

BASIC RESEARCH ARTICLE



Cumulative incidence of mental disorders in military personnel after 20 years of war in Afghanistan and 10 years in Mali – a comparison

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ABSTRACT

Background: This study compares the mental health effects of deployment on soldiers that have been deployed to Afghanistan and Mali. The psychiatric disorders among Mali veterans represent a previously unstudied area, particularly when compared to the larger and more thoroughly researched group of Afghanistan veterans. This comparison will help shed light on the unique challenges faced by soldiers deployed in Mali.

Aims: To gain better insight, all German armed forces personnel who were deployed to Mali before 2023 are compared with the total sample that was deployed to Afghanistan. Because there were more critical incidents per deployed soldier, the cumulative incidence rates of all mental disorders are expected to be higher among Afghanistan veterans.

Methods: All $N = 111,157$ German soldiers who were deployed to Afghanistan ($n = 93,000$; 2001–2021) or Mali ($n = 18,157$; 2013–2022) were included. According to the Central Registry, which records all soldiers with documented deployment-related mental disorders, the number for these two missions was $n = 2,652$ (Afghanistan: $n = 2,458$; Mali: $n = 194$; female: $n = 183$; 6.9%). The cumulative incidence between the two deployments was compared using χ^2 tests. In addition, the frequency of diagnosis among affected soldiers was compared.

Results: The cumulative incidence of all deployment-related mental disorders was higher among Afghanistan veterans (2.6% to 1.1%; OR = 2.51, 95% CI: [2.17, 2.91]). Afghanistan veterans had a higher cumulative incidence of PTSD, anxiety disorders, affective disorders and substance abuse, with ORs ranging from 1.6 to 4.1. PTSD was more common among Afghanistan veterans, while anxiety disorders were most common among Mali veterans.

Conclusion: Mali veterans had significantly lower cumulative incidence rates for all mental disorders, but showed a shift in frequency towards more anxiety disorders. These findings have implications for optimising mental health training before and after deployments in Mali and similar areas.

Incidencia acumulada de trastornos mentales en personal militar después de 20 años de guerra en Afganistán y 10 años en Mali: una comparación

Antecedentes: Este estudio compara los efectos en la salud mental en soldados desplegados que han sido asignados a Afganistán y Malí. Los trastornos psiquiátricos entre los veteranos de Malí representan un área previamente no estudiada, especialmente en comparación con el grupo más numeroso y ampliamente investigado de veteranos de Afganistán. Esta comparación permitirá comprender mejor los desafíos específicos que enfrentan los soldados desplegados en Malí.

Objetivos: Para obtener una mejor comprensión, se comparó a todo el personal de las fuerzas armadas alemanas que fue desplegada en Malí antes de 2023, con la muestra total de soldados enviados a Afganistán. Debido a que en Afganistán hubo más incidentes críticos por cada soldado desplegado, se espera que las tasas de incidencia acumulada de todos los trastornos mentales sean más altas entre veteranos de Afganistán.

Métodos: Se incluyeron en el estudio a $N = 111,157$ soldados alemanes que fueron desplegados en Afganistán ($n = 93,000$; 2001–2021) o Malí ($n = 18,157$; 2013–2022). De acuerdo con el "Registro Central", que registra a todos los soldados con trastornos mentales relacionados con el despliegue, el número total de casos en ambas misiones fue $n = 2,652$ (Afganistán: $n = 2,458$; Malí: $n = 194$; mujeres: $n = 183$; 6.9%). Se comparó la incidencia acumulada entre ambas misiones utilizando pruebas χ^2 . Además, se analizó la frecuencia de los diagnósticos en los soldados afectados.

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Personal militar; veterano; salud mental; despliegue; Mali; Afganistán; TEPT (trastorno de estrés postraumático); ansiedad; depresión

HIGHLIGHTS

- First representative study to examine the mental health of military personnel deployed to Mali. It compares deployment-related mental disorders with a total sample of Afghanistan veterans.
- Veterans from Mali were less than half as likely to suffer from a deployment-related mental disorder, reflecting their overall lower exposure to critical incidents.
- Anxiety disorders were much more prevalent in the Mali group while PTSD and affective disorders were more prevalent within the Afghanistan group.

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Resultados: La incidencia acumulada de todos los trastornos mentales relacionados con el despliegue fue mayor entre los veteranos de Afganistán (2.6% frente a 1.1%; OR = 2.51, IC 95%: [2.17, 2.91]). Los veteranos de Afganistán presentaron una mayor incidencia acumulada de TEPT (Trastorno de Estrés Postraumático), trastornos de ansiedad, trastornos afectivos y abuso de sustancias, con ORs que oscilaron entre 1.6 y 4.1. El TEPT fue más frecuente entre los veteranos de Afganistán, mientras que los trastornos de ansiedad fueron más comunes entre los veteranos de Malí.

Conclusión: Los veteranos de Malí presentaron tasas de incidencia acumulada significativamente más bajas para todos los trastornos mentales, pero mostraron un cambio en la frecuencia hacia un mayor número de trastornos de ansiedad. Estos hallazgos tienen implicaciones para la optimización del entrenamiento en salud mental antes y después del despliegue en Malí y en zonas similares.

Abbreviations: AF: Afghanistan; BwJFOCOM: Bundeswehr Joint Forces Operations Command; ML: Mali; PTSD Posttraumatic Stress Disorder

1. Introduction

1.1. The German armed forces (Bundeswehr) in Mali and Afghanistan

German participation in the war in Afghanistan began in 2001, after the US -led invasion that followed the 9/11 attacks, and lasted until 2021. With 93,000 soldiers deployed there during the 20 years of the war, it was the largest German foreign deployment to date (Bundeswehr, 2021). Germany was a key contributor to NATO's International Security Assistance Force (ISAF), focusing on reconstruction, stabilisation, and training of Afghan security forces. German troops were primarily stationed in northern Afghanistan, particularly around Kunduz and Mazar-i-Sharif. Over time, the mission evolved from reconstruction efforts to combat operations as the security situation deteriorated, forcing German forces into counterinsurgency roles. In August 2021, Germany, along with other NATO allies, withdrew its troops amid the Taliban's rapid return to power, marking the end of its 20-year involvement.

