The United Kingdom Armed Forces Veterans' Health and Gambling Study



Swansea University
Prifysgol Abertawe

FiMT
forces in mind trust
SUCCESSFUL SUSTAINABLE TRANSITION

COMMUNITY FUND

UK ARMED FORCES VETERANS'



HEALTH AND GAMBLING STUDY

Acknowledgements 4

Forewords
Tom McBarnet, FiMT Director of Programmes 5
Dr Frank Atherton, Chief Medical Officer for Wales 6

Executive Summary 7

Introduction 9

Method
Study Design and Research Objectives 14
Participant Selection 15
Measures 16
Survey flow 19
Analysis 20
Ethical approval 21

Sample Characteristics 22

Findings 30

Discussion 43

Conclusions 47

Recommendations 48

Appendix 49

References 50

Acknowledgements

We would like to thank the research participants for giving their time and taking part in this lengthy study. In particular, the honesty and bravery of the veterans in recounting their health and gambling experiences since leaving the Armed Forces is greatly appreciated. We thank the Armed Forces charities and NHS services (e.g., Veterans' NHS Wales) from across the UK and the Armed Forces Forum and Covenant Steering Group in Wales for keen support of the study and assisting with recruitment. We would like to thank Forces in Mind Trust (FiMT) for funding this study and the previous project on which it builds, and Ray Lock (Chief Executive to 11th June 2021) and Kirsteen Waller (Health Programme Manager) for input and encouragement. We are grateful to Dr. Shaun Harris, Dr. Rhys Pockett and Dr. Sebastian Whiteford for their assistance with data analysis. We are also immensely grateful to Peter Evans (Armed Forces Covenant Manager, Welsh Government) for his support of the study, both Dr Frank Atherton (Chief Medical Officer for Wales) and Carolyn Harris MP for highlighting the issue of problem gambling among veterans, and to Nick Phillips and Drew Carnie (Gambling Guardian) for insight into their lived experience.

Authors:
Professor Simon Dymond, Swansea University
Dr. Glen Dighton, Swansea University
Miss Katie Wood, Swansea University

Co-Investigators:
Professor Cherie Armour, Queen's University Belfast
Associate Professor Matt Fossey, Anglia Ruskin University
Dr. Lee Hogan, Bangor University
Dr. Neil Kitchiner, Veterans NHS Wales
Mr Justyn Larcombe, The Recovery Course
Professor Robert D. Rogers, Bangor University

Researchers:
Dr. Glen Dighton, Swansea University
Miss Katie Wood, Swansea University
Dr. Shaun Harris, Swansea University
Dr. Sebastian Whiteford, Swansea University

Forewords

Tom McBarnet, FiMT Director of Programmes

There can be few readers of this report who will not be aware of the growing prominence of gambling opportunities in society and of gambling websites advertised on national television and in the print media, accessible on mobile and home-based devices. Some gambling is innocent and almost altruistic in intent such as weekly scratch cards or national lottery participation for the benefit of social fund raising. However, whatever one's view, it is also difficult not to recognise that gambling is largely promoted as an acceptable and exciting element of modern social interaction and recreational activity that can appeal to all sectors of society that are legally entitled to participate. And in a country where sport and the promotion of sport forms a large part of the diet of entertainment for many, the relationship between gambling and sport has arguably never been stronger.

The flip side of this argument relates to those who cannot control their participation and whose actions jeopardise themselves and their families. As a grant awarding trust, Forces in Mind Trust exists to enable all ex-Service personnel and their families to transition into successful and fulfilled civilian lives and so we are keenly interested in factors that can conspire to cause difficulty for successful transition. From other aspects of our work we are acutely aware that many Service Leavers do not enjoy financial stability and the experience of leaving the relatively secure environment and employment of the Armed Forces can be traumatic and destabilising for some, especially so for those who are also experiencing mental health conditions. Consequently, compulsive or addictive behaviour patterns that exacerbate the pressures of transition demand our attention.

This report identifies and highlights sobering facts that should make policy makers and service deliverers sit up and take action. That gambling is estimated to cost the UK between £260 million to £1.6 billion in economic, health, social and criminal justice costs is alarming enough, but so also is the prevalence of problem gambling in veterans compared to non-veterans, and that in-Service gambling is not assessed at all. This report importantly builds on its FiMT-funded predecessor to flag the equally costly interrelationships of problem gambling with diagnosed mental health conditions, substance and alcohol misuse, and smoking and indicates that work, home and family can all fall victim to its effects. Though these findings were evidenced by samples of help-seeking veterans that could imply some bias, we should not ignore the clear messages of how gambling introduces instability in those that need stability the most.

This report, the **United Kingdom Armed Forces Veterans' Health and Gambling Study,** is also the first survey of gambling, mental health, and its associated costs to have been conducted amongst the veteran community. In seeking to support the best personal preparation and platform for Service leavers and their families' future lives, we ignore the report's findings and recommendations at our peril.

Chief Medical Officer for Wales, Dr Frank Atherton

I welcome this research, which is the first UK wide survey to explore levels of gambling participation and attitudes to gambling in ex-Service personnel. The report provides a valuable insight into gambling behaviours among our veterans, and it is encouraging to see Welsh veterans participating in this research alongside those from across the UK. Whilst we know that a majority of veterans go on to lead successful happy lives after Service, we know some will face difficulties. The study has shown that veterans are much more likely to experience gambling-related harm than non-veterans and these problems co-occur with anxiety and depression and in some cases PTSD. It is my view that addressing gambling-related harm requires a population, public health approach that seeks to address the inequity of harm.

By building on previous research of gambling-related harm among veterans, we are now developing a true understanding of the extent of the issue and crucially adding insight into gambling's interrelationship with other public health concerns such as alcohol, substance misuse and mental health. There is a strong support network for veterans across Wales and the UK and it is important that they also understand the issues around gambling in order to help achieve successful interventions.

I would like to thank all those involved in this study. We know there is excellent work taking place in Wales and across the UK to support those affected by gambling-related harm and I support all efforts to further our understanding of the issues and to prevent harm.



EXECUTIVE SUMMARY

Background

International evidence shows that military veterans (i.e., regulars and reserves who have served for at least one day) are at increased risk of gambling-related harm. As well as the individual concerned, these harms impact one's family, social relationships, finances, health, and society more generally. Gambling problems and the harms they cause are enormously costly both to the individual and to society.

Despite this, little is known about rates of gambling, the co-occurrence of mental health difficulties, social costs and healthcare use among United Kingdom Armed Forces veterans. The United Kingdom Armed Forces Veterans' Health and Gambling Study sought to investigate, for the first time, the nature and extent of gambling experience, potential harm, mental health problems, and social-economic costs among a large sample of help-seeking UK veterans.

Objectives

The study addressed three main objectives. The first objective was to understand gambling participation and potential problem severity among UK veterans relative to the general population. The second was to describe the physical and mental health behaviours associated with gambling-related harm. The final objective was to estimate the healthcare costs associated with gambling in veterans.

Methods

The United Kingdom Armed Forces Veterans' Health and Gambling Study was an online, cross-sectional survey of veterans (n = 1,037) and age- and gender-matched non-veterans (n = 1,148).

Participants completed questionnaires on sociodemographic characteristics, military service, gambling (experience, severity, and motivation), mental health (depression, anxiety, and posttraumatic stress disorder), alcohol and substance use, and healthcare resource utilisation.

Results

Regarding our first objective, we found high rates of gambling participation and potential problematic gambling among veterans. Overall, veterans in our sample were more than ten times more likely than non-veterans to experience gambling harms and to gamble as a way of coping with distress. Regarding our second objective, posttraumatic stress disorder (PTSD) status was closely associated with problem gambling risk. On the other hand, length of military service (between 0 and 4 years) and years since discharge (10 + years) predicted decreased gambling severity.

The veterans surveyed were four times more likely to have gambled in the past year and to have gambled on more activities than their non-veteran counterparts. Our veterans' gambling was motivated by an escape from or avoidance of distress.

All veterans surveyed experienced some symptoms of depression, anxiety, risky alcohol use, nicotine dependence at higher levels, and increased indications of PTSD and complex PTSD (C-PTSD) diagnoses compared to non-veterans. Veteran status in our sample was a significant predictor

of problem gambling, along with gambling motivated by desire to escape/avoidance.

Finally, we addressed our third objective through identification of higher healthcare, social service, and societal costs for veterans than non-veterans. Overall, the veterans from our survey with scores indicating problem gambling had greater associated healthcare costs but experienced no reduction in quality of life (i.e., 'associated healthcare costs' meaning not necessarily due to gambling in itself, but related to gambling, such as risky alcohol use).

Discussion

Consistent with international findings, we found that our sample of UK veterans were at increased risk of problem gambling and that this risk was associated with the co-occurrence of PTSD and C-PTSD, risky alcohol use and smoking, and gambling motivation.

Our findings indicate that negative mental health outcomes may exacerbate gambling risk after leaving the Armed Forces, with gambling being further motivated by a need to escape or avoid emotional distress.

Implications and Recommendations

- Routine screening for gambling problems should be undertaken with help-seeking veterans.
- Early identification of potential harm and signposting to effective sources of treatment and support is essential.
- The costs of screening and better signposting should be assessed and compared with the costs of coping with, and treating, gambling-related harms.
- Gambling risk screening at the point of transition should lead to automatic referral to community resources through Defence Transition Services.
- Further replication and extension of the study is needed with non-help-seeking veterans.
- In-depth interviews with those with lived experience of gambling-related harm should be undertaken to better understand the onset of any such difficulties to understand how to better support veterans and others affected.



INTRODUCTION

In the United Kingdom, gambling is widely accessible. According to the Gambling Commission, 40% of the general population will have gambled within the last four weeks[1]. However, for some people gambling may become persistent and excessive, leading to significant harm across multiple domains of a person's life [2]. These domains of gambling-related harm include relationships with others, finances, and emotional and physical health [3; 4].

Increasing evidence (see Table 1) highlights that vulnerable populations, including Armed Forces veterans, are at a greater risk of gambling-related harm [5; 6].

Indeed, internationally, Etuk et al. estimated that lifetime prevalence rates for problematic gambling among veterans ranged between 2% and 29%; this range of rates are all considerably higher than general population comparisons [5; 7; 8].



STUDY	SAMPLE	KEY FINDINGS
van der Mass & Nower [9]	182 US military service members: 140 veterans and 42 currently serving	30.6% of 'military service members' experienced moderate or higher gambling risk. Rates almost double that of comparative general population sample (16.4%)
Roberts et al. [10]	257 veterans in England	1.4% of veterans experienced problem gambling. Rates more than 8 times that of age- and gender-matched civilian sample (0.2%).
Milton et al. [11]	394 military veterans from Australia, Canada, New Zealand, the UK, and the US	Veterans gambled more frequently than non-veterans, with 44.3% of veterans gambling once a week compared to 40.0% of non-veterans gambling once or twice a year.
Dighton et al. [12]	257 veterans in England	1.4% of veterans met criteria for problem gambling. Rates more than 8 times that of age- and gender-matched civilian sample (0.2%).
Whiting et al. [13]	738 US veterans	4.2% experienced low gambling risk or greater.
Westermeyer et al. [14]	1,999 US veterans from Veterans Affairs centres	Lifetime prevalence rate of 2% 'pathological' gambling.
Biddle et al. [15]	153 Australian veterans seeking treatment for PTSD	Lifetime prevalence rate of 17% problem gambling.

Armed Forces veterans encounter numerous challenges during transition back to civilian life [16, 17] and have heightened risk of contact with the criminal justice system [18]. Despite this, research on the associations between the increased risk of gambling problems and mental health disorders in veterans is limited [5, 7]. Given that gambling problems frequently co-occur with common mental health conditions that veterans are at a higher risk of developing than non-veterans [19], it is important to better understand how these potential associations are configured in UK veterans [5, 7].

Depression and anxiety are strongly associated with gambling disorder. One study identified that 41% of veterans seeking treatment for their gambling problems also reported a lifetime history of mood disorders [20]. Additionally, depression and suicide rates are increased in those veterans who were found to gamble compulsively, with around a third of veterans gambling in this way trying to take their lives within the past 12 months [21].

Substance use is also related to gambling problems in veterans. In a sample of veterans attending treatment for substance misuse, 79% indicated experiencing 'cravings' to gamble. Further, 27% reported experiencing life problems such as relationship breakdown and financial hardship due to their gambling [22]. In a US-based sample of veterans seeking treatment for gambling, almost two thirds (66.4%) reported a substance use or dependence across their lifetime [23]. Whilst the association between the two is well researched, the order in which substance abuse and gambling problems might occur in veterans is not well understood. Reviews separately conclude that the associations and interactions between mental health, substance use, and gambling disorder among some Armed Forces veterans are extremely complex and, because of this, need further examination [5; 7].

Similarly, the relationship between trauma and gambling, and which precedes the other in veterans, is unclear. Though gamblers may be more likely to have a diagnosis of PTSD, some studies have shown no links between gambling severity and combat exposure [24]. Aside from combat-related trauma, relationships between histories of physical or sexual trauma and severity of gambling have been identified in a large sample of veterans [25]. Most studies in this field are based on US veterans, however. The UK and US have committed to different levels of combat engagement in recent conflicts [26] and have some important cultural and organisational differences [27] which may at least partially account for variances in PTSD rates between the two countries. Therefore, analysis of the association between PTSD and gambling among UK veterans is pertinent.

Understanding what motivates one's gambling may help determine the persistence and hence the likely severity of gambling related problems among veterans [28]. Gambling motivated by social interaction and engagement with peers is likely to require a different treatment approach to gambling motivated by the need to escape or avoid stress, for instance. Identifying the motivation(s) for gambling may aid our understanding of why some mental health difficulties co-occur with gambling problems. Gambling has been thought to be motivated by several factors including: to practice or learn the game, to feel competent at an objective, to experience excitement, to socialise with peers and others, to feel important, to win money, and to just continue to gamble with no objective [29].

Drawn from behavioural psychology,

studies employing the Gambling Functional Assessment (GFA; [30; 31]) have identified four reward- or reinforcement-based motivators of gambling behaviour. Positive reinforcement motivations include social attention (e.g., interacting with peers) and receiving tangible rewards (e.g., money). While negative reinforcement motivations of gambling included sensory experiences (e.g., enjoying the lights and sounds, or feeling an emotional rush), and psychological/physical escape (e.g., leaving/being distracted from a difficult work/home environment). Importantly, negative reinforcement of gambling is thought to represent the function most likely to maintain problem gambling [32].

