# SECTION 2
# DETECTION OF MENTAL DISORDERS IN THE ADF

**Contents**

## 2.1 Overview of mental health screening in the ADF

The ADF currently uses three instruments for both screening and monitoring of mental health trends:

- Psychological distress is measured by the Kessler Psychological Distress Scale (K10).
- Post-traumatic stress is measured by the Posttraumatic Stress Disorder Checklist (PCL).
- Alcohol consumption is measured by the Alcohol Use Disorders Identification Test (AUDIT).

### 2.1.1 History of mental health screening in the ADF

The ADF introduced standardised operational mental health screening instruments into its operational mental health support continuum in 1999 (Steele & Goodman, 2006). These instruments are used in the ADF as a guide during screening interviews conducted by a mental health professional (Department of Defence, 2008).

As summarised in Figure 2.1, deployed ADF members are provided with a continuum of mental health support designed to enhance their ability to cope with the challenges of deployment and to improve their capacity for effective transition back to work and family life. Further, this continuum of care allows for early identification and intervention for those individuals considered to be at risk of developing a mental disorder. The process includes mental health screening after exposure to potentially traumatising events for high-risk groups, immediately before return to Australia and three to six months post-deployment.

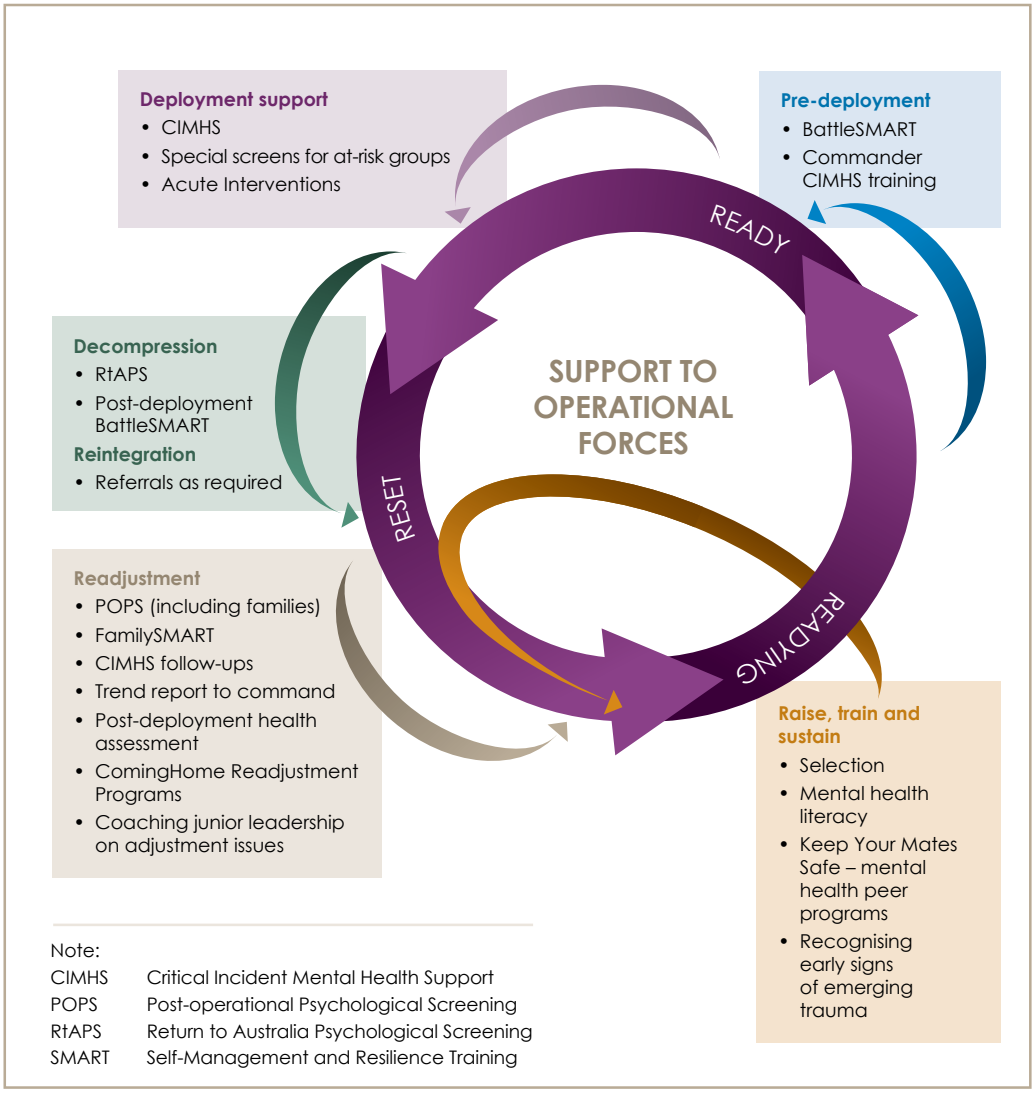
Before deployment to an operational theatre, ADF members are provided with psycho-educational training tailored to the potential risks that they will face. Should ADF members be exposed to a critical incident or potentially traumatic event while on deployment, commanders can activate a Critical Incident Mental Health Support (CIMHS) response, which can involve a screening interview with a mental health professional. Similarly, groups identified as being engaged in high-risk activities for extended periods of time (such as search engineers) may be offered a Special Psychological Screening interview mid-deployment.

A Return to Australia Psychological Screening (RtAPS) is provided immediately before or immediately after members depart the area of operations, while a Post-operational Psychological Screening (POPS) is conducted three to six months after an operation (Department of Defence, 2008). Both types of screening have four goals:

- **psycho-education** – to provide psycho-education about the realities of reintegration to the home environment
- **early intervention** – both RtAPS and POPS provide a single-session intervention to assist in managing low-level mental health and reintegration concerns
- **early identification** of at-risk individuals for referral for comprehensive diagnostic assessment and appropriate treatment

- **surveillance** – to capture information used by command to assist in the operational transition process, and for review of operational issues; and by defence psychologists to identify trends for incorporation into future pre-deployment preparation.

***Figure 2.1:*** *ADF operational mental health support continuum*




In 2003, as the part of an initiative to achieve standardisation between clinical and operational screening, the Mental Health Screen for Casework was introduced into the ADF (Department of Defence 2009) and mental health screens were introduced into the periodic health screening process.

***Table 2.1:*** *Summary of mental health screening for ADF personnel*

| Screen | Mental health screens included | Screen introduced to Defence |
|---|---|---|
| Return to Australia Psychological Screening (RtAPS) | Kessler Psychological Distress Scale (K10), Traumatic Stress Exposure Scale-Revised (TSES-R), Posttraumatic Stress Disorder Checklist (PCL) | 2002[a] |
| Post-operational Psychological Screening (POPS) | K10, PCL, Alcohol Use Disorders Identification Test (AUDIT) | 2002[a] |
| Special Psychological Screen | K10, Acute Stress Disorder Scale (ASDS) | 2006[b] |
| Critical Incident Mental Health Support (CIMHS) initial screen | ASDS, Mental Status Examination | 2002[c] |
| Critical Incident Mental Health Support (CIMHS) follow-up screen | K10, PCL, AUDIT | 2002[c] |
| Mental Health Screen for Casework | K10, PCL, AUDIT | 2005 |
| Annual Health Assessment (AHA) | 2 stress items | 2003 – replaced by PHE 2011 |
| Comprehensive Periodic Health Assessment (CPHA) | 2 stress items and AUDIT | 2003 – replaced by PHE 2011 |
| Periodic Health Examination (PHE) | AUDIT, K10 | Oct 2011 |

a From 1999 to 2002 Defence administered post-operational screening questionnaires termed Post-Deployment Questionnaire (now RtAPS) and the Mental Health Screen (now POPS). While some measures (such as the PCL-C and AUDIT) have remained the same over time, others (for example, GHQ) have been removed.

b The Special Psychological Screen was modified in 2006. It has been administered in various forms since 2003.

c New policy and process implemented 2008.

As summarised in Table 2.1, there are three instruments used in both clinical and mental health screening in the ADF.

- **Kessler Psychological Distress Scale (K10)** is a 10-item measure used in the ADF to assess psychological distress and to monitor depressive and anxiety symptomatology (Andrews & Slade, 2001; Kessler et al., 2002). High scores on this instrument have been shown to have a strong association with the diagnosis of anxiety and affective disorders based on the World Mental Health Composite International Diagnostic Interview (CIDI) (Kessler & Üstün, 2004) (version 3.0) and a lesser but still significant association with the presence of any current mental disorder (Andrews & Slade, 2001).
- **Posttraumatic Stress Disorder Checklist (PCL)** is used to assess self-reported post-traumatic stress disorder symptoms. There are several versions of the PCL. The PCL-Military (PCL-M) covers particular military events, whereas the PCL-Specific (PCL-S) is a non-military version that refers to a specific traumatic event. As the PCL-Civilian (PCL-C) is not linked to a specific event and relates to more general traumatic exposure, this scale was considered the most appropriate for inclusion in ADF psychological screening (Nicholson, 2006; Steele & Goodman, 2006).
- **Alcohol Use Disorders Identification Test (AUDIT)** is used to assess and monitor alcohol consumption.

The efficacy of mental health screening programs for military populations is an area of controversy. Rona and colleagues in the United Kingdom, in particular, have argued that there is too great a likelihood of error or lack of demonstrated positive predictive ability in these programs. They argue that they should only be conducted when there are adequate treatment resources to provide care (Rona, Jones, French, Hooper, & Wessely, 2004).

Bliese and colleagues in the United States (Bliese, Wright, & Hoge, 2011), however, argue that a distinction needs to be made between mental health screening for purposes of personnel selection and screening to facilitate appropriate early assessment and treatment of personnel within an organisation or care-based screening. The lack of positive predictive power in mental health screening for selection purposes has the potential to harm an individual's self-esteem or career, particularly if that individual is incorrectly categorised as having a disorder when a disorder is not present. In care-based screening programs, however, such miscategorisation is less detrimental because it is likely to lead to more thorough follow-up. They argue that the benefits that come from early intervention care-based screening is worth the cost but that the predictive ability of the screens needs to be improved.

The Mental Health Prevalence and Wellbeing Study provides data that enable a detailed examination of ADF mental health screening and of clinical tools that facilitate early intervention for treatment and monitor the level of mental disorders. This report starts this process by identifying optimal cut-offs for ensuring that personnel who are likely to have a disorder are being referred for further assessment and treatment, as well as establishing estimates to allow monitoring of epidemiological trends.

Two sets of cut-offs were determined:

- the optimal screening cut-off, which is the value that maximises the sum of the sensitivity and specificity (the proportion of those with and without the disoder who are correctly classified) – this cut-off can be used to identify individuals who might need care and is designed to be more inclusive and should be used in screening settings.
- the optimal epidemiological cut-off, which is the value that brings the number of false positives (mistaken identifications of disorders) and false negatives (missed identifications of disorders) closest together, thereby counterbalancing these sources of error most accurately. Therefore, this cut-off would give the closest estimate of the true prevalence of 30-day ICD-10 disorder as measured by the CIDI and should be used to monitor disorder trends.

## 2.2 Psychological distress – Kessler Psychological Distress Scale (K10)

- 3.6% of ADF personnel reported in the very high risk category for psychological distress.
- Females reported significantly higher mean K10 scores than ADF males.
- ADF members reported an average of 1.5 days of lost productivity each per month due to symptoms of psychological distress.
- The Navy reported significantly higher mean scores on the K10 than both the Army and the Air Force, and reported significantly more days out of role.
- Other ranks reported significantly higher mean K10 scores than both officers and non-commissioned officers, and had significantly more days out of role but significantly more visits to the doctor.
- Deployed personnel reported significantly lower mean K10 scores than non-deployed personnel.
- The optimal screening cut-off on the K10 for the ADF is 17, and the optimal epidemiological cut-off is 25.

This section provides a detailed summary of the pattern of psychological distress reported by currently serving ADF members in the ADF population as measured by the K10. The distribution of psychological distress by the demographic categories of rank, sex, Service and deployment status is examined, together with the impairment and rates of help seeking associated with each of the scoring categories. Finally, this section provides the optimal psychometric cut-offs for use in the ADF to screen for and detect affective and anxiety disorders.

The K10 was designed as a short, easily administered screening instrument for psychological distress. The K10 is typically used to inform and complement clinical interviews and to quantify levels of distress in those who are in particular need of treatment.

Respondents were instructed to rate the amount of time they had experienced one of 10 emotional states during the previous four weeks (for example, tired for no good reason, nervous, hopeless, depressed). The 10 questions were scored from 1 to 5, whereby the respondent indicated how often they had been feeling that way, using one of the following response options: 'all of the time' (5), 'most of the time' (4), 'some of the time' (3), 'a little of the time' (2) or 'none of the time' (1). Scores for the 10 questions were then summed to give a total score between 10 and 50.

Two forms of scoring bands are reported in this report, including bands from the literature and scoring that has been developed specifically for the ADF. First, bands of low (10–15), moderate (16–21), high (22–29) and very high (30–50) used in this report are derived from the K10 cut-offs that were used in the Australian National Mental Health and Wellbeing Survey (Australian Bureau of Statistics, 2008; Slade et al., 2009). They are reported to allow comparison with other published research.

ADF bands are also reported to allow comparison with ADF surveillance reporting. The K10 bands used in the ADF post-operational screening process were reviewed in 2008 (Department of Defence 2009), when it was determined that an increase from a cut-off of 16 to 20 reduces the chance of falsely identifying a person as having an anxiety or depressive disorder from 22% to 8%.

The current K10 scoring bands used for post-operational screening are low (10–15), medium (16–19) and high (20+). For ADF post-operational surveillance reporting, a K10 cut-off of 20 is used. People scoring 20 or higher on the K10 have at least four times the population risk of having a depressive or anxiety disorder (Furukawa, Kessler, Slade, & Andrews, 2003). A cut-off of 20 aligns with that used by the 2001 National Health Survey (Australian Bureau of Statistics, 2003). The Mental Health Advice Book suggests that people seen in primary care who score below 20 are likely to be well (Australian Centre for Posttraumatic Mental Health, 2007).

Hence, K10 scores in this report were also categorised into two levels of psychological distress, low (10–19) and high (20–50), allowing comparison with ADF post-operational surveillance reports and also ADF health studies of deployed personnel (Bleier et al., 2011).

Receiver Operating Characteristic (ROC) analysis was also used to determine the optimal psychometric cut-off in the ADF to detect 30-day ICD-10 affective disorder, 30-day ICD-10 anxiety disorder and 30-day ICD-10 anxiety or affective disorder examined using the CIDI (version 3.0).

### 2.2.1 Distribution of psychological distress in the ADF

The distribution of psychological distress scores is summarised in Table 2.2.

