SECONDARY DATA ANALYSIS REPORT

INVESTIGATING THE RELATIONSHIP BETWEEN PHYSICAL AND MENTAL HEALTH CONDITIONS AND GAMBLING IN ENGLAND AND SCOTLAND

Isabel Taylor, Ph.D.

Research Director
The National Centre for Social Research
Isabel.taylor@natcen.ca.uk

Heather Wardle, Ph.D.

Lord Kelvin Adam Smith Reader
University of Glasgow

Ben Stoker

Research Assistant
The National Centre for Social Research

Bea Taylor

Research Assistant
The National Centre for Social Research

Date Submitted: April 30th, 2021
Date Published: May 20th, 2021

GREO

SUGGESTED CITATION

Taylor, I., Wardle, H., Stoker, B., & Taylor, B. (2021). Investigating the relationship between physical and mental health conditions and gambling in England and Scotland. Report prepared for Gambling Research Exchange (GREO), Guelph, Ontario, Canada. https://doi.org/10.33684/2021.003

ABSTRACT

Purpose & significance: Although there is evidence of an association between a wide range of physical and mental conditions, and problem gambling, little robust evidence is available about this relationship or the relationship between gambling formats and these factors in Britain, particularly since the full enactment of the Gambling Act 2005, and since the increased availability and participation in online gambling over the last decade. The purpose of this project is to investigate the physical and mental health correlates among two groups of people in England and Scotland: adults with differing levels of problem gambling severity, and gamblers who engage with gambling activities in different types of location (with a particular focus on online, and/or land-based locations). **Methodology:** The 2012, 2015, and 2016 Combined Data from the Health Survey for England, and the Scottish Health Survey were pooled, and bivariate analyses were used to ensure that relationships between mental and physical health, smoking and drinking, and gambling behaviours varied between different survey years. Bivariate analyses and binary logistic regression (controlling for demographics) were used to investigate the relationships between mental and physical health, smoking and drinking, and experiences of problem gambling across the sample, and for men and women separately. Bivariate analyses and binary logistic regression (controlling for demographics) were then used to investigate the relationships between mental and physical health, smoking and drinking, and gambling activity in different locations for all gamblers. This analysis was also conducted for men and women who gamble separately. **Results**: There are significant associations between mental health and experiences of problem gambling, particularly for men, but the relationship between physical health conditions and problem gambling is less clear-cut. Physical health conditions are, however, associated with gambling in different locations. Furthermore, there is a clear relationship between health behaviours and both problem gambling and gambling in different locations; smoking and drinking are both associated with experiences of problem gambling and with gambling in both land-based and online locations. **Implications**: These results suggests that screening linked to physical health conditions may not be sufficient to detect experiences of problem gambling by primary care providers, but other health-related indicators (including experiencing mental health conditions, poor self-reported general health, and high levels of smoking or drinking) may be useful indicators. The health-related indicators that may help to identify people engaging in gambling behaviour, or gambling behaviour in certain locations, are not necessarily useful indicators to identify people at the greatest risk of gambling harm.

Keywords: problem gambling; online gambling; land-based gambling; mental health; physical health; smoking; alcohol; UK

Funding source: Funding for this research was provided by Greo. Greo was not involved in the ideas presented herein and imposed no constraints on publishing.

Corresponding author: Isabel Taylor, Isabel.taylor@natcen.ca.uk

INTRODUCTION

Gambling is associated with a range of harms including harms to health. Problem gambling has a well documented association with a wide range of mental health conditions. Lorains, et al.'s[1] systematic review noted that people experiencing problem gambling had high rates of co-occurring substance abuse disorder, anxiety disorders, and mood disorders. There are also associations between physical health conditions and problem gambling, with high prevalence rates of digestive disorders, cardiovascular disorders, and sleep disorders among those experiencing gambling problems.[2] Desai et al. have noted similar patterns among a nationally representative sample in the US, stating that problem gambling was uniformly associated with poorer health and that poorer health measures were also apparent among recreational gambling, suggesting presence of a dose/response relationship.[3] The relationship between specific physical health conditions and problem gambling, however, has been less well documented.

In Britain, few studies have examined this systematically. This is a gap in knowledge, as the prevalence and experience of health conditions vary between jurisdictions meaning that local, contextual knowledge of their distribution and relationship with gambling is needed. Wardle et al.,[4] noted that having untreated high blood pressure and low mental wellbeing scores were highly associated with problem gambling, but limited sample sizes precluded looking at health behaviours more in-depth and exploring if these associations differed between men and women. Cowlishaw and Kessler[5] analysed data collected by the 2007 Adult Psychiatric Morbidity Survey and their "preliminary" analyses found significant associations between problem gambling and a number of dimensions of poor mental health, though the study was limited by the small number of problem gamblers (n=41) found in the dataset. Since this information was collected, the context in which people are gambling in Britain has changed. The Gambling Act 2005 has been fully enacted, allowing gambling companies to advertise on TV and radio, and a large expansion in the opportunities for and prevalence of online gambling. There is a pressing need to update and extend these observations with more recent insight.

This report aims to analyse data from the combined English and Scottish Health Surveys (2012, 2015, 2016) to:

- Explore the associations between physical and mental health conditions, alcohol consumption and smoking habits, and problem gambling status and whether these associations vary by problem gambling score and severity.

- Examine whether any observed associations between physical and mental health conditions, and problem gambling status differ for men and women.

In addition, little is known about the health behaviours and correlates of people who engage in different gambling formats, especially online gambling. A 2012 review[6] found that online gambling was associated with poor mental health correlates and substance use. Lloyd et al.,[7] found that among a self-selecting non-probability sample of British internet gamblers, those who gambled online on casino and sports events, and multi-activity online gamblers had the highest prevalence of mental disorder, though the generalisability of these results to the broader population is unknown. As with problem gamblers and health, context is important. Britain has one of the most accessible and liberalised online gambling regimes in the world. Therefore, in addition we aim to examine how mental and physical health conditions, and other health behaviours are associated with different gambling formats.

METHODOLOGY

DATA AND MEASURES

This analysis uses data from the Health Survey for England and the Scottish Health Survey which are available as combined datasets on Gambling in England and Scotland for 2012, 2015, and 2016 (2012: n=13,106; 2015: n=20,166; 2016: n=12,334). Each of these annual datasets draws on the annual cross-sectional study from each nation, based on nationally representative samples of people in private households in England and Scotland, respectively. For each year's data, variables that were consistent across the English and Scottish datasets, and those that could be derived to create matching variables, were included in the annual combined dataset. New weights to reflect the distribution of the population in the combined geographic were also generated for each combined dataset.

