

**INTERVENTIONS TO REDUCE THE PUBLIC HEALTH BURDEN OF
GAMBLING RELATED HARMS:**

A mapping review of the international evidence

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Literature mapping review

Introduction:

The objective of this initial phase of review work was to map out and broadly describe the published systematic review literature on interventions to address or prevent gambling related harm. The intention was to use the result of this mapping exercise to guide decisions about subsequent focused review work.

For the purpose of mapping the literature we included only systematic review evidence and applied broad inclusion criteria to include all forms of gambling and all populations (both studies which considered participants with a defined gambling-related problem and those which looked at the population as a whole). In this case, although not typical for a mapping review, we did complete extractions of papers at the full paper level in order to allow us to categorise the described approaches and generate a typology of the interventions undertaken (as this information was often missing from the title/abstract of included papers).

Methods:

Review objectives

The objective of the mapping review was to identify review level evidence, which supplemented by stakeholder consultation, will be used to identify and clarify gaps in the evidence, and key research questions related to effectiveness and cost effectiveness of interventions.

Search strategy

Mapping searches were conducted in the following databases: Medline/Embase, Web of Science (Science Citation Index and Social Science Citation Index), Applied Social Sciences Index and Abstracts, PsycINFO, Social Policy and Practice).

The search strategy combined a number of terms relating to gambling, and included both subject (MeSH) and free-text searches. In addition, methodological search filters for systematic review level evidence (and umbrella reviews) were applied.

The full search strategy and further details of search filters are provided in Appendix 1.

In line with mapping review methods grey literature and citation searches were not conducted. However, reference lists of included studies were scrutinised for the inclusion of additional potentially relevant reviews.

Inclusion criteria

Population: whole population or identified gamblers (including self-defined); also reviews of specific populations at risk e.g. children and young people

Intervention: any intervention to prevent or address gambling related harm

Comparator: any or no comparison

Outcome: Prevention or treatment of gambling related harm.

Results were limited by date to reviews published since 2012: the date of the first comprehensive international evidence review in this field (William et al. 2012). Due to time and budget restrictions, the review was also limited to evidence published in English.

Quality appraisal

As is common for a mapping review (Grant and Booth 2019) quality appraisal was not undertaken at this stage.

Screening process

Search results were downloaded in a reference manager database (Endnote) screened by one reviewer (with 20% checked by a second reviewer) and coded using the Keyword function. Papers which were identified as potential systematic reviews of interventions to address or prevent gambling related harm were coded and retrieved as full paper articles. We also coded systems (and other) models of gambling related harm (for comparison with our own developing model). In the first instance, coding was based on title and abstract (where available) only. Where the title and abstract did not give a clear indication of whether the paper should be considered or not, an inclusive approach was taken with the full paper being considered for potential inclusion.

Data extraction

For studies judged to be relevant, full papers were obtained and the following data was extracted and tabulated: Author/Year, Review Design, Setting, Population, Intervention, Inclusion Criteria and Search Date, Outcomes assessed, Findings, Conclusions, Limitations/Notes.

Synthesis method

The findings were synthesised narratively and a typology of interventions developed, drawing on a pathway model approach to illustrate the changing nature of gambling, and the need to consider gambling within a systems perspective.

Patient and public involvement

A public advisory group consisting of eight individuals from across the country who had experience of gambling addiction themselves, or a close family or friend with gambling addiction, provided advisory input via teleconference during the initial stage of searching, and during the analysis and synthesis. The group provided very valuable input in regard to understanding the experience of and effects of gambling addiction, highlighted the changing nature of people affected by addiction, emphasised the need to describe gambling as an addiction, and outlined the lifelong struggles to avoid relapse. The group assisted in drafting a Plain English summary of the study, and their input was key in developing the pathway model to synthesise the findings in an accessible summary format. In addition, the Sheffield PPI group originally established to support research for the National Institute of Health Research School of Public Health Research programme and now also providing general PPI input and advice for the PHR Review Team was also consulted to get a broader PPI perspective. This informed the a-priori systems model used in the protocol development stage and ensured that we considered wider population views on gambling as well as seeking the view of those directly affected by gambling related harm.

Stakeholder consultation

In order to seek the view of the broadest range of stakeholders, open invitation emails were circulated to invite participants to a webinar to discuss the initial findings from the mapping review. In total 19 participants representing a range of practice, charity and academic stakeholders attended the webinar and provided useful insights in terms of the work conducted to date and the possible focus of future reviews. Key comments and questions included:

- People may begin gambling to attempt to alleviate a problematic financial situation and do not always follow the trajectory from recreational gambling to gambling related harm and addiction.
- Citizens Advice service are piloting a screening tool for gambling addiction, but the project and evaluation of this won't be completed for two years.
- Should the model cater for harms being experienced by third parties and how people are harmed by the gambling addiction of somebody else?
- There was a strong opinion throughout the group that grey literature will be a significant source of evidence when it is included in subsequent reviews.

Results:

After duplication, the searches generated 1080 records, of which 43 were retrieved as full papers. A further 23 which were queried for full paper consideration were excluded after discussion between the reviewers. Of the 43 papers, 13 were excluded at the full paper stage (Figure 1). This was mostly due to the methodology not being systematic (e.g. discursive review), or the review not considering intervention studies. The reasons for each full paper exclusion are given in Appendix 2.

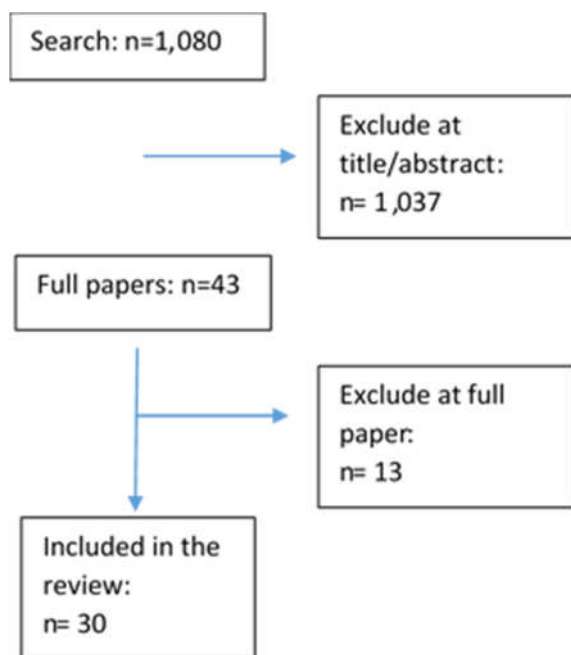


Figure 1. PRISMA diagram of study selection.

