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Interventions to reduce the public health burden of gambling-related harms: a mapping review

Lindsay Blank, Susan Baxter, Helen Buckley Woods, Elizabeth Goyder

Recognition is growing that gambling, although highly profitable for corporations and governments, is a source of serious and unevenly distributed harm. This recognition has led to demands for public health strategies at the local, national, and international levels. We aimed to identify review-level evidence for interventions to address or prevent gambling-related harms and explore policy implications, using stakeholder consultation to assess the evidence base, identify gaps, and suggest key research questions. We opted for a systematic mapping review and narrative synthesis for all forms of gambling in any setting. We included participants from the whole population, identified gamblers including self-defined, and specific populations at risk (eg, children and young people). We included all outcome measures relating to prevention or treatment of gambling-related harms that were reported by review authors. After duplication, the searches generated 1080 records. Of 43 potential papers, 13 were excluded at the full paper stage and 30 papers were included in the Review. We identified whole-population preventive interventions, such as demand reduction (n=3) and supply reduction (n=4) interventions, and targeted treatment interventions for individuals addicted to gambling, such as therapeutic (n=12), pharmacological (n=5), and self-help or mutual support (n=4) interventions. We also reviewed studies (n=2) comparing these approaches. Interventions to screen, identify, and support individuals at risk of gambling-related harms and interventions to support ongoing recovery and prevent relapse for individuals with a gambling addiction were not represented in the review-level evidence. A public health approach suggests that there are opportunities to reduce gambling-related harms by intervening across the whole gambling pathway, from regulation of access to gambling to screening for individuals at risk and services for individuals with an identified gambling problem. The dearth of evidence for some interventions means that implementation must be accompanied by robust evaluation.

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Introduction

Gambling is a highly profitable commercial activity with providers that include international corporations and governments.[1] The past decade has seen unprecedented growth in commercial gambling. The prevalence of problem gambling in different countries across the world was estimated to vary between 0·1% and 5·8% in 2019.[2] Revenue from advertising has increased substantially, driven by gambling in the home and on mobile devices.[3] In 2018–19, the total revenue for the UK gambling industry was £14·3 billion,[4] with £5·6 billion lost by online gamblers in 2018.[5]

Gambling-related harms are the "adverse impacts from gambling on the health and wellbeing of individuals, families, communities and society".[2,6] Gambling has the potential to negatively affect physical health, psychological health, and the social functioning of the people who gamble and others around them.[2] Various terms have been used to describe potentially harmful gambling behaviour, including compulsive gambling, addictive gambling, problem gambling, and pathological gambling.[7] These terms all refer to a pattern of excessive gambling with impaired control over gambling behaviour, substantial negative consequences deriving from this impaired control, and persistence in excessive gambling despite these negative consequences.[8] Previous reviews have shown that education and prevention initiatives could succeed in increasing knowledge and awareness of the risks associated with gambling, but the extent to which these interventions can alter behaviour and therefore mitigate harm is yet to be ascertained.[9]

In several countries, policy documents increasingly propose public health strategies to reduce harms at the national and local level,[10–13] with calls to regulate stakes and prizes, improve affordability checks, and provide better support to gamblers.[5] Still, it is not clear how best to reduce the wider impact of gambling-related harms. We did a mapping review of review-level evidence to identify, appraise, and synthesise existing evidence for interventions that aim to reduce gambling-related harms, and to identify gaps in the evidence base.

Methods

Overview

The objective of the initial phase of our work was to map out and broadly describe the published systematic-review literature on interventions to address or prevent gambling-related harms. We included only systematic review-level evidence, but we applied broad criteria to include all forms of gambling and all populations (both studies that considered participants with an increased risk of gambling-related harms and studies that looked at the population as a whole). Although not typical of a mapping review, we carried out extractions at the level of full papers to allow us to generate a typology of the interventions done. The protocol of our mapping review is available online.

For the **mapping review protocol** see https://scharr.dept.shef.ac.uk/phrt/wp-content/uploads/sites/24/2020/09/Review-Protocol-Policies-and-interventions-to-reduce-gambling-related-harm-revised-FINAL.pdf

Search strategy and selection criteria

We searched the MEDLINE, Embase, Web of Science (Science Citation Index and Social Science Citation Index), Applied Social Sciences Index and Abstracts,

PsycINFO, and Social Policy and Practice databases. The search strategy combined various terms relating to gambling and included both subject (Medical Subject Headings [MeSH]) and free-text searches (appendix). We applied methodological search filters for systematic review-level evidence and scrutinised the reference lists of included studies. We limited results to reviews published since 2012—the date of the first comprehensive international review of gambling-related harms[7]—and to reviews published in English. For full details of the search terms used, see the appendix.

See Online for appendix

Search results were downloaded with EndNote, screened by LB (with 20% of results checked by SB), and coded with the keyword function. Papers that potentially met the inclusion criteria were coded and retrieved as full paper articles. For papers for which the title and abstract did not give a clear indication of whether the paper should be considered or not, we took an inclusive approach by examining the full paper.

Papers, to be included in our analysis, were required to address the whole population, identified gamblers (including self-defined), or specific populations at risk (eg, children and young people). The papers were also required to use any intervention to prevent or address gambling-related harms, with any or no comparison, and measure any outcome related to the prevention or treatment of gambling-related harms.

Data analysis

For studies judged to be potentially relevant, we obtained full papers and extracted and tabulated data on author, year, review design, setting, target population, intervention, inclusion criteria and search date, outcomes assessed, findings, conclusions, limitations, and notes. We synthesised the findings narratively and developed a typology of interventions. We drew on a systems approach adopted for the project overall to ensure that the mapping review considered evidence at all levels in systems connecting gambling activity to gambling-related harms. This approach meant we could identify where there were specific gaps in the availability of evidence. As is common for a mapping review,[14] we did not do a quality appraisal but we did record the type of study design.

A public advisory group consisting of eight individuals from across the UK with experience of gambling-related harms themselves, or through family or friends, provided advisory input via teleconference throughout the process. Their input highlighted the changing nature of people affected by addiction, emphasising the need to describe gambling as an addiction, and the lifelong struggles to avoid relapse. The group ensured that we considered wider population views on gambling-related harms, rather than just the views of the authors of included studies. We also sought participation from a broad range of stakeholders via a webinar, in which we discussed the initial findings from the mapping review. In total, 19 participants representing a range of practice, charity, and academic stakeholders from the UK attended the webinar and provided input regarding the implications of the evidence we had identified and gaps in our understanding.

