



COUNTING THE COSTS

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Executive summary

Background

- The United Kingdom Armed Forces (UK AF) has deployed to numerous conflict zones since 1991. Research has shown that some Personnel will experience adverse deployment-related mental and physical health consequences [1]. Non-deployment physical injuries have also been frequently reported [2].
- Perhaps less visible has been the potential for military Service to negatively impact partners, children and parents of Service Personnel.
- In order to better understand the health consequences of military Service, this study aimed to establish the total number of people (Service Personnel, Veterans and their families) who might require health or welfare support following Service in the British Armed Forces during the UK's recent conflicts in Iraq, Afghanistan or elsewhere since 1991.

Approach

- The information presented in this report specifically focused on individuals who served in the UK AF between April 1991 and October 2014, and their families. This included regular Service Personnel, Regulars who became Veterans, volunteer Reservists and Reservists who became Veterans.
- A number of sources were accessed to obtain basic numbers including Freedom of Information (FOI) requests to Defence Statistics (Def Stats), National Audit Office (NAO) and Ministry of Defence (MoD) reports. Some of the basic numbers (e.g. denominators) had to be calculated by the study team. Because of the diversity of data sources used in this report, the results should be considered provisional and used for guidance only.
- To arrive at estimates for health needs, statistics from Def Stats were used along with data from King's Centre for Military Health Research (KCMHR) research studies for which primary data was accessible. Statistics from Def Stats included (but were not limited to) medical discharge, War Pension and Armed Forces Compensation Scheme (AFCS) statistics [3-5]. KCMHR research studies included (but were not limited to) the KCMHR cohort study [1], a large representative mental health dataset that included UK

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AF Personnel who had deployed to Afghanistan and Iraq, and the Gulf 1 cohort study [6], which focused on the health and wellbeing of Op Granby (1991 Gulf War) Veterans.

- The report presents results in a number of ways:
 - The ‘hardfloor’ figures for mental and physical health problems are firm, verifiable numbers. Hardfloor figures come from officially provided sources such as medical discharge statistics, from which the lowest or most certain numbers were used; or studies conducted by KCMHR (e.g. KCMHR cohort study) for which primary data was available. Hardfloor numbers can be described as ‘at least’.
 - ‘Possible’ numbers are also shown that represent the top end estimates.
 - ‘Probable’ figures represent a modest addition to the hardfloor figures, which might be useful for those planning services.

Main findings

Basic numbers

- Based on yearly summary and inflow statistics, it was estimated that 757,805 Personnel have undertaken regular Service between 1991 and 2014. Of these, 156,630 were still in Service in 2014; thus 601,175 became regular Veterans in this period. For volunteer Reserve Forces, the estimates were less reliable, since inflow statistics were not readily available but had to be estimated. However, it was estimated that between 1991 and 2014 there were 253,406 Reservists of which 27,270 were still in Service and 226,136 had become Veterans.
- For the major deployments between 1991 and 2014 including Operation Granby, and Operations in Bosnia, Afghanistan and Iraq it was estimated that 235,187 regular Service Personnel had undertaken one or more deployment.

Physical and/or mental health problems

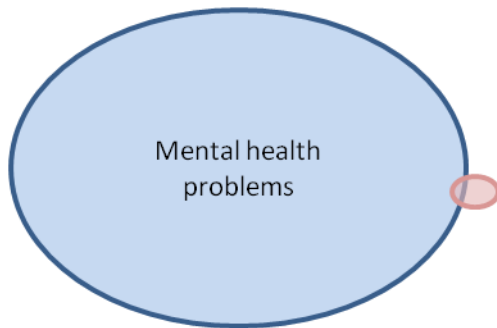
- The available data suggested that at least 6,195 Veterans (Regulars and Reservists) might suffer from physical health problems at some point. This number was derived from a combination of Veterans who received a disablement pension or a guaranteed income payment.

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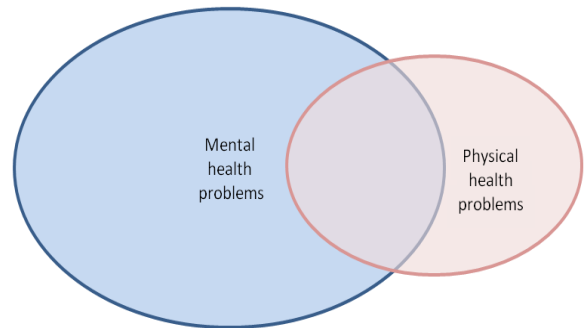
- The estimates for mental health problems were based on results from different scientific studies that have been conducted by KCMHR. Based on estimated percentages of how many regular Veterans might suffer from mental health problems and on basic numbers of how many regular Veterans there might be, it was estimated that at least 61,319 regular Veterans might suffer from mental health problems.
- The combination of the two figures would mean that at least 67,514 Veterans are likely to suffer from mental and/or physical health problems at some point. However, this figure does not take into account co-morbidity. Based on a population-based study in which routinely collected data of attendances at emergency departments in military hospitals in Iraq and Afghanistan had been linked with mental health data on Army Personnel (KCMHR cohort study;^[7]), the probable overlap of mental and physical health problems was estimated. Taking into account this overlap it was estimated that at least 66,090 Veterans might need health-related support at some point.

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Venn diagram for the hardfloor figure of mental and physical health problems



Venn diagram for the probable figure of mental and physical health problems



Significant others

- It was estimated that in the period of study there were at least 860,927 partners and children of regulars and reservists.
- Research on UK service dependents lags behind research among Service Personnel and most research that was conducted was conducted using US participants. It was not possible to generate any specific numbers in relation to health problems among dependents and how such problems relate to the mental health problems of Service Personnel. For example, the potential scale of the impact of service life upon dependants was exemplified by estimates suggesting that between 2.1% (around 8,116) and 14.8% (around 57,119) of partners of regular Service Personnel might suffer from Post-Traumatic Stress Disorder (PTSD).

Recommendations for future research

- Future research should involve filling the substantial gaps in research on the impact of military Service on significant others, and in particular research about the psychological impact upon children of military families.
- Periodic research studies are warranted that use a combination of approaches, such as the Adult Psychiatric Morbidity Study in England or The Royal British Legion Household survey, in order to use scientifically valid and well-constructed survey techniques that focus on Veterans and service families.

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1. Introduction

Military service, including deployment, may have a negative impact on physical and mental health. In term of physical health, Def Stats report on official adverse physical health outcomes, such as amputations, resulting from blast and gunshot wounds during deployment [8]. Statistics on medical discharges also show that musculoskeletal disorders are highly prevalent in deployed and non-deployed Personnel, and were often responsible for disrupted careers [4]. Physical injuries have often been related to training exercises, sport and recreation activities as well as deployment [2].

With respect to mental health, scientific studies have found that deployed regular Service Personnel report more alcohol abuse problems than non-deployed personal and those in combat roles might be especially at risk of developing PTSD. Deployed Reservists have also been shown to be more vulnerable to PTSD than regular Service Personnel [1, 9].

Perhaps less visible has been the potential for military Service to have a negative impact not just upon the Service Person but also their partners, children and parents. Although research has suggested dependents' mental health might also be negatively affected, less is known about the consequences of military Service on dependents [10, 11].

Despite the evidence that military Service could have a negative effect on Personnel and dependents, the extent to which serving in the UK AF might adversely affect health, and how many of those in the UK AF (and their dependents) might have health or welfare needs, has been unclear. Yet, in order to plan future health provision, it is necessary to establish how many of those who served in the UK AF, and how many of their dependents, might have health problems and what kind of problems these might be. The current study therefore aimed to examine the number of military Personnel and their dependents who might need health or welfare support in the years ahead. The study aimed to 'Count the Costs' of military Service in order to provide an estimate for Help for Heroes (H4H), the wider military charity community and the National Health Service (NHS) of the approximate extent of support required for this group.

2. General methodology to arrive at a final figure of health related need for UK AF Personnel

2.1. The target group

This report specifically focused on those who served in the UK AF between April 1991 and October 2014 including regular Service Personnel, regular Veterans, volunteer Reservists and veteran Reservists. A number of sources were used to obtain basic numbers including FOI requests to Def Stats, NAO and MoD reports. We calculated some necessary basic numbers (e.g. denominators) in accordance with the methodology described below.

Definitions

Since Def Stats reports were used to arrive at a total number for those who have served in the UK AF between April 1991 and October 2014, the same definition for regular Service Personnel was used to align the reports:

UK Regulars are full time Service personnel, including Nursing Services, but excluding FTRS personnel, Gurkhas, Naval activated Reservists, mobilised Reservists, Military Provost Guarding Service (MPGS) and Non Regular Permanent Service (NRPS). Unless otherwise stated, [the number] includes trained and untrained personnel.” ([12], p.20)

Intake statistics were similarly defined:

Intake to UK Regular Forces comprises new entrants, re-entrants, direct trained entrants (including professionally qualified officers) and intake from the reserves. It excludes all movements within the Regular Forces; including flows from the untrained to trained strength, transfers between Services and flows from ranks to officer due to commissioning. ([12], p.3)

For volunteer Reserves the following definition was adopted:

Volunteer Reserves comprise the Maritime Reserve, the Army Reserve and the Royal Auxiliary Air Force. They are members of society who voluntarily accept a liability to attend training with the Armed Forces on a part-time basis (usually conducted during evenings and weekends) and to be mobilised to deploy on operations alongside the Regular Force.

As they are at a known level of readiness they are usually the first reservists who are called on for operations. The Volunteer Reserve also includes personnel with capabilities or skills that cannot be held economically within the Regular Force or are better drawn from the civil sector, for example personnel with specialist IT or medical skills. ([13], p.28)

2.2. Health needs assessment

To arrive at estimates for health needs, statistics from Def Stats and data from KCMHR research studies, for which primary data was available, were used. Statistics from Def Stats included (but were not limited to) medical discharge statistics, War Pension statistics and AFCS statistics [3-5]. KCMHR research studies included (but were not limited to) the KCMHR cohort study [1, 9] and the Gulf 1 cohort study [6]. Both these studies are large epidemiological studies with randomly selected samples, which are thus truly representative of the UK AF as a whole. Importantly, although the participants in the initial phases of these studies were all selected at a time when they were part of the regular or reserve forces, follow-up phases of the studies continue to include participants from earlier phases even if they have left Service.

2.3. Deriving 'final figures' for problems

In order to interpret the study outcomes and to understand the information gleaned from reviewing appropriate published literature, stated figures reflect four levels of certainty:

'Hardfloor' figures: These numbers are robust and can be confirmed. Hardfloor figures come from officially provided numbers such as medical discharge statistics, from which the lowest or most certain numbers were taken; or studies that have been conducted by KCMHR (e.g. KCMHR cohort study) where primary data was accessible. Hardfloor numbers can be described as 'at least'.

'Possible' figures: These are tangible estimates of maximum likely numbers that come from estimates also using officially provided figures and research data. Possible figures represent the top of the range of possible numbers and thus can be described as 'up to' numbers.

'Probable' figures: It is often not possible to confirm the true value for a particular outcome of interest. True values are likely to lie between the hardfloor figure and the possible figure. For the purposes of this report the term 'probable' is used to describe the lower tertile (33%) of the

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range of numbers between the hardfloor and the possible numbers. Whilst it is uncertain that probable figures are indeed correct, it is very likely that the true values will be more than the hardfloor figures. Therefore, for planning purposes, the probable numbers may be more useful.

'Uncertain' numbers refers to numbers that are known to exist but which cannot be estimated with any reliability.

2.4. Basic numbers

Regular Service Personnel: Veterans and still in Service

In 1991 there were 298,060 Service Personnel [14]. To arrive at a total number for regular Service Personnel between 1991 and 2014, this figure is added to total inflow of Service Personnel for each year starting from 1991 to 2014 (with the additional six months from April to October 2014). This results in an estimate of 757,805. The baseline number and the inflow numbers for each year are freely available in reports provided by Def Stats ([14], see Table 1).

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Table 1. Number of regular Service Personnel between 1991 and 2014

Year	Number
Baseline 1991	298,060
Inflow 1991	27,907
1992	14,842
1993	11,952
1994	13,007
1995	17,672
1996	22,165
1997	23,610
1999	26,000
2000	25,550
2001	23,020
2002	23,730
2003	26,350
2004	23,540
2005	17,590
2006	18,150
2007	20,100
2008	21,350
2009	21,350
2010	21,500
2011	12,730
2012	14,800
2013	14,370
2014	6,580
Total 1991-2014	757,805

The annual Personnel report that is published by Def Stats shows that in 2014 there were 156,630 people in Service [12]. If this number is subtracted from the total number of Personnel in Service between 1991 and 2014, an estimate of how many of those in Service between 1991 and 2014 had left Service by 2014 can be made. This number (601,175) will be referred to as the regular Veteran population.

Reservists and veteran Reservists

Reports from Def Stats do not provide inflow and outflow statistics for Reserve Forces. Only the total number of Reserve Forces for each year can be obtained. Since the numbers of people

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entering and leaving the Reserve Forces are not provided, the actual turnover is unknown and a total number for this group cannot be validly calculated. However, information obtained from the response to an FOI request¹ on the numbers of individuals serving in the volunteer Reserve Forces between 1991 and 2014 (FOI 201501103) gives some guidance: “Between 1 October 2012 and the 1 November 2014, there have been an estimated 40,240 individuals serving in the Volunteer Reserve Forces”. In April 2012, there were 31,310 Reservists (FOI 201501103). By subtracting the number of Reservists for 2012 (31,310) from the total that served between 1 October 2012 and 1 November 2014 (40,240) it was possible to provide a mean estimate of how many people joined the volunteer Reserve Forces in 2013 and 2014: $40,240 - 31,310 = 8,930$. Since this is the number over a two year period, dividing this number by two gives us an estimate of inflow per year, which is 4,465.

An NAO report [15] provides figures on inflow and outflow data for the volunteer Reserve Forces between 1999/2000 and 2004/2005 (see Figure 1).

