International Gambling Studies

ISSN: 1445-9795 (Print) 1479-4276 (Online) Journal homepage: www.tandfonline.com/journals/rigs20

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To cite this article: Iina Savolainen, Tomi Roukka & Atte Oksanen (19 Aug 2025): The impact of gambling advertising online: a longitudinal study on exposure and harm, International Gambling Studies, DOI: 10.1080/14459795.2025.2548220

To link to this article: https://doi.org/10.1080/14459795.2025.2548220

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Published online: 19 Aug 2025.

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INTERNATIONAL GAMBLING STUDIES
https://doi.org/10.1080/14459795.2025.2548220

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The impact of gambling advertising online: a longitudinal study on exposure and harm

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ABSTRACT

Gambling advertising online is increasingly prevalent but longitudinal population studies on its impact remain scarce. The current study utilizes a longitudinal survey with a representative sample of Finnish adults (18–75 years) across seven time points from 2021 to 2024 (T1: $N = 1530$; $M_{age} = 46.67$; $SD = 16.42$; 50.33% male). Gambling advertising exposure was measured with a single item. Gambling harms were assessed through severe financial difficulties (debt enforcement) and problem gambling severity (PGSI). Independent variables included gambling online (onshore and offshore) and land-based gambling. Analyses used population-averaged models and multilevel regressions. Males, younger individuals, and offshore gamblers encountered gambling advertising online most often. Encountering adverts online was directly linked to problem gambling, and it also amplified problem gambling among online gamblers and increased the likelihood of debt enforcement. Unregulated offshore sites posed a higher risk. There is a need for effective policy interventions to mitigate gambling-related harms linked to online advertising.

ARTICLE HISTORY
Received 4 April 2025
Accepted 5 August 2025

KEYWORDS
Gambling; problem gambling; online advertising; marketing; longitudinal

1. Introduction

The prevalence of gambling-related problems is a growing concern, recent studies showing a significant number of individuals experiencing financial struggles, addiction, and psychological distress as a result of gambling (Gabellini et al., 2023; Price et al., 2021). Gambling is popular leisure activity; according to a recent systematic review and meta-analyses, 46.2% of adults and 17.9% of adolescents globally have gambled in the past 12 months, while 8.7% of adults are classified as engaging in any risk gambling, and 1.41% engage in problematic gambling (Tran et al., 2024). There are, however, differences in the risks different gambling types pose, some involving more harm than others.

Online gambling has been associated with increased gambling harms (Hing, Russell et al., 2022), but some sites are likely to be riskier than others (Oksanen et al., 2024). Onshore gambling sites, which refer to gambling within one's homeland, typically comply with national regulations that shape their advertising strategies. Offshore sites

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operate outside of national jurisdiction, are typically in a gray area of regulation, and may employ more aggressive techniques to keep players engaged (Gainsbury et al., 2019).

Online advertising of various gambling activities has become commonplace, shaping consumer behavior in unprecedented ways (Guillou-Landreat et al., 2021; McGrane et al., 2025). Although internet users are exposed to myriads of advertisements on their screens daily, gambling advertisements stand out for their potential to cause significant harm. As gambling advertisements become increasingly sophisticated and pervasive, employing advanced strategies to target and attract vulnerable individuals by highlighting ubiquitous gambling opportunities, there is growing concern about their lasting impact, particularly on those who are more susceptible to problem gambling (McGrane et al., 2025; Newall et al., 2019; Wardle et al., 2022). This longitudinal study examines who is most likely to encounter gambling advertising online and analyzes the subsequent relationship between exposure to gambling advertisements and gambling-related harm, including financial struggles and gambling problems.

Gambling marketing is highly profitable which has driven companies to invest heavily in diverse advertising strategies (García-Pérez et al., 2024). Most notably, digital advancements and widespread use of the internet have enabled gambling companies to leverage the online space for marketing their products (Guillou-Landreat et al., 2021), rapidly reaching vast audiences regardless of location or legislature. As a result, the placement and delivery of gambling advertising has intensified and become more tactical. Online adverts can take numerous forms, including pop-ups and banner ads on websites, sponsored posts, and targeted ads coated with personalized benefits and bonuses, also utilizing social media platforms (Gainsbury et al., 2015, 2016; Killick & D Griffiths, 2020; Rossi & Nairn, 2022; Syvertsen et al., 2020). Offline advertising, such as printed ads and television, underscores the contrast with digital channels, as it tends to be encountered less frequently and is generally less direct or interactive in nature. In contrast, online advertising is harder to avoid and may contribute to heightened risks for vulnerable individuals (Hing, Smith, et al., 2022; Parker et al., 2024).