The Bundeswehr's involvement in Mali began in 2013 in response to a political and security crisis and the rise of Islamist insurgencies in the region. Germany initially joined the European Union Training Mission (EUTM Mali), with a focus on strengthening the Malian military's professionalism, command structures, and adherence to human rights. Alongside this, Germany contributed to the United Nations mission, MINUSMA, offering logistical, medical, and intelligence support to aid in political stabilisation, civilian protection, and restoring government authority, particularly in northern Mali. By 2022, Germany had announced its plan to withdraw from Mali by 2024 due to concerns about the mission's effectiveness and Mali's shifting political alliances after a military coup in 2020 (United Nations, 2023). According to our correspondence with the Bundeswehr Joint Forces Operations Command (BwJFOCOM), 18,157 German soldiers were stationed in Mali until December 2022.

While both missions involved counterterrorism and regional stabilisation, Afghanistan saw more intense combat, with German forces frequently facing insurgent attacks and improvised explosive devices (IEDs). The Bundeswehr's role in Mali was mostly non-combat, focused on training, peacekeeping, and intelligence. However, German soldiers in Mali were also targeted by Islamist groups, facing threats like small arms fire and IEDs. Despite extensive efforts, neither mission managed to sustainably achieve its objectives, prompting some soldiers to question the impact of their deployments.

Classified documents from BwJFOCOM records indicate that Afghanistan missions experienced a significantly higher rate of traumatic incidents per soldier compared to Mali deployments. The rate of recorded traumatic incidents per soldier was approximately 2.3 times higher during the Afghanistan missions. This disparity highlights the more intense combat conditions faced by German forces in Afghanistan relative to their operations in Mali.

1.2. Foreign deployments and military mental health

Foreign deployments are a risk factor that can lead to mental disorders in soldiers (Bøg et al., 2018; Doody et al., 2022; MacManus et al., 2015). The association with various mental disorders is well documented. In particular, post-traumatic stress disorder (PTSD) as a deployment-related mental disorder has been investigated in detail in a large number of studies. A 2014 meta-analysis found that 7.1% of all US, Canadian and British soldiers previously deployed to Afghanistan suffered from PTSD (Hines et al., 2014). The differences in PTSD rates between US and UK soldiers could be explained by differences in combat exposure (Sundin et al., 2014). When examining risk factors for post-deployment PTSD, Iversen and colleagues found that combat exposure was one of

the most important predictors of post-traumatic stress symptoms (Iversen et al., 2008).

PTSD in military personnel is associated with several psychological and somatoform comorbidities (Britvić et al., 2015; Walter et al., 2018). Depressive disorders are the most common comorbidities of PTSD. Walter and colleagues found that 49% of all active US soldiers diagnosed with PTSD also had a depressive disorder (Walter et al., 2018). A link between PTSD and substance use in the military context has also been found (Homish et al., 2019).

Previous studies compared military personnel deployed with comrades at home. Newer approaches propose a comparison of military personnel deployed with and without a life-threatening military-specific incident. This makes national and international research comparable, as common operational stressors such as climate, handling of weapons, combat readiness, perceived threat, constant vigilance, etc. are distinguished from actual, operational-related life-threatening situations. Following major disasters, different groups of rescue workers show different mental health effects (Wesemann et al., 2020; Wesemann et al., 2024). Here, occupational groups can be considered as proxy variables for different tasks, perceived emotions or conditions on site. Given this understanding, it is reasonable to propose that soldiers encountering different challenges during deployments to distinct conflict zones may develop different mental disorders. Knowledge of these disparities could help build resilience through appropriate training. Comparing different missions is not only important to adopt pre- and post-deployment training, it could also help to better detect mental health problems and reduce stigma.

Active soldiers and veterans are reported to face distinct barriers that prevent them from seeking help. Stigma is cited as the biggest obstacle (Kulesza et al., 2015; Sharp et al., 2015). Although there are particular barriers to mental health treatment in the military context, soldiers and veterans use mental health services to a similar extent as civilians (Iversen et al., 2010; Williams 2022). Male and female soldiers are equally likely to seek help for a mental disorder (Hourani et al., 2016).

1.3. Mental health and deployment in the Bundeswehr

Trautman and colleagues compared the prevalence of mental illness in active soldiers with the prevalence in a civilian control group from the German population. They found that the 12-month prevalence of any mental disorder was lower in German soldiers than in the civilian control group (14.4% to 20%) (Trautmann et al., 2017). The researchers point out that these results differ from similar studies on American and

British military personnel. There, soldiers show higher prevalence rates of mental disorders compared to civilians (Goodwin et al., 2015; Kessler et al., 2014). Similar to their US and British comrades, deployment significantly increased the risk of mental disorders in the Bundeswehr. The main reason for this was high combat stress. German soldiers deployed abroad and exposed to high levels of combat stress were three times more likely to suffer from PTSD than civilians. They were also almost three times more likely to develop panic disorder/agoraphobia (Trautmann et al., 2017). Another study found that the 12-month prevalence of PTSD among returnees was 2.9% (95% CI: 2.1–4.1) and the unweighted 12-month incidence was 2.1%. Overall, 49.2% of all returnees experienced a traumatic deployment event in terms of the respective DSM-IV category (Wittchen et al., 2012). These results have since been replicated by Wesemann and colleagues. They found a 12-month incidence of mental disorders of 7.3% in a German combat unit after a deployment in Afghanistan. Most common diagnoses were specific phobias (3.2%), PTSD (2.2%) and moderate and severe depressive episodes with 2.2% (Wesemann et al., 2022). In a study spanning an 18-month period from 2010 to 2011, 64% of German soldiers who contacted army medical services for symptoms of a mental disorder sought out help from a specialist within the first year of symptom onset, and 94% received specialist treatment within two years. 78.8% of those soldiers had their symptom onset within the first six months after a traumatic event (Kowalski et al., 2012).