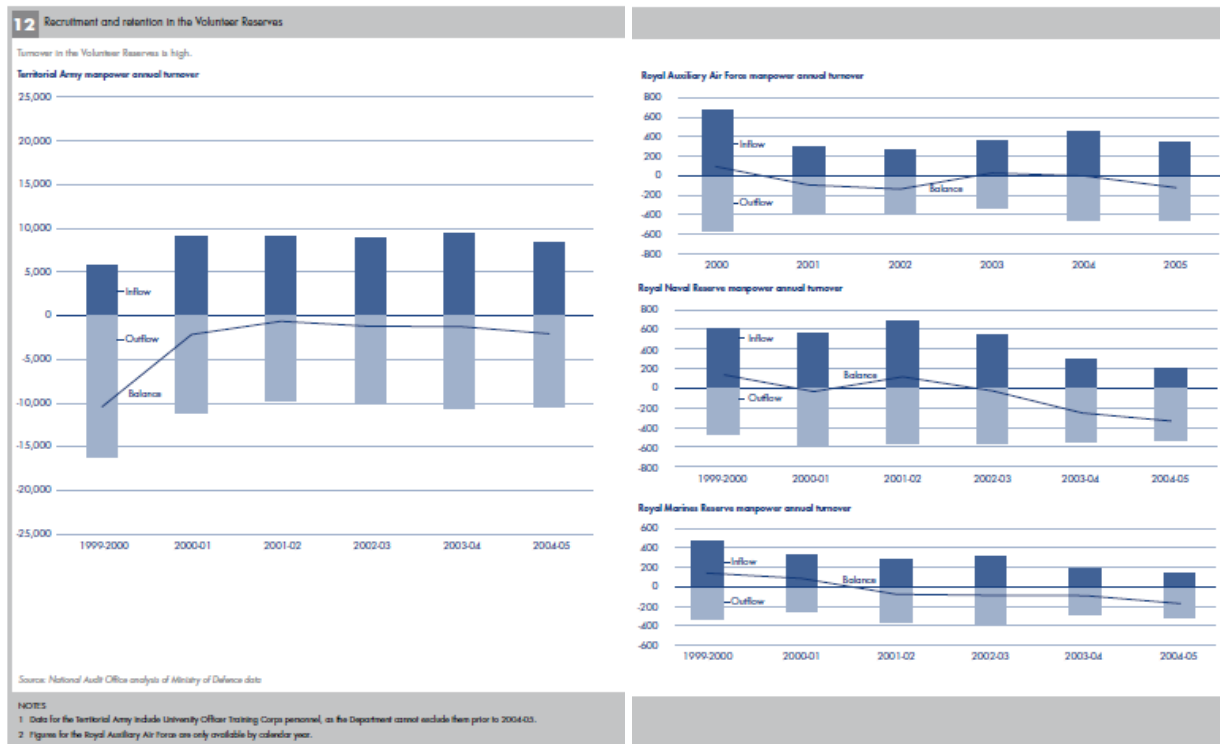


Figure 1. Source: National Audit Office, 2006. Ministry of Defence - Reserve Forces. HC 964 Session 2005-2006, pp. 32, London, The Stationery Office

¹ Appendix A provides more information about FOI requests and responses used in this report.

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Due to the non-retention policy of the NAO under which files are destroyed after five years, the numbers on which these figures were based could not be provided. Therefore an estimate of the number was derived from the figures (see Table 2).

Table 2. Inflow and Outflow of volunteer Reserves 1999 to 2004

Year	Inflow					Outflow				
	Army	Air Force	Naval Forces	Marines	Total	Army	Air Force	Naval Forces	Marines	Total
1999	5850	675	600	450	7575	16500	600	475	350	17925
2000	9100	300	575	350	10325	11200	400	600	250	12450
2001	9150	250	675	275	10350	9000	400	575	375	10350
2002	9000	350	550	300	10200	10100	350	575	400	11425
2003	9300	450	300	200	10250	10750	450	550	300	12050
2004	8350	275	200	175	9000	10250	450	550	350	11600

The calculations based on these figures suggest that the mean inflow is 9,617 (standard deviation 1,125).

To arrive at a single mean inflow number per year, the mean of this estimate, and of that calculated from the FOI request, were summed and divided by two: $(4,465 + 9,617) / 2 = 7,041$. If the mean inflow number for each year from 1991 to 2014 (thus 23 times) is added to the number of Reserves serving in 1991 (91,463) the total number of volunteer Reserve Forces personnel between 1991 and 2014 can be estimated: $91,463 + 23 * 7,041 = 253,406$.

The number of Reserves in 2014 was 27,270 [13]. If this number is subtracted from the total number of Reserves estimated for 1991 to 2014, the number of people who served as Reservists in the UK AF between 1991 and 2014 who have been discharged from Service can be calculated: $253,406 - 27,270 = 226,136$. This group will be referred to as veteran Reservists.

2.5. Deployments

Deployment of Regulars

A response to an FOI request regarding deployment to Afghanistan and Iraq states: *“Since the beginning of the conflicts in Afghanistan and Iraq to 31 March 2014, 220,550 individual UK Armed Forces Personnel have been deployed to either or both Afghanistan and Iraq.”* (FOI

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2014/03892). 53,462 UK AF Personnel were deployed to the 1991 Gulf War 1, codenamed Operation Granby [16]. According to various scientific articles, 39,217 Personnel deployed to Bosnia between April 1992 and February 1997 (e.g. [6]). A second FOI request gives additional information on deployment figures from 2007 onwards (FOI 2015 01104). Between April 2007 and November 2014 an additional 490 Service Personnel were deployed to Bosnia. It is therefore possible to calculate an approximate figure for Personnel deployed on major deployments (Operation Granby, Bosnia, Afghanistan and Iraq) between 1991 and 2014. These deployment figures also include Reserve Forces². Therefore the numbers established for the deployments of Reserve Forces are subtracted from the numbers above (see below for more information about deployment of Reserve Forces). This calculation generates a number of 198,264 for Afghanistan and Iraq, 33,844 for Bosnia and for Operation Granby, 53,462 (a firm figure). Deployment figures for volunteer Reservists prior to 1995 were not available.

This report focuses on the major deployments (Operation Granby, Bosnia, Afghanistan and Iraq) undertaken between 1991 and 2014. The figure received from Def Stats regarding deployments to Afghanistan and Iraq, from which figures for Regulars only were derived, was for individuals. Therefore this number does not include any multiple counts of Regulars who undertook two or more deployments. To take into account the fact that regular Service Personnel might deploy on more than one operation, the number of regular Service Personnel deployed to Afghanistan, Iraq, Bosnia and on Operation Granby was calculated. From the KCMHR cohort study the percentage of regular Service Personnel who deployed to Afghanistan and/or Iraq and to Bosnia or on Operation Granby can be calculated. 21% of those who had been on deployment in Afghanistan and/or Iraq had also been on deployment to Bosnia or Operation Granby; 41,635 (0.21×198264) had therefore been on multiple deployments. From the cohort study by Unwin and colleagues (1999), which focused on deployment to Bosnia and on Operation Granby, the percentages of those who deployed to both fields of operation can be calculated. Approximately 10% of all those who had deployed to Bosnia and on Operation Granby had

² Deployment figures for reserve forces included only numbers on operations to the Balkan as a whole. These were subtracted from the deployment figure for regulars to Bosnia.

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deployed to both fields of operation. This generates a figure of 8,730 ($0.1 \times (33,844 + 53,462)$) regular Service Personnel who had undertaken both deployments.

The overlap of deployment to Afghanistan/Iraq with Bosnia and Operation Granby was calculated in a different way and in a different dataset from the overlap calculation for deployment to Bosnia and Operation Granby in order to provide more useful estimates. However, it was not feasible to provide an estimate of deployments to all four fields of operation. It is however possible to estimate how many individual regular Service Personnel had been deployed to Afghanistan, Iraq, Bosnia and/or on Operation Granby: $198,246 + 33,844 + 53,462 - 41,635 - 8,730 = 235,187$. It is therefore estimated that 235,187 regular Service Personnel undertook 285,570 deployments to operational areas as described.

The above number is almost certainly an underestimate. In spite of making considerable efforts, reliable figures for the numbers of Personnel who deployed to Northern Ireland since 1991 could not be obtained and while it is known that Personnel deployed to Northern Ireland the final number is unknown. As there were no reliable deployment figures available for Personnel deployed to all other theatres (e.g. Sierra Leone, Kosovo), these were also excluded from the estimates.

The deployment figure does not include any deployment of Special Forces (SF) personnel, including regular troops who worked alongside SF troops (who fall under the 'Special Forces umbrella'). This figure also does not include regular operational deployments of Royal Naval personnel on ships or submarines, including those who operate the nuclear missile submarines (SSBNs) which operate continuously.

[Deployments of reservists](#)

The report from the NAO [15] on Reserve Forces provides some information on how many Reservists have been on deployments between 1995 and 2005³ (see Table 3).

³ Individuals may be counted multiple times.

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Table 3. Deployment figures of volunteer Reserve Forces

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Balkans	437	1,166	588	621	836	540	573	387	395	175	85
Afghanistan							6	313	252	66	47
Sierra Leone							51	11	0	0	2
Op TELIC									8,284	2,370	1,198
Total	437	1,166	588	621	836	540	630	711	8,931	2,611	1,332

Note. Numbers extracted from National Audit Office, 2006. Ministry of Defence - Reserve Forces. HC 964 Session 2005-2006, p.8, London, The Stationery Office NAO, 2006.

Further to the response to the FOI request about deployment for Reservists between 1991 and 2014, information was received about deployments from 2007 onwards (FOI 2015/06422, see Table 4).

Table 4. Number of unique Reservists deployed to each country operation

	Iraq	Afghanistan	Northern Ireland	Bosnia
Individual UK Reserve Personnel on deployments between 1 April '07 to 31 October '14	1,280	8,470	240	60

Note. Counts of unique individuals per tour but may include double counts if an individual has been deployed to different countries.

From these two figures (NAO, 2006 and FOI 2015/06422) the number of Reservists who have been deployed between 1995 and 2014 (with the exclusion of 2006) can be estimated: 28,149 (18,341 + 9,810) Reservists have been on deployments⁴ to Iraq, Afghanistan and/or the Balkans.

Since deployment figures for Reservists are less robust than deployment figures for regular Service Personnel, estimates and corrections cannot be generated for multiple deployments. The total deployment figure for Reservists is therefore highly provisional given that it might contain multiple counts and does not include deployment figures for 2006 or prior to 1995.

⁴ Not taking into account that an individual might have deployed to different countries and therefore be counted twice.

2.6. Physical health

Medically discharged Personnel

Regulars

According to the medical discharge statistics, 36,506 regular Service Personnel were medically discharged between 1st April 1991 and 1st April 2014. Principal ICD 10 (International Classification of Diseases Volume 10 [17]) diagnostic code groups were only available from Def Stats from 2001 onwards ([4] and FOI 2014/3893). Between 2005 and 2013, about 872 or 6% of medical discharges were of a kind that was likely to be unrelated to military Service (e.g. neoplasm, diabetes, unspecified (rather than noise-induced) hearing loss, asthma, pregnancy, congenital malformations). If the reasons for medical discharges did not vary substantially between 1991 and 2014⁵, then 6% of all medical discharged Personnel were discharged due to reasons that were unlikely to be Service related ($0.06 \times 36,506 = 2,190$), this number is therefore subtracted from the figure for all medical discharges. Since this estimate is for physical problems, 4,745 discharges related to mental and behavioural disorders must also be subtracted (see “Mental health” on p. 22 to find more information about how this number has been calculated).

90 of the 14,952 (i.e. 0.6%) Service Personnel who had been medically discharged between April 2005 and April 2014 were awarded a lump sum plus Guaranteed Income Payment (GIP, see “War Pensions” further down). This number could be larger than 90, though, since Personnel claiming under the AFCS prior to their medical discharge are registered as having an in-Service claim [5]. Thus, for at least 0.6% it is known that the medical discharge was due to an illness or injury attributable to Service with a medium to large impact on future functioning. If the 0.6% proportion is applied to all those who have been medically discharged between 1991 and 2014, it is estimated that 219 of those medically discharged between 1991 and 2014 had been discharged due to an illness/injury attributable to Service with a medium to large impact on future functioning. 1,040 medical discharge claims were awarded a lump sum only. It is not

⁵ The authors are aware that this is a strong assumption. However in order to provide a hardfloor figure that will not be an overestimate, the correction for unrelated disorders is included for all years (1991 tot 2014) rather than only for the years (2001 to 2014) for which the data was available.

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known how many people made these claims (see passage “Armed Forces Compensation Scheme” on p. 18 for more information about lump sums and GIPs).

The main reasons given for medical discharges between 2001 and 2014 were musculoskeletal disorders and injuries. During these years, 60% (varying between 55% and 70%) of all medical discharges were for musculoskeletal reasons. If it is assumed that the reasons for medical discharges did not vary substantially in the years from 1991 to 2014, then about 60% of all medical discharges between 1991 and 2014 were due to musculoskeletal reasons. Mental and behavioural disorders were the second most common category (see section “Mental health, Medical discharges and AFCS” on p.22 for more information).

If the medical discharges and primary ICD codes between 2001 and 2014 are examined, it can be seen that between 2001 and 2003 there were more medical discharges due to musculoskeletal reasons (between 64% and 70% of all medical discharges) than in the years from 2004 onwards (between 55% and 60%). Also in reports on medical discharges in Army personnel prior to 1997 [18], medical discharges for causes classified as musculoskeletal illnesses ranged between 61% and 74%, which also indicates that between 1991 and 2003 medical discharges were more likely to be related to musculoskeletal disorders. Since these latter numbers are only based on Army Personnel, the earlier 60% estimate seems appropriate. However it seems likely that this 60% estimate is an underestimation and that the number of those who have been medically discharged due to musculoskeletal disorders between 1991 and 2014 is probably greater than 60%.

Reservists

As stated in the medical discharge statistics provided by MoD: *“there may be a presence of a small unknown number of reservist personnel within the medical discharge dataset which may cause a small bias in the results.”* ([4], p.3) Since the number of Reservist Personnel in the medical discharge statistics is unknown, reliable estimates for medically discharged Reservists cannot be generated.

For final figures

Since a conservative estimate for the hardfloor figure is desirable, medical discharge statistics are not included in the hardfloor figure. That is because those who definitely need help in the

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future are also covered in the statistics provided by AFCS and probably also from the War Pension Scheme. The latter may be somewhat unreliable since these statistics do not hold information about how many of those who have been medically discharged received a disability pension.

For the possible figure, all those Personnel who were medically discharged for primary physical cause codes between 1991 and 2014, and for which the medical codes are likely to be related to military Service, were taken into account: $36,506 - 4,745 - 2,190 = 29,571$.

For the probable figure, 33% is added to the hardfloor figure of the difference between the possible figure and the hardfloor figure: $0 + 0.33*(29,571-0) = 9,758$.

Amputations

Between 7 October 2001 and 30 September 2014, approximately 370 Service Personnel had a partial or complete limb amputation which that was a result of injuries sustained in Iraq, Afghanistan or elsewhere. 186 of the 370 had been medically discharged by 31 March 2014 and for 152 of the 186, the reason for discharge was recorded as musculoskeletal disorder and injury [8].