Evidence from one review suggests that gambling advertising online has become more complex and interactive (Torrance et al., 2021). The dissemination of incentivizing content, such as offers of free rounds that are quick and easy to access, is a prominent method for encouraging potential customer interest and engagement. Gambling advertisements have traditionally presented their content in a positive light, but this framing has now evolved beyond general glamorization to include features like emotionally charged situations, team loyalty, peer bonding, player control, and seemingly high chances of winning (Lopez-Gonzalez et al., 2018; Torrance et al., 2021). These features can pose unique challenges to consumers to resist gambling involvement. Lopez-Gonzalez et al. (2024) found that gamblers with gambling disorder (GD), who experienced more severe clinical symptoms, also reported a higher perceived impact of gambling advertising. Syvertsen et al. (2022) examined the impact of gambling advertising via different outlets (TV, online, retail, and newspaper) and found that internet advertising had the strongest perceived impact on gambling involvement.

Ubiquitous gambling advertising can normalize the activity, and while gambling advertising on the internet is increasingly prevalent, longitudinal population-level studies examining its longer-term impact on gambling-related behavior and harms remain limited (Bouguettaya et al., 2020; García-Pérez et al., 2024). Prior research has

associated gambling marketing with more risky gambling behavior, but much of the evidence is cross-sectional or qualitative in nature. Moreover, the systematic review by Guillou-Landreat et al. (2021) examining gambling advertising strategies online, highlighted a gap in outcome data specific to Europe. Addressing these gaps is essential to gain a deeper understanding of the long-term impact of gambling advertising and to identify at-risk populations, which can further inform consumer protection and regulatory policies.

This study aims to address these gaps by investigating the characteristics of individuals who encounter gambling advertising online and examining the relationship between gambling advertising and associated harm among a sample of Finnish adults. In Finland, gambling is highly prevalent, with 70% of the 15–74-year-old population having gambled in the past year, according to the latest population study by the National Institute for Health and Welfare (Grönroos et al., 2024). Finland currently operates under a state-controlled gambling monopoly with *Veikkaus* as the sole state-owned gambling operator holding exclusive rights to provide gambling services on the mainland. Paf (Ålands Penningautomatförening), is a regional government owned gambling operator based on the Åland Islands and offers both online games and games on ships sailing between Finland, Estonia, and Sweden.

However, the monopoly system of Finland is expected to change with the projected implementation of a new licensing system for online gambling in 2026. One of the driving factors behind the new licensing system is the prevalence of offshore gambling, which prior research has associated with increased gambling problems (Hagfors et al., 2024; Oksanen et al., 2024). According to the Lotteries Act in Finland, currently only Veikkaus is allowed to market its gambling services to the Finnish citizens. This also includes running ads online. Other gambling providers are prohibited from marketing their products in Finland and the marketing done by Veikkaus is regulated so that it should not involve a risk of negative effects or promote gambling that causes social and health-related problems (Ministry of the Interior, n.d.). The upcoming shift in the licensing system highlights the need to address the challenges of gambling marketing in the changing online landscape.

As offshore gambling platforms typically operate outside the regulatory framework of the country, it is difficult for authorities to enforce responsible gambling measures and protect the platforms' users (Gainsbury et al., 2019). These platforms may also not adhere to the expected standards of player protection, such as self-exclusion programs, deposit limits, and rigorous age verification processes, exposing players to riskier gambling environments and potentially increasing the risk of problem gambling (Gainsbury et al., 2019; Hagfors et al., 2024). With the licensing system, countries like Finland aim to bring all online gambling operators under one regulatory framework, ensuring better oversight and responsible gambling.

Within this context, this exploratory study aims to investigate the associations between existing gambling behavior and the likelihood of encountering gambling advertising online. We further examine how both gambling type and advertising exposure relate to gambling-related harms, operationalized as gambling problems and financial difficulties. Our focus is on identifying patterns of exposure and outcomes across different gambling profiles; therefore, we did not formulate specific hypotheses. For this investigation, we set the following research questions:

RQ1: Who is most likely to encounter gambling advertising online?

RQ2: How is encountering gambling advertising online associated with various gambling-related harms over time?

2. Method

2.1. Participants and procedure

This study is part of a larger longitudinal *Gambling in the Digital Age* research project focusing on new forms of gambling and gaming especially in digital environments. The project began in early 2021 with data collections conducted biannually. The data were gathered from an online panel managed by a data provider company Norstat. To ensure population representativeness, Norstat invited participants who matched the pre-set key demographic variables on the basis of age, gender, and region. Specifically, the study was targeted to adults aged 18 to 75 residing in Finland. We reached an initial nationwide sample of 18–75-year-old Finnish participants living in mainland Finland in April 2021 (T1; $N = 1530$; 50.33% male, 49.41% female, and 0.026% other gender). The response rate was 34.60%, and the sample was representative of the Finnish 18–75-year-old population in terms of age, gender, and geographical distribution, as compared to official demographic data provided by Statistics Finland.

