

Table 4: Change in percentage of problem gambling behaviors from 2019 to 2022**

	2019, N = 113,707	**2022**, N = 83,545	**Difference** 2019 to 2022	**p-value**[1]	**95 % CI**[1,2]	**Cohen's h**
All Students						
No Gambling	70.3%	67.5%	-2.8%	<0.001	-3.2%, -2.4%	0.030
No Problem Gambling	26.9%	29.1%	2.2%	<0.001	1.8%, 2.6%	0.025
Subclinical Problem Gambling	2.3%	2.8%	0.5%	<0.001	0.4%, 0.6%	0.016
Problem Gambling	0.5%	0.7%	0.2%	<0.001	0.1%, 0.3%	0.013
Male						
No Gambling	61.2%	57.%	-3.5%	<0.001	-3.9, -3.1%	0.036
No Problem Gambling	34.3%	36.9%	2.6%	<0.001	2.2%, 3.0%	0.027
Subclinical Problem Gambling	3.6%	4.3%	0.7%	<0.001	0.5%, 0.9%	0.018
Problem Gambling	0.9%	1.0%	0.1%	0.023	0.0%, 0.2%	0.005
Female						
No Gambling	78.9%	76.8%	-2.1%	<0.001	-2.4%, -1.8%	0.025
No Problem Gambling	19.9%	21.7%	1.8%	<0.001	1.5%, 2.1%	0.022
Subclinical Problem Gambling	1.0%	1.3%	0.3%	<0.001	0.2%, 0.4%	0.014
Problem Gambling	0.2%	0.3%	0.1%	<0.001	0.1% 0.1%	0.010
Male, Grade 8						
No Gambling	61.1%	56.7%	-4.4%	<0.001	-4.8%, -4.0%	0.045
No Problem Gambling	34.4%	38.2%	3.8%	<0.001	3.4%, 4.2%	0.040
Subclinical Problem Gambling	3.7%	4.2%	0.5%	<0.001	0.3%, 0.7%	0.013
Problem Gambling	0.8%	0.9%	0.1%	0.016	0.0%, 0.2%	0.005
Female, Grade 8						
No Gambling	74.8%	71.3%	-3.5%	<0.001	-3.9%, -3.1%	0.039
No Problem Gambling	23.8%	26.8%	3.0%	<0.001	2.6%, 3.4%	0.035
Subclinical Problem Gambling	1.1%	1.5%	0.4%	<0.001	0.3%, 0.5%	0.018
Problem Gambling	0.2%	0.3%	0.1%	<0.001	0.1%, 0.1%	0.010
Male, Grade 9						
No Gambling	62.0%	58.3%	-3.7%	<0.001	-4.1%, -3.3%	0.038
No Problem Gambling	33.8%	36.9%	3.1%	<0.001	2.7%, 3.5%	0.032
Subclinical Problem Gambling	3.3%	3.9%	0.6%	<0.001	0.4%, 0.8%	0.016
Problem Gambling	0.8%	0.9%	0.1%	0.016	0.0%, 0.2%	0.005
Female, Grade 9						
No Gambling	79.5%	77.8%	-1.7%	<0.001	-2.0%, -1.4%	0.021
No Problem Gambling	19.2%	20.6%	1.4%	<0.001	1.1%, 1.7%	0.018

