

# Remote Gambling Research

Interim report on Phase I

April 2016



**pwc**



**RESPONSIBLE GAMBLING COUNCIL**

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# Introduction

## *Project context*

Society has significantly increased the amount of time and money it spends online. So too has there been a significant increase in the use of the internet to gamble. Remote gambling has become a major part of the estimated £13bn UK gambling industry<sup>i,ii</sup> accounting for an estimated 31% share in 2015. The UK market includes lottery, betting on sports and other events, gaming machines, casino and bingo, all of which can be played via land-based and remote channels. While remote gambling<sup>iii</sup> can theoretically use any form of remote communications device, the predominant method is internet gambling, whether using a computer, tablet or mobile phone. Between 2010 and 2014, gambling participation (as measured as any type of betting over the last four weeks) has remained fairly flat (an average of 56% of adults in the Great Britain).<sup>1</sup> During this same period of time, online gambling has increased over 20%. In particular, gambling using mobile devices has grown significantly over the past five years (now accounting for an estimated 28% of remote gambling) and has made gambling remotely more easy and accessible than ever.

The harmful effects<sup>iv</sup> of problematic gambling is recognised as a key issue for the gambling industry as a whole. *Gambling-related harm* has been defined “as both personal (e.g., health, wellbeing, relationships) and economic (e.g., financial) harm that occurs from exceeding one’s disposable income or disposable leisure time.”<sup>2(9)</sup> According to the 2010 British Gambling Prevalence Survey, of the several millions of gamblers in the country, approximately 451,000<sup>v</sup> can be classed as problem gamblers.<sup>3</sup> Online slot machine games are associated with the second highest proportion of problem gamblers in Britain (9.1%), second only to pub/club poker (12.8%).<sup>3</sup> The British prevalence study also found that those engaging in both online and offline forms of gambling featured higher rates of gambling involvement and gambling problems than single-mode players.<sup>4</sup>

To address this growing concern, an improved understanding of the risk factors<sup>vi</sup> and the development of effective mitigants for problematic gambling is particularly important for remote gambling given its rapid growth. Put simply, gambling *risk* includes all those individual attributes (e.g., pre-existing vulnerabilities) and behaviours that act as precursors to or share an association with remote gambling harm.<sup>2,5</sup> The importance of an effective method to accurately identify problematic gamblers remotely and determine ways to provide

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[i] All H2 Gambling Capital estimates, January 2016

[ii] Measured by UK player gross gambling revenue 2015; all betting and gaming, land based and remote

[iii] In the UK, the Gambling Act (2005) describes remote gambling as involving the use of remote communications, including: Internet, telephone, television, radio and any other form of electronic or technological communication.

[iv] By harms we mean the adverse financial, personal and social consequences to player, their families and wider social networks that can be caused by uncontrolled gambling. Harm from remote gambling is reflected in negative consequences resulting from problematic gambling behaviour. Much like its land-based counterparts, remote gambling harm can include financial distress, psychological problems, relationship troubles, criminal activity, poor physical health, and employment issues. These types of harm may be difficult to capture in real-time, but risk factors associated with gambling harm provide a basis for prompting preventative action before negative outcomes become fully manifest.

<sup>v</sup> 451,000 was the mean estimate of problem gamblers according to valid DSM-IV screening scores of the population sample

[vi] Risk factors include all those individual attributes (e.g. pre-existing vulnerabilities) and behaviours that feature an association with remote gambling harm. Unique characteristics of the online gambling environment also modify the experience of risk. For example, access, anonymity and isolation are just some of the inherent characteristics of remote gambling that set it apart from many non-remote forms of gambling (e.g. land-based casino games).

timely and appropriate support is clear. The ability to generate a detailed understanding of a customer online, both in terms of player profile and behaviour, and monitor this over time means the remote gambling industry is potentially well positioned to mitigate the harms from problem gambling.

Historically, the UK has been at the forefront of implementing new regulation directed at the remote gambling market being among the first European countries to regulate its online gambling industry. Re-regulation<sup>vii</sup> of the UK gambling market in 2014 means that all operators taking bets from a UK-based customer must now possess a UK licence. However, until now, there has yet to be a study commissioned using customer behavioural data from multiple remote gambling operators serving UK customers to analyse and compare against an objective measure of problem gambling and develop predictive models of risk and harm, which can be used to test potential mitigating interventions. This is the aim of the research study.

This work has been commissioned by the Responsible Gambling Trust (RGT) and is being led by PwC who are working alongside the Responsible Gambling Council of Canada (RGC). In addition this work is made possible by the cooperation of the UK's leading remote gambling operators. The purpose of this document is to introduce the project, summarise Phase 1 and to introduce our approach to Phases 2 and 3 which we intend to complete in 2016.

## *Project objectives and approach*

The Responsible Gambling Trust has commissioned a programme of research aiming to explore the potential usefulness of industry-held data and behavioural analytics in the remote gambling sector, primarily to indicate markers and patterns of harmful or risky behaviour and then to recommend practical applications of harm minimisation. Importantly, there is an emphasis on *how* harmful and risky behaviour can be mitigated, not just *if* it can be identified and mitigated.

Following initial discussions between PwC, the RGT, and the RGC on how to meet this aim, an approach towards a set of specific project objectives was agreed upon. For greater industry insight, representatives of organisations that account for the vast majority of the UK remote gambling industry were also consulted.

This overall project has the following objectives and design:

**Phase 1** synthesises the latest thinking on harm from problematic behaviour in remote gambling through a literature review and consultation with leading remote gambling operators; and then recommends an approach for Phase 2. The intention is that Phase 1 will establish a baseline of understanding in responsible gambling, a clear view of the current approaches used by major operators and some themes of any best practice observed.

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[vii] "Up to October 2014, overseas operators did not require a Gambling Commission licence to supply gambling services to GB customers. From 1 November 2014, when the Gambling (Licensing and Advertising) Act came into force, all operators supplying gambling services to GB customers have had to be licensed by the Commission." UK Gambling Commission.

| <b>Phase 1</b>                           | <b>Objectives</b>   | <b>Approach</b>  |
|--|---|--|
| <b>1</b><br><b>Literature review</b>     | <ul style="list-style-type: none"> <li>Determine the markers of remote gambling risk and harm to help the design and completion of data analysis in Phase 2</li> <li>Determine how remote gambling risk and harm is best mitigated to help the development and testing of potential interventions in Phase 3</li> <li>Review commercial behavioural analytics tools currently used for harm minimisation</li> </ul> | <ul style="list-style-type: none"> <li>Consolidate the latest research on problem gambling and specifically review the markers of problematic behaviour</li> <li>Review what products and solutions are currently available</li> <li>Capture the outputs in the Phase 1 deliverable</li> </ul> |
| <b>2</b><br><b>Operator consultation</b> | <ul style="list-style-type: none"> <li>Document the markers used by each operator to signal potential problematic play</li> <li>Understand operator approaches, processes and controls to minimise harm</li> <li>Establish the potential for involvement of operators in Phase 2</li> </ul>   | <ul style="list-style-type: none"> <li>Engage with 6-8 operators via a 1/2 day working session with each</li> <li>Develop a standardised set of objectives and questions to cover with all operators</li> <li>Capture the outputs in the Phase 1 deliverable</li> </ul>                        |
| <b>3</b><br><b>Recommended Phase 2</b>   | <ul style="list-style-type: none"> <li>Recommend the objectives, approach and methodology for Phase 2 to achieve the overall project aim of <i>“informing practical applications of harm minimisation for remote gambling operators serving British consumers”</i></li> </ul>   | <ul style="list-style-type: none"> <li>Consolidate insights from Phase 1 and use to recommend objectives and approach for Phase 2</li> </ul>   |

**Phase 2** will aim to develop and validate markers which are predictive of online problem gambling behaviour using online customer activity and account information. We will use an online survey of UK remote gambling customers and an analysis of industry held data on the respondents’ account and play behaviour to determine markers of risk of harm. See section ‘Recommendations for Phase 2’ for more detail on the approach.

| <b>Phase 2</b>                                    | <b>Objectives</b>   | <b>Approach</b>  |
|---|---|--|
| <b>4</b><br><b>Online survey</b>                  | <ul style="list-style-type: none"> <li>Identify customers at varying levels of risk for gambling related problems and gather contextual markers of problematic behaviour</li> </ul> | <ul style="list-style-type: none"> <li>PwC will survey UK customers of remote gambling operators to identify a cohort of problem gamblers and a cohort of lower risk customers. A Problem Gambling Severity Index (PGSI) screen will be used</li> <li>The online survey will be hosted by PwC and the results will not be shared with the operator</li> <li>Customer names will not be requested at any stage</li> </ul> |
| <b>5</b><br><b>Analysis of industry-held data</b> | <ul style="list-style-type: none"> <li>Match customers’ survey data with account data to identify markers in playing patterns of problem gambling</li> </ul>                        | <ul style="list-style-type: none"> <li>PwC will compare customer account and play behaviour data with survey responses to identify patterns of markers that are predictive of problem gambling</li> <li>PwC will test the ability of these markers to accurately detect potential problem gamblers</li> </ul>  |

**Phase 3** will develop and test a set of interventions to target at-risk individuals. The methodology for doing so will be finalised following Phase 2.

| <b>Phase 3</b>                          | <b>High level objectives</b>   |
|---|--|
| <b>6</b><br><b>Focus group</b>          | <ul style="list-style-type: none"> <li>Combine insights from the literature review and operator consultation with focus group feedback to develop effective interventions for testing</li> </ul> |
| <b>7</b><br><b>Intervention testing</b> | <ul style="list-style-type: none"> <li>Understand the potential effectiveness of the developed interventions to alter problem gambling behaviour</li> </ul>                                      |

This remainder of this document focuses on Phase 1 which commenced in July 2015 and is now complete. It then finishes with a description of the approach to Phase 2 which commences in February 2016. The overall project is intended to run for approximately 18 months.

## *Key parties*

Following a competitive tender process launched by the RGT, in July 2015, PwC, working with the Responsible Gambling Council of Canada, was selected to lead and coordinate this project. These disparate organisations – PwC, the Responsible Gambling Council of Canada alongside several gambling operators – were brought together in order to most effectively leverage each organisation's expertise. We see this collaborative approach as a fundamental strength of this research project and something which will most effectively accomplish its intended aims.

The **Responsible Gambling Trust** is the leading charity in Britain committed to minimising gambling-related harm. As an independent national charity funded by donations from the gambling industry, RGT funds education, prevention and treatment services and commissions research to broaden public understanding of gambling-related harm. The aim is to stop people getting into problems with their gambling, and ensure those that do develop problems receive fast and effective treatment and support. The RGT has commissioned this work.