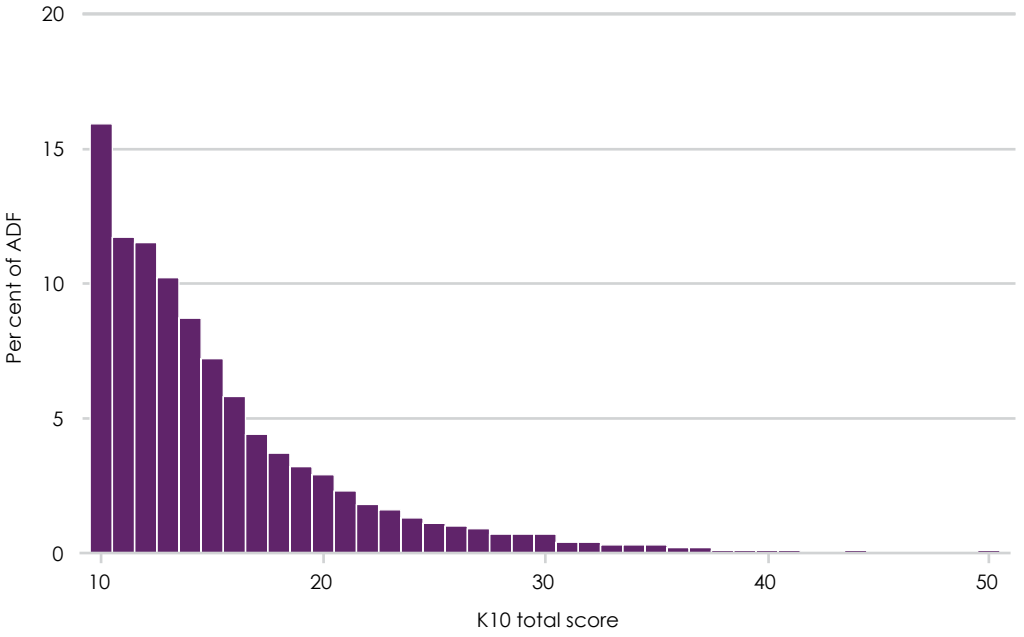
***Table 2.2:*** *K10 quantiles for the ADF*

| K10 score summary statistics | Estimate | 95% CI |
|---|---|---|
| Minimum | 10.0 | |
| 10% | 10.0 | 10.0–10.0 |
| 25% | 10.8 | 10.8–10.8 |
| Median | 13.2 | 13.1–13.2 |
| Mean | 15.4 | 15.3–15.5 |
| 75% | 17.0 | 16.9–17.1 |
| 90% | 22.6 | 22.4–22.8 |
| 95% | 27.0 | 26.7–27.3 |
| 99% | 35.2 | 34.7–35.8 |
| Maximum | 50.0 | |

Table 2.2 reports the K10 quantiles for the ADF and indicates that approximately 10% scored in the high to very high range using the banding as reported in the national study. Of the three scales being investigated, the K10 is the only one that can be directly compared with the Australian community sample from the 2007 ABS study. Using the age, sex and employment adjusted sample, the mean K10 score for the ADF (15.4) was significantly higher than the Australian national average (14.1) and this difference was consistent across males and females (ADF 15.3 versus ABS 14.0 for males and ADF 16.2 versus ABS 15.0 for females).

As can be seen in Table 2.2, the median score for currently serving ADF members is in the low group (13.2). The skewed nature of the distribution, or the fact that most of the ADF report a low level of distress, is demonstrated in Figure 2.2.

***Figure 2.2:*** *Distribution of K10 total scores in the ADF*




### 2.2.2 K10 in the ADF and ABS by sex

A comparison of the K10 scoring bands for risk in the ADF for males and females is presented in Table 2.3.

***Table 2.3:*** *K10 risk categories in the ADF, by sex*

| | Males | | Females | | Total | |
|---|---|---|---|---|---|---|
| | % | 95% CI | % | 95% CI | % | 95% CI |
| Low | 65.7 | 65.1-66.3 | 58.5 | 57.2-59.8 | 64.7 | 64.1-65.3 |
| Moderate | 22.0 | 21.4-22.5 | 25.4 | 24.3-26.6 | 22.5 | 22.0-22.9 |
| High | 9.0 | 8.7-9.4 | 11.0 | 10.1-11.8 | 9.3 | 9.0-9.6 |
| Very high | 3.3 | 3.1-3.6 | 5.1 | 4.5-5.7 | 3.6 | 3.3-3.8 |

Overall in the ADF, 3.6% scored in the very high range on the K10, 9.3% scored in the high range and 22.5% scored in the moderate range.

A comparison of males and females in the ADF, using mean scores not reported in the table above, showed that ADF females reported significantly higher mean K10 scores than ADF males (16.21 versus 15.36; mean difference 0.85, 95% CI 0.67, 1.03). There was no significant interaction, however, between sex and Service on the mean K10 scores.

### 2.2.3 K10 in different population subgroups

#### 2.2.3.1 Rank

***Table 2.4:*** *K10 risk categories in the ADF, by rank*

| | Officers | | | Non-commissioned officers | | | Other ranks | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Low | *8,353* | 69.4 | 68.6–70.2 | *14,723* | 66.0 | 65.3–66.6 | *9,304* | 59.3 | 57.9–60.6 |
| Moderate | *2,500* | 20.8 | 20.1–21.5 | *4,878* | 21.9 | 21.3–22.5 | *3,859* | 24.6 | 23.4–25.8 |
| High | *930* | 7.7 | 7.3–8.2 | *1,977* | 8.9 | 8.5–9.3 | *1,747* | 11.1 | 10.3–12.0 |
| Very high | *251* | 2.1 | 1.9–2.3 | *741* | 3.3 | 3.1–3.6 | *786* | 5.0 | 4.4–5.6 |

When looking at the rank structure of the ADF, a notable finding is the high rates of distress among the other ranks, among whom 5% scored in the very high category, compared to 2.1% of officers.

In an analysis of mean scores, there was a significant effect of rank on the mean K10 scores: the other ranks reported significantly higher mean K10 scores than officers (16.3 versus 15.22; mean difference 1.08, 95% CI 0.90–1.27) and non-commissioned officers (16.3 versus 15.84; mean difference 0.47, 95% CI 0.28–0.66). Non-commissioned officers also reported significantly higher K10 scores than officers (15.84 versus 15.22; mean difference 0.61, 95% CI 0.50–0.73).

#### 2.2.3.2 Service

Tables 2.5 to 2.7 report the K10 scoring bands for each of the three Services.

***Table 2.5:*** *K10 risk categories in the Navy, by sex*

| | Male | | | Female | | | Persons | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Low | *5,810* | 61.1 | 59.7–62.5 | *1,156* | 54.9 | 52.2–57.6 | *6,966* | 60.0 | 58.7–61.2 |
| Moderate | *2,347* | 24.7 | 23.4–25.9 | *537* | 25.5 | 23.2–27.9 | *2,884* | 24.8 | 23.7–25.9 |
| High | *979* | 10.3 | 9.4–11.2 | *268* | 12.7 | 10.9–14.6 | *1,247* | 10.7 | 9.9–11.5 |
| Very high | *372* | 3.9 | 3.3–4.5 | *144* | 6.8 | 5.4–8.2 | *516* | 4.4 | 3.9–5.0 |

***Table 2.6:*** *K10 risk categories in the Army, by sex*

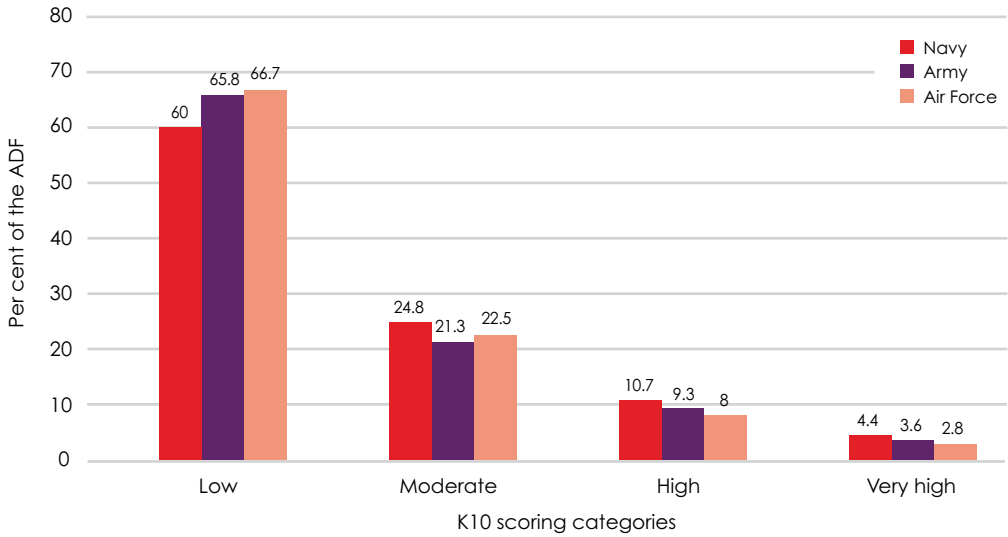
| | Male | | | Female | | | Persons | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Low | *15,178* | 66.4 | 65.5–67.4 | *1,505* | 59.9 | 57.8–62.0 | *16,683* | 65.8 | 65.0–66.6 |
| Moderate | *4,788* | 21.0 | 20.2–21.8 | *625* | 24.9 | 23.0–26.7 | *5,413* | 21.3 | 20.6–22.1 |
| High | *2,093* | 9.2 | 8.6–9.7 | *266* | 10.6 | 9.2–11.9 | *2,359* | 9.3 | 8.8–9.8 |
| Very high | *784* | 3.4 | 3.1–3.8 | *118* | 4.7 | 3.7–5.6 | *901* | 3.6 | 3.2–3.9 |

***Table 2.7:*** *K10 risk categories in the Air Force, by sex*

| | Male | | | Female | | | Persons | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Low | *7,409* | 68.0 | 67.1–68.9 | *1,322* | 60.3 | 58.4–62.3 | *8,731* | 66.7 | 65.9–67.6 |
| Moderate | *2,369* | 21.8 | 20.9–22.6 | *571* | 26.1 | 24.3–27.8 | *2,940* | 22.5 | 21.7–23.2 |
| High | *836* | 7.7 | 7.2–8.2 | *212* | 9.7 | 8.5–10.9 | *1,049* | 8.0 | 7.5–8.5 |
| Very high | *275* | 2.5 | 2.2–2.8 | *86* | 3.9 | 3.1–4.7 | *361* | 2.8 | 2.5–3.0 |

In an analysis of mean scores, there was a significant effect of Service on the mean K10 scores: both the Navy (16.31 versus 15.33; mean difference 0.98, 95% CI 0.81, 1.15) and the Army (15.72 versus 15.33; mean difference 0.39, 95% CI 0.25, 0.52) reported significantly higher average K10 scores than the Air Force. The Army reported a significantly lower average K10 score than the Navy (15.72 versus 16.31; mean difference –0.59, 95% CI –0.78, –0.41). The proportion of the Navy, Army and Air Force scoring in each of the four K10 scoring categories is presented in Figure 2.3.

***Figure 2.3:*** *Proportion of Navy, Army and Air Force scoring in each of the four K10 scoring zones*



#### 2.2.3.3 Deployment

***Table 2.8:*** *K10 risk categories in the ADF, by deployment status*

| | Ever deployed | | | Never deployed | | |
|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI |
| Low | *20,471* | 68.5 | 67.8–69.2 | *11,909* | 59.0 | 58.1–60.0 |
| Moderate | *6,008* | 20.1 | 19.5–20.7 | *5,228* | 25.9 | 25.0–26.8 |
| High | *2,481* | 8.3 | 7.9–8.7 | *2,174* | 10.8 | 10.2–11.4 |
| Very high | *918* | 3.1 | 2.8–3.3 | *859* | 4.3 | 3.8–4.7 |

There was a significant effect of deployment status on K10 scores: those who had been on operational deployment reported significantly lower mean K10 scores than those who had never been on operational deployment (15.27 versus 16.30; mean difference –1.03, 95% CI –1.18, –0.88).

In addition to the four-level scoring system described above, K10 scores were also categorised into two levels of psychological distress, low (10–19) and high (20–50), to enable comparison with ADF post-operational screening surveillance reports (that is, reports on the trends from the RtAPS and POPS). A table showing these outcomes is presented in Annex B (see Table B.21).

Using this scoring classification, 18.1% (95% CI 17.6–18.5) (17.5% of males and 21.4% of females) of the ADF scored in the high-risk category. Of the ADF personnel who had been on operational deployment, 15.8% scored in the high-risk group. This is higher than rates seen in recently deployed groups to the Middle East Area of Operations (MEAO) (8%) and those deployed to major operations in 2009 across the three Services (with a range of 5.0 to 9.3%) (Benassi & Steele, 2011; Nicholson, 2010). Further detailed analyses of these differences will be conducted later.

A detailed table combining all data presented in Tables 2.3 to 2.8 is provided in Annex B for ease of comparison across all ADF population subgroups (see Table B.22).

### 2.2.4 Impact of K10 psychological distress on daily activities

Information on total and partial days out of role as a result of psychological distress reported on the K10 was obtained from the self-report questionnaire. Each ADF member was asked to nominate how many days in the previous four weeks they were totally unable to carry out their work, study or day-to-day activities due to feelings of psychological distress and how many days they had to cut down on their work, study or day-to-day activities due to feelings of psychological distress (measured using the K10). The mean number of days totally and partially out of role in the ADF are presented in Tables 2.9 and 2.10. Detailed tables reporting the total and partial days out of role in the previous four weeks (sub-grouped by weeks) are provided in Annex B.

***Table 2.9:*** *Average number of days in the previous four weeks ADF personnel were totally unable to carry out their work, study or day-to-day activities due to psychological distress*

| | Days in the previous four weeks totally unable to work | |
|---|---|---|
| | Mean | 95% CI |
| **Total** | 0.37 | 0.35–0.40 |
| Males | 0.36 | 0.33–0.39 |
| Females | 0.49 | 0.42–0.55 |
| **Navy** | 0.42 | 0.36–0.48 |
| Male | 0.38 | 0.31–0.44 |
| Female | 0.64 | 0.48–0.80 |
| **Army** | 0.40 | 0.36–0.44 |
| Male | 0.39 | 0.35–0.44 |
| Female | 0.46 | 0.38–0.55 |
| **Air Force** | 0.28 | 0.25–0.31 |
| Male | 0.26 | 0.23–0.30 |
| Female | 0.37 | 0.28–0.46 |
| **Officers** | 0.22 | 0.20–0.25 |
| **Non-commissioned officers** | 0.37 | 0.34–0.41 |
| **Other ranks** | 0.50 | 0.43–0.56 |
| **Ever deployed** | 0.34 | 0.31–0.37 |
| **Never deployed** | 0.42 | 0.38–0.47 |

Results from zero-inflated negative binomial regressions showed the following factors to be significant predictors of psychological distress, which could result in total days out of role:

- sex (females were twice as likely compared to males (OR 2.42, 95% CI 2.08–2.81) to report psychological distress)
- Service (Navy members were 23% more likely than Air Force (OR 1.23, 95% CI 1.05–1.44) and Army members were 19% more likely than Air Force members (OR 1.19, 95% CI 1.04–1.37))
- rank (non-commissioned officers were 41% more likely than officers (OR 1.41, 95% CI 1.25–1.60) and other ranks were 53% more likely than officers (OR 1.53, 95% CI 1.30–1.81))
- deployment status (those who had been deployed were 15% less likely than those who had not been deployed (OR 0.85, 95% CI 0.74–0.97)).

In relation to the number of total days out of role due to psychological distress, the following predictor variables emerged as significant:

- sex (for females, the expected number of days totally out of role due to psychological distress was 31% less than for males (OR 0.69, 95% CI 0.58–0.82))

- Service (for Navy members, the expected number of days totally out of role due to psychological distress was 24% more than for Air Force members (RR 1.24, 95% CI 1.02–1.50); for Army members, the expected number of days totally out of role due to psychological distress was 21% more than for Air Force members (RR 1.21, 95% CI 1.03–1.43))
- rank (for non-commissioned officers, the expected number of days totally out of role due to psychological distress was 29% more than for officers (RR 1.29, 95% CI 1.10–1.53); for other ranks, the expected number of days totally out of role due to psychological distress was 44% more than for officers (RR 1.44, 95% CI 1.17–1.76)).

Deployment, however, was not a significant predictor of number of total days out of role due to psychological distress. Those effects were estimated for those who could have had total days out of role to psychological distress. Figure 2.4 shows the distribution in the ADF of total days lost in the previous four weeks due to psychological distress. Not represented in this figure is the 93.19% of ADF personnel who reported zero days out of role in the previous four weeks.

