

## SECONDARY DATA ANALYSIS REPORT

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# A HEALTH INEQUALITY EXAMINATION OF PROBLEM GAMBLING, SUBSTANCE ABUSE, MENTAL HEALTH, AND POVERTY IN THE UNITED KINGDOM; A SECONDARY ANALYSIS AND STAKEHOLDER INTERVIEWS

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## Abstract and Summary

**Purpose:** This project is focused on the social determinants of health associated with problem gambling and examined gambling-related disparities and the determinants of negative health outcomes. Social determinants include social class education, ethnic group, age, and sex (Elton-Marshall, et al., 2017). The main aims of the study were as follows:

Aim 1: In this study, we used the large data set to determine subpopulations who are experiencing social inequity (e.g., youth, older adults, women, Black people and other minority ethnic groups, and people with low income; see Elton-Marshall, et al., 2017) to determine how much they are impacted by gambling.

Aim 2: We tested the data as an interaction model to see if there are disparities in the impact of gambling by sociodemographic variables. The analysis included tests of the factorial structure of the Problem Gambling Severity Index (PGSI) across subpopulations (e.g., young vs. old, low-income vs. higher income, and Scotland vs England).

Aim 3: In addition, we conducted interviews with a small number of key stakeholders who were treatment providers or administrators of problem gambling services to discuss the research findings and to help us understand the data and develop a dissemination plan.

**Methodology:** This project consisted of a secondary analysis of the “Gambling in England and Scotland, 2016: Combined Data from the Health Survey for England and the Scottish Health Survey.” We concatenated the data from 2012, 2014, and 2016. This study is a secondary analysis of a large data set. The project incorporated a series of statistical analysis including logistic regression, multinomial regression, cluster analysis and confirmatory factor analysis and to explore the relationship between gambling and social and demographic variables.

**Results:** Based on our analysis combining the DSM and PGSI, about half a percent of the adults in England and Scotland met the threshold for a severe gambling problem. In terms of gambling behaviors, the most common games were national lottery tickets, scratch cards, and other lotteries. As expected, social and demographic variables were both significantly associated with problem gambling. Significant social and demographic risk factors for problem gambling include sex (male), age (being younger, 25 to 34), marital status (being single or never married), social class (manual and routine labour), ethnic /racial group (Black or other), and education (lower levels of education). In addition, being a heavy drinker, a current smoker and having a lower level of Wellbeing were also related to problem gambling. Although the results suggest that people in Scotland gamble somewhat more often especially on lotteries, **Country** (England vs. Scotland) was not associated with gambling problems. In terms of games played, according to the logistic regression, the largest association was for electronic gambling machines (EGMs), followed by Sports gambling and then online gambling. The interaction of games with sex is interesting suggesting that the male vs. female differences is smaller for EGMs and online gambling, but larger for sports gambling.

As Part of Aim 2, we tested the psychometric properties of the PGSI gambling inventory and found that the PGSI was a valid construct for measuring problem gambling in the United Kingdom (UK). Moreover, we found that the PGSI scale operated similarly for respondents from both England and Scotland, suggesting generalisability across the UK.

In terms of Aim 3, the key stakeholder interviews, most of the stakeholders felt that the reported frequencies were lower than they expected and questioned the accuracy of the prevalence estimates. Several stakeholders noted that some ethnic communities (Chinese, Muslims) were not adequately represented in the survey, and speculated that this was due to under reporting. Several

stakeholders also suggested that the prevalence of gambling problems among women who gamble may be higher than males who gamble, however analysis did not support this view. In terms of directions for future research, the stakeholders suggested the need to better understand the impact of trauma on gambling, the potential side effects of medication(s), and a more comprehensive examination of environmental factors during childhood that increase the risk of problem gambling during adulthood. Overall, the stakeholders felt that the results provide useful information but note that more research is needed to better understand gambling problems. Finally, several stakeholders believed that both government and industry should do more to help reduce problem gambling; however, one stakeholder cautioned that over regulation could backfire and push gamblers to non-regulated gambling sites.

**Conclusions:** The results of this research provide a detailed examination of the association between problem gambling and the social determinants of health in the UK. In summary, the key findings are that social and demographic risk factors for problem gambling include sex (male), age (being younger, 25 to 34), marital status (being single or never married), social class (manual and routine labour), ethnic /racial group (Black or other), education (lower levels of education), are significant factors in determining problem gambling. In addition, being a heavy drinker, a current smoker and having a lower level of Wellbeing, more psychological distress, and a greater rate of mental health problems, were also related to problem gambling. This knowledge will help to inform public health strategies in the UK related to the prevention and treatment of gambling disorders, as well as the prevention of gambling-related harm at the population level and for different groups (e.g., age groups, income groups, ethnic groups).

**Implications:**

1. Problem gamblers are more likely to have lower levels of education, were less likely to be in managerial work, and in terms of ethnic group were Black or other.
2. Problem gamblers are physically healthy, but have an elevated risk of mental health problems, have a poorer sense of well-being and are more likely to smoke or engage in heavy drinking.
3. The results found that country (England vs. Scotland) was not associated with differences in gambling problems, however, people in Scotland gamble somewhat more often especially on Lotteries.
4. In terms of Aim 2, the results suggest that the PGSI is a valid measure of gambling in the Great Britain and that it is equally valid for both England and Scotland.
5. Non-problem gamblers appear to be a relatively healthy population and had the best scores in terms of mental health and well-being, though the contrasts with non-gamblers were trivial.
6. Non-problem gamblers had a somewhat greater rate of smoking, heavy drinking and obesity compared to non-gamblers suggesting they may have more health problems eventually. Effort should be made to encourage more physical activity amongst recreational gamblers.

A health inequality examination of problem gambling, substance abuse, mental health, and poverty in the United Kingdom:  
A secondary analysis and stakeholder interviews

## **1.0 Purpose and significance**

**Purpose:** The purpose of this project was to conduct a secondary analysis by concatenating the National Health Surveys from England and Scotland (2012-2016) to examine the links between gambling-related disparities and the determinants of negative health outcomes related to sex, age, and ethnicity. The gambling industry in the United Kingdom (UK) is a mature market (Conolly, Davies, Fuller, Heinze, & Wardle, 2018), like local casinos, amusement arcades with fruit machines, lotteries, off-track betting offices, betting using smartphones, bingo halls, fixed odds bets at betting offices, and regulated internet gambling are among the wide variety of gambling opportunities available to consumers. The combined survey data provides a wealth of information about social status, Wellbeing, smoking, and alcohol consumption as well as gambling and gambling problems.

For this secondary analysis, we examined the frequency of gambling behaviours using a health disparities lens to determine sub-populations that may be experiencing social inequity (e.g., youth, older adults, women, minority and ethnic groups, and people with low income) and the extent they are impacted by gambling. The analysis using large data sets was backed up by key stakeholder interviews with treatment providers.

**Significance:** The data set upon which this project is based is a wealth of information about the relationship between health and problem gambling in the UK, as well as a detailed level of information about the relationship between social disadvantage and problem gambling. This research provides valuable information about the UK that will help guide the planning of the provision of treatment resources and prevention and harm reduction strategies in the UK.

## **1.1 Rationale and literature review**

Although there are few large casinos in the UK (Wainwright, 2015), the gambling market is “one of the most accessible gambling markets in the world” (Conolly et al., 2018, p. 5). Recent estimates show that 57% of the population of England, Scotland, and Wales, participate in some form of gambling activity (Conolly et al., 2018). The most popular gambling activity is lottery games which include the national lottery (41%), followed by scratch tickets (21%), and other lotteries (14%). After lotteries, the most popular games are betting on horse racing (9%), online betting with a bookmaker (8%), and slot machines (6%). Males (62%) are more likely to participate in gambling activities than females (52%). Conolly et al. (2018) also outlined other findings from the survey of gambling behaviour in Great Britain which combined data from the Health Survey for England (HSE) 2016, the Scottish Health Survey (SHeS) 2016 and the Wales Omnibus in 2016. While the report provided an overview of the frequency of gambling behaviors and the co-occurrence of gambling and health, across various strata of the population, there was no use of complex analysis methods to examine the interrelationships between these variables. Additional analysis of this data has focused on gambling amongst younger adults (Stark, Wardle, and Burdett, 2021) and mental and physical health as it is related to problem gambling and location of gambling (Taylor, Wardle, Stoker and Taylor, 2021). However, these reports did not examine health disparities related to age, ethnicity, and income.

This dataset has the potential to help us understand gambling from a public health perspective and remains largely untapped. There is currently a lack of studies focused on the relationships between problem gambling and the social determinants of health (Elton-Marshall et al., 2017; World Health Organization, 2010). This project leveraged the richness of the data to examine the general health effects of gambling, and the potential disparities in the consequences of gambling by socioeconomic

status (SES) and race/ethnicity. This research provides a framework for understanding the negative health outcomes associated with gambling disorders in the UK. As elucidated by Elton-Marshall et al. (2017), there are large gaps in our understanding of how social structural factors such as social-economic status, age, ethnicity, and sex interact with gambling problems. In this project, we examined the nature of the interrelationship between gambling, health, mental health, substance use and poverty and how gambling contributes to or exacerbates the problems of people in vulnerable populations such as youth, older adults, women, Black people and other ethnic minorities, and low-income communities. The survey data provides us with a unique opportunity to determine the link between social disparities and problem gambling in the population of England and Scotland.

This project examined the interrelationship between gambling and health outcomes based on the social determinants of the health model (Elton-Marshall et al., 2017; World Health Organization, 2010) and estimated gambling-related health disparities through the following aims:

Aim 1: The primary focus of this project examined the large data set using a health disparities lens to determine subpopulations who are experiencing social inequity (e.g., older adults, women, Black people and other minority ethnic groups, low income, lower levels of education) to determine how they are impacted by gambling.

Aim 2: As part of these analyses these data allowed us to test the factorial structure across subpopulations (Scotland vs. England; male vs. female; age groups).

Aim 3: In addition, to support our dissemination efforts, we will conduct interviews with key stakeholders such as treatment providers and administrators of problem gambling services to discuss the research findings.

## **1.2 Methodology**

This secondary analysis used combined data from 2012, 2014, and 2016 “Health Survey for England and the Scottish Health Survey” with a total sample of approximately 32,000. This large nationally representative sample of England and Scotland provides a comprehensive picture of the gambling market in England and Scotland as well as the potential for examining trends over time from the 2012 survey to the 2016 survey.

### **Methods**

*The data for this study was taken from the National Health Surveys from England and Scotland (2012, 2014, and 2016). The data from the three surveys was combined. Each of these annual datasets draws on cross-sectional studies, based on nationally representative samples of people in private households in England and Scotland, respectively. Variables that were consistent across the English and Scottish datasets, were included in the combined dataset. New weights to reflect the distribution of the population in the combined geographic region were generated for the combined dataset.*

### **Participants**

The total sample for the current study (n=32,105) was restricted to adult respondents who completed gambling-related questions in the 2012, 2014 or 2016 Household Surveys for England or Scotland. The descriptive statistics for the sample are given in Table 2.01. There was a slightly higher proportion of females (51.1%) than males (48.9%) in the sample. Respondents were well represented across different aged categories, while most respondents were either married or living in a civil partnership (62.4%), were White (88%), and approximately 40% reported participation in some higher-level education or degree program.

## Measures

The data includes measures of the gambling behavior over a wide range of gambling activities including lotteries, bingo, race-track bettering, betting with a bookmaker online, fruit or slot machines, and casino gambling.

Physical Health was measured using questions on 13 health complaints which were answered yes (1) or no (0). In addition questions were included that asked the participants about obesity (Body mass index > 30), high blood pressure, and diabetes. These were also scored as yes (1) or no (0). Mental health was measured with one yes or no question for Mental Disorder, as well as the General Health Questionnaire or GHQ (Goldberg & Williams (1988) and Wellbeing (Tennant, et al., 2007). Mental Wellbeing, measured with the Warwick-Edinburgh Wellbeing Scale (WEMWBS), which is a 14-item scale that measures mental well-being focusing entirely on positive aspects of mental health. The items answered on a 5-point scale from “none of the time” (1) to “all of the time” (5). The answers are added together for a range of from 14 to 70. Previous studies have shown that the WEMWBS has good internal consistency as shown by a Cronbach's alpha score of 0.91 for population samples (Tennant, et al., 2007). Psychological Distress was measured using the 12-item version of the General Health Questionnaire (Goldberg & Williams (1988). GHQ-12 was developed as a brief, paper and pencil assessment of psychological distress, and is indicative of common mental disorder (Stochl et al., 2016; Cuéllar-Flores et al., 2014; Cornelius, et al., 2013). Half of the items are reverse coded. Previous studies have found the GHQ to have a high alpha of 0.906 (Cornelius, et al., 2013). A cut off score of 20 for mental distress was used based on Cornelius, et al., (2013).

In addition, the survey included questions on smoking and alcohol. Smoking behaviour was scored in terms of never smoked, former smokers, and current smokers. We focused on the prevalence of current smokers. Drinking was scored in terms of non-drinkers, low risk, moderate risk, and high-risk drinkers. We focused on the prevalence high-risk drinking.

In addition, the survey contains two measures of gambling problems: the Problem Gambling Severity Index (Ferris & Wynne, 2001) and the DSM-IV (American Psychiatric Association, 1994, 2013). The Problem Gambling Severity Index (PGSI) is a widely validated measure that is part of the Canadian Problem Gambling Index (Ferris & Wynne, 2001). Items are scored on a 4-point scale from Never (0), sometimes (1), most of the time (2), to almost always (3). The PGSI traditionally groups participants into non-gamblers (0), low risk (1-2) moderate problems (3-7) and severe gambling problems (a score of 8 or higher). Non-gamblers were defined as those who scored 0 on the PGSI and reported no gambling behavior in the past year. The DSM-IV questions were included but were asked in terms of a 4-point scale similar to the PGSI, never (4), occasionally (3), fairly often (2), very often (1). For a DSM-IV diagnosis, a score of 1 or 2 was taken as positive indicate for each symptom for each item, and the number of symptoms was added up. A diagnosis of pathological gambler was a score of 5 or more (Note, current DSM-5 uses a cut off score of 4 out of 9 symptoms; American Psychiatric Association, 2013).

Demographics included sex, age, country (Scotland, England), marital status, ethnic group (Black, White, Asian, and other), Education (No qualifications, GCSE standard, A-level, Higher Education less than degree, and Degree or higher), and social class (Routine/manual occupation, Intermediate occupation, Professional occupation).

The primary focus of this project (Aim 1) examined the nature of the interrelationship between gambling levels of risk, health, mental health, and substance use, amongst groups who are experiencing social inequity (e.g., older adults, women, Black people and other minority ethnic groups, and people with low income). Using a health disparities lens, we identified disparities in problem gambling and gambling-related harms by education, income, and race/ethnicity, and how gambling problems contribute to mental health problems.

### **1.3 Analysis**

Analysis began with an examination of the distributions of the variables, frequencies, means, and cross tabulations.

### **1.4 Logistic Regression**

In addition, we used logistic regression to estimate whether the association between gambling problems sex, social class, education, age, ethnic group (Aim 1). For most analysis, the problem gambling group was the dependent variable. Analyses either contrast moderate to severe problem with all others or contrasted non-gamblers with non-problem gamblers. We conducted univariate and multivariate analyses of risk factors for problem gambling including game activities and social demographics. Multinomial logistic regression used the 5 groups; non-gambler, non-problem, low risk, moderate risk, and severe problem gambler as the dependent variable. Analyses were conducted to determine which variables were risk factors for problem gambling.

### **1.5 Cluster Analysis Statistical Analysis**

We conducted a preliminary exploration of the clusters in the data using cluster analysis to determine the nature of subpopulations in the data. Cluster analysis, rather than latent structure analysis was used because we were conducting an exploratory analysis of the data. The cluster analyses were performed including the following variables: gambling problem, smoking intensity, drinking frequency in the last year, and Wellbeing, to provide a detailed assessment of the types of profiles found among our sample of moderate to severe gamblers (N=287). These analyses used a listwise deletion that included drinking and smoking intensity which had more missing values, so the sample sizes were smaller than for the other analyses. For the cluster analysis we used Ward's method (Ward, 1963) of hierarchical cluster analysis. Second, to explore the relationship between cluster membership and the gamblers' sociodemographic characteristics,  $\chi^2$  for the following categorical variables: age, sex, ethnicity, education, socioeconomic status, and marital status. Additionally, multiple comparisons using Bonferroni correction were conducted. The same analysis was undertaken including both gamblers and non-gamblers (N=7741). We will redo these analyses after reducing the amount of missing values, and then follow up the analysis using latent class analyses.

### **1.6 Factor Analysis**

As part of this analysis, we used factor analysis (Aim 2) on the PGSI (Ferris & Wynne, 2001) to determine factorial invariance across regions (Scotland vs. England), and sex (male vs. female).

