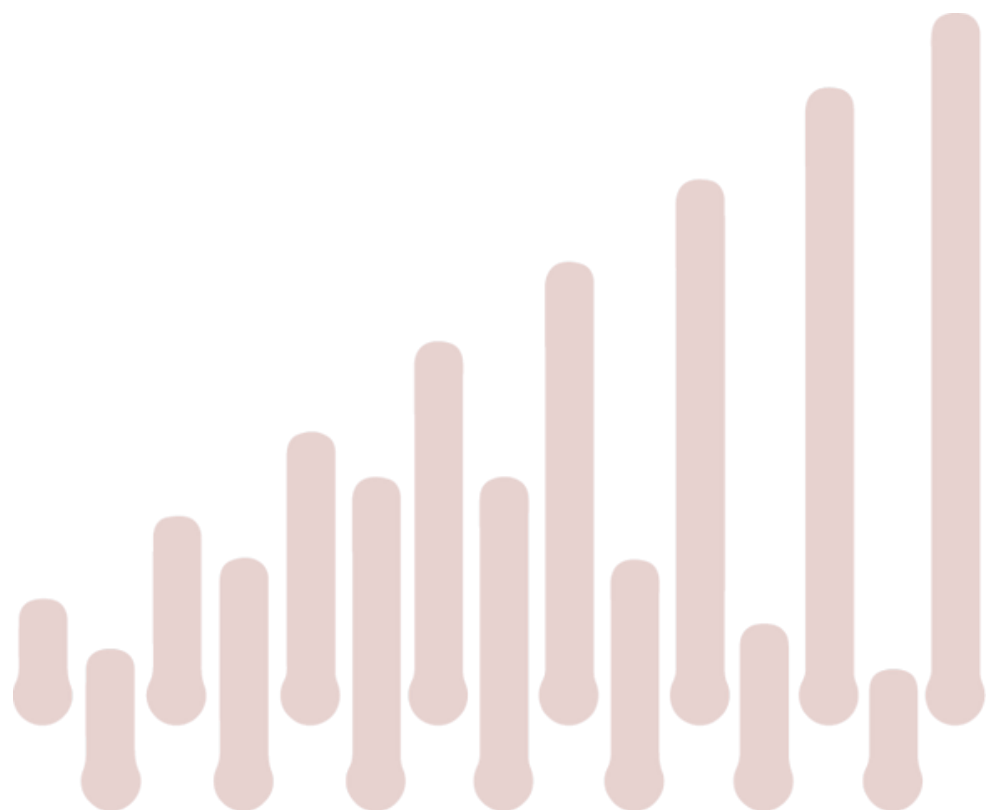# The Fiscal Costs and Benefits of Problem Gambling: Towards Better Estimates

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About the National Institute of Economic and Social Research

The National Institute of Economic and Social Research is Britain's longest established independent research institute, founded in 1938. The vision of our founders was to carry out research to improve understanding of the economic and social forces that affect people's lives, and the ways in which policy can bring about change. Over eighty years later, this remains central to NIESR's ethos. We continue to apply our expertise in both quantitative and qualitative methods and our understanding of economic and social issues to current debates and to influence policy. The Institute is independent of all party-political interests.

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Executive Summary

This report examines the fiscal benefits and costs of gambling, with a focus on the fiscal burden to the Exchequer that is associated with harms arising from 'problem gambling'.

While recognising the benefits, we firm up the estimates of the fiscal burden. Our research finds that the fiscal cost per person experiencing problem gambling is approximately £3,700 per year compared with people experiencing 'at-risk' gambling. The bulk of the fiscal cost relates to higher welfare support, in addition to increased healthcare, criminal justice costs and the costs of homelessness.

Our central estimate is that the number of people experiencing problem gambling is 0.7 per cent of the total population of 16 years and older living in private accommodation, which corresponds to about 380,000 people. On that basis, the total fiscal cost associated with harms from problematic gambling is £1.4 billion per year.

However, our calculations are likely an under-estimate of the true fiscal burden. Due to a lack of publicly available data, it has not been possible to include the costs to "affected others", which arise from the links between gambling, debt and family breakdown, or the costs of suicide linked to problem gambling.

Given the focus of this report, we recommend a number of reforms:

1. Recognition of the fiscal costs of problem gambling in the Government's proposed regulatory changes as part of the Review of the 2005 Gambling Act in the White Paper, which will be published imminently.

2. Inclusion of clear screening diagnostics for people experiencing problem gambling (PGSI or DSM-IV/V screens) in the next rounds of the Wealth and Assets Survey (WAS) and the updating of our fiscal estimates once the 2022 Adult Psychiatric Morbidity Survey (APMS) data are available.

3. Large-scale data collection as part of the remit of the Gambling Commission, especially in relation to the association between problem gambling and "affected others" and between problem gambling and suicide.

Purpose of Research

This report seeks to estimate the fiscal benefits and costs of gambling, with a focus on the fiscal burden to the Exchequer associated with 'problem gambling' (on definition of problem and at-risk gambling, see Box 1 in Section 1). A variety of public bodies have highlighted the need for a better understanding of these costs, including the House of Lords Select Committee "Inquiry into the Social and Economic Impact of the Gambling Industry" (HoL, 2020) and the Public Accounts Committee (PAC, 2020).

Prior studies have addressed this question but have resulted in estimates with high uncertainty and, correspondingly, a very large range of monetary values, rendering them less helpful when applied to policy (e.g. IPPR, 2016; PHE, 2021; cf. OHID, 2023). Furthermore, they report extrapolations from non-British based datasets, raising queries by some stakeholders about their usefulness.

Better estimates of the fiscal costs associated with problem gambling is essential, especially for policymakers who are attempting to understand the broader impact of proposed changes to gambling regulations in the forthcoming White Paper. Our study aims to provide a more accurate assessment of the costs of problem gambling by:

- applying innovative analytical techniques to the calculation of the fiscal costs associated with problem gambling, thus deriving updated estimates with reduced uncertainty of the range within which our estimates lie;

- generating these estimates by using British-based data sources and accounting for the heterogeneity of experiences across individuals and households to increase confidence in the resulting estimates.

A secondary objective is to compare our revised estimates of the direct costs to the Exchequer with the direct fiscal benefits. The latter is measured through examination of receipts of corporation tax and gaming duty.

We acknowledge that there are other benefits provided by gambling, for example, the positive implications for entrepreneurship and value creation that arise from risk-taking and the 'economics of happiness' associated with winning money, but an examination of the broader range of benefits is beyond the scope of this report.

Similarly, we acknowledge that there are large-scale costs associated with problem gambling that we cannot include in this report because of data deficiencies, for instance costs associated with "affected others" such as debt and family breakdown. The results provided in this report are our best estimates based on currently available, and publicly accessible, data.

Approach

First, we use the metrics of harms outlined by Wardle et al. (2018) as a starting guide for our analysis. Then we detail the two datasets that our research is based upon: (1) the Office for National Statistics (ONS)'s UK Wealth and Assets Survey (WAS) and (2) the Adult Psychiatric

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Morbidity Survey (APMS), which together provide key insights into problem gambling and its economic effects. As the use of both these datasets involves methodological challenges, we detail our analytical approach to clarify what we can and cannot infer from these data and our calculations of the fiscal costs (see also the Technical Appendix in Section 7).

We set out in detail how we go from using these data to providing a statistically significant association between problem gambling, the corresponding use of specific public services and a fiscal cost per person experiencing problem gambling. Further, we estimate more precisely the number of people experiencing problem gambling in the population through a comprehensive, combined analysis based on three years of data from the Health Survey for England series (2015-2018). This allows us to produce calculations of problem gambling with narrower confidence intervals and to estimate a smaller range of fiscal costs.

Previous studies of this nature have received criticism on a number of methodological grounds. This partly reflects the sensitive nature of research in this area. We therefore seek partly to meet these concerns with the intention of reducing ambiguity and uncertainty regarding the potential costs associated with problem gambling.

One main challenge is with whom we compare the people experiencing problem gambling. For example, if we found that those experiencing problem gambling are more frequently admitted to hospital for mental health issues, previous studies have compared this finding to the average population and attributed the difference to the likely effect of problem gambling (e.g. IPPR, 2016). However, we think that it is better to compare the people experiencing problem gambling to the people experiencing at-risk gambling because the behavioural profile of these two categories of gamblers is more similar than the behavioural profile of the general population who are largely non-gamblers.

Our approach is different from the 2021 Public Health England (PHE, 2021; cf. OHID, 2023) report in this area, which due to methodological challenges elected to combine the at-risk and problem gambling populations together and compare the results to the general population. We instead split these groups into the respective classifications of problem gambling severity and compare associations between each other rather than to the general population.

It is likely that this approach underestimates the severity of the effects. The reason is that, if problem gambling severity exists along a continuum, then the difference between someone experiencing problem gambling and someone experiencing at-risk gambling will be less stark than it would be if we compared the former to the general population.

Estimates of Fiscal Cost and Comparison with Tax Receipts

Our research estimates that the average fiscal cost per person experiencing problem gambling is approximately £3,700 per year more than those at-risk. The breakdown of the costs per person experiencing problem gambling is as follows:

- Healthcare (GP visits): £57

- Healthcare (hospital visits): £1,200

- Police Callout: £85

- Court Appearance: £24

- Homelessness Support: £43

- Benefits Payments: £2,300

This is based on our estimates that people experiencing problem gambling are more likely to require public services than those experiencing at-risk gambling, including:

- 2 times more likely to require GP services

- 9 times more likely to require hospital treatment

- 3 times more likely to commit crime involving the police

- 2 times more likely to commit crime involving a court appearance

- 4 times more likely to require homelessness support

In addition, people experiencing problem gambling receive 73 per cent more welfare support on average than people experiencing at-risk gambling.

In light of these numbers, we estimate that the total fiscal cost associated with problem gambling is approximately between £1.1 billion and £1.7 billion per year. This range is based on our estimate that the approximate 95 per cent confidence interval of the total number of people experiencing problem gambling is between 300,000 and 470,000 (0.57-0.87 per cent of the total population of 16 years and older living in private accommodation), which is based on multiple datasets from Health Survey England (HSE).

Our central estimate is that the number of people experiencing problem gambling is close to the average, that is 380,000 or 0.7 per cent of the population experiencing problem gambling. Based on this, the central estimate of the fiscal cost is £1.4 billion per year.

