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Original Research

What is the evidence that advertising policies could have an impact on gambling-related harms? A systematic umbrella review of the literature

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ABSTRACT

Objective: To summarise the evidence on the impacts of gambling-related advertising that could lead to gambling-related harm, including impacts on vulnerable individuals and inequalities in the distribution of harms.

Study design: An umbrella review of studies investigating the impact of gambling advertising.

Methods: A review was undertaken of systematic reviews of qualitative, quantitative and mixed method studies reporting outcomes associated with gambling advertising and marketing. The search strategy included database searches (Web of Science, PsycInfo) and website searches. The quality of the included reviews was determined using A MeaSurement Tool to Assess systematic Reviews 2.

Results: 1024 papers were identified by database searches. Eight systematic reviews, including 74 unique studies, met inclusion criteria. Included studies, using quantitative and qualitative methods, consistently support the existence of a causal relationship between exposure to advertising of gambling products/brands and more positive attitudes to gambling, greater intentions to gamble and increased gambling activity at both individual and population level. There is evidence of a 'dose–response' effect; greater advertising exposure increases participation which leads to a greater risk of harm. There was more evidence for the impact on children and young people and for those already at risk from current gambling activity with those most vulnerable more likely to be influenced.

Conclusion: Gambling advertising restrictions could reduce overall harm and mitigate the impact of advertising on gambling-related inequalities. Public health harm prevention strategies should include policies which limit exposure to advertising, particularly among children and vulnerable groups.

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Introduction

There is substantial international and UK-specific evidence base on the range of harms related to gambling¹ and the risk factors that predict an increased risk of harm from gambling.² Causal pathways between gambling, health and wellbeing at both individual and population levels include the effects of financial loss and debt, as well as wider impacts on relationships, education, employment and

crime. Recent national and regional data have quantified the scale of the associated harms and economic costs for the UK.^{3,4}

Whilst gambling disorder may be the most serious and widely recognised gambling-related health condition, harm to health may occur even at relatively low levels of gambling activity. The various harms to health and wellbeing may be the result of diverse mechanisms including impacts on mental health, relationships and financial stresses.⁵ Risks of gambling-related harms are associated with a range of individual, psychosocial, political, economic and commercial factors. Thus gambling-related harms represent a significant potential driver of health inequalities because those already experiencing financial, social and mental health

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disadvantage are also at increased risk of experiencing gambling-related harm (the ‘gambling harm paradox’).⁶

As one aspect of industry marketing strategies, gambling advertising is ubiquitous across a wide range of media including both more traditional forms (e.g. television, newspapers, outdoor and point of sale advertising) and more recent channels (e.g. internet and social media advertising). Recent policy reports and evidence reviews suggest that direct evidence of a causal relationship between exposure to gambling advertising and gambling-related harms is not easily obtainable. Yet a wealth of indirect evidence exists showing an association between advertising and attitudes and behaviour as well as an association between attitudes and behaviour and subsequent risk of harms.

We undertook a synthesis of review evidence on the relationship between advertising and attitudes, intentions and behaviours which, in turn, may be associated with an increased risk of gambling-related harms. We aimed to summarise evidence exploring the relationship between exposure to advertising and attitudes and behaviour that can lead to harms and to explore evidence on the impact of advertising for individuals and communities known to be more vulnerable to gambling-related harms.

Methods

Given the large volume and diversity of research on gambling advertising and its effects, we undertook an umbrella review of relevant systematic reviews which included primary studies of the impact of gambling advertising.

Search strategy and selection criteria

The search, which comprised subject headings and free-text terms, was initially developed and run on PsycINFO before being adapted for Web Of Science (Science Citation Index and Social Science Citation Index) (see Supplementary File 1 for search strategy). Database searches, undertaken in February 2022 and citation searches in March 2022, were limited to English language reviews published since 2000. Database searching was accompanied by scrutiny of reference lists and citations of included papers, searches for grey literature including a search of relevant key websites (see Supplementary File 1) in March 2022. Two reviewers (EM and EG) independently undertook study selection. Uncertainties on study inclusion were resolved by discussion between the two reviewers and among the wider review team as required. Inclusion criteria were specified as:

Population: Any population/region exposed to gambling advertising including subgroups e.g. children and young people; groups at higher risk of gambling-related harms; those already experiencing gambling-related harms and/or seeking treatment.

