Long-term Health Outcomes of Returning Danish Soldiers: A Follow-up Study

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October 6, 2022

Abstract

Following up on a previous study of deployed Danish soldiers, this paper studies the long-term consequences of deployment on soldiers' mental health. The study focuses on objective measures of mental health from administrative records and explores the full population of deployed Danish soldiers in the period 1992-2012. For deployed men soldiers born 1976-1989, a control group of men deemed fit for military service and born in the same years, but who were not deployed, is constructed. The study also compares the background characteristics of deployed women with fit-for-service women. For the soldiers deployed to missions in Iraq and Afghanistan in 2003-2012, the relation between combat exposure and mental health outcomes is investigated. Results show increasing patterns in the utilization of mental health services including the purchase of mental health medication for the deployed soldiers. The paper also provides a summary of the findings from the project *Returning Soldiers*.

JEL Classification: I1, H56

Keywords: Military deployment, Mental health, Combat exposure

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1 Introduction

Since the early 1990s, Denmark has sent about 50,000 soldiers to participate in over 50 international military missions, resulting in more than 83,000 individual deployments. The present study focuses on the Danish soldiers deployed between 1992-2012, about 27,000 soldiers and 47,000 individual deployments. Previous work (Lyk-Jensen and Pedersen, 2019; Lyk-Jensen et al., 2016, 2012) has contributed new knowledge about Danish soldiers and provided some initial results on the consequences of international mission deployments for Danish soldiers. These previous results show that while Danish soldiers generally coped well during deployment, they were a highly heterogeneous group whose backgrounds and reactions to their experiences during and after deployment differ widely. Another finding was the increasing trend in self-reported deployment-related psychological problems over time from first missions to the later ones.

At the same time, many changes have occurred in the studied period: The type of mission has changed to involved more armed conflicts and engagements (from peace keeping to peace enforcing), the armed forces have changed their recruitment processes, and since October 2010, a Danish veteran policy has offered various programs to veterans[1] when they return home. The previous study about the mental health profile of Danish soldiers (Lyk-Jensen et al., 2012) stopped at the same time Denmark introduced its veteran policy.[2] Moreover, the society to which the soldiers return to has also changed (Culp et al., 2013).

The present study can better draw long-term consequences of deployment for the generations of soldiers deployed to Iraq and Afghanistan, as psychological injuries can arise a number of years after deployment (Lyk-Jensen and Pedersen, 2019; Møller et al., 2020). The literature about the consequences of deployment on mental health is much too large to give a full account of here, thus one can refer to a Campbell Systematic Review for more details (see Bøg

[1] A veteran is defined as person who has been deployed in international operations at least once regardless of whether they are still in service or have left the army.

[2] Denmark's first veteran policy was published on 13 October 2010. An English version of the veteran policy of Denmark 2016 is available at: https://www.fmn.dk/globalassets/fmn/dokumenter/strategi/veteraner/-the-veteran-policy-of-denmark-2016-.pdf

et al., 2018). The main conclusion from this systematic review is that deployment to military operations negatively affects the mental health and functioning of deployed personnel.

While missions in the Balkans were mostly peace keeping, the missions in Iraq and Afghanistan are peace enforcing and characterized by asymmetric warfare with enemies of less military power—the Global War on Terrorism (GWOT). Tanielian et al. (2008) described the invisible wounds of war and the consequences from conflicts in Afghanistan and Iraq for U.S. soldiers, showing that Post-Traumatic Stress Disorder (PTSD), major depression, and traumatic brain injury (TBI) could have long-term cascading consequences such as substance abuse, suicide attempts, unhealthy behaviors, physical health problems, mortality, as well as diminished productivity and unemployment.

For U.S. soldiers the literature has reported strong evidence for combat-induced addiction e.g., alcohol (Seal et al., 2011) or opioids (Cesur et al., 2019). Seal et al. (2011) found that post-deployment alcohol use disorder and drug use disorder diagnoses were more prevalent in subgroups of Iraq and Afghanistan veterans and were highly co-morbid with PTSD and depression. Cesur et al. (2019) reported that war-related physical injuries, death-related battlefield trauma, and PTSD emerge as primary mechanisms to explain the abuse of opioids.

In general, most previous research on mental health among returning soldiers from the GWOT includes either self-reported assessment of mental health or short follow-ups (e.g., Hoge et al. (2006, 2008), and many research designs cannot demonstrate causality (Gade and Wenger, 2011). Although some studies exploit natural experiments to investigate the effect of combat on mental health (Cesur et al., 2013; Watts and Wright, 2021), they also rely on self-reported assessments of both mental health and combat exposure for relatively small samples. To date, no studies have included objective measures of mental health combined with individual combat exposure from military record for extended follow-up periods.

This study investigates the trends since the last study in 2010 (Lyk-Jensen et al. (2012). As in Lyk-Jensen and Pedersen (2019) and Lyk-Jensen et al. (2016), the study uses objective measures for mental health to avoid recall bias (Wessely et al., 2003) or justification bias (Black et al., 2017). Moreover, with these kind of measurements from administrative records, it is also possible to avoid limitations such as the absence of a control group in surveys (Bache, 1998) or

drop out of the respondents (non-response bias). Indeed, Rona et al. (2004) showed that military personnel with potentially serious mental illness had a lower response rate than the rest of the population considered and Hoge et al. (2006) found that soldiers may not report symptoms, because they feared for their career.

While the purpose of this follow-up study is to focus on returning soldiers' mental health outcomes several years after their last deployment, the study does not evaluate the impact of the veteran policy on these outcomes. Nonetheless, one cannot exclude that veteran policy programs may have impacted help-seeking behaviors, as well as the likelihood of being registered with a psychiatric treatment.

Using register data for a full population of deployed soldiers, the present study can investigate mental health problems with a longer follow up for these heterogeneous groups of deployed soldiers. Moreover, by focusing on peace enforcing missions, for which information about combat exposure from military communications is available—thus avoiding that self-reported combat exposure may be affected by soldiers' concurrent PTSD symptoms (Wilson et al. (2008)—one can study the impact of combat exposure on this sub-population of soldiers deployed to Iraq and Afghanistan in 2003-2012.

Because the incidents experienced within each mission and unit are to a large degree unpredictable, one can use the conditional randomness of combat exposure within and between the missions. This natural experiment enables us to analyze a group of soldiers who experienced potentially traumatic incidents and a control group of soldiers who did not. In this way, it is possible to identify the causal effect of potentially traumatic incidents on psycho-social outcomes.

To investigate the changes in the soldiers' mental health, follow-up studies for psychiatric diagnoses, suicide attempts, contacts with physicians and medical specialists, and medication patterns to treat mental disorders are carried out, and the study also focuses on specific psychiatric diagnoses (e.g., PTSD). Soldiers are compared with a control group of fit-for-service (FFS) Danish men born in the same year as the soldiers, but never deployed to international missions. Furthermore, the effect of combat exposure on these mental health outcomes for soldiers deployed to Iraq in 2003-2009 and Afghanistan in 2006-2012 is investigated.

These follow-up studies reveal the changes in living conditions over time, as well as illustrating differences among soldiers who have experienced different types of missions. The results show an increase in the utilization of mental health services (MHS) for soldiers. For example, the number of soldiers registered with either a psychiatric diagnosis or the purchase of mental health medicine, without having such a registration before their first mission has increased by 60%. From 2010, soldiers show higher use of MHS than FFS men who were never deployed. Moreover, individual combat exposure does not necessarily predict a higher use of MHS and a soldier's family background and previous use of MHS are important factors in explaining the post-deployment use of MHS.

This study contributes to the literature on the consequences of deployment on mental health by providing a long-term follow up of soldiers' use of MHS, purchase of mental health medicine (MHM), suicide attempts, and death (during and after mission). Moreover, given the Danish registers, it is possible to both retrieve pre- and post-mission information and follow these soldiers and their controls several years after homecoming. Furthermore, exploiting unique Danish data about combat exposure, one can study its impact on mental health for the soldiers deployed during the GWOT.

The paper proceeds as follows. Section 2 presents some background about the research project and its current results. Section 3 describes of the institutional settings and main changes during the studied period. Section 4 presents our empirical approach and Section 5 the data. Section 6 describes the samples, and Section 7 presents the results. Section 8 concludes.

2 Background

This follow-up study is a part of a larger project: *Returning soldiers: costs, consequences and mechanisms—Evidence from Denmark*. The project is organized around three themes. The first theme includes the benefits and costs of participation in conflict zones and how these benefits and costs changed from the early 1990s to the 2010s. The results are reported in Lyk-Jensen and Pedersen (2022) and Bingley and Lyk-Jensen (2022).

The second theme focuses on the health situation for returning soldiers, e.g., help-seeking behavior, in Møller et al. (2020), and the relationship between suicide attempts and perceived

combat exposure, in Vedtofte et al. (2021), and cascading mental effects in the soldiers' families, in Lyk-Jensen and Bingley (2022).

This follow-up study is a part of the mental health theme and investigates how the health situation of returning soldiers changed several years after deployment through soldiers' medication patterns regarding prescription drugs to treat mental disorders (mental health medicine, MHM), psychiatric diagnoses, and contacts with physicians and medical specialists.

The third theme is about how deployment imposes costs on soldiers by altering the way they make choices, as shown in Chanel et al. (2022).

Lyk-Jensen and Pedersen (2022) and Lyk-Jensen and Bingley (2022) also test and exploit the fact, that conditional on type of unit, the mission, and the soldier's rank, combat exposure is exogenous to the outcomes of interest. Lyk-Jensen and Pedersen (2022) find that while combat exposure has no effect on soldiers' socio-economic and health outcomes, soldiers' pre-mission characteristics are important factors in explaining the post-deployment use of mental health services and the incidence of crime. Lyk-Jensen and Bingley (2022) investigate the effect of fathers deployed and exposed to combat on their children and the mothers of these children. The results show that children of exposed fathers have lower test scores than children of deployed fathers not exposed to combat. The results are robust to several falsification tests. Other findings of the study are that combat exposure increases the likelihood of substance abuse diagnosis for the father and the use of mental health services and antidepressants for the mothers and the children.

As mentioned previously, the project also analyses the help-seeking behavior of the soldiers (Møller et al., 2020) and the relationship between suicide attempts and perceived combat exposure (Vedtofte et al., 2021). Both studies combine survey data with Danish register data on MHS use. Vedtofte et al. (2021) show that the perceived combat exposure was associated with an increased risk of suicide attempt and that this association was fully mediated by mental disorders such as PTSD, depression or a combination of both.

Møller et al. (2020) investigate the post-deployment MHS use in soldiers who report mental health problems in a post-deployment survey. Their results show that significantly more veterans with self-reported mental health problems receive professional help. However, for most

deployed soldiers, this does not happen until four years after their deployment, suggesting that a long follow-up period is important for those soldiers who need treatment. Møller et al. (2020) also show that veterans who have experienced being wounded in combat or seeing a comrade die, be wounded or be injured, are more likely to have been in contact with the psychiatric system. These types of experiences can be related to the category of passive exposure—with high external locus of control (Rotter,1966; 1975), i.e., feeling like they have little control over events as depicted in Gallaway et al. (2014). Moreover, Gallaway et al. (2014) show that passive exposure is predictive of PTSD.

Beyond the risk of injury or death during deployment, participation in military missions may also affect soldiers' later behaviors due to changes in personality (self-discipline and control), risk preferences (risk taking) and time preferences (discounting factor), all of which could result in different later life outcomes (e.g., civilian earnings, family situation, and health). Using survey data, Chanel et al. (2022) investigate how the difference between anticipated emotion and the emotion actually experienced, may induce changes in preferences on time, risk and occupation after combat. Their results indicate that higher anticipated fear compared to the one actually experienced increases risk tolerance and impatience, while higher anticipated excitement strengthens the will to stay in the military. However, for the single mission studied (Afghanistan mission 11), trauma has no impact on the soldier's time and risk preferences.

Since the end of the Cold War, European armed forces have changed function from mass civil defense to deployment in international operations. At the same time, and partially because of these changed demands, several countries have abolished conscription in favor of an all-volunteer military. Despite a long history of variation in military recruitment, very little is known about how conscripts compare to volunteers in terms of effective soldiers.

To fill this knowledge gap, Bingley and Lyk-Jensen (2022) used the case of Denmark, which is one of the few countries recruiting a mixture of conscripts and volunteers, and one of the few randomly assigning individuals to military service—300,000 men since the 1990s. Although in Denmark being deployed is a voluntary choice made by soldiers after their initial recruitment for military service, Bingley and Lyk-Jensen (2022) use the random initial assignment to estimate the causal relationship between recruitment method and soldiers' outcomes by comparing the

outcomes of the initial volunteers and conscripts during or after deployment.

The results suggest that while conscripts and volunteers differ in terms of Armed Forces Qualification Test (AFQT) scores[3] (higher for the conscripts) and height (lower for the conscripts) measured at the Danish Armed Forces Day (AFD—a recruitment day to military service), these differences disappear among the deployed. The remaining differences in terms of characteristics are that compared to volunteers, deployed conscripts are less likely to have a married mother and less likely to have parents with college education, and are more likely to have lower household income when they are 15 and to have lower birth weight. Despite this social negative selection, deployed conscripts (compared to volunteers) are more likely to achieve the rank of officer. There are no differences in number and length of military deployments or employment in the Army, but conscripts (compared to volunteers) are less likely to stay several years after their missions. Concerning civilian outcomes after deployment or after exiting the Danish Armed Forces (DAF), their findings show no differences between conscripts and volunteers in terms of unemployment or mortality.

3 Institutional settings and changes

3.1 The main changes in the military system

As previously mentioned, since the 1990s several changes in type of mission and recruitment of soldiers to these missions have occurred. The missions have changed from being mainly peace keeping[4] to peace enforcing[5], which involves engagement in combat situations. Moreover, since 2004 a marked shift has occurred from soldiers occasionally being deployed for military operations abroad, to that deployment becoming part of the norm. Furthermore, Denmark introduced

[3]AFQT denotes the Børge Prien Prøven, i.e., the Danish Armed forces intelligence test. The test has been used since 1957. See Teasdale (2009) for psychometric properties of the Børge Prien Prøve and a review of its applications. Mortensen et al. (1989) show that the Børg Prien Prøve is correlated 0.82 with the Wechsler Adult Intelligence Scale.

[4]Examples from the peace keeping missions, Danish soldiers were deployed to UNPROFOR (United Nations Protection Forces in Bosnia Herzegovina, Croatia, Serbia, Montenegro and Macedonian, February 1992-March 1995); UNCRO (United Nations Confidence Restoration in Croatia, March 1995-January 1996; IFOR (NATO-led Implementation Force, December 1995-December 1996 in Bosnia and Herzegovina); SFOR (Stabilization Force in Bosnia and Herzegovina, December 1996-2004); KFOR (NATO Kosovo Force i Kosovo, since June 1999).

[5]Example of peace enforcing missions Danish soldiers were deployed to Multinational Force in Iraq (2003-2007); ISAF, International Security Assistance Force in Afghanistan (2001-2014).

its veteran policy in 2010.

Both the 2008 financial crisis and the media coverage of the Afghanistan war have likely influenced military recruitment, making a military career more appealing for some and less appealing for others. For example, since 2006, the Danish media have reported the increased numbers of wounded and killed Danish soldiers in Afghanistan, highlighting the danger of these missions, and at the same time the 2008 financial crisis worsened civilian job opportunities in Denmark, especially for young and unskilled people, making an army career more attractive to them.

The recruitment and training of deployed soldiers also changed during this period. From 1994 to 2005, the Danish International Brigade (Den Danske Internationale Brigade, DIB) was the typical entry point for soldiers deployed to international missions offering a three-year contract for international missions.[6] Most of the soldiers deployed during 1994–2009 were recruited through these DIB contracts.

Since 2005, the first selection or screening has taken place during the Armed Forces Day (draft day), when the eligibility of men called up for military service is determined; how many are actually conscripted is determined by how many men have volunteered and how many have been selected for military service.

Between 2006 and 2012, the percentage of volunteers for military service increased from 76 to 96 percent of those recruited, along with an increase in the number of deployments. The previous conscription (before 2005) had far fewer volunteers, and since 2011 the draft lottery (the randomized recruitment mechanism for conscripts) became almost obsolete. Despite public discussions about whether the lottery should be abolished, the Danish government decided to keep it, but to reduce the number of conscripts. In November 2012, a majority in the Danish Parliament reduced the number of conscripts from about 5,000 to about 4,200. By keeping the lottery, the military can draft more conscripts if the economic cycle changes and fewer people volunteer. Thus, both the reduction in average length of military service from about eight months to four months and the decision to reduce the number of conscripts can explain the increasing share of volunteers during the period studied.

[6]DIB was established in 1994 and disbanded on February 15, 2005.

During 1992–2012, the DAF sent an average of 2,000–4,000 soldiers on international military deployments annually. These soldiers sign contracts of varying lengths.[7]

3.2 The current Danish military system

The two pillars of the current Danish military system are limited conscription and deployable professionals (Heurlin, 2006).

In Denmark, attendance at the Armed Forces Day meeting is mandatory for all men when they turn 18, and since 2004, women have also been invited to participate.[8] Before the mandatory AFD meeting, all prospective draftees complete a health questionnaire that forms the basis for a health assessment. The military physician can, if necessary, seek additional medical information from public health records prior to the AFD. On the AFD, prospective draftees undergo a medical examination and an IQ test (Armed Forces Qualification Test, AFQT).

On average, 60-70% of a birth cohort is declared eligible (Lyk-Jensen, 2018). Only men declared eligible must participate in the draft lottery, which inducts men into military service. After military service, eligible men who volunteer and obtain a contract with the DAF can be deployed. Importantly, no matter what the lottery outcome is, only personnel who volunteer for deployment can be deployed. As the DAF capacity is limited, not all men who want to join necessarily obtain a contract. Although men volunteer to sign a contract, they cannot volunteer for a deployment to a specific mission. As mentioned in Cesur et al. (2013), the army deploys units, and not men. Moreover, soldiers of identical military rank and occupation specialty are essentially perfect substitutes in the assignment of their duties.