Our estimates are conservative, as we only include a narrow range of costs where data are available, and we do not include costs for "affected others". Besides, we benchmark fiscal costs of problem gambling against at-risk gambling, rather than low-risk or non-gambling, for the above-mentioned reason that the behavioural profile of these two categories of gambling resembles each other more than the behavioural profile of the general population who are largely non-gamblers. Therefore, we think that these are the minimum fiscal costs associated with problem gambling.

Regarding the benefits, we look specifically at the observable tax revenue generated from gambling behaviour. To do so, we draw on existing findings in this area undertaken by the Office for Budget Responsibility (OBR) regarding the revenue from betting and gaming duties and official corporation tax from HMRC. The OBR project the former to reach around £3.3 billion in the 2022-23 financial year, whereas latest HMRC figures state the government

receive a total of around £200 million in corporation tax receipts (HMRC, 2022). Together, these figures imply HM Treasury (HMT) receives £3.5 billion from these taxes alone. In the same manner as our estimates of the economic costs associated with problem gambling, these benefits in terms of tax receipts are not an exhaustive account of how gambling affects the UK economy.

Project Scope

The research presented in this report was funded from a regulatory settlement approved by the Gambling Commission. As with all research funded in this way, the work is a pilot project aiming to improve the estimates of the observable costs associated with problem gambling and compare this to the observable tax revenue gained from the wider industry. We consider these 'core' costs and benefits, as they are identifiable within existing data. Consequently, this report does not provide a complete and comprehensive cost-benefit analysis of gambling or, more specifically, of problem gambling.

On the cost side, due to data deficiencies, the report does not include both the economic and social costs of suicide and costs to "affected others", which are associated with problem gambling. Nor does it extend to benefits such as the 'economics of enjoyment', risk-taking for business activity, the total economic advantages of the gambling industry in relation to employment and multiplier effects from spending on gambling and related consumption.

Funding

This project was funded by a regulatory settlement approved by the Gambling Commission to NIESR. Projects funded by regulatory settlements and approved by the Gambling Commission are to be used against socially responsible projects to reduce gambling harms. Our report is the main output from that project. A second, separate output will be a pilot survey together with the Behavioural Insights Team (BIT) on behavioural changes by people experiencing gambling harms in response to new regulation of the gambling industry, with a focus on the impact of spending patterns.

Going forward, NIESR will explore other areas of research that build on the present report, for example:

1. Exploring ways of conducting a nationally representative survey of gambling behaviour to generate more primary data about the benefits and costs associated with gambling activity.

2. Conducting quantitative research on the costs associated with problem gambling in relation to "affected others".

3. Linking qualitative research on the lived experience of people who suffer harm associated with problem gambling to quantitative research on the fiscal burden.

4. Measuring the interaction of various gambling harms and fiscal costs, e.g. mental health, homelessness and welfare benefits.

5. Comparing wider economic benefits and costs associated with gambling, including the positive implications for entrepreneurship and value creation that arise from risk-taking and the 'economics of happiness', but also the negative implications that are linked to unhappiness or misery that results from losing money and accruing debt.

6. Assessing the distributional impact of gambling-related harm at the regional and household level which will build on ongoing NIESR work in Chapter 2 of our quarterly UK Economic Outlook (Bhattacharjee et al., 2022a-d and 2023) with a twofold focus on (1) those living in the most deprived parts of the UK who are many times more likely to experience harms from problem gambling than those living in the most prosperous parts and on (2) the co-occurrence of gambling-related harms and socio-economic and health inequalities such as deprivation, unhealthy alcohol consumption and mental health problems.

1. Introduction

1.1. Background

The Government has been undertaking a review of the 2005 Gambling Act to "*make sure*" that both the legislation and the regulatory framework are "*fit for the digital age*" (DCMS, 2020). The reforms that will be set out in the forthcoming White Paper aim to minimise harms from gambling whilst allowing the industry to grow and continue making a contribution to the UK economy.

Since the review was launched more than three years ago, the debate over gambling reform has focused on two main issues: harm reduction and cost. The Gambling Act Review highlights harm reduction as a key objective in the terms of reference and asks whether "*further protections*" are needed (DCMS, 2020). But this involves a trade-off between two types of cost: gambling-related harm is associated with costs to health and wellbeing and thereby to the public purse, while reforms that limit harm may incur costs in terms of lower industry profits and thus lower tax revenues from gambling.

Striking the right balance between harm reduction and cost is at the heart of the legislative and regulatory review process. It is essential to have a proper understanding and measurement of gambling-related harm and the cost associated with it. This has been recognised by the regulator itself: in its 2019 National Strategy to Reduce Gambling Harms, the Gambling Commission defined the task as follows: "*We need to develop a way to comprehensively measure the harms caused by gambling and their cost to society*" (GC, 2019).

Despite several recent reports in this area, it is widely accepted that neither the Government nor the Gambling Commission have a accurate estimate of the economic costs of gambling-related harm. Reports by the House of Lords Gambling Industry Select Committee (HoL, 2020), the All Party Parliamentary Group for Gambling Related Harm (APPG, 2020) and the Social Market Foundation (SMF, 2020), all published in 2020, have pointed to the need for a greater understanding of harm.

For instance, the Public Accounts Committee has stated that government lacks a clear sense of the costs associated with gambling harms. In its 2020 report, it writes that

> *Government has a poor understanding of gambling problems and the consequences for people and public services, and therefore of how to target its limited resources effectively. Problem gambling can have devastating consequences on people and their families, including financial loss, relationship breakdowns, criminality and suicide. Government and regulators need to understand the causes and impacts of gambling harm to design an effective response and target resources where they are needed most* (PAC, 2020).

Box 1: Gambling-Related Harms and Problem Gambling: A Note on Definitions and Terms

The regulator defines problem gambling as "*gambling to a degree that compromises, disrupts or damages family, personal or recreational pursuits*", which affects those gamblers who "gamble with negative consequences and a possible loss of control" (GC, 2020). Those who display some signs of problematic gambling behaviour but remain below the threshold for problem gambling are specifically termed 'at-risk' gambling (GC, 2020.

Gambling-related harms (GRHs) is the term increasingly used by policy-makers, regulators and academics to describe the wide range of consequences that can arise from gambling. In Britain, these harms are described as *"the adverse impacts from gambling on the health and wellbeing of individuals, families, communities and society. These harms are diverse, affecting resources, relationships and health, and may reflect an interplay between individual, family and community processes. The harmful effects from gambling may be short-lived but can persist, having longer term and enduring consequences that can exacerbate existing inequalities"* (Wardle et al., 2018).

GRHs are thus broader in scope and definition than more clinical conceptions of disordered gambling or 'problem' gambling. In short, people experiencing disordered or 'problem' gambling will be experiencing harms from gambling. However, these are not the only people who are harmed by gambling; rather, they are simply a subset of a wider group affected.

In British-based studies to date, the wider array of gambling-related harms either from someone's own gambling, or from someone else's gambling, has not been measured. Instead, measurement instruments focus on the identification of behaviours and consequences that establish if someone is experiencing 'problem gambling'. In Britain, this terminology was first used in the 1999 British Gambling Prevalence Survey, which categorised people as experiencing 'problem gambling' if they endorsed three out of ten questions asked using the American Psychiatric Association's Diagnostic and Statistics Manual (DSM) IV schedule. Problem gambling was defined as "*gambling to a degree that compromises, disrupts or damages family, personal or recreational pursuits*".

Similar categorisation, definitions and terminology have since been used in a range of other British surveys, including the Adult Psychiatric Morbidity Survey (APMS) of 2007 and the Health Survey for England (HSE) series. In addition, the APMS 2007 survey also included a categorisation of 'at-risk', being those people who endorsed one or two questions from DSM-IV schedule on gambling. Like other similar gambling screens, (e.g. the NORC Diagnostic Screen for Gambling Disorder), this identifies people with mild, but sub-clinical, risk of gambling problems.

This study uses data from the APMS 2007 and therefore inherits the classifications and terminologies used in that report. It would be our preference not to employ the language of 'problem gambling', especially given concerns about the use of stigmatising language in policy and research. However, for clarity we have retained the original terms used by the APMS 2007.

In response, the Government states that it "*agrees with the Committee that a robust evidence base is essential to effective policy making and regulation, and in order to make progress in this area we are working with experts to develop a model that delivers the data and insights we need to more fully understand gambling in Britain*" (DCMS, 2020) – a reference to the studies by Public Health England (PHE, 2021) and the National Institute for Health Research/University of Sheffield research (Blank et al., 2021), as well as the Gambling Commission's new pilot set of questions on its quarterly online omnibus survey to understand the public's experience of gambling-related harms (GC, 2022a). The Government adds that "*this builds on work by academics to develop a framework of harms and focuses on the themes of health, financial and relationship based harms*" (DCMS, 2020).

Nevertheless, progress in this area is ongoing and broader measurement of the full range of harms associated with gambling in Britain has not, as yet, been produced. This lack of measurement has immediate consequences for our understanding of the fiscal costs associated with the wider range of harms from gambling: costs cannot be attributed where harms have not been measured. Instead, research has focused on the fiscal costs associated with problem gambling (see Box 1 for explanation of difference between harms and problem gambling and our use of these terms in this report). We follow this procedure for the present report and as a result we note that our estimates are conservative.

1.2.   Previous Research and Gaps in the Evidence Base

Two prior studies have attempted to quantify the fiscal costs of problem gambling in Britain. The first is the 2016 report 'Cards on the Table' by the Institute for Public Policy Research (IPPR, 2016), which attempted to assess the total social costs of problem gambling in terms of direct health costs, financial costs, wider costs including family and community networks as well as associated costs in terms of addiction, crime and debt.

This report concluded that an "illustrative" estimate of the costs of problem gambling to the Exchequer ranged between £260 million and £1.16 billion per year – a figure which, despite still being widely cited in reports today, is clearly not sufficiently precise to be of use for policy and regulatory interventions.

A second study, published by Public Health England in September 2021 (PHE, 2021) expanded on this by estimating the social and economic costs from at-risk and problem gambling. It included a different range of metrics, including suicide, to arrive at a higher rate than the IPPR report but produced an even larger estimated range of costs – between £841 million and £2.12 billion per year.

Following the evidence update published in January 2023, the report now estimates that "*the annual excess direct financial cost to government associated with harmful gambling is equivalent to £412.9 million*" (OHID, 2023) and that together with the annual societal value of health the combined estimate is approximately £1.05 billion to £1.77 billion.

