

PSYCHOSOCIAL RISK FACTORS IN DISORDERED GAMBLING: A DESCRIPTIVE SYSTEMATIC OVERVIEW OF VULNERABLE POPULATIONS

ABSTRACT

Background: Gambling is a behaviour engaged in by millions of people worldwide; for some, gambling can become a severely maladaptive behaviour, and previous research has identified a wide range of psychosocial risk factors that can be considered important for the development and maintenance of disordered gambling. Although risk factors have been identified, the homogeneity of risk factors across specific groups thought to be vulnerable to disordered gambling is to date, unexplored.

Methods: To address this, the current review sought to conduct a systematic overview of literature relating to seven vulnerable groups: young people and adolescents, older adults, women, veterans, indigenous peoples, prisoners, and low socio-economic/income groups.

Results: Multiple risk factors associated with disordered gambling were identified; some appeared consistently across most groups, including being male, co-morbid mental and physical health conditions, substance use disorders, accessibility and availability of gambling, form and mode of gambling, and experience of trauma. Further risk factors were identified that were specific to each vulnerable group.

Conclusion: Within the general population, certain groups are more vulnerable to disordered gambling. Although some risk factors are consistent across groups, some risk factors appear to be group specific. It is clear that there is no homogenous pathway in to disordered gambling, and that social, developmental, environmental and demographic characteristics can all interact to influence an individual's relationship with gambling.

INTRODUCTION

Disordered gambling, a useful umbrella term encompassing the varied gambling lexicon, has been measured in large scale prevalence surveys worldwide (see Calado, & Griffiths (2016) for a comprehensive review). Such surveys provide informative and robust national level data that can generate the capacity for secondary analysis and further research on sub-populations, to establish more nuanced demographic-specific prevalence and risk factors. Such analyses have indicated that within general populations, specific groups appear to be more vulnerable to disordered gambling.

Previous international research has indicated that young people and adolescents are vulnerable to disordered gambling, with studies indicating disordered gambling prevalence rates ranging from 1% (Turner et al, 2018) to 10.4% (Yip et al, 2011) (See Calado, Alexandre, & Griffiths, 2017a, for a comprehensive review). Disordered gambling is also common in older adults; in a systematic review, Subramaniam et al., (2015), identified 25 studies measuring the prevalence of disordered gambling in older adults from a range of different countries, including the US, Canada, Australia, New Zealand, Denmark, and Sweden, with prevalence reaching as high as 10.6% (Ladd et al., 2003). Women have also been identified as a vulnerable group, with international studies reporting prevalence rates of disordered gambling ranging from 0.06% in Denmark (Bonke & Borregaard, 2009), to 10% in Greenland (Larsen, Curtis & Bjerregaard (2013), and 15.3% in a sample of indigenous Australian women (Hing, Breen, Gordon, & Russell, 2014c). Disordered gambling is also prevalent in veterans, although research is predominantly US based. Reported prevalence ranges from 0.2% past year pathological gambling in veterans accessing mental health services, Edens & Rosenheck (2012), to 10.7% a lifetime problem or pathological gambling rate in veterans accessing clinical care (Westermeyer et al., 2013). Furthermore, several studies have indicated elevated prevalence of disordered gambling in Indigenous populations in a range of countries including Australia (Hing et al., 2014c; Riley, Larsen, Battersby & Harvey, 2018; Stevens & Young 2009a; Young et al., 2007), New Zealand , (Ministry of Health, 2009; Rossen, 2015; Thimasarn-Anwar et al., 2017; Walker, Abbott & Gray, 2012), the US (Alegria et al., 2009; Wardman, el-Guebaly & Hodgins, 2001; Wolf et al., 2015) and Canada (Currie et al., 2013; Dion et al., 2015; Gill et al., 2016; Williams, Belanger, & Prusak 2016).

More recently, international research has shown that the prevalence of disordered gambling in prison populations is high. In the US, research at different stages of the justice system reveal an elevated prevalence of disordered gambling in an arrestee population (Cuadrado & Lieberman, 2012), in two county jails (Hickey et al., 2014; Kerber et al., 2012), in juvenile offenders (Westphal & Johnson, 2006) and from a federal probation office (April & Weinstock (2018). Elevated levels of

disordered gambling in those in contact with the criminal justice system has also been found in Canada (Turner et al., 2009; Turner et al., 2013a), Australia (Lahn, 2005; Riley & Oakes, 2015; Riley et al., 2017; Riley et al., 2018), New Zealand (Abbott, McKenna, & Giles, 2005; Abbott & McKenna, 2005; Sullivan, Brown, & Skinner, 2008), the UK (May-Chahal et al., 2017; Pachur, Hanoch & Gummerum, 2010), Germany (Zurhold, Verthein, & Kalke, 2014), Hungary (Tessényi, & Kovács, 2016), and Sweden (Widinghoff et al., 2018).

Previous research has indicated that poverty is also related to disordered gambling, at individual (Afifi, Cox, et al., 2010; ANPAA et al., 2011; Breen, 2012a; Southwell, Boreham, & Laffan, 2008; Thorley, Stirling, & Huynh, 2016; Tozzi et al., 2013; Walker et al., 2012; Welte, et al., 2004; Williams et al., 2016; Williams, Lee, & Back, 2013), household (Elgar et al., 2018; Orford, 2004; MacDonald, McMullan, & Perrier, 2004), neighbourhood (Barnes, Welte, Tidwell, & Hoffman, 2013; Lussier et al., 2014; Martins, Storr, Lee, & Jalongo, 2013; Welte, Barnes, Tidwell, & Wiczorek 2017) and regional (Canale, Vieno, Lenzi, et al., 2017; Dellis et al., 2013) levels. Higher levels of disordered gambling have also been recorded in homeless samples in the US (Nower et al., 2015; Shaffer, Freed & Healea, 2002), Canada (Matheson et al., 2014), and the UK (Sharman et al., 2015; Sharman et al., 2016). Furthermore, disordered gambling has been reported as being associated with increased odds of homelessness (ANPAA et al., 2011; Edens, Kaspro, Tsai, & Rosencheck, 2011; Edens & Rosencheck, 2012; Harris et al., 2017; Roberts et al., 2016), and as a significant contributory factor in homelessness in a variety of homeless samples (Crane et al., 2005; Harris et al., 2017; Rota-Bartelink & Lipmann, 2007).

It is clear from previous research that disordered gambling is consistently more prevalent in some specific groups. However, less is known regarding the consistency or heterogeneity of psychosocial risk factors that increase the vulnerability of these specific groups to disordered gambling. Although psychosocial risk factors have been comprehensively studied within specific populations, these more focussed analyses, often necessarily, create a fragmented approach to the study of risk factors that are important in the development and maintenance of disordered gambling behaviour.

Consequently, a comprehensive overview of the literature on the risk factors for disordered gambling in vulnerable populations is currently missing. To address this, the current review will assimilate and review research on disordered gambling in seven specific vulnerable populations. The aim is to identify all studies reporting psychosocial risk factors relating to disordered gambling in young people and adolescents, older adults, women, veterans, indigenous peoples, prisoners, and low socio-economic/income groups, and to establish which factors are consistent across groups, and which risk factors appear to be group specific.