For this analysis, all people with valid responses to the PGSI questions were included in the analytical sample for investigations into the relationships between mental and physical health, smoking and alcohol consumption, and problem gambling (n=31,928). For analysis of activity in different gambling locations, only those people who had indicated that they had gambled in the previous 12 months were included in the analytical sample (n=21,184).

The combined English and Scottish Health Survey datasets contain a wide range of variables relating to people's physical and mental health, their health behaviour, and their gambling habits, as well as demographic and socio-economic information. A subset of these variables was used in this analysis, to focus on key measures that could be standardised across multiple years, as outlined below.

Socio-demographic variables: The following variables were included to reflect people's demographics and socio-economic characteristics: gender (recoded to male = 0, female =1),

ethnicity (recoded to White British/White Other = 0, Other ethnic group(s) = 1), age (recoded to 16-24 = 0, 25-34 = 1, 35-44 = 2, 45-54 = 3, 55-64 = 4, 65+ = 5), level of education (recoded to No university degree = 0, Has university degree = 1), employment status (recoded to Not in work = 0, In work = 1), and housing tenure (recoded to Does not own home = 0, Owns home = 1). Comparable income measures were not available between countries across different years, so no measure of income was used in this analysis.

Mental health: Mental wellbeing was measured using two different instruments: the 14-item Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) and the 12-item General Health Questionnaire (GHQ-12). Responses to WEMWBS questions range from none of the time to all the time (a scale of 0-5) and were combined to create a scale from 0-70. A cut-off score of 40 was used to identify people likely experiencing probable depression[8] to create a new dichotomous variable (Probable depression = 1, No probable depression = 0). GHQ-12 questions were only available in the 2012 and the 2016 datasets. Responses to these questions were combined to create an overall scale reflecting the number of symptoms of mental distress (ranging from 0-12) experienced by people in recent weeks. A cut-off score of four was used to identify people experiencing significant mental distress[9] to create a new dichotomous variable (Significant mental distress = 1, No significant mental distress = 0). Doctor-diagnosed mental health disorders were also measured dichotomously (Diagnosed condition = 1, No diagnosed condition = 0).

Physical health: Doctor diagnosed physical health conditions were measured using dichotomous variables (recoded to Diagnosed condition = 1, No diagnosed condition = 0). These covered endocrine/metabolic, nervous system, heart or circulatory system, respiratory system, digestive system, and musculoskeletal system conditions as well as eye or ear complaints, diabetes, and high blood pressure. A dichotomous variable also denoted whether a person had a long-term illness (Yes = 1, No = 0). Self-assessed general health was measured on a five-point scale ranging from very good to very bad (recoded to Bad/Very bad = 1, Fair = 2, Very good/Good = 3). Body Mass Index was also included (recoded to Not obese or overweight = 0, Obese or overweight = 1).

Smoking habits: Three measures of smoking habits were included in this analysis; peoples' current smoking status (Never smoked = 0, Former smoker = 1, Current smoker = 2), number of cigarettes smoked per day (Non-smoker = 0, 1 to 10 = 1, 11 to 20 = 2, 21 or more = 3), and the age a person started smoking (recoded to Never smoked = 0, Under 16 years old = 1, 16-17 years old = 2, 18 years old or older = 3).

Alcohol consumption: Three measures of alcohol consumption were included; persons' drinking risk category based on current guidance[10] and standardised across all years' data (recoded to Non drinker = 0, Lower risk drinker = 1: 14 units or less per week for men or women, Moderate risk drinker = 2: 15-50 units for men or 15-35 units for women, Higher risk

drinker = 3: Over 50 units for men or over 35 units for women), the number of days on which a person drank the previous week (recoded to None = 0, 1 to 5 days = 1, 6 or 7 days = 2), and the number of units a person had consumed on their heaviest day of drinking the previous week (No alcohol = 0, 1 to 7 units = 1, 8+ units = 2).

Gambling problems: Gambling problems were measured using the Canadian Problem Gambling Index (CPGI)'s Problem Gambling Severity Index (PGSI).[11] This is made up of nine survey items asking people if they have never (equal to a score of 0), sometimes (1), most of the time (2) or almost always (3) experienced a given behaviour. Responses can be combined to create a scale from 0 to 27, which can identify four categories of non-problem (0), low risk (1-2), moderate risk (3-7), and problem (8+) gamblers. An additional variable to differentiate more between PGSI scores in more detail was also created with eight categories (PGSI scores of 0, 1, 2, 3, 4-5, 6-7, 8-9, 10+).[a]

Gambling behaviour: The data contains multiple measures asking people if they had taken part in different forms of gambling in the previous twelve months. People who played the National Lottery were distinguished from all other gamblers as National Lottery tickets can be bought both online and in land-based locations, with the questionnaire not differentiating between these. Furthermore, lotteries are typically considered less risky forms of gambling than other activities, whilst being one of the most popular forms. For this reason, in British policy/research reports, it is typical to explore the gambling behaviours of those who only play lotteries vs those who do other things (potentially alongside lottery gambling). A new variable was created from these to reflect the locations where an individual had taken part in gambling activities during the previous 12 months (No gambling = 0, National Lottery only = 1, Land-based gambling only = 2, Online gambling only = 3, Land-based and online gambling = 4).

DATA ANALYSIS

Weighted bivariate analyses were carried out on the pooled datasets for 2012, 2015, and 2016 combined to investigate if relationships between problem gambling and measures of physical and mental health, smoking and alcohol consumption varied between these years. These relationships remained stable between 2012, 2015, and 2016 (see Table 1 in the supplementary tables). Therefore, subsequent stages of analysis used data pooled across all three years to increase sample size for this analysis.

Weighted bivariate analyses were then performed to investigate the relationships between problem gambling and people's mental and physical health conditions and their smoking and drinking habits. Two measures of problem gambling were used in these analyses: the

[a] The Health Survey Series also includes identification of problem gambling according to the DSM-IV criteria. We were interested in sub-threshold problem gambling as well as problem gambling, with analysis in this report limited to the PGSI screen.

established PGSI problem gambling categories and the newly created 8-category PGSI variable outlined above to allow greater differentiation between categories. Bivariate analyses using the established PGSI problem gambling categories were also performed for men and women separately to investigate if and how these relationships varied between sexes.

Logistic regression models were then built to investigate the relationship between health conditions, smoking and alcohol consumption, and problem gambling. Due to the substantially greater prevalence of problem gambling among men versus women, different models were estimated for men and women within the data. For men, two sets of models were estimated with different outcome variables: 1) problem gambling status (Not problem gambler = 0, Problem gambler = 1), and 2) moderate-risk gambling status (Not moderate-risk gambler = 0, Moderate-risk gambler = 1). For women, only one set of models was estimated predicting the likelihood of experiencing either problem or moderate-risk gambling (Neither moderate-risk nor problem gambler = 0, Moderate risk or problem gambler = 1). Each set of models included one model for each independent variable of interest in turn, controlling for all relevant demographic and socio-economic characteristics available in the data.