As per German law, soldiers who receive a deployment-related psychiatric diagnosis are often entitled to compensation, depending on the severity of their injury. To ensure proper procedure, the diagnosis of a suspected deployment-related psychiatric disorder is always performed by a trained Bundeswehr psychiatrist. Typically, diagnostic tests are conducted at one of the five Bundeswehr Hospitals, to which patients are usually referred by their unit's assigned general practitioner.

The Bundeswehr uses various measures to prevent deployment-related psychological impairments among its soldiers. The soldiers must take part in pre-deployment training, which also includes psychological elements. As part of the 'Psychological Fitness' program, soldiers are to be examined individually using a questionnaire. The aim is to estimate the risk of deployment-related psychological damage during or after deployment (Wesemann et al., 2018). After returning from deployment, soldiers are required to participate in follow-up programmes. The focus is on the psychological processing of the mission.

Although the mental health impacts on soldiers returning from Afghanistan have been extensively researched, the effects of deployment to Mali have

remained largely unexplored. To the best of our knowledge, there is only scant scientific research on military mental health in the Malian context. This is surprising due to the fact that tens of thousands of soldiers from various nations were deployed there. This study aims to contribute to closing this gap by comparing soldiers returning from Mali and the well-studied Afghanistan mission returnees. The focus is on deployment-related mental disorders. This is intended to help identify and understand possible differences in mental disorders. This information could be used to improve the effectiveness of mental health prevention and follow-up programmes.

BwJFOCOM data provides clear evidence that deployments to Afghanistan have a higher rate of traumatic events per soldier than deployments to Mali. Traumatic events such as combat exposure are associated with increased rates of PTSD (Bøg et al., 2018). PTSD, in turn, correlates with comorbid substance abuse disorders (Homish et al., 2019). Therefore, Afghanistan veterans are believed to have higher cumulative incidence rates of all mental disorders. A second hypothesis was that affected soldiers returning from Afghanistan were especially more likely to have a diagnosis of PTSD and substance abuse.

2. Methods

All data used in this study is anonymous, as soldiers included in the registry are pseudonymized through a system that uses their personal identification number for encryption. Written informed consent was not applicable for this study. The study was approved by the ethics committee of the University of the Bundeswehr Munich (No: 43 EK UniBw M 23–02). Publishing of this study was approved by the Federal Ministry of Defence.

All $N = 111,157$ German soldiers who were deployed in Afghanistan or Mali between 2001 and 2022 were included. The missions are listed in Table 1. In particular, Operation Enduring Freedom (OEF) was excluded from this study because German soldiers participating in this mission were stationed not only in Afghanistan, but also in Kuwait and on the high seas of Somalia. The data from these missions were divided into two groups, a group with missions from

Afghanistan (AF; $n = 93,000$) and a group with missions from Mali (ML; $n = 18,157$). They were compared with those who had a confirmed diagnosis of a PTSD, anxiety disorder, mood disorder or substance abuse due to these two deployments. For this, the central registry of the Bundeswehr Hospital in Berlin was used. The registry was established in 1996 and moved from Munich to Berlin in 2010 after several revisions. All German soldiers with a confirmed deployment-related mental disorder are recorded in this database. All diagnoses were made by trained psychiatrists of the Bundeswehr using the ICD-10 diagnostic system. No duplicates were included across the two subgroups. Cut-off point for all data collection was December 31, 2022. All data analysis was conducted using IBM SPSS Statistics.

The groups of soldiers with these deployment-related mental disorders were then further divided into subgroups based on their mental disorders. These subgroups included $n = 2,652$ affected soldiers, $n = 2,458$ (92.7%) from AF and $n = 194$ (7.3%) from ML.

To look for systematic differences in the AF and ML groups with respect to sociodemographic data, independent-samples t-tests for metric variables and χ^2 tests for dichotomous or ordinal data were performed.

First, the cumulative incidence of the various post-deployment mental disorders was compared between AF and ML deployments. The cumulative incidence was defined by the number of affected soldiers compared to all deployed soldiers. For this purpose, the odds ratio (OR) was calculated using a χ^2 test.

To test the second hypothesis of different frequencies between the different mental disorders, χ^2 tests were used and OR were calculated. Only soldiers with deployment-related mental disorders (affected soldiers) were taken into account for these calculations.

Subsequently, an ANCOVA was carried out with PTSD as the dependent variable, deployment (AF vs. ML) as predictor and sociodemographic data as covariates. Finally, descriptive statistics were generated for the different types of mood and anxiety disorders. Since there is no information on gender distribution in AF and ML missions, no separate gender comparisons were made.

As the timeframe of the Afghanistan missions extends further into the past, soldiers deployed there have had more time to develop deployment-related psychiatric illnesses. To estimate the risk of post-data collection diagnoses among Mali veterans skewing overall results and limiting comparability, the latency period for affected military personnel in Mali was calculated.

3. Results

An independent samples t-test including demographic data revealed no significant differences between the

Table 1. Deployment missions of the Bundeswehr by deployment area.