METHODS

Engagement with gambling and the potential for this behaviour to evolve into a maladaptive action is influenced by a multitude of factors. Vulnerability to disordered gambling represents a complex interaction between the gambler and specific risk factors, including biological, psychological and social risk factors (Fong, 2005). However, the relative contribution of each risk factor to the life-course of the disorder ensures variability in vulnerability across groups, and individuals. Some risk factors are individually specific and may predispose the individual to a range of disorders such as dysfunctional reward processing, where gambling is merely an expression of underlying vulnerability, whereas other vulnerabilities may only develop as a function of engagement with gambling, or a result of change in life circumstance. The vulnerable groups included in the review were based on a review by Fong (2005). Six groups identified by Fong are reviewed in this paper, with the addition of prisoners. Prisoners were included due to the growing body of literature published since the Fong review, indicating elevated rates of disordered gambling in those in contact with the criminal justice system. Systematic methods were applied to locate and identify published, peer-reviewed articles reporting psychosocial risk factors for the development of disordered gambling. The aim of this review was to provide a descriptive, systematic overview of risk factors for disordered gambling in specific vulnerable populations. Due to the sizeable scope of the subject area, and the large number of vulnerable groups considered in this review, a systematic overview was considered preferable to a more focussed and arguably more limiting systematic review (Grant & Booth, 2009). Overviews have been used in previous studies reviewing facets of disordered gambling, including the neurobiology of gambling (Potenza, 2008), cognitive mechanisms in pathological gambling (Jacobsen et al., 2007), and the assessment and treatment of pathological gambling (George and Murali, 2005).

Inclusion Criteria

Inclusion criteria for the systematic overview were determined a priori; some criteria were applied across all vulnerable groups, and some criteria were necessarily group specific. General inclusion criteria included being written in English, including human participants, and being in peer-reviewed articles published in academic journals. Exclusion criteria included reviews, commentaries, dissertations and book chapters. Grey literature that was identified through regular database searches was included, however outputs from governments, research centres and charities were not searched directly. When identifying prevalence and risk factors, further group specific inclusion criteria were applied:

- Youth and adolescents: participants were required to be aged 19 years or under. Studies reporting on 'young adults', US-based college students, and university students were excluded due to the likelihood of the majority of participants being aged 19 or over. Where a participant group included participants that spanned both inclusion and exclusion ages (e.g. 16-22 years), the study was included if the average age was below or less than one standard deviation above 19 years.
- Older adults: inclusion criteria were aged 55 years and over. To extend an existing systematic review of gambling disorder prevalence studies with similar inclusion criteria to ours (Subramaniam et al., 2015), the current review included prevalence studies published since 2013.
- Women: inclusion criteria included the identification of females as a specific group to be researched.
- Veterans: inclusion criteria included the identification of veterans as a specific group to be researched.
- Indigenous populations: The Indigenous ethnic group to be studied was required to be identified. Additionally, first nation population studies were only included from New Zealand, Australia, Canada, and the USA. These four former British colonies were included due to having Indigenous populations who suffered negative experiences through colonisation, and also have a permissive gambling legislative environment.
- Prisoners: for prison populations, inclusion criteria were that participants must be in contact with the criminal justice system post-arrest, either through the courts and appeal process, incarcerated, or via post-release probation services.
- Poverty: Inclusion criteria for studies relating to poverty included confirmation of the participant's socio-economic status, including income, employment status, current living arrangements, or area index of multiple deprivation score.

Furthermore, risk factors were required to fall under the broad umbrella of psychosocial risk factors. Previous reviews exist on the neurobiology of gambling (Potenza, 2008) and on cognitive mechanisms in pathological gambling (Jacobsen et al., 2007), therefore, studies reporting on genetic, neurological or neurocognitive risk factors were excluded from the current review.

Search strategy

Two electronic databases were searched from their inception to 31st December 2018: EBSCO (including Academic Search Complete, CINAHL Plus, PsycARTICLES and PsycINFO), and PubMed (including MEDLINE). Search strategies were developed using key words prominent in article indexing identified during a scoping search for each group. Full search strategies are shown in appendix A. Searches were tailored to each host search platform.

Study selection and data extraction

Manuscript titles for pre-assigned groups were independently screened by a single reviewer (one of SS, KB & AR). At this stage, only duplicates were removed. Following removal of duplicates, each specific group was screened by two pre-assigned members of the review team; the third review team member acted as arbitrator to resolve any disagreements. Where required, the full text article was accessed to ascertain eligibility. The following data were extracted: target population of study, relevant population specific demographics, and risk factors identified. Upon review of the included articles, it was considered that due to the existence of post 2000 systematic reviews for a number of the groups (Calado, Alexandre, & Griffiths, 2017a; Johansson et al., 2009; Levy & Tracy, 2018; Subramaniam et al., 2015; Wardman, el-Guebaly, & Hodgins, 2001; Williams, Royston & Hagen, 2005), it would be more productive to complement rather than reproduce this work. Therefore, only studies published from 2000 onwards were selected for psychosocial risk factors. PRISMA flow charts for risk factors are presented (figure 1).

Quality appraisal and data synthesis

As the current review is a descriptive systematic overview, studies were not subject to any formal assessment of quality. Although this creates the potential for lower quality studies and risk of bias to be introduced into the review, systematic overviews of this nature can call on elements of rigour associated with systematic reviews whilst providing a broad and comprehensive summation of a large topic area (Grant & Booth, 2009). Studies reporting risk factors for each group were reviewed, before an overall narrative synthesis was applied.

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VULNERABLE GROUPS

Young people and adolescents

Previous research has identified factors that increase vulnerability to gambling disorder in young people. Personal circumstance and social environment factors that can increase the risk of experiencing a gambling disorder include being male (Abbott, Romild & Volberg, 2014; Abdi, Ruiter

& Adal, 2015; Anagnostopoulos et al., 2017; Barnes, Welte, Hoffman, & Tidwell, 2011; Calado, Alexandre & Griffiths, 2017b; Cosenza, Ciccarelli, & Nigro, 2018; Desai, Maciejewski, Pantaloni, & Potenza, 2005; Forrest & McHale, 2012; Giralt *et al.*, 2018; Hardoon, Gupta, & Derevensky, 2004; Jaisoorya *et al.*, 2017; Lee, Martins, Pas & Bradshaw, 2014; Molde et al., 2009; Olason, et al., 2006; Sheela et al., 2016; Skokauskas & Satkeviciute, 2007; Splevins, et al., 2010; Špolc, Mravčík, Drbohlavová, & Chomynová, 2019; Spritzer *et al.*, 2011; Villella *et al.*, 2011; Wilson et al., 2006; Wong & So, 2014), parental engagement with gambling activities (Abdi et al., 2015; Anagnostopoulos *et al.*, 2017; Forrest & McHale, 2012; González-Roz, et al., 2017; Hanss et al., 2015; Hardoon et al., 2004; Langhinrichsen-Rohling, Rohde, Seely, & Rohling, 2004; Magoon & Ingersoll, 2006; Sheela, et al., 2016; Skokauskas & Satkeviciute, 2007; Vachon, Vitaro, Wanner, & Tremblay, 2004; Zhai et al., 2017), having friends that gamble (Abdi *et al.*, 2015; Anagnostopoulos et al., 2017; Canale, Vieno, Griffiths, et al., 2017; Castrén, et al., 2015; Gori *et al.*, 2015; Lussier, Derevensky, Gupta & Vitaro, 2014; Wilson et al., 2006; Zhai et al., 2017), lower family connectedness and peer support (Delfabbro, Lahn, & Grabosky, 2006; Dickson, Derevensky & Gupta, 2008; Elgar et al., 2018; Hardoon et al., 2004; Lussier et al., 2007; Magoon & Ingersoll, 2006; Vitaro, Brendgen, Ladouceur, & Tremblay, 2001) being an only child (Forrest & McHale, 2012), student employment (Canale, Scacchi, & Griffiths, 2016), being of foreign nationality or an immigrant (Abbott *et al.*, 2014; Anagnostopoulos et al., 2017; Canale et al., 2017; Giralt *et al.*, 2018; Lehman et al., 2016; Sullivan, 2005), high deprivation (Elgar et al., 2018, Forrest & McHale, 2012; Schissel, 2001; Sullivan, 2005), low grades at school (Anagnostopoulos et al., 2017; De Luigi et al., 2018; Ricijaš, Dodig-Hundrić, Huić, & Kranželić, 2016; Potenza et al, 2011; Vitaro et al., 2018; Wong & So, 2014; Yip *et al.*, 2011), an absence of availability of food in the household (Anagnostopoulos et al., 2017) and experiencing major negative life events (Bergevin, Gupta, Derevensky & Kaufman, 2006).