**PwC** is a leading global professional services firm with extensive experience within the gaming and betting sector. PwC has invested heavily in developing leading data analytics capabilities. This combination of expertise means that PwC is coordinating consultation with operators, designing and running all data analytics and is responsible for managing the project.

The **Responsible Gambling Council (RGC)** is a Canadian-based research group dedicated to minimising the occurrence of problem gambling. The RGC acts to increase public knowledge of problem gambling issues, promote the adoption of improved play safeguards and foster dialogues between affected individuals, operators, policy makers, regulators and treatment professionals. The RGC is supporting PwC on issues specific to problem gambling and its harms and has completed the literature review in Phase 1.

**Leading operators serving UK-based customers** with remote gambling products are involved to leverage their existing experience and access to data and customers that are crucial for completing this project's aims. In Phase 1 there has been significant involvement from Bet365, Betfair, Gala Coral Group, Ladbrokes, Paddy Power, Sky Betting & Gaming, and Unibet. Collectively this group accounts for the majority of the UK remote gambling market in terms of market share of GGR and coverage of key remote gambling products. Lottery is the only major market vertical which has been intentionally excluded; it is estimated that less than 20% of the UK market for lottery products is mediated by remote channels.

## Key Phase 1 messages

### **Current views on problem gambling**

- Previously identified behavioural markers that are predictive of risk of harm when gambling remotely can be categorised into those associated with account management, betting behaviour, types of gambling, time management, monetary loss and contextual factors
- Several commercial products are currently available which aim to identify individuals with gambling-related problems, though, as most are proprietary, the markers used are often undisclosed

### **Operators' approach to problem gambling**

- There is no standardised way in which operators define remote gambling related risk of harm but all recognise the need to deal with it as a priority
- Most operators have expressed a desire to go above and beyond the current industry regulations designed to minimise harm from problem gambling; however, their approaches to and execution of harm minimisation processes vary
- Operators differ in what behavioural markers they monitor. Approaches to determining the existence of harmful play are similarly varied, as is minimising harm once it is thought to have been detected

### **Processes for monitoring problem gambling behaviour**

- All operators use manual processes to identify and validate potential risk, mainly using trained customer contact agents and responsible gambling specialist teams
- Most operators have a degree of automated process for monitoring behavioural markers to flag customers deemed at risk of harm. The used markers vary but typically resemble those identified in the literature review
- Commonly used automated triggers, not identified in the literature review include: 1) number of payment methods, 2) cancelled withdrawals, 3) declined deposits, and 4) adding, removing and changing self-protection tools

### **Approaches to intervention**

- Some operators are more willing to intervene based on automated processes – e.g. changing what marketing is targeted to higher risk groups or in more severe cases freezing accounts – whereas others are reticent to make decisions without human review
- Many operators are unwilling to unilaterally exclude a customer. Some argue that engaging the customer with support and information, rather than excluding them, is more effective for harm minimisation as the customer may simply switch operators
- Other operators appear more willing to exclude a customer on the basis of automated risk evaluation alone (in one case) or complemented by manual, human processes
- Self-exclusion is offered by all operators and appears to be the primary device for addressing harm, though other, less restrictive tools are also used, e.g. deposit limits, time limits and time-outs. All tools are opt-in rather than opt-out
- About half of operators offer product-specific self-exclusion. Following a customer request to self-exclude online, all operators execute this immediately (except one operator that requires the customer to confirm their decision by postal form, an action which usually is not completed)
- Unlike, for example, the credit card industry, operators do not use demographic indicators (e.g. address) to estimate risk in individuals when accounts are opened

### **Future steps**

- There remains a number of uncertainties which appear to be preventing operators from devising and executing a clear strategy for harm minimisation. Questions such as “what does a good responsible gambling interaction look like?” or “what is a good level of self-exclusions” are common and highlight wider uncertainty and potential nervousness on this topic
- Our goal in Phase 2 is to enlist operators' customers to undertake a survey containing a problem gambling index which will then be matched with the behavioural profile of their online gambling account to understand what patterns of behaviour can act as markers for risk of harm. Phase 3 will seek to develop and refine some harm minimisation interventions

# Literature review

Work Package 1

## *Work package objectives*

- Determine the markers of remote gambling risk and harm to help the design and completion of data analysis in Phase 2
- Determine how remote gambling risk and harm is best mitigated to help the development and testing of potential interventions in Phase 3
- Review commercial behavioural analytics tools currently used for harm minimisation

## *Introductory statements*

This literature review seeks to inform the development of behavioural analytics using industry-held data and practical applications of the reduction of harms for remote gambling operators serving British consumers. More specifically, the literature review explores gambling risk associated with remote gambling in order to identify evidence-based markers of problematic gambling behaviour. Evidence of remote gambling interventions aimed at minimising harm are also reviewed. In addition, this exercise provides a basis of comparison that can be applied to products and solutions already adopted by operators in the gambling industry.

Establishing these objectives gives context to the approaches which online gambling industry operators have taken towards identifying and assisting individuals with potential gambling problems (see next section: ‘Operator consultation’) and provides guidance throughout the later phases of the project.

## *Methodology*

The review of literature follows a rapid evidence summary approach adapted from the Knowledge to Action (KTA) research program at the Ottawa Hospital Research Institute.<sup>6</sup> This approach has been specifically developed to produce summaries of evidence and information that cater to the needs of knowledge users in a timely, user-friendly and transparent manner. The rapid evidence review process included a systematic literature search guided by the assessed needs of the Responsible Gambling Trust (outlined in their tender) and the objectives stated above. Details of the search, collection, sampling, and synthesis process are briefly covered in the sections below.

The adoption of the rapid evidence summary approach was chosen over other rigorous review processes like a preferred reporting items for systematic review and meta-analysis (PRISMA) due primarily to the time it would require to complete. The literature review process for this project had a window of approximately four months, whereas a typical PRISMA review can take between 6 months to 2 years and caters more often to addressing narrow clinical questions.<sup>6</sup> In addition, the field of remote gambling risk and risk prevention is still emerging, with few experimental studies; behavioural studies sharing a limited number of large datasets; and many more survey studies. With this in mind, exposing this body of evidence to an assessment of evidentiary strength using instruments such as the Cochrane scale may be premature. Despite these issues, this review follows the general principles of a PRISMA review, which include following a set of clearly laid out objectives; a systematic search of the literature to collect relevant documents meeting the inclusion

criteria; an assessment of validity and utility in the findings of included studies; and the systematic presentation of findings and a synthesis, albeit in a narrative format.

## **Collection and Sampling**

The rapid review of evidence includes an extensive literature search, targeting a broad array of materials from peer-reviewed and grey sources. The strategy for collecting relevant literature included keyword searches<sup>viii</sup> of electronic journal databases and Google with no restrictions on dates of publication or sources, although assessments of evidence quality are made to temper findings. Peer-reviewed literature were identified through various academic databases such as IngentaConnect, Proquest, PubMed, PsychInfo, Science Direct, SpringerLink, The Cochrane Library, and Web of Science. Grey literature, such as published and/or unpublished reports by the remote gaming industry on their use of analytics to identify risky behaviour and intervene to reduce risk, were also included where available. Reference lists from articles were used to identify further resources for the study. Only online accessible documents were collected and reviewed. This decision was made on a basis of cost and time to complete the literature review. The collection process involved the screening of literature before the formal review. Screening helped ensure consistency with the inclusion/exclusion criteria, such as only including English language documents. While the focus of the search and sampling was on documents detailing aspects of remote gambling, the dearth of literature in this area required some supplementation with research from the field of land-based gambling. Special care was made to emphasize gambling literature from the United Kingdom, but relevant international documents were also included to increase the breadth and depth of the review.

## **Review and Synthesis**

All collected materials were sorted and reviewed in an Excel spreadsheet according to author(s), date, document type, methodology, topic area, and summaries of findings, discussions and conclusions. A narrative synthesis of the literature took information from this descriptive state and placed it into the relevant context of remote gambling risk; strategies and tools for minimisation of risk and harm; and the use of behavioural data to identify risk and harm, as well as target minimisation efforts. The synthesis process also provided an overview of the evidence to indicate the direction of current knowledge, and gaps, on the issues and interventions under examination. This literature review process was overseen by at least two investigators in order to expedite completion as well as enhance the reliability of the final synthesis through spot-checks<sup>ix</sup> and partner debriefing<sup>x</sup>. For a summary of the details pertaining to each study included in this review, including methodological design, sampling and analytical approach, please see *Appendix 2*.

## **Limitations**

While the literature review aims to be as comprehensive as possible in covering the key topics of this study, it does not represent a systematic review in the traditional sense. Systematic reviews are extremely thorough and typically take between six months to a year or more to complete.<sup>7</sup> Given the timeline and dependence of subsequent research activities on the literature synthesis, the research team has opted for a more expedited literature review process. As a result, there is a possibility that some information may not be fully

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<sup>viii</sup> A sample of keyword search terms can be found in Appendix 1

<sup>ix</sup> Spot-checking involves reviewing literature summaries for accuracy and completeness.

<sup>x</sup> Partner debriefing involves asking questions regarding how interpretations of the literature have been derived to ensure appropriateness maintain analytical rigour.

highlighted, but it is believed this risk is low given existing familiarity and experience with the topic areas through other RGC projects.

## **Implications**

The narrative synthesis resulting from this literature review serves comparisons with current approaches and solutions to remote gambling risk and harm minimisation employed by gaming operators, including the use of behavioural algorithms. This comparison informs Phase 2 of this project—namely the development of a remote gambling algorithm for identifying at-risk gamblers (i.e., players engaging in risky gambling behaviours who may or may not have yet experienced harms) and appropriate forms of intervention.