Summary of findings

Thirty full papers were deemed to meet the inclusion criteria and were included in the mapping review (Appendix 3). Search end dates in the identified reviews varied between 2011 (two reviews) and 2018 (1 review) with many searches being conducted between 2015 and 2017 (16 reviews in total). Three papers did not state their search date. The search dates are reflected in the publication dates of the reviews, which ranged between 2012 and 2019 (with eight reviews published in the last 18 months: 2018/19). Therefore, evidence at the systematic review level can be considered to be relatively up to date and therefore informative as to the scope and depth of evidence available from primary studies.

Typology of interventions

In order to attempt to categorise the types of interventions delivered we considered the population under study and the type of interventions that were delivered. A potential a-priori list of interventions was taken from the draft systems model developed for the review protocol (Appendix 4), and consideration was given to how well the reported interventions fitted into that model.

In terms of *population*, the reviews were divided into reporting on preventative interventions for the whole population and treatment interventions for those with a known to be gambling addiction (either medically or self-diagnosed). The interventions themselves mirrored the systems model and included:

Whole population preventative interventions:

- Demand reduction: interventions to reduce the demand for gambling.
- Supply reduction: interventions to limit opportunities to gamble.

Targeted treatment interventions for individuals with an identified gambling addiction:

- Therapeutic interventions
- Pharmacological interventions
- Self-help/mutual support interventions
- Studies comparing two or more of these approaches

However, two potential types of intervention identified in the draft systems model were not represented in the systematic review level evidence. These were:

Whole population interventions:

- Harm reduction: to screen, identify and support individuals at risk of gambling related harm.

Targeted treatment interventions for individuals with an identified gambling addiction:

- Risk factor management: interventions to support ongoing recovery and prevent relapse into gambling related harm.

i. Whole population preventative interventions

Demand reduction: The systematic review studies identified which report on demand reduction interventions were limited to interventions delivered to children and young people. Three reviews

reporting school-based education programmes were identified (Keen et al. 2017; Kourgiantakis et al. 2016; Ladouceur et al. 2016).

Keen et al. (2017) identified 19 studies (reported in 20 papers) of school based gambling education programmes. Programmes ranged from 20-500 minutes in length and were mostly classroom cohort videos. Nine studies measured outcomes related to gambling behaviour of which five showed positive effects; however follow up for most studies was short and the definitions of gambling related harm and measures of gambling behaviour varied between studies.

Ladouceur et al. (2013) considered both school-based gambling related harm prevention programmes and also gambling and related skills workshops to prevent gambling related harm for youth aged 9-20 years. They reported that programmes and workshops were both effective in reducing misconceptions and increasing knowledge about gambling in the short term. Again, lack of long-term follow up was noted.

In contrast, Kourgiantakis et al. (2016) set out to identify gambling related harm prevention programmes which targeted the children of gamblers. However, the 16 studies that they identified were all universal interventions and did not target their population of interest. As with Keen et al. (2017) they reported a lack of long-term follow up (not more than 3 months in most cases), but the identified studies did suggest increases in both knowledge and attitude measures towards gambling in the short term.

Therefore, the review level evidence on demand reduction interventions although limited, suggests likely benefits in terms of gambling knowledge and attitudes for young people in the short term. However, longer-term benefits are not considered and the review level evidence is limited to interventions for young people. In addition, Keen et al. (2017) reported that it was challenging to determine if interventions are able to prevent the development of gambling related harm as only relatively small numbers of youths gamble at a level likely to cause harm, making “real world” outcomes challenging to assess.

Supply reduction: Four systematic reviews which considered supply reduction were identified.

Ginley et al. (2017) reviewed on screen and poster gambling related warning messages (limit setting, educational animations, cash expended displays, and personalised feedback) in studies conducted in both laboratory based and “naturalistic” studies (n=31). They found that static signs have limited efficacy, but that pop up messages are largely support and potentially reduce harm – in particular high threat messages endorsed by medical or government agencies.

Ladouceur et al. (2012) reviewed pre-commitment systems for electronic gaming machines (time and expenditure limits). The studies (n=17) reported variable adherence to limits with few gamblers using time limits. Importantly studies failed to control for concurrent gambling (outside the trial venues).

McMahon et al. (2019) conducted a review of reviews on prevention and harm reduction programmes for gambling and gambling related harm in both adults and youths with and without a diagnosed gambling problem: identifying 10 systematic reviews that met their inclusion criteria (n=55 studies). They reported “some support” for smoking bans, limit setting, self-exclusion, prohibiting large notes, maximum bets, removal of ATMs, machine messages, personalised feedback interventions; but stated that the evidence over all was poor.

Tanner et al. (2017) looked at industry and environmental based strategies for gambling related harm prevention (n=27 studies). They found mixed effects for mandatory limiting setting, smaller notes, on screen clocks or counters, and smoking bans; but generally positive effects for removal of ATMs. Again they report that studies were of poor quality, and there was a reliance on self-reported measures.

Therefore, although the review evidence is up to date for these interventions, little evidence to support industry supply reduction initiatives was found. On screen pop up messages may be the most promising – in particular high threat messages endorsed by medical or government agencies. However, no reviews were found which considered adherence to or regulation of enforcement interventions by these agencies.

ii. Targeted treatment interventions for individuals with an identified gambling addiction

Therapeutic interventions: 12 reviews considered various therapeutic interventions for gambling addiction including cognitive and behavioural therapies, motivation interviewing, psychological therapies in general, brief interventions, self-help and mutual support interventions, and internet-based therapies.

Challet-Bouji et al. (2017) considered cognitive remediation interventions (a behavioural training intervention) to reduce gambling related harm; but only identified one study. Also Luquiens et al. (2013) reviewed cognitive training interventions but did not find any studies. More successfully, Chretien et al. (2017) reviewed cognitive restructuring interventions (a type of CBT) identifying 39 studies: but their review aimed to describe how the intervention was carried out with gamblers; not to consider its effectiveness. Tolchard et al. (2017) looked at studies of CBT or behavioural

approaches including Exposure Therapy and Cognitive Restructuring, suggesting that both cognitive and behavioural approaches can be effective in reducing gambling related harm. However, this paper is poorly structured with no clear indication of how many studies were included – so the findings should be treated with caution.