Further risk factors for adolescent gambling disorders include psychological vulnerabilities, such as a history of sexual abuse (Jaisoorya *et al.*, 2017), childhood maltreatment (Felsher, Derevensky & Gupta, 2010), negative affectivity (Passanisi, D'Urso, & Pace, 2018; Yücel et al., 2015) depression and anxiety, (Allami et al., 2018; Cosenza et al, 2018; Estevez, Herrero-Fernández, Sarabia, & Jauregui, 2015; Lee, Storr, Ialongo & Martins, 2011; Martins, Storr, Ialongo, & Chilcoat, 2007; Molde et al, 2009; Nigro, Cosenza, & Ciccarelli, 2017; Petry & Tawfik, 2001; Potenza et al, 2011; Ste-marie, Gupta, & Derevensky, 2002; Vitaro et al., 2004, Yip et al., 2011), low self-esteem (Abdi et al., 2015; Delfabbro, et al., 2006), low self-control (Cheung, 2014, 2016), medication related to nervousness (Canale *et al.*, 2017), higher ADHD scores (Chamberlain *et al.*, 2017; Derevensky, Pratt, Hardoon, & Gupta, 2007; Faregh & Derevensky, 2011), childhood hyperactivity (Martins et al., 2007) and increased prevalence of learning disorders (Parker, et al., 2013; Taylor et al., 2015).

Engagement in other delinquent behaviours also predict gambling disorders, including higher lifetime rates of tobacco and alcohol use (Buja *et al.*, 2017; Chiu & Woo, 2012; Gerdner & Svensson, 2003; Gori *et al.*, 2015; Hardoon *et al.*, 2004; Langhinrichsen-Rohling *et al.*, 2004; Lee *et al.*, 2014; Molinaro *et al.*, 2018; Potenza *et al.*, 2011; Skokauskas & Satkeviciute, 2007; Špolc *et al.*, 2019; Weinburger *et al.*, 2015; Yücel *et al.*, 2015), substance use, (Abdi *et al.*, 2015; Cook *et al.*, 2015; De Luigi *et al.*, 2018; Gori *et al.*, 2015; Hammond *et al.*, 2014; Hardoon *et al.*, 2004; Langhinrichsen-Rohling *et al.*, 2004; Lehman *et al.*, 2016; Lynch, Maciejewski, & Potenza, 2004; Martins *et al.*, 2007; Molinaro *et al.*, 2018; Petry & Tawfik, 2001; Richard, Potenza, Ivoska & Derevensky, 2018; Potenza *et al.*, 2011; Ste-marie *et al.*, 2002; Wilson *et al.*, 2006; Yip *et al.*, 2011), consuming alcohol with energy drinks (Vieno *et al.*, 2018), conduct problems (Hardoon *et al.*, 2004; Langhinrichsen-Rohling *et al.*, 2004; Temcheff *et al.*, 2016; Tsitsika *et al.*, 2011; Welte, Barnes, Tidwell & Hoffman, 2009) and other high-risk behaviours or anti-social behaviours such as fighting, illegal car racing, committing crime, sexual promiscuity, carrying a weapon (Allami *et al.*, 2018; Cook *et al.*, 2015; Petry & Tawfik, 2001; Potenza *et al.*, 2011; Räsänen, Lintonen, Joronen, & Konu, 2015; Sheela *et al.*, 2016), and using a fake ID (Poulin, 2000). Involvement in competitive sports also increases risk of disordered gambling (Gavriel-Fried, Bronstein, & Sherpsky, 2015; Molinaro *et al.*, 2018).

Gambling related traits and behaviour also predict gambling engagement, including reporting an accepting attitude to gambling (Gori *et al.*, 2015; Rossen, Clark, *et al.*, 2016), playing video games with simulated gambling (Castrén *et al.*, 2015; Chiu & Woo, 2012; King, Delfabbro, Kaptsis, & Zwaans, 2014; McBride & Derevensky, 2017), engaging with social casinos (Veselka *et al.*, 2018), exposure to gambling advertising (Clemens, Hanewinkel, & Morgenstern, 2017; Derevensky, Gupta & Messerlian, 2010), gambling frequency or involvement (Dixon *et al.*, 2016; Kristiansen, Jensen, & Trabjerg, 2014; Moore & Ohtsuka, 2000; Räsänen, Lintonen, & Konu, 2015; Räsänen, Lintonen, Raisamo, & Konu, 2016; Rossen *et al.*, 2016; Zhao, Marchica, Derevensky, & Ivoska, 2018), availability of gambling (Abdi *et al.*, 2015; Ho, 2017), cognitive biases and distortions (Cosenza *et al.*, 2018; Donati, Chiesi, & Primi, 2013; Skokauskas & Satkeviciute, 2007; Tang & Wu, 2012), receiving lottery tickets as a gift (Kundu *et al.*, 2013) and the form and mode of gambling engaged in (Brunelle *et al.*, 2012; Canale, Griffiths, Vieno, Siciliano, & Molinaro, 2016; Giralt *et al.*, 2018; González-Roz *et al.*, 2017; Ho, 2017; Marchica, Zhao, Derevensky & Ivoska, 2017; Rahman *et al.*, 2012; Rossen *et al.*, 2016; Wong & So, 2014; Zhao *et al.*, 2018).

Older Adults

A number of risk factors for disordered gambling amongst older adults have been identified, which one paper classified in to three clusters: individual vulnerability, social and environmental factors,

and factors affecting behavioural regulation (Tirachaimongkol, Jackson, & Tomnay, 2010). Alternatively, motivations to gamble can be clustered in to three types (entertainment, emotions, and money), where motivations related to money and emotion were associated with a higher odds of problem gambling (van der Maas et al., 2018). Risk factors identified included being male (Chen & Dong, 2015), accessibility (Piscitelli, Harrison, Doherty & Carmichael, 2017; van der Maas et al, 2017; Wick, 2012), parental gambling (Clarke & Clarkson, 2009), having a limited and fixed income, and limited future earning potential (Fong, 2005; Southwell, Boreham & Laffan, 2008). An important age-related risk factor that appears to result in greater vulnerability to disordered gambling is the loss of a partner and living alone; it has been found that greater problem gambling in older adults is predicted by loneliness (Elton-Marshall et al, 2018; Parke, Griffiths, Pattinson, & Keatley, 2018), amotivation (Clarke & Clarkson, 2009) or a smaller and less satisfying social network (Lichtenberg, Martin, & Anderson, 2009), whilst qualitative analysis with older female gamblers identifies 'filling a void' as a core theme (Pattinson & Parke, 2017). Specific forms also appear to be related to gambling problems: there is increased casino visitation among older adults with reduced social support (Zaraneck & Chapleski, 2005), those without a partner have greater motivation to play electronic gaming machines and rely on these machines for recreational and social needs (Southwell et al., 2008), and increased problem gambling risk was found in those who primarily play video poker (Preston, Shapiro, & Keene, 2007). Loneliness mediates the association between marital status and problem gambling (Elton-Marshall et al., 2018), although this may be more true in older men than in older women (Botterill, Gill, McLaren, & Gomez, 2016). Gambling may provide older adults with opportunities for social engagement (Vander Bilt et al., 2004) and entertainment (Stansbury et al., 2015), however Chen & Dong (2015) identify living with more people as a risk factor, Preston et al., (2007) report that adults for whom gambling forms a significant part of their recreation are at greater risk of problem gambling, and Wick (2012) identified family and friend acceptance of gambling as a risk factor.

