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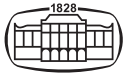
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# Gambling and COVID-19: Swedish national gambling data from a state-owned gambling sports and casino operator

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## FULL-LENGTH REPORT



### ABSTRACT

**Background and aims:** The lockdown of sports and gambling venues during the coronavirus disease 2019 (COVID-19) pandemic caused a fear of increased gambling on other online gambling types, with a risk for transfer to more addictive gambling than otherwise. This study aimed to estimate changes in gambling activity during COVID-19-affected periods among all gamblers at a Swedish state-owned gambling operator and to analyse observable sex differences. **Methods:** This study included gambling tracking data from the Swedish state-owned gambling operator Svenska Spel Sports & Casino (sports betting, online bingo, casino and poker). All individuals ( $n = 616,245$ ) who gambled at least once from February 10 to July 19, 2020, were included. The study period was divided into four periods according to their expected level of COVID-19 impact on gambling opportunities: one pre-COVID period and three COVID-affected periods (sports cancellation, emerging return of sports, substantial return of sports). **Results:** Sports betting experienced an apparent decrease, followed by a gradual normalization and an end level substantially below prepandemic levels. For online bingo, gambling levels increased upon sports interruption and then decreased with the return to normality in sports events but remained higher than baseline levels. We observed a similar trend for online poker during the interruption of sports, but with a lower level than baseline levels when sports events normalized. We noticed a trend favouring online casinos during the sports interruption period regarding gambling intensity but not wagering levels. **Discussion and conclusions:** Dramatic changes in the content of the gambling market may divert some gamblers to other gambling types, but maintained effects could not be demonstrated.

### KEYWORDS

COVID-19, gambling disorder, gambling tracking data, online gambling

### INTRODUCTION

The global spread of SARS-CoV-2, which causes coronavirus disease 2019 (COVID-19), has posed a major threat to public health, including mental health, worldwide (Holmes et al., 2020; Mahase, 2020; Wang, Horby, Hayden, & Gao, 2020). Gambling disorder is one of the specific mental health challenges mentioned by researchers and policy-makers as potentially

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being associated with changes occurring during the pandemic. In the early phases of the spread of the virus, the interruption of sports events and the lockdown of gambling venues and restaurants in many countries led to a fear of increased gambling in other types of online games, with a fear of transferring to even more addictive gambling types than otherwise (Auer & Griffiths, 2021; Håkansson, Fernández-Aranda, Menchón, Potenza, & Jiménez-Murcia, 2020). For example, this led to special regulations in several countries to mitigate the risk of worsening gambling habits (Håkansson & Widinghoff, 2021).

Thereafter, the research experience of gambling-related behaviours in relation to the pandemic has been mixed. Auer and Griffiths studied gambling data from more than 130,000 Swedish gamblers using anonymous online commercial casino services from January through May 2020. Although almost half of the study period was not affected by any substantial COVID-19-related changes in society, the study concluded that there was no obvious increase in online casino gambling. While the number of unique online casino gamblers increased over the study period, there was no indication of an increase in gamblers with the highest gambling levels (Auer & Griffiths, 2021). A similar study that included an anonymous commercial gambling operator for sports betting and online casino services demonstrated a decrease in sports betting during the interruption of sports and a limited increase in online casino gambling. During a study period that ended on April 8, 2020, a net decrease in gambling activity was observed for this specific operator (Lindner, Forsström, Jonsson, Berman, & Carlbring, 2020). Survey data from Australia did not detect any increase in gambling during the pandemic (Gainsbury, Swanton, Burgess, & Blaszczynski, 2021). Furthermore, among Ontario land-based casino gamblers, a shift towards online gambling was seen only in the subgroup with previous online gambling experience (Price, 2020). Altogether, gambling markets worldwide demonstrated a diverse picture with respect to COVID-19-related consequences on gambling. One important perspective is the experience of problem gamblers who reported subjective relief during lockdown measures when land-based gambling venues were unavailable (Gainsbury et al., 2021).

On the other hand, in a nationwide study on gambling operators in Sweden using taxation records, only a moderate change was observed regarding sports betting revenues despite a substantial structural decrease in sports events worldwide (Håkansson, 2020a). Subjective self-reported data in web surveys, carried out in April/May 2020 and in November 2020, also demonstrated that a self-reported increase in gambling during the pandemic was markedly more common among problem gamblers (Håkansson, 2020b; Håkansson & Widinghoff, 2021).

Altogether, it can be concluded that overall gambling activity in society may not have increased during the early phases of the pandemic, which is in contrast to what was somewhat expected, and that the results are mixed regarding whether people with intense gambling habits and gambling problems may be at particularly high risk of increasing their gambling habits during the pandemic.

Among the studies on gambling and COVID-19 carried out thus far, few have been able to address head to head a longer course of gambling for different types of gambling, which intuitively should be affected by pandemic-related changes in society. The studies by Auer & Griffiths and Auer et al. demonstrated that a pronounced decrease in sports betting corresponded only to limited increases in online casino gambling (Auer, Malischnig, & Griffiths, 2020; Auer & Griffiths, 2021). Additionally, studies thus far have not, to a major extent, been able to assess gambling activity in relation to different phases of the pandemic, in which gambling opportunities during the first months of COVID-19 changed dramatically over a brief period.

In addition, beyond the pandemic, there are specificities in online and offline gambling according to sex. McCormack et al. studied this contrast among online gamblers, and the results showed significant differences in the duration of gambling sessions, motivation gambling and feelings about gambling according to sex (McCormack, Shorter, & Griffiths, 2014). Additionally, gambling type preferences differ according to sex. Women tend to prefer nonstrategic gambling activities such as slot machines, scratch games and lottery activities, while men prefer strategic gambling activities such as sports betting and poker (Blanco, Hasin, Petry, Stinson, & Grant, 2006; Wenzel & Dahl, 2009). It therefore seems necessary to consider the specificities and differences according to sex in this study.

Moreover, Binde et al. demonstrated that the level of gambling involvement (i.e., participation in multiple forms of gambling) is positively associated with both the intensity of gambling and problem gambling and that this latter association is influenced by participation in specific forms of gambling compared to others (Binde, Romild, & Volberg, 2017). Thus, it is essential to control for the level of gambling involvement when assessing changes in gambling behaviours due to the COVID-19 pandemic.

Therefore, in the present study, we aimed to assess changes in gambling behaviours for different types of gambling, all within one major gambling operator owned by the Swedish state: Svenska Spel Sports & Casino. We aimed to describe potential changes over time in relation to baseline gambling activity and to different phases of COVID-19-related effects on sports availability during the first pandemic-affected months of 2020. Our hypothesis was that gambling activity through sports betting and online bingo, casinos and poker would differ in relation to the sudden and nearly total interruption of sports and would then change again with an increasing degree of the return of sports. One part of this hypothesis was that nonsports-related online gambling may have increased in response to the interruption of sports and may then have normalized upon the return of sports. Another part of the hypothesis was that the transfer of gambling activity from sports-related to nonsports-related online gambling would differ according to sex in terms of intensity and frequency. We thus aimed to estimate changes in gambling activity during the COVID-19-affected periods among all gamblers at Svenska Spel and analyse observable sex differences. The hypotheses were defined prior to calculating the results (Balem, Karlsson, et al., 2022).



