Gambling and Mental Health:

Analysis of the Annual GB Treatment and Support Survey

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About the authors

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Alma Economics combines unparalleled analytical expertise with the ability to communicate complex ideas clearly.

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About the commissioning organisation

GambleAware

GambleAware commissions research and evaluation to build knowledge of what works in prevention and reduction of gambling harms that is independent of industry, government, and the regulator. The authors alone are responsible for the views expressed in this article, which do not necessarily represent the views, decisions, or policies of the institutions with which they are affiliated.

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Executive Summary

Project background and methods

Alma Economics was commissioned by GambleAware to explore the relationship between mental health and gambling harms using data from the Annual Great Britain Treatment and Support Survey run by YouGov. This includes three waves collected in November 2020, 2021, and 2022. In phase one, we carried out a desk-based review of evidence on gambling harms and mental health. In addition, we also reviewed literature on individuals who have been negatively affected by someone else's gambling, known as affected others. In phase two, we conducted the following quantitative analysis:

1. **Descriptive analysis:** This included an overview of the estimated prevalence of each of the Problem Gambling Severity Index[1] (PGSI) categories, gambling habits (including type of gambling and gambling frequency), and mental health conditions across the wider population. In addition, we calculated population estimates for affected others, the types of harms they face, and the type of relationship they have with the individual who is gambling and negatively impacting them.

2. **Correlation analysis:** This focused on the relationship between raw PGSI scores and key variables of interest, including mental health variables such as feeling suicidal, having a diagnosed mental health condition, and composite measures of mental health status, the Kessler Psychological Distress Scale (K10)[2] and the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS)[3].We also calculated the correlation between debt and childhood exposure to gambling, as these are important pathways discussed in the literature.

3. **Regression analysis:** We estimated a series of regression models to understand the relationship between PGSI scores, gambling habits and mental health. We also used regressions to analyse how harms experienced by affected others translate to their broader mental health. These models could then be used to make non-causal predictions for individual risk profiles including estimating the probability of having a mental health diagnosis given a specific PGSI score. Additional robustness check methods included random forest and cluster analysis.

Overarching themes

Findings from these research activities complement and inform each other. The desk-based review, random forest, and cluster analysis helped to identify important gambling behaviours, mental health groups, and demographic groups that play a role in the relationship between gambling harms and mental health. The descriptive analysis identified population estimates which informed trends of gambling behaviours and mental health outcomes, the prevalence of PGSI categories across mental health groups as well as mental health prevalence across PGSI categories. Regression analysis helped to identify the size and statistical significance of the relationship between PGSI scores and various mental health indicators. Below we discuss the overarching themes that emerged from our research.

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[1] Refer to Appendix 1 for a more detailed description of the Problem Gambling Severity Index (PGSI).
[2] Refer to Appendix 1 for a more detailed description of the Kessler Psychological Distress Scale (K10).
[3] Refer to Appendix 1 for a more detailed description of the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS).

Increasing prevalence of problem gambling & mental health

The estimated population of "problem gamblers" (individuals with a PGSI score of 8+) and the number of people who have a mental health diagnosis has increased since 2020. In Great Britain, an estimated 1.5 million individuals had a PGSI 8+ score in 2022, a 23% increase from 2020, while an estimated 7.5 million people reported having a mental health diagnosis in 2022, an 11% increase over the same period. The most frequently reported mental health diagnoses were depression (estimated 7.2 million), anxiety (estimated 5.7 million), and PTSD (estimated 1.1 million).

Specific mental health issues are more prevalent among the PGSI 8+ group than the general population

Individuals in the PGSI 8+ category make up about 2.7% of the total population but account for an estimated (i) 26% of those with intermittent explosive disorder, and (ii) 15% of those with ADHD. Individuals in the PGSI 1+ category (inclusive of PGSI 8+) also experience high rates of ADHD and intermittent explosive disorder. Rates of ADHD and intermittent explosive disorder among individuals who do not gamble are similar to rates among the general population. However, people who gamble but experience no associated harm (PGSI 0) make up 46% of the population but only 23% of those with an intermittent explosive disorder and 30% of those with ADHD.

Higher PGSI scores associated with increased probability of poor mental health

Regression analysis suggests that a one unit increase in PGSI score is associated with approximately a 3% increase in the probability of someone having a diagnosed mental health condition. An individual with a PGSI score of 0 has a 22% probability of having a mental health diagnosis, while an individual with a PGSI score of 8 has a 41% probability of having a mental health condition. Higher PGSI scores are also associated with having worse mental health as measured by K10 scores. Within the PGSI 8+ category, 47% of individuals are likely to have a severe mental health disorder (as measured by K10 scores), compared to 16% of individuals who do not gamble. Higher PGSI scores are also associated with a higher probability of experiencing suicidal thoughts, with a 1.4% increase in probability for every one-point increase in PGSI score.

Affected others experience worse mental health than the general population

Individuals who identify as an affected other and suffer financial harms as a result also experience significant effects on their mental health, including being 10% more likely to have suicidal thoughts and an approximate 2-point increase in K10 scores (indicating worse mental health). Affected others who experience harms relating to breakdowns in communication have a 10% increase in their probability of having suicidal thoughts and an approximate 2-point decrease in WEMWBS scores (indicating worse well-being).

Debt as a pathway between PGSI and mental health

Questions on the PGSI questionnaire which relate to debt because of gambling, including whether an individual has bet more than they could afford to lose, have a statistically significant and positive association with mental health variables. Together with evidence from the wider literature, this indicates that gambling harms relating to debt could be one of the key pathways through which PGSI scores and mental health status are related.

Limitations

This analysis is not without limitations, including an inability to compare some variables across waves due to changes in the questionnaire. Much of the demographic and mental health condition data relied on YouGov profiles, and there was significant missing data for some of these variables. We tried to mitigate these issues by focusing on specific waves with more complete data, for example mental health conditions have much lower rates of missing variables reported in wave three compared to previous waves. In addition, while we have reported associations between mental health and PGSI scores including prevalence in the population and cross-tabulations, these results are not causal, and we cannot determine if mental health issues cause problematic gambling behaviours or vice versa, and relationships we observe could be due to other confounding variables that we cannot observe.

Areas for future research

We focused our analysis on identifying the relationship between mental health and PGSI scores, the estimated prevalence of mental health conditions in PGSI categories, and the estimated prevalence of gambling and mental health in the wider population. We have established that there is a strong association between PGSI scores and a variety of mental health indicators, but further analysis could be done to establish links between specific gambling habits and behaviours and specific mental health conditions. For example, our findings suggest that ADHD[4] and gambling have a significant relationship and a more in-depth analysis be conducted.

Additional research can also be conducted to identify causal pathways to explain through what means gambling and mental health are linked. We identified some pathways within the literature, including debt and exposure to frequent gambling before the age of 18, but a more robust analysis could be conducted to see how these pathways effect different groups or specific mental health conditions. Data on when individuals began experiencing specific mental health conditions or gambling harms could also allow for potential causal analysis in terms of identifying whether poor mental health resulted in problematic gambling behaviours, or if problematic gambling behaviours led to poor mental health outcomes. Further research can be done to distinguish the timelines of this relationship, using methods designed to shed light on causal relationships (such as quasi-experimental research designs).

These findings indicate that mental health disorders are more prevalent among individuals who are experiencing gambling disorders. Understanding the relationship between mental health and experiencing gambling problems is valuable for both practitioners and gambling support organisations, as this could influence what types of treatments and tools may best help the individual. Someone with a depression disorder who is using gambling as a form of self-harm may need a different set of support compared to someone with ADHD who uses gambling as a calming mechanism. Our findings also indicate that the mental health of affected others is also impacted by an individual's gambling, and practitioners or support groups should encourage mental health support for these groups in addition to individuals participating in gambling. With a more complete picture of the number of complex factors that influence one's gambling and the harms it can produce to themselves and affected others in their lives, support and treatments can be better tailored to individual needs.

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[4] Within some academic and medical circles, there is a movement away from referring to ADHD as a mental health condition and instead strictly as a neurodevelopmental condition. However, within the context of the Treatment & Support Survey data and the literature reviewed, ADHD is referred to as a mental health condition and we have included it in the scope of this research for that reason.

1. Introduction

1.1. Institutional background

GambleAware is an independent, grant-making charity which commissions prevention and treatment services across England, Wales, and Scotland to help individuals make informed decisions about their gambling. This includes providing information about gambling risks, what safer gambling looks like and where to go for support if needed. GambleAware works in partnership with various expert organisations and agencies across three areas; (i) commissioning the National Gambling Support Network, (ii) producing public health campaigns, and (iii) commissioning research and evaluation to improve knowledge of prevention activities.

1.2. Project objectives

The research aims to understand the association between gambling and mental health and help to provide new insights into this relationship with a focus on the following research questions:

1. **How do gambling harms affect mental health?**
   - How do mental health variables present across Problem Gambling Severity Index (PGSI)[5] categories?
   - Are people experiencing high gambling problems more likely to experience symptoms of poor mental health than people who do not gamble?
   - Is there a PGSI threshold where mental health problems emerge?
   - Which individual PGSI questions are most likely to identify poor mental health?
2. **How does mental health affect gambling harms and habits?**
   - What proportion of people who said they experienced mental health issues are also "problem gamblers" (PGSI +8) or at some risk of problem gambling (PGSI +1)?
   - What is the prevalence of existing mental health conditions across PGSI categories?
   - How do specific types of existing mental health conditions effect PGSI scores?
   - Through what pathways are mental health and gambling likely to be related?
3. **What is the impact of gambling harms on other people (affected others)?**
   - What negative harms are faced by affected others because of someone else's gambling?
   - What is the impact of gambling on affected others mental health?

Key findings from the evidence review

We carried out a desk-based review of existing evidence on the links between gambling harms and mental health. This review aimed to provide a foundation of literature and to inform the secondary analysis we conducted, which variables to prioritise and use, and appropriate research questions. As part of this review, we reviewed 44 papers across both academic and grey literature, including policy papers, prior GambleAware reports and government briefs. We categorised the literature into 5 themes; (1) Overarching gambling behaviours, (2) Gambling impacts on mental health, (3) Mental health impacts on gambling, (4) Affected Others and (5), COVID-19 impacts on gambling.

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[5] The Problem Gambling Severity Index was initially developed to assess gambling-related harms in the general population by Ferris and Wynne (2001). Individuals are asked nine questions related to their experience of gambling harms and are grouped based on their responses into categories. PGSI scores can range between 0 and 27. A PGSI score of one or higher (1+) suggests the individual has experienced some harm because of their gambling. An individual with a score of eight or higher is categorised as a "problem gambler" or someone whose gambling has negative consequences and may result in having lost control.

A summary of the evidence reviewed is provided below. The evidence is arranged around the following themes: background on mental health and gambling; the relationships between mental health and gambling; and the impact of an individual's gambling on the people around them (affected others).

Background on mental health and gambling

Blaszczynski and Nower (2002) developed a model of potential gambling pathways which describe how different types of people develop gambling disorders. This model aims to identify pathways that integrate a "complex array of biological, personality, development, cognitive, learning theory and ecological determinants" that lead to harmful gambling behaviours (Blaszczynski and Nower, 2002, p. 97). The authors establish various behavioural, emotional, and social mental health problems as a comorbid attribute among people who experience gambling harms. These mental health problems range from anxiety and depression to disorders related to impulsivity, including Attention Deficit/Hyperactivity Disorder (ADHD) or substance use disorder (Blaszczynski and Nower, 2002). They find that people experiencing gambling harms are more likely to experience mental health problems, and this will vary across demographic profiles.

Some characteristics are more common among individuals who experience gambling problems. Analysis by Wardle et al., (2019) suggests that "problem gamblers", as identified through the Diagnosis and Statistical Manual of Mental Disorders-5 (DSM-IV) gambling score, are more likely to be young, male, live in rented accommodation and have fewer qualifications. Demographic characteristics also appear to influence the relationship between mental health and gambling profiles. For example, women are more likely to experience mental health problems (including depression and suicidal ideation), but both men and women with gambling disorders experience higher rates of mental health problems than those without a gambling disorder (Sundqvist and Rosendahl, 2019).

Strands of the literature have explored which factors are found with poor mental health and gambling. Evidence from Swanton and Gainsbury (2020) suggest that debt stress can partly explain this relationship, as after controlling for debt stress, the effect of "problem gambling" on wellbeing, psychological distress and depression and family impacts reduced significantly. This indicates a strong mediating impact between debt stress, gambling, and comorbid mental health issues. Other pathways between mental health and gambling disorders include traumatic life events (e.g., childhood trauma or neglect) which trigger poor mental health and have been associated with "problem gambling" symptoms later in life (Quigley et al., 2015).

Substance use, particularly alcohol, is another strong factor relating to both gambling harms and mental health issues. Evidence from El-Guebaly et al., (2006) compares individuals within PGSI categories with and without mood and substance use disorders and finds that the use of substances amplifies the association between mental health and gambling disorders, indicating that an individual with both mood and substance use disorders are five times more likely to experience moderate or high severity gambling harms. Similar evidence is found across several studies in the literature including across specific demographic groups such as veterans (Cowlishaw et al., 2017; Dighton et al., 2022; Grant et al., 2019; Haydock et al., 2015; Jacob, Haro and Koyanagi 2018; Roberts et al., 2016).

Finally, the recent COVID-19 pandemic impacted both mental health among the general population and gambling behaviours. Anxiety, depression, and stress increased across the UK, regardless of gambling behaviours (Sharman et al., 2021). Individual gambling behaviours also changed in response to COVID-19. Overall gambling reduced during lockdowns in the UK due to the physical closures of many gambling locations. Research suggests that individuals with low PGSI scores (low to moderate risk gamblers with scores between 1 and 7) decreased their gambling, however "problem gamblers" (PGSI 8+) shifted their gambling online and engaged in higher-risk gambling alongside heavier alcohol use (Public Health England, 2021b).

Links between mental health status and gambling

It is likely that the relationship between mental health and gambling runs both ways, where poor mental health can encourage more and riskier gambling, while harmful gambling can also impact individuals' mental health. Therefore, it is difficult to isolate the impact of one on the other to examine causality in more detail. Only one paper in this review took an approach that allowed the identification of causal impacts between gambling and health outcomes (Humphreys, Nyman and Ruseki, 2011). The authors take an Instrument Variable (IV) approach, which uses a third variable that impacts one variable of interest (in this case gambling) but not the other (in this case, health outcomes) to isolate the pathways of causal effect between gambling and health outcomes. Humphreys, Nyman and Ruseki (2011) use the number of gambling facilities per capita in each province (Canada) to identify recreational gambling opportunities. Gambling facilities include the number of physical gambling opportunities available, including bingo halls, casinos, racetracks, poker rooms, lottery outlets or video lottery terminals which are typically in bars and restaurants (Humphreys, Nyman and Ruseki, 2011). The authors found that recreational gambling had a negative and significant impact on mood disorders and anxiety. Individuals with gambling disorders were also significantly associated with poor mental health and well-being outcomes (Humphreys, Nyman and Ruseki, 2011).

There is a much larger literature that examines associations between mental health status and gambling without identifying driving causal factors. For instance, Preston et al., (2012) found that mental health indicators are a relevant factor for severe gambling disorders, both as a precipitant and a consequence. Literature regarding impulsive disorders found that individuals experiencing a gambling disorder had higher scores on the UPPS-P Impulse Behaviour Scale (Cyders et al., 2007) and "displayed higher levels of gambling distortions and elevated preference for immediate rewards" (Michalczuk et al., 2011, p. 2626). Among men in the UK who self-reported a gambling disorder, Roberts et al., (2016) found associations with impulsive disorders, mental health disorders, and substance use disorders, and found that all forms of gambling behaviours from "non-problem" to "problem" gambling have significantly increased odds for "perpetration of violence and being in a fight in the last five years" (p. 8). Jones et al., (2015) found that individuals with moderate to severe problem gambling risk (a PGSI score between three and seven) were four times more likely to have a diagnosed bipolar disorder compared to the general population. It's important to note that while the literature has demonstrated an association between these traits it is likely that outside factors, for example an individual's debt or unobservable traits, play an important role in the relationship between gambling disorders, mental health, and substance use disorders.