Older adults with disordered gambling are more likely to have comorbid physical and mental health problems than non/low frequency gamblers (Chou & Cheung, 2013; Erickson, Molina, Ladd, Pietrzak, & Petry, 2005; Granero et al., 2014; Kerber, Black, & Buckwalter, 2008; Kerber, et al., 2012; Levens et al, 2005; Lichtenberg et al., 2009; Pietrzak, Molina, Ladd, Kerins, & Petry, 2005; Pietrzak, Morasco, Blanco, Grant, & Petry, 2007; Pilver & Potenza, 2013, Southwell et al, 2008), as well as having alcohol or substance use problems (Kerber et al., 2008; Levens et al., 2005; McCready et al., 2008; Pietrzak et al., 2007; Wick, 2012). It is possible that these other health conditions may mask gambling-related problems from healthcare providers or reduce the perceived seriousness of the gambling problem relative to other health concerns. Problem gamblers over 65 years old had more health problems

with earlier rather than late onset of gambling (Burge, Pietrzak, Molina, & Petry, 2004). Furthermore, older recreational gamblers may be healthier than non-gamblers (Desai, Maciejewski, Dausey, Caldarone & Potenza, 2004), however when compared to older non/low frequency gamblers, past year at risk/problem/pathological gambling in older adults was associated with subsequent incidence of generalized anxiety and substance use disorders when controlling for baseline psychiatric comorbidity (Pilver, Libby, Hoff & Potenza, 2013a) suggesting some directionality to this association. Older gamblers who reported later problem gambling onset (at or after 55) were more likely to report an anxiety disorder than early onset gamblers (Grant et al, 2009).

Women and gambling

Labelled the 'feminization' of gambling (Volberg, 2003), more women than ever before are gambling, developing gambling-related problems and seeking help (Holdsworth, Hing & Breen, 2012). Several studies have highlighted heightened risk factors for disordered gambling in women, including availability and access (McCarthy et al., 2018), household financial problems and low income (Afifi et al., 2010; Fröberg et al., 2015), unemployment (Morrison, 2017; Tang, Wu, & Tang, 2007), greater endorsement of material and financial gain (Riley et al., 2017; Teeters et al., 2015), overspending (Pattinson & Parke, 2017), more family support (González-Ortega et al., 2013), having never been married (Afifi et al., 2010), childhood hyperactivity (Martins et al., 2007) and gambling as part of a social experience (McCarthy et al., 2018). For adolescent female gamblers, parental gambling has been shown to be predictive of gambling risk (Donati, et al., 2013). Furthermore, it has been shown that women progress more quickly than men from the initiation of gambling to experiencing gambling problems, a process called "telescoping" (González-Ortega et al., 2013; Grant & Kim, 2002; Potenza et al., 2001; Tang, Wu, & Tang, 2007; Tavares, Zilberman, Beites, & Gentil, 2001). Female treatment-seeking gamblers are more likely to report negative reinforcement motivations for gambling and present with other comorbid disorders such as anxiety, depression or mood disorders, (Andronicos et al., 2015; Boughton & Falenchuk, 2007; Davis & Avery, 2004; Desai et al., 2005; Grant et al., 2012; Martins et al, 2007; Ronzitti et al., 2016; Wenzel & Dahl, 2009) and substance-use disorders (Blanco, et al., 2006; Boughton & Falenchuk, 2007; Cunningham-Williams, et al., 2007; Davis & Avery, 2004; Grant & Kim, 2002; Hing et al., 2014d; Martins et al., 2007; Nordmyr et al., 2014; Petry, Stinson & Grant, 2005; Pilver et al., 2013b).

Several studies have also shown that there is a high history of trauma or abuse in female disordered gambling groups (Afifi et al., 2010; Boughton & Falenchuk, 2007; Davis & Avery, 2004; Endrass & Rossegger, 2009; Hagen et al, 2013; Petry & Steinberg, 2005). Living in an abusive home

environment with violent partner, or having a violent partner are also risk factors for disordered gambling (Andronicos et al., 2015; Lee et al., 2012; Morrison, 2017; Roberts et al., 2016). Further research has identified lower self-esteem (Echeburua, González-Ortega, De Corral, & Polo-López, 2011), poor coping skills (Afifi et al., 2010; Cheung, 2015; Scannell et al., 2000), and higher levels of baseline aggression in female adolescents are also predictive of future risky gambling (Yücel et al., 2015), whilst Delfabbro, Thomas, & Armstrong (2018) suggest behaviours indicating emotional distress were observable risk indicators for problem gambling. Women are increasingly gambling online and represent a growing market for gambling companies (Edgren et al., 2017; McCarthy et al., 2018), identifying accessibility, anonymity, and being less of a male domain as reasons for gambling online (Corney & Davis, 2010). Loss chasing among women was found to be highly indicative of disordered gambling (Temcheff, Paskus, Potenza, & Derevensky, 2016).

Veterans

Previous research on gambling risk factors in veterans indicates an association between disordered gambling and mental health comorbidity (Edens & Rosenheck, 2012). In one study in Native American and Hispanic American veterans, a 70% lifetime comorbidity of Axis I psychiatric disorders was found, and pathological gambling was associated with substance, mood and antisocial personality disorders compared with a 46% prevalence in veterans without pathological gambling (Westermeyer, Canive, Garrard, Thuras, & Thompson, 2005). Past year pathological and problem gambling in veterans has also been found to be associated with substance dependence (Dickerson et al., 2009; Edens & Rosenheck, 2012; Stefanovics et al., 2017; Whiting et al., 2016), depression, anxiety, mood or antisocial personality disorders (Edens & Rosenheck, 2012; Scherrer, Slutske, et al., 2007, Stefanovics et al., 2017; Whiting et al., 2016), and PTSD (Whiting et al., 2016), however Biddle et al., (2005) found there was no significant relationship between problem gambling and PTSD, anxiety, depression, or alcohol use.

Risk factors for disordered gambling in veterans can include exposure to traumatic events such as witnessing someone being badly hurt or killed or being physically attacked (Scherrer, Xian, et al., 2007, Stefanovics et al., 2017). Experience of emotional, physical and sexual trauma, mostly in childhood, is also highly prevalent in veterans who are pathological gamblers (Kausch, Ruge, & Rowland, 2006), however traumatic experiences post age-16 have also been identified as a gambling risk factor (Dighton et al., 2018). Further risk factors for gambling in veterans include homelessness (Edens & Rosenheck, 2012; Harris et al., 2017), lower social support post deployment (Whiting et al., 2016), being female (Edens & Rosenheck, 2012; Westermeyer et al., 2013), being male (Whiting et al., 2016), being younger (Stefanovics et al., 2017; Westermeyer, 2013), experiencing a traumatic

brain injury (Whiting et al., 2016), identifying as black (Stefanovics et al., 2017), having friends and family members engaged in gambling (Freeman, Volberg & Zorn, 2019), and gambling on Electronic Gaming Machines (Biddle et al., 2005).