Since 2005, the recruits have undergone basic Army training (Hærens Basisuddannelse, HBU) for four months (HBU)[9] After having completed basic training (HBU), the soldier can apply for Army Reaction Forces Training (Hærens Reaktionsstyrke Uddannelse, HRU) which last eight months. This training constitutes the principal foundation for later deployment, which

[7] In Denmark soldiers can serve short-term contracts (e.g., three years) and then return to civilian life after only one deployment.

[8] Since 2004 around 15–20% of recruits have been women (Ministry of Defense Personnel Administration).

[9] HBU is a standard training program including different modules: basic military education; field training; fire training; combat training; help to the rest of society (environment tasks or rescue techniques) and an introduction to peace keeping operations. The military basic education means that the soldiers can succeed in an uncertain environment, provide first aid, operate handguns and use other equipment and supplies.

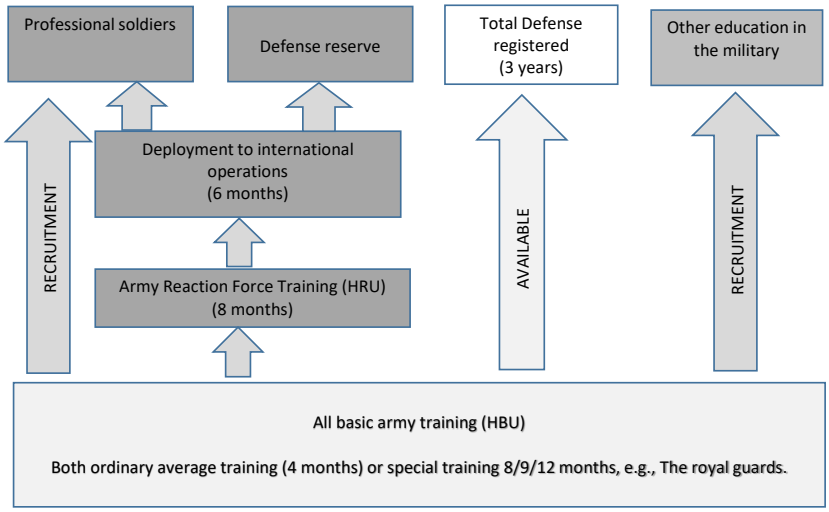
typically lasts six months. During HBU, the conscripts and volunteers who want to continue in HRU are evaluated by their group leader (informal screening) to see if they react as expected and their physical condition is checked. The intensity and extent of the screening differ according to the groups of personnel —privates, non-commissioned officers (NCO) (e.g., sergeant) and officers.

While HRU prepares soldiers for deployment to international military missions as privates, future officers tend to bypass HRU, going straight to a military training college for three to four years.

Deployed soldiers in the DAF have had at least 12 months training before being deployed to an international military mission. These soldiers are either HRU personnel with short-term contracts or professional soldiers from the Army Standing Reaction Force (Haerens Staaende ReaktionsStyrke, SRS) with long-term contracts.

Figure 1 illustrates the general principle for military recruitment in Denmark. Our description of recruitment focuses on deployment to international missions. The Figure also shows that after one or more deployments to international missions, HRU soldiers can also become professional soldiers.

FIG. 1.—General principle for military recruitment in Denmark



NOTE.— Source the Danish Defense.

3.3 The Danish health system

While the Danish military has its own medical system, "Military Health System," it is not an alternative parallel to the civilian health system (National Health Service, NHS). The military health system mainly ensures that soldiers are fit for a deployment and provide medical support during the deployment, whereas access to hospital treatment is possible only through the NHS. Soldiers are treated in the same hospitals as civilians and have access to the same general practitioners (GPs) and specialists.[10]

Soldiers can be formally registered as having a psychiatric diagnosis either as acute emergency cases or through contacts with hospitals (either admissions or day patients) via prescriptions from GP, specialists, or military doctors. Prescription drugs are readily available and heavily subsidized in Denmark. Moreover, all people living in Denmark have free access to a GP. Thus, with the Danish health registers, a possible underestimation of mental health problems due to self-reporting, re-call bias, fear for career or other barriers to health care access that might be present in other institutional contexts can be avoided. However, the registers only report on the persons who are in treatment and one cannot exclude that some persons may be sick without being registered in the data.

The Danish participation in international military missions and the changes in type of mission (from peace keeping to peace enforcing) has occurred rapidly and the NHS was not particularly aware of soldiers' mental health issues. As previously mentioned, the Danish veteran policy focusing on the consequences of deployment on soldiers' mental health was first implemented in October 2010. In 2014 a new law (Act on compensation to formerly deployed soldiers and other state employees with late diagnosed PTSD; LOV nr. 336 2/04/2014), made it possible to have PTSD recognized as an occupational disease if the diagnosis occurred more than six months after the traumatizing event.

[10]Contrary to many other NATO countries, a large number of Danish soldiers have short-term contracts and leave the military after one or two deployments. The military health system offers free psychological help from military psychologists or private-practice psychologists, even after the soldier has left the military system. However, before 2010, the program was not in great use. Military psychologists cannot prescribe medicine, nor can they refer soldiers to psychiatric hospitals.

4 Empirical Approach

The methods vary throughout the analysis. Results from register data are presented in the form of descriptive analyses. This study uses econometric analyses with logistic regressions explaining the probability of specific health outcomes.

A control group is used in many of the analyses, as investigating the relationship between deployment, combat exposure, and mental health is also complicated by positive selection into the military, whereby selected individuals have to satisfy both physical and mental criteria. By constructing a control group of men of similar age and fit for military service but not deployed on an international military mission, one can better compare the utilization of the mental health service (MHS) among both soldiers and civilians, and explore the resilience of the deployed.[11]

As a control group for the deployed soldiers, section 6.1 uses men and women in a relevant age interval who are FFS, but who have never been deployed. For both groups information from register data is available. However, because the number of deployed women is relatively low, the first registration of mental health outcomes for deployed women and FFS women over time cannot be investigated.

Section 6.2, focuses on soldiers deployed to GWOT missions in Iraq (2003-2009) and Afghanistan (2006-2012) and exploits a natural experiment about combat exposure. To show that combat exposure among the deployed soldiers is as good as random, a balancing test is conducted to explain combat exposure (yes/no) by soldiers' pre-deployment characteristics such as year of birth, family background (e.g., parental education, and family income), conditional on their military characteristics (rank at first mission, the specific mission, and the type of unit).

After showing, this conditional randomness of exposure, one can analyze the impact of combat exposure on the mental health of the first-timers deployed in 2003-2012 (soldiers who have never been deployed before 2003). In this case, the control group is constituted by the non-exposed soldiers by mission, age, rank, and type of unit.

The effect of combat exposure on soldier's mental health outcomes presented in the previous

[11] Lyk-Jensen et al. (2016) uses propensity scores matching to estimate the effect of deployment on mental health by using a comparison group of FFS men. In this study the control group is essentially used to compare changes over time for a better comparison group than the general population.

sections is investigated, by estimating the following equation:

$$y_i = \pi_0 + \pi_1 COMBAT_i + \pi_2 X_i + \upsilon_i, \tag{1}$$

where y_i is the health outcomes of soldier i, $COMBAT$ is a dummy indicating whether soldier i is exposed to combat, and X is a set of control variables for soldier's family background. If combat exposure is random, one can directly estimate this equation with Ordinary Least Squares (OLS).

In terms of standard statistics, tests and logistical regressions are used in the analysis of the probability of realizing one of the outcome variables. For the explanatory variable in the logistic regressions, the odds ratio is used, where values over one imply that the respective variable increases the probability for the respective outcome, whereas values below one decrease the probability.

The descriptive analyses provide the p-value for Chi2-tests and t-tests showing the probability that the results (usually the difference in characteristics in two groups) occurred by chance. Low p-values indicate that the result did not occur by chance and show a statistical significant difference. The mental health outcomes for the period 1995-2018 are reported.

5 Data

The military register datasets used in this study contain information on 27,520 soldiers deployed since the end of the 1990s through 2012 and on 404,414 individuals eligible for military service from 1994 through 2017, but not deployed. Moreover, for each deployed soldier there is information on the type and number of missions, the place and date of these missions, the soldier's rank and for more than 45 percent of the veterans information about Armed Forces Day tests (ability and physical tests). Furthermore, for those deployed to Iraq in 2003-2008 and Afghanistan 2006-2012, there are data on military communications from the military archives about special events (SEs) such as ambush, improvised explosive devices (IED), or indirect fire attack. Each event is characterized by a date, a place and the units or the soldiers exposed to it.

Thanks to the unique Danish civil registration number for each individual in Denmark, one

can link administrative records to a huge variety of socio-demographic characteristics from Statistics Denmark and to military administrative records.

5.1 Mental health measures

This study uses objective measures for mental health. The Danish Psychiatric Central Research Register (Munk-Jørgensen and Mortensen, 1997; Mors et al., 2011) contains both data on inpatient contacts since 1969, and since 1995, outpatient and emergency contacts. This register is used to measure the utilization of mental health services among soldiers after deployment.

To examine the individual's purchase of mental health medication (MHM), as another indicator of psychological problems, the study uses data from the Danish National Prescription Registry (Lægemiddeldatabasen), which classifies prescription medicine, according to the Anatomical Therapeutic Chemical Classification (ATC) system. It contains data on redeemed drug prescriptions in Denmark from 1995 (Wallach Kildemoes et al., 2011).

Redeemed prescriptions are used for the following drug classes with ATC-codes in parentheses: antipsychotics (N05A), anxiolytics (N05B), hypnotics and sedatives (N05C), antidepressants (N06A).[12] In the analysis, all these medicines are grouped together, while the purchase of opioids (N02A) is investigated separately.

Suicide attempts among the deployed soldiers are also examined.[13] In Denmark, suicide attempts can be identified from the National Patient register and Psychiatric Central Research Register by using the International Classification for Diseases (ICD)-10 codes X60-X84 or if the reason for contact is listed as suicide attempt or self-harm. As these episodes of suicide attempts are under-reported in the register (Nordentoft, 2007; Helweg-Larsen, 2006), self-harm is used as probable suicide attempts regardless of intent, self-harm includes episodes, such as poisoning as well as injuries to the hand and/or forearm in combination with a primary diagnosis

[12]The previous study (Lyk-Jensen et al., 2012) included psychostimulants (N06B) and psychostimulants for alcohol dependency (N07BB), which also can be used to treat the after-effects of deployment. N06B and N07BB are not always used in the definition of MHM and they have also been excluded from this study's definition of MHM in order to compare the results with other studies. Nevertheless, because of a low prevalence for this type of medicine it does not change the results.

[13]See also Vedtofte et al. (2021), one of the publication from the current project, *Returning Soldiers*, which investigates the association between self-reported perceived danger during deployment such as combat exposure and post-deployment suicide attempts among Danish military personnel.

of a mental illness.[14]

To measure the use of MHS, the study uses a dummy, which is one if the soldier is registered after his first deployment with a psychiatric diagnosis, with the purchase of mental health medication, or with a contact to health system including suicide attempts.

The descriptive analysis compares the first year of registration for the deployed soldiers and the control group of FFS men.

5.2 The combat exposure data

To measure the impact of combat exposure on mental health outcomes, the study focuses on soldiers deployed to Iraq in 2003-2009—Iraq missions 1 to 9, and to Afghanistan in 2006-2012—International Security Assistance Force (ISAF) Regional commando (RC) South(S) and South West (SW): ISAF RC(S) missions 1 to 9 and ISAF RC(SW) missions 10 to 12. Taken together, these 21 missions include 12,604 deployments and involved 8,913 soldiers.

For this population of deployed soldiers, military communications reporting the previously mentioned SEs were collected from the military historical archives. During their mission, officers have to report these SEs, i.e., combat events, but also sickness and other events related to their staff that are "special". The reports are sent to the Danish Defence headquarters and follow a standard layout where it is possible to identify the date, the place, the type of event and which units or persons are involved. The reports also include a battle damage assessment when relevant. Each event is characterized by a date, a place and the unit or soldier directly exposed to this special event.

These 21 missions are called in the following "SE missions", as information about all the SEs occurring during these missions is used in the analysis: about 1,500 SEs. Special events are grouped into combat and non-combat events. Combat events include ambush, direct and indirect fire, improvised explosive devices (IEDs), combat and collateral damages, and combat support. The non-combat event category includes e.g., non-combat injury or accident (non-

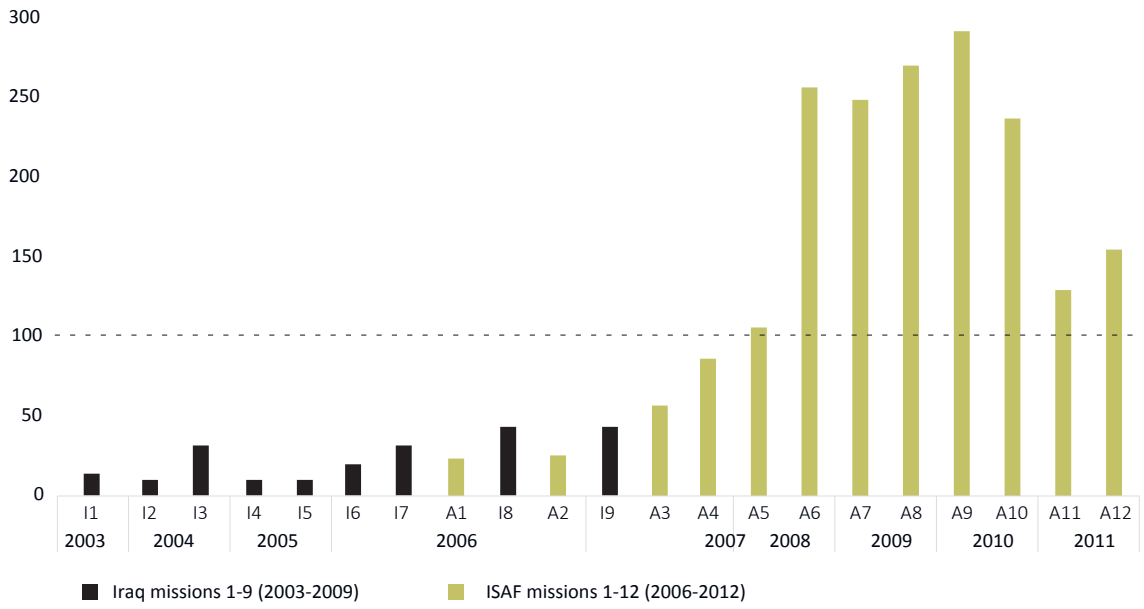
[14]Two groups of 'probable suicide attempts' can be considered (1) a primary psychiatric diagnosis (ICD10 code F00-F99) in combination with secondary diagnoses: cutting of sharp objects (S51, S55, S59, S61, S65, S69), poisoning of drugs (T36-T50), poisoning of non-pharmaceutical substances (T52-T60); (2) a main diagnosis of poisoning by mild analgesics (T39, T40), poisoning with opioids, psychotropic drugs, and by carbon monoxide (T42, T43, and T58). Although Gasse et al. (2018) found that those registered as in group (1) have a low predictive value for suicide they are also included in the analysis.

battle related).

This study focuses on how combat may directly affect the soldier's mental health, and only consider the category of combat events. Lyk-Jensen and Bingley (2022) also considers the category of non-combat events for fathers and find no effect for these.

Figure 2 shows an index for combat exposure based on the combat-events occurring during each mission. The basis index 100 corresponds to the aggregate average level of exposure for all the 21 SE missions. Figure 2 also shows that missions in Afghanistan have a much higher index than the missions in Iraq.

FIG. 2.—Index for Combat Events. SE missions Afghanistan and Iraq



NOTE.—The figure shows an index (basis 100) for combat events (ambush, direct and indirect fire, IEDs, combat and collateral damages, and combat support). The basis of each index is 100 for the average exposure among the 21 SE missions. Iraq missions are denoted by "I" and the number of the mission, while Afghanistan missions are denoted by "A" and the number of the mission.

6 Descriptive statistics

As previously mentioned, the follow-up studies focus on soldiers deployed in 1992-2012 in the Balkans, Afghanistan, Iraq and other countries, while the impact of combat exposure on mental health outcomes is examined by focusing on a sub-sample of the soldiers deployed to missions in Iraq and Afghanistan in 2003-2012 (SE missions).

6.1 The full sample of deployed soldiers in 1992-2012

This section describes the full sample of deployed soldiers in 1992-2012. Table 1 shows some descriptive statistics comparing all FFS individuals not deployed against all deployed soldiers (columns 1-2).[15] Then, the sample is restricted to the cohorts 1976-1989 for these two groups.

Columns 1-2 in Table 1 show a large variation in the average year of birth of the FFS individuals and the deployed soldiers, which makes comparison difficult. Columns 3-4 in Table 1 provide a better comparison.[16] They show that the deployed soldiers born 1976-1989 compared to the FFS individuals born 1976-1989 (controls) are more likely to have been placed in out-of-home care during childhood (4.3% vs. 3.6%), to have grown up in single-parent (21% vs. 18%) and to have had lower household family income (27,519 USD vs. 29,310 USD). While these deployed soldiers compared to the FFS individuals are less likely to have parents with a college education (e.g., father with college: 22% vs. 26%), they nonetheless have slightly higher AFQT scores (44.8 vs. 44.6). Columns 5 shows the p-value of a ttest comparing columns 3 and 4.

[15] Lyk-Jensen et al. (2011) also provide a description of the deployed soldiers one year before their first mission, as well as comparisons of the deployed soldiers with the Danish population (men).