Much of the literature has examined the characteristics of individuals with gambling disorders compared to the general population. Ronzitti et al. (2017) found that suicidal thoughts increased with PGSI scores compared to those without such thoughts. Churchill and Farrell (2018) also found that higher PGSI scores are associated with higher levels of depression and as individuals transition from social gambling behaviours to more problematic forms of gambling, the impact of gambling on their depression intensifies. Individuals who experience moderate to high problem gambling (PGSI score of three or higher), have higher odds of poorer health outcomes, and worse life satisfaction as measured by the Warwick- Edinburgh Mental Health Well-being Scale (WEMWBS) (Butler et al., 2020).

Another strand of the literature focuses on the outcomes of individuals experiencing a gambling disorder and a mental health condition. Among adults with gambling-related debts, Lees (2022) found that individuals experiencing a gambling disorder and poor mental health are twice as likely to fall behind on payments due to gambling than those without mental health problems. Certain types of gambling are also associated with poor mental health. Gambling online is associated with worse mental health, where individuals use it as a form of escapism or self-harm, where those gambling want to lose as a form of punishment (Holkar and Lees, 2020). Online gambling was the most accessible

option during COVID-19 and, as discussed above, many people experiencing a gambling disorder also increased their online gambling during the pandemic (Emond et al., 2021).

Much of the literature also examines the links between gambling behaviours and mental health for specific population groups. Population groups which have been researched include:

- *Age*— evidence shows that age is an important factor in the relationship between mental health and gambling harms. For older adults, gambling can be beneficial for mental health as it offers socialisation for adults who may otherwise have diminishing social networks and offers opportunities for improved cognitive functions. Older adults can experience severe harm if gambling behaviours lead to negative outcomes including debt, social conflicts, or suicide (Alberghetti and Collins, 2015). Individuals who are younger than 35 are more likely than the general population to be an "at-risk" or "problem gambler" and are more likely to experience suicidal thoughts (Wardle et al., 2019).

- *Sexual minorities*—evidence has found that gambling harms are more prevalent among members of the LGBTQ+ community compared to heterosexual counterparts. The authors argue that this is due to a higher level of risk tolerance from those who identify as LGBTQ+ (Richard et al., 2019).

- *Individuals involved in the justice system*—studies with individuals who are incarcerated demonstrate a significant correlation between gambling disorders and mental health issues including social anxiety, depression, substance use disorders, impulsive disorders, and ADHD symptoms. These relationships have been observed in both incarcerated individuals and the general populations (Preston et al., 2012).

- *Individuals experiencing homelessness*—studies with people experiencing homelessness have detected higher rates of harmful gambling behaviours than in the general population (Sharman et al., 2015).

- *Veterans*—being a veteran is associated with mental health problems including depression, anxiety, and substance use. Research suggests that veterans are ten times more likely to experience gambling disorders than non-veterans (Dighton et al., 2022). Literature on specific armed forces branches including the United Kingdom Royal Air Force demonstrated riskier gambling associated with deteriorating mental health due to the impacts of COVID-19 (Pritchard and Dymond, 2022).

Affected others and mental health

Though research in this area is limited, some studies have sought to establish the impacts of an individual's gambling on others. Gambling harms tend to accumulate more quickly for the individual who is gambling than for affected others, however, impacts can be strong on individuals in the same family (Li et al., 2017). Affected others tend to be in the same family as the individual who is experiencing gambling harms and are more likely to be women, children (where the parent is the one experiencing gambling harms) or a parent (child is experiencing gambling harms) (Kourgiantakis, Saint-Jacques and Tremblay, 2013). Research also suggests there is an overlap between experiencing problem gambling and being an affected other. Gunstone et al., (2022) also found that 20% of "problem gamblers" (as defined by PGSI) also identified as an affected other.

Affected others have reported that someone else's gambling has led to mental health problems for them (Preston et al., 2012). Specific impacts on affected others that have been identified in the literature include mistrust, anger, anxiety/worry, a breakdown in communication, stress (related to reduced income), attempted suicide, emergency treatment, overeating, self-harm, reduced sleep (typically due to worry/anxiety), sense of hopelessness (Holkar and Lees, 2017; Li et al., 2017; Lind et al., 2022; Public Health England, 2021a)

2. Results & key findings

2.1. Overall approach to analysis

Based on the insights identified in the desk-based review, we selected relevant variables from the Annual Great Britain Treatment and Support Survey for analysis. We weighted the survey data using the survey weights provided by YouGov to ensure results were representative of the population aged 18 and over in Great Britain[6]. Additional information about how population estimates were calculated can be found in Appendix 1. We undertook the following research activities to assess the association between gambling and mental health, including:

1. **Descriptive analysis:** This included an overview of the estimated prevalence of PGSI categories, gambling habits and mental health conditions within the population of Great Britain. We also examined key categories by groups of interest, for example comparing gambling habits, demographics, and mental health scores and conditions across PGSI categories. Finally, we calculated population estimates for affected others, the types of harms they face, and the type of relationship they have with the individual whose gambling is negatively impacting them.

2. **Correlation analysis:** We calculated the correlation between raw PGSI scores and key variables of interest including mental health variables (feeling suicidal, K10 Scores, WEMWBS scores, having a mental health condition, and specific issues such as anxiety or depression). In addition, we examined the correlation between debt and childhood exposure to gambling, as these are important pathways discussed in the literature.

3. **Regression analysis:** We ran several linear and logistic regressions to understand the relationship between PGSI scores, gambling habits, and mental health. Findings from these regressions allowed us to analyse how various harms experienced by affected others translate to their broader mental health. This included univariate and multivariate analysis (depending on whether we wanted to control for other variables or not), non-linear relationships (by adding a squared parameter), and interactions between variables. We used our results to calculate predicted values to understand individual risk profiles, for example, estimating at each level of PGSI score what someone's probability of having a mental health diagnosis is.

4. **Random forests and cluster analysis:** By using random forest models (a supervised machine learning technique used to predict outcomes based on specific input variables), we can uncover relationships between PGSI categories to understand which variables play an important role in distinguishing the different groups within and between PGSI categories. We also used cluster analysis to understand if there are groupings of individuals within the sample that correlates with their observed PGSI category.

2.2. Overview of the population

In this section we explore the prevalence and distribution of gambling harms and mental health issues in the survey population and extrapolate these figures to the general population. We consider:

- the proportion of "problem gamblers" (by PGSI score) in the population
- how gambling behaviour varies in terms of frequency, motivation, and type of gambling
- how gambling behaviour varies by population demographics
- the prevalence and severity of mental health issues across the population

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[6] The general population estimates for each wave are: (i) wave one 51,153,013 (ii) wave two: 51,435,642, and (iii) wave three: 51,692,312. More details on survey methodology and estimates can be found in Appendix 1.

Key findings from the section

- There were an estimated 1.5 million[7] "problem gamblers" (individuals with a PGSI score of 8 and above) in Great Britain in 2022, up 23% from 2020.

- Non-problem gamblers (PGSI score of 0) are most likely to gamble through purchasing lottery tickets.

- At-risk and "problem" gamblers (PGSI 1+ and PGSI 8+) gamble more frequently and are more likely to say they gamble to compete with others or to impress other people than non-problem gamblers.

- An estimated 7.5 million people in Great Britain had a mental health diagnosis in 2022, up 500,000 since 2020. The most common diagnoses are depression and anxiety disorder.

- Mental health wellbeing scores, as measured by the K10 and WEMWBS scale, suggest that a large proportion of the population are living with low levels of wellbeing (41% in the WEMWBS scale).

Gambling prevalence in the population

The results of the Great Britain Treatment and Support Survey suggest that the number of all types of gamblers in Great Britain is increasing with an estimated 31.2 million participating in gambling in 2022, compared to 28.7 million in 2020. "Problem gamblers" (individuals with a PGSI score of eight or higher) are estimated to make up 1.5 million individuals in Great Britain in 2022, approximately 3% of the population. This is a 23% increase from Wave 1 in 2020. The number of low-risk gamblers (PGSI score between 1 and 2) and non-problem gamblers (PGSI score equal to 0) have also increased since 2020, by 19% and 7% respectively.

In contrast, individuals with a PGSI score between two and seven (moderate risk gamblers) have decreased by approximately 6% since 2020. The affected population in 2022 was an estimated 1.5 million, down from 1.6 million in 2020. The number of individuals who do not gamble has also decreased by 8%, with an estimated 40% of the population not gambling at all in 2022. This decline in both non-gamblers and moderate risk gamblers indicates individuals are moving to low-risk or problem categories of gambling.

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[7] Note that numbers in the millions throughout the report are population number estimates that have been extrapolated from the survey and survey weights, not the number of survey responses received. More detail on the survey methodology can be found in Appendix 1.

Figure 1. Estimated population in each PGSI category
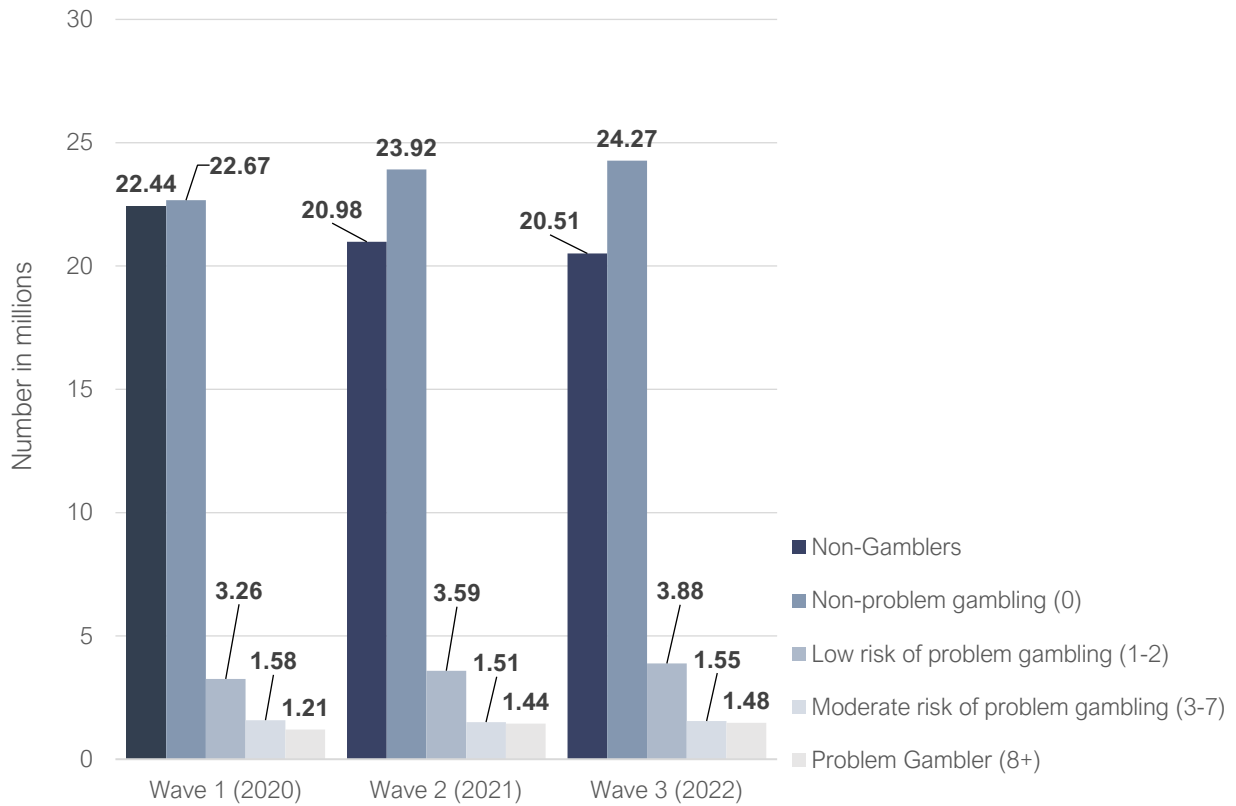
Figure 2. Estimated percentage of population in each PGSI category
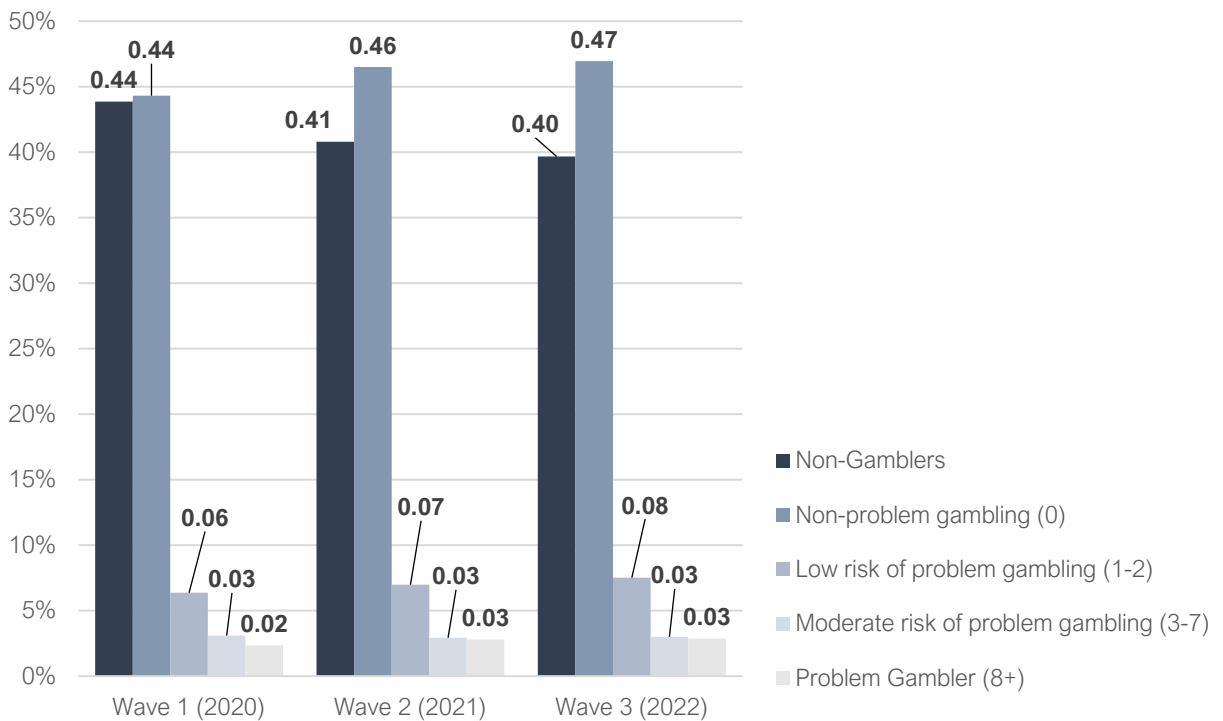
Gambling habits by PGSI category

This section provides a high-level overview of different gambling habits across PGSI categories. Tables with detailed descriptive statistics are presented in Appendix 2.

- **Type of gambling:** Non-problem gamblers mostly participate in lottery draws and scratch cards, while all other types of gambling (in particular the use of gaming machines, betting on football, and online casino games) are much higher for both PGSI 1+ and PGSI 8+ individuals in comparison.

- **Reasons for gambling:** While winning and making money is a top reason for gambling across all PGSI categories, those in PGSI 1+ and PGSI 8+ categories are more likely to cite reasons relating to (i) competing with others, (ii) impressing other people, and (iii) help when feeling tense, relative to those in the PGSI 0 group. These findings indicate that more at-risk gambling behaviours are associated with gambling for competition or validation from others.

- **Gambling frequency:** Individuals with PGSI scores in the PGSI 1+ and PGSI 8+ categories are more likely to gamble more frequently (more than once a week) compared to non-problem gamblers (PGSI scores of 0). Non-problem gamblers are more likely to gamble once a month or less compared to PGSI 1+ or PGSI 8+ individuals.

- **Childhood exposure to frequent gambling:** Exposure to frequent gambling before turning 18 is a relevant determinant for individuals and their future gambling behaviours. An estimated 2.5 million non-gamblers had exposure to frequent gambling, compared to an estimated 3.5 million people and 1.5 million people in the PGSI 0 and PGSI 1+ categories, respectively.

