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The prevalence of gambling problems in prison populations: A systematic review and meta-analysis

Journal of Behavioral Addictions

13 (2024) 1, 25–35

DOI:
10.1556/2006.2024.00005

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Received: August 3, 2023 • Revised manuscript received: January 14, 2024 • Accepted: January 28, 2024
Published online: March 8, 2024

REVIEW ARTICLE

ABSTRACT

Introduction: The overall prevalence of gambling problems across prison populations is currently unknown. The objective of the present study was therefore to quantitatively synthetize prevalence estimates of gambling problems in prison populations using a random effects meta-analytic model and to investigate if the estimates were moderated by time frame, cut-off levels, and sample size. *Methods:* To be included the studies had to report original data on the prevalence of gambling problems in a prison sample and to be written in a European language, whereas data based on abstracts or qualitative reports were excluded. The search ended on December 1, 2023 and were conducted in Web of Science, PubMed, Cinahl, PsycINFO, Embase, Google Scholar, Grey Literature Report, and GreyNet. Risk of bias was assessed with a standardized 10-item measure for epidemiological studies. *Results:* A total of 26 studies comprising 9,491 participants were included. The vast majority of the participants were males. The most commonly used instrument for assessment of gambling problems was the South Oaks Gambling Screen. The pooled random-effects gambling problems prevalence estimate was 30.8% (95% CI = 25.1–37.3). The meta-regression analysis showed that none of the three moderator variables (criteria, timeframe, sample size) were related to the gambling problems prevalence. Common limitations of the included studies entailed not being representative nationally or for the target population, lack of randomization, and low response rate. The meta-analysis was restricted to studies published in a European language. *Conclusions:* Overall, the studies show that 1 in 3 prisoners has gambling problems and suggests that more emphasis on relevant prevention and treatment is warranted for this population. The study was funded by the Norwegian Competence Center for Gambling and Gaming Research and pre-registered at PROSPERO (CRD42023390552).

KEYWORDS

prison, problem gambling, meta-analysis, systematic review

Gambling can be defined as staking money or other possessions of material value on the outcome of a game or event that is partly or completely determined by chance (Bolen & Boyd, 1968). For most people, gambling is a recreational activity, but may for some develop into problem gambling, characterized by loss of control which can manifest itself in terms of impaired economy, relationships, wellbeing, health, cultural connectedness, work/school-performance and illegal behaviors (Langham et al., 2016). Prevalence studies indicate that between 0.7 and 6.5% of the general adult population in Europe, Asia, North America, and Oceania report gambling problems (Calado & Griffiths, 2016). In more severe cases, the gambler fulfills the diagnostic criteria for gambling disorder, which is subclassified into mild, moderate and severe depending on number of the diagnostic criteria satisfied (APA, 2013).

Some populations may be more vulnerable in terms of developing gambling problems and several studies indicate that the prevalence of problem gambling within prison populations is considerably higher than that observed in the general population. For instance, a study

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conducted by Riley, Larsen, Battersby, and Harvey (2018) assessed problem gambling among male prisoners in Australia and found a lifetime prevalence of 60.1%. Similarly, Riley, Larsen, Battersby, & Harvey (2017) examined problem gambling in an Australian female prison sample and reported a lifetime prevalence rate of 63.5%. Moreover, the elevated prevalence of problem gambling among prisoners has consistently been documented across different geographical regions. A study conducted by Yokotani, Tamura, Kaneko, and Kamimura (2019) examined the rates of problem gambling in a Japanese prison and revealed an average lifetime prevalence rate of 38.6%. Another study conducted by Lelonek-Kulela (2020) found gambling lifetime prevalence rates to be 29.4% among a sample of Polish prisoners. These findings further attest to the global nature of the issue and emphasize the urgency of understanding and addressing problem gambling among incarcerated individuals.

Why the prevalence rates seem dramatically elevated in prison populations is not completely determined, but several mechanisms may be in play. Firstly, gambling has been deemed “criminogenic”. Historically, gambling has been associated with organized crime such as illegal gambling, corruption, and money laundering (Ferentzy and Turner, 2009). Due to the nature of gambling some gamblers accumulate debts or severe economic problems which may cause them to commit economic crimes such as fraud and embezzlement, although violent crimes also have been described in this context (Adolphe, Khatib, van Golde, Gainsbury, & Blaszczynski, 2019; Binge et al., 2022). Secondly, a less discussed path goes from the prison system to gambling. In a study among prisoners in the UK 30% agreed that gambling was a normal part of prison life, and 8% started gambling when being incarcerated. Beyond money, currency used were food, cigarettes, drugs and drinks (Smith, Sharman, & Roberts, 2022). Abbott, McKenna and Giles (2005) and Abbott and McKenna (2005), reporting from a New Zealand prison, found that gambling was prevalent both among male and female prisoners. Thirdly, it is conceivable that several common “third variables” which have relevance for gambling as well as crime are involved. Both crimes and excessive gambling have been associated with environmental risk factors such as poverty and deprived communities, and also with personality related conditions and traits such as conduct disorder, antisocial personality, impulsivity and risk taking (Dennison, Finkeldey, & Rocheleau, 2021).

