

RESEARCH REPORT

# Gambling problems, risk factors, and implications in Australian veterans

April 2021





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The authors declare no conflict of interest in relation to this report or project.

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# Gambling problems, risk factors, and implications in Australian veterans

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## Terminology

Term	Definition
ADF	Australian Defence Force
Veteran	Ex-serving members of a defence force
Contemporary veteran	Ex-serving members who served after 1999
Deployment	Military personnel can be deployed to war or war-like operations, peacekeeping operations, and/or other operations related to national security, such as border force and emergency responses.
Gambling harms	Gambling-related negative consequences such as financial problems, relationship conflict or breakdown, psychological distress, occupational difficulties, criminality, violence, and suicidality.
Problem Gambling Severity Index (PGSI)	A nine-item self-report measure of gambling problem severity that is commonly used in community based epidemiological studies.
Problem gambling (PG)	A clinically significant gambling-related condition, which was defined by scores of $\geq 5$ on the PGSI in this study.
At-risk gambling (ARG)	A sub-clinical gambling-related condition, which defined by scores of 1-4 on the PGSI in this study.
Gambling problems	The continuum of gambling problem severity, including both ARG and PG, which is thus defined by scores of $\geq 1$ on the PGSI in this study.
Military personnel	Currently serving members of a defence force; also called 'active serving'
PTSD	Posttraumatic Stress Disorder
Service	Time spent by an individual serving in the military
The Programme	Transition and Wellbeing Research Programme

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# Executive summary

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## Background

The period of transitioning from the military is a time of change and challenge. Research has highlighted that it is a time of increasing vulnerability to psychiatric disorders with the risk doubling within the first five years. While emerging research indicates that gambling problems are common relative to other psychiatric disorders while an individual remains in the military, very little research has investigated gambling problems once an individual has transitioned to civilian life.

## Objectives

The aims of this project were to explore broadly the relationship between gambling and transitioning from the military in contemporary Australian Defence Force (ADF) veterans. Specific aims were to:

1. Evaluate levels of gambling problems among Australian veterans who have recently transitioned out of full-time military service
2. Explore risk factors for at-risk gambling and problem gambling and determine vulnerable groups, including service-related and psychiatric risk factors;
3. Examine links between trauma exposure and gambling problems among veterans
4. Examine links between gambling problems and suicidality, in the context of other well established risk factors for suicidality including depression, social support, and financial hardship among veterans
5. Examine rates and differences in financial harm, relationship conflict or breakdown, psychological distress, occupational harm, homelessness, and criminality amongst veterans with no gambling problems, at-risk gambling, and problem gambling
6. Examine patterns of help-seeking in veterans with problem gambling.

## Method

Data for this project was collected as part of the *Transition and Wellbeing Research Programme (The Programme)*, the most comprehensive study undertaken in Australia on the impact of transitioning out of the military. This project utilised the responses of 3,511 transitioned ADF members who left the military within the past five years. Surveys included the nine-item Problem Gambling Severity Index (PGSI), which was used to identify gambling problems across a continuum of severity, including clinically significant levels of problem gambling (PGSI  $\geq 5$ ), and sub-clinical conditions which were classified as at-risk gambling (PGSI = 1-4). The term 'gambling problems' is used to describe the full spectrum of gambling problem severity (PGSI 1+). These were additional to measures of probable depression (PHQ-9), posttraumatic stress disorder (PTSD; PCL-5), alcohol use problems (AUDIT), problem anger (DAR-5), psychological distress (K10), aggression (two-item measure) and suicidality (four-item measure), as well as a range of possible gambling harms including financial harm, unemployment, homelessness, criminality, and relationship breakdown. A range of descriptive statistics and logistic regression analyses were produced to indicate the rates, risk factors and implications of gambling problems among contemporary veterans.

## Results

The key findings were:

- 13.4 per cent of transitioned veterans reported any gambling problems (PGSI  $\geq$  1), with rates of 4.6 per cent for problem gambling (PGSI  $\geq$  5), and 8.8 per cent for at-risk gambling (PGSI = 1-4).
- Several population sub-groups were particularly vulnerable to any gambling problems with higher rates observed in: males, younger veterans, and unemployed veterans, as well as veterans reporting Army and Navy service, junior ranks, those who had been medically discharged, and those who were DVA-connected.
- Rates of any gambling problems were comparable to rates for harmful drinking (11.2 per cent), and alcohol dependence (6.4 per cent) in this population, and may be considered alongside a spectrum of risk-taking behaviour in veterans.
- Veterans with at-risk gambling were at an increased risk of probable psychiatric disorders and other mental health problems, including significantly higher levels of self-reported depression, PTSD, psychological distress, harmful drinking, alcohol dependence and problem anger indicating that veterans lower on the spectrum of gambling problems remain vulnerable to significant adverse consequences.
- While military-related and non-military related traumatic events, as well as PTSD symptoms and depression, were associated with gambling problems, it was specific symptom clusters of hyper arousal and dysphoric-related affect factors that directly explained the relationship between trauma and gambling problems.
- Rates of suicidality were very high in veterans with problem gambling (ideation 43.9 per cent; plans or attempts 19.5 per cent).
- Along the spectrum of gambling harms, in veterans with both at-risk gambling and problem gambling, except for differences in the very extreme harms of violence and suicidal attempts, there were no significant differences in indicators of possible gambling harms including suicidal ideation, financial harm, unemployment, homelessness, criminality, and relationships breakdown, indicating the need to deliver intervention for gambling problems across the spectrum. Additionally, when compared to no gambling problems, both groups were more likely to experience these harms.
- Help-seeking rates for veterans with problem gambling were low, with 97.9 per cent of veterans who sought help reporting their main reason for seeking care was non-gambling related issues.

Key implications include:

- Gambling problems are common in veteran populations and may be under-recognised relative to other common mental health conditions. Veterans are in a period of vulnerability during transition out of military service, and harms associated with gambling problems may be significant exacerbated during this period of transition. There is a need for universal prevention strategies for gambling problems in veterans that will cut across those within and outside veteran focused services.
- Given the association between common mental health problems, including alcohol dependence, depression, and PTSD, and gambling problems, targeted screening of veterans with these common mental health conditions for potential gambling-related issues, including within alcohol and other mental health services, may be helpful in identifying those who require gambling-specific treatment.
- Veteran-focused responses to gambling problems should address the continuum of severity, and prevention strategies should focus on preventing any problems, and not just the prevention of problem gambling.
- The extremely high rates of suicidality in veterans with problem gambling highlight an important modifiable risk factor for the prevention of suicide. There is a strong need for further research which can further examine more complex causal models and thus inform the targeting of such suicide prevention strategies.



## Background

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### Military and veteran mental health

Military personnel (i.e., those who are currently serving in the military), and veteran populations (defined here as those who have left the military and returned to civilian life, also known as ex-serving personnel) have a diverse range of mental health profiles. Research on current military personnel suggests a so-called “healthy soldier effect”, whereby rates of certain psychiatric disorders and physical conditions are lower when compared to civilian populations. This is probably due to many factors including recruitment selection, the beneficial effects of intense physical training, and that most individuals only remain in the military while they feel physically and psychologically well enough.<sup>1,2</sup> However, once an individual leaves the military, they are at greater risk of developing psychiatric disorders when compared to current serving military personnel, as well as civilian populations.<sup>3</sup> Research indicates that common psychiatric disorders that occur in veterans after leaving military service include posttraumatic stress disorder (PTSD), alcohol use disorders, and depressive disorders, as well as high levels of psychological distress.<sup>3</sup> Moreover, research shows that the risk of developing a range of psychiatric disorders and other mental health problems increases within the first five years of leaving the military and the returning to civilian life.<sup>3</sup>

### The transition from military to civilian life

Transitioning out of the military back into civilian life occurs for a range of reasons, including voluntary reasons such as wanting to pursue alternate career opportunities; or non-voluntary reasons, such as reaching compulsory retirement age, sustaining a physical and/or mental health injury that results in being deemed unfit for service; and less commonly, for disciplinary-related issues. Regardless of the reason, research shows that this transition comprises a period of vulnerability for military personnel, and is widely considered one of the most significant and stressful stages of an individual’s career trajectory.<sup>4</sup>

Research shows that while the majority of individuals ‘transition well’, there is a sizeable minority who experience significant challenges.<sup>3</sup> During transition, an individual may simultaneously experience changes to almost every facet of their life, including changes to identity, community, social ties, status, finances, routines, occupation, and family roles. In this context, the risk of psychiatric disorders and other mental health problems has been shown to increase substantially following transition.<sup>3</sup> Compounding these risks, an individual may take with them into civilian life the cultures, beliefs, and attitudes around help-seeking and mental health that develop in military service, which may become ingrained, and subsequently compound or exacerbate psychiatric disorders and other mental health problems.<sup>5</sup>

### Gambling problems in veterans

Gambling problems are defined by persistent maladaptive gambling behaviours (e.g., gambling more than intended; chasing losses) that precede gambling-related harms, or negative consequences. Several dimensions of harm are broadly recognised by the field, and include financial problems, relationship conflict or breakdown, psychological distress, occupational difficulties, and criminality.<sup>6-8</sup> Within these, severe gambling harms may include suicidality<sup>9</sup> and violence.<sup>10-12</sup> Importantly, gambling harm dimensions affect both the individual who gambles, as well as their family, social ties, and broader community.<sup>8</sup> For purposes of this report, the term **problem gambling** will be used

to refer to severe and clinically significant gambling-related conditions.<sup>13,14</sup> Furthermore, the term **at-risk gambling** will be used to refer to subclinical problems, consistent with prior research.<sup>9,15</sup> The term 'gambling problems' will be used to describe the full spectrum of gambling problem severity.