Demographic characteristics of PGSI categories and non-gamblers

Table 1 sets out the proportion of individuals in each PGSI category who belong to a specific demographic group. For example, approximately 61% of individuals in the "problem gambler" category (PGSI 8+) are between the ages of 18 and 34 years old. Young people, men and people experiencing unemployment are all proportionally over-represented in the PGSI 8+ and PGSI 1+ categories. PGSI 8+ individuals are more likely to be a member of the armed forces, hold religious beliefs, be in the bottom 30% of IMD[8], and have rent debt compared to any other PGSI category. About 12% of individuals in all PGSI categories drink alcohol 4+ times per week. White people make up about 93% of PGSI 0 individuals, but only 68% of PGSI 8+ individuals, indicating that ethnic minorities who gamble make up a proportionally higher share of the PGSI 8+ group in comparison to white people.

> **How to interpret Table 1**
>
> This table describes the demographic make-up of individuals in each PGSI category, answering questions like "What proportion of PGSI 8+ individuals are between the ages of 18-34?"
>
> For example, approximately 61% of individuals in the PGSI 8+ category are between 18-34 years old, while 34% of non-gamblers (no PGSI score) are in the same age group. This indicates that 18-34 year olds make up a higher proportion of PGSI 8+ than they do other PGSI categories.
>
> This interpretation is also used for Table 3.

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[8] Index of Multiple Deprivation

Table 1.   Proportion of individuals in each PGSI category belonging to select population groups

	Non-Gambler	*PGSI 0 Non-Problem Gambler*	*PGSI 1+ At-Risk Gambler[9]*	*PGSI 8+ Problem Gambler*
18-34 year olds	34.1%	19.1%	40.9%	60.7%
Males	44.6%	48.8%	63.4%	66.8%
White	86.4%	93.1%	81.0%	67.9%
Unemployed	11.4%	8.6%	13.6%	15.8%
Member of the Armed Forces	0.9%	1.6%	1.3%	2.06%
Member of LGBTQ+	12.1%	8.8%	12.9%	17.7%
Any religious beliefs	41.8%	42.2%	43.5%	53.7%
IMD Bottom 30%	26.4%	26.5%	34.7%	41.3%
Debt: Behind on rent bills by 3 months or more	0.2%	0.2%	0.9%	2.0%
Had a big life event in the past 12 months	31.5%	31.0%	34.9%	40.5%
Drink alcohol 4+ times a week	11.7%	13.7%	12.2%	11.9%

Table 2 presents the distribution of each demographic group across the four gambling categories, e.g., around 50% of 18 – 34-year-olds are non-gamblers. It also includes the prevalence of each PGSI category in the population for comparison. Results indicate that 38% of the population with rent debt are PGSI 1+ individuals who gamble. This is more than twice the proportion of PGSI 1+ individuals in the general population (12.6%), suggesting debt levels are related to gambling behaviours and harms. In addition, Table 2 indicates that more than two-thirds of men gamble (PGSI 0 or 1+), and 4% of males are "problem gamblers" (PGSI 8+).

How to interpret Table 2

This table describes how each demographic group is *distributed* across each PGSI category. For example, of the number of 18-34 years old within the population, what proportion of them are non-gamblers? What proportion of 18-34 year olds are in the PGSI 8+ category?

For example, of the 18-34 years in the UK population, 50.4% of them are non-gamblers and 5.8% of them are in the PGSI 8+ category. This indicates that this age group is over-represented compared to the general population, where only 2.7% of individuals are categorised as PGSI 8+.

This interpretation is also used for Table 4.

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[9] Note that PGSI +1 is inclusive of PGSI 8+.

Table 2.   Demographic distribution across PGSI categories

	Non-Gambler	PGSI 0 Non-Problem Gambler	PGSI 1+ At-Risk Gambler[10]	PGSI 8+ Problem Gambler
General population	**41.4%**	**46.0%**	**12.6%**	**2.7%**
18-34 year olds	50.4%	31.2%	18.4%	5.8%
Males	37.8%	45.8%	16.4%	3.6%
White	40.4%	48.1%	11.5%	2.04%
Unemployed	45.5%	38.0%	16.5%	4.04%
Member of the Armed Forces	28.9%	57.7%	13.4%	4.4%
Member of LGBTQ+	47.0%	37.9%	15.2%	4.4%
Any religious beliefs	41.1%	45.9%	13.0%	3.4%
IMD Bottom 30%	39.8%	44.3%	15.9%	4.0%
Debt: Behind on rent bills by 3 months or more	30.7%	31.0%	38.4%	18.0%
Had a big life event in the past 12 months	41.2%	44.9%	13.9%	3.4%
Drink alcohol 4+ times a week	38.1%	49.7%	12.1%	2.5%

Population analysis of mental health indicators

This section provides an overview of population-wide mental health indicators estimates in Great Britain. The survey provides data on individual mental health issues and two composite measures of mental health and wellbeing:

- **The Kessler Psychological Distress Scale (K10)**[11] – Waves 1 and 2 of the survey. K10 scores are based on an individual's responses to 10 questions relating to psychological distress including stress, anxiety, self-worth, and depression. Scores range from 10 to 50 and higher scores indicate poorer mental health. Categories and more information about this measure can be found in Appendix 1.
- **The Warwick-Edinburgh Mental Health Well-being Scale (WEMWBS)**[12] – Wave 3 of the survey. WEMWBS scores are based on responses to a set of 14 questions. Scores can range from 14 to 70. In contrast to K10 scores, higher WEMWBS scores indicate better mental wellbeing. Categories and more information about this measure can be found in Appendix 1.

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[10] Note that PGSI +1 is inclusive of PGSI 8+.

[11] K10 scores between 10 to 19 indicate that you are likely to be well, scores between 20 to 24 indicate that you are likely to have a mild disorder, scores between 25 to 29 indicate that you are likely to have a moderate disorder, and scores between 30 to 50 indicate you are likely to have a severe disorder. Higher scores indicate higher levels of psychological distress.

[12] WEMWBS scores between 14 to 42 indicate low levels of wellbeing, scores between 43-60 indicate medium levels of wellbeing, and scores that are between 61-70 indicate greater levels of wellbeing. Low scores indicate that you have low levels of well-being while high scores indicate that you have high levels of wellbeing.

Tables with descriptive statistics of population mental health status are presented in Appendix 2, and more details about the measures can be found in Appendix 1. A summary is presented below:

- **Distribution of mental health diagnoses by type**: The estimated population with a mental health diagnosis has increased by about 11% since 2020 (a total of 7.5 million individuals). Depression and anxiety are the two most common diagnoses, with approximately 7.2 million and 5.7 million individuals affected, respectively).

- **Mental health scores (K10[13], Waves 1 and 2):** An estimated 20.1 million people in Great Britain have a K10 score between 10 and 19, indicating that an individual is likely to be mentally well. Around 14.2 million individuals are likely to be experiencing mild to severe disorders on the K10 psychological scale.

- **Mental health scores (WEMWBS[14], Wave 3):** An estimated 41% of the population of Great Britain in Wave 3 have low levels of wellbeing. These results are much higher than previous population estimates with WEMWBS scores: Tennant et al. (2007) found that the UK population had a mean WEMWBS score of 51 and a standard deviation of 7, with 15% of the population estimated to be in the lowest and highest cut-off ranges. The mean of the WEMWBS sample in Wave 3 is 44 with a standard deviation of 12.[15]

2.3. Gambling and Mental Health

In this section we explore the links between gambling behaviours and mental health. We present a descriptive analysis of the correlation between measures of mental health and PGSI scores and the demographic characteristics of individuals by PGSI score and mental health status.

Key findings from the section

- A one-point increase in PGSI score is associated with a 3% increase in the probability of having a mental health condition.
- Higher PGSI scores are associated with poorer mental wellbeing as measured both by K10 and WEMWBS scales.
- "Problem gamblers" (PGSI 8+) are more likely to have experienced suicidal thoughts in the past 12 months and have higher rates of ADHD and intermittent explosive disorder.
- Debt is a potential pathway between PGSI scores and poor mental health. Betting more than you can afford to lose is associated with poorer mental health.

Descriptive Analysis: PGSI Categories and mental health

Figures 3 and 4 show that higher PGSI scores are associated with poorer levels of mental health, as measured by K10 (where higher scores indicate worse mental health) and WEMWBS scores (where lower scores indicate a lower level of wellness). As shown by the positive relationship between K10 scores and PGSI scores in Figure 3, and the negative relationship between WEMWBS scores and PGSI scores shown in Figure 4. The R-squared indicates that neither measure can fully explain the variation of PGSI scores among individuals, though about 13% of the variation is explained with K10 scores. This means that other factors are needed to explain differences in mental health outcomes.

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[13] Kessler et al., 2003

[14] Tennant et al., 2007

[15] The 2022 YouGov surveys took place during a period of record inflation rates and cost-of-living crises in the aftermath of the COVID-19 pandemic, which are likely to influence measures of individual wellbeing.

What is an R-Squared?

R-squared is a statistical measure used to explain the extent to which the variance of one variable explains the variance of a second variable. The closer the R-squared is to one, the more variation that is explained. For example, an R-squared of 0.5 means that approximately half of the observed variation is being explained by the model we are using. It does not show whether a relationship is causal or the direction of the relationship.

Figure 3. K10 Scores and PGSI 1+ Scores (Waves 1 and 2)
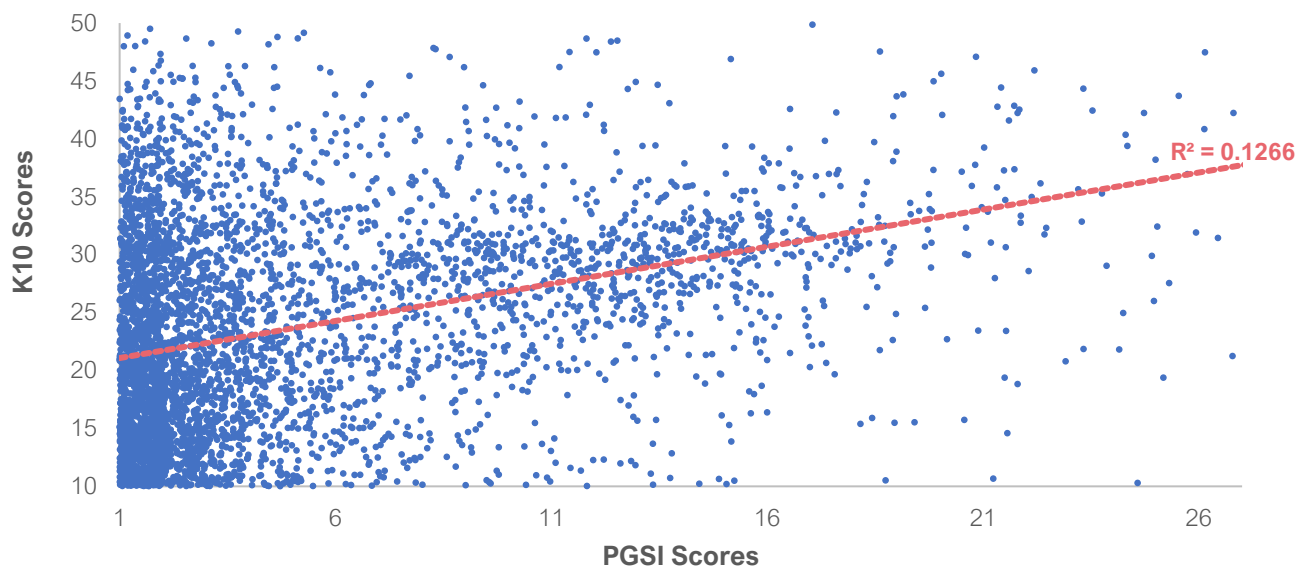
Figure 4. WEMWBS Scores and PGSI 1+ Scores (Wave 3)
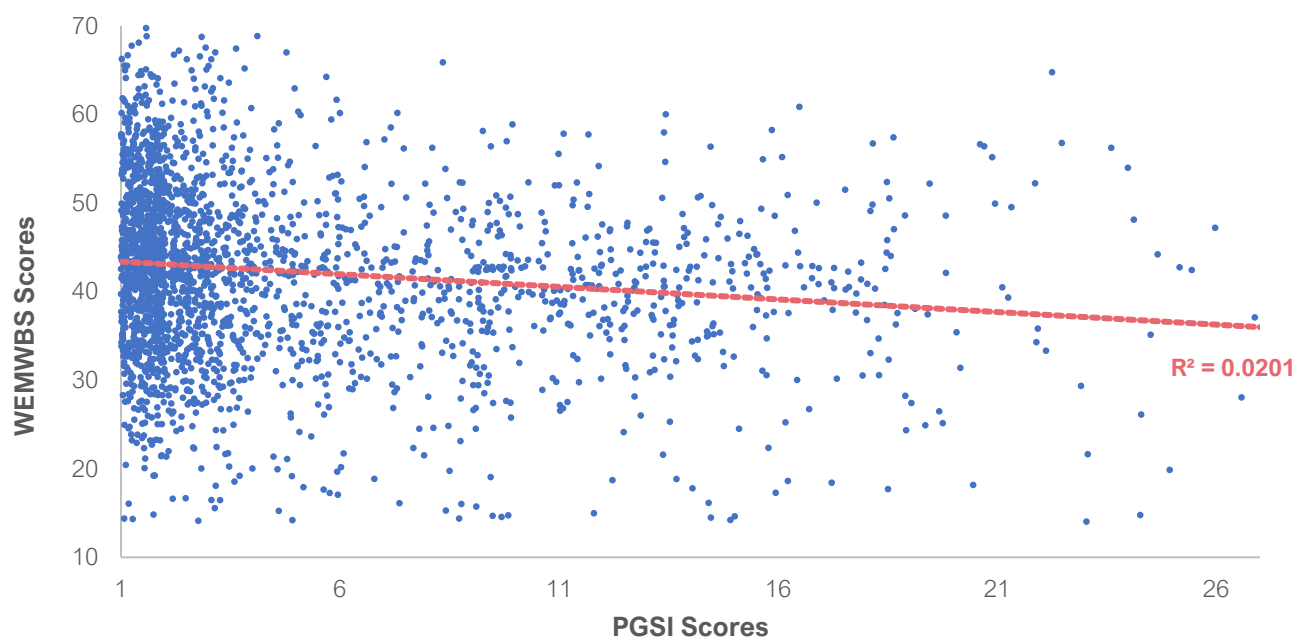
Mental health variables prevalent in PGSI categories

Individuals with a PGSI 8+ score are more likely than those in other PGSI categories to be suicidal, have a severe disorder (K10 score greater than 30), and have a lower level of wellness as measured by WEMWBS scores. Having a mental diagnosis does not appear to vary much across PGSI categories (including non-gamblers), though PGSI 1+ rates are higher. Rates of depression, anxiety, and PTSD are similar across all categories. Individuals with ADHD and intermittent explosive disorder are proportionately overrepresented in the PGSI 8+ group.

Table 3.   Proportion of individuals in each PGSI category with selected mental health issues[16]

	Non-Gambler	PGSI 0 Non-Problem Gambler	PGSI 1+ At-Risk Gambler[17]	PGSI 8+ Problem Gambler
Feeling suicidal in the past 12 months	6%	5.4%	25.9%	31.3%
Having a diagnosed mental health condition[18]	14.8%	12.4%	16.1%	13.7%
Likely to have a severe disorder (K10 > 30)	15.9%	10.5%	25.5%	47.1%
Low level of wellness (WEMWBS < 42)	42.1%	36.4%	52.5%	64.8%
Depression	14.0%	13.5%	14.6%	12.5%
Anxiety	11.7%	9.9%	13.6%	14.7%
ADHD	1.2%	0.6%	2.2%	5.5%
PTSD	2.3%	2.1%	2.2%	2.3%
Intermittent explosive disorder	0.3%	0.2%	0.9%	3.14%

As shown below in Table 4, of individuals who have felt suicidal in the past 12 months, approximately 5% of them have PGSI scores of 8+, which is about double the proportion of individuals with a PGSI score of 8+ in the general population. 8% of individuals with a severe mental disorder have PGSI scores of 8+ which is more than double the proportion of the general population in the PGSI 8+ category (2.7%). A similar trend is shown for WEMWBS scores which indicate low levels of mental wellness. Individuals with specific mental health issues are also more likely to fall into the PGSI 8+ category than the general population. 4% of individuals with anxiety disorders, 15% with ADHD, 4% with PTSD, and 27% with intermittent explosive disorder are "problem gamblers". By comparison, only 2.7% of the general population are "problem gamblers" as measured by PGSI.

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[16] All variables are from wave three only, apart from K10 scores and having a diagnosed mental health condition, which there is more information available in footnote 18.

[17] Note that PGSI +1 is inclusive of PGSI 8+.