The follow-up data collections were carried out in six subsequent time points spaced six months apart. The first follow-up survey was conducted in October – November 2021 (T2: $n = 1198$, response rate 78.30% of T1 respondents). The second follow-up took place in April-May 2022 (T3: $n = 1{,}095$, response rate 71.57% of T1). The third follow-up occurred in October-November 2022 (T4: $n = 1{,}004$, response rate 65.62% of T1 respondents). The fourth follow-up was in April – May 2023 (T5: $n = 934$, response rate 61.05% of T1) and the fifth follow-up in October – November 2023 (T6: $n = 889$, response rate 58% of T1 respondents). The final, sixth follow-up, was collected in April – May 2024 (T7: $n = 873$, response rate 57% of T1 respondents). Of the initial T1 participants, 706 (46%) participated in all seven surveys.

The data have remained nationally representative in terms of gender and geographical distributions; however, younger participants have been more likely to drop out during follow-up data collections (mean age at T1: 46.67 vs T7: 54.89). While part of the age difference between T1 and T7 is attributable to the three and a half-year duration of the project, the remaining shift is likely due to lower motivation to continue participating in the study or external factors related to life-events.

The survey was updated over time to reflect current and emerging societal issues. Questions regarding exposure to gambling advertising online were introduced in Spring 2023 (T5) and included in T6 and T7. As this particular study focuses on marketing and advertising dimension, the analyses cover a 1.5-year segment within the overall 3.5-year project. At each timepoint, the participants were briefed about the aims and use of the survey and provided their consent by completing the entire survey. Anonymity was protected as Norstat supplied the researcher group with only anonymized data, from

where individual respondents could not be identified even by matching data points. The Academic Ethics Committee of the Tampere region reviewed and approved the study before the data collection began (decision #24/2021). Data quality checks were performed after each data completion to eliminate any clearly biased response patterns from the final dataset.

2.2. Measures

Our main outcome variables were gambling-related harm pertaining to debt enforcement and problem gambling. Debt enforcement, referring to a situation in which an individual is unable to repay their debt and is consequently subjected to official collection procedures (Oksanen et al., 2015), was measured with a single item asking 'Have you been subjected to debt enforcement during the past six months?' Answer choices were *no*, (0), *yes* (1), and *I prefer not to say* (3).

Problem gambling was assessed using the widely recognized Problem Gambling Severity Index (PGSI; Currie et al., 2010; Ferris & Wynne, 2001). The PGSI is specifically designed to measure problem gambling in the general population. It consists of nine items, each capturing different aspects of at-risk and problem gambling, such as feelings of guilt and financial harm. Responses to the nine statements (e.g. 'Has gambling caused you any health problems, including stress or anxiety?') are given on a scale from 0 to 3, where 0 = *Never*, 1 = *Sometimes*, 2 = *Most of the time*, and 3 = *Almost always*. See Appendix I for all items of the scale. The total scores range from 0 to 27, with higher scores indicating a greater likelihood of problem gambling. The PGSI has demonstrated good performance in non-clinical populations and showed excellent internal consistency across the measurement points in our sample (T1: ω = .94; T2: ω = .93; T3: ω = .94; T4: ω = .94; T5: ω = .94; T6: ω = .94; T7: ω = .93).

Our main predictor variable was the frequency of participants' exposure to gambling advertising online. The survey assessed exposure to gambling advertising broadly, without focusing on specific subtypes (e.g. promotions, sponsorships) or modes of delivery (e.g. pop-ups). Advertising exposure was thus measured with the question: 'How often do you encounter advertisements for gambling on the internet (e.g. while browsing websites or social media)?' This framing allowed respondents to interpret 'gambling advertising' in a way that aligned with their own experiences and was intended to facilitate more accurate recall. Answers were given on a scale ranging from 0 (*Never*) to 5 (*Several times a day*).

Gambling engagement in various gambling activities was asked with the question: 'How often, in the past six months, have you used the following gambling services or sites?' The list of gambling activities included: 'sites offered by the Finnish gambling provider Veikkaus,' 'sites offered by Paf,' 'sites offered by foreign gambling providers (other than Veikkaus or Paf),' 'online casinos (e.g. online fruit slot games),' 'online poker sites,' 'land-based gambling at a gambling venue' (e.g. *roulette* or *blackjack*), 'land-based electronic gambling machines (EGMs),' 'the lottery,' and 'scratch tickets.' Answer choices were *Never* (0), *Less than once a month* (1), *Monthly* (2), *Weekly* (3), *Once a day* (4), and *Several times a day* (5). For the analyses, we categorized gambling types into three different groups: offshore gambling (i.e. gambling on unregulated online gambling sites which include sites offered by foreign gambling providers and Paf, online casinos, and

online poker sites), onshore gambling (limited to sites offered by the Finnish gambling provider Veikkaus), and land-based gambling (including EGMs, lottery, scratch tickets, and various forms of gambling typically found at in-person venues, such as table games like roulette and blackjack). While examples of land-based games were provided to participants in the survey for clarification, the item did not require participants to specify which type of game was played. Further, although Paf is a government-owned gambling operator based in the Åland Islands (an autonomous region of Finland), it operates under a separate licensing system and is considered unlicensed in Mainland Finland, according to the *Finnish Gambling 2023* report by the Finnish Institute for Health and Welfare (THL; Grönroos et al., 2024). The onshore and land-based gambling groups consist exclusively of individuals who engage solely in those activities. The offshore gambling group includes individuals who gamble exclusively offshore but also those who participate in both onshore and offshore activities. We chose this approach to ensure adequate sample sizes for the analysis. The variable for gambling type was further recoded to involve those who gambled at a monthly frequency to account for amount of gambling and ensure comparability between groups.