Table 4: Change in percentage of problem gambling behaviors from 2019 to 2022**

	2019, N = 113,707	**2022**, N = 83,545	**Difference** 2019 to 2022	**p-value**[1]	**95 % CI**[1,2]	**Cohen's h**
Subclinical Problem Gambling	1.0%	1.3%	0.3%	<0.001	0.2%, 0.4%	0.014
Problem Gambling	0.3%	0.2%	-0.1%	<0.001	-0.1%, -0.1%	0.010
Male, Grade 11						
No Gambling	60.5%	58.4%	-2.1%	<0.001	-2.5%, -1.7%	0.021
No Problem Gambling	34.7%	35.1%	0.4%	0.065	0.0%, 0.8%	0.004
Subclinical Problem Gambling	3.8%	5.1%	1.3%	<0.001	1.1%, 1.5%	0.032
Problem Gambling	1.0%	1.4%	0.4%	<0.001	0.3%, 0.5%	0.018
Female, Grade 11						
No Gambling	83.4%	82.9%	-0.5%	0.003	-0.8%, -0.2%	0.007
No Problem Gambling	15.7%	15.8%	0.1%	0.5	-0.2, 0.4%	0.001
Subclinical Problem Gambling	0.7%	1.0%	0.3%	<0.001	0.2%, 0.4%	0.016
Problem Gambling	0.1%	0.3%	0.2%	<0.001	0.2%, 0.2%	0.023

[1]Two sample test for equality of proportions

[2]CI = Confidence Interval

** Rates of problem and frequent gambling in the 2022 MSS sample were published reported in King et al., 2025 in *JAMA Pediatrics* and 2022 rates of frequent and problem gambling in 2025 are reported in this table only for the purposes of reporting the results of the primary analysis of the change score analysis from 2019 to 2022 (the focus of the current analysis and scientific question). To cite rates of frequent or problem gambling in our 2022 sample, please cite the original King et al., 2025 *JAMA Pediatrics* article cited in this paper.

Table 5. Difference between sexes in percentage of **any** gambling by type in 2022

	Female, N = 42,989	**Male**, N = 40,556	**Difference**[1]	**95% CI**[1,2]	**p-value**[1]	**Cohen's h**
Informal Sports/Games	15.9%	32.9%	17%	16%, 18%	<0.001	0.201
Formal Sports/Games	8.4%	20.6%	12%	12%, 13%	<0.001	0.177
Lottery	6.9%	7.6%	0.66%	0.31%, 1.0%	<0.001	0.014
Casino	1.0%	2.2%	1.2%	1.0%, 1.4%	<0.001	0.049
Online	1.3%	8.1%	6.8%	6.5%, 7.1%	<0.001	0.174
Any Gambling	23.2%	42.3%	19%	18%, 20%	<0.001	0.206

[1]Two sample test for equality of proportions

[2]CI = Confidence Interval

Table 6: Difference between sexes in percentage of **frequent** and **problem** gambling in 2022

	Female, N = 42,989	**Male**, N = 40,556	**Difference**[1]	**95% CI**[1,2]	**p-value**[1]	**Cohen's h**
Frequent Gambling	4.3%	11.9%	7.6%	7.2%, 7.9%	<0.001	0.143
Problem Gambling	0.3%	1.0%	0.74%	0.62%, 0.85%	<0.001	0.045

[1]Two sample test for equality of proportions

[2]CI = Confidence Interval

** Rates of problem and frequent gambling in the 2022 MSS sample were published reported in King et al., 2025 in *JAMA Pediatrics* and 2022 rates of Frequent and Problem gambling in 2025 are reported in this table only for the purposes of reporting the results of the primary analysis of the change score analysis from 2019 to 2022 (the focus of the current analysis and scientific question). To cite rates of frequent or problem gambling in our 2022 sample, please cite the original King et al., 2025 *JAMA Pediatrics* article cited in this paper.