Current literature indicates that gambling problems are significant in military populations. A comprehensive study of current Australian military personnel who had recently returned from deployment found rates of 2.0 per cent for past year problem gambling, and rates of a further 5.7 per cent for at-risk gambling in the past year (i.e., 7.7 per cent total for any gambling problems).<sup>16</sup> Rates of problem gambling (2.0 per cent) were comparable to other conditions, including probable depression (1.2 per cent) and alcohol dependence (2.4 per cent), while rates of any gambling problems (7.7 per cent) were high relative to harmful drinking (5.1 per cent). Research in the UK military has identified rates of 1.4 per cent, and 3.6 per cent lifetime problem gambling and at-risk gambling, respectively.<sup>17,18</sup> Thus, current literature indicate that gambling problems can emerge during military service, and are comparable in prevalence to some other common mental health problems such as harmful drinking, prior to leaving the military. Historically, alcohol misuse has been encouraged in the military as a way of bonding and coping with stress,<sup>2,19</sup> although in the past decade there have been significant shifts to change this culture and discourage alcohol as a coping strategy. Research in other militaries has reported alcohol misuse is often higher in the Army and Navy, possibly reflecting the Services that require high levels of teamwork, and have stronger historical cultures around drinking as a positive way to bond and cope with stress.<sup>20</sup>

Very little research has been conducted on gambling problems in veteran populations, once an individual leaves the military. A small Australian study of veterans in treatment for PTSD found that more than a quarter (28 per cent) reported probable problem gambling.<sup>21</sup> Internationally, US research shows rates of 2.2–4.2 per cent for past year problem gambling in veteran populations;<sup>22,23</sup> and lifetime prevalence rates of 10 per cent.<sup>24</sup> Given that psychiatric disorders increase once an individual leaves the military, and the known association between psychiatric disorders and gambling behaviour, there is strong reason to suspect that the risk of gambling problems may also increase upon transition from service. The highly stressful nature of transition may make veterans particularly vulnerable to the development of gambling problems, in that some veterans are experiencing changes to their financial, social, community, and housing situations, and may feel particularly isolated from civilian society. Gambling behaviours are often used as a form of socialisation, both with civilians and other veterans, and may be exacerbated by the sense of disconnection veterans can feel during transition.<sup>17</sup>

## The role of trauma and gambling problems

While emerging evidence indicates both military and veteran populations are at risk of gambling problems, little research has addressed predictors of these issues. Research in US veterans indicates that veterans may be at greater risk of developing gambling problems due to the high co-occurrence of mental health problems, as well as military-related factors such as stressful deployment related experiences.<sup>23</sup> Deployment, in addition to transition, is widely recognised as a stressful period during military career, during which an individual may be at risk of exposure to significant stressors and/or traumatic events.

A traumatic event is defined as one in which “actual or threatened death, serious injury, or sexual violence” occurs. Traumatic events, such as motor vehicle accidents, sexual assault, natural disasters, a serious injury or illness, and in the case of veteran and military populations, exposure to combat or war-torn environments, can result in a range of posttraumatic psychopathology.<sup>25</sup> Trauma exposure is common in veteran and military populations, both through pre-military experiences, as well as deployment or service related experiences.<sup>26</sup> Approximately one-in-ten individuals who experience a traumatic event, will go on to develop PTSD.<sup>21</sup> The four key symptoms include re-experiencing the traumatic event through nightmares and intrusive memories (commonly referred to as ‘flashbacks’), avoidance of stimuli that triggers memories of the traumatic event, negative thoughts and feelings, and alterations in arousal and reactivity, including irritability, risky behaviour and hypervigilance. In addition to

PTSD, depression, psychological distress, alcohol misuse, suicidality, and problems with anger and aggression are common posttraumatic mental health problems.<sup>26-28</sup>

Increasingly, attention has turned to how trauma and gambling problems interact.<sup>29</sup> Research indicates high rates of trauma amongst civilian problem gamblers,<sup>30</sup> and suggests that these exposures may create vulnerabilities to the development and maintenance of gambling problems.<sup>31</sup> Given the high rates of gambling problems and trauma exposure in veteran and military populations, it is important to understand how trauma, and associated posttraumatic psychiatric disorders such as PTSD and depression, relate to gambling problems, in order to more effectively prevent and treat gambling problems in veterans.

## Implications of gambling problems, and help-seeking in veterans

In addition to the need to understand the prevalence and the relationship between gambling problems and trauma in veterans, research is needed to describe the range of gambling harms that may specifically affect veteran populations. For example, research shows that civilian problem gamblers report higher rates of injuries, marital difficulties,<sup>32</sup> homelessness, financial problems and criminality than non-problem gamblers, and these life stressors may have a causative effect on gambling behaviour, as well as maintain problem gambling, in a cyclical fashion.

Understanding how financial, social and physical harms manifest in recently transitioned veterans with gambling problems is important in relation to prevention and treatment efforts, particularly given that transitioned veterans may experience such significant financial and social upheaval during transition. Of particular importance are the severe end of harms, which includes suicidality. Suicidality can be distinguished along a graded continuum of severity that extends from ideation and plans to attempts, and is common in both problem gambling<sup>33,34</sup> and veteran populations. The rate of suicide in ex-serving ADF men is 18 per cent higher than similarly-aged Australian men in the general population.<sup>35</sup> This trend is also seen in Canadian and US veterans, whereas veterans from Sweden, the Netherlands, and the UK have equal or lower rates than the general population. The suicide rate of ex-serving ADF women is 115 per cent higher than age-matched Australian women in the general population. Recent evidence suggests that 21.7 per cent of recently transitioned veterans reported suicidality (including ideations, plans and attempts) in the last 12 months.<sup>3</sup> It is likely that the interpersonal harms from gambling can have negative impacts on support networks and lead to the reduction of social resources and feelings of connectedness that have central roles in major theoretical models of suicide risk.<sup>36</sup> Given the high rates of suicidality and gambling problems in veteran and military populations, an understanding of this relationship is needed in order to better address these issues, including the relationship with established risk factors of suicidality including social support, depression, and financial hardship.

Finally, veterans can face real barriers to help-seeking for mental health problems, due to stigma towards mental health, delays in treatment engagement, and other real-world barriers to care.<sup>26</sup> Understanding the nature of help-seeking in veterans with gambling problems is needed in order to improve our strategies to enhance engagement in treatment.

## The current study

The *Transition and Wellbeing Research Programme* (The Programme) is the most comprehensive study undertaken in Australia of the mental, physical, and social health of Australian veterans who have recently transitioned out of the regular ADF.<sup>3</sup> Previous analyses have shown 46 per cent of veterans who transitioned in the past five years met 12-month diagnostic criteria for a common psychiatric disorders. While problem gambling was measured in The Programme, the relevant data have not yet been analysed.

The aims of the current secondary data analyses project were to:

1. Evaluate levels of gambling problems among Australian veterans who have recently transitioned out of full-time military service
2. Explore risk factors for at-risk gambling and problem gambling and determine vulnerable groups, including service-related and psychiatric risk factors
3. Examine links between trauma exposure and gambling problems among veterans
4. Examine links between gambling problems and suicidality, as well as other predictors of suicidality including depression, social support, and financial hardship among veterans
5. Examine rates and differences in financial harm, relationship conflict or breakdown, psychological distress, occupational harm, homelessness, and criminality amongst veterans with no gambling problems, at-risk gambling, and problem gambling
6. Examine patterns of help-seeking in veterans with problem gambling.

## Approach

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This project is based on the secondary analysis of cross-sectional survey data from The Programme<sup>37</sup>, which aimed to examine the mental health and wellbeing of Australian Defence Force (ADF) members who transitioned from the Regular ADF between 2010 and 2014 (i.e., transitioned) compared to a sample of permanent, full-time serving ADF personnel in 2015 (current). The current reports considers data from the transitioned ADF members only.

The methods for the research programme are described in detail elsewhere.<sup>37</sup> The samples were taken from the Military and Veteran Research Study Roll (Study Roll) generated for The Programme from members' data from Defence, contact data from DVA and contact details from ComSuper, and cross-referenced against the National Death Index. An email was sent to 23,974 transitioned ADF members inviting them to complete a 60-minute online self-report survey. Participants could also opt to have a hardcopy survey posted to them. Responses were received from  $n = 4,326$  (response rate = 18.0 per cent) participants. Responders were similar to the entire Transitioned ADF population in terms of Service, sex, and medical fitness, but lower ranks were underrepresented. Participants that were missing data (after imputation) on the Problem Gambling Severity Index were excluded, giving a final sample of  $n = 3,511$  for this report. Small numbers of participants had missing data for the explanatory variables and these were addressed using pairwise deletion.

## Measures

The measures for this study were selected to capture gambling problems, psychiatric disorders, and possible harms.

**Socio-demographic characteristics** included age (18-27, 28-37, 38-47, 48-57, 58+ years), sex, relationship status (Not in a relationship; In a relationship not living together; In a relationship and living together), education (Primary or Secondary; Certificate or Diploma; University), employment (Full/part time paid work; Unemployed; Retired; Other), income (Wage/salary/own business/partnership, Age pension or Superannuation, Invalidity service pension or VEA/SRCA/MRCA compensation, Other).

**Service-related characteristics** included ADF service (Navy, Army, Air Force), Rank (Commissioned Officer; Non-Commissioned Officer / Other Ranks), length of service (0–4, 5–9, 10–19 and 20+ years), serving status (Ex-serving; Active / Inactive reservist<sup>1</sup>), years since transitioned (0, 1, 2, 3, 4, 5+), Medical discharge (Yes; No), Ever deployed (Yes; No), DVA client (Yes; No), DVA treatment support since transition (white or gold card).

**Gambling problems** were measured using the Problem Gambling Severity Index (PGSI).<sup>38</sup> The PGSI comprises nine items about gambling experiences and consequences which are scored on a four-point scale (0=never, 3=almost always), and have high internal consistency (Cronbach's  $\alpha = 0.90$ ) and strong associations with comparable measures.<sup>39</sup> The current study used a criterion of PGSI  $\geq 5$  for problem gambling which has been shown to yield greatest classification accuracy relative to clinician ratings involving detailed case conceptualisations, while scores of PGSI 1–4 indicated at-risk gambling, consistent with prior research.<sup>15,39,40</sup> Any gambling problems was defined as 1+ on the PGSI.

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1 Please note, active/inactive reservists are considered ex-serving in that they have left active military service

**Depressive symptoms** was assessed using the nine-item Patient Health Questionnaire (PHQ-9). Each item comprising the PHQ-9 evaluates the frequency of one of the nine DSM-IV criteria for major depressive episode over the past two weeks. The PHQ-9 has been validated against clinical diagnoses from medical professionals and has superior operating characteristics to alternative scales.<sup>41</sup> A summed score of  $\geq 10$  on the PHQ-9 was used to identify probable major depressive episode in this study.<sup>41</sup>

**Posttraumatic Stress Disorder (PTSD)** symptoms were assessed using both the Posttraumatic Stress Disorder checklist civilian version (PCL-C) and the Posttraumatic Stress Disorder checklist for DSM-5 (PCL-5). The PCL-5 has the robust structure required to investigate current symptom clusters, whereas the PCL-C has the capacity to detect for sub-syndromal PTSD symptoms, and as such both were used in this study.