Demographic variables included age, gender, and income. Due to the absence of those reporting 'other' gender in the timepoints covering our analyses, gender was treated as a binary (male/female) variable. Income was queried by asking the participants to select the income bracket that best matches their monthly income before tax (*Less than 1000 euros* [1], *1000–1999* euros [2], *2000–2999* euros [3], *3000–3999* euros [4], *4000–4999 euros* [5], *5000–5999 euros* [6], *6000–6999 euros* [7], *7000 euros or more* [8]). For the analyses, the income variable was dichotomized into *low* and *moderate to high* income groups based on the median value (2,000–2,999 euros).

2.3. Statistical analysis

The analyses included data from waves T5–T7. These are the timepoints when encountering gambling advertisement while browsing the web was measured. This totaled 2118 observations from 706 individuals, spanning 1,5 years. First, we examined the descriptive statistics and correlations of all target variables. To answer our RQs, we conducted three separate models. The first model, assessing factors associated with encountering gambling advertising online over time, utilized a Generalized Estimating Equations (GEE) population-averaged model. GEE models estimate population-level effects while accounting for repeated measurements and the correlation between observations within the same group (Preisser et al., 2019; Zeger et al., 1988). Specifically, in our models, repeated measures refer to measures within the same individuals over time (time-point level) and the model adjusts for this within-person correlation (population level). The outcome variable was encountering gambling advertising online, and the predictor variables included gambling type (at least monthly land-based gambling, online gambling on (1) onshore sites and (2) offshore sites), income, gender, and age. We selected GEE models over random-effects models, as our primary interest was to estimate average associations and make inferences about the relationships between these variables over time.

In the second part of the analysis, we conducted two different models to investigate the harms associated with encountering gambling advertising online. We employed random effects multilevel regression modeling. First, a linear model was used to examine the

relationship between encountering gambling advertising online and gambling harms, with the continuous PGSI score as the outcome variable. Predictor variables included gambling type and demographic characteristics (gender, age, income). Next, to assess within-person interaction effects between advertising exposure and gambling type on problem gambling over time, we utilized fixed effects regression. In the last part of the analysis, a logistic random effects model was applied using a binary debt enforcement variable as the harm outcome.We used Stata software version 18 to conduct the analyses.

3. Results

Encountering gambling advertisement online was very common in the sample, majority (approximately 75%) of the participants having encountered such advertising online during the year and a half of measurement (Table 1). Of the total sample, 15% were monthly land-based gamblers, 35% were monthly onshore gamblers, and 8% were monthly offshore gamblers. The most commonly reported monthly gambling expenditures over the past 1.5 years fell within the 1–24€ and 25–49€ ranges (on a scale ranging from 0€ to 1,000€ or more). At T5, 36% of respondents reported spending 1–24€, 14% spent 25–49€, and 8% spent 50–99€. Similar patterns were observed at T6 (36%, 16%, and 8%, respectively) and at T7 (35%, 15%, and 8%).

The mean problem gambling score (PGSI) in the sample was consistently close to 1 (on a scale from 0 to 27). Approximately 3% of the total sample attained a PGSI score of ≥5, indicating moderate-risk or problem gambling behavior (Currie et al., 2013). Among these individuals, 4% were men and 2.5% were women. This also reflects the general population of Finland and is mirrored in our sample. Gambling problems were most common among the younger age groups, with individuals scoring five points or higher on the PGSI belonging either to the 18–24 (4.5%) or 25–34 (4.7%) age group. The lowest prevalence of problem gambling was observed in the 65–75 age group, at approximately 2%. Those with low income (below median level) had a slightly higher frequency of gambling problems (6%) than those with moderate to high income (5%). Table 2 reports all the descriptive statistics of the target variables

Our first model investigated who encounters gambling advertising online, based on gambling type and demographic variables. According to the analyses, monthly offshore gambling was strongly associated with encountering gambling advertising online (95% CI = 0.419, 0.848; $p < 0.001$). Male gender (95% CI = 0.277, 0.550; $p < 0.001$), and younger age (95% CI = −0.02, −0.007; $p < 0.001$) were also associated with exposure to gambling advertising over time. See Table 3 for all results.

Table 1. Frequencies of encountering gambling advertising online between Spring 2023 and Spring 2024.