Weighted bivariate analyses were also performed to explore the relationship between health conditions and behaviours, and the location at which gamblers engaged in gambling activity (National Lottery only, online only, land-based only, or both online and land-based). This was replicated for men and women separately to investigate if and how relationships between these factors and gambling locations varied between sexes.

Binary logistic regression models were then built to predict a gambler's likelihood of engaging in gambling activity in each location in turn (National Lottery only, online only, land-based only, or both online and land-based). In each model, dummy variables were used to show if a gambler engaged in gambling activity in that location versus all other location categories (Gambled in this location = 1, Gambled in other location = 0). For each outcome, individual regression models were built including each independent variable in turn while controlling for all relevant demographic and socio-economic characteristics available in the data.

RESULTS

THE RELATIONSHIP BETWEEN PROBLEM GAMBLING, MENTAL AND PHYSICAL HEALTH CONDITIONS AND HEALTH BEHAVIOURS

MENTAL HEALTH AND PROBLEM GAMBLING

Bivariate analyses were conducted to investigate the association between PGSI problem gambling categories and the mental health variables outlined above. Experience of problem gambling were higher among people with a clinically significant level of mental distress (1.3% compared to only 0.2% of those without), probable depression (1.5% compared to 0.3%

without), and a doctor diagnosed mental health condition (1.2% compared to 0.4% without). As Figure 1 indicates, this was particularly the case for men; 2.9% of men with significant distress (compared to 0.4% without), 3.0% with probable depression (compared to 0.6%

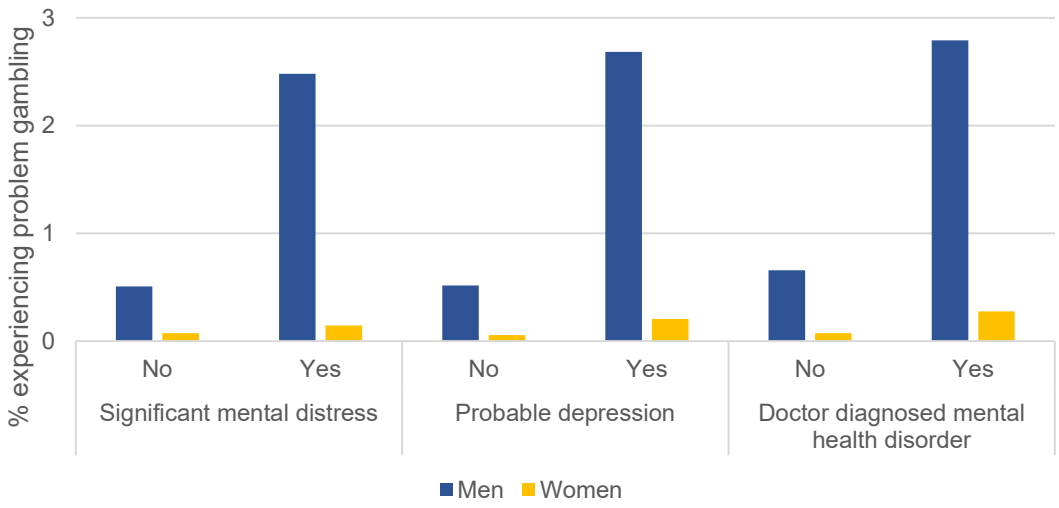

Figure 1: Percentage of people experiencing problem gambling by sex and mental health conditions

without), and 2.5% with a diagnosed mental health condition (compared to 0.7% without) experienced problem gambling.

People experiencing significant mental distress, probable depression or a diagnosed mental health condition were also more likely to report more severe PGSI scores than those without such conditions (Figure 2). Although very few people overall (only 0.3%) score 10 or higher on

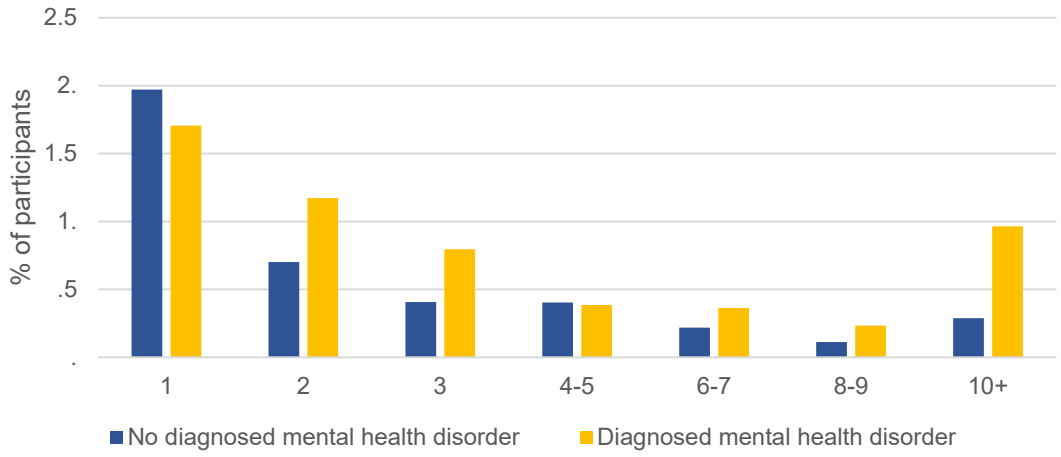

Figure 2: Percentage of people with PGSI scores one or higher by diagnosed mental health disorder and PGSI score

the PGSI scale, this increases to at least 1% of those experiencing significant mental distress, probable depression or who have a diagnosed mental health condition. This suggests that people in poor mental health are not only more likely to experience problem gambling, but also far more likely to experience greater severity of gambling harms.

Among men, these relationships hold when included in logistic regression models predicting people's problem gambling status; among men, having a clinically significant level of mental distress, probable depression or a doctor diagnosed mental health condition continues to be associated with a higher rate of problem gambling. Equally, having a clinically significant level of mental distress (but not probable depression or a diagnosed mental disorder) was also associated with moderate risk gambling among men. Among women, these factors were not associated with moderate risk or problem gambling.

PHYSICAL HEALTH AND PROBLEM GAMBLING

Although mental health conditions are strongly and consistently associated with problem gambling, particularly among men, there is no clear evidence of significant relationships between diagnosed physical health conditions and problem gambling in these data. This may be due to the small proportion of problem gamblers captured by even these combined datasets and the low prevalence of many of the physical health conditions (only high blood pressure, musculoskeletal, and health or circulatory conditions are reported by more than 10%

of people) making associations between these conditions and problem gambling difficult to detect despite large sample sizes within the combined datasets.