The PCL-C comprises a 17-item self-administered questionnaire, which has been widely used for assessing PTSD symptoms over the past month. The PCL-C has excellent test-retest reliability and internal consistency, and has been used extensively in the context of population-based research.<sup>42</sup> A total symptom severity score was obtained by summing scores across items to give a score between 17 and 85, whereby higher scores indicate greater severity of PTSD symptoms. In accordance with ADF-specific cut-offs developed as part of the 2010 ADF Mental Health Prevalence and Wellbeing Study, a score of 29-52 was used to identify sub-syndromal PTSD and a score of 53+ to identify probable PTSD.<sup>1</sup>

The PTSD Checklist for DSM-5 (PCL-5)<sup>43</sup> is a 20-item self-administered measure asking about symptoms in the past month, on a scale from 0 'not at all' to 4 'extremely'. Items were summed to give a total severity score ranging from 0 to 80. Consistent with previous literature, a score of 33+ was used to indicate a probable PTSD case.<sup>44</sup> Additionally, items of each of the 4 PCL-5 subscales were summed to give total severity scores for each; 5 re-experiencing items (cluster B), 2 avoidance items (cluster C), 7 negative cognitions and mood items (cluster D), and 6 arousal items (cluster E). The PCL-5 shows good psychometric properties.<sup>45</sup>

**Psychological distress** was assessed using the 10-item Kessler distress scale (K10). The K10 is a widely used and validated measure of non-specific distress measured over the past four weeks.<sup>46</sup> Responses are scored on a five-point scale (where 5 = all of the time, and 1 = none of the time). Summed scores can be used to signal risk of mental health problems and high levels of psychological distress ( $K10 \geq 20$ ).<sup>47</sup>

**Alcohol use problems** were measured using the 10-item Alcohol Use Disorders Identification Test (AUDIT). This scale examines quantity and frequency of alcohol consumption, potential alcohol dependence symptoms, and problems related to alcohol, with a wide recall reference period varying for items across past week, month, and year. The AUDIT is considered valid and reliable.<sup>48</sup> The first eight questions of the AUDIT are scored using a five-point Likert scale (scored 0-4), while the last two questions use a three-point scale (scored 0, 2 or 4). Given that the AUDIT does not comprise a unidimensional scale, the Cronbach's  $\alpha$  internal consistency reliability was not informative and was not produced. A total score was derived by summing item responses, with summed scores  $\geq 16$  and  $\geq 20$  suggesting harmful drinking and probable alcohol dependence, respectively.<sup>49</sup>

**Suicidal ideation and behaviour** were assessed using four items that asked about suicidal thoughts, plans and attempts in the last 12-months. Three of the items were adapted from the *National Survey of Mental Health and Wellbeing*,<sup>50</sup> and the final item was devised by researchers for use in The Programme.<sup>37</sup> Suicidality was categorised into no suicidality, ideation only (no plan or attempt) and plan or attempt. It was also categorised into those reporting no suicidality versus those endorsing any suicide item.

**Anger** was assessed using the Dimensions of Anger Reactions five-item scale (DAR-5).<sup>51</sup> The DAR-5 examines anger frequency, intensity, duration, aggression, and interference with social functioning. Items are scored on a five-point Likert scale generating a severity score ranging from 5 to 25, with higher scores indicative of worse symptomatology. Scores  $\geq 12$  indicated problem anger. This scale has been used previously to assess Australian Vietnam veterans, as well as US Afghanistan and Iraq veterans, and shows strong psychometric properties.<sup>52,53</sup>



**Aggression** was assessed using two items taken from the 2010 Mental Health Prevalence Wellbeing Study.<sup>1</sup> Participants were asked how often they have been responsible for threatened or physical violence in the last month, and responded on a five-point scale from 'Never' to '5 or more times'.

**Lifetime non-military trauma exposure** was assessed using a list of 24 traumatic events taken from the Composite International Diagnostic Interview (CIDI 3.0) PTSD module.<sup>54</sup> Participants were asked if they had ever experienced any of the events in their lifetime. Examples included 'being in a life-threatening automobile accident', and 'having someone close to you die unexpectedly'. The number of events reported were summed to give an indication of total lifetime non-military trauma. Two of the original 26 CIDI events: 'combat (military or organised non-military group)' and 'peacekeeper or relief worker in a war zone or in a place where there was ongoing terror of people because of political, ethnic, religious or other conflicts' were excluded as they relate to military trauma.

**Traumatic deployment exposures** was assessed using items taken from the Middle East Area of Operations Census Study.<sup>55</sup> Participants reported how many times they had experienced a list of 12 deployment exposures during their military career. Response categories ranged from 'Never' to '10+ times'. Examples of events included 'discharge of weapon in direct combat' and 'handled or saw dead bodies'. The number of events reported were summed to give an indication of career traumatic deployment exposure.

**Financial harm** was assessed using three measures: current financial status, current financial hardship, and recent major financial crisis.

Current financial status was assessed by a single item taken from the HILDA Survey.<sup>56</sup> Participants were asked 'Given your current needs and financial responsibilities, would you say that you and your family are...' on a scale six-point scale: 'Prosperous', 'Very comfortable', 'Reasonably comfortable', 'Just getting along', 'Poor', 'Very poor'. Responses were combined to create a variable indicating 'Just getting along/ Poor/ Very poor' versus 'Prosperous/ Very comfortable/ Reasonably comfortable'.

Current financial hardship was assessed by a single item taken from the *Health and Wellbeing Survey of Serving and Ex-Serving Personnel of the UK Armed Forces: Phase 2*.<sup>57</sup> Participants were asked whether they were currently having any problems paying money they owe (e.g., loans from family/friends, credit cards, bank loans, utility bills, rent or mortgage repayments).

Recent major financial crisis was assessed by a single item from a modified version of the 15-item version of the List of Threatening Experiences that measures recent stressful life events.<sup>58</sup> Participants were asked 'In the last 12 months, have you been personally affected by any of the following: You had a major financial crisis.'

**Unemployment** was assessed using a single item asking participants, 'Since transitioning from regular ADF service, have you had a period of unemployment greater than 3 months?'. This item was taken from the *Australian Gulf War Veterans' Health Study 2011*.<sup>59</sup>

**Homelessness** was assessed using two measures: concern about stable housing; and past year homelessness.

Concern about stable housing in the next two months was assessed using a single item asking participants, 'Are you worried or concerned that in the next two months you may NOT have stable housing that you own, rent, or stay in as part of a household?'. This item was taken from the Homelessness Screening Clinical Reminder (HSCR).<sup>60,61</sup>

Past year homelessness was assessed using questions from the 2010 ABS General Social Survey (GSS).<sup>62</sup> Items looked at: participants' experiences of homelessness, reasons for homelessness, frequency of homelessness, details about their most recent experience of homelessness (reason for homelessness, time frame, recency), assistance sought during period(s) of homelessness/helpfulness of these services, and barriers to seeking support.

**Criminality** was assessed by a single item from a modified version of the 15-item version of the List of Threatening Experiences that measures recent stressful life events.<sup>58</sup> Participants were asked 'In the last 12 months, have you been personally affected by any of the following: You had problems with the police and a court appearance?'

**Relationships** were assessed using four measures of relationship breakdown, relationship problems, tension in relationship, and parental self-efficacy:

Relationship breakdown in last 12 months was assessed by two items from a modified version of the 15-item version of the List of Threatening Experiences.<sup>58</sup> Participants were asked 'In the last 12 months, have you been personally affected by any of the following?' – 'You had a separation due to marital/relationship difficulties?' And – 'You broke off a steady relationship?.'

Relationship problems in the last 12 months was also assessed using the List of Threatening Experiences<sup>58</sup>. Participants were asked 'In the last 12 months, have you been personally affected by any of the following?' – 'You had relationship problems with your spouse/partner?.'

Tension in relationship was assessed using the first item from the Woman Abuse Screening Tool (WAST)<sup>63</sup>. Participants were asked, 'In general, how would you describe your relationship?' on a three-point scale from 'No tension' to 'A lot of tension'.

Parental self-efficacy was assessed by asking participants, 'Overall, as a parent, do you feel that you are...' on a five-point Likert-type scale ranging from 'not very good at being a parent' to 'a very good parent'. Responses were combined to create a variable indicating 'Not very good or some trouble at being a parent' versus 'An average, better than average or very good parent'. This item was taken from the Longitudinal Study of Australian Children<sup>64</sup>.

**Social support** from friends and family was assessed using an adapted version of the Schuster Social Support Scale.<sup>65</sup> Affective support was indicated by responses to questions about how often family/friends made them feel cared for and how often family/friends expressed interest in how they were doing. Negative interactions were indicated by responses to questions about how often family/friends made too many demands on them, how often they criticised them and how often they created tensions or arguments with them. All items were answered on four-point Likert-type scale ranging from 'often' to 'never'. Scores on the five items were summed separately for family and friends, creating two total scores.

**Lifetime concern about mental health** was assessed by asking participants whether they have ever been concerned about their mental health (e.g., stress, anxiety, depression, anger, relationship problems). These items were developed specifically for the study by investigators.

**Reasons for seeking help** was assessed by asking participants to indicate what primary reason and secondary reason(s) led them to seeking care. Examples included 'anger', 'depression' and 'gambling'. These two questions were developed by researchers for specific use in the study.

## Data analysis plan

Data-file management and preliminary exploration were conducted using SPSS version 25, while MPlus (version 8) was used subsequently for substantive analyses. Preliminary analyses involved quantification of the extent of missing data (e.g., due to item non-response), production of descriptive statistics to characterise the sample, and a descriptive analysis of help-seeking. These were followed by substantive analyses which were conducted subsequently and across four main stages.



The first stage comprised a series of descriptive statistics including item-level analyses to quantify the frequencies of specific gambling problems (as operationalised by PGSI items) in order to meet Aim One. Aggregate scale scores for the PGSI were then formed and defined using cut-off criteria that distinguished gambling problems across a continuum of severity. Prevalence point estimates (and 95 per cent Confidence Intervals; CIs) were thus calculated to indicate levels of (a) at-risk gambling (PGSI = 1-4) and (b) problem gambling (PGSI  $\geq$  5). These prevalence estimates were considered relative to the prevalence point estimates and CIs of other probable psychiatric disorders (e.g., depression) and substance use problems (e.g., harmful drinking). Mean imputation of data occurred on mental health measures (PHQ-9, PCL-C, PCL-5, K10, AUDIT, DAR-5) for cases with  $\leq$  25 per cent missing data on that measure. This equated to imputation of up to four items on the PCL-C and PCL-5, two items on the PHQ-9, K10 and AUDIT and one item on the DAR-5. Up to one missing value was imputed for the PGSI. Weighted prevalence estimates are presented, with the methods for creating weights described elsewhere.<sup>37</sup> All survey data for the transitioned ADF was weighted using distinct strata for sex, Service, rank and medical fitness.

The second stage involved a series of covariate analyses which were initially conducted to examine variability in gambling problems according to socio-demographic and service-related characteristics in order to meet Aim Two and Five. These comprised multinomial logistic regression models in which gambling problems were specified as a three-level measure of gambling problems (No gambling problems; at-risk gambling: PGSI = 1-4; problem gambling: PGSI  $\geq$  5) was specified as the outcome (dependent) variable. This measure was regressed on socio-demographic and service-related characteristics that were explanatory variables. The latter were specified using dummy variables, and were evaluated in separate models which estimated bivariate associations, which were deemed appropriate given the primary focus on identifying discernible risk factors for gambling problems. It is important to note that while these models treat gambling problems as explanatory variables (which predict measures of mental health and adjustment), the models were based on cross-sectional data and directionality of effects cannot be assumed. However, this approach does allow us to look at different relationships amongst at-risk gambling compared to problem gambling.