Gambling as a form of escape/avoidance-based emotional coping is further highlighted through research linking PTSD and gambling. Coping-based motivations for gambling and inaccurate positive expectancies are heightened in those experiencing symptoms of PTSD, both in treatment-seeking samples and samples recruited online [33]. Although little is currently known about factors that may maintain gambling in veterans, how one reacts to stress and stressful situations is a significant factor in the gambling behaviour of the general population [34].

Gambling is often used as a coping mechanism to distract from stress, yet gambling may itself also come to act as a stressor, especially when this behaviour becomes harmful. This can in turn generate a feedback-loop whereby stress-induced loss-chasing (i.e., continued gambling to try and recoup one's losses) may become further aggravated by a blunting of the physiological reaction to stress requiring more and more gambling as the behaviour becomes the new norm. [34]. Gambling might be further influenced by family experience and living arrangements, which may contribute to early exposure and provide a reason to escape through gambling [35]. Research has identified that veterans with family members engaged in gambling have a higher likelihood of gambling themselves, and to an increased degree [19].

The social and economic costs of gambling harms are wide-ranging. Gambling is estimated to cost the UK between £260 million and £1.6 billion a year in economic, health, social and criminal justice costs [36]. Little is known about the costs of gambling-related harm among UK veterans or the impact that coping with a gambling problem might have on healthcare utilisation, social service provision or criminal justice contact in veterans.

To date, there has been minimal research concerning UK veterans' gambling. Our previous findings, funded by Forces in Mind Trust, from analysis of an existing large public health dataset (the *Adult Psychiatric Morbidity Survey* 2007; [37]) indicated that veterans residing in England were up to 8 times more likely to have experienced problem gambling than non-veterans [12; 10]. This relationship was not explained by differences in mental health conditions, substance abuse, or financial management.

Additionally, while veterans were more likely to experience a traumatic event than non-veterans, this was not related to an increase in problem gambling severity. Length of service, or leaving the Armed Forces early, had no effect on gambling severity either. However, these findings involved small numbers of veterans living in England and utilised data that was obtained over fifteen years ago. Due to these limitations, the studies were unable to reflect the changing nature of modern combat service roles and operational deployments. Our previous findings provided a preliminary exploration of rates

of problem gambling in veterans, but they tell us little about contemporary gambling problems and gambling-related harm in veterans from across the UK.

Therefore, the **United Kingdom Armed Forces Veterans' Health and Gambling Study** survey was launched. The key objectives of this study were:

1. to understand gambling participation and severity among a sample of UK veterans relative to the general population.
2. to observe physical and mental health behaviours associated with gambling related harm.
3. to estimate the healthcare, economic, social, and criminal justice costs associated with gambling-related harm among our veterans.



METHOD

This section describes the research objectives, how the study was designed, and which measures were used to meet the objectives.

Study Design

To explore gambling and mental health issues in veterans, we designed an online survey and compared responses with a group of non-veterans matched for age and gender. The table below outlines the approach we took to each of our research objectives. Respondents were presented with an information sheet at the start of the survey. After reading the information sheet, respondents could give their informed consent before completing the survey questions. At the end of the survey, a debrief sheet contained information about how to contact gambling and mental health support services.

OBJECTIVE	APPROACH
To understand gambling experience and problem severity among UK veterans relative to the general population 	Two samples were collected: one consisting of UK Armed Forces veterans, and one of non-veterans to represent the general population. The non-veteran sample was age- and gender-matched with the veteran sample. We explored the gambling experience and problem severity among both samples by asking respondents which gambling activities they had participated in during the past year and based on those gambling activities (if any), we measured the severity of gambling problems.
To observe physical and mental health behaviours associated with gambling-related harm 	We identified the proportion of veterans and non-veterans from our sample who experienced depression, anxiety, PTSD/C-PTSD, alcohol and substance use and examined which of these factors were associated with problem gambling.
To establish the costs associated with gambling-related harm 	We identified healthcare and social resources used by veterans and non-veterans in the initial survey and calculated the associated costs for those who experienced problem gambling.

Participant Selection

Respondents were mainly recruited online, through targeted advertisements on social media (e.g., Facebook) and via the online participation platform, Prolific (www.prolific.co). For the veteran sample, the survey was also advertised via Armed Forces veterans' NHS services and charities. We received a total of 5,147 survey responses:

- 2,535 veterans
- 2,612 non-veterans

To conduct a nationally representative survey, we estimated a sample of 1,067 veterans and a similar sized, age-and-gender-matched group of non-veterans would need to be recruited. The estimated sample size was based on the UK veteran population of 2.56 million [38] and a total Armed Forces population size of 2.8 million. Thus, assuming a conservative difference in rates of gambling problems of 1% between the groups [12], a veteran's sample of this size can detect a medium to large effect size with a power of 0.75.

We conducted several quality control measures to screen for and remove the following responses from the veteran sample:

1. opened the survey but did not complete any measures (*n* = 282);
2. did not complete the consent form (*n* = 87);
3. did not meet the minimum threshold of completion of measures for inclusion in the study (43% completion: *n* = 484);
4. did not provide legitimate military credentials to be included in the veteran sample (*n* = 591);
5. did not meet the inclusion criteria for the study (i.e., less than 18 years of age, not a UK citizen, currently serving member of the Armed Forces; *n* = 54).

Our final sample included:

1,037 veterans



Similar quality control measures were applied to the non-veteran sample:

1. opened the survey but did not complete any measures (*n* = 613);
2. did not complete the consent form (*n* = 51);
3. did not meet the minimum threshold of completion of measures for inclusion in the study (43% completion: *n* = 84);
4. did not meet the inclusion criteria (i.e., less than 18 years of age, not a UK citizen, currently serving member of the Armed Forces or Armed Forces Veteran; *n* = 63)
5. did not provide a legitimate postcode for their country of residence, completed the survey from outside the UK or provided inconsistent data in the follow-up quality control check (*n* = 646).

Our final sample included:

1,148 non-veterans



Measures

Within the survey, as well as questions relating to sociodemographic information and military characteristics (for the veteran sample only), respondents completed questionnaires about their gambling behaviour and mental health. Measuring sociodemographic characteristics permits further examination of associations with the other outcome measures.

If respondents said they had gambled within the past year on at least one of the gambling activities listed, they were presented with a set of survey questionnaires exploring the severity of their gambling behaviour (i.e., the extent to which it may be problematic or not) and their motivations associated with gambling.

Factors	Measure
Sociodemographic Characteristics	
Age	Age in years calculated from self-reported date of birth and date of survey completion.
Gender	Male, female or other.
Country of residence	England, Scotland, Wales, Northern Ireland or other (for those in the veteran sample who have immigrated since leaving the UK Armed Forces).
Ethnicity	Respondents are asked which ethnic group they consider themselves to belong to.
Relationship status	Single, in a relationship, co-habiting, married, separated, divorced or widowed.
Employment status	In paid employment, looking after home/family, retired, in training/education, in sheltered work, unemployed and actively seeking employment, unemployment and not actively seeking employment or not working due to long-term illness or disability.
Highest qualification*	No formal qualifications, entry level certificate. GCSE grade D-G, GCSE grade A*-C, AS/A Levels, Certificate of Higher Education, Bachelor's Degree or equivalent, Master's degree or Doctorate. *based on the English educational qualification system.
Household arrangement	Live alone, live with family or live with non-family.
Accommodation	Owner, privately renting, renting from local authority, living in home owned by family, community living, living in sheltered housing or homeless.
Benefits	Respondents were asked if they are in receipt of benefits and, if so, which ones.

Factors	Measure
Military-Related Variables	
Service Number	Used as a content-knowledge question to confirm veteran status. Confirmed against enlistment date as a further validation.
Branch of service	Army, Royal Air Force (RAF) or Royal Navy including Royal Marines and Royal Fleet Auxiliary. All branches include reserves.
Rank at discharge	Self-reported rank.
Length of service	Self-reported years in service.
Discharge status	Medical, at own request (PVR), end of engagement, administrative, compulsory, redundancy or other.
Years since leaving service	Years since leaving service calculated from self-reported enlistment date and date of survey completion.
Location(s) of deployment	Respondents were able to select more than one deployment location.

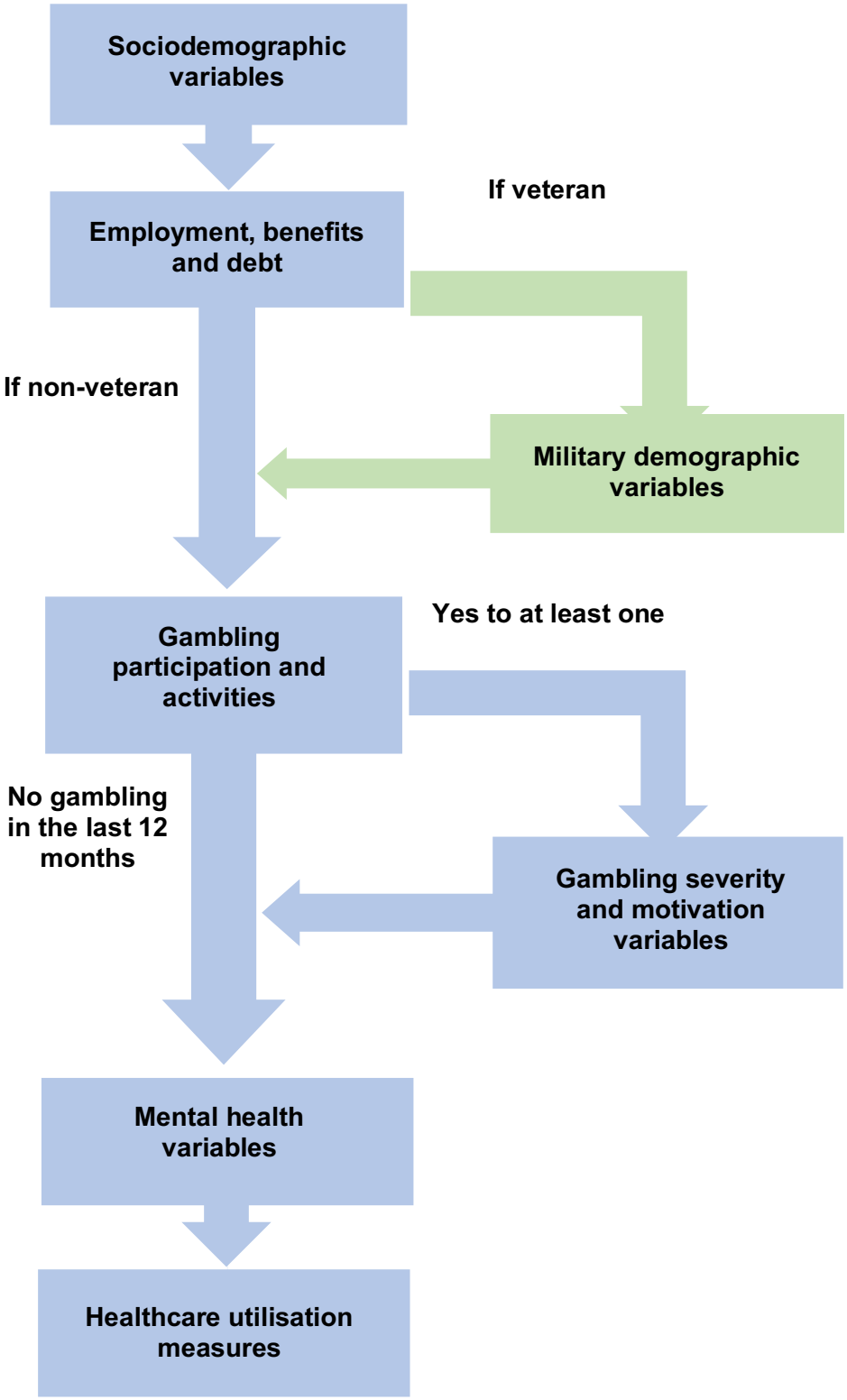
Factors	Measure
Gambling Behaviour	
Gambling participation and activities	Respondents were asked if they had participated in one or more of 19 gambling activities within the past 12 months [(39)]. If they had gambled in the last 12 months, they were presented with the gambling severity and motivation measures.
Problem gambling severity	*Problem Gambling Severity Index* (PGSI; [40]) measures risk behaviours attributing to problem gambling.
Gambling motivation	*Gambling Functional Assessment – Revised* (GFA-R; [31]). Respondents rate how often a particular experience motivates their gambling. Their overall scores are split into two subscales to indicate each type of motivation: positive reinforcement and negative reinforcement.

Factors	Measure
Mental Health Outcomes	
Depression	*Patient Health Questionnaire* (PHQ-9; [41]). Respondents indicated how often in the last two weeks they experienced a certain statement related to symptoms of depression.
Generalised Anxiety Disorder	*Generalised Anxiety Disorder assessment* (GAD-7; [42]). Respondents indicated how often in the last two weeks they experienced a certain statement related to symptoms of generalised anxiety disorder.
Post-Traumatic Stress Disorder (PTSD)	*International Trauma Questionnaire* (ITQ; [43]) to measure PTSD and Complex PTSD (C-PTSD).
Alcohol use	*Alcohol Use Disorder Identification Test* (AUDIT; [44]) screens for harmful alcohol consumption.
Nicotine dependence	*Fagerström Test for Nicotine Dependence* (FTND; [45]) measures cigarette consumption, compulsion to use and dependence.

Factors	Measure
Healthcare Utilisation & Costs	
Health-related quality of life	The *European Quality of Life in 5 Dimensions – 5 levels* (EQ-5D-5L) [(46)] measures 5 domains of perceived health curtailments: mobility, self-care, activities of daily living, pain/discomfort, and anxiety/depression. Additionally, respondents indicated their perceived current health on a scale of 0-100.
Health and social care utilisation	A version of the *Client Service Receipt Inventory* (CSRI)[(47)] to measure NHS and social service utilisation.
Criminal justice contact	Respondents were asked if they had contact with the criminal justice system in the last 3 months and whether they have ever been convicted of a criminal offence, and, if so, the nature of the offence.

Survey Flow

The diagram below shows the order the measures were presented to respondents.



Analysis

We first undertook summaries of the key sociodemographic characteristics for the full sample of the UK Armed Forces Veterans' Health and Gambling Study. Further cross-sample analyses were conducted between veteran and non-veteran samples, and within these respective samples, with associations between veteran status and outcome variables. Odds ratios, or the likelihood of one outcome being impacted by another outcome, were calculated for significant associations. Differences between groups were further analysed and we used stepwise multiple linear regressions to predict gambling severity (PGSI score). Three models were developed: sociodemographic characteristics only, gambling measures and mental health variables only, and an omnibus model of the strongest predictors from the previous two models. Subsample analysis of non-veterans followed this three-model procedure, while a fourth model included military demographics of the veteran sample.