Petry et al. (2017) looked at any psychological intervention for gambling (clinically or self-diagnosed). They found 21 trials suggesting benefit from CBT alone, or in combination with motivational interviewing (MI) (but not MI alone). A lack of long term follow up was noted. Previously Cowlshaw et al. (2012) also considered psychological therapies including CBT, MI and integrative therapy. They identified 14 studies, of which 11 suggested that at three months post treatment, CBT showed beneficial effects of therapy on gambling symptom severity and financial loss. Again, longer term benefits were unclear. In addition, Merkouris et al (2016) reviewed all psychological treatments for adults seeking treatment for a gambling disorder identifying 50 papers reporting 33 studies. They reported that a higher number of treatment sessions attended was associated with better gambling behaviour outcomes: along with a range of socio-economic factors with predicted treatment success.

Two very recent reviews considered brief interventions for gambling addiction. Peters et al. (2019) found that, in brief interventions (not more than one session), the strongest predictor of short term positive effect was the inclusion of an educational element, followed by the use of MI (n=11 studies). In contrast, Quilty et al. (2019) defined brief interventions as no more than three sessions identifying five studies suggesting small, but significant reduction in gambling behaviour in the short term.

Two studies reviewed the evidence for internet-based therapies for gambling addiction. Chebli et al. (2016) considered interventions which combined online therapeutic interventions with clinical assistance (via real time chat or follow up email) for treatment seeking adults. Of sixteen studies, only four considered pathological gambling: all were CBT based interventions and favourable changes in gambling behaviours were sustained up to three years post intervention. More recently, van der Maas et al. (2019) reviewed internet interventions for gambling (either exclusively or as a component of a larger intervention). Of 27 studies, most reported positive gambling outcomes: although only five of seven RCTs did so, and high rates of attrition were reported in some studies.

Therefore, a considerable number of reviews of various therapeutic interventions for gambling have been conducted in recent years. Despite this, at present evidence only really exists to suggested positive outcomes in the short term, with little evidence to support longer term outcomes, or to favour one particular type of therapeutic intervention or mode of delivery over another.

Self-help and mutual support interventions: Five papers looked at diverse interventions which can be loosely grouped together as they all took self-help or mutual support approaches to managing gambling related harm.

Drawson et al. (2017) considered self-help interventions which aimed to reduce gambling behaviours through protective behavioural strategies such as self-exclusion, time limiting, monetary limit and cashless cards (instigated by the gambler not the service provider). Although they identified 33 studies, they reported that evidence was limited as study quality was low. 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. Despite this gambling frequency, duration, expense, debt and urge were reduced up to 12 months after the intervention.

Marchica et al. (2016) considered personal feedback interventions for gambling. Six studies, including three with university students reported some reduction in a range of gambling behaviour outcomes and in changing perceived norms around gambling behaviours.

Schuler et al. (2016) reviewed Gamblers Anonymous (GA) as a treatment for gambling behaviours. Seventeen studies in 25 publications (including four RCTs) showed reduction in time and money spent on gambling; but GA coupled with stress management was more effective than GA alone, and attending GA meetings (rather than participating online) was important. In addition MI and CBT were also both found to be more effective than GA.

Shonin et al. (2013) reviewed interventions which were derived from Buddhist philosophies or meditation techniques (including mindfulness interventions). The four included studies (cross sectional and case studies only) all focused on mindfulness meditation with reported reductions in gambling severity, thought suppression, anxiety and distress.

Therefore it is difficult to draw any clear conclusions from the review level evidence for self-help interventions.

Comparing targeted treatments: Goslar et al. (2017) compared face to face with self-guided therapy. Twenty-seven studies, mostly on electronic gambling, indicated significantly higher effect sizes for face to face treatments in reducing gambling behaviour (frequency and financial loss) at 3 months. The intensity of treatment moderated the effect (but the type of intervention did not). Studies were small and varied in terms of participant gambling severity. Rodda et al. (2018)

identified 46 studies of 35 psychological and self-help interventions. However, they conducted 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 very little evidence to compare one type of targeted intervention over another for reducing gambling behaviours.

Pharmacological: Five papers compared outcomes across various pharmacological treatments to treat gambling addiction and reduce gambling related harm (mostly from RCT evidence). The drugs under consideration included: opioid antagonists, glutameric agents, antidepressants, antipsychotics, mood stabilisers and topiramate (an anticonvulsant).

Bartley et al. (2013) compared opioid antagonists to placebo identifying small but significant benefits in 14 studies. Non-significant benefits were also reported for antidepressants, antipsychotics and topiramate versus placebo. However, they noted that early opioid trials were flawed due to not using intention to treat analysis, therefore results may be skewed. Lupi et al. (2014) identified 75 papers reporting conflicting findings for antidepressants, opioid antagonists, and mood stabilisers: concluding only that pharmacological interventions are “promising” in the treatment of gambling.

More recently Goslar et al. (2018) identified 39 studies and reported pre-post reduction in gambling global severity, frequency and financial loss; but did not find advantage for any medical class over another. They also reported small advantage (non-significant) for combining a therapeutic treatment with the pharmacological intervention). Grant et al. (2012) identified 18 RCT studies which suggested opioid antagonists and glutameric agents may be the most promising treatments: however studies were small and the review included very little methodology so results should be treated with caution. Victorri-Vigneau et al. (2018) reviewed treatment with opioid antagonists naltrexone and nalmefene. They identified 34 articles included seven RCTs of which four showed positive. They note that the treatment effect is acting on underlying vulnerabilities (e.g. alcohol use disorder) as oppose to the gambling behaviour itself.

Therefore, as with the previous types of interventions although review level data is up to date, there is no conclusive message to support or refute pharmacological intervention for gambling – and in particular it is not possible to confidently recommend one drug treatment over another.

A summary of the intervention typology is outlined in Appendix 5.

Mapping review conclusions and next steps

Our mapping review of interventions to address or prevent gambling related harm has identified a significant number of systematic review studies of both whole population preventative interventions and targeted treatments for individuals with a diagnosed gambling addiction (including self-identified). Although there have been a number of very recent reviews, evidence from the primary literature remains limited, and review authors struggled to make conclusive statements about the evidence they reviewed in terms of clear support for any type of intervention over another. Our stakeholder consultation webinar did not identify any missing review level evidence but a recently identified grey literature document was identified by a member of our advisory group was noted (Livingstone et al. 2019). This document details a substantial review of interventions to prevent or minimise harms associated with gambling.