Full Name	Abbreviation	Location
International Security Assistance Force	ISAF	AF
Resolute Support	RS	AF
African-led International Support Mission in Mali	AFISMA	ML
United Nations Multidimensional Integrated Stabilization Mission in Mali	MINUSMA	ML
European Union Training Mission Mali	EUTM Mali	ML

Note. Overview of all deployment missions that were included in this study. AF = Afghanistan, ML = Mali.

Table 2. Group differences between soldiers with deployment-related mental disorders in Afghanistan and Mali in relation to demographic characteristics.

	Deployment	N	Mean	SD	T-value	df	p-value
Age	Afghanistan	2448	37.0	8.36	-.02	2638	.981
	Mali	192	37.0	8.92			
N_Depl.	Afghanistan	1538	1.7	0.78	2.99	1680	.003
	Mali	144	1.5	0.72			
YoS	Afghanistan	1707	13.6	7.79	5.11	188.6	<.001
	Mali	151	10.7	6.64			

Note. SD: standard deviation; p-value: significance 2-tailed; N_Depl.: number of deployments; YoS: years of service. Differences in *df* are due to missing data. *df* with decimals were corrected due to variance heterogeneity using Welch's test.

Table 3. Group differences between soldiers with deployment-related mental disorders in Afghanistan and Mali in relation to demographic characteristics.

	N Afghanistan	N Mali	χ^2	p-value
Male	2293	176	1.84	.174
Female	165	18		
Private	584	69	19.2	<.001
Sergeant	1644	120		
Officer	198	4		
With partnership	1743	152		
Without partnership	466	35	0.59	.442

Note. AF = Afghanistan, ML = Mali.

AF and ML groups in age, but did show significant differences in years of service (YoS) and number of deployments (both higher in the AF group). A χ^2 test revealed no significant differences in gender or partnership, but there were significant differences in rank. An overview of demographic data and detailed test results can be found in Table 2 and Table 3.

Data collection results revealed that 2,458 soldiers had received a deployment-related diagnosis for deployment to Afghanistan and 194 to Mali (affected soldiers). The total of main diagnoses for PTSD, anxiety disorders, mood disorders, and substance abuse, are shown in Table 4.

Table 5 contains a list of all deployment-related mental disorders among soldiers. PTSD was most common in Afghanistan deployments (66.7%); in Mali it was anxiety disorders (61.3%).

The latency period for affected military personnel from the Mali missions was calculated: 60.8% were diagnosed within one year, and 81.8% within the second year after their deployment.

3.1. Cumulative incidence of mental disorders

Of 93,000 soldiers deployed in Afghanistan, 2,458 (2.6%) suffered from at least one deployment-related mental disorder. Of 18,157 soldiers deployed in Mali,

Table 4. Total number of soldiers affected by main diagnoses and area of deployment.

	N Afghanistan	N Mali
PTSD	1,553	89
Substance related disorders	13	0
Affective disorders	204	11
Anxiety disorders	632	94
Total	2,458	194

Note. This table only contains main diagnoses.

Table 5. Number of all diagnoses of soldiers with deployment-related mental disorders by deployment location.

	Afghanistan	Mali
PTSD	1,640 (66.72%)	92 (47.42%)
Substance related disorders	211 (8.58%)	10 (5.15%)
Affective disorders	677 (27.54%)	36 (18.56%)
Anxiety disorders	632 (39.26%)	94 (61.34%)

Note. This table contains all diagnoses. Percentages are counted by soldiers who received treatment for a deployment-related mental disorder.

194 (1.1%) suffered from at least one deployment-related mental disorder. Area of deployment shows a clear impact on the cumulative incidence of mental disorders ($\chi^2(1, N = 111,157) = 161.72$; $p < .001$; OR = 2.51, 95% CI: [2.17–2.91]). Soldiers who were stationed in Afghanistan are more often affected.

The cumulative incidence of the subtypes of mental disorders examined in this study, was compared and analysed in terms of the odds ratios between the two groups. Soldiers from Afghanistan were more likely to develop one of these disorders, as shown in Table 6.

3.2. PTSD

A total of 1,640 returnees from Afghanistan and 92 from Mali received a deployment-related PTSD diagnosis. This means that 66.7% of Afghanistan veterans diagnosed with a mental disorder received a PTSD diagnosis, compared to 47.4% of Mali veterans ($\chi^2(1, N = 2,652) = 29.56$; $p < .001$). In a consecutive analysis of covariance controlling for number of deployments, years of service, and rank, the difference

Table 6. Cumulative incidence and comparison of soldiers with deployment-related mental disorders by area of deployment, including all deployed soldiers.

Diagnosis	Afghanistan	Mali
PTSD	1.76% OR: 3.53 [95% CI: 2.86, 4.35]	0.51% OR: 0.28 [95% CI: 0.23, 0.35]
Substance use disorders	0.23% OR: 4.13 [95% CI: 2.19, 7.78]	0.06% OR: 0.24 [95% CI: 0.13, 0.46]
Affective disorders	0.73% OR: 3.69 [95% CI: 2.64, 5.16]	0.20% OR: 0.27 [95% CI: 0.19, 0.38]
Anxiety disorders	1.04% OR: 1.59 [95% CI: 1.31, 1.92]	0.66% OR: 0.63 [95% CI: 0.52, 0.67]

Note. Percentages are counted by soldiers who have been deployed there. OR = Odds ratio, CI = Confidence interval, all *p*-values < .001.

Table 7. Influence of deployment area on the presence of PTSD, including number of previous deployments, years of service, and rank as covariates.