The health-economic costs analyses compared costs and outcomes for veterans and non-veterans. Analysis was conducted using Stata 16 [48]. Utilisation of different resources was calculated for each type (social, healthcare, criminal justice, etc.) for the three months period of the resource-use questionnaire, along with mean number of social service and other resource contacts. Unit costs were obtained from published sources to undertake economic evaluation [49; 50]. Each item's total cost was calculated by multiplying resource use by the unit costs and summed for each participant. Total costs and utility, and differences between groups, were estimated. Costs and utilities were adjusted for age group, ethnicity, country of residence, qualifications, relationship status, PHQ-9 total score, and GAD-7 total score as covariates.

As the study considered a single timepoint, a cost-consequence analysis was conducted which presents costs alongside a range of outcomes allowing decision makers to form their own opinion on their comparative relevance and importance [51]. This approach is recommended where a range of health and non-health benefits may be difficult to measure or quantify [52]. Although mean utility values were calculated for each group, data was only available for a single timepoint, therefore it was not possible to calculate quality adjusted life years (or the extent by which perceived quality of life improved or not across the course of the study).

Ethical Approval

The study protocol was reviewed by Wales NHS Research Ethics Committee (REC) 6 and obtained favourable Health Research Authority and Health and Care Research Wales approval. The REC reference is 19/WA/0134 and the study was conducted in accordance with Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines.

Participants were provided with information about the study content, but not specific measures (to avoid priming of desirable responses), prior to completing an informed consent form. This information set out the participants' right to withdraw from the study at any stage and notified them of support information accessible at any time during and after the study.



Sample Characteristics

This section describes the sample, how it was collected, and how veterans and non-veterans differ on several sociodemographic characteristics.

To participate, both veterans and non-veterans had to be a minimum of 18 years old and not currently serving in the UK Armed Forces. The non-veteran sample was limited to those who are domiciled within the UK; however, veterans that were able to provide a UK Armed Forces service number but had emigrated since leaving the Armed Forces were included in the sample along with veterans who were ordinarily resident in the UK. All participants were reimbursed for their time with a £20 shopping voucher on completion of the study.

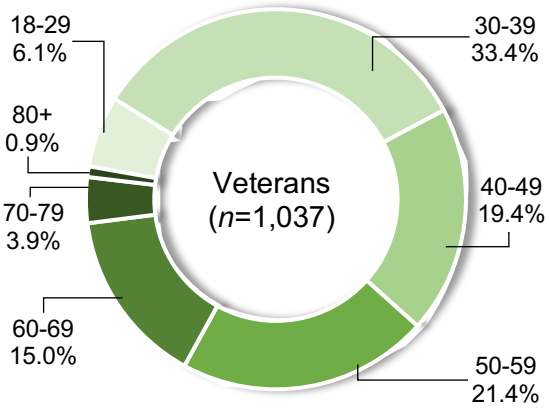


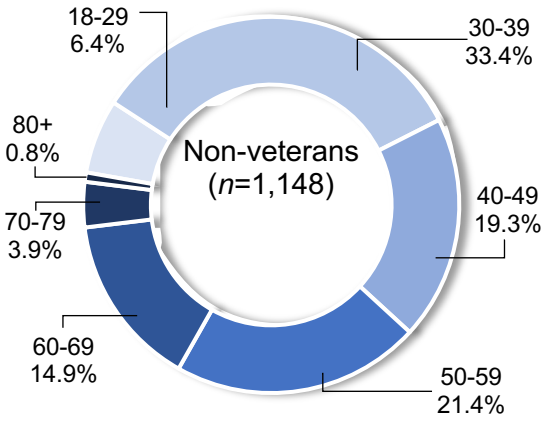
Age and Gender

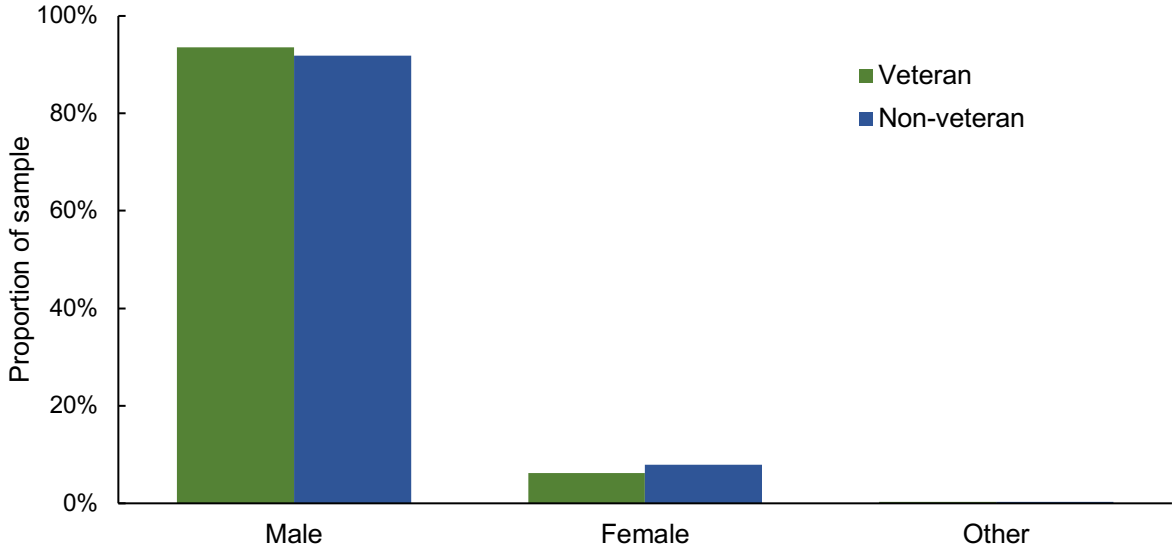
Our sample of veterans and non-veterans were age- and gender-matched, and so the samples did not differ significantly in age (p=0.999) or gender (p=0.278).

Most veterans were aged between 30-39 years old, with the least number of veterans in the 80+ years age group. There was representation of all age groups in the veteran sample, with the youngest veteran in the sample aged 20 years and the oldest aged 92 years. Most veterans were male (93.5%), which is unsurprising given the male to female ratio of the Armed Forces.

The non-veteran sample was aged-matched with the veteran sample. Therefore, most non-veterans were also aged between 30-39 years old, with the least number of non-veterans in the 80+ years age group. Again, there was representation of all age groups in the non-veteran sample, with the youngest non-veteran aged 20 years and the oldest aged 88 years. Most non-veterans were male (91.8%).

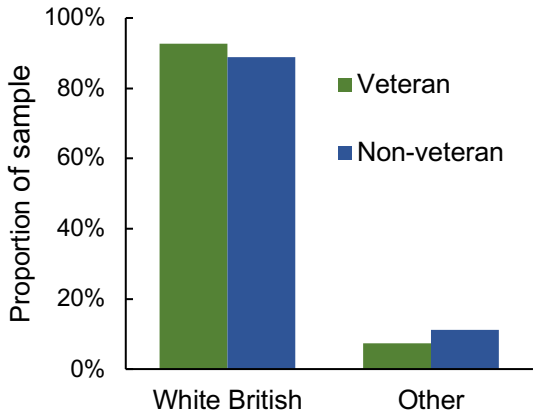




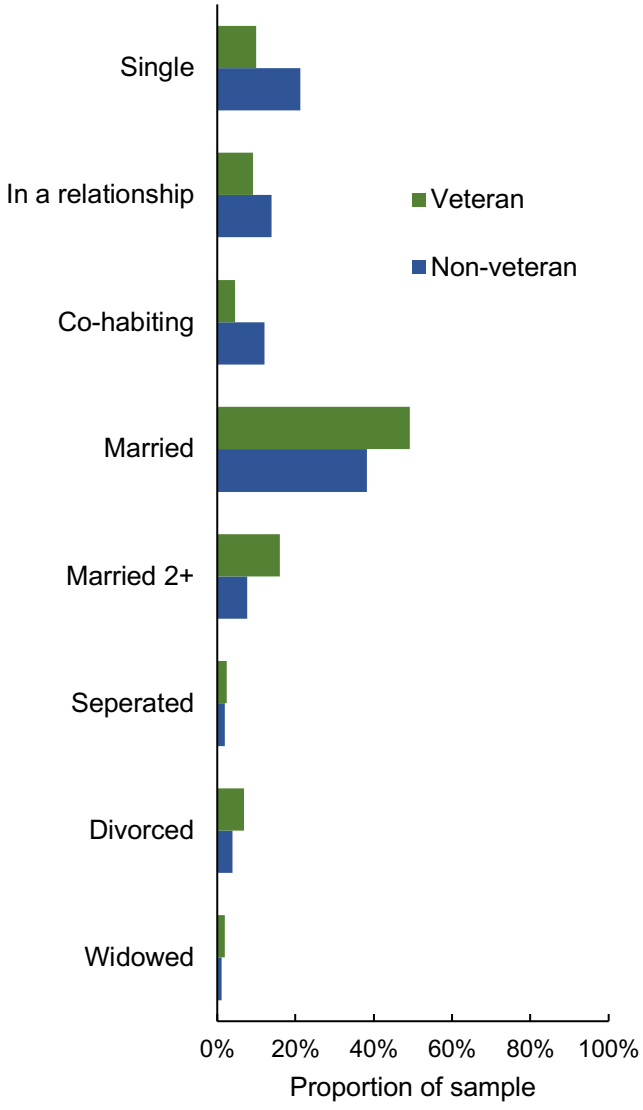


Ethnicity

Most veterans reported themselves as being of 'White-British' ethnicity (92.6%), with the rest of the sample being made up of other ethnic groups (7.4%). Similarly, most non-veterans self-selected themselves as being of 'White-British' ethnicity (88.9%), with the rest of the sample being made up of other ethnic groups (11.1%).



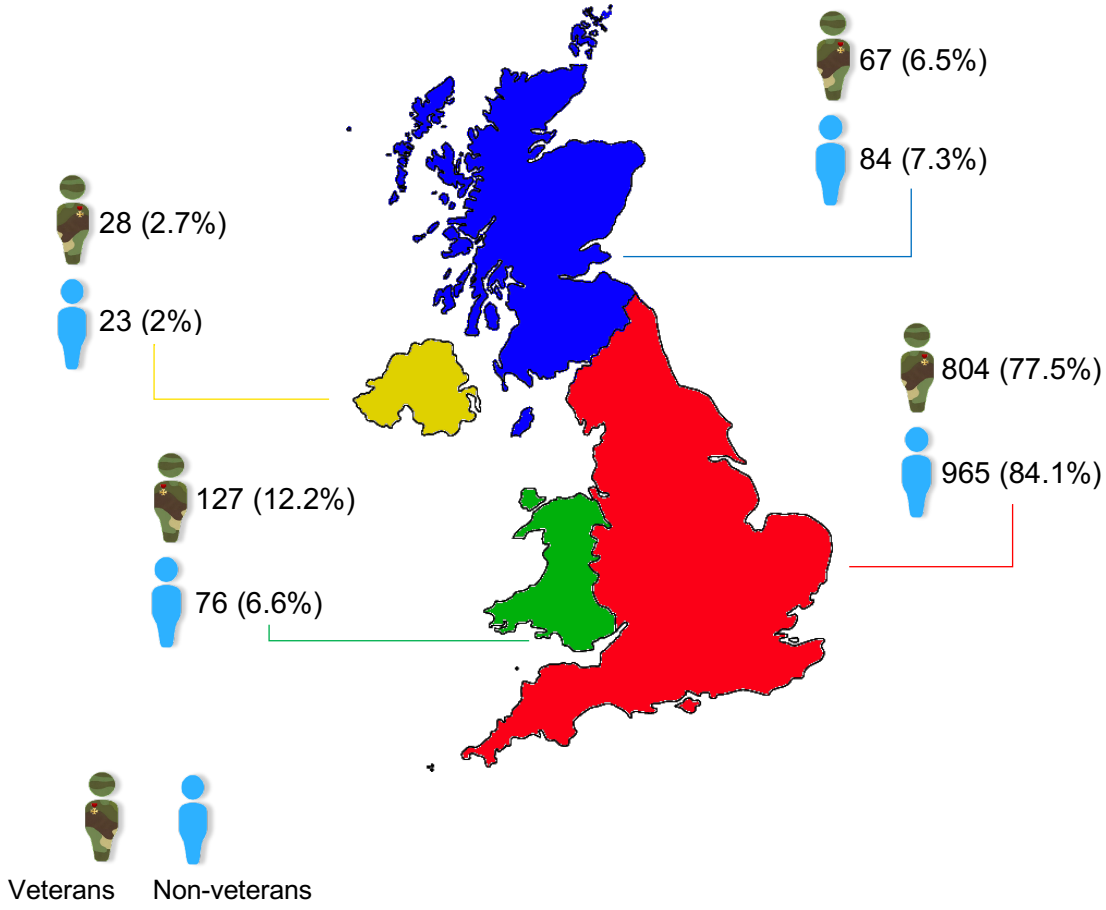
Marital Status



Most veterans reported being married (49.2%), with a further 16% reporting being in their second or more marriage. The sample was further made up of veterans who were single (9.9%), in a relationship (9.2%) divorced (6.8%) or cohabiting with a partner (4.5%). The sample also contained small proportions of veterans who were currently separated from their partner but not divorced (2.4%) or who were widowed from their partner (2.0%).

Comparably, most non-veterans were married at the time of sampling (38.3%). The rest of the non-veteran sample were made up of those who were single (21.2%), in a relationship (13.9%), co-habiting with their partner (12.0%), or on their second or higher marriage (7.6%). Small proportions of non-veterans reported being divorced (3.9%), separated (1.9%), or widowed (1.1%).

Country of Residence: Veterans and Non-Veterans



Most veterans in our sample resided in England (805; 77.6%). The second highest number of veterans resided in Wales (127; 12.2%), followed by Scotland (67; 6.5%) and Northern Ireland (28; 2.7%). There were also a small number of veterans in our sample who were classed as 'other' (10; 1.0%). These were veterans originally from the UK, but since leaving the Armed Forces had moved abroad.

