Mental health consequences of overstretch in the UK Armed Forces 2007-2009

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Abstract

Background There has been concern about the impact of tour length on the mental health of the UK Armed Forces. In 2007 we reported that cumulative length of deployment was associated with mental illnesses among military personnel. This gave empirical evidence to support the UK advisory policy on tour length, known as Harmony Guidelines. If fully implemented, the guidelines would be expected to be a tool to prevent mental illnesses. This study re-evaluates the relationship between cumulative length of deployment and number of deployments over three years, and mental illnesses in the UK forces.

Methods We assessed 3,982 UK regulars, from a representative study of the military, who had deployed during the three years prior to completing a questionnaire between November 2007 and September 2009. The outcomes of the study were posttraumatic stress disorder checklist (PCL), General Health Questionnaire (GHQ-12), multiple physical symptoms (MPS), Alcohol Use Disorders Identification Test (AUDIT), and problems at home during and post-deployment. The key independent factors were deployment for 13 or more months and number of deployments in the last three years.

Findings Deployment for longer than 13 months decreased from 22% in our previous study to 12% now. Cumulative length of deployment as a continuous variable was associated with all outcomes. 13 or more months of deployment was associated with MPS, PCL (score 40 or more), problems at home, but not PCL (score 50 or more), GHQ-12 (score four or more) and AUDIT (score 16 or more). Number of deployments was not associated with worse mental illness status or problems at home.

Interpretation The Harmony Guidelines have been shown to prevent mental illness in the UK Armed Forces and its introduction has decreased the number deploying in excess of its recommendations since 2006. Monitoring cumulative length of deployment is effective in reducing mental illness in the UK military.

Key words: Alcohol misuse, physical symptoms, population study, posttraumatic stress disorder (PTSD), psychological distress, problems at home

Concerns about tour length and frequency in the UK military stimulated the development of the Harmony Guidelines which provides maximum allowable periods of deployment for each service. The Harmony Guidelines are intended to monitor the pace of military deployments of the UK Armed Forces. Overall, 22% of deployed personnel in our study in 2007 were above the Army Harmony Guidelines threshold of 13 months or more in the last three years.[1] We showed that violation of this threshold was associated with several mental illness outcomes.[1] The consistency of the findings throughout all the outcomes was remarkable, providing empirical evidence of the damaging effect of overstretch, i.e. the pace of military deployments.

In contrast, UK studies based on the Iraq and Afghanistan conflicts have consistently shown no association between a deployment per se and psychological distress and posttraumatic stress disorder (PTSD) in regulars, but the prevalence of both is higher in those with a combat role.[2-4] Deployment is associated with number of somatic symptoms[2] and alcohol misuse,[3] probably of short duration, after which people return to pre-deployment alcohol use, albeit still high.[5]

In this study we revisit the impact of the Harmony Guidelines on mental ill-health and problems at home using new data. This issue remains topical because as the UK military strives to increase efficiency, amid a continuous decrease in the strength of regular forces, an increase in the length of a single deployment to, say, nine months, or a shorter break between deployments from the current 24 months to, say, 18 months are obvious possible targets. Several other non-UK based studies have been carried out, but the results have been inconsistent.[6-10] Our previous report was based on service personnel who were deployed between 2003 and the beginning of 2006, and completed a questionnaire between June 2004 and March 2006 (phase 1).[1] This period was characterised by intense activity with approximately 100,000 UK military personnel deploying to Iraq.[2] We have replicated our analysis based on a study carried out between 2007 and 2009 (phase 2).[3] The period was characterised by a continuation of the hostilities in Iraq and the intensification of the UK involvement in the campaign in Afghanistan. Military personnel could have been deployed to both

Iraq and Afghanistan. The main aim of our study was to assess the possible association of cumulative length of deployment and number of deployments with mental illnesses and problems at home during the three years before questionnaire completion.