However, people's self-assessed general health was associated with problem gambling; people who said their general health was bad or very bad were almost three times as likely as those who rated it as good or very good to be experiencing problem gambling (0.8% compared to 0.3%). As Figure 3 shows, people who said their health was good or very good were also the least likely to score 10 or more on the PGSI numerical scale; 0.6% of people with the worst assessment of their general health and 0.7% of those with who said it as fair scored 10 or higher, compared to only 0.2% of people with good or very good general health.

Notably, this pattern was observed for men only. When bivariate analysis was conducted for men and women separately, men with bad or very bad or with fair self-assessed general health were almost three times as likely as those who rated it as good or very good to be a problem gambler (1.7% compared to 0.6%). However, there was no clear relationship for self-assessed health and problem gambling among women.

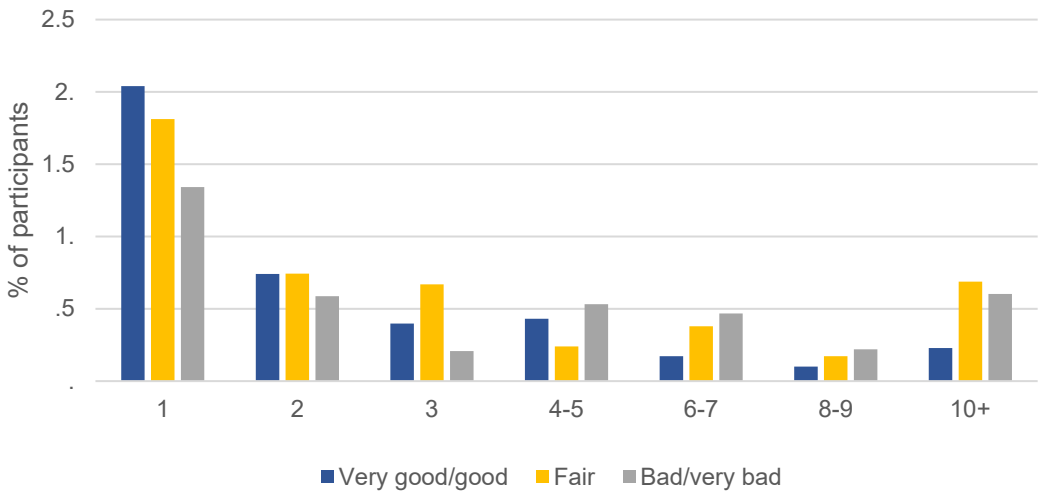

Figure 3: Percentage of people with PGSI scores one or higher by self-assessed general health and PGSI score

Even when controlling for an people's demographic and socio-economic characteristics, there is very little evidence of physical health conditions being significantly associated with problem gambling among men or moderate risk and problem gambling among women; men with diagnosed ear complaints were significantly less likely to experience problem or moderate risk gambling than those without while women with a heart or circulatory system condition were

almost three times as likely to experience problem or moderate risk gambling as those without. Women with a long-term health condition were also more than twice as likely as those without such an illness to experience problem or moderate risk gambling.

Commensurate with evidence from the bivariate analysis, individual self-assessed general health was significantly associated with problem gambling status in the logistic regression models. Men who rated their general health as “Fair” were more than four times and those who rated it as “Very bad” or “Bad” were more than five times as likely as those who rated it as “Very good” or “Good” to experience problem gambling. Women who rated their health as “Fair” were also more than twice as likely as those who rated it “Very good” or “Good” to experience problem or moderate risk gambling.

ALCOHOL CONSUMPTION

Although doctor-diagnosed health conditions do not appear to be significantly associated with problem gambling in bivariate analyses, health behaviours appear to have a much stronger and more consistent relationship with problem gambling. As highlighted in Figure 4, higher-risk drinkers are four times as likely as non-drinkers to experience problem gambling (1.2% compared to 0.3%) and three times as likely to experience moderate risk gambling (2.4% compared to 0.8%). Higher-risk drinkers were also more likely than other drinkers to score the highest scores (10+) on the overall PGSI scale, although these differences were not significant.

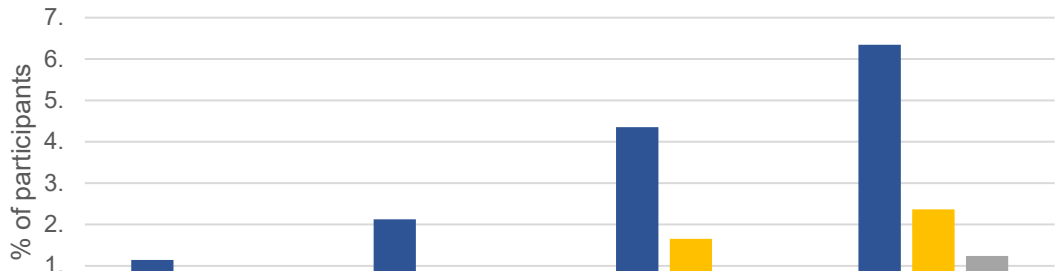

Figure 4: Percentage of people experiencing low risk, moderate risk, and problem gambling by level of alcohol consumption

Heavy drinkers (those who drank eight or more units on their heaviest day of drinking during the previous week) were also more likely to experience moderate risk (2.4%) and problem gambling (0.8%) than those who did not drink or who drank less than eight units on their heaviest drinking day. In particular, people who drank eight or more units on their heaviest day were more than twice as likely than those who drank one to seven units to experience problem gambling (0.8% compared to 0.3%). They were also the most likely to record a score of 10 or more on the PGSI scale, but these differences were not significant.

The relationship between alcohol consumption and problem gambling was particularly strong for men. Men who were higher-risk drinkers were significantly more likely than men who were moderate-risk drinkers to be low-risk, moderate-risk, or problem gamblers; 1.9% of men who were higher-risk drinkers were problem gamblers, compared to only 0.7% of men who were moderate-risk drinkers. However, women higher-risk drinkers were no more likely than women who drank less or not at all to be moderate-risk or problem gamblers (though this may be due to relatively small sub-sample sizes).

Among men, the results from the logistic regression models broadly mirrored those from the bivariate analysis: logistic regression models predicting problem gambling among men showed that men who were higher-risk drinkers (who drank over 50 units a week) were more than five times as likely as non-drinkers to experience problem gambling. However, this was not associated with moderate risk gambling among men or either moderate risk or problem gambling among women. Finally, men who drank eight or more units of alcohol on their heaviest drinking day were also twice as likely to experience moderate risk gambling than those who did not drink. However, this measure of heavy drinking was not a significant predictor of problem gambling among men or of problem or moderate risk gambling among women.