As the review evidence is up to date, there does not seem to be any benefit in revisiting any of the review questions recently addressed at this time. However, our review (supported by our developing conceptual model) suggests two areas of potential intervention where no systematic review level evidence has been identified. These are:

Whole population interventions:

- Harm reduction: to screen, identify and support individuals at risk of gambling harm.

Targeted treatment interventions for individuals with an identified gambling addiction:

- Risk factor management: interventions to support ongoing recovery and prevent relapse into gambling.

Therefore, both of these areas are potential targets in which to conduct further systematic reviews. In order to establish the feasibility and potential benefits of doing so, we have conducted scoping searches in both areas to determine if there is a body of primary evidence which could be reviewed and synthesised.

Scoping for focused systematic reviews

In order to scope out the potential for conducting systematic reviews into screening and relapse prevention for gambling related harm we undertook a brief scoping review in Medline only to determine whether there was an evidence base to review. The scoping review search strategy is set out in Appendix 6. The search identified 695 papers of which 21 considered screening for gambling behaviour risk and five looked at relapse prevention. This initial search therefore suggests that there

is a body of evidence available to consider in relation to these research questions. Comprehensive searching of all sources including grey literature will now be undertaken to support this.

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Appendix 1.

Mapping search strategy

Database: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) <1946 to April 08, 2019>

Search Strategy:

-
- 1 (gamb* or betting or lottery or lotto or lotteries or wager or electronic gambling machine*).ti,ab. (10130)
 - 2 Gambling/ (5061)
 - 3 1 or 2 (10744)
 - 4 meta analysis.mp,pt. or review.pt. or search:tw. (2794329)
 - 5 (umbrella review or review of reviews).ti,ab. (624)
 - 6 4 or 5 (2794452)
 - 7 3 and 6 (1145)
 - 8 limit 7 to english language (1032)

Appendix 2.

Full paper excluded studies.

Abbott, M. W. (2019). "Self-directed interventions for gambling disorder." *Current opinion in psychiatry*. 16.

Bullock, Scott A. and Potenza, Marc N (2013). *Curr Psychopharmacol*. 2013 ; 2(3): 204–211.

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Appendix 3.

Extraction table.

Author Year	Review design	Setting	Population	Intervention	Other inclusion criteria /search date	Outcome(s) assessed	Findings	Conclusion	Limitations / notes
Bartley 2013	Systematic review and meta-analysis	Clinical	Pathological gambling Adults	Pharmacological treatments	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 compared to placebo for antidepressants, antipsychotics, and topiramate.	Currently available treatments at best have minimal benefit compared to placebo. Little data to suggest efficacy of any pharmacological treatment for problem gambling.	Flawed early trials of opiate antagonists suggested significance (not ITT trials). Small numbers of trials.
Challet-Bouju 2017	Systematic review	N/S	Problem gambling (DSM/ICD)	THERAPY CR: Cognitive remediation; “behavioural training intervention that aims to improve cognitive processes with the goal of durability and generalisation”	Therapeutic aim. Search date: January 2017	Efficacy of CR interventions – to reduce problem gambling	Only one study identified. Playmaker – a serious video game with biofeedback. Designed to treat impulse control disorders . Suggests positive effect on impulsivity and expression of anger. No evidence of effect on relapse.	Research needed. CR *may* be associated with commonly used interventions (such as CBT or MI) in order to make therapeutic interventions more effective, longer lasting and decrease relapse. This appears to be speculative!	No study limitations are discussed in this paper.

Chebli 2016	Systematic review	Online	Treatment seeking adults.	THERAPY: Internet based interventions – structured therapeutic interventions in conjunction with clinical assistance (may be real time or delayed (e.g. chat vs. email).	Excluded self-help programmes with no therapist input. Search date: May 2015	Effectiveness in treating addictive behaviour. Follow up period. Therapist contact throughout the programme. Psychological distress /psychopathology	16 studies; 4 considering pathological gambling (not defined). All interventions were CBT. Three non- comparative and one RCT. Favourable changes in problem gambling sustained at follow up (max. 3 years). Additional components such as phone consultations were time efficient and cost effective Drop out range 17-31%. Also positive effects on general psychological distress, psychopathology	Positive treatment outcomes reported for all gambling studies wrt gambling behaviour.	Studies lacked control and comparison groups. No effect sizes reported. No meta-analyses.
Chretien 2017	Systematic review	N/S	Gamblers (mentions DSM pathological gambling in the paper).	THERAPY: Cognitive restructuring (CR): a form of CBT to treat gambling as the main problem.	Written in English or French. Search date: 1980-2013.	Aims to describe how CR is carried out with gamblers.	39 studies. 69.2% clearly reported therapeutic techniques to correct gambler's thoughts. 47 treatments described: 8 cognitive, 39 cognitive and behavioural.	CR seems to include the "best practices" of CBT. More research needed.....	39 studies didn't describe the type of gambling. Little detail of the intervention techniques used.

							Face to face (n=42) or self treatment by manual or internet (n=5).		
Cowlishaw 2012	Systematic review (Cochrane)	N/S (Papers found were in community /outpatient settings	Pathological and problem gamblers (male and female of any age and ethnicity). Included clinically diagnosed and self-assessed.	THERAPY: Psychological therapies (CBT, MI, integrative therapy, other).	Search date: 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 post treatment CBT showed beneficial effects of therapy on gambling symptom severity and financial loss (n=11). At 6-12 months MI showed significant effect in terms of frequency of gambling (n=4). Other interventions had very small numbers of studies.	Supports short term efficacy of CBT in reducing gambling behaviour post treatment. Preliminary evidence for some benefits from MI.	Studies varied in quality. Longer term benefits unclear. Lack of long term studies. Inadequate concerning relapse. Studies had few exclusion criteria and various types of preferred gambling method.
Drawson 2017	Systematic review	N/S	Gamblers Adults	SELF HELP: Harm reduction through protective behavioural strategies [PBS] (self-exclusion, time limiting, monetary limit, cashless cards)	Actual or perceived benefits of PBS. Search date: to August 2015.	Reducing harms associated with gambling. Reported gamblers' views (perceived benefits).	33 studies. Evidence limited. Self exclusion most often endorsed by gamblers but many returned to gambling after the exclusions period. However, gambling frequency, duration, expense, debt and urge were reduced at 12 months.	Self-exclusion most "promising" strategy. But limited evidence. Self exclusion may not be enforced by casinos.	Livingstone 2014? Study quality was low – QA was not done as all studies would be excluded!
Ginley 2017	Systematic review	Laboratory based interventions	Gamblers	INDUSTRY: Gambling related warning	Onscreen or poster messages.	Impact on gambling attitude,	31 studies	Pop up messages are largely supported and potentially reduced harm.	Questions over transfer from laboratory