***Figure 2.4:*** *Proportion of ADF personnel reporting days totally unable to carry out their work, study or day-to-day activities due to psychological distress in the previous four weeks*

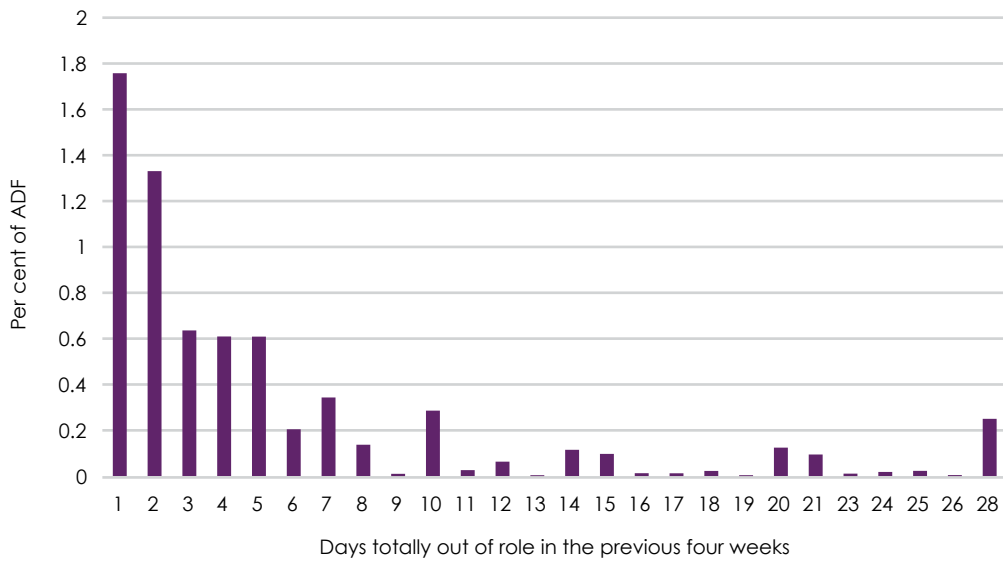


***Table 2.10:*** *Average number of days in the previous four weeks ADF personnel were partially unable to carry out their work, study or day-to-day activities due to psychological distress*

| | Days in the previous four weeks partially out of role | |
|---|---|---|
| | Mean | 95% CI |
| **Total** | 1.17 | 1.12–1.22 |
| Males | 1.09 | 1.04–1.14 |
| Females | 1.67 | 1.54–1.80 |
| **Navy** | 1.33 | 1.22–1.44 |
| Male | 1.24 | 1.11–1.36 |
| Female | 1.75 | 1.50–2.00 |
| **Army** | 1.13 | 1.06–1.20 |
| Male | 1.05 | 0.98–1.13 |
| Female | 1.86 | 1.61–2.10 |
| **Air Force** | 1.10 | 1.03–1.16 |
| Male | 1.04 | 0.97–1.11 |
| Female | 1.38 | 1.21–1.55 |
| **Officers** | 0.96 | 0.90–1.02 |
| **Non-commissioned officers** | 1.26 | 1.19–1.32 |
| **Other ranks** | 1.21 | 1.09–1.33 |
| **Ever deployed** | 1.14 | 1.09–1.20 |
| **Never deployed** | 1.20 | 1.12–1.29 |

Results from zero-inflated negative binomial regressions showed the following factors to be significant predictors of psychological distress, which could result in partial days out of role:

- sex (females were 64% more likely compared to males (OR 1.64, 95% CI 1.51–1.79) to report psychological distress)
- Service (Navy members were 15% more likely than Air Force (OR 1.15, 95% CI 1.05–1.26) and Army members were 25% more likely than Navy members (OR 1.25, 95% CI 1.14–1.37))
- rank (other ranks were 13% less likely than officers (OR 0.87, 95% CI 0.78–0.96))
- deployment status (those who had been deployed were 12% less likely than those who had not been deployed (OR 0.88, 95% CI 0.81–0.95)).

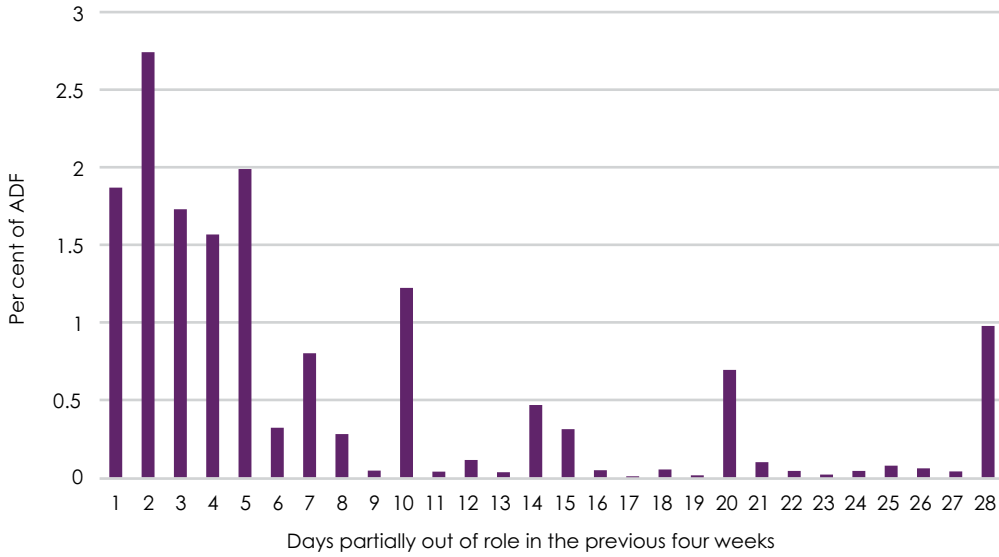
In relation to the number of partial days out of role due to psychological distress, the following predictor variables emerged as significant:

- sex by Service interaction (among Army personnel, the expected number of days partially out of role due to psychological distress was 21% more in females than males (RR 1.21, 95% CI 1.06–1.37); among females, the expected number of days partially out of role due to psychological distress was 38% more in the Army than the Air Force (RR 1.38, 95% CI 1.19–1.61))

- rank (for non-commissioned officers, the expected number of days partially out of role due to psychological distress was 39% more than for officers (RR 1.39, 95% CI 1.29–1.49); for other ranks, the expected number of days partially out of role due to psychological distress was 41% more than for officers (RR 1.41, 95% CI 1.27–1.57)).

Deployment, however, was not a significant predictor of number of partial days out of role due to psychological distress. Those effects were estimated for those who could have reported partial days out of role due to psychological distress. Figure 2.5 shows the distribution in the ADF of partial days lost in the previous four weeks due to psychological distress. Not represented in this figure is the 84.30% of ADF personnel who reported zero partial days out of role in the previous four weeks.

***Figure 2.5:*** *Proportion of ADF personnel reporting days partially unable to carry out their work, study or day-to-day activities due to psychological distress in the previous four weeks*




### 2.2.4.1 Doctor visits for K10 psychological distress

Information on the number of times ADF personnel saw a doctor in the previous four weeks for symptoms of psychological distress according to ADF population characteristics is reported in Table 2.11. A detailed table reporting the number of times ADF personnel reported seeing a doctor in the previous four weeks presented as a frequency is provided in Annex B.

***Table 2.11:*** *Doctor visits over the previous four weeks for symptoms of psychological distress*

| | Times seen a doctor in the previous four weeks | |
|---|---|---|
| | Mean | 95% CI |
| **Total** | 0.24 | 0.22–0.25 |
| Males | 0.21 | 0.20–0.22 |
| Females | 0.41 | 0.37–0.45 |
| **Navy** | 0.23 | 0.21–0.26 |
| Male | 0.19 | 0.16–0.21 |
| Female | 0.44 | 0.35–0.52 |
| **Army** | 0.26 | 0.24–0.28 |
| Male | 0.24 | 0.22–0.26 |
| Female | 0.43 | 0.36–0.51 |
| **Air Force** | 0.19 | 0.18–0.21 |
| Male | 0.16 | 0.15–0.18 |
| Female | 0.35 | 0.28–0.41 |
| **Officers** | 0.16 | 0.15–0.17 |
| **Non-commissioned officers** | 0.24 | 0.23–0.26 |
| **Other ranks** | 0.29 | 0.25–0.32 |
| **Ever deployed** | 0.24 | 0.22–0.26 |
| **Never deployed** | 0.23 | 0.22–0.25 |

Results from zero-inflated negative binomial regressions showed the following factors to be significant predictors of psychological distress, which could possibly result in a doctor visit:

- sex (females were twice as likely compared to males (OR 2.05, 95% CI 1.77–2.37) to report psychological distress)
- Service (Army members were 14% less likely than Air Force members (OR 0.86, 95% CI 0.75–0.98))
- rank (non-commissioned officers were 36% more likely than officers (OR 1.36, 95% CI 1.20–1.54) and other ranks were 45% more likely than officers (OR 1.45, 95% CI 1.23–1.71)).

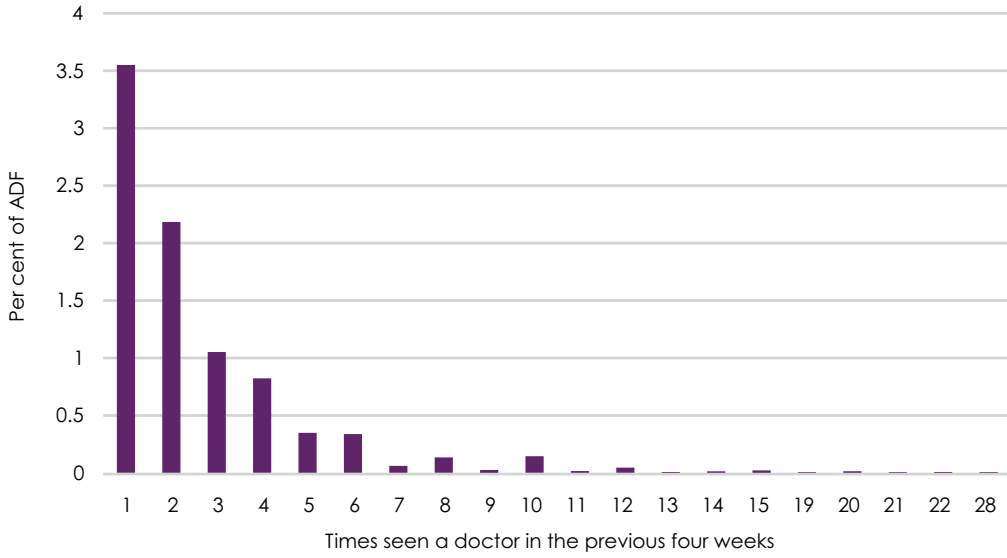
In relation to the number of visits to a doctor due to psychological distress, the following predictor variables emerged as significant:

- sex (for females, the expected number of doctor visits due to psychological distress was 22% more than for males (RR 1.22, 95% CI 1.05–1.43))
- Service (for Army members, the expected number of doctor visits due to psychological distress was 52% more than for Air Force members (RR 1.52, 95% CI 1.31–1.77) and 31% more than for Navy members (RR 1.31, 95% CI 1.13–1.54))

- rank (for non-commissioned officers, the expected number of doctor visits due to psychological distress was 20% more than for officers (RR 1.20, 95% CI 1.03–1.38); for other ranks, the expected number of doctor visits due to psychological distress was 32% more than for officers (RR 1.32, 95% CI 1.11–1.57)).

These effects were estimated for those who could have visited a doctor due to psychological distress. Deployment, however, was not a significant predictor of psychological distress that could result in a doctor visit or the number of visits to a doctor due to psychological distress. Figure 2.6 shows the distribution in the ADF of the number of visits to the doctor in the previous four weeks due to psychological distress. Not represented in this figure is the 91.19% of ADF personnel who reported zero visits to the doctor in the previous four weeks.

***Figure 2.6:*** *Proportion of ADF personnel reporting visits to the doctor due to psychological distress in the previous four weeks*




### 2.2.5 K10 cut-offs

Receiver Operating Characteristic (ROC) analysis was used to determine the optimal cut-off in the ADF to detect 30-day ICD-10 anxiety disorder, ICD-10 affective disorder and ICD-10 anxiety or affective disorder (Tables 2.12 to 2.14 and Figures 2.7 to 2.9), examined using the CIDI.

***Table 2.12:*** *Properties of the K10 optimal cut-offs for predicting 30-day ICD-10 anxiety disorder*

| | Sensitivity | | Specificity | | Positive predictive value | | Negative predictive value | |
|---|---|---|---|---|---|---|---|---|
| Cut-off | Value | 95% CI | Value | 95% CI | Value | 95% CI | Value | 95% CI |
| 17 | 0.68 | 0.49–0.87 | 0.72 | 0.68–0.75 | 0.16 | 0.13–0.20 | 0.96 | 0.94–0.99 |
| 26 | 0.30 | 0.19–0.40 | 0.95 | 0.93–0.96 | 0.31 | 0.23–0.39 | 0.94 | 0.92–0.97 |

ROC analysis found that the optimal cut-off for detecting any ICD-10 anxiety disorder was 17 (Table 2.12). This is the value that maximises the sum of the sensitivity and specificity (the proportion of those with and without the disease that are correctly classified). The area under the ROC curve was 0.75 (95% CI 0.60–0.89). Using the cut-off of 17, the sensitivity was 0.68 (95% CI 0.49–0.87), indicating that the K10 will detect 68% of those with an ICD-10 anxiety disorder. The specificity was 0.72 (95% CI 0.68–0.75), indicating that there is a 72% probability that those who do not have an ICD-10 anxiety disorder will score below the cut-off of 17 on the K10.

The second cut-off of 26 is the value that brings the number of false positives and false negatives closest together, counterbalancing these sources of error most accurately. Therefore, this cut-off would give the closest estimate to the true prevalence of 30-day ICD-10 anxiety as measured by the CIDI.

***Figure 2.7:*** *Receiver Operating Characteristic curve based on the K10 total score and 30-day ICD-10 anxiety disorder*

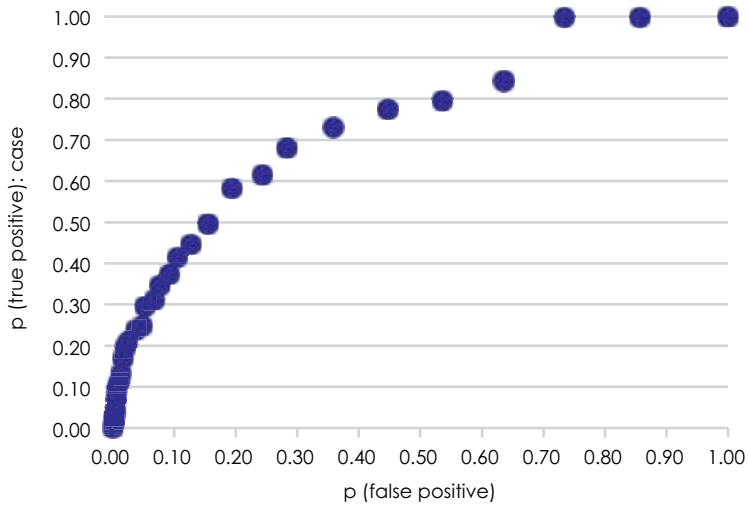



Figure 2.7 shows the ROC curve for the K10, using cut-off values to predict 30-day ICD-10 anxiety disorder. A more detailed table of the sensitivity, specificity, positive predictive value and negative predictive value for each of the cut-offs presented in this figure is provided in Annex B (see Table B.26).

***Table 2.13:*** *Properties of the K10 optimal cut-offs for predicting 30-day ICD-10 affective disorder*

| | Sensitivity | | Specificity | | Positive predictive value | | Negative predictive value | |
|---|---|---|---|---|---|---|---|---|
| Cut-off | Value | 95% CI | Value | 95% CI | Value | 95% CI | Value | 95% CI |
| 19 | 0.75 | 0.59–0.91 | 0.79 | 0.76–0.82 | 0.09 | 0.06–0.11 | 0.99 | 0.98–1.00 |
| 31 | 0.23 | 0.13–0.33 | 0.98 | 0.97–0.98 | 0.21 | 0.13–0.30 | 0.98 | 0.97–0.99 |

As can be seen in Table 2.13, the K10 performs better at predicting 30-day ICD-10 affective disorder than ICD-10 anxiety disorder. ROC analysis found that the optimal cut-off for detecting any ICD-10 affective disorder was 19, which was slightly higher than the cut-off for detecting 30-day anxiety disorder. The area under the ROC curve was also higher (0.81) (95% CI 0.70–0.91). Using the cut-off of 19, the sensitivity was 0.75 (95% CI 0.59–0.91), indicating that the K10 will detect 75% of those with an ICD-10 affective disorder. The specificity was 0.79 (95% CI 0.76–0.82), indicating that there is a 79% probability that those who do not have an ICD-10 affective disorder will score below the cut-off of 19 on the K10.