SMOKING HABITS

Smoking behaviour was also associated with problem gambling status; current smokers were three times more likely to experience problem gambling than people who had never smoked (0.9% compared to 0.3%). Furthermore, heavy smokers (who smoked 20 or more cigarettes a day) were four times as likely as non-smokers to experience problem gambling (1.7% compared to 0.4%) and almost three times as likely to experience moderate-risk gambling (2.3% compared to 0.8%). They were also significantly more likely to score the highest values on the PGSI problem gambling scale; 1.3% of heavy smokers scored 10 or above compared to only 0.3% of non-smokers.

Men who were current smokers were significantly more likely than men who had never smoked to experience moderate risk gambling (2.7% compared to 1.4%). They were also twice as likely to experience problem gambling (1.4% compared to 0.7%). Men who were

heavy smokers were also particularly likely to experience problem gambling; 2.2% of this group experienced problem gambling compared to only 0.7% of men who did not smoke.

The relationship between smoking and problem gambling appeared to be particularly strong among women. Women who were current smokers were more than three times as likely as women who had never smoked to experience moderate risk gambling (1.3% compared to 0.3%). Once again, the amount smoked appeared to be a strong predictor of problem gambling; 1.0% of women who smoked more than 20 cigarettes a day experienced problem gambling, compared to under 0.1% of women who did not smoke.

Even in binary logistic regression models controlling for other individual characteristics, smoking continues to be a significant predictor of problem gambling. Although there was no significant relationship between current smoking status and problem gambling for men, men who were current smokers were 1.7 times as likely to experience moderate-risk gambling as men who did not smoke. However, men who smoked at least 20 cigarettes a day were more than two and a half times as likely as non-smokers to experience problem gambling.

Within the regression models, the relationship between smoking and problem/moderate risk gambling appeared to be even stronger for women; women who were current smokers were 3.3 times as likely to experience problem or moderate-risk gambling as those who did not smoke, while women who were heavy smokers were 4.6 times as likely as non-smokers to fall into either category, even when controlling for other relevant individual characteristics.

Furthermore, starting smoking at a younger age was associated with problem gambling. Men who started smoking before age 16 were almost twice as likely as men who never smoked to experience moderate-risk gambling while women who started smoking at this age were 3.3 times as likely as those who never smoked to experience problem/moderate risk gambling.

THE RELATIONSHIP BETWEEN GAMBLING LOCATIONS, MENTAL AND PHYSICAL HEALTH CONDITIONS AND HEALTH BEHAVIOURS

To investigate the relationship between people's mental and physical health, alcohol consumption and smoking habits, and the locations in which they gamble, the analysis was limited to the sub-sample of people who indicated that they had engaged in any gambling activity (including the National Lottery) in the 12 months prior to their health survey interview. This restricts the analytical sample to a maximum of 21,184 people.

Due to the large increase in online gambling in recent years – even before the COVID-19 pandemic limited in-person gambling opportunities – figures from these analyses reflect lower levels of online gambling than we would expect to find in more recent data. In particular, the very low proportion who report gambling online only (3% of men and 1% of women, as shown in Figure 5) limits the ability of these analyses to detect significant relationships between the independent variables of interest and online only gambling.

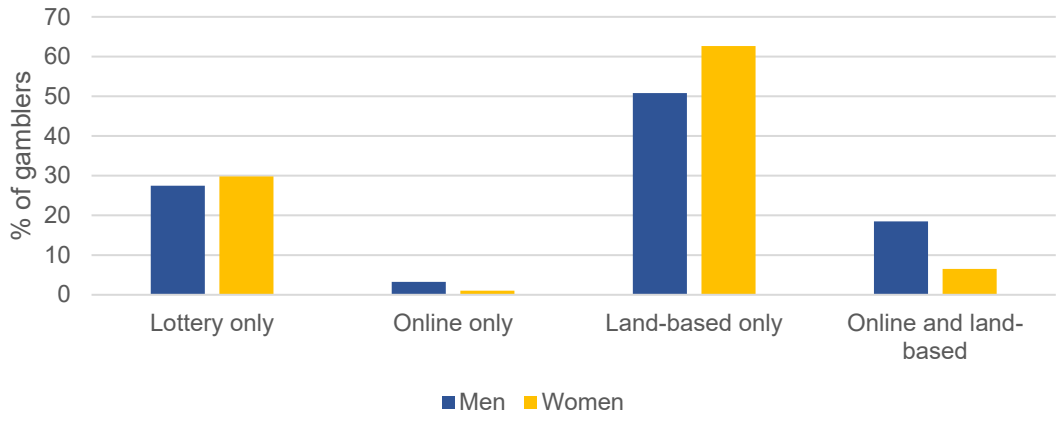

Figure 5: Percentage of men and women who gamble by gambling location

MENTAL HEALTH AND GAMBLING LOCATIONS

Gamblers with significant mental distress (using the GHQ-12 instrument) or probable depression (using the WEMWBS instrument) were not significantly more likely to gamble in any of the location types (on the National Lottery only, online only, in land-based locations only or both online and in land-based locations) than those with no significant mental distress or probable depression. However, gamblers with a diagnosed mental disorder were more likely to gamble in land-based locations only (64.3% compared to 55.5%). They were also less likely than those without such a diagnosis to play only the National Lottery (24.8% compared to 30.1%) or to be both online and land-based gamblers (9.2% compared to 12.3%).

Women with probable depression who gambled were twice as likely as those without probable depression to gamble online only (2% compared to 0.9%) while women gamblers with a diagnosed mental health disorder were less likely to play the National Lottery only (26% compared to 31% with no diagnosis) and more likely to gamble in land-based locations only (68% compared to 62%). Men with a diagnosed mental health condition who gambled were also more likely to gamble in land-based locations (59% compared to 50% without a diagnosis), but less likely to gamble both online and in land-based locations (12% compared to 18%).

In binary regression models for all gamblers combined, having a doctor diagnosed mental health conditions continued to be associated with gambling locations, even when controlling for people's demographic and socio-economic characteristics. Gamblers with a diagnosed mental health condition were less likely to be National Lottery only gamblers or to gamble both in land-based locations and online than those with no diagnosed condition. They were however 1.4 times more likely to gamble in land-based locations only.