A relevant theoretical perspective in this realm is problem behavior theory (Jessor, 1987; Jessor & Jessor, 1977). According to this theory, behavior is a result of three systems of variables: 1) antecedent-background variables (e.g., family background and socialization), 2) social-psychological variables, such as the personality system (e.g., values, expectations, beliefs and personal control structures) and the perceived environment system (e.g., support/control from others and problem behavioral approval from others), and 3) social behavior variables (e.g., problem-behavior structure and conventional behavior structure). Within each system variables either reflect instigations towards or controls against problem behavior (Jessor, 1987). Problem behavior theory proposes a ‘problem behavior syndrome’ where involvement in one problem behavior such as problem gambling co-occurs with involvement in other problem behaviors such as economic and violent crime (Jessor & Jessor, 1977).

Although both assumed mechanisms and empirical studies suggest that gambling problems are significantly elevated in prison populations, still, no quantitative synthesis of gambling problems in such populations has been performed. Due to lack of systematic reviews not much is known in regard to factors that may moderate prevalence rates. In terms of the latter, previous studies have generally shown far higher lifetime than current prevalence of mental disorders among defendants at criminal court (Brown et al., 2022). Furthermore, there is reason to believe that lenient criteria categorizing gambling problems will provide higher prevalences than studies based on more strict cut-offs (Sassen, Kraus, & Bühringer, 2011). Finally, another study characteristic which may influence the estimates is sample size as small samples (small study effect) have been associated with inflated estimates more often than large samples (Richter, Wall, Bruen, & Whittington, 2019).

Against this backdrop, we conducted a systematic review and meta-analysis of the prevalence of problem gambling in prison populations and investigated (in the presence of heterogenous prevalence estimates) if moderators in terms of time frame (current vs. lifetime), cut-off (lenient vs. strict) and sample size could explain the dispersion in prevalence estimates.

METHODS

Search strategy and inclusion criteria

The present study was pre-registered at PROSPERO (CRD42023390552). We conducted a systematic and comprehensive literature search in Web of Science, PubMed, Cinahl, PsycInfo, Embase, Google Scholar, Grey Literature Report, and GreyNet. The following search string was used: “Gambl* AND (prison* OR institution* OR jail* OR detain* OR correction* OR offend* OR penal* OR penitentiar* OR incarcerat* OR felon* OR custod* OR remand* OR inmate* OR sentenc* OR gaol* OR crim* OR jurid* OR detention*). A total of 5,891 hits (including the first 286 hits in Google Scholar) were identified from the database search. The search from Google Scholar, Grey Literature Report and GreyNet was conducted in order to identify gray literature. After removing duplicates, 5,244 records were available for screening. Of this pool, 4,889 records were removed after screening their titles. Next, the abstracts of the remaining 355 records were inspected of which 267 were discarded after going through the abstracts. After screening the remaining 88 full-text records for eligibility, 26 were included in the analysis.

The key inclusion criteria were that the study or record presented original data on the prevalence of gambling problems in a prison sample and was published in a European language. Data only presented in abstracts or in qualitative reports were excluded. The literature search ended on June 1, 2023 (with a supplementary search ending December 1, 2023). We conducted the literature search and selection in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) procedure (Page et al., 2021) and the Meta-Analysis of Observational Studies in Epidemiology (Brooke, Schwartz, & Pawlik, 2021). Figure 1 presents the literature search and selection process. See Appendix for a completed PRISMA-guideline checklist.

Data extraction

EVT and FM independently conducted the literature search and selection of articles based on the aforementioned criteria. Using a pretested data extraction form, the following data were extracted from the identified studies and coded accordingly: first author name and publication year, country, prison conditions (sentence served in prison vs. open), problem gambling assessment/measure, sample size (total, female, and male), age of the participants (range, $M \pm SD$), prevalence of problem gambling, and response rate (Table 1). Discrepant extractions were resolved through discussion and further reviewed until consensus was reached. None of the authors have any competing interests to declare.

Statistical analysis

A random-effects model using the DerSimonian and Laird approach for estimating the between-study variance (DerSimonian & Laird, 1986) was used. Prevalence estimates and their corresponding 95% confidence intervals (95% CI) were calculated for each study in addition to pooled results and prediction interval. The latter represents the interval within which the effect size of a future study would fall, given that the study was randomly selected from the same population as the studies included in the present meta-analysis (IntHout, Ioannidis, Rovers, & Goeman, 2016).