Predictors	df	F	Sig.	R ²	η ²
Number of previous deployments	1	0.55	.460		< .001
Years of service	1	0.58	.447		< .001
Rank	1	0.20	.651		< .001
Deployment area	1	12.18	< .001		.007
Total	4 (1,783)	3.70	.005	.008	.008

Note. df: degrees of freedom; F: F-value; Sig.: significance; R²: coefficient of determination; η²: partial eta square.

in PTSD rates remained statistically significant, but with only a weak effect. The exact results are shown in Table 7.

3.3. Anxiety disorders

There were a total of 965 (39.3%) diagnoses of deployment-related anxiety disorders among Afghanistan veterans compared to 119 (61.3%) from Mali ($\chi^2(1, N = 2,652) = 36.26; p < .001$). The higher number of diagnoses compared to Table 5 is due to comorbidities in anxiety disorders. The most common diagnoses were reaction to severe stress and adjustment disorders ($N(\text{AF} - \text{ML}) = 647-98$). Together they account for 67.1% (AF) and 82.4% (ML) of anxiety disorder diagnoses, respectively. This results in a higher risk for affected soldiers after the Mali deployment (OR: 2.29 [95% CI: 1, 41–3.74]). The frequencies of the individual anxiety disorders are listed in Table 8 without further group comparisons.

3.4. Affective disorders

Afghanistan veterans with deployment-related mental disorders had a higher rate of mood disorders at 27.5% than Mali veterans at 18.6% ($\chi^2(1, N = 2652) = 7.39; p < .01$). The most common diagnoses were depressive episodes ($N(\text{AF} - \text{ML}) = 496-29$) and recurrent depressive disorders ($N(\text{AF} - \text{ML}) = 165-7$). Here, too, the frequency of the individual depressive disorders is listed in Table 9 without further group comparisons.

3.5. Substance abuse

Substance abuse was diagnosed in 211 (8.6%) Afghanistan veterans with deployment-related mental disorders

and 10 (5.2%) Mali veterans ($\chi^2(1, N = 2,652) = 2.77; p = .096$). The most common substance-related diagnosis in both groups was alcohol abuse ($N(\text{AF} - \text{ML}) = 164(77.7\%) - 7(70\%)$).

4. Discussion

In this study, the deployment-related mental disorders of all Bundeswehr veterans of operations in Afghanistan and Mali were compared. This is the first representative study of its kind for the Mali area of operations. Differences in mental disorders between both groups suggest that the respective deployment area, including factors such as mission type and overall conditions, has a major influence on mental health outcomes.

The cumulative incidence of deployment-related mental disorders is 2.6% for Afghanistan and 1.1% for Mali.

In another large US registry study of active-duty soldiers from 2001 to 2017, 1-year incidence rates of PTSD ranged from 0.1% to 1.3% (Judkins et al., 2020). This is also comparable to our incidence results.

The findings of our latency analysis suggest that the vast majority of affected Mali veterans were included in our study. The latency period data provides valuable insight into the timing of deployment-related psychiatric diagnoses, supporting the notion that most cases are identified relatively early after deployment. This limits the likelihood of a substantial number of diagnoses occurring after data collection, thereby minimising the potential statistical impact of future diagnoses among Mali veterans and enhancing overall comparability between the missions.

A comparison between deployments shows a higher cumulative incidence of any type of deployment-related mental disorders among Afghanistan veterans, with an OR ranging from 1.6 to 4.1. Comparing only military personnel with deployment-related mental disorders, we find that soldiers returning from Afghanistan suffer significantly more often

Table 8. Subtypes of anxiety disorder diagnoses.

Anxiety disorders	Afghanistan	Mali
[F40] Phobic Anxiety Disorders	179 (18.55%)	12 (10.08%)
[F41] Other Anxiety Disorders	63 (6.53%)	2 (1.68%)
[F42] Obsessive-compulsive Disorders	10 (1.04%)	3 (2.52%)
[F43] Reaction to severe stress, and adjustment Disorders (excl. PTSD)	647 (67.05%)	98 (82.35%)
[F44] Dissociative [conversion] Disorders	3 (0.31%)	0
[F45] Somatoform Disorders	53 (5.49%)	3 (0.31%)
[F48] Other Neurotic Disorders	10 (1.04%)	1 (0.84%)
Total	965	119

Note. Codes refer to the ICD-10 diagnostic system. Percentages are counted by soldiers who received an anxiety disorder diagnosis per location.

Table 9. Subtypes of affective disorder diagnoses.

Affective disorders	Afghanistan	Mali
[F31] Bipolar Affective Disorder	8 (1.18%)	0
[F32] Depressive Episode	496 (73.26%)	29 (80.56%)
[F33] Recurrent Depressive Disorder	165 (24.37%)	7 (19.44%)
[F34] Persistent Mood [Affective] Disorder	8 (1.18%)	0
Total	677	36

Note. Codes refer to the ICD-10 diagnostic system.

from PTSD and mood disorders than soldiers from Mali. Furthermore, the data indicate that Afghanistan veterans tend to be diagnosed with substance abuse more often.

The data provided to us by BwJFOCOM on traumatic incidents in Afghanistan and Mali would fit this narrative. In particular, higher levels of combat exposure and proximity to the event have been linked to increases in PTSD rates (MacManus et al., 2015; Motreff et al., 2020). Lower rates of PTSD may explain lower rates of mood disorders, as these have been shown to be among the most common PTSD comorbidities in military personnel (Britvić et al., 2015; Walter et al., 2018). An association between PTSD and substance abuse in military veterans has previously been noted by Homish and colleagues (2019). The results of this study are consistent with this finding and further confirm it.

Returnees from Bundeswehr missions in Mali who had deployment-related mental disorders were more likely to be diagnosed with an anxiety disorder than their comrades from Afghanistan. Although the incidence of this disorder is higher post-deployment among those returning from Afghanistan, there is a shift in diagnosis. Higher rates of anxiety disorders among returnees from Mali may be related to the perceived threat in everyday life in the camp itself. However, further research would be required to confirm this hypothesis.