War Pensions and Armed Forces Compensation Scheme

War Pension and AFCS statistics may include both regular Service Personnel and Reservists [3, 5]. The proportion of regular Service Personnel and Reservists for each year is calculated to arrive at a mean proportion for the years 1991 to 2005 and 2005 to 2014 (for Regulars: $\text{total Regulars}/(\text{total Reservists} + \text{total Regulars})$, see Table 5). Under the assumption that the proportions of Regulars and Reservists who have been in Service between 1991 and 2014 was the same as the proportion of Regulars and Reservists having made claims under the War Pension Scheme and the AFCS, these proportions can be used to estimate how many of those who received compensation under the War Pension Scheme and under the AFCS are likely to be regular Service Personnel and Reservists.

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Table 5. Proportion of regular Service Personnel and Reservists per year

Year	Total regular Service Personnel	Total Reservists	Proportion of regular Service Personnel	Proportion of Reservists
1991	298,060	91,463	0.77	0.23
1992	293,440	89,115	0.77	0.23
1993	274,850	76,100	0.78	0.22
1994	254,490	71,100	0.78	0.22
1995	233,340	64,689	0.78	0.22
1996	221,870	57,715	0.79	0.21
1997	210,820	58,000	0.78	0.22
1998	210,140	57,539	0.79	0.21
1999	208,640	51,297	0.80	0.20
2000	207,610	45,976	0.82	0.18
2001	205,650	47,231	0.81	0.19
2002	204,680	36,400	0.85	0.15
2003	206,920	40,420	0.84	0.16
2004	207,020	38,850	0.84	0.16
2005	201,100	37,570	0.84	0.16
2006	195,805	39,590	0.83	0.17
2007	190,670	35,960	0.84	0.16
2008	186,910	34,970	0.84	0.16
2009	188,600	34,790	0.84	0.16
2010	191,710	33,490	0.85	0.15
2011	186,360	31,260	0.86	0.14
2012	179,800	31,470	0.85	0.15
2013	170,710	30,650	0.85	0.15
2014	156,630	28,860	0.84	0.16

The mean proportion of Regulars between 1991 and 2005 was 80% (and 20% for Reservists) whereas the mean proportion of Regulars for 2005 to 2014 was 85% (and 15% for Reservists).

War Pensions

Anyone who served prior to 6 April 2005, who has terminated Service and who believes that there was a causal link between his/her disablement and Service may be eligible for a War Pension. War Pensions were established to recognise the sacrifice of military Personnel who suffer personal injury due to military Service by making awards to both them and their dependents [19]. Awards under the War Pension Scheme depend on the medically assessed level of disablement, which is expressed as a percentage and compares the disabled person with a healthy person of the same age and gender. The assessment method is set out in

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legislation. If an individual is assessed at a disablement percentage of 20% to 100%, they will be awarded an ongoing War Pension. A disablement pensioner (DP) is defined as a former member of the Services with an injury/illness resulting from their Service [3].

Information about how many of those who received a War Pension in 2014 had been in Service between 1991 and 2005 was unavailable. Therefore, to estimate the number of Personnel who served after 1991 who received a War Pension in 2014, some assumptions were made and numbers were calculated in the following way:

Table 1.6 of the War Pension Scheme annual statistics 2008 to 2014 provides numbers of DPs by age group (see Table 6 below for some numbers from table 1.6, [3] p.14). With the help of this table and some assumptions on the age distribution of Service Personnel, the number of Service Personnel serving between 1991 and 2014 who received a War Pension in 2014 could be calculated.

The earliest age at which people can join the military is 16 years. Therefore if somebody aged 16 had joined the military in 1991, then they would have been 39 in 2014. The youngest person who can be part of the target group (1991 to 2014) in the category 35-39 in Table 6, that has been established in 2014 can be identified. It is safe to assume that anybody within the age categories up to 39 is part of the target group, since everybody who is younger than 39 has joined the UK AF at a later stage (after 1991). This gives a total number of 4,700 DPs, which is most likely an underestimation of DPs who were in Service between 1991 and 2014, since, for example, somebody who was 30 in 1991 would also be part of the target group. However, this age group number is taken to be a hardfloor figure. If we split this number into Regulars and Reservists, this would mean: $0.8 * 4,700 = 3,760$ regular Veterans and $0.2 * 4,700 = 940$ veteran Reservists.

To find a possible figure (the number of Service Personnel who were older than 16 in 1991) some assumptions are required regarding the age at which people leave the UK AF. Calculations of age distributions reported by Def Stats (compendia 1991, 2000, 2011, 2013) show that 97% of those who served in each given year were 50 years or younger (see Table 6). Calculations of age distributions reported by Def Stats on the Future Reserves 2020 Volunteer Reserve Forces

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(UK Reserve Forces and Cadets reports 2013 and 2014, MoD) showed that about 85% of the Reserve Forces were 50 years or younger.

Table 6. Cumulative percentages for age groups per year for regular Service Personnel

	1991	2001	2011	2013
under 18	12%	3%	1%	1%
18-19		11%	6%	5%
20-24	41%	31%	29%	28%
25-29	63%	54%	52%	51%
30-34	78%	73%	68%	69%
35-39	89%	89%	82%	82%
40-44	95%	95%	93%	92%
45-49	98%	98%	97%	97%
50 and above	100%	100%	100%	100%

The target person is one who was 50 in 1991 in the category 70-74 in Table 7, as this person would be 73 in 2014. Since this person, like the 16 year old, was serving in 1991, he or she would be part of the target group. Therefore the category 70-74 is the upper boundary. If all DPs in the age groups 70-74 and younger are examined this would mean that there are 71,155 DPs in 2014 in receipt of a War Pension due to their Service between 1991 and 2005. This number is likely to be an overestimation, though, since most Service Personnel do not stay in the AF until the age of 30 and because War Pensions can be claimed at any time after having left the AF. This number is nonetheless the possible figure. The possible figure for Regulars is: $0.8 * 71,155 = 56,924$ and for Reservists is: $0.2 * 71,155 = 14,231$.

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Table 7. DPs by age group

Age group	All DPs
Under 30	330
30-34	1,565
35-39	2,805
40-44	7,540
45-49	9,340
50-54	10,685
55-59	9,440
60-64	8,615
65-69	10,645
70-74	10,190
Total	71,155

Source: War Pension Scheme Annual Statistics, 1 April 2009 – 31 March 2014

To arrive at a number for the probable figure, 33% of the difference between the hardfloor figure and the possible figure ($0.33 \times (71,155 - 4,700)$) is calculated and added to the hardfloor figure (4,700), giving a total of 26,630. If this figure is split out for Regulars and Reservists, final totals of 21,304 ($3,760 + 0.33 \times (56,924 - 3,760)$) for Regulars and 5,326 ($940 + 0.33 \times (14,231 - 940)$) for Reservists are generated.

AFCS

In 2005 the Armed Forces Compensation Scheme was established and replaced the War Pension Scheme for injury due to Service on or after 6 April 2005. The War Pension Scheme remains open for disablement causally related to Service before 6 April 2005. Under the AFCS, individuals can make injury claims for which they may receive a full and final lump sum payment or, for more serious injuries, a lump sum payment plus a Guaranteed Income Payment (GIP). The GIP aims to address the disabling effects of the accepted condition on occupational and social function, particularly civilian employability. There are 15 tariff levels for lump sums that reflect the severity of the injury, tariff level 1 being associated with the most serious injuries and 15 with the least serious [5].

An individual can make multiple claims for multiple injuries and therefore might be eligible to receive multiple lump sums. In contrast, (s)he can only receive one GIP for which the level is determined by the most serious injury. Under the AFCS, unlike in the War Pension Scheme, a

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claim can be made and awarded while still in Service. The GIP is paid from Service termination for life [5].

Under the AFCS, 23,710 claimants were awarded for a total of 27,805 injury claims for 39,855 injuries. These injury claims were awarded a lump sum at tariff level 1-11 (5,690 or 14% of all injuries/illnesses) and/or a lump sum at tariff level 12-15 (34,160 or 86% of all injuries/illnesses). As indicated earlier, an individual may receive only one GIP due to the most serious injury. Therefore, the number of claims granted for the lump sum plus GIP do not reflect GIPs that have been granted. On the contrary, only 1,495 individuals received a GIP by 30 September 2014 and in 535 cases a GIP has been awarded, but payment has been deferred until the claimant leaves Service. 1,495 is therefore the hardfloor figure.

If 85% of the 1,495 is calculated, an estimate of regular Service Personnel who might have been granted a GIP under the AFCS can be generated: $0.85 * 1,495 = 1,270$. The rest (225) were probably Reservists. Since the numbers for lump sum payments only reflect numbers of injuries awarded under the AFCS instead of individual claimants, inferences cannot be made about how many individuals suffered from which conditions. However, Table 8 provides some information about what type of injury or illness occurs most frequently and how serious the injuries in a given category are.

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Table 8. Injuries/illnesses awarded under the AFCS at tariff levels 1-15

Type	Tariff level	Number of claims granted
Burns	Lump sum plus GIP (tariffs 1-11)	75
	Lump sum only (tariffs 12-15)	240
Injuries, Wounds and scarring	Lump sum plus GIP (tariffs 1-11)	2,055
	Lump sum only (tariffs 12-15)	4,830
Mental Disorders	Lump sum plus GIP (tariffs 1-11)	195
	Lump sum only (tariffs 12-15)	1,405
Physical Disorders including infectious diseases	Lump sum plus GIP (tariffs 1-11)	110
	Lump sum only (tariffs 12-15)	600
Amputations	Lump sum plus GIP (tariffs 1-11)	590
	Lump sum only (tariffs 12-15)	140
Neurological disorders	Lump sum plus GIP (tariffs 1-11)	390
	Lump sum only (tariffs 12-15)	505
Senses	Lump sum plus GIP (tariffs 1-11)	555
	Lump sum only (tariffs 12-15)	1,735
Fractures and Dislocations	Lump sum plus GIP (tariffs 1-11)	1,195
	Lump sum only (tariffs 12-15)	8,860
Musculoskeletal Disorders	Lump sum plus GIP (tariffs 1-11)	505
	Lump sum only (tariffs 12-15)	15,810

Note. Numbers extracted from table 3.3a in the UK Armed Forces Compensation Scheme Biannual Statistics: 6 April 2005 to 30 September 2014 report

As previously mentioned, those who receive a GIP reflect those who are most seriously injured and are therefore likely to need additional help. It is important to acknowledge that the AF comprises a population that are younger and fitter than the general population and that fitness is most important for being able to pursue a career in the UK AF. However somebody who has received a lump sum might still be perfectly able to pursue a civil career.

As a possible figure the number for those who received a lump sum at any tariff level with the exclusion of those who received it for a mental health condition⁶ is taken: 23,710 – 948 = 22,762. In terms of Regulars and Reserves this would mean: 19,348 (0.85*22,762) and 3,414 (0.15*22,762) respectively.

⁶ See for more information about how we arrived at this number the following section about “Mental health”.

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For the probable figure, 33% of the difference of the possible figure and the hardfloor figure is added to the hardfloor figure: 8,513 (= 1,495 + (0.33*(22,762-1,495)). For Regulars this would mean: 7,236 (0.85*8,513) and for Reservists: 1,277 (0.15*8,513).

Claims awarded for medical discharges

Under the AFCS 1,145 claims of medically discharged Personnel were awarded. These were approximately 4.1% of all claims. If the proportion of claims and claimants is the same, then 4.1% of all claimants had been medically discharged, which means: 22,762*0.041 = 933. Under the assumption that the proportion of claims made by medically discharged Personnel is the same proportion as medically discharged claimants and assuming that none of these statistics includes Reservists, it can be assumed that there is an overlap of 933 regular Service Personnel who are part of both the AFCS statistics and the medical discharge statistics.

Physical health recap

Based on the medical discharge statistics, the War Pension statistics and the AFCS, an estimate can be derived for all Service Personnel (Regulars and Reservists) who served between 1991 and 2014 and who might have physical problems. The physical health hardfloor figure can be calculated as the sum of the hardfloor figures based on the War Pension Scheme and the AFCS: 4,700 DPs + 1,495 GIPs = 6,195 of which probably 5,030 (3,760 + 1,270) Regulars and 1,165 (940 DPs + 225 GIP) Reservists.

The possible estimate includes the possible figures for DPs, and the AFCS and medical discharged Personnel taking into account the possible overlap between medical discharges and awards under the AFCS: 29,571 + 71,155 + 22,762 - 933 = 122,555 of which 104,911 are possibly Regulars (56,924 + 19,349 + 29,571 - 933) and 17,646 are possibly Reservists (14,231 + 3,415).

The probable estimate is the sum of the hardfloor and 33% of the difference of the possible estimate and the hardfloor. For all: 6,195 + (0.33* 122,555 - 6,195) = 44,593; for Regulars: 5,030 + 0.33* (104,911 - 5,030) = 37,990 and for Reservists: 1,165 + (0.33* (17646 - 1,165)) = 6,603.

2.7. Mental health

Medical discharge and AFCS

13%, which is the second largest category, of medical discharges between 2001 and 2014 were due to a principal ICD code for mental and behavioural disorders. Under the assumption that the reasons for medical discharges did not substantially vary in the years from 1991 to 2005, the total number of medical discharges due to a principal ICD code of mental and behavioural disorders is $0.13 * 36,506 = 4,745$.

Under the AFCS, 1,600 (e.g. 4%) illnesses/injuries were categorized as mental disorders. Since it is unknown to how many people this number refers, it can only be assumed that the proportion for illnesses/injuries is the same as for people which would mean that 4% of all claimants were awarded a lump sum due to mental health problems: $0.04 * 23,710 = 948$.

Scientific studies

To find out more about mental health problems of Service Personnel, different meta-analyses⁷ were conducted. The results from different studies conducted by KCMHR were combined to obtain one pooled estimate. A meta-analysis is a statistical method which allows data sources from multiple studies to be combined to arrive at a mean [average] for the various studies.

The studies that were included are listed below:

- a) Study data presented in the research article by Unwin and colleagues [6]. This cohort includes mainly Service Personnel that had been deployed on Operation Granby 1991/92 and to Bosnia 1992-97.

⁷ A meta-analysis is a method to combine pooled results from different studies to produce one overall summary figure. For the purpose of this report only studies which were conducted by researchers from KCMHR were considered, since for these primary datasets could be accessed and the instruments used for almost all studies were the same. Studies were chosen that included participants who had deployed on operations that were of interest for the current report. In order to avoid double inclusion of participants, only some studies were selected. For each study, the number of probable cases on the GHQ, the AUDIT, and the PCL were calculated. Considering the diversity of studies with respect to deployment focus, a random effects model rather than a fixed effects model was applied to calculate the overall effect. Instead of assuming that the true effect is the same in each study, the diversity of studies was taken into account and it was assumed that the true effects were normally distributed [20].