A random-effects model is preferred as the included studies were assumed to represent different populations of studies (Borenstein et al., 2009). In the case of significant between study heterogeneity, we decided a priori to conduct a random-effects meta-regression analysis to examine whether the following predictors explained heterogeneity in gambling problem prevalence: a) diagnostic cut-off a (lenient vs. strict), b) time frame (current/last 12 months vs. lifetime), and c) sample size. Regarding strict vs. lenient operationalization of gambling problems, we coded the cut-off as strict if the study employed clinical assessment and/or

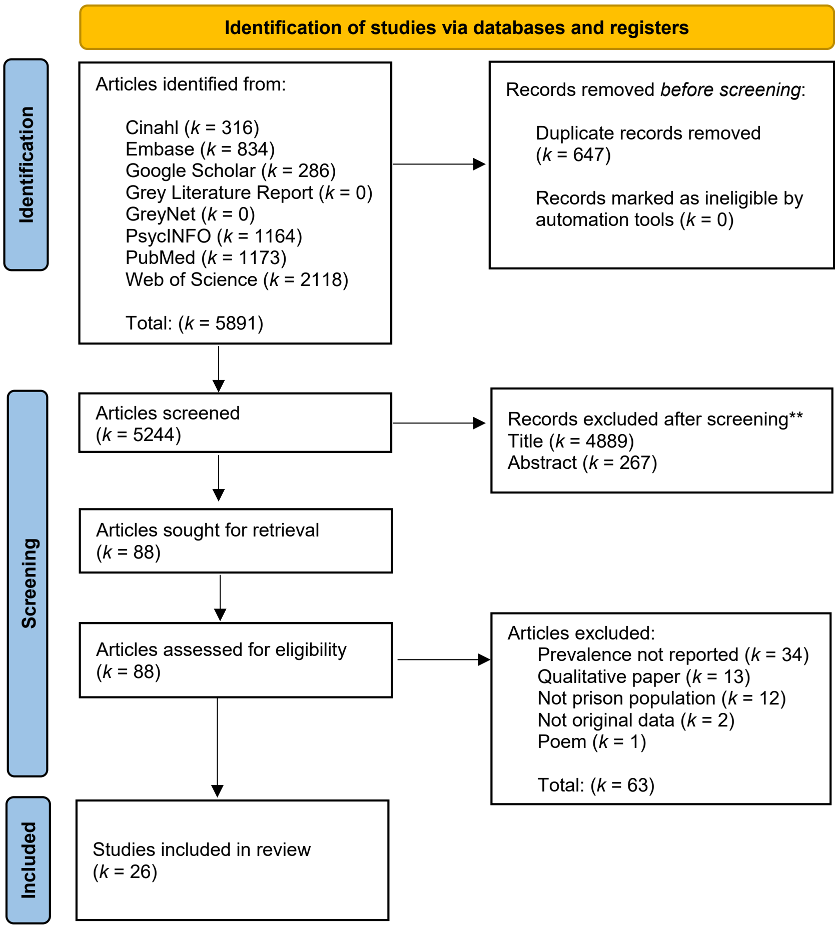

Fig. 1. Flow diagram of systematic literature search on problem gambling in prison populations

Table 1. Characteristics of prevalence studies of problem gambling in prison populations