		and "naturalistic" settings		messages (limit setting, educational animations, cash expended displays, personalised feedback		knowledge or behaviour.	Static signs have limited 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.	Particularly high threat messages endorsed by medical/government. Greatest impact for messages about likely losses and social consequences. Limit setting and personal feedback reduced money spent and time gambling. Participants were more likely to set time limits.	(often one gambling interaction) to real life. Reliance on self-reporting of message impact. No long term.
Goslar 2017	Systematic review and meta-analysis	Clinic/home	Pathological gambling /problem gambling disorder (DSM5) Adults	THERAPY: Psychological treatments: Face to face versus self-guided treatment. To reduce problematic gambling behaviour	RCT (or quasi)	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 most.	Most studies were on electronic gambling. Small number of studies. Participants varied in terms of gambling severity.

Goslar 2018	Systematic review and Meta-analysis	Medical	Adults? Average age 43	Pharmacological treatment (including combined with psychological treatment)	RCT (or quasi) Not secondary to a medical condition (e.g. Parkinsons)	Global severity of gambling, frequency of gambling and financial loss from gambling.	39 studies. Pharma treatments associated with large and medium pre-post reduction in global severity, frequency and financial loss. No advantage of any medical class over another. Small and non-significant advantage of combined treatment vs. pharma alone.	A variety of medications are affective for the management of gambling behaviour. Suggest no pharma treatment superior and potential additional benefit from combination with psychological therapy.	“Ludomania” Small number of studies in meta-analysis. Differing methodological quality. Limited quality of evidence.
Grant 2012	Systematic review	N/S	Pathological gamblers	Pharmaco-therapeutic gambling interventions	Not stated	Not stated	18 double blind, placebo controlled trials. Opioid antagonists and glutamatergic agents most promising. Antidepressants, antipsychotics, and mood stabilizers demonstrated mixed results.	Opioid antagonists most promising treatment.	Small sample sizes. Non-representative groups (e.g. without co-occurring psychiatric disorder). Very limited info on review methodology.
Keen 2017	Systematic review	School based		School based gambling education programmes	Quantitative analysis. Primary or high school.	Behavioural outcomes Cognitive outcomes (knowledge,	19 studies (20 papers) 20-500 min per programme (v.	Not possible to determine if cognitive improvements prevent development of gambling problems: relatively small numbers of youth gamble at	Methodological inadequacies: brief/no follow up, no control, inconsistencies in measures of

					Not therapeutic setting, media campaign, public announcement or website. Search date: to January 2017	perceptions and beliefs)	varied). Mostly class cohort videos. 9 studies measured behavioural outcomes – 5 showed positive effects. Universal and targeted approaches.	problem levels so hard to assess real world outcomes. Programmes should be universal and early age.	gambling behaviours. Probable publication bias as large numbers of school programmes exist.
Kourgiantakis 2016	Systematic review	Not limited to schools.	Children or youth (not defined).	Problem gambling prevention programmes	Qual, quant and mixed methods. English or French. Search date: 2000-2014.	Increased knowledge and modify misconceptions about gambling. Participant “skills”(?) Gambling behaviour.	16 studies All programmes were universal and did not target subgroups (e.g. children of problem gamblers). Most studies had single post test measure (1-3 months). Most found increase in knowledge/attitude measures. Only two studies showed change in gambling behaviour post intervention.	Lack of secondary/tertiary prevention programmes. Lack of family focused prevention.	No study limitations reported.
Ladouceur 2012	Systematic review (described as “critical review)	Electronic gaming machines	Electronic game gamblers	Pre-commitment systems for electronic gaming machines	Search date not stated.	Self reported measures of gambling. “Trials”.	17 studies Variable findings for adherence to money and	Pre-commitment systems show “potential promise for a minority of gamblers” – but a	Review reports individual studies only – no synthesis. Not clear

				(expenditure and time limits).			expenditure limits. Few gamblers used time limits. Suggests 70% of gamblers positively predisposed to pre-commitment (but not clear where this figure comes from).	conclusive statement "cannot be offered".	where discussion comes from. Studies failed to control for concurrent gambling outside the trials (e.g. other venues).
Ladouceur 2013	Systematic review (described as "critical review)	Universal / school based	Youth	Gambling specific prevention programmes and gambling and related skills workshops	Review date: not stated.	Reducing gambling misconceptions. Increasing gambling knowledge.	Xx studies Ages 9 – 20 years. 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 reported. Good strategies to raise awareness of problems. Targeted preventative approaches required.	Review reports individual studies only – no synthesis. Lack of long term follow up. Lack of behavioural measures.
Lupi 2014	SR	NR/Any	Pathological gambling	Pharmacological agents	Multiple databases to 2013, English, reviews, trials and case reports	NR/Any	75 papers included. Conflicting findings for antidepressants (More effective than placebo in 3 of 7 studies). Opioid antagonists promising results (more effective than placebo in 4 of 5 studies). Mood stabilisers and atypical anti-psychotics weak evidence (more effective than	Pharmacological interventions are promising	Little known about mechanisms of action, combinations may be worthwhile to study. Studies all in people who had requested help.