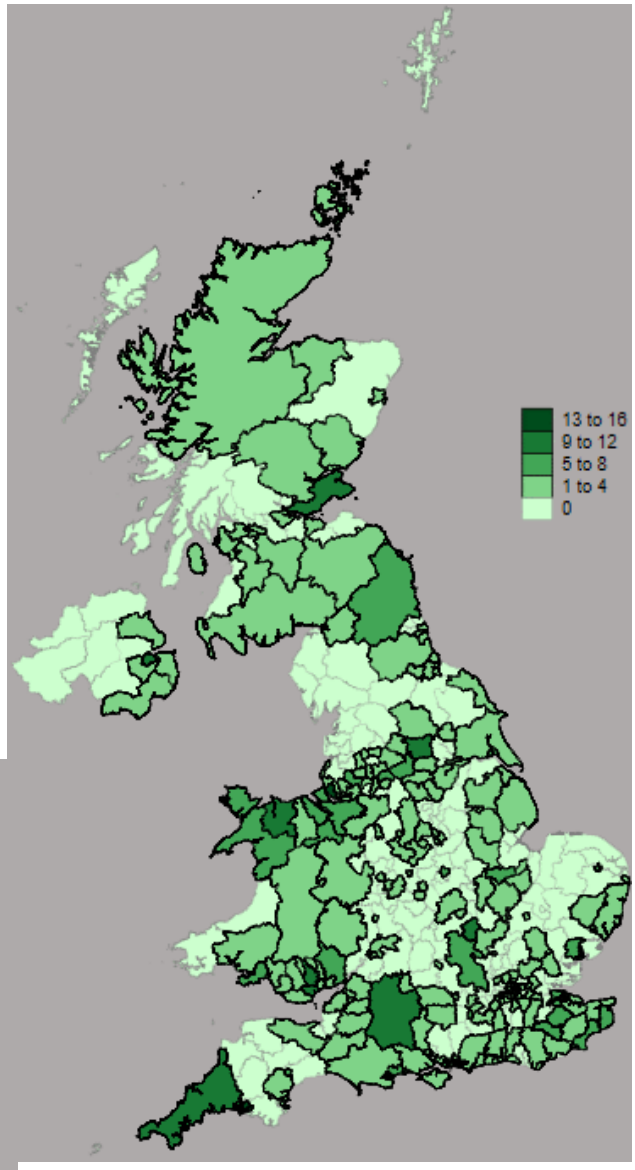
Most non-veterans in our sample also resided in England (965; 84.1%). The second highest number of non-veterans in our sample resided in Scotland (84; 7.3%). This was closely followed by Wales (76; 6.6%) and finally, Northern Ireland (23; 2.0%). There were no non-veterans in the 'other' category, as only non-veterans currently living in the UK were eligible to complete the survey.

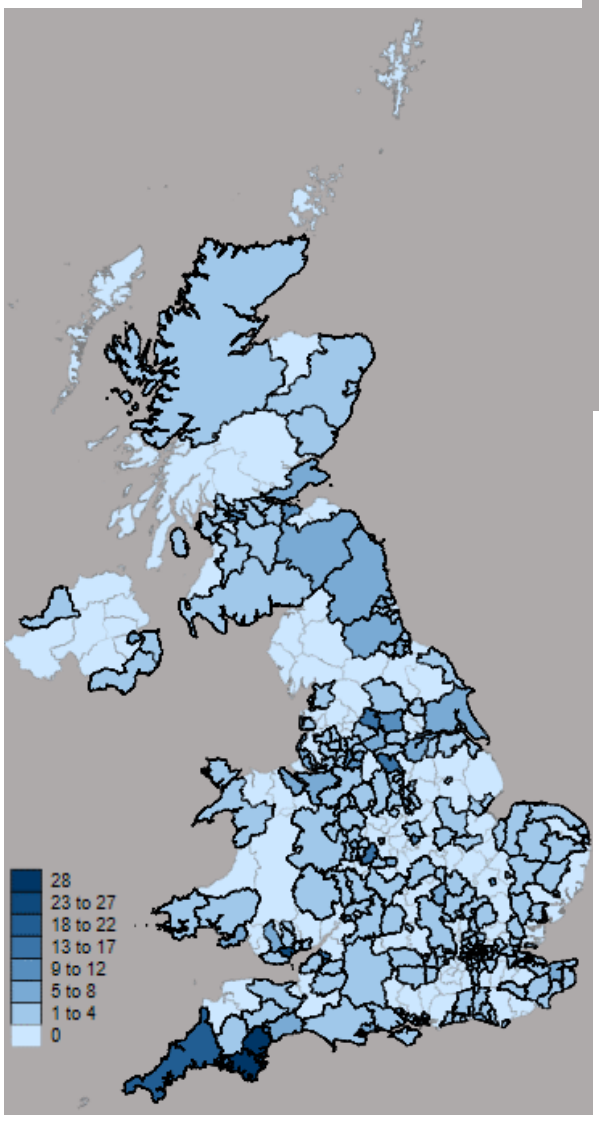
Postcode Maps

Veterans

Using the postcodes entered at survey outset, we were able to map location of our veteran sample across the UK.

There are several areas which had a high sampling concentration of veterans. These include Liverpool (16), Plymouth (14), Leeds (13), Fife (12), Wiltshire (11), Belfast (11), and Cardiff (11).





Non-veterans

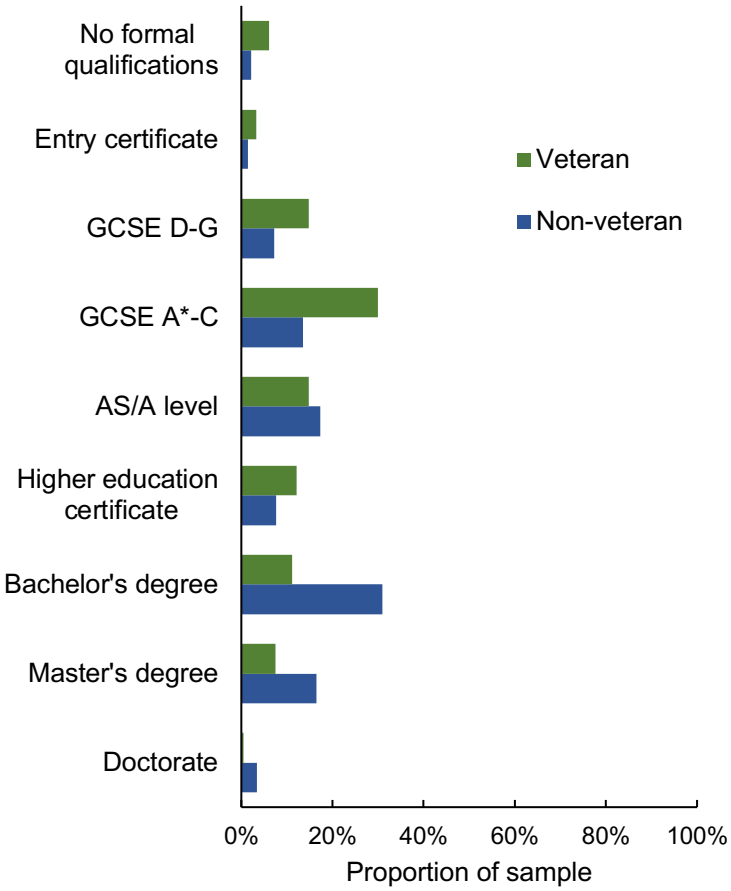
The non-veterans sample had similar distributions across the UK but included multiple districts with high clustering of the sample.

These included: South Hams Devon (28), Teignbridge (28), Torbay (24), Cardiff (23), Cornwall (22), Sheffield (17), and Bristol (16).

Highest Qualification

Most veterans attained GCSEs at A*-C level (30.0%), followed by AS/A Levels and GCSE D-G (both 14.8%) (or equivalents), suggesting that most veterans completed compulsory education, with some continuing to tertiary education. Some veterans continued education to University level, attaining the equivalent to a Bachelor's degree (11.2%) or Master's degree (7.5%). The rest of the veteran sample was made up by those who attained no formal qualifications (6.1%), an Entry Certificate (3.3%), with very few attaining a Doctorate (0.4%).

Most non-veterans attained a Bachelor's degree (30.9%). The rest of the sample was made up by those with a Master's degree (16.5%), AS/A Levels (17.3%), GCSEs A*-C (13.6%), Higher Education Certificate (7.6%), GCSEs D-G (7.2%), Doctorate (3.4%), or Entry Certificate (3.3%) equivalents. Few non-veterans had no formal qualifications (2.1%).



Employment Status

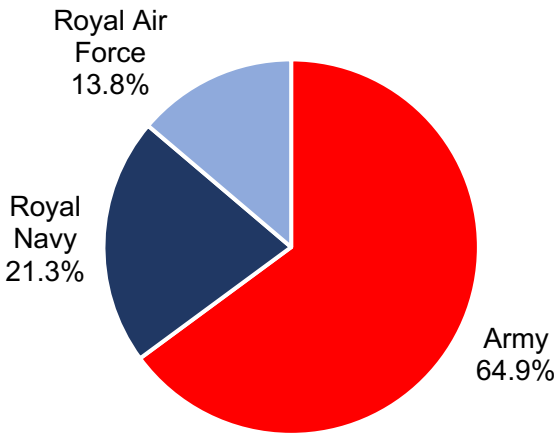


Most veterans were in paid employment at the time they completed the survey (67.9%) with the second largest group being retired veterans (14.2%). The rest of the veteran sample were either not working due to long term illness (6.2%), unemployed but actively seeking employment (5.3%), in training or education (2.3%).

Few veterans were unemployed and not actively seeking work (1.4%) or staying at home to look after the family (1.9%). Similarly, most non-veterans were in paid employment (70.6%).

Military Branch

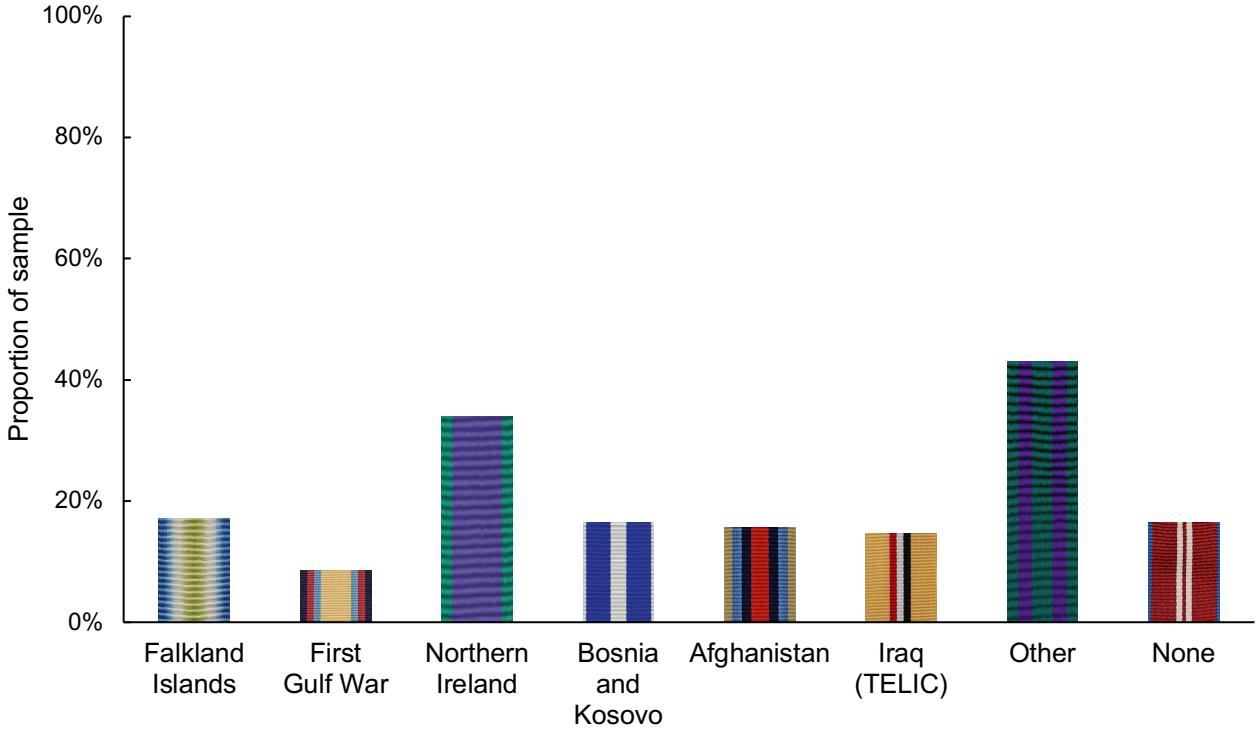
Most of the veteran sample reported that they had served the largest part of their military career in the Army (64.9%), with the remainder serving with the Royal Navy (including Royal Marines; 21.3%) and the RAF (13.8%), respectively.



Operational Deployment

The veteran sample was diverse in its deployment activity (i.e., serving in operational military theatres). While 15.8% of veterans were not deployed during their time in the Armed Forces, 39.2% deployed to a single theatre, with the majority (41.8%) deploying to multiple operational environments.

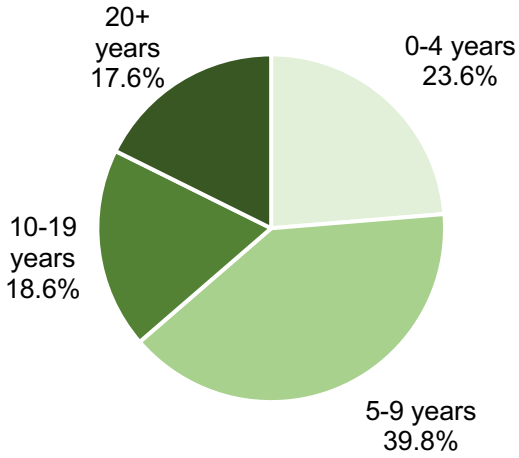
Deployed veterans could select multiple deployment theatres when completing the survey. While most veterans were deployed to 'Other' theatres (e.g., Cyprus, Korea, Africa; 43.1%), the most-attended theatre from the sample was Northern Ireland (33.9%). This was followed by deployment to the Falkland Islands (17.1%), Bosnia and Kosovo (16.4%), Afghanistan (15.7%), Iraq (14.6%), and deployment during the First Gulf War (8.5%).



Length of Service

Most veterans served in the Armed Forces for between 5 to 9 years (39.8%). Almost a quarter of veterans served for between 0 to 4 years and were categorised as 'early service leavers' (23.6%).