References	Country	Sentence served in prison	Screening tool	*n*	*n* ♀	*n* ♂	Age range	Age *M* ± *SD*	T prev %[b]	RR %[c]	Cuf off	Time frame
Abbott et al. (2005)	New Zealand	Yes	SOGS-R[d]	357		357	17–36+[a]		31.1	87.5	Lenient	Lifetime
Abbott and McKenna (2005)	New Zealand	Yes	SOGS-R[d]	94	94			30 ± 8	55.3	62	Lenient	Lifetime
Anderson (1999)	USA	Yes	SOGS-E[e]	223		223			73	74	Lenient	Lifetime
Kerber et al. (2012)	USA	Yes	SOGS[e]	43		43	50+[a]		44.2	93.5	Lenient	Lifetime
Kirchmann-Kallas et al. (2023)	Germany	Prison hospital	KFG[e]	134		134			20.5	97.1	Strict	Lifetime
Lahn (2005)	Australia	Both	SOGS[d]	102	5	97			34.3	11.23	Strict	Current
Lelonek-Kulela (2020)	Poland	Yes	SOGS[e]	891		891	18–69	34.24 ± 10.379	29.4		Strict	Lifetime
Lind et al. (2019)	Finland	Both	BBGS[e]	94	39	55	18–55+[a]		16	30.8	Strict	Current
May-Chahal et al. (2012)	England	Yes	PGSI[e]	423	222	201	21–60+[a]		22.7	60	Lenient	Current
May-Chahal et al. (2016)	UK	Yes	PGSI[e]	1,057	252	805	18–77	33.5	23.1	88	Lenient	Current
Riley & Oakes. (2015)	Australia	Yes	EIGHT[e]	105		105			52.4	70	Lenient	Lifetime
Riley et al. (2017)	Australia	Yes	EIGHT[e]	74	74			38.54 ± 9.86	63.5	58	Lenient	Lifetime
Riley et al. (2018)	Australia	Yes	EIGHT[e]	296		296		37.70 ± 11.08	60.1	66	Lenient	Lifetime
Ruiz-Pérez and Echeburúa (2019)	Colombia	Yes	BQPG[e]	100	47	53		37.6 ± 12.6	33		Lenient	Lifetime
Smith et al. (2022)	UK	Yes	PGSI[e]	282	0	282	18–75	34.5 ± 11.4	14.5		Strict	Lifetime
Sullivan et al. (2008)	New Zealand	Yes	EIGHT/SOGS[e]	100		100			29	100	Strict	Current
Templer et al. (1993)	USA	Yes	SOGS[e]	136		136	20–64	31.68 ± 8.91	47.1		Lenient	Current
Turner et al. (2009)	Canada	Yes	SOGS[e]	254		254		34.6 ± 10.8	22.8	39	Lenient	Lifetime
Turner et al. (2012)	Canada	Yes	SOGS/PGSI/DSM-IV[e]	422	41	381	18–82	38.7	17.3	61.5	Lenient	Current
Walters (1997)	USA	Yes	SOGS[d]	363		363	19–74	31.47 ± 8.15	12.7	91.44	Lenient	Lifetime
Walters et al. (1998)	USA	Yes	SOGS[e]	316		316	18+[a]		50.6	72	Lenient	Current
Westphal and Johnson (2006)	USA	Yes	SOGS-R/DSM-IV-JR[e]	1,636	169	1,444	10–19		20.5	92	Strict	Current
Widinghoff et al. (2019)	Sweden	Yes	DSM-IV[e]	263		263	18–25	22.3	16.3	71	Strict	Lifetime
Yokotani et al. (2019)	Japan	Yes	SOGS-R[e]	332		332	18+[a]	51.34 ± 12.82	38.6	74.6	Strict	Lifetime
Zorland et al. (2013)	USA	No	SOGS[e]	602	172	430	18–63	36 ± 10.60	30.4		Lenient	Lifetime
Zurhold et al. (2014)	Germany	Yes	Lie-Bet[d]	792				34.3 ± 10.3	6.6	89	Lenient	Lifetime

Note: [a]As reported from authors, [b]Prevalence, [c]Response rate, [d]Interview, [e]Self-Report, BBGS = Brief Biosocial Gambling Screen, BQPG = Brief Questionnaire of Pathological Gambling, DSM-IV = Diagnostic and Statistical Manual, EIGHT = Early Intervention Gambling Health Test, KFG = Kurzfragebogen zum Glücksspielverhalten, PGSI = Problem Gambling Severity Index, SOGS = South Oaks Gambling Screen.

a standardized and validated measurement of gambling problems using conventional cut-off values to indicate the most severe category (e.g., PGSI ≥8/SOGS ≥5). We coded the cut-off as lenient if the study employed a lower cut-off value than the conventional cut-off when using standardized and validated measurements (e.g., PGSI 3-7/SOGS 3 or 4). If the screening tool covered a mixed timeframe (Petry, 1996), “lifetime” was used as moderator value in the analysis. Heterogeneity was assessed using Cochran's *Q and* the I^2 statistic, the latter reflecting the proportion of variation in observed effects that is due to variation in true effect sizes (Borenstein, Higgins, Hedges, & Rothstein, 2017). An I^2 of 0% suggests no heterogeneity, 25% indicate low heterogeneity, 50% indicate moderate heterogeneity, and 75% indicate high heterogeneity, respectively (Higgins, Thompson, Deeks, & Altman, 2003).

Publication bias was investigated using Egger test, which is based on a regression model where the standardized effect size comprises the dependent variable and the inverse of the standard error constitute the independent variable. An intercept significantly different from zero suggests bias (Egger, Davey Smith, Schneider, & Minder, 1997). Also, a trim-and-fill procedure (Duval & Tweedie, 2000) was used for investigation of publication bias. This procedure is based on a funnel plot, where effect sizes are depicted along the *x* axis and where the inverse of the variance (sample size) is represented on the *y* axis. This creates a funnel plot with the largest and most precise studies situated at the top of the funnel. In the absence of publication bias, the funnel plot is symmetrical. Publication bias often entails lack of small studies with small effects. The trim-and-fill procedure trims off asymmetric outlying studies and replaces them with studies around the center, whereupon an adjusted effect size and 95% CI are calculated.