## METHODS

### Participants

This study included all gambling carried out by customers of the Sports & Casino subdivision of the Swedish state-owned gambling operator Svenska Spel. Svenska Spel is owned entirely by the Swedish state. Its Sports & Casino subdivision includes gambling for which the state-owned operator is among the licenced operators in a commercial market. Other subdivisions of Svenska Spel include chance-based number games and lotteries (Svenska Spel Tur, 'chance') and the state monopoly of land-based electronic gambling machines and land-based casino gambling (Casino Cosmopol), the latter consisting of three land-based casinos in the three largest cities of the country. Svenska Spel offers gambling through sports betting (live and nonlive, and for bets made either online or in land-based gambling stores) and online bingo, casinos and poker gambling.

### Measures

Data collected from Svenska Spel included sex, age and tracked gambling data of gamblers from calendar week 7 (starting on February 10, 2020) through calendar week 29 (ending on July 19, 2020). This study included all individuals ( $n = 616,245$ ) who gambled at least once during this period using any of the gambling services provided by the operator. Among these individuals, 499,519 (81%) were men, 116,709 (19%) were women, and sex data were missing for 18 individuals. The median age was 51 years. We described gamblers according to gambling type (Table 1). Tracked gambling data were aggregated weekly over 23 weeks, and two indicators of gambling behaviours were selected for the analysis: the amount of money wagered (gambling intensity indicator) and the number of gambling days (gambling frequency indicator) (Table 2).

The COVID-19 pandemic reached Sweden with the first confirmed case on January 31, 2020, the second confirmed case on February 26, 2020, and the first confirmed COVID-19-related fatality reported on March 11, 2020.

The COVID-19 period assessed in the present study was divided into four periods according to the expected level of impact of COVID-19 on gambling opportunities through the Sports & Casino subdivision:

- Weeks 7–10 (February 10–March 8): Pre-COVID period (here named pre-C), without major impact on the content and possibility of gambling through the Sports & Casino subdivision.
- Weeks 11–20 (March 9–May 17): First COVID-affected period (here named C1). For example, the Italian and French soccer leagues were cancelled on March 9 and March 13, respectively, the Swedish ice hockey league was suspended on March 15, and the country advised individuals to begin working from home on March 16 (Håkansson, 2020a). Additionally, on April 1, the state-owned land casinos were closed because of the pandemic.
- Weeks 21–24 (May 18–June 14): Second COVID-affected period (C2), when sports gradually began to return; after the start of the Korean soccer league on May 9, the first major European soccer league (Germany) started on May 16. Thereafter, the Spanish league restarted on June 11 (Håkansson, 2020a).
- Weeks 25–29 (June 15–July 19): Third COVID-affected period (C3), when sports returned substantially. The Swedish soccer league started on June 14. The common week-end soccer betting *Stryktipset* (a major part of sports-related betting in Sweden) opened for betting on June 17, and the first games took place on June 20.

### Statistical analysis

We used linear mixed models and generalized linear mixed models (GLMMs) to analyse changes in gambling activity for each of the COVID-19-affected periods (C1, C2, C3) in comparison to the pre-COVID period (pre-C). Analyses were performed separately for each type of gambling (sports betting, online bingo, online casinos and online poker) and for two indicators of gambling behaviours: the amount of money wagered (in Swedish currency, SEK) and the number of gambling days.

We chose the link function according to the nature of the dependent gambling behaviour variable. For the amount of money wagered, which was a quantitative continuous variable, a log-transformation ( $\log(x+1)$ ) was used to overcome the nonnormal distribution of the data. Then, linear mixed models were estimated (West, 2021). For the number of gambling days, which was a count variable, GLMMs for the negative binomial family were implemented to take into account the overdispersion of the data (Booth, Casella, Friedl, & Hobert, 2003; Lawless, 1987). Random effects were included to consider the repeated data design. Moreover, the models included the following covariates: sex (male or female), age (years), the level of gambling involvement (from 1 to 4 different games played during the study period) and whether the individual had gambled during the last week of February 2020, in which the monthly salary is dispensed in Sweden. To visualize the differential impact of COVID-19-affected periods on sex and the level of gambling involvement, we included the interaction between these variables and the COVID-19-affected periods in the analyses when Wald tests for them and the COVID-19-affected period variables were significant in the models without interaction terms. *P* values were adjusted for multiple testing with Benjamini & Hochberg correction (Benjamini & Hochberg, 1995; Glickman, Rao, & Schultz, 2014). Analyses were performed using Stata version 16.0 (function `mixed()` and `menbreg()`). The analysis code is provided in the Open Science Framework project attached to this study (Balem, Karlsson, et al., 2022).

### Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The Swedish Ethical Review Authority approved this study.



## RESULTS

A flowchart of the selection process of the participants included in each model is provided in Fig. 1.

### Description of gamblers and gambling behaviours

As described in Table 1, the population consisted predominantly of male individuals (82.8%), and this pattern was seen throughout all categories of gambling, especially for sports betting, online casinos and online poker. Gamblers who were engaged in online casinos and online poker were younger. Gambling during the salary week was markedly

higher for gamblers engaged in sports betting (57.5%) than for gamblers engaged in online bingo (20.7%), online casinos (28%) and online poker (22.8%). The customers of Svenska Spel were largely represented by sports betting gamblers. Indeed, almost 89% of the gamblers participated in sports betting at least once during the study period, compared to 6%, 18%, and 7% who participated in online bingo, online casinos and online poker respectively.

As shown in Table 2, the amounts of money wagered by online casino and online poker gamblers were higher than those wagered by sports betting and online bingo gamblers, with similar results seen for the number of gambling days.

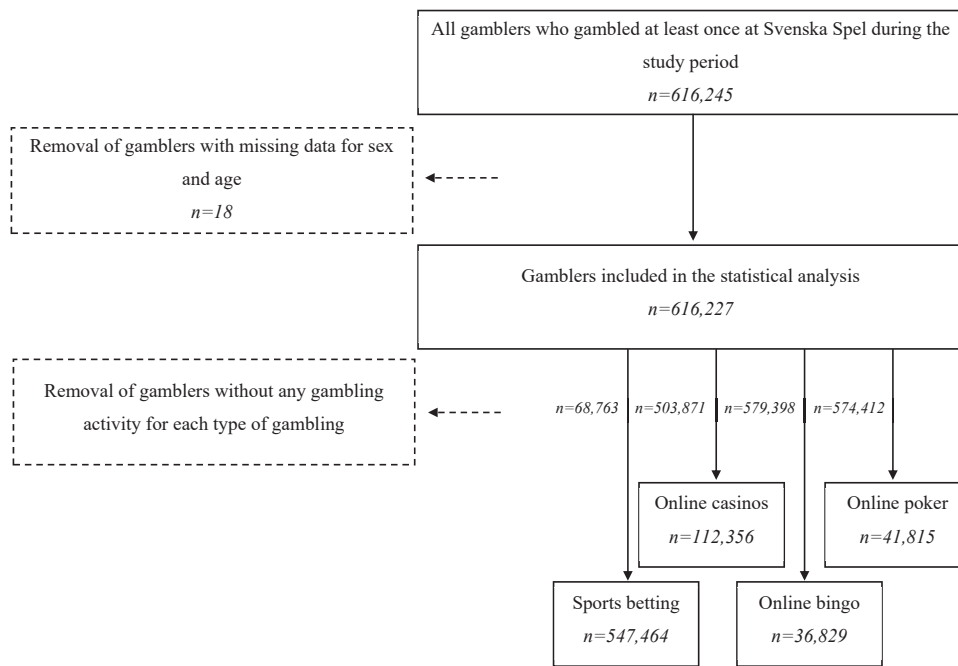


Fig. 1. Flowchart of the selection process for the gamblers included in the analyses