### **1.7 Stakeholder Interviews**

As noted above we conducted 10 key stakeholder interviews (Aim 3) with people who were service providers for problem gambling, or in the management of services for problem gambling in the UK. These interviews were recorded via Zoom and in one case the questions were sent by email and answered via email; these were conducted by the staff at Manchester University. The recorded interviews were approximately 45 mins to 60 mins long. They were conducted by OS who was also based in the UK over a 1-year period. Interviews stopped once data saturation was reached.

The interviews were transcribed verbatim by a transcription service. We contacted 12 treatment agencies and asked the managers by phone or email if we could arrange to interview a member of their staff to discuss the research and get their thoughts on dissemination of our findings. In total, we arranged interviews with 10 participants who are service providers for people with gambling problems in the UK. The stakeholder interviews were conducted using the Zoom software. We also contacted



several gambling corporations and tried to find someone who was willing to discuss our research. However, no one from the gambling industry agreed to participate in our study.

The consent form was sent to the person who had volunteered. When they read it and returned a signed copy to our team, we arranged a Zoom call and sent them the Zoom link. The person had 2 weeks to decide whether to participate and say yes or no. Also, during the interview, they were informed that they can end the interview at any time they wish and that all the information recorded will be discarded from the study.

During the interview, we described the research finding and ask the participants about gaps in knowledge as well as gaps in treatment and service provision to reduce the harm to individuals, families, and/or communities across the spectrum of gambling risk levels.

The key stakeholder's data were examined for recurring themes emerging from the data across multiple interviews. The interviews were specifically centred around the findings of the survey analysis and thus the analysis of interview data was also centred around the findings of the survey to help us guide interpretation and dissemination of the findings.

Privacy and security of data collection. We did not keep any of the contact information and any identifier was deleted once the interview has been completed. Thus, no personal information about the participant was retained, so that the participants data was essentially anonymous. The anonymized data was password protected when transferred between members of the research team in England, and Canada.

The key informant data was examined for recurring themes emerging from the data across multiple interviews. The interviews specifically centred around the findings of the survey analysis and thus the analysis of interview data also be centred around the findings of the survey to help us guide the interpretation and dissemination of the findings.

## Section 2

### 2.0 Sample description

The total analytic sample for the current study (n=32,105) was restricted to adult respondents who completed gambling-related questions in the 2012, 2014 or 2016 Household Surveys for England or Scotland. The descriptive statistics for sociodemographic and gambling-related risk factors are available in Table 2.01. The Sample included an over sampling of people from Scotland, such that 63.3% were from England, and 36.7% were from Scotland. After weighting, the demographic profile of England and Scotland, respondents in the weighted sample were predominately from England (91%; Park, 2020), with a slightly higher proportion of females (51.1%) than males (48.9%). Respondents were well represented across different aged categories, while most respondents were either married or living in a civil partnership (62.4%), were White (88%), and approximately 40% reported participation in some higher-level education or degree program. Social class, measured with the National Statistics socio-economic classification (NS-SEC), was distributed relatively evenly across the three classifications, and was most common for routine/manual occupations (38.4%) and for professional occupations (37%).

The descriptive statistics for gambling-related risk factors are also available in Table 2.01. Most respondents reported moderate weekly drinking behavior (64.9%), and 51.6% of respondents reported never smoking cigarettes in their lifetime. Mental Wellbeing, measured with the Warwick-Edinburgh Wellbeing Scale (WEMWBS), had a mean of 51 among respondents (standard deviation=8.7), a finding that is nearly identical with the findings from the WEMWBS UK validation study (Tennant, et al., 2007).

Table 2.01. Descriptive Statistics for Gambling Study, Household Survey for England, and Scotland (2012, 2014, 2016)

|                             | N      | % <sup>^</sup> | 95% CI     |
|-----------------------------|--------|----------------|------------|
| <i>Demographic Factors</i>  |        |                |            |
| Sex                         |        |                |            |
| Male                        | 14,257 | 48.9           | 48.3, 49.6 |
| Female                      | 17,848 | 51.1           | 50.4, 51.7 |
| Age                         |        |                |            |
| 16-24                       | 2,995  | 14.1           | 13.5, 14.7 |
| 25-34                       | 4,447  | 16.8           | 16.3, 17.4 |
| 35-44                       | 5,220  | 16.4           | 15.9, 16.9 |
| 45-54                       | 5,770  | 17.5           | 17.0, 18.0 |
| 55-64                       | 5,385  | 14.4           | 13.9, 14.8 |
| 65-74                       | 4,945  | 11.6           | 11.2, 12.0 |
| 75+                         | 3,383  | 9.2            | 8.9, 9.6   |
| Marital Status              |        |                |            |
| Single                      | 6,089  | 23.5           | 22.8, 24.1 |
| Married/civil partnership   | 20,609 | 62.4           | 61.7, 63.0 |
| Separated/divorced          | 3,102  | 8.4            | 8.1, 8.8   |
| Widowed                     | 2,306  | 5.7            | 5.5, 6.0   |
| Race/ethnicity <sup>†</sup> |        |                |            |

|                                   |        |            |            |
|-----------------------------------|--------|------------|------------|
| White                             | 22,135 | 88         | 87.5, 88.5 |
| Black                             | 523    | 2.8        | 2.6, 3.1   |
| Asian                             | 1,220  | 6.8        | 6.4, 7.2   |
| Other                             | 460    | 2.4        | 2.2, 2.7   |
| Education††                       |        |            |            |
| No qualifications                 | 5,576  | 18.3       | 17.8, 18.9 |
| GCSE standard                     | 6,960  | 24.1       | 23.5, 24.8 |
| A-level                           | 4,503  | 17.8       | 17.1, 18.2 |
| Higher Education less than degree | 3,191  | 11.1       | 10.7, 11.6 |
| Degree or higher                  | 7,869  | 28.7       | 28.1, 29.4 |
| Social Class                      |        |            |            |
| Routine/manual occupation         | 12,055 | 38.4       | 37.7, 39.1 |
| Intermediate occupation           | 7,448  | 24.6       | 24.0, 25.2 |
| Professional occupation           | 11,063 | 37         | 36.3, 37.6 |
| Country                           |        |            |            |
| England                           | 20,271 | 91         | 90.8, 91.2 |
| Scotland                          | 11,834 | 9          | 8.8, 9.2   |
| <i>Risk Factors</i>               |        |            |            |
| Weekly Drinking Behavior          |        |            |            |
| Non-drinker                       | 4,850  | 15.3       | 14.8, 15.8 |
| Moderate drinking                 | 20,540 | 64.9       | 64.3, 65.6 |
| Hazardous drinking                | 4,930  | 15.5       | 15.0, 16.0 |
| Harmful drinking                  | 1,338  | 4.3        | 4.0, 4.6   |
| Smoking Status                    |        |            |            |
| Never smoker                      | 15,758 | 51.6       | 50.9, 52.3 |
| Former smoker                     | 10,338 | 30.2       | 29.5, 30.8 |
| Current smoker                    | 5,947  | 18.2       | 17.7, 18.8 |
| Wellbeing (mean, SD)              | 28,966 | 51.0 (8.7) |            |

^Descriptive statistics were calculated using the survey weight for the gambling measures.

Respondents who didn't respond to the gambling items were excluded from the analytic sample

†Ethnicity variable was not available for Scotland in 2014 or 2016

††education variable was not available in Scotland in 2016

## 2.1 Prevalence of problem gambling in England and Scotland

- The Household Survey of England and Scotland includes two separate measures of problem gambling: the *Problem Gambling Severity Index* (PGSI) and the *Diagnostic and Statistical Manual of Mental Disorders, Problem Gambling Index, fourth edition* (DSM-IV). Table 2.02 provides an overview of the prevalence estimates for England and Scotland from 2012-2016. There was very little missingness for the two problem gambling measures (0.14% and 0.37% respectively), and the correlation between DSM-4 and the PGSI was .77,  $p < .001$ . The PGSI was categorized using the standard scoring method to (No problem = 0, low risk = 1 to 2, moderate problems = 3 to 7, severe problems = 8 or more; Ferris and Wynne, 2001), with 2.8% being classified as low-risk problem

gamblers (95% CI: 2.59%, 3.09%), 1.1% being classified as moderate risk problem gamblers (95% CI: 0.94%, 1.25%), and 0.5% being classified as high-risk problem gamblers (95% CI: 0.38%, 0.6%). For the DSM-IV problem gambling measure, we categorized respondents based on their scores with 1 to 2 scored as low risk (2.7%), 3 to 4 scored as moderate risk (0.34%), and 5 and above scored as severe risk (0.28%). A composite problem gambling measure was constructed based on respondents who met the threshold for the high/severe risk group for either problem gambling measure. Using this composite measure, 0.7% of adults in England and Scotland (95% CI: 0.58%, 0.84%) were classified as having a gambling problem between 2012-2016.

Table 2.03 shows a cross-tabulation of DSM and PGSI scores. Table 2.04 presents the number of problems by measure, as well as for a combination of problem gambling using a combination of PGSI and DSM. The combination is based on the maximum scores category on either PGSI or DSM. That is a person is classed as having a severe problem if their score is 5 or more on the DSM or 8 or more on the PGSI.

Table 2.02. Prevalence of problem gambling using PGSI and DSM problem gambling inventories, Household Survey England and Scotland (2012, 2014, 2016)

|                                                          | N      | %     | Lower<br>95% CI | Upper<br>95% CI |
|----------------------------------------------------------|--------|-------|-----------------|-----------------|
| <i>PGSI Categorical Problem Gambling†</i>                |        |       |                 |                 |
| non-problem gambler (0)                                  | 30,816 | 95.60 | 95.29           | 95.91           |
| low risk problem gambler (1 to 2)                        | 755    | 2.80  | 2.59            | 3.09            |
| moderate risk problem gambler (3 to 7)                   | 282    | 1.10  | 0.94            | 1.25            |
| high risk problem gambler (8 to 27)                      | 133    | 0.50  | 0.38            | 0.60            |
| <i>PGSI Dichotomous Problem Gambling</i>                 |        |       |                 |                 |
| Not a severe problem gambler (0 to 7)                    | 31,853 | 99.50 | 99.40           | 99.62           |
| Severe problem gambler (8 to 27)                         | 133    | 0.50  | 0.38            | 0.60            |
| <i>DSM-IV Problem Gambling Symptoms††</i>                |        |       |                 |                 |
| no problem gambling Symptoms                             | 31,172 | 96.70 | 96.48           | 97              |
| one problem gambling Symptoms                            | 622    | 2.30  | 2.10            | 2.53            |
| two problem gambling Symptoms                            | 103    | 0.40  | 0.28            | 0.45            |
| three problem gambling Symptoms                          | 49     | 0.20  | 0.13            | 0.29            |
| four problem gambling Symptoms                           | 33     | 0.12  | 0.08            | 0.18            |
| five or more problem gambling Symptoms                   | 81     | 0.28  | 0.21            | 0.37            |
| <i>Any Problem Gambling (either PGSI or DSM)<br/>†††</i> |        |       |                 |                 |
| no gambling problem                                      | 31906  | 99.30 | 99.16           | 99.41           |
| gambling problem                                         | 199    | 0.70  | 0.58            | 0.84            |

†Prevalence estimates were calculated using the PGSI-specific weight

†† Prevalence estimates for the were calculated using the DSM-specific weight

Table 2.03. Cross-tabulation of PGSI and DSM-IV problem gambling measures, Household Survey England, and Scotland (2012, 2014, 2016)

| PGSI categories       | PGSI<br>Score<br>ranges | DSM=0 | DSM=1 to 2 | DSM=3 to 4 | DSM=5+ |
|-----------------------|-------------------------|-------|------------|------------|--------|
| No Problem            | 0                       | 29988 | 540        | 13         | 4      |
| Low risk gambler      | 1 to 2                  | 731   | 163        | 5          | 0      |
| Moderate risk gambler | 3 to 7                  | 182   | 118        | 42         | 4      |
| Problem gambler       | 8 plus                  | 8     | 29         | 35         | 81     |

Table 2.04: PGSI and DSM-IV and the maximum category of either PGSI or DSM-IV problem gambling measures, Household Survey England, and Scotland (2012, 2014, 2016)

|                             | DSM    |       |      | PGSI   |       |      | Combined (max) |      |
|-----------------------------|--------|-------|------|--------|-------|------|----------------|------|
| No Problem                  | 0      | 31013 | 96.6 | 0      | 30587 | 95.3 | 30136          | 93.9 |
| Low risk gambler            | 1 to 2 | 854   | 2.7  | 1 to 2 | 904   | 2.8  | 1443           | 4.5  |
| Moderate risk gambler       | 3 to 4 | 100   | 0.3  | 3 to 7 | 347   | 1.1  | 366            | 1.1  |
| Problem gambler /Disordered | 5 plus | 88    | 0.3  | 8 plus | 152   | 0.5  | 160            | 0.5  |
| Missing                     |        | 49    | 0.2  | .      | 114   | 0.4  |                |      |
| Total                       |        |       |      |        |       |      | 32106          |      |

Note: combined uses the largest category for each person based on DSM or PGSI.

## Section 3

### 3.0 Gambling activities

Gambling behavior was common as 60.0% of respondents reported participating in some form of gambling during the past 12-months prior to their interview between 2012-2016 (see Table 3.01). The most common types of gambling were National Lottery Tickets (46.5%), followed by scratch card lotteries (20.8%), and other lotteries 14.5%. In total, 43.1% reported participating in some non-lottery game with the most common being horse race betting (10.6%), followed by Slot machine or Fruit machine games (7.1%) and casino bookmaker (6.9%). In terms of online gambling 3.5% reported gambling online. The number of games played is highly skewed with 40.0% reporting no gambling, and 49.8% reporting 3 or fewer games played. On average people reported playing 1.4 games (1.9).

Table 3.02 provides a summary of the number of different games respondents reported playing during the past 12-months. The most frequent response option was zero, reflecting respondents who did not report any gambling behavior during the past 12-months. Among those who reported past year gambling, the most frequent response option was one game, and only 1.8% of respondents surveyed between 2012-2016 in England and Scotland reported playing five or more types of different gambling games in the last 12-months.

Table 3.03 provides a summary of the correlations between each type of severe problem gambling (vs. all others) and moderate to severe problem gambling (vs. all others). We then computed the ordinal correlations (Kendal Tau) of these games with problem gambling. In this table, for problem gambling, we show the correlations for the severe problems (compared to all others  $N = 32,105$ ) and for moderate to severe problem (compared to all others). As shown in Table 3.03 many games are associated with problems with the largest correlations being for virtual gaming at a bookmaker,  $r = .27$ , followed by online gambling,  $r = .24$ , Sporting events,  $r = .20$ , and other events,  $r = .20$ . We also included a correlation with the number of gambling activities in total, which produced a stronger correlation than any of the specific gambling games.

Table 3.01. Frequency of play on different types of gambling during the past 12-months, Household Survey England, and Scotland (2012, 2014, 2016).

| Game Type                        | %     |
|----------------------------------|-------|
| Tickets national lottery         | 46.5% |
| Scratch cards                    | 20.8% |
| Other lottery, including charity | 14.5% |
| Horse races                      | 10.6% |
| Fruit or slot machines           | 7.1%  |
| Online Book Maker                | 6.9%  |
| Bingo                            | 5.6%  |
| Sporting events                  | 5.3%  |
| Private betting                  | 5.0%  |
| Football pools                   | 2.9%  |
| Online gambling                  | 3.5%  |
| Table games (casino)             | 3.5%  |
| Virtual gaming at bookmakers     | 3.2%  |
| Dog races                        | 2.6%  |
| Another form of gambling         | 1.6%  |

|                                        |       |
|----------------------------------------|-------|
| Other events                           | 1.3%  |
| Playing poker at pub/tournament/league | 1.1%  |
| Betting exchange                       | 1.1%  |
| Spread betting                         | 0.6%  |
| Any past 12-month gambling             | 60.0% |

Note: Percentages calculated using weights calibrated for those who responded to PGSI or DSM gambling items

Table 3.02. Number of different types of gambling during the past 12-months, Household Survey England and Scotland (2012, 2014, 2016) (N = 32,105)

| Number of Games played | %     |
|------------------------|-------|
| 0                      | 38.4% |
| 1                      | 26.2% |
| 2                      | 17.3% |
| 3                      | 8.5%  |
| 4                      | 4.2%  |
| 5                      | 2.2%  |
| 6 or more              | 3.3%  |

Note: Percentages calculated using weights calibrated for those who responded to PGSI or DSM gambling items

People who gamble played anywhere from 1 to 19 of these games (see Table 3.04). The average number of gambles played (excluding those who reported not playing any game) was 2.36 (SD = 1.97). with a skew of 2.94 and a kurtosis of 13.00. As shown in Table 3.05, non-problem gamblers reported participating in only 2.1 games, whereas severe problem gamblers reported participating in 7.1 games on average. We conducted an analysis of the number of gambling activities by levels of gambling problems. For the level of problem gambling, we used the maximum category of either the DSM-4 or PGSI. The means and standard deviations for each group are given in Table 3.05. Not surprisingly there was a significant correlation between gambling problems and number of games played,  $\rho = .30$ ,  $p < .001$ .