Risk of bias was evaluated using a quality assessment checklist for prevalence studies (Hoy et al., 2012). The checklist comprised items reflecting ten characteristics of the included studies, each scored 0 (low risk of bias) or 1 (high risk of bias): High risk was indicated by each of the following items: 1) study target population is not representative of the national prison population, 2) sampling frame is not a representation of the target population, 3) random selection is not used, 4) response rate is less than 75%, 5) data is collected from a proxy, 6) an acceptable case definition is not used, 7) the study instrument is not shown to have reliability or validity, 8) same mode of data collection is not used for all subjects, 9) the shortest prevalence period for the parameter is not appropriate, and 10) one or more of the numerator(s) or denominator(s) is inappropriate. Hence, the total score ranged from 0 to 10 and was categorized as high quality/low risk (0–3), moderate quality/risk (4–6), and low quality/high risk (7–10), respectively. See Table 2. The meta-analysis and meta-regression analysis were conducted using Comprehensive Meta-Analysis 4.0 (Biostat Inc., 2014). The extraction sheet and data file are available as supplementary material.

RESULTS

Description of studies

Of the 26 included studies, publication years ranged from 1993 (Templer, Kaiser, & Siscoe, 1993) to 2023 (Kirchmann-Kallas et al., 2023). Studies were conducted in USA (k = 7; Anderson, 1999; Kerber, Hickey, Astroth, & Kim, 2012; Templer et al., 1993; Walters, 1997; Walters & Contri, 1998; Westphal & Johnson, 2006; Zorland, Kuperminc, Mooss, Gilmore, & Emshoff, 2013), Australia (k = 4; Lahn, 2005; Riley & Oakes, 2015; Riley et al., 2017, 2018), New Zealand (k = 3; Abbott, McKenna, & Giles, 2005; Abbott & McKenna, 2005; Sullivan, Brown, & Skinner, 2008), UK (k = 3; May-Chahal, Wilson, Humphreys, & Anderson, 2012; May-Chahal, Humphreys, Clifton, Francis, & Reith, 2016; Smith et al., 2022), Canada (k = 2; Turner, Preston, Saunders, McAvoy, & Jain, 2009, 2012), Germany (k = 2; Kirchmann-Kallas et al., 2023; Zurhold, Verthein, & Kalke, 2014), and one study each from the following countries: Colombia (Ruiz-Pérez & Echeburúa, 2019), Finland (Lind, Salonen, Järvinen-Tassopoulos, Alho, & Castrén, 2019), Japan (Yokotani et al., 2019), Poland (Lelonek-Kulela, 2020) and Sweden (Widinghoff et al., 2019).

The majority of studies (k = 15) assessed gambling problems with the South Oaks Gambling Screen (SOGS) (Abbott et al., 2005; Abbott & McKenna, 2005; Anderson, 1999; Kerber et al., 2012; Lahn, 2005; Sullivan et al., 2008; Lelonek-Kulela, 2020; Templer, 1993; Turner et al., 2009, 2012; Walters, 1997; Walters & Contri, 1998; Westphal et al., 2006; Yokotani et al., 2019; Zorland et al., 2013), some (k = 4) studies used the Problem Gambling Severity Index (PGSI) measure (May-Chahal et al., 2012, 2016; Smith et al., 2022; Turner, Preston, McAvoy, & Gillam, 2012), others (k = 4) used the Early Intervention Gambling Health Test (EIGHT) (Riley & Oakes, 2015; Riley et al., 2017, 2018; Sullivan et al., 2008), and (k = 3), and some studies (k = 3) used the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) or DSM-IV-JUNIOR (JR) criteria (Turner et al., 2012; Westphal & Johnson, 2006; Widinghoff et al., 2019). One study each used the BQPG measure (Ruiz-Pérez & Echeburúa, 2019), the Lie/Bet Questionnaire (Zurhold et al., 2014), BBGS measure (Lind et al., 2019), and KFG (Petry, 1996).

The studies included a total of 9,491 participants, ranging from 43 (Kerber et al., 2012) to 1,636 (Westphal & Johnson, 2006) with a mean of 365.0 (SD = 368.4) participants. Based on the 26 articles, the vast majority were males (n = 7,561), whereas 1,115 were females. Globally, 93.1% of those serving time in prisons are men (Fair & Walmsley, 2022). One article did not report the gender of the participants (Zurhold et al., 2014).

Publication bias

The findings of the Egger test (b = 2.80, 95% CI = −2.98–8.58, t = 1.00, p = 0.33) revealed an absence of publication