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- b) Screening study phase 2, for which data collection took place at the same time as the KCMHR cohort study phase 1. See Rona and colleagues [21] for more information. We included those who participated only in phase two in this group.
- c) Screening study phase 3, third phase of the screening study [21] for which data collection took place at the same time as for the KCMHR cohort study phase 2. For the purpose of our meta-analyses we included those who participated in phase 2 and phase 3 only in this group to avoid double counting.
- d) KCMHR cohort study phase 1: This study compared the mental and physical health of UK AF Personnel who had served in Operation TELIC 1 (n = 4,722) with that of a military group who had not (n = 5,550; see for more information [9]).
- e) KCMHR cohort study phase 2: In this phase the mental health of those who participated in phase 1 (n = 6,429) of the cohort study was re-assessed and two additional groups of UK AF Personnel were included to represent the military structure in 2009 (those who have joined the military since 2003; n = 2,665) and operational deployments to Afghanistan, between April, 2006, and April, 2007, n = 896 (see for more information [1]). For the purpose of our meta-analyses we included those who participated in phase 1 and phase 2 of the cohort study only in this group to avoid double counting.

Studies b. to e. included all the same questionnaires to screen for mental health problems:

The General Health Questionnaire (GHQ-12 [22]) is a 12-item questionnaire to assess probable common mental disorders. A case⁸ is generally defined as 4 or more symptoms and is referred to in this report as a lenient threshold. A strict cut-off score of 9 or more symptoms was also defined because at 9 or more the GHQ is more likely to identify only true cases (higher specificity, see [23]). The PTSD Checklist (PCL [24]) is a 17-item standardised self-report rating scale for PTSD. A case of probable PTSD is defined as a score of 50 or more. The Alcohol Use Disorders Identification Test (AUDIT [25]) is a 10-item screening test for probable alcohol

⁸ Note that these questionnaires are all screenings instruments, developed to identify probable cases in the general population. Being a probable case does not mean the individual will definite have a formal clinical diagnosis but well-constructed surveys of randomly selected samples are routinely taken to be valid estimates of true population prevalence rates.

abuse/misuse; a case is in most KCMHR studies defined as 16 or more. A second stricter cut-off score of 20 was chosen to identify those who would be advised to get further diagnostic evaluation for alcohol dependence [25]. In study a), items from the Mississippi Scale for Combat related PTSD (M-PTSD [26]) were used to assess probable PTSD; a case was defined as the experience of one symptom in each of four classifications—intrusive thoughts, avoidance, arousal and irritability—and at least two further symptoms of unrefreshing sleep, fatigue, alcohol intolerance, forgetfulness, poor concentration, loss of sexual interest and decrease in appetite [6]. Alcohol abuse was not measured using a structured validated instrument and, therefore, this study was not included in the meta-analyses reporting on alcohol abuse. Since co-morbidity was expected, cases of any mental disorder were defined. This was in order to take into account probable overlap between disorders. Caseness of any mental health disorder was defined as a case on either AUDIT, PCL/M-PTSD and GHQ, incorporating the strict cut-off scores.

Tables 9 to 12 show the combined results of these studies for which a meta-analytical approach was used. The prevalence (or the weighted estimates of caseness) for each outcome and the 95% Confidence Interval (CI; based on the numbers reported in the included studies, there is a 95% chance that the true value (e.g. the true prevalence) lies between these two numbers; this is a standard scientific method of demonstrating the range of possible true values and precision) are reported. It should be noted that for most of the meta-analyses that were executed the CIs are more often wide than narrow. This means that there is more uncertainty about the true prevalence of a particular condition. If the CIs for two statistics do not overlap this means that they are significantly different from each other.

There was also a lot of variety between studies with respect to how many cases there were of probable PTSD, psychiatric morbidity and alcohol abuse. Also, when samples were divided into different subgroups, this resulted in few participants for some outcomes from some studies. Although the weighting that was assigned to each study in the meta-analyses account for the differences in numbers of participants per study (with larger studies receiving larger weights and having therefore more impact on the overall outcome), very small subgroups are still problematic since outcomes from small subgroups are less reliable.

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Meta-analyses were executed for the different outcome measures as previously described in eight different groups:

1. Regular Service Personnel deployed
2. Regular Service Personnel non-deployed
3. Regular Veterans deployed
4. Regular Veterans non-deployed
5. Serving Reservists deployed
6. Serving Reservists non-deployed
7. Veteran Reservists deployed
8. Veteran Reservists non-deployed

To establish an estimate of how many regular Service Personnel might have mental health problems, the following approach was used:

In 2014 there were 156,630 regular Service Personnel. In meta-analyses for groups 1 and 2 estimates were calculated of how many might have common mental health problems, probable PTSD, alcohol abuse problems and any mental health problems. It is unknown how many of these 156,630 have been deployed, which is why estimations about the total number are made taking the lowest prevalence either as established for non-deployed or deployed regular Service Personnel.

There was a significant difference between deployed and non-deployed regular Service Personnel with respect to “any mental health problems”. Table 9 presents the results.

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Table 9. Percentages of cases on the GHQ, PCL/M-PTSD and the AUDIT for regular Serving Personnel

	GHQ 4	GHQ 9	PCL	AUDIT 16	AUDIT 20	Any
Deployed	20.1 [14.5; 25.8] ^{a, b, c, d, e}	4.0 [2.9; 5.2] ^{a, b, c, d, e}	3.6 [2.2; 5.0] ^{a, b, c, d, e}	13.9 [9.9; 17.7] ^{b, c, d, e}	5.9 [3.6; 8.2] ^{b, c, d, e}	10.2 [8.1; 12.0] ^{b, c, d, e}
Non-deployed	20.9 [19.6; 22.2] ^{a, b, c, d, e}	10.5 [5.0;15.9] ^{a, b, c, d, e}	3.0 [2.3; 3.7] ^{a, b, c, d, e}	11.4 [7.6; 15.3] ^{b, c, d, e}	7.4 [4.0; 10;8] ^{b, c, d, e}	16.6 [12.7; 20.6] ^{b, c, d, e}

Note: Upper case letters are the studies included in the meta-analyses.

GHQ 4: lenient cut-off score of 4 used; GHQ 9: strict cut-off score of 9 used; AUDIT 16: lenient cut-off score of 16 used; AUDIT 20: strict cut off score of 20 used; Any: any mental health problems.

If it was assumed that 10.2% of regular Service Personnel suffered from any mental health problems, this would mean: $0.102 * 156,630 = 15,976$.

To establish an estimate of how many regular Veterans who have served between 1991 and 2014 might have mental health problems, the following approach was used:

It was estimated earlier that between 1991 and 2014 there have been 601,175 regular Veterans. In meta-analyses for groups 3 and 4, estimates were calculated of how many regular Veterans might have common mental health problems, probable PTSD, alcohol abuse problems and any mental health problems. Since it is unknown how many of the total regular Veteran population have been deployed, estimations were made about the total number of 601,175 taking the lowest prevalence either as established for non-deployed or deployed regular Veterans.

With the more lenient, routine, cut-off scores, there are no significant differences between deployed and non-deployed regular Veterans. With the stricter cut-off scores, deployed veterans show less common mental health problems than non-deployed (Table 10).

Table 10. Percentages of cases on the GHQ, PCL/M-PTSD and the AUDIT for regular Veterans

	GHQ 4	GHQ 9	PCL	AUDIT 16	AUDIT 20	Any
Deployed	31.8 [19.9; 43.8] ^{a, b, c, d, e}	4.4 [2.9; 5.0] ^{a, b, c, d, e}	8.9 [3.3; 14.5] ^{a, b, c, d, e}	13.2 [7.6; 18.7] ^{b, c, d, e}	5.0 [2.7; 7.3] ^{b, c, d, e}	10.2 [7.1; 13.3] ^{b, c, d, e}
Non-deployed	23.2 [18.6; 27.9] ^{a, b, c, d, e}	7.9 [6.7; 9.0] ^{a, c, d, e}	5.6 [4.6; 6.7] ^{a, c, d, e}	10.1 [5.2; 15.0] ^{b, c, d, e}	5.6 [2.2; 9.0] ^{b, c, d, e}	14.0 [9.1; 19.0] ^{b, c, d, e}

Note: Upper case letters are the studies included in the meta-analyses.

GHQ 4: lenient cut-off score of 4 used; GHQ 9: strict cut-off score of 9 used; AUDIT 16: lenient cut-off score of 16 used; AUDIT 20: strict cut off score of 20 used; Any: any mental health problems.

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If it was assumed that 10.2% of the regular veteran population suffered from any mental health problems, this would mean: $0.102 * 601,175 = 61,319$.

To establish an estimate of how many serving Reservists might have mental health problems, the following approach was used:

In 2014 there were 27,270 Reservists. In meta-analyses for groups 5 and 6 estimates were calculated of how many might have common mental health problems, probable PTSD, alcohol abuse problems and any mental health problems. Since it is unknown how many of these have been deployed, estimates were made about the total number of 27,270 taking the lowest prevalence either as established for non-deployed or deployed Reservists.

There was no indication that there were significant differences between deployed and non-deployed Reservists. Table 11 presents the results.

Table 11. Percentages of cases on the GHQ, PCL/M-PTSD and the AUDIT for Reservists

	GHQ 4	GHQ 9	PCL	AUDIT 16	AUDIT 20	Any
Deployed	25.0 [17.9; 32.0] ^{a, d, e}	7.7 [4.0; 11.0] ^{a, d, e}	4.2 [2.3; 6.1] ^{a, d, e}	9.0 [7.1; 10.7] ^{d, e}	3.5 [1.9; 5.0] ^{d, e}	10.9 [8.9; 12.0] ^{d, e}
Non-deployed	15.2 [11.8; 18.5] ^{a, c, d, e}	14.0 [5.8; 22.0] ^{a, d, e}	1.7 [0.06; 2.7] ^{d, e}	8.1 [1.2; 15.0] ^{b, d, e}	5.8 [3.4; 8.2] ^{b, d, e}	16.5 [9.3; 23.7] ^{c, d, e}

Note: Upper case letters are the studies included in the meta-analyses.

GHQ 4: lenient cut-off score of 4 used; GHQ 9: strict cut-off score of 9 used; AUDIT 16: lenient cut-off score of 16 used; AUDIT 20: strict cut off score of 20 used; Any: any mental health problems.

If it was assumed that 10.9% of the serving reservist population suffered from any mental health problems, this would mean: $0.109 * 27,270 = 2,972$ serving Reservists.

To establish an estimate of how many veteran Reservists who have served between 1991 and 2014 might have mental health problems, the following approach was used:

Previously it was estimated that between 1991 and 2014 there have been 226,136 veteran Reservists. In meta-analyses for groups 7 and 8, estimates were calculated of how many might have common mental health problems, probable PTSD, alcohol abuse problems and any mental health problems. Since it is unknown how many of those have been deployed, estimations are made about the total number of 226,136 taking the lowest prevalence either as established for non-deployed or deployed veteran Reservists.

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No indication was found for significant differences between deployed and non-deployed veteran Reservists. Table 12 presents the results.

Table 12. Percentages of cases on the GHQ, PCL/M-PTSD and the AUDIT for veteran Reservists

	GHQ	GHQ 9	PCL	AUDIT-16	AUDIT-20	Any
Deployed	42.5 [21.8; 63.3] ^{a, c, d, e}	3.0 [1.6; 4.0] ^{a, c, d, e}	9.7 [2.3; 17.1] ^{a, c, d, e}	11.9 [8.6; 15.3] ^{c, d, e}	2.6 [1.4; 3.9] ^{c, d, e}	5.7 [2.4; 8.9] ^{b, d, e}
Non-deployed	20.8 [15.8; 25.8] ^{a, b, c, d, e}	4.7 [2.0; 7.0] ^{a, c, d, e}	6.0 [0; 13.0] ^{a, c, d, e}	11.5 [0.8; 22.3] ^{b, c, d, e}	8.7 [0; 19.3] ^{b, c, d, e}	18.8 [1.3; 36.4] ^{c, d, e}

Note: Upper case letters are the studies included in the meta-analyses.

GHQ 4: lenient cut-off score of 4 used; GHQ 9: strict cut-off score of 9 used; AUDIT 16: lenient cut-off score of 16 used; AUDIT 20: strict cut off score of 20 used; Any: any mental health problems.

If it was assumed that 5.7% of the veteran reservist population suffered from any mental health problems, this would mean: $0.057 * 226,136 = 12,889$ veteran Reservists.

Mental health recap

As previously stated, estimates of how many people might suffer from mental health problems varied across populations for which the estimates were made. To arrive at one reliable estimate for the hardfloor figure, only the estimate for regular Veterans was taken into consideration. This was for two reasons: first, because unlike the estimate for Reservists, the baseline figures for Regulars were relatively reliable. Second, because the estimates for physical and mental health problems needed to be combined. Since the estimates of how many Service Personnel might have physical problems included only Veterans, the estimate for mental health problems was limited to that population too. Therefore, the estimate for mental health problems was: 61,319.

For the probable estimate, the number for all regular Service Personnel who might suffer from mental health problems was taken: 77,296 ($0.102 * 757,805$). This was again for two reasons: First, the same reason as before; because unlike the estimate for Reservists, the baseline figures for Regulars were relatively reliable. Second, because the estimates for physical and mental health problems needed to be combined. Since the estimate for physical health problems might include both regular Service Personnel and Veterans, the estimate for mental health problems was based on all regular Service Personnel.

2.8. Overlap of physical health and mental health

Forbes and colleagues [7] conducted a population-based study, in which routinely collected data of attendances at emergency departments in military hospitals in Iraq and Afghanistan [Operational Emergency Department Attendance Register (OpEDAR)] was linked with data on 3,896 UK Army personnel who participated in the KCMHR cohort study phase 1 and phase 2. Therefore, the overlap of physical and mental health problems in regular Veterans could be estimated. 23% of those with a record on the OpEDAR also had mental health problems⁹, 33% of those who had mental health problems also had physical health problems and 16% of all had both mental and physical health problems.

Since the estimate for the hardfloor figure of how many Service Personnel might have physical health problems was conservative, this estimate was very small in comparison to the mental health figure. It was therefore not feasible to translate the 16% overlap figure to the sum of the hardfloor figures of physical and mental health problems. However, based on findings from scientific research [7, 27] and the calculations that were executed on the OpEDAR data for the purpose of this report, overlap between mental and physical health problems was expected. Therefore, for the hardfloor figure the overlap of those who had physical and mental health problems was estimated solely on the 23% with physical problems who also had mental health problems: $0.23 * 6,195 = 1,424$.

For the possible figure the overlap between mental and physical health problems was estimated based on the 16% figure of physical and mental health problems. For regular Service Personnel (Veterans and in Service) this would mean: $0.16 * (104,911 + 77,296) = 29,153$.