Table 3.04

Games played and gambling problems.

| Games played | No-problem | Low | Medium | Severe |
|--------------|------------|-----|--------|--------|
| 0            | 12852      | 0   | 0      | 0      |
| 1            | 7638       | 325 | 19     | 16     |
| 2            | 4945       | 309 | 53     | 10     |
| 3            | 2395       | 204 | 48     | 13     |
| 4            | 1125       | 159 | 61     | 18     |
| 5            | 558        | 114 | 26     | 18     |
| 6            | 262        | 79  | 42     | 14     |
| 7            | 136        | 61  | 29     | 8      |
| 8            | 74         | 77  | 26     | 16     |
| 9            | 63         | 34  | 12     | 8      |
| 10           | 37         | 20  | 11     | 5      |
| 11           | 9          | 23  | 10     | 9      |
| 12           | 17         | 12  | 9      | 3      |
| 13           | 9          | 5   | 4      | 5      |
| 14           | 3          | 5   | 4      | 1      |
| 15           | 2          | 5   | 3      | 6      |
| 16           | 2          | 10  | 1      | 1      |



|    |   |   |   |   |
|----|---|---|---|---|
| 17 | 2 | 0 | 1 | 3 |
| 18 | 6 | 0 | 5 | 1 |
| 19 | 1 | 0 | 0 | 7 |

Table 3.05. Mean and log 10 mean numbers of games played by problem gambling severity group.

| Mean number of games played |       |      |      |
|-----------------------------|-------|------|------|
| Problem Group               | N     | Mean | SD   |
| No problem                  | 17283 | 2.12 | 1.55 |
| Low risk                    | 1443  | 3.86 | 3.02 |
| Medium risk                 | 366   | 5.56 | 3.58 |
| Severe problems             | 160   | 7.14 | 4.84 |

Note: only people who played at least 1 game were included in these means.

Given the large number of games and the low frequency of many of these games reported, we consolidated the list of games into a smaller set of types of games that were conceptually related, to examine which games were most strongly associated with problem gambling. Bingo was grouped by itself; poker and table games were grouped as table games. Fruit machines and virtual gaming at a bookmaker were grouped into EGMs (electronic gambling machines). National Lottery, scratch cards, and other lottery were grouped into "Lotteries". Online gambling, gambling at a betting exchange, and gambling at an online bookmaker were grouped into "Online" gambling. Private betting and other gambling were grouped into "Other" games. Football, horse races, dog races, sports, other events, spread betting, and bookmakers were grouped into "Sports". In each case, if the person endorsed any of these games, they were scored a 1, and 0 if they endorse none of them. Note that bookmaking and spread betting were included in both online gambling and sports gambling.

Table 3.06 lists the frequency of the games based on these groups and it is substantially easier to interpret than the full list of 19 games. All the games were significantly associated with problem gambling except for lotteries. Table 3.06 also indicates the odds of problem gambler groups, playing each of the games (with the game as the criterion variable) and non-problem as the reference group. correlations of each game type with severe (vs all others) and moderate to severe (vs all others). The largest odds ratios were for EGMs,  $OR = r = 4.37$ ,  $p < .001$ , followed by Online gambling  $OR = 3.20$ ,  $p < .001$ , and Casino gambling,  $r = 2.07$ ,  $p < .001$ . Not surprising lotteries were both the most frequently endorsed type of gambling but also had the lowest odds for problem gambling. In the second analysis contrasting severe with all other participants, the results were similar, but Casino and Online gambling swapped places in terms of the size of the effect. The Nagelkerke R Square for these analyses was .24 and .23 respectively.

Table 3.06. Frequency of game groups and odds ratios for participation for moderate to severe compared to low risk and non-problem gamblers as well as the odds ratios of severe problem gamblers vs all others (N = 18671).

|         |       | Moderate to severe |       |       | Severe only |      |       |       |     |
|---------|-------|--------------------|-------|-------|-------------|------|-------|-------|-----|
|         |       | OR                 | Lower | Upper |             | OR   | Lower | Upper |     |
| Lottery | 53.9% | 0.79               | 0.61  | 1.02  |             | 0.70 | 0.45  | 1.09  |     |
| Sports  | 17.6% | 1.75               | 1.37  | 2.23  | ***         | 1.86 | 1.19  | 2.90  | **  |
| Online  | 8.9%  | 3.20               | 2.53  | 4.07  | ***         | 2.11 | 1.38  | 3.22  | *** |

|        |      |      |      |      |     |      |      |      |     |
|--------|------|------|------|------|-----|------|------|------|-----|
| EGM    | 8.4% | 4.37 | 3.51 | 5.43 | *** | 5.16 | 3.40 | 7.84 | *** |
| Bingo  | 5.6% | 1.42 | 1.10 | 1.82 | **  | 1.99 | 1.35 | 2.95 | *** |
| Casino | 4.0% | 2.07 | 1.63 | 2.64 | *** | 3.20 | 2.13 | 4.80 | *** |
| Other  | 6.0% | 1.56 | 1.24 | 1.97 | *** | 1.42 | 0.95 | 2.12 |     |

---

Note: The non-problem / low risk group is the reference category for the analysis of moderate to severe. For the analysis of severe only, the reference group was non-problem / low risk / moderate gamblers. Non-gamblers were excluded from this analysis.

### **3.2 National differences: England vs. Scotland**

We next turned to contrast the gambling data from England and Scotland. Table 3.07 displays the participation rates of these games by country. We conducted binominal regression of game participation on country (England vs. Scotland) with country as the criterion variables to see if these game participation rates differed significantly. Overall participation rates are slightly higher in Scotland for participation in lotteries (OR = 1.27) Bingo (OR = 1.24), Casinos (OR = 1.2) and Sports (OR = 1.14), but lower for other types of gambling (OR = 0.72). These differences are significant, but very small (See table 3.07) suggesting that there are no meaningful differences between the countries in terms of games played. There was no significant difference between England and Scotland in terms of levels of problem gambling either in terms of the 4 categories of severity or in terms of moderate to severe problem gambling (OR = 1.07, ns).

We also entered the country (Scotland vs. England) into the logistic regression model with the types of games to test the association of the country on moderate to severe problem gambling. The country variable was not significant, suggesting that engagement in a given type of gambling activity is a better predictor of gambling problems than country. In addition, we then tested interactions for each of the game types with the country. None of the interactions reached significance indicating that the risk of gambling problems related to these games was not statistically different in England and Scotland.

Table 3.07

Participation rates of each type of gambling by Country.

|         | England | Scotland |     |
|---------|---------|----------|-----|
| Lottery | 53.3%   | 59.7%    | *** |
| Sports  | 17.3%   | 20.8%    | *   |
| Online  | 8.7%    | 10.9%    |     |
| EGM     | 8.2%    | 10.0%    |     |
| Bingo   | 5.5%    | 7.2%     | **  |
| Casino  | 3.8%    | 5.0%     | *   |
| Other   | 6.0%    | 5.4%     | *** |

Note: Significance was tested using logistic regression with country as the dependant variable.

### 3.3 Survey's Waves

The data was collected in three waves, 2012, 2014, and 2016. We used logistic regression to test for differences in the number of moderate to severe problem gambling was related to the wave of the study or the country. There was no effect of wave, no effect of country or interaction between them.

On the other hand, survey wave did have significant effects on the number of games played. Given the large skew of games played we simply tested the number of people who reported playing at least one game. Using gambling participation as the criterion variables, we tested if wave and country were significantly related to playing at least one game. Compared to 2016, somewhat more people reported gambling in 2012 (OR = 1.4,  $p < .001$ ) and in 2014 (OR = 1.2,  $p < .001$ ). In addition, we entered country into the equation and the Scottish reported playing at least one game, somewhat more often than the English participants (OR = 1.4,  $p < .001$ ). We also tested the for possible interactions between country and wave and found no significant interaction. These are small effects. The total Nagelkerke R-square was .007.

Table 3.08

Survey wave and country differences in gambling participation rates.

| Survey Wave | England |       | Scotland |       |
|-------------|---------|-------|----------|-------|
| Raw Means   | N       | %     | N        | %     |
| 2012        | 9928    | 62.5% | 986      | 68.5% |
| 2014        | 9924    | 60.4% | 977      | 65.2% |
| 2016        | 9369    | 55.0% | 920      | 63.5% |

We also examined wave and country differences in sense of Wellbeing. Country,  $F(1, 27688) = 70.9$ ,  $p < .001$ , and Wave,  $F(2, 27688) = 26.5$ , were significant, and there was a significant interaction  $F(2, 27688) = 17.5$ ,  $p < .001$ . People in Scotland reported lower levels of Wellbeing in 2012 and as shown in Table 3.09 scores on Wellbeing in England decreased from wave 1 to wave 3 and by wave 3 there was no difference. The decreases from 2012 to 2016 was a small effect size,  $d = .28$ , and from 2014 to 2016 was a moderately small effect size,  $d = .39$ . The differences between England and Scotland in 2012, 2014 and 2016 were small ( $d = .29$ ,  $d = .20$  and  $d = .06$ , respectively).

Table 3.09

Survey wave and country differences in sense of Wellbeing

| Survey Wave | England |      |     | Scotland |      |     |
|-------------|---------|------|-----|----------|------|-----|
|             | N       | Mean | SD  | N        | Mean | SD  |
| 2012        | 6045    | 52.6 | 8.8 | 967      | 50.0 | 8.4 |
| 2014        | 9648    | 51.6 | 8.5 | 951      | 49.9 | 8.5 |
| 2016        | 9170    | 49.2 | 8.7 | 908      | 49.7 | 8.6 |

Game play varied somewhat across the three waves of the study. As shown in Table 3.10 Lottery participation showed a linear decrease from 2012 to 2016,  $X^2(1) = 143.1$ ,  $p < .001$ . Online gambling increased from 7.3% in 2012 to 9.8% in 2014 and then stayed the same at 9.7% in 2016,  $X^2(1) = 38.2$ ,  $p < .001$ . Sports, other games, Bingo, and EMG gambling also increased from 2012 to 2014, but decreased again in 2016.

Table 3.10

Game participation rates

|         | 2012  | 2014  | 2016  | Total |     |
|---------|-------|-------|-------|-------|-----|
| Lottery | 57.5% | 54.6% | 49.3% | 53.9% | *** |
| Bingo   | 5.6%  | 6.1%  | 5.2%  | 5.6%  | *   |
| Casino  | 4.0%  | 4.2%  | 3.7%  | 4.0%  |     |
| EGM     | 8.6%  | 8.8%  | 7.8%  | 8.4%  | *   |
| Online  | 7.3%  | 9.8%  | 9.7%  | 8.9%  | *** |
| Sports  | 16.9% | 18.4% | 17.4% | 17.6% | *   |
| Other   | 6.3%  | 6.5%  | 5.0%  | 6.0%  | *** |

As shown in Table 3.11, an analysis of the GHQ measure of psychological distress did not show any significant differences between waves or countries.

Table 3.11

Psychological distress (GHQ) comparing 2012 to 2016, in Scotland and England.

| Wave | England |      |      | Scotland |      |      |
|------|---------|------|------|----------|------|------|
|      | Mean    | N    | SD   | Mean     | N    | SD   |
| 2012 | 9928    | 1.18 | 3.18 | 986      | 1.24 | 2.97 |
| 2016 | 9369    | 1.49 | 3.22 | 920      | 1.38 | 2.91 |

### 3.4 Sex differences

In the data set, 49.0% of the sample was male, and 51% of the sample was female. As shown in Table 3.12, There were no missing values for sex and no other categories were listed. Males were significantly more likely to engage in all forms of gambling except for Bingo which was significantly more common for females. Table 3.13 provides a breakdown of the prevalence of moderate to severe problem gambling in by game type for males and females. As shown in the table, in all games, the prevalence of moderate to severe problem gambling is higher for males than for females. The highest rate of moderate to severe problem gambling was for casino gambling.

Table 3.12. Game participation by sex.

|         | Male  | Female |     |
|---------|-------|--------|-----|
| Bingo   | 3.7%  | 7.5%   | *** |
| Casino  | 6.4%  | 1.6%   | *** |
| EGMs    | 11.8% | 5.1%   | *** |
| Lottery | 56.8% | 51.1%  | *** |
| Online  | 13.8% | 4.3%   | *** |
| Other   | 9.3%  | 2.7%   | *** |
| Sports  | 24.0% | 11.4%  | *** |

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

Table 3.13. Moderate to severe problem gambling by sex

|         | Full Sample |      | Males |      | Females |      |
|---------|-------------|------|-------|------|---------|------|
|         | N           | % PG | N     | % PG | N       | % PG |
| Lottery | 17282       | 0.8  | 8914  | 1.3  | 8368    | 0.2  |
| Bingo   | 1774        | 5.9  | 567   | 12.1 | 1207    | 3.0  |
| Casino  | 1248        | 14.5 | 989   | 16.5 | 259     | 7.0  |
| EGM     | 2651        | 11.4 | 1827  | 13.5 | 824     | 6.8  |
| On-line | 2821        | 10.7 | 2137  | 12.1 | 683     | 6.6  |
| Sports  | 5568        | 6.3  | 3739  | 8.6  | 1830    | 1.8  |
| Other   | 1883        | 9.6  | 1443  | 12.2 | 440     | 4.2  |

We then examined whether sex was associated with moderate to severe gambling problems and whether sex interacted with game type. As shown in Table 3.14, females were significantly less likely to have a moderate to severe problem gambling than males (OR = 0.38). In addition, three of the games showed significant interactions with sex, EGMs (OR = 2.15), online (OR = 2.18), and sports (OR = 0.28). In the case of EGMs and online gambling, the difference in the relationship between these games and problem gambling was smaller for these variables than with other games. That is male and female scores on these games were more similar. In contrast, for sports betting, males were much more likely to play sports problematically than females.

Table 3.14

Logistic regression of gambling types and sex on moderate to severe problem gambling.

|                       | Wald    | OR    |     |
|-----------------------|---------|-------|-----|
| Bingo                 | 8.382   | 1.610 | **  |
| Casino                | 21.238  | 1.872 | *** |
| EGM                   | 101.243 | 3.577 | *** |
| Lottery               | 7.490   | 1.486 | **  |
| Online                | 40.375  | 2.394 | *** |
| Other                 | 10.984  | 1.540 | *** |
| Sports                | 52.735  | 3.082 | *** |
| Sex(female)           | 12.386  | 0.378 | *** |
| Bingo by sex (female) | 0.003   | 0.982 |     |

|                         |        |       |     |
|-------------------------|--------|-------|-----|
| Casino by sex (female)  | 1.423  | 1.515 |     |
| EGM by sex (female)     | 6.879  | 2.147 | **  |
| Lottery by sex (female) | 0.340  | 1.202 |     |
| Online by sex (female)  | 6.564  | 2.179 | **  |
| Other by sex (female)   | 0.485  | 1.262 |     |
| Sports by sex (female)  | 17.117 | 0.281 | *** |

Note: Weighted data

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

## Section 4

**4.0 Comparisons of non-gamblers, non-problem gamblers, and problem gamblers.** To address Aim 1, we explored the differences between non gamblers, non-problem gamblers, and problem gamblers. This will allow us to determine if gambling is inherently problematic. In addition, we determined if health consequences increase with the severity of problem gambling.

First, we conducted an analysis comparing non-gamblers with non-problem gamblers which we defined as those who score 0 on both the DSM-4 and the PGSI. Of the people who did not have any gambling problems 57.4% of the sample were non-problem gamblers and 42.6% were non-gamblers. A somewhat higher percentage of people in Scotland 63.8% engaged in gambling compared to England 56.7%,  $X^2 = 51.1$ ,  $p < .001$ . In addition, the rate of gambling was lower among females than male (54.4% vs. 60.6%)  $X^2 = 118.7$ ,  $p < .001$ . The lowest rate of gambling was among people 65 or older (52.1%) and those 16 and 24 (45.3%). For the rest of the age groups 60% or more participated in some form of gambling, and the highest rate of non-problem gambling was for people 35 to 44 (63.0%),  $X^2 = 98.6$ ,  $p < .001$ . In terms of marital status, the rate of non-problem gambling was lower for people who are single (48.4%) and those widowed (47.4%) and higher for people who are married (61.3%),  $X^2 = 409.1$ ,  $p < .001$ . The marital differences maybe be due to the age differences in that non-gamblers were more likely to be older or younger compared to non-problem gamblers.

### 4.1 Social and health consequences of gambling and problem gambling

In this section we examined the association between social and health variables and moderate to severe problem gambling to determine the social and health consequences of problem gambling. In addition, we examined difference between non-gamblers with non-problem gamblers to determine if there were any social or health consequences associated with non-problem gambling.

In Table 4.01 we present the relationship between education and moderate to severe problem gambling. The lowest rate of moderate to severe problem gamblers was among people with a degree or professional degree, 1.1%,  $X^2 (4, 30762) = 30.3$ ,  $p < .001$ .