Figure 6: Odds ratio predicting likelihood of gambling in different locations for gamblers with a diagnosed mental health condition compared to gamblers with no diagnosed mental health condition

The relationship between mental health and gambling locations appears to be stronger for women than for men. In models predicting women who gamble's gambling location alone, having a doctor diagnosed mental condition reduces the odds of a gambler playing the National Lottery only and (as for men) increases the odds of gambling in land-based locations only. Furthermore, women who reported significant mental distress and gambled were 1.4 times more likely to be both an online and land-based gambler while those with probable depression were 2.3 times more likely to be online only gamblers.

PHYSICAL HEALTH AND GAMBLING LOCATION

Measures of individual health conditions suggest that gamblers in poorer health are generally more likely to play the National Lottery only and less likely to be online and land-based gamblers than those without each condition. Gamblers with endocrine or metabolic, heart or circulatory system or musculoskeletal system conditions, ear complaints, diabetes, high blood pressure or long-term health conditions were all more likely to be National Lottery players only than gamblers without each of these conditions. They, along with gamblers with a nervous system condition or eye complaints, were also less likely than those without such health conditions to gamble both online and in land-based locations. These relationships were particularly strong among men who gambled, with weaker relationships between physical health and gambling locations for women who gamble.

Gamblers' self-assessed general health was also associated with the locations in which they gambled. Gamblers who rated their health as bad or very bad were more likely to play the National Lottery only (36.1% compared to 28.9% of those who they rated it as good or very good) while gamblers with positive assessments of their health were the most likely to gamble both on-land and online (13.3% were both land-based and online gamblers, compared to only 7.5% of those who said their health was bad or very bad, and 8.7% who rated it as fair). Once again, this relationship appeared stronger for men than for women; men who gambled and said their health was good or very good were more than twice as likely to be both land-based and online gamblers as those who said it was bad or very bad (19.6% compared to 9.3%). They were also significantly less likely to play only the National Lottery (27.4% compared to 38%).

However, as the prevalence of many of these conditions – and poor health in general – increases with age, these bivariate associations may be reflecting other characteristics of gamblers in these locations. Nonetheless, a number of relationships between physical health conditions and gambling locations remained significant even when controlling for other individual factors. In particular, reporting eye complaints (for all gamblers and women alone) and a respiratory system or musculoskeletal condition continued to be associated with lower odds of being a lottery only gambler, having a musculoskeletal condition continued to be associated with higher odds of being a gambler only in land-based locations (for all gamblers and men alone), and gamblers with a nervous system condition were twice as likely as those with no such condition to be an online only gambler. This was even higher for women; among female gamblers, those with a nervous condition were three times as likely to be online only gamblers as those with no such conditions. In addition, women who gambled and had a respiratory system condition were twice as likely as those without such a condition to be online only gamblers and those with an eye complaint were 1.5 times as likely to gamble only in land-based locations.

Gamblers with diabetes were also less likely to gamble in land-based locations only (among all gamblers and for men alone) and more likely to gamble both online and in land-based locations than those without diabetes, while gamblers classified as overweight or obese (according to their BMI) were 1.25 times as likely to gamble both online and in land-based locations as those classified as underweight or a healthy weight, and significantly less likely to be lottery only gamblers. Women classified as overweight or obese were also more likely to be land-based only gamblers.

ALCOHOL CONSUMPTION AND GAMBLING LOCATION

Gamblers classified as higher-risk drinkers were more than three times as likely as those who did not drink to gamble both in land-based locations and online (19.1% compared to 6.2%), while non-drinkers and lower-risk drinkers were more likely to play the National Lottery only than moderate-risk or higher-risk drinkers. As shown in Figure 7, the likelihood of gambling both online and at land-based locations increased as alcohol consumption increased for both men and women.

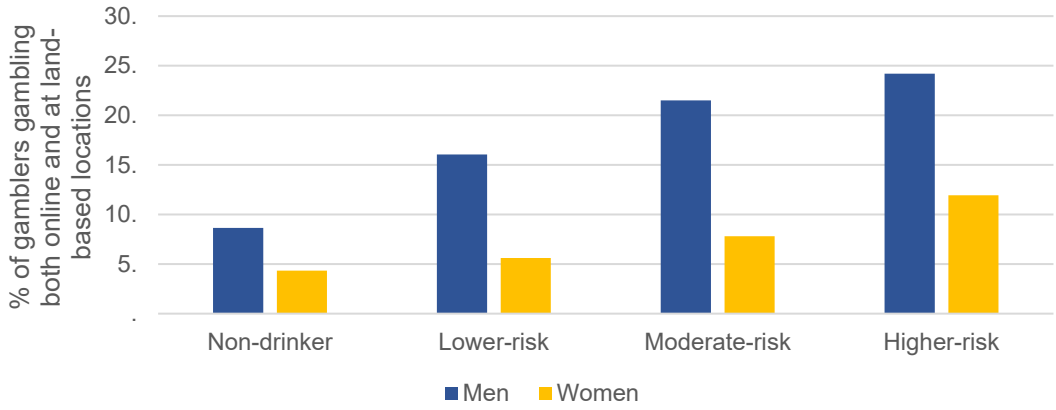

Figure 7: Percentage of gamblers who gamble both online and at land-based locations by sex and drinking category

But the heaviest drinkers (those who said they had consumed eight or more units of alcohol in their heaviest drinking day during the previous week) were the most likely to be both land-based and online gamblers and the least likely to play the National Lottery only (Figure 8); about one in five of this group (20.8%) were both land-based and online gamblers, compared to fewer than one in 10 gamblers who did not drink (9.6%) or who drank between one and seven units of alcohol (10.5%) in the previous week. In fact, gamblers who drank eight units or more on their heaviest day of drinking were as likely to be both online and land-based gamblers as they were to play the National Lottery only, while non-drinkers and those that drank less than eight units were three times more likely to play the National Lottery only as to be both online and land-based gamblers.

Furthermore, the heaviest group of drinkers (who drank eight or more units on their heaviest day of drinking during the previous week) were significantly more likely to be online only gamblers than those who had not consumed alcohol in the previous week; 2.8% of heavy drinkers were online only gamblers, compared to 1.6% of gamblers who did not drink (Figure 8).

Gamblers classified as moderate-risk or higher-risk drinkers were significantly less likely to be lottery only gamblers than non-drinkers, even when controlling for individual characteristics in logistic regression models. In fact, men who drank more than 50 units a week were only half as likely as non-drinkers to play only the National Lottery. Gamblers who drank eight or more units in their heaviest day of drinking during the week prior to the survey were also less likely to be lottery-only gamblers.