## *Markers of remote gambling risk*

Prior remote gambling research has identified customer attributes and gambling behaviours which act as markers of risk of harm. The findings, summarised here, will inform approaches taken at future stages of the project, including determining what operator data is needed and which questions to include in the survey given to operator customers. In reviewing the literature surrounding remote gambling risk, six general categories of evidence emerge: *account management, betting and wagering behaviour, types of gambling, time management, monetary loss, and other markers.*

### **Account management**

There are several aspects to the management of remote gambling accounts that may indicate risk. For instance, survey research has noted that the *re-opening of an account* following a closure is a significant predictor ( $p=.024$ ) of gambling-related problems.<sup>8</sup> However, even more powerful ( $p<.003$ ) is the *frequency of customer service contacts* (and perhaps the tone and subjects of these interactions) for predicting remote gambling risk (Ibid.). Other risk markers include the holding of multiple accounts, which when compared to single-account users experienced significantly higher degrees of psychological distress ( $p<.001$ ).<sup>9</sup> In addition, *multiple account holders* were significantly more likely to be classified as moderate or high-risk gamblers and be involved in more online gambling activities (e.g., sports-betting, race-betting, and poker) (Ibid.). Finally, *deposit size and frequency*, particularly when it exceeded a set limit, was associated with other risk markers including increased betting frequency and intensity.<sup>10</sup> While not fully established, one can reasonably speculate that increased size and frequency of deposits may also be indicative of a gambler chasing losses.

### **Betting and wagering behaviour**

Markers of remote gambling risk based upon betting and wagering patterns are among the strongest currently available in the research literature.<sup>11</sup> *Frequency of betting*—the total number of active days for one month of betting—is among the most well-established marker of remote gambling risk. This marker has shown consistent significant predictive value in studies utilizing different sets of actual gambling behavioural data.<sup>11–14</sup> While cut-offs for different levels of risk are dependent on the cohort and activity, some research has illustrated high frequency betting at averages of 11 to nearly 14 days per month.<sup>14</sup> The *intensity of betting*—the average number of bets per period of time, such as a day—is another strong remote gambling risk marker that, like frequency of betting, has been successful in identifying high-risk Internet gamblers in both general and sports-betting cohorts (Ibid.). At this time, it is difficult to suggest a specific threshold of at-risk gambling, but some analyses of industry data of remote casino players have presented high intensity betting at over 21 bets per day, compared to an average of 4.75 bets per day.<sup>14</sup> Analyses of Internet sports-

betting shows a distinctly risky gambling cluster around two or more bets per day.<sup>13</sup> *Variability in bet size*, as measured by the standard deviation of stakes, has also shown promise as a marker capable of distinguishing high-risk gamblers from lower risk counterparts.<sup>11,12</sup> Studies examining variability note that in addition to large standard deviations in stakes per bet, as compared to low-risk gamblers, *fluctuations between intervals* of increasing and rapid drops in wager size resembling a “sawtooth” pattern is indicative of risky gambling.<sup>11</sup>

Other important remote gambling risk markers that relate to betting and wagers focus on *increasing patterns of wagers*. For example, research using behavioural data of remote gamblers during their first month of betting on new accounts found significant increases in the size of wagers among high-risk subgroups ( $p < .01$ ), when compared to low and moderate risk groups.<sup>12</sup> Similarly, previous research has found that *increasing stakes per bet* in the days prior to account closure can increase from 5% to 10% per day, as compared to control groups that had a near zero rate of change in wagers.<sup>15</sup> Patterns of increasing wagers may also bear relation to the phenomenon of *chasing losses* (i.e., intensifying gambling in an attempt to win back losses). Recent survey research ( $n=10,838$ ) covering 96 countries examined loss-chasing behaviour among Internet casino and poker players and confirmed 1) an association with irrational beliefs about gambling and 2) greater time and money spent than those not reportedly affected by previous losses.<sup>16</sup>

## **Types of gambling**

The type of gambling people engage in can impact, in part, the level of risk they may experience. For instance, Brosowski and colleagues<sup>17</sup> (2012) examined the behavioural data (*bwin*) of 27,653 remote gambling subscribers to see if certain products were riskier than others. The authors note that *live-action betting* and *poker* were significantly ( $p < .001$ ) associated with at-risk gambling when adjusted for multiple game involvement (Ibid). On the latter point, Brosowski et al. and others<sup>11,18,19</sup> have maintained the reliable predictability of increased remote gambling risk and harm when players *engage in multiple types of different games*—each additional type of gambling activity increased risk threefold.<sup>17</sup> In addition, survey research ( $n=620$ ) comparing Internet players with gambling problems to land-based players with gambling problems found that the former had experienced significantly ( $p < .001$ ) more issues with *sports* and *race wagering*.<sup>20</sup> *Mixed-mode gambling* (i.e., engaging in both online and on-land forms of gambling) has emerged as another distinct type of gambling risk marker among remote players. In this case, Wardle and colleagues<sup>4</sup> (2011) analysed data from the British Gambling Prevalence Survey (2010) and found that mixed-mode gamblers had the highest rates of gambling involvement and higher problem gambling prevalence than single mode players (either on-land or online). A more recent survey study of remote gamblers ( $n=1,119$ ) by McCormack, Shorter and Griffiths (2013) found that nearly two-thirds of their sample also gambled offline. Those who played more than two types of games regularly were significantly ( $p < .001$ ) more likely to be problem gamblers or at-risk for problems than those that did not exceed more than one online gambling activity.<sup>21</sup> In addition, the authors also note that online problem gamblers were more likely to be involved in spread betting, slot games, roulette, blackjack, horse and dog race betting, and sports betting.

## **Time management**

Time management is a category that predominantly relates to *involvement* (time spent) in remote gambling. Studies have indicated that extended involvement in forms of remote gambling can foster disassociation (i.e., losing track of time or feeling like a different person) as well as slower response to external stimuli.<sup>22</sup> Generally, continuous forms of gambling, such as online casino games, bingo, poker, and slot-style games have been noted as being amongst the most relevant to temporal risk factors.<sup>3,23,24</sup> Studies utilising large *bwin*

datasets have helped establish involvement as an important potential indicator of gambling problems alongside money wagered and lost.<sup>18,25</sup> This corroborates past survey research that has shown a steady increase in risk the more often people gamble.<sup>26</sup> A recent comparative study of online gamblers from Britain, the US, Canada and Australia found, for instance, that those who gambled more than 4 hours at a time were two-times more likely ( $p < .05$ ) to have gambling problems.<sup>24</sup> It should be noted that in this study, the sample was predominantly male (81.6%) with an average age of 36 years betting on a wide variety of games, including poker, roulette, blackjack, horse racing, dog racing, sports events, bingo, slots, and others. In reference to Wardle et al.'s (2011) work on mixed-mode gambling amongst a representative census sample of British adults, the authors point out that engagement in multiple types of gambling also increases time spent.<sup>4</sup>

## Monetary loss

Monetary loss can become a significant gambling harm when it impacts negatively on gamblers' quality of life or that of their close relations. With this harmful outcome in mind, patterns of monetary loss have become a focus of research and a possible marker of remote gambling risk. Two studies in particular, both robust case-control designs utilizing *bwin* behavioural data, examined patterns of monetary loss. Xuan and Shaffer<sup>15</sup> (2009) looked at the behavioural patterns of Internet gamblers who had experienced gambling problems and subsequently closed their accounts. A key finding from this study was that account closures, due to self-identified problematic gambling, had been significantly associated with patterns of *increasing monetary loss* ( $p < .05$ ) in the days immediately prior. In a subsequent longitudinal study of remote gamblers followed over a 10-year period, Gray, LaPlante and Shaffer<sup>25</sup> (2012) found that *net monetary loss* was also a reliable risk marker associated with indicators of gambling harm, such as account closure, self-reported problems, self-exclusion, third-party contact and other negative gambling events. Higher monetary net loss (using a discriminant function of 0.50 or higher) was itself predicted by other strong markers such as intense betting activity and high monetary investment in gambling. While the findings from these studies are noteworthy, they all emerge from the same dataset, which limits the generalizability of these findings due to a lack of independence.

## Other markers of gambling risk

While the abovementioned markers of remote gambling risk are likely not exhaustive—research in this area is still developing—they do represent some of the strongest indicators for predicting gambling-related problems. Other risk markers that may not have as much predictive value, yet deserve consideration include *poor gambling knowledge* and *demographic characteristics of high-risk gamblers*. Recent survey research ( $n=2799$  Australian Internet gamblers) compared those with gambling problems to those with no problems to understand why some players experience harm.<sup>27</sup> Findings show a significantly ( $p < .001$ ) lower score on gambling knowledge and beliefs among the group with problems (Ibid.). Demographic profiles of individuals with gambling problems have also illustrated a relatively consistent profile, including male, young and educated.<sup>19,20,24,28–30</sup> *Substance use*, specifically tobacco and alcohol, have also been featured in some research looking at at-risk and problem gambling.<sup>29</sup>

In addition, *customer service interactions* has been presented as a potentially useful marker of risk in a mixed-methods study involving qualitative screening of senior staff ( $n=8$ ) from three private Internet gambling operations and quantitative predictive component (self-excluders=150; controls=150) to confirm the validity of the risk marker.<sup>8</sup> In this particular study, the frequency of customer service interactions had the greatest significant association ( $p < .003$ ) with self-excluded gamblers (presumably dealing with problematic gambling issues), followed by interactions to re-open accounts ( $p < .024$ ). Using their model of

customer service interactions to predictively confirm the test cohort of self-excluded gamblers, the authors reported an accuracy of 76.6%.<sup>8</sup>

## *Reducing remote gambling risk*

Alongside using markers to identify customers at risk of harm, it is also important to identify effective means of supporting these customers, once identified. Summarised below are the findings from the literature assessing how to best reduce risk of harm from remote gambling. This will be used to guide the development and testing of potential interventions in Phase 3.

### **Self-limiting**

There are many different forms of self-limiting, which generally relate to time and money. Research into these particular interventions is still emerging and not fully formed, but has yielded some promising findings that merit further testing. *Voluntary spending limits* can pertain to *play* (the maximum amount of money that can be played with at any given time) and *betting* (the maximum amount of money that can be bet on a single game or on concurrent games).<sup>31</sup> In a study by Auer and Griffiths<sup>31</sup> (2013) of *win2day* gamblers, a test-sample (n=5,000) drawn from 100,000 players who set voluntary spending limits, investigators found a significant effect on the theoretical loss (a function of bet-size and house advantage) amongst the top 10% of intense bettors (500 individuals).<sup>[xi]</sup> In particular, gamblers playing the lottery (p<.001), casino (p<.0001) and poker (p<.05) saw their spending positively affected by voluntary spending limits.

*Voluntary time limits* (the maximum amount of time that can be used to play per session and/or day) have also been found to have a significant effect on actual remote gambling behaviour, in the same Auer and Griffiths (2013) study.<sup>31</sup> Among the most intense online gamblers, the setting of time limits produced a 10% reduction in monetary loss from the previous month, prior to the establishment of limits.<sup>31</sup> In addition, an extremely strong association (p<.00001) was found among poker players who set time limits and experienced 30% less time playing (Ibid.).