Logistic regression models were conducted for binary outcomes, multinomial logistic regression models for 3-level categorical outcomes, and negative binomial regression for count outcomes. Odds Ratios (ORs) for categorical outcomes and Incident Risk Ratio's (IRR) for count outcomes, along with 95 per cent Confidence Intervals (CIs), were all produced in order to quantify the magnitude of associations in these analyses.

The third stage involved a stepped negative binomial regression model examining predictors of gambling problems (PGSI total score) to investigate Aim Three. Demographic and service characteristics (age, sex, relationship status, education, rank, serving status and ever deployed) were entered as covariates in step one. Number of non-military lifetime traumas and number of traumatic deployment experiences were entered in step two. Depression (PHQ-9) total score was entered in step three. The sum of items on the four PCL-5 subscales were entered in step four. Adjusted IRR's and 95 per cent Confidence Intervals (CIs) were calculated.

The final stage involved three separate logistic regression models examining predictors of any suicidality to investigate Aim Four. Step one of all models included PGSI gambling total score, along with the same demographic and service covariates in the previous model. The second step varied for each model, but looked at the following predictors controlling for variables in the preceding step:

Model 1: Depression (PHQ-9 total score)

Model 2: Social support from family and friends

Model 3: Financial difficulties

Additionally, the effect of the addition of the step two variable(s) on the predictive capability of PGSI score was examined to identify potential mediators in the relationship between gambling and suicide. Adjusted Odds Ratios (aORs) and 95 per cent Confidence Intervals (CIs) were produced.

The multinomial logistic models enabled specification of gambling problem categories as an outcome, and were selected since they supported consideration of risk factors for gambling problems across a continuum of severity, including specific risk factors for at-risk gambling. In contrast, these categorical models were less well suited for consideration of associations when controlling for covariates, since they produce multiple coefficients (comparing different groups) that could be modified by inclusion of potential mediating or confounding factors. As such, in the context of stepped models that included covariates only, we adopted negative binomial models that quantified associations with gambling problems via a single coefficient that also supported more clear and parsimonious interpretations.

## Results

### Preliminary analyses

The analytic sample comprised  $n = 3,511$  respondents, which corresponds to 14.6 per cent of the invited population of transitioned ADF veterans. Table 1 shows socio-demographic and service-related characteristics for the analytic sample. As can be seen, the respondents were predominately male, the majority were aged between 28–47 years, and most were in a relationship. The majority of participants reported service with the Army, were Non-Commissioned Officers or Other Ranks, and had served with the ADF for more than 10 years. There was a minority of respondents that reported 20 years or more of military service.

**Table 1. Participant characteristics (n = 3,511)**

	n	%
Sex (male)	2960	84.3
<b>Age, years</b>		
18-27	340	9.8
28-37	978	28.1
38-47	911	26.2
48-57	755	21.7
58+	497	14.3
<b>Relationship status</b>		
Not in a relationship	671	19.3
In a relationship not living together	229	6.6
In a relationship and living together	2578	74.1
<b>Education</b>		
Primary / Secondary school	787	22.6
Certificate / Diploma	1664	47.7
University	1036	29.7
<b>Service</b>		
Army	1971	56.1
Navy	699	19.9
Air Force	841	24.0
Rank (NCO/Other ranks)	2417	68.8
<b>Time served (years)</b>		
0-4	388	11.2
5-9	786	22.7
10-19	892	25.8
20+	1390	40.2

## Descriptive analyses

Table 2 presents the prevalence of gambling problems across a continuum of severity and rates probable mental disorder among recently transitioned ADF Members. As shown, there were 4.6 per cent of transitioned veterans that reported past-year problem gambling according to the PGSI, with a further 8.8 per cent reporting at-risk gambling. There was a combined total of 13.4 per cent (95 per cent CI = 13.0 per cent to 13.8 per cent) of transitioned members that reported any gambling problems across a continuum of severity. Prevalence of gambling problems using alternative cut-offs of the PGSI are presented in Appendix A with further data available upon request.

Estimates of gambling problem prevalence can be considered next to other psychiatric disorders and mental health problems, with such comparisons viewed cautiously given different reference periods across measures of gambling problems (past-year), depression (past two weeks), PTSD (past-month), psychological distress (past 4 weeks), alcohol problems (past-year), suicidality (past-year), problem anger (past-month) and aggression (past four weeks). As can be seen, gambling problems were observed less frequently than probable depression, problem anger, and probable PTSD, which were all common in this sample. In contrast, the estimated rate of any gambling problems and PG were comparable to figures for harmful drinking and alcohol dependence, respectively.

**Table 2. Estimated prevalence (weighted) of gambling and mental health problems among recently Transitioned ADF members (n = 24,832)**

	Weighted n	%	95% CI	
			LB	UB
Gambling problems (past-year)				
At-risk gambling	2174	8.8	8.4	9.1
Problem gambling	1153	4.6	4.4	4.9
Any gambling problems	3327	13.4	13.0	13.8
Depression (past two weeks)	6246	30.7	30.3	31.6
PTSD (past-month)	4044	19.1	18.5	19.6
Harmful drinking (past 12 months)	2444	11.2	10.8	11.6
Alcohol dependence (past 12 months)	1401	6.4	6.1	6.8
Problem anger (past four weeks)	6205	30.5	30.2	31.5

## Covariate analyses

### Risk factors for gambling problems

Table 3 shows findings from multinomial logistic regression analyses examining sociodemographic characteristics as predictors of gambling problems. As can be seen, the likelihood of reporting at-risk gambling and problem gambling was significantly associated with characteristics including age, sex, relationship status, education, and employment status. The highest rate of ARG was observed among younger adults aged 18–27 years (11.2 per cent), with lower rates observed among the older age groups (although not all such differences were statistically significant). Males were more likely to report both at-risk gambling and problem gambling when compared to females, while respondents who were in a relationship, but not living together were more likely to report at-risk gambling (12.7 per cent) compared to those that were in a relationship and living together. Respondents who were in a relationship and living together compared to those who were in a relationship but not living together reported lower levels of at-risk gambling. Respondents who were in a relationship and living together compared to those not in a relationship also reported lower levels of problem gambling. Respondents who reported a university education also reported the lowest levels of both at-risk gambling and problem gambling. Being unemployed (including those on a disability support pension) was associated with higher levels of both at-risk gambling and problem gambling, when compared to respondents who were in full or part-time paid work. However, there were no discernible links between gambling problems and main source of income.

Table 4 shows findings from multinomial logistic regression analyses examining the service-related risk factors gambling problems. As can be seen, veterans who reported Army service reported higher levels of at-risk gambling and problem gambling when compared to Air Force personnel, and higher levels of problem gambling when compared to Navy personnel while increased rates of both at-risk gambling and problem gambling were also reported by NCOs / Other Ranks (when compared to Commissioned Officers), and among Ex-serving members (when compared to Active or Inactive Reservists). Veterans who were medically discharged also reported higher rates of at-risk gambling and problem gambling, while those who reported a history of operational deployment reported increased rates of at-risk gambling when compared to those who had never deployed. Department of Veterans Affairs (DVA) clients and those receiving DVA treatment support since transition were more likely to report both at-risk gambling and problem gambling compared to non-DVA clients and those not receiving DVA treatment support. In contrast, gambling problems did not differ by years of service and time since transition.

**Table 3. Multinomial logistic regression models indicating sociodemographic predictors of ARG (PGSI = 1-4) and PG (PGSI ≥ 5)**

Demographic characteristics	No gambling problems (n = 3091)		At risk gambling (n = 286)		Problem gambling (n = 134)		Logistic regression models							
	(0)		(1)		(2)		(0) vs (1)				(0) vs (2)			
	n	%	n	%	n	%	OR	LB	UB	p	OR	LB	UB	p
<b>Age group</b>														
18-27	282	82.9	38	11.2	20	5.9	ref				ref			
28-37	858	87.7	83	8.5	37	3.8	0.72	0.48	1.08	0.110	0.61	0.35	1.07	0.082
38-47	807	88.6	70	7.7	34	3.7	0.64	0.42	0.98	0.039*	0.59	0.34	1.05	0.073
48-57	679	89.9	51	6.8	25	3.3	0.56	0.36	0.87	0.010*	0.52	0.28	0.95	0.033*
58+	436	87.7	43	8.7	18	3.6	0.73	0.46	1.16	0.185	0.58	0.30	1.12	0.105
<b>Sex</b>														
Male	2562	86.6	267	9.0	131	4.4	2.90	1.81	4.66	<0.001***	9.02	2.86	28.43	<0.001***
Female	529	96.0	19	3.4	3	0.5	ref				ref			
<b>Relationship status</b>														
Not in a relationship	570	84.9	63	9.4	38	5.7	1.31	0.97	1.77	0.076	1.83	1.23	2.71	0.003**
In a relationship, not living together	189	82.5	29	12.7	11	4.8	1.82	1.20	2.76	0.005**	1.59	0.84	3.04	0.157
In a relationship and living together	2300	89.2	194	7.5	84	3.3	ref				ref			
<b>Education</b>														
Primary or Secondary school	674	85.6	77	9.8	36	4.6	2.58	1.75	3.80	<0.001***	2.47	1.43	4.27	0.001**
Certificate or Diploma	1422	85.5	165	9.9	77	4.6	2.62	1.86	3.70	<0.001***	2.50	1.54	4.08	<0.001***
University	971	93.8	43	4.2	21	2.0	ref				ref			

Demographic characteristics	No gambling problems (n = 3091)		At risk gambling (n = 286)		Problem gambling (n = 134)		Logistic regression models							
	(0)		(1)		(2)		(0) vs (1)				(0) vs (2)			
	n	%	n	%	n	%	OR	LB	UB	p	OR	LB	UB	p
<b>Employment status</b>														
Full/ part time paid work	2087	88.8	185	7.9	79	3.4	ref				ref			
Unemployed (incl. disability support pension)	420	83.8	54	10.8	27	5.4	1.45	1.05	2.00	0.023*	1.70	1.08	2.66	0.021*
Retired	293	85.4	32	9.3	18	5.2	1.23	0.83	1.83	0.300	1.62	0.96	2.75	0.071
Other (student, unpaid work)	262	91.9	13	4.6	10	3.5	0.56	0.31	1.00	0.049*	1.01	0.52	1.97	0.981
<b>Main source of income</b>														
Wage/salary/own business/partnership	1845	88.7	163	7.8	71	3.4	ref				ref			
Age pension or Superannuation	522	87.6	54	9.1	20	3.4	1.17	0.85	1.62	0.338	1.00	0.60	1.65	0.986
Invalidity service pension or VEA/SRCA/MRCA compensation	312	85.2	34	9.3	20	5.5	1.23	0.84	1.82	0.290	1.67	1.00	2.78	0.050
Other	371	87.1	33	7.7	22	5.2	1.01	0.68	1.49	0.973	1.54	0.94	2.52	0.084

Note: \*\*\* = p < 0.001, \*\* = p < 0.01, \* = p < 0.05.