Table 1. Description of gamblers according to the type of gambling

	Gamblers* who bet on sports n = 547,464	Gamblers* who played online bingo n = 36,829	Gamblers* who played online casino games n = 112,356	Gamblers* who played online poker n = 41,815
Sex (n, %)				
Men	453,064 (82.8%)	21,421 (58.2%)	88,805 (79%)	38,698 (92.6%)
Women	94,400 (17.2%)	15,408 (41.8%)	23,551 (21%)	3,117 (7.4%)
Age (median, [min-max])	52 [18–102]	50 [18–92]	39 [18–92]	39 [18–92]
Gambling during the February salary week (n, %)				
Yes	314,932 (57.5%)	7,630 (20.7%)	31,413 (28%)	9,519 (22.8%)
No	232,532 (42.5%)	29,199 (79.3%)	80,943 (72%)	32,296 (77.2%)
Level of involvement (n, %)				
Only one type of gambling	458,848 (83.8%)	7,047 (19.1%)	36,184 (32.2%)	14,186 (33.9%)
Two different types of gambling	68,694 (12.55%)	16,722 (45.4%)	56,460 (20.2%)	17,226 (41.2%)
Three different types of gambling	18,046 (3.30%)	11,184 (30.4%)	17,836 (15.9%)	8,527 (20.4%)
All types of gambling**	1,876 (0.34%)	1,876 (5.1%)	1,876 (1.7%)	1,876 (5.5%)

\* A gambler can be represented in more than one type of gambling because they can engage in several types of gambling. \*\* Gamblers who bet on sports and played online bingo, online casino games and online poker at least once during the study period.

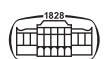




Table 2. Description of the two indicators of gambling behaviours for each type of gambling

Indicators	Gambling type (number of study observations)*	Min	Max	Q1	Q2	Q3	P90	Mean (SD)
Amount of money wagered (SEK)	Sports betting (12,591,672)*	0	739,869	0	0	0	182	132.4 (1,622.4)
	Online bingo (847,067)*	0	41,357	0	0	0	143	88.8 (491.9)
	Online casinos (2,584,188)*	0	33,075,936	0	0	2.9	2,445	2,170.3 (33,347.6)
	Online poker (961,745)*	0	6,231,265	0	0	0	929.5	2,203.8 (37,418.0)
Number of gambling days	Sports betting (12,591,672)*	0	7	0	0	0	2	0.5 (1.3)
	Online bingo (847,067)*	0	7	0	0	0	2	0.5 (1.3)
	Online casinos (2,584,188)*	0	7	0	0	1	2	0.6 (1.4)
	Online poker (961,745)*	0	7	0	0	0	3	0.7 (1.6)

Q1 = first quartile; Q2 = median; Q3 = third quartile; P90 = 90th percentile; SD = standard deviation.

\*: corresponds to the total number of observations for each type of gambling. For example, there were 12,591,672 observations for the gamblers engaged in sports betting (i.e., 547,464 gamblers \* 23 weeks = 12,591,672 observations).

### Linear mixed models & GLMMs

The predicted means and delta coefficients for differences were estimated with each model according to sex and are presented in Table 3. The predicted means are given for the Pre-C period, and the delta coefficients are given to represent the differences between the Pre-C and the other periods. The full results of the models are provided in the Supplementary material.

The interruption of sports events had an important impact on the frequency and intensity of the gambling activity of sports betting gamblers, particularly during the C1 period. Sports betting decreased strongly during the C1 period compared to the pre-C period; it also decreased moderately during the C2 and C3 periods. The differences among the C1, C2 and C3 periods compared to the pre-C period were higher among men than among women. For the gamblers engaged in online bingo, the predicted means of the two indicators increased in the three periods compared to the pre-C period, but the increases were higher in the C1 period. Moreover, we observed that the predicted means for women were higher in the C3 period than in the pre-C period despite the return to normal for sports events. The differences among the periods were more pronounced for women than for men. Regarding the gamblers engaged in online casinos, the pandemic and the interruption of sports did not seem to impact the frequency of gambling practices. For the intensity of gambling practices, the predicted means for women were highest in the three periods compared to the pre-C period. For men, there was an increase only for the C1 period compared with the pre-C period. Finally, for the gamblers engaged in online poker, the predicted means for the two indicators widely increased during the C1 period compared to the pre-C period. These means decreased in the C2 and C3 periods until they returned to the same level as those of the pre-C period for both men and women.

The predicted means and delta coefficients for differences were estimated with each model according to the level of gambling involvement and are presented in Table 4. The predicted means are given for gamblers who engaged in only

one gambling activity, and the delta coefficients are given to represent the differences between gamblers engaged in one activity and gamblers engaged in two, three or all other gambling activities.

The intensity and frequency of gambling seemed to correlate positively with the increase in the level of gambling involvement for gamblers engaged in sports betting and online casinos. Gamblers wagered almost twice as much when they gambled on all types of gambling compared to gamblers who gambled only in sports betting or online casinos.

Conversely, gamblers engaged in online bingo who gambled on all types of gambling seemed to gamble with lower intensity than those who gambled only on online bingo. Changes in the frequency of gambling were statistically uninterpretable.

Finally, the levels of gambling involvement for gamblers engaged in online poker were statistically not interpretable for the intensity nor frequency of gambling.

Figure 2 compares the observed means and the predicted means estimated by the models over the weeks for each period according to sex. The peak observed during week 23 corresponded to a holiday jackpot with an unusually high amount for the national day in Sweden. Additionally, regarding the fluctuations for online casinos, each "peak" approximately corresponded to the last week of the month and the first week of the next month, i.e., during the weeks when Swedish employees receive their salary.

Figure 3 represents the observed means of gambling activity according to the gamblers' regularity over the weeks. For example, a gambler who gambled at least once through sports betting during each of the four periods was considered a regular sports betting gambler compared with a gambler who gambled only once during the entire study period. Overall, the trends were similar between regular and nonregular gamblers for all gambling types and the two indicators. However, the increase in money wagered and the number of gambling days during the C1 period for bingo and poker were more widely pronounced for regular gamblers than for others. The same pattern is seen for the



Table 3. Results of the predicted means and delta coefficients for differences ( $\Delta$ ) according to sex estimated by linear mixed models and GLMMs