In a study of *voluntary deposit limit* use among 47,134 online gamblers (*bwin* data), Nelson and colleagues<sup>18</sup> (2008) noted that players who used the option were more likely (p<.001) to be involved with fixed-odds (99%) and live-action (81.7%) betting than other gambling activities (e.g., casino games, supertoto, lottery, poker etc.). After gamblers established voluntary deposit limits, fewer bets were placed and less money was wagered. The researchers also noticed that for sports-betting gamblers, the frequency of betting, amount wagered per bet, net loss, and percent-loss did not change.<sup>18</sup>

*Imposed deposit limits* are another protective feature of some remote gambling operations that act as a safe-guard against behaviour and monetary loss. Some examples have included €1,000 daily limit and €5,000 monthly limit, which have also been the focus of large scale behavioural data analysis (*bwin* data). Broda et al.<sup>10</sup> (2008) examined 47,000 gambling records and found that only a very small proportion of subscribers (0.3%) attempted to exceed the imposed deposit limits. Although this rate of excess is miniscule, the findings may not be grounds to dismiss this intervention in principle, as testing of imposed deposit limits at lower daily and monthly thresholds may prove more effective and appropriate. For instance, Currie et al. (2006) found that thresholds for risky expenditures among Canadians (n=7675) fell between \$500 and \$1000 CAD, or 1% of gross annual income.<sup>26,32</sup> Needless to

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[xi] Auer and Griffiths use theoretical loss as a way of measuring gambling intensity

say, an imposed monthly limit of €5,000 far exceeds Currie's threshold by a considerable margin.

### **Gambling literacy**

Player education has long been a tool used by responsible gambling professionals for addressing risk and harm. *Pot-odds calculation training*<sup>[xii]</sup> is a functional risk minimisation tool that has been associated with reductions in monetary loss among small cohorts of poker players.<sup>33</sup> Interestingly, the addition of pot-odds calculation can also serve to slow games down and extend their length. Reviews of responsible gambling education argue that information needs to stimulate self-evaluation and provide guidance on making less risky gambling decision, such as through an understanding of probability.<sup>2</sup>

### **Self-awareness**

Messaging, like education, pertains to the transmission of information designed and presented to help remote gamblers make decisions about their gambling behaviour that is protective and less risky. *Pop-up messages* prompted by play history or at set intervals have seen extensive coverage in the research literature. These interventions are considered useful for drawing player attention to responsible gambling information and strategies, in-between games.<sup>22</sup> Early research looking at the use of pop-ups in electronic gaming machines tested responsible gambling messages at 60 minute and 30 minute intervals and found that among high-risk players, session length, expenditures and frequency of play budgets being exceeded were reduced.<sup>34</sup> Subsequent laboratory studies of pop-up warning messages for Internet-based roulette among young adults (n=122) involving no real money have noted significant ( $p < .05$ ) increases in gambling knowledge, fewer irrational beliefs, and more money remaining at the end of gambling sessions than the pre-intervention condition.<sup>35</sup> In studies comparing the effectiveness of messages and pauses in play, messages had a greater impact on erroneous beliefs, although both had a greater effect than the control.<sup>36</sup> Similar studies of young adults and the effects of pop-up advertisements provides additional insights, such as when ads are perceived as intrusive, irritation is elicited.<sup>37</sup> However, when the message is informative and entertaining, ads are perceived as less intrusive (Ibid.). More recent research on the use of animation-based videos delivered to land-based slot machines noted significant improvements in gambling knowledge ( $p < .001$ ), reduction in time limits being exceeded ( $< .001$ ), and greater adoption of responsible gambling strategies ( $p = .003$ ).<sup>38</sup> A key feature of this intervention was that animations utilised metaphors, such as conveyor belts and bags of marbles to illustrate misconceptions held by slot players. According to the authors, this provided gamblers with an intuitive visual explanation of odds and probability.

In addition to pop-up messages, *player reports*, which summarize play history (time spent, money wagered, number of bets, wins and losses, etc.) over a period of time can be a useful tool for providing perspective on the behaviour of players and the impact of their decisions.<sup>39</sup> To this end, they are judgement-free depictions of remote gambling that could be paired with or supplement other guidance information on responsible gambling, such as pop-ups and education.

### **Tertiary support**

Risk minimisation for gamblers on land or online needs to account for the level of risk and harm experienced and provide appropriate support.<sup>40</sup> When remote gambling risk and harm is beyond what can effectively be managed by the gambler themselves, tertiary support that

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[xii] Pot odds calculation training involves learning the probability of certain outcomes in games of chance. In some instances, particularly with remote gambling, the assistance of software applications can help in training and calculation.

involves the assistance of external parties may be helpful. One such intervention includes self-exclusion, which provides gamblers who feel at-risk or are experiencing gambling harm to voluntarily ban themselves from an online or land-based venue for a period of time or indefinitely.<sup>2</sup> Studies show Internet self-exclusion programs, like land-based counterparts, can have positive effects on players who may be or perceive themselves to be at-risk of gambling harm.<sup>41,42</sup> However, self-exclusion programmes have historically been isolated to individual gambling venues or sites where from players have registered. In effect, one could exclude him- or herself from one site or venue and simply visit another in moments of vulnerability. *Multi-operator self-exclusion schemes (MOSES)*, which has been a topic of discussion by both the Responsible Gambling Trust and the Gambling Commission in the UK, would have all remote gambling sites share exclusion lists to effectively and comprehensively ban anyone who has registered for such a programme with any British service provider.<sup>2,43</sup>

*Counselling services* that are remote access (e.g., online or over telephone) have been shown to produce a positive effect on risky gambling behaviour. Randomised control trials comparing brief interventions that include motivational interviews, self-instructional workbooks and follow-up sessions have found significant improvements in terms of days gambled, money lost, Problem Gambling Severity Index (PGSI)<sup>xiii</sup> score and control over gambling behaviour.<sup>44</sup> Even standard treatment and approaches to tertiary support that include service referral, the provision of information, discussions of strategies for safer gambling, and other common advice have shown positive effect (Ibid.). Survey research of web-based counselling has shown that a broad spectrum of players engaged in different gaming activities and of different age groups all receive value from such services.<sup>45</sup> Overall, this form of counselling shows promise as an accessible and convenient entry point.

### *Limitations of Remote Gambling Literature*

To date, most if not all studies of remote gambling offer only a partial picture of relevant risk markers and intervention effectiveness. For instance, none provide a *definitive, representative* and *generalizable* set of predictive markers for accurately detecting remote gambling risk across all game types and player contexts. This should not be grounds for dismissing the findings presented, but rather an opportunity to test and refine the current evidence base.

The limitations in the included studies can be grouped by those relying on large behavioural datasets, namely the *bwin* dataset, and survey designs. While the studies utilizing the *bwin* dataset have provided some of the strongest evidence on remote gambling behaviour they often only cover players during a two year period, using subscription cancellation as a proxy for potential gambling problems.<sup>11</sup> In addition, the collection of self-reported responses by these unsubscribed players on their motives for account closures do not constitute clinical assessments of gambling problems. Moreover, the equation of self-exclusion status, self-reported experience of gambling harm, and problem or pathological status on screening tools are not entirely accurate assessments of gambling-related harm. More accurate assessments would likely require audits of player financial records and impact assessments of social networks, which are unreasonable and perhaps unethical. With this in mind, the aforementioned proxies provide a reasonable glimpse of risk and harm, which can form the basis for further exploration of the phenomena. Additional details that limit algorithmic data include its isolation from the broader community of both remote gambling and offline or land-based gambling. As play outside of the *bwin* service was not captured, it is arguable that complete profiles of player activities are not represented in the findings of these studies.<sup>11,12,14</sup> Many of these studies chose to focus on a limited number of characteristics of

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<sup>xiii</sup> The PGSI is a validated<sup>52</sup> screening tool for assessing problem gambling or non-problem gambling status, developed by Ferris and Wynne (2001)<sup>51</sup>

betting, leaving out other potentially relevant factors.<sup>12</sup> *Bwin*'s main business focus is live-action sports betting, which highlights some of the potential gaps in our knowledge of predictive modelling, as other popular forms of betting were not adequately covered by the available samples.<sup>12,18</sup> It should also be noted that a degree of bias may have been introduced prior to the recruitment of the *bwin* dataset, as the operator conducted an extensive marketing campaign, which may have artificially inflated samples with gamblers who were primarily interested in receiving bonuses—and whose gambling activities decreased shortly after enrolment.<sup>17</sup> Turning to the investigation of both voluntary and mandatory limit-setting in the *bwin* studies, differentiating between types of limits that led to player notifications was not possible.<sup>10</sup> The results were findings on the effectiveness of limit-setting that lacked some degree of nuance. Finally, the use of k-means cluster analysis in several studies, while generally robust, has been noted to have difficulty grouping data with large outliers that are skewed or not normally distributed.<sup>14</sup>

The limitations in survey research are fairly common and predominantly relate to their ability to elaborate on and generalize human behaviour. For instance, survey samples that are self-selected (not randomly selected) are not robust enough to represent an entire target population.<sup>9,16,27</sup> Survey samples in some studies featured lower response rates and small sub-groups that also acted to limit generalizability.<sup>4</sup> Other issues emerging from sampling difficulties also included gender imbalances, which limited cross comparisons.<sup>24</sup> These issues pertain to the difficulty in recruitment of respondent samples and lead investigators to allow for convenience sampling or recruitment that may introduce bias, such as through gambling help sites featuring disproportionately high pools of motivated help-seekers.<sup>20</sup> As many survey studies are either one time or limited follow-up designs, the resulting cross-sectional data can only represent a single moment in time and is not equipped to infer upon causal relationships.<sup>20</sup> Also, the relative prevalence of incomplete responses, such as on screening components, can hamper survey assessments of risk and harm.<sup>24,27</sup> In addition, studies that investigated the effectiveness of interventions, such as limit-setting, could not fully elaborate on how they are used—did players simply go gamble on a different site once a limit was hit on another?<sup>31</sup> In the case of experimental design studies, the use of artificial gaming environments and imaginary money presented serious questions about the validity of findings concerning the use of pop-up messages and the representativeness of participant gambling behaviour.<sup>35</sup>

## *Commercial product review*

There are currently a few established behavioural analytics products being used to predict risk from remote gambling. These products are proprietary algorithms, such as those previously mentioned (e.g., the *bwin* model developed by Dr. Howard Shaffer). Some other products<sup>[xiv]</sup> include *Playscan*, *BetBuddy*, and *ARIC*. These products are often employed in single operations and do not capture the gambling behaviour of players beyond those accounts, challenging the assessment of risk and the effectiveness of harm minimisation efforts.