[16] Although deployed are slightly older than the FFS men (less than one year).

TABLE 1

Descriptive statistics for the deployed soldiers and fit-for-service individuals

	All cohorts		Cohorts born 1976-89		
	Deployed	FFS	Deployed	FFS	P-value
Out-of-home care placement	0.0445	0.0285	0.0435	0.0360	(0.000)
Single-parent family	0.2044	0.1907	0.2116	0.1783	(0.000)
Birth weight lowest quartile	0.1996	0.2108	0.2748	0.2446	(0.000)
Birth weight top quartile	0.1202	0.2786	0.2367	0.2476	(0.006)
Male	0.9497	0.9675	0.9446	0.9777	(0.000)
Year of birth	1973.2	1986.8	1981.7	1982.5	(0.000)
	(10.10)	(7.07)	(3.86)	(4.15)	
Mother with college education	0.1477	0.2917	0.2096	0.2523	(0.000)
Father with college education	0.1745	0.2823	0.2235	0.2580	(0.000)
Father with high school education	0.3833	0.4629	0.4741	0.4590	(0.001)
Mother with high school education	0.3442	0.4378	0.4252	0.4166	(0.064)
Household income at age 15 (1,000 USD)	25.255	30.206	27.518	29.310	(0.000)
	(11.10)	(15.42)	(11.27)	(14.49)	
Missing household income at age 15	0.1313	0.2290	0.0112	0.0093	(0.055)
Missing information for birthweight	0.4390	0.0542	0.0409	0.0506	(0.000)
AFQT score	44.74	43.81	44.803	44.60	(0.007)
	(7.87)	(7.95)	(7.85)	(8.14)	
Missing information for AFD	0.5390	0.0000	0.0590	0.0000	(0.000)
Individuals	27,520	404,414	11,967	220,693	

NOTE.—The population covers the full population of deployed in 1992-2012 to missions in the Balkans, Afghanistan, Iraq and some other countries. This study compares deployed soldiers with fit-for-service (FFS) individuals born 1976-1989. The FFS column describes members of this population with valid lottery number (for men), height, and AFQT score. Disposable household income at 15 is equivalized according to the formula (sum of income in the household plus transfers minus taxes)/(1*first_adult+0.7*second_adult+0.5*number_of_children) and deflated to 2018 prices by the CPI and converted to '000 USD at exchange rate 1DKK=0.147USD. AFQT score, height are observed on the AFD. AFQT scores are the number of correct answers out of 78 items. Mother's and father's schooling are observed on January 1 of the year the individual turns age 15. Means, and standard deviations in parentheses for non dummy variables. The mean of a dummy variable represents the percentage of cases that have a value of 1 for that variable.

In Table 2, the population from Table 1 is split by sex. Since 1962, women have been able to join the DAF, and from 1988, legislation was changed to allow women to take part in combat situations. The first women were deployed in the 1990s. A previous study (Lyk-Jensen et al., 2011), shows that the share of women increased in the period 1992-2009 with about 4 percent women among the deployed and the current study finds an increase around 5 percent for the period 1992-2012. An increase in the yearly proportion of women among the first-timers from 2 percent in 1992 to 12 percent in 2009 has previously been documented (Lyk-Jensen et al., 2011).[17]

[17]For comparison, the U.S. Department of Defense (2007) reports that of the U.S. military personnel serving in the operation enduring freedom (OEF) and Operation Iraqi freedom (OIF), 89 percent were men and 11 percent women, and over 40 percent of active-component officers were over 35 years old compared to 15 percent of active-component enlisted personnel. Of the active-component force, 55.2 percent are married. Some 43 percent of

Table 2 shows that deployed men and women have similar family background characteristics, with deployed women having higher AFQT scores than men (45.9 vs. 44.7), while men have more deployments on average than women (1.7 vs. 1.6). Compared to FFS men and women, both women and men deployed come from families with lower incomes and with a lower share of parents with college education. However, the deployed men and women have higher AFQT scores. Deployed women are older than the FFS women, also within the selected birth cohorts 1976-1989.

TABLE 2

Descriptive statistics for the deployed soldiers and fit-for-service individuals by sex

	All cohorts				Cohorts born 1976-89			
	Deployed		FFS		Deployed		FFS	
	Men	Women	Men	Women	Men	Women	Men	Women
Out-of-home care placement	0.0447	0.0412	0.0282	0.0348	0.0433	0.0483	0.0356	0.0524
Single-parent family	0.2044	0.2044	0.1896	0.2228	0.2118	0.2086	0.1774	0.2177
Birth weight lowest quartile	0.1988	0.2159	0.2110	0.2060	0.2722	0.3183	0.2446	0.2460
Birth weight top quartile	0.1208	0.1090	0.2800	0.2360	0.2382	0.2097	0.2487	0.2022
Year of birth	1973.3	1972.3	1986.7	1990.0	1981.7	1981.9	1982.4	1985.1
Mother with college education	0.1477	0.1473	0.2921	0.2801	0.2105	0.1931	0.2529	0.2284
Father with college education	0.1747	0.1697	0.2833	0.2527	0.2235	0.2232	0.2588	0.2227
Father with high school education	0.3855	0.3415	0.4619	0.4920	0.4749	0.4600	0.4586	0.4732
Mother with high school education	0.3459	0.3126	0.4364	0.4789	0.4254	0.4208	0.4160	0.4421
Mother with education lower than high school	0.3305	0.2859	0.2424	0.2193	0.3335	0.3514	0.2975	0.2996
Father with education lower than high school	0.2413	0.2051	0.2100	0.2156	0.2528	0.2579	0.2335	0.2511
Household income at age 15 (1,000 USD)	25.267	25.006	30.203	30.309	27.543	27.090	29.322	28.768
	(11.05)	(12.20)	(15.45)	(14.42)	(11.09)	(13.97)	(14.50)	(13.96)
Missing household income at age 15	0.1271	0.2101	0.2263	0.3090	0.0110	0.0151	0.0092	0.0134
Missing birth weight	0.4386	0.4462	0.0544	0.0460	0.0409	0.0422	0.0508	0.0445
AFQT score	44.68	45.87	43.85	42.62	44.75	45.71	44.63	43.3134
	(7.87)	(7.85)	(7.96)	(7.52)	(7.85)	(7.79)	(8.15)	(7.83)
Missing information for AFD	0.5410	0.5025	0.0000	0.0000	0.0558	0.1131	0.0000	0.0000
No. of deployments	1.7266	1.6029	.	.	1.5874	1.4223	.	.
	(1.1525)	(1.0192)	(.)	(.)	(0.9304)	(0.7494)	(.)	(.)
Individuals	26,135	1,385	391,285	13,129	11,304	663	215,767	4,926

NOTE.—The population covers the full population of deployed in 1992-2012 to missions in the Balkans, Afghanistan, Iraq and some other countries. The population is split by sex and the study compares the deployed soldiers with fit-for-service (FFS) men and women born 1976-1989. The FFS columns describe members of this population with valid lottery number, height, and AFQT score. Disposable household income at 15 is equivalized according to the formula (sum of income in the household plus transfers minus taxes)/(1*first_adult+0.7*second_adult+0.5*number_of_children) and deflated to 2018 prices by the CPI and converted to '000 USD at exchange rate 1DKK=0.147USD. AFQT score and eligibility status are observed on the AFD. AFQT scores are the number of correct answers out of 78 items. Mother's and father's schooling are observed on January 1 of the year the individual turns age 15. Means, and standard deviations in parentheses for non dummy variables. The mean of a dummy variable represents the percentage of cases that have a value of 1 for that variable.

Table 3 provides a description of the military characteristics of the deployed soldiers by sex. As in Lyk-Jensen et al. (2011), compared to men, a very large proportion of women belong to the other personnel group. In Lyk-Jensen et al. (2011), the large proportion of women in 2008 and 2009 reflected the establishment of a field hospital in Camp Bastion in Afghanistan.

active-component members have children, two on average.

Almost half of the deployed women with information on personnel group are privates. However, compared with men, while Lyk-Jensen et al. (2011), found a relative over-representation of women among the officer group, and an under-representation in the sergeant group, the present study finds that women are both under-represented in the officer group and especially among the sergeant group. Given that there was an increase in the proportion of women during the period studied, one could expect that most of them were deployed to the most recent missions of our period, i.e. missions in Kosovo, Iraq and Afghanistan. Table 3 shows that 48 percent of women were deployed to the Balkans for their overall mission experience and about 32 percent were first deployed to Iraq and Afghanistan.[18] For the population of 27,520 deployed soldiers, 65 died during their missions, 225 were wounded and about 631 were repatriated[19] before the end of their mission.

[18]Other countries are possibly included in the categories of mission experiences.

[19]Data on repatriations are only available from 2005.

TABLE 3

Military characteristics for the deployed soldiers by sex. Numbers

	Number			Share		
	All	Men	Women	All	Men	Women
One time deployed	16,244	15,371	873	0.590	0.588	0.630
Wounded	225	222	3	0.008	0.008	0.002
Repatriated	631	596	35	0.023	0.023	0.025
Rank at first mission						
Private	7,951	7,521	430	0.289	0.288	0.310
Sergeant	2,329	2,253	76	0.085	0.086	0.055
Officer	1,688	1,563	125	0.061	0.060	0.090
Other staff	652	400	252	0.024	0.015	0.182
Missing info rank	14,900	14,398	502	0.541	0.551	0.363
Rank at last mission						
Private	9,291	8,818	473	0.338	0.337	0.342
Sergeant	3,453	3,362	91	0.126	0.129	0.066
Officer	2,624	2,487	137	0.095	0.095	0.099
Other staff	865	547	318	0.031	0.021	0.230
Missing info rank	11,287	10,921	366	0.410	0.418	0.264
First mission						
UNPROFOR	6,337	6,184	153	0.230	0.237	0.111
IFOR	1,390	1,343	47	0.051	0.051	0.034
SFOR	4,274	4,050	224	0.155	0.155	0.162
KFOR	5,968	5,557	411	0.217	0.213	0.297
ISAF	4,091	3,782	309	0.149	0.145	0.223
IRAQ	2,094	1,966	128	0.076	0.075	0.092
Overall mission experience						
Balkans, Iraq or, and Afghanistan	4,365	4,162	203	0.159	0.159	0.147
Balkans	14,682	14,012	670	0.534	0.536	0.484
Iraq and, or Afghanistan	7,009	6,560	449	0.255	0.251	0.324
Other countries	1,464	1,401	63	0.053	0.054	0.045
Individuals	27,520	26,135	1,385	1	0.95	0.05
Deployments	47,370	45,150	2,220	1.72	1.73	1.60

NOTE.—The population covers the full population of deployed soldiers in 1992-2012 to missions in the Balkans, Afghanistan, Iraq and some other countries. There is less missing information for the recent missions, which may explain the differences in number in the rank category between the fist and the last mission of the soldier. For the one-time deployed, first and last mission are identical. UNPROFOR (United Nations Protection Forces in Bosnia Herzegovina, Croatia, Serbia, Montenegro and Macedonian, February 1992-March 1995) and UNCRO (United Nations Confidence Restoration in Croatia, March 1995-January 1996) are reported as UNPROFOR; IFOR (NATO-led Implementation Force, December 1995-December 1996 in Bosnia and Herzegovina) SFOR (Stabilization Force in Bosnia and Herzegovina, December 1996-2004) KFOR (NATO Kosovo Force i Kosovo, since June 1999) ISAF (International Security Assistance Force in Afghanistan (2001-2014)); IRAQ (Multinational Force in Iraq (2003-2007).

6.2 Soldiers deployed to SE missions in Iraq and Afghanistan in 2003-2012

This section describes the soldiers deployed to Iraq in 2003-2009 and Afghanistan in 2006-2012, for which the impact of combat exposure on mental health is studied. For this sub-sample of soldiers, information for types of unit, rank, and combat exposure is also available. The analysis splits the sample into first-timers (soldiers never deployed before 2003) and previously deployed soldiers. To analyze the effect of combat exposure, the sample of first-timers is used, as it is possible to fully control for their combat exposure contrary to the soldiers previously deployed.

Table 4 provides some descriptive statistics for these SE missions soldiers by first-timers and previously deployed soldiers. Figure B.1 in the Appendix shows what functions are included in each type of unit. Table 4 shows that first-timers to these SE missions included more women (about 6%). More first-timers belong to combat units and were more exposed to combat and consequently more first-timers were killed in action (KIA), wounded or repatriated. In general, Table 4 illustrates that, as expected, previously deployed soldiers have more experience and higher rank than first-timers. As Table 4 also shows, the soldiers who are first-timers in 2003 can be deployed to other SE missions in the period 2003-2012, for example almost 7% were deployed to several ISAF SE missions, and 2% were deployed to several Iraq SE missions.

TABLE 4

Military and demographic descriptive statistics for soldiers deployed to SE missions

	First-timers	Previously deployed	All deployed SE missions	P-value
Male	0.9411	0.9717	0.9500	(0.000)
Died during the mission	0.0063	0.0019	0.0050	(0.001)
Died during or after deployment	0.0123	0.0178	0.0139	(0.063)
Wounded during the mission	0.0239	0.0054	0.0185	(0.000)
Repatriated during the mission	0.0570	0.0290	0.0489	(0.000)
Exposed to combat during the mission	0.6184	0.4652	0.5740	(0.000)
Privates	0.6796	0.4861	0.6235	(0.000)
Sergeant	0.1762	0.2624	0.2012	(0.000)
Officer	0.1002	0.2098	0.1319	(0.000)
Other staff	0.0332	0.0364	0.0341	(0.459)
Missing info rank	0.0109	0.0054	0.0093	(0.005)
No specific unit	0.0079	0.0182	0.0109	(0.000)
Staff unit	0.0793	0.1815	0.1089	(0.000)
Support unit	0.5206	0.5515	0.5296	(0.008)
Combat unit	0.3922	0.2488	0.3506	(0.000)
Several times deployed to SE missions	0.0883	0.1455	0.1049	(0.000)
Several times deployed to ISAF SE missions	0.0676	0.0499	0.0625	(0.001)
Several times deployed to Iraq SE missions	0.0202	0.0937	0.0415	(0.000)
Number of missions before SE-mission	0.0000	1.7616	0.5107	(0.000)
	(0.0000)	(1.0287)	(0.9724)	
Height (cm)	179.77	179.63	179.75	(0.577)
	(6.96)	(7.14)	(6.98)	
Height missing	0.1386	0.6440	0.2851	(0.000)
AFQT score	44.55	43.59	44.41	(0.001)
AFQT missing	0.1716	0.6455	0.3090	(0.000)
Individuals	6,329	2,584	8,913	

NOTE.—The population covers the full population of deployed in 2003-2012 to missions in Afghanistan (ISAF RC(S)1- ISAF RC(S)9 and ISAF RC(SW) 10- ISAF RC(W)12), and in Iraq (Iraq 1 to Iraq 9). The study compares the first-timers in 2003 and the previously deployed from these missions. AFQT score and height are observed on the AFD. AFQT scores are the number of correct answers out of 78 items. Rank and unit are observed at the first SE mission. The p-value correspond to a t-test comparing first-timers (column 1) and previously deployed (column 2). Means, and standard deviations in parentheses for non dummy variables. The mean of a dummy variable represents the percentage of cases that have a value of 1 for that variable.

Table 5 provides further descriptive statistics about the family background of these soldiers. It shows that first-timers are more likely to come from a single-parent family, but their parents have higher education than the "previously deployed" soldiers, as level of education in the population increases over time.

TABLE 5

Family background characteristics of deployed soldiers to SE missions

	First-timers	Previously deployed	All deployed to SE missions	P-value
Out-of-home care placement	0.0419	0.0515	0.0447	(0.056)
Single-parent family	0.2000	0.1397	0.1825	(0.000)
Birth weight lowest quartile	0.1959	0.2291	0.2055	(0.000)
Birth weight top quartile	0.2274	0.0770	0.1838	(0.000)
Male	0.9411	0.9717	0.9500	(0.000)
Year of birth	1981.6	1970.7	1978.4	(0.000)
	(7.60)	(7.77)	(9.13)	
Mother with college education	0.2143	0.1142	0.1852	(0.000)
Father with college education	0.2139	0.1517	0.1959	(0.000)
Father with high school education	0.4421	0.3680	0.4206	(0.000)
Mother with high school education	0.4170	0.3019	0.3836	(0.000)
Household income at age 15 (1,000 USD)	28.066	23.422	26.813	(0.000)
	(11.695)	(9.461)	(11.325)	
Missing household income at age 15	0.0542	0.1440	0.0802	(0.000)
Missing information for birth weight	0.1480	0.5163	0.2548	(0.000)
Individuals	6,329	2,584	8,913	

NOTE.—The population covers the full population of deployed soldiers in 2003-2012 to missions in Afghanistan (ISAF RC (S)1- ISAF RC(S) 9 and ISAF RC(SW) 10- ISAF RC(W)12) and in Iraq (Iraq 1 to Iraq 9). The study compares the first-timers and the previously deployed from these missions. Disposable household income at 15 is equivalized according to the formula (sum of income in the household plus transfers minus taxes)/(1*first_adult+0.7*second_adult+0.5*number_of_children) and deflated to 2018 prices by the CPI and converted to '000 USD at exchange rate 1DKK=0.147USD. Mother's and father's schooling are observed on January 1 of the year the individual turns age 15. Means, and standard deviations in parentheses for non dummy variables. The mean of a dummy variable represents the percentage of cases that have a value of 1 for that variable.

Conditional on type of unit, rank and the specific mission, one can expect that combat exposure is as-good-as randomly distributed among the deployed soldiers and therefore can use it as a natural experiment. As mentioned previously, deployment decisions are not based on the characteristics of the individual soldiers, and the DAF deploys units, not individual soldiers for these missions.