One of the reasons why these reports produce such vast ranges relates to the confidence in precision of our estimates of problem gambling. These are generated from national surveys of

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gambling and/or health behaviours and as such should be considered along their reported confidence intervals. These confidence intervals alter the upper and lower bounds for the number of people within the population believed to be experiencing problem gambling, which when applied to fiscal costs results in the large ranges observed in these two reports. For policy purposes, ranges which span nearly £1 billion become difficult for policymakers to use. It is essential to try to reduce the uncertainty around these estimates, which this report attempts to do.

These two reports also highlight the paucity of data evident for a range of likely fiscal costs associated with problem gambling. In some cases, such as with the PHE report, estimates were extrapolated from non-UK based studies. This may not of itself be a limitation, if there is good reason to suppose the patterns are likely to be very similar. However, it does provide an opportunity for some stakeholders to query the confidence that can be applied to these estimates.

These issues of data availability and confidence are a major challenge to the existing estimation of the fiscal costs of gambling. To arrive at the fiscal cost associated with problem gambling requires examining a large number of outcomes ranging from health to welfare needs of those experiencing this, which in turn involves the analysis of multiple datasets that can offer insights in these outcomes while having robust measures that can identify those experiencing problem gambling. It is this research gap that this report seeks to fill.

1.3.   Project Aims and Overview

This report presents research aimed at providing policymakers with a more comprehensive picture of the economic connection between gambling activity and the public finances. We focus predominantly on updating and extending current estimates of the fiscal costs associated with problem gambling. To do this, we have identified new sources of survey data that can be used to help inform estimation of the fiscal costs of gambling. This includes undertaking new analysis and applying a new generation of quantitative modelling techniques to the UK Wealth and Assets Survey (WAS), which is published by the Office for National Statistics (ONS). Specifically, we estimate a parsimonious zero-inflated ordered probit model with covariates selected from a large collection of socio-economic-demographic data included in the WAS (See Technical Appendix for details about why our research uses this econometric model).

We also conduct new analysis of the 2007 Adult Psychiatric Morbidity Survey (APMS) to better estimate the range of healthcare services, homelessness and crime used by those experiencing problem gambling. In addition, combined analysis from the Health Survey for England series (2015-2018) allows us to produce estimates of problem gambling with narrower confidence intervals. Taken together, these approaches update and extend current estimates of the fiscal costs associated with gambling (see Section 2 and Technical Appendix).

Second, having generated new estimates of fiscal costs of gambling harms, we compare them with core fiscal benefits. This is done using reported data of tax receipts (corporate and gaming duty). We note that this report does not provide a complete cost-benefit analysis of the gambling sector. That is beyond the scope of this pilot project. There are numerous

elements to both the costs and benefits of gambling, from the costs of "affected others" and the costs of suicide to the economics of enjoyment and the benefits of risk taking for business activity. This report is not able to capture all the factors that affect government tax receipts or the wider economic effects.

Consequently, the work has focused on two core elements: first, identifying the fiscal costs associated with demand for health, police, welfare and homelessness services; second, comparing these figures to the tax receipts from Betting & Gaming duties and corporation tax (OBR, 2022). Lastly, due to persistent data limitations, this report does not claim to provide causal relationships. Rather, we document the association of problem gambling with certain fiscal costs, and estimate fiscal costs by comparing its association with problem and at-risk gambling behaviours.

1.4.   Project Content and Report Structure

This report begins with detail of the methodologies employed in Section 2. We start from an overview of the metrics of harm we use, based on previous work by Wardle et al. (2018), which serves as a guide for our analysis. We detail the two datasets this work is based upon, including the Wealth and Assets Survey (WAS) and the Adult Psychiatric Morbidity Survey (APMS), which together provide key insight into problem gambling behaviour and its effects. As both involve a number of methodological challenges, we detail our use of both these datasets to determine what we can and cannot infer from them.

We set out in Section 2 how we go from using this data to provide a statistically significant association between problem gambling and particular public service use to a fiscal cost per person experiencing problem gambling. From here, we detail how we narrow the range of estimated people experiencing problem gambling in the population by analysing the Health Survey of England (HSE) datasets of 2015-2018, which allows us to estimate a subsequently narrower range of national fiscal costs.

Section 3 lists our findings according to four categories of fiscal cost: (1) welfare support; (2) health; (3) crime; (4) homelessness. We also summarise our fiscal cost analysis both per person experiencing problem gambling and at the national level. This section concludes with a comparison of existing evidence in this field, and we list why our calculations may be an underestimate of the true fiscal burden.

We summarise our findings with a discussion in Section 4 that focuses on the implications for the Exchequer and future avenues for research. Section 5 summarises our key findings and our recommendations. This is followed by the list of bibliographical references and the technical appendix, which explains in more detail how we analysed the existing data using NIESR's modelling capability.

2. Methodology

2.1.   Metrics of Harm

To arrive at an estimate of fiscal cost associated with problem gambling, we first need to understand the demand that problem gambling places on public services and other ways in which it has an adverse impact on public finances. Is problem gambling associated with higher public service usage, such as NHS mental health support? Does it have any impact on working patterns in a way that could affect government tax receipts?

Building on the 50 metrics of gambling-related harms (Wardle et al., 2018), which inform the Gambling Commission's National Strategy to Reduce Gambling Harms (GC, 2019), we assess harms associated with problem gambling that could result in a fiscal cost. Not all 50 harms have a fiscal implication, but we assign each harm to one of four categories, which have a fiscal implication:

1) healthcare spending

2) welfare support

3) housing needs

4) incidence of crime

These categories serve as a guide for our analysis into both the Wealth and Assets Survey (WAS 2018) published by the ONS and the Adult Psychiatric Morbidity Survey (APMS 2007) datasets (see section 2.2), from which we identify the following outcomes:

<u>Healthcare</u>:

      a.   GMS consultation (mental health) (APMS 2007)

      b.   Hospital inpatient (APMS 2007)

<u>Welfare support</u>:

      c.   Amount received in welfare support (WAS 2018)

<u>Housing needs</u>:

      d.   Incidence of being homeless (APMS 2007)

<u>Incidence of crime</u>:

      e.   Crime committed with police call-out (APMS 2007)

      f.   Court appearance (APMS 2007)

There are other variables in the two datasets with a potential fiscal implication that we have considered, such as worklessness and community psychiatric care, but we have not used them since the association between these variables and problem gambling was not statistically significant at 5 per cent level. In other words, there was no evidence that these factors were experienced disproportionately more by those experiencing problem gambling.

In this light, the aforementioned variables are not an exhaustive list, but they are the measures that, when analysed using the WAS 2018 and APMS 2007 datasets, exhibit a statistically significant relationship between problem gambling and public service demand.
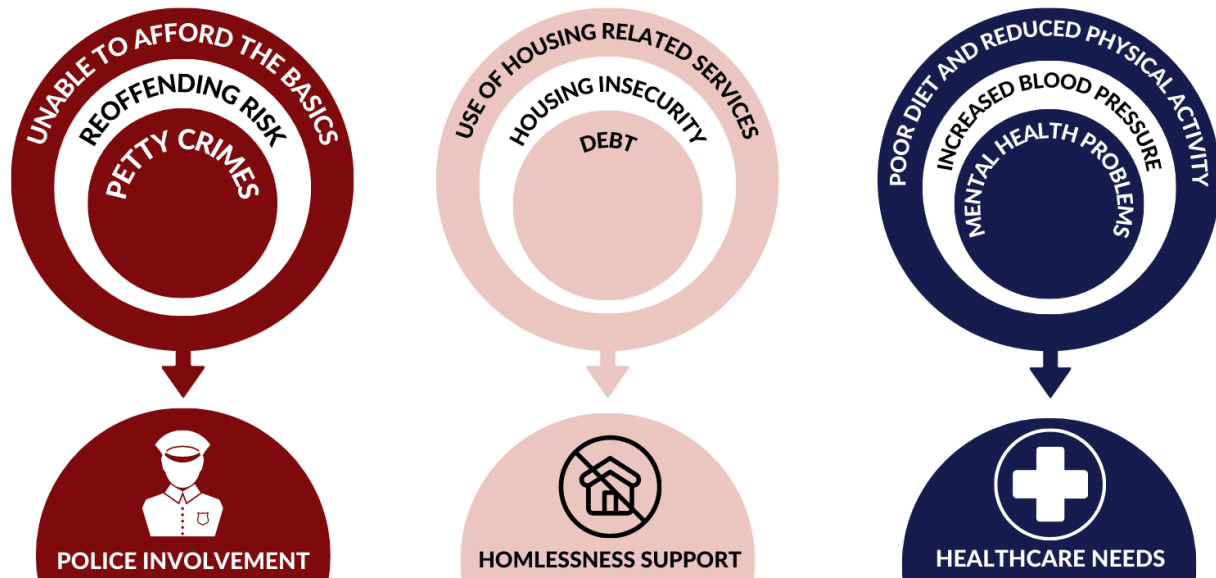
The underlying transmission mechanism between problematic gambling behaviour (harm metric) and the resulting fiscal implication (fiscal metric) is based on Wardle et al. (2018) and set out in Table 1 (with the regression results reported in Section 3.1).

Table 1: Harm Metrics and Fiscal Metrics

Harm Metric (based on Wardle et al., 2018)	Fiscal Metric
increased benefits claims	Welfare benefits
unable to gain employment	Welfare benefits
bankruptcy and other related financial difficulties	Welfare benefits
experience of homelessness/housing insecurity	Homelessness Support
use of housing and related services	Homelessness Support
crimes committed	Police Involvement
increased reoffending	Police Involvement
petty crime and criminality (not convictions)	Police Involvement
police callouts	Police Involvement
reduced physical activity	Healthcare Needs
increased blood pressure	Healthcare Needs
poor diet/nutrition	Healthcare Needs
poor overall wellbeing	Healthcare Needs
increased stress	Healthcare Needs
feelings of shame	Healthcare Needs
feelings of stigma	Healthcare Needs
experience of insomnia	Healthcare Needs
experience of depression	Healthcare Needs
increased anxiety	Healthcare Needs
self-harm	Healthcare Needs
suicide and suicidality	Healthcare Needs
substance abuse/misuse	Healthcare Needs
use of alcohol/drug treatment services	Healthcare Needs
use of mental health, primary and secondary healthcare	Healthcare Needs
erosion of personal values impacting wellbeing	Healthcare Needs
increase in benefits claims for long term disability/ill-health	Healthcare Needs

For example, as a result of problem gambling, both reduced physical activity and increased blood pressure (harm metrics) lead to enhanced NHS usage (fiscal metric), as illustrated in Figure 1.