### **Bwin model**

After nearly ten years of research and development, through collaboration with the Cambridge Health Alliance's Division on Addiction, *bwin* officially launched their predictive model algorithm on August 2014. While the research behind this model is probably the most widely known, specific details of the algorithm are not entirely clear. It is reasonable to assume, based on the reviewed research above, that strong markers such as *monetary loss*

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[xiv] The products summarised here are only a sample of available products to illustrate some of their attributes and capabilities. In addition, alternative vendors include Techlink, GameRes Ltd., Iviewsystems, IBM, Deloitte, Focal Research Consultant, and Neccton

*patterns, game types, betting frequency, intensity, variability, trajectory*, and even *customer service interactions* could be included in the *bwin* algorithm.<sup>8,11–13</sup> Given markers such as customer service interactions and communication have yielded high predictability (76.6%), the model may certainly have a reasonable degree of effectiveness.<sup>8</sup> However, how the model adapts to new product offerings and how markers are weighted in relation to one another to estimate player risk is not clear.

## **Playscan**

*Playscan* is one of the earliest algorithmic predictive models for tracking gamblers online. It is primarily adopted and used by Svenska Spel, the state-owned Swedish gambling operator. This system works for online players through a loyalty program and is voluntary. Generally, the *Playscan* system tracks gambling behaviour in addition to prompting players to report any gambling problems experienced and perceptions of adequate time and money to spend gambling.<sup>46</sup> This monitoring system is then linked to a feedback mechanism that reports apparent risk based on green, yellow and red alerts. The specific details (i.e., risk markers and weighting; adaptive modelling, etc.), accuracy and effectiveness of this system is not entirely known, most likely due to its proprietary nature.

## **BetBuddy**

For the past few years, *BetBuddy* has been developing algorithms for the detection of gambling risk, which are paired with account management systems that cater to both operators and players. Over the past year, the Ontario Lottery and Gaming Corporation has adopted the *BetBuddy* system in support of the launch of their remote gambling business, PlayOLG. Recently, researchers from the City University London have provided assistance to enhance the accuracy of *BetBuddy*'s 'early warning' system to automatically inform gamblers of risky behaviour.<sup>47</sup> Garcez and colleagues have stated that their research has increased the accuracy of predicting playing patterns that potentially lead to gambling harm to 87%. The researchers note that this has been achieved by using a method of machine learning known as 'random forests.' The details of this research, and in particular the context and methods involved, have yet to be published and reviewed by the wider academic and scientific community.

## **ARIC**

Adaptive, Real-time, Individual, Change-identification (ARIC) is an algorithmic modelling product developed by Featurespace. Traditionally, this firm has focused on their ARIC machine-learning system and adaptive behavioural analytics services to help clients prevent fraud, manage risk and demonstrate compliance.<sup>48</sup> More recently, Featurespace has collaborated with the Responsible Gambling Trust to explore the issue of predicting problem gambling by analysing industry data and transferring this knowledge into a new product offering entitled *ARIC Responsible Gaming*.<sup>49</sup> This particular system applies Bayesian statistical techniques in real-time to model and account for significant anomalies and even uncertainties in data and understandings of behavioural phenomena. This analytical approach can be a powerful means for drawing inference, but becomes computationally intensive as the number of variables increase—this is before considering the effort required to conduct analyses and simulations to validate algorithms in real-time.<sup>50</sup> Some applied statisticians have also expressed their concern that Bayesian methods promote the idea that several parameters or variables can be handled through hierarchical models to draw automatic inferences, which relies heavily on the selection of valid assumptions of meaningful parameters—known as prior probability distributions (*Ibid.*). The caution in this case is that these *priors* can result from the subjective assessment of the analyst.

## *Concluding statements*

A significant number of behavioural markers can be used to predict risk of harm, many of which are likely to be tracked by remote gambling operators and potentially available for analysis. A few attempts to develop predictive models, or algorithms, of remote gambling risk among online players have been made, many of which use behavioural markers such as self-exclusion or account closure to approximate harm. However, it is rare that samples of remote gamblers have received validated problem gambling screening assessments, such as the Problem Gambling Severity Index (PGSI) to make a determination of harm and risk of harm.<sup>51</sup> It is rarer still to integrate behavioural data with survey data that ask gamblers how many games they play, the number of sites they visit, and their online and land-based gambling habits—information not regularly captured by remote gambling operators. A further limitation of current algorithms is their inability to capture gambling behaviour beyond a single site, despite many players holding several remote gambling accounts.

These gaps represent a distinct opportunity to advance the field of predictive modelling by developing and testing a framework incorporating valid and reliable variables from past works, related survey data as well as risk markers that have yet to be applied to a large industry-held behavioural dataset of remote gamblers. In conjunction with findings from survey analysis of sampled account holders across participating operators, such a study would go a long way to confirming or disconfirming the findings that have predominantly been derived from one operator dataset (i.e. *bwin*) dating back almost a decade. To address the issue of measuring gambling behaviour beyond single sites to include a more representative picture of multiple account holders, this project hopes engage and recruit operator sites to explore the possibility of a linked sample of multiple account holders. Even if taken only for research purposes, this may serve the process of validating key risk markers among multiple account holders.

Certain restrictions imposed upon remote gamblers appear to be able to reduce the amount of losses incurred by risky play. However, with many of these interventions, it remains unclear to what extent these behaviour changes translate to a reduction of harm and how enduring the effects of these interventions are.

# Operator consultation

## Work Package 2

### *Work package objectives*

- Document the markers used by each operator to signal potential problematic play
- Understand operator approaches, processes and controls to minimise harm
- Establish the potential for involvement of operators in Phase 2

### *Introductory statements*

Between September and November 2015 PwC engaged seven leading UK remote gambling providers - Bet365, Betfair, Gala Coral Group, Ladbrokes, Paddy Power, Sky Betting & Gaming, and Unibet - in a series of consultations to understand how operators currently approach and manage harm minimisation in remote gambling. We had discussions with senior employees representing functional areas including compliance, marketing, public affairs and communications, customer service and finance. Some participants were dedicated to the area of responsible gambling.

A guiding principle of our discussions was the confidentiality of any information shared. It is our intention to provide a generalised set of insights from these discussions without attributing examples to particular operators. This approach was taken to ensure a good level of disclosure and the best possible learning from the process. The agenda of each discussion was consistent and included the following topics which are summarised here:

- **Overall approach to responsible gambling** – how operators define problem gambling, what their attitudes are towards it and what kinds of action they believe are necessary to combat it
- **Monitoring customers for problem gambling risks** – how operators monitor customers for behaviours which may indicate a risk of problem gambling behaviour, which are the key markers that are used and how those markers were determined
- **Managing risk before and after it is detected** – at what point do operators intervene in customer behaviour and what approaches they take towards harm minimisation
- **Phase 2 participation** – whether operators would be willing to take part in future stages of the project, and the practicalities of granting access to customers and their behavioural data

Our review does not constitute an audit of operators' approaches. We have not sought to verify what we have been told beyond checking information that is readily available in the public domain. This limitation should be considered in the summary of our operator meetings below.

### *Overall approach to responsible gambling*

Operators unequivocally agree on the importance of a responsible approach to harm minimisation (e.g. “there is a top down edict to get this right” / “responsible gambling always comes out near the top of our strategies”). They believe it is the right thing to do as a responsible, licensed operator and is aligned with long-term commercial objectives and their ethical responsibilities. There is however no standardised way in which operators define and

approach problem gambling, partially due to the lack of consensus on a clear definition. It appears that operators are trying to do their best on the basis of regulatory guidance, internal experience and intuition. Most operators recognise that they are at the relatively early stages of developing and refining their approach to harm minimisation, and would welcome more guidance on ‘what good looks like’. The opportunity to engage in this process, for example, was met with enthusiasm as a means of better understanding a baseline of what the industry is doing on this topic and where everyone can learn and improve.

All operators acknowledge that there is an important issue to be addressed when it comes to dealing with those who are exhibiting signals of risky behaviour. Indeed most have expressed a desire to go above and beyond the current industry regulations to combat the issue. However, among these general intentions, more variation is observed when it comes to the design and execution of harm minimisation processes. Operators differ in what signals they look for and how they are monitored. Approaches to validating the potential of harmful play are similarly varied, as is minimising harm once it is believed to have been detected. Furthermore, many of the systems currently in place to identify and manage the higher risk individuals are dependent on the execution of fully or partially manual processes.

The section below summarises some of the themes observed when it comes to operators’ organisational and cultural approach to problem gambling in remote play. We next turn to the specific approaches to monitoring signals, detecting problematic play and managing harm minimisation:

- When it comes to definitions, operators have historically taken different approaches to considering what constitutes problematic gambling behaviour. Some operators tend to use more academic approaches to their definitions, using the PGSI and the DSM-V. Other operators use definitions such as “*[the customer] is affected financially or affected socially*” which have often been developed internally;
- There has been a general move from a more ‘reactive’ approach to harm minimisation (e.g. a customer reporting a self-diagnosed problem via the customer contact centre) to a more ‘proactive’ approach (e.g. an operator identifies a customer exhibiting signs of risk of harm via an automated system);
- Behavioural analytics are starting to be used to more effectively discriminate between individuals with gambling problems and other, lower risk customers in an automated fashion;
- However it appears that many operators are a long way from a near fully-automated process, in part, because some are reluctant to be overly interventionist;
- There is a general sense from operators that it is better to educate, inform and provide the means to customers to responsibly manage one’s play rather than to intervene;
- However some operators appear more willing to take a pre-defined position on what is and is not problematic play (and will take unilateral actions to manage this, often by an automated process) whereas others refuse to unilaterally exclude a customer from play without engaging the customer in dialogue;
- Operators are beginning to implement a greater variety of online gambling tools such as providing exclusion options for specific products and certain operators are inserting certain limitations in their games to reduce harmful behaviour (e.g. pauses between betting);
- Organisationally, most operators report that they have found that the best way to organise problem gambling is to embed it within the business and operating structures, rather than position it as a standalone entity between business units. An interesting example of this is one organisation that has the CEO sitting on a Responsible Gambling committee with business unit commercial representatives and problem gambling dedicated specialists;

- There is a wide range of approaches taken to reporting problem gambling within organisations. Some use structured monthly reports and others are more ad hoc. Overall there is variation and some nervousness about what to report and how to report it. This appears to stem from the uncertainty about appropriately defining harm and problem gambling, and of ‘what good would look like?’ (e.g. “Is a high level of self-exclusions a good thing or bad thing?”)
- Additionally, and we expect in part because of the above, incentives to individuals within these organisations to effectively address problem gambling are limited or appear to be non-existent. One operator monitors call centre activity and reviews responsiveness to ‘problem gambling triggers’ (e.g. “my gambling is out of control”), with negative financial consequences for any ‘misses’ complemented with additional training
- Some operators do have a clearly defined responsible gambling strategy and mission statement that incorporates problem gambling at its core, whereas others report that the approach is less well defined and is evolving

### *Monitoring customers for problem gambling risks*

Operators differ in the approaches they use to monitor for potential signs of problem gambling and the processes they have gone through to develop these approaches. All operators are using call centres and other customer contacts to monitor potential problematic play, using trained staff to monitor and then escalate issues if detected. Of more recent development is the introduction of automated behavioural analytical tools. Nearly all of the seven organisations we interviewed now use some sort of automated tool to monitor risk. These automated systems utilise a variety of behavioural markers to flag potentially at-risk individuals. Operators have used a combination of the academic literature, specific analysis and prior experience to determine which markers to assess. There is one organisation that was using a 3<sup>rd</sup> party’s software to run this automated process. Some systems had been in place for years, and others have been implemented in recent months. We expect on the basis of current plans that all operators will be using automated systems going forward.