Table 2. Risk-of-bias evaluation of the included studies

References	*N* representativeness	*N* frame	Randomization	Non-response bias	Primary data	Operationalization	Instrument	Consistency	Period	Estimation	Total risk score	Risk category
Abbott et al. (2005)	0	0	0	0	0	0	0	0	0	0	0	Low
Abbott and McKenna (2005)	1	0	0	1	0	0	0	0	0	0	2	Low
Anderson (1999)	0	0	0	1	0	0	0	0	0	0	1	Low
Kerber et al. (2012)	1	1	1	0	0	0	0	0	0	0	3	Low
Kirchmann-Kallas et al. (2023)	1	0	1	0	0	0	0	0	0	0	2	Low
Lahn (2005)	1	1	1	1	0	0	0	0	0	0	4	Moderate
Lelonek-Kulela (2020)	0	0	1	1	0	0	0	0	0	0	2	Low
Lind et al. (2019)	0	1	1	1	0	0	0	0	0	0	3	Low
May-Chahal et al. (2012)	0	0	1	1	0	0	0	0	0	0	2	Low
May-Chahal et al. (2016)	0	0	1	0	0	0	0	0	0	0	1	Low
Riley and Oakes (2015)	1	1	1	1	0	0	0	0	0	0	4	Moderate
Riley et al. (2017)	1	0	1	1	0	0	0	0	0	0	3	Low
Riley et al. (2018)	0	0	1	1	0	0	0	0	0	0	2	Low
Ruiz-Pérez and Echeburúa (2019)	1	1	1	1	0	0	0	0	0	0	4	Moderate
Smith et al. (2022)	1	0	1	1	0	0	0	0	0	0	3	Low
Templer et al. (1993)	1	1	1	1	0	0	0	0	0	0	4	Moderate
Turner et al. (2009)	0	0	1	1	0	0	0	0	0	0	2	Low
Turner et al. (2012)	0	0	1	1	0	0	0	0	0	0	2	Low
Walters (1997)	1	1	1	1	0	0	0	0	0	0	4	Moderate
Walters et al. (1998)	1	1	1	1	0	0	0	0	0	0	4	Moderate
Westphal and Johnson (2006)	1	0	1	1	0	0	0	0	0	0	3	Low
Widinghoff et al. (2019)	1	1	1	1	0	0	0	0	0	0	4	Moderate
Yokotani et al. (2019)	1	0	1	1	0	0	0	0	0	0	3	Low
Zorland et al. (2013)	1	0	1	1	0	0	0	0	0	0	3	Low
Zurhold et al. (2014)	1	1	1	0	0	0	0	0	0	0	3	Low

Item score: (0: low risk, 1: high risk). §Total quality/risk score: [range (0–10): high quality/low risk (0–3), moderate quality/risk (4–6), poor quality/high risk (7–10)].

bias. The trim-and-fill procedure trimmed 0 studies and did not, accordingly, change the overall prevalence estimates.

Interrater reliability

Interrater reliability was calculated as initial percent agreement between the two independent raters and was calculated separately for inclusion/exclusion of articles (90.4%), study characteristics including prevalence rates (96.4%), and thirdly for risk of bias (88.1%).

Prevalence estimates, confidence and prediction intervals, and heterogeneity

The results of the meta-analysis are presented in Fig. 2. The overall prevalence across all 26 studies was 30.8% (95% CI = 25.1–37.3, $p < 0.001$). The 95% prediction interval ranged from 8.8% to 67.3%. Cochran's Q was significant ($Q = 841.70$, $df = 25$, $p < 0.001$) suggesting heterogeneity across the prevalence estimates, and the I^2 statistic was 97.0% indicating very high heterogeneity.

Association of problem gambling in prisons

Due to the significant heterogeneity, a meta-regression analysis based on a random-effects model with Knapp Hartung adjustment (Knapp & Hartung, 2003) was conducted including three moderators: Cut-off (lenient vs. strict), time frame (current/12 months vs. lifetime), and sample size. As specific hypotheses were stated for all the moderators one-tailed significance tests were used. The results are presented in Table 3. Overall, the regression model was not significant ($F[3, 22] = 2.00$, $p = 0.14$, R^2 analog = 0.00) and none of the moderators turned out significant. There were significant proportions of the variance that were not accounted for ($Q = 681.1$, $df = 22$, $p < 0.001$).

Table 3. Results of meta-regression of diagnostic cut-off procedure, time frame, and sample size on gambling problems prevalence

Predictor	Coefficient	*SE*	95% CI	*t*	1-sided *p*
Intercept	−0.3658	0.3723	−1.1378, 0.4062	−0.99	0.1683
Diagnostic criteria	−0.4891	0.3425	−1.1994, 0.2212	−1.43	0.0837
Time frame	0.0260	0.3484	−0.6965, 0.7884	0.07	0.4706
Sample size	−0.0008	0.0005	−0.0017, 0.0002	−1.71	0.0505

Note. Diagnostic criteria (lenient = 0, strict = 1), time frame (current/12 month = 0, lifetime = 1). $k = 24$. R^2 analog = 0.00.