To check whether this hypothesis is valid in the Danish context, a regression was run explaining combat exposure by the soldier's family background characteristics, all measured before the start of the missions.

Table 6 presents the balancing test of combat exposure on the background characteristics of the deployed soldiers (men and women in columns 1-3; and men only in columns 4-5) after controlling for dummies for year of birth, the mission, the types of unit and the rank of the soldier. Furthermore, a distinction is made between first-timers (soldiers, who had never been deployed before the SE mission) from previously deployed. Using the set of predetermined variables

presented in Table 6, this study shows that none of these variables can predict the occurrence of combat events, according to F-statistics of joint significance of covariates.[20] Thus, combat exposure events are conditional as-good-as randomly distributed among soldiers.[21] Although the exposure to SE missions is balanced for all the sub-groups in Table 6, the analysis of the effect on combat exposure is restricted on the sample of first-timers, as it is not possible to fully control for combat exposure of the previously deployed soldiers.

[20] As household income is missing for some soldiers, there are less individuals in Table 6. However the balancing test is also valid if the covariate on household income are excluded in the full sample.

[21] Lyk-Jensen and Pedersen (2022) use different measures for combat exposure e.g., using the combat intensity by using standardized measures of combat events. However, using these measures did not change the results of the analysis.

TABLE 6
Balancing test

	Men and women			Men only		
	(1)	(2)	(3)	(4)	(5)	(6)
	First--timers	Previously deployed	All	First -timers	Previously deployed	All
Male	0.0010	0.0377	0.0085	0.0000	0.0000	0.0000
	(0.0231)	(0.0614)	(0.0214)	(.)	(.)	(.)
Mother with college education	0.0171	-0.0160	0.0106	0.0199	-0.0093	0.0138
	(0.0127)	(0.0289)	(0.0117)	(0.0131)	(0.0294)	(0.0120)
Father with college education	0.0075	0.0292	0.0125	0.0032	0.0254	0.0084
	(0.0128)	(0.0250)	(0.0114)	(0.0131)	(0.0252)	(0.0117)
Mother with education lower than high school	0.0185	-0.0236	0.0069	0.0171	-0.0225	0.0058
	(0.0120)	(0.0204)	(0.0103)	(0.0123)	(0.0207)	(0.0106)
Father with education lower than high school	0.0007	-0.0003	0.0003	0.0019	0.0007	0.0014
	(0.0122)	(0.0217)	(0.0107)	(0.0125)	(0.0219)	(0.0109)
Birth weight lowest quartile	-0.0229	0.0051	-0.0167	-0.0244	0.0058	-0.0175
	(0.0139)	(0.0262)	(0.0122)	(0.0143)	(0.0267)	(0.0126)
Birth weight top quartile	0.0097	0.0345	0.0137	0.0102	0.0287	0.0130
	(0.0120)	(0.0352)	(0.0114)	(0.0123)	(0.0352)	(0.0116)
Out-of home care placement	-0.0230	0.0350	-0.0036	-0.0281	0.0315	-0.0068
	(0.0235)	(0.0382)	(0.0202)	(0.0242)	(0.0387)	(0.0208)
Single parent family	0.0228	0.0474	0.0300**	0.0187	0.0457	0.0268*
	(0.0123)	(0.0260)	(0.0111)	(0.0125)	(0.0264)	(0.0114)
Household income at age 15 (1,000 USD)	-0.0006	0.0007	-0.0003	-0.0006	0.0007	-0.0003
	(0.0005)	(0.0008)	(0.0004)	(0.0005)	(0.0008)	(0.0004)
F-Statistic	1.4362	0.9542	1.5473	1.4755	0.8596	1.4475
F-Stat p-value	0.1574	0.4819	0.1160	0.1507	0.5611	0.1616
Partial-R^2	0.0024	0.0044	0.0019	0.0024	0.0037	0.0017
Observations	5,986	2,212	8,198	5,650	2,164	7,814

NOTE.—Columns present coefficients from different OLS regressions. The dependent variable is an indicator taking the value one if the soldier was exposed to a combat event while deployed, and zero otherwise. Columns 1 (4) show results for first-timers sample (men), columns 2 (5) for previously deployed (men) and columns 3 (6) for all the deployed soldiers to SE missions (men). If "Household income at age 15" is missing, soldiers are excluded from the regression in columns 2-4. Additional controls included but not shown are dummies for the mission, rank (private, sergeant, officer, other), unit type (combat, support, staff, other), year of birth of soldier. Robust Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

7 Results

This section examines how the mental health outcomes of the deployed soldiers have changed since the previous study (Lyk-Jensen et al., 2012) by providing an analysis of the health profile before and after deployment for the about 27,000 soldiers who were deployed between 1992 and 2012 and the sub-sample of those deployed 1992-2009. Chapter 8 of Lyk-Jensen and Pedersen

(2019) presents the trends for this sub-sample up to 2010.[22] The present study adds a ten-year follow-up period to investigate the long-term effects up to 2018. The results for psychological health in terms of psychiatric diagnoses, purchase of MHM, suicide attempts and mortality are reported in the following. This section also reports whether or not previously deployed soldiers had a psychiatric diagnosis in the period before, or after deployment, and for the whole period.

This study also compares deployed soldiers with a control group made up of men who were deemed FFS on their Armed Forces Day, but never deployed.[23] Finally, the study tests the effect of combat exposure on soldiers' mental health for the sample of the first-timers deployed to the SE missions in 2003-2012.

7.1 Psychiatric diagnoses

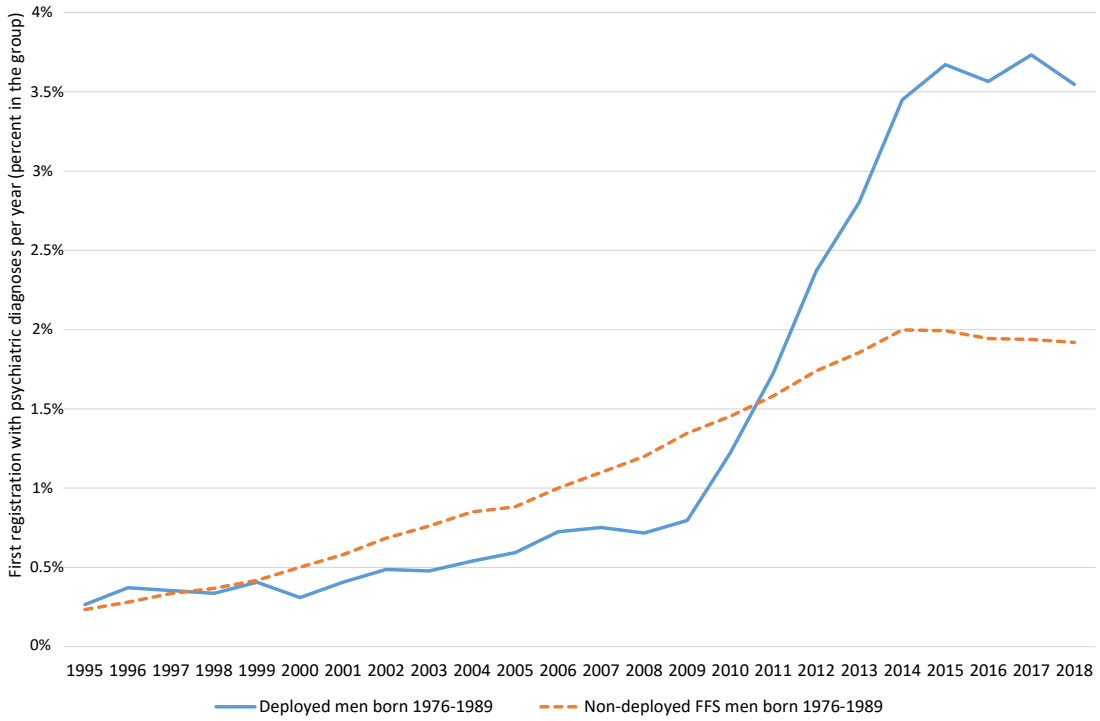
This section starts by comparing the previously deployed soldiers with the control group of FFS men born 1976-1989. Experience from the USA (Larson et al., 2008) shows that mental stress reactions in U.S. soldiers is often detected early, so that the basic training works as a psychological selection process. This result is known as the "Healthy Warrior Effect" and because of this early detection of mental health problems among soldiers during the training and preparation period, all symptoms of mental disorders with the exception of PTSD occurs with lower frequency among deployed military personnel than among military personnel who are not deployed.

[22] These previous findings are also reported in Danish in Lyk-Jensen et al. (2012).

[23] As there are too few new deployed women by year and which consequently means one cannot follow and report the same statistics for women, only men are included in these analyses.

7.1.1 The deployed men and their controls

FIG. 3.—First annual registration with a psychiatric diagnosis in the period 1995-2018



NOTE.— The figure compares the first registration with a psychiatric diagnosis in the period 1995-2018 for deployed men born 1976-1989 and to fit-for-service men who were not deployed. Percentage for each group. P-value=0 for the Pearson Chi-squared testing the difference between the two groups.

Figure 3 shows the percentage of first annual registration of psychiatric diagnoses for the deployed and FFS non deployed men born 1976-1989. As expected, the number of persons registered with a diagnosis increase over time in the two groups. Figure 3 is likely to illustrates the healthy warrior effect, especially in the period 1995-2010, where the control group (non-deployed FFS men and born 1976-1989) has a relatively higher occurrence until 2010. After 2010, it is difficult to disentangle the effect of the increase in awareness in society about the consequences of a military mission on mental health from the effect of implementing new programs to help the soldiers, and from the effect of the increase in combat situations. All these effects are likely to affect the registrations of mental health disorders, and they all occur around the year 2010.

Table 7 shows some descriptive statistics comparing the non-deployed FFS men with the deployed soldiers for some selected psychiatric diagnoses. These diagnoses were the most

common among the deployed soldiers in the previous study (Lyk-Jensen et al., 2012). In the period 1995-2010, among all veterans deployed between 1992 and 2009, 2.4 percent have been diagnosed with post-traumatic stress disorder (PTSD, F431) after being deployed (see table 4.5 in Lyk-Jensen et al. (2012). In 2018 almost 5% are diagnosed with PTSD, among all veterans deployed between 1992 and 2012.[24]

Moreover, Table 7 shows that the prevalence of the selected diagnoses is significantly higher in the group of deployed men born 1976-1989 compared to the non-deployed FFS men from the same cohorts.

TABLE 7
Selected types of diagnosis registered 1995-2018. Deployed soldiers and FFS men

	Deployed men	FFS men	Deployed born 76-89 men	FFS born 76-89 men	FFS - Deployed p-value
Major depressive disorder, single episode	0.0285	0.0147	0.0298	0.0178	(0.000)
Major depressive disorder, recurrent	0.0152	0.0073	0.0129	0.0100	(0.008)
Reaction to severe stress	0.0768	0.0295	0.0800	0.0357	(0.000)
PTSD	0.0491	0.0021	0.0522	0.0028	(0.000)
Personality change after catastrophic experience	0.0080	0.0001	0.0073	0.0002	(0.000)
Substance abuse diagnosis	0.0203	0.0116	0.0134	0.0155	(0.049)
Individuals	26,135	391,285	11,304	215,767	227,071

NOTE.—The population covers the full population of men deployed in 1992-2012 to missions in the Balkans, Afghanistan, Iraq and some other countries. The deployed men are compared with fit-for-service individuals born 1976-1989. The FFS column describes members of this population with valid lottery number (for men), height, and AFQT. The last column provides the p-value of a t-test comparing deployed and FFS men born 1976-1989. Means of dummy variables represents the percentage of cases that have a value of 1 for that variable.

7.1.2 The deployed soldiers

Table 8 compares the registration of diagnosis relative to the date of the first deployment for the period 1995-2018 for the full population of soldiers (men and women) deployed in 1992-2012 (column 3) and for the periods 1995-2010 (column 1) and 1995-2018 (column 2) for the soldiers deployed in 1992-2009. Lyk-Jensen et al. (2012) investigates the population of the deployed soldiers in 1992-2009 in the period 1995-2010. As in the previous study, this study finds that about one percent of the deployed soldiers were already recorded with at least one psychiatric diagnosis before their mission and did not receive a new diagnosis after the mission. Since the previous study, the share of deployed soldiers with at least a psychiatric diagnosis has changed from around 5 percent to almost 11 percent.[25]

[24]The percentage of PTSD diagnoses among the deployed 1992-2009 is also almost 5%.

[25]Table A.1 in the Appendix shows the socio-demographic characteristics measured before the first mission for the sample of the 27,520 soldiers deployed in 1992-2012. Psychiatric diagnoses during the period 1995-2018 are

TABLE 8

Deployed with at least one psychiatric diagnosis, depending on when the diagnosis is registered in relation to the first mission

	Deployed 1992-2009		Deployed 1992-2012
	1995-2010	1995-2018	1995-2018
Psychiatric diagnosis only before	0.009	0.008	0.009
Psychiatric diagnosis only after	0.041	0.094	0.095
Psychiatric diagnosis both before and after	0.002	0.003	0.004
No diagnosis	0.949	0.895	0.892
Individuals	26,154	26,154	27,520

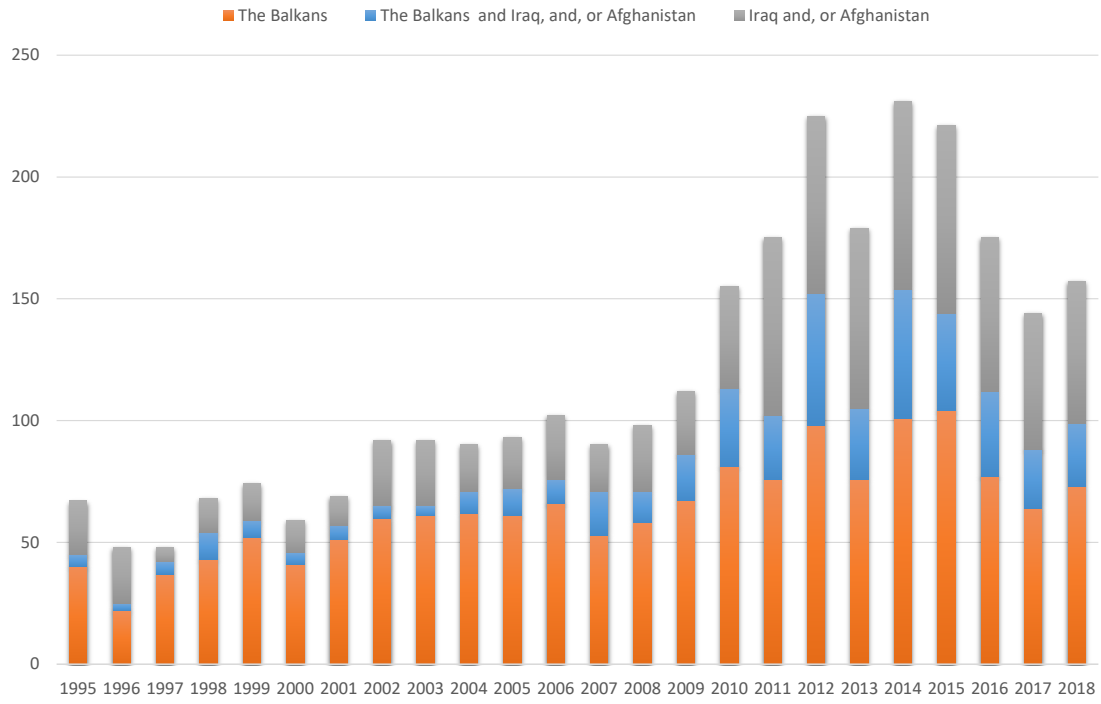
NOTE.— The sample refers to the soldiers deployed in 1992-2012 for the current follow-up study and the sample of soldiers deployed in 1992-2009 from the previous study Lyk-Jensen et al. (2012).

Lyk-Jensen et al. (2012) showed that for the sample of deployed soldiers in 1992-2009, 5% were registered with a psychiatric diagnosis in the period 1995-2010, while 4% were only registered with a diagnosis after their mission. In 2018, the share for this population of deployed in 1992-2009 with a diagnosis has increased to 10%, and 9% are registered in 2018 with at least one psychiatric diagnosis only after their deployment. For this sample of deployed in 1992-2009, the number of soldiers registered with a psychiatric diagnosis has more than doubled.

In Figure 4, soldiers are grouped by their mission experiences (excluding other countries than Iraq and Afghanistan in combination with the reported mission experiences categories). The figure shows that soldiers deployed to the Balkans (or the Balkans and other countries than Iraq or Afghanistan) still represent a large share of the new registrations of mental health diagnoses in the most recent years. Figure 4 also shows the increase in registered diagnoses for the soldiers deployed to Iraq and Afghanistan in the more recent years and especially from 2010.

more common among deployed soldiers who were in placed out-of-home care as children, grew up in a single-parent family or died during the period. Statistics about deaths include both death during and after deployment.

FIG. 4.—First registration with a psychiatric diagnosis in the period 1995-2018 by mission experiences



NOTE.— The figure shows the first registration with a psychiatric diagnosis in the period 1995-2018 for deployed soldiers in 1992-2012 by mission experiences. Soldiers exclusively deployed to other countries are excluded. However soldiers who have been deployed to other countries and in the Balkans, or Afghanistan or Iraq are included in the three reported mission experiences.

In the following, multiple logistic regression analyses are used to identify the different factors that may increase the probability of being diagnosed with a mental illness after deployment.

Figure 5 shows all the variables included in the regression. The risk and protective factors for being registered with a psychiatric diagnosis after the first mission and during the period 1995-2018 are investigated by using soldiers' pre-mission characteristics and characteristics measured while deployed. Figure 5 illustrates the results of a logistic regression explaining the probability of receiving a psychiatric diagnosis after the first deployment. For each variable, an estimated odds ratio (OR) is given (with the 95% confidence interval, 95% CI), the risk factors are the variables with a odds ratio larger than one, while protective factors have a odds ratio lower than one.