In this section we will cover what is monitored and how, and then in the next section we will look at how risk is managed once detected and what tools are offered to customers.

Operators monitor ongoing customer behaviour using both automated methods and more manual processes such as phone conversations.

*Automated processes* use a variety of markers to determine whether individuals are exhibiting signs of problematic behaviour and these markers differ in their frequency of use. The following summarises the broad markers used by the operators using tools to monitor account and play behaviour in an automated way.

Most operators monitor:

- Number of payment methods used for deposits
- Hours spent playing

Half of operators monitor:

- Cancelled withdrawals
- Declined deposits
- Adding, removing and changing self-protection tools

One or two operators monitor:

- Deposit value and frequency – both absolute levels and changes in levels
- Losses
- Chasing losses and winnings behaviour
- Increasing play volume
- “Jumping between sessions”
- Changes in numbers of games played
- A higher mix of gaming than betting
- 18-25 year olds using credit cards
- Short tenure as a customer
- Requests for bonuses and requests for bets to be voided (“didn’t mean to do it”)\*

*\*Note that whilst requests for bonuses and asking for bets to be voided are commonly described as markers looked for via customer contact agents, one operator integrates these data into their automated algorithm.*

These markers generally resemble those suggested by studies covered in the literature review, with the exception of one which is not possible for a single operator to determine: customers with accounts from multiple operators. Interestingly the majority of the more commonly used automated triggers in our operator sample are not identified in the literature review: 1) number of payment methods, 2) cancelled withdrawals, 3) declined deposits, and 4) adding, removing and changing self-protection tools.

Besides the *automated* monitoring of behaviour, operators use *manual sources* too in order to identify at-risk customers. Operators monitor phone conversations with customers for key words and reported behaviours to detect problematic behaviour. Comments such as “I’ve lost too much money and can’t pay the mortgage” and spurious complaints such as “the game is rigged” or “I fell on my iPad and didn’t mean to place the bet” are logged and then flagged if appropriate. This process is implemented by training of customer contact agents. The tone of the conversation, alongside the content, is also deemed important, with individuals who show high levels of aggression being viewed as higher risk. It appears common practice that there is an escalation process for review of customer cases and for managing serious cases, often involving senior members of the team. Most operators have a team dedicated to addressing problem gambling. These teams are typically given training in the detection of problem gamblers, often by external groups such as Gamcare.

*Contextual indicators* such as demographic information are rarely used to predict potential risk. Operators comment that gender and age are used to inform how customers are contacted, but there is little or no use of data to assess risk in an automated way. The way the credit card industry, for example, assesses credit risk is an interesting comparison.

Most operators have developed their view on which markers to monitor by way of internal discussion, leveraging industry experience and to a greater or lesser extent, academic research. One operator has developed their automated screening markers by analysing customer behaviour against an objective measure, the DSM-V. Self-excluders were used as a proxy to analyse the behaviour of a more targeted group with a higher likelihood of problem gambling (noting all operators agree that self-exclusion is not highly predictive of problem gambling). Play behaviour was paired with problem gambling incidence to determine a set of markers to use in an automated predictive model. The use of self-excluders only and a small sample size are potential limitations of what is otherwise the most advanced attempt of any operator to develop a predictive model. Additionally, some operators are currently collaborating with other external research groups to better understand the markers of risk.

We now turn to the processes used by operators to minimise harm.

## *Managing risk before and after it is detected*

Operators use a combination of methods, both proactive and reactive, to minimise harm. We first review the **proactive measures** offered to all customers, irrespective of the operators' assessment of their risk.

### *Customer registration:*

All operators are required to comply with standard know-your-client ('KYC') and anti-money laundering ('AML') procedures at the time of initial registration and when customers deposit and withdraw funds. Many of these procedures overlap with procedures in place to protect customers or limit harm, such as:

- **Age verification** – operators are required to verify whether a customer is above the legal age to participate in remote gambling
- **Self-excluded lists** – most of the operators have automated checks to ensure a new registration is not for a customer that has already voluntarily self-excluded for the specific website or product provider by the operators
- **Marketing preferences** – operators are required to allow customers to share their marketing preferences. Certain operators further restrict a customer's marketing profile if markers of potential harm have been identified and thereby restrict marketing materials being distributed.

### *Customer protection tools:*

After the registration and deposit process, operators offer a range of tools to their customers to enable them to manage their gambling behaviour responsibly. These are available to all customers and can be managed remotely by the customer themselves at all times (although some impose a 24 hour "cool off" between being able to change limits for example). While the details and usage do vary between operators, there is a lot of commonality in the approaches taken. For example, offering self-exclusion is a condition of UK remote gambling licenses (set out in the Gambling Commission's "Licence conditions and codes of practice"). Self-exclusion however does vary both in terms of whether it is offered by product or only for all activity and how the process is effected from the point the customer decides to self-exclude. One operator commented that "lots of customers are not aware of the options available."

The following are the main tools offered by the operators we spoke to:

- **Deposit limits and / or loss limits** – appear to be offered by all operators and can be set at registration and reviewed thereafter. As the section above mentioned, some operators even collect data on the frequency of changes to limits and use this as a marker of potential problematic behaviour
- **Self-exclusion** – is offered by all operators to their customers and many operators mentioned their involvement in developing a national database of online self-excluders to be shared between operators. Given the importance of self-exclusion as a tool, it is explored in more detail below
- **Time limits** – are offered by most but not all and when they are offered, one operator told us they are not used by customers as much as deposit limits. One

operator offers time limits for gaming products only (not gambling on sports for example) but is in the process of rolling this tool out across all products

- **Time outs** – sometimes referred to as “take a break” or “cool offs,” are offered by most operators. Options vary by time, e.g. 24 hours, 48 hours, 1 month. Some that do offer it have a product specific version as well as one for all products. Some operators that do not offer this are in process of adding it. One operator is looking to improve protection tools by offering “time out” on certain days of the week to help customers that believe they are more likely to engage in problematic play on certain days, e.g. “on a Friday after going to the pub”
- **Time checks** – are less common, but allow the customer to set an automated reminder after playing for a certain period of time. If the customer does not set a limit, some operators will automatically flag longer periods of continuous play, e.g. one organisation will tell customers after eight hours of play; another provides a “reality check” each hour
- **Website and email information** – is available from all operators on responsible gambling but the content and approach varies. One operator informed us that a responsible gambling page is only ever two clicks away on their website; others told us that responsible gambling information is included on all emails. One operator offers a problem gambling questionnaire on their website and if a threshold score is reached, the site advises the individual to call for help.

In addition to these tools, there are other examples we heard about, both currently offered and planned to be introduced. One organisation has a reasonably sophisticated linkage between the automated analysis of behavioural risk that it runs with other interventions including responsible gambling emails about potential tools, removal from hospitality lists and the informing of customer service agents. Some operators also provide deposit limits upon the return of a previously excluded customer and, following multiple self-exclusions, the customer is permanently disallowed.

*Self-exclusion* was frequently mentioned as an imperfect indicator of problem gambling (“many self-excluders just do it to close their account or because they don’t like the site”). Therefore one operator has added a ‘close account’ function to reduce the ambiguity between self-exclusion and a decision to simply not consume the product further.

Self-exclusion is offered in some form by all operators. When a customer self-excludes there is an immediate freezing of their account for the specified period of time. The account cannot be reactivated nor can another account be opened by the same individual. Customers are able to self-exclude for varying periods of time; from short periods of time to permanently, sometimes for specific products. About half of the operators we spoke to told us they offer self-exclusion by product while others are considering it. One operator took the view that “if you have a problem for one product then you have a problem for all – i.e. exclusion should be for all”. One customer’s self-reflection that “I’m fine with sports but as soon as I’m on casino I can’t control myself” has prompted one operator to further consider the merits of self-exclusion by product. The range of time options available for self-exclusion do vary but are generally consistent between operators in that all offer a shorter period such as 6-months and then increments up to five years or permanent exclusion.

As previously mentioned, it is not clear to what extent individuals who exclude do so because they are experiencing harm or to what extent those who do experience harm eventually self-exclude. Importantly, we are told that a significant number of customers do not appear to exclude because they are suffering from gambling related harm. Rather, a number of things may lead a customer to self-exclude. For example, operators have noted large amounts of day-one self-exclusion related to dissatisfaction with the operator website. This appears likely because self-exclusion can be an easy and immediate way to close an account.

The vast majority of operators we talked to offer immediate online exclusion, i.e. there is one-click (and then potentially a confirmation click) required on the website, on tablet and on mobile. At this point the account is frozen and the customer is excluded. There was one example where following this sort of procedure, a customer is asked to complete and return a paper-based form to confirm the self-exclusion. In this instance we were told that c. 85% of individuals do not complete their self-exclusion by returning the form. The customer is then required to call the operator to reactivate the account, and explain why they have had a change of mind. No other operators we talked to have this step in their self-exclusion procedure.

In the remainder of this section we summarise the approach taken by operators in order to minimise harm in a **reactive way** once potential problematic behaviour is detected. Operators differ in the approach they take to further consider the level of risk and they also differ in what they do once their view on the level of risk has been established.