2.9. Physical and/or mental health problems

The hardfloor estimate of those who might have physical and/or mental health problems was based on the physical health hardfloor figure that was established for all Veterans, 6,195, and the mental health hardfloor figure that was established for regular Veterans. Taking into account the possible overlap between physical and mental health problems, the estimate for the combined hardfloor figure for mental and/or physical health problems was:

⁹ Estimates for mental health problems based on the same strict cut-off scores that were used in the meta-analyses.

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$$6,195 + 61,319 - 1,424 = 66,090.$$

The possible estimate of those who might have physical and/or mental health problems was based on the possible figure for physical health problems that was established for all regular Service Personnel, 104,911, and the possible figure for mental health problems that was established for all regular Service Personnel, 77,296. Taking into account the possible overlap between physical and mental health problems, the estimate for the combined possible figure for mental and physical health problems was: $104,911 + 77,296 - 29,153 = 153,054$.

The probable estimate was the sum of our hardfloor estimate and 33% of the difference of the possible estimate and the hardfloor estimate: $66,090 + 0.33 * (153,054 - 66,090) = 94,788$.

2.10. Additional data sources

[The Royal British Legion Household report 2014](#)¹⁰

From the dataset of the household survey of ex-service community commissioned by The Royal British Legion [28], a subset of Veterans who, according to the questionnaire had left Service less than 30 years ago (best match for our aim was the category “20 years, but less than 30 years” as upper boundary) was extracted. This resulted in a subset of 307 Veterans.

The survey included 40 questions about health and welfare needs, as well as awareness and experiences of ex-service charities and other agencies. The large majority of questions were in multiple choice format and were administered during an interview. Respondents were, for example, asked which, if any, difficulty they had experienced from lists of welfare and health related problems. Apart from those questions, the survey also included the AUDIT [25] questionnaire which respondents filled out by self-completion. The AUDIT was the only validated questionnaire included in this survey.

As reported in Table 13, 43.3% of the interviewed Veterans reported suffering from one or more health related problems. Most of the sample reported musculoskeletal problems and

¹⁰ The 2014 Household Survey of ex-service community commissioned by The Royal British Legion [28]: The aim of this survey was to provide an estimate of the size of the ex-service community and the main health, financial and welfare needs in that population. Interviews were conducted face-to-face in respondents’ own homes during January/February 2014 (n = 2,121, Veterans and adult dependents).

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41.4% of these believed that the problems were related to their prior military service. 2% reported any alcohol or drug problems whereas on the AUDIT, 11 Veterans scored 16 or more points and were identified as cases (3.8%, 21 observations missing). In comparison to the results from the previously reported meta-analyses, the figure of 3.8% was quite low. A possible explanation could be that the group who were interviewed for the Household Survey had left Service for a longer period of time than those who participated in the different KCMHR studies. This hypothesis could not be tested since for TRBL sample no data was available about precisely when people had left Service. However, support for this hypothesis came from the comparison of the meta-analyses of those who had left Service and those who were still in Service. Here it could be seen that fewer of those who left Service reported alcohol problems. The differences were small though.

Besides which health problems they suffered from, interviewees were asked if they had sought any help for their problems (e.g. GP, counselling, health visitor etc.) and if they thought that the problems were related to Service (see Table 13 for results).

Table 13. Frequencies of reported health problems, help seeking and relation to service

Health problem	N	Report problems	Sought help	Related to service
Any musculoskeletal	307	70 (22.8%)	60 (85.7%)	29 (41.4%)
Any cardio-vascular/respiratory	307	46 (15%)	37 (80.4%)	5 (10.9%)
Any digestive/diabetes/progressive illness	307	38 (12.4%)	30 (78.9%)	4 (10.5%)
Any sensory	307	39 (12.7%)	31 (79.5%)	22 (56.4%)
Any mental illness	307	39 (12.7%)	29 (74.4%)	22 (56.4%)
Any neurological	307	5 (1.6%)	4 (80%)	0
Any alcohol/drug problems	307	6 (2%)	5 (83.3%)	3 (50%)
Multiple conditions	307	67 (21.8%)		
One condition	307	66 (21.5%)		
Any	307	133 (43.3%)		

About half of those who were interviewed reported one or more Welfare Needs (see Table 14). Most problems were reported in the categories: Employment, Psychological and Financial. As

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can be seen in Table 15, people were more likely to report no difficulties rather than multiple difficulties or only one difficulty.

Table 14. Frequencies of welfare needs

Need/difficulty	Frequency
Self-care	33 (10.7%)
Psychological	54 (17.6%)
Mobility	26 (8.5%)
Fear of Violence or Crime	20 (6.5%)
Housing	26 (8.5%)
Financial	52 (16.9%)
Employment	56 (18.2%)
Transport	10 (3.3%)
One difficulty	34 (14%)
Multiple difficulties	114 (37.1%)
Any	148 of 307

A look at the overlap between health and welfare needs showed that 89 (29%) reported both.

[Adult Psychiatric Morbidity Survey \(APMS\) 2007¹¹](#)

For the purpose of this report, data was extracted for those participants who had left Service after 1990. This resulted in a subsample of 106 Veterans (87 men and 19 women).

Since the sample was very small, it was not appropriate to draw firm conclusions based on this data, other than future APMS would be more useful for a future 'Counting the Costs' study if it included more Veterans, and their families.

Table 15 reports some results from the phase 1 interviews split for men and women.

¹¹ The APMS 2007 is a survey of psychiatric morbidity in adults living in private households. It was carried out by the National Centre for Social Research (NatCen) in collaboration with the University of Leicester, and was commissioned by the NHS Information Centre for health and social care. Data from 7403 people was collected [29].

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Table 15. Percentages of disorders/health measures for Veterans

Disorder/Health measure		Men	Women	All
Indication for Neurotic Disorder (CIS-R ¹² total >12)		6 (7%)	7 (37%)	13 (12.3%)
PTSD (>5 on TSQ ¹³ total)	Military related	1 (1%)	0	1 (1%)
	Non-military related	1 (1%)	1 (5%)	2 (2%)
AUDIT	>7	35 (40%)	3 (16%)	38 (36%)
	>15	5 (6%)	0	5 (5%)
BMI ¹⁴	>24	38 (44%)	4 (21%)	42 (40%)
	>29	17 (20%)	5 (26%)	22 (21%)
Drug dependency	All	5 (6%)	0	5 (5%)
	Only Cannabis	3 (3%)	0	3 (3%)

Data from the [Scottish Veterans Health Study](#)

The Scottish Veterans Health Study¹⁵, provides information about hospital admissions, mental health admissions and day-care, cancer registrations and deaths due to different health outcomes in a sample of Scottish Veterans and non-Veterans. For the purpose of this report, a subgroup of Veterans who had left Service during and after 1991 was created. Data on 24,303 Veterans was available, in addition to a comparison group of 31,902 Veterans who had left Service prior to 1991 and a group of 172,741 non-Veterans (the cohort has been described in full by Bergman and colleagues [30]).

Table 16 provides information about the comparison of Veterans who left Service after 1991 and non-Veterans (adjusting for age and deprivation). A hazard ratio less than one indicates that the Veterans were at lower risk of the outcome than the non-Veterans. Only for PTSD were the Veterans at significantly higher risk than the non-Veterans. On all other measures Veterans were either doing better or doing the same as non-Veterans.

¹² Clinical Interview Schedule-Revised: standardised interview to assess psychiatric disorders.

¹³ Trauma Screening Questionnaire: 10-item questionnaire to screen for PTSD symptoms.

¹⁴ Body Mass Index: measure of healthy weight.

¹⁵ The Scottish Veterans Health Study is a retrospective cohort study that comprises all 56,570 military Veterans born between 1945 and 1985 who were registered with the NHS Scotland both prior to military Service and following discharge, as well as a 3:1 comparison group of 172,753 persons with no record of military Service who were matched to the Veterans by age, sex, and residential postcode sector [30].

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Table 16. Veterans' hospital admissions, mental health admissions and day-care, cancer registrations and deaths in comparison with non-Veterans, 1991 and later leavers only referent to all non-Veterans

Health outcome:	Hazard ratio
AMI (Acute Myocardial Infarction)	0.90 [0.80-1.01]
Stroke	0.82 [0.64-1.07]
Any cancer	0.86 [0.79-0.92]*
Lung cancer	0.96 [0.73-1.25]
Diabetes	0.87 [0.78-0.97]*
Peptic ulcer	0.80 [0.7-0.93]*
Any mental health disorder	0.96 [0.88-1.05]
Non-fatal self-harm	0.91 [0.83-1.00]
Mood disorder	0.89 [0.79-0.99]*
Anxiety	1.10 [0.97-1.25]
Stress/PTSD	1.74 [1.47-2.05]*
Psychosis	0.81 [0.65-1.00]
Suicide	0.73 [0.57-0.94]*
Alcoholic liver disease	0.68 [0.56-0.83]*

Note: *p<.05, thus groups differ significantly

Different studies and results from surveys have shown that generally the health of the Scottish population is worse than that of people living in other parts of the UK. A report by the National Statistics Office for example, shows that the life expectancy for people living in Scotland was lower (76.8 between 2011-2013) than for people living in Northern Ireland (78.0), Wales (78.2) and England (79.2) [31]. Another report showed that more Scottish men are overweight than English men or men in Northern Ireland (68.5%, 65.9%, 64.1%, respectively; [32]). Information on drinking habits shows that people in Scotland generally do not drink more frequently than people living in other parts of the UK. However, at times when they drink alcohol (on the heaviest drinking day of the week) they tend to drink larger amounts of alcohol [33].

Yet on self-reported questionnaires about long-standing illnesses or disabilities, a smaller proportion of Scottish citizens report problems than for example people living in Wales, the North East or the South West and about the same proportion as in England [34]. Also, rates of probable common mental health disorders (as measured with the GHQ 12, using a cut-off score

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of 4), have been shown to be similar in England and Scotland (12% for Scottish men) and lower than in Northern Ireland (16% for men; [32]).

Irrespective of whether health outcomes differ per region, it is unlikely that there are any systematic regional differences in health outcomes between Veterans and non-Veterans, although no data is available other than for Scotland. This might therefore mean that Veterans (those who served from 1991 onwards) are not at a greater risk of ill-health than non-Veterans, with the exception of a greater risk of developing PTSD.

Geographical mapping of potential beneficiaries

From the “Annual Location of UK Armed Forces Pension and Compensation Recipients” [35] statistics data was extracted for DPs and AFCS recipients who were no longer in Service. As can be seen in Table 16, distributions do not fluctuate strongly over the years.

Table 17. Distribution of DPs and AFCS recipients by area

	DPs			AFCS, post service		
	2011	2012	2014	2011	2012	2014
England	73.55%	73.54%	74.44%	76.25%	77.40%	78.52%
Wales	5.69%	5.69%	5.62%	4.29%	4.15%	4.31%
Scotland	9.95%	9.87%	9.65%	6.58%	6.63%	6.57%
Northern Ireland	2.63%	2.75%	2.98%	1.57%	1.12%	1.34%

Source: MOD Annual Location of UK Armed Forces Pension and Compensation Recipients¹⁶

Figure 2 presents more detailed information about the distribution of Veterans according to different sources. The data from Def Stats and GP registrations match quite well. It is also remarkable that in contrast to the distribution of the general England population, relatively fewer Veterans live in the area of Greater London and more live in the South West.

¹⁶ Percentages do not add up to 100 because unknown/missing information is not displayed.

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	England population %	Royal British Legion Household 2014 Adult ex- Service community %	Armed Forces Compensation (AFCS and WP) %	GP Registration %
Greater London	16%	4%	4%	4%
South East	17%	15%	19%	19%
South West	10%	15%	19%	19%
East of England	11%	12%	9%	8%
East Midlands	8%	10%	9%	12%
West Midlands	11%	11%	8%	9%
Yorkshire & Humber	10%	14%	10%	10%
North East	5%	7%	8%	7%
North West	13%	12%	14%	12%

Figure 2. Comparative Figure for Veteran Distribution¹⁷. Source: NHS England [36]

¹⁷ Figures only limited comparable since methods on how each figure was calculated vary.

3. Summary results

This chapter starts with the summary results for regular Service Personnel and Reservists combined, followed by the separated summary results for the two groups.

3.1. Regular Service Personnel and Reservists, combined

Basic numbers: regular Service Personnel

It was estimated that the number of regular Service Personnel between 1991 and 2014 was 757,805. In 2014, there were 156,630 Service Personnel. Therefore the regular veteran population (1991 to 2014) would be 601,175.

Basic numbers: volunteer Reserve Forces

It was estimated that between 1991 and 2014 there were 253,406 Reservists. In 2014 there were 27,270 serving Reservists. Therefore the number of veteran Reservists (1991 to 2014) would be 226,136.

Deployments

If the numbers for all major deployments (Operation Granby, Bosnia, Afghanistan and Iraq) between 1991 and 2014 were added up, one would arrive at a total of 313,719 deployed Service Personnel (Regulars and Reservists; see Table 17)¹⁸. Taking into account multiple deployments of regular Service Personnel, it can be estimated that 235,187 regular Service Personnel undertook 285,570 deployments.

Table 18. Number of deployed Personnel per field of deployment

Deployment	Number of deployed Personnel
Afghanistan/Iraq	220,550
Gulf War 1	53,462
Bosnia	39,707
Total	313,719

¹² Not taking into account that an individual might have deployed to different countries and might therefore be counted multiple times.

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Physical health problems

Medically discharged Personnel

It was estimated that 34,316 (36,506-2,190) of all medical discharges from the UK AF between 1991 and 2014 were likely to be related to military Service. For 4,745 the primary medical code for medical discharge was assumed to be mental and behavioural problems. For 219 people (e.g. $0.6 \times 36,506$) the medical discharge was probably due to an illness/injury attributable to Service. 21,903 ($36,506 \times 0.6$) of those who have been medically discharged between 1991 and 2014 have probably been discharged due to musculoskeletal disorders and injuries.

As explained before, the goal of this report was to present a conservative estimate for the hardfloor figure. Therefore no medical discharge statistics were included in the hardfloor estimate. That was because those who quite certainly were in need of help were also covered in the statistics from the AFCS and probably also from the War Pension Scheme.

Hardfloor figure: 0

Possible figure: 29,571 (= 34,316 – 4,745)

Probable figure: 9,758 (= $0 + (0.33 \times (29,571 - 0))$)

Amputations

Between 7 October 2001 and 30 September 2014, approximately 370 Service Personnel had a partial or complete limb amputation which was a result of injuries sustained in Iraq, Afghanistan or elsewhere. 186 of the 370 had been medically discharged by 31 March 2014 and for 152 of the 186 the reason given was musculoskeletal disorders and injuries.