Methods

Sample

This analysis is based on data collected during phase 2 of a cohort study from UK service personnel who completed a questionnaire between November 2007 and September 2009, and deployed in the three years before questionnaire completion. The study consisted of four representative samples based on separate sampling frames. The phase 1 samples, comprising personnel who deployed at the beginning of the Iraq war (codename TELIC 1) and personnel who were in the military at the same time but did not deployed to TELIC 1, were followed up at phase 2. 5,334 regulars completed the questionnaire at follow-up. Two new samples were added in phase 2, random sample of personnel deployed to Afghanistan between April 2006 and April 2007 (codename HERRICK) and those who joined the UK military between April 2003 and April 2007 (the replenishment sample) who may have deployed to Iraq or Afghanistan. 746 regulars in the HERRICK sample and 2,198 in the replenishment sample completed the questionnaire. The two new samples were added to account for the expansion of the military activity in Afghanistan and to account for the current demographic distribution of the UK Armed Forces. Altogether, 8278 (57.1%) regulars responded. See Fear et al for further details. [3]

As in the previous analysis,[1] reserves were excluded from this analysis because their deployments were noticeably shorter. The analysis was based on the 3982 (48.2%) out of the 8278 regulars who had deployment experience in the last three years before questionnaire completion. The study included only personnel deployed in the last three years, as the main objective was to assess the length and frequency of deployment and not whether there was an association between deployment status and mental illness, as this has been previously assessed. [4]

Measurements

The main outcome measures in this study were: the PTSD Checklist – Civilian version (PCL-C) preferred to the military version (PCL-M) because it is less restrictive in a population that may have suffered traumatic events unrelated to military activities. In addition it has been used in previous US and UK studies thus allowing comparison.[11] Possible PTSD was defined both as a score of 50 or above and a score of 40 or above to account for borderline cases (range 17 to 85); [12] symptoms of psychological distress measured by the General Health Questionnaire 12 (GHQ-12), [13] with cases defined as individuals with a score of 4 or above (range 0 to 12); multiple physical symptoms(MPS) were assessed using a checklist of 53 symptoms, based on the work of Derogatis and colleagues [14] but with additional symptoms reflecting new issues in the military,[2] with cases defined as individuals reporting 18 or more symptoms; a score of 16 or more (range 0 to 40) was used to define alcohol misuse using the 10-item World Health Organization Alcohol Use Disorders Identification Test (AUDIT); [15] problems during deployment included not receiving enough support from the family, having serious financial problems, partner/spouse left, problems with children and other problems at home and were defined as present or absent; problems at home post deployment were based on 10 items including difficulty adjusting to being back home, people not understanding what the person went through, difficulty resuming normal social activities, having financial problems, having been let down by others and being physically violent towards a family member, and were divided into zero problems, 1 or 2 problems and 3 or more problems; relationship/family problems as a result of deployment was a single yes/no question. The main independent variables were cumulative time of deployment in the last three years and number of times deployed in the last three years. Deployments considered in this study were to Afghanistan, Iraq and, for a small percentage, Pakistan, Bosnia and Kosovo or the Persian Gulf. Length of deployment was categorised as: less than 5 months, 5 to 8 months, 9 to 12 months and 13 or more months. According to the Army Harmony Guidelines personnel should not deploy for more than 13 months in a period of three years to allow for a 24 months break between deployments. Other variables in the analysis were age at

questionnaire completion in years, sex, serving status (still serving or left service), rank (commissioned officer, non-commissioned officers or other ranks), service (Royal Navy, Royal Marines, Army, Royal Air Force), marital status (married/living with partner, single or separated/divorced/widowed) and deployment role. We also assessed number of combat related events during last deployment based on 16 statements modified from the Walter Reed Army Institute of Research (WRAIR) Land Combat Study.[16]