Figure 1: How We Use APMS Data

UNABLE TO AFFORD THE BASICS
REOFFENDING RISK
PETTY CRIMES
POLICE INVOLVEMENT

USE OF HOUSING RELATED SERVICES
HOUSING INSECURITY
DEBT
HOMLESSNESS SUPPORT

POOR DIET AND REDUCED PHYSICAL ACTIVITY
INCREASED BLOOD PRESSURE
MENTAL HEALTH PROBLEMS
HEALTHCARE NEEDS

2.2.   Datasets

To determine demand for these public services by those experiencing problem gambling, we examined two datasets. The first is the Wealth and Assets Survey (WAS) provided by the ONS, which is a longitudinal survey of a large representative sample of individuals and households across the UK. WAS includes an extensive collection of variables relating to individual and household finances, which give us key insights into the resources side of the metrics we employ. Our base data, for the year 2017, is drawn from the nationally representative UK Wealth and Assets Survey Round 6 (Round 6 covers 2016-17 and 2017-18).

This covers the entire population of around 62 million individuals aged 18 years or over and living in Great Britain (England, Wales and Scotland) during this period (Northern Ireland is not covered in the WAS). The representativeness of the sample data and the population is established by statistically sound sampling weights. We use this version rather than the more recent version of WAS (Round 7, 2018-2020) because data for the latter were collected using phone interviews due to Covid-19 restrictions instead of face-to-face interviews.

The WAS data include information on income, taxes and benefits – together with demographic and behavioural characteristics of individuals and households, in the population. This encompasses detailed information on income from benefits, which we use to evaluate welfare costs. It also contains information on gambling behaviour and its harmful effects on people's financial situation and insolvency, as well as gambling wins. Based on these data, we construct measures of at-risk gambling and problem gambling using triangulation with other variables in order to refine our estimates (further details, including how at-risk gambling and problem gambling are defined in the WAS, are provided in the Technical Appendix).

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Furthermore, we model underreporting of both at-risk and problem gambling by using a zero inflated ordered probit model, which is estimated using the individual and household level data in WAS (for a more detailed outline of our calculations, see sections 2.6 and 3.1.) These estimates are then used to measure gambling behaviour (eliminating under-reporting) as part of NIESR's microsimulation models (NIESR, 2016 and 2018). This places at-risk and problem gambling behaviour at 2.2 per cent and 0.7 per cent of the population, respectively. We compute the welfare costs associated with problem gambling by applying the model to WAS data (see again the Technical Appendix).

For this reason, WAS is useful in estimating the costs of problem gambling that are associated with welfare benefits as well as aggregation from the household to the national levels. However, WAS does not include standardised screens for problem gambling, though it does contain some information which allows us to model and proxy these outcomes, for example, gambling wins and losses/ruin due to gambling, together with gambling behaviour and its association with economic inactivity or poor health (see Section 2.3 and Technical Appendix).

The second dataset is the Adult Psychiatric Morbidity Survey (APMS), which is a dataset provided by the National Health Service (NHS) that surveys psychiatric disorders. This dataset contains data on indicators of psychiatric disorders among those aged 16 and over in England. The dataset we use is the APMS 2007 dataset, as this includes both the DSM-IV screen for problem gambling and a number of important outcomes that may result in a fiscal cost, from use of primary healthcare to incidents involving a police officer call-out. This dataset has frequently been used in gambling research, notably in the recent Public Health England (PHE, 2021) report into the economic cost of gambling related harm and by Cowlishaw and Kessler (2016), which went on to form part of the IPPR (2016) report.

But since the APMS data are over ten years old, we have checked what exactly we can and cannot infer from it for contemporary problem gambling. There are two ways in which the relevance of these data for research on the fiscal costs associated with problem gambling at present could be limited. First of all, the nature of gambling itself might have changed in a significant way since the data was collected. Prima facie, this would seem to be the case: since 2007 the gambling environment has been transformed by the growth in online gambling.

The biggest change is the switch from in person gambling to online forms of gambling with lower physical barriers to entry and associated effects on the demographics of gamblers, especially young people experiencing problem gambling. As Gambling Commission data from its quarterly telephone survey suggests, online gambling participation rates have gone from 50 per cent of in-person gambling to approximately the same level in the period 2017 to 2022, with the proportion of adults gambling online and those gambling in person both standing at 18 per cent (GC, 2022b).

It is unclear how the significant growth in online gambling has changed the nature of gambling itself, or the transmission mechanism of gambling and harm. The same Gambling Commission data also shows that "*despite the increase, the online gambling participation rate ha[d] not yet reached the level of in person participation before the pandemic, which was 24.4 percent in 2019*" (GC, 2022b). In addition, contrary to industry concerns about a Covid-induced negative

impact on retail gambling, in person participation increased in September 2022 compared with September 2021, especially among males and younger adults (up to the age of 24 years).

Moreover, there does not appear to be a significant and lasting increase in the overall number of people gambling or the number of young gamblers who might also experience problem gambling. According to the Gambling Commission, the total number of adults who gamble has been broadly static up until the onset of the Covid-19 pandemic in March 2020, with the headline participation at 32 per cent for the adult population between 2017 and 2019 and the age group most likely to participate in gambling still being the 25 to 34 year old group (GC, 2022b).

One change that has occurred since the APMS 2007 data relates to Gross Gambling Yield (GGY), which denotes the amount retained by gambling operators after the payment of winnings before operating cost are deduced. Over the past six to seven years, there has been a marked increase in the share of GGY that is generated from online gambling. The Gambling Commission reports that it has risen from 42 per cent in 2015-16 to 61 per cent in 2021-22 (not including the National Lottery).

In relation to gambling products, the substantial growth in GGY has been "*generated by online slots over the same period from nearly £1.6 billion in 2015-16 to nearly £3.0 billion in 2021-22. The rate of increase in spend has always been higher than of participation*" (GC, 2022b). Higher spend linked to online slots raises questions about the complex connections between online gambling and severe gambling harms arising from problem gambling.

This brings us to the second challenge in using the APMS dataset, which relates to whether the profile of those who experience gambling-related harm arising from problem gambling has significantly evolved since the data were collected in 2007. Although the growth in online gambling has driven changes in the profile of problem gambling, the Gambling Commission reports that "*the headline rates for problem gambling have been static in recent years*" (GC, 2022b). Among those people experiencing harm arising from problem gambling, there are fairly stable characteristics, such as being predominantly male and in younger age group, with probable mental health issues, unemployed and living in the socio-economically deprived parts of the country.

As the Gambling Commission suggests, "[*w]hilst adults may be in a vulnerable situation at any age, young adults may in particular be additionally vulnerable to gambling related harms due to a combination of biological, situational and environmental factors. In a 2018 analysis of the Avon Longitudinal Study of Parents and Children, young adults were found to be most at risk of falling into problem gambling around the age of 20 to 21. This is a time when many young adults are adjusting to new freedoms such as moving out of home and managing their own finances*" (GC, 2022b). As personal characteristics are included in the APMS dataset, this allows us to control for them in our calculations. This means that the dataset itself is still relevant to research in the current gambling environment.

2.3.   Identifying Gambling Behaviour in the Datasets

A key task is to identify problem gambling behaviour in both datasets. The APMS data includes the standard DSM-IV screen, which allows us to divide all people who gamble into three categories:

i) problem gambling (with a score of 3+)

ii) at-risk gambling (with a score of 1-2)

iii) non-risk gambling (with a score of 0)

Both DSM-IV and PGSI problem gambling screens provide useful categories of problem gambling severity. In our report, we compare those experiencing problem gambling with those experiencing at-risk gambling. Our main rational for doing so is that we did not find a statistically significant difference between the public service usage by people experiencing at-risk gambling and non-risk gambling. Thus, for those experiencing problem gambling, we compare their propensity to use a public service to that of people experiencing at-risk gambling. The rationale for this is, as already mentioned, that it makes more sense to compare at-risk gambling to problem gambling because the people experiencing at-risk gambling exhibit a behavioural profile which is more like that of people experiencing problem gambling than the general population. Therefore, there is a higher statistical confidence that the difference is attributed to gambling.

In the WAS data, identifying gambling categories is less straightforward as this dataset does not include these standard measures of problem gambling behaviour. Neither does it have standardised measurement of gambling behaviours. However, the WAS dataset does include several potentially relevant questions, such as:

1. Gambling wins (£500 or more in the past 2 years)

2. Gambling losses as a reason for insolvency

3. Gambling losses as a reason for financial situations becoming worse

4. Gambling behaviour (as reflected in 1., 2. or 3. Above) interacted with "very poor" (self-reported) health, or economic inactivity due to health reasons

These variables allow us to identify two groups: first, a sub-set of participants who have experienced some kind of financial harm from gambling, or experience both gambling behaviour and poor health; second, a broader sub-set of people who have gambled and won in the past two years. Used alone, these measures will underestimate participation in gambling and the prevalence of gambling harm.

However, the WAS dataset includes a very large collection of additional information, particularly on demographic, economic (income, wealth, education and labour markets) and behavioural characteristics, including the above markers of gambling behaviour. This makes it possible to construct statistical models that can produce micro-simulated data on gambling

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behaviour. We use a zero-inflated ordered probit model (Harris and Zhao, 2007) to construct a synthetic indicator of problem gambling and at-risk gambling. This indicator calibrates well to aggregate prevalence of problem and at-risk gambling in the population – as estimated in the HSE (see below and see also Technical Appendix for the full technical details of our micro-simulation approach).

This approach enables us to obtain estimates of welfare costs (particularly benefits income) as well as evaluate the uncertainty surrounding such estimates. Importantly, our synthetic indicator also reflects the fact that, while welfare costs are substantially higher for problem gambling, they are lower for at-risk gambling relative to the general population. Hence, welfare costs for problem gambling are compared to at-risk gambling.

Our approach is only second best compared with access to real data on gambling behaviour, which could be available if the WAS were to include standardised measurements of problem gambling in the future. Having said this, the use of meta-analysis and big data machine learning methods to construct synthetic measures of problem gambling is useful and fairly standard in recent work; see, for example, Deng et al. (2019), Allami et al. (2021), and Auer and Griffiths (2022).

2.4.   Attributing Fiscal Cost per person Experiencing Problem Gambling

Once we have identified the categories of gambling behaviour in the two datasets, we begin our analysis by determining how the above harm metrics could result in a fiscal cost. For instance, the health metrics included in our list (Table 1) refer to increased anxiety, stress, increased alcohol consumption and other health harms associated with problem gambling. These do not themselves result in a fiscal cost. But they do if, for instance, they lead to people who experience harm arising from problem gambling going to their GP with problems such as physical or mental health issues as a result of having a poor diet. Therefore, we attribute each metric to a 'bottom-line-cost' which has a fiscal implication.