Exposure: This included exposure to any form of gambling advertising including experimentally-manipulated or observed exposure, or self-reported recall of exposure. All forms of advertising were included (broadcast and print media, outdoors, on line and point of sale advertising) but other marketing strategies (e.g. sponsorship of events or charitable funding) which did not use advertising to raise awareness or encourage product use were outside the scope of this review.

Outcomes: Any outcome related to gambling in terms of attitudes, intentions or behaviour.

Studies: We included all reviews which described a systematic method for identifying included evidence, reviews including both published and unpublished (‘grey’) literature. We excluded reviews which only covered advertising or marketing content or strategies and did not include studies related to the impact of advertising.

Data analysis

Data extraction was performed by one reviewer (EM) and checked for accuracy and consistency by a second (EG). The data extraction focused on identifying the main associations between exposure to advertising, attitudes, intentions and behaviour that were reported and the number and nature of the primary studies on which the findings were based. The quality of the included reviews was determined by two reviewers (EG and EM) independently using A MeaSurement Tool to Assess systematic Reviews 2 (see Supplementary File 3 for findings).⁷ The extracted data was synthesised narratively due to the diverse nature of the evidence.

Results

After de-duplication, the initial database searches generated 1024 records, of which 24 were retrieved as full papers. Five of these met our inclusion criteria (see Supplementary File 2 list of excluded reviews). Two additional reviews were identified from website searches and one additional review was identified by a topic expert. No additional reviews were identified by reference or citation searches (Fig. 1 shows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram).

In total, eight systematic reviews met inclusion criteria. The scope and main findings of individual reviews are summarised in Table 1 (see Supplementary File 3 for quality appraisal findings). Three reviews included both studies of those already at risk from their gambling and general populations (both adults and children).^{8–10} Two reviews only included studies of children^{11,12} and one review focused on migrant communities.¹³ Two reviews commissioned to inform policymaking focused on intervention policies.^{14,15} One review, funded by a national charity that receives funds from the gambling industry (GambleAware), explicitly stated a funding source.⁹

Bouguettaya (2020)⁸ was the only review to include a quantitative synthesis of the relationship between exposure to gambling advertising and gambling attitudes, intentions and behaviours. In total, 28 papers published between 2000 and 2019 were included in this study (24 in the meta-analysis). All included studies measured the impact of gambling advertising, six qualitative, 20 quantitative and two mixed methods. The correlation coefficients on attitude ranged from $r = 0.12$ to $r = 0.62$ (mean $r = 0.40$), those on intentions ranged from $r = 0$ to $r = 0.2$ (mean $r = 0.05$), those on behaviour ranged from $r = -0.8$ to $r = 0.68$ (mean $r = 0.24$). The aggregated meta-analysis correlation coefficients were positive but not statistically significant for intentions and attitudes. The aggregated coefficient on the behavioural variable was positive and statistically significant; this category included a much larger number of papers with higher numbers of significant effect sizes. Thus, the quantitative evidence is strongest for the relationship between advertising exposure and behaviour. Longitudinal Ecological Momentary Assessment studies which asked individuals to report their actual exposure to direct messaging as it occurred reported the highest number of significant effects.