(a). Money wagered (SEK)				
Gambling type	Effects	All gamblers	Men	Women
		Predicted mean & $\Delta$ [95% CI]	Predicted mean & $\Delta$ [95% CI]	Predicted mean & $\Delta$ [95% CI]
Sports betting	Period:			
	Pre-C	280.1 [279; 281.3] <sup>ref</sup>	316.5 [315.1; 317.8] <sup>ref</sup>	124.3 [123.2; 125.5] <sup>ref</sup>
	C1	<b>-250.8 [-251.9; -249.7]<sup>***</sup></b>	<b>-288.3 [-289.5; -287]<sup>***</sup></b>	<b>-96.1 [-97.1; -95.4]<sup>***</sup></b>
	C2	<b>-235 [-236; -234.1]<sup>***</sup></b>	<b>-270.7 [-271.8; -269.5]<sup>***</sup></b>	<b>-91.1 [-92.3; -79.5]<sup>***</sup></b>
C3	<b>-168.4 [-169.1; -167.3]<sup>***</sup></b>	<b>-194.4 [-195.2; -193.5]<sup>***</sup></b>	<b>-66.1 [-66.7; -65.5]<sup>***</sup></b>	
Online bingo	Period:			
	Pre-C	48.1 [47.1; 49] <sup>ref</sup>	41.6 [40.7; 42.6] <sup>ref</sup>	53.9 [52.6; 55.2] <sup>ref</sup>
	C1	<b>+10.3 [+10.2; +10.5]<sup>***</sup></b>	+8.4 [+8.3; +8.6]	<b>+12.3 [+12.1; +12.4]<sup>***</sup></b>
	C2	<b>+8.6 [+8.5; +8.9]<sup>***</sup></b>	<b>+6.8 [+6.7; +6.9]<sup>**</sup></b>	<b>+10.9 [+10.6; +11.2]<sup>***</sup></b>
C3	<b>+1.8 [+1.8; +1.8]<sup>***</sup></b>	<b>-0.1 [-0.2; -0.1]<sup>***</sup></b>	<b>+5.1 [+5; +5.2]<sup>**</sup></b>	
Online casinos	Period:			
	Pre-C	4,283.6 [4,231.2; 4,336] <sup>ref</sup>	4,270.7 [4,211.9; 4,329.6] <sup>ref</sup>	4,317.7 [4,231.2; 4,333.7] <sup>ref</sup>
	C1	<b>+220.4 [+216.2; +224.3]<sup>***</sup></b>	<b>+196.7 [+192; +201.4]<sup>*</sup></b>	<b>+310.9 [+288.2; +404.6]<sup>***</sup></b>
	C2	+44.8 [+44.2; +45.3]	<b>-24.3 [-24.7; -24]<sup>***</sup></b>	<b>+318.3 [+280.3; +426.9]<sup>***</sup></b>
C3	<b>+271.9 [+270.7; +272.1]<sup>***</sup></b>	<b>+106.9 [+106; +107.7]<sup>***</sup></b>	<b>+957.9 [+908; +1,078.2]<sup>***</sup></b>	
Online poker	Period:			
	Pre-C	1,214.7 [1,178.3; 1,251.1] <sup>ref</sup>	1,217.5 [1,180.4; 1,254.7] <sup>ref</sup>	1,186.6 [1,102.0; 1,271.2] <sup>ref</sup>
	C1	<b>+707.8 [+688.7; +726.8]<sup>***</sup></b>	<b>+733.4 [+713.3; +753.4]<sup>***</sup></b>	<b>+424 [+404.3; +443.8]<sup>***</sup></b>
	C2	<b>+124.5 [+120.8; +128.2]<sup>***</sup></b>	+133.8 [+129.7; +137.9]	+17.3 [+16.1; +18.5]
C3	<b>-56.5 [-58.6; -54.4]<sup>***</sup></b>	-53.6 [-55.8; -51.6]	<b>-90.5 [-99.2; -81.7]<sup>**</sup></b>	
(b). Gambling days				
Gambling type	Effects	All gamblers	Men	Women
		Predicted mean & $\Delta$ [95% CI]	Predicted mean & $\Delta$ [95% CI]	Predicted mean & $\Delta$ [95% CI]
Sports betting	Period:			
	Pre-C	1.3 [1.3; 1.3] <sup>ref</sup>	1.3 [1.3; 1.4] <sup>ref</sup>	0.9 [0.9; 0.9] <sup>ref</sup>
	C1	<b>-1.1 [-1.1; -1.1]<sup>***</sup></b>	<b>-1.1 [-1.1; -1.1]<sup>***</sup></b>	<b>-0.8 [-0.8; -0.8]<sup>***</sup></b>
	C2	<b>-1 [-1; -1]<sup>***</sup></b>	<b>-0.9 [-1; -0.9]<sup>***</sup></b>	<b>-0.7 [-0.7; -0.7]<sup>***</sup></b>
C3	<b>-0.5 [-0.5; -0.5]<sup>***</sup></b>	<b>-0.5 [-0.5; -0.5]<sup>***</sup></b>	<b>-0.4 [-0.4; -0.4]<sup>***</sup></b>	
Online bingo	Period:			
	Pre-C	0.4 [0.4; 0.4] <sup>ref</sup>	0.3 [0.3; 0.4] <sup>ref</sup>	0.5 [0.5; 0.5] <sup>ref</sup>
	C1	<b>+0.1 [+0.1; +0.2]<sup>***</sup></b>	<b>+0.2 [+0.1; +0.2]<sup>***</sup></b>	<b>+0.1 [+0.1; +0.1]<sup>***</sup></b>
	C2	<b>+0.1 [+0.1; +0.1]<sup>***</sup></b>	+0.1 [+0.1; +0.1]	<b>+0.1 [+0.1; +0.1]<sup>***</sup></b>
C3	<b>+0.1 [+0.1; +0.1]<sup>***</sup></b>	<b>+0.1 [0; +0.1]<sup>***</sup></b>	<b>+0.1 [0; +0.1]<sup>***</sup></b>	
Online casinos	Period:			
	Pre-C	0.6 [0.6; 0.6] <sup>ref</sup>	0.6 [0.6; 0.6] <sup>ref</sup>	0.6 [0.6; 0.6] <sup>ref</sup>
	C1	0 [0; 0]	<b>+0.1 [0; +0.1]<sup>**</sup></b>	<b>+0.1 [0; +0.1]<sup>**</sup></b>
	C2	0 [0; 0]	<b>+0.1 [0; +0.1]<sup>***</sup></b>	<b>+0.2 [+0.2; +0.2]<sup>***</sup></b>
C3	<b>+0.1 [0; +0.1]<sup>***</sup></b>	<b>+0.1 [0; +0.1]<sup>***</sup></b>	<b>+0.2 [+0.2; +0.3]<sup>***</sup></b>	
Online poker	Period:			
	Pre-C	0.7 [0.6; 0.7] <sup>ref</sup>		
	C1	<b>+0.2 [+0.2; +0.3]<sup>***</sup></b>		
	C2	<b>+0.1 [+0.1; +0.1]<sup>***</sup></b>		
C3	<b>-0.1 [-0.1; 0]<sup>***</sup></b>			

The stars correspond to the significance of the *P* value for the comparison of the periods (the pre-C period is the reference period).  
<sup>ref</sup>: reference. \*: *P* < 0.05; \*\*: *P* < 0.01; \*\*\*: *P* < 0.001. Delta coefficients for differences with a *P* value that was statistically significant (<0.05) are in bold. At the time of the analysis, a currency exchange rate of 1.00 SEK = \$0.088 = €0.091 was applicable.