War Pensions and Armed Forces Compensation Scheme

War Pensions

Based on the age distribution in the UK AF the lower boundary was set at 39 years for Disablement Pensioners (DPs) that were included in our hardfloor figure, which resulted in 4,700 DPs. The upper boundary was set at 74 years which resulted in 71,155 DPs.

Hardfloor figure: 4,700 DPs

Possible figure: 71,155

Probable figure: 26,630 ($4,700 + 0.33 \times (71,155 - 4,700)$)

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AFCS (probable physical illnesses/injuries)

There were 1,495 individuals who received a GIP in 2014. Therefore the hardfloor figure was: 1,495. For the possible figure all people were taken into account who were awarded a lump sum at any tariff level, excluding those who might receive a lump sum due to mental health problems: $23,710 - 948 = 22,762$.

Hardfloor figure: 1,495 GIPs

Possible figure: 22,762

Probable figure: $8,513 (= 1,495 + (0.33*(22,762 - 1,495)))$

Claims awarded for medical discharges

It can be assumed that there was an overlap of 933 ($22,764*0.041$) people between the AFCS and medical discharge statistics.

Physical health recap

Hardfloor estimate: $4,700 \text{ DPs} + 1,495 \text{ GIP} = 6,195$

Possible estimate: $29,571 + 71,155 + 22,762 - 933 = 122,555$

Probable estimate: $6,195 + (0.33* 122,555 - 6,195) = 44,593$

For the physical health figure, a combined figure can be estimated for regular Service Personnel and Reservists since the estimates were based on the same statistics. The combined hardfloor figure for regular Service Personnel and Reservists, and therefore those who were likely to need help with physical health problems was 6,195. These were all Veterans.

Mental health

Medical discharge and AFCS

It was assumed that 13% of 36,506, thus 4,745 of those who have been medically discharged suffered primarily from mental and behavioural disorders. Under the AFCS, probably 4% of all claimants (23,710) or 948 had been awarded a lump sum due to mental and behavioural disorders.

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Scientific studies

Percentages of how many UK AF Service Personnel might suffer from mental health problems were estimated by means of different meta-analyses. By applying these percentages to different populations, estimates were made about how many people in these populations might suffer from mental health problems.

Regular Service Personnel

Between 1991 and 2014 there have been 156,630 regular Service Personnel. Based on the performed meta-analyses one can assume that 10.2% of regular Service Personnel suffered from any mental health problems, which would mean: $0.102 * 156,630 = 15,976$.

Regular Veterans

Between 1991 and 2014 there have been 601,175 regular Veterans. Based on the performed meta-analyses it can be assumed that 10.2% of regular Veterans suffered from any mental health problems, which would mean: $0.102 * 601,175 = 61,319$.

Serving Reservists

In 2014 there were 27,270 serving Reservists. Based on the performed meta-analyses it can be assumed that 10.9% of the serving reservist population suffered from any mental health problems. This would mean: $0.109 * 27,270 = 2,972$ serving Reservists.

Veteran Reservists

Between 1991 and 2014 there have been 226,136 veteran Reservists. Based on the performed meta-analyses it can be assumed that 5.7% of the veteran reservist population suffered from any mental health problems, this would mean: $0.057 * 226,136 = 12,889$ veteran Reservists.

Mental health recap

To derive the most reliable estimate for our hardfloor figure, only the estimate for regular Veterans (61,319) was included. Reservists were excluded since the estimates of how many Reservists might have mental health problems were not reliable. As the goal was to combine the hardfloor estimate for mental health problems and physical health problems, it was appropriate to include the estimates for the same population (regular Veterans).

For the probable estimate, the number for all regular Service Personnel who might suffer from mental health problems was included: 77,296 ($0.102 * 757,805$). Again, Reservists were excluded

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but since our estimate for physical health problems might include both regular Service Personnel in Service and Veterans, all regular Service Personnel were included.

Overlap

For the hardfloor figure it was estimated that 23% of Veterans who suffered from physical health problems also suffered from mental health problems: $0.23 * 6,195 = 1,424$.

For the possible figure it was estimated that the overlap of mental and physical health problems was 16%. For regular Service Personnel (in Service and Veterans) this would mean: $0.16 * (104,911 + 77,296) = 29,153$.

Final figure: Physical and/or mental health problems

6,195 was established as the hardfloor figure for physical health problems. This number was based on the War Pension and AFCS statistics and included Veterans (Regulars and Reservists), who receive a Disablement Pension or a Guaranteed Income Payment.

61,319 was established as hardfloor figure for mental health problems (regular veterans only).

1,424 was the estimate of the possible overlap between the hardfloor figures for mental and physical health problems.

The total hardfloor figure was therefore: $6,195 + 61,319 - 1,424 = 66,090$.

The possible estimate of those who might have physical and/or mental health problems was based on the possible figure for physical health problems that was established for all regular Service Personnel, 104,911, and the possible figure for mental health problems that was established for all regular Service Personnel, 77,296.

The possible overlap between the probable figures for mental and physical health problems was estimated to be: 29,153.

The possible estimate is therefore: $104,911 + 77,296 - 29,153 = 153,054$.

The probable estimate was the sum of our hardfloor estimate and 33% of the difference of the possible estimate and the hardfloor estimate: $66,090 + 0.33 * (153,054 - 66,090) = 94,788$.

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3.2. Results for regular Service Personnel and Reservists, separately

Whilst the overall results were presented in the previous section, this part of the report deals with the results for regular Service Personnel and Reservists independently of each other, excluding the calculation of the combined mental and physical health hardfloor figure which includes both Regulars and Reserves.

Summary results: regular Service Personnel

Basic numbers for regular Service Personnel

As was previously stated, the number of regular Service Personnel was 298,060 in 1991. If this was added to the inflow for each year starting from 1991 until 2014, one could estimate that the total number of regular Service Personnel between 1991 and 2014 was 757,805 (see Table 1). The difference of 757,805 and 156,630 was 601,175, which would be referred to as the regular veteran population.

Deployments of Regulars

If the numbers of regular Service Personnel who have been on deployments on Operation Granby, Bosnia, Afghanistan and Iraq between 1991 and 2014 were summed up, this would result in a total of 285,570 deployed regular Service Personnel (see Table 18).

Table 19. Number of deployed Personnel per field of deployment

Deployment	Number of deployed Personnel
Afghanistan/Iraq	198,264
Gulf War 1	53,462
Bosnia	33,844
Total	285,570

Taking into account possible multiple deployments, this would mean that 235,187 individual regular Service Personnel had been on 285,570 deployments.

Physical problems: regular Service Personnel

Medically discharged Personnel

A previously stated, it was estimated that 29,571 (36,506 - 4,745 - 2,190) of all medical discharges with primary physical medical codes between 1991 and 2014 were likely to be

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related to military Service. For 0.6% or an estimated 219 people ($0.006 * 36,506$) the medical discharge was probably due to an illness/injury attributable to service.

It was estimated that 21,903 ($0.6 * 36,506$) of those who were medically discharged between 1991 and 2014 were discharged due to musculoskeletal disorders and injuries.

As previously stated, since the goal of this report was to arrive at a conservative estimate for a hardfloor figure, no medical discharge statistics were included in the hardfloor estimate. This is because those who quite certainly need help were also covered in the statistics from the AFCS and probably also from the War Pension Scheme.

Hardfloor figure: 0

Possible figure: 29,571 ($= 34,316 - 4,745$)

Probable figure: 9,758 ($= 0 + (0.33 * (29,571 - 0))$)

War Pensions and Armed Forces Compensation Scheme

War Pensions

Based on the age distribution a lower boundary was set at 39 years for DPs who were included in the hardfloor figure. This resulted in 4,700 DPs. It could be assumed that 80% were regular Veterans, therefore the hardfloor figure was: $4,700 * 0.80 = 3,760$. 74 years was set as an upper boundary which resulted in 71,155 DPs. It was assumed that 80% were regular Veterans (and 20% veteran Reservists). Therefore the possible figure was: $71,155 * 0.80 = 56,924$.

Hardfloor figure: 3,760 DPs

Possible figure: 56,924

Probable figure: 21,304 ($3,760 + 0.33 * (56,924 - 3,760)$)

AFCS (probable physical illnesses/injuries)

There were 1,495 individuals who received a GIP in 2014. It was assumed that 85% of these were regular Veterans (and 15% veteran Reservists). Therefore the hardfloor figure was: $1,495 * 0.85 = 1,270$. For the possible figure all people were taken into account who were awarded a lump sum at any tariff level, excluding the estimate for Reservists and those who might receive a lump sum due to mental health problems: $0.85 * (23,710 - 948) = 19,347$.

Hardfloor figure: 1,270

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Possible figure: 19,347

Probable figure: $7,235 (1,270 + (0.33*(19,348 - 1,270)))$

Claims awarded for medical discharges

It can be assumed that there was an overlap of 933 ($22,764*0.041$) people between the AFCS and medical discharge statistics.

Physical health recap

For the hardfloor figure the statistics from the War Pension Scheme and the AFCS were taken into account. For the possible and probable figures the statistics from the medical discharge statistics were also taken into account and therefore also the probable overlap between the AFCS and the medical discharge statistics.

Hardfloor estimate: $3,760 \text{ DPs} + 1,270 \text{ GIP} = 5,030$

Possible estimate: $56,924 + 19,347 + 29,571 - 933 = 104,909$

Probable estimate: $5,030 + (0.33* (104,909 - 5,030)) = 37,990$

Mental health

Medical discharge and AFCS

13% of 36,506, thus 4,745 of those who have been medically discharged probably suffered primarily from mental and behavioural disorders. Under the AFCS, 4% of all claimants (23,710) or 948 have probably been awarded a lump sum due to mental and behavioural disorders. It could be assumed that 85% of these were regular Veterans (and 15% veteran Reservists) which would mean that 805 were regular Veterans.

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Scientific studies

As previously explained, percentages of how many regular Service Personnel might suffer from mental health problems were estimated by means of different meta-analyses. By applying these percentages to different populations, estimates of how many people in these populations might suffer from mental health problems could be established. Additionally it was possible to compare the outcomes for different populations. Here, only the results from the meta-analyses for regular Service Personnel and regular Veterans are presented.

Regular Service Personnel

A significant difference between deployed and non-deployed regular Service Personnel with respect to “any mental health problems” was found. Table 20 presents the results.

Table 20. Percentages of cases on the GHQ, PCL/M-PTSD and the AUDIT for regular Serving Personnel

	GHQ 4	GHQ 9	PCL	AUDIT 16	AUDIT 20	Any
Deployed	20.1 [14.5; 25.8] ^{a, b, c, d, e}	4.0 [2.9; 5.2] ^{a, b, c, d, e}	3.6 [2.2; 5.0] ^{a, b, c, d, e}	13.9 [9.9; 17.7] ^{b, c, d, e}	5.9 [3.6; 8.2] ^{b, c, d, e}	10.2 [8.1; 12.0] ^{b, c, d, e}
Non-deployed	20.9 [19.6; 22.2] ^{a, b, c, d, e}	10.5 [5.0; 15.9] ^{a, b, c, d, e}	3.0 [2.3; 3.7] ^{a, b, c, d, e}	11.4 [7.6; 15.3] ^{b, c, d, e}	7.4 [4.0; 10;8] ^{b, c, d, e}	16.6 [12.7; 20.6] ^{b, c, d, e}

Note: Upper case letters are the studies included in the meta-analyses.

GHQ 4: lenient cut-off score of 4 used; GHQ 9: strict cut-off score of 9 used; AUDIT 16: lenient cut-off score of 16 used; AUDIT 20: strict cut off score of 20 used; Any: any mental health problems.

Assuming that 10.2% of the regular Service Personnel suffered from any mental health problems, this would mean: $0.102 * 156,630 = 15,976$.

Regular Veterans

As pointed out earlier, with the more lenient, routine, cut-off scores, there were no significant differences between deployed and non-deployed regular Veterans. With the stricter cut-off scores, deployed Veterans showed less common mental health problems than non-deployed Veterans (Table 21).

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Table 21. Percentages of cases on the GHQ, PCL/M-PTSD and the AUDIT for regular Veterans

	GHQ 4	GHQ 9	PCL	AUDIT 16	AUDIT 20	Any
Deployed	31.8 [19.9; 43.8] ^{a, b, c, d, e}	4.4 [2.9; 5.0] ^{a, b, c, d, e}	8.9 [3.3; 14.5] ^{a, b, c, d, e}	13.2 [7.6; 18.7] ^{b, c, d, e}	5.0 [2.7; 7.3] ^{b, c, d, e}	10.2 [7.1; 13.3] ^{b, c, d, e}
Non-deployed	23.2 [18.6; 27.9] ^{a, b, c, d, e}	7.9 [6.7; 9.0] ^{a, c, d, e}	5.6 [4.6; 6.7] ^{a, c, d, e}	10.1 [5.2; 15.0] ^{b, c, d, e}	5.6 [2.2; 9.0] ^{b, c, d, e}	14.0 [9.1; 19.0] ^{b, c, d, e}

Note: Upper case letters are the studies included in the meta-analyses.

GHQ 4: lenient cut-off score of 4 used; GHQ 9: strict cut-off score of 9 used; AUDIT 16: lenient cut-off score of 16 used; AUDIT 20: strict cut off score of 20 used; Any: any mental health problems.

Assuming that 10.2% of the regular veteran population suffered from any mental health problems, this would mean: $0.102 * 601,175 = 61,319$.

Mental health recap

As previously stated, it was estimated that 61,319 of regular Veterans suffered from mental health problems. 77,296 ($0.102 * 757,805$) was an estimate of all regular Service Personnel who might suffer from mental health problems.

Summary results: Reservists

Basic numbers: Reservists

As previously described, in 1991 there were 91,463 serving Reservists. The mean inflow for Reservists between 1991 and 2014 could be estimated to be 7,041. Therefore the estimate for the total number of Reservists who have served between 1991 and 2014 was: $91,463 + 23 * 7,041 = 253,406$.

The number of veteran Reservists (1991 to 2014) could be estimated by subtracting the number of those still serving in 2014 from the total number of Reservists (1991 to 2014): $253,406 - 27,270 = 226,136$.

Deployments of Reservists

Between 1995 and 2005, 18,339 Reservists might have been deployed to the Balkans, Afghanistan and on Operation Telic. Between April 2007 and November 2014, 9,810 Reservists were deployed to Iraq, Afghanistan and/or Bosnia. Therefore, with the exclusion of numbers for

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1991 to 1995 and the year 2006, one could estimate that 28,149 (18,339 + 9,810) Reservists went on deployments¹⁹ to Iraq, Afghanistan and/or the Balkans.