Table 4.01. Education status comparing Non-Problem & Low Risk vs. Moderate to Severe problem (N and percentage).

|                                 | no qual       | GCSE<br>standard | A-level       | Higher ed <<br>degree | degree or<br>Higher |
|---------------------------------|---------------|------------------|---------------|-----------------------|---------------------|
| No problem to low risk          | 5537<br>98.1% | 7290<br>98.1%    | 5342<br>98.3% | 3347<br>97.8%         | 8736<br>98.9%       |
| Moderate and severe<br>problems | 106<br>1.9%   | 139<br>1.9%      | 94<br>1.7%    | 77<br>2.2%            | 94<br>1.1%          |

As shown in Table 4.02 there were also some educational differences with between non-gamblers and non-problem gamblers,  $X^2(4) = 191.8$ ,  $p < .001$ . Non-gamblers were more likely than non-problem gamblers to be at either end of the spectrum: more likely to have no qualification and more likely to have a degree or professional qualifications. Non-problem gamblers were more likely to have GCSE standards or A-level.

Table 4.02. Educational attainment of non-gamblers and non-problem gamblers: count and percentage.

|                       | No Qual       | GCSE<br>Standard | A-Level       | Higher Ed <<br>Degree | Degree or<br>Higher |
|-----------------------|---------------|------------------|---------------|-----------------------|---------------------|
| Non-Gamblers          | 2534<br>47.6% | 2711<br>39.1%    | 2029<br>40.5% | 1240<br>39.2%         | 3811<br>45.3%       |
| Non-Problem, Gamblers | 2786<br>52.4% | 4228<br>60.9%    | 2980<br>59.5% | 1920<br>60.8%         | 4606<br>54.7%       |

We next looked at social class of occupation (see Table 4.03). The rate of moderate to severe problem gamblers was higher in routine or manual occupations (2.2%) compared to intermediate (1.4%) or managerial (1.2%) positions,  $X^2(2) = 36.1$ ,  $p < .001$ . In contrast as Shown in Table 4.04 for non-problem gamblers compared non-gamblers, there was no significant difference in occupational status.

Table 4.03. Social occupational status comparing Non-Problem & Low Risk vs. Moderate to Severe problem (N and percentage).

|                                 | routine/<br>manual<br>occupation | intermediate<br>occupation | Managerial /<br>Professional<br>occupation | Total          |
|---------------------------------|----------------------------------|----------------------------|--------------------------------------------|----------------|
| No problem to low risk          | 11250<br>97.8%                   | 7268<br>98.6%              | 10930<br>98.8%                             | 29448<br>98.3% |
| Moderate and severe<br>problems | 255<br>2.2%                      | 106<br>1.4%                | 137<br>1.2%                                | 498<br>1.7%    |

Table 4.04. Occupational Status among non-gamblers and non-problem gamblers.

|              | Routine/<br>Manual<br>Occupation | Intermediate<br>Occupation | Managerial /<br>Professional<br>Occupation | Total          |
|--------------|----------------------------------|----------------------------|--------------------------------------------|----------------|
| Non-gamblers | 4313<br>40.5%                    | 2812<br>40.3%              | 4250<br>40.5%                              | 11375<br>40.5% |



|                      |       |       |       |       |
|----------------------|-------|-------|-------|-------|
| Non-problem gamblers | 6329  | 4163  | 6248  | 16740 |
|                      | 59.5% | 59.7% | 59.5% | 59.5% |

## 4.2 Physical Illness

Next, using logistic regression models, we examined the association between the various physical illnesses and problem gambling (see Table 4.05). The only physical illness that was significantly associated with problem gambling was mental health disorders (OR = 2.22).

We also examined if physical health was negatively affected by participation in gambling. The survey includes 17 health problems. The relationship of each to gambling is shown in Table 4.05. A few disorders differed between gamblers and non-gamblers however these effects were very small. Compared to non-gamblers, non-problem gamblers had higher odds of having Obesity (OR = 1.44) and lower odds of Mental disorders (OR = .74), Nervous System complaints (OR = .79), and Eye complaints (OR = .77) and infectious disorders (OR = .57). An additional analysis was conducted controlling for age did not eliminate any of these effects, but found that in addition, respiratory system diseases were slightly more common among non-gamblers (OR = 1.15).

**Table 4.05. Physical health complaints among gamblers by problem gambling category (N = 19780).**

|                            | Non-Gamblers | Non-problem | Low Risk | Moderate | Severe Problems | PG vs others | NG vs. NPG |
|----------------------------|--------------|-------------|----------|----------|-----------------|--------------|------------|
| N                          | 12846        | 17167       | 904      | 346      | 152             | OR           | OR         |
| Neoplasms & benign growths | 2.1%         | 2.1%        | 1.4%     | 1.8%     | 0.8%            | 0.82         | 1.04       |
| Endocrine & metabolic      | 8.3%         | 8.9%        | 4.3%     | 7.4%     | 3.9%            | 0.77         | 1.07       |
| Mental disorders           | 7.1%         | 5.6%        | 6.7%     | 9.1%     | 15.9%           | 2.01***      | 0.74***    |
| Nervous System             | 4.2%         | 3.2%        | 3.7%     | 5.3%     | 1.7%            | 1.12         | 0.79***    |
| Eye complaints             | 2.8%         | 2.0%        | 1.4%     | 2.5%     | 0.0%            | 0.86         | 0.77***    |
| Ear complaints             | 2.5%         | 2.6%        | 2.2%     | 3.8%     | 0.2%            | 1.30         | 1.10       |
| Heart & circulatory system | 10.7%        | 10.9%       | 6.2%     | 7.6%     | 6.9%            | 0.93         | 0.99       |
| Respiratory system         | 7.0%         | 7.7%        | 6.6%     | 6.4%     | 3.6%            | 0.85         | 1.13       |
| Digestive system           | 4.7%         | 4.8%        | 4.6%     | 3.6%     | 3.1%            | 0.84         | 1.09       |
| Genito-urinary system      | 2.3%         | 2.1%        | 1.1%     | 3.0%     | 0.0%            | 1.45         | 0.90       |
| Skin complaints            | 1.3%         | 1.3%        | 1.4%     | 0.2%     | 0.0%            | 0.10         | 0.98       |
| Musculoskeletal system     | 16.5%        | 15.8%       | 10.7%    | 8.9%     | 17.1%           | 0.84         | 0.97       |
| Infectious Disease         | 0.3%         | 0.2%        | 0.0%     | 0.1%     | 0.0%            | 0.00         | 0.57*      |
| † Blood & related organs   | 1.0%         | 1.0%        | 1.0%     | 1.2%     | 0.2%            | 0.84         | 1.00       |
| High Blood Pressure        | 23.4%        | 24.3%       | 14.0%    | 19.2%    | 19.4%           | 1.33         | 0.99       |
| Diabetes                   | 6.3%         | 6.6%        | 3.1%     | 6.6%     | 4.3%            | 1.04         | 0.95       |

|                    |       |       |       |       |       |      |         |
|--------------------|-------|-------|-------|-------|-------|------|---------|
| Obesity (BMI > 30) | 22.6% | 29.2% | 22.6% | 27.3% | 23.8% | 0.82 | 1.44*** |
|--------------------|-------|-------|-------|-------|-------|------|---------|

**Note:** PG = moderate to severe problem gamblers; NG = non-gamblers and NPG = people who score zero on both DSM—4 and PGSI. The sample size is slightly lower, for high blood pressure (32046) diabetes (32094) and obesity (28279).

\* =  $p < .05$ ; \*\*\* $p < .001$

† There was only one person in the moderate to severe problem gambling group who reported an infectious disease.

†† N for the logistic regression was 16,850 after listwise deletion.

### 4.3 Mental Health

As shown above, in terms of physical health consequences, gambling does not appear to be particularly harmful with only mental health resulting in elevated rates of problems relative to non-problem gamblers. In addition, as shown in Table 4.05, the lowest level of psychological distress was for non-problem gamblers and the highest was for severe problem gamblers. Similarly highest level of Wellbeing was for non-problem gamblers and the lowest was for severe problem gamblers (Table 4.06). The contrast of moderate to severe problem gamblers compared to the rest of the participants (non-gamblers, non-problem gamblers and low risk) were significant for Wellbeing,  $t(27687) = 11.8$ ,  $p < .001$ ,  $d = .56$ . Non-problem gamblers scored slightly higher than non gamblers on wellbeing, but this effect is very small,  $d = -.04$ .

For the GHQ, problem gamblers had 2.32 odds of psychological distress compared to non-gamblers (see Table 4.07). Non-problem gamblers had lower odds of psychological distress than non-gamblers, but this was small effect, OR .64,  $< .001$ .

As noted above, mental health problems were more common among people with moderate to severe problem gambling. Among people with moderate to severe problem gambling, females had odds of 1.9 times the chance of males to also report mental health problems,  $p < .05$ .

**Table 4.06. Wellbeing per group and effect sizes (d).**

|                      | Wellbeing |      |     | Non-gamblers | Non problem gamblers | Low risk | Moderate risk |
|----------------------|-----------|------|-----|--------------|----------------------|----------|---------------|
|                      | N         | M    | SD  |              |                      |          |               |
| Non-gamblers         | 11030     | 51.0 | 9.2 |              |                      |          |               |
| Non problem gamblers | 14905     | 51.3 | 8.3 | -0.04**      |                      |          |               |
| Low risk             | 772       | 48.5 | 8.6 | 0.28***      | 0.35***              |          |               |
| Moderate risk        | 292       | 47.5 | 8.1 | 0.38***      | 0.47***              | 0.12     |               |
| Severe problem       | 129       | 43.7 | 9.6 | 0.79***      | 0.92***              | 0.54***  | 0.44***       |
| Total                | 27126     | 51.1 | 8.7 |              |                      |          |               |

Note: significance statistics are based on a One-way analysis of variance using Bonferroni corrections.

**Table 4.07. Psychological distress as measured by the GHQ by participant group.**

|                      | N     | Precent | OR   | 95% C.I. |       |
|----------------------|-------|---------|------|----------|-------|
|                      |       |         |      | Lower    | Upper |
| Non-gamblers         | 8556  | 7.8%    | ref  |          |       |
| Non problem gamblers | 11566 | 5.7%    | 0.71 | 0.64     | 0.80  |
| Low risk             | 596   | 9.4%    | 1.22 | 0.92     | 1.63  |
| Moderate risk        | 229   | 11.9%   | 1.59 | 1.06     | 2.39  |
| Severe problem       | 89    | 16.4%   | 2.32 | 1.32     | 4.08  |

#### 4.4 Substance use

Next, we examined the rate of smoking and alcohol consumption amongst people with various levels of smoking or drinking problems. Both smoking and drinking were higher amongst people with a moderate to severe gambling problem. As shown in Table 4.08, smoking was associated with increased involvement in gambling as 19.6% of non-problem gamblers reported smoking, while 36.2% of severe problem gamblers reported smoking. The contrast of moderate to severe vs. all other was significant,  $X^2(2) = 96.1$ ,  $p < .001$ . Similarly, the rate of problem drinking (Table 4.08) increased with gambling involvement with the lowest level amongst non-gamblers, 2.9%, and the highest level, 12.0%, amongst severe problem gamblers. The contrast of moderate to severe vs. all other was significant,  $X^2(3) = 75.7$ ,  $p < .001$ .

Table 4.08. Smoking status by gambler group

|                         |       | Never<br>Smoker | Former<br>Smoker | Current<br>Smoker | OR<br>Current |
|-------------------------|-------|-----------------|------------------|-------------------|---------------|
| Non-gamblers            | 12793 | 58.6%           | 27.0%            | 14.4%             | Ref           |
| Non problem<br>gamblers | 17153 | 47.7%           | 32.7%            | 19.6%             | 1.5***        |
| Low risk                | 897   | 36.5%           | 28.4%            | 35.1%             | 3.2***        |
| Moderate risk           | 346   | 38.2%           | 26.9%            | 35.0%             | 3.2***        |
| Severe problem          | 152   | 38.8%           | 25.0%            | 36.2%             | 3.4***        |

As shown in Table 4.09, non-problem gamblers compared to non-gamblers, were less likely to be non-drinkers (34.5%), and more likely to be moderate risk drinkers (68.3%) and high-risk drinkers (69.7),  $x^2(3) = 1333.3$ ,  $p < .001$ . Similarly, the rate of non-problem gamblers was relatively high among current smokers (64.5%) and former smokers (61.9%), and lowest among non-smokers (52.2%),  $X^2(2) = 360.6$ ,  $p < .001$ . A logistic regression analysis of gambling status onto smoking status found that non-problem gamblers had odds of 1.5,  $p < .001$ , times more likely to be current smokers. Similarly, a regression of groups onto heavy drinking found that non-problem gamblers had odds of 1.7,  $p < .001$ , to be high risk drinkers. The odds of problem gamblers being smokers was 3.4 times that of non-gamblers, and the odds of problem gamblers being heavy drinkers was 4.5 times that of non-gamblers.

Table 4.09. Drinking status by gambler group

|                      |       | Non-<br>Drinker | Low-<br>Risk | Moderate<br>Risk | High<br>Risk | OR<br>High risk |
|----------------------|-------|-----------------|--------------|------------------|--------------|-----------------|
| Non-gamblers         | 12502 | 24.2%           | 61.7%        | 11.3%            | 2.9%         | Ref             |
| Non problem gamblers | 16965 | 9.4%            | 67.8%        | 18.0%            | 4.9%         | 1.7***          |
| Low risk             | 866   | 6.5%            | 61.2%        | 22.2%            | 10.2%        | 3.5***          |
| Moderate risk        | 337   | 11.3%           | 53.7%        | 25.5%            | 9.5%         | 3.5***          |
| Severe problem       | 142   | 12.0%           | 54.2%        | 21.8%            | 12.0%        | 4.5***          |

#### 4.5 Conclusions regarding health consequences

Taken together, the results for the association between problem gambling and health consequences found few significant health effects associated with moderate to severe problem gambling. The strong association with gambling problems was the presence of a mental health problems. This finding is consistent with the results from other analyses, where we found that problem gambling was associated with lower levels of Wellbeing and higher levels of psychological distress. Moreover, we found that problem gamblers were more likely to be current smokers and were more likely to engage in high levels of alcoholic consumption.

The examination of health difference between non-problem recreational gamblers and non-gamblers also found few health consequences of gambling. There were a small number of disorders that were somewhat more common among non-gamblers, but these associations were very small. On the other hand, obesity was most common among non-problem gamblers, which is perhaps related to the sedentary nature of gambling. In terms of mental health problems, non-problem gamblers were less likely to report a mental health problem, had lower scores on the GHQ and higher scores on Wellbeing than all other groups. The results do not suggest that non-problem gambling does not have a detrimental association with physical health or mental health. In terms of substance use, non-gamblers were less likely than all other groups to report smoking and less likely to report high risk alcohol consumption. Although non-gamblers are apparently healthy at the time of the survey, they may acquire some health consequences over time because of their obesity, somewhat higher smoking, and somewhat higher alcohol consumptions. It is important to consider that the slightly lower sense of wellbeing and higher GHQ scores for non-gamblers could be the result of recovered gamblers who no longer gamble. In conclusion, the result of the contrast of non-gamblers compared to non-problem gamblers, contradicts a strong version of the overall consumption model of gambling, at least at the time that this survey was conducted. That is non-problem gambling does not appear to have a negative association with a person health. On the other hand, for people who gamble problematically, mental health consequences appear to be the main result of their gambling behavior.

## Section 5

### 5.0 Regression of risk factors on moderate & severe problem gambling

We then computed separate analyses for various risk factors including alcohol use, age, marital status, smoking category, sense of Wellbeing, education, ethnic groups, and social class. We first examined each of these variables separately to understand the unadjusted association between these variables and problem gambling. Each of these variables showed a significant relationship to problem gambling. Compared to non-drinkers, moderate drinkers had 2.1 the odds of having a gambling problem and high-risk drinkers had 3.3 odds of having a gambling problem. The highest rates of gambling problems were in the two youngest age groups with odds of 4.98 and 4.89 respectively compared to people 65 and over (reference group). Problems decreased with age. In terms of marital status, problem gambling appears to be highest among single people odds of 2.17 compared to those who were married. Widowed people had odds of .228 compared to married people. In terms of smoking, compared to non-smokers, current smokers have odds of 2.56 of having a gambling problem, and former smokers are not significantly different from non-smokers. In terms of Wellbeing, people with a below average Well-being had odds of 2.8 more likely to have a gambling problem compared to those above the mean. For education, all groups had a significantly higher odds of a gambling problem compared to people with a degree or higher. For ethnic groups, with White people as the reference category, Black OR = 1.78, and Other OR = 2.08 had significantly higher rates of problem gambling. For social class having a routine/manual labour occupation had 1.8 higher odds of a gambling problem compared to people in a managerial occupation.

We then conducted an analysis with all of these variables entered into the model simultaneously. The results were largely the same when we combined all these analyses into a single multivariate logistic regression, however the effects for the social status of work dropped to non-significant. This is likely due to the strong correlation between social occupational status and education attainment ( $Rho = .51$ ,  $p < .001$ ). The effect of marital status also decreased to an OR of only 1.35,  $p < .05$  and the odds ratio related to education for not having any qualification increased to 3.5. The overall Nagelkerke  $R^2$  for this analysis was .145.