	T5		T6		T7	
	N	%	N	%	N	%
Never	207	22.16	209	23.51	180	25.5
Less than once a month	273	29.23	265	29.81	211	29.89
Monthly	176	18.84	176	19.8	132	18.7
Weekly	214	22.91	161	18.11	136	19.26
Once a day	33	3.53	40	4.5	21	2.97
Multiple times a day	31	3.32	38	4.27	26	3.68
Total	934	100	889	100	706	100

Table 2. Descriptive values of the main study variables ($N = 1530$).

Continuous variables	Range	T1, M (SD)	T2, M (SD)	T3, M (SD)	T4, M (SD)	T5, M (SD)	T6, M (SD)	T7, M (SD)
Problem gambling	0–27	1.15 (3.02)	1.12 (2.98)	1.11 (3.03)	1.01 (2.85)	1.00 (2.80)	0.90 (2.63)	0.87 (2.50)
Age (at T1)	18–75	46.67 (16.42)						
Categorical variables		*n* (%)	*n (%)*	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Land-based gambling						155 (16.60)	137 (15.41)	125 (14.30)
Onshore gambling						324 (34.70)	319 (35.90)	310 (35.50)
Offshore gambling						78 (8.35)	75 (8.40)	72 (8.25)
Debt enforcement		304 (19.87)*	80 (6.68)	81 (7.40)	59 (5.88)	65 (6.96)	39 (4.39)	41 (4.70)
Male		770 (50.33)	608 (50.75)	548 (50.05)	506 (50.40)	472 (50.54)	445 (50.23)	440 (50.40)
Female		756 (49.41)	590 (49.25)	547 (49.95)	498 (49.60)	462 (49.46)	441 (49.77)	433 (49.60)
Other		4 (0.26)	–	–	–	–	–	–
Income								
<3000 € (low)		590 (38.56)	447 (29.22)	384 (35.07)	331 (32.97)	299 (32.01)	269 (30.26)	276 (31.62)
≥3000 € (moderate to high)		940 (61.44)	751 (62.69)	711 (64.93)	673 (67.03)	635 (67.99)	620 (69.74)	597 (68.38)

Note. *Debt enforcement at T1 measured with the item 'Have you *ever* been subjected to debt enforcement?,' subsequent timepoints asking about debt enforcement 'in the past six months.'

In the second part of the analyses, we investigated how is seeing gambling advertising online related to gambling harms. First, we analyzed adverts' role in subsequent gambling problems measured with the PGSI. The analyses showed that encountering gambling advertising was directly associated with problem gambling (95% CI = 0.014, 0.135; $p = 0.015$). All gambling types also had a significant between group effect on problem gambling, monthly offshore gambling having the strongest association (95% CI = 3.179, 3.910; $p < 0.001$) in relation to monthly land-based gambling (95% CI = 0.218, 0.726; $p < 0.001$) and monthly onshore gambling (95% CI = 0.295, 0.748; $p < 0.001$). Younger age was also a significant predictor of problem gambling over time (95% CI = −0.030, −0.012; $p < 0.001$). These results are reported in Table 4. As a sensitivity analysis, we also ran the model using only those participants who had engaged in the three types of gambling ($n = 622$). The results remained consistent, so they are not reported separately.

Next, we conducted interaction analyses (Table 5) to examine the combined effect of monthly gambling type and exposure to gambling advertising on problem gambling severity. The analyses revealed a significantly stronger association between

Table 3. GEE population-averaged model predicting exposure to gambling advertising online by gambling profiles and characteristics.

	B	SE	95% CI	z	*p*
Gambling type					
Land-based	0.05	0.08	−0.105, 0.209	0.64	0.519
Onshore	0.06	0.07	−0.073, 0.194	0.89	0.374
Offshore	0.63	0.11	0.419, 0.848	5.80	<0.001
Income (low)	0.01	0.06	−0.114, 0.142	0.21	0.831
Age	−0.01	0.00	−0.02, −0.007	−5.41	<0.001
Male gender	0.41	0.07	0.277, 0.550	5.93	<0.001

Table 4. Random effects multilevel regression model predicting gambling harm (PGSI).

	B	SE	95% CI	*p*
Gambling advertising	0.07	0.03	0.014, 0.135	0.015
Gambling type				
Land-based	0.47	0.13	0.218, 0.726	<0.000
Onshore	0.52	0.12	0.295, 0.748	<0.001
Offshore	3.54	0.18	3.179, 3.910	<0.001
Income (low)	0.01	0.11	−0.212, 0.238	0.909
Age	−0.02	0.00	−0.030, −0.012	<0.001
Male gender	0.15	0.15	−0.137, 0.435	0.308

Table 5. Interaction analyses investigating gambling type and encountering gambling advertising online.