Cross-sectional evidence on children and adolescents showed that higher exposure to advertising is associated with higher gambling rates and severity. Some studies found links with gambling intent amongst adolescents and other studies found links with attitudes. Cross sectional evidence reports that higher exposure to advertising is particularly associated with stronger intentions and influences betting behaviour in those who are current and higher risk gamblers. Higher risk gamblers also have a higher self-reported exposure to advertising and tend to hold more positive attitudes about advertising. In general, qualitative findings indicate that high levels of exposure to advertising normalises

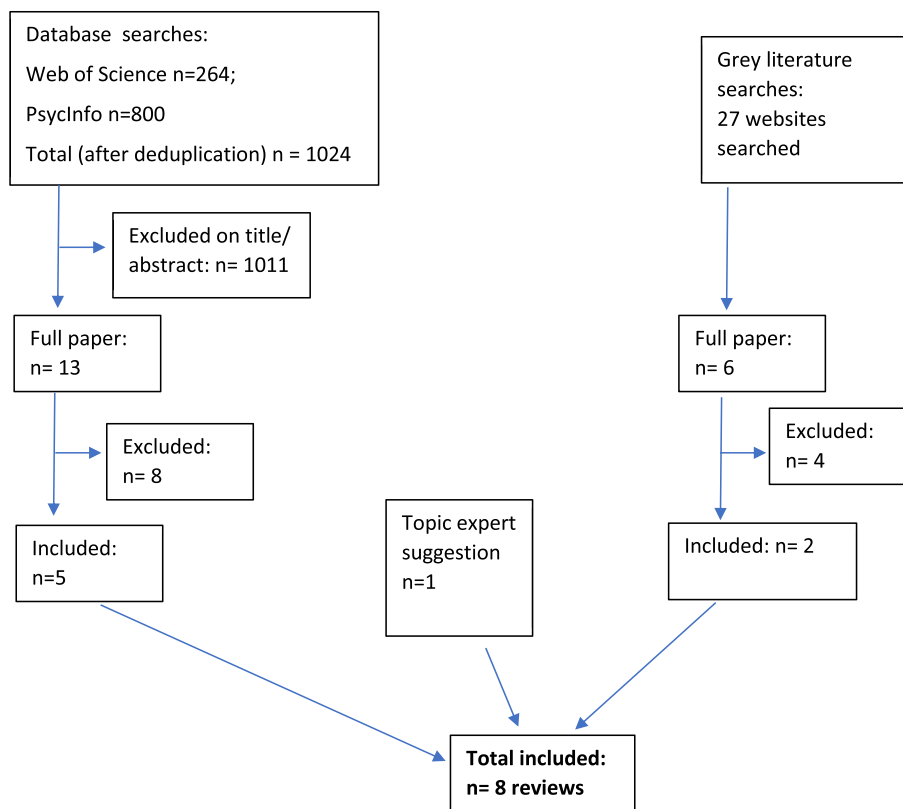


Fig. 1. PRISMA Flow Diagram of studies.

gambling, creates positive attitudes and acts as an incentive to gamble.

Included studies suggested that advertising would not encourage young people to start gambling, but instead generate difficulties for existing young gamblers, especially those experiencing problems, who reported that gambling advertising had some impact on their behaviour. Additionally, advertising was observed to have a priming effect, teaching children how to place a bet.

Newall et al. (2019)⁹ carried out a systematic review of gambling marketing research published between 2014 and 2018. Of the 46 papers included, 27 focused on advertising and behaviour. Seven were unique to this review. Of these 27 behavioural papers, 18 included an explicit discussion of the impact of advertising exposure, ten quantitative, six qualitative, two mixed-methods. Longitudinal observational studies also found that advertising exposure was associated with increased gambling expenditure. An experimental study found that 'push' notifications resulted in larger and riskier bets being placed. The cross-sectional quantitative evidence showed that higher risk gamblers have a greater awareness of and exposure to gambling advertising. They are also more likely to report that it has increased their involvement in gambling, notably in studies looking at sports betting.

Guillou-Landreat (2021)¹⁰ identified 21 studies on the digital marketing, of which nine specifically discuss the impact of advertising: five quantitative, three qualitative and one mixed-method. Longitudinal studies suggest that exposure to different forms of advertising is consistently associated with either an increased probability of betting, increased expenditure on betting or increased intention to bet amongst sports bettors. Cross-sectional evidence demonstrated a dose-response effect with the average number of inducement offers received significantly predicting the

number of unplanned bets placed before and during sports matches. Cross-sectional evidence showed the perceived self-reported impact of advertising on behaviour is a significant predictor of problematic gambling severity. A higher percentage of those experiencing moderate risk or problem gambling reported that social media promotions for gambling increased their problems compared with low-risk and 'non-problem' gamblers. These promotions also increased impulsive betting for higher-risk gamblers.