Analysis

We carried out multiple logistic or multinomial logistic regression analyses separately for the whole sample (all services); for the Royal Marines and Army combined, as the larger contributors to deployment; and for those with a combat role. The dependent variables in our analysis were possible PTSD, psychological distress, alcohol misuse, MPS, and problems at home during and post-deployment, and relationship or family problems. Multinomial logistic analysis was carried out for problems at home post-deployment; and logistic analyses for binary options for problems during deployment and relationships or family problems. We adjusted for age, sex, serving status, rank, service and marital status. The reference groups were the 5 to 8 months of cumulative deployment length and one deployment for the number of deployments. We also carried out analyses including length of deployment and frequency of deployment as continuous variables. Weights were created to account for sampling fractions and for response rate differences at phase 2. All analyses were conducted in STATA v11.2. Analyses presented here used the survey commands. Weighted percentages and odds ratios (OR) are presented in the tables with unweighted cell counts. For the purposes of these analyses, all samples have been combined and sample weights have been generated to reflect the inverse probability of a subject from a specific subpopulation being sampled. Response weights were also generated to account for non-response. Response weights were defined as the inverse probability of responding once sampled and driven by factors shown

empirically to predict response (sex, rank, age, and sample). The sample and response weights were multiplied together to generate one combined weight. [3]

Role of the funding source

The UK Ministry of Defence (MOD) funded the study. The authors' work was independent of the funding agency which had no role in the analysis, interpretation, or decision to submit the report. Defence Statistics identified the sample frames and selected a random sample based on the instructions of the study team. Defence Statistics supplied addresses and identifiers of those in the selected samples.

Results

Table 1 presents the socio-demographic and service characteristics for the overall sample, for the Royal Marines and Army, and for those in a combat role in those two services. The Army was the biggest contributor to deployment (71%), most deployed personnel were males (93%), in a long-term relationship (76%), in active service (93%), 17% were commissioned officers and the mean age at questionnaire completion was 32.4 years. The mean age was lower in those with a combat role (by 1.9 years) and in those in the Royal Marines and Army (by 0.7 years). The mean number of combat related events during last deployment was near four in the total sample and increased in those with a combat role. Nearly 12% of the total sample deployed for 13 or more months in the three years before questionnaire completion. The Spearman correlation between cumulative length of deployment and number of deployments was 0.42 in the total sample, 0.50 in the Royal Marines and Army and 0.53 in those holding a combat role.

There was an association between the cumulative time deployed for a PCL score of 40 or more, psychological distress, MPS and alcohol misuse although not significant for alcohol misuse ($p = 0.052$) (Table 2). The association between those deploying for 13 or more months in the last three years was significant with a PCL score of 40 or more and MPS. The ORs for cumulative length of

deployment and the other mental illness outcomes were between 1.3 and 1.5, but they were not statistically significant. No association between number of deployments and the mental illness outcomes were found, but for a PCL score of 50 or more the association approached statistical significance, the OR in the group deploying 3 or more times was lower than for the other groups.

Cumulative length of deployment was associated with problems at home during and post-deployment, and relationship or family problems, but number of deployments was not associated with problems at home (Table 3). There was a consistent effect of cumulative length of deployment on post-deployment problems at home; those with zero problems tended to deploy for a shorter cumulative length of deployment and those having three or more problems to deploy for a longer cumulative time than those with one or two problems.

In the analyses restricted to Royal Marines and Army personnel or restricted to those with a combat role, there was no significant association between cumulative deployment length and mental illness outcomes, except for MPS (adjusted OR (AOR) 1.96, 95% CI 1.21 – 3.16 in those deploying 13 or more months in Royal Marines and Army personnel) (data not shown but available from authors). Likewise no association was observed between number of deployments and mental ill health. As for the total sample, problems at home during and post deployment, and relationships and family problems increased with cumulative length of deployment in those in the Royal Marines or the Army. There was a significant trend between problems at home post-deployment in those with a combat role and cumulative length of deployment ($p= 0.04$) and problems were more common in those deploying for 13 or more months (AOR 1.59 (95% CI, 0.99-2.55). Problems at home post-deployment were negatively associated with number of times deployed in those with a combat role.

There was a significant association between three or more deployments and zero problems at home in those with a combat role (data not shown but available from the authors). Although not statistically significant, possible PTSD tended to be less frequent in those with more deployments.