The second cut-off of 31 is the cut-off that would give the closest estimate to the true prevalence of 30-day ICD-10 affective disorder as measured by the CIDI.

***Figure 2.8:*** *Receiver Operating Characteristic curve based on the K10 total score and 30 day ICD-10 affective disorder*

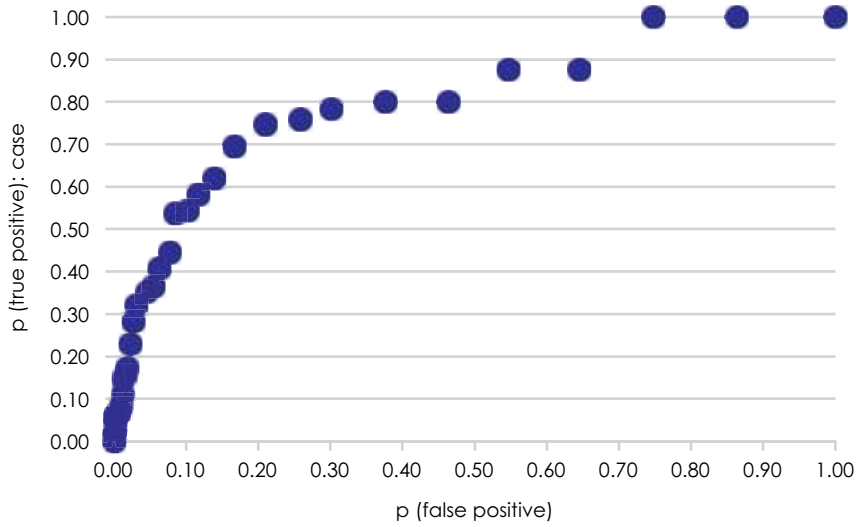



Figure 2.8 shows the ROC curve for the K10 using cut-off values to predict 30-day ICD-10 affective disorder. A more detailed table of the sensitivity, specificity, positive predictive value and negative predictive value for each of the cut-offs presented in this figure is provided in Annex B (see Table B.27).

***Table 2.14:*** *Properties of the K10 optimal values for predicting 30-day ICD-10 anxiety or affective disorder*

| | Sensitivity | | Specificity | | Positive predictive value | | Negative predictive value | |
|---|---|---|---|---|---|---|---|---|
| Cut-off | Value | 95% CI | Value | 95% CI | Value | 95% CI | Value | 95% CI |
| 19 | 0.59 | 0.44–0.73 | 0.81 | 0.78–0.84 | 0.24 | 0.19–0.28 | 0.95 | 0.92–0.98 |
| 25 | 0.30 | 0.21–0.39 | 0.93 | 0.92–0.95 | 0.32 | 0.24–0.39 | 0.93 | 0.91–0.96 |

Finally, Table 2.14 reports the psychometric properties of the K10 in the detection of any 30-day ICD-10 anxiety or affective disorder. ROC analysis found that the optimal cut-off for detecting any ICD-10 anxiety or affective disorder was 19, the same cut-off for detecting 30-day affective disorder alone. The area under the ROC curve, however, was lower (0.75) (95% CI 0.63–0.86). Using the cut-off of 19, the sensitivity was substantially lower (0.59) (95% CI 0.44–0.73), indicating that the K10 will only detect 59% of those with an ICD-10 anxiety or affective disorder if a cut-off of 19 is used. The specificity, however, was higher (0.81) (95% CI 0.78–0.84), indicating that there is an 81% probability that those who do not have an ICD-10 anxiety or affective disorder will score below the cut-off of 19 on the K10.

The second cut-off of 25 is the cut-off that would give the closest estimate to the true prevalence of 30-day ICD-10 affective disorder as measured by the CIDI.

***Figure 2.9:*** *Receiver Operating Characteristic curve based on the K10 total score and 30-day ICD-10 affective disorder or anxiety disorder*

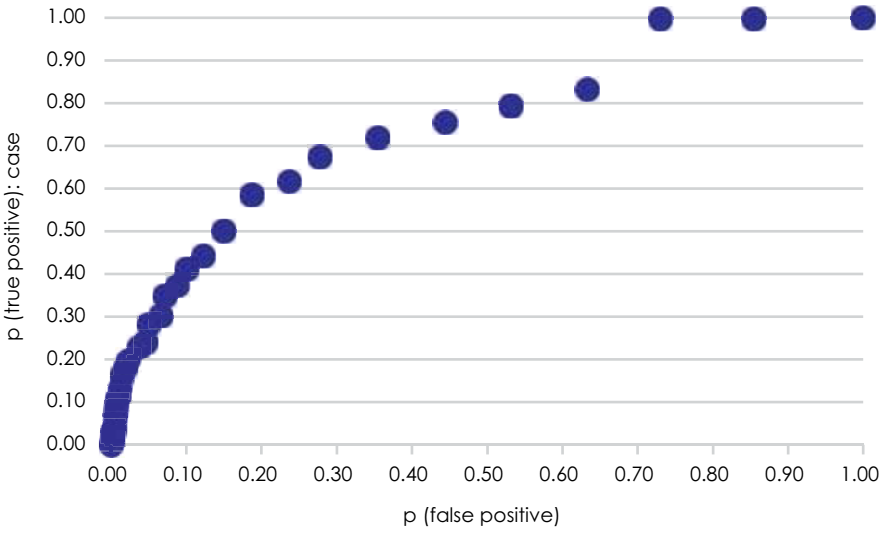



Figure 2.9 shows the ROC curve for the K10 using cut-off values to predict any 30-day ICD-10 affective disorder or any 30-day ICD-10 anxiety disorder. A more detailed table of the sensitivity, specificity, positive predictive value and negative predictive value for each of the cut-offs presented in this figure is provided in Annex B (see Table B.28).

### 2.2.6 Discussion

Overall, 3.6% of the ADF reported very high levels of psychological distress on the K10, 9.3% reported high levels of distress and 22.5% reported moderate levels of distress. Around two-thirds of the ADF reported nil or low levels of psychological distress. The average number of days out of role in the previous four weeks in the ADF due to psychological distress was 0.37 days. A further 1.17 mean days were associated with partial loss of productivity. This equated to an average of 1.5 days per ADF member of lost productivity due to symptoms psychological distress.

In Australia, the K10 was used in deployment health studies of personnel deployed in Bougainville, East Timor, Solomon Islands and the first Gulf War. In the Bougainville post-deployment health study, 5% of veterans reported very high levels of psychological distress, which was slightly lower than an ADF comparison group of 7% (McGuire, Waller et al., 2009a). Data from the East Timor study identified that 7% of veterans and 5% of the comparison group scored in the very high category (McGuire, Waller et al., 2009b). The Solomon Islands study demonstrated lower levels among the Solomon Islands veterans: 3.5% scored in the very high category, compared to 4.8% among the comparison group (McGuire, Waller, D'Este et al., 2009).

A recent study combining these datasets identified that deployment to Bougainville, East Timor or the Solomon Islands (jointly referred to as the Near North Areas of Influence) was associated with higher scores on the K10. Specifically, ADF personnel who were deployed for eight to 10 months were 1.5 times more likely to score above 20, compared to those who had been deployed for one to three months. Those who had been deployed at least twice were twice as likely to score above 20 than those who had never been deployed (Bleier et al., 2011).

In a study reporting K10 rates at POPS for personnel deployed to the MEAO in 2010, 8% of members reported K10 scores in the high risk category (K10 ≥ 20) (Benassi & Steele, 2011). Similarly, the proportion of ADF personnel deployed to major operations in 2009 reporting in the high risk category (K10 ≥20) for psychological distress ranged from 5.0 to 9.3% across the three Services (Nicholson, 2010).

#### 2.2.6.1 Demographic characteristics

Females reported significantly higher mean K10 scores than ADF males; Army females reported more partial days out of role than Army males and Air Force females. There was no significant difference between the sexes, however, in total days out of role due to psychological distress. However, females were also more inclined to seek help from a doctor in relation to that psychological distress; the expected number of doctor visits due to psychological distress in the previous four weeks was 22% higher for females compared to males.

The Navy reported significantly higher mean scores on the K10 than both the Army and the Air Force and significantly more total days out of role due to this distress than Air Force members. Navy members also sought help from a doctor significantly fewer times than Army members.

In relation to rank, the other ranks reported significantly higher mean K10 scores than both officers and non-commissioned officers. Consistent with this finding, other ranks reported significantly more total days out of role in the previous four weeks than officers as a result of that psychological distress, and they also reported significantly more visits to the doctor than officers.

Of the ADF personnel who had been on operational deployment, 15.8% scored in the high-risk group (scores of 20 to 50 on the K10). This is higher than rates seen in recently deployed groups to the MEAO (8%) and across the three Services deployed to major operations in 2009 (with a range of 5.0 to 9.3%) (Benassi & Steele, 2011; Nicholson, 2010). This suggests that when completing identified screening instruments (such as the RtAPS and POPS), ADF personnel may be less likely to report psychological distress than when the survey is anonymous.

There was a significant effect of deployment status on K10 scores: those who had been on operational deployment reported significantly lower mean K10 scores compared to those who had never been on operational deployment. On the surface, this might suggest that there is no particular risk of psychological distress associated with operational service. It may be, however, that it is not until the nature of the deployment is examined (warlike or non-warlike deployments) that an effect may emerge. An alternative explanation is that the ADF Medical Classification System (MEC system) may have precluded individuals from being deployed due to medical or psychological conditions. As a consequence there may be slightly higher rates in the non-deployed sample. These are questions that need to be addressed in further analyses. There were no noteworthy differences between those who had been on deployment and those who had not been on deployment in relation to levels of impairment or number of visits to the doctor.

#### 2.2.6.2 ADF-specific cut-offs

ROC analysis was used to examine the psychometric properties of the K10 in determining ICD anxiety and affective disorders. Previously, research has shown that the K10 performs adequately at predicting current and 12-month ICD-10/DSM-IV disorders within the Australian community (specifically affective and anxiety disorders) with area under the ROC curves ranging from 0.80 to 0.955 (Cairney, Veldhuizen, Wade, Kurdyak, & Streiner, 2007; Furukawa et al., 2003; Kessler et al., 2002; Oakley Browne, Wells, Scott, & McGee, 2010).

Using the standard K10 cut-off of 20 that is currently used in Defence for clinical screens, the K10 performs better at predicting 30-day affective disorder than 30-day anxiety disorder. Psychometric analysis of the K10 indicated that the optimal screening cut-off for affective disorder would be 19 and for anxiety disorder, 17. Therefore, to most effectively capture both disorders, the conservative cut-off of 17 should be used.

To determine epidemiological caseness, a more stringent cut-off needs to be applied to reduce the number of false diagnoses. For this purpose, in the ADF population a cut-off of 25 needs to be applied. This would provide the most accurate estimate of the number of personnel with either a current anxiety or current affective disorder.

In summary, the K10 is an instrument that is widely used in epidemiological studies to identify the levels of distress and possible psychological caseness within a population. Although self-reported psychological distress in the ADF was low, the K10 remains an appropriate screening tool for use in the ADF, particularly for ICD-10 affective disorders. A cut-off of 17 is recommended.

### 2.2.7 Proposed further analyses

This section reports the analyses completed at the time of publication. Proposed further analyses include:

- examining the psychometric properties and determining the most effective cut-off for detecting ICD-10 mood disorders (depressive episodes and dysthymia only) compared to ICD-10 affective disorders. This is in response to recent studies that suggest that the K10 may be a better predictor of affective disorders, which do not include mania or hypomania
- establishing optimal cut-offs on the K10 for each gender and Service in the ADF
- examining the relationship between K10 scores and lifetime ICD-10 affective and anxiety disorders
- examining the relationship between K10 scores and 12-month ICD-10 affective and anxiety disorders
- examining the relationship between K10 scores and sub-threshold anxiety and affective disorder
- examining the relationship between K10 scores and DSM-IV disorders and determining cut-offs for 30-day, 12-month and lifetime affective and anxiety disorders
- examining the relationship between K10 scores obtained from the Mental Health Prevalence Study and other datasets, such as the RtAPS and POPS
- establishing different cut-offs for each type of anxiety disorder and affective disorder
- examining the nature of the distress in ADF personnel who score high on the K10 but do not have a diagnosable disorder based on the CIDI.

## 2.3 Posttraumatic Stress Disorder Checklist (PCL)

- Of ADF personnel, 6.7% reported in the high to very high risk category for PTSD.
- For both males and females, the Navy reported significantly higher mean PCL scores than the Air Force.
- Army males reported significantly higher mean PCL scores than Navy males.
- Air Force females reported significantly higher mean PCL scores than Air Force males.
- Non-commissioned officers were most at risk, reporting significantly higher mean PCL scores than both commissioned officers and other ranks.
- Deployed personnel reported significantly higher mean PCL scores than non-deployed personnel.
- A PCL-C cut-off of 29 is recommended for screening for PTSD in ADF populations.
- A PCL-C cut-off of 53 is recommended for reporting diagnosable PTSD.

This section provides a detailed summary of self-report post-traumatic symptoms in the ADF population reported by currently serving ADF members. This section examines the distribution of symptomatology by the demographic categories of rank, sex, Service and deployment status. Receiver Operating Characteristic (ROC) analyses were used to determine the optimal psychometric cut-offs for use in the ADF to screen for and detect 30-day ICD-10 post-traumatic stress disorder.

The 17 questions of the PCL were scored from 1 to 5 and summed to give a total score from 17 to 85. To allow comparison with the broader military literature, the PCL scores were grouped into four risk levels: low (17 to 29), moderate (30 to 39), high (40 to 49) and very high (50 to 85), which reflect the risk of post-traumatic stress disorder. These same risk groupings are used in post-operational screening surveillance reports (Weathers, Litz, Herman, Huska, & Keane, 1993).

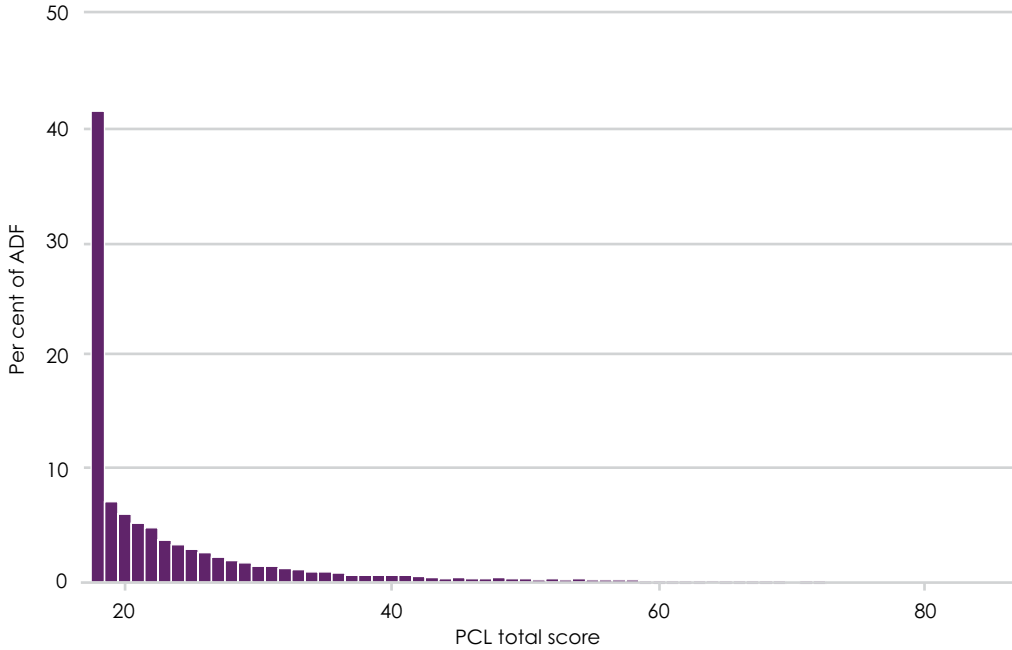
### 2.3.1 Distribution of post-traumatic symptoms within the ADF

Examining the data of the total PCL-C scores (Table 2.15) using the four risk levels – low (17 to 29), moderate (30 to 39), high (40 to 49) and very high (50 to 85) – less than 5% of the ADF would be considered very high risk. The mean PCL total score for the ADF was 22, which is in the low-scoring category. The distribution of PCL total scores for the entire ADF is presented in Figure 2.10.