Labrador et al. (2021)¹² summarised the last 10 years of literature on gambling advertising to adolescent and youth populations. Of 31 included studies, 17 studies specifically discussed the impact of advertising, seven quantitative, eight qualitative and two mixed methods. All included studies were cross-sectional and descriptive. In these studies, most adolescents and youth report that advertising would not influence their own behaviour, and only a small proportion also said that they intended to gamble at age 18. However, adolescents who have already engaged in some form of gambling (the majority in most studies) have enhanced recall of advertising. They were familiar with the content of gambling advertising and some believed that it misinforms people, pushing them to gamble. Some studies found that exposure to advertisements significantly predicted adolescent gambling behaviour, but only for people over the age of 18. Despite these discrepancies, advertising including pricing promotions and those which appear visually appealing were consistently mentioned as being the most effective strategy for motivating young people to participate in gambling activities. Bouguettaya et al. reported similar findings.⁸ A large percentage of adolescents experiencing problem gambling reacted to advertising with a want to engage in betting. They also reported an oversaturation of advertising and marketing, contributing to the normalisation of gambling.

Table 1
Characteristics of included reviews.

| Authors | Title | No. of relevant studies included | Exposure variables identified | Outcome variables identified | Subgroups and modifying factors identified | Limitations and potential sources of bias identified within included primary studies | Summary of results |
|--|--|---|--|---|---|---|--|
| Bouguettaya et al. (2020) ⁸ | The relationship between gambling advertising and gambling attitudes, intentions and behaviours: a critical and meta-analytic review | 27 (11 –attitudes 8—intentions 2—behaviour) | Advertising observed (recall), fake or real advertisements, ban on EGMs, expenditure on advertising, reporting watching a show with embedded advertising, online and offline advertising | Intent to gamble (e.g. likelihood of placing a bet), problem gambling, actual betting, past gambling, attitudes (e.g. feelings) | Children and young people; 'problem' and 'non-problem' gamblers | Lack of high quality research. Most rely on recall or self-report which risks reporting bias. Quantitative papers suffer from poor methodological and statistical reporting. Reverse causation cannot be ruled out due to lack of longitudinal and experimental studies. Majority evidence from Australia (16 of 27) | Attitudes and intentions: exposure likely to be associated with more positive attitudes and greater intentions to gamble. Behaviour: exposure likely to increase gambling and problem gambling behaviour. |
| Newall et al. (2019) ⁹ | Gambling marketing from 2014 to 2018: A literature review | 19—perception 8—behaviour | Different types of advertising e.g. free bets/'risk-free'/sports related/casino games | Perceptions related to recall; awareness; normalisation; understanding; susceptibility | Children; 'problem' and 'non-problem' gamblers | Largely retrospective and recall of advertising and of behaviour both subject to recall/reporting bias. Majority of evidence from Australia; little from other countries | Perception: more negative for active gamblers; children may be influenced/misled Behaviour: exposure prompts more frequent and riskier gambling |
| Guillou-Landreat et al. (2021) ¹⁰ | Gambling Marketing Strategies and the Internet: What Do We Know? A Systematic Review. | 21 (9—behaviour 12— content/ perceptions) | Self-reported exposure to advertising, uptake of inducements, receiving direct messages, number of gambling accounts | Subjective (self-reported) influence on betting, impact of specific features of advertising | Children and young people; 'problem' and 'non-problem' gamblers | Potential cultural bias as most studies are from New Zealand and Australia. Potential selection bias as it did not include studies on traditional media (i.e. TV, radio, press). Both limit the generalisability of results. Limited discussion of the methodological limitations of the literature (relying on self-report, lack of causal evidence) | Behaviour: increased accessibility and use of promotions as influencing behaviour. Problem of impulse sports betting, especially for problem/at-risk gamblers. |
| Wardle (2019) ¹¹ | Perceptions, people and place: Findings from a rapid review of qualitative research on youth gambling | 21 (8—advertising and behaviour, 13—other) | N/A | Self-reported opinions on gambling advertising (focus groups/interviews) | | Methodologies (including sampling) tend to be poorly reported, and there is a lack of detailed analysis in some papers. Some studies had wide ranging aims and lacked depth. Lack of evidence on gender and cultural differences (and socioeconomic). Potential for systematic biases in those who took part in the research due to this lack of diversity. | Perceptions: advertising seen to normalise gambling (especially in sport) Behaviour: bonus offers (free bets) as being the greatest incentive, advertising making young people 'want to bet' |
| Labrador et al. (2021) ¹² | Exposure of adolescents and youth to gambling advertising: A systematic review | 31 (23—behaviour/ attitude, 8—content) | Recall of brands/adverts, self-reported exposure to gambling advertising | Self-reported (perceived) impact of advertising | Gender as modifying factor (young people only included) | Some studies are older and might be outdated Papers rely on self-report which risks reporting and recall bias Cultural bias as most studies from Australia/Canada | Behaviour: most young people feel that advertising would not influence their behaviour. Some feel that it makes them want to bet. Promotions are seen as the most effective strategy to motivate participation. Attitudes: advertising normalises gambling, shows you how to do it Gender: some evidence that young males are more affected by advertising |
| Wardle et al. (2019) ¹³ | What do we know about gambling-related harm affecting migrants and migrant communities? A rapid review | 38 (4—advertising and behaviour) | N/A | N/A | Migrant groups (not born in the country in the study) | Most studies are New Zealand/Australia so there may be a cultural bias | Exposure: might have increased exposure compared to their home jurisdictions; advertising targeted towards specific ethnic groups (e.g. built on significant cultural events) Behaviour: migrants tend to gamble less overall |