In the majority of cases, an initial flagging of a customer will lead to closer, often manual monitoring of the customer, with additional checks being performed to better establish risk. For example with some operators social media is used to review concerns. Facebook will be used to look at the customers' lifestyle and family situation; LinkedIn is used to check the customers' employment status and potential salary. This highly manual process appears to be undertaken in a thorough way with several hours or longer taken to review an individual account. It is commonplace also to look at notes on the customers' accounts, for example, considering past history of requesting bonuses. For high-value, VIP customers, relationship managers will often also be involved to help provide context and information that can aid the assessment. Once many of these checks have been completed, a trained specialist may also call the customer to have a conversation and try to find out more information. In almost all cases, it is manual processes complemented by an assessment from a responsible gambling dedicated employee that are used to review risk. This links with the cultural observation we identified through our conversations that most operators are reluctant to rely on automated processes only to intervene.

However, in one case, an operator we spoke to runs a more objective and less manual process. Following an initial flag from their automated system, this organisation will ask the customer to complete a risk-assessment questionnaire (using a PGSI-based survey). The customer is unable to place any bets until this questionnaire has been completed. Another organisation categorises customers into risk groups who then receive a different level of intervention via an automated process.

The approach to intervening in order to minimise harm varies widely. As noted in the section summarising the cultural approach, many operators take the view that their responsibility is to provide responsible gambling tools but ultimately a customer needs to decide for themselves that they have a problem. Therefore there is reticence to be overly interventionist. However, for others, the organisation has taken the decision to unilaterally stop a customer from gambling if the perceived risk is high enough.

One operator segments their approach based on a categorisation of risk. Once a customer has been segmented into a risk group, this will automatically trigger, for example sending warning signals, providing guidance on customer protection tools, having a bearing on what (if any) marketing is communicated or, in extreme cases, freezing accounts. The organisation that requires customers to complete a self-assessment questionnaire if a risk is flagged will automatically freeze an account if any questions return a worrying answer. We were told that whilst a PGSI score may require multiple positive responses in order to strictly result in a tag of 'problem gambling' this organisation has decided that a "yes" answer to any question is enough to freeze activity.

Other operators take a more manual judgement on a case-by-case basis. When customers are identified as being at risk, responsible gambling teams sample customer calls or assess customers' social media profiles, looking for warning signs. Periodic reports are generated of the flagged customers with some cases being escalated to a more direct review if the individual is perceived to be at high levels of risk. The eventual goal of most operators is to guide flagged customers towards a phone call with operator staff (or a face-to-face conversation in the case of a VIP customer). In these conversations, trained staff make a judgement of whether the customer shows signs of being at-risk by looking for key words, phrases or dispositions indicating that they are likely to have a problem. The majority of our conversations made it clear that operators will only proactively exclude a customer in extreme cases with very few instances of this happening. The exceptions are the examples cited above.

### *Phase 2 participation*

We concluded our discussions by describing our intended approach to Phase 2 and asking for an indication of the operators' interest to participate. This would require anonymous access to customers in order to survey and identify a problem gambling group, and then access to their account and play behaviour in order to find some predictive markers of higher problem gambling risk.

In general, there was willingness from all operators to help further understand risk markers and potential means of minimising harm, with some inevitable nervousness about the nature and sensitivity of such information. There were instances where operators are in the middle of or about to embark on their own customer behavioural analytics work, and therefore want to avoid duplication with our intended approach. In the final section we summarise this approach to the next phase.

## Recommendations for Phase 2

### Work Package 3

As of December 2015, Phase I of the project was completed. This includes the literature review, authored by the RGC, and the operator consultations which have granted considerable insight into the state of the remote gambling industry and the approaches which it currently takes towards responsible gambling. Phase 2 will lead directly on from the operator consultation in that it will aim to, in cooperation with several operators, survey current customers online to determine their risk of harm and match this data with customer account behavioural data provided by the operator. This will allow for markers of harm to be established for remote gamblers. In Phase 2 the two components will be an online survey and an analysis of industry-held data.

#### *Online survey*

Targeting a representative customer sample described by a unique customer ID, from multiple remote gambling operators across a range of remote gambling verticals, customers will be notified of the opportunity to take part in an online survey (hosted by PwC) aimed at understanding problem gambling, being informed that their answers will have no bearing upon their account status. Customers separately flagged as at-risk by the operator will be additionally requested to complete the survey. The surveys will aim to achieve the following key goals:

- **Administer PGSI to assess risk of harm**
  - The chief purpose of the survey is to administer the PGSI which will give an indication of an individual customer's risk of harm to later be matched with a customer's online behavioural profile
- **Gather additional data**
  - In addition to completing the PGSI, customers will be asked a series of questions to determine information on potential markers that is likely not captured in operator data such as whether they hold accounts with other operators or certain demographic questions. Importantly, the purpose of these surveys is not to estimate the proportion of problem gamblers in a population of customers, rather, to draw out markers of risk of harm

#### *Analysis of industry-held data*

We will request operators' customer account data of respondents to our survey using the unique customer IDs, requiring the relevant information associated with their online gambling activity, account history and customer service contact history. These data will be paired, using the customer ID, with responses to the online survey, allowing behavioural profiles to be correlated with risk of harm.

- **Establish markers**
  - Using previously identified markers as a guide, the behavioural data of operator customers, and the additional data gathered during the survey, will be analysed to determine which clusters of behaviours over time indicate harmful markers or patterns of markers
- **Validate information**

- To validate the markers established by the previous steps of the project, they will be assessed for their ability to predict customers historically identified as being at higher risk of harm by operators. We will use proxies such as self-exclusion or where the operator has decided there is a problem via customer contact to test how many previously identified customers are accurately identified by the marker group (and the extent to which there are false positives)

In Phase 3 we will develop and test a set of interventions to target at-risk individuals. This methodology for doing so will be finalised following Phase 2.

## Glossary

**Gross Gambling Revenue** - For games in which the operator accepts risk gross gambling revenue is defined as stakes less winnings; for games in which the operator accepts no risk gross gambling revenue is the revenue that accrues to the operator (e.g. commission or equivalent charges)

**Harm** (*no commonly accepted definition*) - The adverse financial, personal and social consequences to player, their families and wider social networks that can be caused by uncontrolled gambling

**Problem gambling** (*no commonly accepted definition*) - A progressive disorder characterized by a continuous or periodic loss of control over gambling; a preoccupation with gambling and with obtaining money with which to gamble; irrational thinking; and a continuation of the behaviour despite adverse consequences

**Problem Gambling Severity Index (PGSI)** - A measure that allows for the assessment of social and environmental aspects of gambling with the ability to identify levels of problem gambling

**Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-V)** - The American Psychiatric Association's classification and diagnostic tool for mental disorders

**Loss chasing** - Attempting to 'win back' money lost in a prior or current gambling session

**Marker** - A behaviour or indicator which can be used to reliably predict another behaviour or state, such as problem gambling

**Sensitivity** - Ability to successfully detect a high proportion of individuals possessing a particular characteristic within a population

**Specificity** - Ability to successfully discriminate between the individuals with the characteristic being searched for and other individuals within a population

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## **Appendix: Sample keyword search terms**

Remote Gambling

Online Gambling

Internet Gambling

Gambling Behaviour

Risk Markers, Indicators, Factors

Behavioural Data

Gambling Data

Algorithm

Modelling, Model

Predictive

Counselling

Helpline

Brief Intervention

Responsible Gambling

Self-Exclusion

Pop-Up Messaging

Problem Gambling

Prevention

Risk Minimisation

Harm Minimisation

## Appendix: Summary of review literature

| Authors/Date               | Doc. Type     | Topic Area  | Methods   |
|----------------------------|---------------|---|---|
| Adami et al. 2013          | Peer Reviewed | Study proposes novel markers for identifying at-risk gamblers based on the concept of sustainability  | Quantitative analysis of actual remote gambling behaviour (bwin data; n=482). Authors conducted a k-means cluster analysis, repeated over more than 100 trials to return 5 stable gambler groups.   |
| Braverman and Shaffer 2010 | Peer Reviewed | Study identifying behavioural markers for high-risk internet gambling                                 | Quantitative analysis of actual remote gambling behaviour (bwin data; n=530). Analysis used k-means clustering, yielding 4 stable and reliable subgroups  |
| Auer and Griffiths 2013    | Peer Reviewed | Study investigates voluntary limit setting and player choice amongst intense Austrian online gamblers | Quantitative analysis of representative random sample (n=5000) of 100,000 records on the <i>win2day</i> website. T-tests performed to examine mean changes before and after voluntary limit setting   |
| Broda et al. 2008          | Peer Reviewed | Study examined the effects of imposed money deposit limits on gambling behaviour                      | Quantitative analysis (n=47000, bwin data). Comparative analysis between users who did and did not exceed deposit limits. Also analysed the average no. of bets per active betting day and average size of bets in Euro using Log variables |

|                                   |               |  |   |
|-----------------------------------|---------------|--|---|
| Costello and Fuqua 2012           | Peer Reviewed | Study examined the effects of time engaged in online gambling; the pattern of pot odds betting; and the impact on monetary loss/gain from gambling amongst university undergraduates in the US | Quantitative play history tracking (n=4, several months of observations) using American university students (ages 19 to 26).<br>Participants assessed using South Oaks Gambling Screen. Play was recorded under controlled, laboratory conditions<br>Analytical design involved non-concurrent multiple baseline across subjects.                           |
| Dragicevic, Tsogas and Kudic 2011 | Peer Reviewed | Study builds on previous research analysing behavioural markers for high-risk Internet gambling using a GTECH G2 dataset of online players across Europe                                       | Quantitative analysis (n=546 online casino gamblers opening accounts in the last year and placed at least 2 bets during first month).<br>K-means clustering approach used. Variability was calculated using the amount bet per betting day rather than per wager. Study attempts to replicate Braverman and Shaffer`s (2010) use of four-variable analysis. |

|                           |                           |  |   |
|---------------------------|---------------------------|--|---|
| Gainsbury et al. 2014     | Peer Reviewed             | Study compared Australian problem and non-problem gamblers and at-risk gamblers to understand why some internet gamblers experience harms  | <p>Survey (n=2799 Australian Internet gamblers) recruited through paid website advertisements between December 2010 and August 2011.</p> <p>The survey examined scaled gambling behaviour, Internet gambling, gambling attitudes, gambling knowledge and beliefs, problem gambling severity (PGSI), and demographics.</p> <p>Analysis was carried out using independent sample t-tests, Chi-square tests, and logistic regression to explore characteristic differences between problem and non-problem Internet gamblers</p> |
| Griffiths and Whitty 2010 | Peer Reviewed Chapter (8) | Article discusses methodological issues in online gambling research; behavioural tracking tools in online gambling; the ethics of online data collection by gambling industry; ethical issues in online behavioural tracking research; and implications of online behavioural tracking for problem gambling screening criteria | Discussion paper  |