Results

Our searches generated 1080 unique records. Of these records, 43 citations were retrieved as potentially relevant full papers. We excluded 13 from these 43 citations, mostly because the methodology was not systematic or the review did not consider intervention studies (appendix).

Of the 30 papers that met the criteria for our Review, search end dates varied between 2011 (n=2) and 2018 (n=1), with half of all searches done between 2015 and 2017 (n=16). Three papers did not state their search dates. Publication dates ranged from 2012 to 2019 (with eight reviews published in 2018–19).

To synthesise the results of the identified systematic reviews, we developed a typology of interventions in terms of the study target population and the type of intervention. A draft list of interventions was taken from the work done to inform the Review protocol. Consideration was given to how well the reported interventions fitted the model and whether any gaps were notable.

The reviews were divided into those reporting on universal preventive interventions for the whole population and those evaluating selective interventions for individuals at high risk of harms. The whole-population preventive interventions included interventions to reduce the demand for gambling (demand reduction; n=3) and interventions to restrict opportunities to gamble (interventions restricting gambling activity; n=4). Targeted interventions for individuals at increased risk of gambling-related harms included therapeutic interventions (n=12), self-help or mutual-support interventions (n=4), and pharmacological interventions (n=5). We also included studies comparing different interventions (n=2).

Two further potential types of intervention we had expected to find were not represented in the systematic review-level evidence. First, interventions to screen, identify, and support individuals at risk of gambling-related harms (whole population). Second, interventions to support ongoing recovery and prevent relapse for gamblers at risk of harms. The intervention typology is outlined in the figure, with study details summarised in the table.

Whole-population preventive interventions

Demand reduction

The interventions to reduce demand identified by our searches were limited to interventions delivered to children and young people. Three reviews reporting school-based education programmes were identified.[15–17]

Keen and colleagues[15] identified 19 studies of school-based education programmes for gambling. Programmes

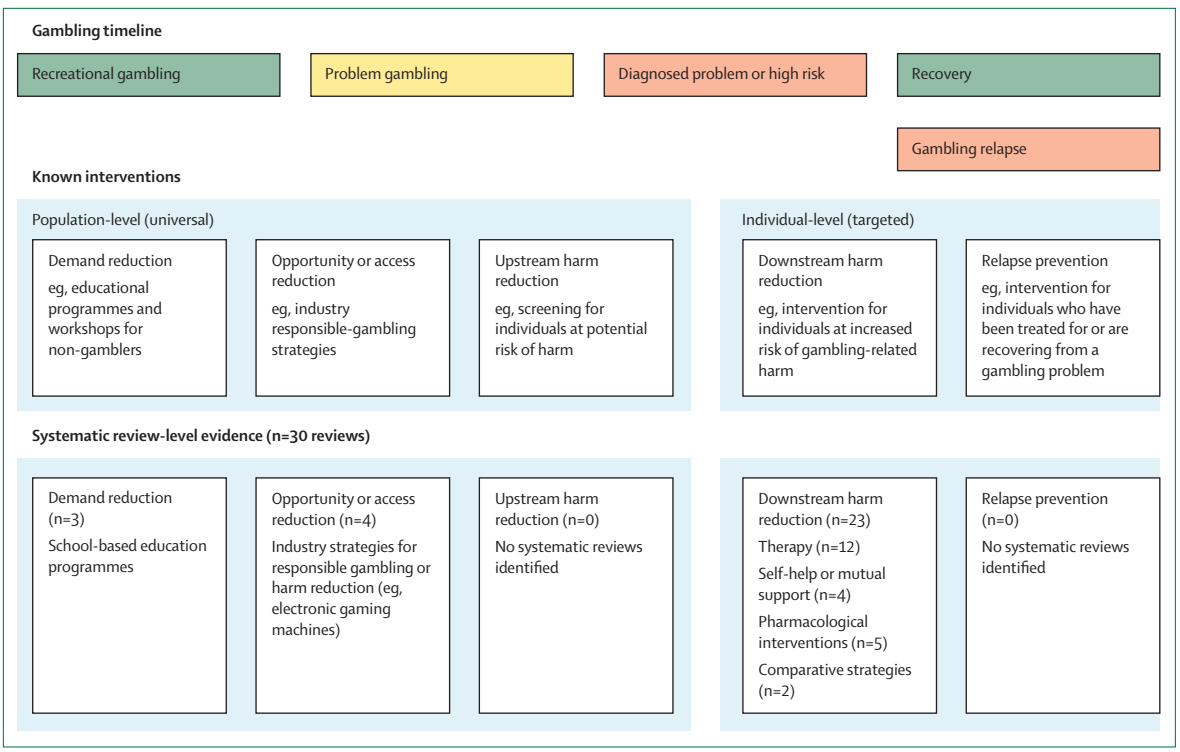

Figure: **Timeline of gambling stages with associated interventions and supporting evidence**

ranged from 20 to 500 min in length and typically consisted of videos viewed by whole classes. Nine studies measured outcomes related to gambling behaviour, of which five showed positive effects. Follow-up for most studies was short, and definitions of gambling-related harm and measures of gambling behaviour varied between studies. Ladouceur and colleagues[16] reviewed both school-based programmes for the prevention of gambling-related harms, and gambling and related skills workshops to prevent gambling-related harms for youths (aged 9–20 years). The authors reported that programmes and workshops were both effective in reducing misconceptions and increasing knowledge about gambling in the short term, but a scarcity of long-term follow-up was noted. Kourgiantakis and colleagues[17] aimed to identify programmes for the prevention of gambling-related harms that targeted children of gamblers. However, the 16 studies that they identified were all universal interventions and did not target their population of interest. Kourgiantakis and colleagues also reported a scarcity of long-term follow-up (no more than 3 months in most cases).

Review-level evidence on demand reduction interventions therefore, although sparse, suggests probable benefits of better gambling knowledge and attitudes of young people in the short term. However, little evidence regarding longer-term benefit exists. Establishing whether interventions are able to prevent the development of gambling-related harms in youths remains difficult.