***Table 2.15:*** *PCL score summary statistics*

| | Estimate | 95% CI |
|---|---|---|
| Minimum | 17.0 | |
| 10% | 17.0 | 17.0–17.0 |
| 25% | 17.0 | 17.0–17.0 |
| Median | 18.1 | 18.0–18.2 |
| Mean | 22.7 | 22.6–22.8 |
| 75% | 24.0 | 23.8–24.2 |
| 90% | 33.8 | 33.5–34.2 |
| 95% | 42.6 | 42.0–43.3 |
| 99% | 60.2 | 59.1–61.3 |
| Maximum | 85.0 | |

***Figure 2.10:*** *Distribution of PCL total scores in the ADF*



#### 2.3.1.1 PCL in the ADF by sex

A comparison of the PCL scoring bands in the ADF for males and females is presented in Table 2.16.

***Table 2.16:*** *PCL risk categories in the ADF, by sex*

| | Males | | Females | | Total | |
|---|---|---|---|---|---|---|
| | % | 95% CI | % | 95% CI | % | 95% CI |
| Low | 84.7 | 65.1–66.3 | 84.0 | 83.1–84.9 | 84.6 | 84.3–85.0 |
| Moderate | 8.7 | 8.3–9.0 | 9.0 | 8.3–9.7 | 8.7 | 8.4–9.0 |
| High | 3.7 | 3.4–3.9 | 4.0 | 3.5–4.4 | 3.7 | 3.5–3.9 |
| Very high | 2.9 | 2.7–3.1 | 3.0 | 2.6–3.5 | 3.0 | 2.8–3.1 |

Overall in the ADF, 3.0% scored in the very high range on the PCL, 3.7% scored in the high range and 8.7% scored in the moderate range.

From the analysis of PCL score (not presented), there was a significant sex by Service interaction; therefore, the individual effect of sex will not be reported in this section.

### 2.3.2 PCL in different population subgroups

#### 2.3.2.1 Rank

Table 2.17 reports the PCL risk categories by rank.

***Table 2.17:*** *PCL risk categories in the ADF, by rank*

| | Officers | | | Non-commissioned officers | | | Other ranks | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Low | *10,513* | 87.4 | 86.8–87.9 | *18,498* | 82.9 | 82.4–83.4 | *13,352* | 85.1 | 84.2–86.0 |
| Moderate | *937* | 7.8 | 7.4–8.2 | *2,134* | 9.6 | 9.2–9.9 | *1,290* | 8.2 | 7.5–8.9 |
| High | *930* | 7.7 | 7.3–8.2 | *1,977* | 8.9 | 8.5–9.3 | *1,747* | 11.1 | 10.3–12.0 |
| Very high | *266* | 2.2 | 2.0–2.4 | *739* | 3.3 | 3.1–3.5 | *472* | 3.0 | 2.6–3.4 |

From the multiple regression of PCL scores, non-commissioned officers were most at risk, reporting significantly higher mean PCL scores than both officers (23.25 versus 22.06; mean difference 1.19, 95% CI 1.01–1.37) and other ranks (23.25 versus 22.4; mean difference 0.76, 95% CI 0.49–1.03). Personnel in the other ranks also reported significantly higher mean K10 scores than officers (22.49 versus 22.06; mean difference 0.43, 95% CI 0.16–0.70).

#### 2.3.2.2 Service

Tables 2.18 to 2.20 report the PCL scoring bands for each of the three Services by sex.

***Table 2.18:*** *PCL risk categories in the Navy, by sex*

| | Male | | | Female | | | Persons | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Low | *8,022* | 84.4 | 83.4–85.3 | *1,731* | 82.3 | 80.4–84.1 | *9,753* | 84.0 | 83.1–84.8 |
| Moderate | *846* | 8.9 | 8.2–9.6 | *214* | 10.2 | 8.7–11.7 | *1,060* | 9.1 | 8.5–9.8 |
| High | *351* | 3.7 | 3.2–4.2 | *103* | 4.9 | 3.9–5.9 | *454* | 3.9 | 3.5–4.4 |
| Very high | *289* | 3.0 | 2.6–3.5 | *57* | 2.7 | 1.9–3.5 | *345* | 3.0 | 2.6–3.4 |

***Table 2.19:*** *PCL risk categories in the Army, by sex*

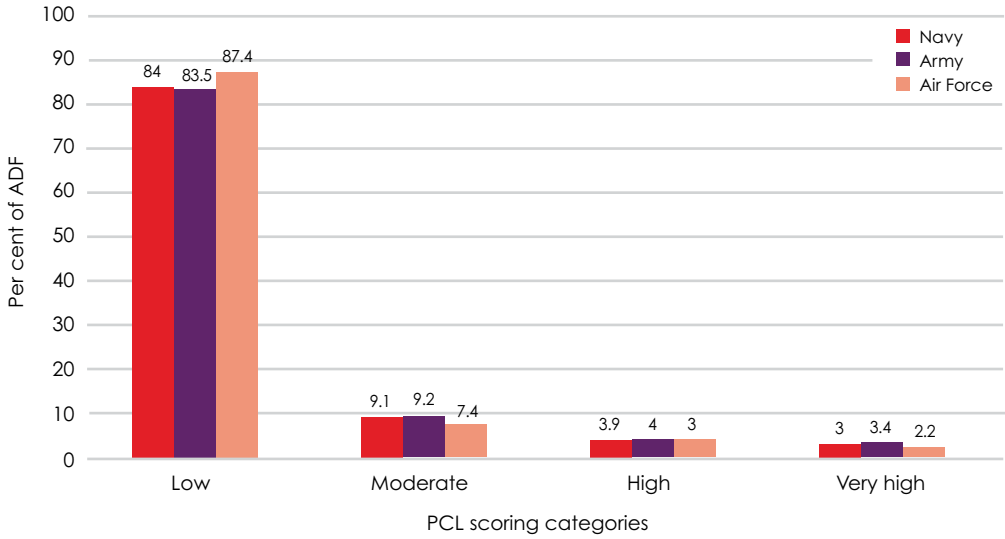
| | Male | | | Female | | | Persons | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Low | *19,058* | 83.4 | 82.8–84.1 | *2,114* | 84.1 | 82.7–85.5 | *21,173* | 83.5 | 82.9–84.1 |
| Moderate | *2,100* | 9.2 | 8.7–9.7 | *227* | 9.0 | 7.9–10.2 | *2,327* | 9.2 | 8.7–9.6 |
| High | *910* | 4.0 | 3.7–4.3 | 96 | 3.8 | 3.1–4.6 | *1,006* | 4.0 | 3.7–4.3 |
| Very high | *774* | 3.4 | 3.1–3.7 | *75* | 3.0 | 2.3–3.7 | *850* | 3.4 | 3.1–3.6 |

***Table 2.20:*** *PCL risk categories in the Air Force, by sex*

| | Male | | | Female | | | Persons | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Low | *9,564* | 87.8 | 87.2–88.4 | *1,874* | 85.5 | 84.3–86.7 | *11,438* | 87.4 | 86.9–88.0 |
| Moderate | *803* | 7.4 | 6.9–7.8 | *170* | 7.8 | 6.8–8.7 | *973* | 7.4 | 7.0–7.9 |
| High | *317* | 2.9 | 2.6–3.2 | *71* | 3.3 | 2.6–3.9 | *388* | 3.0 | 2.7–3.2 |
| Very high | *206* | 1.9 | 1.7–2.1 | *75* | 3.4 | 2.8–4.0 | *282* | 2.2 | 1.9–2.4 |

From the multiple regression of PCL scores, there was a significant sex by Service interaction. Within the Air Force, females reported significantly higher mean PCL scores than males (22.44 versus 21.63; mean difference 0.81, 95% CI 0.46, 1.16). Within males, both the Army (22.90 versus 21.63; mean difference 1.27, 95% CI 1.06, 1.49) and the Navy (22.7 versus 21.63; mean difference 1.07, 95% CI 0.79, 1.35) reported significantly higher mean PCL scores than the Air Force. Within ADF females, the only significant effect was for the Navy compared to the Air Force: Navy females reported significantly higher mean scores (23.15 versus 22.44; mean difference 0.71, 95% CI 0.15, 1.26). Due to the significant sex by Service interaction, separate Service effects will not be reported in this section; however, the proportion of Navy, Army and Air Force personnel scoring in each of the four PCL scoring categories is presented in Figure 2.11.

***Figure 2.11:*** *Proportion of Navy, Army and Air Force scoring in each of the four PCL scoring zones*




### 2.3.2.3 Deployment

Post-traumatic risk categories in the ADF by deployment status are summarised in Table 2.21.

***Table 2.21:*** *PCL risk categories in the ADF, by deployment status*

| | Ever deployed | | | Never deployed | | |
|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI |
| Low | *25,954* | 84.1 | 83.7–84.6 | *16,410* | 85.5 | 84.8–86.1 |
| Moderate | *2,815* | 9.1 | 8.8–9.5 | *1,545* | 8.0 | 7.5–8.6 |
| High | *1,140* | 3.7 | 3.5–3.9 | *708* | 3.7 | 3.3–4.0 |
| Very high | *941* | 3.0 | 2.8–3.3 | *536* | 2.8 | 2.5–3.1 |

There was a significant effect of deployment status on PCL scores: those who had been on operational deployment reported significantly higher mean PCL scores compared to those who had never been on operational deployment (22.75 versus 22.45; mean difference 0.31, 95% CI 0.09–0.53).

A detailed table combining all data presented in Tables 2.16 to 2.21 is provided in Annex B for ease of comparison across all ADF population subgroups (see Table B.29).

## 2.3.3 Optimal PCL cut-offs

Receiver Operating Characteristic (ROC) analysis was used to determine the optimal cut-off in the ADF to detect 30-day ICD-10 PTSD (Table 2.22), examined using the CIDI.

***Table 2.22:*** *Properties of the optimal PCL cut-offs for predicting 30-day ICD-10 PTSD*

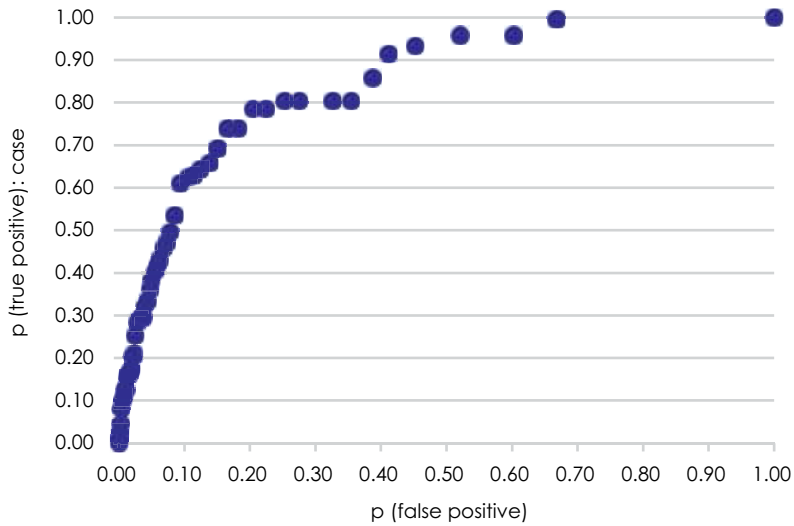
| Cut-off | Sensitivity | | Specificity | | Positive predictive value | | Negative predictive value | |
|---|---|---|---|---|---|---|---|---|
| | Value | 95% CI | Value | 95% CI | Value | 95% CI | Value | 95% CI |
| 29 | 0.79 | 0.65–0.92 | 0.80 | 0.77–0.82 | 0.12 | 0.09–0.15 | 0.99 | 0.98–1.00 |
| 53 | 0.25 | 0.15–0.35 | 0.97 | 0.97–0.98 | 0.26 | 0.16–0.36 | 0.97 | 0.97–0.98 |

ROC analysis found that the optimal cut-off for detecting any ICD-10 PTSD was 29, which is similar to the cut-off of 30 used in the ADF operational screening environment to warrant an interview with a psychologist and possible referral. This value of 29 maximised the sum of the sensitivity and specificity (the proportion of those with and without the disorder who are correctly classified). The area under the ROC curve was 0.85 (95% CI 0.79–0.91). Using a cut-off of 29, the sensitivity was 0.79 (95% CI 0.65–0.92), indicating that 79% of those with ICD-10 PTSD would be detected. The specificity was 0.80 (95% CI 0.77–0.82), indicating that there was an 80% probability that those who did not have an ICD-10 PTSD would score below the cut-off of 29 on the PCL-C.

The second cut-off of 53 is the value that brings the number of false positives and false negatives closest together, counterbalancing those sources of error most accurately. Therefore, this cut-off would give the closest estimate to the true prevalence of 30-day ICD-10 PTSD as measured by the CIDI.

Figure 2.12 shows the ROC curve for the PCL using cut-off values to predict any 30-day ICD-10 PTSD.

***Figure 2.12:*** *Receiver Operating Characteristic curve based on the PCL total score and 30-day ICD-10 PTSD*




A more detailed table of the sensitivity, specificity, positive predictive value and negative predictive value for each of the cut-offs presented in this figure is provided in Annex B (see Table B.30).

### 2.3.4 Discussion

Overall in the ADF, 3.0% scored in the very high range on the PCL, 3.7% scored in the high range and 8.7% scored in the moderate range.

#### 2.3.4.1 Demographic characteristics

There was a significant sex by Service interaction from the multiple regression for PCL scores. Within both males and females, the Navy reported significantly higher mean PCL scores than the Air Force. In addition, Army males reported significantly higher mean PCL scores than Navy males. The only difference within Service to be observed was for the Air Force, in which females reported significantly higher mean PCL scores than males.

In relation to rank, non-commissioned officers were most at risk, reporting significantly higher mean PCL scores than both officers and other ranks.

Finally, there was a significant effect of deployment status on PCL scores. Those who had been on operational deployment reported significantly higher mean PCL scores compared to those who had never been on operational deployment.

#### 2.3.4.2 ADF-specific cut-offs

Using a cut-off of 50 on the self-report PCL, 3.0% of the ADF population was likely to be at risk for developing post-traumatic stress disorder. This is notably lower than rates between 4.0% and 25.6% identified in other military samples and the estimated 12-month ICD-10 PTSD rate of 8.3% reported in Section 1 of this report.

One of the challenges in interpreting data from the PCL-C is determining the optimal cut-off for case identification of PTSD. Based on work with Vietnam combat veterans, the instrument's developers (Weathers et al., 1993) recommended a cut-off of 50 to indicate those likely to be diagnosed with PTSD. Forbes et al. (2001) in a study of Australian Vietnam veterans also recommended a cut-off of 50. A cut-off of 50 on the PCL has been used in a number of major deployment studies (Barrett et al., 2002; Fear et al., 2010; Hoge et al., 2004; Thomas et al., 2010). Hoge and colleagues, for example, reported a PTSD prevalence of 6.2% in US Afghan veterans and 12.9% in US Iraq veterans (Hoge et al., 2004). The rate of PTSD following deployment to Iraq and Afghanistan among UK forces has been reported as 4% (Fear et al., 2010). Other studies have reported higher rates, such as the US study of the National Guard, in which 25.6% scored above the cut-off for PTSD one year post-deployment (Thomas et al., 2010). It is important to note that differences in reported rates may be partially explained by systematic response bias or measurement issues.

In the Australian context, a PCL cut-off of 50 has been used to examine PTSD in military personnel returning from deployment in Bougainville, East Timor and the first Gulf War. In the Bougainville post-deployment health study, 6.5% of veterans were at risk of PTSD using a cut-off score of 50, compared to 8% in those who had not been deployed (McGuire, Waller et al., 2009a). Data from the East Timor study identified a risk rate for PTSD of 7.0% in the veterans and 6.0% in the comparison sample (McGuire, Waller et al., 2009b). Following the first Gulf War, a rate of 7.9% was found among the Gulf War veterans and 4.6% among the comparison group (McKenzie et al., 2004). A large proportion of participants in the latter study, however, were no longer active serving members of the ADF.