**Table 4. Multinomial logistic regression models indicating service-related predictors of ARG (PGSI = 1-4) and PG (PGSI ≥ 5)**

Demographic characteristics	No gambling problems (n = 3091)		At risk gambling (n = 286)		Problem gambling (n = 134)		Logistic regression models							
	(0)		(1)		(2)		(0) vs (1)				(0) vs (2)			
	n	%	n	%	n	%	OR	LB	UB	p	OR	LB	UB	p
<b>Service</b>														
Army	1704	86.5	176	8.9	91	4.6	ref				ref			
Navy	618	88.4	62	8.9	19	2.7	0.97	0.72	1.32	0.851	0.58	0.35	0.95	0.031*
Air Force	769	91.4	48	5.7	24	2.9	0.60	0.43	0.84	0.003**	0.58	0.37	0.92	0.021*
<b>Rank</b>														
Commissioned Officer	1018	93.1	56	5.1	20	1.8	ref				ref			
Non-Commissioned Officer / Other Ranks	2073	85.8	230	9.5	114	4.7	2.02	1.49	2.73	<0.001***	2.80	1.73	4.53	<0.001***
<b>Time served in Regular ADF</b>														
0-4 years	339	87.4	28	7.2	21	5.4	0.91	0.59	1.40	0.658	1.59	0.94	2.69	0.086
5-9 years	679	86.4	77	9.8	30	3.8	1.25	0.92	1.69	0.158	1.13	0.71	1.80	0.601
10-19 years	793	88.9	67	7.5	32	3.6	0.93	0.68	1.27	0.642	1.03	0.66	1.63	0.886
20+ years	1230	88.5	112	8.1	48	3.5	ref				ref			
<b>Serving status</b>														
Ex-Serving	1133	85.3	126	9.5	69	5.2	1.36	1.07	1.74	0.013*	1.83	1.29	2.58	0.001**
Active or Inactive Reservist	1948	89.7	159	7.3	65	3.0	ref				ref			
<b>Years since transitioned</b>														
0	272	88.0	28	9.1	9	2.9	1.04	0.62	1.73	0.896	0.90	0.39	2.12	0.814



Demographic characteristics	No gambling problems (n = 3091)		At risk gambling (n = 286)		Problem gambling (n = 134)		Logistic regression models								
	(0)		(1)		(2)		(0) vs (1)				(0) vs (2)				
	n	%	n	%	n	%	OR	LB	UB	p	OR	LB	UB	p	
1	618	88.4	48	6.9	33	4.7	0.78	0.50	1.22	0.275	1.46	0.77	2.76	0.248	
2	605	90.2	49	7.3	17	2.5	0.81	0.52	1.27	0.363	0.77	0.37	1.57	0.469	
3	609	86.3	64	9.1	33	4.7	1.06	0.69	1.61	0.798	1.48	0.78	2.80	0.230	
4	472	87.7	45	8.4	21	3.9	0.96	0.61	1.51	0.854	1.21	0.61	2.42	0.582	
5+	382	88.0	38	8.8	14	3.2	ref				ref				
<b>Medical discharge</b>															
No	2446	89.1	212	7.7	87	3.2	ref				ref				
Yes	613	83.9	73	10.0	45	6.2	1.37	1.04	1.82	0.026*	2.06	1.43	2.99	<0.001***	
<b>Ever deployed</b>															
No	594	91.5	37	5.7	18	2.8	ref				ref				
Yes	2495	87.2	249	8.7	116	4.1	1.60	1.12	2.29	0.010*	1.53	0.93	2.54	0.096	
<b>DVA client</b>															
No	1245	91.2	86	6.3	34	2.5	ref				ref				
Yes	1496	85.3	170	9.7	87	5.0	1.65	1.26	2.16	<0.001***	2.13	1.42	3.19	<0.001***	
<b>DVA treatment support since transition (white or gold card)</b>															
No	1592	90.5	117	6.6	51	2.9	ref				ref				
Yes	1499	85.6	169	9.7	83	4.7	1.53	1.20	1.96	0.001**	1.73	1.21	2.47	0.003**	

Note: \*\*\* = p < 0.001, \*\* = p < 0.01, \* = p < 0.05.

## Gambling problems, other psychiatric disorders and mental health problems, and help-seeking

A subsequent series of regression models were estimated to examine associations between gambling problems and various indicators of mental health and wellbeing, in order to investigate study aims 2, 5 and 6. For these analyses, the measures of mental health and adjustment were specified as outcome (dependent) variables in separate models, while gambling problems were treated as explanatory (independent) variables, to reflect the possible relationship (albeit speculative in cross-sectional data). The latter were specified using dummy variables which compared both at-risk gambling and problem gambling with respondents reporting no gambling problems (PGSI = 0), while at-risk gambling was also compared to problem gambling in additional models.

Table 5 presents initial findings from regression models that considered measures of mental health as outcomes, and these demonstrated wide ranging and generally strong associations with gambling problems across the continuum of severity. By way of illustration, when compared to participants reporting no gambling problems, at-risk gambling was associated with near two-fold increases in rates of probable depression, PTSD, high psychological distress, and problem anger, and near three-fold increases in harmful drinking and alcohol dependence. In addition, problem gambling was associated with a near three-fold increase in high psychological distress, a near four-fold increase in problem anger, depression and PTSD, and a five-fold increase in harmful drinking and alcohol dependence. When compared to at-risk gambling, Problem gambling was associated with around two-fold increases in all mental health outcomes, with the exception of alcohol dependence. In relation to co-morbidity, 67.2 per cent of veterans with problem gambling and 46.5 per cent of veterans with at-risk gambling reporting at least one additional condition

Table 6 describes patterns of help-seeking and differences according to gambling problem severity. These descriptive analyses indicated that 37.6 per cent (n = 50) of transitioned veterans that reported problem gambling described currently receiving assistance for their mental health, relative to 22.5 per cent (n = 64) among personnel who reported at-risk gambling, and 17.6 per cent (n = 540) among respondents who described no gambling problems. As can be seen, there were very small numbers of respondents who indicated that gambling was a reason for seeking care, which includes only 2.1 per cent (n = 2) of respondents who were classified in terms of problem gambling. Rather, transitioned personnel who reported both at-risk gambling and problem gambling were much more likely to report seeking care for other conditions, the most common of which were anxiety or depression, functional impairment, and anger.

**Table 5. Binary logistic regression models indicating at-risk gambling (PGSI = 1-4) and problem gambling (PGSI ≥ 5) as predictors of mental health outcomes**

Mental health outcomes	No gambling problems (n = 3091)		At risk gambling (n = 286)		Problem gambling (n = 134)		Logistic regression models											
	(0)		(1)		(2)		(0) vs (1)				(0) vs (2)			(1) vs (2)				
	n	%	n	%	n	%	OR	LB	UB	p	OR	LB	UB	p	OR	LB	UB	p
Probable depression	833	27.1	122	43.0	82	61.2	2.03	1.6	2.6	<0.001***	4.24	2.97	6.06	<0.001***	2.09	1.38	3.19	0.001**
Probable PTSD	511	16.7	82	29.1	60	45.8	2.04	1.6	2.7	<0.001***	4.21	2.95	6.02	<0.001***	2.06	1.34	3.17	0.001**
High psychological distress	1082	35.2	140	49.1	85	63.4	1.78	1.4	2.3	<0.001***	3.19	2.23	4.57	<0.001***	1.80	1.18	2.74	0.006**
Harmful drinking	260	8.5	67	23.7	46	34.6	3.34	2.5	4.5	<0.001***	5.70	3.90	8.33	<0.001***	1.71	1.09	2.67	0.020*
Alcohol dependence	149	4.9	42	14.8	29	21.8	3.41	2.4	4.9	<0.001***	5.45	3.50	8.50	<0.001***	1.60	0.95	2.71	0.080
Problem anger	784	25.5	111	39.4	75	56.0	1.89	1.5	2.4	<0.001***	3.71	2.61	5.27	<0.001***	1.96	1.29	2.97	0.002**
Any depression, PTSD or alcohol dependence	926	30.0	133	46.5	90	67.2	2.03	1.59	2.60	<0.001***	4.78	3.31	6.91	<0.001***	2.35	1.53	3.61	<0.001***

Note: \*\*\* = p < 0.001, \*\* = p < 0.01, \* = p < 0.05.

**Table 6. Help-seeking according to problem gambling severity**

	No gambling problems (n = 3091)		At risk gambling (n = 286)		Problem gambling (n = 134)	
	n	%	n	%	n	%
<b>Main reason for seeking care</b>						
Anger	186	11.2	21	12.4	12	12.8
Anxiety or depression	750	45.3	71	41.8	38	40.4
Functional impairment (relationship or work problems)	380	22.9	28	16.5	17	18.1
Sleep or nightmares	123	7.4	21	12.4	11	11.7
Alcohol or other drug problems	38	2.3	7	4.1	2	2.1
Gambling	0	0.0	0	0.0	2	2.1
Other (including pain)	180	10.9	22	12.9	12	12.8

Note: main and secondary reason for seeking care were only answered for those who reported ever seeking assistance for mental health

## Gambling problems and psychosocial adjustment

In investigation of Aims 5 and 6, Table 7 presents comparable findings from regression models that considered measures of psychosocial adjustment as outcomes, including suicidal ideation, plans and attempts, as well as aggression, financial or relationship problems. As can be seen, at-risk gambling was associated with a two-fold increase in the risk of suicidal ideation, as well as plans and attempts, whereas problem gambling predicted a three-fold increase in ideation and a four-fold increase in plans and attempts, compared to no gambling problems. Problem gambling was also associated with a two-fold risk of suicide plans and attempts when compared to at-risk gambling. At-risk gambling also predicted a 2.5-fold increase in threatened violence, and problem gambling predicting a four-fold increase.

Table 7 also indicates that both at-risk gambling and problem gambling were associated with a wide range of socio-economic and psychosocial difficulties, including reports of poor financial circumstances and financial hardship, as well as extended unemployment since transition, concerns about housing stability, encounters with the criminal justice system, as well as reports of relationship breakdown or problems. In all instances, both at-risk gambling and problem gambling were associated with reports of these socio-economic and psychosocial difficulties, with larger associations observed for problem gambling and no differences between at-risk and problem gambling.