The most important risk factor is having a pre-mission psychiatric diagnosis. Factors that markedly increase the probability of being registered with a psychiatric diagnosis after the first

mission are as follows, with the reference (ref.) category in parentheses:

- short education, i.e., secondary school (ref. high school and vocational education) OR=1.57; 95% CI: [2.8,4.6];
- spent all or some of childhood in out-of-home care, such as foster care OR=2.14; 95% CI: [1.8,2.5] (ref. never placed in out of home care);
- grew up in a single-parent family OR=1.4; 95% CI: [1.2,1.5] (ref. did not grow up in single-parent family);
- having been unemployed during the year before the first deployment OR=1.7; 95% CI: [1.4,2.1] (ref. not unemployed the year before the first deployment);
- having the first mission experience in the Balkans (UNPROFOR/UNCRO) OR=1.7; 95% CI: [1.4,2.0], Iraq or Afghanistan (ISAF OR=2.4; 95% CI: [1.9,2.9]; Iraq OR=1.6; 95% CI: [1.2,2.0]) (ref. other missions);
- repatriated from a mission OR=2.4; 95% CI: [1.9,2.9] (ref. never repatriated from a mission); wounded during a mission OR=1.6; 95% CI: [1.2,2.3] (ref. not wounded during a mission);

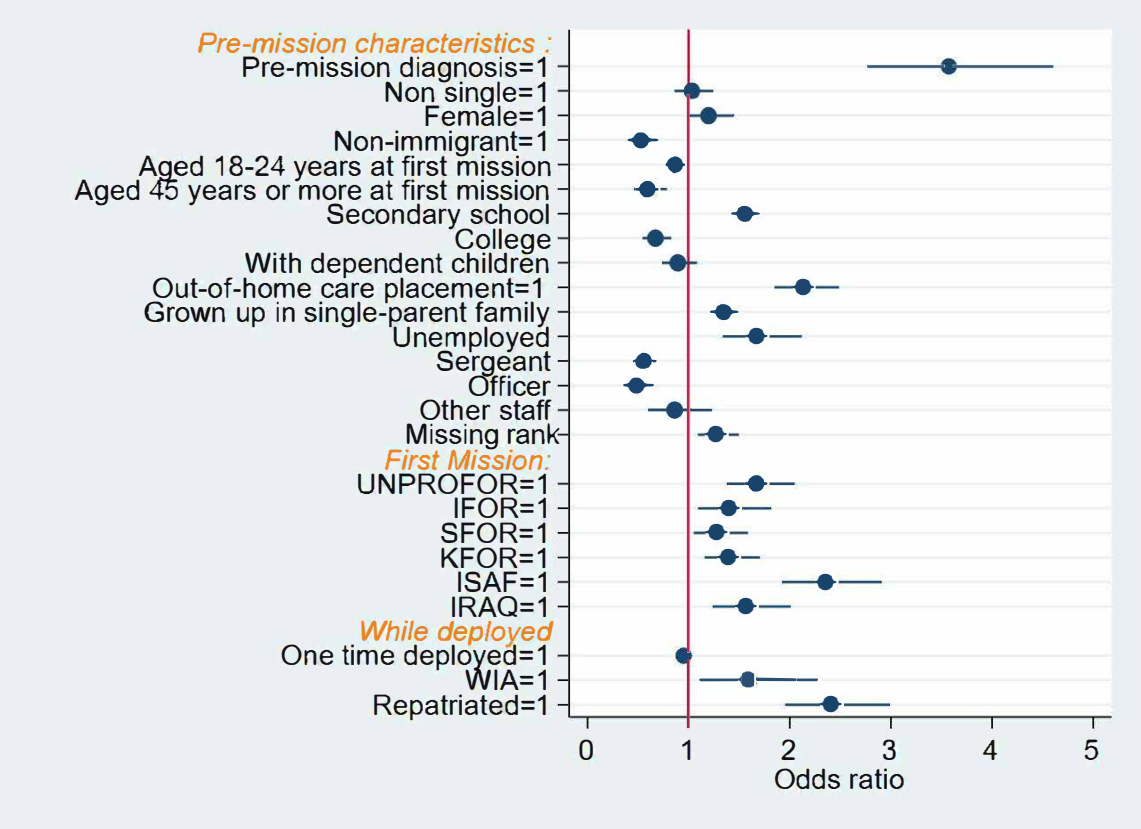
A number of other factors reduce the risk of being registered with a psychiatric diagnosis:

- non-immigrant, i.e., ethnic Danish background OR=0.5; 95% CI: [0.4,0.7] (ref. immigrant);
- aged 45 or more at first mission OR=0.60; 95% CI: [0.5,0.8] (ref. 25-44 years) ;
- sergeant (OR=0.6; 95% CI [0.5,0.7]) or officer rank (OR=0.49; 95% CI: [0.4,0.7]) (ref. private);
- having college education OR=0.7; 95% CI: [0.5,0.8] (ref. high school and vocational education);

Being a male or a female, marital status, having children, or being deployed only once do not affect the probability of being registered with a psychiatric diagnosis. These results are very

similar to those in the previous study (Lyk-Jensen et al. (2012). The main difference is that in the present study the missions to Iraq and Afghanistan also increase the probability of being registered with a psychiatric diagnosis. As mentioned previously, it is difficult to disentangle the effect of combat exposure in the more recent missions to Iraq and Afghanistan from the increase of awareness and specific programs to help the soldiers when they return from their missions. Section 7.5 investigates the effect of combat exposure on mental health for the 21 SE missions.

FIG. 5.—Risk and protective factors for being registered with a psychiatric diagnosis 1995-2018. Odds ratio



NOTE.—The figure shows the odds ratios and 95% confidence intervals for the different pre-mission or at mission characteristics contributing to the being registered with a psychiatric diagnosis after deployment and in the period 1995-2018. Results are obtained from a multi-variate regression. Risk factors are those with an odds ratio greater than one. All variables are dummies. References categories for education are high school and vocational education. Reference category for rank is private, other missions for the first mission, and aged 25-44 years for ages.

7.2 Purchase of mental health medication and opioid

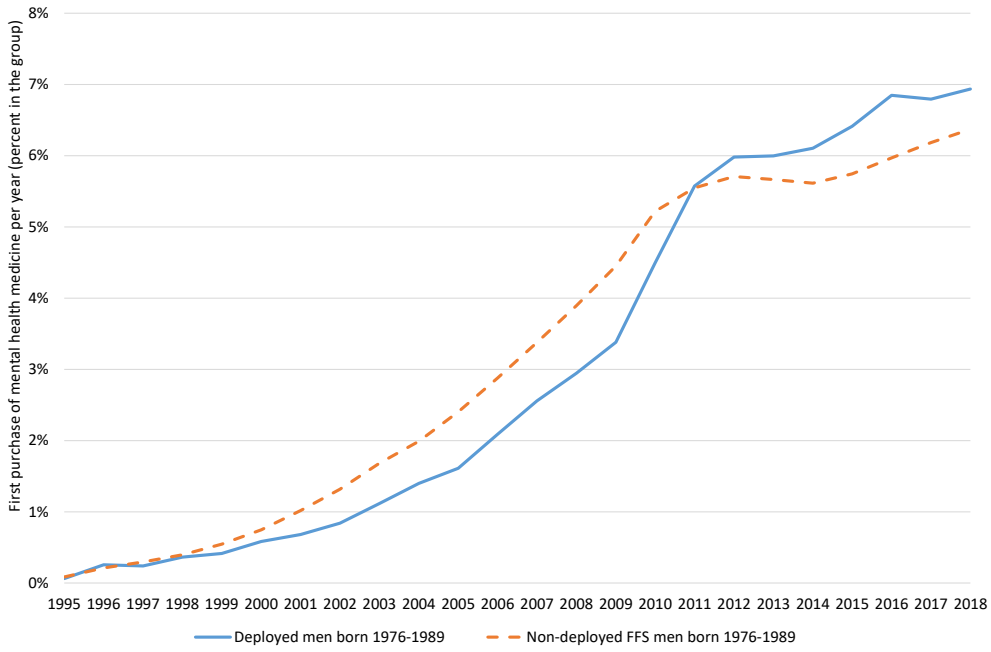
This section starts by comparing the purchase of MHM and opioids for the deployed soldiers born 1976-1989 with FFS men from the same birth cohorts, but who were never deployed. The two groups are observed for the period 1995-2018. Then, for the population of the deployed in

1992-2012, the risk and protective factors for purchasing MHM medicine are investigated.

7.2.1 The deployed men and their controls

Figure 6 shows the percentage of persons purchasing MHM. Comparing Figures 3 and 6 shows that in general more deployed men and non-deployed men are registered with a purchase of MHM without having a registered diagnosis. Figure 6 also shows an increase in the purchase of MHM over the period with a similar pattern to the registered psychiatric diagnoses in Figure 3.

FIG. 6.—First annual registration with a purchase of mental health medication in the period 1995-2018

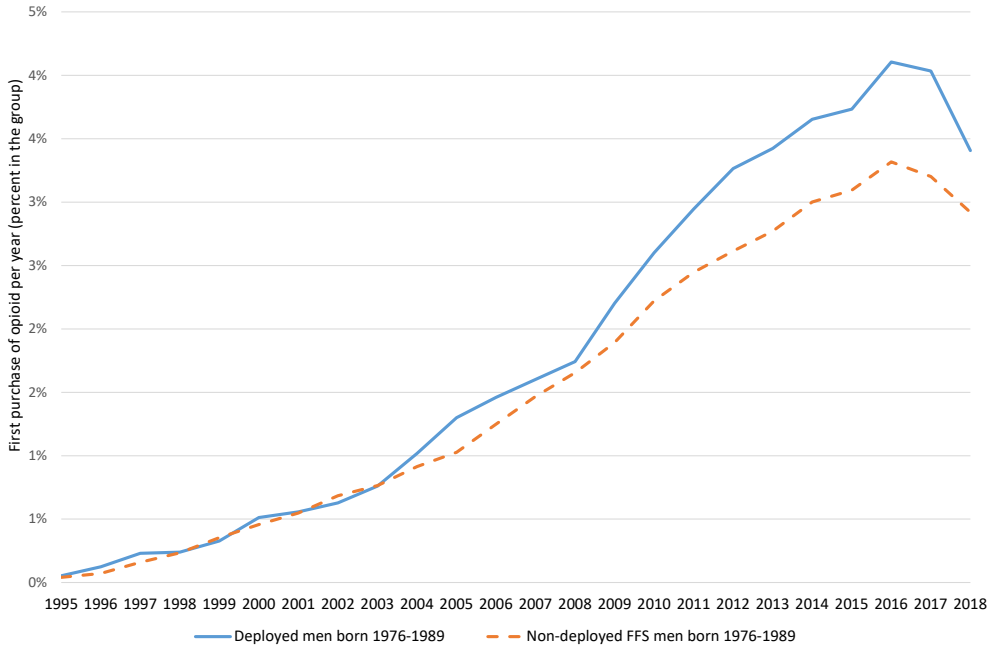


NOTE.— The figure compares the first purchase of mental health medication in the period 1995-2018 for the deployed men born 1976-1989 with the FFS men who were not deployed. Mental health medication groups the following ATC codes: antipsychotics (N05A), anxiolytics (N05B), hypnotics and sedatives (N05C), antidepressants (N06A), and psychostimulants (N06B). Percent in each group of men. P-value=0 for the Pearson Chi-squared testing the difference between the two groups.

Cesur et al. (2019) estimated the causal impact of combat deployments in the GWOT for U.S. soldiers on opioid abuse. Exploiting a natural experiment in overseas deployment assignments, they found that combat service substantially increased the risk of painkiller abuse and illicit heroin use among active-duty servicemen. Abuse is self-assessed by the respondents in the survey. They reported that war-related physical injuries, death-related battlefield trauma, and PTSD emerged as primary mechanisms.

Figure 7 shows the first annual registration for purchasing opioid in the period 1995-2018 for both deployed men born 1976-1989 and the non-deployed FFS men born 1976-1989. It only shows the purchase, which, for the soldiers, may be explained by the likelihood of being injured during deployment and having pain, and not necessarily the abuse of opioids.

FIG. 7.—First annual registration with a purchase of opioid medicine in the period 1995-2018



NOTE.— The figure compares the first purchase of opioid medication in the period 1995-2018 for deployed men born 1976-1989 with the FFS men who were not deployed. Opioid is the N02A ATC code. Percent in each group of men. P-value=0 for the Pearson Chi-squared testing the difference between the two groups.

7.2.2 The deployed soldiers

Let us now focus on the group of deployed soldiers, both men and women. Table 9 shows how many deployed soldiers were registered with a purchase of mental health medicine relative to the date of their first mission. Columns 1-2 refer to the deployed soldiers in 1992-2009 for the periods 1995-2010 and 1995-2018, while column 3 refers to the soldiers deployed 1992-2012 for the current follow-up study.

TABLE 9

Deployed soldiers with at least one purchase of mental health medicine in different periods, depending on when the purchase is registered in relation to the first mission

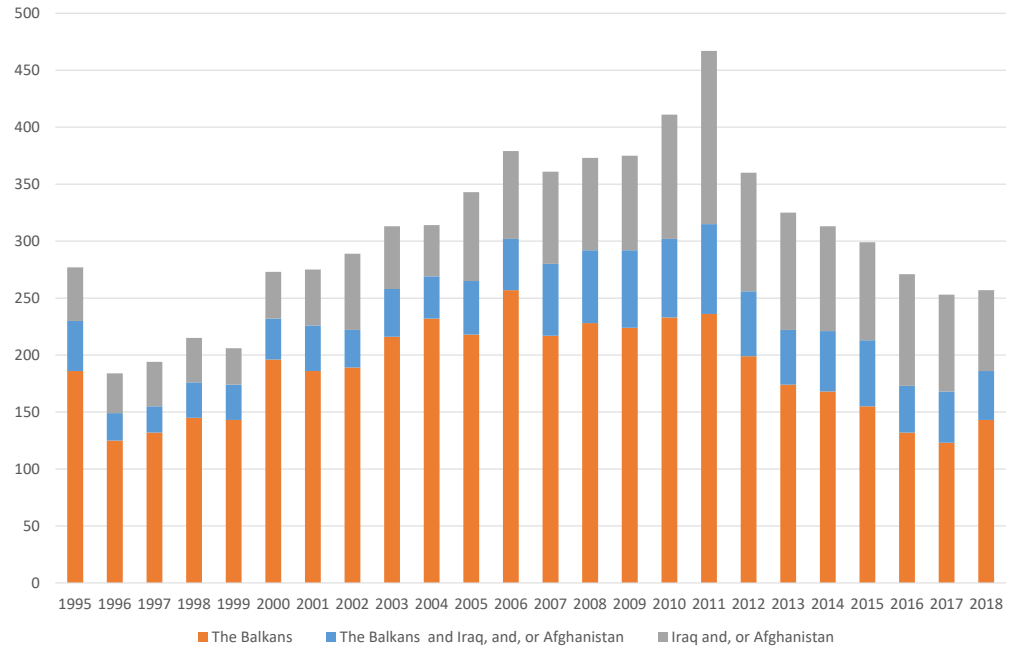
	Deployed 1992-2009		Deployed 1992-2012
	1995-2010	1995-2018	1995-2018
Purchase of MHM only before	0.022	0.016	0.018
Purchase of MHM only after	0.143	0.235	0.230
Purchase of MHM both before and after	0.015	0.021	0.022
No Purchase of MHM	0.819	0.728	0.730
Individuals	26,154	26,154	27,520

NOTE.—The sample refers to the soldiers deployed in 1992-2012 for the current follow-up study and the sample of soldiers deployed in 1992-2009 from the previous study Lyk-Jensen et al. (2012).

Table 9 shows that 73% of the soldiers deployed in 1992-2012 did not buy MHM in the period 1995-2018. This share is identical for the population of deployed in 1992-2009. For this population of deployed 1992-2009, there is a about a 8% percentage point increase in the share of soldiers who bought MHM either before, and or after their first deployment (18% in 1995-2010 vs. 27% in 1995-2018), i.e., a 50% increase; while the share of soldiers buying MHM only after their first deployment has increased from about 15% to 21%, i.e., about a 40% increase at the mean.

While some soldiers are deployed once, others have several deployments to different missions. Figure 8 grouped the mission experiences from the 27,520 deployed soldiers in the period 1992-2012. Figure 8 shows an increase in the number of MHM purchase up to 2011, as well as soldiers deployed to the Balkans still being an important share of the new registrations, also in the most recent years. Figure 8 also shows an increase in the number of MHM purchases for the soldiers deployed to Iraq and Afghanistan.

FIG. 8.—Mission experience and first registration for a purchase of mental health medication



NOTE.—The figure shows the first purchase of mental health medication in the period 1995-2018 for all the deployed in 1992-2012 by mission experience. While the soldiers exclusively deployed to other countries are excluded, other countries' experiences are included in the three mission experiences depicted in the figure. Mental health medication groups the following ATC codes: antipsychotics (N05A), anxiolitics (N05B), hypnotics and sedatives (N05C), antidepressants (N06A), and psychostimulants (N06B). Number per year.