[18] There are three questions within the YouGov survey that refer to mental health diagnosis. One is within the survey directly (Have you been diagnosed with any of the following? Mental Health Disorder (Q20_9)), and the other two are YouGov profile questions. This statistic refers to the survey question, as only 2% of data was missing, while each of the two profile questions had over 60% of data missing (disabilities_diagnosed_3 and mental_issues_99).

Table 4.   Distribution of mental health variables across PGSI categories[19]

	Non-Gambler	PGSI 0 Non-Problem Gambler	PGSI 1+ At-Risk Gambler[20]	PGSI 8+ Problem Gambler
PGSI Population Prevalence	**41.4%**	**46.0%**	**12.6%**	**2.7%**
Feeling suicidal in the past 12 months	40.7%	40.5%	18.8%	4.9%
Having a diagnosed mental health condition[21]	44.2%	41.1%	14.7%	2.6%
Likely to have a severe disorder (K10 > 30)	46.0%	32.7%	21.3%	8.3%
Low level of wellness (WEMWBS < 42)	40.9%	41.9%	17.2%	4.5%
Depression	40.12%	45.8%	14.07%	2.58%
Anxiety	43.1%	40.2%	16.7%	4.0%
ADHD	43.3%	29.5%	27.2%	14.8%
PTSD	41.8%	43.7%	14.5%	3.8%
Intermittent explosive disorder	40.2%	23.3%	36.5%	25.6%

PGSI categories and mental health score comparison

We also compared mental health scores within each PGSI category to assess if individuals with poor mental health scores are more likely to be in PGSI 1+ and PGSI 8+ categories. Figure 5 compares individuals with the lowest and highest K10 scores. Among the PGSI 8+ category individuals with a severe disorder (0.44 million) outnumber individuals who are likely to be well (0.1 million). PGSI 8+ is the only category where this is the case. Figure 6 shows a similar comparison for WEMWBS scores across PGSI categories. Individuals reporting low levels of mental wellbeing (low WEMWBS scores) outnumber those reporting high mental wellbeing across all categories. This is related to the distribution of WEMWBS referenced in Table 23 and Figure 15 in Appendix 2, where the WEMWBS sample has a much higher percentage of individuals reporting low levels of well-being.

[19] All variables are in wave three only apart from K10 scores and having a diagnosed mental health condition, which is only in wave one and two with more information available in footnote 15.

[20] Note that PGSI +1 is inclusive of PGSI 8+.

[21] There are three questions within the YouGov survey that refer to mental health diagnosis. One is within the survey directly (Have you been diagnosed with any of the following? Mental Health Disorder (Q20_9)), and the other two are YouGov profile questions. This statistic refers to the survey question, as only 2% of data was missing, while each of the two profile questions had over 60% of data missing (disabilities_diagnosed_3 and mental_issues_99).

Figure 5.   Low and high K10 scores within each PGSI category (waves 1 and 2 only)
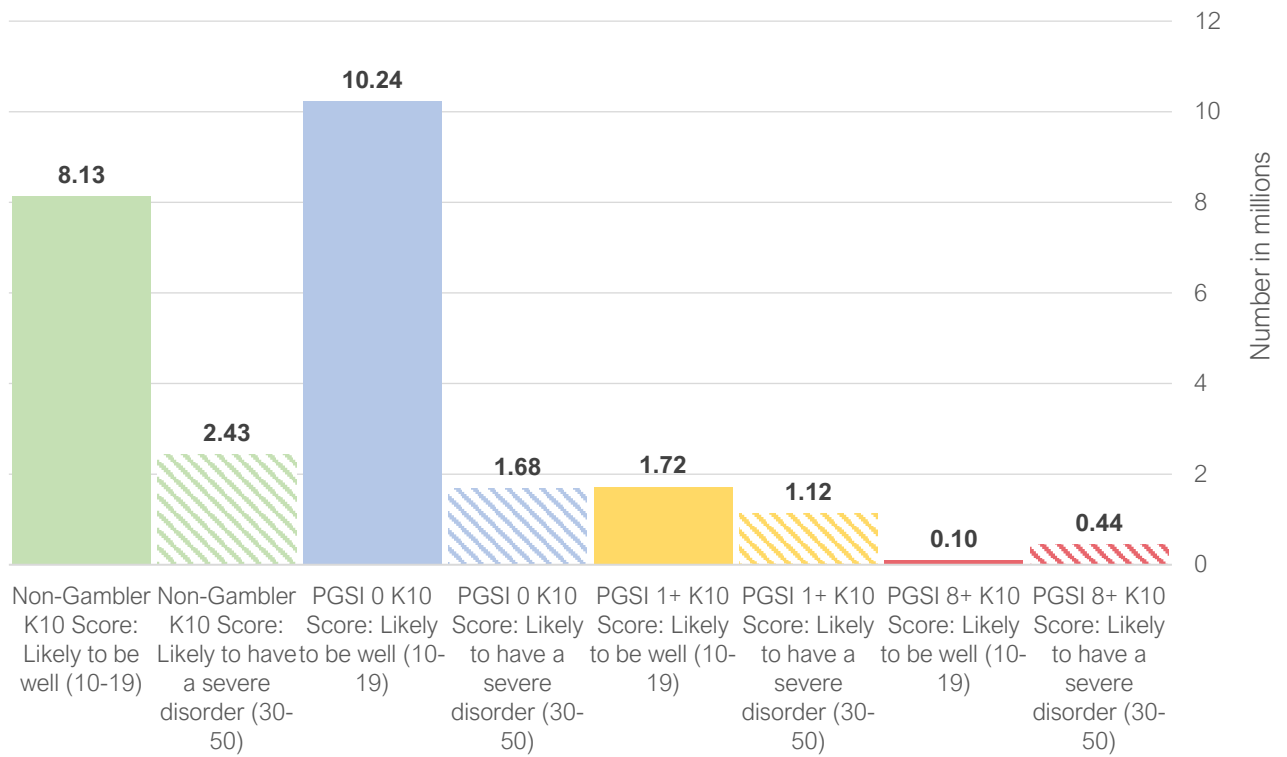
Figure 6.   Low and high WEMWBS scores within each PGSI category (wave 3 only)
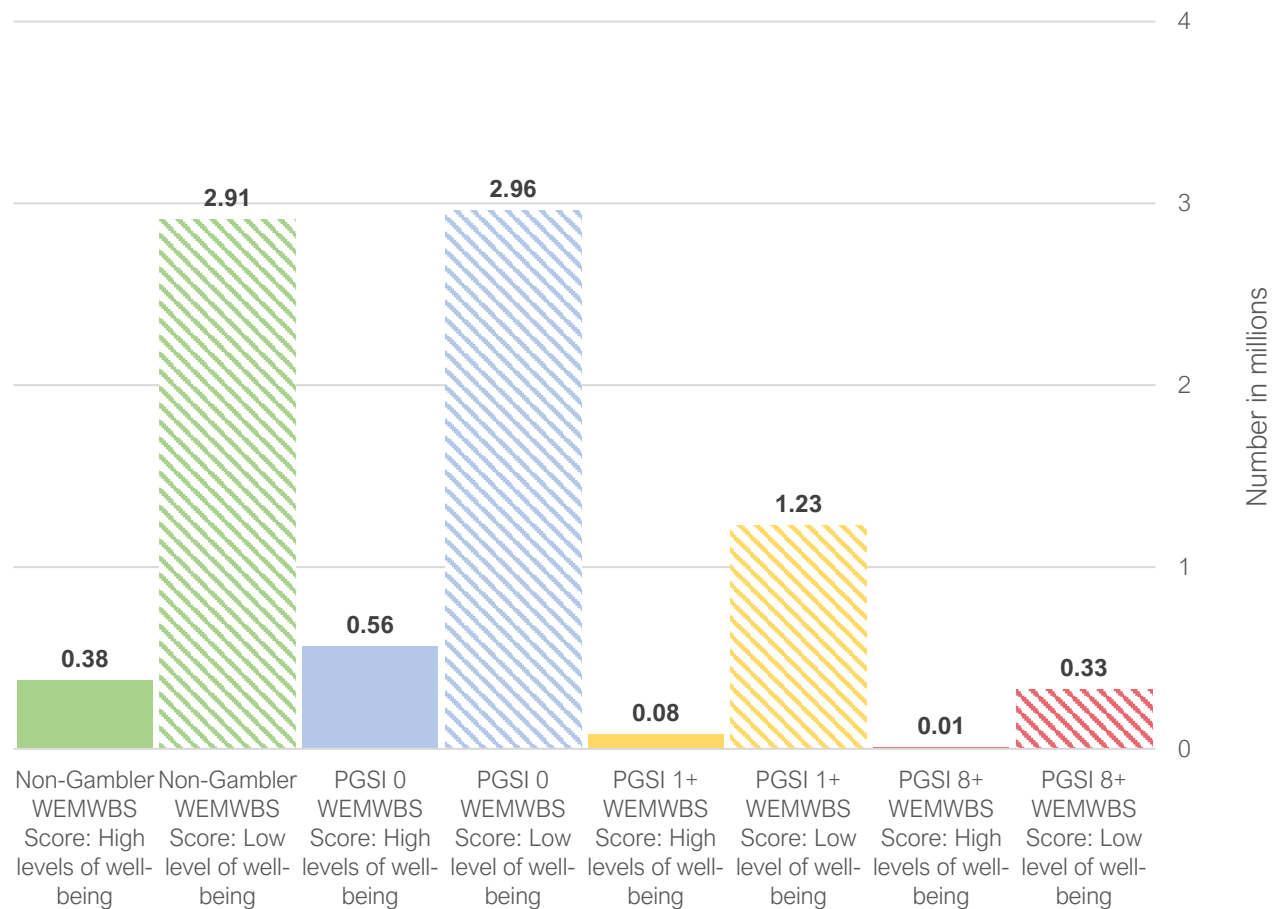
Pairwise Correlations

The following tables show the pairwise correlations of PGSI scores with key indicators of mental health variables as well as important gambling pathways identified in the literature, including debt and childhood exposure to gambling.

All variables are positively correlated with PGSI scores, except for WEMWBS scores. This makes intuitive sense as higher WEMWBS scores indicate higher levels of mental wellbeing, therefore a negative relationship suggests that low levels of mental wellbeing are associated with higher PGSI scores, as demonstrated in the scatterplot in Figure 4. The highest correlation is with K10 scores (0.29), which is stronger than the correlation with WEMWBS scores (-0.15). For mental health issues, the most highly correlated include ADHD (0.14) and intermittent explosive disorder (0.14). More common mental health issues such as depression and anxiety have low correlations with PGSI scores, 0.02 and 0.06 respectively. We also included rent debt as a proxy for extreme types of debt, which has a stronger correlation with PGSI scores of 0.16. Knowing someone who gambled frequently before the age of 18 was used as a proxy for childhood exposure to gambling and has a correlation of 0.17. All correlations are statistically significant except for coefficient between PTSD and PGSI scores.

> **Interpretation of pairwise correlations**
>
> Correlations do not imply a causal relationship between variables or indicate the direction of causality. If X and Y are correlated, X could be driving Y, Y could be driving X, other variables (Z) could be driving both X and Y, or any combination of the above is possible. The closer the correlation coefficient is to 0, the less of a relationship two variables have. The closer the correlation coefficient it to 1 (negative or positive), the stronger the correlation.

Table 5.   Correlation between PGSI Scores and key variables[22]

Gambling Severity (PGSI Scores)		
	Coefficient	**Observations**
Feeling suicidal in the past 12 months	0.14	9920
Having a diagnosed mental health condition	0.12	11016
K10 Scores	0.29	21172
WEMWMBS Scores	-0.15	10827
Depression	0.02	8794
Anxiety	0.06	8794
ADHD	0.14	8794
PTSD	0.02	8794
Intermittent explosive disorder	0.14	8794
Rent Debt	0.16	13330
Knowing someone who gambled frequently before 18	0.17	11016

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[22] All variables are wave three only except for K10 scores.

PGSI scores and mental health: regression analysis

The regression output shown in Table 6 indicates that PGSI scores have a statistically significant effect on mental health status as measured by K10 scores and WEMWBS scores. This result remains significant with or without other controls.

Interpretation of regression tables

The coefficient represents the estimated change in Y if X changes by one unit. In Table 6 for example, we estimate the impact of increasing PGSI scores (X) by 1 on K10 scores and WEMWBS scores (Y). Each row reports the result of a different regression specification where different variables are included. This includes adding non-linear elements (e.g., PGSI Scores squared) or additional variables (known as controls) to further isolate the effect that X has on Y. The stars next to the coefficient indicate statistical significance, where no stars indicate that the result is not significant at the 10% level, one star is significant at the 10% level, two stars are significant at the 5% level, and three stars indicate significance at the 1% level. The number in brackets refers to standard errors used to calculate significance levels. The more statistically significant a result is, the more likely it is that the relationship we observe reflects a real underlying relationship rather than random chance in our sample.

Model (2) in Table 6 includes PGSI score parameter and a non-linear parameter of PGSI scores with no controls. The relationships we have observed among survey respondents indicate that:

- An individual with a PGSI score of 1, is likely to have a K10 score of about 19, indicating that they are likely to be well. However, with a PGSI score of 9, they are likely to have a K10 score of 27, indicating that they are likely to have a moderate disorder.

- The estimated change in the effect of PGSI scores on K10 scores decreases at higher PGSI scores. For example, moving from a PGSI score of 0 to 2 changes the predicted K10 score by about 3 points, while moving from a PGSI score of 10 to 12 changes the predicted K10 score by about 1.5 points.

- For someone with a PGSI score of 1, they are likely to have a WEMWBS score of about 44, indicating medium levels of well-being. However, with a PGSI score of 9, they are likely to have a WEMWBS score of 37, which indicates low levels of well-being.

- The estimated change in the effect of PGSI scores on WEMWBS scores decreases at higher PGSI scores. For example, moving from a PGSI score of 0 to 2 changes the WEMWBS score by about 2.5 points, while moving from a PGSI score of 10 to 12 changes the WEMWBS score by about 0.5 points.

Table 6. Linear probability regression model of PGSI scores on K10 scores and WEMWBS scores

	Outcome Variable							
	K10 Score *Wave 1 and 2*				**WEMWBS Score** *Wave 3*			
Coefficients[23]	**(1)** *No controls*	**(2)** *No controls*	**(3)** *With controls*[24]	**(4)** *With controls*	**(1)** *No controls*	**(2)** *No controls*	**(3)** *With controls*[25]	**(4)** *With controls*
PGSI Score	0.830*** (0.018)	1.209*** (0.052)	0.731*** (0.037)	1.040*** (0.096)	-0.636*** (0.047)	-1.318*** (0.112)	- 0.406*** (0.114)	-1.011*** (0.253)
PGSI Score^2		-0.025*** (0.003)		-0.021*** (0.006)		0.045*** (0.008)		0.038** (0.019)

We then examined the relationship between PGSI scores and other mental health variables, including feeling suicidal in the past 12 months (Table 7), having a mental health diagnosis (Table 8) and having specific types of disorders (Table 10). This analysis only includes wave three data due to the difference of questions between waves and the high number of missing values in waves one and two for profile-specific mental health issues.

Table 7. Linear probability regression model of PGSI scores on feeling suicidal in the past 12 months

	Coefficients[26]	
Outcome Variable	**(1)** **PGSI Scores** *No controls*	**(2)** **PGSI Scores** *With controls*[27]
Feeling suicidal in the past 12 months	0.019*** (0.002)	0.014*** (0.004)

Table 7 indicates that for every one unit increase of PGSI score, there is an approximate 2% increase in the probability of feeling suicidal in the past 12 months. When relevant controls are added, this decreases to a 1.4% increase in probability, but is still highly significant.

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[23] Regressions are run with heteroskedasticity robust standard errors.

[24] Controls include: gender, age, being unemployed, having rent debt and ethnicity and drinking alcohol 4+ times per week. For the WEMWBS regression, a control for whether or not individuals had someone gambling frequently in their life before the age of 18 is also included.

[25] Controls include: gender, age, being unemployed, having rent debt and ethnicity and drinking alcohol 4+ times per week. For the WEMWBS regression, a control for whether or not individuals had someone gambling frequently in their life before the age of 18 is also included.

[26] Regressions are run with heteroskedasticity robust standard errors.

[27] Controls include: gender, age, being unemployed, having rent debt and ethnicity, drinking alcohol 4+ times per week, and knowing someone who gambled frequently in their life before the age of 18.