Figure 1. Frequent Gambling by Sex in 2019.**

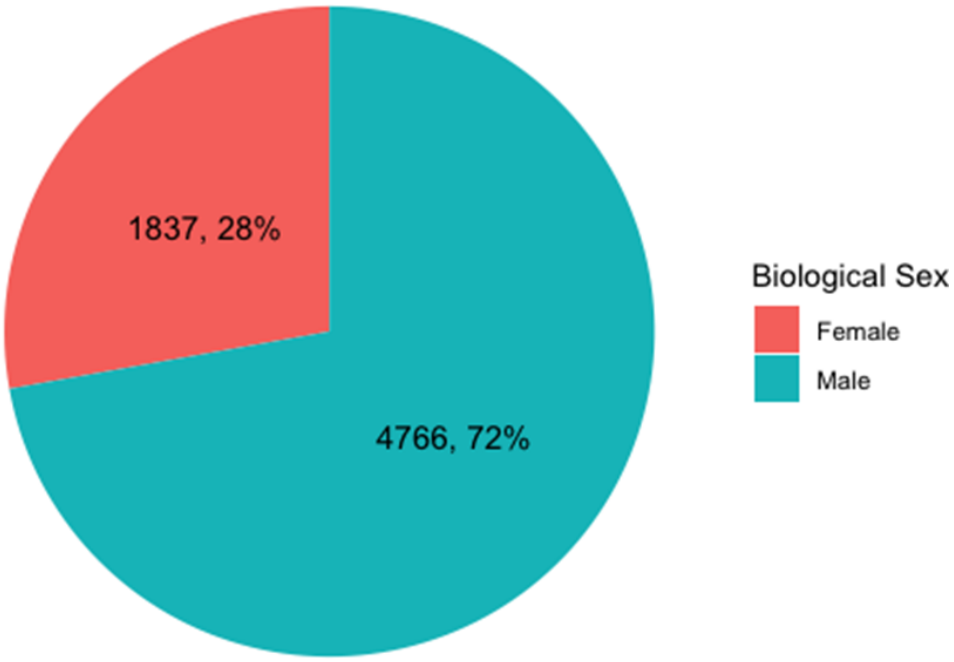


Figure note.

** Rates of problem and frequent gambling in the 2022 MSS sample were published reported in King et al., 2025 in *JAMA Pediatrics* and 2022 rates of Frequent and Problem gambling in 2025 are reported in this table only for the purposes of reporting the results of the primary analysis of the change score analysis from 2019 to 2022 (the focus of the current analysis and scientific question). To cite rates of frequent or problem gambling in our 2022 sample, please cite the original King et al., 2025 *JAMA Pediatrics* article cited in this paper.