Months of deployment as a continuous variable, and mental illnesses, problems at home and relationship or family problems as a result of deployment showed a significant association in the total sample (Table 4). The association was also statistically significant for MPS, a PCL score of 40 or more, problems at home and relationship and family problems in the Army and Marines analysis. The only exception was length of deployment and possible PTSD when using a score of 50 or over. Only post-deployment problems at home, relationship and family problems were associated with cumulative length of deployment in those with a combat role.

Discussion

The main findings were a trend between the cumulative length of deployment over a three years period and mental illnesses, problems at home, and relationship and family problems related to deployment. Deploying 13 or more months in the last three years was associated with MPS, PCL score of 40 or more, problems at home, and relationships and family problems, but the effect sizes were small. Although the OR estimates were similar to those previously reported,[1] deployment for 13 months or over was not significantly associated with PCL score 50 or more, psychological distress and alcohol misuse. Number of deployments in the last three years was not associated with mental illnesses or problems at home. There was no evidence that those in a combat role deploying for 13 or more months were more likely to have mental illnesses.

OMITTED 148 words

Interpretation of the results

It has been difficult to distinguish between the effect of deployment as distinct from the effects of holding a combat role or combat exposure not least because there is clear evidence that holding a combat role or increasing combat exposure during deployment are associated with PTSD and other mental health problems. [2, 3, 16-18] In this paper, we found that the ORs were similar in the total sample and in those with a combat role suggesting that our results were not due to combat exposure. The

estimates of cumulative length of deployment over a three year period and each of the mental health outcomes in this study were similar to those reported before, [1] but the association reached a statistically significant level only for MPS and PCL score of 40 or over, an outcome not included in our previous study.

The most probable explanation of the difference between our previous and the current study is that the statistical power to make inferences decreased as only 12% of deployed personnel were above the recommended Army Harmony Guidelines threshold in phase 2 in contrast to 22% in phase 1.[1] This is further supported by the association between cumulative length of deployment as a continuous variable and all our outcomes in the total sample and that a PCL score of 40 or more, but not 50 or more, demonstrated a statistically significant association. In the literature three reports have found an association,[1, 6, 7] but a similar number of reports have not found an association.[8-10] Possible explanations are differences in the way Armed Forces operate in different countries or methodological issues related to statistical power.

The consistent association between deployment length and problems at home could be a mediating factor in the association between cumulative deployment length and mental illness. The cross-sectional design of the study does not allow us to distinguish the temporal association between these factors. In support of our results, length of deployment was negatively related to rates of reenlistment over time in the US military.[19] Failure to reenlist was more common in those who deployed for more than 12 months. Another study reported that a longer dwell time, i.e. the interval period at home between two successive deployments relative to the first deployment length, was associated with decreased risk of PTSD,[20] but this finding was not supported by another study.[21]

An unexpected finding in our study, albeit non-significant, was that number of deployments tended to be negatively associated with possible PTSD ($p = 0.07$) and not associated with other health outcomes or problems at home. Several studies have reported a positive association between

number of deployments and mental illnesses,[8, 20-24] but with others reporting a negative association, [3, 9, 21]or association for PTSD but not for other mental illness outcomes.[23] Similar lack of consistency has been reported on the possible effects of length of a single deployment.[25]

Although the cumulative length of deployment and number of deployments in three years were associated in our study (Spearman correlation between 0.42 and 0.53) the two variables are not equivalent. In part, the lack of a higher correlation is due to the differences in deployment policy between the service branches of the UK military, but it is also possible that the association may be influenced by a chain of command decision that an individual is not deployable or a request from an individual to not deploy for personal reasons. It is possible that most of these individuals have a mental health problem or a serious problem at home. It is also possible that in special cases service personnel may be deployed for a shorter period of time because of health and family problems. These explanations may all tend to attenuate the association between cumulative length of deployments and/or number of deployments and mental illness, but the net effect may not be the same for these two variables.