Indigenous Peoples

Many indigenous populations have experienced traumatic events through discrimination and dispossession (Breen & Gainsbury, 2013), and are thought to be vulnerable to gambling disorders. Some risk factors for gambling disorders retain consistency across indigenous cultures, however some vulnerability factors appear to be more culturally sensitive. In Australia, risk factors include being male (Dickerson et al., 1996), female (McMillen, Marshall, Ahmed, & Wenzel, 2004; Stevens & Young, 2010) working part-time, being separated, divorced or widowed, (Hing, Breen, Gordon, & Russell, 2014a; 2014e), childhood exposure to gambling, having friends and family who gamble (Hing, Breen, Gordon, & Russell, 2014c), and being either socially marginalised (McMillen & Donnelly, 2008) or connected (Stevens & Young, 2010). The Aboriginal Health and Medical Research Council (AHMRC) identified stress, anxiety, grief and loss (AHRMC, 2007), whilst Hing, Breen, Gordon, & Russell (2014b) identified coping and escape as gambling risk factors. Multiple studies identify substance abuse as a gambling risk factor (AHMRC, 2007; Hing et al. 2014a; 2014c; 2014d; 2014e; McMillen & Donnelly, 2008). Further risk factors identified include living in a remote location (Stevens & Young, 2010), gambling behaviour and motivations (Breen, 2012b; 2012c; Hing et al., 2014d; 2014e), increased availability (Stevens & Young 2009a; Breen 2012a), early gambling onset (Hing et al., 2014c; 2014d; 2014e), type of gambling (Young, Stevens, & Morris, 2008), use of non-monetary stakes (Breen, 2012a) and superstitious ties to 'lucky' poker machines (Breen, Hing, & Gordon, 2011). Stevens & Bailie, (2012) identified less access to a doctor as a significant risk factor for disordered gambling. In New Zealand, escape from stress (Dyall, 2007) and easy access to gambling (Lin, Casswell, Huckle, You, & Asiasiga, 2011; Ministry of Health, 2009; Tse et al., 2012) have been identified as important factors in the development of gambling disorders, whilst suicide attempts in disordered gamblers were more likely to come from Māori people (Penfold, Hatcher, Sullivan, & Collins, 2006). Historical dispossession experienced by Māori people is thought to be fundamental to the development and maintenance of gambling disorders (Dyall, 2007). Considerable attention has been given to the misappropriation of Māori culture, through the use of Māori artwork, poi, and carvings in gambling venues (Dyall, Tse, & Kingi, 2009) and both the provision of gambling funds for community events, and the involvement of Māori elders in the opening of new gambling venues (Dyall, 2007; Dyall et al. 2009), thus legitimising gambling as a safe activity. Kolandai-Matchett et al., (2017) identify collectivism, gift-giving, gambling based fundraising, patriarchy, beliefs about blessings, and sports celebrities as important cultural contexts in which

gambling is normalised. Furthermore, poker machines are often concentrated in low income areas that include Māori and Pacific people, facilitating the development of gambling problems (Tse, et al. 2012; Walker et al. 2012).

In North America, research with Canadian aboriginal peoples has identified a range of risk factors, including childhood sexual abuse (Dion, et al., 2010; Dion, Cantinotti, Ross, & Collin-Vézina, 2015) type (specifically EGMs, instant lotteries and bingo) and intensity of gambling (Williams et al., 2016) and gambling availability (Wynne & McCready, 2005). Further studies have identified experiencing traumatic life events, (Gill et al., 2016) social trauma including racism and colonization (Currie et al., 2013; Hagen et al., 2013), unemployment (Williams et al., 2016) socio-economic marginality and feeling of relative powerlessness (Schissel, 2001) as antecedents of disordered gambling. Anxiety, depression and drug/alcohol abuse have also been identified as risk factors for problem gambling (Gill *et al.*, 2016). In the US, Westermeyer *et al.*, (2005) reported that pathological gambling was associated with substance abuse, mood swings and antisocial personality disorders, and that those diagnosed with an DSM-IV Axis I disorder (Diagnostic and Statistical Manual of Mental Disorders, 4th Edition criteria (DSM-IV; American Psychiatric Association (APA), 1994) were up to 3 times more likely to be pathological gamblers. The same study also identified increased exposure and access to gambling as significant risk factors (Westermeyer *et al.*, 2005). Kong et al., (2016) also found at risk/problem gambling to be associated with multiple Axis-I and lifetime Axis-II psychiatric disorders more strongly in American-Indian/Alaska natives than other American adults. Further risk factors identified for Native Americans included greater mental disabilities (Alegría *et al.*, 2009), lifetime nicotine dependence (Dickerson et al., 2009), neighbourhood disadvantage (Barnes, Welte, & Tidwell, 2017), and lower socioeconomic status (Wolf, Welte, Barnes, Tidwell, & Spicer, 2015).

Prisoners

A number of risk factors have been identified, however despite the prevalence of gambling in prisons, it has been suggested that there is little institutional response (McEvoy & Spirgen, 2012). Lower levels of perceived health (Hickey et al., 2014; Kerber et al., 2012), social functioning (Kerber et al., 2012), and educational attainment (Widinghoff et al., 2018) are associated with disordered gambling in prisoners while the prevalence of addiction and psychiatric comorbidity is increased (Abbott & McKenna, 2005; Pastwa-Wojciechowska, 2011; Widinghoff et al., 2018). Several studies have shown that prisoners tend to be impulsive and poor decision makers in risky situations with a reduced sense of regret (Hughes, Dolan, & Stout, 2014; Pachur, Hanoch, & Gummerum, 2010; Varghese, Charlton, Wood, & Trower, 2014; Yechiam et al., 2008) and this may explain not only participation in criminal behaviour but also why the prevalence of gambling is much higher than in

the general population. Gamblers are also more likely to commit income producing offences, but not violent offences than non-gambling prisoners (Turner et al., 2009), and to need to win money to pay debts (Riley et al., 2017; Turner et al., 2009).

Unintentional changes in gambling behaviour have been observed such as a reduction in the number of prisoners gambling after tobacco was banned in Canadian federal correctional institutions in 2008 (Turner, et al., 2013b). However, the same study found there was also evidence that gambling had become more serious among those who continued to gamble with a shift from using tobacco as gambling currency to money wagers following the ban (Turner, et al., 2013b). Indeed, McEvoy & Spirgen (2012) suggest that gambling constitutes an important feature of the underground economy in prisons. Further reasons for gambling in prison include alleviating boredom, providing excitement, and the opportunity to socialise (Williams & Liz Hinton, 2006), whilst criminals with the highest rates of offending exhibiting the greatest levels of loss chasing (May-Chahal et al., 2017).

Poverty

Previous research has indicated that gambling problems are more prevalent in those who are financially disadvantaged, including those living in poverty, in a low socio-economic bracket, on a low income, or economically inactive. Higher levels of loss are experienced in areas of socio-economic disadvantage (Dellis, et al., 2013; Rintoul, Livingstone, Mellor, & Jolley, 2013), whilst a higher proportion of income is spent on gambling in lowest income households (Grun & McKeigue, 2000). Access to gambling is thought to be relevant to increased gambling problems in lower socio-economic groups (Kato & Goto, 2018; Robitaille, & Herjean, 2008; Welte, et al., 2004; Wheeler, Rigby, & Huriwai, 2006), whilst the availability of specific forms of gambling appear to be clustered in more disadvantaged, low socioeconomic areas, particularly electronic gaming machines (Abbott, Volberg, Bellringer, & Reith, 2004; Livingstone, 2001; Marshall & Baker, 2001; Rintoul et al., 2013; Wardle, Keily, Astbury, & Reith, 2014; Wilson et al., 2006) and lottery outlets (Wiggins, Nower, Mayers, & Peterson, 2010). Casino type gambling and lottery gambling have been shown to increase bankruptcies (Daraban & Thies, 2011).

Explanations for the appeal of gambling to lower income and socio-economic individuals and groups include an expression of dissatisfaction with social marginalisation and relative powerlessness (Schissel, 2001), social disorganisation and social deprivation (Dyall, 2007), the relationship between socio-economic context, psychiatric disorders and gambling (van der Maas, 2016), the influence of mortality and childhood socio-economic status on risk preference and delay discounting (Griskevicius, Tybur, Delton, & Robertson, 2011), and the consideration of gambling as a 'utility premium', that is, reward without work (Nyman, Dowd, Hakes, Winters, & King, 2013).

DISCUSSION

This review sought to provide a systematic, descriptive overview of psychosocial risk factors for disordered gambling in seven specified vulnerable populations. Psychosocial risk factors were identified for each group; some risk factors were consistent across all groups, whereas other factors appeared to be unique to specific groups.