|                                   |               |   |  |
|-----------------------------------|---------------|---|--|
| Haefeli, Lischer and Schwarz 2011 | Peer Reviewed | Study sought to ID indicators in customer correspondence used as predictor for gambling-related problems. Next, the study explores how predictive indicators of problem gambling are  | Qualitative screening (interviews with internet gambling operator staff, n=8)<br>Quantitative prediction (survey, n1=150 self-excluded and n2=150 controls).<br>Analysis was confirmatory with the aim of testing the research question. Self-exclusion used as criterion for problem gambling.            |
| Hing et al. 2015                  | Peer Reviewed | Study aims to compare characteristics of Australian problem internet gamblers and problem land-based gamblers and uptake of different types and modes of help between problem internet gamblers and problem land-based gamblers | Survey (n= 620 of problem gamblers in Sydney, Australia). Recruitment facilitated by advertisements placed on 46 websites thought to be visited by gamblers.<br>PGSI used to assess gambling severity.<br>Comparative analysis used non-parametric tests, chi-square tests, and independent sample t-tests |
| Jimenez-Murcia et al. 2011        | Peer Reviewed | Study compares Spanish online pathological gamblers (OPG) to non-OPG in terms of gambling behaviour, socio-demographic features, psychopathology and personality characteristics  | Quantitative (n=1015; using SOGS; pathological gambling patients in Barcelona) 53 OPG, 962 non-OPGs. Other instruments used included: Stinchfield's diagnostic questionnaire; TCI-R; SCL-90-R)<br>t-tests and chi-square tests used for quantitative variables and categorical variables, respectively     |

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|-------------------------|---------------------------------------|--|--|
| Labrie and Shaffer 2010 | Peer Reviewed                         | Article identifies patterns of sports gambling that discriminate sports bettors with self-reported gambling-related problems from sports bettors without such difficulties | Quantitative (n=679 bettors of a 2yr longitudinal study of 47,134 internet gambling subs. (bwin data)<br>Analysis conducted involved multivariate discriminant function using a three group study sample |
| Monaghan 2008           | Peer Reviewed                         | Discusses the use of pop-up messages encouraging self-awareness to effectively increase responsible gambling and reduce the incidence of problem gambling                  | Discussion paper   |
| Griffiths 2015          | Peer Reviewed<br>Book chapter<br>(15) | Chapter provides an overview of internet gambling (types, factors influencing PG, and assist and treatment)  | Discussion paper   |
| Suurvali et al. 2009    | Peer Reviewed                         | Review summarizes recent empirical research on obstacles preventing problem gamblers from seeking treatment for their gambling problems                                    | Literature review (n=19 studies in five countries) searched Medline, PsychINFO, CINAHL and HealthStar. Only first 200 hits on searches were investigated   |

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| Wardle et al. 2011                 | Peer Reviewed | Study attempts to define online gamblers, behaviour patterns in Britain. Included subgroups: those who gambled in-person only; online only gamblers; mixed mode gamblers (same activities); and mixed mode (different activities) | Quantitative (British Gambling Prevalence Study data (2010) n=7756,) using random probability sampling. Collecting involved computer-assisted self-interview. Descriptive and multivariate logistic regression were used to explore factors and associations. 95% CI used in conjunction with odds ratios for predicting membership in four subgroups. |
| Xuan and Shaffer 2009              | Peer Reviewed | Article examines behavioural patterns of actual internet gamblers who experienced gambling-related problems and voluntarily close their accounts  | Quantitative (nested case-control, random sample (n=226) of gamblers who closed accounts due to gambling problems (2005 bwin data).  |
| Blaszczynski, Parke and Parke 2014 | Grey Document | Operator-based approaches to harm minimisation in gambling. Review covers personal harm and economic harms. Review closes with recommendations for practice and future research.  | Literature review included search of online databases; grey literature search through web, personal knowledge and professional contacts. Databases included: Academic Search Elite, Business Source Complete, PsychArticles, PsychInfo, Science Direct and Scopus  |

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| Wood and Williams 2011               | Peer Reviewed | study examines the comparative demographic and health characteristics of Canadian internet vs land-based gamblers; the chars predictive of internet gambling; the game play patterns of internet gamblers; the comparative gambling expenditures of internet vs land-based gamblers; and the comparative rate of problem gambling among internet vs land-based gamblers | Quantitative (survey data, n1=1954 internet gamblers and n2=5967 non-internet gamblers). Sample is considered by author to be representative of Canadian remote gamblers. Additional sampling of international remote gamblers (n=12,521)  |
| Cloutier, Ladouceur and Sevigny 2006 | Peer Reviewed | Article examines the effects of messages and pauses, presented on VLT screens, on erroneous beliefs and persistence to play among Canadian university students in Quebec  | Canadian undergrads from Quebec (n=40 who scored highest on illusion of control screen) two groups for testing the effects of messages and pauses presented on VLT. Data was analysed using an analysis of covariance technique and controlling for pretest scores   |
| Nelson et al. 2008                   | Peer Reviewed | Study focuses onbettors experiencing problems by sampling internet gamblers who imposed limits on the amount they were allowed to deposit   | Betting transactions of n=47,134 gamblers (567 used self-limit tool) over 18 months, online betting site (bwin data). Pre- and post-limit betting periods varied and not directly comparable, instead analysed averaged betting behaviours (bets per day) or % loss rather than sums (total number of bets). |

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| Gray, LaPlante, Shaffer 2012             | Peer Reviewed | Study examines actual internet gambling behaviour during 10 years of play; compared test and control group using indices of intensity of gambling activity, particularly related to live-action sports betting  | electronic gambling records of subs (T=2066, C=2066, bwin.party data) who triggered a RG alert system at a large international online gaming company; used discriminant function analysis to explore what aspects of gambling behaviour distinguish cases from controls |
| Brosowski, Meyer and Hayer 2012          | Peer Reviewed | Article extends previous pubs of actual online gambling behaviour that neglected involvement across multiple types of gambling and did not provide levels of at-risk involvement  | Behavioural data from 27,653 subs of bwin in Feb. 2005 were reanalyzed across eight products over seven months (92% men, 8% female), mainly Germans, as with many other studies   |
| Gainsbury, Suhonen and Saastamoinen 2014 | Peer Reviewed | Study examines loss chasing behaviour in a sample of internet casino and poker players in 96 countries (mainly in North America and the UK) and the socio-demographic variables, irrational beliefs, and gambling behaviours associated with chasing losses | Online survey (n=10,838), 58% male from 96 countries. The survey included 85 closed and open-ended questions covering five categories, ranging from socio-demographic information, chasing behaviour, internet casino use, internet poker play, and others.             |
| Philander and MacKay 2014                | Peer Reviewed | Study attempts to test whether internet gambling as a risk factor for disordered gambling and is capturing a fully formed causal relationship using population samples from the UK and Canada   | Secondary data from the 2010 British Gambling Prevalence Survey (n=7756 adults age 16+), PG measured by DSM-IV and PGSI. British data is compared to survey data collected in Ontario, Canada (n=3343)  |

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| Gainsbury, Russell, Blaszczynski and Hing 2015 | Peer Reviewed | Study examines differences between Australian internet gamblers with a single or multiple online gambling accounts, including their gambling behaviours, factors influencing their online gambling and risk of experiencing gambling problems | Australian Internet gambler online survey (n=3178) assessing gambling behaviour and the use of single or multiple online gambling accounts. Recruitment predominantly facilitated by gambling sites (53.9%), Facebook (17.6%) and Google (6.3%). Analyses utilized independent sample t-test. chi-square tests of independence were used with post-hoc z-tests. |
| McCormarck, Shorter and Griffiths 2013         | Peer Reviewed | Study examines the predictors of online problem gambling and whether these differed from established predictors of offline problem gambling using samples from the UK, US, Canada and Australia   | Secondary data pulled from customer postings on 32 gambling websites (n=1119). Half of the sample were British, a third from the USA, and other marginal representation from Canada and Australia. The 30 item survey generated data, which was analysed using descriptive statistics, chi-square tests and multinomial logistic regression                     |
| Lucar, Wiebe and Philander 2012                | Grey Document | Review of monetary limit tools for internet gamblers  | Literature review and policy analysis of 50 sites and current monetary limit setting tools, and a review of internet gambling player discussion forums  |
| Braverman, Labrie and Shaffer 2011             | Peer Reviewed | Article attempts to determine if characteristics of extreme gambling are qualitatively distinct or a point along a dimension  | Review of bets made in a 24-month period (most involved gamblers n=4595, of larger 48114 cohort; bwin data). Examined total money lost, total number of bets, and total money wagered   |

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| Edwards, Li and Lee 2002      | Peer Reviewed | Paper explores the use of forced viewing of pop-up ads on the Internet to understand how viewers enrolled in a Midwestern US university come to define ads as irritation and decide to avoid them | 379 (58% women) undergraduates from Midwestern US university. Analysis included 2x2x3 factorial design using a web-based task (info gathering on financial aid or current movies)-- experiment exposed subjects to PU ads at different intensities   |
| Floyd, Whelan and Meyers 2006 | Peer Reviewed | Study assessed the effectiveness of warning messages during internet-based roulette games intended to aid in the control of gambling.   | 122 undergraduates from urban US university psychology class (42% men); participants subjected to gambling history questionnaire, gambling beliefs questionnaire, receipt (of educational messages) questionnaire, roulette belief questionnaire, gambling experience questionnaire, and computerized roulette game. Results were subjected to multivariate analysis of covariance with five dependent variables to determine there were any sig. covariates |

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| Wohl et al. 2010 | Peer Reviewed | Study examines the preventative effects of an animation-based video (using metaphors to depict gambling knowledge) that educated participants from Ottawa, Ontario on how slot machines function, the prudence of setting financial limits, and strategies to avoid problems. | Convenience sample of 242 non-problem gamblers (119 male), screened via CPGI /PGSI participating in a 30 day and exposed to animation-based education intervention on slot machines. The control condition was a neutral video about the lines of business managed by the OLG with no information on how games slots work and no habits for problem free gambling are presented |
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