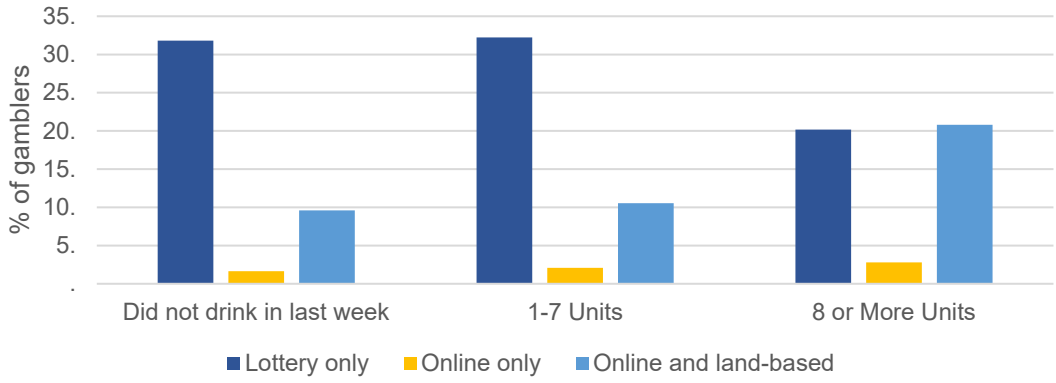

Figure 8: Percentage of gamblers by number of units of alcohol drank on heaviest day in previous week and gambling location

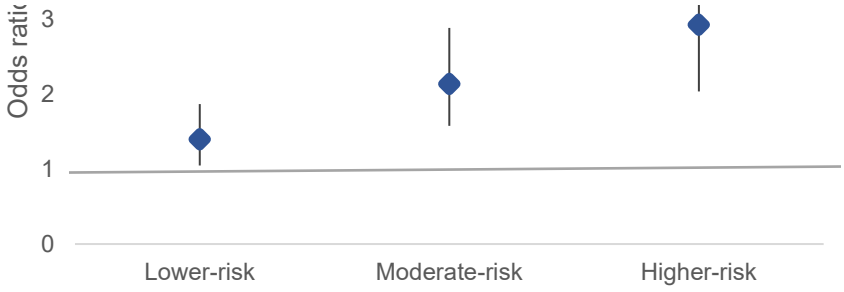

Figure 9: Odds ratio predicting gamblers' likelihood of gambling both on land and online by level of drinking, compared to non-drinking gamblers

Among gamblers, heavier and more frequent consumption of alcohol was associated with higher odds of gambling both in land-based locations and online (Figure 9). Odds of gambling in both land-based locations and online increased with the amount of alcohol consumed; compared to gamblers who did not drink, gamblers classified as low-risk drinkers were 1.4 times more likely, moderate-risk drinkers were 2.6 times more likely and higher-risk drinkers were 3.1 times more likely to gamble both in land-based locations and online. While this pattern was particularly clear in models including men alone, women who were classified as higher-risk drinkers were still 2.4 times more likely than women who did not drink to gamble both in land-based locations and online.

Similar patterns could be seen when looking at the relationship between how often gamblers consumed alcohol and gambling locations. Gamblers who drank on six or seven days a week were 2.4 times more likely than non-drinkers to gamble both online and in land-based locations (and this association was significant for both men and women). Furthermore, gamblers who drank eight or more units of alcohol on their heaviest day of drinking during the previous week were twice as likely as those who did not drink to gamble both in land-based locations and online.

SMOKING HABITS AND GAMBLING LOCATION

Among gamblers, current smokers were more likely than non-smokers or former smokers to be both land-based and online gamblers (14.8% of current smokers compared to 10.2% of former smokers and 12.4% of never smokers) and to only gamble in land-based locations (61.0% compared to 54.7% of former smokers and 54.5% of never smokers). Therefore, three-quarters of gamblers who were current smokers reported gambling in land-based locations during the previous 12 months (either alongside online gambling or not). In contrast, gamblers who did smoke were the least likely to play the National Lottery only (22.5% compared to 31.0% of non-smokers and 32.8% of former smokers).

These differences were also apparent when comparing the gambling locations of men and women who gamble separately; over half of men who currently smoked (56.2%) were land-based only gamblers, compared to only 48.3% of men who had never smoked while two thirds of women who smoked (66.6%) gambled only in land-based locations (compared to 60.7% of those that never smoked). Women gamblers who currently smoked were also more likely than former or never smokers to gamble both online and in land-based locations (8.6% compared to 5.8% of never smokers and 5.2% of former smokers). Among both men and women who gambled, current smokers were the least likely to play the National Lottery only.

In regression models, being a current smoker continued to be associated with lower odds of being a lottery only gambler and higher odds of being gambling only in land-based locations (for men, women, and all gamblers combined). Gamblers who started smoking under age 16 were also less likely to be lottery only gamblers and more likely to gamble only in land-based locations. Gamblers who smoked at least 20 cigarettes a day (i.e., who were classified as heavy smokers) were also 1.4 times more likely to gamble both in land-based locations and online; among women, the odds of being an online and land-based gambler was 1.7 times greater for heavy smokers than for non-smokers.

DISCUSSION

This report, like others before it, provides clear and compelling evidence of the relationship between problem gambling and mental health and wellbeing. In particular, it lends further

support to earlier studies of the UK and beyond that poor mental health, including anxiety and mood disorders, as well as substance disorders are associated with problem gambling.[1, 4, 5] This association was particularly pronounced among men, where results from logistic regression models showed that probable mental distress, probable depression, and having a doctor diagnosed mental condition were all significantly and substantially associated with elevated odds of experiencing problem gambling.

Whilst a similar pattern did not emerge for women, this maybe due to the small number of women experiencing problem gambling even within this large sample size. Our solution, to examine the factors associated with moderate risk or problem gambling among women, may have diluted some of these potential association. Evidence from men suggests this to be the case, where the relationship between mental health and gambling were less pronounced among those experiencing moderate risk gambling (though there still was some association).

However, the evidence of the relationship between physical health conditions and gambling is less clear-cut. This may be because many of the physical health conditions measured in this data are relatively rare across the population as a whole, which – in combination with low levels of problem gambling (particularly among women) – means that significant relationships are difficult to detect.

There is increasing effort among primary care practitioners to screen higher risk groups for gambling harms. Currently, a general practitioner (GP)-led pilot in Britain is doing this for people who use an online system to book GP appointments. This is triaged and the gambling questions appear based on the relevance of presenting conditions. Evidence from this study suggests that certain and specific health conditions alone may not necessarily be useful indicators to identify people who may be at particular risk of problem gambling. That said, self-reported general health may be a useful gambling risk indicator, especially among men where those in poor health were over five times more likely to experience problem gambling than those in good health. In short, poor mental health or generally feeling in poor health are likely more useful indicators for the experience of problem gambling than specific health conditions.