Reading key:

(a). Sports betting: During the C1, C2 and C3 periods, all gamblers who participated at least once in sports betting wagered, on average, 250.8 SEK [249.7; 251.9], 235 SEK [234.1; 236] and 168.4 SEK [167.3; 169.1] less than during the pre-C period, respectively. During the C1, C2 and C3 periods, men wagered, on average, 288.3 SEK [287; 289.5], 270.7 SEK [269.5; 271.8] and 194.4 SEK [193.5; 195.2] less than during the pre-C period, respectively, and women wagered, on average, 96.1 SEK [95.4; 97.1], 91.1 SEK [79.5; 90] and 66.1 SEK [65.5; 66.7] less than during the pre-C period, respectively.

(b). Sports betting: During the C1, C2 and C3 periods, all gamblers who participated at least once in sports betting gambled, on average, 1.1 [1.1; 1.1], 1 [1; 1] and 0.5 [0.5; 0.5] days less than during the pre-C period, respectively. During the C1, C2 and C3 periods, men gambled, on average, 1.1 [1.1; 1.1], 0.9 [0.9; 1] and 0.5 [0.5; 0.5] days less than during the pre-C period, respectively, and women gambled, on average, 0.8 [0.8; 0.8], 0.7 [0.7; 0.7] and 0.4 [0.4; 0.4] days less than during the pre-C period, respectively.

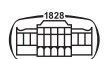


Table 4. Results of the predicted means and delta coefficients for differences ( $\Delta$ ) according to the level of gambling involvement estimated by linear mixed models and GLMMs

(a). Money wagered (SEK)					
Gambling type	Effects	Pre-C Predicted mean & $\Delta$ [95% CI]	C1 Predicted mean & $\Delta$ [95% CI]	C2 Predicted mean & $\Delta$ [95% CI]	C3 Predicted mean & $\Delta$ [95% CI]
Sports betting	Level of involvement:				
	Only sports betting	264.6 [263.5; 265.8] <sup>ref</sup>	25.9 [25.8; 26] <sup>ref</sup>	40.4 [40.2; 40.6] <sup>ref</sup>	103.5 [103; 103.9] <sup>ref</sup>
	Two different types of gambling	+143.6 [+141; +146.1] <sup>***</sup>	+14.1 [+13.8; +14.3] <sup>***</sup>	+21.9 [+21.6; +22.3] <sup>***</sup>	+56.1 [+55.1; +57.2] <sup>***</sup>
	Three different types of gambling	+244.3 [+236.8; +251.6] <sup>***</sup>	+23.9 [+23.2; +24.7] <sup>***</sup>	+37.3 [+36.1; +38.4] <sup>***</sup>	+95.5 [+92.6; +98.4] <sup>***</sup>
	All types of gambling	+505.2 [+466.6; +543.2] <sup>***</sup>	+49.5 [+45.7; +53.2] <sup>***</sup>	+77.2 [+71.2; +83] <sup>***</sup>	+197.5 [+182.5; +212.5] <sup>***</sup>
Online bingo	Level of involvement:				
	Only online bingo	53 [51.4; 54.7] <sup>ref</sup>	64.6 [62.7; 66.5] <sup>ref</sup>	62.9 [61; 64.8] <sup>ref</sup>	55.8 [54.1; 57.5] <sup>ref</sup>
	Two different types of gambling	-6.6 [-7.3; -6.1] <sup>***</sup>	-8.2 [-8.8; -7.5] <sup>***</sup>	-7.9 [-8.7; -7.3] <sup>***</sup>	-7 [-7.5; -6.4] <sup>***</sup>
	Three different types of gambling	-7.2 [-7.7; -6.9] <sup>***</sup>	-8.9 [-9.3; -8.4] <sup>***</sup>	-8.6 [-9; -8.2] <sup>***</sup>	-7.6 [-8; -7.3] <sup>***</sup>
	All types of gambling	-4.1 [-5.3; -3.1] <sup>***</sup>	-5.1 [-6.5; -3.7] <sup>***</sup>	-5 [-6.3; -3.6] <sup>***</sup>	-4.4 [-5.6; -3.2] <sup>***</sup>
Online casinos	Level of involvement:				
	Only online casinos	3,785.9 [3,693.8; 3,878] <sup>ref</sup>	3,986 [3,981.9; 4,080] <sup>ref</sup>	3,842.9 [3,749.5; 3,936.3] <sup>ref</sup>	4,075.3 [3,977.2; 4,173.4] <sup>ref</sup>
	Two different types of gambling	+383.5 [+377.1; +392] <sup>***</sup>	+403.7 [+377.1; +392] <sup>***</sup>	+389.3 [+383; +395.5] <sup>***</sup>	+412.7 [+406.3; +419.4] <sup>***</sup>
	Three different types of gambling	+1,464.6 [+1,404.3; +1,524.9] <sup>***</sup>	+1,541.6 [+1,478.9; +1,605.1] <sup>***</sup>	+1,486.6 [+1,425.1; +1,548.1] <sup>***</sup>	+1,576.5 [+1,511.1; +1,548.1] <sup>***</sup>
	All types of gambling	+4,200.7 [+3,632.6; +4,714.8] <sup>***</sup>	+4,394.2 [+3,823.3; +4,965] <sup>***</sup>	+4,236.5 [+3,687; +4,786] <sup>***</sup>	+4,492.7 [+3,909.3; +5,076] <sup>***</sup>
Online poker	Level of involvement:				
	Only online poker	1,218.8 [1,173.9; 1,263.7] <sup>ref</sup>	1,928.2 [1,858.9; 1,997.6] <sup>ref</sup>	1,343.1 [1,293.6; 1,392.6] <sup>ref</sup>	1,161.9 [1,119.4; 1,204.3] <sup>ref</sup>
	Two different types of gambling	-4.1 [-5.8; -2.5]	-6.6 [-9.4; -3.8]	-4.5 [-6.4; -2.7]	-4 [-5.6; -2.4]
	Three different types of gambling	+0.2 [-8.3; +8.8]	+0.3 [-13.5; +14]	+0.3 [-9.1; +9.6]	+0.5 [-8; +8.4]
	All types of gambling	-48.1 [-95.5; -0.7]	-76.1 [-152.1; -0.2]	-53 [-105.2; -0.8]	-45.9 [-91.3.2; -0.5]
(b). Gambling days					
Gambling type	Effects	Pre-C Predicted mean & $\Delta$ [95% CI]	C1 Predicted mean & $\Delta$ [95% CI]	C2 Predicted mean & $\Delta$ [95% CI]	C3 Predicted mean & $\Delta$ [95% CI]
Sports betting	Level of involvement:				
	Only sports betting	1.2 [1.2; 1.2] <sup>ref</sup>	0.2 [0.2; 0.2] <sup>ref</sup>	0.3 [0.3; 0.3] <sup>ref</sup>	0.7 [0.7; 0.7] <sup>ref</sup>
	Two different types of gambling	+0.6 [+0.6; +0.7] <sup>***</sup>	0 [0; 0] <sup>***</sup>	+0.2 [+0.2; +0.2] <sup>***</sup>	+0.4 [+0.4; +0.4] <sup>***</sup>
	Three different types of gambling	+1 [+1; +1] <sup>***</sup>	+0.1 [+0.1; +0.1] <sup>***</sup>	+0.3 [+0.3; +0.3] <sup>***</sup>	+0.7 [+0.7; +0.7] <sup>***</sup>
	All types of gambling <sup>a</sup>	+1.7 [+1.6; +1.9] <sup>***</sup>	+0.2 [+0.2; +0.2] <sup>***</sup>	+0.5 [+0.5; +0.5] <sup>***</sup>	+1.1 [+1.1; +1.1] <sup>***</sup>
Online bingo	Level of involvement:				
	Only online bingo	0.4 [0.4; 0.5] <sup>ref</sup>	0.6 [0.5; 0.6] <sup>ref</sup>	0.6 [0.5; 0.6] <sup>ref</sup>	0.5 [0.5; 0.5] <sup>ref</sup>
	Two different types of gambling	0 [0; 0] <sup>***</sup>	-0.1 [-0.1; 0] <sup>***</sup>	-0.1 [-0.1; 0] <sup>***</sup>	0 [0; +0.1] <sup>***</sup>
	Three different types of gambling	0 [0; 0] <sup>**</sup>	-0.1 [-0.1; 0] <sup>**</sup>	-0.1 [-0.1; 0] <sup>**</sup>	+0.1 [+0.1; +0.1] <sup>**</sup>
	All types of gambling <sup>a</sup>	0 [0; +0.1]	0 [-0.1; 0]	-0.1 [-0.1; 0]	+0.1 [+0.1; +0.1]
Online casinos	Level of involvement:				
	Only online casinos	0.5 [0.5; 0.6] <sup>ref</sup>	0.5 [0.5; 0.5] <sup>ref</sup>	0.5 [0.5; 0.6] <sup>ref</sup>	0.6 [0.6; 0.6] <sup>ref</sup>
	Two different types of gambling	+0.1 [+0.1; +0.1] <sup>***</sup>	+0.1 [+0.1; +0.1] <sup>***</sup>	+0.1 [+0.1; +0.1] <sup>***</sup>	+0.1 [+0.1; +0.1] <sup>***</sup>