Physical Health problems

War Pensions

Based on the age distribution for DPs that were included in the hardfloor figure, the lower boundary was set at 39 years. This resulted in 4,700 DPs. It could be assumed that 20% were veteran Reservists (and 80% regular Veterans); therefore the hardfloor figure was: $4,700 * 0.20 = 940$. 74 years was set as an upper boundary which resulted in 71,155 DPs. It could be assumed that 20% were veteran Reservists (and 80% regular Veterans). Therefore, the possible figure was: $71,155 * 0.20 = 14,231$.

Hardfloor figure: 940 DPs

Possible figure: 14,231

Probable figure: $940 + 0.33 * (14,231 - 940)$

AFCS (probable physical illnesses/injuries)

There were 1,495 individuals who received a GIP in 2014. It was assumed that 15% of these were veteran Reservists. Therefore the hardfloor figure was: $1,495 * 0.15 = 224$. For the possible figure, all people were taken into account who were awarded a lump sum at any tariff level, excluding the estimate for regular Service Personnel and those who might have received a lump sum due to mental health problems: $0.15 * (23,710 - 948) = 3,414$.

Hardfloor figure: 224

Possible figure: 3,414

Probable figure: $224 + (0.33 * (3,414 - 224)) = 1,276$

Physical health recap

The total estimate of Reservists who might suffer from physical health problems was the sum of the estimates that were based on the War Pension Scheme and the AFCS.

¹⁹ Not taking into account that an individual might have deployed to different countries and might therefore be counted multiple times.

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Hardfloor estimate: 940 DPs + 224 GIP = 1,164

Possible estimate: 14,231 + 3,413 = 17,644

Probable estimate: 1,165 + (0.33* (17646 - 1,165)) = 6,603

Mental health

AFCS

Under the AFCS, 4% of all claimants (23,710), or 948, might have been awarded a lump sum due to mental and behavioural disorders. If it was assumed that 0.15 of these were Reservists, this would mean that 142 of the claimants were Reservists.

Scientific studies

Percentages of Reservists who might suffer from mental health problems were estimated by means of different meta-analyses. By applying these percentages to different populations, estimates could be made about how many in these populations might suffer from mental health problems.

Serving Reservists

In 2014 there were 27,270 serving Reservists. Based on the performed meta-analyses one could assume that 10.9% of the serving reservist population suffered from any mental health problems (see Table 21). This would mean: 0.109*27,270 = 2,972 serving Reservists.

Table 22. Percentages of cases on the GHQ, PCL/M-PTSD and the AUDIT for serving Reservists

	GHQ 4	GHQ 9	PCL	AUDIT 16	AUDIT 20	Any
Deployed	25.0 [17.9; 32.0] ^{a, d, e}	7.7 [4.0; 11.0] ^{a, d, e}	4.2 [2.3; 6.1] ^{a, d, e}	9.0 [7.1; 10.7] ^{d, e}	3.5 [1.9; 5.0] ^{d, e}	10.9 [8.9; 12.0] ^{d, e}
Non-deployed	15.2 [11.8; 18.5] ^{a, c, d, e}	14.0 [5.8; 22.0] ^{a, d, e}	1.7 [0.06; 2.7] ^{d, e}	8.1 [1.2; 15.0] ^{b, d, e}	5.8 [3.4; 8.2] ^{b, d, e}	16.5 [9.3; 23.7] ^{c, d, e}

Note: Upper case letters are the studies included in the meta-analyses.

GHQ 4: lenient cut-off score of 4 used; GHQ 9: strict cut-off score of 9 used; AUDIT 16: lenient cut-off score of 16 used; AUDIT 20: strict cut off score of 20 used; Any: any mental health problems.

Veteran Reservists

Between 1991 and 2014 there were 226,136 veteran Reservists. Based on the performed meta-analyses it could be assumed that 5.7% of the veteran reservist population suffered from any mental health problems; this would mean: 0.057*226,136 = 12,889 veteran Reservists (see Table 22 for the percentages).

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Table 23. Percentages of cases on the GHQ, PCL/M-PTSD and the AUDIT for veteran Reservists

	GHQ	GHQ 9	PCL	AUDIT-16	AUDIT-20	Any
Deployed	42.5 [21.8; 63.3] ^{a, c, d, e}	3.0 [1.6; 4.0] ^{a, c, d, e}	9.7 [2.3; 17.1] ^{a, c, d, e}	11.9 [8.6; 15.3] ^{c, d, e}	2.6 [1.4; 3.9] ^{c, d, e}	5.7 [2.4; 8.9] ^{b, d, e}
Non-deployed	20.8 [15.8; 25.8] ^{a, b, c, d, e}	4.7 [2.0; 7.0] ^{a, c, d, e}	6.0 [0; 13.0] ^{a, c, d, e}	11.5 [0.8; 22.3] ^{b, c, d, e}	8.7 [0; 19.3] ^{b, c, d, e}	18.8 [1.3; 36.4] ^{c, d, e}

Note: Upper case letters are the studies included in the meta-analyses.

GHQ 4: lenient cut-off score of 4 used; GHQ 9: strict cut-off score of 9 used; AUDIT 16: lenient cut-off score of 16 used; AUDIT 20: strict cut off score of 20 used; Any: any mental health problems.

Mental health recap

Estimates of how many veteran Reservists might suffer from mental health problems were based on estimates of how many Reservists have been serving in the AF UK between 1991 and 2014. Since these estimates were not reliable, our estimates of how many suffered from mental health problems were not reliable either. In 2014 there were 27,270 serving Reservists. Based on this and on the results of our meta-analysis it could, however, be estimated that 2,972 had mental health problems.

4. Dependents

4.1. Dependents of Regulars

Besides Service Personnel, dependents of Service Personnel were also of interest to this report. Therefore, estimates were calculated of how many of those who were in Service between 1991 and 2014 had been married and had children. Reports on the Armed Forces Continuous Attitude Survey (AFCAS²⁰, [37]) of the years 2007 to 2014 provided percentages of regular Service Personnel that have been married/in a civil partnership each year. The average percentages over these years could be estimated and extrapolated to the total number of those in Service between 1991 and 2014 in order to arrive at an estimate of numbers of spouses/partners. An FOI request (2015 05385) provided percentages of military Personnel who had one or more children under the age of 18 for the years 2009 to 2014. If the average percentage over these years was calculated and extrapolated to the total number of those who have served between 1991 and 2014, an estimate of regular Service Personnel who have at least one child under the age of 18 could be estimated (see Table 23). This was probably an underestimate of the total number of children. Firstly, this is because those who have children might have more than one child, and secondly, this is because this number only included children under the age of 18.

Table 24. Marital status and percentages of regular Service Personnel who have one or more children

	Married/Civil partnership	Children under the age of 18
2007	53% (AFCAS)	
2008	52% (AFCAS)	
2009	51% (AFCAS)	25.6% (FOI 2015 05385)
2010	50% (AFCAS)	26.2% (FOI 2015 05385)
2011	49% (AFCAS)	28.0% (FOI 2015 05385)
2012	49% (AFCAS)	29.4% (FOI 2015 05385)
2013	52% (AFCAS)	30.3% (FOI 2015 05385)
2014	51% (AFCAS)	31.3% (FOI 2015 05385)
Average	51%	28.5%

²⁰ "The aim of the Armed Forces Continuous Attitude Survey is to assess and monitor the attitudes of Service Personnel across the Royal Navy (RN), Royal Marines (RM), Army and RAF in key Personnel management areas." [37], p.i). It was introduced in 2007 and since then, yearly surveys have been conducted. On average 11,595 Service Personnel have contributed data to AFCAS.

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If these percentages were transferred to those in Service between 1991 and 2014, estimates for dependents of Service Personnel could be calculated:

On average, 51% of all regular Service Personnel had been married/in a civil partnership and 28.5% had at least one child under the age of 18 years between 1991 and 2014. This would mean that there were 386,480 ($757,805 \times 0.51$) partners and at least 215,974 children ($757,805 \times 0.285$) under the age of 18.

4.2. Dependents of Reservists

For estimates of dependents of Reservists, this report used data from the KCMHR cohort study Phase 2 [1]. In this study 56% of Reservists reported to be married/ in a civil partnership and 46% reported that they had at least one child they financially supported. These percentages were transferred to the number of Reservists between 1991 and 2014, to estimate the number of partners and children of Reservists.

56% of Reservists might be married and 46% might have at least one child they financially support. Since it was estimated that between 1991 and 2014 there were 253,406 Reservists, it could be assumed that there were about 141,907 ($253,406 \times 0.56$) partners and at least 116,566 ($253,406 \times 0.46$) children.

4.3. Mental health problems

To find out the effect of Service Personnel's/Veteran's poor mental health as a result of military Service (in particular PTSD) and/or their traumatic experiences on significant others, the scientific literature was systematically reviewed. Different literature databases (Pubmed, Psycinfo, Embase, pilots, Cochrane database) were searched for terms related to family, PTSD and military. Studies were included in which PTSD was measured in Veterans and/or dependents. If PTSD was only measured in the Veteran and not in the dependent, then another mental disorder needed to be measured in the dependent. This second group of studies was included since patients who suffer from PTSD also frequently suffer from co-morbid disorders like anxiety and mood disorders.

Fourteen studies were found which included spouses of Service Personnel of which the large majority had been deployed to Afghanistan or/and Iraq. In the studies that investigated

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secondary traumatic stress in spouses, the results varied strongly. Melvin and colleagues [38], for example, found that of 47 civilian wives of OIF/OEF²¹ deployed service members, only one was identified as showing elevated PTSD symptoms (>30 on the PCL) in absence of any own traumatic experience. Bjoernstad and colleagues [39] also found in a sample of 227 couples, a relatively low prevalence of 2.6% with elevated PCL scores, whereas Herzog and colleagues [40] found in a sample of 54 couples that 14.8% of partners reported secondary traumatic stress. Both studies had been conducted in National Guard soldiers. Three other studies also investigated PTSD in spouses, however symptoms were (probably) not related to the partner's military Service. In these studies, caseness varied between 2.4% and 17% ([41-43]. In an effectiveness trial conducted in 190 deployed service members with elevated PTSD symptoms and their spouses, Renshaw and colleagues [44] found that only 15.5% of the spouses attributed their own symptoms solely to their partner's military experience. Based on the previous studies, a hardfloor figure for secondary PTSD in partners would be as low as 1 in 47 (2.1%) as found by Melvin and colleagues [38] and a possible figure could be as high as 14.8% as reported by Herzog and colleagues [40]; thus of the 386,480 partners the figures for secondary PTSD could be as low as 8,116 or as high as 57,199.

Bjoernstad and colleagues [39] also investigated the relationship between service members' and spouses' PTSD. They found a significant though small correlation of .21. Other researchers found even smaller correlations, like Erbes and colleagues [41] who found a non-significant correlation between spouses' PTSD symptoms and service members PTSD symptoms in a sample of 216 mobilized National Guard soldiers. A comparable small correlation ($r = .16$) was found by Blow and colleagues [45] although this correlation was significant in a sample of 661 National Guard Service members who had returned from deployment and their spouses.

In two studies that investigated the relationship between service members' PTSD symptoms and spousal depression, the correlations were larger than those found in the previous studies for PTSD. Goreman and colleagues [42] and Renshaw and colleagues [46] found in samples of National Guard members and their spouses similar percentages for spousal depression of 22.0%

²¹ Operation Iraqi Freedom/Operation Enduring Freedom

and 22.6%. However in both studies low and therefore sensitive cut-off scores were used which probably resulted in an overestimation of those who suffer from clinical depression.

In a meta-analytic review, Card and colleagues [10] did not find an association between deployment and internalising or externalising symptoms of children. However, emerging information from a KCL study lead by Professor Nicola Fear, which should be in the public domain later this year, is likely to show that there appears to be an impact on some children as a result of parental ill-health caused as a result of deployment.

5. General discussion

This study aimed to identify how many Veterans, and close family members, might suffer physical or psychological health problems as a result of military Service. It focused on Personnel who had served in the UK AF between 1991 and 2014. The study made use of a variety of sources of data including official statistics and research data; however there were a number of gaps in the available data which limited our ability to provide a single accurate answer to the question.

However, using official statistics, high quality research data and conservative estimation methods, this study found a hardfloor figure of at least 66,090 individuals who had served in the UK AF during that time period who were likely to have a significant mental and or physical health need at some point. This figure is largely based on the regular veteran population and the large majority of these individuals are likely to suffer from mental health problems. Using valid but not conservative estimation methods, it was estimated that the possible number of individuals, mainly within regular Veterans, who might have health related needs could be up to 153,054. This figure would include much more people with physical health needs than our hardfloor figure. As it is highly likely that the hardfloor figure is an underestimate of the true number of entitled people who could benefit from future assistance, for planning purposes, it was suggested that health services for around 94,788 individuals will be required. Neither of those figures includes estimates of mental health problems of Reservists and reports on physical health problems are also likely to be an underrepresentation of problems in Reservists since these might not be registered in records from MoD but be included in records from the NHS.

In terms of the impact of deployment on mental health problems, it was found that deployed regular Personnel reported significantly less mental health problems than non-deployed regular Personnel when incorporating strict criteria for defining cases. This finding might be the result of the 'healthy warrior' effect. The healthy warrior effect describes a selection bias that occurs due to the fact that healthy military Personnel are deployed to war zones while Personnel who are chronically ill are less likely to be deployed [47].

Another explanation could be that in the deployed group, Service Personnel were less likely to report mental health problems, either because they did not think that these health problems were severe or would impede their daily functioning; or because they underreported symptoms due to fear that they would not be deployed again if they answered truthfully. In the non-deployed group, on the other hand, Service Personnel might have over-reported symptoms with the aim of not having to go on deployment. These explanations are however highly speculative. What is clear is that overall there was no clearly definable excess of treatment needs in Personnel who had deployed.

The analysis of the well-constructed KCMHR datasets revealed a strong indication that regular Veterans reported more PTSD symptoms than regular Service Personnel, both in deployed and non-deployed Personnel. It could be that PTSD only develops after Personnel leave Service, maybe because the challenges of their transition to civil life conflict with their routine service life. Leaving the UK AF is likely to be in itself a stressful, life-changing event and the previously readily available support from comrades is lost or at least harder to readily access. The challenges of transition have been the focus of many other studies including a recent report by Lord Ashcroft [48] and a comprehensive report compiled by the Forces in Mind Trust [49]. On the other hand it may be that whilst in Service, individuals might underreport PTSD symptoms due to fears about the potential impact on their career, a mistrust of military health care systems being confidential and stigma, all of which have been discussed at length in the scientific literature [50]. Some of these concerns, at least, may not be applicable after Personnel have left Service.

For Reservists there were no significant differences between deployed and non-deployed or between serving and veteran Reservists. However, while there seemed to be a tendency towards fewer cases of probable alcohol abuse and probable common mental health problems in deployed Personnel than in non-deployed Personnel when the stricter cut-off scores for the GHQ and the AUDIT were used, there seemed to be more cases of probable common mental health problems and probable alcohol abuse in deployed Reservists when the more lenient cut-off scores were used. This finding again might be the result of the healthy warrior effect and

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may reflect that less serious concerns, possibly requiring no professional intervention, are more common in deployed Reservists.