The role of the family can also influence the effect of deployment on service personnel. Deployment extensions have been found to have an impact on the spouses of army personnel in terms of relationships, child care and problems at home[26] and use of mental health services.[27]

Strengths and weaknesses

This is a large cohort study with a satisfactory response rate considering that the population is highly mobile, young and mainly male. A 57% response rate may not be considered high, but it is rarely achieved in representative samples in other military studies. Both our outcomes and our independent variables are self-reported and random misclassification may occur. It is also possible that the lack of anonymity may inhibit participants from admitting symptoms of mental illnesses.[28] This effect was found in relation to PTSD, but not psychological distress in one of our studies.[29] However, we are not aware of any empirical data showing a systematic bias in not reporting PTSD

symptoms according to length of deployment. These sources of inaccuracy may cause attenuation of effects**.** The length of deployment for an individual can be altered by the chain of command based on considerations related to the individuals and to operational concerns. The net effect of these decisions is difficult to model. We adjusted for possible confounders, but an unknown factor may have influenced our results.

Implications

104,342 episodes of deployment occurred between 15 November 2004 and 14 September 2009 and we estimated, based on our data on number of deployment over 3 years that 79,176 service personnel would have been involved. Extrapolating from our results, a decrease from 22% to 12% in personnel deployed above the Harmony Guidelines may have prevented 138 PTSD cases, 453 cases of psychological distress, 309 cases of MPS and 490 cases of alcohol misuse, a total of 1389 cases. This numbers would be reduced by 10% if reserves are excluded from the calculation. Some individuals may be cases for more than one mental illness outcome.

Conclusion

The Harmony Guidelines fulfil an important policy role to limit maximum periods of deployment over a defined period of time. Cumulative length of deployment should be monitored as it may prevent an increase in levels of stress and mental illness in the UK military.

Panel: Research in context

Systematic review

Only one study on the cumulative length of deployment[1] was available in a previous systematic review[30] and there has not been a systematic review on number of deployments. 131 papers on the effect of number and cumulative length of deployments on mental health in Iraq and Afghanistan between 2002 and 2014 were obtained in a Web of Science search. Altogether 10 papers were deemed relevant in relation to number of deployments, eight from our search and two from other sources. Five reports showed a positive association between number of deployments and PTSD,[8, 10, 22, 23, 31] but two reports showed no association.[1, 9] There were as many positive associations as no associations or an association in the opposite direction for mood disorders, alcohol misuse, anxiety and somatic symptoms.[1, 8, 22-24, 31] The six reports assessing cumulative length of deployment usually over a set time period, usually three years:[1, 6-10] show lack of consistency in the findings for PTSD and somatic symptoms, two papers reported an association in relation to alcohol misuse[1, 6] and one an association with anxiety.[7] The effect of the length of a single deployment was excluded in this review. Differences in the definition of outcomes, adjustment for confounders, combat exposure or combat role between studies may have contributed to the lack of consistency of findings between reports.

Interpretation

Deployment is an essential component of military life, but its characteristics may impact on levels of satisfaction, stress at home and mental illness of service personnel and their family. The long duration of the Iraq and Afghanistan conflicts tested the effects of deployment on mental illness. Our study has demonstrated that cumulative length of deployment above the Army Harmony Guidelines has an impact on mental illness and that its impact could be decreased if the chain of

command adheres to the Harmony Guidelines. However, the reasons why the results in the UK studies are only partially replicated in other armed forces and why, in our studies, number of deployments is not associated to mental illness are unclear. Possible explanations for the inconsistencies are the role of deployed personnel, the intensity of the conflicts over time, the length of a single deployment, which is longer in the US military than in other forces, and the spurious effect of study design and selection bias. The dilemma is whether one should act based on divergent results. Our results support the Harmony Guidelines used in the UK military which is a policy that can be monitored and its impact on mental illness measured.