Post-deployment screening data for personnel returning from deployment to the Middle East Area of Operations (MEAO) in 2010 have shown that the majority of personnel report in the low risk category (91.3%) (Benassi & Steele, 2011). Only 1% of ADF personnel reported in the very high risk group (50+) and 1.4% of ADF personnel reported in the high risk group (40 to 49).

There is increasing evidence in the literature that a score of 50 is not the optimal cut-off for all populations or settings. Research has focused in particular on military populations, where under-reporting may occur because of the perception that the impact of seeking treatment will affect the individual's employability.

A recent study by Bliese and colleagues (2008) on combat forces identified that a more efficient cut-off for the PCL with US forces was between 30 and 34. Specifically, that study reported that with a cut-off score of 50 the positive predictive value for identifying PTSD was 0.56, with a specificity of 0.98 and a sensitivity of 0.24. In contrast, the positive predictive value for a cut-off score of 30 was 0.38, with a specificity of 0.88 and a sensitivity of 0.78. Although false positives and false negatives will always exist, ideally a cut-off should be associated with a specificity of approximately 0.90, while maintaining sensitivity values above 0.70.

Bliese and colleagues (2008) suggest that the cut-off score of 50 might be too high in a military primary care or post-deployment setting (because mental health stigmas result in symptom under-reporting), but that such a score may be suitable for treatment-seeking mental health populations.

Recent guidance from the US Department of Veterans Affairs National Center for PTSD states that 'a lower cut-off should be considered when screening or when it is desirable to maximise detection of possible cases' (Department of Veterans Affairs, 2010). A higher cut-off should be considered when attempting to make a definite diagnosis or to minimise false positives.

While the ADF originally employed a PCL-C cut-off of 50 for post-operational screening, a review by Nicholson (2006) prompted a change in mid-2008 (Department of Defence 2009). Policy was changed to recommend that deployed ADF personnel reporting scores between 30 and 39 were of medium risk and warranted further assessment or examination by a psychologist and possible referral, and that members reporting scores over 40 were of high risk and required more thorough assessment and may need further intervention such as counselling.

When using the cut-off of 40 recommended by the ADF in post-operational screening to warrant assessment and possible counselling, 6.7% of ADF personnel in the study reported in this risk range. In addition, using a cut-off of 30, 15.4% of ADF personnel reported PTSD symptomatology. These findings support the need to retain the bands recommended in the current ADF policy to ensure that members are being identified and treated appropriately.

To determine the optimal cut-off for detecting 30-day ICD-10 PTSD, ROC analysis was performed. Using this method, the optimal cut-off was 29, which maximised the sum of the sensitivity and specificity. This score is only slightly lower than the cut-off of 30 suggested by Nicholson (2006).

To report prevalence rates and for clinical diagnosis, a PCL-C cut-off of 53 is recommended (noting the importance of there being a trauma exposure and reaction (Criterion A) in a diagnosis of PTSD).

### 2.3.5 Proposed further analyses

This section reports the analyses completed at the time of publication. Proposed further analyses include:

- establishing optimal cut-offs on the PCL specific to each sex and Service in the ADF
- examining the symptom factor structure of PTSD (that is, re-experiencing [cluster B], avoidance/numbing [cluster C], and hyperarousal [cluster D]) in the ADF. We note that the three-factor structure of PTSD has been called into question by theorists and empirical findings. It has been repeatedly suggested that a four-factor model may best represent the latent structure of PTSD
- examining the relationship between PCL scores and lifetime ICD-10 PTSD
- examining the relationship between PCL scores and 12-month ICD-10 PTSD
- examining the relationship between the PCL and sub-threshold PTSD
- examining the relationship between PCL scores and DSM-IV disorder and determine cut-offs for 30-day, 12-month and lifetime DSM-IV PTSD
- examining the relationship between PCL scores obtained from the Mental Health Prevalence Study and other datasets, such as the RtAPS and POPS, to better map longitudinally emerging patterns of PTSD
- providing a detailed analysis of the psychometric differences between the PCL methodology used in the non-MEAO subpopulation and that used in the MEAO subpopulation
- examining the relationship between trauma exposure and scores on the PCL
- examining the nature of distress in ADF personnel who score high on the K10 but do not have a diagnosable disorder based on the CIDI.

## 2.4 Alcohol consumption – Alcohol Use Disorders Identification Test (AUDIT)

- 40% of the ADF reported drinking an alcoholic drink at least twice a week.
- 29% of the ADF drank more than five alcoholic drinks on a typical day when they were drinking.
- The number of self-reported problems with alcohol was low.
- 3.7% of personnel scored within a high risk category, indicating the need for counselling or treatment.
- Males showed a consistent pattern of greater alcohol consumption and alcohol-related problems compared to females across all Services.
- Air Force personnel were the least likely to report alcohol misuse.
- Other ranks most often scored in the risk categories that indicated hazardous or harmful alcohol use.
- Whether or not an individual had been on operational deployment had no significant impact on the amount of alcohol consumed on a typical day.
- The AUDIT is a useful tool for mapping patterns of consumption and the risky use of alcohol in the ADF.
- An AUDIT cut-off of 8 is effective as a clinical screening instrument to maximise the number of personnel identified for further assessment.
- Binge drinking rather than alcohol dependence may be a primary target for behavioural change in the ADF.

This section provides a detailed summary of the pattern of self-report alcohol use within the ADF population. It also summarises the optimal cut-offs in the ADF to detect 30-day ICD-10 any alcohol disorder, ICD-10 alcohol harmful use and ICD-10 alcohol dependence.

The Alcohol Use Disorders Identification Test (AUDIT) (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) is a brief self-report instrument that is widely used in epidemiological and clinical practice for defining at-risk patterns of drinking. It was developed by the World Health Organization (WHO) for primary care setting after an extensive six-nation validation trial that included Australia (Babor, Higgins-Biddle, & Saunders, 2001).

The AUDIT examines the quantity and frequency of alcohol consumption, possible symptoms of dependence, and the reactions or problems related to alcohol. The first eight questions use a five-item continuous scale (scored 0 to 4), while the last two questions use a three-item scale (scored 0, 2 or 4). A final score is reached by summing across all 10 questions.

The AUDIT has been used by the ADF as an educational, epidemiological and clinical tool since the start of the ADF Mental Health Strategy. It was officially recognised as a tool to 'identify people whose drinking may pose a risk to their health, or who are already experiencing alcohol-related problems, including dependence' in ADF Health

Bulletin Number 15/2003 (Department of Defence, 2003). The ADF chose to use the AUDIT due to its extensive use across the world, its brevity and the large amount of supportive research (Swann, 2005). Members can self-score the AUDIT on the Mental Health Strategy website and learn about alcohol-related harm. It is also used in periodic health screening and in clinical settings. It has been part of the Post-operational Psychological Screen (POPS) process since its introduction in 1999 (Steele & Goodman, 2006). Due to its widespread use by Defence, it is important that the most appropriate cut-offs be applied to ensure that early detection and optimal care can be provided.

Currently, the recommended WHO risk categories are used with ADF populations and are the cut-offs used in the study. This process identifies four zones of risk:

- **Zone I** (scores of 0 to 7) represents those who would benefit from alcohol education.
- **Zone II** (scores of 8 to 15) represents those who are likely to require simple advice.
- **Zone III** (scores of 16 to 19) represents those for whom counselling and continued monitoring is recommended.
- **Zone IV** (scores of 20 to 40) requires diagnostic evaluation and treatment (Babor, de la Fuente, Saunders, & Grant, 1989; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001).

It should be recognised, however, that several other scoring methods and cut-off scores have also been developed and used in the Australian community for other populations (Adewuya, 2005; Pal, Jenar, & Yadav, 2004).

Receiver Operating Characteristic (ROC) analyses were used to determine the optimal cut-off in the ADF to detect 30-day ICD-10 any alcohol disorder, ICD-10 alcohol harmful use and ICD-10 alcohol dependence, examined using the CIDI.

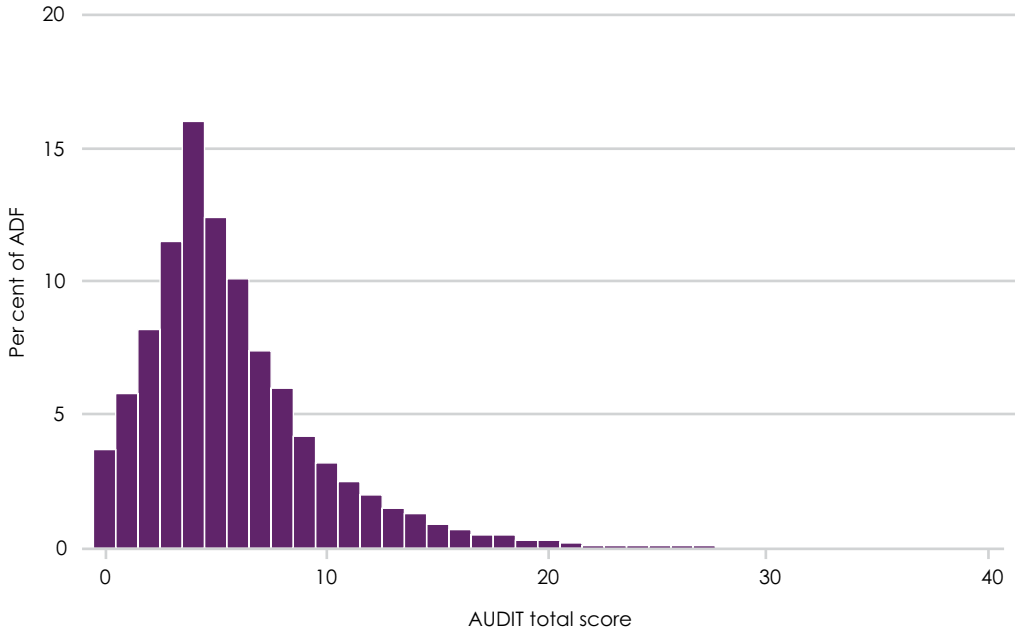
### 2.4.1 The distribution of AUDIT scores in the ADF

***Table 2.23:*** *AUDIT score summary statistics*

| | Estimate | 95% CI |
|---|---|---|
| Minimum | 0.0 | |
| 10% | 1.1 | 1.0–1.1 |
| 25% | 2.7 | 2.7–2.8 |
| Median | 4.5 | 4.5–4.6 |
| Mean | 6.0 | 5.9–6.0 |
| 75% | 7.2 | 7.1–7.3 |
| 90% | 10.9 | 10.8–11.0 |
| 95% | 13.7 | 13.5–13.9 |
| 99% | 20.3 | 19.7–20.8 |
| Maximum | 39.0 | |

Examination of the data on the AUDIT score quantiles chart (Table 2.23) suggests that about 25% of the ADF population has an audit score above 8, warranting some intervention, including simple advice, while less than 5% of the ADF population requires counselling or treatment. The distribution of AUDIT total scores for the entire ADF is presented in Figure 2.13.

***Figure 2.13:*** *Distribution of AUDIT total scores in the ADF*




## 2.4.2 AUDIT in the ADF by sex

A comparison of the AUDIT risk categories in the ADF for males and females is presented in Table 2.24.

***Table 2.24:*** *AUDIT risk categories in the ADF, by sex*

| | Males | | Females | | Total | |
|---|---|---|---|---|---|---|
| | % | 95% CI | % | 95% CI | % | 95% CI |
| Zone I | 71.9 | 71.3–72.5 | 71.9 | 71.3–72.5 | 73.6 | 73.1–74.2 |
| Zone II | 24.1 | 23.5–24.7 | 24.1 | 23.5–24.7 | 22.7 | 22.2–23.2 |
| Zone III | 2.5 | 2.3–2.8 | 2.5 | 2.3–2.8 | 2.3 | 2.1–2.5 |
| Zone IV | 1.5 | 1.3–1.7 | 1.5 | 1.3–1.7 | 1.4 | 1.2–1.5 |

Overall in the ADF, 1.4% scored in Zone IV, indicating that diagnostic evaluation and treatment are required, and 2.3% scored in Zone III and hence should be recommended to receive counselling and continued monitoring. Most of the ADF (73.6%) scored in the lowest-scoring group.

From the multiple regression for AUDIT scores, there was a significant sex by Service interaction; therefore, the individual effect of sex will not be reported in this section.

### 2.4.3 AUDIT in different population subgroups

#### 2.4.3.1 Rank

Table 2.25 provides a summary of AUDIT risk zones by rank.

***Table 2.25:*** *AUDIT risk categories in the ADF, by rank*

| | Officers | | | Non-commissioned officers | | | Other ranks | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Zone I | *9,667* | 80.3 | 79.7–81.0 | *16,878* | 75.6 | 75.0–76.3 | *10,303* | 65.6 | 64.3–67.0 |
| Zone II | *2,103* | 17.5 | 16.8–18.1 | *4,774* | 21.4 | 20.8–22.0 | *4,468* | 28.5 | 27.2–29.8 |
| Zone III | *204* | 1.7 | 1.5–1.9 | *408* | 1.8 | 1.6–2.0 | *561* | 3.6 | 3.0–4.1 |
| Zone IV | *59* | 0.5 | 0.4–0.6 | *260* | 1.2 | 1.0–1.3 | *365* | 2.3 | 1.9–2.8 |

From the analysis of AUDIT scores, the personnel in the other ranks demonstrated the riskiest patterns of drinking, reporting significantly higher mean AUDIT scores than both officers (6.04 versus 4.77; mean difference 1.27, 95% CI 1.12–1.42) and non-commissioned officers (6.04 versus 5.04; mean difference 1.00, 95% CI 0.85–1.15). Officers were least likely to report risky patterns of drinking and significantly lower mean AUDIT scores than non-commissioned officers (4.77 versus 5.04; mean difference 0.27, 95% CI 0.18–0.35).

#### 2.4.3.2 Service

Tables 2.26 to 2.28 report the AUDIT risk zones for each of the three Services by sex.