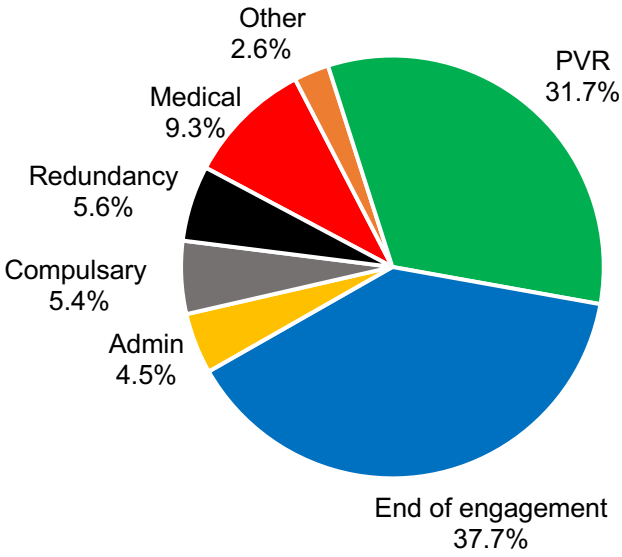
The remaining veterans had served for 10-19 years (18.6%) or over 20 years (17.6%), respectively.

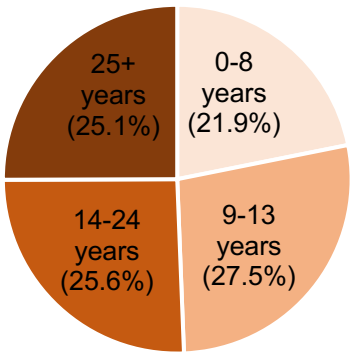


Reason for Discharge

Most veterans left the Armed Forces after their contracted engagement period ended (37.7%). Those who asked to leave the Armed Forces early using the Premature Voluntary Release (PVR) scheme made up the second largest group of veterans (31.7%)

The rest of the sample was made up of veterans who were medically discharged (9.3%), were made redundant (5.6%), compulsory withdrawal (5.4%), administrative discharge (4.5%), or other reasons (e.g., compassionate grounds; 2.6%).





Years Since Leaving

To examine how relationships between Armed Forces service and outcome variables attenuate over time post-service, evenly distributed categories for years since leaving the Armed Forces were generated from the collected data.

Most of the sample was discharged 9-13 years previously (27.5%), with similar proportions of veterans having been discharged 14-24 years previously (25.6%) and for 25 or more years (25.1%). 21.9% of the sample had been discharged up to 8 years previously.

FINDINGS

This section describes the main differences between the veterans and non-veterans in terms of problem gambling severity, gambling motivation, mental health outcomes, alcohol-use, and smoking, as well as healthcare resource utilisation, benefits and debt, and costs. The characteristics of the two samples are then used to predict increases and decreases in gambling severity.

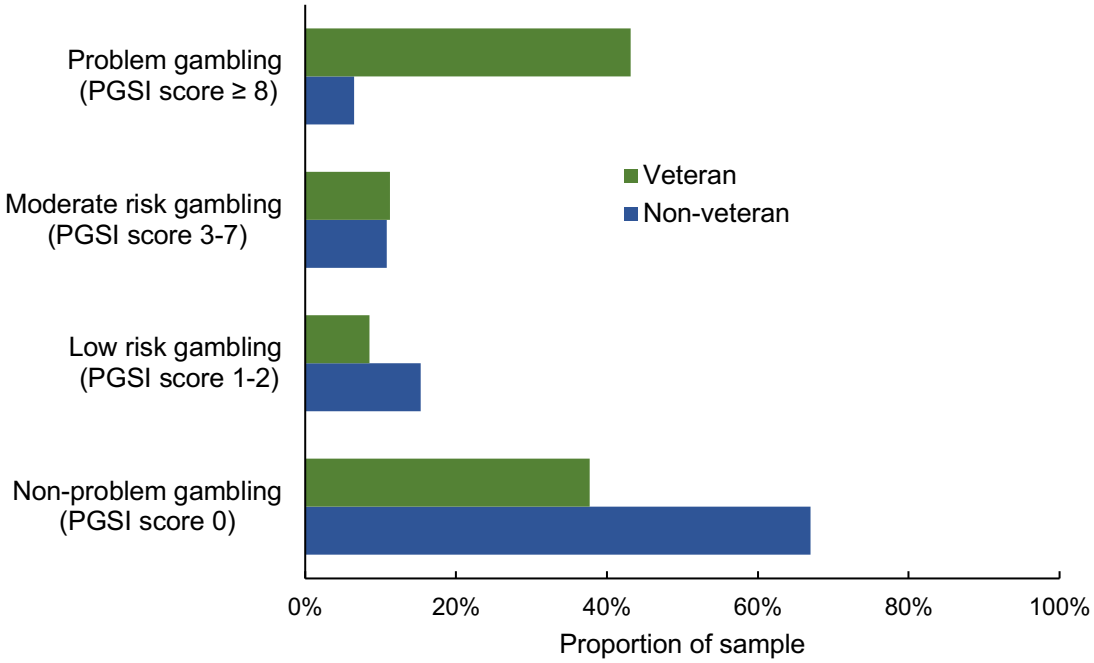
Gambling Activities

Past-year gambling participation was significantly more common among our veteran sample (91.5%) than non-veteran sample (71.0%), with veterans being 4.41 times more likely to gamble.

The most popular gambling activity seen in both the veteran and non-veteran samples was playing the National Lottery. The next most preferred activities differed between the two samples: for veterans, it was scratch cards (40.5%), other lotteries (35.4%), fruit or slot machines (29.8%), and online betting (27.1%); while for non-veterans, it was online betting (39.5%), scratch cards (33.4%), online gambling (23.2%), and other lotteries (18.9%).



Gambling Severity

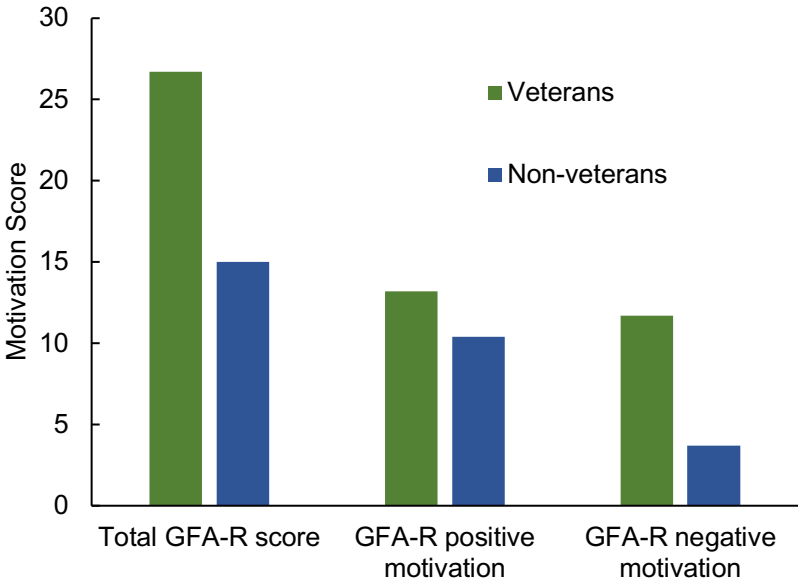


Of those who had gambled, 43.1% of the veteran sample had PGSI scores indicating problem gambling. Most of the non-veterans who had gambled did not indicate any gambling problems (67.0%). Only 6.5% of non-veterans experienced problem gambling.

The veterans in our sample were over 10 times more likely to experience problem gambling than non-veterans (95% Confidence Intervals [CIs][a]: 8.01, 14.79).

[a] *A 95% confidence interval represents a range of values in which we are confident the population mean falls between.*

Gambling Motivation



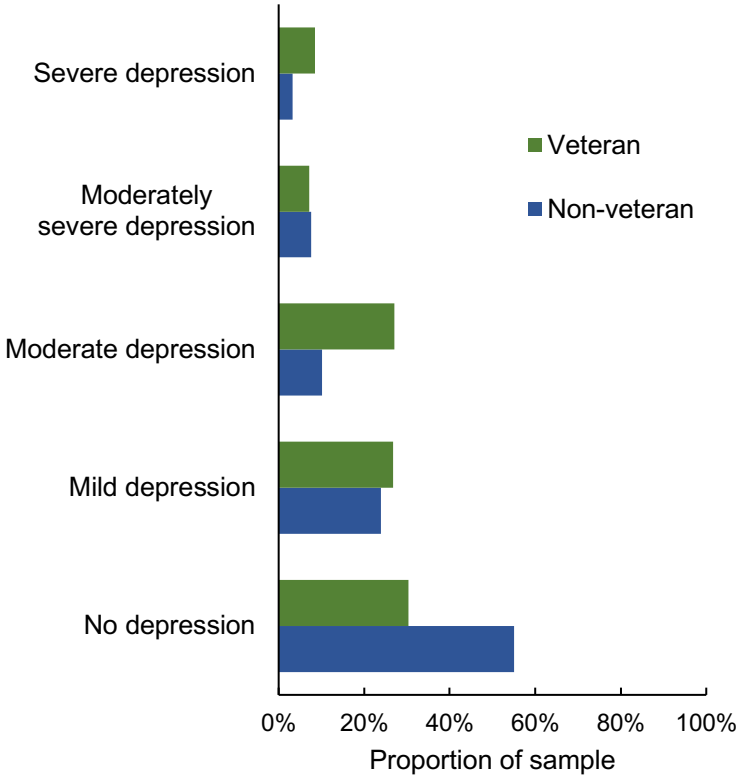
In our sample, veterans' gambling was over 7 times more likely to be motivated by escape or avoidance of distress (GFA-R negative reinforcement motivation) compared to non-veterans (95% CIs: 5.43, 10.02).



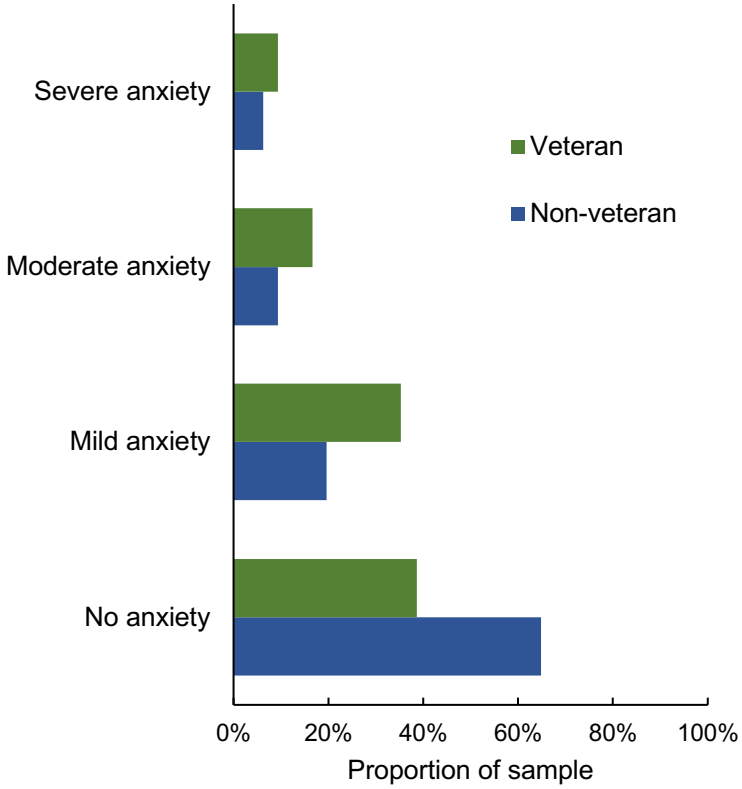
Depression

30.4% of veterans in the sample and 55.0% of non-veterans indicated no symptoms of depression, according to the PHQ-9. However, veterans were around 3 times more likely to experience moderate (95% CIs: 2.59 – 4.17) or severe depression (95% CIs: 1.82 – 4.00) than non-veterans.





Anxiety



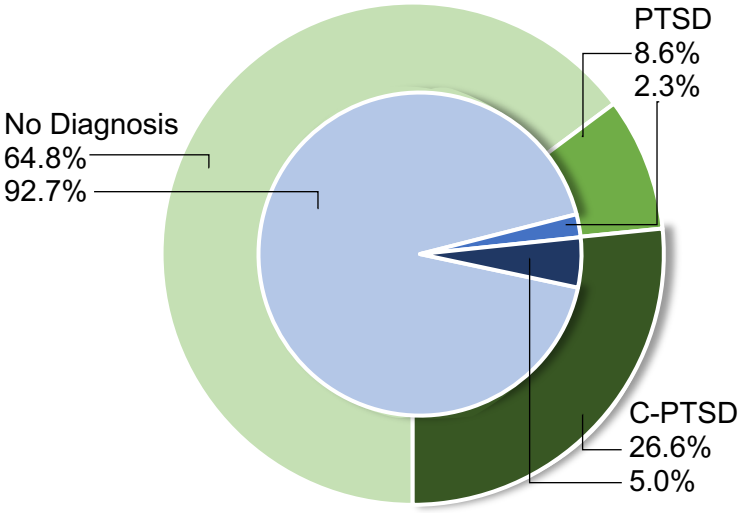
38.7% of veterans in the sample and 64.9% of non-veterans indicated no anxiety, but veterans were twice as likely to experience mild (95% CIs: 1.85 – 2.73) or moderate anxiety (95% CIs: 1.51 – 2.54), and 1.5 times more likely to experience severe anxiety (95% CIs: 1.11 – 2.10) than non-veterans.



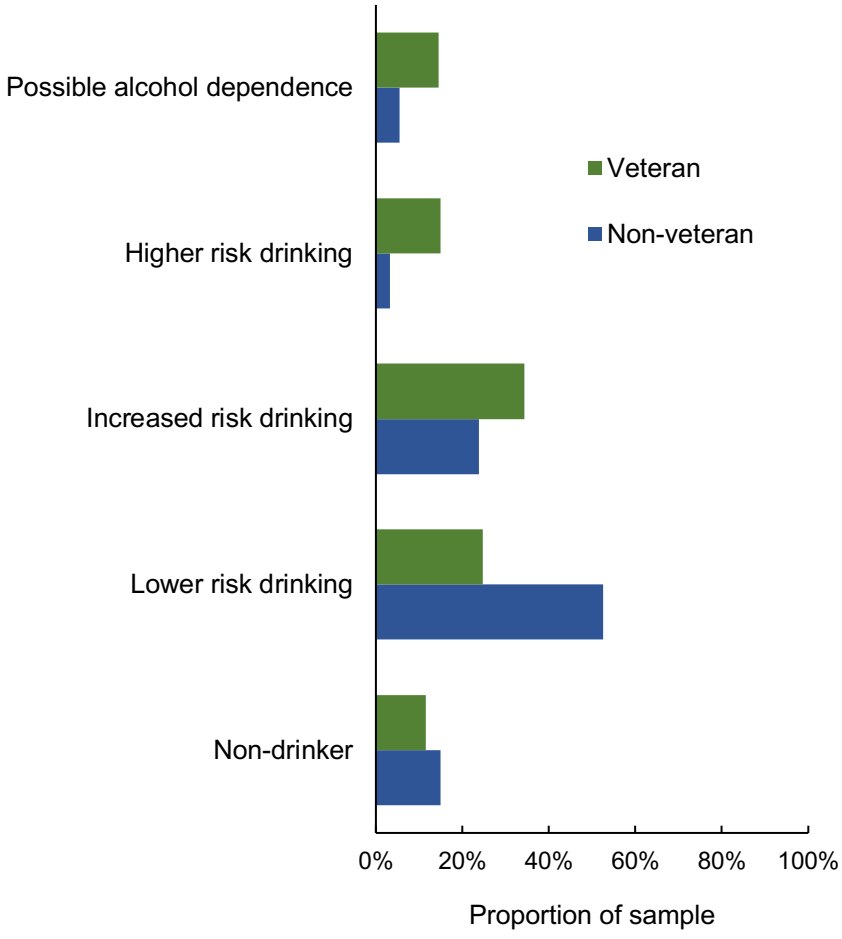
Trauma

Over a quarter of our sample of veterans met the criteria for self-reported Complex PTSD (C-PTSD) (26.6%).