Table 8.   Linear probability regression model: PGSI scores impact on having a mental health diagnosis

Outcome Variable	Coefficients[28]	
	PGSI Scores	PGSI Scores^2
Having a mental health condition diagnosis	**0.027*** (0.004)	**-0.001*** (0.0002)

From Table 8, we see there is a non-linear relationship between PGSI scores and the probability of having a mental health diagnosis as the coefficient of the squared parameter is statistically significant. The non-linearity of the relationship indicates that, as with the K10 and WEMWBS results in Table 6, as PGSI scores increase, their impact on having a diagnosed mental health condition decrease.

Based on the results in Table 8, Table 9 shows the estimated likelihood of having a diagnosed mental health condition for a given PGSI score. Having a PGSI score of 1 indicated an estimated 25% probability of having a diagnosed mental health condition, while having a PGSI score of 8 indicates an estimated 39% probability of having a diagnosed mental health condition. The non-linearity of the relationship suggests that the change in the probability of having a diagnosed mental health condition between lower PGSI scores is larger than the change in higher PGSI scores. For example, moving from a PGSI score of 0 to 5 increases your probability of having a diagnosed mental health condition by 12 percentage points, while moving from 10 to 15 increases your probability by only 4 percentage points.

In Table 10, we try to understand what types of mental health diagnoses possibly drive this relationship demonstrated in Tables 8 and 9. In Table 10, we regress PGSI scores on each mental health condition. Only conditions with statistical significance or frequently mentioned in the literature are shown in Table 10, with other mental conditions shown in Table 25 in Appendix 3.

Table 10 demonstrates which mental health conditions drive the results shown in Table 8. The largest effect comes from ADHD. A one-point increase in PGSI scores is associated with a 0.7% increase in the probability of having ADHD. While statistically significant, changes in PGSI scores have a relatively small effect on all other mental health issues, and all these effects decrease with more controls added.

---

[28] Regressions are run with heteroskedasticity robust standard errors.

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Table 9. Predicted values[29]: PGSI Score and the probability of having a mental health diagnosis

PGSI Score	Probability of having a diagnosed mental health condition (%)
0	22%
1	25%
2	27%
3	29%
4	32%
5	34%
6	36%
7	37%
8	39%
10	42%
15	46%
20	47%
25	44%
27	42%

Table 10. Linear probability regression model of PGSI scores impact on specific mental health issues (wave 3 only)

	Coefficients[30]	
Outcome Variable	**(1) PGSI Scores** *No controls*	**(2) PGSI Scores** *With controls[31]*
Anxiety disorder	**0.007***** (.001)	**0.004*** (.002)
Having ADHD	**0.006***** (.0004)	**0.007***** (.0007)
Autism spectrum disorder	**0.004***** (.0004)	**0.003***** (.0008)
Bipolar affective disorder	**0.004***** (.0003)	**0.003***** (.0006)
Body dysmorphic disorder	**0.003***** (.0004)	**0.001***** (.0005)
Stress disorders	**0.003***** (.0005)	**0.002**** (.001)
Intermittent explosive disorder	**0.003***** (.002)	**0.004***** (.0004)
Depression (including postpartum disorder)	**0.003**** (.001)	.001 (0.002)
Having OCD	**0.002***** (.0005)	**0.001*** (.0008)
Dissociative disorder	**0.002***** (.0002)	**0.001***** (.0004)
Substance Abuse disorder	**0.002***** (.0003)	**0.001**** (.0005)

---

[29] The values from Table 9 are calculated by plugging in PGSI values (from 0 to 27) into the linear probability regression model from Table 8.

[30] Regressions are run with heteroskedasticity robust standard errors.

[31] Controls include: gender, age, being unemployed, having rent debt and ethnicity, drinking alcohol 4+ times per week, and knowing someone who gambled frequently in their life before the age of 18.

PGSI questionnaire and mental health: regression analysis

We also explored the link between the individual questions which are asked to calculate PGSI scores and mental health status. Regressions were conducted with and without Q6 on the PGSI questionnaire, as this question asks individuals directly about whether their gambling has caused them stress or anxiety and therefore is likely to be closely related to mental health, without telling us more about the relationship between gambling and mental health.

Our results are reported in detail in Table 25 in Appendix 3. The strongest result was that an individual's response to Q1 of the PGSI questionnaire (asking if they have bet more than they could afford to lose) had a significant negative relationship with wellbeing as measured by both K10 and WEMWBS scores. Specifically, when Q6 was removed, responding that they "always", "often" or "sometimes" bet more than they could afford to lose was associated with a K10 score that was 2.7 points worse for mental health and a WEMWBS score that was 3.1 points worse for mental well-being. In Table 26 in Appendix 3, We also looked at the relationship between PGSI questionnaire questions and the probability of an individual having a mental health diagnosis, where individuals who had bet more than they could afford to lose were more likely to have a diagnosed mental health condition.

Other parts of the PGSI questionnaire were also associated with mental health status. Responses to eight of the PGSI questions which suggested problem gambling behaviours were significantly associated with worse mental health as measured by K10 scores. Gambling to win back money lost and feeling guilty about gambling also had a significant association with worse mental health as measured by WEMWBS. However, these questions were not significantly associated with having a diagnosed mental health condition. These results can be seen in Table 25 (K10 and WEMWBS) and Table 26 (mental health diagnosis) in Appendix 3.

Gambling frequency, mental health and PGSI scores: regression analysis

Previous research has linked gambling frequency with specific mental health disorders, especially those which affect an individual's impulsivity and ability to control themselves (Grant et al., 2019). To explore this relationship, we ran a regression with an interaction between gambling frequency (in this case gambling everyday) and having an ADHD diagnosis. Our detailed results are included in Table 31[32] in Appendix 3 and support the association found elsewhere in the literature. Both gambling every day and ADHD were separately significantly associated with higher PGSI scores. In addition, the interaction between the two variables was also significantly associated with higher PGSI scores, and the effect size suggests that the combination of frequent gambling and ADHD has a very strong association with high PGSI scores.

What is an interaction term?

Within a regression, the relationship between X and Y may be influenced by the value of another variable, say Z. In our example, ADHD **and** frequent gambling habits have a different effect than ADHD **or** frequent gambling alone. To test this effect, we include an interaction term which is an extra term in the regression which multiplies the variable for ADHD and variable for gambling frequency together. The coefficient size and significance on this interaction then tell us if the effect of X and Z (in this case, ADHD, and gambling frequency) have a different effect on Y when they are combined with each other than they would separately.

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[32] Tables 27 to 30 include other interaction relationships around gambling reasons and age. Since they don't relate to mental health, they are only discussed in Appendix 3.

2.4. Affected Others

This section provides an overview of affected others within the population, including the demographics of affected others, how many affected others also gamble and have a PGSI score of 1+, what their relationship is with the individuals in their life who are experiencing gambling harms. We also conduct regression analysis to see which types of negative harms effect affected other's mental health.

Key findings from the section

- The estimated number of affected others in Great Britain has increased by 9% since 2020, with an estimated 3.5 million affected others in 2022.

- Affected others are on average in their 40s and more likely to be female.

- The most common affected other relationship with someone who gambles is with a spouse or partner, followed closely by parents and friends.

- Affected others who experience negative financial harms are more likely to have experienced suicidal ideation in the past 12 months.

Overview of affected others in the population

The results of the Great Britain Treatment and Support Survey suggest that there were an estimated 3.5 million individuals in Great Britain who identified as an affected other in 2022, an approximately 9% increase since 2020. This aligns with the findings in Section 2.1 where the number of individuals experiencing gambling harms in Great Britain has also increased. Of the individuals who identify as an affected other, an estimated 800,000 were also in the PGSI 1+ category in 2022, an 18% increase since 2020.

The average age of affected others is 46, with affected others who are also in the PGSI 1+ category skewing slightly younger (39). 58% of affected others are females, though this drops to 43% if the affected other also gambles and increases to 62% if they identify only as an affected other.

Figure 7.   Estimated affected population of affected others and affected others who are also PGSI 1+

Number of Affected Others vs Affected Others & PGSI 1+

Affected Others (Only)   **Affected Others & PGSI 1+**
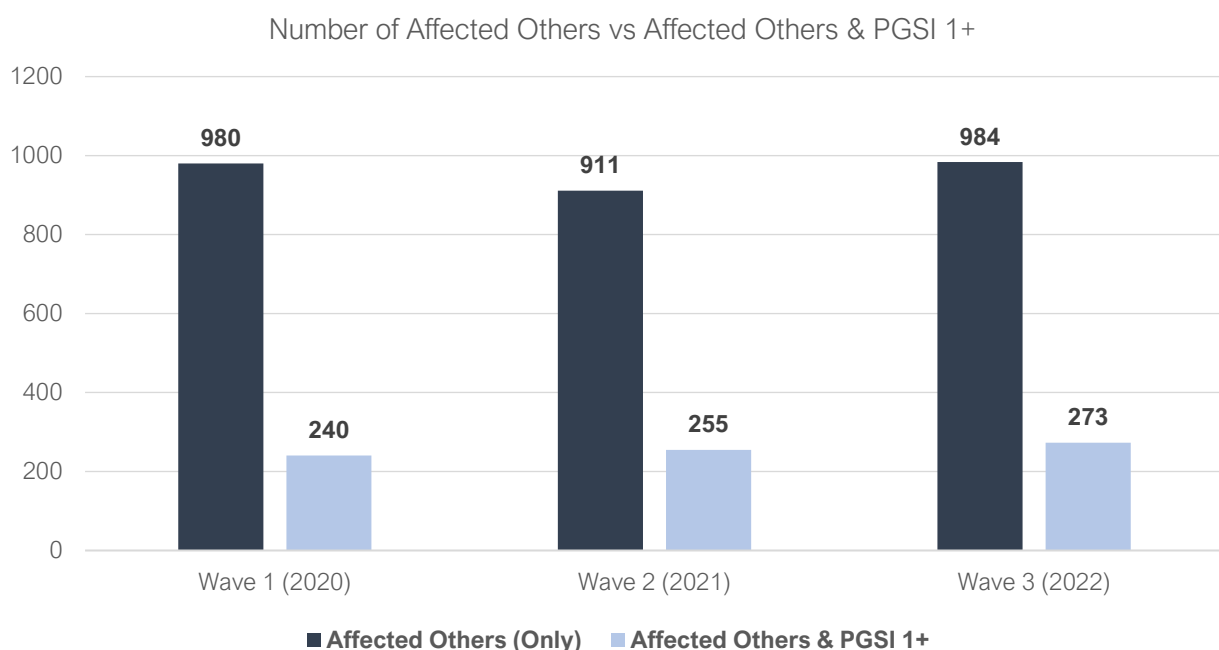
Figure 8.   Affected other relationship with people who gamble: population estimates

Number in Millions
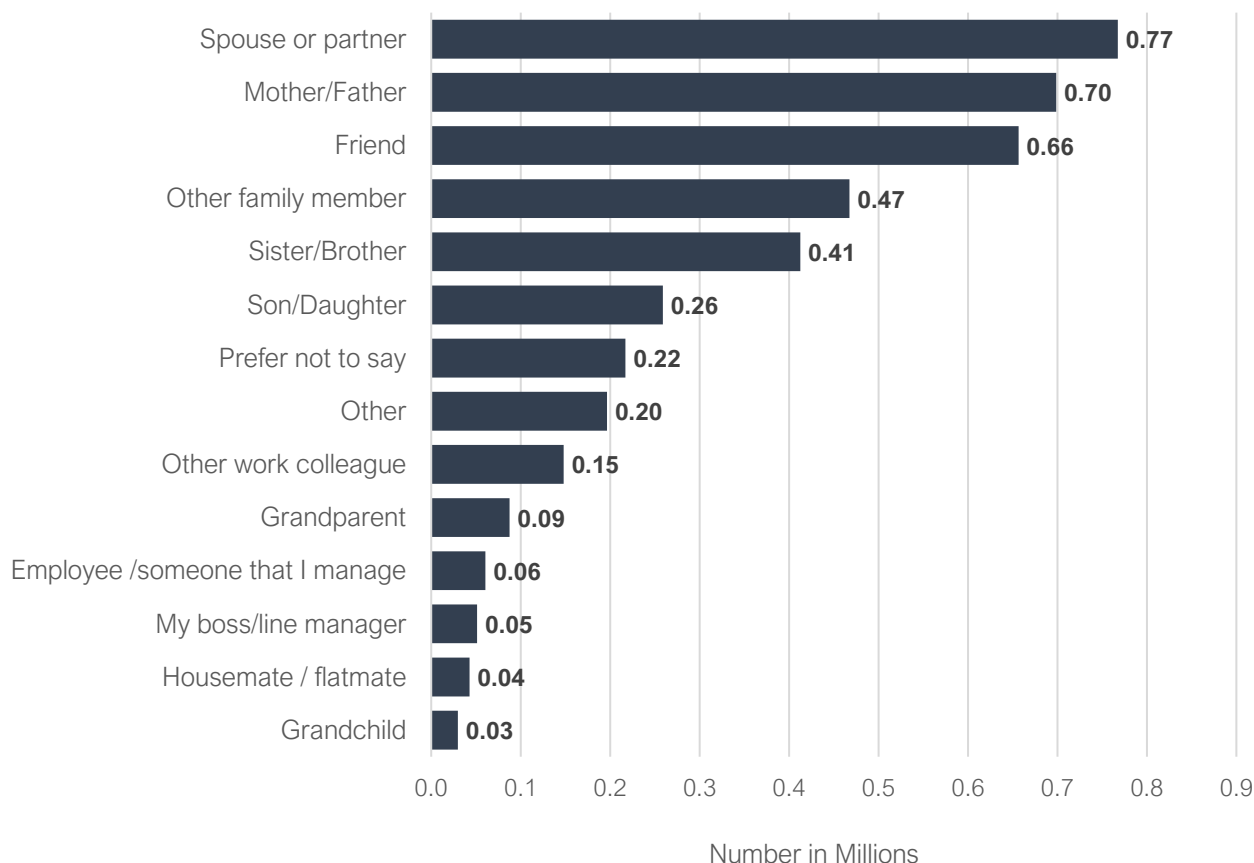
The three most common relationships that affected others have with the person whose gambling has caused them harm are (i) spouse or partner, (ii) mother or father, and (iii) a friend. An estimated 770,000 people in Great Britain have experienced harm due to their partners' gambling behaviours. An estimated 700,000 people have been negatively affected by their mother or father gambling, and 600,000 people have been negatively affected by a friend gambling.

Harms faced by affected others

Reported harms faced by affected others because of someone else's gambling fall into four categories: (i) a negative effect on their relationship with the person, (ii) a negative effect on their own mental health or (iii) financial concerns or (iv) taking over household responsibilities.

The most common reported harms are a negative effect on the relationship or the affected other's own mental health. Reported impacts on the relationship include an inability to trust the individual who is gambling (estimated 1.9 million people affected), family violence/conflicts (estimated 1.2 million people affected) and a breakdown in communication with them (estimated 1.2 million people affected). The most common negative impacts on affected others mental health include (i) depression/sadness (estimated 1.6 million people affected), (ii) anger (estimated 1.5 million affected), and (iii) anxiety (estimated 1.2 million people affected).

Figure 9. Harms experienced by affected others as a result of someone's gambling

Harm	Number in millions
An inability to trust them	1.86
Depression/Sadness	1.60
Feelings of anger towards them	1.51
Feelings of anxiety	1.18
Family violence/conflict	1.18
A breakdown in communication with them	1.16
Reduced income for household running costs (e.g., food, rent, bills)	1.06
A lack of money for family projects (e.g., major purchases, holidays)	1.05
Financial hardship (e.g. getting into debt)	1.04
Increased arguments over their gambling	1.04
Distress or upset due to their continued gambling-related absences	0.91
Less quality time with them	0.89
Helplessness	0.53
Taking over financial responsibility in the home	0.51
Taking over decision making in the home	0.34
None of these	0.17
Prefer not to answer	0.08

Impact of harms on affected others mental health and wellbeing

To assess how the harms experienced by affected others impacts their mental health, we ran regressions to explore the links between harms and whether the individual has felt suicidal in the past 12 months, their K10 scores, and their WEMWBS scores. Results are in Table 11 and 12.