The same, however, could be said about health behaviours as higher levels of both alcohol consumption and smoking are associated with problem gambling. In particular, higher risk drinking among men was associated with substantially elevated odds of problem gambling, whilst for both men and women, problem gambling (or problem and moderate risk gambling for women) was associated with the highest consumption of cigarettes per day (20 or more). This was particularly pronounced among women. Co-occurrence of these high-risk health behaviours suggest that broad and multi-dimensional health initiatives may help to address multiple high-risk behaviours (smoking, alcohol consumption, and problem gambling).

Whilst the first part of this report looked at the associations between physical and mental health conditions and problem gambling, the second part looked at the associations between physical and mental health conditions and the location in which someone gambles. This showed a range of different physical and mental health conditions being associated with gambling in different locations. Those who only gambled on the lottery tended to have a somewhat better health profile than other gamblers: those with doctor diagnosed mental health conditions, who had a long-term illness, who were moderate risk or high-risk drinkers, or smokers were all less likely to be a lottery only gambler. Contrary to this, those who only gambled in land-based environments tended to have a comparatively worse health profile: those with a diagnosed mental health condition, a BMI status indicating obesity, who were "binge" drinkers and who smoked a lot were all more likely to be land-based only gamblers than others. Among those who did both, the main differentiating features were experience of probable mental distress and high levels of alcohol consumption – people in both of these groups were more likely to be both online and offline gamblers. Because of the very small number of online only gamblers in our sample, few significant associations were observed. Even so, for women the odds of gambling only online were higher among those with probable depression. For men and women, the odds were higher among those with a doctor diagnosed nervous system condition.

Although these patterns are interesting, the relationship between mental health indicators and location of past year gambling was far less strong or clear than the relationship between problem gambling and these conditions. For example, while people with a diagnosed mental health condition were more likely to have not gambled in the past year (44.9%) than those without (39.1%), they were more likely to have been experiencing problem gambling (1.2% compared to 0.4%). This may suggest people experiencing these conditions are not more likely to gamble, or gamble in specific locations, but those that do gamble are far more likely to experience harms. Similar patterns were observed for self-assessed general health: being in poor self-assessed health was not associated with any forms of past year gambling, yet those in poor health were more likely to experience problem gambling. These results tentatively suggest evidence of a health harm paradox – one in which certain people with certain health experiences are no more likely to gamble than others but they are more likely to experience problem gambling. It is likely that gambling harms may exacerbate mental distress or feelings of poor health, but other factors may drive this observation also.

As with every study, there are some limitations to be considered. Although the data analysed here were collected after the full enactment of the Gambling Act 2005, which allowed gambling companies to advertise on TV and radio and facilitated the expansion of online gambling, the gambling environment in England and Scotland has continued to evolve since 2016 (the most recent point of data collection), with large increases in online gambling even before the COVID-19 pandemic closed many land-based locations. More recent data, particularly in the wake of the COVID-19 pandemic and the lockdown it brought about, would

be required to better understand the relationship between health or health behaviours and gambling. That said, the data presented here are cross-sectional, showing associations only, to better understand the relationships between health, wellbeing, and gambling behaviours, longitudinal insight is needed. In addition, the instrument used here to look at harms from gambling is limited. The PGSI instrument does not capture the full range of harms generated by gambling and we may have missed some important associations because of this. Despite combining several years of data together, the sample sizes, especially for women experiencing gambling problems were low. Likewise, the prevalence rates of several health conditions considered were also low and this study may still have been under-powered to detect associations between them and problem gambling. That said, the combined Health Surveys dataset does represent the largest sample of moderate risk and problem gambling analysed in Britain to date and did allow us to look specifically at some differences between men and women.

In conclusion, data from this project shows that health behaviours, smoking, and alcohol consumption, were, consistently associated with different types of gambling – especially land-based gambling and land-based and online gambling, suggesting that these broader constellations of behaviours are related both to the form of gambling people undertake and the harms experienced. This lends further support to the need to consider gambling as part of a wider constellation of multiple high-risk behaviours than can have adverse health consequences. While these relationships may have evolved as the opportunities for gambling in England and Wales have changed since 2016, these findings offer insights into the ways in which these high-risk behaviours intersected in England and Scotland after the full enactment of the Gambling Act, 2005. With a revised Gambling Act expected to be introduced in the coming years, replication of these analyses once this is in place would allow us to explore if, and how, these relationships differ under new gambling legislation in the UK, though ideally high-quality longitudinal data would allow us to look in more depth at the mechanism and drivers than underpin these associations.

REFERENCES

1. Lorains FK, Cowlishaw S, Thomas SA. Prevalence of comorbid disorders in problem and pathological gambling: Systematic review and meta-analysis of population surveys. *Addiction*. 2011;106(3):490-8.
2. Benchebra L, Alexandre J-M, Dubernet J, Fatséas M, Auriacombe M. Gambling and gaming disorders and physical health of players: A critical review of the literature. *Presse medicale (Paris, France : 1983)*. 2019;48(12):1551-68.
3. Desai RA, Desai MM, Potenza MN. Gambling, health and age: Data from the national epidemiologic survey on alcohol and related conditions. *Psychology of Addictive Behaviors : Journal of the Society of Psychologists in Addictive Behaviors*. 2007;21(4):431-40.
4. Wardle H, Seabury C, Ahmed H, Payne C, Byron C, Corbett J, et al. Gambling behaviour in England and Scotland: Findings from the health survey for England 2012 and Scottish health survey 2012. London: NatCen Social Research; 2014.
5. Cowlishaw S, Kessler D. Problem gambling in the UK: Implications for health, psychosocial adjustment and health care utilization. *European Addiction Research*. 2016;22(2):90-8.
6. Scholes-Balog KE, Hemphill SA. Relationships between online gambling, mental health, and substance use: A review. *Cyberpsychology, Behavior and Social Networking* 2012;15(12):688-92.
7. Lloyd J, Doll H, Hawton K, Dutton WH, Geddes JR, Goodwin GM, et al. Internet gamblers: A latent class analysis of their behaviours and health experiences. *Journal of Gambling Studies*. 2010;26(3):387-99.
8. Taggart F, Stewart-Brown S, Parkinson J. Warwick-Edinburgh Mental Well-being Scale (WEMWBS) user guide, version 2. *NHS Health Scotland*. 2015.
9. Neave A. Health survey for England 2016. *London: NHS Digital, Office for National Statistics*. 2017.
10. Brown L. Health survey for England 2015: Adult alcohol consumption. 2016.
11. Ferris J, Wynne H. The Canadian problem gambling index: Final report. Ottawa, ON: Canadian Consortium for Gambling Research; 2001. Available from: https://www.greo.ca/Modules/EvidenceCentre/files/Ferris%20et%20al(2001)The_Canadian_Problem_Gambling_Index.pdf