Consistent factors

Methodological inconsistencies notwithstanding, the review identified some risk factors that are consistent across a number of vulnerable groups. Co-morbid mental and physical health problems were the most commonly and consistently identified risk factor for disordered gambling across all groups (except the poverty group). Mental health problems encompassed a range of disorders, primarily anxiety and depression, but also included disorders such as personality disorders, and PTSD. It is possible gambling is used as a maladaptive coping mechanism, facilitating escape from stress, anxiety and depression (e.g. Ste-marie et al., 2002), and from negative symptoms associated with physical health disorders (e.g. Erickson et al., 2005). Furthermore, medications for some neurodegenerative diseases such as Parkinson's disease are associated with the development of disordered gambling problems (Dodd et al., 2005; Voon et al., 2007), highlighting how mental and physical health problems can increase the risk of disordered gambling in different ways. Substance use (including drugs, alcohol and tobacco) were also consistently identified as risk factors across all groups apart from the poverty group. Motivations for engaging in substance use and abuse are heterogeneous, and as such, the relationship between substance use and gambling across groups is complex. Although substance use is identified as a risk factor for disordered gambling in the studies reviewed, reasons for engaging in said behaviours are rarely interrogated. This allows only limited conclusions to be drawn and further research is needed in order to delineate whether substance abuse precedes gambling problems or vice versa, or whether this association is mediated by shared vulnerabilities to addictive behaviour e.g. reward sensitivity and impulsivity. It is perhaps surprising that no studies identified a positive association between mental/physical health problems, or substance use as a risk factor for gambling in the poverty group, given that both mental health problems (Fazel et al, 2008) and substance use (Kemp, Neale, & Robertson, 2016) are more prevalent in individuals living in poverty than those with higher socio-economic status.

Although those of a low socio-economic status or living in high deprivation or poverty were included in the review as a discrete vulnerable group, high deprivation and poverty, homelessness, low income, unemployment and poverty are risk factors for disordered gambling consistently across almost all of the groups. A number of studies have examined the relationship between poverty and

financial hardship on decision making, including Mani et al., (2013) who found that poverty impedes cognitive function, and Haushofer & Fehr (2014), who suggest that poverty has particular psychological consequences, that in turn lead an individual to economic behaviours that perpetuate the cycle of poverty. It is therefore unsurprising that low income, unemployment, high deprivation and homelessness were consistently identified across vulnerable groups as a risk factor for problem gambling.

The availability and accessibility of gambling was also a key risk factor, identified across multiple groups. Logic dictates that an individual has to be able to access gambling to actually engage in the gambling activity. However, the utility of gambling availability is expressed differently across groups. For example, for female gamblers, online accessibility in an environment that is anonymous and male-free was an important risk factor, whereas for youth gamblers, finding a venue where they could gamble (illegally) created accessibility, and subsequently a risk factor. Accessibility and availability were common risk factors amongst Indigenous populations, possibly due to the cultural and social aspects associated with gambling; where gambling is culturally ingrained, it may be more socially acceptable. Accessibility and availability were not risk factors for prisoners arguably because of the limited availability of different forms of gambling found in incarceration. The form and mode of gambling was also an important risk factor; this seemed to be particularly prominent for EGM gambling, which was the form most commonly identified a risk factor for disordered gambling across groups, except for female gamblers who identified online gambling as a common risk factor for the reasons highlighted above.

Two consistent yet contradictory risk factors identified were isolation (derived from loneliness, low family and social connectedness, never married, and separated, divorced or widowed), and gambling for social engagement and entertainment. Isolation was most consistently identified in young and adolescent gamblers, whilst gambling for entertainment and social engagement was most common in the older gamblers, highlighting a significant difference in age related risk factors. Whilst younger gamblers are drawn to solo gambling activities that maintain physical isolation (such as online gambling) through isolation via factors such as being an only child and lower social connectedness, older gamblers are drawn to gambling activities that help them escape isolation and offer social engagement, such as bingo and organised casino tours. This apparent contradiction was also apparent within Indigenous groups, where both being socially marginalised (McMillen & Donnelly, 2008), and socially connected (Stevens & Young, 2010) were found to be risk factors for disordered gambling. This contradiction emphasises how gambling when isolated can be a risk factor for disordered gambling, however using gambling as an activity to escape that isolation can also become a risk factor. Therefore, whilst a wealth of studies have sought to identify risk factors associated with

disordered gambling, fewer studies have sought to align predictive risk factors with the function that the behaviour performs for the individual. The relationship between the function gambling performs for an individual and perceived risk factors requires further investigation. Another contradictory risk factor is that of gender; although being male is commonly identified as a risk factor, within both the veteran and the Indigenous groups, being female was also identified as a risk factor. Research focusing on gambling choices and behaviour has shown form of gambling is important (Nordmyr et al., 2014; Stark, et al., 2012; Tavares et al, 2003), and that women's gambling preferences and motivations differ from men's (e.g. Hing & Breen, 2001; Thomas & Moore, 2003). It has been established that men are inclined to gamble for the excitement on competitive skill-based games, while women tend to favour luck or chance-based games (Grant, et al., 2012; Li, 2007; Svensson & Romild, 2014) that provide relaxation, a way of managing emotions or escape from problems (Hing & Breen, 2001; Hing et al., 2014d; Holdsworth et al., 2012; Pattinson & Parke, 2017; Sacco et al., 2011; Thomas & Moore, 2003). It is therefore likely that motivations for gambling and perceived benefits from such activity differs according to gender and more research is needed in this area. However, for veterans, the traumas of active duty can affect both genders; it is therefore perhaps unsurprising that both male and female veterans may use gambling as a maladaptive escape.

A risk factor that is consistently identified across groups but manifests in different ways is experience of trauma. Indigenous groups have historically been vulnerable to trauma such as displacement and are more likely to face discrimination (Gill et al., 2016). Future research exploring the mechanisms of adversity on transgenerational risk of disordered gambling is required. Veterans who have seen combat may be more likely to experience PTSD than the general population (Fulton et al., 2015), a result of active duty related trauma. Sexual abuse was a significant risk factor for young adults, and loss of a partner a factor for older adults. Differential experience of trauma might suggest that the experience of trauma whether physical, psychological, sexual or cultural may be another important risk factor increasing gambling vulnerability across groups, however the trauma can manifest in ways specific to each group. Subtypes of trauma have been found to impact cognitive and biological systems (e.g. Butler et al. 2017) and further work is required to delineate the mediating pathways by which exposure to trauma can lead to disordered gambling.

Group specific factors

A number of risk factors were identified that were group specific. Adolescents and young people were reported to have the highest number of unique group specific risk factors, including conduct problems / disorders, playing video games with simulated gambling, engaging with social casinos, higher ADHD scores, involvement in competitive sport, being an only child, exposure to gambling

advertising and marketing, being employed as a student, and using a fake ID. Whilst some factors such as using a fake ID might be expected to be unique to adolescents, it is interesting to note risk factors only identified in this group that are related to more contemporary ways in which gambling companies engage an audience, including video games with simulated gambling, and engaging with social casinos. Gambling in gaming, and social casino games (often free to play) are a 'soft' introduction to gambling, however as they have been identified as risk factors for adolescent and youth disordered gambling, thought should be given to mechanisms of regulation, or use restriction for young players.

Research with Indigenous populations also reveal some group specific risk factors, including cultural context and cultural misappropriation, living in a remote location, and less access to a doctor, powerlessness, and superstition. In this review, there are no other groups that have experienced historical racism, discrimination and displacement in the way that Indigenous peoples have, therefore risk factors framed by this historical context are by definition, unique to this group (Currie et al., 2013; Hagen et al., 2013). Superstitions and adherence to specific cultural beliefs, alongside the role in which gambling can play in Indigenous communities places gambling as an activity in a unique context. Furthermore, a number of group specific risk factors have been identified for female gamblers. These include loss chasing, overspending in other life areas, gambling for anonymity, and exhibiting outward signs of behavioural distress when gambling. However, the most commonly identified risk factor for female gamblers was being a victim of domestic violence; no other groups identified this risk factor. Females living with an abusive partner use gambling as an escape, sometimes as a psychological escape, sometimes as a way to physically remove themselves from the abusive environment (e.g Lee et al., 2012).