Contributors: RJR is a principal investigator of the study, planned and sought funding for the study, design analysis and lead author in writing the paper. NTF is a principal investigator, was involved in data collection, was responsible for data processing, discussed and carried out analysis, and commented all drafts of the paper. MJ involved in data collection, data processing, planning and design of study, commented all drafts. MK contributed to analysis of long term relationship in deployed personnel, commented all drafts. LH was responsible for the coordination of this study, involved in the design and planning of the study and commented on the report. SW is a principal investigator, planned, designed and sought funding for the study and commented all drafts.

Conflict of interest: SW is paid by King's College London, is an honorary civilian consultant adviser in psychiatry to the British Army and a trustee of Combat Stress, a UK charity that provides service and support for veterans with mental health problems. RJR is paid by a grant of the US Congressionally Directed Medical Research Programs (CDMRP). MK is paid by the Support to the Families Wounded Injured and Sick study and the Stigma study (MOD grant). MJ and LH are paid by the King's Centre for Military Health Research grant. NTF is paid by Academic Centre for Defence Mental Health (ACDMH) grant.

Acknowledgments: The UK Ministry of Defence (MOD) funded the study. The authors are grateful to the MOD; in particular, we thank the Surgeon General's Department, Defence Statistics, the single

Services, the Joint Personnel Administration, and the Service & Veterans Welfare, Ministry of Defence.

Ethical standards: This study was approved by the Ministry of Defence Research Ethics Committee (MODREC)and the King's College Hospital local research ethics committee.

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Table 1: Socio-demographic and military characteristics of the samples, includes only regulars who have been deployed within the last 3 years and have health data collected at phase 2

Variable	**Overall sample, n (%)** **N= 3982**	Army & Royal Marines, n (%) N= 2927	Army & Royal Marines in combat roles, n (%) N= 1230
Deployment			
- **Iraq**	1782 (49.6)	1352 (50.1)	563 (51.2)
- **Afghanistan**	905 (21.6)	705 (22.7)	291 (21.5)
- **Both**	1183 (25.5)	812 (24.6)	360 (25.4)
- **Other**[1]	112 (3.4)	58 (2.6)	16 (1.9)
Service			
- **Royal Navy**	267 (7.0)	-	-
- **Royal Marines**	188 (3.7)	188 (5.0)	129 (7.4)
- **Army**	2739 (70.9)	2739 (95.0)	1101 (92.6)
- **RAF**	788 (18.4)	-	-
Sex			
- **Males**	3649 (93.0)	2729 (94.3)	1220 (99.1)
- **Females**	333 (7.0)	198 (5.7)	10 (0.9)
Rank			
- **Officer**	820 (17.3)	534 (15.3)	245 (17.1)

- **Non-commissioned officer**	2263 (63.6)	1764 (66.8)	606 (56.1)
- **Other rank**	899 (19.1)	629 (17.9)	379 (26.9)
Mean months deployed (95% CI)	8.20 (8.05-8.35)	8.31 (8.14-8.47)	8.81 (8.56-9.07)
Mean age at questionnaire completion (95% CI)	32.42 (32.16-32.68)	31.72 (31.43-32.01)	30.57 (30.15-31.00)
Marital status			
- **Married/living with partner**	2979 (76.2)	2180 (75.6)	919 (75.5)
- **Single**	764 (16.9)	584 (17.5)	260 (19.1)
- **Separated/divorced/widowed**	231 (6.9)	159 (6.9)	50 (5.4)
Serving status			
- **Serving**	3713 (92.8)	2730 (92.7)	1136 (91.9)
- **Discharged**	268 (7.3)	197 (7.3)	94 (8.1)
Cumulative deployment length over three years (months)			
- **<5 months**	679 (12.7)	366 (12.1)	116 (9.0)
- **5-8 months**	1822 (45.5)	1480 (50.2)	594 (48.2)
- **9-12 months**	1019 (25.6)	789 (27.4)	368 (30.1)
- **>12 months**	462 (11.7)	292 (10.4)	152 (12.7)
Number of deployment in the last three years			
- **1**	2484 (63.0)	1945 (65.6)	763 (61.8)