Figure 9 shows the risk and protective factors for purchasing MHM. Again, having purchased MHM before deployment is the most important risk factor. Other factors resulting in a significantly higher probability are as follows, with the reference (ref.) category in parentheses, and the odds ratios (OR) and 95% confidence intervals (95% CI):

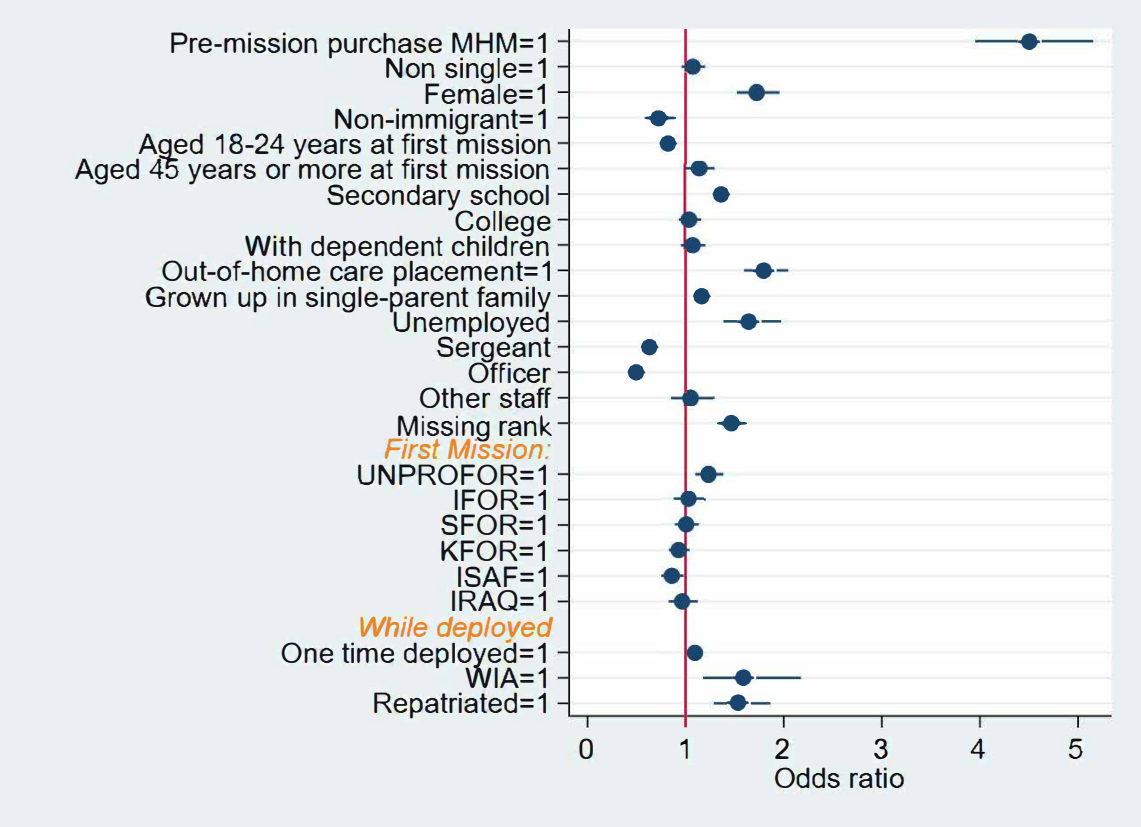
- being a female, OR=1.7; 95% CI: [1.5,2.0] (ref. male);
- having a short education (secondary school), OR: 1.4; 95% CI: [1.3,1.5], (ref. vocational education or high school);
- having been in out-of-home care for all or some of childhood, OR=1.8; 95% CI: [1.6,2.1] (ref. not having been place in out-of-home care);
- growing up in a single-parent family, OR=1.2; 95% CI: [1.1,1.3] (ref. not growing up in a single-parent family);

- having been unemployed during the year before the first deployment, OR=1.7; 95% CI: [1.4,2.0] (ref. not unemployed one year before the first deployment);
- being wounded, OR= 1.6; 95% CI: [1.2,2.2] (ref. not wounded) ;
- being repatriated, OR=1.6; 95% CI: [1.3,1.9] (ref. not repatriated);

This study finds the same protective factors as for being registered with a psychiatric diagnosis, i.e. being non-immigrant (OR=0.7; 95% CI: [0.6,0.9]), having a rank of sergeant (OR=0.6; 95% CI: [0.6,0.7]) or officer (OR=0.50; 95% CI: [0.4,0.6]), (ref. private). Having a university degree (OR=1.0; 95% CI: [0.9,1.2]) (ref. college) compared to vocational or high school education is no longer a protective factor.

While the probability of being registered with a psychiatric diagnosis was higher for some missions, this result is not found for the probability of purchasing MHM. Only being deployed on UNPROFOR/UNCRO missions remains a risk factor (OR=1.24; 95% CI: [1.1,1.4]). Contrary to psychiatric diagnoses, female soldiers are more likely to purchase MHM compared to male soldiers. The other risk factors are similar to the one found for being registered with a psychiatric diagnosis.

FIG. 9.—Risk and protective factors for purchasing mental health medicine in 1995-2018. Odds ratio



NOTE.—The figure shows the odds ratios and the 95% confidence intervals (robust standard errors) for the different pre-mission or at mission characteristics contributing to the purchase of mental health medicine after the first deployment and in the period 1995-2018. Results are obtained from a multi-variate regression. Risk factors are those with an odds ratio greater than one. All variables are dummies. References categories for education are high school and vocational education. Reference category for rank is privates, other missions for the first mission, and aged 25-44 years for age.

7.3 Mortality and suicide attempts for the deployed men and their controls

This section compares mortality and suicide attempts for deployed men born 1976-1989 with non-deployed FFS men from the same cohorts. For the population of soldiers deployed in 1992-2012, battlefield death or death during the mission, and post-deployment death are included. The cause of death (e.g., death by accident or suicide) is investigated, as are suicide attempts or self-harm and all suicide attempts according to the previously mentioned definitions.

Table 10 shows that death among deployed men born 1976-1982 is slightly higher than among the non-deployed FFS men born in the same years (significant at 8 percent level). Otherwise there is no significant difference by cause of death (suicide or accident) or suicide attempts.

These results need to be seen in light of the "healthy warrior effect" given that deployed men have to go through more physical and psychological screening before they can be deployed. In the previous study (Lyk-Jensen et al., 2012), death by suicide represented about 13 percent of the total deaths, while in 2018 they represent about 10 percent.

TABLE 10
Mortality and suicide attempts registered 1995-2018. Deployed and FFS men

	Deployed men	FFS men	Deployed born 76-89 men	FFS born 76-89 men	FFS - Deployed p-value
Death 1992-2020	0.0266	0.0059	0.0100	0.0083	(0.084)
Death by suicide	0.0028	0.0010	0.0012	0.0014	(0.391)
Death by accident	0.0031	0.0019	0.0023	0.0027	(0.409)
Suicide attempt or self-harm	0.0122	0.0090	0.0132	0.0120	(0.280)
All suicide attempts	0.0191	0.0166	0.0213	0.0206	(0.624)
Individuals	26,135	391,285	11,304	215,767	227,071

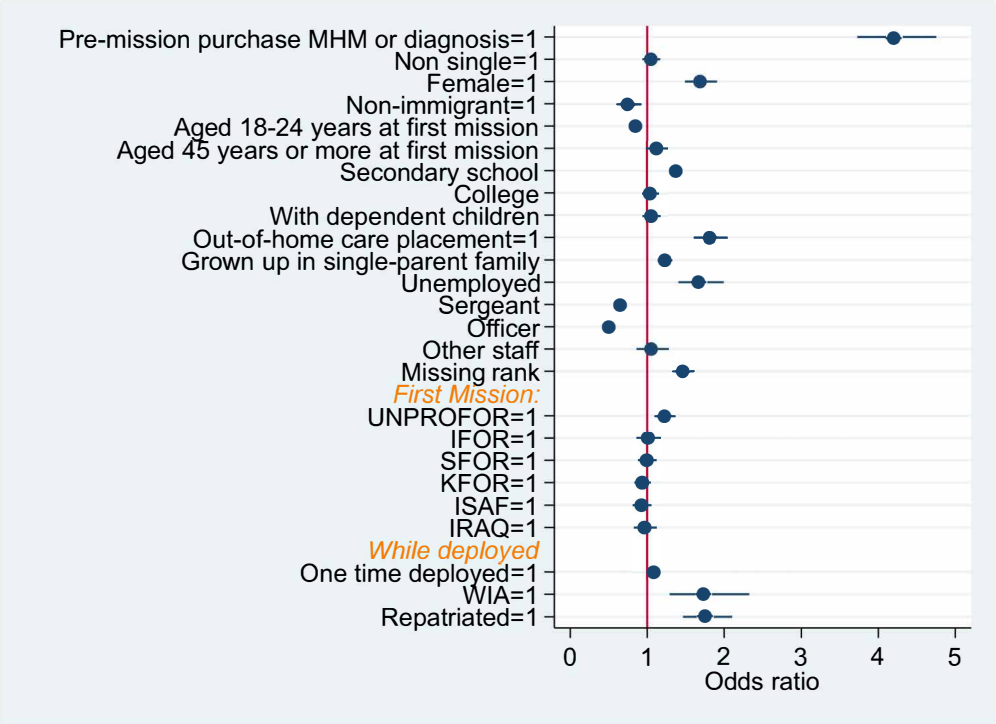
NOTE.—The population covers the full population of deployed men in 1992-2012 to missions in the Balkans, Afghanistan, Iraq and some other countries. The study compares the deployed with FFS men born 1976-1989. The FFS column describes members of this population with valid lottery number (for men), service status, height, AFQT score and potential service date. The last column provides the p-value of a t-test comparing deployed and FFS men born 1976-1989. "All suicide attempts" include mental disorder with concomitant diagnosis. The mean of a dummy variable represents the percentage of cases that have a value of 1 for that variable.

7.4 Profile of the deployed soldiers with mental health problems

This section investigates the risk and protective factors for being registered with either a psychiatric diagnosis, or a purchase of MHM, or a suicide attempt for the full population of deployed soldiers in 1992-2012.

As shown in Figure 10, when combining these different outcomes, the results are very similar to the results from the MHM purchase. As previously mentioned, the number of deployed soldiers purchasing MHM is higher than the number of deployed soldiers registered with a mental health diagnosis.

FIG. 10.—Risk and protective factors for being registered with a psychiatric, diagnosis, purchasing MHM, or attempting a suicide in the period 1995-2018. Odds ratio



NOTE.—The figure shows the odds ratios and the 95% confidence intervals (robust standard errors) for the different pre-mission or at mission characteristics contributing to the being registered with either a psychiatric diagnosis, or a purchase of MHM, or an attempting a suicide after the first deployment in the period 1995-2018. Results are obtained from a multi-variate regression. Risk factors are those with an odds ratio greater than one. All variables are dummies. References categories for education are high school and vocational education. Privates is the reference category for rank, "other missions" for first mission, and aged 25-44 years is the reference category for age.

Regardless of pre-mission registrations, almost 28% of all the deployed soldiers (men and women) are registered with at least one psychiatric diagnosis, or a purchase of MHM, or a suicide attempt after their first mission, with 10 percent registered with a diagnosis, 27% with a purchase of MHM and 2% with a suicide attempt.

In 2010, 15% of the soldiers deployed in 1992-2009 were registered with either a psychiatric diagnosis or the purchase of mental health medication, without having any registration of this kind before their mission.[26]

The present follow-up study finds that 24% of both the 27,520 deployed in 1992-2012 and the sub-sample of those deployed in 1992-2009 are registered with either a psychiatric diagnosis

[26]Lyk-Jensen et al. (2012) reported that 17% of the deployed soldiers in 1992-2009 were registered in the period 1995-2010 with either a psychiatric diagnosis or the purchase of mental health medication, without having any registration of this kind before their mission. This finding included soldiers registered with treatment for addiction. This information about addiction treatment is not available in the current dataset.

or the purchase of MHM after their first mission, without any registration of this kind before their mission. Thus, there is an increase about 60% (9 percentage points) in the number of soldiers registered with either a psychiatric diagnosis or the purchase of MHM, without having such a registration before their mission.

7.5 Combat exposure and mental health outcomes

This section explores the relationship between combat exposure and the use of mental health services, and the causal effect of combat exposure on the use of mental health services, as it has been shown that combat exposure is balanced on observed characteristics conditional on deployment (Table 6). The sample includes soldiers deployed to the 21 SE missions and results are presented for the first-timers in 2003, i.e., those who had not been deployed previously to the SE missions.

Understanding the long-term health consequences of military deployments is critical, not only for society as a whole, but also for the individual soldiers before they are deployed. As previously mentioned, no studies have included objective measures of mental health combined with individual combat exposure from military record for extended follow-up periods. Some studies also exploit natural experiments to investigate the effect of combat on mental health (Cesur et al., 2013; Watts and Wright, 2021), but they also rely on self-reported assessments of both mental health and combat exposure for relatively small samples.

7.5.1 Association between combat exposure and mental health outcomes

Lyk-Jensen et al. (2012) reported that the impact on mental health occurs many years after deployment, especially for the soldiers deployed to the Balkans. This section starts by describing the risk and the protective factors for being registered with a psychiatric diagnosis after missions for the first-timers for SE missions. The date of their first SE mission is used to define post- and pre-registration with a psychiatric diagnosis.[27]

Figure 11 shows the results of logistic analyses explaining the likelihood of being registered with a psychiatric diagnosis when combat exposure is included as an explanatory variable

[27]Registrations with a psychiatric diagnosis, or a purchase of mental health medicine, a suicide attempt all together were also investigated and gave very similar patterns.

(Figure B.2 shows very similar results if combat exposure is not included as a covariate, while Figures B.3 and B.4 show the results for Iraq and Afghanistan missions separately). Figure 11 also shows that missions with a high index of combat exposure, as shown in Figure 2, have also more soldiers registered with a psychiatric diagnosis post-deployment. Moreover, among the soldiers registered with PTSD in the most recent years, there is a large share of the first-timers to the SE missions in 2003-2012 (see Table A.2 for a description of the mental health outcomes of first-timers to SE missions).

In general, there are very similar risk and protective factors for being registered with a psychiatric diagnosis as for the full population of the deployed soldiers. The most important risks factors are:

- pre-mission diagnosis, OR=3.1, 95% CI: [2.3,4.3] (ref. no pre-mission diagnosis);
- secondary school, OR=1.6, 95% CI: [1.4,1.9] (ref. high school and vocational education);
- being placed in out of home care, OR=2.0; 95% CI: [1.5,2.5] (ref. not placed in out of home care);
- growing up in single-parent family, OR=1.3; 95% CI: [1.2,1.6] (ref. not growing up in single-parent family);
- and being repatriated before the end of the mission, OR=3.0; 95% CI: [2.4,3.8] (ref. not being repatriated);

The main protective factors are:

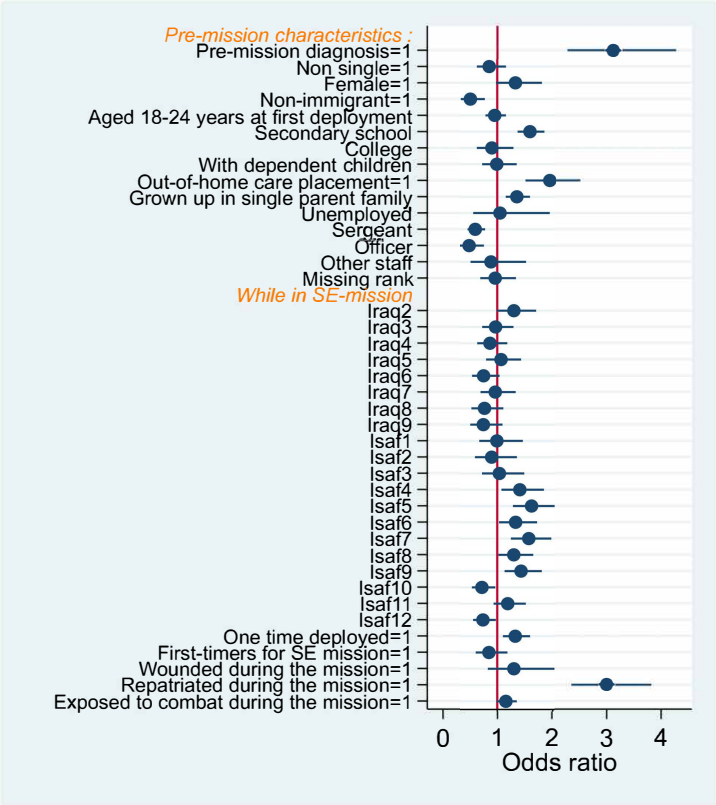
- being non-immigrant, OR=0.5, 95% CI: [0.3,0.8] (ref. immigrant);
- having the rank of sergeant, OR=0.60, 95% CI: [0.5,0.8] or officer, OR=0.5; 95% CI: [0.3,0.8], (ref. privates).

Among the missions, the missions representing the most important risk factor are (with Iraq 1 as the reference mission)[28]: being deployed on ISAF 5, OR=1.6, 95% CI: [1.3,2.0]; ISAF 7, OR=1.6, 95% IC: [1.3,2.0]; ISAF 9, OR=1.4, 95% IC: [1.1,1.8]; ISAF 4, OR=1.4, 95% IC:

[28]Being exposed to combat during the mission is only significant at 10%, OR=1.2, 95% CI: [1.0,1.4]

[1.1,1.8], and ISAF 6, OR=1.3, 95% CI: [1.0,1.7]. The missions providing a protective factors are ISAF 10, OR=0.7; 95% CI: [0.5,1.0]; and ISAF 12, OR= 0.7, 95% CI: [0.6,1.0].

FIG. 11.—Risk and protective factors for being registered with a psychiatric, diagnosis, after a mission. Odds ratio



NOTE.—The figure shows the odds ratios and 95% confidence intervals (robust standard errors) for the different pre-mission or at mission characteristics contributing to the being registered with a psychiatric diagnosis after a SE mission in the period 2003-2012. Results are obtained from a multi-variate regression. Risk factors are those with an odds ratio greater than one. All variable are dummies. References categories for education are high school and vocational education. Privates is the reference category for rank, Iraq 1 for the SE missions, and aged over 25 years is the reference category for ages.