							placebo in 1 of 4 studies).		
Luquiens 2018	SR	NR/Any	Gambling disorder	Cognitive training – neurocognitive approach for problem behaviours	PubMed/Medline, google, trials database, no language exclusion. To 2017. Reporting efficacy data.	NR/Any	No studies identified.	There is currently no data regarding the effectiveness of cognitive training in gambling disorder.	Authors argue the approach has potential.
Marchica 2016	SR	NR/Any	NR, but most studies were in problem or at risk gamblers, three in University students	Personalised feedback interventions	Included a comparator group, English, 2003-2015, multiple databases	Gambling prevention or reduction	Six studies included. All studies reported some reduction in a range of gambling behaviour outcomes but not all statistically significant. Reduction in perceived norms.	PFI may be an effective intervention for changing perceptions of gambling and reducing at risk problem gambling. Altering perceived norms a factor in change pathway.	Half studies in student at risk populations, varying outcome measures,
McMahon 2019	Review of reviews	NR/Any	Children and adults with or without a diagnosed gambling disorder (studies exclusively in those with a gambling disorder excluded)	Prevention and harm reduction programmes for gambling and gambling harm – categorised as 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 DARE criteria.	Influence on capability, opportunity, motivation-behaviour (COM-B framework) Change in gambling related behaviour or gambling harm. Effects on population sub-groups.	10 SRs were included (55 studies) One review found limiting opening hours/shutdown machines did not lead to positive outcomes. Another that caps on gaming machines had no effect. Some support but overall mixed evidence on youth prevention interventions, smoking bans, limit setting, self-	Some limited support for smoking bans, limit setting, self-exclusion, prohibiting large notes, maximum bet, removal of ATMs, machine messages, personalised feedback interventions. Overall quality of evidence poor.	Voluntary interventions limited by user adherence to them, and may have unintended negative consequences for high risk gamblers. Focus on individual reduction rather than supply reduction.

							exclusion, prohibiting large notes, maximum bet, removal of ATMs. Evidence of positive effects of machine messages, personalised feedback interventions,		
Merkouris 2016	SR	NR/Any	Adults seeking treatment for a gambling disorder (not solely adolescents)	Any psychological treatment, not pharmacological.	Multiple databases 1990 – 2016. Studies conducting statistical tests, measurement post-treatment, published in English, primary studies	Gambling behaviours (e.g., expenditure, frequency or time spent gambling) and/or gambling symptom severity (e.g. preoccupation with gambling, gambling urges, gambling harm, and/or gambling-related problems such as health or financial difficulties	50 articles included from 33 studies. Older age, having a significant other, no gambling-related debt, lower levels 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 greater persistence, together with higher number of treatment sessions attended associated	Socio-demographic and psychosocial/psychological characteristics are predictors of gambling treatment outcomes	Need to consider during treatment and post-treatment predictors, not only pre-treatment predictors. Statistical significance rather than clinical significance.

							with better outcomes. Higher number of treatment sessions related to better outcomes.		
Peter 2019	Meta-analysis	Minimal or no direct contact or in-person contact	Unclear	Brief personal feedback interventions (maximum one session), studies outlined behavioural feedback or psychological measure feedback	English only, peer reviewed, studies with random allocation to a comparator condition, included one other SR, to 2016, multiple databases	Behavioural gambling data and/or 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 to 0.27). The strongest predictor of effect size was the inclusion of education, followed by the use of MI. 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. Non in person interventions are more effective and cost effective.	Short term effects only examined.
Petry 2017	SR	NR/Any	Gambling problem (based on clinical diagnosis or screening questionnaire assessment)	Any psychological intervention	Trials with random assignment, at least 25 participants per condition, in English, PubMed	Gambling outcomes	21 trials included. Most studies found benefits from cognitive-behavioural interventions (alone or combined with motivational interviewing). Interventions can	There is evidence that a 6-8 session or chapter of CB treatment, that integrates MI if the CB treatment is entirely self-directed, for individuals seeking gambling treatment is effective. For persons with less severe gambling problems	Benefits reported in the short term but few studies reported longer term follow up. Included populations differed

							be delivered individually or group, in person or via the internet. Evidence that MI is not effective unless combined with CB. Brief advice or feedback may be of benefit but no better than other interventions and may not be suitable for those seeking treatment.	interventions involving feedback may suffice. Studies found most interventions may be effective, with little difference between them.	substantially. Most studies used wait list controls. Unclear whether interventions outperform natural recovery over longer periods. Controlled gambling may be more successful than abstinence so goals may be important in outcomes.
Quilty 2019	Systematic review and meta-analysis	All settings (study settings included academic institutions, health care settings and community). Group, telephone or online not included.	problem gambling adults over 16 years.	In person brief interventions for gambling behaviours / problem gambling.	RCT Brief intervention of no more than 3 sessions. Search date: 1990 – 1 st Sept 2017.	Gambling behaviour (presence/absence, frequency, severity) and/or associated problems.	5 studies. Small but statistically significant reduction in gambling behaviour short term versus assessment only control. Not significant for “longer term changes” (duration unclear). No difference between short and longer interventions.	Supports the efficacy of brief interventions for problem gambling over the short term. No difference between brief and longer active interventions.	Limited number of studies. Only 4 research teams. Many had fewer than 25 participants per treatment condition. All conducted in North America.

Rodda 2018	Systematic review	N/S (included studies from community, university and clinical settings).	Gambling or problem gambling. Adults	Content analysis of psychological interventions.	RCT/quasi/cross-over. Search date: January 1980 – April 2016.	Gambling symptom severity, gambling frequency or gambling expenditure.	46 studies: psychological and self-help. 35 interventions characteristics to define type of change technique, participant and study characteristics, delivery and conduct of intervention and evaluation (e.g. control group). Most delivered by therapist only (no self help). 18 characteristics of change technique identified.	Assists in identifying and describing components of interventions, but further work needed in order to identify categories of technique types and delivery characteristics associated with good outcomes.	Identification of mechanism of change rarely identified in study reports.
Schuler 2016	Scoping review	NR/Any	Adults and adolescents with identified problems with gambling	Gamblers Anonymous, attending GA meetings or in GA. Excluded if embedded in a treatment.	Multiple databases, 2002-2015, any design	NR/Any	17 studies in 25 publications. Four RCTs showed reduction in time/money/symptoms. But GA plus stress management more effective than GA alone, imaginal desensitisation plus MI more effective than GA, and CB or CBT more effective than GA. In one RCT while GA was less effective at 2	Evidence for the effectiveness of GA is inconsistent. In comparisons other interventions may be more successful. Attendance at meetings and participation an important factor. A different type of person may attend GA.	Limited evidence regarding outcomes from GA. Studies were included that had GA as a control or an intervention arm.