Supply reduction

We identified four systematic reviews of interventions that aimed to facilitate gamblers themselves to restrict their gambling activity. Ginley and colleagues[18] reviewed on-screen and poster warning messages related to gambling (limit-setting messages, educational animations, cash-expended displays, and personalised feedback) in both laboratory-based and so-called naturalistic studies (n=31). The review indicated that static signs have poor efficacy, but that pop-up messages can potentially reduce harm, particularly high-threat messages endorsed by medical or government agencies. Ladouceur and colleagues[19] reviewed pre-commitment systems for electronic gaming machines. The studies (n=17) found variable adherence to time limits. Importantly, these studies failed to control for concurrent gambling outside the trial venues. McMahon and colleagues[20] did a review of reviews on prevention and harm-reduction programmes for gambling in adults and youths, with and without a diagnosed gambling-related condition. They identified ten systematic reviews that met their inclusion criteria (n=55 studies). They reported some support for smoking bans, limit-setting messages, self-exclusion, prohibition of large notes, maximum bets, removal of cash machines, machine messages, and personalised feedback interventions but stated that the evidence overall was poor. Tanner and colleagues[21] evaluated industry and environment-based strategies for the prevention of gambling-related harms (n=27 studies). They found mixed effects for mandatory limit-setting,

	Review design	Setting	Target population	Intervention	Other inclusion criteria and search date	Outcomes assessed	Findings	Conclusion	Limitations and notes
Demand reduction interventions									
Keen et al (2017)[15]	Systematic review	School-based	Schoolchildren	Gambling education programmes	Quantitative analysis; not therapeutic setting, media campaign, public announcement, or website; search date: up to January, 2017	Behavioural outcomes; cognitive outcomes (knowledge, perceptions, and beliefs)	19 studies (20 papers); 20–500 min per programme (very varied); mostly class cohort videos; nine studies measured behavioural outcomes and five showed positive effects; universal and targeted approaches	Not possible to establish whether cognitive improvements prevent development of gambling problems: fairly few youths gamble at problematic levels so hard to assess real-world outcomes; programmes should be universal and early-age focused	Methodological inadequacies: brief or no follow-up, no control, inconsistencies in measures of gambling behaviours; probable publication bias as large numbers of school programmes exist
Ladouceur et al (2013)[16]	Systematic review (described as critical review)	Universal and school-based	Youths (aged 9–20 years)	Gambling-specific prevention programmes; gambling and related skills workshops	Search date not stated	Reducing gambling misconceptions; increasing gambling knowledge	15 studies; programmes and workshops effective in reducing misconceptions and increasing knowledge about gambling in the short term	No positive effects on gambling behaviours or gambling-related problems; good strategies to raise awareness of problems; targeted preventive approaches required	Review reports individual studies only—no synthesis; primary studies did not have long-term follow-up or behavioural outcomes
Kourgiantakis et al (2016)[17]	Systematic review	Any	Children or youth (not defined)	Problem gambling prevention programmes	Qualitative, quantitative, and mixed methods; published in English or French; search date: 2000–14	Increasing knowledge and modifying misconceptions about gambling; participant skills; gambling behaviour	16 studies; all programmes were universal and did not target intended subgroups (ie, children of problem gamblers); most studies had single post-test measure (1–3 months); most found increase in knowledge and attitude measures; only two studies showed change in gambling behaviour after intervention	No secondary or tertiary prevention programmes; no family-focused prevention	No study limitations reported
Supply reduction interventions									
Ginley et al (2017)[18]	Systematic review	Laboratory-based interventions; naturalistic studies	Gamblers	Gambling-related warning messages: limit setting, educational animations, cash expended displays, PFIs	On-screen or poster messages; search date: up to June, 2016	Effect on gambling attitude, knowledge, or behaviour	31 studies; static signs have modest efficacy; on-screen placement of pop-up messages appears to be important and messages were more effective if they interrupted play and required active removal by the player; the most effective messages were brief, easy to read, and direct	Pop-up messages are largely supported and potentially reduced harm, particularly high-threat messages endorsed by medical and government agencies; greatest effect with messages about probable losses and social consequences; limit-setting and personal feedback reduced money spent and time gambling; participants were more likely to set time limits than money limits	Questions over transfer from laboratory (often one gambling interaction) to real life; reliance on self-reporting of message effect; no long-term follow-up
Ladouceur et al (2012)[19]	Systematic review (described as critical review)	Electronic gaming machines	Individuals who gamble using electronic gaming machines	Pre-commitment systems for electronic gaming machines (expenditure and time limits)	Search date not stated	Self-reported measures of gambling	17 studies; variable adherence to money and expenditure limits; few gamblers used time limits; suggests 70% of gamblers positively predisposed to pre-commitment (but not clear where this figure comes from)	Pre-commitment systems show potential promise for some gamblers, but no conclusive statement is offered	Individual studies only, no synthesis; unclear where discussion comes from; studies failed to control for concurrent gambling outside the trials (eg, other venues)