(continued on next page)

Table 1 (continued)

| Authors | Title | No. of relevant studies included | Exposure variables identified | Outcome variables identified | Subgroups and modifying factors identified | Limitations and potential sources of bias identified within primary studies | Summary of results |
|---|---|---|-------------------------------|--|--|--|--|
| Livingstone et al. (2019) ¹⁴ | Identifying effective policy interventions to prevent gambling-related harm and behaviour | 100 (4—advertising and behaviour) | | Attitudes (whether advertising resonates with respondents) | Adolescents and young people | Overall study quality is weak (lack of large-scale studies, RCTs not feasible, significant influence from industry). Undeclared, incomplete or inaccurate declarations of COI in relevant sections of publications (some journals do not consistently enforce ISAJE guidelines). Lack of neutral terminology (e.g. “gaming” instead of “gambling”, “play” instead of “use”). | Behaviour: there is little evidence on the efficacy/effectiveness of restricting advertising; sports betting advertising resonates with younger fans (<18yrs) by normalising/legitimising it. Attitudes: studies reported no effects from intervention or did not recommend school-based educational programmes. |
| Rodda (2020) ¹⁵ | A Rapid Review and Research Gap Analysis: A 2020 update. | 215 (20—policy, of which 8—advertising and behaviour) 195—other | | Attitudes, intentions (intended betting), and behaviour (actual betting) | Adolescents and young people; ‘non-problem’ gamblers | Empirical literature is mostly exploratory and cross-sectional (low quality). Policy literature (section including the advertising literature) assigned a particularly low quality rating: 75% low/very low, 10% high quality | Behaviour: included studies consistently report an association between advertising, incentives, and unwanted gambling behaviours (e.g. ‘problem’ gambling). Evidence is well established (particularly for in-game promotions) |