Study name	Event rate	Lower limit	Upper limit
Abbott & McKenna, 2005b	0,553	0,452	0,650
Abbott et al., 2005a	0,311	0,265	0,361
Anderson, 1999	0,726	0,664	0,781
Kerber et al., 2012	0,442	0,302	0,591
Kirrchmann-Kallas et al., 2023	0,201	0,142	0,278
Lahn, 2005	0,343	0,258	0,440
Lelonek-Kulela et al., 2019	0,294	0,265	0,325
Lind et al., 2019	0,160	0,099	0,248
May-Chahal et al., 2012	0,227	0,190	0,269
May-Chahal et al., 2016	0,231	0,206	0,257
Riley & Oakes, 2015	0,524	0,429	0,617
Riley et al., 2017a	0,635	0,520	0,736
Riley et al., 2017b	0,601	0,544	0,656
Ruiz-Peres & Echeburúa, 2019	0,330	0,245	0,428
Smith et al., 2022	0,145	0,109	0,192
Sullivan et al., 2007	0,290	0,210	0,386
Templer et al., 1993	0,471	0,388	0,555
Turner et al., 2009	0,228	0,181	0,284
Turner et al., 2012	0,173	0,140	0,212
Walters & Contri, 1998	0,506	0,451	0,561
Walters, 1997	0,127	0,096	0,165
Westphan & Johnson, 2006	0,205	0,186	0,226
Widinghoff et al., 2019	0,163	0,124	0,213
Yokotani et al., 2019	0,386	0,335	0,439
Zorland et al., 2013	0,304	0,269	0,342
Zurhold et al., 2014	0,066	0,050	0,085
Pooled	**0,308**	**0,251**	**0,373**

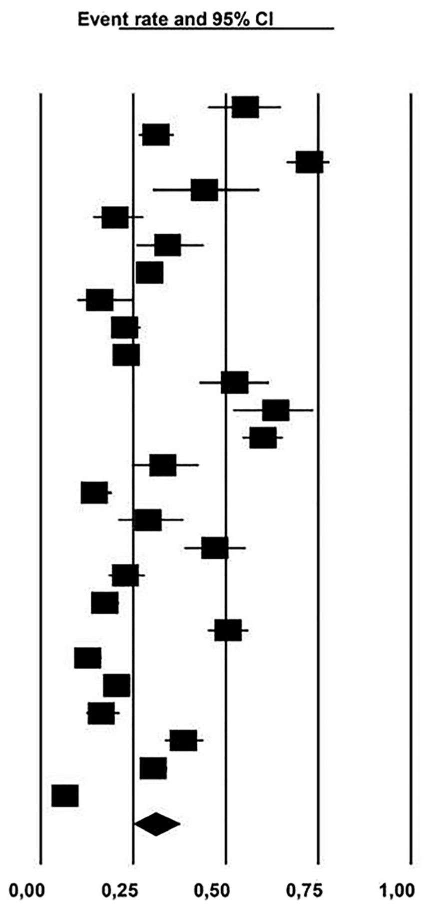

Fig. 2. Forest plot of the included studies

DISCUSSION

We investigated the prevalence of gambling problems in prison populations. A total of 26 studies fulfilled the inclusion criteria and were included in the meta-analysis. The overall problem gambling prevalence among prison populations was 30.8%, suggesting that nearly one-third of the prison population has gambling problems. However, the dispersion of effect sizes was significant, ranging from 6.6% (Zurhold et al., 2014) to 73% (Anderson, 1999).

The disparity in prevalences suggests that the included studies differ greatly across multiple dimensions. In terms of the meta-regression none of the moderator variables could explain the disparity of prevalence in gambling problems. Other potential factors that might moderate the estimates may be the type of prison (high/low security; prison vs. open sentencing), the country in which the study was conducted and the composition of the type of convicts in the sample, such as age, gender and type of criminality. Such potential moderates should be investigated in future studies.

The high overall prevalence of problem gambling in prison populations can be hypothesized to reflect the "criminogenic pathway" implying that gambling problems cause (e.g. theft/fraud) crime (Adolphe et al., 2019; Langham et al., 2016; WHO, 1992). However, the reversed causality, implying that prison environments foster excessive gambling (Beauregard & Brochu, 2013) cannot be ruled out. The same goes for the "third variable explanation", presupposing common vulnerability factors (e.g., proximity and upbringing in deprived environments, conduct disorder, antisocial personality disorder, difficulties with impulsivity as well as risk taking behavior and genetics) for excessive gambling and criminal behaviors (Dennison et al., 2021). As such, future well-designed longitudinal studies are called for in order to elucidate the temporal relationship between gambling and crime.

The problem-behavior model (Jessor, 1987; Jessor & Jessor, 1977), previously presented, represents a more detailed and comprehensive explanatory model which explains the co-occurrence of different problem-behaviors, such as gambling and law disobedience.