Other explanations for this could be the soldier's constant exposure to stress like absence from family and friends, perceived threat, worse living conditions and extreme climate, but lower rates of traumatic and life-threatening events compared to Afghanistan missions, resulting in less PTSD diagnoses.

When analysing distribution of anxiety disorders, 'reaction to severe stress, and adjustment disorders' (excl. PTSD) emerges as the single most common diagnosis. This includes the ICD-10 diagnoses of acute stress reactions, adjustment disorders, other reactions to severe stress and the reactions to severe stress, unspecified.

The low cumulative incidence of substance use disorders is attributed to the high level of stigma. Soldiers with this main diagnosis seem to avoid medical care (Bogaers et al., 2023). When recognised, this is usually through treatment for another mental disorder (Sharbafchi & Heydari, 2017).

While the mental health effects of soldiers returning from Afghanistan have been widely studied, deployments to Mali have largely remained unexplored. To the best of our knowledge, there is only scant scientific research on military mental health in the Malian context. This study aims to contribute to closing this gap by comparing soldiers returning from Mali with well-studied returnees from the Afghanistan mission. The focus is on deployment-related mental disorders,

with the intention of identifying and understanding possible differences in these disorders.

The results may help to make pre- and post-treatment more mission-specific in the future. The Mali location was associated with a shift in diagnosis frequency towards anxiety disorders. For Mali and similar operational areas, a more specific focus on anxiety disorders and their screening and prevention could be made. This could perhaps have been achieved through more psychoeducation. Since anxiety disorders were the most common disorder there, the focus could have been on avoidance behaviour. Knowledge of this phenomenon could prevent people from starting to avoid objects or situations. Involving comrades in particular could be helpful. Since there is little privacy during operations, even small changes are quickly noticed. A similar approach can be applied to all subsequent deployments. Once the most common psychological changes are known, behavioural therapy elements can be used that are below the therapeutic interventions. Early use of these elements could reduce the likelihood of developing mental disorders. However, PTSD also represents a substantial portion of deployment-related mental health diagnoses associated with the Mali mission. Research in this area will therefore continue to be a challenge for military mental health.

5. Limitations

The use of existing databases is largely dependent on soldiers seeking treatment. Some studies have found that there are no differences in acceptance of mental health care between military personnel and civilians (Homish et al., 2019; Sharp et al., 2015). However, several studies see major obstacles in this area (Trautmann et al., 2017; Walter et al., 2018). Overall, it can be assumed that the number of unreported cases is to some extent higher in both deployments.

Another limitation regarding soldiers seeking treatment lies within the different time frames of deployment. During the time from 2001 to 2012, Bundeswehr soldiers were already deployed to Afghanistan, while the Mali missions only started in 2013. Therefore, Afghanistan veterans have had more time to develop deployment-related mental disorders, possibly skewing results towards more Afghanistan veteran diagnoses. However, as Kowalski et al. found, 96% of Bundeswehr soldiers who sought help within a 2001–2012 timeframe received specialist care within the first two years after symptom onset (Kowalski et al., 2012), and with the time period in question being 21–10 years before the cut-off point for data collection we do not expect this to significantly skew the overall results. For the Malian theatre, our data also indicates short follow-up times, with 81.8% of included soldiers being diagnosed within two years

after deployment, further limiting the impact of time difference. Changes in the number of diagnoses due to differences in mental-health awareness between 2001–2012 and the rest of the included timeframe could not be accounted for.

This study demonstrates differences in the cumulative incidence and proportion of individual deployment-related mental disorders between the two deployment locations. However, as a registry study, it cannot make conclusive statements regarding the origins of these observed phenomena. For example, the stability and quality of partnerships, as well as the relationship with one's children, are also relevant factors. Clear negative effects have been established in these areas following critical deployment experiences (Wesemann et al., 2024). Further research would be needed to provide clear evidence on the causes of differences between the two deployment theatres.

As this study uses data from military personnel diagnosed with a deployment-related mental disorder, it reflects a long-term average of conditions for these deployment areas. However, deployment conditions can be dynamic and change. For example, deployments with a relatively low combat load can quickly turn into deployments with a high combat load and vice versa. Such changes could not be taken into account here. A comparison of the two missions only from 2013 onwards could exclude some confounding factors. However, this would significantly limit the representativeness of the Afghanistan mission. It was therefore decided to conduct the study as a full survey.

All registered soldiers with confirmed deployment-related mental disorders were included, and all participants received their diagnosis from a trained Bundeswehr psychiatrist, eliminating a wide range of potential biases.

6. Conclusions

Mental health issues of foreign mission returnees continue to be a large part of military healthcare. Apart from an army's duty of care for its wounded soldiers, treatment and personnel losses due to this problem will continue to be a challenge within the military for years to come. Adequate prevention, aftercare and treatment of deployment-related mental health problems is therefore mandatory. Prevention and aftercare tailored to the specific theatre of operations can lead to better mental health outcomes for soldiers and a more efficient healthcare system.

The results of mental disorders in soldiers after deployment were found to be significantly influenced by their respective area of deployment. In particular, former participants in the AFISMA, MINUSMA and EUTM Mali missions generally suffer less from

deployment-related mental disorders compared to the well-studied Afghanistan missions. However, they have a significantly higher proportion of anxiety disorder diagnoses.

The study's findings reveal vastly different prevalences of mental disorders among veterans from these theatres of war, raising important questions about the underlying causes of this phenomenon. Further research is needed to draw conclusions regarding the factors contributing to the observed differences between the two subgroups. Understanding these causes may significantly alter the approaches we use for the prevention, treatment, and screening of deployment-related psychiatric disorders.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

The data that support the findings of this study are available upon reasonable request from the corresponding author, N. Hüttermann. The data are not publicly available due to their sensitive nature.