							months, by 12 months FU all interventions were equally successful in terms of abstinence or reduction.		
Shonin 2013	SR	NR/Any	Healthy adults	Buddhist derived intervention or meditation technique. Includes mindfulness based Cognitive Therapy	Multiple databases Up to 2012 English only	Problem gambling and/or relationships	Four included studies, all focused on mindfulness meditation. Reported reduction in gambling severity, thought suppression, anxiety, distress	Mindfulness therapies based on Buddhist philosophies have potential for reducing problem gambling	Cross sectional and case study research only, small number of studies. Potential for these approaches to have less relapse.
Tanner 2017	SR	NR/Any	Those of legal age to gamble (17 year olds in lab-based studies included)	Industry or environmental-based strategies	English, quantitative measure, general awareness and advertising excluded. PsychINFO and PubMed to 2016	NR/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 ATMs. Limited effects of shutting down machines. Most researched area was pop up messages. Self-appraisal messages more effective than information messages.	Potential for positive effects of self-appraisal pop-up messages, \$1 maximum bets, removal of large note acceptors and ATMs, reduced operating hours, and smoking bans. Pop up messages combined with mandatory monetary limiting may be effective.	Studies poor quality, reliance on self-report measures
Tolchard 2017	Described as not a SR, but	NR/Any	NR/Any	CBT or behavioural	CINAHL, MedLine 1980-2015	Any	Unclear how many studies included.	Both cognitive and behavioural approaches	Studies not controlled,

	used systematic searching and inclusion criteria			approaches – most Exposure Therapy, or Cognitive Restructuring			ET reported as being effective in up to 70% of cases. Evidence on CR similarly positive for all types.	can be effective in reducing problem gambling. Many interventions include elements of both.	small number, small sample sizes, multi-morbidity often excluded, unclear what active element in combined approaches is.
van der Maas 2019	Scoping review	Online	Any – most studies drew participants from users of gambling help websites	Internet or online intervention for problem gambling – either exclusively or as a component. CBT in 6 of 27 included studies, most connected clients to mental health counselling	6 databases 2007-2017	Included any outcomes – studies reported problem gambling scores gambling behaviour, anxiety and depression, gambling frequency, faulty cognitions surrounding gambling alcohol consumption, distress	27 studies included. Most studies reported improved problem gambling outcomes including 5 of 7 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. Lack of studies in marginalised groups.
Victorri-Vigneau 2018	SR	NR/Any	Unclear inclusion criteria “Pathological gamblers”, problem gamblers, gambling disorders, addictive-like disorders	Treatment with opioid antagonists - naltrexone and nalmefene	PubMed, PsychInfo, Cochrane No limits Any study design including reviews and opinion pieces	Any including urges to gamble, gambling episodes,	34 articles included, 7 RCTs with 4 indicating positive effects and 2 no significant difference, 1 limited effect . Evidence is limited but supports that opiates have potential as a treatment either alone or in conjunction with	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 vulnerability rather than gambling behaviours Almost all studies excluded those with psychiatric co-morbidities,

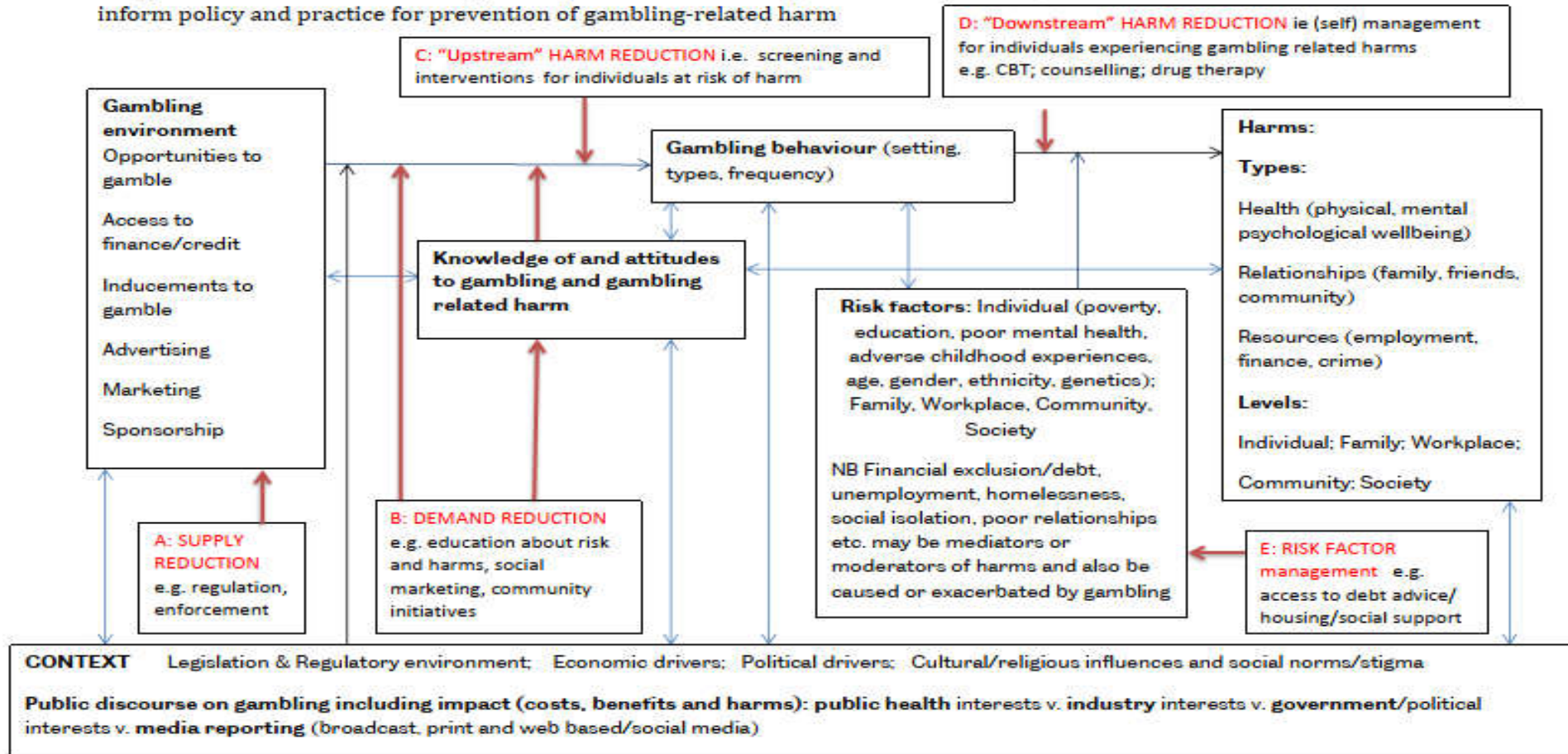
							other behavioural interventions		although these are a large proportion of the population. High short term response to placebo noted in several studies.
Yakovenko 2015	Meta-analysis	NR/Any	“Adult disordered gamblers”	Motivational interviewing. Most studies one session face to face.	1966-2013 Multiple databases, all languages. RCTs only with no intervention control or no MI control.	Gambling frequency or gambling expenditure (most studies used mean days per month or mean dollars lost per month)	5 studies included in meta-analysis published 2001-2009. Significant reduction in gambling frequency per month at 6 month follow up (mean difference -1.22 days/month, 95% CI -2.06 to -0.38 p<0.0), also significant at 9 to 12 follow up (-1.12 days/month, 95% CI -2.16 to -0.07 p<0.05). However, 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 MI on reducing gambling frequency. Authors also conclude evidence of a reduction in gambling expenditure but the data presented shows a non-significant effect.	Difference between author conclusion of effects on both outcomes and analysis presented. Authors highlight small number of studies and limitations in measurement comparability between studies.