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	Review design	Setting	Target population	Intervention	Other inclusion criteria and search date	Outcomes assessed	Findings	Conclusion	Limitations and notes
(Continued from previous page)									
McMahon et al (2019)[20]	Review of reviews	Any	Children and adults with or without a diagnosed gambling disorder (studies exclusively in individuals with a gambling disorder excluded)	Prevention and harm-reduction programmes for gambling: supply reduction, demand reduction, and harm reduction (harm minimisation framework)	Four databases, inception to 2018; reviews including studies with or without controls; qualitative syntheses excluded; reviews met Database of Abstracts of Reviews of Evidence criteria; search date: up to May 1, 2018	Influence on capability, opportunity, motivation–behaviour (COM-B framework); change in gambling-related behaviour or gambling harm; effects on population subgroups	Ten systematic reviews (55 studies); one review found limiting opening hours and shutdown machines did not lead to positive outcomes; another review found that caps on gaming machines had no effect; some support but overall mixed evidence on youth prevention interventions, smoking bans, limit-setting, self-exclusion, prohibiting large notes, maximum bets, removal of cash machines; evidence of positive effects of machine messages and PFIs	Some weak support for smoking bans, limit-setting, self-exclusion, prohibition of large notes, maximum bets, removal of cash machines, machine messages, and PFIs; overall quality of evidence is poor	Voluntary interventions limited by user adherence to them and could have unintended negative consequences for high-risk gamblers; focus on individual reduction rather than supply reduction
Tanner et al (2017)[21]	Systematic review	Any	People of legal age to gamble (17-year-olds in laboratory-based studies included)	Industry or environmental-based strategies	Published in English; quantitative measures; general awareness and advertising excluded; PsycINFO and PubMed databases; search date: up to 2016	Any	27 studies included; mixed effects for mandatory limit-setting, smaller notes, on-screen clock or counter, smoking bans; generally positive effects from removal of cash machines; small effects of removing cash machines from venues; most researched area was pop-up messages; self-appraisal messages were more effective than information messages	Potential for positive effects of self-appraisal pop-up messages, US$1 maximum bets, removal of large-note acceptors and cash machines, reduced operating hours, and smoking bans; pop-up messages combined with mandatory monetary limits might be effective	Studies are of poor quality, with reliance on self-reported measures
Therapeutic interventions									
Challet-Bouju et al (2017)[22]	Systematic review	Not specified	Problem gamblers, according to DSM and ICD	Cognitive remediation (behavioural training intervention to improve cognitive processes aiming for durability and generalisation)	Therapeutic aim; search date: January, 2017	Efficacy of interventions to reduce problem gambling	Only one study identified; playmaker video game with biofeedback, designed to treat impulse control disorders; positive effect on impulsivity and expression of anger; no evidence of effect on relapse	Research needed; cognitive remediation might be combined with commonly used interventions (such as CBT or motivational interviewing) to make therapeutic interventions more effective and longer lasting than by itself, and decrease relapse	No study limitations are discussed in this paper; conclusion appears to be speculative
Luquiens et al (2018)[23]	Systematic review	Not specified	People with a gambling disorder	Cognitive training (neurocognitive approach for problem behaviours)	PubMed, Google, ClinicalTrials.gov database; no language restriction; reporting efficacy data; search date: up to 2017	Any	No studies identified	No data currently regarding the effectiveness of cognitive training in gambling disorder	Authors argue the approach has potential

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	Review design	Setting	Target population	Intervention	Other inclusion criteria and search date	Outcomes assessed	Findings	Conclusion	Limitations and notes
(Continued from previous page)									
Chrétien et al (2017)[24]	Systematic review	Not specified	Gamblers; mentions DSM pathological gambling in the paper	Cognitive restructuring (a form of CBT that treats gambling as the main problem)	In English or French; search date: 1980–2013	Aims to describe how cognitive remediation is done with gamblers	39 studies; 69·2% clearly reported therapeutic techniques to correct gamblers' thoughts; 47 treatments described: eight cognitive, 39 cognitive and behavioural; face to face (n=42) or self-treatment by manual or internet (n=5)	Cognitive restructuring seems to include the best practices of CBT; more research needed	39 studies did not describe the type of gambling; little detail of the intervention techniques used
Tolchard (2017)[25]	Described as not a systematic review but used systematic searching and inclusion criteria	Any	Any	CBT or behavioural approaches (mostly exposure therapy or cognitive restructuring)	CINAHL, MEDLINE databases; search dates: 1980–2015	Any	Unclear how many studies included; exposure therapy reported as being effective in up to 70% of cases; evidence on cognitive restructuring similarly positive for all types	Both cognitive and behavioural approaches can be effective in reducing problem gambling; many interventions include elements of both	Studies not controlled; few studies; small sample sizes; multimorbidity often excluded; unclear what active element in combined approaches is
Merkouris et al (2016)[26]	Systematic review	Any	Adults and adolescents seeking treatment for a gambling disorder	Any psychological treatment (no pharmacological treatments)	Multiple databases; studies doing statistical tests and measurements after treatment; published in English; primary studies; search date: 1990–2016	Gambling behaviours (eg, expenditure, frequency or time spent gambling), gambling symptom severity (eg, preoccupation with gambling, gambling urges, gambling harm), and gambling-related problems (eg, health or financial difficulties)	50 articles included from 33 studies; old age, being in a relationship, no gambling-related debt, small degree of pre-treatment gambling, low levels of alcohol use, low levels of depression, being in the action stage of change, being female, being Asian-American, and personality traits (eg, low self-transcendence, novelty-seeking, avoidance, and persistence) together with higher numbers of treatment sessions attended was associated with better outcomes	Sociodemographic, psychosocial, and psychological characteristics are predictors of gambling treatment outcomes	Need to consider during-treatment and post-treatment predictors, not only pretreatment predictors; statistical significance rather than clinical significance
Petry et al (2017)[27]	Systematic review	Any	People with a gambling problem (based on clinical diagnosis or screening questionnaire assessment)	Any psychological intervention	Trials with random assignment; at least 25 participants per condition; published in English; PubMed search engine; search date: up to September, 2016	Gambling outcomes	21 trials included; most studies found benefits from CBT (alone or combined with motivational interviewing); interventions can be delivered individually or in groups, in person or via the internet; evidence that motivational interviewing is not effective unless combined with CBT; brief advice or feedback might be of benefit but no better than other interventions and might not be suitable for those seeking treatment	There is evidence that six to eight sessions or a chapter of CBT that integrates motivational interviewing, if the treatment is entirely self-directed, for individuals seeking gambling treatment is effective at reducing gambling outcomes; for people with mild gambling problems, interventions involving feedback might suffice; studies found most interventions might be effective, with little difference between them	Benefits reported in the short term, but few studies reported long-term follow-up; included populations differed substantially; most studies used waiting-list controls; unclear whether interventions outperform natural recovery over long periods; controlled gambling might be more successful than abstinence so goals might be important in outcomes