Table 5.01

Separate univariate Analysis of demographics and social factors.

|                           | Nagelkerke<br>R-square | Wald      | Exp(B) | Sig.  |
|---------------------------|------------------------|-----------|--------|-------|
| Age                       | .016                   |           |        |       |
| 16-24                     |                        | 73.911    | 4.982  | 0.000 |
| 25-34                     |                        | 74.698    | 4.887  | 0.000 |
| 35-44                     |                        | 35.855    | 3.189  | 0.000 |
| 45-54                     |                        | 21.926    | 2.534  | 0.000 |
| 55-64                     |                        | 6.043     | 1.725  | 0.014 |
| 65+                       |                        | Reference |        |       |
| Marital Status            | .013                   |           |        |       |
| Married/civil partnership |                        | Reference |        |       |
| Single                    |                        | 69.545    | 2.173  | 0.000 |
| Separated/divorced        |                        | 1.173     | 1.197  | 0.279 |
| Widowed                   |                        | 12.010    | 0.228  | 0.001 |

|                          |      |           |       |       |
|--------------------------|------|-----------|-------|-------|
| Weekly Drinking Behavior | .017 |           |       |       |
| Non-drinker              |      | Reference |       |       |
| Moderate drinking        |      | 0.89      | 1.15  | 0.345 |
| Hazardous drinking       |      | 20.74     | 2.10  | 0.000 |
| Harmful drinking         |      | 36.76     | 3.27  | 0.000 |
| Smoking Status           | .027 |           |       |       |
| Never smoker             |      | Reference |       |       |
| Former smoker            |      | 2.29      | 1.18  | 0.130 |
| Current smoker           |      | 83.04     | 2.56  | 0.000 |
| Well-being (Mean Split)  | .027 |           |       |       |
| Below average            |      | 102.695   | 2.836 | 0.000 |
| Above Average well being |      | Reference |       |       |
| Education                | .007 |           |       |       |
| No qual                  |      | 16.323    | 1.782 | 0.000 |
| GCSE standard            |      | 18.520    | 1.785 | 0.000 |
| A-level                  |      | 11.592    | 1.649 | 0.001 |
| Higher ed < degree       |      | 24.380    | 2.151 | 0.000 |
| Degree or higher         |      | Reference |       |       |
| Ethnic Group             | .003 |           |       |       |
| White                    |      | Reference |       |       |
| Black                    |      | 7.118     | 1.779 | 0.008 |
| Asian                    |      | 0.048     | 1.041 | 0.826 |
| Other                    |      | 11.366    | 2.075 | 0.001 |
| Occupational status      | .008 |           |       |       |
| Manual                   |      | 30.497    | 1.802 | 0.000 |
| Intermediate             |      | 1.239     | 1.156 | 0.266 |
| Managerial               |      | Reference |       |       |

**Table 5.02.** Combined Multivariate Analysis

| Variables                 | OR        | Lower | Upper  | Sig. |
|---------------------------|-----------|-------|--------|------|
| Age                       | Reference |       |        |      |
| 16-24                     | 6.707     | 3.919 | 11.479 | ***  |
| 25-34                     | 7.196     | 4.448 | 11.641 | ***  |
| 35-44                     | 3.634     | 2.216 | 5.960  | ***  |
| 45-54                     | 2.469     | 1.503 | 4.054  | ***  |
| 55-64                     | 1.770     | 1.047 | 2.993  | *    |
| Marital Status            |           |       |        |      |
| Married/civil partnership | Reference |       |        |      |
| Single                    | 1.349     | 1.045 | 1.743  |      |
| Separated/divorced        | 1.156     | 0.755 | 1.770  |      |
| Widowed                   | 0.771     | 0.291 | 2.043  |      |
| Weekly Drinking Behavior  |           |       |        |      |
| Non-drinker               | Reference |       |        |      |
| Moderate drinking         | 1.577     | 1.037 | 2.399  | *    |
| Hazardous drinking        | 3.013     | 1.908 | 4.756  | ***  |
| Harmful drinking          | 3.642     | 2.168 | 6.119  | ***  |
| Smoking Status            |           |       |        |      |
| Never smoker              | Reference |       |        |      |
| Former smoker             | 1.152     | 0.884 | 1.502  |      |
| Current smoker            | 1.408     | 1.091 | 1.818  | **   |
| Well-being (Mean Split)   |           |       |        |      |
| Above Average well being  | Reference |       |        |      |
| Below average             | 2.682     | 2.142 | 3.359  | ***  |
| Education                 |           |       |        |      |
| No qual                   | 3.498     | 2.361 | 5.183  | ***  |
| GCSE standard             | 2.054     | 1.450 | 2.908  | ***  |
| A-level                   | 1.384     | 0.964 | 1.988  |      |
| Higher ed < degree        | 1.920     | 1.315 | 2.803  | ***  |
| Degree or higher          | Reference |       |        |      |
| Ethnic Group              |           |       |        |      |
| White                     | Reference |       |        |      |
| Black                     | 2.013     | 1.157 | 3.502  | **   |
| Asian                     | 1.005     | 0.575 | 1.757  |      |
| Other                     | 2.055     | 1.244 | 3.394  | **   |
| Occupational status       |           |       |        |      |
| Manual                    | 0.987     | 0.743 | 1.311  |      |
| Intermediate              | 1.020     | 0.748 | 1.391  |      |
| Managerial                | Reference |       |        |      |

**Section 6**



## 6.0 Multinomial Logistic Regression

The multivariate logistic regression is shown in Table 6.01 was conducted using STATA. The results of the multi-nominal multivariate research indicate that problem gambling is more likely among males, younger participants, people who are single (never married), current smokers and people who have lower mental health. Hazardous drinking is higher across all gambling levels, but harmful drinking increases with the gambling risk level. Problem gamblers are less likely to be married, however, there were too few divorced or widowed to compare them vs. single (never married). Nonetheless, it looks like married compared to single is the key contrast. For Smoking, the key contrast appears to be current smokers vs never smokers. This is consistent with previous studies, but interestingly former smokers are somewhat less likely to have a gambling problem and as noted above are not different from people who never smoked. According to an SPSS analysis, this regression model would yield a Nagelkerke R<sup>2</sup> of .14.

Table 6.01

2 Logistic regression of demographics on problem gambling status.

| Demographic Factors       | Non-problem gambling behaviour |      |        |       | Low risk gambling behaviour |      |        |       | Moderate risk gambling behaviour |      |        |       | High risk gambling behaviour |      |        |       | P   |
|---------------------------|--------------------------------|------|--------|-------|-----------------------------|------|--------|-------|----------------------------------|------|--------|-------|------------------------------|------|--------|-------|-----|
|                           | N                              | %^   | 95% CI |       | N                           | %^   | 95% CI |       | N                                | %^   | 95% CI |       | N                            | %^   | 95% CI |       |     |
| Sex                       |                                |      |        |       |                             |      |        |       |                                  |      |        |       |                              |      |        |       | *** |
| Male                      | 13320                          | 47.6 | [46.9  | 48.3] | 547                         | 76.4 | [72.9  | 79.7] | 219                              | 77.4 | [71    | 82.7] | 115                          | 89.1 | [82.3  | 93.5] |     |
| Female                    | 17496                          | 52.4 | [51.7  | 53.1] | 208                         | 23.6 | [20.3  | 27.2] | 63                               | 22.6 | [17.3  | 29]   | 18                           | 10.9 | [6.5   | 17.7] |     |
| Age                       |                                |      |        |       |                             |      |        |       |                                  |      |        |       |                              |      |        |       | *** |
| 16-24                     | 2716                           | 13.5 | [12.9  | 14.1] | 163                         | 30.9 | [26.6  | 35.6] | 50                               | 24.9 | [18.8  | 32.3] | 19                           | 22.5 | [13.7  | 34.7] |     |
| 25-34                     | 4140                           | 16.3 | [15.8  | 16.9] | 192                         | 27.8 | [24    | 32.1] | 79                               | 28.4 | [22.5  | 35.1] | 29                           | 29.1 | [18.9  | 41.9] |     |
| 35-44                     | 4998                           | 16.5 | [16    | 17]   | 130                         | 13.3 | [10.8  | 16.3] | 58                               | 19.9 | [14.9  | 26.1] | 28                           | 15.8 | [9.8   | 24.4] |     |
| 45-54                     | 5566                           | 17.6 | [17.1  | 18.1] | 116                         | 13.8 | [11.2  | 16.8] | 36                               | 13.2 | [9     | 18.8] | 26                           | 17.4 | [11.2  | 26]   |     |
| 55-64                     | 5227                           | 14.6 | [14.2  | 15.1] | 80                          | 8.1  | [6.3   | 10.4] | 30                               | 7.3  | [4.8   | 11]   | 22                           | 10.7 | [6.4   | 17.4] |     |
| 65+                       | 8169                           | 21.5 | [21    | 22]   | 74                          | 6.1  | [4.7   | 8]    | 29                               | 6.3  | [3.8   | 10.4] | 9                            | 4.4  | [2     | 9.6]  |     |
| Marital Status            |                                |      |        |       |                             |      |        |       |                                  |      |        |       |                              |      |        |       | *** |
| Single                    | 5662                           | 22.6 | [22    | 23.2] | 263                         | 43.8 | [39.2  | 48.5] | 95                               | 39.3 | [32.3  | 46.7] | 45                           | 43.7 | [32.5  | 55.7] |     |
| Married/civil partnership | 19877                          | 62.9 | [62.2  | 63.6] | 425                         | 49.9 | [45.4  | 54.4] | 157                              | 52.5 | [45.2  | 59.5] | 72                           | 46.4 | [35.4  | 57.6] |     |
| Separated /divorced       | 2992                           | 8.5  | [8.2   | 9.9]  | 59                          | 5.5  | [4.1   | 7.4]  | 25                               | 7.4  | [4.4   | 12.2] | 13                           | 8.3  | [4.5   | 14.7] |     |
| Widowed                   | 2277                           | 6    | [5.7   | 6.3]  | 8                           | 0.79 | [0.33  | 1.63] | 5                                | 0.88 | [0.29  | 2.6]  | 3                            | 1.6  | [0.46  | 5.9]  |     |
| Weekly Drinking Behavior  |                                |      |        |       |                             |      |        |       |                                  |      |        |       |                              |      |        |       | *** |
| Non-drinker               | 4719                           | 15.6 | [15.1  | 16.1] | 62                          | 6.5  | [4.8   | 8.8]  | 36                               | 11.3 | [7.6   | 16.4] | 15                           | 11.8 | [6.6   | 20.2] |     |
| Moderate                  | 19809                          | 65.3 | [64.6  | 65.9] | 439                         | 61.3 | [56.7  | 63.6] | 151                              | 53.8 | [46.5  | 61.0] | 72                           | 54.5 | [43.0  | 65.6] |     |
| Hazardous                 | 4651                           | 15.1 | [14.6  | 15.6] | 170                         | 22.1 | [18.6  | 26.2] | 60                               | 25.5 | [19.4  | 32.7] | 23                           | 21.9 | [13.5  | 33.5] |     |
| Harmful                   | 1224                           | 4    | [3.8   | 4.3]  | 63                          | 10.1 | [7.6   | 13.4] | 29                               | 9.4  | [6.0   | 14.4] | 17                           | 11.8 | [6.5   | 20.5] |     |
| Smoking Status            |                                |      |        |       |                             |      |        |       |                                  |      |        |       |                              |      |        |       | *** |
| Never smoker              | 15288                          | 52.3 | [51.6  | 53.0] | 278                         | 36.4 | [32.2  | 40.9] | 102                              | 38.1 | [31.4  | 45.5] | 42                           | 38.7 | [28.1  | 50.4] |     |
| Former smoker             | 9973                           | 30.3 | [29.6  | 30.9] | 209                         | 28.5 | [24.6  | 32.7] | 84                               | 26.9 | [21.2  | 33.4] | 32                           | 25.2 | [15.8  | 37.6] |     |
| Current smoker            | 5498                           | 17.4 | [16.9  | 18.0] | 264                         | 35.1 | [30.9  | 39.5] | 96                               | 35   | [28.3  | 42.3] | 59                           | 36.2 | [26.6  | 47.0] |     |

|                                 |                |                |               |               |     |
|---------------------------------|----------------|----------------|---------------|---------------|-----|
| <b>Wellbeing (mean,<br/>SD)</b> | 51.20<br>(8.7) | 48.47<br>(7.9) | 47.9<br>(7.4) | 43.7<br>(8.8) | *** |
|---------------------------------|----------------|----------------|---------------|---------------|-----|

note: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001

^Prevalence estimates were calculated using the appropriate PGSI, DSM, or combined weight

4

6 **Section 7**

## 7.0 Cluster Analysis

8 Cluster analysis was conducted on the total sample (i.e., gamblers and non-gamblers), and  
 10 moderate to severe problem gamblers. These analyses used a listwise deletion that included drinking  
 and smoking intensity which had more missing values, so the sample sizes were smaller than for the  
 above analyses. The sociodemographic characteristics of these two samples are described in Table  
 12 7.01. Both Ward's and Hierarchical methods indicated that a three-cluster solution provided the most  
 meaningful description of the data (see the Ward's method in Appendix, Table A1). Means and  
 14 standard deviations of the characteristics of the Total Sample and the Gamblers Only validity and  
 factors are presented in Table 7.02. Labels for each cluster were generated based upon their profile on  
 16 the scores of gambling measure (i.e., PGSI), that is, Low gamblers for Cluster 1, Medium gamblers for  
 Cluster 2, and High gamblers for Cluster 3.

18

20 Table 7.01

Sociodemographic Characteristics of the Total and Gamblers Samples for Cluster Analysis

| Variables            | Total Sample<br>(N=7741) | Gamblers Only<br>(N=287) |
|----------------------|--------------------------|--------------------------|
| Age                  | %                        | %                        |
| 16-24                | 7                        | 15                       |
| 25-34                | 13                       | 23                       |
| 35-44                | 17                       | 20                       |
| 45-54                | 20                       | 16                       |
| 55-64                | 18                       | 10                       |
| 65-74                | 25                       | 16                       |
| Sex                  |                          |                          |
| Male                 | 55                       | 77                       |
| Female               | 45                       | 23                       |
| Education            |                          |                          |
| No qualifications    | 19                       | 19                       |
| GCSE stand           | 24                       | 29                       |
| A-level              | 15                       | 19                       |
| Higher ed < degree   | 12                       | 14                       |
| Degree or higher     | 29                       | 18                       |
| Socioeconomic status |                          |                          |
| Routine/manual occ   | 39                       | 53                       |
| Intermediate occ     | 24                       | 20                       |
| Managerial/prof occ  | 37                       | 27                       |
| Ethnicity            |                          |                          |
| White                | 95                       | 95                       |
| Black                | 1                        | 1                        |
| Asian                | 3                        | 2                        |
| Other                | 1                        | 2                        |

|                                             |             |             |
|---------------------------------------------|-------------|-------------|
| Marital status                              |             |             |
| Single                                      | 16          | 32          |
| Married/civil partner                       | 67          | 57          |
| Separated/divorced                          | 10          | 8           |
| Widowed                                     | 7           | 3           |
| Drinking frequency in the last year [M(SD)] | 4.72(2.24)  | 4.27(1.98)  |
| Smoking intensity[M(SD)]                    | 2.56(6.35)  | 5.72(8.96)  |
| Wellbeing[M(SD)]                            | 51.39(8.72) | 47.97(8.57) |
| Gambling problem (PGSI) [M(SD)]             | 0.10(0.84)  | 2.81(3.37)  |

Table 7.02

Cluster Analysis Group Membership for Gamblers

| Cluster Method    | Drinking<br>frequency<br>(last 12-months) | PGSI         | Smoking<br>intensity | Wellbeing    |
|-------------------|-------------------------------------------|--------------|----------------------|--------------|
|                   | Mean (SD)                                 | Mean<br>(SD) | Mean (SD)            | Mean (SD)    |
| Hierarchical      |                                           |              |                      |              |
| Cluster 1 (n=58)  | 3.48(1.65)                                | 4.03(4.71)   | 20.41(6.19)          | 42.79(8.02)  |
| Cluster 2 (n=38)  | 7.81(1.20)                                | 2.03(1.65)   | 5.46(8.22)           | 48.31(10.17) |
| Cluster 3 (n=191) | 3.80(1.37)                                | 2.60(3.05)   | 1.31(3.31)           | 49.50(7.78)  |

The results of the Hierarchical clusters for gamblers are given in Table 7.02. Cluster 1- Smoker Gamblers accounted for 20% of the sample (for K-means, see Appendix Table A1). This cluster was characterized by individuals scoring high in gambling and smoking. They yield the lowest Wellbeing, but drinking was medium compared to the gamblers sample.

Cluster 2-Drinker Gamblers accounted for 13% of the sample. Cluster 2 was characterized by an elevation in gambling and drinking.