**Table 7. Regression models indicating at-risk gambling (PGSI = 1-4) and problem gambling (PGSI ≥ 5) as predictors of suicidality, aggression, and financial, social and physical harm outcomes**

Harm outcomes	No gambling problems (n = 3091)		At risk gambling (n = 286)		Problem gambling (n = 134)		Logistic regression models											
	(0)		(1)		(2)		(0) vs (1)				(0) vs (2)				(1) vs (2)			
	n	%	n	%	n	%	OR	LB	UB	p	OR	LB	UB	p	OR	LB	UB	p
<b>Suicidality (past 12 months)</b>																		
Ideation	622	21.9	88	35.2	47	43.9	1.93	1.47	2.53	<0.001***	2.75	1.86	4.06	<0.001***	1.43	0.90	2.26	0.130
Plan or attempt	225	7.3	34	12.0	26	19.5	2.07	1.39	3.06	<0.001***	4.22	2.61	6.81	<0.001***	2.04	1.13	3.68	0.017*
<b>Aggression (past month)</b>																		
Threatened physical violence	308	10.1	60	21.1	42	31.3	2.40	1.76	3.26	<0.001***	4.08	2.78	5.99	<0.001***	1.70	1.07	2.71	0.024*
<b>Financial harm</b>																		
Current financial status																		
Just getting along/ Poor/ Very poor	1036	33.9	149	52.1	81	61.8	2.12	1.66	2.71	<0.001***	3.16	2.21	4.53	<0.001***	1.49	0.98	2.27	0.064
Prosperous/ Very comfortable/ Reasonably comfortable	2022	66.1	137	47.9	50	38.2	ref				ref				ref			
Current financial hardship (trouble paying money owed)	468	15.3	90	31.7	54	41.5	2.56	1.96	3.35	<0.001***	3.92	2.73	5.63	<0.001***	1.53	1.00	2.35	

Harm outcomes	No gambling problems (n = 3091)		At risk gambling (n = 286)		Problem gambling (n = 134)		Logistic regression models											
	(0)		(1)		(2)		(0) vs (1)				(0) vs (2)				(1) vs (2)			
	n	%	n	%	n	%	OR	LB	UB	p	OR	LB	UB	p	OR	LB	UB	p
<b>Unemployment</b>																		
Unemployed for at least three months since transition	1214	40.0	139	48.8	73	54.9	1.43	1.12	1.82	0.004**	1.83	1.29	2.59	0.001**	1.28	0.85	1.93	0.245
<b>Homelessness</b>																		
Concern may not have stable housing in next two months	265	8.7	39	13.6	22	16.8	1.66	1.16	2.38	0.006**	2.12	1.32	3.41	0.002**	1.28	0.72	2.26	0.398
<b>Criminality</b>																		
Problems with the police and a court appearance (last 12 months)	80	2.6	17	6.0	10	7.6	2.37	1.38	4.06	0.002**	3.06	1.55	6.06	0.001**	1.29	0.58	2.90	0.535
<b>Relationships</b>																		
Relationship breakdown (last 12 months)	351	11.4	53	18.6	32	24.2	1.78	1.29	2.45	<0.001***	2.49	1.65	3.77	<0.001***	1.40	0.85	2.30	0.184
Relationship problems (last 12 months)	717	23.3	109	38.5	61	46.2	2.06	1.60	2.66	<0.001***	2.83	1.99	4.02	<0.001***	1.37	0.90	2.08	0.138

Note: \*\*\* = p < 0.001, \*\* = p < 0.01, \* = p < 0.05.

## Multivariate models

The relationships between trauma, posttraumatic mental health conditions, and gambling problems, as well as suicidality and gambling problems were investigated in a series of multivariate models.

### Traumatic events and posttraumatic mental health problems as predictors of gambling problems

In order to investigate Aim 3, a series of regression models were estimated to explore the potential influences of trauma exposures and symptoms on gambling problems. For purposes of this stage of analysis, the three-level measure of gambling problems was specified as the outcome (dependent) variable, which was regressed on trauma-related variables using multinomial logistic regression. These explanatory variables were considered in separate (bivariate) models in the first instance, and were then considered in a multiple regression model.

Table 8 presents findings from (bivariate) multinomial logistic regression models of the trauma-related predictors of gambling problems. As can be seen, greater numbers of military and non-military (lifetime) traumatic events were both associated with rates of at-risk gambling and problem gambling when compared to no gambling problems, while all subscales of PTSD were also significantly associated with any gambling problems.

The unique influences of these variables on the severity of gambling problems were considered in a multiple negative binomial regression, which included as covariates indices of trauma exposure, depression, and each of the PCL-5 PTSD subscales and the total gambling score as the dependent variable. All measures of socio-demographic and service-related characteristics were also included as control variables in models which are presented in Table 9. As can be seen, measures of trauma exposure were included in the regression model in step one, which indicated that the number of lifetime non-military traumatic events was a significant predictor of gambling problems when controlling for socio-demographic and service-related characteristics. In contrast, the number of military-related trauma exposures was not significantly associated with gambling problems when controlling for lifetime trauma history. PHQ-9 depression scores were also related to gambling problems when entered into the model in step two, while the arousal symptoms of PTSD was a significant unique predictor in step three. Both depression and arousal scores were significant predictors of gambling problems in the final model (step three), while non-military traumatic events were no longer significant when controlling for these post-traumatic mental health problems.

**Table 8. Multinomial logistic regression models indicating PTSD and trauma as predictors of at-risk gambling (PGSI = 1-4) and problem gambling (PGSI ≥ 5)**

	No gambling problems (n = 3091)		At risk gambling (n = 286)		Problem gambling (n = 134)		Logistic regression models											
	(0)		(1)		(2)		(0) vs (1)				(0) vs (2)				(1) vs (2)			
	n	%	n	%	n	%	OR	LB	UB	p	OR	LB	UB	p	OR	LB	UB	p
<b>Trauma exposures</b>																		
Number of lifetime non-military traumatic events (M, SD)	2.6	(2.6)	3.4	(2.9)	3.6	(3.3)	1.10	1.05	1.14	<0.001***	1.12	1.06	1.19	<0.001***	1.03	0.96	1.09	0.426
Number of military-related trauma exposures (M, SD)	4.0	(3.8)	5.4	(4.0)	5.3	(4.0)	1.10	1.06	1.13	<0.001***	1.09	1.04	1.13	<0.001***	0.99	0.94	1.04	0.741
<b>PTSD (PCL-C) (past month)</b>																		
No PTSD (0-28)	1905	92.1	125	6.0	38	1.8	ref				ref				ref			
Sub-syndromal PTSD (29-52)	783	84.1	99	10.6	49	5.3	1.93	1.46	2.54	<0.001***	3.14	2.04	4.83	<0.001***	1.63	0.99	2.68	0.056
Probable PTSD (53+)	370	78.4	58	12.3	44	9.3	2.39	1.72	3.33	<0.001***	5.96	3.81	9.33	<0.001***	2.50	1.46	4.26	0.001**
<b>PCL-5 PTSD subscales</b>																		
Re-experiencing (B)	3.1	(4.7)	4.7	(5.1)	6.8	(6.5)	1.06	1.04	1.08	<0.001***	1.12	1.09	1.15	<0.001***	1.06	1.03	1.09	<0.001***
Avoidance (C)	1.5	(2.3)	2.2	(2.3)	3.0	(2.8)	1.13	1.09	1.18	<0.001***	1.25	1.18	1.33	<0.001***	1.11	1.03	1.18	0.004**
Negative cognitions and mood (D)	5.2	(7.0)	8.3	(8.1)	11.0	(8.7)	1.05	1.04	1.07	<0.001***	1.09	1.07	1.11	<0.001***	1.04	1.01	1.06	0.002**
Arousal (E)	5.0	(5.7)	7.4	(6.2)	10.4	(7.3)	1.06	1.05	1.08	<0.001***	1.13	1.10	1.16	<0.001***	1.06	1.03	1.09	<0.001***

Note: \*\*\* = p < 0.001, \*\* = p < 0.01, \* = p < 0.05.



**Table 9. Negative binomial regression model predicting gambling total score**

	Step 1				Step 2				Step 3			
	IRR	LB	UB	p	IRR	LB	UB	p	IRR	LB	UB	p
<b>Trauma exposure</b>												
Number of non-military lifetime traumas	1.10	1.03	1.16	0.002**	1.04	0.98	1.10	0.146	1.04	0.98	1.10	0.147
Number of traumatic deployment experiences	1.03	0.97	1.10	0.310	1.00	0.93	1.07	0.956	0.99	0.92	1.05	0.656
<b>Depression</b>												
PHQ-9 total score	-	-	-	-	1.10	1.07	1.12	<0.001***	1.07	1.03	1.11	<0.001***
<b>PCL-5 PTSD subscales</b>												
Re-experiencing (B)	-	-	-	-	-	-	-	-	0.99	0.93	1.05	0.762
Avoidance (C)	-	-	-	-	-	-	-	-	1.02	0.90	1.14	0.770
Negative cognitions and mood (D)	-	-	-	-	-	-	-	-	0.97	0.93	1.01	0.144
Arousal (E)	-	-	-	-	-	-	-	-	1.08	1.01	1.14	0.016*

Note: \*\*\* =  $p < 0.001$ , \*\* =  $p < 0.01$ , \* =  $p < 0.05$ . All models control for socio-demographic and service-related characteristics; age, sex, relationship status, education, service, rank, serving status, ever deployed.

## **Depression, social support and financial hardship as predictors of any suicidality**

A subsequent series of multiple binary logistic regressions were estimated in order to further explore the associations of gambling problems (independent variable) on self-reported suicidality (dependent variable). All models included PGSI gambling total score, along with demographic and service characteristics. Subsequent models then considered the implications of controlling alternatively for depression, social support, and financial hardship, which are all potential mediators of the effects of gambling problems on suicidality.

The results of these analyses are presented in Table 10. As can be seen from Model 1, PGSI scores remained significantly associated with any suicidality (i.e., ideation, plans and/or attempts) when controlling for socio-demographic and service-related characteristics. Model 2 included PHQ-9 total scores as an additional predictor, and this indicated that gambling problems were no longer significantly associated with suicidality when controlling for depression. Alternative models controlled for equivalent effects of social support (Model 3) and financial hardship (Model 4), and these indicated that while the additional covariates were significantly associated with suicidality, the effects of gambling problems were only modestly reduced and remained significant. Thus, on the basis of these alternative models it appears that co-occurring depression has a particularly influential role in explaining the association between gambling problems and suicidality.

**Table 10. Three alternative binary logistic regression models predicting any suicidality**

	Model 1				Model 2				Model 3				Model 4			
	OR	LB	UB	p	OR	LB	UB	p	OR	LB	UB	p	OR	LB	UB	p
PGSI gambling total score	1.14	1.09	1.18	<0.001***	1.03	0.98	1.08	0.208	1.10	1.06	1.15	<0.001***	1.11	1.06	1.15	<0.001***
PHQ-9 depression total score	-	-	-	-	1.26	1.24	1.28	<0.001***	-	-	-		-	-	-	-
Social support from family	-	-	-	-	-	-	-	-	0.84	0.81	0.86	<0.001***	-	-	-	-
Social support from friends	-	-	-	-	-	-	-	-	0.83	0.80	0.87	<0.001***	-	-	-	-
Current financial hardship (trouble paying money owed)	-	-	-	-	-	-	-	-	-	-	-	-	3.39	2.79	4.13	<0.001***

Note: \*\*\* =  $p < 0.001$ , \*\* =  $p < 0.01$ , \* =  $p < 0.05$ . All models control for all socio-demographic and service-related characteristics; age, sex, relationship status, education, service, rank, serving status, ever deployed.