Although not unique to one specific group, some risk factors are more strongly identified in one group than in others. This was primarily the case in young and adolescent gamblers.

Underachievement and low school grades were consistently identified as a risk factor in young gamblers, as well as in two instances for prisoners. Engagement in other high risk and delinquent behaviours such as street fighting, joy riding and sexual promiscuity was common in young gamblers, however one study identified concurrent high-risk behaviours in female gamblers. Furthermore, both parental engagement with gambling, and having friends and family that gamble, although rarely identified as risk factors across most groups, were consistently identified as risk factors for young gamblers highlighting the importance of the developmental environment in disordered gambling onset. Lastly, gambling as a coping mechanism was commonly identified as a risk factor in female gamblers, but also less commonly in Indigenous gamblers. Females and Indigenous groups are arguably the most oppressed groups considered in the current review and are therefore arguably

the most likely to use gambling as a coping mechanism to escape domestic violence, abusive relationships, racism and discrimination. For prisoners, crime was often associated with gambling and incarceration; large proportions of disordered gamblers that their crimes are gambling-related (Abbott & McKenna, 2005; Abbott et al., 2005; Turner, et al., 2009; Zurhold, Verthein, & Kalke, 2014). Engaging in criminal activity may be associated with gambling disorder in other groups, however further research is needed to delineate any important differences between gamblers who commit crime, and criminals who gamble in prisons. Nevertheless, tackling disordered gambling in prisons is an important part of rehabilitation since increased gambling severity is significantly associated with increased risk of re-offending (April & Weinstock, 2018),

Limitations

Although providing a comprehensive systematic overview of prevalence and risk factors for disordered gambling in specific vulnerable groups, the current review was not without limitations. Across the studies reviewed, there were many methodological inconsistencies; for example, the way in which researchers use group classification is often different across studies; the terms 'adolescents' and 'young people' appeared to encompass young children under 10, to adults in their mid-20's, where as an 'older' sample could start from anywhere as 'young' as 45. Additionally, when comparing studies internationally, it is difficult to assimilate cultural nuances and jurisdictional specificities such as the respective permissiveness of country's legislative environment. Additionally, as no formal quality of assessment was performed, the robustness of the evidence base for some risk factors, particularly for those where only a single study had identified the risk factor, cannot be assumed, and perhaps warrant further investigation.

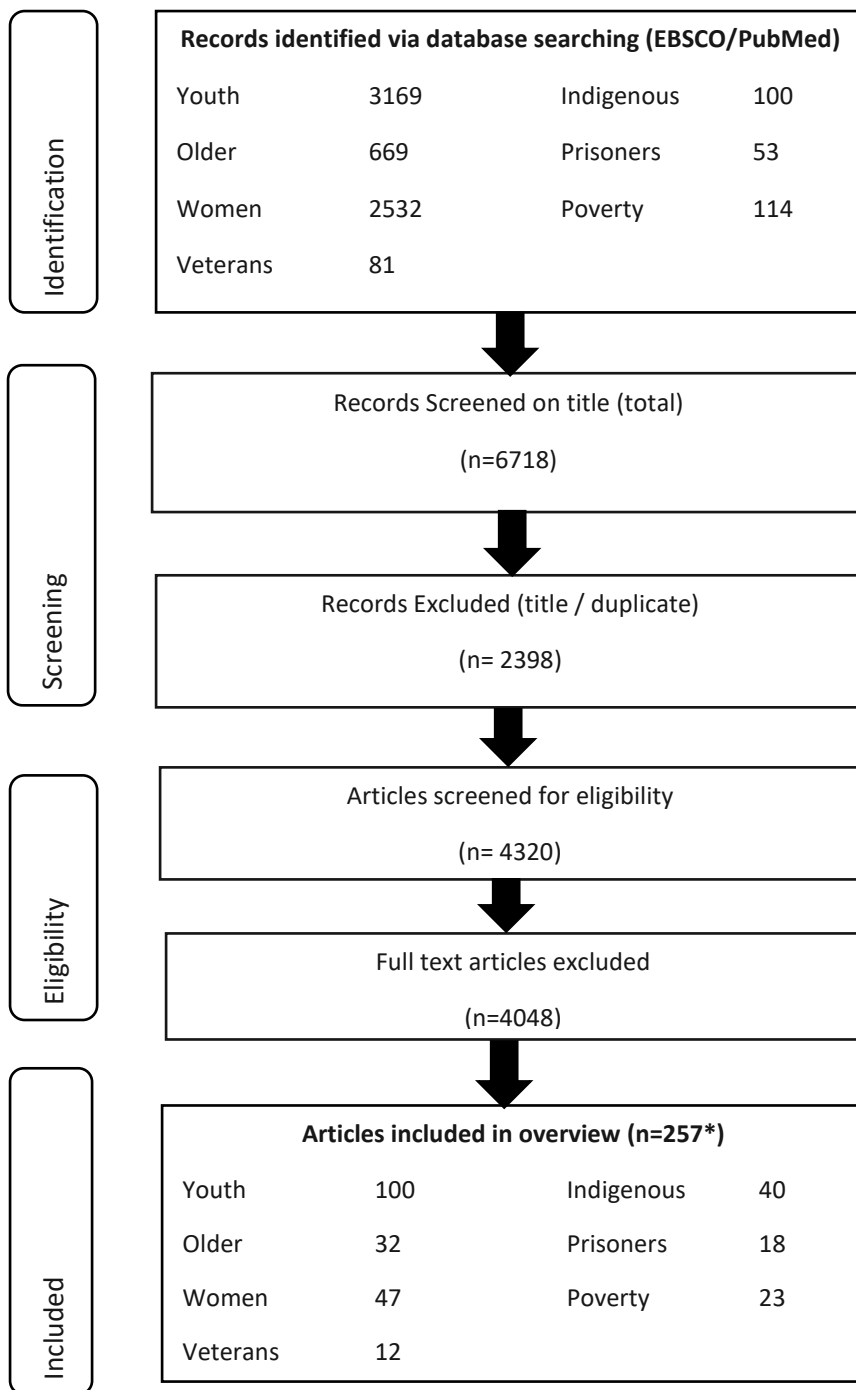
Furthermore, although the current review sought to identify group specific gambling prevalence and vulnerabilities, it is clear that many groups overlap, and therefore share risk factors. For example, all groups contain females (in addition to our female specific vulnerability group), and many Indigenous urban communities are found in low socio-economic areas. Therefore, although many studies included in the review have sought to identify group-specific risk factors and conducted statistical analysis controlling for potential confounding variables, participants rarely fall in to one, neat, researcher-labelled box. In the current review, studies were classified on the primary demographic of interest as identified by the study, and risk factors only identified where the study authors explicitly associated the risk factor with a specific demographic. Additionally, risks factors relating to poverty, low-socioeconomic status and low income were commonly identified across all groups. However, within the poverty group, very few risk factors were identified outside of experiencing poverty; therefore, it is possible experiencing poverty and low socio-economic status should not be

considered a defining group characteristic, rather than current economic status represents a significant risk factor that is apparent across all other groups defined by alternative characteristics.

Conclusions

The current review sought to provide a systematic overview of psychosocial risk factors for the development and maintenance of disordered gambling. Some risk factors for disordered gambling are reported consistently across groups, whilst some factors are unique to specific groups. Results indicate there is no generic pathway into gambling, and that each gambler will be susceptible to different risk factors that increase vulnerability to disordered gambling.