Figure 2. Problem Gambling, All Students, 2022. **

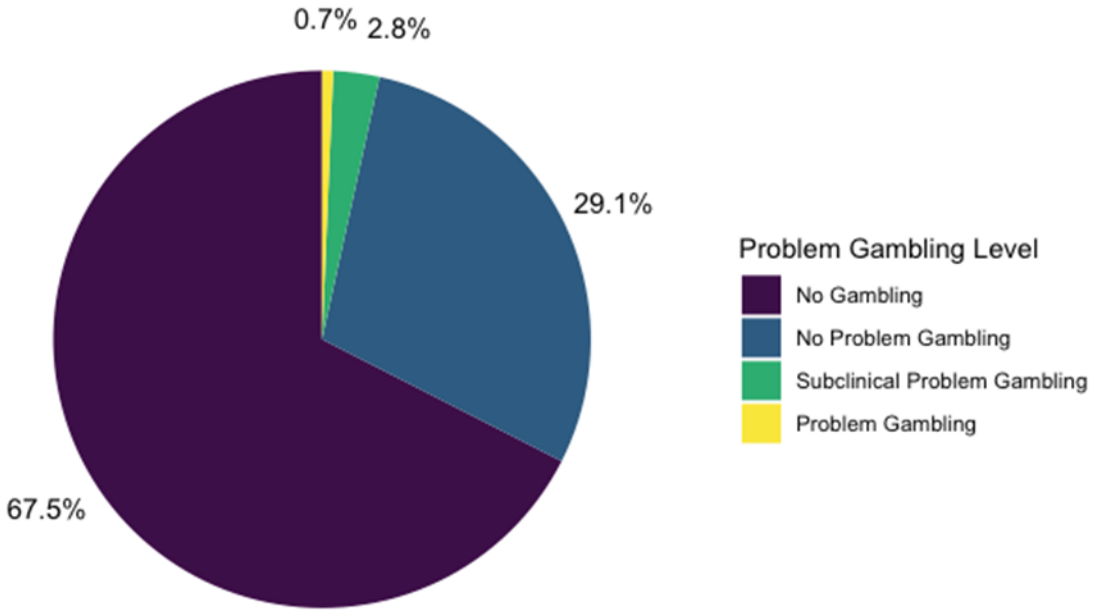
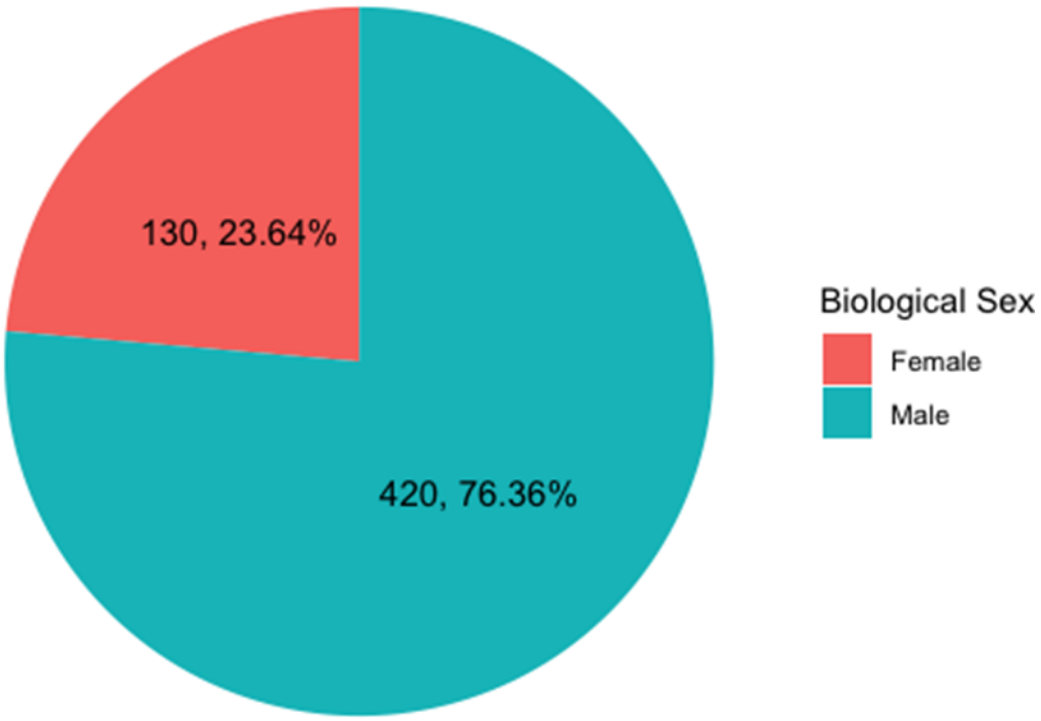


Table note: The figure represented the percentage of the 2022 sample who report no gambling, no problem gambling (but gambled), subclinical and problem gambling.

** Rates of problem and frequent gambling in the 2022 MSS sample were published reported in King et al., 2025 in *JAMA Pediatrics* and 2022 rates of Frequent and Problem gambling in 2025 are reported in this table only for the purposes of reporting the results of the primary analysis of the change score analysis from 2019 to 2022 (the focus of the current analysis and scientific question). To cite rates of frequent or problem gambling in our 2022 sample, please cite the original King et al., 2025 *JAMA Pediatrics* article cited in this paper.

Figure 3. Problem Gambling by Sex, 2022.



The whole of the pie chart reflects the entire population of MSS participants who met the threshold for problem gambling and the chart is divided by sex.