- **2**	1054 (26.6)	793 (27.6)	387 (31.2)
- **3 or more**	444 (10.3)	189 (6.8)	80 (7.0)
Mean number Mean number of combat related events on last deployment (95% CI)	3.87 (3.73-4.00)	4.50 (4.34-4.65)	6.20 (5.94-6.46)

[1] Other deployments include Lebanon, Pakistan, Bosnia and Kosovo, and Gulf

Numbers might not add to totals because of missing data

Table 2 Association between cumulative deployment length and number of deployments in the last three years, and mental illnesses in the total sample (Royal Navy, Royal Marines, Army and RAF) (N= 3982).[1,2]

Variables	Posttraumatic Stress Disorder (PCL cut-off of 50+) N =142 (3.8%)		Posttraumatic Stress Disorder (PCL cut-off of 40+) N= 296 (7.8%)		Psychological distress N= 736 (19.4%)		Alcohol misuse N= 686 (16.7%)		Multiple physical symptoms N= 302 (8.5%)	
Cumulative time deployed last three years (months)	N (%)	Adjusted[3] Odds ratio (95% CI)	N (%)	Adjusted[3] Odds ratio (95% CI)	N (%)	Adjusted[3] Odds ratio (95% CI)	N (%)	Adjusted[3] Odds ratio (95% CI)	N (%)	Adjusted[3] Odds ratio (95% CI)
<5	23 (3.7)	1.02 (0.56-1.88)	43 (6.0)	0.78 (0.50-1.21)	122 (18.3)	0.94 (0.71-1.25)	88 (12.7)	0.88 (0.64-1.21)	54 (9.2)	1.29 (0.86-1.94)
5-8	56 (3.7)	1.0	121 (7.7)	1.0	317 (18.3)	1.0	314 (17.0)	1.0	116 (7.1)	1.0
9-12	42 (3.5)	1.01 (0.62-1.63)	84 (7.5)	1.02 (0.72-1.45)	208 (21.1)	1.23 (0.97-1.56)	183 (16.9)	1.03 (0.81-1.32)	86 (9.0)	1.33 (0.94-1.89)

13+	21 (4.7)	1.50 (0.82-2.75)	48 (12.0)	2.02 (1.31-3.12)	89 (21.5)	1.34 (0.98-1.85)	101 (21.2)	1.32 (0.97-1.80)	46 (12.2)	2.15 (1.39-3.32)
P-trend		0.394		0.002		0.018		0.052		0.030
Number of deployment last three years										
1	95 (4.3)	1.0	189 (8.2)	1.0	474 (20.0)	1.0	445 (17.6)	1.0	187 (8.5)	1.0
2	40 (3.4)	0.88 (0.57-1.38)	88 (7.9)	1.06 (0.77-1.46)	191 (18.4)	0.95 (0.76-1.19)	176 (15.7)	0.89 (0.70-1.12)	83 (8.5)	1.09 (0.79-1.50)
3+	7 (1.6)	0.43 (0.18-1.03)	19 (5.4)	0.76 (0.42-1.37)	71 (17.8)	0.93 (0.67-1.31)	65 (13.6)	0.80 (0.56-1.13)	32 (8.9)	1.23 (0.76-1.97)
P-trend		0.071		0.583		0.600		0.134		0.367

[1] Analyses restricted to those with both months on deployment and number of deployments.

[2] Analyses are weighted for sample and response rates.

[3] Adjusted for age (in years), sex, serving status, rank, service and marital status.