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	Review design	Setting	Target population	Intervention	Other inclusion criteria and search date	Outcomes assessed	Findings	Conclusion	Limitations and notes
(Continued from previous page)									
Cowlishaw et al (2012)[28]	Systematic review (Cochrane)	Not specified; papers found were in community or outpatient settings	Pathological and problem gamblers (male and female of any age and ethnicity); included gamblers who were clinically diagnosed and self-assessed	Psychological therapies (CBT, motivational interviewing, integrative therapy, other psychological therapies)	Search date: up to October, 2011	Gambling symptom severity; financial loss from gambling; frequency of gambling; occurrence of pathological gambling diagnoses; anxiety; depression	14 studies; at 3 months after treatment, CBT showed beneficial effects on gambling symptom severity and financial loss (n=11); at 6–12 months, motivational interviewing showed a significant effect in terms of gambling frequency (n=4); other interventions had very small numbers of studies	Supports short-term efficacy of CBT in reducing gambling behaviour after treatment; preliminary evidence for some benefits from motivational interviewing	Studies varied in quality; long-term benefits unclear; inadequate concerning relapse; studies had few exclusion criteria and various types of preferred gambling method
Yakovenko et al (2015)[29]	Meta-analysis	Any	Adult disordered gamblers	Motivational interviewing; most studies were one session face to face	Multiple databases; no language restrictions; RCTs with control group of no intervention or no MI (an alternative intervention was provided to the control group); search date: 1966–2013;	Gambling frequency or gambling expenditure (most studies used mean days per month or mean dollars lost per month)	Five studies included in meta-analysis, published in 2001–09; significant reduction in gambling frequency per month at 6-month follow-up (mean difference −1·22 days per month, 95% CI −2·06 to −0·38, p<0·05); also significant at 9-month to 12-month follow-up (−1·12 days per month, 95% CI −2·16 to −0·07, p<0·05); no significant reduction in gambling expenditure at 6 months (p=0·07) or 9–12 months (p=0·15)	Evidence of positive (but clinically modest) effect of motivational interviewing on reducing gambling frequency; authors also conclude there is evidence for a reduction in gambling expenditure but the data presented shows a non-significant effect	Difference between author conclusion on effects on both outcomes and analysis presented; authors highlight small number of studies and limitations in measurement comparability between studies
Peter et al (2019)[30]	Meta-analysis	Minimal or no direct contact or in-person contact	Unclear	Brief PFIs (maximum one session); studies outlined behavioural feedback or psychological measure feedback	Published in English; peer-reviewed studies with random allocation to a comparator condition; included one other systematic review; multiple databases; search date: up to 2016	Behavioural gambling data; measures of gambling problems;	11 studies included, detailing 16 types of intervention; small but statistically significant effect of PFIs (*d*=0·20, 95% CI 0·12–0·27); strongest predictor of effect size was the inclusion of education, followed by use of motivational interviewing; providing feedback on a psychological measure and therapist delivery of the intervention negatively predicted effect size	Gambling-focused PFIs serve as a viable harm-reduction strategy; interventions should include behavioural descriptions of an individual's own gambling behaviour paired with normative comparisons; interventions that are not in person are more effective and cost-effective than in-person interventions in the absence of motivational interviewing	Only short-term effects examined
Quilty et al (2019)[31]	Systematic review and meta-analysis	All settings (eg, academic institutions, health-care settings, and community settings) apart from group, telephone, and online settings	Problem gamblers older than 16 years	In-person brief interventions for gambling behaviours and problem gambling	RCTs; brief intervention of no more than three sessions; search date: 1990–Sept 1, 2017	Gambling behaviour (presence or absence, frequency, severity); associated problems	Five studies; small but statistically significant reduction in gambling behaviour in short term *vs* assessment-only control; not significant for long-term changes (duration unclear); no difference between short and long interventions	Supports the efficacy of brief interventions for problem gambling over the short term; no difference between brief and long interventions	Few studies; only four research teams; many had fewer than 25 participants per treatment condition; all done in North America

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	Review design	Setting	Target population	Intervention	Other inclusion criteria and search date	Outcomes assessed	Findings	Conclusion	Limitations and notes
(Continued from previous page)									
Chebli et al (2016)[32]	Systematic review	Online	Treatment-seeking adults	Internet-based therapeutic interventions in conjunction with clinical assistance (might be real-time or delayed [eg, chat *vs* email])	Excluded self-help programmes with no therapist input; search date: up to May, 2015	Effectiveness in treating addictive behaviour; follow-up period; therapist contact throughout the programme; psychological distress and psychopathology	16 studies; four considering pathological gambling (not defined); all interventions were CBT; three non-comparative studies and one RCT; favourable changes in pathological gambling sustained at follow-up (maximum 3 years)	Positive treatment outcomes reported for all gambling studies with respect to gambling behaviour	Three studies did not have control and comparison groups; no effect sizes reported; no meta-analyses
van der Maas et al (2019)[33]	Scoping review	Online	Any; most studies drew participants from users of gambling help websites	Internet or online interventions for problem gambling (either exclusively or as a component); CBT in six of 27 studies, most of which connected clients to mental health counselling	Six databases; search date: 2007–17	Included any outcomes; studies reported problem-gambling scores, gambling behaviour, anxiety and depression, gambling frequency, faulty cognitions surrounding gambling and alcohol consumption, distress	27 studies included; most studies reported improved problem gambling outcomes, including five of seven RCTs	Internet-based interventions are effective for problem gambling and offer a modified form of existing therapies	High rates of attrition; variance in the way people used interventions; internet gives easier and more flexible access to mental health professional help; absence of studies in marginalised groups
Comparing treatment interventions									
Goslar et al (2018)[34]	Systematic review and meta-analysis	Clinic and home	Adults with pathological gambling or problem gambling disorder (DSM-5)	Psychological treatments: face-to-face *vs* self-guided treatment to reduce problematic gambling behaviour	RCT (or quasi-RCT); search date: up to April 30, 2018	Global severity of disordered gambling; frequency of gambling; final loss from gambling at 0–3 months	27 studies; significantly higher effect sizes for face-to-face treatments in reducing problematic gambling behaviour; intensity of treatment moderated the effect but not type of intervention	Face-to-face treatment effectively reduced frequency and financial loss from gambling at 0–3 months after treatment; results from self-guided treatment were significantly inferior; individuals who gambled electronically benefited the most	Most studies were on electronic gambling; few studies; participants varied in terms of gambling severity
Rodda et al (2018)[35]	Systematic review and content analysis	Not specified (included studies from community, university, and clinic settings)	Adult gamblers or problem gamblers	Psychological and self-help interventions	RCT, quasi-RCT, or cross-over RCT; search date: January, 1980–April, 2016	Gambling symptom severity; gambling frequency; gambling expenditure	46 studies; psychological and self-help interventions; 35 intervention characteristics to define type of change technique, participant, study, intervention delivery and conduct, and evaluation (eg, control group); most (30 studies) were delivered by a therapist without a self-help element	Review assists in identifying and describing components of interventions, but further work is needed to identify categories of technique types and delivery characteristics associated with good outcomes	Mechanism of change rarely identified in study reports
Self-help and mutual-support interventions									
Drawson et al (2017)[36]	Systematic review	Not specified	Adult gamblers	Self-help: harm reduction through protective behavioural strategies (eg, self-exclusion, time and, monetary limits, cashless cards)	Actual or perceived benefits of protective behavioural strategies; search date: up to August, 2015	Reducing harms associated with gambling; gamblers' reported views (perceived benefits)	33 studies; evidence was weak; self-exclusion most often endorsed by gamblers but many returned to gambling after the exclusion period; gambling frequency, duration, expense, debt, and urge were reduced at 12 months	Self-exclusion was deemed the most promising strategy, but evidence was poor; self-exclusion might not be enforced by casinos	Study quality was low; quality analysis was not done as all studies would be excluded