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References

- Afghanistan: Waren 160.000 Soldatinnen und Soldaten oder nur 93.000 im Einsatz? [Translation: "Afghanistan: Were 160,000 soldiers deployed or just 93,000?"]. Retrieved March 2, 2023, from <https://www.bundeswehr.de/de/aktuelles/meldungen/afghanistan-160-000-oder-93-000-im-einsatz-5229438>
- Bogaers, R., Geuze, E., van Weeghel, J., Leijten, F., van de Mheen, D., Greenberg, N., Rozema, A. D., & Brouwers, E. (2023). Mental health issues and illness and substance use disorder (non-)disclosure to a supervisor: A cross-sectional study on beliefs, attitudes and needs of military personnel. *BMJ Open*, 13(4), e063125. <https://doi.org/10.1136/bmjopen-2022-063125>
- Bøg, M., Filges, T., & Jørgensen, A. M. K. (2018). Deployment of personnel to military operations: Impact on mental health and social functioning. *Campbell Systematic Reviews*, 14(1), 1–127. <https://doi.org/10.4073/csr.2018.6>
- Britvić, D., Antičević, V., Kaliterna, M., Lušić, L., Beg, A., Brajević-Gizdić, I., Kudrić, M., Stupalo, Ž., Krolo, V., & Pivac, N. (2015). Comorbidities with Posttraumatic Stress Disorder (PTSD) among combat veterans: 15 years postwar analysis. *International Journal of Clinical*

- and *Health Psychology*, 15(2), 81–92. <https://doi.org/10.1016/j.ijchp.2014.11.002>
- Doody, C. B., Egan, J., Bogue, J., & Sarma, K. M. (2022). Military personnels' experience of deployment: An exploration of psychological trauma, protective influences, and resilience. *Psychological Trauma: Theory, Research, Practice, and Policy*, 14(4), 545–557. <https://doi.org/10.1037/tra0001114>
- Goodwin, L., Wessely, S., Hotopf, M., Jones, M., Greenberg, N., Rona, R. J., Hull, L., & Fear, N. T. (2015). Are common mental disorders more prevalent in the UK serving military compared to the general working population? *Psychological Medicine*, 45(9), 1881–1891. <https://doi.org/10.1017/S0033291714002980>
- Hines, L. A., Sundin, J., Rona, R. J., Wessely, S., & Fear, N. T. (2014). Posttraumatic stress disorder post Iraq and Afghanistan: Prevalence among military subgroups. *The Canadian Journal of Psychiatry*, 59(9), 468–479. <https://doi.org/10.1177/070674371405900903>
- Homish, G. G., Hoopsick, R. A., Heavey, S. C., Homish, D. L., & Cornelius, J. R. (2019). Drug use and hazardous drinking are associated with PTSD symptoms and symptom clusters in US army reserve/national guard soldiers. *The American Journal on Addictions*, 28(1), 22–28. <https://doi.org/10.1111/ajad.12829>
- Hourani, L., Williams, J., Bray, R. M., Wilk, J. E., & Hoge, C. W. (2016). Gender differences in posttraumatic stress disorder and help seeking in the U. S. Army. *Journal of Women's Health*, 25(1), 22–31. <https://doi.org/10.1089/jwh.2014.5078>
- Iversen, A. C., Fear, N. T., Ehlers, A., Hacker Hughes, J., Hull, L., Earnshaw, M., Greenberg, N., Rona, R., Wessely, S., & Hotopf, M. (2008). Risk factors for post-traumatic stress disorder among UK armed forces personnel. *Psychological Medicine*, 38(4), 511–522. <https://doi.org/10.1017/S0033291708002778>
- Iversen, A. C., van Staden, L., Hughes, J. H., Browne, T., Greenberg, N., Hotopf, M., Rona, R. J., Wessely, S., Thornicroft, G., & Fear, N. T. (2010). Help-seeking and receipt of treatment among UK service personnel. *British Journal of Psychiatry*, 197(2), 149–155. <https://doi.org/10.1192/bjp.bp.109.075762>
- Judkins, J. L., Moore, B. A., Collette, T. L., Hale, W. J., Peterson, A. L., & Morissette, S. B. (2020). Incidence rates of posttraumatic stress disorder over a 17-year period in active duty military service members. *Journal of Traumatic Stress*, 33(6), 994–1006. <https://doi.org/10.1002/jts.22558>
- Kessler, R. C., Heeringa, S. G., Stein, M. B., Colpe, L. J., Fullerton, C. S., Hwang, I., Naifeh, J. A., Nock, M. K., Petukhova, M., Sampson, N. A., Schoenbaum, M., & Zaslavsky, A. M. (2014). Ursano RJ; army STARRS collaborators. Thirty-day prevalence of DSM-IV mental disorders among nondeployed soldiers in the US army: Results from the army study to assess risk and resilience in servicemembers (Army STARRS). *JAMA Psychiatry*, 71(5), 504–513. <https://doi.org/10.1001/jamapsychiatry.2014.28>
- Kowalski, J. T., Hauffa, R., Jacobs, H., Höllmer, H., Gerber, W. D., & Zimmermann, P. (2012). Deployment-related stress disorder in German soldiers: Utilization of psychiatric and psychotherapeutic treatment. *Deutsches Ärzteblatt International*, 109(35–36), 569–575. <https://doi.org/10.3238/arztebl.2012.0569>
- Kulesza, M., Pedersen, E., Corrigan, P., & Marshall, G. (2015). Help-seeking stigma and mental health treatment seeking among young adult veterans. *Military Behavioral Health*, 3(4), 230–239. <https://doi.org/10.1080/21635781.2015.1055866>
- MacManus, D., Rona, R., Dickson, H., Somaini, G., Fear, N., & Wessely, S. (2015). Aggressive and violent behavior among military personnel deployed to Iraq and Afghanistan: Prevalence and link with deployment and combat exposure. *Epidemiologic Reviews*, 37(1), 196–212. <https://doi.org/10.1093/epirev/mxu006>
- Motreff, Y., Baubet, T., Pirard, P., Rabet, G., Petitclerc, M., Stene, L. E., Vuillermoz, C., Chauvin, P., & Vandentorren, S. (2020). Factors associated with PTSD and partial PTSD among first responders following the Paris terror attacks in November 2015. *Journal of Psychiatric Research*, 121, 143–150. <https://doi.org/10.1016/j.jpsychires.2019.11.018>
- Sharbafchi, M. R., & Heydari, M. (2017). Management of substance use disorder in military services: A comprehensive approach. *Advanced Biomedical Research*, 6(1), 122. https://doi.org/10.4103/abr.abr_283_16
- Sharp, M. L., Fear, N. T., Rona, R. J., Wessely, S., Greenberg, N., Jones, N., & Goodwin, L. (2015). Stigma as a barrier to seeking health care among military personnel with mental health problems. *Epidemiologic Reviews*, 37(1), 144–162. <https://doi.org/10.1093/epirev/mxu012>
- Sundin, J., Herrell, R. K., Hoge, C. W., Fear, N. T., Adler, A. B., Greenberg, N., Riviere, L. A., Thomas, J. L., Wessely, S., & Bliese, P. D. (2014). Mental health outcomes in US and UK military personnel returning from Iraq. *British Journal of Psychiatry*, 204(3), 200–207. <https://doi.org/10.1192/bjp.bp.113.129569>
- Trautmann, S., Goodwin, L., Höfler, M., Jacobi, F., Strehle, J., Zimmermann, P., & Wittchen, H. U. (2017). Prevalence and severity of mental disorders in military personnel: A standardised comparison with civilians. *Epidemiology and Psychiatric Sciences*, 26(2), 199–208. <https://doi.org/10.1017/S204579601600024X>
- United Nations. (2023). Security council ends MINUSMA mandate, adopts withdrawal resolution. Bureau de la Communication Stratégique et de l'information publique. Retrieved November 2, 2023, from <https://reliefweb.int/report/mali/security-council-ends-minusma-mandate-adopts-withdrawal-resolution%20Security%20Council%20ends%20MINUSMA%20mandate%2C%20adopts%20withdrawal%20resolution%20%20%20.pdf>
- Walter, K. H., Levine, J. A., Highfill-McRoy, R. M., Navarro, M., & Thomsen, C. J. (2018). Prevalence of posttraumatic stress disorder and psychological comorbidities Among U.S. Active duty service members, 2006–2013. *Journal of Traumatic Stress*, 31(6), 837–844. <https://doi.org/10.1002/jts.22337>
- Wesemann, U., Bühler, A., Mahnke, M., Polk, S., & Willmund, G. (2020). Longitudinal mental health effects of the 2016 terrorist attack in Berlin on various occupational groups of emergency service personnel. *Health Security*, 18(5), 403–408. <https://doi.org/10.1089/HS.2019.0108>
- Wesemann, U., Rowlands, K., Renner, K. H., Konhäuser, L., Köhler, K., & Himmerich, H. (2024). Impact of life-threatening military incidents during deployments abroad on the relationships between military personnel and their families. *Frontiers in Psychiatry*, 15, 1481901. <https://doi.org/10.3389/FPSYT.2024.1419022/BIBTEX>
- Wesemann, U., Sahebi, A., & Himmerich, H. (2024). Editorial: Impact of deployment in disaster situations on the mental health of emergency responders. *Frontiers in Psychiatry*, 15. <https://doi.org/10.3389/FPSYT.2024.1481901>