Table 3 Association between cumulative deployment length and number of deployments in the last three years, and problems at home during deployment and post deployment in the total sample (Royal Navy, Royal Marines, Army and RAF) (N= 3982).[1,2]

Variables	Problems at home during deployment N= 1134 (31.8%)		Problems at home post-deployment						Relationship or family problems related to deployment N=534 (14.8%)	
			None, N= 1075 (28.1%)		1 or 2 N= 1565 (40.0%)		3+ N= 1212 (31.9%)			
Cumulative time deployed last three years (months)	N (%)	Adjusted[3] Odds ratio (95% CI)	N (%)	Adjusted[3] Multinomial odds ratio (95% CI)	N (%)	Adjusted[3] Multinomial odds ratio (95% CI)	N (%)	Adjusted[3] Multinomial odds ratio (95% CI)	N (%)	Adjusted[3] Multinomial odds ratio (95% CI)
<5	175 (28.7)	0.91 (0.71-1.16)	252 (41.4)	1.51 (1.17-1.94)	254 (39.0)	1.0	139 (19.6)	0.65 (0.49-0.86)	69 (10.4)	0.73 (0.52-1.03)
5-8	516 (30.9)	1.0	474 (26.5)	1.0	738 (40.2)	1.0	573 (33.2)	1.0	228 (13.4)	1.0

9-12	290 (32.6)	1.06 (0.87-1.31)	247 (24.6)	0.89 (0.70-1.13)	411 (41.9)	1.0	331 (33.5)	0.97 (0.78-1.21)	166 (18.6)	1.48 (1.14-1.93)
13+	153 (37.9)	1.52 (1.16-2.00)	102 (22.5)	0.91 (0.65-1.27)	162 (36.5)	1.0	169 (41.0)	1.51 (1.13-2.04)	71 (18.4)	1.70 (1.19-2.43)
P-trend		0.003		0.001				<0.0001		<0.0001
Number of deployment										
1	694 (32.0)	1.0	657 (28.2)	1.0	956 (39.5)	1.0	764 (32.3)	1.0	133 (14.5)	1.0
2	304 (30.7)	0.94 (0.77-1.14)	288 (27.5)	0.96 (0.77-1.19)	425 (41.1)	1.0	330 (31.4)	0.94 (0.77-1.16)	159 (15.9)	1.13 (0.88-1.46)
3+	136 (33.0)	1.10 (0.84-1.45)	130 (29.1)	1.00 (0.74-1.36)	184 (40.2)	1.0	118 (30.7)	1.04 (0.77-1.42)	42 (13.8)	1.03 (0.69-1.52)
P-trend		0.832		0.850				0.947		0.557

[1] Analyses restricted to those with both months on deployment and number of deployments.

[2] Analyses are weighted for sample and response rates.

[3] Adjusted for age (in years), sex, serving status, rank, service and marital status.

Table 4 Adjusted analyses for months on deployment as a continuous variable (adjusted for age (in years), sex, serving status, rank, service and marital status)

	Probable PTSD (PCL cut-off of 50+)	Probable PTSD (PCL cut-off of 40+)	GHQ	Alcohol misuse	Multiple physical symptoms	Problems at home during deployment
Overall sample Adjusted OR (95% CI)	1.03 (0.98-1.08)	1.06 (1.03-1.10)	1.03 (1.00-1.05)	1.02 (1.00-1.05)	1.04 (1.01-1.08)	1.04 (1.02-1.06)
Army and Marines Adjusted OR (95% CI)	0.99 (0.93-1.06)	1.06 (1.02-1.11)	1.02 (0.99-1.05)	1.01 (0.98-1.04)	1.04 (1.00-1.08)	1.04 (1.01-1.06)
Army and Marines in combat roles Adjusted OR (95% CI)	1.02 (0.94-1.11)	1.07 (1.01-1.13)	1.03 (0.98-1.07)	0.99 (0.95-1.04)	1.05 (0.99-1.11)	1.00 (0.96-1.04)

	Problems at home post-deployment			Relationship or family problems related to deployment
	None	1-2	3+	
Overall sample Adjusted OR (95% CI)	0.96 (0.93-0.99)	1.0	1.04 (1.02-1.07)	1.07 (1.04-1.09)
Army and Marines Adjusted OR (95% CI)	0.96 (0.92-0.99)	1.0	1.03 (1.00-1.06)	1.09 (1.05-1.13)
Army and Marines in combat roles Adjusted OR (95% CI)	1.00 (0.95-1.05)	1.0	1.04 (1.00-1.09)	1.08 (1.03-1.13)