Wardle (2019)¹¹ undertook a rapid systematic review of qualitative literature on the perceptions, determinants and gambling experiences of young people to understand the impact of gambling and the precursors of gambling behaviour in the future. 21 papers were included, of which seven discussed the impact of advertising five qualitative, two mixed-methods. The mixed methods research shows that children and young people have high awareness and recall and therefore exposure to gambling advertising. When asked directly, young people report that advertising does not impact their behaviour. Despite this, the anecdotal evidence in qualitative studies suggests that children and young people are influenced by gambling advertising. Evidence shows that young people were influenced most by promotions, such as bonus bets. Many view these incentives as ‘free money’, encouraging them to sign-up with multiple operators. Incentives were seen to ‘lure’ young people into gambling with the promise of winning or the ‘fear of missing out’. Targeted and personalised advertising was also recognised as gambling companies ‘pursuing’ young people. Generally, advertising is seen to alter the gambling environment for young people, normalising the activity and making young people feel a need to bet.

Another rapid systematic review by Wardle et al. (2019)¹³ explored gambling participation, motivations, harms and provision of support for migrant populations. Of 38 included studies, three papers published between 2009 and 2016 discussed the potential impact of advertising two qualitative and one literature review. The literature suggests that advertising may be specifically targeted towards migrant groups to encourage participation in gambling. Some advertising campaigns have been reported to utilise significant cultural events to attract ethnic minorities to gambling activities, using people as cultural symbols.

A systematic review by Livingstone et al. (2019)¹⁴ sought to critically assess the literature on harm minimisation related to Electronic Gaming Machines (EGM) and online betting. Out of 100 articles related to gambling, four studies looked at gambling advertising. Of these, three were unique to this review and two looked specifically at the impact of advertising; the widely cited Binde (2014)¹⁶ literature review and a qualitative study found that children have high recall of gambling advertising and brands. Children and young people were most aware of advertising linked with sports, which is seen to normalise gambling. Some children reported wanting to bet on sports due to the widespread advertising of sports gambling.

Rodda (2020)¹⁵ undertook a rapid systematic review of the gambling literature with a focus on harm minimisation. This review included 215 studies covering seven research questions. 20 papers were relevant to the research question about policy and 14 of these included a discussion on gambling advertising. This search captured four systematic reviews already included in this umbrella review and an additional five unique primary papers. The longitudinal and cross-sectional evidence shows that advertisements for gambling are linked to a greater likelihood of betting, intention to bet, and expenditure on betting. Longitudinal evidence suggests that advertising influences the frequency and size of bets amongst existing bettors, but these results do not vary by gambling risk level. Cross-sectional evidence suggests that young people have high recall of gambling advertising. Experimental evidence indicates that higher risk gamblers experience higher physiological desire when viewing advertising. They also have higher overall desire ratings for advertisements and subsequently higher rates of gambling harm.

Overall, these reviews consistently reported that exposure to advertising is associated with more positive attitudes and greater reported intentions to gamble. They find a direct association between exposure to advertising and gambling activity, with a ‘dose

response' effect whereby greater exposure to or awareness of advertising is associated with more gambling activity and higher risk gambling activity. Associations between exposure to advertising, positive attitudes to gambling and more risky gambling behaviour are generally found to be greater for those individuals who are already at risk of harms and higher levels of exposure to advertising are directly related to gambling severity scores (as measured by the Problem Gambling Severity Index).¹⁶ Children and young people consistently report a high level of awareness of and exposure to advertisements with both parents and children reporting that advertising has normalised gambling as a risk-free leisure activity.

Discussion

The number of very recent systematic reviews included in this umbrella review reflects a significant increase in both primary research and evidence synthesis in the field of gambling advertising. A particularly large number of relevant primary studies and reviews have been published in the last three years. Limited time and resources meant that our review could not be fully comprehensive. In particular, we were not able to include reviews published on languages other than English that might have expanded the coverage of regions with different policy approaches to gambling advertising.