(continued)





Table 4. Continued

(b). Gambling days		Pre-C	C1	C2	C3
Gambling type	Effects	Predicted mean & Δ [95% CI]	Predicted mean & Δ [95% CI]	Predicted mean & Δ [95% CI]	Predicted mean & Δ [95% CI]
Online poker	Three different types of gambling	<b>+0.3</b> [+0.2; +0.3] <sup>***</sup>	<b>+0.2</b> [+0.2; +0.3] <sup>***</sup>	<b>+0.3</b> [+0.2; +0.3] <sup>***</sup>	<b>+0.3</b> [+0.3; +0.3] <sup>***</sup>
	All types of gambling <sup>a</sup>	<b>+0.5</b> [+0.4; +0.5] <sup>***</sup>	<b>+0.5</b> [+0.4; +0.5] <sup>***</sup>	<b>+0.5</b> [+0.4; +0.5] <sup>***</sup>	<b>+0.5</b> [+0.4; +0.6] <sup>***</sup>
	Level of involvement: Only online poker	0.7 [0.6; 0.7] <sup>ref</sup>	0.9 [0.9; 1] <sup>ref</sup>	0.7 [0.7; 0.7] <sup>ref</sup>	0.6 [0.6; 0.7] <sup>ref</sup>
	Two different types of gambling	0 [0; 0]	0 [0; 0]	0 [0; 0]	0 [0; 0]
	Three different types of gambling	0 [0; 0]	0 [0; 0]	0 [0; 0]	0 [0; 0]
	All types of gambling <sup>a</sup>	0 [0; 0]	0 [0; 0]	0 [0; 0]	0 [0; 0]

The stars correspond to the significance of the *P* value for the comparison of the level of involvement (with only one gambling activity used as the reference period). ref: reference. \*: *P* < 0.05; \*\*: *P* < 0.01; \*\*\*: *P* < 0.001. Delta coefficients for differences with a *P* value that was statistically significant (<0.05) are in bold. <sup>a</sup>: Gamblers who bet on sports and played online bingo, online casino games and online poker at least once during the study period. At the time of the analysis, a currency exchange rate of 1.00 SEK = \$0.088 = €0.091 was applicable. Level of involvement (example for sports betting): “Only sports betting”: individuals who participated only in sports betting during the study period; “Two different types of gambling”: individuals who participated at least once in sports betting and another type of gambling (online casino, online bingo or online poker); “Three different types of gambling”: individuals who participated at least once in sports betting and in two other types of gambling (online casino, online bingo or online poker); “All types of gambling”: individuals who participated at least once in sports betting, online casinos, online bingo and online poker.

Reading key:

(a). Sports betting: During the C1 period, gamblers who participated in two different types of gambling wagered, on average, 143.6 SEK [141; 146.1] more than gamblers who bet only on sports. Gamblers who participated in three different types of gambling wagered, on average, 244.3 [236.8; 251.6] more than gamblers who bet only on sports. Gamblers who participated in all types of gambling wagered, on average, 505.2 [466.6; 543.2] more than gamblers who bet only on sports.

(b). Sports betting: During the C1 period, gamblers who participated in two different types of gambling gambled, on average, 0.6 [0.6; 0.7] days more than gamblers who bet only on sports. Gamblers who participated in three different types of gambling gambled, on average, 1 [1; 1] day more than gamblers who bet only on sports. Gamblers who participated in all types of gambling gambled, on average, 1.7 [1.6; 1.9] days more than gamblers who bet only on sports.