## Conclusions

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To our knowledge, this is the first comprehensive study of gambling problems in recently transitioned veterans from Australia. The results indicated 13.4 per cent reported at least some gambling problems, including 4.6 per cent with clinically significant levels of problem gambling (PGSI  $\geq$  5), and 8.8 per cent with sub-clinical levels of at-risk gambling (PGSI 1–4). These rates are higher than those reported in recent Australian community prevalence research.<sup>66</sup> In addition, previous research in ADF military personnel indicates 7.7 per cent prevalence of any gambling problems, and taken together, indicate that Australian veterans are a high-risk group in relation to gambling problems.

The finding of elevated rates in transitioned veterans relative to current serving personnel may indicate that gambling problems increase after transition out of military service, and that veterans are particularly vulnerable once they leave the military. This proposal is consistent with the broader veteran mental health field that indicates transition from military service is a highly vulnerable time for the development of any mental health issue.<sup>3</sup> Of note, neither years since transition, nor years served in the military, had any significant relationship with rates of at-risk gambling or problem gambling. This suggests that gambling problems may be equally likely to develop either early in the transition period. These findings contrast with trajectories often seen for other common psychiatric disorders and other mental health problems in recently transitioned veterans, with research showing that self-reported psychological distress, depression, anger, anxiety, and suicidality are all lowest within the first 12 months following transition and increase significantly with greater time since transition.<sup>3</sup> This may suggest that gambling problems could temporally precede other mental health problems among transitioned members, and may have potential roles in the development of some of these conditions.

Further analyses also indicated several population sub-groups that were particularly vulnerable to gambling problems, with the highest levels of at-risk gambling (11.2 per cent) and problem gambling (5.9 per cent) in veterans aged 18–27, in males (ARG: 9.0 per cent; PG: 4.4 per cent), and in unemployed veterans, including those on disability support pensions (ARG: 10.8 per cent; PG: 5.4 per cent). There was no relationship between source of income and gambling problems, including those on military-related service pensions. In addition to these demographic factors, several military-related factors were identified. Those in the Army were at greater risk of problem gambling (4.6 per cent) relative to those in the other Services, however, rates of at-risk gambling did not differ between Army (8.9 per cent) and Navy (8.9 per cent), although both were higher than rates in the Air Force (5.7 per cent). Those who were Non-Commissioned Officer/Other Ranks had higher rates of at-risk gambling (9.5 per cent), as well as those who had ever been deployed (8.7 per cent). Finally, those who had been medically discharged (ARG: 10.0 per cent; PG: 6.2 per cent), veterans who were DVA clients (ARG: 9.7 per cent; PG: 5.0 per cent), and veterans with white or gold cards (ARG: 9.7 per cent; PG: 4.7 per cent) had higher rates. These findings extend previous research in Australian military personnel,<sup>16</sup> and the international field more broadly by highlighting the prevalence of gambling problems amongst recently transitioned veterans, and by understanding sub-groups particularly at risk. Younger males, who are unemployed and/or with a medical discharge are at greater risk of gambling problems, indicating important sub-groups where treatment and prevention efforts can be focused. While not all veterans are DVA-connected, the findings that DVA clients are at greater risk is important, in that treatment efforts within DVA itself are of high value.

In addition to gambling problems being prevalent, the prevalence point estimates for past year problem gambling (4.6 per cent) and at-risk gambling (8.8 per cent) were also high relative to past-year harmful drinking (11.2 per cent) and alcohol dependence (6.4 per cent). Of particular note is that past year any gambling problems (13.4 per cent) was higher than past year harmful drinking (11.2 per cent), indicating that gambling is as common as alcohol misuse in veteran populations. Furthermore, while our results indicated that gambling problems were linked to all mental health indicators, they were most strongly linked to alcohol misuse. These findings are notable, as alcohol

misuse is widely recognised as a key issue in veteran populations. Implications of this finding are discussed in sections below.

This pattern of findings in relation to alcohol misuse being linked to service factors were replicated in this study, with Army and Navy veterans having significantly higher rates of at-risk gambling relative to Air Force veterans. Researchers have proposed that military service is likely to attract individuals with higher levels of risk-taking, as this is conducive to the high intensity of combat situations, and propose predisposition in the population may further compound alcohol misuse issues.<sup>19</sup> Other research in military populations has extended this finding to a range of risky health behaviours including substance use, risky driving, and physical fighting, showing they are prevalent and strongly linked to gambling problems.<sup>67</sup> Our results extend these findings to indicate that gambling problems occur in veteran populations at comparable rates to alcohol misuse, and may potentially be considered along a spectrum of addictive behaviours that is exacerbated by predispositions to risk-taking. More research into gambling problems, pre-disposition to risk-taking, and their associations with military service are needed.

Additionally, the current findings indicate that mental health problems are prevalent in veterans both with at-risk gambling and problem gambling. While depression, PTSD, distress, harmful drinking, alcohol dependence and problem anger were all significantly higher in veterans with problem gambling relative to at-risk gambling, nevertheless, veterans with at-risk gambling had significantly elevated levels of these mental health issues relative to veterans with no gambling problems. Veterans with any gambling problems across the spectrum of severity, remain at elevated risk for adverse mental health outcomes, consistent with civilian literature that indicates the high rates of co-morbidity.<sup>68</sup> Presence of co-morbidity in the form of an additional significant mental health condition such as alcohol dependence, depression, or PTSD were the rule, rather than the exception, with 67.2 per cent of veterans with problem gambling and 46.5 per cent of veterans with at-risk gambling reporting at least one additional condition. The finding that veterans with gambling problems are at greater risk for mental health issues extends previous research in serving ADF personnel<sup>16</sup> indicating similar profiles in terms of prevalence. The cross-sectional nature of the survey does not allow for directional influences. However, it is likely that gambling problems are both a cause and a symptom of adverse mental health issues, and that at-risk gambling veterans are vulnerable to other mental health issues.<sup>69</sup>

## Psychosocial implications for veterans with at-risk and problem gambling

Gambling harms exist across the spectrum of gambling problems, in that individuals with any level of gambling problems are at risk of experiencing gambling harm. Gambling harm (in addition to gambling problems) can be considered along a spectrum, from low to severe harms.<sup>7</sup> Although the PGSI has few direct indicators of harm, we investigated possible harms (i.e., psychosocial implications) as indicated by associations with measures of suicidality, aggression, financial problems, unemployment, homelessness, criminality, and relationship difficulties. Many of these psychosocial implications are likely to be situated at the severe end of the harm spectrum.<sup>6</sup>

Results indicated that at-risk gambling was associated with elevated risk of harms relative to veterans with no gambling problems, across all dimensions. These included the very severe harms in the form of criminality, which were 2.4 times greater in at-risk gambling compared to veterans with no gambling problems, suicidal ideation (1.9 times greater), suicide plans or attempts (2.1 times greater), and threatened physical violence (2.4 times greater). Veterans with problem gambling had higher levels of harm than at-risk gambling on only two of the harm dimensions- suicide plans or attempts (but not ideation) and threatened violence. Of particular note, in veterans with problem gambling, rates of suicidal ideation were 43.9 per cent, and rates of suicidal plans or attempts were 19.5 per cent. Although the lack of differences between problem gambling and at-risk gambling veterans on all other harm dimensions may be due to low statistical power, the pattern overall indicates modest but consistent

differences in dimensions of harm. This finding is consistent with the broader literature in gambling harms in civilians, in that serious harms are commonly found in lower risk gamblers, with problem gambling then predicting the most severe gambling harms.<sup>6</sup>

These dimensions of harm are important in the context of transition, as during this period veterans may be simultaneously undergoing changes to many aspects of their life, including their occupational role/employment status, relationships, housing, and finances. The Australian military provides employment, medical and psychological care, clothing, food, housing, transport, and many other aspects of life for personnel, meaning that leaving the military often involves learning simultaneously how to undertake many basic life skills for the first time, often much later in adulthood than typically occurs in civilians.<sup>70</sup> In addition, the Australian military relocates, houses, and supports partners and dependents during service, yet this role of the military ceases upon transition. Returning to the workforce is a notable challenge for many, in that many veterans have never written a resume, applied or interviewed for a job, or had exposure to a civilian workplace, which has entirely different rules, language, and structure to military workplaces.<sup>70</sup> These 'simpler' challenges are layered with extreme shifts in identity, community, social, personal, and cultural ties.

While many veterans manage these significant challenges and transition 'well', research shows that these transition challenges are severely compounded by mental health issues.<sup>71</sup> Veterans can be financially and socially vulnerable during transition, as they need to seek new employment or income sources, and are disconnected from their former social structures. A number of veteran social clubs within Australia can contain large numbers of electronic gambling machines which may prove difficult for vulnerable veterans. Moreover, many veterans receive a bulk sum upon leaving the military as a result of various leave entitlements. Some veterans, particularly those who are medically discharged, will remain out of employment for longer periods of time, which contrasts significantly with the highly structured routines of military life, and leaves periods of unstructured time to fill. It is within this context that gambling as a behaviour is extremely risky.

Veterans who are already more likely to be pre-disposed to risk-taking, and who may already have some gambling behaviours, are then vulnerable to the financial and social challenges of transition, as well as have significant periods of downtime to fill. This vulnerability is compounded as time since leaving the military increases, as many mental health problems emerge later in the transition trajectory. It is within this context of developing mental health problems, gambling may be used as a maladaptive coping strategy, consistent with self-medication hypothesis, in particular to manage symptoms of arousal and dysphoric-related affect. Our findings indicate the potential for gambling problems in veterans to have a multiplier or antecedent effect on the development of future mental health issues, and highlights the need for focus on early intervention and prevention.

Our results showed that veterans with the lowest levels of income, either as unemployed or on disability support pensions, had the highest levels of gambling problems. Individuals with the lowest levels of income are likely to experience the greatest levels of financial harm from gambling problems. In the veteran context, the added harms of gambling may be compounded by the extenuating factors related to transition, and indeed may worsen gambling problems or other adverse mental health outcomes. Our findings indicate that veterans with any gambling problems require particular support in the transition period to reduce the likelihood of experiencing extreme harms.

## Trauma and gambling problems in veterans

Increasingly, research has focused on the relationship between trauma and gambling problems. For example, previous research in military personnel show that individuals with PTSD are more likely to engage in gambling behaviours.<sup>23</sup> Our results show that while military-related and non-military related traumatic events, as well as PTSD symptoms and depression all had associations with gambling problems at the bivariate level, it is arousal and dysphoric-related affect factors that may directly explain the relationship between trauma and gambling

problems. Controlling for socio-demographic and service-related characteristics, both depression symptoms and PTSD sub-scale hyper arousal scores were significant predictors of gambling problems, while non-military traumatic events were no longer significant when controlling for these post-traumatic mental health problems.