Appendix 4.

Draft systems model

Draft scope for conceptual framework for “gambling-related harms” with complex system characteristics

Purpose of framework: to identify and explore the relationships between risk factors, behaviours and harms in order to inform policy and practice for prevention of gambling-related harm

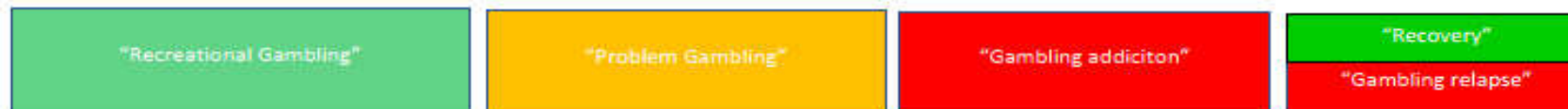


Appendix 5

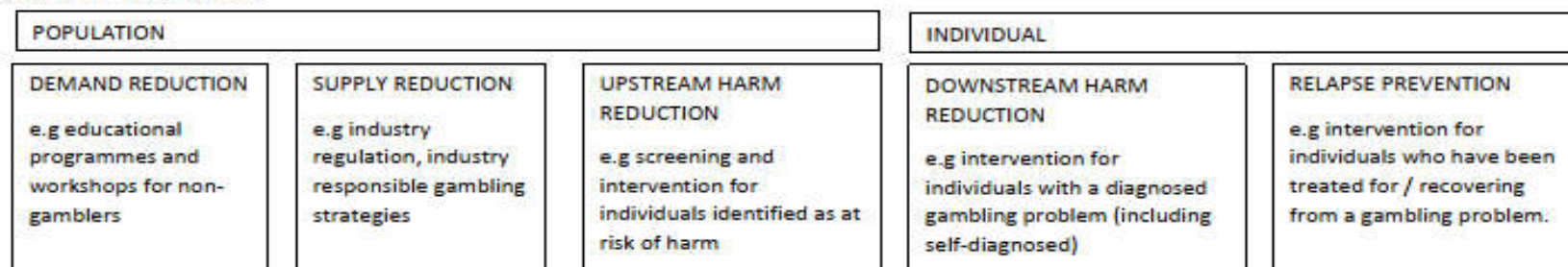
Systematic review intervention typology

Map of systematic review evidence for gambling interventions.

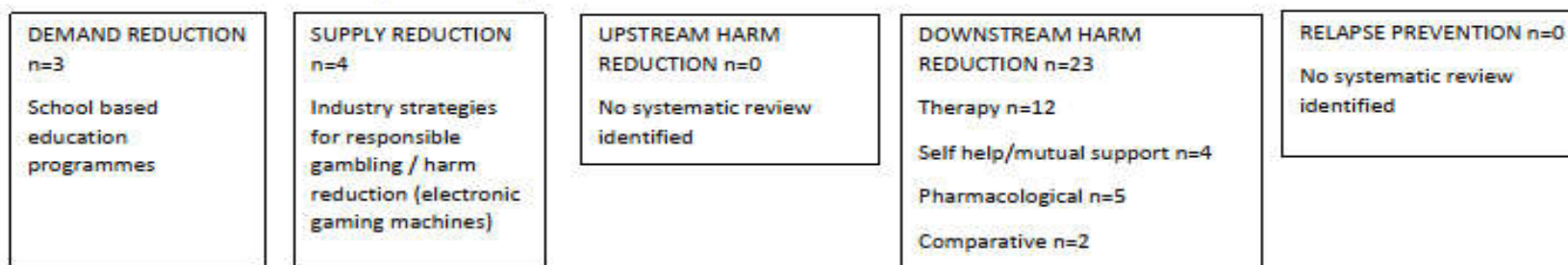
GAMBLING TIMELINE:



KNOWN INTERVENTIONS:



SYSTEMATIC REVIEW LEVEL EVIDENCE (n= 30 reviews)



Appendix 6

Scoping review search strategy – screening and relapse prevention

Database: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) <1946 to July 08, 2019>

Search Strategy:

-
- 1 Gambling/ (5154)
 - 2 (gambl* or betting or lottery or lotto or lotteries or wager or electronic gambling machine*).mp. (11049)
 - 3 1 or 2 (11049)
 - 4 (screen* or self-screen* or self screen* or self-check* or self check* or counselling or harm reduction or harm minimi#ation or risk reduction or risk minimi#ation or brief counsel?ing* or brief intervention*).mp. (817427)
 - 5 exp *Social Support/ (25236)
 - 6 *Mass Screening/ (51671)
 - 7 *Secondary Prevention/ (3056)
 - 8 *Harm Reduction/ (1370)
 - 9 *Risk Reduction Behavior/ (4613)
 - 10 *Population Surveillance/mt [Methods] (7823)
 - 11 *Behavior, Addictive/ep [Epidemiology] (747)
 - 12 *Self-Help Groups/ (5079)
 - 13 *Cognitive Dissonance/ (364)
 - 14 *Cognitive Behavioral Therapy/ (16486)
 - 15 (GamCare or National Problem Gambling Clinic or Gordon Moody Association or Gamblers Anonymous or GamAnon or Gambling Therapy Website).ti,ab. (79)
 - 16 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 (872247)
 - 17 3 and 16 (1369)
 - 18 limit 17 to yr="2012 -Current" (726)
 - 19 limit 18 to english language (695)