- Wesemann, U., Willmund, G. D., Ungerer, J., Kreim, G., Zimmermann, P. L., Bühler, A., Stein, M., Kaiser, J., & Kowalski, J. T. (2018). Assessing psychological fitness in the military – development of an effective and economic screening instrument. *Military Medicine*, 183(7–8), e261–e269. <https://doi.org/10.1093/milmed/usy021>
- Wesemann, U., Zimmermann, P., Heinrich, S., & Gründler, T. O. J. (2022). Erfassung psychischer Störungen vor und nach militärischen Auslandseinsätzen bei Kampftruppen [Translation: “Recording of mental disorders before and after military deployments abroad in combat troops”]. *Trauma – Zeitschrift für Psychotraumatologie und ihre Anwendungen*, 20(4), 6–19. https://www.researchgate.net/publication/366808458_Erfassung_psychischer_Störungen_vor_und_nach_militärischen_Auslandseinsätzen_bei_Kampftruppen_Trauma_-_Zeitschrift_für_Psychotraumatologie_und_ihre_Anwendungen
- Williams, J. D. (2022). Do veterans seek mental health counseling? *J Grad Educ Res*, 3(9), 45–50. <https://scholarworks.harding.edu/jger/vol3/iss1/9>.
- Wittchen, H. U., Schönfeld, S., Kirschbaum, C., Thureau, C., Trautmann, S., Steudte, S., Klotsche, J., Höfler, M., Hauffa, R., & Zimmermann, P. (2012). Traumatic experiences and posttraumatic stress disorder in soldiers following deployment abroad: How big is the hidden problem? *Deutsches Ärzteblatt International*, 109(35–36), 559–568. <https://doi.org/10.3238/arztebl.2012.0559>