	B	SE	95% CI	*p*
Gambling advertising	−0.15	0.05	−0.248, −0.044	0.005
Gambling type				
Land-based	0.20	0.21	−0.202, 0.612	0.324
Onshore	0.08	0.19	0.302, 0.460	0.686
Offshore	0.824	0.35	0.143, 1.506	0.018
Gambling type X gambling advertising				
Land-based	0.06	0.09	−0.109, 0.232	0.479
Onshore	0.21	0.07	0.066, 0.358	0.004
Offshore	0.50	0.11	0.285, 0.722	<0.001

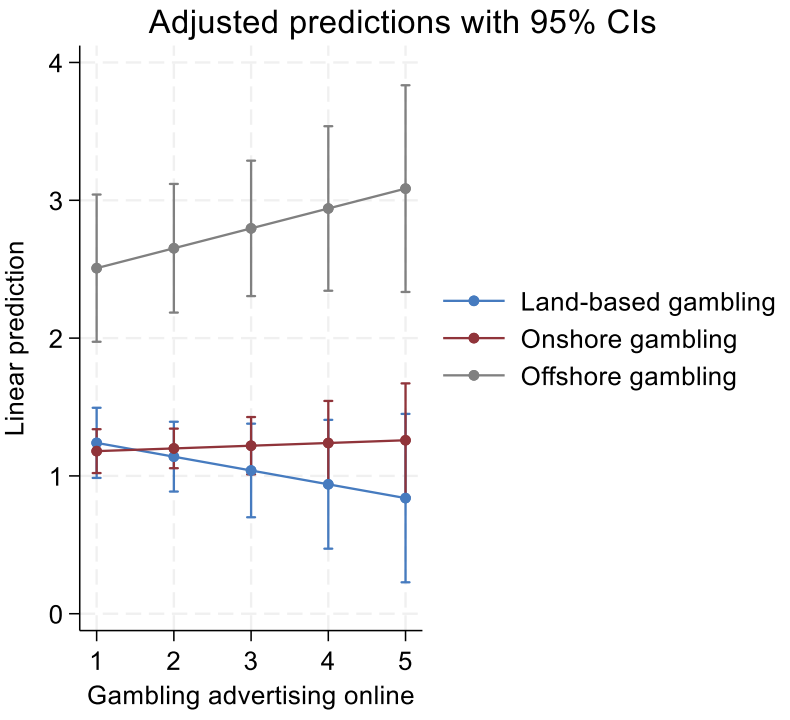

Figure 1. Interaction effect between gambling type and encountering gambling advertising online on problem gambling (PGSI score).

Table 6. Logistic random effects model predicting the likelihood of experiencing severe financial harm (debt enforcement).

	OR	SE	95% CI	*p*
Gambling advertising	1.57	0.29	1.095, 2.248	0.014
Gambling type				
Land-based	2.07	1.56	0.472, 9.062	0.335
Onshore	1.52	0.96	0.443, 5.226	0.506
Offshore	19.13	18.54	2.860, 127.91	0.002
Income (low)	4.72	2.67	1.559, 14.341	0.006
Age	0.98	0.02	0.944, 1.023	0.398
Male gender	1.61	1.01	0.471, 5.498	0.448

advertising exposure and problem gambling among online gamblers, both onshore and offshore. Specifically, as exposure to advertising increases, problem gambling scores rise more steeply for individuals who engage in online gambling (onshore gambling: 95% CI = 0.066, 0.358; $p = 0.004$; offshore: 95% CI = 0.285, 0.722; $p < 0.001$). The interaction effect is visualized in Figure 1. As sensitivity analyses, we conducted an interaction model that controlled for multiple engagement across all three gambling types. These results supported the main analysis, revealing that the effect of advertising exposure on PGSI scores varied significantly across gambling type. Offshore gamblers (95% CI = 0.678, 0.100; $p < .001$) and onshore gamblers (95% CI = 0.185, 0.065; $p = .004$) showed stronger associations between advertising exposure and gambling problems, while the association was not significant for land-based

gamblers. We also conducted additional interaction analyses to examine whether the impact of gambling advertising varied by gender or age. These results were non-significant and are therefore not reported separately.

In the final model, we investigated financial harms as an outcome of encountering gambling advertising online (Table 6). The results of the logistic random effects model show that encountering gambling advertising online is a significant risk factor for becoming subjected to debt enforcement (95% CI = 1.095, 2.248; $p = 0.014$). Among gambling types, monthly offshore gambling significantly increased the risk of becoming subjected to debt enforcement (95% CI = 2.860, 127.91; $p = 0.002$). Additionally, low income increases the risk of debt enforcement (95% CI = 1.559, 14.341; $p = 0.006$).

4. Discussion

This longitudinal study based on a population-wide sample of Finnish adults investigated the characteristics of those encountering gambling advertising online and the role of such advertising in experiencing gambling and financial harms. The study has followed the same participants for 3,5 years and the analyses focused on observing between- and within-person changes occurring during the past 1,5 years' time. In the sample, most participants had encountered gambling advertisements during the year and a half of follow-up while browsing the web or social media sites. Specifically, more than 80% of males had encountered gambling advertising online at least sometimes. This finding aligns with previous reports on the prevalence of gambling marketing online, especially those showing that young men are the target audience for such advertising and encounter it more often (Guillou-Landreat et al., 2021).