Appendix 1. Gambling Items from the Minnesota Student Survey in 2019 and 2022

Question	2019	2022	Different or same in 2019 and 2022?
Gambling Involvement/ Frequency			
During the past 12 months, how often have you done the following:	Played cards, bet on sports teams or games of personal skill like video gaming, pool, golf or bowling	**Bet on informal games of personal skill such as playing cards, video games, pool, golf, etc.**	different
During the past 12 months, how often have you done the following:	N/A	**Bet on formal sports events or games including esports**	different
During the past 12 months, how often have you done the following:	Bought lottery tickets or scratch offs	Bought lottery tickets or scratch offs	same
During the past 12 months, how often have you done the following:	Gambled in a casino	Gambled in a casino	same
During the past 12 months, how often have you done the following:	Gambled for money online	Gambled for money online **including loot boxes**	different (loot boxes)
Problem Gambling Items (BAGS)			
During the last 12 months, how often have you:	Hidden your gambling/betting from your parents, other family members or teachers?	hidden your gambling/betting from your parents, other family members or teachers?	same
During the last 12 months, how often have you:	felt that you might have a problem with gambling/betting?	felt that you might have a problem with gambling/betting?	same
During the last 12 months, how often have you:	Skipped hanging out with friends who do not gamble/bet to hang out with friends who do gamble/bet?	skipped hanging out with friends who do not gamble/bet to hang out with friends who do gamble/bet?	same

Note: The 2019 survey included four gambling items whereas the 2022 survey included five items. In 2019, the survey included a single question that covered betting on informal games and betting on formal sports. A change was made in 2022 to include separate items for informal games of personal skill and betting on formal sports or games. Therefore, the items covering informal games and sports betting are not comparable from 2019 to 2022. In 2019, the

survey assessed whether participants had: played cards, bet on sports teams or games of personal skill like video gaming, pool, golf or bowling. In 2022, gambling items assessed betting on informal games of personal skill including playing cards, video games, pool, and golf. For the purposes of this study, we defined *games of personal skill* as the following: cards, sports teams, skill games such as video, pool, golf or bowling. Betting on formal sports events or games and esports were also included in the 2022 assessment.

Note the subtleties involved in defining these forms of gambling. In both *informal games of personal skill* and *formal sports events or games*, the method of betting is not identified as formal or informal, nor do the participants need to be playing the games themselves in order to bet on them. For instance, placing an impromptu bet with a friend while watching the superbowl would count as betting on a formal game. Similarly, placing a bet via an organized website about the outcome of the superbowl would also count as betting on a formal sports event or game. Incidentally, this latter example would also count as (5), "gambled online", demonstrating that the survey's forms of gambling are not mutually exclusive.

The following items were identical in the 2019 to 2022 surveys: *lottery* and *gambled in a casino*. In 2019, the online gambling question asked only about online gambling, whereas the 2022 question included online gambling and loot boxes (in the same question). The major change from 2019 to 2022 in this portion of the survey was the inclusion of betting on sports with e-sports in a single item. Wherever possible, we compared rates of gambling participation where identical methods were used. Where this was not possible, we omitted comparisons on the level of gambling type and instead compared overall levels of gambling participation. Variation in assessment methods should be considered and are noted throughout the tables and results sections.

STATEMENT OF COMPETING INTERESTS

None

ETHICS APPROVAL

The Hamline University Institutional Research Board determined the project was exempt due to analysis of secondary data (4/4/23).

RELATIVE CONTRIBUTIONS

All authors conceived of the study. KA and JW conducted the analyses and SK wrote the first draft of the paper. KA, JW and RS revised the first draft. All authors approved of the final version.

ACKNOWLEDGEMENTS AND FUNDING SOURCES

SK, KA, JW, and RS received research funding from the Minnesota Alliance on Problem Gambling for this research. The authors would like to thank the team at the Minnesota Student Survey for their assistance in collecting and accessing the data.

RESEARCH PROMOTION

This study examined the Minnesota Student Survey, a population-based survey administered in schools of public school students from 8th, 9th, and 11th grades (total N = 83,545). Boys reported having gambled, gambled frequently, and endorsed problem gambling more often than girls. There was a slightly greater percentage of students gambling frequently in 2022 than in 2019 (8.0% versus 6.5%). Based on current data trends, there is benefit to addressing youth who are engaging in problematic gambling.

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