The next step is to test our samples of gambling behaviour against these bottom-line costs. We produce a coefficient for each metric to see by how much a particular type of person is more or less likely to use a public service or engage in a particular activity, such as how much a person experiencing problem gambling is more likely to visit a GP with a mental health complaint than a person experiencing at-risk gambling, while controlling for key characteristics and factors that could introduce any error into the results. Although there are many ways metrics might result in a fiscal cost, if our coefficient is not statistically significant, then we do not use the metric in question.

To illustrate our methods, we can use the example of GP visits for a mental health complaint. Here we use existing research to find the per person average of GP visits for with a mental health complaint. This is then multiplied this by our identified coefficient to arrive at the number of times a person experiencing problem gambling visits a GP more than those at-risk for this reason. In this example, we find that on average someone experiencing problem gambling goes to the GP 1.35 times more a year than those at-risk.

To arrive at an estimate of the fiscal cost, we rely on a Unit Cost Database maintained by the Greater Manchester Combined Authority. This database is an amalgamation of research into

determining the fiscal cost of particular services or activities such as national tax-receipt loss from not working. Continuing with our GP example, we find here that the average cost per appointment is £31, so we multiply this by the additional times we find that someone experiencing problem gambling goes to the GP more than those at-risk arriving at a fiscal cost of £42 per person (1.35 multiplied by £31) experiencing problem gambling. Repeating this exercise for each category of harm considered, we arrive at an annual fiscal cost per person experiencing problem gambling.

2.5.   Estimating National Fiscal Cost

Narrowing the National Estimate of Problem Gambling Prevalence

To estimate the total fiscal cost at the national level, we need to make some assumptions about the numbers of people experiencing problem gambling in the population. Previous studies that have attempted to do so have resulted in large ranges of fiscal costs because they have relied on wide ranges of the number of people experiencing problem gambling in the population. In its 2016 report, for example, the IPPR assumed that the problem gambling prevalence estimate ranges from 0.2 to 1.4 per cent of the population aged 16 years and older and living in private accommodation.

The difference may appear small, but when you consider that this is a difference of around 380,000 individuals, it has a large effect on the size of the final range of fiscal costs. In turn, it is the reason for the IPPR's wide range of the economic costs of harm, from a lower bound of £230 million to an upper bound of £1.16 billion per year (IPPR, 2016). The sheer size of this difference makes the range of little use to policymakers.

The 2021 PHR report arrived at a similarly large range of £1.05 billion and £1.77 billion for England, but this depends on the costs of death from suicide linked to problem gambling, which PHE put at between £241 million and £962 million (PHE, 2021; cf. OHID, 2023). While PHE put the estimate of the population suffering harm related to problem gambling at 0.5 per cent, it estimated that as many as 3.8 per cent of the population can be classified as gambling at elevated risk (both low- and moderate-risk gambling). As we will show below, our estimate of the proportion of the population suffering harm from problem gambling is higher (0.7 per cent) but the proportion of the population experiencing at-risk gambling is lower (2.2 per cent).

To arrive at these estimates, our approach is two-fold: first, establishing estimates at the individual level and, second, calculating the total fiscal costs based on new evidence about the national prevalence of problem gambling (Ashford et al., 2022). We not only need to make an assumption about the number of people experiencing problem gambling in the population, but we also need to do so with sufficient precision, such that the resulting range is as narrow as possible and without undermining methodological rigour.

Combining HSE Datasets

For the purposes of this report, the national prevalence estimates we use are based on the Health Survey England (HSE) series. This is a household survey of all adults aged 16 and over living in private households in England, using random probability sampling methods. To

reduce the size of the estimated range of problem gambling prevalence in the population, we combine multiple years together (2015, 2016 and 2018) to increase the sample size and thus reduce the confidence intervals, resulting in a range of 0.57 to 0.87 per cent, with a central estimate of 0.7 per cent. This equates to around 300,000 to 470,000 people (0.57-0.87 per cent of the total population of 16 years and older living in private accommodation). The central estimate assumes that 378,000 or 0.7 per cent of the 16+ population experience problem gambling.

Although this range of 0.57 to 0.87 per cent is sufficiently narrow for total fiscal estimates to be usable, we think that the range itself is likely to be a cautious estimate of the number of people experiencing problem gambling. It does not include those living in institutions, such as student halls of residences or prisons where we may reasonably expect higher rates of problem gambling among these populations. Recent methodological work published by the Gambling Commission suggests that the HSE may underestimate the proportion of people experiencing problem gambling (Ashford et al., 2022). This is why it is important that our report also provides the per-person experiencing problem gambling estimates, so that our calculations can be applied to future national prevalence reports and findings.

3. Findings

3.1.   Regression Results (APMS 2007)

The regression results from our logit models within the APMS dataset can be found in Table 2. We find a statistically significant association between people experiencing problem gambling and indicators of harm with a fiscal cost. For instance, we find that people experiencing problem gambling are 5.78 times more likely to be a hospital inpatient after controlling for key socio-economic characteristics and underlying health conditions and assuming that each of these outcomes are independent. Figures that do not meet our threshold for statistical significance (defined using a p-value) are not included in our subsequent calculations.

These results show that, similar to Cowlishaw and Kessler (2016), there is often a highly statistically significant association between problem gambling severity and variables indicating harm. This association is not found as clearly for people who experience at-risk gambling.

Table 2: Logistic Regression Showing the Association between DSM-IV Score and a Range of Outcomes

Note: *, **, ***: Statistically significant at 10 per cent, 5 per cent, and 1 per cent levels, respectively. For logit

	Model 1		Model 2	
	Effective sample size 6,900 (177 persons experiencing at-risk gambling)		Effective sample size 6,771 (48 persons experiencing problem gambling)	
	Odds ratio [95% Conf.Int.]	Estimate (Std.Error)	Odds ratio [95% Conf.Int.]	Estimate (Std.Error)
Health				
GMS Consultation (Mental Health)	1.481 [0.88,2.48]	0.393 (0.26)	2.897 [1.20,7.02]	1.064** (0.45)
Hospital Inpatient	0.687 [0.28,1.66]	-0.375 (0.45)	5.575 [2.14,14.50]	1.718*** (0.49)
Crime				
Crime Committed with Police Callout	1.762 [0.70,4.43]	0.567 (0.47)	4.623 [1.37,15.61]	1.531** (0.62)
Court Appearance	2.464 [1.54,3.94]	0.902*** (0.24)	3.946 [1.60,9.72]	1.373*** (0.46)
Housing				
Homelessness	0.867 [0.36,2.07]	-0.142 (0.44)	3.771 [1.38,10.29]	1.327*** (0.51)

coefficient estimates, Huber-White sandwich robust standard errors are presented in parentheses. Estimated odds ratios are also presented together with 95% confidence intervals (in squared brackets). We control for underlying health conditions and characteristics such as sex/age/ethnicity, work status and marital status. The raw sample size is 6,941. Accounting for sampling weights, the effective sample size for Model 1 (persons experiencing at-risk gambling) and for Model 2 (persons experiencing problem gambling) are 6,900 and 6,771, respectively.
Source: APMS and NIESR Calculations

In the remainder of this section, we set out the fiscal costs for each of the indicators of harm.

3.2.   Welfare

We first estimate a zero-inflated ordered probit model (Harris and Zhao, 2007) for gambling behaviour; these estimates are reported in Table 3. Based on this estimated model, a synthetic indicator is constructed for problem gambling and at-risk gambling behaviour to supplement the recorded (and under-reported, or zero-inflated) gambling data in WAS. This is an essential feature of our microsimulation approach (see Technical Appendix for further details).

Table 3: Estimates of Zero-Inflated Ordered Probit Model for Gambling Status

Model/Regressors	Estimates (Std. Error)
Ordered Probit	
Financial situation worse – current/prev. year	31.12*** (4.92)
Region fixed effects – Base (North East)	**Default region**
– North West	-12.39*** (2.12)
– Yorks. & Humber	-10.78*** (2.00)
– East Midlands	-9.58*** (1.61)
– West Midlands	-13.71*** (2.37)
– East of England	-11.90*** (2.15)
– London	-11.15*** (1.82)
– South East	-12.54*** (2.18)
– South West	-12.07*** (1.98)
– Wales	-10.68*** (2.04)
– Scotland	-13.78*** (2.50)
Household (HH) & Individual demographics	
– Number of adults, HH	-0.497* (0.269)
– Number of children, HH	-0.699** (0.341)
– Age (in years)	2.080*** (0.765)
– Age-squared	-0.190*** (0.070)
Labour market status – Base (others)	
– Long term unemployed	-16.42*** (3.15)
– Full-time student	-11.29*** (2.19)
Zero Inflation (Gaussian probability)	
Gender – Female	-0.333*** (0.089)
Marital status – Married	-0.245*** (0.093)
Education status – No qualifications	-0.262** (0.115)
Intercept	-1.904*** (0.148)
Gambling status cut-points (Gaussian probabilities)	
– Non-/Low-risk (< L); At-risk [L, U]; Problem (> U)	
L(ower)	-7.54 (2.01)
U(pper)	3.22 (2.12)

Note: *, **, *** : Statistically significant at 10 per cent, 5 per cent, and 1 per cent levels, respectively. Standard errors are reported in parentheses. Sample size: 43,350. Maximised pseudo log-likelihood= -943.01; Wald chi-square (19)=1285.5 (p-value=0).
Source: WAS and NIESR Calculations

The UK Wealth and Assets Survey contains extensive data on welfare/benefits income of individuals and households. For each category of our micro-simulated measure of gambling behaviour ('non- or low-risk gambler', 'at-risk gambler' and 'problem gambler'), we then tabulate the distribution of Universal Credit (welfare benefits) income across all the 10

deciles of benefits income. Then, for each decile, we evaluate how much benefits would have been lower if all people experiencing problem gambling were experiencing at-risk gambling instead. This provides us with estimates of welfare cost (per person experiencing problem gambling; Table 4) together with uncertainty bounds. The bounds are computed as empirical (2.5 per cent, 77.5 per cent) confidence intervals based on WAS data.

It is important to note that the largest part of these welfare costs associated with gambling behaviour relate to problem gambling and less so for at-risk gambling. In fact, many people experiencing at-risk gambling have higher incomes and hence do not qualify for Universal Credit. Therefore, we compare welfare costs for problem gambling against at-risk gambling; taking 'non- or low-risk gambling' as the default group induces little change in our estimates of welfare costs associated with problem gambling.