We found that intense engagement in gambling, particularly monthly gambling on offshore sites, was associated with a higher incidence of encountering gambling advertising online. This highlights the unregulated nature of offshore gambling, where players are also exposed to advertising that is not controlled by domestic regulations. While the aim of transitioning to a licensing model is intended to enhance player protection by bringing additional gambling operators under national regulation, the gambling industry often frames this shift as a step to prevent players from migrating to offshore sites. This narrative typically argues that excessive restrictions, particularly on advertising, make domestic gambling products less appealing, thereby pushing consumers toward unregulated providers who can offer more attractive promotions and incentives. However, this line of argument is largely driven by commercial self-interest, and easing domestic advertising restrictions would unlikely achieve the protective outcomes the industry claims.

McGrane et al. (2023) suggest a 'dose-response' effect, where increased advertising exposure leads to higher participation and a greater risk of harm, this impact being more pronounced among children, young people, and those already at risk from current gambling activities. Consequently, the most vulnerable individuals, and those who are easily persuaded and have a higher tendency to impulsive behavior, are more likely to be influenced by adverts (Bouguettaya et al., 2020; McGrane et al., 2023). Our results

support this notion and provide added empirical evidence on the long-term effects of encountering gambling advertisements online.

An additional challenge arises as the same individuals exposed to gambling advertising online also encounter other types of advertisements related to financial decision making, such as ads for cryptocurrencies, quick loans, and investment opportunities. Exposure to gambling advertisements already poses a significant risk for developing gambling problems and serious financial issues, particularly for those participating in offshore games. These risks may intensify if individuals actively seek out gambling-related information or financial opportunities online. They may also be drawn to new gambling incentives, such as bonuses or reward campaigns that allow initial engagement at no cost but become costly once real bets are required, especially as the player is likely to start losing.

We found that encountering gambling marketing online was directly associated with problem gambling, but the interaction analyses further revealed that there exists a combined effect between advertising and type of gambling: the impact of gambling advertising was significant specifically for online gamblers, both onshore and offshore. Thus, as online gamblers encounter advertising about gambling products and services, their problem gambling scores increase. Active engagement in all the three types of gambling included in the analyses had a significant between group effect on problem gambling, but offshore gambling had the strongest association. In terms of financial harm, our analyses showed that encountering gambling advertisement online significantly increases the risk of becoming subjected to debt enforcement. Relating to gambling type, offshore gamblers were at a higher risk for debt enforcement. There is likely a link between active gambling engagement and seeing related advertisements, which may encourage individuals to place more bets and perhaps fund gambling by using credit cards or instant loans (Oksanen et al., 2018). These results echo those of prior research showing that gambling is very popular among indebted individuals (Marionneau et al., 2024) and offshore gambling is a particularly consequential form of gambling when it comes to potential harm (Gainsbury et al., 2019; Hagfors et al., 2024).

Overall, our study supports prior research on online gamblers seeing gambling ads frequently, also demonstrating the bidirectional relationship between gambling activity and marketing, as individuals with a more intense engagement or higher severity of the problem, are more likely to be exposed to such promotions (García-Pérez et al., 2024). These results highlight a need for effective and innovative interventions, and clearer universal regulation of gambling marketing that is fit specifically for the online sphere (Rossi & Nairn, 2022). The need is especially relevant in the context of marketing content promoting unregulated gambling sites and those intentionally targeting at-risk populations. It is also important to critically examine industry discourse within the broader policy context. The regulation of gambling marketing is currently highly relevant for Finland, due to the upcoming switch to a license-system. It is expected that the marketing and overall visibility of gambling increases in the new system, because of the substantial increase in the number of gambling companies in the market. The Finnish Gambling Policy Programme states the prevention and reduction of gambling-related harm as its central goals. However, our findings suggest that the planned transition to a licensing model contradicts these objectives if not carefully designed and accompanied by evidence-based harm reduction safeguards. In light of this, we recommend that the licensing proposal is reevaluated to ensure it includes clear restrictions on advertising, marketing

incentives, and providing products containing high risk. Moreover, resources should be allocated to gambling prevention and treatment services, and to independent research under the new system.

The large sample, longitudinal design, and robust models are strengths of our study and provide novel evidence of the harm posed by encountering gambling advertisement online. However, certain limitations must be acknowledged. Our analyses focused on individuals who reported gambling at least monthly. This approach was taken to reduce variability in gambling frequency across the sample and, while it offers a degree of control, future studies should address gambling frequency in more detail. The response rate at baseline (T1) was 34%. While consistent with online survey studies, potential for nonresponse bias may exist. Although demographic comparisons suggest our sample broadly reflects the general adult population in Finland, any generalizations should be made with caution.