Veterans in the sample were 4 times more likely to have symptoms indicative of PTSD (95% CIs: 2.56 – 6.39) than non-veterans and were almost 7 times more likely to have symptoms indicative of C-PTSD (95% CIs: 5.03 – 9.26) than non-veterans.



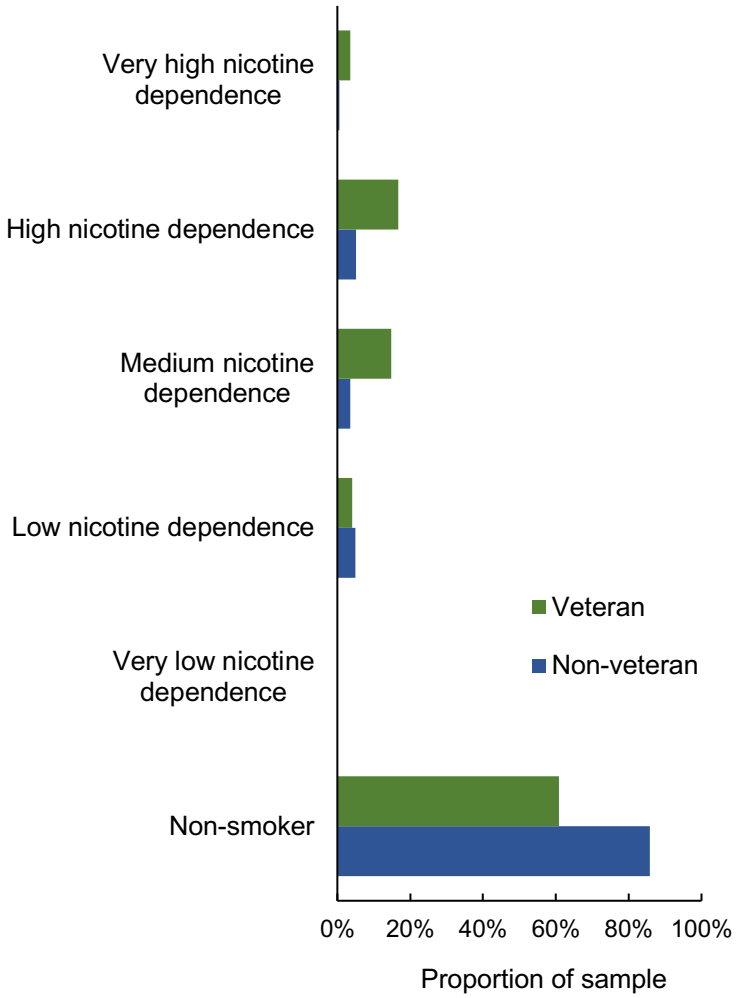
Alcohol Use



The highest proportion of non-veterans reported lower risk drinking (52.5%), while the highest proportion of veterans reported increased risk drinking (34.3%).

Veterans were almost 1.5 times more likely to experience increased risk drinking (95% CIs: 1.38 – 2.02), 5 times more likely to be experiencing higher risk drinking (95% CIs: 3.50 – 7.32) and 3 times more likely to be experiencing possible alcohol dependence (95% CIs: 2.18 – 4.09) than non-veterans.

Smoking



Smoking was uncommon, with the majority of veterans (60.5%) and non-veterans stating they were non-smokers (85.8%).

Veterans were almost 5 times more likely to be experiencing medium nicotine dependence (95% CIs: 1.85 – 2.73), almost 4 times more likely to be experiencing high nicotine dependence (95% CIs: 1.85 – 2.73), and almost 7 times more likely to be experiencing very high nicotine dependence (95% CIs: 1.85 – 2.73)



Healthcare Utilisation

Veterans in the sample had more visits to their GP, A&E attendances and admissions, hospital inpatient stays, and outpatient appointments than the non-veteran sample.

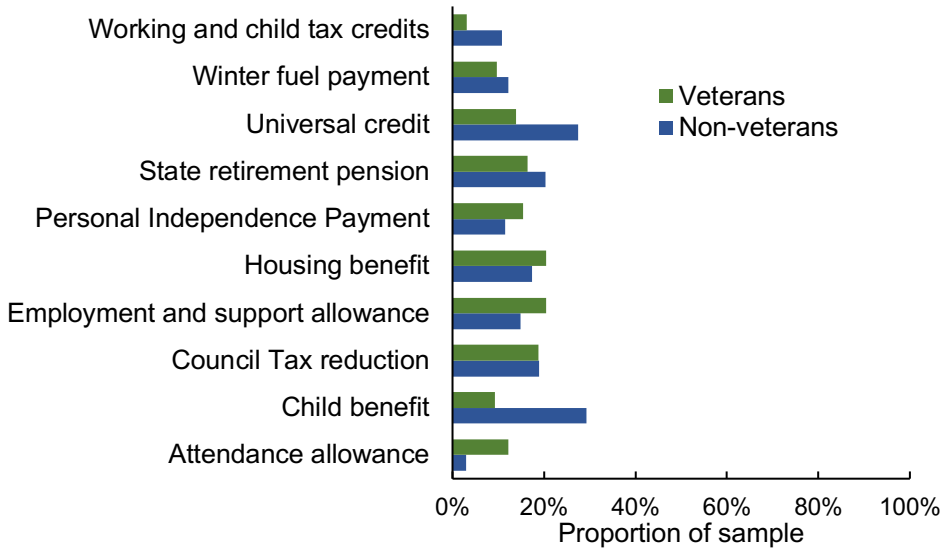
Veterans were attending more counselling sessions and seeing a psychologist more often than non-veterans. They also utilised gambling support, alcohol misuse services, and substance misuse services more than non-veterans.

Veterans had more contacts with the criminal justice system than non-veterans; and had higher numbers of contact with the police, higher court appearances, and more probation service contacts than non-veterans.

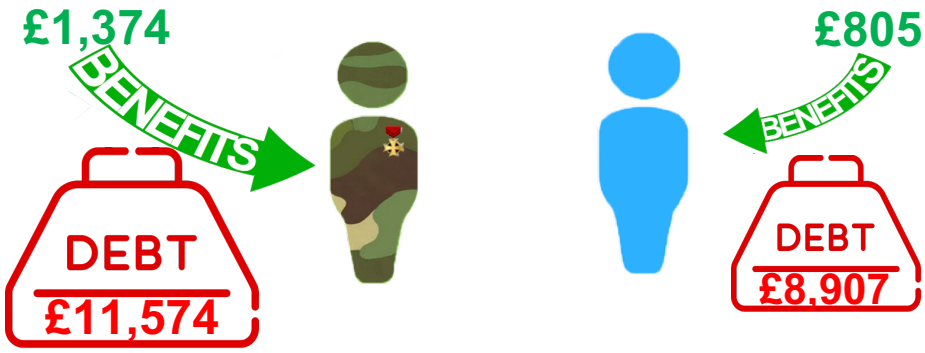
Veterans had a higher number of lost work hours (33 hours) due to illness or otherwise, compared to non-veterans (18 hours)

Benefits and Debt

When asked if they were in receipt of benefits, most respondents reported that they were not. Overall, less than half of the veteran sample were in receipt of benefits (45.8%). The proportion of non-veterans who were in receipt of benefits was almost half that of veterans (23.5%).

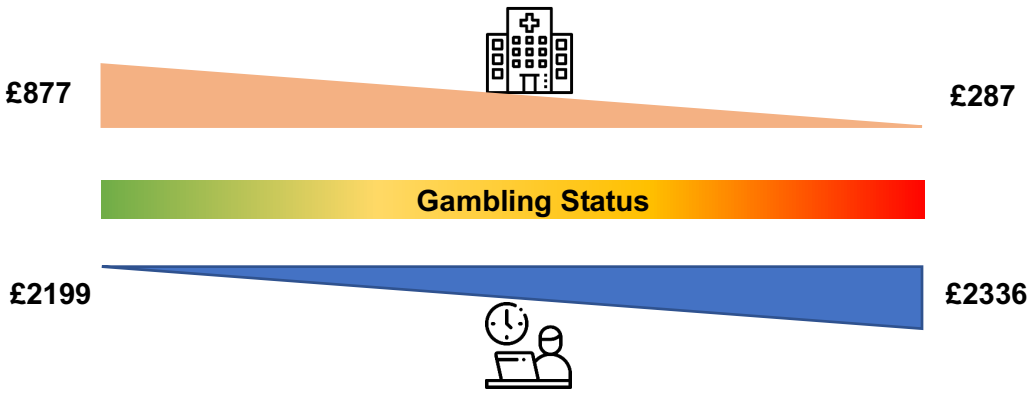


Respondents who said they were in receipt of benefits then indicated which benefits they were receiving from a list of 30 benefits available to eligible UK citizens. The highest proportion of benefits received by the veterans were housing benefit (20.4%) and employment and support allowance (20.4%). The highest proportions of benefits received by non-veterans were child benefit (29.3%) and universal credit (27.4%). In comparison, only 9.3% of the veterans received benefits attributed to child benefit and 13.9% to universal credit. Veterans' benefits also amounted to more financially, averaging £1,374 compared to non-veterans who received £805 on average.



Veterans had greater debt, owing an average of £11,574 compared to non-veterans who owed an average of £8,907.

Estimated Healthcare and Societal Costs

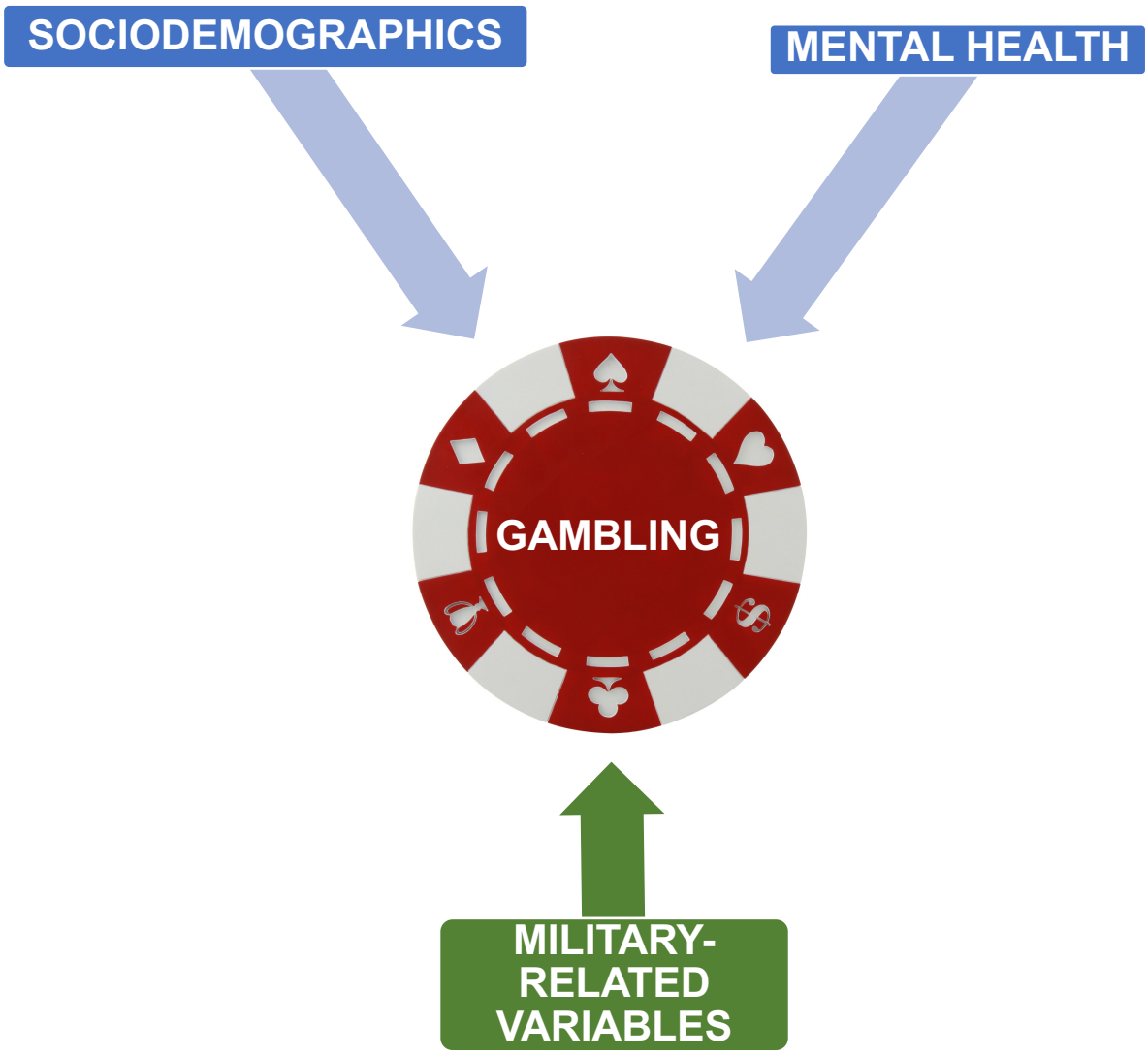


Adjusted mean costs of healthcare use decreased as a veteran's gambling severity score increased (from left (green) to right (red) on the image above). The opposite was true from a societal perspective, where veterans with higher PGSI scores (red on the image above) had greater societal costs associated with sum of benefits received, lost work costs, and so on.

Predictors of Gambling Severity

The development and exacerbation of gambling behaviour is known to be complex, involving intricate and complicated relationships between the environment, genetics, and behaviour [53].