Table 4: Welfare Costs Associated with Problem Gambling

			National Estimates		
	Category	Per person experiencing problem gambling	Lower Bound (0.57)	Average (0.7)	Upper Bound (0.87)
Welfare	Universal Credit	£2,300	£700,000,000	£800,300,000	£1,100,000,000

Source: WAS and NIESR calculations

3.3.   Health (Primary and Secondary)

Our regression results in Table 2 have identified a statistically significant association between problem gambling and GP consultation for mental health reasons and being a hospital in-patient (for both physical and mental health reasons). To apply these coefficients to a relevant fiscal cost, we first need to determine how many times an average person visits the GP for a mental health reason and is a hospital in-patient first year.

Starting with the former, there is little available data on the number of GP consultations per person. The last year this was collected in such a format was 2008, which identified that the average person visits the GP 5.5 times a year. New research has showed the demand for healthcare services has risen since then, with one authoritative report stating this figure was 15 per cent higher by 2015 (Maguire et al., 2016). We therefore inflate this figure by 15 per cent resulting in an assumed average GP attendance per person of 6.3. As we only find a statistically significant result for mental health visits, we depress this number to account for the fact that only 18 per cent of GP visits are for mental health reasons. This results in 1.2 GP visits for a mental health complaint on average per person.

Since people experiencing problem gambling visit the GP for a mental health 2.74 more times than the average person, we multiplied this by the average number of annual GP visits for mental health reasons (1.2) to establish that a person experiencing problem gambling visits the GP for a mental health complaint 3.2 times a year. When we repeat this exercise for people experiencing at-risk gambling, we find that they visit the GP for the same reason 1.7 times a year. Taking the difference between these figures results in an estimate of 1.5

additional visits to the GP for a mental health complaint that can be attributed to problem gambling.

We can then multiply this by the typical cost associated with each trip to the GP, which is £35 according to Curtis and Burns (2018), uprated to today's prices. Multiplying this to each excess use of GP services identified above yields a cost of £47 per person experiencing problem gambling (Table 5).

Table 5: Healthcare Costs Associated with Problem Gambling

	Category	Per person experiencing problem gambling	National Estimates		
			Lower Bound (0.57)	Average (0.7)	Upper Bound (0.87)
Health	GMS Consultation (mental health)	£57	£1,760,000	£21,600,000	£27,000,000
Health	Hospital Inpatient	£1,200	£364,800,000	£446,700,000	£555,200,000
Total		£1,300	£366,560,000	£468,300,000	£582,200,000

Source: APMS and NIESR calculations

3.4.   Crime

The results presented above in Table 2 show a statistically significant association between problem gambling and being likely to commit a crime involving the police and being involved in a court appearance. We apply this finding with the same methodological steps to arrive at an estimate of fiscal cost.

Using the latest round of crime statistics produced by the ONS, we take the total number of crimes recorded of 5.8 million in 2021 (ONS, 2022), which implies a crime per person of 0.09. Our regression model produced a statistically significant coefficient of 4.32 for people experiencing problem gambling being involved in a crime that required a police callout, and a coefficient of 1.65 for at-risk gambling. Applying these results to the average per person crime number of 0.09 above implies that a person experiencing problem gambling on average commits 0.39 crimes per year, and a person experiencing at-risk gambling 0.15 per year.

As the counterfactual for a person experiencing problem gambling is someone experiencing at-risk gambling rather than the general population, we take the difference between 0.39 and 0.15 which is 0.24 (rather than the average crime per person of 0.09). Although this will reduce results, we think that this is a more plausible comparison.

Once we attribute this to the cost of a police callout, which according to the Home Office is £328 per call out uprated to today's prices (Home Office, 2018), we arrive at a cost per person

experiencing problem gambling of £79 per year. Assuming 0.7 per cent of the population is experiencing problem gambling, this amounts to a total fiscal cost of £30 million per year.

Repeating the same exercise for court appearances, we start from the basis that according to the House of Commons Library there are 2.9 million criminal cases dealt with each year (HoCL, 2021). This implies a court appearance per person of 0.04 per annum. Applying the statistically significant coefficient of 4 for a person experiencing problem gambling to this number means that people experiencing problem gambling are likely involved in a court appearance 0.16 times a year, and 0.1 times a year for those experiencing at-risk gambling using the coefficient of 2.47. Taking the difference between the two, a person experiencing problem gambling is involved in 0.6 times more court appearances per year.

Assuming a cost per court visit of £397 uprated to today's prices, we arrive at a cost of £24 per person experiencing problem gambling per year and a total fiscal cost of £9 million per year based on our central estimate that 0.7 per cent of the population experience problem gambling (Table 6).

Table 6: Crime Costs Associated with Problem Gambling

| | Category | Per person experiencing problem gambling | National Estimates | | |
			Lower Bound (0.57)	Average (0.7)	Upper Bound (0.87)
Crime	Crime Committed (police call out)	£85	£26,000,000	£32,000,000	£40,000,000
Crime	Court Appearance	£24	£7,300,000	£9,000,000	£11,000,000
Total		£100	£33,300,000	£41,000,000	£51,000,000

Source: APMS and NIESR Calculations

3.5.   Homelessness

Our regression results in Table 2 indicate a statistically significant chance of a person experiencing problem gambling being 3.5 times more likely to be homeless and a non-significant 0.84 times for a person experiencing at-risk gambling. Given that the population of homeless people stands at 274,000 in 2021 (Shelter, 2021), which implies 0.004 per person, we can assume that on average the chance of being homeless is 0.01 for a person experiencing problem gambling and essentially 0 for someone experiencing at-risk gambling. We multiply the 0.01 figure by the assumed cost of homelessness support, which according to the National Schedule of Reference Costs is £3,742 uprated to today's prices (NHS, 2022). This implies a cost per person experiencing problem gambling of £41 per year, and a total fiscal cost of £15.3 million per year based on our central estimate that 0.7 per cent of the population experience problem gambling (Table 7).

Table 7: Homelessness Costs Associated with Problem Gambling

	Category	Per person experiencing problem gambling	National Estimates		
			Lower Bound (0.57)	Average (0.7)	Upper Bound (0.87)
Housing	Homelessness Support	£43	£13,400,000	£16,500,000	£20,500,000

Source: APMS and NIESR Calculations

3.6.   Fiscal Cost Analysis

Table 8: Total Fiscal Cost Associated with Problem Gambling

	Category	Per person experiencing problem gambling	National Estimates		
			Lower Bound (0.57)	Average (0.7)	Upper Bound (0.87)
Health	GMS Consultation (mental health)	£57	£1,760,000	£21,600,000	£27,000,000
Health	Hospital Inpatient	£1,200	£364,800,000	£446,700,000	£555,200,000
Crime	Crime Committed (police call out)	£85	£26,000,000	£32,000,000	£40,000,000
Crime	Court Appearance	£24	£7,300,000	£9,000,000	£11,000,000
Housing	Homelessness Support	£43	£13,400,000	£16,500,000	£20,500,000
Welfare	Universal Credit	£2,300	£700,000,000	£800,300,000	1,100,000,000
Total		£3,700	*£1,100,000,00*	*£1,400,000,000*	*£1,700,000,000*

Source: NIESR calculations

Table 8 presents a summary of the total cost per person experiencing problem gambling. The high cost is driven mostly by welfare and healthcare costs. We provide a comparison to existing estimates of annual fiscal cost per person experiencing problem gambling in section

3.7, where we find that our estimated costs are higher than those in the 2016 IPPR report (IPPR, 2016) but lower than in the 2012 PHE study (PHE, 2021; cf. OHID, 2023).

Table 8 also presents a summary of the total fiscal costs for all people experiencing problem gambling. This takes the above figures and multiplies them based on the assumed number of people experiencing problem gambling in the population. As we have so far emphasised, the population prevalence figures are likely to be on the cautious side and therefore the resulting calculations will likely be an underestimate (see Section 3.8).

3.7.   Comparison with Existing Evidence

Table 9 compares our estimates to the two reports that have attempted to calculate the fiscal costs associated with problem gambling: the 2016 IPPR report (IPPR, 2016) and the 2021 PHE report (PHE, 2021; cf. OHID, 2023).

Table 9: Comparison of Fiscal Cost Per Person Experiencing Problem Gambling

	IPPR	PHE	NIESR
Assumed Population % experiencing problem gambling*	0.75	0.4	0.7
Total Fiscal Cost	£730,000,000	£647,000,000	*£1,400,000000*
Implied Cost Per Person Experiencing Problem Gambling	£1,800	£3,850	£3,700

Notes: population percentages multiplied by over-16 population (54m)
* Where a range is reported we take the central estimate to aid interpretability

3.8.   Why Results may be an Underestimate

Underestimating the rates of problem gambling

Our central estimate of the proportion of people experiencing harm from problem gambling is 0.7 per cent of the total population of 16 years and older living in private accommodation, which corresponds to approximately 378,000 people. This is higher than the oft-quoted figure in the press of 0.2 per cent and also higher than the estimate of 168,000 people in the Health Survey for England (HSE, 2018) and around 270,000 in the trend-adjusted HSE figures (HSE, 2019). However, our central estimate of 0.7 per cent is lower than estimates of between 1 per cent for studies using probability methods as such Radom Digital Dialling (RDD) and 2-3 per cent for non-probability method such as online panels.

According to the review of evidence by Sturgis and Kuha (2022), it is possible that online surveys have a tendency to over-estimate gambling participation and that health surveys tend to under-estimate the prevalence of problem gambling. Reasons for the latter are the under-representation of gamblers in online surveys and the non-disclosure of gambling activity, linked to those experiencing problem gambling feeling shame and stigma and often being adept at hiding their gambling behaviour from others.

While 2-3 per cent seems to be an over-statement, it is likely that the true number of people experiencing harm from problem gambling is higher than 0.7 per cent for a number of reasons. First, the pilot study by Ashford et al. (2022) suggests that the rates of problematic gambling might be higher than previously assumed for "*younger people, particularly women, notably in relation to online gambling rates*". This is consistent with the evidence presented by the Gambling Commission (GC, 2022b), as already mentioned in Section 2.2. The GC reports that since the end of Covid-related restrictions, "*there are signs of a return to gambling amongst younger age groups aged 16 to 24*" and "*for products under the Gambling Act 2005 [...] the increase [...] was also driven mainly by women rather than men – from 13.2 percent in September 2019 to 17.2 per cent in September 2022*" (GC, 2022b).