***Table 2.26:*** *AUDIT risk categories in the Navy, by sex*

| | Male | | | Female | | | Persons | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Zone I | *6,872* | 72.3 | 70.9-73.6 | *1,721* | 81.8 | 79.7-83.9 | *8,594* | 74.0 | 72.9-75.2 |
| Zone II | *2,228* | 23.4 | 22.2-24.7 | *346* | 16.4 | 14.4-18.5 | *2,574* | 22.2 | 21.1-23.3 |
| Zone III | *240* | 2.5 | 2.0-3.0 | *23* | 1.1 | 0.5-1.7 | *263* | 2.3 | 1.8-2.7 |
| Zone IV | *168* | 1.8 | 1.3-2.2 | *14* | 0.6 | 0.2-1.1 | *182* | 1.6 | 1.2-1.9 |

***Table 2.27:*** *AUDIT risk categories in the Army, by sex*

| | Male | | | Female | | | Persons | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Zone I | *15,428* | 67.5 | 66.6–68.5 | *2,098* | 83.5 | 81.9–85.1 | *17,526* | 69.1 | 68.3–70.0 |
| Zone II | *6,251* | 27.4 | 26.5–28.3 | *366* | 14.6 | 13.0–16.1 | *6,617* | 26.1 | 25.3–26.9 |
| Zone III | *720* | 3.2 | 2.8–3.5 | *43* | 1.7 | 1.1–2.3 | *762* | 3.0 | 2.7–3.3 |
| Zone IV | *444* | 1.9 | 1.7–2.2 | *6* | 0.2 | 0.0–0.4 | *450* | 1.8 | 1.5–2.0 |

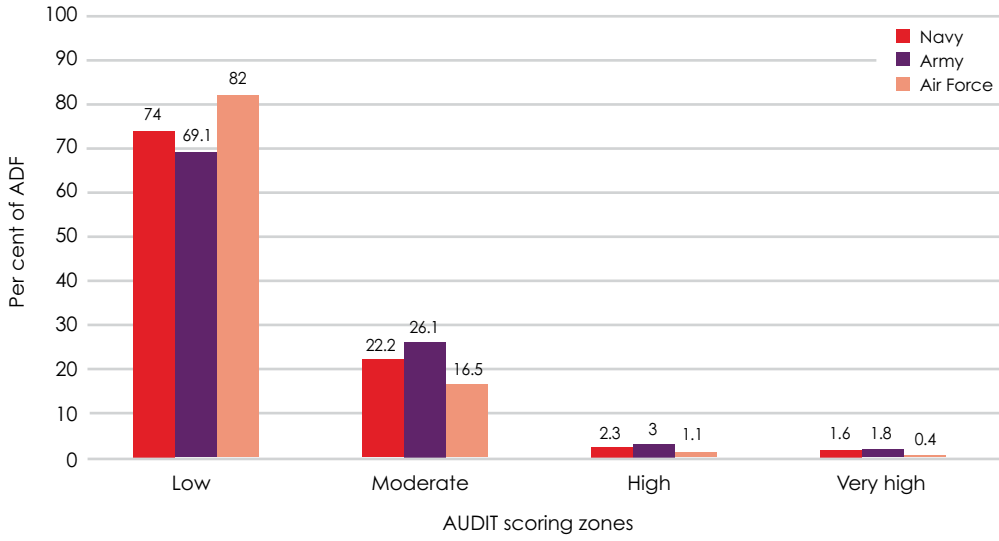
***Table 2.28:*** *AUDIT risk categories in the Air Force, by sex*

| | Male | | | Female | | | Persons | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI | N | % | 95% CI |
| Zone I | *8,772* | 80.6 | 79.8–81.3 | *1,956* | 89.3 | 88.1–90.5 | *10,728* | 82.0 | 81.3–82.7 |
| Zone II | *1,937* | 17.8 | 17.0–18.6 | *217* | 9.9 | 8.7–11.0 | *2,154* | 16.5 | 15.8–17.1 |
| Zone III | *132* | 1.2 | 1.0–1.4 | *15* | 0.7 | 0.4–1.0 | *147* | 1.1 | 0.9–1.3 |
| Zone IV | *49* | 0.5 | 0.3–0.6 | *3* | 0.1 | 0.0–0.4 | *52* | 0.4 | 0.3–0.5 |

From the multiple regression of AUDIT scores, there was a significant sex by Service interaction. Within all three Services – the Navy (4.74 versus 6.29; mean difference –1.55, 95% CI –1.79, –1.31), the Army (4.75 versus 6.56; mean difference –1.81, 95% CI –1.98, –1.63) and the Air Force (4.03 versus 5.33; mean difference –1.30, 95% CI –1.44, –1.16) – females reported significantly lower mean AUDIT scores compared to males.

Within males, both the Navy (6.29 versus 5.33; mean difference 0.97, 95% CI 0.82, 1.12) and the Army (6.56 versus 5.33; mean difference 1.23, 95% CI 1.11, 1.34) reported significantly higher mean AUDIT scores than the Air Force. Army members were at the greatest risk, also reporting significantly higher mean AUDIT scores than the Navy (6.56 versus 6.29; mean difference 0.26, 95% CI 0.10, 0.42). Within ADF females, a similar pattern emerged: both Navy females (4.74 versus 4.03; mean difference 0.72, 95% CI 0.49, 0.95) and Army females (4.75 versus 4.03; mean difference 0.72, 95% CI 0.52, 0.91) reported significantly higher mean AUDIT scores than Air Force females. Due to the significant sex by Service interaction, separate Service effects will not be reported in this section; however, Figure 2.14 shows the distribution of AUDIT scores across the three Services.

***Figure 2.14:*** *Proportion of Navy, Army and Air Force scoring in each of the four AUDIT scoring zones*



#### 2.4.3.3 Deployment

Audit risk categories by deployment status are summarised in Table 2.29.

***Table 2.29:*** *AUDIT risk categories in the ADF, by deployment status*

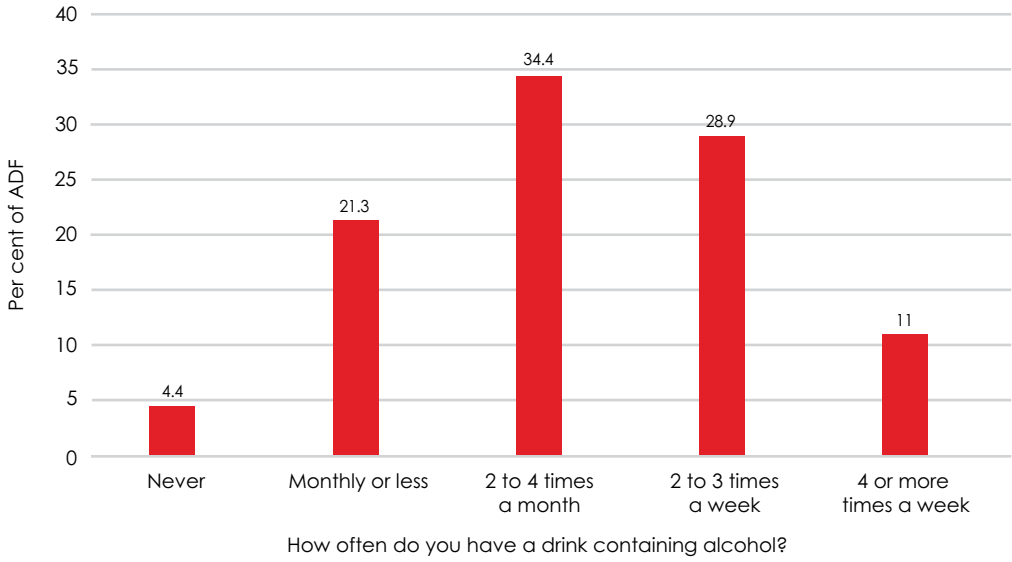
| | Ever deployed | | | Never deployed | | |
|---|---|---|---|---|---|---|
| | N | % | 95% CI | N | % | 95% CI |
| Zone I | *22,971* | 74.0 | 73.4–74.7 | *13,877* | 73.0 | 72.0–74.0 |
| Zone II | *6,951* | 22.4 | 21.8–23.0 | *4,394* | 23.1 | 22.2–24.0 |
| Zone III | *713* | 2.3 | 2.1–2.5 | *459* | 2.4 | 2.0–2.8 |
| Zone IV | *404* | 1.3 | 1.1–1.5 | *280* | 1.5 | 1.2–1.8 |

There was no significant effect of deployment status on AUDIT scores.

A detailed table combining all data presented in Tables 2.24 to 2.29 is provided in Annex B for ease of comparison across all ADF population subgroups (see Table B.31).

### 2.4.4 Frequency of alcohol consumption in the ADF

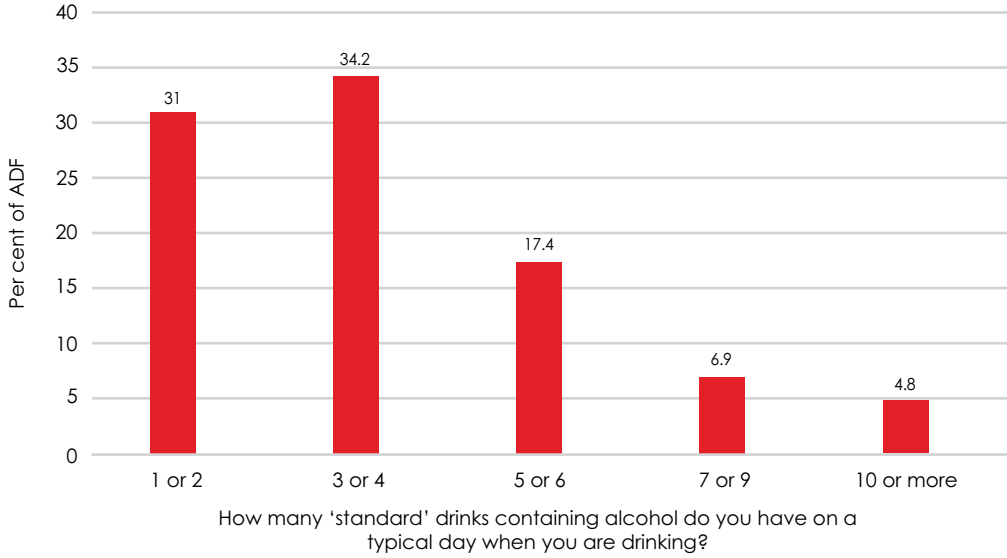
***Figure 2.15:*** *Frequency of alcohol consumption in the ADF in a typical month*




As can be seen in Figure 2.15, most ADF personnel (34.4%) consume alcohol on average once a week or once a fortnight; 28.9% drink alcohol two to three times a week; and 11% drink four or more times a week. A small proportion of the ADF never drink alcohol (4.4%). A more detailed table of the frequency of alcohol consumption by sex, Service, rank and deployment is provided in Annex B (see Table B.32).

### 2.4.5 Quantity of alcohol consumed in the ADF

***Figure 2.16:*** *Number of standard alcoholic drinks consumed by ADF personnel on a typical day*




On a typical day, most ADF personnel consume between one and four alcoholic beverages (65.2%); 17.4% of ADF personnel consume five or six drinks; and 11.7% consume more than seven drinks per day. A more detailed table of the quantity of alcohol consumed in the ADF by sex, Service, rank, and deployment is provided in Annex B (see Table B.33).

### 2.4.6 Self-reported drinking problem

***Figure 2.17:*** *Percentage of ADF personnel reporting a problem with drinking*

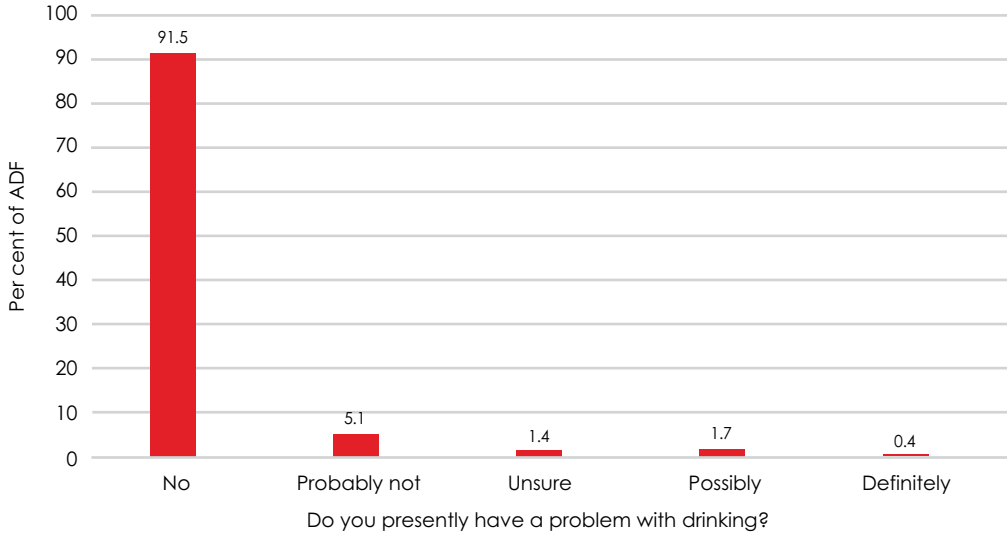
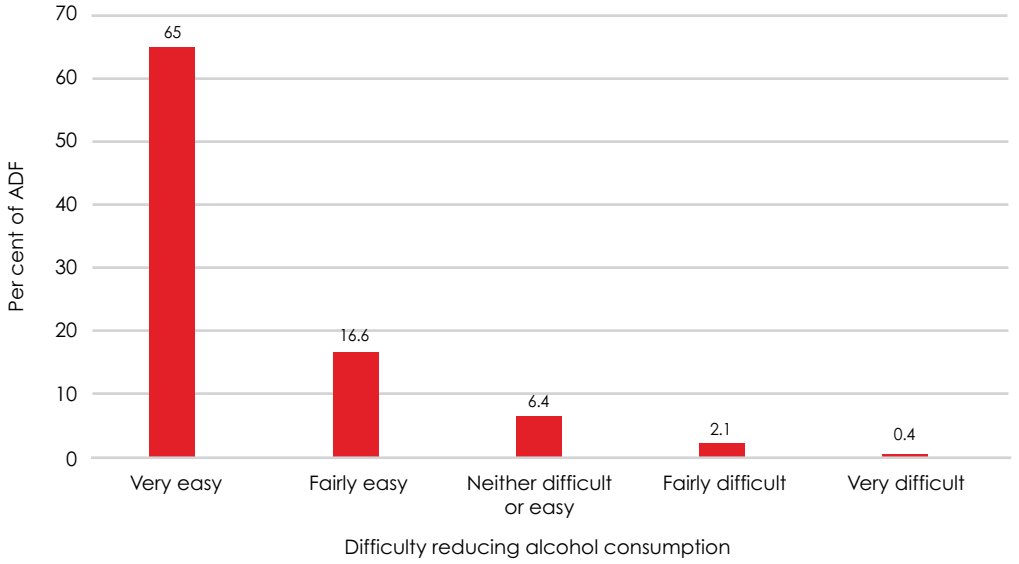


Figure 2.17 reports the percentage of ADF who reported a problem with drinking. Only a small proportion of the ADF reported possibly or definitely having a problem. Over 91.5% responded 'no' to presently having a problem. Further detail on the prevalence of self-reported drinking problems in the ADF by sex, Service, rank, and deployment is provided in Annex B (see Table B.34).

### 2.4.6.1 Self-reported difficulties reducing alcohol consumption

***Figure 2.18:*** *Percentage of ADF members reporting anticipating difficulty reducing their alcohol intake over the next three months*




Finally, ADF members were asked to quantify how difficult they would find it to cut down or stop drinking in the next three months. Once again only a small proportion (2.5%) anticipated having some difficulty reducing their alcohol consumption. Further detail on the proportion of ADF personnel reporting difficulty reducing alcohol consumption by sex, Service, rank, and deployment is provided in Annex B (see Table B.35).

## 2.4.7 AUDIT cut-offs

Receiver Operating Characteristic (ROC) analysis was used to determine the optimal cut-off in the ADF to detect 30-day ICD-10 any alcohol disorder (Table 2.30), ICD-10 alcohol harmful use (Table 2.31) and ICD-10 alcohol dependence (Table 2.32), examined using the CIDI.

***Table 2.30:*** *Properties of AUDIT optimal cut-offs for predicting 30-day ICD-10 any alcohol disorder*

| | Sensitivity | | Specificity | | Positive predictive value | | Negative predictive value | |
|---|---|---|---|---|---|---|---|---|
| Cut-off | Value | 95% CI | Value | 95% CI | Value | 95% CI | Value | 95% CI |
| 8 | 0.95 | 0.89–1.00 | 0.76 | 0.73–0.78 | 0.04 | 0.02–0.06 | 1.00 | 1.00–1.00 |
| 20 | 0.19 | 0.02–0.37 | 0.99 | 0.99–1.00 | 0.22 | 0.03–0.41 | 0.99 | 0.99–1.00 |

ROC analysis found that the optimal cut-off for detecting any ICD-10 alcohol disorder was an AUDIT score of 8 (matching the WHO recommended cut-off). This is the value that maximises the sum of the sensitivity and specificity (the proportion of those with and without the disorder who are correctly classified). The area under the ROC curve was 0.91 (95% CI 0.87–0.96). Using the cut-off of 8, the sensitivity was 0.95 (95% CI 0.89–1.00), indicating that the AUDIT is a good screening instrument to detect any ICD-10 alcohol disorder, because it will detect 95% of those with either alcohol abuse or alcohol dependence. The specificity, however, was slightly lower at 0.76 (95% CI 0.73–0.78), indicating that there is a 76% probability that those who do not have an ICD-10 alcohol disorder will score below the cut-off of 8 on the AUDIT.

The second cut-off of 20 is the value that brings the number of false positives and false negatives closest together, counterbalancing these sources of error most accurately. Therefore, this cut-off would give the closest estimate to the true prevalence of any 30-day ICD-10 alcohol disorder as measured by the CIDI.