Limitations of included studies

Limitations of the meta-analysis should be acknowledged among others due to the inclusion of several studies that had high risk on certain dimensions of the Hoy et al. (2012) risk of bias tool. Specifically, a number of included studies were rated as high risk on dimensions such as representativeness (not representative of the national prison population), sample frame (not representative of the target population), randomization (not randomly drawn samples, and non-response bias (low response rate). These limitations affect the overall quality and reliability of the meta-analysis findings. The high risk of bias associated with representativeness and sample frame indicates that the included studies not adequately reflect diverse and representative samples of prison populations. This may limit the generalizability of the findings to broader prison populations. Further it cannot be ruled out that the inclusion of studies with limited representation may result in a biased estimation of the true prevalence of problem gambling in prison populations. Furthermore, the presence of high risk on the randomization dimension also introduces the potential for selection bias, which may affect the accuracy of the prevalence estimates. The high risk on the non-response bias dimension implies that there may have been systematic differences between participants who agreed to participate in the studies and those who declined or were non-responsive. This bias can lead to an over -or underrepresentation of certain subgroups within the prison population which may impact the reliability and generalizability of the prevalence estimates.

It is essential to acknowledge these limitations and emphasize the need for future studies to address these in order to obtain more accurate estimates of the prevalence of problem gambling in prison populations. By addressing these limitations, future studies can provide more robust and reliable evidence on the prevalence of problem gambling among prisoners.

Although several studies included in the meta-analysis were found to be high risk on certain dimensions according to the Hoy et al. (2012) tool, it is worth noting that none of the studies were categorized as having poor study quality/high risk on the overall risk evaluation. While specific dimensions may raise concerns about certain aspects of the studies' methodology, the overall quality of the included studies remained acceptable. This indicates that despite the identified limitations, the studies provided valuable data.

Strengths and limitations of the present meta-analysis

Some other limitations should also be mentioned. Although two authors independently collected and analyzed the data, providing a reliable process with a reduced risk of overlooking relevant information, it is still possible that some studies may have been missed. Still, efforts were made to minimize this risk by including grey literature and systematically searching reference lists of relevance reviews and included studies. Furthermore, by restricting our search to papers written in European languages, there is a potential bias towards excluding studies published in non-European languages. This limitation may have impacted the comprehensiveness and generalizability of the findings, particularly in relation to non-European prison populations.

Although the moderators in the regression model were selected based on hypothesized relationships, the model failed to explain variance in gambling problem prevalences. Exclusion of potential moderators (e.g. type of prison and type of convictions) may have influenced the model. Future meta-analyses should consider including a wider range of moderators to enhance the explanatory power of the model and to capture additional sources of variation.

Despite these limitations, it is important to note that our meta-analysis followed the updated 2020 PRISMA guidelines, which promote comprehensive reporting and methodological transparency. The inclusion of grey literature and adherence to rigorous search strategies across multiple databases contribute to the strength of the study. Still, researchers should be cautious when interpreting the findings, recognizing the potential for missed studies, language bias, and the need for further investigation into unexplored moderators.

Implications for practice and future research

More focus on gambling and gambling problems in prisons by correctional officials has been suggested as a means of controlling and limiting gambling problems in correctional settings. Informing new prisoners about the risks of inmate gambling and screening new prisoners for problem gambling have also been proposed (McEvoy & Spirgen, 2012). In addition, improved training of prison workers in terms of the problems and developing better guidelines for identifying and responding to gambling problems have been implied (Castren, Lind, Jarvinen-Tassopoulos, Alho, & Salonen, 2021). Specific treatment approaches have further been outlined for potential use in the prison environment (Weatherly, Montes, Peters, & Wilson, 2012). Addressing gambling problems could also be included in each prisoner's rehabilitation plan. Future research should aim to include larger, representative samples, use rigorous randomization procedures, and minimize non-response bias when assessing the prevalence of gambling problems in prison populations. In addition, future research should address risk factors associated with individual prisoners and with prison systems regarding development of gambling problems. Investigating effects of screening, as well as preventive and treatment efforts with the correctional setting should also be given prioritization in terms of future research.

CONCLUSION

The prevalence of problem gambling in prison populations was overall high (30.8%), although single estimates varied. This finding suggests that preventative and treatment efforts should be considered to better help this population. Several of the included studies rely on non-probability sampling and non-representative sampling frames, which should be addressed to ensure more representative prevalence estimates. Finally, studies from non-Western countries and longitudinal study designs elucidating the relationship between crime and gambling problems are warranted.

Funding sources: The study was supported by the Norwegian Competence Center for Gambling and Gaming Research, University of Bergen, Norway.

Authors' contribution: EVT, SP and FM designed and conceptualized the study. EVT and FM conducted the literature search and coded the included articles, whereas SP performed the analysis. All authors took part in results interpretation. Primary manuscript composition was undertaken by EVT, SP, and FM, with contributions from DS and LØS. All authors approved the final version of the manuscript and the subsequent revision before submission and resubmission, respectively. All authors had full access to all data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Conflict of interest: The authors have no conflicts of interest.

SUPPLEMENTARY DATA

Supplementary data to this article can be found online at https://doi.org/10.1556/2006.2024.00005.

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