Second, as Ashford et al. (2022) report, it could be that new approaches such as push-to-web, which use offline contact methods to encourage people to go online and complete a questionnaire, might produce higher estimates of the prevalence of problem gambling because "*people provide more honest answers when reporting behaviours online than when filling in self-completion questionnaires when an interviewer or other family members are present*" (Ashford et al., 2022). While more research is needed to ascertain or invalidate these findings, there are strong indications that the proportion of people experiencing harm from problem gambling is higher than our central estimate of 0.7 per cent. However, the lack of publicly available data is one of the main obstacles in trying to establish the true proportion of people experiencing problem gambling.

The total fiscal cost depends on the prevalence of problem gambling. Like previous reports (IPPR, 2016; OHID, 2023), we have opted for a range of the fiscal costs, but we have also provided a central estimate. We are aware that the size of the range and the approximate value of the central estimate depend not only on the available data and evidence but also reflect the sensitivity of the fiscal costs to small variations in the number of people experiencing harm from problem gambling. Based on our calculations, a proportion of people experiencing harm from problem gambling of around 1 per cent of the total population would mean a total fiscal cost of approximately £2 billion per year.

Underestimating the fiscal cost

Our calculations are an underestimate of the full fiscal costs associated with problem gambling because we do not include a number of metrics that are not statistically significant given the currently publicly available public data. The missing metrics include impacts on the relationships of those experiencing problem gambling and wider impacts on families, friends and close networks ("affected others"). Those costs encompass financial problems such as debt and higher costs of borrowing (Muggleton et al., 2021), more exposure to risks by lower insurance coverage, lower savings and lower pensions contributions, as well as the so-called 'poverty premium' of having to spend more on necessities: for example, single tickets rather than season tickets.

However, these costs cannot be calculated with any degree of accuracy due to a lack of publicly available data. As the OHID (2023) has said, "*gaps need to be filled to conduct a costing analysis for financial harms to the individual, such as evidence that estimates the extent of financial harm experienced by those engaging in harmful gambling (identified by their PGSI score) compared to those not engaging in harmful gambling. The evidence also*

needs to show how this is broken down by age, sex, income and other variables, as well as data to estimate the rates of bankruptcies and use of debt services for people who participate in harmful gambling compared with the general adult population".

Moreover, the economic costs of 'affected others' extend beyond direct financial costs to include the loss of output and productivity associated with ill physical health, mental health problems such as depression and losing a loved one to suicide. However, we do not include the cost of suicide due to the large range of costs according to the OHID calculations, notably the range of £241.1 million to £961.7 million.

Finally, our calculations are an underestimate of the full fiscal costs because the charity sector provides substantial support to those experiencing problem gambling, which compensates for the lack of state assistance and would otherwise add to the fiscal costs associated with problem gambling. More research is needed to quantify the contribution by charities towards helping people who experience harm from problem gambling, e.g. homelessness, but also the need for welfare.

# 4. Discussion and Avenues for Future Research

4.1. Comparison to the Fiscal Benefits of Gambling

The primary objective of this report is to estimate the fiscal costs associated with problem gambling. A secondary objective is to compare these fiscal costs with the direct fiscal benefits to the Exchequer. The latter is measured by examining the receipts of corporation tax and gaming duty. We acknowledge that there are other benefits provided by the gambling industry: for example, Ernst and Young have provided a report for the gambling industry trade association that puts forward an argument for the economic contribution of the industry, measured in tax yield and jobs (EY, 2021). However, an examination of this broader range of benefits and the multiplier effects of spending on different forms of gambling is beyond the scope of this initial project.

According to the Office for Budget Responsibility (OBR), the revenue from betting and gaming duties is projected to reach £3.3 billion per year in the financial year 2022-23 (OBR, 2022). The most up to date HMRC figures suggest that corporation tax receipts from the gambling industry amount to approximately £200 million per annum (HMRC, 2022). The total tax revenue accruing to HM Treasury of around £3.5 billion per year is the direct fiscal benefit.

We display in Figure 4 the contribution from betting and gaming duties, which are levied on either the gross profits of the industry or on the total stakes. This shows on the left-hand-side the contribution in nominal terms and puts the figure into context on the right-hand-side by showing this as a proportion of GDP.

Figure 4: Betting and Gaming Duty Revenue Total and Percentage of GDP
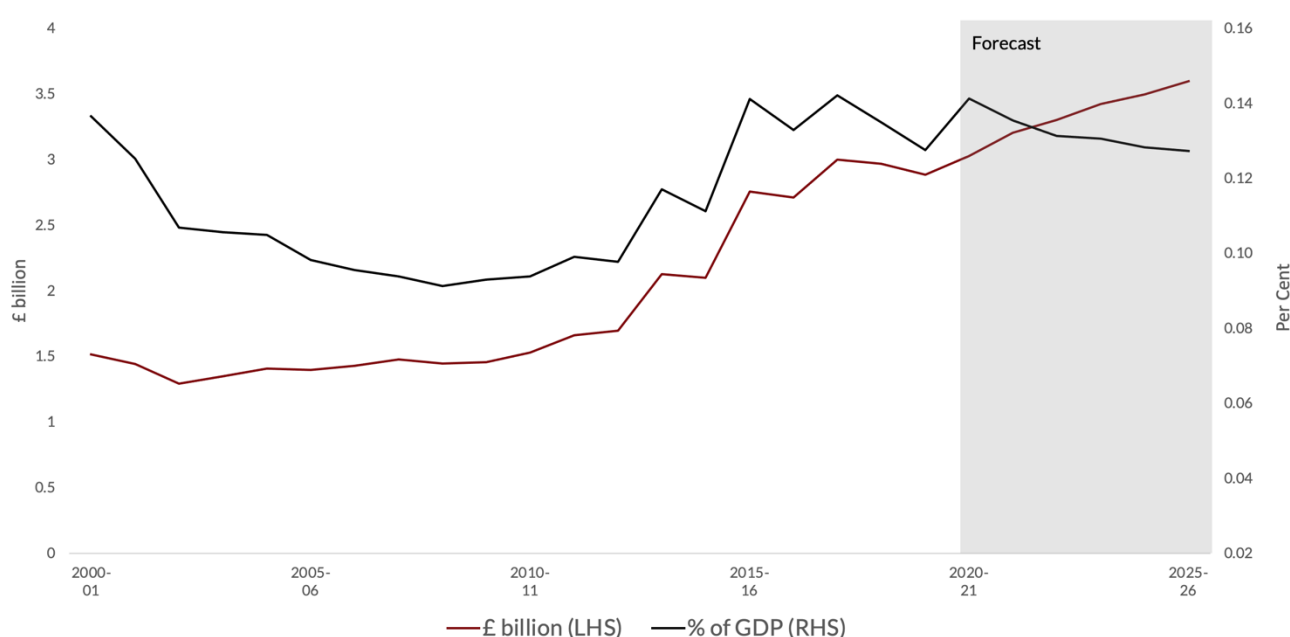
Source: OBR (2022)

However, it is worth pointing out that the issue of tax receipt from gambling is affected by complex questions of offshore fiscal location in territories such as Gibraltar. In 2014 the government introduced the so-called 'point of consumption' principle to Remote Gaming Duty with the aim of ensuring that "*remote gambling operators will pay tax on the gross gambling profits generated from UK customers, no matter where in the world the operator itself is located*" (HMRC, 2014). However, it is also the case that Remote Gambling Duty, which currently stands at 21 per cent and applies to gambling operators based in offshore locations, is lower than the equivalent taxes levelled on land-based operators located in the UK (cf. Noyes, 2023). In other words, offshore gambling operators avoid certain other duties and associated costs compared with land-based operators and in this sense reduce the overall tax benefits that would otherwise accrue to the Exchequer.

Moreover, some analysts have raised doubts as to whether the wider economic benefits arising from the gambling industry and gambling activity can fully compensate for those lower tax benefits. According to some recent reports, the argument is that there are specific characteristics that apply to many parts of the gambling industry, including low employment rates, short supply lines and a limit multiplier effect (NEC, 2021; SMF, 2021). As with the wider fiscal costs associated with problem gambling, an independent and robust assessment of the wider fiscal benefits arising from gambling.

4.2.   On the Contribution of this Report

This understanding of the tax contribution of gambling activity provides greater context to the estimates of fiscal costs in this report. It is neither the case that fiscal costs exist in isolation of benefits, nor that tax revenue from gambling exists independently of potential costs.

As this report is not a full cost-benefit analysis, it is not possible to compare the costs and benefits of gambling in order to state more definitively whether gambling contributes more to the Exchequer than it costs it. However, based on the calculations we have set out in section 3, we can say that a substantial amount of tax revenue from gambling is offset by the costs associated with harm from problem gambling.

This report also identifies what generates gambling-related harms and ensuing fiscal costs. Unlike previous studies which tend amalgamate people experiencing at-risk and problem gambling, we provide estimates for each. We are able to identify a strong association between problem gambling and harm with a fiscal cost, but do not discover the same for 'at-risk' gambling. This does not necessarily mean there are no harms associated with a fiscal cost implication for 'at-risk' gambling. Rather, it suggests that our econometric methods and analysis of the available data are not currently in a position to show whether a statistically significant relation exists between the harms from 'at-risk' gambling and the ensuing fiscal costs.

4.3.   Avenues for Future Research

This report focuses on the core fiscal costs associated with problem gambling and the main fiscal benefits linked to tax revenue from the gambling industry. It does not provide a

comprehensive cost-benefit analysis of all gambling activity in the UK. There are a number of avenues for future research that will need to be explored in future.

First of all, the Gambling Commission (GC, 2018) already conducts research on gambling prevalence (how many people gamble) and attitudes (what they think about gambling). Work by Forrest and McHale (2021) together with NatCen focuses on gambling products (what people gamble on). This research makes the link between certain products (online slots) and higher rates of harm and addiction. It also makes a link to social deprivation (higher clusters of harm in some communities), which complements ongoing work by NIESR on destitution (Bhattacharjee and Lisauskaite, 2020a,b; Bhattacharjee et al., 2022a,b,c). Because harm is linked to product, there is the concern that certain sections of the population are using more addictive gambling products than others and that they are being targeted.