Figure 2.19 shows the ROC curve for the AUDIT using cut-off values to predict any 30-day ICD-10 alcohol disorder. A more detailed table of the sensitivity, specificity, positive predictive value and negative predictive value for each of the cut-offs presented in this figure is provided in Annex B (see Table B.36).

***Figure 2.19:*** *Receiver Operating Characteristic curve based on the AUDIT total score and any 30-day ICD-10 alcohol disorder*

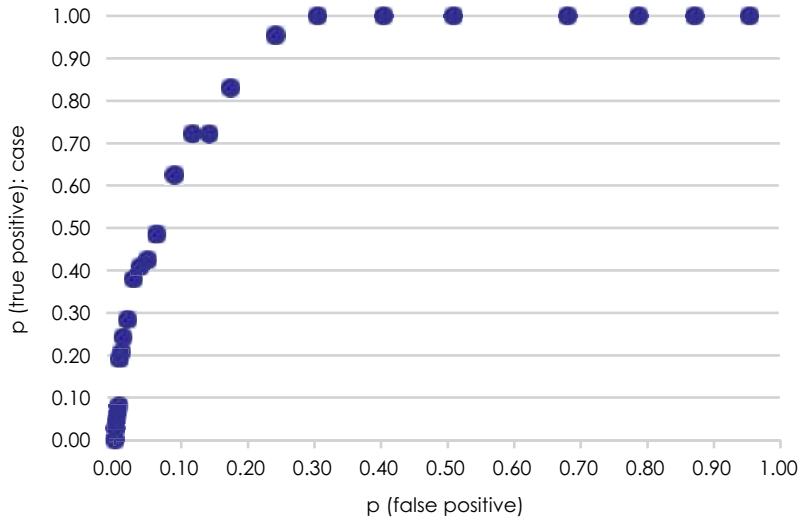



***Table 2.31:*** *Properties of AUDIT optimal cut-offs for predicting 30-day ICD-10 alcohol harmful use*

| | Sensitivity | | Specificity | | Positive predictive value | | Negative predictive value | |
|---|---|---|---|---|---|---|---|---|
| Cut-off | Value | 95% CI | Value | 95% CI | Value | 95% CI | Value | 95% CI |
| 8 | 1.00 | 1.00–1.00 | 0.75 | 0.73–0.78 | 0.01 | 0.00–0.02 | 1.00 | 1.00–1.00 |
| 26 | 0.00 | 0.00–0.00 | 1.00 | 1.00–1.00 | 0.00 | 0.00–0.00 | 1.00 | 1.00–1.00 |

As reported in Table 2.31, ROC analysis found that the optimal cut-off for detecting ICD-10 alcohol harmful use was 8. The area under the ROC curve was slightly lower at 0.87 (95% CI 0.72–0.98). Using the cut-off of 8, the sensitivity was 1.00 (95% CI 1.00–1.00), indicating that 100% of ADF members with ICD-10 alcohol harmful use will score 8 or above on the AUDIT. Once again, the specificity was slightly lower at 0.75 (95% CI 0.73–0.78).

A cut-off of 26 would give the closest estimate to the true prevalence of any 30-day ICD-10 alcohol harmful use as measured by the CIDI.

Figure 2.20 shows the ROC curve for the AUDIT using cut-off values to predict 30-day ICD-10 alcohol harmful use. A more detailed table of the sensitivity, specificity, positive predictive value and negative predictive value for each of the cut-offs presented in this figure is provided in Annex B (see Table B.37).

***Figure 2.20:*** *Receiver Operating Characteristic curve based on the AUDIT total score and 30-day ICD-10 harmful alcohol use*

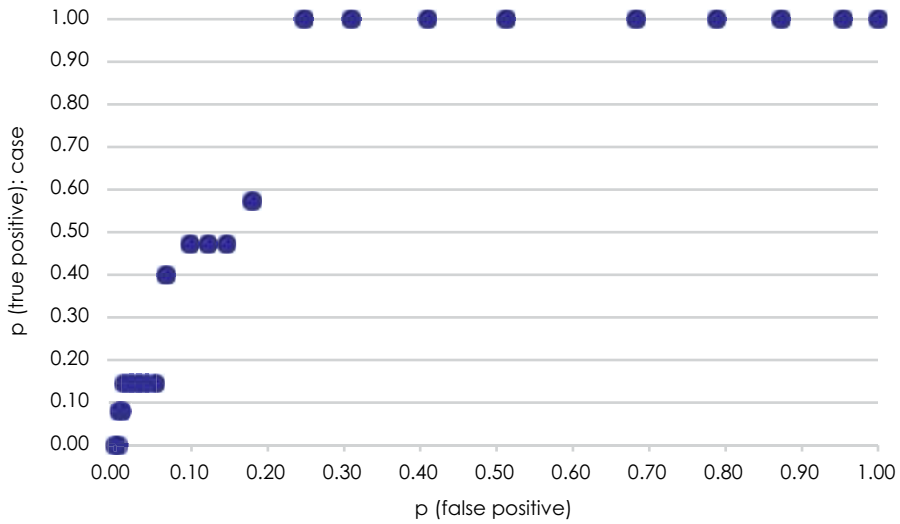



***Table 2.32:*** *Properties of AUDIT optimal cut-offs for predicting 30-day ICD-10 alcohol dependence*

| | Sensitivity | | Specificity | | Positive predictive value | | Negative predictive value | |
|---|---|---|---|---|---|---|---|---|
| Cut-off | Value | 95% CI | Value | 95% CI | Value | 95% CI | Value | 95% CI |
| 9 | 0.91 | 0.81–1.00 | 0.83 | 0.81–0.85 | 0.04 | 0.02–0.06 | 1.00 | 1.00–1.00 |
| 21 | 0.08 | 0.01–0.18 | 0.99 | 0.99–1.00 | 0.09 | 0.02–0.19 | 0.99 | 0.99–1.00 |

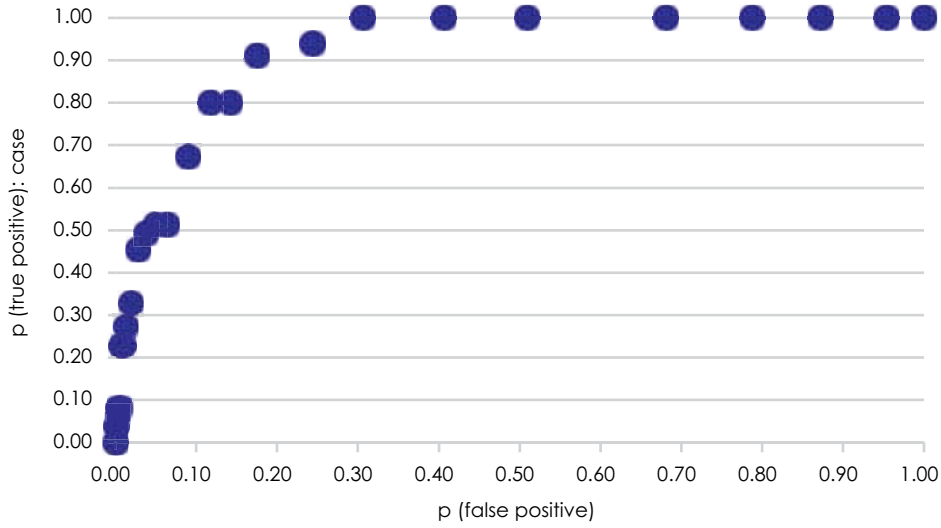
Finally, the psychometric properties of the AUDIT for detecting ICD-10 Alcohol Dependence are presented in Table 2.32. The optimal cut-off for detecting any ICD-10 alcohol dependence was 9, slightly higher than the optimal cut-off for ICD-10 alcohol harmful use. The area under the ROC curve was 0.93 (95% CI 0.89–0.97). Using the cut-off of 9, the sensitivity was 0.91 (95% CI 0.81–1.00), indicating that 91% of

ADF members with ICD-10 alcohol dependence will score 9 or above on the AUDIT. Once again, the specificity was slightly lower at 0.83 (95% CI 0.81–0.85).

A cut-off of 21 would give the closest estimate to the true prevalence of any 30-day ICD-10 alcohol dependence as measured by the CIDI.

Figure 2.21 shows the ROC curve for the AUDIT, using cut-off values to predict 30-day ICD-10 alcohol dependence. A more detailed table of the sensitivity, specificity, positive predictive value and negative predictive value for each of the cut-offs presented in this figure is provided in Annex B (Table B.38).

***Figure 2.21:*** *Receiver Operating Characteristic curve based on the AUDIT total score and 30-day ICD-10 alcohol dependence*




## 2.4.8 Discussion

Although ADF members are regularly consuming significant quantities of alcohol, the number of self-reported problems is low. Forty per cent of the ADF report drinking an alcoholic drink at least twice a week and 29% of the ADF drink more than five alcoholic drinks on a typical day when they are drinking.

The study found that 3.7% of personnel scored within a high to very high risk category on the AUDIT, indicating the need for counselling or treatment.

### 2.4.8.1 Demographic characteristics

Males show a consistent pattern of significantly greater alcohol consumption and alcohol-related problems compared to females across all three Services.

Air Force personnel were the least likely to report alcohol misuse. Within both males and females, both Army and Navy personnel reported significantly higher average AUDIT scores compared to the Air Force.

In relation to rank, it is other ranks who most often score in risk categories that indicate hazardous or harmful alcohol use. The other ranks reported significantly higher average AUDIT scores than both officers and non-commissioned officers. Officers were least at risk, and had lower mean AUDIT scores than non-commissioned officers.

There was no significant difference between groups who had been deployed versus those who had not: 3.6% of deployed personnel reported in the high to very high risk category on the AUDIT. This is still higher than results from post-deployment screening data, in which a small proportion of people reported drinking at harmful (0.7%) or dependent (0.4%) levels in the reintegration phase (three to six months) following return from deployment to the MEAO. This suggests that when the AUDIT is administered by Defence personnel, members under-report levels of risky drinking.

The absence of a deployment effect in these data merits discussion. It contrasts with the results of several studies of US veterans of the Afghan and Iraq conflicts that indicated higher rates of alcohol misuse in the deployed versus non-deployed military personnel (Hoge, 2006; Jacobson et al., 2010; Seal et al., 2009) . The estimates for alcohol misuse among these veterans range from 12% to 40% (Burnett-Zeigler et al., 2011).

Since the scale was developed, numerous studies have confirmed the recommended cut-off of 8. Most studies have found favourable sensitivity and lower but acceptable specificity; however, there has been research improving detection of alcohol disorders by either lowering or raising the cut-off by one to two points. Studies examining the psychometric properties of the AUDIT are summarised in a review paper by de Meneses Gaya and colleagues (de Meneses Gaya, Zuardi, Loureiro, & Crippa, 2009).

There has been very little research in the validity of the AUDIT with an Australian military population. In one of the few studies in an Australian context, McKenzie and colleagues (McKenzie et al., 2006) examined the issue of caseness in 1,232 male Royal Australian Navy Gulf War Veterans. Using Receiver Operating Characteristic (ROC) analysis, they reported the optimal cut-off of 10 or greater to detect 12-month DSM-IV alcohol use or dependence. They found that the area under the ROC curve was 0.88 (95% CI 0.84–0.92), and that the optimal cut-off had a sensitivity of 0.85 (95% CI 0.73–0.80) and specificity of 0.77 (95% CI 0.75–0.79). Using this cut-off, 4.5% of the sample met criteria for DSM-IV alcohol use or dependence in the previous 12 months.

Subgroups particularly at risk of scoring above the cut-off included former smokers or those who had never smoked of lower rank who were not married or who were married and had a current diagnosis of major depression. Other studies examining the psychometric properties of the AUDIT are summarised in a review paper by de Meneses Gaya and colleagues (de Meneses Gaya et al., 2009).

Post-deployment screening data for personnel returning from deployment to the Middle East Area of Operations (MEAO) in 2010 showed that the majority of personnel reported in the low-risk Zone 1 (83.4%) (Benassi & Steele, 2011). Less than 1% reported drinking at harmful (0.7%) or dependent (0.4%) levels in the reintegration phase (three to six months) following return from deployment to the MEAO.

In interpreting the data from different nations and forces, the issue of the cut-offs for the definition of heavy drinking and/or substance abuse requires careful analysis. For example, Jacobson and colleagues (Jacobson et al., 2010) defined heavy weekly drinking as more than 14 drinks for males and more than seven drinks for females. Binge drinking was also defined as drinking four or more drinks for men and

four or more drinks for women at least one day of the week or on at least one day or occasion a year. Heavy weekly drinking was identified as being present in 4.8% of non-deployed troops and 6% of those who had been deployed with combat exposure. Binge drinking was identified in 19.3% of non-deployed and 26.6% of those deployed with combat exposure.

Within the ADF population, the AUDIT is a very effective measure for detecting individuals with an ICD-10 alcohol disorder (especially alcohol harmful use) and, therefore, with a cut-off of 8 it is a very effective screening instrument. However, at that cut-off it also identifies individuals who do not have the disorder. This highlights a limitation in using the AUDIT to determine prevalence of alcohol disorder if such a low cut-off is implemented. In contrast to other disorders, which are associated with very disorder-specific symptoms, the drinking patterns of many individuals identified using the AUDIT imitate the symptoms of abuse and dependence even though those individuals do not meet criteria for these disorders. This is emphasised by the very low positive predictive value in all three analyses and can be especially problematic when using the AUDIT to determine population prevalence estimates because it may lead to inflated results if such a low cut-off is implemented.

Rona and colleagues (Rona et al., 2010) highlighted a similar problem in their paper on alcohol use in the UK armed forces. In particular, when comparing the levels of function impairment in those consuming alcohol using the Short Form 36 Health Survey (SF36), they identified that scores greater than or equal to 20 on the AUDIT were consistently associated with impairment (OR 1.8, 95% CI 1.4–2.3), whereas AUDIT scores of less than 20 were not associated with increased impairment. In fact, moderate drinkers with an AUDIT score of 8 to 15 perceived their functioning to be better than that of those with an AUDIT score of less than 8. This suggests that, although a cut-off of 8 may be effective in detecting all cases of alcohol disorder, it is not until AUDIT scores reach 20 or more that significant impairment and mental health co-morbidity occur and that this may be where the true disorder lies.

This finding aligns very well with the current practice in the ADF of reporting AUDIT scores within bands. Each band has a tailored response based on the severity of the drinking behaviour. For those scoring between 8 and 15, brief intervention using simple advice and health education materials is recommended as the most appropriate course of action. For those reporting scores between 16 and 19, the initial plan is for a combination of simple advice, brief counselling and continued monitoring by a health or allied health professional. Finally, for those reporting AUDIT scores over 20 the ADF recommends that individuals be referred to specialist alcohol and other drug providers to consider withdrawal, pharmacotherapy and/or other more intensive treatments. These strategies are supported by the data analyses in this report.

The data summarised in this chapter confirm that the AUDIT is a useful tool for mapping patterns of consumption and the risky use of alcohol in the ADF. It indicated that a cut-off of 8 is effective as a clinical screening instrument to maximise the number of personnel identified for further assessment.

### 2.4.9 Proposed further analyses

This section reports the analyses completed at the time of publication. Proposed further analyses include:

- establishing optimal cut-offs on the AUDIT specific to each sex and Service in the ADF
- examining the symptom factor structure of the AUDIT in the ADF and its relationship to at-risk drinking
- examining the relationship between AUDIT scores and lifetime ICD-10 disorders, and the evidence for self-medication and the aggravation of mental disorders
- examining the relationship between AUDIT scores and 12-month ICD-10 disorders
- examining the relationship between AUDIT scores and DSM-IV disorders and determining cut-offs for 30-day, 12-month and lifetime DSM-IV alcohol abuse and dependence
- examining the relationship between AUDIT scores obtained from the Mental Health Prevalence Study and other datasets, such as the RtAPS and POPS, to better map longitudinally emerging patterns of alcohol consumption and mental disorders generally
- providing a detailed analysis of the psychometric differences between the AUDIT methodology used in the non-MEAO subpopulation and that used in the MEAO subpopulation
- examining the relationship between trauma exposure and scores on the AUDIT
- examining the patterns of drinking and associated risks and distress of those with high levels of consumption in the absence of mental disorder.

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