To best understand the interplay between military service and gambling, we used stepwise linear regression to model each of sociodemographic, mental health, and military-related variables, to predict gambling behaviour severity (PGSI score; see Appendix) in each case. The significant predictors were then taken from these separate models and used in a combined, 'omnibus' model. This procedure was used to ensure that only significant predictors were present. Omnibus models were created for each of (a), the full 'combined' sample, (b) the veteran sample, and (c) non-veteran groups.



For **the combined sample** of veterans and non-veterans, significant predictors (below) were taken from sociodemographic and mental health variables to best predict changes (increases or decreases) in gambling severity scores:

Sociodemographic Variables
Veteran Status (Veteran)
Gender (Male)
Age
Ethnicity (White-British)
Country of Residence (Wales)
Relationship Status (Married)
Relationship Status (Divorced)
Benefits (Yes)

Mental Health Variables
Total Number of Gambling Activities
GFA-R (Negative Reinforcement)
PHQ-9 (No Depression)
PHQ-9 (Moderate Depression)
AUDIT (Higher Risk Drinking)
AUDIT (Possible Alcohol Dependence)
FTND (Medium Nicotine Dependence)
FTND (High Nicotine Dependence)
ITQ (No PTSD or C-PTSD Diagnosis)

The strongest predictor of increased gambling severity (PGSI score) was being motivated to gamble to alleviate stress or avoid distress (i.e., one of the mental health variables above - gambling due to 'negative reinforcement').

The next most significant predictors of an increase in gambling severity were the number of gambling activities participated in, and high nicotine dependence (again, from the mental health variables above).

Having no self-diagnosis of PTSD or C-PTSD was a strong negative predictor of gambling severity (i.e., those with no self-diagnosis had lower PGSI gambling severity scores). Critically, being a veteran was found to be a significant predictor of an increased gambling severity score (i.e., from the sociodemographic variables listed above).

Including the military-related variables, the following predictors were used to best predict any changes in gambling severity within **the veteran sample**:

Sociodemographic Variables
Age
Ethnicity
Benefits
Relationship Status (Married)
Highest Qualification (GCSE D-G)
Accommodation (Private Rent)
Accommodation (Supported Living)
Live with Non-Family

Military-Related Variables
Length of Service (4+ years)
Years Since Discharge
Branch (Royal Navy)
Discharge (At Own Request)
Discharge (Medical)
Discharge (Other)
Not Deployed
Deployed to Afghanistan

Mental Health Variables
Total Number of Gambling Activities
GFA-R (Negative Reinforcement)
PHQ-9 (No Depression)
PHQ-9 (Severe Depression)
FTND (Medium Nicotine Dependence)
FTND (High Nicotine Dependence)
ITQ (No PTSD or C-PTSD Diagnosis)



Gambling motivated by negative reinforcement (i.e., stress alleviation/ distress avoidance) was again the strongest predictor of gambling, representing an increased PGSI severity score of 4.59 (i.e., a score of 4 would predict moderate-risk problem gambling; see Appendix) from this category of gambling motivation.

The next strongest predictors of an increase in gambling severity (PGSI) scores also mirrored the findings above - high nicotine dependence and total number of gambling activities.

Those veterans with no symptoms of depression, or no self-diagnosis of PTSD or C-PTSD, were predicted as having lower gambling severity (PGSI) scores.

Again, being discharged in any of the 'Other' category (e.g., on compassionate grounds; see p.16), or due to medical reasons or PVR were all found to be negative predictors of gambling severity. The same was found for length of service (4 or more years) and years since discharge (i.e., as these increased, gambling severity was predicted to decrease).

Analyses of **the non-veteran sample** used the following significant predictors from the sociodemographic characteristics and mental health variables to determine the best predictors of gambling severity.

Sociodemographics
Age
Ethnicity
Highest Qualification (GCSE D-G)
Highest Qualification (GCSE A*-C)
Highest Qualification (AS/A Level)
Relationship Status (In A Relationship)



Mental Health Variables
Total Number of Gambling Activities
GFA-R (Negative Reinforcement)
PHQ-9 (No Depression)
PHQ-9 (Mild Depression)
GAD-7 (Severe Anxiety)
AUDIT (Higher Risk Drinking)
AUDIT (Possible Alcohol Dependence)
FTND (Non-Smoker)
FTND (Low Nicotine Dependence)
ITQ (Likely PTSD)

Again, the strongest predictor of gambling severity was being motivated to gamble to escape/avoid distress (i.e., negative reinforcement).

Other predictors of an increased PGSI severity score among non-veterans included: total number of gambling activities participated in, having a likely self-diagnosis of PTSD, experiencing severe anxiety, and experiencing either higher risk drinking, or possible alcohol dependence.

Experiencing no symptoms of depression, or having only mild depression, and not smoking, or experiencing only low nicotine dependence, were all predictors of a decrease in gambling severity in non-veterans.



Summary of Findings

OBJECTIVE	FINDINGS
To understand gambling experience and problem severity among a sample of UK veterans relative to the general population 	43.1% of the veteran sample experienced problem gambling. The sample of veterans was over 10 times more likely to experience problem gambling than the non-veterans sample. The veteran sample was over 7 times more likely to gamble as a potential coping mechanism (i.e., to escape or avoid distress) compared to the non-veterans sample.
To observe physical and mental health behaviours associated with gambling-related harm 	26.6% of the veteran sample had self-diagnosed C-PTSD. 8.5% reported severe depression and 9.3% reported severe anxiety. 14.6% reported possible alcohol dependence and 3.5% reported very high nicotine dependence.
To establish the costs associated with gambling-related harm 	Our veterans had higher healthcare resource utilisation and costs, more hospital and GP visits, greater contact with criminal justice, and lost more work hours than non-veterans. Our sample of veterans were in receipt of more types of benefits and had larger debt than non-veterans. For those veterans in our sample who gambled, societal costs increased by gambling status.

DISCUSSION

The **United Kingdom Armed Forces Veterans' Health and Gambling Study** represents the first survey of gambling, mental health, and associated costs among a sample of UK veterans. The study aimed to explore the rates of gambling-related harm in UK veterans, how these rates interact with mental health in veterans and the related health economic costs. The key objectives of this study were:

1. to understand gambling participation and severity among a sample of UK veterans relative to the general population.

2. to observe physical and mental health behaviours associated with gambling related harm.

3. to estimate the costs associated with gambling-related harm.

In line with findings from both our previous research in the UK [12; 10] and international studies [5; 7], we found that UK Armed Forces veterans were at increased risk of experiencing problem gambling.

Veterans were found to have gambled on more types of gambling activities than their non-veteran counterparts. Additionally, veterans were more likely to be motivated to gamble by negative reinforcement factors (escape from or avoidance of distress).

Corroborating with previous findings, veterans in this sample experienced symptoms of depression, anxiety, risky alcohol use, and nicotine dependence at higher levels and frequencies compared to non-veterans [54]. Further to this, veterans were identified as also having increased likelihood of both PTSD and C-PTSD diagnoses compared to non-veterans; this is also comparable to previous research by Murphy et al.[55]

Veteran status was found to be a significant predictor of increased PGSI gambling behaviour severity score. This is alongside being motivated to gamble due to negative reinforcement factors. By contrast, experiencing no symptoms of depression and having no likely diagnoses of PTSD predicted decreased gambling severity. In terms of military service characteristics, both a shorter length of service and greater years since leaving the Armed Forces also predicted a decrease in gambling severity. It is possible that longer service in the Armed Forces may be a protective factor against problem gambling risk.

Veterans in general were found to have higher utilisation of healthcare services such as inpatient stays, visits to GPs, and contact with social workers than their non-veteran counterparts. In terms of social service utilisation, our sample of veterans had greater contact with the Police, lost more work hours, were in receipt of more benefits and had larger debts than non-veterans. The sample of veterans incurred substantially higher healthcare provider and personal social service costs, as well as societal costs (e.g., lost workdays, etc.) than non-veterans. We found that as problem gambling severity scores increased, veterans' adjusted costs decreased. However, the opposite was found with healthcare and social service utilisation increasing in tandem with increased gambling severity scores.

Gambling in Veterans

The most striking finding was that 43.1% of the veteran sample experienced problem gambling. This represents a 10 times higher likelihood of experiencing problem gambling compared to the non-veteran sample. The estimated rate of problem gambling and odds ratio detected among our sample are significantly higher than previous research of gambling severity in other samples of veterans conducted using the PGSI. One such study [56] of comparative size (*n*=1,324) found that 2% experienced problem gambling (PGSI>5), with a further 5.7% reporting at least some gambling related problems when assessed post-deployment (PGSI 1-4). Notably, in the comparative study, greater difficulties were most pronounced in early service leavers serving in the Army as non-commissioned officers (NCOs)/Other Ranks. Our findings partially mirror these, with shorter length of service identified as a key predictor of harm among most of our veterans who had served in the UK Army in NCO roles.

When we compare our findings to previous international research, Biddle et al. [15] found rates of 28% in a sample of PTSD treatment-seeking veterans, while Grant and colleagues [57] identified rates of 25.9% problem gambling among help-seeking samples of veterans receiving treatment for alcohol dependence and co-occurring psychiatric disorders, respectively. However, our sample of veterans may have been affected by selection bias due to their recruitment online, which is likely to have inflated the reported rates of problem gambling.

Mental Health and Gambling Harm

We found that the veteran sample was at much greater risk of poor mental health outcomes compared to the non-veteran counterpart [54]. Large scale studies of the rates of common mental health disorders and alcohol misuse in veterans (*n*=8093) [58] report around 21.5% of veterans experience depression and/or anxiety (4 or more on the GHQ-12), and 10.3% of veterans experience hazardous drinking (16 or more on the AUDIT). The veterans in our sample exceeded all three of these proportional prevalence rates, with over 69.6% experiencing some form of depression, 61.3% experiencing some form of anxiety, and 29.4% experiencing alcohol misuse [58].

The heightened rates of mental health outcomes that we saw in our veteran sample resemble the mental health profile of help-seeking populations of veterans [59]. Indeed, among help-seeking veterans, higher levels of depression, anxiety and alcohol misuse have all been identified to have overlapping associations, with younger, single veterans having significantly higher co-morbidity levels [60].

Our sample of veterans was found to consist of 8.6% who met the criteria for likely PTSD, and 26.6% reporting probable C-PTSD. These estimates are lower than those reported in studies investigating similar samples of help-seeking UK veterans; albeit in smaller samples (*n*=96, 54.3%) [61]. Increasing evidence suggests that C-PTSD is a more common mental health outcome than PTSD in UK veterans [61] and, although research focussing on the co-occurrence of C-PTSD with other mental health difficulties is limited, it is well understood that C-PTSD is linked to poorer treatment outcomes for veterans [62; 63]. Guilt, shame, and other complex emotional responses that are closely related to C-PTSD [61] also have some intersections with gambling, with guilt and shame motivating gambling through negative reinforcement,

such as a need to avoid or escape these emotions [64]. Our findings represent the first time that problem gambling and C-PTSD have been found to co-occur in UK veterans.

Negative reinforcement as the primary motivation to gamble was the strongest predictor of increased PGSI score in both the full sample and the veteran sample. Focussing on veterans, those who identified themselves as gamblers were found to be over 7 times more likely to be motivated to do so due to negative reinforcement; that is, avoidance or escape from distress. Whilst this finding is corroborated by Biddle and colleagues' work [15], this also mirrors the increased levels of alcohol use in veterans as another potential coping strategy [60]. In interviews conducted on the topic of coping with trauma in the military, Williamson et al. [65] found that some veterans indicated that 'avoidance' was the most accessible and utilised coping strategy; this is of relevance here as avoidance is core to the symptomatology of PTSD. When these findings are brought together in the veteran sample, increased scores on mental health outcomes and high rates of probable C-PTSD suggest that gambling may be used as a coping mechanism by veterans to deal with negative emotions like distress.

Costs of Gambling

Our sample of veterans who gambled were shown to have a higher number of hospital attendances (e.g., inpatient admissions, outpatient admissions, and emergency attendances), primary care contacts (e.g., GP visits), and mental health contacts (e.g., psychologist or counselling sessions) than non-veterans. It is widely accepted that veterans are reluctant to seek health and social care support due to perceived barriers or mistrust of the civilian system [66]. Indeed, rates in our study may have been higher if these barriers did not exist. With rates of healthcare utilisation higher than non-veterans, it would suggest our veteran sample was indeed largely help-seeking with a range of pre-existing conditions [67; 61]. Our findings on the costs of gambling among our sample of veterans should be borne in mind given this limitation.

Overall, our findings provide the first examination of social and economic costs of gambling within UK Armed Forces veterans. The cost differences identified further highlight the impact that military service has on the physical and mental health needs of some veterans [67].

Strengths and Limitations

The UK AF Veterans' Health and Gambling Study is the first such gambling and mental health focussed survey of a sample of UK veterans and non-veterans. It recruited a large sample size and carefully controlled for age and gender with a matched non-veteran sample. Our study employed a range of contemporary, validated measures of gambling and mental health and included estimates of healthcare utilisation costs. As such, it represents a significant milestone in research on addiction and wellbeing in former members of the UK's Armed Forces.

There are however several limitations worth noting. First, the survey was conducted almost entirely online which may have excluded both older veterans and the homeless without access to the Internet. Second, because of the online recruitment methods and data-collection, potential study sampling and self-selection bias effects cannot be ruled out. That is, veterans who gambled may have been more likely to complete the survey. This limits the representativeness of the

findings, and as such, our findings should be interpreted with caution. Third, some data collection occurred during COVID-19 lockdown restrictions which may have caused additional stress and influenced the rates of reporting of addictive behaviours and mental health coping. Finally, the survey relied on self-report measures and no clinical interviews were undertaken.



Implications

In line with international evidence (Introduction), the findings of our study highlight the necessity of screening for potential gambling problems in the UK Armed Forces [5; 7; 11]. Currently, gambling is not assessed at all prior to transition or during active service. Doing so would help to ensure that those at risk of gambling-related harm receive tailored intervention and support. Screening would also provide regular estimates of the nature and extent of gambling-related problems and help identify trends in incidence rates.

Whilst service personnel who transition out of the Armed Forces are referred to Defence Transition Services if they have "Debt, gambling or other finance-related concerns", this will only occur if the service person comes forward with a problem with gambling [69]. Given the highly stigmatising and secretive nature of gambling problems, it is unlikely personnel will seek help for their gambling prior to leaving the Armed Forces. More needs to be done to overcome the stigma and secrecy of gambling related problems in service personnel.

Screening for gambling would establish parity of care for gambling-related harm with, for instance, substance use disorders among those who have been continually identified as having heightened vulnerability for problem gambling on leaving the Armed Forces.