Cluster 3-Medium Gamblers accounted for 66% of the sample. This cluster had the lowest level of smoking, and the highest scores on Wellbeing. Their scores of drinking were like cluster 1. Cluster 3 of the gamblers group appears to be relatively healthy compared to the other two groups. Table 7.03 provides the Cohen d for the variables that defined the various clusters based on the Hierarchical cluster scores. Smoking scores for cluster 1 compared to both cluster 2 and 3 were very large effect ( $d > 2.0$ ). The difference between cluster 2 and 3 was a large effect ( $d = 1.0$ ). Drinking scores for cluster 2 compared to both other clusters was a very large effect size ( $d > 2.0$ ). The difference in drinking between the cluster 1 compared to 3 was a small effect,  $d = .22$ . For Wellbeing the effect size was large comparing cluster 1 to cluster 2 and 3, but there was very little difference between clusters 2 and 3. In terms of gambling problems, there was a moderately large effect size of Cluster 1 vs. Cluster 2 and a moderate effect size difference between cluster 1 and 3. The difference between cluster 2 and 3 was small. The results suggest that smoking was more common among those with the most severe problem gambling behavior.

Table 7.03. Effect size contrasts between Clusters (Hierarchical clusters).

| Contrast | Drinking<br>frequency | PGSI | Smoking<br>intensity | Wellbeing |
|----------|-----------------------|------|----------------------|-----------|
| d1v2     | -2.94                 | 0.57 | 2.14                 | -0.62     |

|      |       |       |      |       |
|------|-------|-------|------|-------|
| d2v3 | 2.99  | -0.20 | 1.01 | -0.15 |
| d1v3 | -0.22 | 0.42  | 4.80 | -0.86 |

For the total sample (i.e., gamblers and non-gamblers), both Ward's and Hierarchical methods indicated that a two-cluster solution provided the most meaningful description of the data (for Ward's method, see Appendix, Table A2). Means and standard deviations of the validity variables are presented in Table 7.04. The two-cluster solution yielded two remarkably different clusters for all factors reducing the presence of a third meaningful group. Cluster 1- accounted for 16% of the sample. Focusing on the hierarchical model, the two clusters primarily differed on drinking with Cluster 1 scored substantially higher on the frequency of alcohol consumption with a large effect size ( $d = 3.11$ ). The two clusters also differed on well-being with Cluster 2 scoring higher than Cluster 1 and the effect was moderate ( $d = .54$ ). Neither cluster showed a strong difference on the gambling measure (i.e., PGSI), however Cluster 2 scored slightly higher on the PGSI, but the difference between the groups was small  $d = .11$ . Similarly, neither cluster showed much of a difference on smoking however Cluster 2 scored slightly lower on the smoking than Cluster 1, but again the difference between the groups was small  $d = .11$ . The results suggest that Cluster 1 is a group of people with low levels of Wellbeing and relatively heavy drinking, more smoking but were not engaged in gambling (see Table 7.04).

Table 7.04. Cluster Analysis Group Membership for the Total Sample

| Cluster Method        | Drinking frequency<br>(last 12-months) | PGSI       | Smoking<br>intensity | Wellbeing   |
|-----------------------|----------------------------------------|------------|----------------------|-------------|
| Hierarchical          |                                        |            |                      |             |
| Cluster 1<br>(n=1282) | 8.52(0.88)                             | 0.03(0.30) | 3.20(7.20)           | 47.51(9.85) |
| Cluster 2<br>(n=6459) | 3.96(1.58)                             | 0.12(0.91) | 2.43(6.17)           | 52.15(8.27) |

## 7.1 Sociodemographic Differences Between Groups

The distinctiveness of the three clusters was examined by investigating between-groups differences on a range of sociodemographic variables such as age, sex, education, ethnicity, socioeconomic status, and marital status. The chi-squared test yielded no statistically significant differences between groups in any sociodemographic variables after the Bonferroni correction (see Table 7.05, and for Ward's method, see Appendix Table A3). This absence of significance is due to the small sample size and the Bonferroni correction is conservative. However, when examining the cluster analysis of the total sample that included gamblers and non-gamblers in the clusters, the Chi-squared test yielded statistically significant differences between groups in all sociodemographic variables after Bonferroni correction (see Table 7.06).

Comparison of Cluster Groups on Sociodemographic Characteristics of Gamblers (N=287)

| Variables              | Hierarchical         |                     |                     | $\chi^2$ |
|------------------------|----------------------|---------------------|---------------------|----------|
|                        | Cluster 1<br>(n=179) | Cluster 2<br>(n=56) | Cluster 3<br>(n=52) |          |
| Age                    |                      |                     |                     | 29.40    |
| 16-24(%)               | 9                    | 10                  | 18                  |          |
| 25-34(%)               | 21                   | 10                  | 26                  |          |
| 35-44(%)               | 29                   | 16                  | 18                  |          |
| 45-54(%)               | 29                   | 16                  | 12                  |          |
| 55-64(%)               | 7                    | 10                  | 11                  |          |
| 65-74(%)               | 5                    | 37                  | 15                  |          |
| Sex                    |                      |                     |                     | 0.39     |
| Male (%)               | 74                   | 74                  | 78                  |          |
| Female(%)              | 26                   | 26                  | 22                  |          |
| Education              |                      |                     |                     | 15.57    |
| No qualifications (%)  | 26                   | 29                  | 16                  |          |
| GCSE stand (%)         | 40                   | 39                  | 24                  |          |
| A-level(%)             | 14                   | 13                  | 21                  |          |
| Higher ed < degree (%) | 15                   | 8                   | 15                  |          |
| Degree or higher(%)    | 5                    | 10                  | 23                  |          |
| Socioeconomic status   |                      |                     |                     | 7.53     |
| Routine/manual occ(%)  | 62                   | 58                  | 49                  |          |
| Intermediate occ(%)    | 21                   | 29                  | 18                  |          |
| Managerial/prof occ(%) | 17                   | 13                  | 33                  |          |
| Ethnicity              |                      |                     |                     | 8.73     |
| White (%)              | 98                   | 87                  | 95                  |          |
| Black (%)              | 2                    | 3                   | 0.5                 |          |
| Asian(%)               | 0                    | 8                   | 2                   |          |
| Other(%)               | 0                    | 3                   | 2                   |          |
| Marital status         |                      |                     |                     | 6.51     |
| Single (%)             | 38                   | 29                  | 31                  |          |
| Married/civil part(%)  | 53                   | 53                  | 59                  |          |
| Sep/div(%)             | 9                    | 10                  | 7                   |          |
| Widowed(%)             | 0                    | 8                   | 3                   |          |

Table 7.06

82 Comparison of Cluster Groups on Sociodemographic Characteristics of the Total Sample (N=7741)

| Variables              | Hierarchical          |                       | $\chi^2$   |
|------------------------|-----------------------|-----------------------|------------|
|                        | Cluster 1<br>(n=1282) | Cluster 2<br>(n=6459) |            |
| Age                    |                       |                       | 137.69**** |
| 16-24(%)               | 4                     | 7                     |            |
| 25-34(%)               | 10                    | 13                    |            |
| 35-44(%)               | 14                    | 18                    |            |
| 45-54(%)               | 17                    | 21                    |            |
| 55-64(%)               | 17                    | 18                    |            |
| 65-74(%)               | 38                    | 23                    |            |
| Sex                    |                       |                       | 64.14*     |
| Male (%)               | 35                    | 47                    |            |
| Female(%)              | 65                    | 53                    |            |
| Education              |                       |                       | 318.58**** |
| No qualifications(%)   | 36                    | 16                    |            |
| GCSE stand (%)         | 26                    | 24                    |            |
| A-level(%)             | 11                    | 16                    |            |
| Higher ed < degree (%) | 9                     | 13                    |            |
| Degree or higher(%)    | 18                    | 31                    |            |
| Socioeconomic status   |                       |                       | 138.35**** |
| Routine/manual occ(%)  | 53                    | 36                    |            |
| Intermediate occ(%)    | 23                    | 24                    |            |
| Managerial/prof occ(%) | 24                    | 39                    |            |
| Ethnicity              |                       |                       | 185.54**** |
| White (%)              | 88                    | 96                    |            |
| Black (%)              | 2                     | 1                     |            |
| Asian(%)               | 8                     | 1                     |            |
| Other(%)               | 1                     | 0.8                   |            |
| Marital status         |                       |                       | 149.38**** |
| Single (%)             | 16                    | 16                    |            |
| Married/civil part(%)  | 57                    | 69                    |            |
| Sep/div(%)             | 12                    | 9                     |            |
| Widowed(%)             | 14                    | 6                     |            |



Cluster 1 had relatively more older people than cluster 2. Cluster 1 had more females than cluster 2. In terms of educational status, cluster 1 had a larger number with no-qualifications and cluster 2 had more people with a degree or higher. About half of cluster 1 (53%) reported manual or routine occupations, compared to only 36% for cluster 2. In terms of ethnicity, the number of White people was higher in cluster 2 (96%) compared to Cluster 1, and the number of Asian people was higher in cluster 1 (8%) compared to cluster 2. Cluster 2 had relatively more married people and fewer widows. This is likely due to the age of the Cluster 1 (for Ward's method, see Appendix A4) .

## 7.2 Summary

The Cluster analysis revealed several interesting subgroups among people who experience some gambling related problems. The analysis suggests that heavy smokers (Cluster 1) who gamble cluster separately than heavy drinkers who gamble (Cluster 2). Cluster 1 had the highest rate of manual or routine labour, and the lowest level of degrees. Cluster 2 were also the mostly likely to be single and were the least ethnically diverse. Cluster 2 on the other had had the lowest level of education and the highest rate of being widows; these two effects are likely due to their greater age. The third cluster scored relatively low on gambling, smoking and alcohol, and higher on Wellbeing suggesting they were healthier than the other two groups. Examining the demographics for Cluster 3 also revealed they tend to be younger, more often married, had a higher degree of education, and were more likely in a managerial position. The higher level of education and career success for Cluster 3 may contribute to their higher level of well being. Interestingly sex did not differentiate any of these clusters.

The analysis of the full sample revealed that Cluster 1 is a group of people with a poor sense of Wellbeing and relatively heavy drinking, slightly more smoking but were not engaged in gambling. In addition, Cluster 1 had relatively more older people than cluster 2, more females, and were more likely to be employed in manual / routine labour. Cluster 2 on the other hand had fewer females, more people with a degree or higher and were somewhat less ethnically diverse than cluster 1. Cluster 2 had relatively more married people and fewer widows. The difference in terms of widows is likely due to the greater age of the cluster 1.

Section 8

8.0 Factor analysis of the Problem Gambling Severity Index (PGSI)

To address Aim 2, we conducted a factor analysis of the PGSI to determine if the PGSI is unifactorial and if the PGSI is equally valid in Scotland and England. We first conducted an analysis of the PGSI in the entire UK sample. The initial analysis indicated that the first Eigenvalue was 5.8 or 64.6% of the variance in the sample. The next eigenvalue was .64 indicating that there was only a single actual factor in the data when including both problem and non-problem gamblers. We repeated the overall UK analysis with only people who scored at least 1 on the PGSI and this only resulted in one eigenvalue greater than 1 reinforcing the notion that the PGSI is unifactorial for the UK population. These analyses were the same with weighted or unweighted data.

We then repeated this analysis for the data for England and Scotland separately. For England, the first eigenvalue was 5.8, and for Scotland, the first eigenvalue was 6.0. Thus, for both samples, the PGSI is unifactorial when including both problem and non-problem gamblers.

The structure matrix for the overall model as well as for Scotland and England separately are given in Table 8.01. As shown in Table 8.01, the component loadings are very similar for England and Scotland. We computed a correlation between the English and Scottish loadings and the correlation was  $r = .95$ . In addition, we present the item frequencies for the sample in Table 8.02. The response frequencies for England and Scotland are very similar. A significance test revealed that item 3, on going back to try and win back losses, is slightly more common in England than in Scotland, but the difference was very small,  $r = .02$ ,  $p < .01$ , and was only significant because of the large sample size. Overall, these findings suggest that the PGSI performs similarly in the English and Scottish populations.

Table 8.01  
Component structure for UK total sample, England and Scotland (weighted).

| PGSI |         |          |          |
|------|---------|----------|----------|
| Item | England | Scotland | Combined |
| 1    | 0.761   | 0.767    | 0.761    |
| 2    | 0.755   | 0.754    | 0.754    |
| 3    | 0.680   | 0.714    | 0.682    |
| 4    | 0.782   | 0.796    | 0.784    |
| 5    | 0.874   | 0.872    | 0.874    |
| 6    | 0.848   | 0.845    | 0.847    |
| 7    | 0.811   | 0.840    | 0.814    |
| 8    | 0.868   | 0.879    | 0.869    |
| 9    | 0.822   | 0.874    | 0.827    |

Table 8.02  
Item category responses comparing England and Scotland (unweighted).

| ITEM | England |           |       |        | Scotland |           |       |        |
|------|---------|-----------|-------|--------|----------|-----------|-------|--------|
|      | Never   | Sometimes | Often | Always | Never    | Sometimes | Often | Always |
| 1    | 97.49%  | 2.08%     | 0.24% | 0.18%  | 97.44%   | 2.12%     | 0.22% | 0.21%  |
| 2    | 98.82%  | 0.94%     | 0.12% | 0.12%  | 98.86%   | 0.93%     | 0.14% | 0.07%  |
| 3    | 95.75%  | 3.68%     | 0.37% | 0.19%  | 96.69%   | 2.86%     | 0.31% | 0.13%  |

|   |        |       |       |       |        |       |       |       |
|---|--------|-------|-------|-------|--------|-------|-------|-------|
| 4 | 99.38% | 0.45% | 0.07% | 0.10% | 99.38% | 0.45% | 0.10% | 0.07% |
| 5 | 98.34% | 1.31% | 0.22% | 0.12% | 98.50% | 1.05% | 0.22% | 0.22% |
| 6 | 98.82% | 0.88% | 0.16% | 0.14% | 98.96% | 0.76% | 0.13% | 0.14% |
| 7 | 98.30% | 1.34% | 0.21% | 0.15% | 98.44% | 1.21% | 0.17% | 0.18% |
| 8 | 98.89% | 0.81% | 0.17% | 0.13% | 98.96% | 0.71% | 0.21% | 0.12% |
| 9 | 97.90% | 1.69% | 0.23% | 0.18% | 98.23% | 1.26% | 0.33% | 0.18% |

### 8.1 Factorial Invariance

We used LISREL 11 to conduct a confirmatory factor analysis of the data and on subsamples of country, sex, and age. In addition, we tested the factorial invariance of the overall model in each of these samples. All participants who reported participating in at least 1 gambling game were included in the analysis. These analyses were conducted using polychronic correlations with an asymptotically correct weight matrix and analyzed using weighted least squares. Analysis of the factor structure confirmed that the CPGI was unifactorial with the UK data. As shown in Table 8.03, this was done including all participants who gamble (N = 19201). Separate analyses were conducted for males, females, Scotland, England, younger participants (16-35) middle-aged participants (35 to 54), and older participants. In each case, the analysis indicated that there was only one factor in the data. In all cases, the Normed Fit Index (NFI), Non-Normed Fit Index (NNFI) and Goodness of Fit (GFI) were close to 1.0 and indicated that the fit of the one-factor model was very good. The Root Mean Residual Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) indicated that the average residuals were small. The Largest modification index score was significant, but the expected effect of these changes was trivial. Furthermore, tests of factorial invariance for the country, sex, and age group suggested the parameters were very similar across subsamples. In summary, the modification index did not suggest any alternative model factor structure for any of these analyses.

Table 8.03

Confirmatory factor structure of the PGSI; overall sample, country, sex and age subsamples and tests of factorial invariance.

|            | Df | Chi <sup>2</sup> | RMSEA | NFI   | NNFI  | SRMR   | GFI  | Largest MI     | Effect | Group |
|------------|----|------------------|-------|-------|-------|--------|------|----------------|--------|-------|
| Full data  | 27 | 83.2             | 0.013 | 0.998 | 0.998 | 0.041  | 1    | 8.6 TD (8,1)   | 0.021  |       |
| Country    |    |                  |       |       |       |        |      |                |        |       |
| England    | 27 | 56.3             | 0.01  | 0.998 | 0.999 | 0.054  | 1    | 7.4 TD (7.6)   | -0.022 |       |
| Scotland   | 27 | 38.8             | 0.008 | 0.998 | 0.999 | 0.044  | 1    | 3.1 TD (9,5)   | 0.014  |       |
| Invariance | 80 | 307.5            | 0.017 | 0.994 | 0.996 | 0.088  | 1    | 26.8 TD (7.6)  | -0.039 | 1     |
| Sex        |    |                  |       |       |       |        |      |                |        |       |
| Female     | 27 | 30.7             | 0.004 | 0.999 | 1     | 0.082  | 1    | 5.4 TD (9,2)   | -0.046 |       |
| Male       | 27 | 77.8             | 0.014 | 0.997 | 0.997 | 0.049  | 0.99 | 10.3 TD (8,1)  | 0.028  |       |
| Invariance | 80 | 285.1            | 0.016 | 0.995 | 0.997 | 0.121  | 1    | 20.42 TD (3,3) | .062   | 2     |
| Age        |    |                  |       |       |       |        |      |                |        |       |
| Young      | 27 | 45.6             | 0.012 | 0.994 | 0.997 | 0.0628 | 0.99 | 11.0 TD (8,1)  | 0.053  |       |

|            |     |       |       |       |       |        |   |               |        |   |
|------------|-----|-------|-------|-------|-------|--------|---|---------------|--------|---|
| Middle     | 27  | 48.74 | 0.011 | 0.999 | 0.999 | 0.0518 | 1 | 10.3 TD (9,4) | -0.026 |   |
| Old        | 27  | 34.69 | 0.006 | 0.999 | 1     | 0.061  | 1 | 6.91 TD (5,4) | -0.016 |   |
| Invariance | 125 | 253.5 | 0.013 | 0.997 | 0.999 | 0.087  | 1 | 14.98TD (8,1) | 0.045  | 1 |

172 Note: df = degrees of freedom, Chi2 is the weighted least squares Chi-square; RMSEA is the Root  
174 Mean Residual Error of Approximation; NFI is the Normed Fit Index; NNFI is the Non-Normed fit  
176 Index; GFI is the Goodness of Fit; Largest MI is the largest value of the Modification Index; The  
Effect is the expected change in the parameter if set free, and the group is a group where the largest MI  
effect was found.