More research is required to establish whether more gambling-related harms can be measured using some of the metrics in the framework elaborated by Wardle et al. (2018) and using new data sources to ascertain whether there is a statistically significant relationship between problem gambling, harms beyond those covered in this report and a fiscal cost. Specifically, what are the particular harms to "affected others" such as relationship breakdown or the so-called 'poverty premium' (see Section 3.8)? How do various gambling harms and fiscal costs interact with one another, e.g. the complex connections of mental health problems, homelessness and higher welfare benefits. To shed light on these phenomena, more quantitative and qualitative research needs to be conducted on the costs associated with problem gambling in relation to "affected others" and the lived experience of people who experience harm associated with problem gambling. A nationally representative survey of gambling behaviour to generate more primary data about the benefits and costs associated with gambling activity would help provide a more comprehensive account of the total costs associated with problem gambling.

To obtain a more detailed cost-benefit analysis, we also need to know more about the wider economic benefits that accrue from gambling, including the positive implications for entrepreneurship and value creation that arise from risk-taking and the 'economics of happiness'. This would involve quantifying the utility or economic benefit that emerges from the pleasure of engaging and winning in gambling activities as well as the unhappiness or misery that results from losing money. The empirical evidence of 'loss aversion' indicates that the latter could be twice as big a negative shock compared to the positive impact of the former (Kahneman and Tversky, 1979; Dolton and MacKerron, 2023).

Second, we need to assess the distributional impact of gambling-related harm at the regional and household level, with a twofold focus on (1) those living in the most deprived parts of the UK who are many times more likely to experience harms from problem gambling than those living in the most prosperous parts and on (2) the co-occurrence of gambling-related harms and socio-economic and health inequalities such as deprivation, unhealthy alcohol consumption and mental health problems. We will build on NIESR's quarterly analysis of the disparities of wealth and health at the level of devolved nations, England's regions and households (Bhattacharjee et al., 2022a-d and 2023), including our regional and household-levels models (NIESR, 2016 and 2023).

Third, although we have an understanding of gambling prevalence, attitudes to gambling and also the fact that there is a link to socioeconomic differences and even deprivation, there is a lack of primary data to measure the costs of gambling-related harm. That is why this report uses data from the WAS and the APMS to estimate the fiscal costs associated with problem gambling. However, some recent studies are based on new data about gambling behaviour and the implications for both harm and costs. Muggleton et al. (2021) assess the financial, social and health outcomes of gambling. This study draws on Lloyds Bank transactional data which the authors use to track certain outcomes of gambling such being late with mortgage payments, showing the harm for individuals that is associated with problem gambling. Though this data is rich, it does not have the standard screens for problem gambling (DSM-IV and PGSI).

Muggleton et al. (2021) therefore use high proportional gambling expenditure as a proxy for gambling harms instead. The challenge here is that it is conceivable that those who have high proportional monthly expenditure of gambling may also receive high returns from this behaviour if their bet is successful, which does not necessarily involve problem gambling behaviour. Monthly expenditure may be a weak explainer of problem gambling. For instance, this measure would assume that 'professional gamblers' who may not experience harm arising from their gambling activity to be people experiencing problem gambling due to their large proportion of monthly gambling spend. We therefore need data and further research on gambling-related harms and fiscal costs with a focus on net spend.

Connected with this is a fourth avenue for further research: another element that is missing from existing studies is evidence on changes in spending behaviour as a result of legislative or regulatory change. It is likely that the savings generated from a reduction in gambling expenditure will be spent on other forms of consumption with different multiplier effects. We need more research on how spending may change in response to new legislation and regulation of the gambling industry, and what the resulting net effect would be on both output and employment. Linked to this is the question of whether online gambling is different from other forms of gambling and how spending on online gambling will be affected by new legislation and regulation, including net spend.

5. Summary and Recommendations

This report focuses on the benefits and costs of gambling, with a focus on the costs to the Exchequer that are associated with gambling harms arising from 'problem gambling'.

The existing evidence is not sufficiently useful for policymakers as current calculations of the fiscal costs are either based on extrapolations from non-UK datasets, or have resulted in estimates with a high degree of uncertainty (ranging from a few hundred million pounds to over two billion pounds per annum), or fail to compare estimated costs to the core benefits.

In the context of the Government's review of the 2005 Gambling Act, more precise estimates of the fiscal costs associated with problem gambling are vital. This is of particular importance for policymakers and the regulator who are attempting to understand the impact of proposed changes to gambling regulation in the forthcoming Government's White Paper.

Drawing on NIESR's modelling capability, we find that the fiscal cost per person experiencing problem gambling is at least £3,700 per year compared with people experiencing 'at-risk' gambling. We compare these two groups because their gambling behaviour is similar in profile, as opposed to the total population that includes many non-gamblers.

The bulk of the cost is linked to higher welfare payments, in addition to increased healthcare, criminal justice costs and the costs of homelessness. In essence, people who experience problem gambling are significantly more likely to require public services than those who experience at-risk gambling.

We estimate that around 380,000 people experience problem gambling, which corresponds to 0.7 per cent of the total population of 16 years and older living in private accommodation. On that basis, our central estimate is that the total fiscal cost is £1.4 billion per year. This is a much more precise number than past attempts that concluded with a large range or amalgamated all forms of harmful gambling.

However, the figure of £1.4 billion per year is likely an underestimate as it does not include a number of elements, such as the costs to "affected others" – e.g. links between gambling, debt and family breakdown – and the costs of suicide. There are also wider social costs associated with problem gambling, including unhappiness or misery that results from losing money.

In relation to the benefits associated with gambling, the total tax revenue from Betting & Gaming Duties and corporation tax receipts from the gambling industry amount to around £3.5 billion per year. Here too, there are other economic benefits associated with gambling, including the benefits linked to happiness and risk taking, which supports entrepreneurial activity. Future research will be required to establish a comprehensive cost-benefit analysis of gambling in general and problem gambling in particular.

Given the focus of this project, we recommend a number of reforms:

1. Recognition of the fiscal costs associated with problem gambling in the Government's proposed regulatory changes as part of the White Paper on Gambling reform.

2. Inclusion of screens (measurement instruments) for people experiencing problem gambling (PGSI or DSM-IV/V screens) in the next round of the Wealth and Assets Survey (WAS) and updating the estimate of fiscal costs once the 2022 Adult Psychiatric Morbidity Survey (APMS) data with those screens are available.

3. Large-scale data collection as part of the remit of the Gambling Commission, especially in relation to the association between problem gambling and "affected others" and between problem gambling and suicide – with a focus on online gambling.

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7. Technical Appendix – Using WAS to Compute Welfare Costs

The Wealth and Assets Survey (WAS) is probably the most important nationally representative survey (except Northern Ireland), with detailed information on welfare together with individual and household heterogeneity. Its rich information on socio-economic and demographic characteristics for individuals and households is critical and very useful for understanding welfare costs. It implies, for example, that any measure of gambling behaviour and of "problem gambling" can be made precise and its outcomes on lives and costs evaluated by harnessing relationships, by triangulation, with the rich collection of heterogeneities at the individual and household levels.

It turns out that measurement of gambling behaviour in WAS is indirect and patchy, hence likely somewhat beset with measurement errors, but this can be addressed using rich information in WAS. Specifically, there is no direct PGSI- or DSM-type measure available in WAS. Instead, there are three variables that are directly relevant: (1) "Net Annual Income - Wins from gambling" (current and previous year); (2) "Financial situation worse in the current year" (also previous year) and reasons thereof; and (3) Insolvency and reasons. This looks promising, but responses to all questions are potentially prone to under-reporting.

On (1), it is also important to recognise that only gambling wins are recorded, not losses, which will imply very small proportions relative to total population of people who gamble because "the house wins on average". For the population of people who gamble and who are losing is where (2) kicks in. Around 15 per cent of the population report either insolvency or "Financial situation worse", either in the current or previous year. However, only a very small proportion report "Losses from gambling/speculation" as the reason for worse financial situation. Likewise, cause of entering into insolvency includes "Gambling or other speculation", but here again the data show only small proportions.

The WAS data also has detailed documentation of labour market states, including inactivity due to health reasons - "Temporarily sick or injured" or "Long-term sick or disabled", together with a rich collection of socio-economic and demographic factors related to gambling behaviour. Most importantly, WAS contains extensive data on benefits income which make it useful to compute fiscal costs. Therefore, our approach is first to measure at-risk gambling and problem gambling using the above three variables, and then refine this measure using the rich information set in WAS. For this purpose, we use data from Round 6 of the WAS, for the years 2016-17 and 2017-18, focusing on data collected by trained survey professionals, rather than more recent data from Round 7 collected during the Covid-19 lockdowns mainly through telephone interviews.

Our measurement of people who experience 'problem gambling' constitutes two stages. In the first stage, we designate some individuals as experiencing at-risk or problem gambling. Persons who have either become insolvent or report worse financial situation because of gambling (or other speculation) are considered to be experiencing problem gambling. They constitute only 0.04 per cent of the population, which is unrealistically low. Together, we consider individuals who report gambling wins while at the same time being economically inactive because of health reasons as experiencing at-risk gambling; they constitute 0.2 per

cent of the population. While both proportions are still too low, the relative proportion is similar to the ratio of people experiencing problem gambling to people experiencing at-risk gambling in the HSE data, which we view as confirmatory evidence.

Overall, this indicates underreporting of gambling behaviour. We address this issue by estimating a zero-inflated ordered probit (Harris and Zhao, 2007; Kelley and Anderson, 2008) based on three states: "non- or low-risk gambler", "at-risk gambler" and "problem gambler". Exploiting the rich collection of variables in WAS, we include a range of covariates as determining gambling propensity:

- insolvent/worse finances;

- taste for risk-taking;
-
- location (NUTS-1/Government Office Region level);
-
- household composition (number of adults/children in the household);
-
- age;
-
- income;
-
- labour market status (long-term unemployed and full-time students).

We include gender, marital status (married or in a relationship), and (low) education as determinants of (zero-inflation) under-reporting. The model (Table 4) fits the data well. Accounting for under-reporting takes the proportion of people experiencing at-risk gambling to 2.2 per cent and those experiencing problem gambling to 0.7 per cent. These are quite close to estimates from HSE.

In the second stage, we take predictions from the model, including the (normally distributed) uncertainty/error and simulate gambling behaviour for individuals who are not identified as engaging in gambling activity in the WAS. In the principle of microsimulation, individual-level designation of gambling status is based on simulated behaviour, which in aggregate can be used to track welfare (benefits) costs of people experiencing at-risk and problem gambling. For further information of NIESR's microsimulation tools and their use, see NIESR (2016) and Bhattacharjee and Szendrei (2021). We find that welfare costs per individual are substantially larger for people experiencing problem gambling than for people experiencing at-risk gambling.

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8. Acknowledgements

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