With regards to whether affected others had felt suicidal in the past 12 months, Table 11 shows that experiencing harms because of someone else's gambling increases the odds of feeling suicidal. The harm with the most significant effect on suicidal ideation is financial hardship, where reporting financial hardship is estimated to increase the probability of suicidal ideation by 10%.

For K10 scores, all coefficients shown are highly significant and positive, indicating that experiencing these harms as an affected other is associated with worse mental health. The harm with the largest effect on K10 scores is feelings of anxiety. Where an affected other reported anxiety due to someone else's gambling, K10 scores increased by 3 points. We found a similar impact of anxiety on mental wellbeing when using WEMWBS scores. In addition, the harms that were most closely related to WEMWBS scores are distress or upset due to gambling-related absences.

Table 11. Univariate linear probability regression model on harms on affected others association with feeling suicidal in the past 12 months

Outcome variable	*Reported harm*	*Coefficient*[33]
Feeling suicidal in the past 12 months	Financial Hardship	**0.10***** (0.030)
	Distress or upset due to their continued gambling-related absences	**0.08**** (0.032)
	A breakdown in communication with them	**0.09***** (0.029)
	Feeling depressed/sadness	**0.17***** (0.022)

Table 12. Univariate linear probability regression model on harms on affected others on mental health and wellbeing scores

Outcome variable	*Reported harm*	*Coefficient*[34]
K10 Scores[35]	Financial hardship	**2.19***** (0.411)
	Lack of money for family project	**1.31***** (0.409)
	Distress or upset due to their continued gambling-related absences	**2.43***** (0.423)
	Less quality time with them	**1.45***** (0.427)
	Feeling depressed/sadness	**2.57***** (0.391)
	Feelings of anxiety	**3.20***** (0.391)
	Increased arguments over their gambling	**1.63***** (0.408)
	Helplessness	**2.81***** (0.657)
	Family conflict/violence	**1.44***** (0.422)
WEMWBS Scores[36]	Distress or upset due to their continued gambling-related absences	**-2.01***** (0.697)
	A breakdown in communication with them	**-1.96***** (0.656)
	Feelings of anxiety	**-2.57***** (0.640)
	Helplessness	**-2.11***** (0.776)

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[33] Regressions are run with heteroskedasticity robust standard errors
[34] Regressions are run with heteroskedasticity robust standard errors
[35] Waves one and two only
[36] Wave three only

4.7 Additional analysis: group classification

To supplement our main analysis, we also tested two different methodologies to identify the most important or relevant underlying characteristics for individuals in the PGSI 0 category compared to individuals in the PGSI 8+ category. First, we used a set of random forest models, which "predict" the PGSI category individuals belong to by assigning weights to individual underlying characteristics (this means the characteristics with the largest weights are the most important for identifying which PGSI categories individuals belong to). This analysis demonstrated that worse K10 scores (indicating worse mental health) were associated with higher PGSI scores. It also highlighted the fact that high PGSI scores were proportionally more common among younger adults (something which is also clear from the descriptive statistics in Table 1 and Table 2. Second, we used a set of cluster analysis models to identify the most predominant/defining characteristics across individuals within each PGSI category (in other words, which individual characteristics are most important in "defining" a PGSI category). This found that while some individual characteristics are more commonly associated with a certain PGSI category, there were no well-defined clusters which could define the whole group of at-risk or problem gamblers.

Outputs from random forest models and cluster analysis are often difficult to interpret. As a result, the main body of the report focuses on outputs from estimating regression models (to facilitate comparison with results from previous research). A table of random forest results and correlations from cluster analysis are available in Appendix 3.

3. Conclusion

This report outlines the associations between PGSI scores, gambling behaviours and various measures of mental health including K10 scores, WEMWBS scores, suicidal thoughts, mental health diagnosis and specific mental health conditions, among adults in Great Britain.

Results show that there is a significant association between higher rates of gambling harms and worse mental health, where a one unit increase in PGSI score increases the probability of someone having a diagnosed mental health condition by 3%. People who do not gamble or participate in non-problem gambling (PGSI 0) are more likely to be mentally well (have low K10 scores) than individuals in PGSI 1+ or PGSI 8+ categories. Those at-risk of problem gambling in the PGSI 1+ category are more likely than non-gamblers to experience suicidal thoughts (26% vs 6%), while those who are experiencing problem gambling in the PGSI 8+ category are more likely to have a severe mental disorder than non-gamblers (47% vs 16%). At-risk and problem gambling behaviours are also more likely to experience specific types of mental health conditions, such as ADHD, and intermittent explosive disorder. PGSI 1+ individuals make up about 13% of the population, but about 17% of all anxiety disorders, 27% of ADHD diagnoses, and 37% of intermittent explosive disorder.

Higher PGSI scores are more likely to be highly associated with mental health issues such as ADHD compared to other types of diagnoses, such as depression or anxiety. The effect of these specific mental health issues is amplified when other types of gambling habits are present, for example if someone gambles every day and has ADHD, the estimated effect on PGSI scores is higher than the estimated effect of having ADHD or gambling everyday alone. Specific PGSI questions were also examined to assess which specific gambling experiences or behaviours had the biggest effect on mental health variables. Questions relating to debt, seeking excitement or risk-taking behaviours were most closely related to mental health variables.

There are an estimated 3.5 million individuals in Great Britain who identified as an affected other in 2022, a 9% increase since 2020. Most affected others experience gambling harms due to a relationship with their spouse or partner, mother or father, or a friend. The harm which is most reported by affected others is negative consequences to the relationship with the person who is gambling. Other common harms include negative effects on their mental health including feeling depressed or sad, and having anxiety. Experiencing harms relating to financial concerns is associated with a 10% increase in the probability of an affected other feeling suicidal, while harms relating to personal mental health (depression, anxiety) are more likely to affect K10 and WEMWBS scores.

This analysis is not without limitations, including an inability to compare some variables across waves due to changes in the questionnaire. Much of the demographic and mental health condition data relied on YouGov profiles, and there was significant missing data for some of these variables. For example, data on whether individuals had a depression diagnosis in waves one and two had about 85% and 78% of data missing, compared to 20% for wave three. More information about the survey can be found in YouGov reports (Gunstone et al., 2021; Gunstone et al., 2022). To mitigate these issues, we focused some on analysis on only a single wave, for example regression analysis on specific mental health issues only used data from wave three. In addition, while we have reported associations between mental health and PGSI scores including prevalence in the population and cross-tabulations, these results are not causal, and we cannot determine if mental health issues cause problematic gambling behaviours or vice versa. Given the nature of survey data, there are likely many factors that are affecting this relationship that were either not collected in the survey or are unobservable, and therefore there are many other research avenues to explore.

There is clearly a strong association between "problem gambling" behaviours and poorer mental health, but further analysis could be done to identify the pathways which underpin this association. We identified some potential pathways in our review of the literature, including debt and exposure to frequent gambling before the age of 18, but a more robust analysis could be conducted with larger sample sizes and more specific questions about childhood gambling traumas. While we explored demographic characteristics and PGSI categories broadly, conducting more in-depth analysis of specific demographic groups and their experience with gambling harms and mental health. For example, focusing on the gambling experiences of specific age groups, ethnicities, or sexualities and how these groups and their mental health changes varies based on gambling harms faced.

In addition, with the right data, more work could be done to isolate the causal impact of problem gambling behaviour on mental health and vice versa. For instance, data which tracks mental health status and gambling behaviour for individuals over time would enable researchers to use quasi-experimental research designs to identify whether poor mental health resulted in problematic gambling behaviours, or if problematic gambling behaviours led to poor mental health outcomes. We therefore recommend continuing to include mental health measures in surveys that aim to understand gambling behaviours and harms and ask questions that help could help to identify the timing of when mental health conditions emerge.

Our findings found that individuals with higher PGSI scores are more likely to also suffer from mental health disorders. This relationship between gambling and mental health is significant for both practitioners and gambling support organisations, as it can influence the type of treatment and support that is best suited for each individual. Depending on the underlying mental health condition, different types of support may be necessary to help those who use gambling as a form of self-harm or a calming mechanism. Furthermore, our findings suggest that problem gambling not only affects the individual, but also the mental health of those around them. Therefore, practitioners and support groups should encourage and provide mental health support for affected others as well. By considering the various complex factors that influence gambling, and its associated harms, personalised support and treatments can be provided to better meet the individual needs of those experiencing gambling harms and affected others in their lives.

Appendix 1: Data and definitions

Overview of data
Annual Great Britain Treatment and Support Survey

This report presents secondary analysis of the Annual Great Britain Treatment and Support Survey that YouGov runs on behalf of GambleAware, with the objective to focus on mental health and gambling. We received the raw dataset directly from GambleAware which covered three waves of data collected in November 2020, 2021, and 2022. This annual survey covers questions pertaining to individual gambling habits (including types of gambling people participate in, reasons why they gamble and how often they gamble), how gambling affects their mental health, use and view of treatment and support options, and whether individuals have a mental health diagnosis. Available in the data are three questionnaires and individuals' scores for (i) PGSI, (ii) Kessler Psychological Distress Scale (K10 Scores), and (iii) WEMWBS. Variables are not the same across all waves, for example K10 is only available for waves one and two while WEMWBS is available for wave three.

YouGov has a "proprietary, automated sampling system that invites respondents based on their profile information…respondents are automatically, randomly selected based on which surveys are 'live' at the time and how that matches their profile information" (Gunstone et al., 2022). GambleAware requested YouGov to include profile data as part of the raw dataset we received, which included demographic variables (sex, age, ethnicity, religion, etc.) as well as various other responses to questions on debt and finances, mental health issues, attitudes on various subjects, and information on life events in the past 12 months. We did not receive the full questions relating to profile variables, nor did we get any information on how these are filled out by YouGov individuals (e.g., whether some questions were mandatory, etc.) or if this changed over the three-wave period.

The responses for each wave of the Great Britain Treatment and Support Survey are as follows: (i) 18305 individuals for wave three (2022), (ii) 18038 individuals for wave two (2021), and (iii) 18879 individuals for wave one (2020). For specific notes on survey biases, limitations, and challenges, refer to the reports by YouGov (Gunstone et al., 2021; Gunstone et al., 2020). Note that at the time of writing this report, the report for the 2022 survey data was not yet available.

Population estimates methodology

To extrapolate population estimates from the survey data, we used the weights provided by YouGov. According to the surveys' technical reports, the sample is weighted to be "representative of all Great Britain adults by age, gender, UK region, socio-economic group and ethnic group" (Gunstone et al., 2021; Gunstone et al., 2020).

In the 2021 report, YouGov used population estimates calculated from the latest ONS mid-year estimates (for Great Britain, 18+, 2020). We used the same population estimates for each wave year that the YouGov sample was based on, providing us with the following 18+ Great Britain populations for each wave: (i) 51,153,013 for wave one (mid-year estimates from 2019), (ii) 51,435,642 for wave two (mid-year estimates from 2020), and (iii) 51,692,312 for wave three (mid-year estimates from 2021). Population weights were then calculated by dividing each year's population estimate by the weights calculated by YouGov. To calculate population estimates for a specific PGSI category, we simply added up the population weights of individuals who were in this category. Since each population weight is based on the mid-year population estimate for that year and the population weight is based on weights developed by YouGov to make the sample representative, we can aggregate the data to create a single large sample or examine each wave individually.

Key Measures[37]
Gambling Measures
Problem Gambling Severity Index (PGSI)

The main indicator for measuring the severity of someone's gambling harms used within the Annual GB Treatment and Support survey is the PGSI. The PGSI is based on nine questions which measure levels of gambling behaviour which could cause harm to the individual. Responses for each question are assessed on a four-point scale: (i) never = 0, (ii) sometimes = 1, (iii) most of the time = 2, and (iv) almost always = 3. The nine questions are listed below:

1. Have you ever bet more than you could afford to lose?
2. Have you needed to gamble with larger amounts of money to get the same excitement?
3. When you gambled, did you go back another day to try and win back the money you lost?
4. Have you borrowed money or sold anything to get money to gamble?
5. Have you felt that you might have a problem with gambling?
6. Has gambling caused you any mental health problems, including stress or anxiety?
7. Have people criticised your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?
8. Has your gambling caused any financial problems for you or your household?
9. Have you felt guilty about the way you gamble or what happens when you gamble?

PGSI scores range from 0 to 27. If an individual did not receive a PGSI score, this indicates that they do not participate in gambling.

Table 13. PGSI Category Definitions

Category	PGSI Score
Non-problem gambler	0
Low-Risk gambler *Gamblers who experience a low level of problems with few or no identified negative consequences*	1-2
Moderate-risk gambler *Gamblers who experience a moderate level of problems leading to some negative consequences*	3-7
Problem Gamblers *Gamblers who gamble with negative consequences and a possible loss of control*	8+

Gambling Habits: Types, Reasons and Frequency

The Annual GB Treatment and Support survey also asks a number of questions relating to gambling habits, including types of gambling they participate in, reasons for participating in gambling and how often they spend money on these gambling activities. These questions include:

- Which, if any, of these [gambling activities] have you spent money on in the past 12 months? Please tick all that apply.

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[37] To see the full survey questions and possible responses, refer to the YouGov reports in the reference list from 2021 and 2022. Note that at the time of this report, the 2022 survey (report published in 2023) had not yet been published. Most of the responses are can be found within tables of this report.

- And which, if any, of these [gambling activities] have you spent money on in the past 4 weeks? Please tick all that apply.

- Thinking about all the gambling activities covered in the previous questions, [how often] would you say you spend money on these activities.

- The questions that follow show reasons that some people have given about why they take part in gambling. For each one, please state whether these are reasons why you take part in gambling. I take part in gambling…

Note that some of the responses to these changed over the three waves. For example, in Wave 3 the following responses (i) online casino games (slot machine style, roulette, instant wins) and (ii) online poker, were separate, while in waves 1 and 2 they were put together as the same responses: online casino games (slot machines, roulette, instant wins, online poker). For analysis purposes, these have been combined into the same response.

Mental Health Measures

Kessler Psychological Distress Scale (K10)

The Kessler Psychological Distress Scale (K10) was developed by Kessler et al., (2003) to measure psychological distress. Individuals are asked ten questions which assess the emotional state of the respondent with a five-level response scale. T

The K10 score measures psychological distress from 10 questions about emotional states. Respondents answer each question with a five level responses scale, with each item scored as (i) none of the time = 1, (ii) a little of the time = 2, (iii) some of the time = 3, (iv) most of the time = 4, (v) all of the time = 5. These questions are listed below:

1. In the past 4 weeks, about how often did you feel tired out for no good reason?
2. In the past 4 weeks, about how often did you feel nervous?
3. In the past 4 weeks, about how often did you feel so nervous that nothing could calm you down?
4. In the past 4 weeks, about how often did you feel hopeless?
5. In the past 4 weeks, about how often did you feel restless or fidgety?
6. In the past 4 weeks, about how often did you feel so restless you could not sit still?
7. In the past 4 weeks, about how often did you feel depressed?
8. In the past 4 weeks, about how often did you feel that everything was an effort?
9. In the past 4 weeks, about how often did you feel so sad that nothing could cheer you up?
10. In the past 4 weeks, about how often did you feel worthless?

Note: These questions were only asked in waves 1 and 2 and are not available for wave 3. Scores of each question are summed, resulting in a range of scores from a minimum score of 10 to a maximum score of 50. Higher scores indicate higher levels of psychological distress. The data provided only gave the 10 questions listed above, so we created the K10 score variable and relevant cut-off categories.

Table 14. K10 Score Cut-Off Definitions[38]

Category	K10 Score
Likely to be well	10-19
Likely to have a mild disorder	20-24
Likely to have a moderate disorder	25-29
Likely to have a severe disorder	30-50

Warwick-Edinburgh Mental Well-Being Scale (WEMWBS)

The WEMWBS was developed and validated with the UK population by an expert panel across psychiatry, psychology, public health, and social science disciplines, and was validated by Tennant et al., (2007). WEMWBS was developed to measure mental wellbeing which focuses entirely on positive aspects of mental health using a 14-item questionnaire with a five-level response scale. The WEMWBS is used to measure subjective well-being in adults who are 16 years and older. The developers of the survey defined mental well-being as relating to a person's psychological functioning, life-satisfaction, and ability to develop and maintain mutually beneficial relationships. Psychological well-being includes the ability to maintain a sense of autonomy, self-acceptance, personal growth, purpose in life, and self-esteem. The WEMWBS is based on fourteen questions where each has a five-item response scale which are scored as (i) none of the time = 1, (ii) a little of the time = 2, (iii) some of the time = 3, (iv) most of the time = 4, (v) all of the time = 5. These questions are listed below:

1. I've been feeling optimistic about the future
2. I've been feeling useful
3. I've been feeling relaxed
4. I've been feeling interested in other people
5. I've had energy to spare
6. I've been dealing with problems well
7. I've been thinking clearly
8. I've been feeling good about myself
9. I've been feeling close to other people
10. I've been feeling confident
11. I've been able to make up my own mind about things
12. I've been feeling loved
13. I've been interested in new things
14. I've been feeling cheerful

Scores are then summed and range from a minimum of 14 to a maximum of 70, with higher scores indicating greater positive mental well-being. The cut-off points are based off previous research on the distribution of WEMWBS scores for the general population in the UK, where 15% of the population was expected to have a score less than 42.3, and 15% were expected to have a score greater than 59.7 (Tennant et al., 2007).