178     **Section 9**

**9.0 Stakeholder consultations**

180           Regarding aim 3, we interviewed stakeholders for their feedback on the results of the study, and  
182 for consultation in developing a plan for disseminating our findings. In total, we interviewed 10  
184 participants who are service providers for people with gambling problems in the UK. Our initial  
attempt was to send individuals from the gambling industry emails with our questions so that they  
186 would respond via email. However, none answered our emails and one who did answer, never sent  
back responses. We then contacted key stakeholder directly for Zoom interviews, most of the  
188 participants stated that they felt the reported frequencies were lower than they expected and questioned  
the accuracy of the findings. For example, P1 speculated that 1% severe problem gamblers in the UK  
was on the low side and had questioned the definition of problems, and mentioned unregulated forms  
of gambling that would not be counted:

190           “I think it’s quite low, if I’m honest, I think the data is probably low. And I think when I’m  
when I’ve been in rooms with similar professionals, there’s been a viewpoint that the statistics  
192 that are often released, are usually on the low side.... where you class someone has been severe  
for someone who is moderately being harmed. And I think that’s where the waters muddled,  
194 because actually, we support people that are harmed in any way through gambling. So it’s  
really hard to put a figure on but when you look at, you know, case studies of, you know,  
196 gambling young people, you know, we start talking in the doors of actually, are we talking  
about non regulated gambling, or we’re talking about unregulated gambling, and we’re talking  
198 about forms of gambling with children that might not actually fit into the criteria such as loot  
box in and how that’s harmed”

200   The participants had a mixed reaction to the information about the larger number of problem gamblers  
amongst younger participants. P1 was not surprised and stated that:

202           young people are definitely higher vulnerability to start with, and I think, if we just look at  
fundament fundamental brain development, I appreciate I’m speaking to someone at the  
204 university. So, forget if wrong, you know, in terms of, if we look at the basic kind of  
neuroscience behind any form of addiction, the prefrontal cortex takes, you know, plays a big  
206 part in terms of logical reasonable reasoning, decision making.

          P8 offered the following explanations for the higher rates of problems among younger participants:

208           But now you have it in the form of a mobile phone, which a lot of the gambling apps are kind  
of designed a bit like a video game. So, they have lots of different aspects, which kind of  
210 connect with that a little bit. So, it’s more accessible.... And just to I guess, just to add to that  
sort of we and in terms of presentations in the clinic, we see a lot of the younger kids coming in  
212 as well. I mean, there’s always been younger demographics, but and I don’t know, in terms of  
the stats, but anecdotally, you know, we’ve seen a lot of kind of young kids coming in. And  
214 when I say that I mean kind of 18,19, and 20. Then also a more recent kind of rising kind of  
online trading and kind of cryptocurrency based.

216 On the other hand, P3 noted that they have very few clients who are young; most being middle aged.  
P4 offered the following explanation of the discrepancy.

218 In terms of young, I would say, we have less young people refer. And typically, when young,  
younger people do refer, they don't necessarily stick out treatment, as well as older people. And  
220 I would say that might be because they haven't experienced the full sort of negative harms of  
gambling yet. So, they may be gambling more, and then they may be more young people  
222 gambling, because they haven't sort of, you know, hit rock bottom, I had the negative  
consequences to such an extent, they're less likely to seek treatment. But it doesn't surprise me  
224 at all that you would find that more young people gamble.

They noted that some ethnic communities (Chinese, Muslims) were not adequately represented in the  
stats perhaps due to under reporting. For example, P2 suggested that some minorities who may not  
226 speak English very well, may be underrepresented in the data:

228 Yes. I don't think so. Because I think for many ethnic minority people, they are  
underprivileged, and they don't speak a good English. So, they may reluctance to seeking help.  
230 So, I read some other report. This our different ethnic group, how serious of the gambling  
problem. I am shocked because under the item of Chinese people, the percentage is really,  
232 really low. But this is absolutely not what I experienced in the past 20 years. But just so they  
don't seeking help. That's it doesn't mean there's not the problem here.

234 They also suggested that the prevalence amongst women who gamble may be higher than amongst  
males. P1 felt that although women are less likely to gamble, when they do, they are more likely to  
236 have problems:

238 What we find actually, is there's a real increase in vulnerability in women. Now where I'm  
interested, does the data fall short because more men gamble therefore, as an average, there will  
240 be more men that have developed problems. But as a percentage of the men that gamble and the  
percentage of the women that gamble I actually think the statistics would be different. So, if we  
242 look at the population in the UK of women that have a gambling addiction.

However, an analysis of the data did not support this view.

244 In terms of future studies, they suggested we need to include trauma in future surveys because  
of its key role in problem gambling and addictions. For example, P5 stated that including trauma would  
246 help them to know where to set up new branches.

248 I don't think in our treatment, because like I say, we focus quite a lot on the trauma. That's  
where we go back to, we treat gambling as a as a symptom rather than a cause. But it certainly  
would help us target our services and know where in the country to open new branches.

250 Some (P3, P4, P6) raised the importance of including the side effects of the antipsychotic medication  
as a risk factor. P6 noted,

We're doing kind of an advocacy piece at the moment at the clinic around the anti psychotic medication, Eric proposal. And that's, I think, in the last audit we did with the last year, we had something like 9% of our clients, who referred to the gambling clinic were prescribed our proposal and had developed gambling as a result of that medication. So huge links around sort of impulse control and that anti psychotic. And yeah, we're doing a bit of an advocacy piece with the media at the moment as well to kind of spread that awareness but that is yeah, a big risk factor to consider (P6)

They felt that the results are useful but that more research is needed to better understand gambling problems. P8 stated that he/she would like to know more about the environment in which the person grew up:

Yeah, I would like, I would like that, you know, the idea of kind of the environment, the environmental effects, I think some are capturing that little bit more will be really helpful. I think. Because, you know, it is quite intuitive, that idea of if you don't have access to certain services or certain things in your community, then there's going to be an increased risk factor. And it's difficult not to think that that risk factor will be tied in with, you know, the amount of money that's going into that area, right? In terms of the council or from the government or so. I think maybe that will be helpful in a way to, you know, to see you actually, you know, there's risk factors, but also protective factors, aren't there. I've tried to be able to see what I can what, what can be helpful there, you know, in terms of what can we address that would be helpful, on a different level than so more systemically rather than just focusing in on the individual and saying, well, you know, it's all your fault. You've got to come to therapy and do it all yourself.

Many believed that both government and industry should do more to help reduce problem gambling, such as reducing advertisements and other changes in legislation. In particular P5 suggested a need for stronger prevention messaging and stopping the advertising linked to sports:

"My first step would be to have a stronger message there stop there advertising on like the Premier League."

On the other hand, P9 argued that

My biggest worry is that the industry is so regulated that customers are driven to the black market which is unregulated and exponentially less safe. It's a happen medium between good sound regulation vs driving people away where we don't then have visibility over their safety. I'd like to know how many customers experience harm but find that it's too easy to bypass via creating new accounts, moving to the black market, changing operator, or going digital to retail.

In addition, P5 advocated a more holistic approach to treatment that considers social care, education, and building a more resilient population:

I think seeing gambling it taking a holistic approach to research and treatment around gambling is highly important. It's from my experience, or Gordon Moody's experience. Gambling is a is a symptom not a cause of a problem and so greater probably greater NHS [National Health Service] treatment, greater education, around childhood better social care all of these sorts of

292 very ground level things need to be addressed and that will reduce the level of harmful  
gambling. It's like Maslow's hierarchy of needs and gambling is one of the it happens further at  
294 the top you need to make sure that the bottom was the shelter the food the water the love the  
Attention that you know that that's in place to build resilient, resilient population who then  
296 don't feel like gambling and harmful gambling is the only option in life

In summary most of the participants felt the reported frequencies were lower than they expected  
298 and questioned the accuracy of the findings. They noted that some ethnic communities (Chinese,  
Muslims) were not adequately represented in the stats perhaps due to under reporting and a language  
300 barrier. They also suggested that the prevalence amongst women who gamble may be higher than  
amongst males. In terms of future studies, they suggested we need to include trauma, medication side  
302 effects, and the environment in which the person grew up in future surveys because these factors play  
key roles in problem gambling and addictions. They felt that the results are useful but that more  
304 research is needed to better understand gambling problems; A holistic approach was also advocated. In  
terms of recommendations, they felt that there needed to be more regulation on gambling especially in  
306 terms of advertisement of gambling.



## Section 10

### 10. 0 Discussion

As expected, both social and demographic variables were significantly associated with problem gambling. Based on our analysis combining the DSM and PGSI, about half a percent of the adults in England and Scotland met the threshold of severe problem gambling. In terms of gambling behaviors, the most common games were national lottery tickets, scratch cards, and other lotteries. The most common non-lottery game was horse race betting followed by fruit machines. The data suggest that horse racing is much more popular in the UK than it is in North America, other than that, the results are like other countries. We consolidated the types of gambling into 7 groups to simplify the analyses. Lotteries were by far the most common form of gambling with 54% of the population engaging in some form of lottery. When all sporting-related gambling was combined (including sports betting and horse racing) the total was 18%. In addition, the consolidated group for online gambling fell into third place with 9%. The games that are most often associated with problem gambling were EGMs, online gambling, casino gambling, and sports gambling. These numbers are largely consistent with research on gambling around the world where EGMs are the games most strongly associated with problem gambling. However, sports gambling is more common in the UK because sports betting has been legal since 1960, and online gambling has been legal since 2005 (Matheson, 2021). Given the recent legalization of sports gambling in North America, that may be changing (Evans, 2021; Matheson, 2021). When game types were entered into a logistic regression, the largest effect was for EGMs, followed by Sports gambling and then online gambling.

In terms of national comparison, people in Scotland appeared to participate more often in gambling, however, these differences were for the most part small except for lotteries and sports betting. There was no evidence of any national difference in the level of problem gambling between England and Scotland. Also note the factor structure of the PGSI for England and Scotland were very similar suggesting that the constructs work well in both contexts, providing some confidence of these instruments across different countries in the UK.

We also made a detailed examination of sex differences. Males in general gambled more often on all forms of gambling except for bingo. Females also had significantly lower odds of having gambling problems. Interestingly, we found that sex interacted with three games in associated with moderate to severe gambling problems: EGMs, online gambling, and sports betting. Follow-up analyses revealed that although males were more likely to play all three of these games, the difference between males and females was larger for sports betting than other games, and smaller for EGMs and online gambling than for other games. We found that the sex difference in gambling involvement also exists among non-problem gamblers. Compared to non-gamblers, people who gambled were somewhat more likely to be Scottish 63.1% compared to English with 57.4% and less likely to be 55 or older (46.4% vs. 41.7%) and more likely to be middle-aged (30.1% vs 37.1%), and gamblers were less likely to be female (39.6% vs. 45.4%). In addition, we found that even among non-problem gamblers (those who score 0 on both measures of problems), the rate of gambling was lower among females than male. This suggests the sex difference in gambling involvement also exists among non-problem gamblers, not just problem gambling.

The present project also focused on the social determinants of health associated with problem gambling and examined gambling-related disparities and the determinants of negative health outcomes. This study analyzed secondary data from the “Gambling in England and Scotland, 2016: Combined data from the Health Survey for England and the Scottish Health Survey.” Where the survey included several health indicators including smoking, alcohol consumption, Wellbeing, psychological distress (GHQ), and 17 physical ailments.

We also examined these variables to determine if gambling in a non-problematic manner, is a health risk. Non-problem and non-gambler have very similar scores on Wellbeing, however, due to the

huge sample size, the contrast is significant with non-problem gambler's scores slightly higher than non-gamblers. This finding suggests that contrary to the total consumption model, non-gamblers do not appear to be suffering from their gambling activities at least in terms of their current mental health.

On the other hand, compared to non-gamblers, non-problem gamblers were less likely to be non-drinkers (9.4% vs. 24.2%), and more likely to be high-risk drinkers (4.9% vs. 2.9%). In addition, non-problem gamblers were more likely than non-gamblers to be current smokers (19.9% vs. 14.8%). Based on the findings regarding sense of Wellbeing, psychological distress, alcohol use and smoking, non-problem gamblers are also more likely to engage in other addictive behaviors but are not different from non-gamblers in terms of Wellbeing or mental distress. It is important to consider that the slightly lower sense of wellbeing and higher GHQ scores for non-gamblers could be the result of recovered gamblers who no longer gamble. Furthermore, we tested if physical health was negatively affected by participation in gambling. The survey includes 13 health problems as well a question about diabetes, obesity, and high blood pressure. Several of these disorders differed between non-problem gamblers and non-gamblers however these effects were very small. Compared to non-gamblers, non-problem gamblers had lower odds of reporting an infectious disease (OR = 0.57), Nervous system disorders (OR = .79), eye complaints (OR = .77), and mental health (OR = 0.74) problems. Although significant, these effects are very small. The lower rates of mental health problems among recreational gamblers are also consistent with the higher scores on Wellbeing and lower scores on psychological distress compared to non-gamblers. These results suggest that non-problem recreational gambling is not associated with any of these health consequences. But this must be balanced out against the somewhat higher rate of smoking, alcohol consumption and obesity among non-problem gamblers than non-gamblers.

On balance, the results contradict a strong version of the overall consumption model of addictive behavior as it applies to problem gambling. That is non-problem gambling appears to be a relatively healthy recreational activity. Previous studies have suggested that recreational gamblers exhibit several health consequences (Desai, et al., 2004, 2007). Desai, et al., (2007) found that recreational gamblers were more likely to have nicotine dependence, alcohol use, obesity, and any chronic condition. In addition, older recreational gamblers were found to also have somewhat more physical and mental health problems. In the current study we indeed found that smoking, alcohol use, and obesity were somewhat more common among non-problem gamblers, however some physical illnesses and mental illness were less often reported by non-problem gamblers compared to non-gamblers. In addition, Wellbeing was higher among non-problem gamblers than non-gamblers. Desai et al., (2004, 2007) studies however included people who scored in the sub-clinical range of problem gamblers. Other studies including Weinstock et al., (2017) and Butler, et al., (2020) have shown that people with subclinical problems have more negative health consequences compared to people who score zero on measures of problem gambling. In summary, non-problem gamblers are somewhat more likely to smoke, drink heavily, and have obesity. The obesity is perhaps related to the sedentary nature of gambling. It is note worthy that their rate of smoking and heavy drinking was substantially lower than problem gamblers. It should also be noted that the highest rate of former smokers was amongst non-problem gamblers. In summary their overall physical and mental health of non-problem gamblers appears to be good, at least for the moment. Long term monitoring is needed to determine if their smoking, drinking and obesity, translate into poor health over time.

We also examined the relationship between these 17 health complaints and level of problem gambling. Analyzing the relationship between the various illnesses and problem gambling, we contrast non-problem and low risk with moderate to severe problem gamblers, where the only illnesses that were associated with problem gambling were mental health disorders which were higher among moderate to severe problem gamblers, and musculoskeletal system complaints which were somewhat lower among moderate to severe problem gamblers. The results for the relationship between problem

gambling and health complaint found few significant health effects associated with moderate to severe problem gambling. The main illness associated with problem gambling is a mental health problem. These results are consistent with the findings on Wellbeing and psychological distress. Further analysis suggests that only severe problem gamblers have a significantly elevated rate of mental health concerns. Only mental health emerged from this analysis as a serious health complaint associated with problem gambling. That result is also consistent with the results on alcohol, tobacco, the GHQ, and Wellbeing.

We then regressed demographics and social factors onto problem gambling first using univariate analysis and then multinomial logistic regression. These analyses showed that problem gambling was associated with heavy drinking, current smoking, less education, lower-status occupations, being younger (16-24 & 25-34), being single, being Black or from another ethnic group, and having a below-average sense of Wellbeing. In addition, males are more likely to be problem gamblers and the more severe the risk level, the bigger the sex difference.