Another limitation is the small number of participants who engaged exclusively in offshore gambling, which prevented us from modeling this group separately. However, as many gamblers tend to engage in the activity across multiple platforms, including both onshore and offshore operators, our analytical approach reflects the reality of contemporary gambling behavior. Nonetheless, this grouping may also obscure important differences between gambling types, and potentially confound the interpretation of results, particularly regarding advertising exposure and harm outcomes. Although our analytical strategy was carefully selected and yields robust associations, future studies should aim to separate exclusive gambling types and utilize mediation analyses to further clarify the mechanisms underlying these relationships. It is worth noting, however, that individuals who engaged in offshore gambling still showed distinct patterns in our models, such as higher exposure to advertising, greater gambling severity, and higher risk of debt enforcement, suggesting that this group is meaningfully different despite overlapping behaviors with onshore gambling.

The study is also limited by the respondents' subjective recall of encountering gambling advertisement which utilized a single-item measure, and the study context is only relied on the sample from Finland. Future longitudinal and cross-national studies should explore these relationships further, using comprehensive measures of advertising exposure. In addition, although online casinos and online poker not operated by Veikkaus fall outside the Finnish licensing system and were therefore classified as offshore or unlicensed operators in our models, we acknowledge that some participants may have interpreted this differently and potentially included Veikkaus's own online poker or casino games in their responses. More precise categorization should therefore be used in future research.

Additionally, our measure for debt enforcement was based on a single item and did not directly assess whether the debt was related to gambling. However, the observed associations between gambling advertising and offshore gambling with debt enforcement suggests that, even if the debt is not directly caused by gambling, offshore gamblers tend to exhibit poorer financial management skills and struggles. Nevertheless, future research should directly examine debt as a potential outcome of gambling in the context of advertising. Whereas our study investigated associations between advertising exposure and harm outcomes over time, it did not specifically model for potential causation of advertising exposure to gambling behavior and subsequent harm. Future studies should

take this approach to verify causality. Lastly, stratifying participants into PGSI risk categories (e.g. low, moderate, high risk) as indicators of gambling harm could provide valuable insights, particularly in contexts that are policy-oriented.

5. Conclusions

A significant proportion of individuals using the internet encounter gambling advertisements daily while browsing general websites or social media. This longitudinal, nation-wide survey of Finnish adults examined the impact of such advertising on gambling behavior and financial harm. The results indicate that online gambling, particularly on offshore sites, is associated with greater experienced harms. Offshore gamblers were not only more frequently exposed to gambling advertisements online, but also exhibited more severe gambling problems. Active offshore gambling also significantly increased the risk of facing debt enforcement, highlighting the financial harm associated with the activities. Current regulations have limited impact on offshore gambling providers, despite the greater harms posed by this form of gambling, emphasizing the need for improved measures to prevent and mitigate gambling-related harm. The findings of this study anticipate the potential effects of the new licensing system taking place in Finland, but they are also relevant across different national contexts, as the online environment enables individuals to gamble beyond their regulatory frameworks, and the gambling landscape continues to evolve.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Finnish Foundation for Alcohol Studies (Gambling in the Digital Age -Project, 2021–2024, PI: Prof. Atte Oksanen). Tomi Roukka received funding for this paper from the Finnish Ministry of Social Affairs and Health based on the provisions of section 52 of the Finnish Lotteries Act; Alkoholitutkimussäätiö [Gambling in the Digital Age -Project, 2021–2024]; Alkoholitutkimussaatio [Gambling in the Digital Age -Project, 2021–2024].

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Data availability statement

The data are available upon reasonable request to the Principal Investigator, Prof. Atte Oksanen

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Appendix I

The Problem Gambling Severity Index (PGSI)

Thinking about the last 12 months. . .

Have you bet more than you could really afford to lose?
Have you needed to gamble with larger amounts of money to get the same feeling of excitement?
When you gambled, did you go back another day to try to win back the money you lost?
Have you borrowed money or sold anything to get money to gamble?
Have you felt that you might have a problem with gambling?
Has gambling caused you any health problems, including stress or anxiety?
Have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?
Has your gambling caused any financial problems for you or your household?
Have you felt guilty about the way you gamble or what happens when you gamble?

Never (0)
Sometimes (1)
Most of the time (2)
Almost always (3)

Correlations of all target variables at T5.

	PGSI	Debt.	Gambl. Ads.	Land-based	Onshore	Offshore	Male
Debt enforcement	0.17***	1					
Gambling ads.	0.19***	0.08***	1				
Land-based gambling	0.14***	0.06	0.06	1			
Onshore gambling	0.17***	0.03	0.04	0.58***	1		
Offshore gambling	0.44***	0.15***	0.20***	0.20***	0.26***	1	
Male gender	0.08**	0.00	0.18***	0.13***	0.08**	0.11**	1
Age	−0.15***	−0.04	−0.15***	0.20***	0.08*	−0.08*	0.01
Income (low)	−0.02	0.10**	−0.02	−0.07*	−0.10*	−0.03	−0.15***