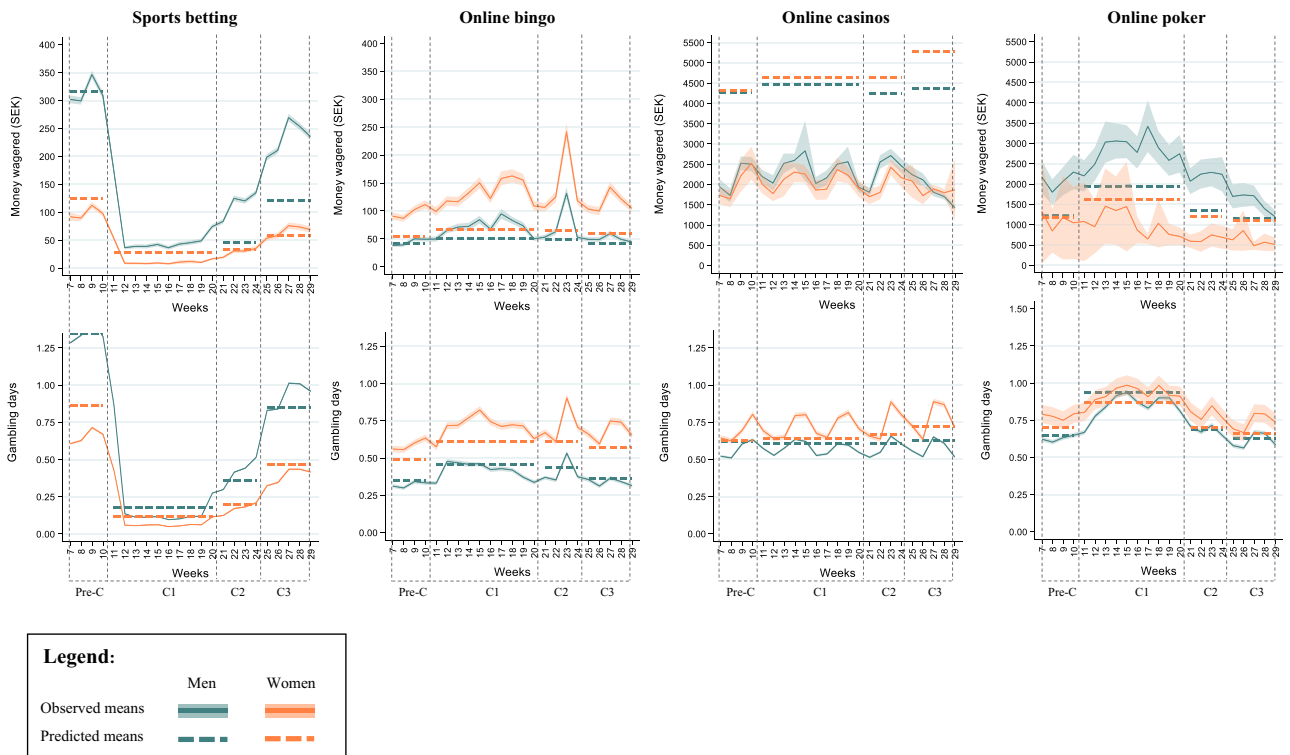
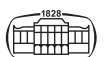
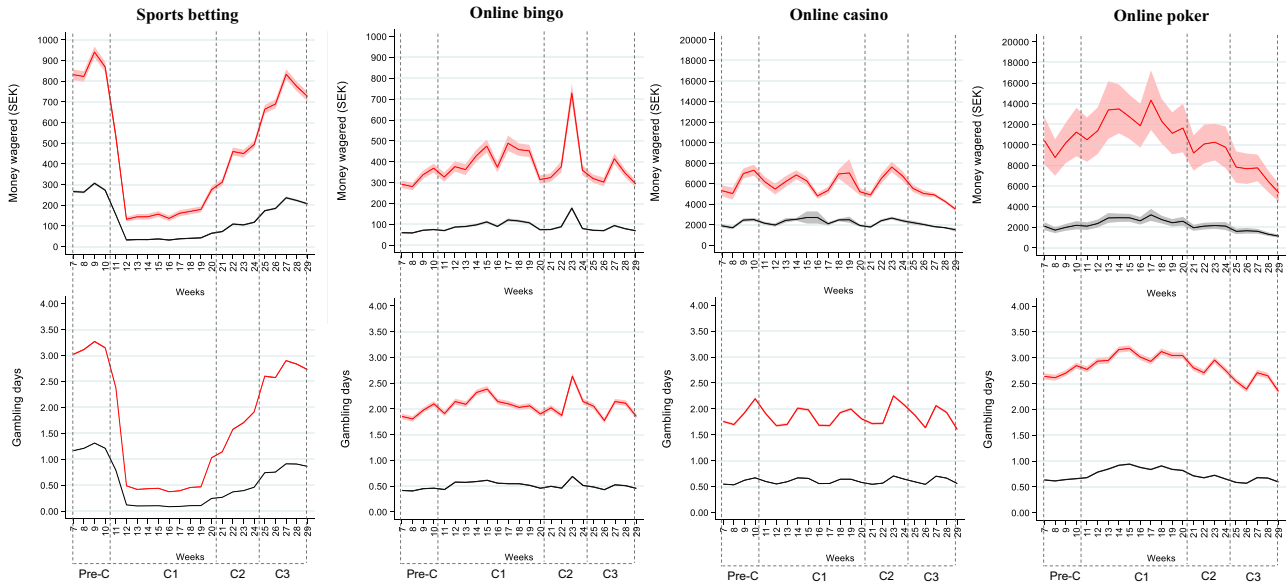


Fig. 2. Representation of the observed and predicted means for each type of gambling and for the two indicators of gambling behaviours





**Legend:**

- Gamblers who gambled at least once during all the study period —
- Gamblers who gambled at least once during each period (pre-C, C1, C2 and C3) —

Fig. 3. Representation of the observed means according to the gamblers' regularity for each gambling type for the two indicators of gambling behaviours

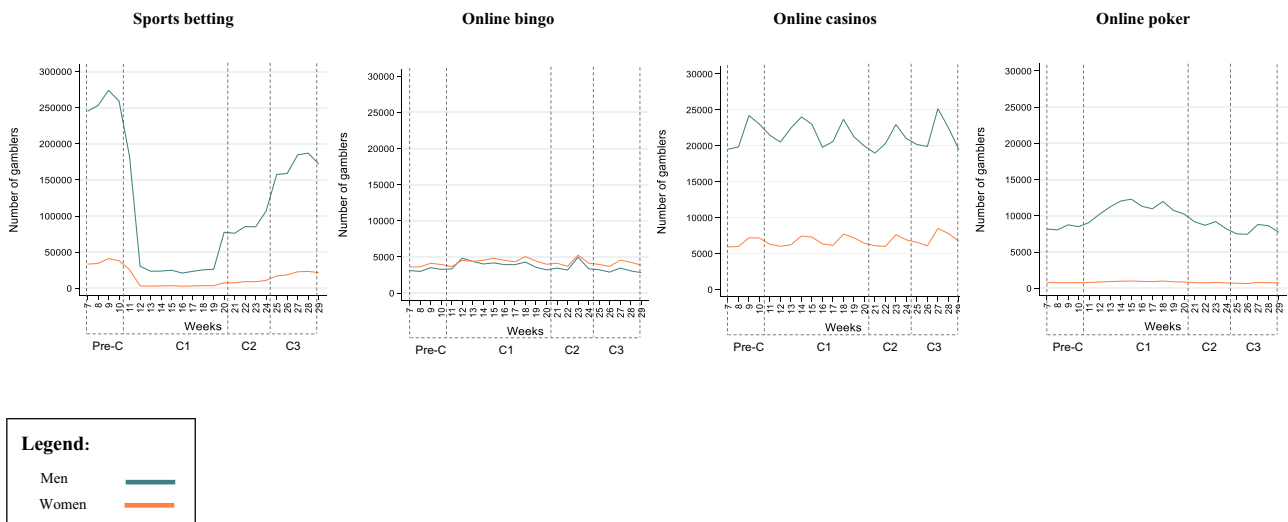
increase in sports betting during the C3 period. Regarding online casinos, the fluctuations were more marked for regular gamblers.

Figure 4 represents the number of gamblers for each type of gambling according to sex. The number of gamblers engaged in poker markedly increased during the C1 period, especially among men. For bingo, the number of gamblers slightly increased during the C1 period compared to the pre-C period, and there was no marked difference according to sex. Regarding the gamblers engaged in sports betting, the number of men fully increased during the C3 period

compared to the number of women. Finally, for the gamblers engaged in online casinos, the number of gamblers and the fluctuations were more marked among men than among women.

**DISCUSSION**

The present study analysed a full gambling operator's activity in the first phases of the COVID-19 pandemic. One major finding was that the patterns of distinct gambling



**Legend:**

- Men —
- Women —

Fig. 4. Representation of the number of gamblers for each gambling type according to sex and for the two indicators of gambling behaviours



types differed markedly. Sports betting followed an apparent decrease and ultimately reached levels that were lower than the prepandemic levels. In contrast, for online bingo, gambling levels increased during the interruption of sports and then decreased with the return to normal for sports events but remained higher than the levels at baseline. We observed the same trend for online poker; however, gambling stabilized at lower levels than those before the interruption of sports. Finally, an increase in online casino gambling was observed during the sports interruption period, but this was observed only for the intensity of gambling practices. Additionally, the resulting final levels for online casino gambling remained higher than those at baseline.