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	Review design	Setting	Target population	Intervention	Other inclusion criteria and search date	Outcomes assessed	Findings	Conclusion	Limitations and notes
(Continued from previous page)									
Marchica and Derevensky (2016)[37]	Systematic review	Any	No restrictions reported; most studies were in problem or at-risk gamblers, with three in university students	PFIs	Included a comparator group; published in English; multiple databases; search date: 2003–15	Gambling prevention or reduction	Six studies included; all studies reported some reduction in a range of gambling behaviour outcomes but not all were significant; reduction in perceived norms	PFIs might be an effective intervention for changing perceptions of gambling and reducing at-risk problem gambling; altering perceived norms is a factor in change pathways	Half of studies in at-risk student populations; varying outcome measures
Schuler et al (2016)[38]	Scoping review	Any	Adults and adolescents with identified problems with gambling	Gamblers Anonymous (attending meetings or being a member); excluded if embedded in a treatment	Multiple databases; any design; search date: 2002–15	Any	17 studies in 25 publications; four RCTs showed reductions in time, money, or symptoms; Gamblers Anonymous plus stress management was more effective than Gamblers Anonymous alone; imaginal desensitisation plus motivational interviewing was more effective than Gamblers Anonymous; CBT was more effective than Gamblers Anonymous; in one RCT, although Gamblers Anonymous was less effective at month 2, by the 12-month follow-up, all interventions were equally successful in terms of abstinence or gambling reduction	Evidence for the effectiveness of Gamblers Anonymous is inconsistent; in comparisons, other interventions might be more successful; attendance at meetings and participation were important factors (different type of person might attend meetings to different extents)	Sparse evidence regarding outcomes from Gamblers Anonymous; studies were included that had Gamblers Anonymous as a control or an intervention group
Shonin et al (2013)[39]	Systematic review	Any	Healthy adults	Buddhist-derived interventions or meditation techniques; includes mindfulness-based cognitive therapy	Multiple databases; published in English; search date: up to 2012	Problem gambling; strength of relationships	Four included studies; all focused on mindfulness meditation; reported reduction in gambling severity, thought suppression, anxiety, and distress	Mindfulness therapies based on Buddhist philosophies have potential for reducing problem gambling; potential for these approaches to lead to decreased relapsing	Cross-sectional and case-study research only; few studies
Pharmacological interventions									
Bartley and Bloch (2013)[40]	Systematic review and meta-analysis	Clinical	Adult pathological gamblers	Pharmacological treatments: opioid antagonists, antidepressants, antipsychotics, and topiramate	RCT; search date: 1965–2013	Endpoint score on a rating scale used to measure gambling severity	14 studies; small but significant benefit for opioid antagonists *vs* placebo; non-significant benefit for antidepressants, antipsychotics, and topiramate *vs* placebo	Available treatments at best have minimal benefit compared with placebo; few data to suggest efficacy of any pharmacological treatment for problem gambling	Flawed early trials of opioid antagonists suggested significance (not intention-to-treat trials); few trials
Lupi et al (2014)[41]	Systematic review	Any	Pathological gamblers	Pharmacological treatments: antidepressants, opioid antagonists, and mood stabilisers	Multiple databases; published in English; reviews, trials, and case reports; search date: up to 2013	Any	75 papers included; conflicting findings for antidepressants (more effective than placebo in three of seven studies); opioid antagonists showed promising results (more effective than placebo in four of five studies); weak evidence for mood stabilisers and atypical antipsychotics (more effective than placebo in one of four studies)	Pharmacological interventions are promising	Little known about mechanisms of action, combinations might be worthwhile to study; studies all in people who had requested help

(Table continues on next page)

	Review design	Setting	Target population	Intervention	Other inclusion criteria and search date	Outcomes assessed	Findings	Conclusion	Limitations and notes
(Continued from previous page)									
Goslar et al (2018)[42]	Systematic review and meta-analysis	Clinical	Adults; average age 43 years	Pharmacological treatments (including with psychological treatment at the same time)	RCT (or quasi-RCT); not secondary to a medical condition (eg, Parkinson's); no search date reported	Global severity of gambling, frequency of gambling, and financial loss from gambling	39 studies; treatments associated with large and medium pre-post reduction in global gambling severity and frequency, and financial loss; no advantage of any medical drug class over another; small and non-significant advantage of combined treatment *vs* pharmacological treatment alone	Various medications are effective for the management of gambling behaviour; authors suggest no pharmacological treatment is superior to another, and there is potential additional benefit from combination with psychological therapy	Few meta-analyses; varying methodological quality; weak evidence
Grant et al (2012)[43]	Systematic review	Not specified	Pathological gamblers	Pharmacotherapeutic gambling interventions (eg, opioid antagonists, glutamatergic agents, antidepressants, antipsychotics, mood stabilisers)	Not stated	Not stated; very sparse information on review methodology	18 double-blind, placebo-controlled trials; opioid antagonists and glutamatergic agents were most promising; antidepressants, antipsychotics, and mood stabilisers showed mixed results	Opioid antagonists are the most promising treatment	Small sample sizes; non-representative groups (eg, without co-occurring psychiatric disorder)
Victorri-Vigneau et al (2018)[44]	Systematic review	Any	Pathological gamblers, problem gamblers; individuals with gambling or addictive-like disorders (unclear inclusion criteria)	Treatment with opioid antagonists (ie, naltrexone and nalmefene)	PubMed, PsycINFO, Cochrane databases; any study design, including reviews and opinion pieces; no date restrictions;	Any, including urges to gamble and gambling episodes	34 articles included; seven RCTs with four indicating positive effects, two non-significant differences, and one only a weak effect; evidence is weak but supports opioids having potential as a treatment either alone or in conjunction with other behavioural interventions	Opioids are effective in reducing gambling disorders, particularly in people with a history of alcohol use disorder or strong gambling tendencies	Treatment effect is on underlying addictive susceptibility rather than gambling behaviours; almost all studies excluded people with psychiatric comorbidities, although these people are a large proportion of the population; high short-term response to placebo noted in several studies

CBT=cognitive behavioural therapy. CINAHL=Cumulative Index to Nursing and Allied Health Literature. DSM=Diagnostic and Statistical Manual of Mental Disorders. ICD=International Classification of Diseases. PFI=personalised feedback intervention. RCT=randomised controlled trial.