A traditional systematic review methodology synthesises findings from similar studies, addressing the same research question and generally using the same or similar methods. In contrast, our review aimed to bring together the diversity of approaches and evidence relevant to understanding the causal pathway between advertising and gambling-related harms. Our review thus included a broad range of evidence, foregoing the ability to undertake a quantitative synthesis and identification of the consistency of evidence at the primary study level. In this context, it is notable that there was strong consensus across reviews in terms of conclusions despite widely differing synthesis methods. Using these methods, we were still able to identify a large and diverse body of evidence on the relationship between advertising and marketing related to gambling activities, products and brands and a wide range of outcomes.

Different study designs provided different types of evidence examining the relationship between advertising and harms. Quasi-experimental studies and surveys have provided consistent evidence for an association between exposure to advertising and gambling-related outcomes and increasing evidence of a 'dose–response' relationship, greater exposure being associated with larger effect sizes. The experimental and qualitative studies provide detailed evidence regarding causal mechanisms. Experimental studies reveal the role of intentions: advertising exposure directly influences decisions to gamble and to participate in more risky gambling. Qualitative studies based on focus groups and in depth interviews explored how, and why, some subgroups may be particularly susceptible to harmful responses to advertising. They demonstrate how social effects of advertising, such as 'normalisation', may lead to harm. All study designs contribute to the evidence for a dose–response relationship whereby increasing exposure has an increasing impact. Similarly, all study types provided evidence specific to the impact of advertising on vulnerable groups who may be at a higher risk of harm from advertising exposure.

Several widely cited reviews, that did not meet our inclusion criteria, support our overall findings of consistent associations between exposure to advertising and attitudes, intentions and gambling behaviour and that the relationship is strongest among those already at risk of harm from their gambling activity.^{17–24}

More recent primary studies provide additional support for consistent associations between exposure to advertising and gambling-related attitudes and behaviour, including higher risks of harmful gambling activities for children, young people and those already at risk of harm from their gambling behaviour.^{25–32}

The evidence base does have significant limitations and is largely characterised by cross-sectional surveys and qualitative studies of self-reported exposure, attitudes and behaviour in the general population and experimental or quasi-experimental studies conducted with those already identified as at increased risk due to their gambling activity or seeking treatment. There is a notable lack of longitudinal studies. There are also gaps in relation to evidence related to some specific forms of advertising, particularly outdoor and point of sale advertising which are environmental exposures over which the individual has very little control. Given the dependence on self-report of gambling activity in this field, there is an urgent need of research to use more objective measures of both exposures to advertising and gambling activity (e.g. account data). However, it is also crucial that research in this field is independent of any risk of industry influence and of direct or indirect industry funding and that funding of research and authors' potential conflicts of interest are always comprehensively and transparently reported.

In the absence of definitive controlled studies, the substantial and consistent evidence base supports restrictions to reduce exposure to gambling advertising. This is particularly likely to reduce risk of harm to children and young people and among adults who are already vulnerable to, or experiencing, gambling-related harms. Such restrictions could not only reduce overall harm but also mitigate the impact of advertising on gambling-related inequalities. Public health harm prevention strategies should therefore include policies which limit exposure to advertising, particularly among children and vulnerable groups.

Gambling advertising restrictions could reduce overall harm and mitigate the impact of advertising on gambling-related inequalities. Public health harm prevention strategies should ideally include a range of policies which limit exposure to advertising, particularly among children and vulnerable groups. Policy evaluations of such restrictions, using methods that have already been successful in evaluating the impact of other advertising restrictions,^{33–35} could also add significantly to the evidence base to inform future public health policy.

Author statements

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Ethical approval

None sought.

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Competing interests

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Contributors

EM, EG, HW, MC and CS drafted the study protocol. MC developed the search strategy and undertook the literature searches, and EM, EG and HW contributed to the screening process and selection of included studies. EM and EG extracted data and completed the quality assessment independently. All authors (EM, HW, MC, LB, RP, MF, CS, EG) contributed to the data synthesis and interpretation of findings. All authors (EM, HW, MC, LB, RP, MF, CS, EG) critically reviewed and approved the manuscript.

Data sharing

All the data included in this review are in the public domain in the form of journal articles and/or reports available on line or from the corresponding author.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.puhe.2022.11.019>.

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