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[38] Kessler et al., 2003

Table 15. WEMWBS Score Cut-Off Definitions

Category	WEMWBS Score
Low levels of well-being	14-42
Average levels of well-being	43-59
High levels of well-being	60-70

Mental Health Diagnosis and specific issues

The Annual GB Treatment and Support survey also asks respondents whether they have been diagnosed with a number of conditions, including a mental health condition. Respondents can skip the question if they would prefer not to answer. There is also a question asking individuals if they have ever felt suicidal in the past 12 months. Respondents can skip this section if they are not comfortable with these types of questions. This question was only asked in wave 3.

The data also has mental health issue information on specific disorders available from YouGov profiles. These include twenty specific mental health issues, ranging from depression disorder to sexual disorders. Further information on how these questions were asked within the profile or if this changed over the three waves was not provided. There is a large difference in missing variables for these questions over the three waves, where both waves 1 and 2 have approximately 15,000 missing variables for the profile-based mental health issue questions, while wave 3 only has approximately 3,500.

Alcohol Use

The survey also includes questions on respondents' alcohol habits. These include questions on frequency of drinking alcohol and the number of units consumed on a typical day of drinking. The questions are below:

- How often do you have a drink consuming alcohol?
- How many units of alcohol do you drink on a typical day when you are drinking?

Affected others measures

The survey has several questions asking individuals if they have experienced negative effects due to someone else's gambling behaviour. Questions relevant to analysis include topics such as (i) the type of relationship with the individual who gambles, and (ii) the types of negative harms experienced due to someone else's gambling. Relevant questions are as follows:

- Which of the following people had or have a gambling problem which has negatively affected you? Please tick all that apply.
- Which, if any, of the following have you experienced as a result of this person's/these people's gambling?

Appendix 2: Additional descriptive statistics

Table 16.   **Types of gambling engaged in by individuals in each PGSI Category**

Gambling Type *Gambling types individuals have spent money on in the past 12 months*	PGSI 0 **Non-Problem Gambler**	PGSI 1+ **At-Risk Gambler**[39]	PGSI 8+ **Problem Gambler**
Tickets for the National Lottery Draw, including Thunderball and EuroMillions and tickets bought online	76.5%	64.8%	44.4%
Tickets for any other lottery, including charity lotteries	24.6%	21.4%	24.2%
Scratch cards	25.4%	39.3%	38.8%
Gaming machines in a bookmakers	0.5%	6.2%	18.7%
Fruit or slot machines	2.5%	10.3%	17.6%
Bingo (including online)	5.0%	12.4%	17.2%
Gambling in a casino (any type)	1.2%	6.3%	12.8%
Online casino games (slot machine style, poker, roulette, instant wins)[40]	3.5%	27.3%	31.2%
Betting on horse or dog races – online	7.7%	17.0%	15.8%
Betting on horse or dog races – in person	3.2%	6.1%	9.2%
Betting on football – online	9.9%	28.8%	25.5%
Betting on football – in person	1.5%	5.8%	11.2%
Betting on other sports – online	4.0%	13.7%	13.6%
Betting on other sports – in person	0.3%	3.1%	7.4%
Loot boxes[41]	0.5%	1.9%	3.0%
Any other type of gambling	2.0%	5.0%	5.3%

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[39] Note that PGSI +1 is inclusive of PGSI 8+.

[40] Note that responses for this category were separate responses in different waves but were pooled together for analysis.

[41] Note this response was only asked in waves 2 and 3.

Table 17. Gambling type distributed by PGSI category

Gambling Type *Gambling types individuals have spent money on in the past 12 months*	PGSI 0 **Non-Problem Gambler**	PGSI 1+ **At-Risk Gambler[42]**	PGSI 8+ **Problem Gambler**
PGSI Population Prevalence	**46%**	**12.6%**	**2.7%**
Tickets for the National Lottery Draw, including Thunderball and EuroMillions and tickets bought online	81.1%	18.9%	2.7%
Tickets for any other lottery, including charity lotteries	81.1%	18.9%	2.7%
Scratch cards	70.2%	29.9%	6.3%
Gaming machines in a bookmakers	21.2%	78.8%	50.2%
Fruit or slot machines	46.7%	53.3%	19.3%
Bingo (including online)	59.4%	40.6%	11.9%
Gambling in a casino (any type)	40.4%	59.6%	25.6%
Online casino games (slot machine style, poker, roulette, instant wins)[43]	37.0%	63.0%	17.0%
Betting on horse or dog races – online	62.2%	37.8%	7.4%
Betting on horse or dog races – in person	65.7%	34.3%	10.9%
Betting on football – online	55.6%	44.4%	8.3%
Betting on football – in person	48.1%	51.9%	21.4%
Betting on other sports – online	51.5%	48.5%	10.2%
Betting on other sports – in person	29.0%	71.0%	36.0%
Loot boxes[44]	50.0%	50.0%	16.7%
Any other type of gambling	58.6%	41.4%	9.2%

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[42] Note that PGSI +1 is inclusive of PGSI 8+.

[43] Note that responses for this category were separate responses in different waves but were pooled together for analysis.

[44] Note this response was only asked in waves 2 and 3.

Figure 10. Estimated affected population participating in online and in-person gambling
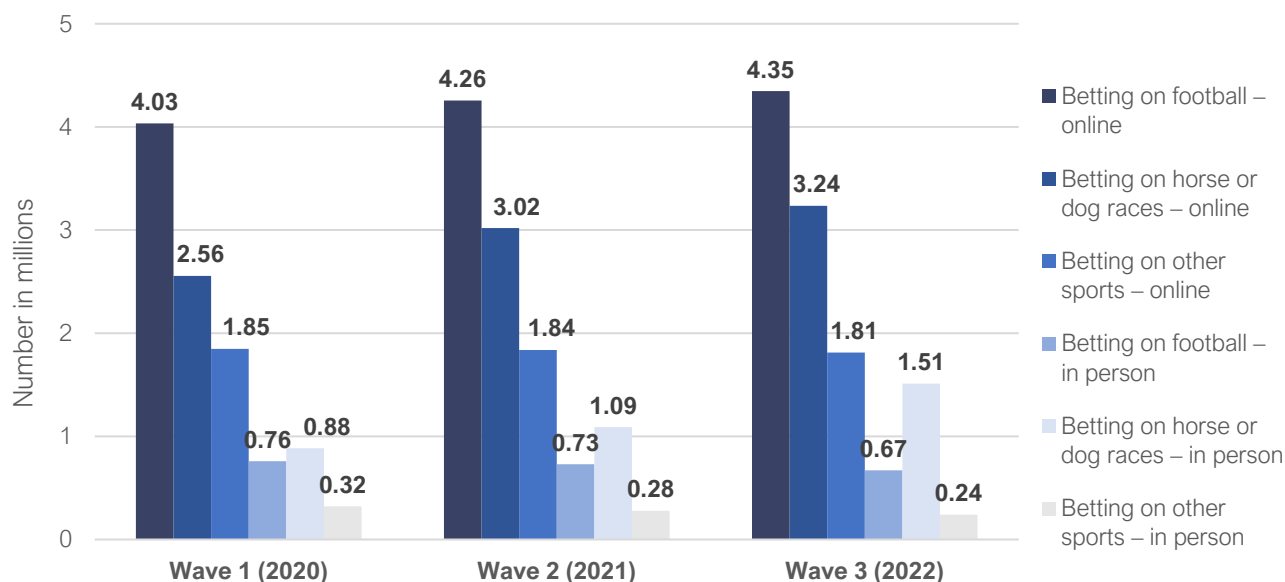
Table 18. Reasons for gambling given by individuals in each PGSI Category

Reason for Gambling[45]	PGSI 0 Non-Problem Gambler	PGSI 1+ At-Risk Gambler[46]	PGSI 8+ Problem Gambler
Chance of winning big money	85.9%	92.5%	93.5%
Because it's fun	58.0%	83.1%	89.3%
As a hobby or a pastime	24.0%	61.0%	82.3%
To escape boredom or to fill my time	17.2%	61.5%	86.3%
because I'm worried about not winning if I don't play	17.7%	46.0%	78.8%
to compete with others (e.g. bookmaker, other gamblers)	5.5%	30.9%	67.5%
because it's exciting	49.2%	81.7%	89.4%
for the mental challenge or to learn about the game or activity	11.8%	44.8%	74.0%
because of the sense of achievement when I win	43.0%	76.2%	87.9%
to impress other people	1.7%	20.3%	60.5%
to be sociable	15.3%	39.5%	70.3%
because it helps when I'm feeling tense	5.6%	38.6%	78.3%
to make money	64.6%	86.8%	91.8%
to relax	15.7%	50.8%	78.5%
because it's something that I do with my friends or family	28.4%	47.8%	72.0%

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[45] Note that the response for each question in the survey was an option of "Always", "Often", "Sometimes", and "Never", but for the purposes of this table responses were coded as a dummy variable where 0= Never and 1=Always, Often or Sometimes.

[46] Note that PGSI +1 is inclusive of PGSI 8+.

Table 19. Gambling reason distributed by PGSI category

Reason for Gambling[47]	PGSI 0 *Non-Problem Gambler*	PGSI 1+ *At-Risk Gambler*[48]	PGSI 8+ *Problem Gambler*
PGSI Population Prevalence	46.0%	12.6%	2.7%
Chance of winning big money	77.2%	22.8%	4.9%
Because it's fun	71.7%	28.3%	6.4%
As a hobby or a pastime	58.9%	41.1%	11.7%
To escape boredom or to fill my time	50.4%	49.6%	14.7%
because I'm worried about not winning if I don't play	58.4%	41.6%	15.1%
to compete with others (e.g. bookmaker, other gamblers)	39.5%	60.5%	28.0%
because it's exciting	68.6%	31.4%	7.3%
for the mental challenge or to learn about the game or activity	49.0%	51.0%	17.8%
because of the sense of achievement when I win	67.2%	32.8%	8.0%
to impress other people	23.8%	76.2%	48.1%
to be sociable	58.4%	41.6%	15.6%
because it helps when I'm feeling tense	34.7%	65.3%	28.0%
to make money	73.0%	27.0%	6.0%
to relax	52.9%	47.1%	15.4%
because it's something that I do with my friends or family	68.4%	31.6%	10.1%

Table 20. Gambling frequency (lottery, scratch card, betting, casino games, gaming machines and bingo) for individuals in each PGSI category

How often do you spend money on gambling activities?	PGSI 0 *Non-Problem Gambler*	PGSI 1+ *At-Risk Gambler*[49]	PGSI 8+ *Problem Gambler*
Everyday/6-7 days a week	1.7%	6.1%	8.7%
4-5 days a week	2.5%	7.4%	11.3%
2-3 days a week	10.5%	19.5%	24.7%
About once a week	25.8%	24.0%	25.3%
About once a fortnight	8.3%	11.0%	11.2%
About once a month	19.5%	12.6%	8.1%
Every 2-3 months	13.7%	9.9%	4.8%
Once or twice a year	17.9%	9.5%	5.8%

[47] Note that the response for each question in the survey was an option of "Always", "Often", "Sometimes", and "Never", but for the purposes of this table responses were coded as a dummy variable where 0= Never and 1=Always, Often or Sometimes.
[48] Note that PGSI +1 is inclusive of PGSI 8+.
[49] Note that PGSI +1 is inclusive of PGSI 8+.

Table 21. Gambling frequency distributed by PGSI category

Reason for gambling	PGSI 0 *Non-Problem Gambler*	PGSI 1+ *At-Risk Gambler*[50]	PGSI 8+ *Problem Gambler*
PGSI Population Prevalence	**46.0%**	**12.6%**	**2.7%**
Everyday/6-7 days a week	51.0%	49.0%	14.72%
4-5 days a week	54.9%	45.1%	14.45%
2-3 days a week	66.2%	33.8%	9.1%
About once a week	79.6%	20.4%	4.54%
About once a fortnight	73.3%	26.7%	5.8%
About once a month	84.9%	15.1%	2.1%
Every 2-3 months	83.5%	16.5%	1.7%
Once or twice a year	87.3%	12.7%	1.6%

Figure 11. Exposure to Gambling before 18 by PGSI Category: Estimated affected population[51]
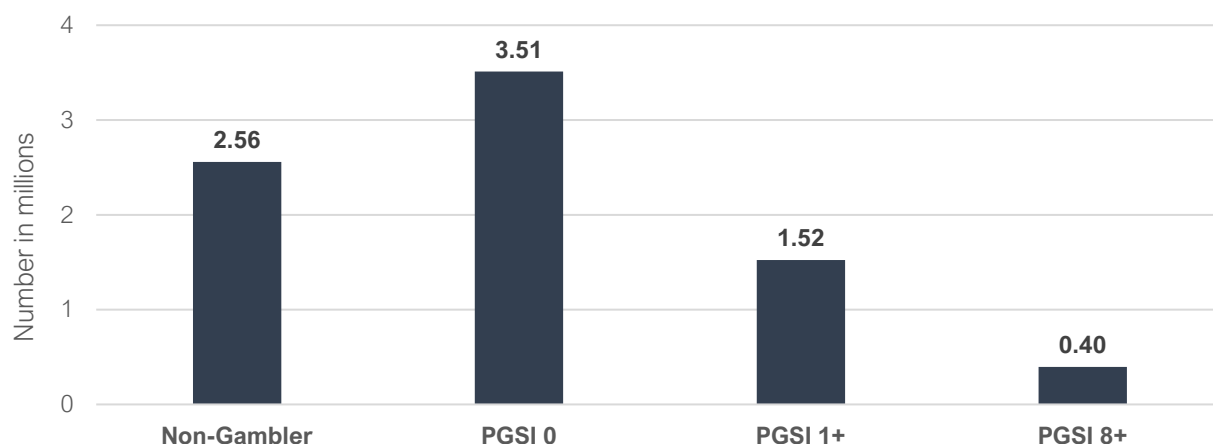
Table 22. Mental Health Diagnosis over three waves[52]

	Wave 1 (2020)	Wave 2 (2021)	Wave 3 (2022)
Weighted Sample	2519	2461	2674
Estimated population affected (Great Britain)	6,825,964	7,019,600	7,551,623
% of estimated population affected	13.3%	13.6%	14.6%

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[50] Note that PGSI +1 is inclusive of PGSI 8+.

[51] Wave three only.

[52] Within the dataset there are three mental health diagnosis questions. One available within the survey and two from YouGov profiles. The table below come from the survey question, have you been diagnosed with any of the following? with mental health condition as a response option. This question was chosen as it had the lowest percentage of missing variables (2%) compared to profile questions (each with 60%+ of missing variables).