Table: **Systematic review-level evidence of interventions to reduce the burden of gambling-related harms**

smaller notes, on-screen clocks or counters, and smoking bans, but generally positive effects for removal of cash machines. As with the other reviews, the authors reported that studies were of poor quality, and there was a reliance on self-reported measures.

Up-to-date review-level evidence exists, therefore, for gambling interventions that encourage individual gamblers to restrict their own gambling, with on-screen pop-up messages appearing to be the most promising approach identified, particularly high-threat messages endorsed by medical or government agencies. However, no reviews were found that considered adherence to or regulation of enforcement interventions by these agencies. Little evidence to support industry supply-reduction initiatives was found.

Targeted interventions for individuals at increased risk of harm

Therapeutic interventions

12 reviews considered different types of therapeutic interventions for gamblers at risk of harm, including cognitive and behavioural therapies, motivational interviewing, psychological therapies in general, brief psychological interventions, self-help and mutual-support interventions, and internet-based therapies.

Challet-Bouju and colleagues[22] considered cognitive remediation interventions to reduce gambling-related harms but only identified one study. Similarly, Luquiens and colleagues[23] reviewed cognitive training interventions but did not find any studies. Chrétien and colleagues[24] reviewed cognitive restructuring interventions, a type of cognitive behavioural therapy (CBT), and identified 39 studies, but their review aimed to describe how the interventions were implemented with gamblers rather than evaluate effectiveness. Tolchard[25] reviewed studies of CBT or behavioural approaches, or both, including exposure therapy and cognitive restructuring. He suggested that both cognitive and behavioural approaches can be effective in reducing gambling-related harms. However, despite the use of systematic searching and inclusion criteria, this paper provides no clear indication of the volume of evidence considered. In a further study, Merkouris and colleagues[26] reviewed all psychological treatments for adults seeking treatment for a gambling disorder and identified 50 papers reporting 33 studies. They reported that higher numbers of treatment sessions attended was associated with better gambling behaviour outcomes, and a range of socioeconomic factors also predicted treatment outcomes.

Petry and colleagues[27] reviewed any psychological intervention for gambling (clinically or self-diagnosed). They included 21 trials and suggested that there is evidence regarding benefit from CBT alone or in combination with motivational interviewing but not from motivational interviewing alone. The authors also highlighted the scarcity of long-term follow-up. Cowlishaw and colleagues[28] also considered psychological therapies, including CBT, motivational interviewing, and integrative therapy. Their review identified 14 studies, of which 11 suggested that, at 3 months after treatment, CBT showed beneficial effects on gambling symptom severity and financial loss; however, longer-term benefits were unclear. Yakovenko and colleagues[29] reviewed motivational-interviewing interventions (mostly one face-to-face session) in adult so-called disordered gamblers and reported a significant reduction in gambling frequency per month at 6-month follow-up (mean difference –1·22 days per month; 95% CI –2·06 to –0·38; p<0·05), and also at 9-month to 12-month follow-up (–1·12 days per month; 95% CI –2·16 to –0·07; p<0·05). However, they found no significant reduction in gambling expenditure at 6 months (p=0·07) or 9–12 months (p=0·15).

Two reviews considered brief psychological interventions for gambling-related harms. Peters and colleagues[30] found that, in brief interventions of one session, the strongest predictor of short-term positive effect was the inclusion of an educational element, followed by motivational interviewing (n=11 studies). By contrast, Quilty and colleagues[31] defined brief interventions as interventions that last no more than three sessions and found evidence of a small but significant reduction in gambling behaviour in the short term.

The final two reviews in the group examining targeted treatments evaluated the evidence for internet-based therapies for gambling-related harms. Chebli and colleagues[32] considered interventions that combined online therapeutic interventions with clinical assistance (via real-time chat or follow-up email) for adults seeking treatment. Only four of 16 studies considered pathological gambling. All studies evaluated CBT-based interventions and reported that favourable changes in gambling behaviours were sustained up to 3 years after intervention. van der Maas and colleagues[33] reviewed internet-based interventions for gambling. Of 27 studies, most reported positive gambling outcomes, although only five of seven randomised controlled trials did so, and high rates of attrition were reported in some studies.

A considerable number of reviews of therapeutic interventions for gambling have been done in recent years. Despite this number, the evidence only indicates positive outcomes in the short term, with little evidence to support longer term effects or to favour one therapeutic intervention or mode of delivery over another.

Studies comparing targeted treatments

Goslar and colleagues[34] compared face-to-face with self-guided therapy. 27 studies, mostly on electronic gambling, indicated higher effect sizes for face-to-face treatments in reducing gambling behaviour (frequency and financial loss) at 3 months than effect sizes for self-guided therapy. The intensity of treatment moderated the effect but the type of intervention did not. Sample sizes were small, and studies varied in terms of participant gambling severity. Rodda and colleagues[35] identified 46 studies of

35 psychological and self-help interventions. However, they did a content analysis of the type of change technique used in the interventions and did not consider effectiveness as an outcome measure. Therefore, there is little evidence available to compare one type of targeted intervention with another for reducing gambling behaviours.

Self-help and mutual-support interventions

Four reviews evaluated interventions that can be characterised as taking a self-help or mutual-support approach to managing gambling-related harms. Drawson and colleagues[36] considered self-help interventions that aimed to reduce gambling behaviours through protective behavioural strategies such as self-exclusion, time and monetary limits, and cashless cards (instigated by the individual, not the service provider). Although they identified 33 studies, they reported that evidence was limited by low study quality. Self-exclusion was mostly endorsed by gamblers, but many returned to gambling after the exclusion period, and self-exclusion was not enforced by the casinos. Nevertheless, gambling frequency, duration, expense, debt, and urge were reduced up to 12 months after the intervention. Marchica and Derevensky[37] considered personal feedback interventions for gambling. Six studies, including three with university students, reported some reduction in a range of gambling behaviour outcomes and change in perceived norms around gambling behaviours. Schuler and colleagues[38] reviewed Gamblers Anonymous meetings as a treatment for gambling behaviours. 17 studies in 25 publications (including four randomised controlled trials) showed a reduction in time and money spent on gambling. However, the review found that Gamblers Anonymous coupled with stress management was more effective than Gamblers Anonymous alone. The authors noted that attending meetings (rather than participating online) was important in achieving optimal outcomes. The review concluded that motivational interviewing and CBT combined were more effective than Gamblers Anonymous. Shonin and colleagues[39] reviewed interventions derived from Buddhist philosophies or meditation techniques. The four included studies (cross-sectional and case studies) focused on mindfulness meditation with reported reductions in gambling severity, thought suppression, anxiety, and distress.