Exposure to traumatic events, posttraumatic psychiatric disorders, and gambling problems may be linked to each other in a range of ways. Firstly, common biological vulnerabilities in the form of higher impulsivity and increased emotionality, which manifest in serotonergic and noradrenergic processes,<sup>72</sup> may predispose an individual to increased risk of experiencing a traumatic event, developing PTSD or depression, as well as problem gambling. Moreover, while a shared vulnerability pathway may predispose an individual to developing these issues, once established, problem gambling and psychopathology may then have reciprocal and bidirectional influences on each other.<sup>16,73</sup> For example, gambling losses, strategies to fund gambling (e.g., theft; selling belongings) and subsequent experiences of guilt, shame, and desperation can exacerbate or cause depression, as well as increase risk of experiencing a traumatic event, from which PTSD can develop.<sup>74</sup> Simultaneously, depressive symptoms and PTSD symptoms can drive and maintain gambling problems, in that both hyperarousal symptoms of PTSD and dysphoric-related affect associated with depression might drive an individual towards maladaptive ways of decreasing arousal and/or alter mood states. Indeed, physiological research has shown that certain types of gambling have differential physiological effects, whereby individuals may be drawn to certain gambling activities based on their arousal states. Specifically, gambling activities that are repetitive and indefinite in nature, such as poker machine gambling, is consistent with hyperarousal and the conceptual notions of 'gambling to escape'.<sup>75</sup> In contrast, types of gambling that have higher stakes and more rapid time frames may be appealing to individuals looking to improve mood or increase arousal, and the conceptual notions of 'gambling high'.<sup>76</sup>

Major theoretical models of gambling problems posit that adverse or traumatic experiences, combined with a strong desire to alter arousal and/or mood states can lead to the development of addiction.<sup>77</sup> Although complex and differentiated based on types of gamblers and gambling behaviour, overall, research shows that gambling can alter physiological and self-reported arousal, and that these alterations in arousal may underpin the development and maintenance of gambling problems.<sup>78</sup> Strongly linked to arousal is the tendency for gamblers to gamble to escape or manage dysphoria or negative mood states.<sup>75</sup> Consistent with previous research proposing the relationship between trauma and gambling problems is driven by arousal and negative mood states,<sup>16</sup> our findings indicate that traumatic experiences per se do not account for the relationship, but rather, arousal-related aspects of posttraumatic mental health are related to gambling problems. Of note, military-related traumatic experience had no meaningful relationship with gambling problems, which has particular relevance given the extent to which military and veteran populations experience deployment related trauma. Our findings complement a smaller study that also found no associations between combat exposure and gambling problems.<sup>79</sup> This suggests that rather than trauma exposure impacting on gambling behaviour, it is the psychiatric consequences of trauma exposure that contributes to gambling problems.

## Suicidality and gambling problems in veterans

Suicide has been recognised as a potential and serious negative consequence of gambling in major taxonomies of gambling-related harm, where it has been viewed as a consequence of other harms (e.g., severe financial problems and debt).<sup>8</sup> Links between gambling problems and suicide have also been inferred from various studies, including investigations of completed suicides<sup>80</sup> and clinical research demonstrating high rates of suicidality among patients seeking treatment for gambling problems,<sup>81,82</sup> including US veterans seeking gambling treatment in VHA services.<sup>83</sup> Associations between gambling problems and suicidality have also been demonstrated in population-based studies of non-military samples, which have indicated that problem gambling predicts 4-fold and 5-fold increases in suicidal ideation and attempts, respectively.<sup>34</sup> The current analyses also indicated that gambling problems were linked strongly with suicidality among transitioned veterans, with associations (ORs) involving at-risk or problem gambling and suicidal ideation, plans or attempts suggesting between near 2-fold and 4-fold increases



in risk at the bivariate level. Strikingly, there were around 44 per cent of transitioned veterans who indicated problem gambling that also reported past year suicidal ideation, while around 20 per cent (near one in five) reported past year suicidal plans or attempts. Suicide is elevated and comprises a major ongoing concern among Australian ex-serving personnel,<sup>84</sup> and the current results thus indicate that gambling problems may be an under-recognised factor that increases risk and could be an important target of suicide prevention strategies situated in military and veteran-specific contexts.

Literature on links involving gambling problems and suicide have referenced a number of different mechanisms that could explain the associations, and these emphasise the potential role of co-occurring mental health problems, as well as gambling-related losses and financial problems.<sup>81</sup> It is also likely that the interpersonal harms from gambling can have negative impacts on support networks and lead to the reduction of social resources and feelings of connectedness that have central roles in major theoretical models of suicide risk.<sup>36</sup> The current study conducted preliminary analyses in order to explore factors that may have salient roles in explaining links involving gambling problems and suicidality, including measures of co-occurring depression, financial problems, and social support. These were considered in a series of analyses which indicated that only models including depression symptoms led to significant reductions in the magnitude of associations between gambling problems and suicidality, whereby this link was no longer significant when controlling for depression comorbidity. Such findings provide evidence which indicates that links between gambling problems and suicidality should not be considered separately from co-occurring mental health problems including depression. They may also suggest a potential indirect pathway whereby gambling problems may exacerbate depression which then increases suicide risk. Although such directional associations cannot be inferred from the current cross-sectional data, they are consistent with additional findings that rates of gambling problems were not associated with years since transition from the ADF. This contrasts with results for other conditions, including depression, which are often characterised by delayed onset and higher rates with increasing years after leaving the ADF.<sup>3</sup> Although speculative, this may suggest that gambling problems are potential 'downstream' factors that contribute to suicide and may thus be an important focus for initiatives to address suicide among veterans.

## Help-seeking for gambling problems

Given the significant harms experienced by veterans with gambling problems, high rates of adverse mental health outcomes, and links with suicide, it is important to understand help-seeking behaviours in veterans. Our results show that the vast majority of veterans with problem gambling do not seek help for gambling problems (97.9 per cent), rather, they seek help primarily for anxiety or depression, functional impairment, or for other reasons such as chronic pain. Similarly, at-risk gambling veterans sought care primarily for anxiety or depression symptoms, as well as functional impairment. Screening in these treatment settings may be an effective way to facilitate access to gambling-related support. If gambling problems temporally precede and contribute to the development of posttraumatic mental health problems in this population, efforts to facilitate help-seeking and early identification of gambling problems may be an important target for early intervention to reduce risk of mental health problems.

These findings are consistent with the broader literature indicating that help-seeking rates in civilians are very low.<sup>85</sup> Common barriers to help-seeking identified in the broader gambling literature primarily include internal barriers such as stigma and shame, as opposed to structural barriers such as access to treatment. While barriers specifically to seeking help for gambling were not investigated in this study, research shows that more generally, initial engagement and uptake of a range of mental health services are reasonably high amongst veterans, but there is an under-engagement with evidence-based treatment, and stigma is a significant barrier.<sup>5</sup> Understanding the barriers to helping seeking for veterans with gambling problems is needed.



## Strengths and limitations

The current study was characterised by notable strengths including large sample size and usage of a range of validated scales with strong psychometric properties. However, the findings should also be viewed in the context of important limitations. Surveys did not include questions about the nature of gambling participation, and thus the types of activities that were implicated in problems (e.g., electronic gambling machines, online sports betting) could not be ascertained. This is particularly relevant in the context of different types of gambling having different physiological affects related to mental health symptoms.<sup>78</sup> Gambling problems were also measured using the PGSI that does not provide a comprehensive assessment of problematic gambling behaviours. Moreover, the dimensions of harm in this study were inferred from covariate models, and were not based on direct questions about negative consequences linked to gambling that have been used in other research, using more robust measures.<sup>6,86</sup>

The analyses were based on cross-sectional data and do not provide evidence of processes that unfold over time, including the likely directionality of associations. As such, the causal precedence of gambling problems over mental health and wellbeing indicators, while assumed by regression analyses, cannot be established using this cross-sectional data. These gambling problems and associated risk factors explored here are likely to mutually reinforce each other. Moreover, only 18 per cent of the total sample responded to the survey, and non-response may bias some of the findings here, particularly for measures relating to homelessness and criminality. Finally, the sample consisted of contemporary veterans (i.e., individuals who served in the military after 1999), meaning they may not generalise to other veteran cohorts, such as Vietnam veterans.

## Implications and future directions

The prevalence of gambling problems found in this study indicates the importance of recognising and responding to gambling problems among veterans. While this study found that contemporary veterans who were DVA connected had higher rates of gambling problems, only one-in-10 Australian veterans are connected with government funded veteran services.<sup>3</sup> Therefore, there is a need for universal prevention strategies that will cut across those within and outside of veteran focused services. Furthermore, the high rates of gambling problems in veterans indicates that Australian gambling services should be aware and ideally, somewhat culturally competent in military and veteran populations, in order to meet their specific treatment needs. More research should address barriers to help-seeking in veterans with gambling problems, as well as targeting the specific vulnerable sub-groups listed here.

Given the association between common mental health problems, including alcohol dependence, depression, and PTSD, and gambling problems, targeted screening of veterans with these common mental health conditions, particularly in relevant mental health/alcohol and drug services for potential gambling-related issues may be helpful in identifying those who require gambling-specific treatment.<sup>67</sup> Treatment is often focused on those with the extreme end of gambling problems, yet these results comprehensively indicate that service responses targeting at-risk gamblers are needed, given the significant psychosocial and mental health profiles of these veterans. Veteran-focused responses to gambling problems should also address the continuum of severity, and prevention strategies should focus on preventing any problems, and not just the prevention of problem gambling.

The extremely high rates of suicidality in veterans who were problem gamblers highlight an important modifiable risk factor for the prevention of suicide. Research shows that transitioned members are at higher risk of suicidality where financial strain or housing instability are present, or in those aged under 28 years. Our results show that gambling problems were more common in younger veterans, and those who were more financially insecure. There is a strong need for further research which can further examine more complex causal models and thus inform the targeting of such suicide prevention strategies.

What remains unclear is how similar or different veterans with gambling problems are to civilians with gambling problems. Direct comparative research is needed to better understand how the risk factors and profiles differ. The findings that symptoms of PTSD and depression, rather than specific trauma exposures, explained the relationships with gambling problems would indicate similarities between civilian and veteran populations with gambling problems. Conversely, veterans do have recognised unique treatment needs in other psychiatric disorders. Future research should address these differences in treatment of gambling problems.

In summary, gambling problems are prevalent in contemporary Australian veterans within the first five years of leaving the military, at rates comparable to other well-recognised psychiatric disorders. Veterans with at-risk gambling problems are at risk of psychiatric disorders and possible gambling harms comparable to those with problem gambling. Veterans are in a period of vulnerability during transition, and harms associated with gambling problems may be significant exacerbated.

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## Appendix A

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	n	%	95% CI	
			LB	UB
<b>Gambling problems (past-year)</b>				
Low risk gambling	1554	6.3	6.0	6.6
Moderate risk gambling	1554	4.6	4.4	4.9
Problem gambling	619	2.5	2.3	2.7



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April 2021

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