Thus, the general impression was that an expected and fully explainable decrease occurred in sports betting, but this was not associated with increased activity in online gambling within this gambling operator during the acute phases of the pandemic. However, as sports gambling decreased simultaneously due to the interruption of sports, an inverse trend was seen in online bingo, poker and casino gambling with rising gambling levels but normalized as sports returned. However, the considerable increase in the number of gamblers engaged in online poker could be associated with the increase in the practice intensity and frequency during the sports interruption period. Indeed, gamblers engaged in sports betting could have transferred their gambling activity to online poker, particularly among men. However, the analyses seemed to show that regular gamblers (i.e., those engaged in online poker throughout the periods studied) also increased their gambling activity during this same period. In contrast, we could have expected a transfer of gambling activity to online bingo for gamblers engaged in sports betting, more specifically among women, but the number of gamblers engaged in online bingo did not increase markedly during the interruption of sports despite the increase in gambling intensity. In contrast, regular gamblers widely increased their gambling activity both in terms of frequency and intensity compared to occasional gamblers. Regarding online casinos, the number of gamblers remained relatively constant (with periodic fluctuations) during the entire period. However, the fluctuations in gambling activity in relation to the salary weeks were most marked among men and regular gamblers. Finally, the results showed that the level of involvement had much more impact in terms of intensity and frequency of gambling practices for gamblers engaged in sports betting and online casinos. This is consistent with results from other studies that reported that gambling involvement is positively associated with the intensity of gambling (Binde et al., 2017; Phillips, Ogeil, Chow, & Blaszczyński, 2013).

The present study did not demonstrate a consistent increase in gambling within the present gambling operator as a result of the COVID-19 pandemic. Therefore, this study did not confirm the fears expressed by researchers and policymakers in the early phases of the pandemic (Håkansson et al., 2020). Instead, these findings are in line with those of European (Auer et al., 2020) and Swedish commercial online

sports and casino gambling operators (Lindner et al., 2020), where the overall trend partly favoured chance-based games in the first phases of the COVID-19 pandemic but where decreases in sports betting were larger. These findings from the early phases of the pandemic, however, do not exclude a potential later and more worrisome increase in gambling in later phases of the pandemic, especially among the most vulnerable gamblers. Indeed, it can be assumed that certain profiles of gamblers may have been more affected by the pandemic and that the apparent return to normal levels of gambling activity at a global level may have hidden a dramatic and lasting increase in gambling behaviours at an individual level. Consequently, studies observing individual longitudinal variations in gambling activity beyond the first wave of the pandemic should be performed in the future to identify those who are at higher risk for a pejorative evolution of gambling in response to the pandemic. Moreover, in addition to the dramatic changes in the actual gambling market in spring 2020, more long-term changes in society may have provoked more problematic gambling patterns, along with other public health challenges that may have followed the pandemic, such as unemployment, job insecurity and other challenges to public mental health (Håkansson et al., 2020; Price, 2020). In addition, the results could be different according to the gambling severity status of gamblers.

### Limitations and strengths

The limitations of the present study include the fact that only one gambling operator was assessed and that potential changes between operators, such as a migration from sports betting to other gambling types during the interruption of sports, could not be studied here. Additionally, the time frame of the study, which covered less than six months, may also be a limitation. Further analyses with more long-term data are needed to study the potential long-term effects of COVID-19, including, for example, the potential effects of unemployment or long-term increases in poor mental health. Furthermore, the indicators chosen to reflect gambling behaviours were restricted to the intensity and frequency of gambling with only two indicators. It would be interesting to extend the analyses to other indicators of gambling activity, such as the amount of deposits or the number of hours spent gambling per gambling day, or to indicators that reveal the propensity for gambling problems, such as the number of episodes of chasing gambling losses (Balem, Perrot, et al., 2022; Walker et al., 2006). Finally, the lack of clinical data on the status of problem gambling severity may also be a limitation. Indeed, it seems necessary to consider problem gambling severity as an indicator because the impact of the COVID-19 pandemic is undoubtedly different according to the intensity of gambling disorders.

Conversely, the strengths of the present study concern the multigame activities of one operator compared to other studies that focused only on one type of gambling. Additionally, the exhaustive list of gamblers, rather than a randomized sample, avoided selection bias and allowed us to analyse a very large sample that could produce robust



results. The analysis period allowed us to consider several phases of the first wave of the COVID-19 pandemic compared to other studies that focused only on the sports interruption period. Finally, gambling activity was considered while controlling for sex, age and the salary week in February.

## Conclusion and perspectives

Investigation of the gambling activity of all clients of the state-owned gambling operator AB Svenska Spel suggests that the dramatic changes in the world of sports during the COVID-19 pandemic led to a steep decrease in sports betting, which normalized only partly during the return of sports in spring 2020, leaving a net decrease in the operator's gambling activities in the first phases of the pandemic. Modest changes were observed in online chance-based gambling when the interruption of sports occurred, but poker and bingo inversely mirrored sports betting more clearly, with an increase during the interruption of sports and a relatively rapid normalization after the return of sports. COVID-19-related effects in the early phases of the pandemic, at least within this operator, were not dramatic, but further studies of potential migration between gambling types or of long-term changes in gambling activity at an individual level in later stages of the pandemic may be warranted. Additionally, potential migration to other types of gambling operators needs further attention, especially in relation to survey data indicating a possible shift in gambling practices among high-risk gamblers, which was beyond the scope of the present study.

The present study sheds light on gambling patterns subject to some academic and political concerns. Although the overall resulting changes during the study period may be seen as modest, they corroborate the previous impression that the types of gambling that were not technically affected by the pandemic may change because of the negative impact on other types of gambling. Thus, altogether, although many gamblers with sports betting as their preferred type of gambling may simply have reduced their gambling during the temporary lockdown, a certain proportion of gamblers may have transferred their gambling to other available types of gambling, which may have happened temporarily for horse race betting (Håkansson, 2020a). One implication of the present paper may be that health care and social service staff should pay attention to individuals' changes in gambling habits as a maladaptive way of coping with a financial or psychosocial crisis. While such an association still cannot be concluded from the available data, another implication of the present study is to inspire more long-term studies of gambling behaviours during the COVID-19 pandemic involving more than one operator and studies that assess movements in the gambling market within and between gambling operators.

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*Authors' contribution:* MB: writing the manuscript, formal analysis; methodology. A.K.: conceptualization, supervision. C.W.: conceptualization. B.P.: supervision, methodology. G.C-B.: supervision, funding acquisition. A.H.: writing the manuscript, obtaining data, conceptualization, project administration, supervision. All authors gave feedback on and approved the manuscript.

*Conflict of interest:* M.B. and G.C-B. declare that the University Hospital of Nantes received funding from the gambling industry [Française des Jeux (FDJ) and Pari Mutuel Urbain (PMU)] in the form of a philanthropic sponsorship (donations that do not assign the purpose of use). Scientific independence with respect to these gambling industries is guaranteed, and this funding did not influence the present work. A.K., C.W., B. P. and A.H. declare no conflict of interest.

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## SUPPLEMENTARY MATERIALS

Supplementary data to this article can be found online at <https://doi.org/10.1556/2006.2022.00089>.

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