Figure 1. PRISMA Flow chart



*total is less than the sum of the number from each vulnerable group in this box due to some articles identifying risk factors for more than one group

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Appendix A - Search Strategies

Database	Group	Search 1	Search 2	Search 3	Search 4
EBSCO	Young people and Adolescents	AB (gambling* OR (problem* ADJ2 gamb*) OR (addict* ADJ2 gamb*) OR (disorder* ADJ2 gamb*) OR (pathological* ADJ2 gamb*)) OR TI (gambling* OR problem* ADJ2 gamb* OR addict* ADJ2 gamb* OR disorder* ADJ2 gamb*) OR (MH "Gambling+")	AB (adolesce* OR young* OR youth* OR (young* ADJ2 person*) OR (young* ADJ2 people) OR TI (adolesce* OR young* OR youth* OR (young* ADJ2 person*) OR (young* ADJ2 people)	AB (risk* OR (risk* ADJ2 factor*))	1 AND 2 AND 3
EBSCO	Older Adults	AB (gambling* OR (problem* ADJ2 gamb*) OR (addict* ADJ2 gamb*) OR (disorder* ADJ2 gamb*) OR (pathological* ADJ2 gamb*)) OR TI (gambling* OR problem* ADJ2 gamb* OR addict* ADJ2 gamb* OR disorder* ADJ2 gamb*) OR (MH "Gambling+")	AB (elder* OR old* OR mature) OR (elder* ADJ2 person*) OR (elder* ADJ2 people*) OR (old* ADJ2 person*) OR (old* ADJ2 people) OR (mature ADJ2 person*) OR (mature ADJ2 people*) OR TI (elder* OR old* OR mature) OR (elder* ADJ2 person*) OR (elder* ADJ2 people*) OR (old* ADJ2 person*) OR (old* ADJ2 people) OR (mature ADJ2 person*) OR (mature ADJ2 people*)	AB (risk* OR (risk* ADJ2 factor*))	1 AND 2 AND 3
EBSCO	Women	AB (gambling* OR (problem* ADJ2 gamb*) OR (addict* ADJ2 gamb*) OR (disorder* ADJ2 gamb*) OR (pathological* ADJ2 gamb*)) OR TI (gambling* OR problem* ADJ2 gamb* OR addict* ADJ2 gamb* OR	AB (female OR women) OR TI (female OR women)	AB (risk* OR (risk* ADJ2 factor*))	1 AND 2 AND 3

		disorder* ADJ2 gamb*) OR (MH "Gambling+")			
EBSCO	Veterans	AB (gambling* OR (problem* ADJ2 gamb*) OR (addict* ADJ2 gamb*) OR (disorder* ADJ2 gamb*) OR (pathological* ADJ2 gamb*)) OR TI (gambling* OR problem* ADJ2 gamb* OR addict* ADJ2 gamb* OR disorder* ADJ2 gamb*) OR (MH "Gambling+")	AB (veteran*) OR TI (veteran*)	AB (risk* OR (risk* ADJ2 factor*))	1 AND 2 AND 3
EBSCO	Indigenous Peoples	AB (gambling* OR (problem* ADJ2 gamb*) OR (addict* ADJ2 gamb*) OR (disorder* ADJ2 gamb*) OR (pathological* ADJ2 gamb*)) OR TI (gambling* OR problem* ADJ2 gamb* OR addict* ADJ2 gamb* OR disorder* ADJ2 gamb*) OR (MH "Gambling+")	AB (indigenous* OR Native OR Aborig*) OR TI (indigenous* OR Native OR Aborig*)	AB (risk* OR (risk* ADJ2 factor*))	1 AND 2 AND 3
EBSCO	Prisoners	AB (gambling* OR (problem* ADJ2 gamb*) OR (addict* ADJ2 gamb*) OR (disorder* ADJ2 gamb*) OR (pathological* ADJ2 gamb*)) OR TI (gambling* OR problem* ADJ2 gamb* OR addict* ADJ2 gamb* OR disorder* ADJ2 gamb*) OR (MH "Gambling+")	AB (prison* OR convict* OR inmate*) OR TI (prison* OR convict* OR inmate*)	AB (risk* OR (risk* ADJ2 factor*))	1 AND 2 AND 3
EBSCO	Poverty	AB (gambling* OR (problem* ADJ2 gamb*) OR (addict* ADJ2 gamb*) OR (disorder* ADJ2 gamb*) OR (pathological* ADJ2	AB (homeless* OR poverty OR (low ADJ2 economic*) OR (low ADJ2 income) OR (socio ADJ2 economic*)) OR TI (homeless* OR poverty OR	AB (risk* OR (risk* ADJ2 factor*))	1 AND 2 AND 3

		gambl*)) OR TI (gambling* OR problem* ADJ2 gambl* OR addict* ADJ2 gambl* OR disorder* ADJ2 gambl*) OR (MH "Gambling+")	(low ADJ2 economic*) OR (low ADJ2 income) OR (socio ADJ2 economic*)		
PUBMED	Young People and Adolescents	(gambling* OR (problem* ADJ2 gambl*) OR (addict* ADJ2 gambl*) OR (disorder* ADJ2 gambl*) OR (pathological ADJ2 gambl*).ab,ti. OR exp gambling/	(adolesce* OR young* OR youth* OR (young* ADJ2 person*) OR (young* ADJ2 people)),ab,ti.	(risk* (risk ADJ2 factor*)).ab,ti	1 AND 2 AND 3
PUBMED	Older Adults	(gambling* OR (problem* ADJ2 gambl*) OR (addict* ADJ2 gambl*) OR (disorder* ADJ2 gambl*) OR (pathological ADJ2 gambl*).ab,ti. OR exp gambling/	(elder* OR old* OR mature) OR (elder* ADJ2 person*) OR (elder* ADJ2 people*) OR (old* ADJ2 person*) OR (old* ADJ2 people) OR (mature ADJ2 person*) OR (mature ADJ2 people*)),ab,ti.	(risk* (risk ADJ2 factor*)).ab,ti	1 AND 2 AND 3
PUBMED	Women	(gambling* OR (problem* ADJ2 gambl*) OR (addict* ADJ2 gambl*) OR (disorder* ADJ2 gambl*) OR (pathological ADJ2 gambl*).ab,ti. OR exp gambling/	(female OR women),ab,ti.	(risk* (risk ADJ2 factor*)).ab,ti	1 AND 2 AND 3
PUBMED	Veterans	(gambling* OR (problem* ADJ2 gambl*) OR (addict* ADJ2 gambl*) OR (disorder* ADJ2 gambl*) OR (pathological ADJ2 gambl*).ab,ti. OR exp gambling/	(veteran*),ab,ti.	(risk* (risk ADJ2 factor*)).ab,ti	1 AND 2 AND 3
PUBMED	Indigenous Peoples	(gambling* OR (problem* ADJ2 gambl*) OR (addict* ADJ2 gambl*) OR (disorder* ADJ2 gambl*) OR (pathological	(indigenous* OR Native OR Aborig*),ab,ti.	(risk* (risk ADJ2 factor*)).ab,ti	1 AND 2 AND 3

		ADJ2 gambl*).ab,ti. OR exp gambling/			
PUBMED	Prisoners	(gambling* OR (problem* ADJ2 gambl*) OR (addict* ADJ2 gambl*) OR (disorder* ADJ2 gambl*) OR (pathological ADJ2 gambl*).ab,ti. OR exp gambling/	(prison* OR convict* OR inmate*),ab,ti.	(risk* (risk ADJ2 factor*)).ab.ti	1 AND 2 AND 3
PUBMED	Poverty	(gambling* OR (problem* ADJ2 gambl*) OR (addict* ADJ2 gambl*) OR (disorder* ADJ2 gambl*) OR (pathological ADJ2 gambl*).ab,ti. OR exp gambling/	(homeless* OR poverty OR (low ADJ2 economic*) OR (low ADJ2 income) OR (socio ADJ2 economic*)),ab,ti.	(risk* (risk ADJ2 factor*)).ab.ti	1 AND 2 AND 3