Figure 12.   Great Britain est. population of mental health issues (Wave 3)

Number in millions

Category	Value
N/A- I have not been diagnosed with any mental illnesses	29.31
Depression (including postpartum depression)	7.18
Anxiety disorder	5.74
Prefer not to say	1.35
Post-Traumatic Stress Disorder (PTSD)	1.13
Stress disorder	0.99
Autism spectrum disorder	0.95
Panic disorder	0.84
Obsessive-Compulsive spectrum disorders	0.69
Eating disorder	0.67
Attention Deficit Hyperactivity Disorder (ADHD)	0.59
Personality disorders	0.44
Other mental disorders	0.44
Phobias	0.37
Substance abuse disorders	0.24
Body dysmorphic disorder	0.23
Bipolar affective disorder	0.20
Dissociative disorder	0.20
Anger disorder (Intermittent Explosive Disorder)	0.17
Sexual disorders	0.15
Paranoid disorder	0.14
Schizophrenia spectrum	0.12
Other psychotic disorders	0.12
Impulse control disorder	0.07

Figure 13.   Estimated affected population K10 Scores (Wave 1 and 2)

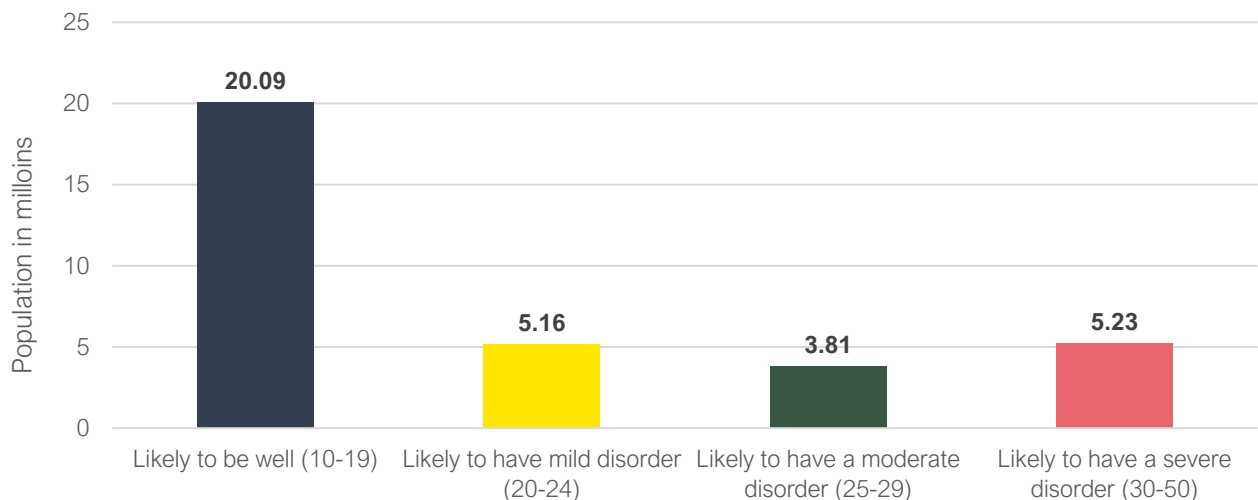| Category	Population in millions
Likely to be well (10-19)	20.09
Likely to have mild disorder (20-24)	5.16
Likely to have a moderate disorder (25-29)	3.81
Likely to have a severe disorder (30-50)	5.23

Figure 14. K10 Score Histogram

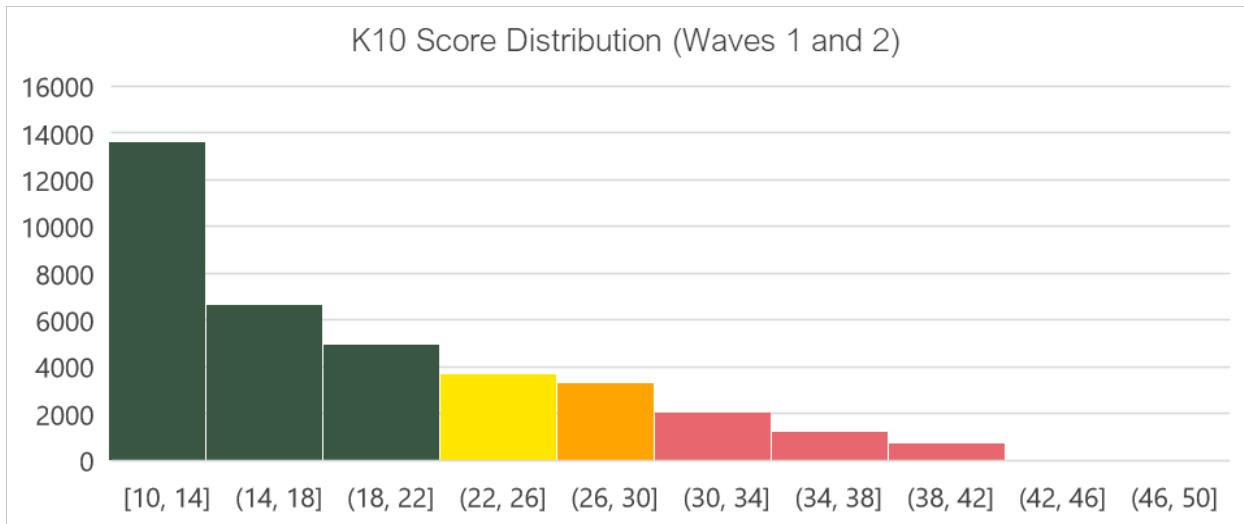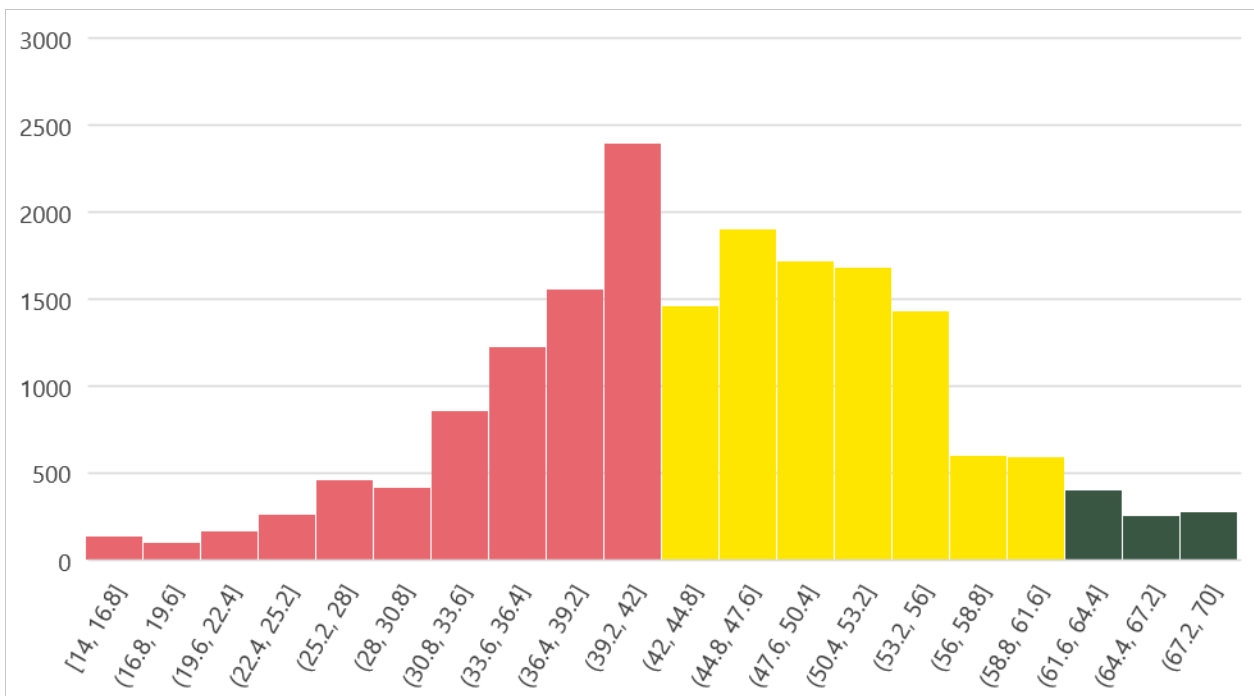**Table 23. WEMWBS Scores in the population**

	Weighted Number in Sample	Estimated Affected Population	Estimated % of Affected Population
Low Levels of Wellbeing (14-42)	7470	21,094,277	41%
Medium Levels of Wellbeing (43-60)	9335	26,360,303	51%
Greater Levels of Wellbeing (61-70)	1126	3,180,372	6%

Figure 15. Histogram of WEMWBS Scores (Wave 3)

Appendix 3: Additional analysis

Mental health conditions and PGSI scores

In our regression analysis, the relationship between PGSI scores and the following mental health conditions was not statistically significant when demographic controls were included.

Table 24. **Linear probability regression model on mental health conditions where PGSI was not a statistically significant predictor**

	Coefficients[53]	
Outcome Variable	**(1)** **PGSI Scores** *No controls*	**(2)** **PGSI Scores** *With controls[54]*
Schizophrenia spectrum	**0.001***** (0.0002)	0.0005 (0.0004)
Sexual disorders	**0.001***** (0.0002)	0.00002 (0.0003)
Personality disorders	**0.001***** (0.0004)	-0.0001 (0.0007)
Paranoid disorder	**0.001***** (0.0002)	-0.0001 (0.0003)
Impulse control disorder	**0.001***** (0.0002)	-0.0001 (0.0002)
Panic disorder	**0.002***** (0.0002)	0.0008 (0.0008)
Phobias	**0.001***** (0.0003)	-0.0003 (0.0006)
Eating disorder	**0.001**** (0.0004)	-0.0004 (0.0007)
Post-Traumatic Stress Disorder (PTSD)	0.0009 (0.0006)	-0.0013 (0.0010)
Other psychotic disorders	**0.001**** (0.0002)	-0.0018 (0.0003)

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[53] Ran regressions with robust standard errors.

[54] Controls include: gender, age, being unemployed, having rent debt and ethnicity, drinking alcohol 4+ times per week, and knowing someone who gambled frequently in their life before the age of 18.

PGSI Questionnaire and Mental Health: regression analysis detail

Each question from the PGSI questionnaire was coded as a dummy variable where the response "never" is equal to 0 and any other response is equal to 1. The PGSI questions that affect mental health categories are (i) betting more than you can afford to lose, (ii) gambling causing stress/anxiety, and (iii) feeling guilty about gambling. All these questions relate to financial harms or personal feelings relating to gambling. Note that only questions that were statistically significant are included.

Table 25. PGSI questionnaire questions and mental health score linear probability model regressions

Outcome Variable		PGSI Questions	
		With PGSI Q6 (1)	**Without PGSI Q6 (2)**
		Coef.	**Coef.**
K10 Scores[55]	**Q1** *Betting more than you can afford to lose*	**2.31*** (0.341)	**2.73*** (0.341)
	Q2 *Betting with larger amounts of money for excitement*	**0.64*** (0.369)	**1.09*** (0.372)
	Q3 *Try to win back money lost*	**0.66*** (0.462)	**0.82*** (0.231)
	Q4 *Borrowing or sold anything to gamble*	**0.786*** (0.462)	**1.28*** (0.462)
	Q6 *Gambling causing stress/anxiety*	**3.59*** (0.378)	-
	Q7 *Had people criticise your gambling or tell you that you have a problem*	**0.66**** (0.453)	**0.87*** (0.332)
	Q8 *Gambling caused financial problems*	**1.05**** (0.454)	**1.78*** (0.448)
	Q9 *Feeling guilty about gambling*	**2.28*** (0.241)	**2.66*** (0.239)
WEMWBS Scores[56]	**Q1** *Betting more than you can afford to lose*	**-2.65*** (0.587)	**-3.11*** (0.578)
	Q3 *Try to win back money lost*	**-0.91**** (0.420)	**-1.12*** (0.435)
	Q6 *Gambling causing stress/anxiety*	**-4.49*** (0.658)	-
	Q9 *Feeling guilty about gambling*	**-1.95*** (0.419)	**-2.31*** (0.438)

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[55] Waves one and two only
[56] Wave three only

Table 26. PGSI questionnaire questions and mental health diagnosis linear probability regression model

		PGSI Question	
Outcome Variable		*With PGSI Q6*	*Without PGSI Q6*
		Coef.	**Coef.**
Having a diagnosed mental health issue[57]	**Q1** *Betting more than you can afford to lose*	**0.05**** (0.023)	**0.06**** (0.023)
	Q6 *Gambling causing stress/anxiety*	**0.08***** (0.028)	-

Impact of Gambling Reasons and Mental Health on PGSI scores

Previous evidence has suggested that gambling reasons paired with specific mental health issues can affect gambling severity, including (i) boredom and depression and (ii) anxiety and fear of missing out (Blaszczynski and Nower, 2002). Evidence has also suggested that gambling for older individuals can have positive effects if it is for socialising or mental stimulation (Alberghetti and Collins, 2015). To test these hypotheses, we ran regressions with interactions which involved multiplying two variables of interest to see their combined effect on PGSI scores. In total we ran four regressions to test (i) gambling due to boredom and depression, (ii) gambling due to a fear of missing wins and anxiety, (iii) gambling for fun and age, and (iv) gambling to socialise and age.

Age interacted with both (i) gambling for fun and (ii) gambling to be social were both highly significant and negative, indicating that gambling for these reasons and getting older decreases PGSI scores. This aligns with the literature that gambling for positive reasons could be beneficial for older adults. Older adult is an important distinction, as gambling for these reasons on their own has a positive effect on PGSI scores, indicating that gambling for fun or for social reasons and being younger could still result in gambling harms.

Table 27. Gambling reasons linear regressions: gambling for fun and age

Outcome variable: *Gambling Severity (PGSI Score)*

	Coef.	Std. Err.
Gambling to have fun	**2.44*****	0.116
Age	**-0.02*****	0.001
Fun x Age	**-0.03*****	0.002

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[57] Wave three only. Note that this comes from the inverse of the YouGov profile mental health question where individuals say they don't have a mental health diagnosis, for consistency of other regressions.

Table 28. Gambling reasons linear regressions: gambling to be social and age

Gambling Severity (PGSI Score)

	Coef.	Std. Err.
Gambling to be social	**4.86*****	0.178
Age	**-0.02*****	0.001
Social x Age	**-0.07*****	0.003

Table 29. Gambling reasons linear regressions: boredom and depression[58]

Gambling Severity (PGSI Score)

	Coef.[59]	Std. Err.
Gambling due to Boredom	**1.64*****	0.145
Depression	-0.09	0.086
Boredom x Depression	0.42*	0.431

Note: Controls include gender, age, ethnicity, being unemployed, sexuality, belonging to the armed forces, being in the bottom 30% IMD, having rent debt, knowing someone who gambled frequently before 18, and drinking 4+ times per week

Table 30. Gambling reasons linear regressions: missing out on winning and anxiety[60]

Gambling Severity (PGSI Score)

	Coef.[61]	Std. Err.
Worry about not winning if I don't play	**1.18*****	0.136
Anxiety	0.10	0.14
Worry x Anxiety	0.30	0.497

Note: controls include gender, age, ethnicity, being unemployed, sexuality, belonging to the armed forces, being in the bottom 30% IMD, having rent debt, knowing someone who gambled frequently before 18, and drinking 4+ times per week

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[58] Wave three only

[59] Ran regressions with standard errors

[60] Wave three only

[61] Regressions are ran with robust standard errors

Impact of gambling frequency and mental health on PGSI scores

Our results indicate that having ADHD and gambling everyday have a combined effect on PGSI scores which results in a higher effect than just ADHD alone or just gambling every day, though either can have their own effect.

Table 31. Gambling frequency linear regression: gambling frequency and having ADHD

Gambling Severity (PGSI Score)[62]

	Coef.	Std. Err.
Gambling Everyday	**2.02***	0.360
Having ADHD	**3.18***	0.582
Everyday x ADHD	**5.67***	3.215

Impact of gambling types and mental health on PGSI scores

The type of gambling that someone participates in and one's mental health has also been paired in the literature, specifically online gambling with stress and anxiety (Holkar and Lees, 2019). To further understand this relationship, we tested multiple types of online gambling, including (i) Online casino games, (ii) online poker, (iii) betting on dog/horse races online, (iv) betting on football online, (v) betting on other sports online, with interactions between both stress disorders and anxiety disorders. Of these models, none of the interactions were significant with either anxiety or stress disorders.

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[62] Wave three only

Random Forest and cluster analysis results

Table 32. Random Forest Variable Importance

Group Classification	Variables of Importance
PGSI 8+ vs PGSI 0	Age x No PTSD
	K10 Score^2
	K10 Score x No Affected Other Depression Harms
	K10 Score x No PTSD
	Age x No Affected Other Depression Harms
	Age x being White
PGSI 1+ vs PGSI 0	Age x being White
	K10 Score x gender
	K10 Score ^2
	Age x Being in a relationship
	Age x Non-Affected Other
	K10 Score
	Age^2

Table 33. Cluster Analysis Correlations

Group Classification	Correlation
PGSI 8+ vs PGSI 0	0.48
PGSI 1+ vs PGSI 0	0.46

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