7.5.2 Effect of combat exposure on mental health

To analyze the effect of combat exposure, the sample of first-timers in 2003 is used, as it is possible to fully control for their combat exposure. Given that that combat exposure among the deployed to SE missions is as good as random (see Table 6), one can credibly estimate the effect of being exposed to combat on mental health service use, measured as registration with a psychiatric diagnosis in Table11 and measured as either diagnosis or the purchase of MHM or suicide attempts in Table 12. One could expect that the coefficient of combat exposure is

positive, i.e., combat exposure will increase the likelihood of being registered with a psychiatric diagnosis. Table 11 shows that the coefficient is positive and small but not statistic significant (the effect size is less than 1% at the mean). While the effect of having a pre-mission psychiatric diagnosis on a post-mission diagnosis is large (an increase of 166% at the mean).

TABLE 11

Effect of combat on mental health measured as registered psychiatric diagnosis after the mission. First-Timers.

	(1)	(2)	(3)	(4)
Exposed to combat during the mission	0.0140	0.0138	0.0137	0.0139
	(0.0113)	(0.0112)	(0.0111)	(0.0114)
Male		-0.0345	-0.0285	0
		(0.0207)	(0.0205)	(.)
Mother with college education		-0.0028	-0.0045	-0.0072
		(0.0111)	(0.0110)	(0.0112)
Father with college education		-0.0194	-0.0188	-0.0167
		(0.0107)	(0.0106)	(0.0109)
Mother with education lower than high school		-0.0021	-0.0025	-0.0017
		(0.0104)	(0.0104)	(0.0107)
Father with education lower than high school		0.0177	0.0163	0.0195
		(0.0109)	(0.0108)	(0.0111)
Birth weight lowest quartile		0.0215	0.0219	0.0208
		(0.0118)	(0.0118)	(0.0121)
Birth weight top quartile		0.0155	0.0161	0.0161
		(0.0106)	(0.0105)	(0.0108)
Out-of-home care placement		0.131***	0.114***	0.115***
		(0.0280)	(0.0276)	(0.0290)
Single-parent family		0.0363**	0.0339**	0.0369**
		(0.0115)	(0.0114)	(0.0117)
Household income at age 15 (1,000 USD)		-0.0009*	-0.0008*	-0.0008*
		(0.0004)	(0.0004)	(0.0004)
Pre-mission diagnosis			0.208***	0.205***
			(0.0334)	(0.0353)
R^2	0.038	0.052	0.065	0.066
Mean of dep var	0.125	0.125	0.125	0.120
Std dev of dep var	0.331	0.331	0.331	0.325
Observations	5,986	5,986	5,986	5,650

NOTE.—The sample contains first-timers to SE missions. The dependent variable is one if the soldier is registered with a psychiatric diagnosis after her, his first SE mission, and zero otherwise. Each column shows the result from different OLS using different covariates as shown in the Table. Additional controls included but not shown are dummies for the mission, rank (private, sergeant, officer, other), unit type (combat, support, staff, other), year of birth of soldier. Robust Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Both Tables 11 and 12 show no effect of combat exposure on the use of mental health services. While the risk of being exposed to combat is independent of pre-mission diagnosis (Table A.3) and pre-mission characteristics (Tables 6 and A.4), the use of mental health services

is explained by soldiers' background characteristics such as pre-mission diagnosis, whether the soldier was placed in out-of-home care or grew up in a single-parent family.

TABLE 12

Effect of combat on mental health measured as registered psychiatric diagnosis, or the purchase of MHM, or a suicide attempt after the first SE mission

	(1)	(2)	(3)	(4)
Exposed to combat during the mission	0.0016	0.0016	0.0014	0.0001
	(0.0143)	(0.0143)	(0.0142)	(0.0146)
Male		-0.0799**	-0.0728**	0
		(0.0263)	(0.0262)	(.)
Mother with college education		0.0065	0.0045	0.0006
		(0.0141)	(0.0140)	(0.0143)
Father with college education		-0.0142	-0.0135	-0.0104
		(0.0139)	(0.0138)	(0.0142)
Mother with education lower than high school		-0.0011	-0.0017	0.0007
		(0.0132)	(0.0131)	(0.0134)
Father with education lower than high school		0.0143	0.0126	0.0144
		(0.0136)	(0.0135)	(0.0138)
Birth weight lowest quartile		0.0233	0.0237	0.0262
		(0.0151)	(0.0150)	(0.0154)
Birth weight top quartile		0.0076	0.0082	0.0101
		(0.0132)	(0.0132)	(0.0134)
Out-of-home care placement		0.157***	0.136***	0.133***
		(0.0312)	(0.0307)	(0.0323)
Single-parent family		0.0336*	0.0308*	0.0328*
		(0.0139)	(0.0139)	(0.0142)
Household income at age 15 (1,000 USD)		-0.0010*	-0.0009*	-0.0008
		(0.0004)	(0.0004)	(0.0004)
Pre-mission diagnosis			0.2510***	0.2510***
			(0.0350)	(0.0370)
R^2	0.0364	0.0482	0.0597	0.0569
Mean of dep var	0.231	0.231	0.231	0.225
Std dev of dep var	0.421	0.421	0.421	0.417
Observations	5,986	5,986	5,986	5,650

NOTE.—The sample contains first-timers to SE missions. The dependent variable is one if the soldier is registered with either a psychiatric diagnosis, a purchase of MHM, or a suicide attempt after her, his first SE mission, and zero otherwise. Each column shows the result from different OLS using different covariates as shown in the Table. Additional controls included but not shown are dummies for the mission, rank (private, sergeant, officer, other), unit type (combat, support, staff, other), year of birth of soldier. First-timers are excluded from the regression if Household income at age 15 is missing. Robust Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

While first-timer soldiers deployed to SE missions with high level of combat exposure are more likely to be registered with mental health outcomes, when conditioning on the mission, rank and type of the unit of the soldiers, combat exposure does not necessarily lead to a registration with mental health outcomes. Thus, while there is a differential in mental health use between missions, no causal relationship of combat on mental health within a mission was found. One possible explanation is that soldiers exposed to similar combat event may react differently. Soldiers with apparently lower social support (measured as growing up in out of home care or in a single-parent family) and pre-mission psychiatric diagnosis are more likely to be recorded with either a diagnosis, an MHM purchase or a suicide attempt. Lyk-Jensen and Pedersen (2022) and Lyk-Jensen and Bingley (2022) considered a dose response for combat exposure. In both cases the results obtained were not sensitive to the number of combat events.

Gallaway et al. (2014), studying post-deployment behavioral and psychiatric issues for U.S. soldiers deployed to Afghanistan, find that some types of combat exposure can be protective, while others can be predictive of screening positively to post-traumatic stress. Among the active exposure they include combat events, such as direct firing, being responsible for a combatant or non-combatant death (collateral damage), seeing dead bodies, removing mines, or searching homes. Examples of passive exposure are being wounded, attacked, whereas recalcitrant exposure or exposure invoking emotions may include seeing injured, or knowing someone killed/injured.

This dichotomy in active and passive combat exposure is consistent with the findings about combat and mental health issues, both when comparing missions in the Balkans relating to more passive "exposure to traumatizing events" and exposure to combat in peace enforcing missions in Iraq and Afghanistan.

8 Summary and conclusion

Danish soldiers have been deployed on international missions of very different character, from peace keeping to peace enforcing missions involving actual combat situations. At the same time, there have been important changes in the society which the soldiers have to return to. This study has focused on previously deployed soldiers in 1992-2012, and compared the changes

since 2010 for the sub-population of the deployed in 1992-2009. Moreover, the study exploits combat exposure data collected for the SE missions in Iraq and Afghanistan in 2003-2012. The study has also compared the deployed soldiers born 1976-1989 with FFS individuals born in the same years (controls).

The previous study reported in Lyk-Jensen and Pedersen (2019) concluded that two groups of soldiers were more likely to both buy mental health medication (MHM) and to be registered with a psychiatric diagnosis after deployment: the soldiers deployed on missions in the Balkans in the early 1990's and the soldiers repatriated from Iraq and Afghanistan in the period 2005-2009.

The first group was mainly traumatized because they were witnesses without having a mandate to intervene, while for the repatriated group, a repatriation may in some cases be a reaction to the first signs of psychological effects, which in the long run can develop into mental illness. Moreover, some repatriated soldiers were feeling guilty (see Lyk-Jensen and Pedersen, 2019, Chapter 5).

Looking at the changes in terms of mental health outcomes for the soldiers deployed in 1992-2009 (Lyk-Jensen et al., 2012), this study finds that about 15% of the deployed soldiers in 1992-2009 are registered in the period 1995-2010 with either a psychiatric diagnosis or the purchase of mental health medication, without having any registration of this kind before their mission.[29] In 2018, almost 24% the deployed soldiers in 1992-2009 are registered with either a psychiatric diagnosis or the purchase of MHM after their first mission, without any registration of this kind before their mission.[30] Thus, there is an increase about 60% at the mean (9 percentage points) in the number of soldiers registered with either a psychiatric diagnosis or the purchase of MHM, without having such a registration before their mission.

Although the study period is longer and may explain some of the observed changes, comparisons with the controls shows a large increase in recorded psychiatric diagnoses around the year 2010 for the deployed soldiers. This increase might be explained, by a change in help-

[29] In the previous study, soldiers registered with addiction were included and the percentage was 17% Lyk-Jensen et al. (2012). In the current dataset, information about addiction treatment is not available.

[30] We also find that in 2018, 24% of the soldiers deployed in 1992-2012 are registered with either a psychiatric diagnosis or the purchase of MHM after their first mission, without any registration of this kind before their mission.

seeking behavior with the introduction of programs that should mitigate the consequences of a deployment. Moreover, the focus on soldiers' mental health has also increased during the period, as well as the combat exposure in the missions to Iraq and Afghanistan. Thus, it is difficult to disentangle all these possible explanations as they occurred at the same time, i.e., around the year 2010.

In the period 1995-2010, among all veterans deployed between 1992 and 2009, 2.4 percent have been diagnosed with post-traumatic stress disorder (PTSD, F431) after being deployed. In 2018 almost 5% of these veterans are diagnosed with PTSD. For PTSD diagnoses, there is a doubling in the number of soldiers diagnosed with PTSD since 2010. Among the soldiers registered with PTSD in the most recent years, there is a large share of the first-timers to the SE missions in 2003-2012.

Lyk-Jensen and Pedersen (2019) reported that, in general, previously deployed soldiers handled everyday situations well in relation to their jobs and families. Focusing on six concurrent missions in Iraq and Afghanistan—with a relatively low level of combat exposure—Lyk-Jensen and Pedersen (2022) show that, when comparing male soldiers several years after their missions with non-deployed FFS men from the same cohorts (controls), soldiers have a higher mortality than their controls, are more likely to be separated (but also more likely to be in a couple), and have fewer children on average. Moreover, soldiers are less likely to be unemployed, charged with committing crimes, or have mental health problems than their controls.

However, Lyk-Jensen and Pedersen (2022) also show that soldiers are more likely than their controls to purchase opioids ten years after deployment. This tendency may result from possible chronic pain due to combat- and non-combat-related injuries during service and does not necessarily reflect an abuse of opioids, as investigated by Cesur et al. (2019) for U.S. soldiers.

As to education measured as years of schooling and compared to their controls, Lyk-Jensen and Pedersen (2022) find that soldiers have on average one year less of schooling measured 10 years after deployment. One possible explanation is that length of deployment may delay soldiers' education plans. Moreover, despite similar AFQT scores, soldiers are less likely to enroll in higher education (e.g., college) than their controls.

In Denmark, returning soldiers have access to free treatment offered by the military psychol-

ogist (if the psychological problem is mission-related). Moreover, access to the public mental health services is free, and no private psychiatric hospital exists. International studies have shown that many soldiers with mental health problems do not receive professional help (e.g., Hoge et al., 2004, Iversen et al., 2010, or Sharp et al., 2015). Denmark provides a good case study, as in principle no economic barriers to help-seeking should be present. However, there could be other barriers, as reported in Møller et al. (2020), such as geographical disparities in the early course of the studied period, where specialized treatment for veterans was only available at a few major hospitals in larger cities, hence there was limited availability and accessibility to specialized treatment in rural areas.[31] Differences in men's and women's help seeking may also exist (Randles and Finnegan, 2022).

Lyk-Jensen and Bingley (2022) show that the soldiers' families are also affected, e.g., the fathers' combat exposure during deployment affects the educational outcomes of their children and the mental health of the soldiers' family members.

In general, this study and the results from the project *Returning soldiers*, shows an increase in the numbers of Danish soldiers recorded with psychiatric diagnoses or the purchase of MHM compared to their controls in the period 1995-2018. Although, the increase in the combat situations for the missions in Iraq and Afghanistan could be one possible explanation, the findings about combat exposure are mixed. Lyk-Jensen and Pedersen (2019) show that while deployed soldiers to the Balkans were exposed to traumatic events without the possibility of intervening, i.e. not directly exposed to "active" combat situation, these deployed soldiers were more likely to be registered with a psychiatric diagnosis or the purchase of MHM. Using questionnaire data on both perceived exposure to danger during deployment and witnessing consequences of the war, with suicide attempts from administrative registers, Vedtofte et al. (2021) find no association between witnessing consequences of war and the risk of post-deployment suicide attempt. The literature on combat exposure, relies mainly, if not exclusively, on self-reported exposure, which can be subject to recall bias or justification bias (see, e.g., Black et al., 2017), or could be affected by the respondent's concurrent PTSD symptoms (Koenen et al., 2007; Wilson et al., 2008). While combat exposure reported in military communications are objective measures,

[31] https://fmn.dk/temaer/veteraner/Documents/service-check-of-the-veterans-effort.pdf

they cannot provide information about the personal relationship between a wounded or a killed soldier with that soldiers comrades or identify how soldiers experience specific combat situations. Thus, further research should try to combine individual combat exposure from both self-reported and objective measures to estimate the relationship between combat exposure and mental health outcomes and to distinguish the effect of active and passive combat exposures.

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Appendix

A Additional tables

TABLE A.1
Number of deployed soldiers with a psychiatric diagnosis by socio-demographics for period 1995-2010 and 1995-2018

	All	1995-2018 With a psychiatric diagnosis
Male	26,135	2,799
Female	1,385	166
Aged 18-24 years at first deployment	16,769	2015
Aged 25-29 years at first deployment	4,554	476
Aged 30-44 years at first deployment	4,377	379
Aged 45 years or more at first deployment	1,801	93
Immigrant	394	71
Danish nationality	2,7478	2,957
Single	23,188	2,654
With children	3833	269
Primary school education	12,017	1,755
High School education	5,754	417
Vocational education	5,686	552
College education	3,603	186
Unemployed	565	104
Out-of home care placement	1,224	311
Single parent family	4,090	642
Died in the period 1992-2020	721	128
Individuals	27,520	2,965

NOTE.—The full population of the deployed soldiers in 1992-2012 and the population of deployed with a psychiatric diagnosis in 1995-2018. All the characteristics are measured at the latest one year before the first mission, with the exception of age, which is reported at the first mission start.

TABLE A.2
Balancing test

	First-timers pre-mission diag.	First-timers PTSD	First-timers post-mission diag.	All First-timers
Male	0.8925	0.9342	0.9296	0.9411
Died during or after deployment	0.0374	0.0205	0.0196	0.0123
Wounded during the mission		0.0395	0.0430	0.0239
Repatriated during the mission	0.1075	0.1564	0.1473	0.0570
Exposed to combat during the mission	0.6542	0.7018	0.6819	0.6184
Privates	0.8505	0.8421	0.8266	0.6796
Sergeant	0.0654	0.0892	0.1017	0.1762
Officer	0.0561	0.0424	0.0391	0.1002
Staff unit	0.0654	0.0599	0.0522	0.0793
Support unit	0.5047	0.4737	0.4876	0.5206
Combat unit	0.4206	0.4561	0.4511	0.3922
Several time deployed to SE missions	0.0701	0.1023	0.1043	0.0883
Several time deployed to ISAF SE missions	0.2944	0.3319	0.3338	0.3972
Several time deployed to Iraq SE missions	0.7757	0.7705	0.7705	0.6906
AFQT score	42.75	42.28	42.37	44.55
	(8.10)	(8.12)	(7.88)	(7.79)
AFQT missing	0.15	0.15	0.14	0.17
Individuals	214	684	767	6,329

NOTE.— Sample include all the first-timers to SE missions in Iraq and Afghanistan in 2003-2012. First column shows some demographics and military characteristics of those with a pre-mission-diagnosis, with a PTSD (F413) diagnosis in 1995-2018, with a post-mission psychiatric diagnosis, and the full sample of first-timers. Means and standard deviations in parentheses.