CONCLUSIONS

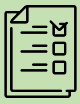
The United Kingdom Armed Forces Veterans' Health and Gambling Study provides the first gambling-focussed source of data in UK Armed Forces veterans. Collected alongside the veteran sample were an age- and gender-matched comparison group of non-veterans which allowed for controlled analyses.

We found that problem gambling was significantly higher in our sample of UK veterans and that it was likely used as a coping mechanism for mental health conditions and driven by a need to avoid or escape emotional distress. The findings indicated that problem gambling co-occurred with poor mental health outcomes such as depression, anxiety, alcohol use, and nicotine dependence. The results suggest that problem gambling may co-occur with C-PTSD in help-seeking veterans.

Problem gambling and the harms it can lead to should feature as a component in pre-enlistment and active service screening procedures to allow for early intervention. Routine screening would help to provide improved treatment and support during service, throughout transition, and into civilian life.



RECOMMENDATIONS

SIGNPOSTING 	• Widen access to gambling education programmes for active service personnel in order to safeguard veterans when they transition out of service (e.g., with Defence Medical Welfare Service). • Continue to raise awareness of the National Gambling Treatment Service (Tel: 0808 8020 133; https://www.begambleaware.org/ngts). • Work to reduce the stigma associated with seeking help for gambling problems among veterans. • Ensure literature and advice is freely available for those veterans who may have problems with gambling, which can be accessed anonymously and confidentially.
SCREENING 	• Undertake routine screening for gambling problems alongside regular mental health check-ups in partnership with Welfare Services. • Gambling-risk screening on leaving the services should be supported by referral to resources such as the Transition, Intervention and Liaison Service (TILS) and the Veterans' Mental Health Complex Treatment Service (CTS). • Develop closer links with external debt support services (e.g., Step Change), mental health (e.g., MIND), and alcohol treatment services (e.g., Alcohol Concern) for veteran-specific support.
RESEARCH 	• Replication of the present study with a large, non-help-seeking sample of UK veterans. • Carry out in-depth, qualitative interviews to understand the lived experiences of veterans who gamble and when such difficulties emerged.

APPENDIX

Problem Gambling Severity Index (PGSI)

Participants responded to the following nine questions concerning their gambling experiences, using a 4-point Likert scale: 1) '*never*', 2) '*sometimes*', 3) '*most of the time*' or 4) '*always*'. The scores for each question were summed to give each participants a total PGSI score.

Total PGSI score placed each participant into one of four categories:

Non-problem gambling (total PGSI score of 0)
Low risk gambling (total PGSI score of 1-2)
Moderate risk gambling (total PGSI score of 3-7)
Problem gambling (total PGSI score of 8 or above)

Thinking about the last 12 months…	
1.	Have you bet more than you could really afford to lose?
2.	Have you needed to gamble with larger amounts of money to get the same feeling of excitement?
3.	When you gambled, did you go back another day to try to win back the money you lost?
4.	Have you borrowed money or sold anything to get money to gamble?
5.	Have you felt that you might have a problem with gambling?
6.	Has gambling caused you any health problems, including stress or anxiety?
7.	Have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?
8.	Has your gambling caused any financial problems for you or your household?
9.	Have you felt guilty about the way you gamble or what happens when you gamble?

REFERENCES

1. Gambling Commission. (2021). *Gambling behaviour in 2021: Findings from the quarterly telephone survey.*

2. American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders*. 6th ed. Washington, DC: American Psychiatric Association.

3. Langham, E., et al. (2015). Understanding gambling related harm: A proposed definition, conceptual framework, and taxonomy of harms. *BMC Public Health*, *16*(1), 1-23.

4. Wardle, H., et al. (2019). Gambling and public health: We need policy action to prevent harm. *BMJ*, *365*.

5. Etuk, R., et al. (2020). Gambling problems in US military veterans. *Current Addiction Reports*, *7*, 210-228.

6. Sharman, S., et al. (2019). Psychosocial risk factors in disordered gambling: A descriptive systematic overview of vulnerable populations. *Addictive Behaviors*, *99*, 106071.

7. Levy, L., & Tracy, J. K. (2018). Gambling disorder in veterans: A review of the literature and implications for future research. *Journal of Gambling Studies*, *34*(4), 1205-1239.

8. Paterson, M., et al. (2020). Exploring the prevalence of gambling harm among active-duty military personnel: A systematic scoping review. *Journal of Gambling Studies*, 1-21.

9. van der Maas, M., & Nower, L. (2021). Gambling and military service: Characteristics, comorbidity, and problem severity in an epidemiological sample. *Addictive Behaviors*, 114, 106725.

10. Roberts, E., et al. (2020). Gambling problems and military-and health-related behaviour in UK Armed Forces veterans. *Military Behavioral Health*, *8*(2), 212-221.

11. Milton, A. C., et al. (2019). Gambling and the role of resilience in an international online sample of current and ex-serving military personnel as compared to the general population. *Journal of Gambling Studies*, *36*, 477-498.

12. Dighton, G., et al. (2018). Gambling problems and the impact of family in UK armed forces veterans. *Journal of Behavioral Addictions*, *7*(2), 355-365.

13. Whiting, S. W., et al. (2016). Investigating veterans' pre-, peri-, and post-deployment experiences as potential risk factors for problem gambling. *Journal of Behavioral Addictions, 5*(2), 213-220.

14. Westermeyer, J., et al. (2013). Pathological and problem gambling among veterans in clinical care: Prevalence, demography, and clinical correlates. *The American Journal on Addictions*, *22*(3), 218-225.

15. Biddle, D., et al. (2005). Problem gambling in Australian PTSD treatment-seeking veterans. *Journal of Traumatic Stress*, *18*(6), 759-767.

16. Warren, J., et al. (2015). Help for heroes? Evaluating a case management programme for ex-service personnel in the United Kingdom. *Perspectives in Public Health*, *135*(1), 37-42.

17. Ahern, J., et al. (2015). The challenges of Afghanistan and Iraq veterans' transition from military to civilian life and approaches to reconnection. *PloS ONE*, *10*(7).

18. MacManus, D., et al. (2021). Risk and protective factors for offending among UK Armed Forces personnel after they leave service: a data linkage study. *Psychological Medicine*, *51*(2), 236-243.

19. Freeman, J. R., et al. (2020). Correlates of at-risk and problem gambling among veterans in Massachusetts. *Journal of Gambling Studies*, *36*(1), 69-83.

20. Shirk, S. D., et al. (2018). Gambling-related cognitive distortions predict level of function among US veterans seeking treatment for gambling disorders. *The American Journal on Addictions*, *27*(2), 108-115.

21. Kausch, O. (2003a). Suicide attempts among veterans seeking treatment for pathological gambling. *The Journal of Clinical Psychiatry*, *64*(9), 1031–1038.

22. Davis, A. K., et al. (2017). Binge-drinking and non-partner aggression are associated with gambling among veterans with recent substance use in VA outpatient treatment. *Addictive Behaviors*, *74*, 27-32.

23. Kausch, O. (2003b). Patterns of substance abuse among treatment-seeking pathological gamblers. *Journal of Substance Abuse Treatment*, *25*(4), 263-270.

24. Westermeyer, J., et al. (2008). Mental health of non-gamblers versus “normal” gamblers among American Indian veterans: A community survey. *Journal of Gambling Studies*, *24*(2), 193-205.

25. Stefanovics, E. A., et al. (2017). Gambling in a national US veteran population: Prevalence, socio-demographics, and psychiatric comorbidities. *Journal of Gambling Studies*, *33*, 1099-1120.

26. Hoge, C. W., & Castro, C. A. (2006). Post-traumatic stress disorder in UK and US forces deployed to Iraq. *Lancet*, *368*(9538), 837.

27. Hotopf, M., et al. (2006). The health of UK military personnel who deployed to the 2003 Iraq war: A cohort study. *The Lancet*, *367*(9524), 1731-1741.

28. Grubbs, J. B., et al. (2018). Examining links between posttraumatic stress and gambling motives: The role of positive gambling expectancies. *Psychology of Addictive Behaviors*, *32*(7), 821.

29. Chantal, Y., et al. (1994). Assessing motivation to gamble: On the development and validation of the Gambling Motivation Scale. *Loisir and Société*, *17*, 189–212.

30. Dixon, M. R., & Johnson, T. E. (2007). The gambling functional assessment (GFA): An assessment device for identification of the maintaining variables of pathological gambling. *Analysis of Gambling Behavior*, *1*(1), 10.

31. Weatherly, J. N., et al. (2011). Testing the construct validity of the Gambling Functional Assessment–Revised. *Behavior Modification*, *35*(6), 553-569.

32. Miller, J. C., et al. (2009). Testing the construct validity of Dixon and Johnson's (2007) Gambling Functional Assessment. *Behavior Modification*, *33*(2), 156-174.

33. Grubbs, J. B., et al. (2019). Post-traumatic stress and gambling related cognitions: Analyses in inpatient and online samples. *Addictive Behaviors*, *89*, 128-135.

34. Buchanan, T. W., et al. (2020). Stress and gambling. *Current Opinion in Behavioral Sciences*, *31*, 8-12.

35. Subramaniam, M., et al. (2017). Gambling and family: A two-way relationship. *Journal of Behavioral Addictions*, *6*(4), 689-698.

36. Thorley, C., et al. (2016). *Cards on the table: the cost to government associated with people who are problem gamblers in Britain*. London, United Kingdom: Institute for Public Policy Research.

37. McManus, S., et al. (2009). *Adult psychiatric morbidity in England: Results of a household survey*. Health and Social Care Information Centre.

38. Ministry of Defence. (2016). *Annual population survey: UK Armed Forces Veterans residing in Great Britain, 2016*.

39. Wardle, H., et al. (2007). *The British gambling prevalence survey 2007*. London, United Kindom: The Stationery Office.

40. Ferris, J. A., & Wynne, H. J. (2001). *The Canadian problem gambling index* (pp. 1-59). Ottawa, ON: Canadian Centre on Substance Abuse.

41. Kroenke, K., et al. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, *16*(9), 606-613.

42. Spitzer, R. L., et al. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine*, *166*(10), 1092-1097.

43. Cloitre, M., et al. (2018). The International Trauma Questionnaire: Development of a self-report measure of ICD-11 PTSD and complex PTSD. *Acta Psychiatrica Scandinavica*, *138*(6), 536-546.

44. Babor, T. F., et al. (2001). *The alcohol use disorders identification test (AUDIT). Guidelines for use in primary care* (2nd ed. (WHO Publication No. 01.6a)). Geneva, Switzerland: World Health Organization.

45. Heatherton, T. F., et al. (1991). The Fagerström test for nicotine dependence: A revision of the Fagerstrom Tolerance Questionnaire. *British Journal of Addiction*, *86*(9), 1119-1127.

46. Herdman, M., et al. (2011). Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). *Quality of Life Research*, *20*(10), 1727-1736.

47. Beecham, J., & Knapp, M. (2001). Costing psychiatric interventions. *Measuring Mental Health Needs*, *2*, 200-224.

48. StataCorp. (2019). *Stata Statistical Software: Release 16*. College Station, TX: StataCorp LLC.

49. Curtis, L. A., & Burns, A. (2020). *Unit costs of health and social care 2020*. Personal Social Services Research Unit.

50. NHS. (2019). *National schedule of NHS costs 2018 to 2019.*

51. Drummond, M. F., et al. (2015). *Methods for the economic evaluation of health care programmes*. Oxford university press.

52. National Institute for Clinical Excellence. (2013). How NICE measure value for money in relation to public health interventions. *Local government briefing*. London, United Kingdom.

53. Potenza, M. N., et al. (2019). Gambling disorder. *Nature Reviews Disease Primers*, *5*(1), 1-21.

54. Goodwin, L., et al. (2015). Are common mental disorders more prevalent in the UK serving military compared to the general working population? *Psychological Medicine*, *45*(9), 1881-1891.

55. Murphy, D., et al. (2021). ICD-11 posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD) in treatment seeking veterans: Risk factors and comorbidity. *Social Psychiatry and Psychiatric Epidemiology*, 1-10.

56. Cowlishaw, S., et al. (2020). Gambling problems among military personnel after deployment. *Journal of Psychiatric Research*, *131*, 47-53.

57. Grant, J. E., et al. (2017). Naltrexone and disulfiram treatment response in veterans with alcohol dependence and co-occurring problem-gambling features. *The Journal of Clinical Psychiatry*, *78*(9), 1299-1306.

58. Stevelink, S. A., et al. (2018). Mental health outcomes at the end of the British involvement in the Iraq and Afghanistan conflicts: A cohort study. *British Journal of Psychiatry*, *213*(6), 690-697.

59. Murphy, D., et al. (2019). Describing the profile of a population of UK veterans seeking support for mental health difficulties. *Journal of Mental Health*, *28*(6), 654-661.

60. Murphy, D., & Turgoose, D. (2019). Childhood adversity and mental health in veterans seeking treatment for mental health difficulties: Comparisons with the general military population. *Psychological Trauma: Theory, Research, Practice, and Policy*.

61. Murphy, D., et al. (2020). A validation study of the International Trauma Questionnaire to assess post-traumatic stress disorder in treatment-seeking veterans. *The British Journal of Psychiatry*, *216*(3), 132-137.

62. Kitchiner, N. J., et al. (2019). Active duty and ex-serving military personnel with post-traumatic stress disorder treated with psychological therapies: Systematic review and meta-analysis. *European Journal of Psychotraumatology*, *10*(1), 1-17.

63. Phelps, A. J., et al. (2018). Key patterns and predictors of response to treatment for military veterans with post-traumatic stress disorder: A growth mixture modelling approach. *Psychological Medicine*, *48*(1), 95-103.

64. Schlagintweit, H. E., et al. (2017). An investigation of the association between shame and problem gambling: The mediating role of maladaptive coping motives. *Journal of Gambling Studies*, *33*(4), 1067-1079.

65. Williamson, V., et al. (2019). The impact of military service on the mental health of older UK veterans: A qualitative study. *International Journal of Geriatric Psychiatry*, *34*(10), 1412-1420.

66. Iversen, A. C., et al. (2011). The stigma of mental health problems and other barriers to care in the UK Armed Forces. *BMC Health Services Research*, *11*(1), 1-10.

67. Murphy, D., & Busuttil, W. (2019). Understanding the needs of veterans seeking support for mental health difficulties. *BMJ Military Health*, *166*(4), 211-213.

68. Fulton, E., et al. (2019). Transition from service to civvy street: the needs of armed forces veterans and their families in the UK. *Perspectives in Public Health*, *139*(1), 49-58.

69. Ministry of Defence. (2021). *JSP 100 defence holistic transition policy, part 1 & part 2 combined: directive and guidance.*