Drawing any clear conclusions from the review-level evidence for self-help interventions is difficult because of the diversity of interventions and a focus on fairly short-term self-reported behaviour change rather than long-term outcomes or direct measures of harm.

Pharmacological interventions

Five papers compared outcomes of pharmacological treatments for medically diagnosed gambling addiction and gambling-related harms (the evidence mostly came from randomised controlled trials). The drugs under consideration included opioid antagonists, glutamatergic agents, antidepressants, antipsychotics, mood stabilisers, and topiramate (an anticonvulsant).

Bartley and Bloch[40] compared opioid antagonists with placebo, identifying small benefits in 14 studies. Non-significant benefits were reported for antidepressants, antipsychotics, and topiramate versus placebo. However, the authors noted that early opioid trials were flawed because they did not use intention-to-treat analyses; therefore, the results might be skewed. Lupi and colleagues[41] identified 75 papers with conflicting findings for antidepressants, opioid antagonists, and mood stabilisers, and concluded that pharmacological interventions are promising for the treatment of gambling. More recently, Goslar and colleagues[42] identified 39 studies and reported pre-post reduction in global gambling severity, frequency, and financial loss but did not find an advantage for any one type of pharmacological treatment over another. They note a small, non-significant advantage for combining a therapeutic treatment with a pharmacological intervention. Grant and colleagues[43] reviewed 18 randomised controlled trials and suggested that opioid antagonists and glutamatergic agents might be the most promising treatments. However, the studies were small and the review method was not robust. In the fifth review in this group, Victorri-Vigneau and colleagues[44] reviewed treatment with the opioid antagonists naltrexone and nalmefene. They identified 34 articles including seven randomised controlled trials, of which four showed positive effects. The authors hypothesised that pharmacological treatment is acting on underlying susceptibilities (eg, alcohol use disorder) as opposed to the gambling behaviour itself.

Therefore, as with the previous types of interventions, there is no conclusive message to support or refute the effectiveness of pharmacological interventions to reduce harm related to gambling behaviour. It is also not possible from the evidence identified to confidently recommend one drug treatment over another.

Discussion

Our mapping review of interventions to address or prevent gambling-related harms identified systematic reviews evaluating whole-population preventive interventions and targeted interventions for individuals at high risk of gambling-related harms. Gambling-related harms are a fairly new concept with most of the literature focusing on so-called problem gamblers. This concept implies that interventions to address gambling-related harms should focus on changing the behaviour of individuals rather than on addressing the underlying causes of harmful behaviour that are related to gambling policies or provision. Moreover, gambling is different to other harmful behaviours, such as tobacco and alcohol consumption, for which a much more direct relationship has been established between the behaviour and risk of experiencing harm. Although studies of interventions to address so-called problem gambling or target problem

gamblers can inform progress in preventing and treating gambling-related harms, it is important to acknowledge the limitations of these terms in addressing gambling-related harms at a societal or population level.

Although there have been some recent reviews, evidence from the primary literature remains sparse and weak, and review authors struggled to make conclusive statements about the evidence they examined, in terms of clear support for any specific types of intervention or for relative superiority of particular interventions or approaches over others. In addition to the weak study designs, the mapping-review method itself is restricted in scope in comparison with a complete systematic review[14] and, as a result, findings should be treated with caution. However, given the need to advance gambling as a public health priority and the existence of a volume of relevant review-level evidence, this type of review remains an efficient way to consider and synthesise the current evidence base.

Review-level evidence was identified for gambling interventions that can reduce opportunities for potentially harmful gambling and for interventions that can reduce demand through information provision or educational programmes. However, the scope of interventions is restricted and the quality of evidence for reported effectiveness is very poor. Two clear gaps were identified in the review-level evidence. Firstly, screening interventions to identify individuals at risk of gambling-related harms who would benefit from brief interventions or referral to specialist treatment services. Secondly, evidence for on-going support after treatment for gambling-related harms. With evidence to suggest that well over half of all incident problem-gambling cases are previous problem gamblers who are relapsing,[45] this absence of support is an important omission. Further reviews of the primary study evidence for these two intervention approaches could clarify the current evidence base.

A policy report[46] has highlighted the complexity in addressing gambling-related harms but did not synthesise the evidence for intervention effectiveness. The authors emphasise the need for multifaceted and systemic interventions, including restrictions on advertising and marketing, changes to the structure of the industry and regulatory frameworks, and the tacking of industrial influence on research. These interventions would be needed to support the public health approaches considered in this Review.

Previous experience suggests that the gambling industry will strongly resist and argue against proposals to introduce interventions that might regulate or restrict their commercial activities. Common arguments from commercial interests include the suggestion that the complexity of the relationship between gambling activity and associated harms and the scarcity of robust evidence of effectiveness are rationales for delaying policy interventions until better evidence is available.[47]

The systems approach adopted for the project overall ensured that the mapping review considered evidence at all levels and all points in the systems connecting gambling activity to gambling-related harms. This approach meant we could identify where there were specific gaps in the evidence. It is, therefore, imperative to ensure that a scarcity of evidence is not used as a justification for inaction in addressing the growing burden of gambling-related harms. Instead, although action still needs to be based on the best available evidence, implementation needs to be accompanied by a comprehensive evaluation of both the intended and unintended consequences. This approach will, in time, allow the current deficiencies in the evidence base to be systematically addressed.

Contributors

LB was co-lead reviewer and the lead author for the manuscript, and contributed to data analysis and interpretation. SB was co-lead reviewer and contributed to data analysis and interpretation. HBW was literature search lead and provided comments on drafts of the manuscript. EG was strategic project lead and provided comments on drafts of the manuscript.

Declaration of interests

We declare no competing interests.

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