These findings are not surprising and are in line with the bulk of the research on gambling (e.g., Dowling, et al. 2017; Turner, et al., 2006; Williams et al., 2021). In this sample, the age of problem gamblers peaks at 25-35 and decreases with older people. This is not surprising and is consistent with most other research. Interestingly, the drop-off in gambling problems with age is quite large where older adults aged 65+ years did not engage as much in gambling as the other age groups. The demographic findings are generally consistent with previous research (Dowling, et al. 2017; Turner, et al., 2006; Williams et al., 2021; van der Maas, et al., 2019).

In terms of aim 2, the factor analysis of the PGSI and the correlations of the PGSI with the DSM suggest that the PGSI is a valid measure of problem gambling in the Great Britain. Furthermore, The PGSI is unifactorial which is important as it indicates that problem gambling is a single disorder. In addition, the component matrix for both England and Scotland were very similar. The factor analysis of the PGSI suggests that the factor structure of the PGSI is valid for the Great Britain and that Scotland and England are very similar in terms of problem gambling. These findings suggest that the PGSI is a valid measure of problem gambling for the UK context for both England and Scotland.

Regarding the third aim to interview key stakeholders in the UK, most of the participants stated that the felt the reported frequencies of severe problem gambling were lower than they expected and questioned the accuracy of the findings. Some were surprised by the number of problem gamblers amongst younger participants, while others were not. Some young people who gamble might not be getting the treatment that they need since service providers are not seeing them, but we have captured them in our survey analysis. Some participants felt that the statistics for the lower rate of problems among females was incorrect and that if we only focused on gamblers, the rates of problem among females would be higher. However as noted in Table 3.13, the rate of moderate to severe problems was higher for males for all forms of gambling even bingo. Nonetheless, mental health problems were nearly twice as common among females who had moderate to severe problem gambling suggesting they may have more complex problems than males who have moderate to severe gambling problems.

Other participants noted that some ethnic communities (Chinese, Muslims) were not adequately represented in the stats perhaps due to under reporting. Translation of future surveys as well as making translators available for culturally relevant treatment may be able to better serve this group. They also suggested that the prevalence amongst women who do gamble may be higher than amongst males. In terms of future studies, they suggested we need to include trauma in future surveys because of its key role in problem gambling and addictions. They felt that the results are useful but that more research is needed to better understand gambling problems. Finally, they believed that both government and industry should do more to help reduce problem gambling, such as reducing advertisements and other changes in legislation. However, one participant voiced a concern that too much regulation would drive the population to unregulated sites which might be worse than the regulated sites.

## 10.1 Limitations

As in all research there are several limitations in this research. The survey is very rich, a repeated cross-sectional survey and thus it lacks longitudinal data. There were several variables which would have been of interest that were not included in the survey such as traumatic life experiences, traumatic brain injury, drug abuse, and impulsivity. A more detailed account of financial status and their debt load would also have been helpful in defining the impact of gambling on their lives. Knowing about the social consequences of their gambling would also have been helpful in defining the impact of gambling.

The data sets were combined to allow detailed analysis, but also made it possible to find significant differences that are very small. We have noted throughout when the effects we have identified are trivial.

Finally, data resource is very valuable monitoring trends in gambling behavior over time however some of the variables were different between the three data sets. For example, the measure of psychological distress was only available for the 2012 and 2016 data sets. These surveys need to be consistent to allow for trend analyses over time to facilitate surveillance and monitoring of problematic gambling behaviours over time. It is important to continually monitor for comorbid risk factors associated with problem gambling.

Finally, for the key stakeholder's component of the study, we would have liked to have interviewed a few people from the gambling industry to get their perspective on the results.

## 10.2 Conclusions

Key findings are that significant social and demographic risk factors for problem gambling include sex (male), age (being younger, 25 to 34), marital status (being single or never married), social class (manual and routine labour), ethnic /racial group (Black or other), education (lower levels of education). In addition, being a heavy drinker, a current smoker and having a lower level of Wellbeing, more psychological distress, and a greater rate of mental health problems, were also related to problem gambling. Although the results suggest that people in Scotland gamble somewhat more often especially on Lotteries, Country (England vs. Scotland) was not associated with gambling problems.

In terms of games played, according to the logistic regression, the largest association was for EGMs, followed by Sports gambling and then by online gambling. The interaction of games with sex is interesting suggesting that the male vs. female differences is smaller for EGMS and online gambling, but larger for sports gambling.

In terms of Aim 2, the results suggest that the PGSI is a valid measure of gambling in the Great Britain and that it is equally valid for both England and Scotland.

The main implication of the study is to establish a clearer picture of the connections between problem gambling and the social determinants of health as it applies to problem gambling. This will help to inform public health strategies in the Great Britain related to harm reduction, prevention, and treatment of gambling disorder. In addition, the analysis has strongly supported the cross-validation of the PGSI (Ferris and Wynne, 2001) for a Great Britain sample.

Although problem gambling is associated with a few social consequences, non-problem gamblers appear to be a relatively healthy population and when compared to non-gamblers had lower rates of some physical ailments including mental health problems, and a higher score on wellbeing however their somewhat greater rate of smoking, heavy drinking and obesity compared to non-gamblers suggests they may have more health problems eventually. Non-problem gamblers also had significantly lower rates of smoking and drinking than problem gamblers but had higher rates of obesity than all other groups. The findings suggest that non-problem gambling is a relatively harmless

502 recreational activity for most people. This would challenge a strong version of a general consumption  
504 model in that people who gamble but have no problems, do not appear to be currently harmed by their  
gambling activity. However more research is needed.

506 Implications:

- 508 1. Problem gamblers are more likely to have lower levels of education, were less likely to be in  
managerial work, and in terms of ethnic group were Black or other.
- 510 2. Problem gamblers are physically healthy, but have an elevated risk of mental health problems,  
have a poorer sense of well-being and are more likely to smoke or engage in heavy drinking.
- 512 3. The results found that country (England vs. Scotland) was not associated with differences in  
gambling problems, however, people in Scotland gamble somewhat more often especially on  
Lotteries.
- 514 4. In terms of Aim 2, the results suggest that the PGSI is a valid measure of gambling in the Great  
Britain and that it is equally valid for both England and Scotland.
- 516 5. Non-problem gamblers appear to be a relatively healthy population and had the best scores in  
terms of mental health and well-being, though the contrasts with non-gamblers were trivial.
- 518 6. Non-problem gamblers had a somewhat greater rate of smoking, heavy drinking and obesity  
520 compared to non-gamblers, suggesting they may have more health problems eventually. Effort  
should be made to encourage more physical activity amongst recreational gamblers.

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## Appendix 1

### Interview Questions:

What is your role and how many years have you held this role?

### TOPIC: Feedback on the results

Q1: I am going to go over the 4 main findings from the Health Survey for England and the Scottish Health Survey and ask you questions about them. In order to preserve the anonymity of your clients, please, do not refer to specific cases or users. I am interested in the general picture of the problem rather than in specific cases.

- *Finding 1/Frequency of serious gambling problems: less than 1% of the UK population, regardless of which gambling measure we used, have serious gambling problems.*
  - What are **your thoughts** on the finding that people who experience **serious** gambling problems are less than 1% of the UK population? (Please, do not mention specific cases or users).
  - "In your experience, **how would you explain this frequency or percentage?**"
    - Prompt: Do you believe this rate **reflects the actual percentage** of people of have serious gambling problems in the UK?
- *Finding 2/Frequency of gambling behaviours: according to the Problem Gambling Severity Index (PGSI) and DSM-V, about 5% have **some type** of gambling behaviours.*
  - What are **your thoughts** on the findings that 5% of people in the UK have problem gambling behaviors? (Please, do not mention specific cases or users)
    - Prompt: What do you think about the **accuracy** of this percentage?
  - "In your experience, **how would you explain this frequency or percentage?**"
  - What are **the issues in detecting gambling behaviors with these 2 instruments.**
  - What are the **strengths** of these **instruments**?
    - [interviewer can probe about the PGSI and DSM-V separately]
- *Finding 3/ Factors: Problem gambling is more likely among males, younger groups, single people, current smokers, and those with lower mental health status.*
  - What do you think about the relationships that we found? (Please do not mention specific cases or users )
    - Based on your experience, **why do you think these are** the factors found with problem gambling? [prompt each variable: males, younger individuals, single people, smokers, and people with lower mental health status]
    - What are **some related factors** to problem gambling that you would have **expected to see that we did not** find?
    - [probe: Do these relationships make sense to you? Do any of these factors come **as a surprise? Are they common among gamblers** who you have come across during these years you have working with?]
- *Finding 4/Factor: harmful drinking seems to increase by gambling risk.*
  - What do you think about this finding? (Please do not mention specific cases or users)
  - In your experience, what are the **strongest factors/characteristics among** gamblers?
    - [probe: what do you think should be the strongest association with gambling risk?]



you describe how harmful drinking is part of your treatment program for gamblers?

- Can you describe what you think is an **integral part of your gambling treatment** programme? [prompt: What are **some other issues that you address** in your treatment program? What are clients in your programme most responsive to? What do **clients feel like they need most**? How might your treatment programme be adapted or updated in the future?

**TOPIC: Suggestions on risk factors that are missing in this analysis and in the survey**

Q3: Given your experience, in general terms, **what other important/common factors with gambling should we have included in this analysis?**

- Probe regarding neighborhood and environment, access to health care, education, economic stability, social and community context

Q4: What additional **questions should be included in the National Health Survey** to help us understand the problem gambling?

Q5: In general terms, can you describe any **typology/specific groups among the clients** you attend? (Please do not mention specific cases or users)

- In case you see different typologies/specific groups, do they inform your practice? (e.g., Tailored treatment)

**TOPIC: how useful the information is to them/relevance of the findings to their practice/work**

Q6: How might these results be useful for your work?

[Probe: In what sense?]

**TOPIC: how the information will be used**

Q7: Can you describe in general terms any other situation or for any other stakeholder where this information might be useful? (e.g., tailoring treatment, amending (risk) assessments tools)

**TOPIC: steps should be taken to reduce the harm of gambling problems in the UK**

Q8: According to these findings and your experience, what steps should be taken to reduce the harm of gambling problems in the UK? (Prompts: go over each finding)

Q9: Can you describe your thoughts on how the gambling industry in the UK is doing to reduce the harm of problem gambling?

- What more do you think should be done to reduce the harm of problem gambling?

\*\*\*Many thanks for your participation in this study\*\*\*

## Appendix 2

### Additional Cluster Analyses

Table A2.01. Cluster Analysis Group Membership for Gamblers

| Cluster Method    | Drinking frequency<br>(last 12-months) | PGSI       | Smoking intensity | Wellbeing    |
|-------------------|----------------------------------------|------------|-------------------|--------------|
| K-Means           | Mean (SD)                              | Mean (SD)  | Mean (SD)         | Mean (SD)    |
| Cluster 1 (n=61)  | 3.38(1.43)                             | 3.54(4.33) | 19.85(6.24)       | 44.23(9.05)  |
| Cluster 2 (n=40)  | 8.05(1.06)                             | 3.95(4.94) | 6.35(8.93)        | 45.67(10.80) |
| Cluster 3 (n=186) | 3.75(1.23)                             | 2.33(2.38) | 0.95(2.45)        | 49.71(7.32)  |

58

708

Table A2.02. Cluster Analysis Group Membership for the Total Sample

| Cluster Method        | Drinking frequency<br>(last 12-months) | PGSI       | Smoking<br>intensity | Wellbeing   |
|-----------------------|----------------------------------------|------------|----------------------|-------------|
| K-Means               | Mean (SD)                              | Mean (SD)  | Mean (SD)            | Mean (SD)   |
| Cluster 1<br>(n=2252) | 7.62(1.28)                             | 0.08(0.88) | 2.94(6.79)           | 50.00(9.47) |
| Cluster 2<br>(n=5489) | 3.52(1.22)                             | 0.11(0.82) | 2.41(6.12)           | 51.96(8.32) |

710

Table A2.03. Comparison of Cluster Groups on Sociodemographic Characteristics of Gamblers (N=287)

| Variables              | K-Means            |                      |                     | $\chi^2$ |
|------------------------|--------------------|----------------------|---------------------|----------|
|                        | Cluster1<br>(n=45) | Cluster 2<br>(n=184) | Cluster 3<br>(n=58) |          |
| Age                    |                    |                      |                     | 28.82    |
| 16-24(%)               | 10                 | 10                   | 18                  |          |
| 25-34(%)               | 20                 | 15                   | 25                  |          |
| 35-44(%)               | 28                 | 15                   | 19                  |          |
| 45-54(%)               | 29                 | 12                   | 12                  |          |
| 55-64(%)               | 6                  | 10                   | 12                  |          |
| 65-74(%)               | 6                  | 37                   | 14                  |          |
| Sex                    |                    |                      |                     | 0.39     |
| Male(%)                | 77                 | 72                   | 77                  |          |
| Female(%)              | 23                 | 27                   | 22                  |          |
| Education              |                    |                      |                     | 18.10    |
| No qualifications (%)  | 23                 | 35                   | 15                  |          |
| GCSE stand(%)          | 36                 | 35                   | 26                  |          |
| A-level(%)             | 15                 | 17                   | 20                  |          |
| Higher ed < degree (%) | 20                 | 6                    | 14                  |          |
| Degree or higher(%)    | 6%                 | 5%                   | 25%                 |          |
| Socioeconomic status   |                    |                      |                     | 5.89     |
| Routine/manual occ(%)  | 62                 | 62                   | 48                  |          |
| Intermediate occ(%)    | 20                 | 22                   | 19                  |          |
| Managerial/prof occ(%) | 18                 | 15                   | 33                  |          |
| Ethnicity              |                    |                      |                     | 10.73    |
| White(%)               | 100                | 87                   | 95                  |          |
| Black(%)               | 0                  | 5                    | 0.5                 |          |
| Asian(%)               | 0                  | 5                    | 3                   |          |
| Other(%)               | 0                  | 2                    | 2                   |          |
| Marital status         |                    |                      |                     | 6.29     |
| Single(%)              | 39                 | 30                   | 30                  |          |
| Married/civil part(%)  | 52                 | 55                   | 59                  |          |
| Sep/div(%)             | 8                  | 7                    | 8                   |          |
| Widowed(%)             | 0                  | 7                    | 3                   |          |



716

Table A2.04. Comparison of Cluster Groups on Sociodemographic Characteristics of the Total Sample (N=7741)

|                                  | <b>K-Means</b>        |                       |           |
|----------------------------------|-----------------------|-----------------------|-----------|
| <b>Variables</b>                 | Cluster 0<br>(n=2252) | Cluster 1<br>(n=5489) | $\chi^2$  |
| <b>Age</b>                       |                       |                       | 106.18*** |
| <b>16-24(%)</b>                  | 6                     | 7                     |           |
| <b>25-34(%)</b>                  | 13                    | 13                    |           |
| <b>35-44(%)</b>                  | 15                    | 18                    |           |
| <b>45-54(%)</b>                  | 17                    | 21                    |           |
| <b>55-64(%)</b>                  | 16                    | 18                    |           |
| <b>65-74(%)</b>                  | 33                    | 22                    |           |
|                                  |                       |                       |           |
| <b>Sex</b>                       |                       |                       | 171.21*** |
| <b>Male(%)</b>                   | 33                    | 50                    |           |
| <b>Female(%)</b>                 | 66                    | 50                    |           |
|                                  |                       |                       |           |
| <b>Education</b>                 |                       |                       | 285.54*** |
| <b>No qualifications(%)</b>      | 30                    | 15                    |           |
| <b>GCSE stand(%)</b>             | 26                    | 23                    |           |
| <b>A-level(%)</b>                | 13                    | 16                    |           |
| <b>Higher ed &lt; degree (%)</b> | 10                    | 13                    |           |
| <b>Degree or higher(%)</b>       | 20                    | 32                    |           |
|                                  |                       |                       |           |
| <b>Socioeconomic status</b>      |                       |                       | 181.52*** |
| <b>Routine/manual occ(%)</b>     | 50                    | 35                    |           |
| <b>Intermediate occ(%)</b>       | 23                    | 25                    |           |
| <b>Managerial/prof occ(%)</b>    | 27                    | 41                    |           |
|                                  |                       |                       |           |
| <b>Ethnicity</b>                 |                       |                       | 171.56*** |
| <b>White(%)</b>                  | 90                    | 97                    |           |
| <b>Black(%)</b>                  | 2                     | 0.8                   |           |
| <b>Asian(%)</b>                  | 6                     | 1                     |           |
| <b>Other(%)</b>                  | 1                     | 0.8                   |           |
|                                  |                       |                       |           |
| <b>Marital status</b>            |                       |                       | 145.15*** |
| <b>Single(%)</b>                 | 18                    | 16                    |           |
| <b>Married/civil part(%)</b>     | 59                    | 70                    |           |
| <b>Sep/div(%)</b>                | 11                    | 9                     |           |
| <b>Widowed(%)</b>                | 12                    | 5                     |           |

718