TABLE A.3
Balancing test

	Male and Female			Male only		
	(1)	(2)	(3)	(4)	(5)	(6)
	First--timers	Previously deployed	All	First -timers	Previously deployed	All
Male	0.0011	0.0382	0.0084	0.0000	0.0000	0.0000
	(0.0231)	(0.0614)	(0.0214)	(.)	(.)	(.)
Mother with college education	0.0170	-0.0173	0.0106	0.0198	-0.0106	0.0139
	(0.0128)	(0.0290)	(0.0117)	(0.0131)	(0.0295)	(0.0120)
Father with college education	0.0075	0.0300	0.0125	0.0032	0.0263	0.0084
	(0.0128)	(0.0251)	(0.0114)	(0.0131)	(0.0252)	(0.0117)
Mother with education lower than high school	0.0185	-0.0240	0.0069	0.0171	-0.0229	0.0058
	(0.0120)	(0.0204)	(0.0103)	(0.0123)	(0.0207)	(0.0106)
Father with education lower than high school	0.0006	-0.0003	0.0003	0.0018	0.0007	0.0014
	(0.0122)	(0.0216)	(0.0107)	(0.0125)	(0.0219)	(0.0109)
Birth weight lowest quartile	-0.0229	0.0050	-0.0167	-0.0244	0.0058	-0.0175
	(0.0139)	(0.0262)	(0.0122)	(0.0143)	(0.0267)	(0.0126)
Birth weight top quartile	0.0097	0.0358	0.0137	0.0102	0.0300	0.0130
	(0.0120)	(0.0352)	(0.0114)	(0.0123)	(0.0352)	(0.0116)
Out-of-home care placement	-0.0233	0.0357	-0.0033	-0.0283	0.0322	-0.0063
	(0.0237)	(0.0382)	(0.0203)	(0.0244)	(0.0387)	(0.0210)
Single-parent family	0.0227	0.0465	0.0301**	0.0186	0.0448	0.0269*
	(0.0123)	(0.0260)	(0.0111)	(0.0125)	(0.0264)	(0.0114)
Household income at age 15 (1,000 USD)	-0.0006	0.0007	-0.0003	-0.0005	0.0007	-0.0003
	(0.0005)	(0.0008)	(0.0004)	(0.0005)	(0.0008)	(0.0004)
Pre-mission diagnosis	0.0031	-0.1483	-0.0051	0.0031	-0.1488	-0.0089
	(0.0266)	(0.1386)	(0.0263)	(0.0276)	(0.1394)	(0.0272)
F-Statistic	1.3066	0.9586	1.4097	1.3288	0.8745	1.3123
F-Stat p-value	0.2134	0.4825	0.1607	0.2083	0.5566	0.2171
Partial-R2	0.0024	0.0049	0.0019	0.0024	0.0041	0.0017
Observations	5,986	2,212	8,198	5,650	2,164	7,814

NOTE.—Columns present coefficients from different OLS regressions. The dependent variable is an indicator taking the value one if the soldier was exposed to a combat event while deployed, and zero otherwise. Columns 1(4) show results for first-timers sample (men), columns 2 (5) for previously deployed (men) and columns 3 (6) for all the deployed soldiers to SE missions (men). Additional controls included but not shown are dummies for the mission, rank (private, sergeant, officer, other), unit type (combat, support, staff, other), year of birth of soldier. Soldiers are excluded from the regression if Household income at age 15 is missing. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

TABLE A.4

Balancing test 2

	First- -timers	Previously deployed	All	First -timers	Previously deployed	All
Male	0.0070	0.0502	0.0143	0.0000	0.0000	0.0000
	(0.0220)	(0.0531)	(0.0200)	(.)	(.)	(.)
Single	0.0427	0.0124	0.0319	0.0457	0.0113	0.0350*
	(0.0223)	(0.0283)	(0.0168)	(0.0237)	(0.0290)	(0.0176)
Unemployed	0.0039	0.0645	0.0348	0.0195	0.0685	0.0412
	(0.0557)	(0.0565)	(0.0398)	(0.0562)	(0.0565)	(0.0399)
Out-of-home care placement	-0.0208	0.0215	-0.0055	-0.0279	0.0166	-0.0104
	(0.0232)	(0.0371)	(0.0199)	(0.0239)	(0.0376)	(0.0205)
Single-parent family	0.0227	0.0480	0.0292**	0.0187	0.0479	0.0265*
	(0.0121)	(0.0256)	(0.0110)	(0.0124)	(0.0260)	(0.0112)
F-Statistic	1.6532	1.3606	2.5139	1.8955	1.8955	1.8955
F-Stat p-value	0.1423	0.2361	0.0278	0.1083	0.1083	0.1083
Partial-R2	0.0013	0.0027	0.0014	0.0013	0.0013	0.0013
Observations	6329	2584	8913	5956	2511	8467

NOTE.—Columns present coefficients from different OLS regressions. The dependent variable is an indicator taking the value one if the soldier was exposed to a combat event while deployed, and zero otherwise. Columns 1(4) show results for first-timers sample (men), columns 2 (5) for previously deployed (men) and columns 3 (6) for all the deployed soldiers to SE missions (men). Additional controls included but not shown are dummies for the mission, rank (private, sergeant, officer, other), unit type (combat, support, staff, other), year of birth of soldier. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

TABLE A.5

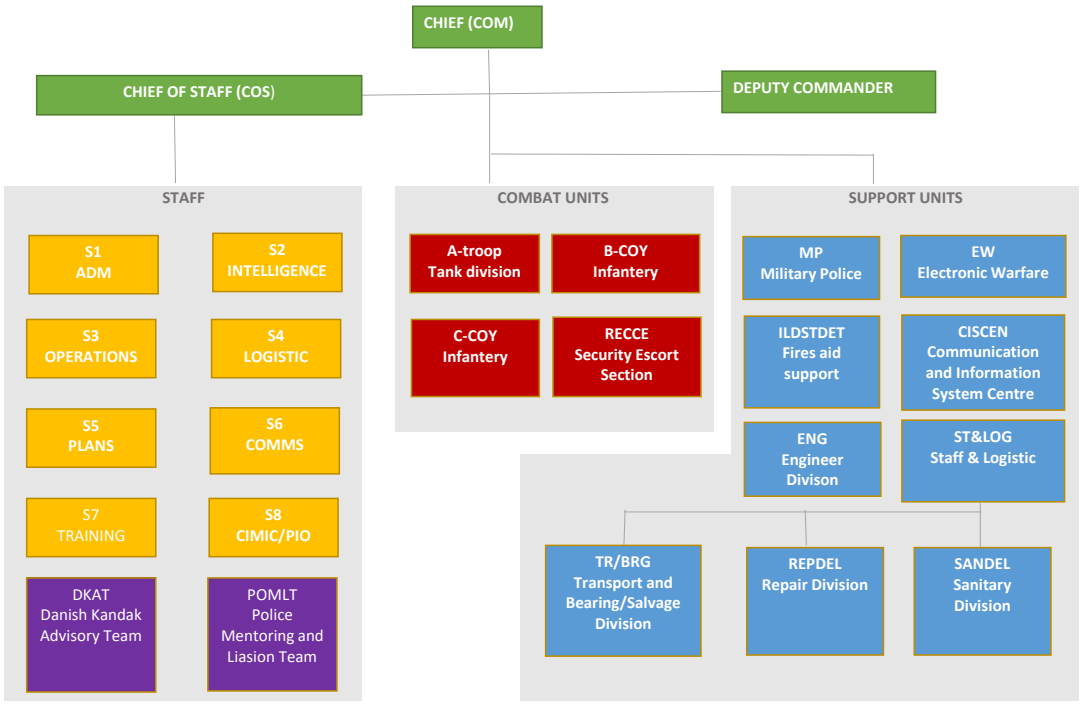
Mental health outcomes of the soldiers first deployed in 2003 (first-timers in 2003) to SE missions

	First-timers pre-mission diag.	First-timers PTSD	First-timers post-mission diag.	All First-timers
Male	0.8925	0.9342	0.9296	0.9411
Died during or after deployment	0.0374	0.0205	0.0196	0.0123
Wounded during the mission		0.0395	0.0430	0.0239
Repatriated during the mission	0.1075	0.1564	0.1473	0.0570
Exposed to combat during the mission	0.6542	0.7018	0.6819	0.6184
Privates	0.8505	0.8421	0.8266	0.6796
Sergeant	0.0654	0.0892	0.1017	0.1762
Officer	0.0561	0.0424	0.0391	0.1002
Staff unit	0.0654	0.0599	0.0522	0.0793
Support unit	0.5047	0.4737	0.4876	0.5206
Combat unit	0.4206	0.4561	0.4511	0.3922
Several time deployed to SE missions	0.0701	0.1023	0.1043	0.0883
Several time deployed to ISAF SE missions	0.2944	0.3319	0.3338	0.3972
Several time deployed to Iraq SE missions	0.7757	0.7705	0.7705	0.6906
AFQT score	42.75	42.28	42.37	44.55
	(8.10)	(8.12)	(7.88)	(7.79)
AFQT missing	0.15	0.15	0.14	0.17
Individuals	214	684	767	6,329

NOTE.—Columns present means and standard deviations for some socio-demographic and military characteristics variables. Column 1 describes first-timers with a psychiatric diagnosis before the first mission, column 2 describes those recorded with a PTSD diagnosis, and columns 3 describe those with a post-mission psychiatric diagnosis. The last column describes the full sample of first-timers to the SE missions.

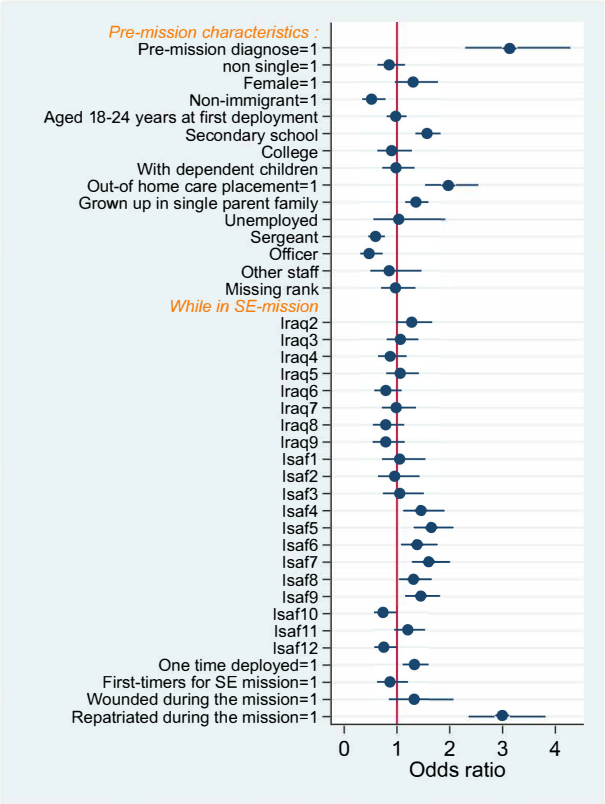
B Additional figures

FIG. B.1.—Composition of a Danish Battle Group



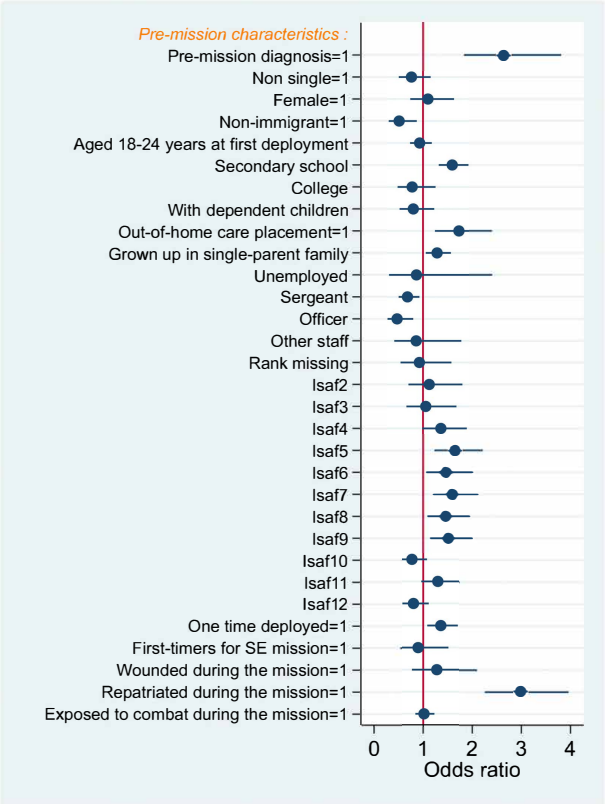
NOTE.— The figure illustrates the organizational structure of a Danish battle group for a mission. Type of units may vary from mission to mission. For example units in purple color were specific to some missions in Afghanistan. Source: Danish Armed Forces.

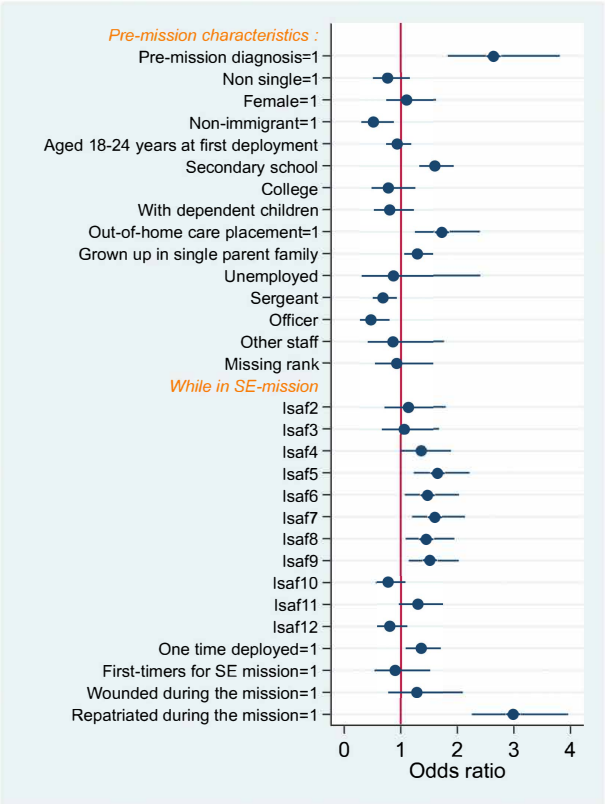
FIG. B.2.—Risk and protective factors for being registered with a psychiatric, diagnosis, after a missions. Odds ratio



NOTE.— The figure shows the odds ratios and the 95% confidence intervals (robust standard errors) for the different pre-mission or at mission characteristics contributing to the being registered with a psychiatric diagnosis after a SE mission in the period 2003-2012. Results are obtained from a multi-variate regression. Risk factors are those with an odds ratio greater than one. All variable are dummies. References categories for education are high school and vocational education. Privates is the reference category for rank, Iraq 1 for the SE missions, and aged over 25 years is the reference category for ages.

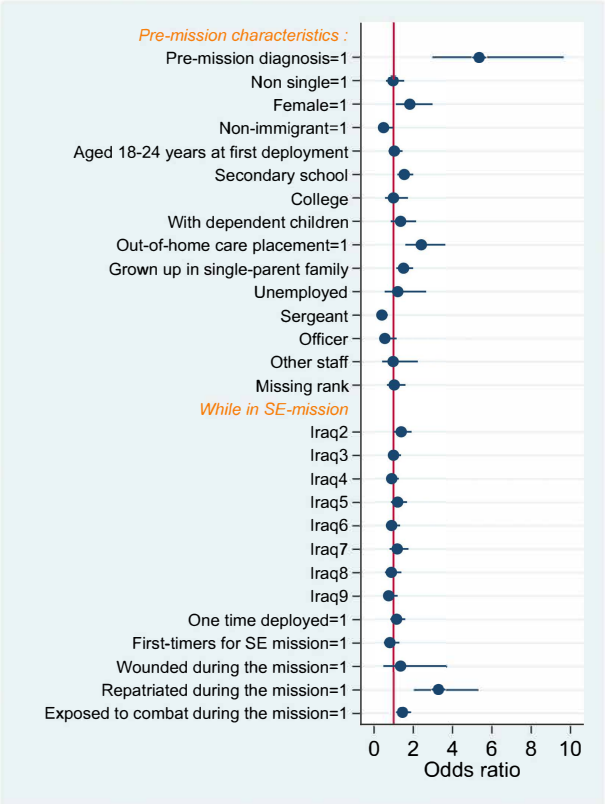
FIG. B.3.—Risk and protective factors for being registered with a psychiatric diagnosis after an SE mission in Afghanistan. Odds ratio

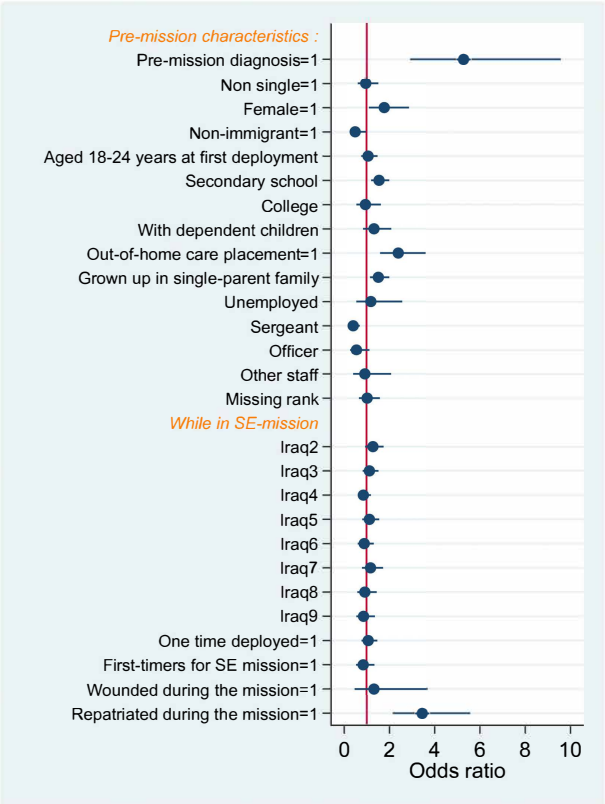




NOTE.—The figure shows the odds ratios and the 95% confidence intervals (robust standard errors) for the different pre-mission or at mission characteristics contributing to mental health problems issues defined as a registered diagnosis. Results are obtained from a multi-variate regression. Risk factors are those with an odds ratio greater than 1

FIG. B.4.—Risk and protective factors for being registered with a psychiatric diagnosis after an SE mission in Iraq. Odds ratio





NOTE.—The figure shows the odds ratios and the 95% confidence intervals (robust standard errors) for the different pre-mission or at mission characteristics contributing to mental health problems issues defined as a registered diagnosis. Results are obtained from a multi-variate regression. Risk factors are those with an odds ratio greater than one.

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