For PTSD there was no indication of a healthy warrior effect. Overall there seemed to be more cases of probable PTSD in deployed Personnel than in non-deployed Personnel. This may be due to the fact that PTSD is the one disorder which requires someone to have experienced an adverse event and which therefore might be more likely to occur in people who have been exposed to war zones than those who have not. However, it is relevant that overall the prevalence of PTSD in the reservist population seems to be relatively small which makes it hard to detect differences. It is also important to consider that for probable PTSD we did not apply a stricter cut-off score than the one routinely used in the research carried out by KCMHR. This is because research has shown that Service Personnel tend to underreport PTSD symptoms in studies in which they are asked to provide personally identifiable information (as is the case with KCMHR studies) compared to studies which are carried out on a wholly anonymous basis [51]. Furthermore, the routine cut-off used within the KCMHR studies included in this report is generally regarded as a specific rather than sensitive score.

Reservists are underrepresented in the previous figures. Since the estimates for denominators of volunteer Reserves relied heavily on assumptions, the estimates of mental health problems were unreliable. There was also only limited information about physical health problems of Reservists. However, the results from the executed meta-analyses suggest that up to 12,889 veteran Reservists might possibly require mental health services. Future changes to the way the composition of the UK AF is likely to include a larger proportion of Reservists compared to regular Service Personnel than was the case previously. Specifically, the MoD has made plans to reduce the strength of regular military Personnel and to increase the strength of trained volunteer Reserves. Reservists differ from regular Service Personnel in terms of demographic variables (they are on average older and have higher educational attainment), social variables (their social network is bound to their civil life with work colleagues and family who might not be aware of what Personnel face on deployment) and roles on deployment (they are more frequently specialists like medical Personnel and less frequently deployed in a combat role).

These differences may contribute to possible differences in health outcomes between Regulars and Reservists and should be considered when planning future health provision.

Lastly, a review of the relevant literature showed that it is not currently possible to estimate a number of spouses, long-term partners or children who would benefit from health or welfare interventions as a direct result of their loved ones having served in the UK AF. However, using a conservative estimation method, there are likely to be at least 386,480 spouses or partners and 215,974 children of regular Service Personnel who could have future needs. Furthermore, the available literature on this group of people suggests that they do indeed have health and welfare needs related to the impact of military Service. Results of how many partners might have mental health problems varied strongly between studies, which is why a hardfloor figure is currently not valid but a possible figure could be as high as 54,535 (for partners of regular Service Personnel). This again shows how uncertain the figures for significant others are. As is often the case, research in children lags behind research in adults and at this stage there is even more uncertainty about what the consequences of military Service and deployment are on children than on partners. Therefore this report does not provide any estimates on the health needs of children. It is likely that further insights on this subject will come from KCMHR research that has recently been completed on this subject.

6. Strengths and limitations

There are a number of methodological limitations that have been used to calculate the results, the most important of which are highlighted below. Many of the presented estimates are based on what we believe to be sound assumptions which nonetheless may not always be correct. For example, because detailed medical discharge statistics were not available for every year, we assumed that the reasons for medical discharges (e.g. ICD medical codes) presented in the more recent reports would not vary in a significant way over time, so we extrapolated the data we did have across the complete timespan of the present study. Additionally, the estimate for mental and physical health problems was also based on a strong assumption, namely that the overlap that was calculated on the basis of the OpEDAR data would be similar for all the overlaps of all the presented estimates. However, we cannot be sure that that these

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assumptions are wholly valid but since no other statistics were available on which these estimates could be based, we used these assumptions and described them transparently.

With respect to the estimates for mental health problems it should be noted that these were based on self-report questionnaires, rather than on diagnostic status that had been confirmed by a clinician. This might have led to the overestimation of actual mental health problems. However, by incorporating stricter cut-off points this risk has been reduced.

The strengths of this report lie in its approach to search and combine different data sources and to use different methodologies. The starting point was to get as much information as possible from official sources. Data was collected from official reports that are available from Def Stats and emerging gaps were attempted to be filled by making FOI requests and by talking to experts in the fields of interest. We identified a number of gaps and unknowns which in itself is an important finding. Data on Reservists were especially hard to identify and it was not possible to make a confident estimation on the available data about the total number of Reservists who served between 1991 and 2014. In contrast to regular Service Personnel, for which inflow and outflow data per year were available, this was not the case for Reservists. Deployment data also could not be provided for all years in the period 1991 to 2014 and the numbers that were reported here may include double tours to the same or different theatres. For deployments, gaps were however not limited to Reservists: for regular Service Personnel too, data on individual deployment were not always accessible. Information on unique individual deployment figures for Afghanistan and Iraq (combined) were provided, however deployment figures for Operation Granby, Bosnia, other operations on the Balkans, the Falklands, or Sierra Leone were more difficult to come by.

In terms of physical health problems, data was collected from different MoD reports like the War Pension Scheme, the AFCS, medical discharge statistics or amputation statistics and also from FOI requests. A positive development from 2000 onwards of official information from Def Stats on physical and also on mental health can be seen.

Estimates of physical health problems were based on the War Pension Scheme, AFCS and medical discharge statistics. Unlike the AFCS statistics, the War Pension Scheme statistics do

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however not provide any categories of injuries or illnesses for which DPs were awarded compensation. Therefore figures in this report were based solely on the AFCS with respect to which types of injuries were awarded compensation and therefore were deemed attributable to Service. Since Service Personnel can make claims while still in Service under the AFCS, whereas War Pension claims can only be made by Veterans, it is likely that the types of injuries and illnesses for which claims are made under each of the two compensation schemes would be different. This is because Veterans are likely to be older than Service Personnel and because those who left Service might report some kinds of illnesses and injuries more readily than those who are still in Service (since those in Service might be sensitive to how a reported injury or illness might affect their career).

With respect to mental health-related problems, the research team was fortunate in being able to access high-quality data from different studies conducted by researchers from KCMHR. It was also helpful to access data from the APMS and the Household Survey from TRBL. These kinds of surveys help to gain more information, though they also have some weaknesses. The APMS for example has been set up for a broader population which means that only a small number of Veterans were included. TRBL Household Survey on the other hand targets the right group of people; however the methodology of such a survey is weaker than that of the APMS.

Another area with many gaps is the field of mental health and welfare needs of significant others. The provided estimates of how many partners and children there were are likely to be an underestimation since only registered partnerships were taken into account, and only one instead of multiple children. Also, this study focused on children and partners of those who had served in the UK AF but there are likely to be other people in close relationships with those who have served, such as parents, who also may have their health adversely affected by military Service.

7. What might be the nature of the future need

This report aimed to identify how many Service Personnel, Veterans and their significant others might have health related needs because of Service in the UK AF between 1991 and 2014. In spite of difficulties in obtaining some information, we were able to estimate numbers for those who served between 1991 and 2014 and who are no longer in Service. In terms of physical health, it appears that musculoskeletal problems predominate as the main reason for medical discharges and also the category for which most lump sum payments have been made. However, we are not able to define more clearly what sort of musculoskeletal needs people will have. Clearly, the needs of the small numbers of amputees are likely to include difficulties related to their missing limbs, however it is likely that the numbers of individuals with back pain or knee injuries are much larger. However, it is also noteworthy that since AF Personnel need to be fit to perform, at times, highly arduous tasks, being discharged for knee or back problem does not mean that affected individuals would be prevented from enjoying a successful civilian life.

With respect to mental health, it was found that for deployed Personnel, PTSD seemed to be the major problem which could be directly attributed to military Service. People with PTSD suffer from intrusion, avoidance and arousal symptoms and negative alterations in cognitions and mood. Those who warrant a formal diagnosis of PTSD will also experience significant distress and are impaired in their daily functioning. For these individuals it is highly likely that treatment will be necessary to avoid long term adverse consequences for them and their families. The methodology of this report took account of the knowledge that not all of those who suffer with the much more prevalent common mental disorders will need treatment; sometimes these disorders may well resolve on their own. However some who do suffer from these disorders will need treatment to recover and many will benefit from an earlier recovery if they access treatment. Earlier treatment of these disorders may also help Veterans affect a more successful transition and increase the likelihood that families will stay together and potentially improve the outcome for children of parents who suffer from these disorders. Yet Woodhead and colleagues [52] for example found that only approximately 20% of Veterans who might suffer from a mental health disorder had accessed treatment. Whilst there is good

evidence that people who suffer with significant alcohol disorders are likely to benefit from treatment, it is fair to say that many people who suffer with these disorders do not seek help for them in spite of the consequential impairment they suffer as a result of the disorders [53]. In conclusion, the presented results show that that the major problems that Service Personnel (will) face are related to mental health problems. Whether these needs are related to Service or more common than in the general population is beyond the scope of this report. However, there seems to be a need for mental health provision for Service Personnel in the future which would provide for people suffering from common mental health disorders, PTSD and alcohol misuse. There is also the pressing question of how best to encourage those who might benefit from support to make use of it which at least in part will require innovative approaches to overcoming barriers to care and perceived stigmatisation.

8. Future research

As identified earlier there are substantial gaps in research on the impact of military Service on significant others. Research into the military-service related healthcare needs of children is especially lacking. Also periodical surveys like the APMS and TRBL Household Survey provide valuable information, however for a future needs assessment a combination of both approaches (i.e. scientifically valid and well-constructed survey techniques focussing on Veterans and service families) would be valuable. More research is also needed to better understand how best to attract Veterans and family members to seek help for mental health problems in order to overcome perceived stigma and practical barriers to care that are known to exist. Additionally, for those who do seek care, more work is needed about how best to treat their problems. For instance, as a cautionary note, a recent well-constructed review of the treatment of military-related PTSD found rather poor outcomes [54]. More research is thus required to identify how best to ensure that treatments that have been found to be successful in non-military settings are successful with Veterans and service families members who require professional intervention.

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Appendix A: Freedom of Information Act requests

The below table summarises FOI requests that were either made by the research group or other parties and from which responses were used in this report.

FOI request	Reference
<p><i>“What was the number of unique British Armed Forces personnel who deployed to Iraq and/or Afghanistan between 1st January 2001 and 31st March 2014? For clarity, we are looking for the total number of distinct individuals who deployed to Afghanistan or Iraq (or to both). For example, a Marine who has served in both Iraq and Afghanistan would count as 1 distinct individual.</i></p> <p><i>If possible, I would be grateful if you could provide the reply in a form that indicates deployments by year.”</i></p>	<p>FOI 2014/03892</p>
<p><i>“What was the number of medically discharged from the Armed Forces between 1st January 2001 and 31st March 2014?</i></p> <p><i>Please could you provide the primary cause for discharge and year?”</i></p>	<p>FOI 2014/03893</p>
<p><i>“Between 1st April 2007 and 31st October 2014, how many British Armed Forces personnel (unique individuals) were deployed overseas? Please provide the total figure as well as the numbers year-by-year. With any available totals provided for dates before back to 1 January 1991.</i></p> <p><i>Between 1st April 2007 and 31st October 2014, how many British Armed Forces personnel (unique individuals) were deployed within the UK? Please provide the total figure as well as the numbers year-by-year. With any available totals provided for dates before back to 1 January 1991.</i></p> <p><i>Between 1st April 2007 and 31st October 2014, and any available information provided for dates before this back to 1 January 1991, how many British Armed Forces personnel deployed to each of the following conflict zones:</i></p> <p><i>Iraq (Telic),</i> <i>Iraq (current ops),</i> <i>Northern Ireland,</i> <i>Afghanistan (Herrick),</i> <i>Bosnia,</i> <i>1991 Gulf War (Granby),</i> <i>Northern Ireland,</i> <i>UK Independent Nuclear Deterrent.</i></p> <p><i>Please provide the number of unique individuals deployed to each conflict zone</i></p>	<p>FOI 2015 01104</p>

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<p><i>(which would be within the main country of operations for each operation)."</i></p>	
<p><i>"How many unique individuals served in the British Armed Forces (as regulars) between 1st April 2007 and 31st October 2014? With any available totals provided for dates before back to 1 January 1991.</i></p> <p><i>☐</i></p> <p><i>How many unique individuals served in the British Armed Forces (as reservists) between 1st October 2012 and 31st October 2014? With any available totals provided for dates before back to 1 January 1991.</i></p> <p><i>What was the size (in terms of Trained Regular Personnel) of the British Armed Forces in each year between 1st January 1991 and 31st October 2014? and with any available detail on;</i></p> <p><i>Combat Arms (Infantry, Cavalry and Royal Marines), Combat Support and Combat Service Support (for Army and Royal Marines Commando personnel) Royal Navy RAF</i></p> <p><i>What was the size (in terms of Trained Reservist Personnel) of the British Armed Forces in each year between 1st April 2012 and 31st October 2014? With any available related totals provided for dates before back to 1 January 1991."</i></p>	<p>FOI 2015 01103</p>
<p><i>"1. The percentage of UK Regular Armed Forces personnel who have children overall and by: Service (Naval Service, Army and RAF), rank (Officers, Other Ranks), marital status (married, not married), gender (male, female)...</i></p> <p><i>2. The percentage of UK Regular Armed Forces personnel who are unmarried with children overall and by: Service (Naval Service, Army and RAF), Rank (Officers, Other Ranks), gender (male, female)...</i></p> <p><i>3. The percentage of UK Regular Armed Forces personnel that took maternity leave overall and by: Service (Naval Service, Army and RAF), rank (Officers, Other Ranks) marital category (married, not married)...</i></p> <p><i>4. The percentage of UK Regular Armed Forces personnel that took paternity leave overall and by: Service (Naval Service, Army and RAF), rank (Officers, Other Ranks), marital category (married, not married).</i></p> <p><i>We would like to have this information by year over the last decade (2005 –</i></p>	<p>FOI 2015 05385</p>

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2014).	
<p><i>“1. Between 1st January 1991 and 31st October 2014, how many British Armed Forces personnel deployed to each of the following Operational Theatres: 1991 Gulf War (Granby), Iraq (Telic), Iraq (current operations against I.S), Northern Ireland, Bosnia, Afghanistan (Herrick), UK Independent Nuclear Deterrent? Please provide the number of unique individuals deployed to each Theatre. (If someone deployed to NI, Granby, Bosnia, Iraq and Afghanistan, please could you count them as 1. Likewise, in the incidence of multiple tours to the same theatre, please just count the first deployment.)</i></p> <p><i>2. Between 1st January 1991 and 31st October 2014, how many British Armed Forces reservists deployed to each of the following Operational Theatres: 1991 Gulf War (Granby), Iraq (Telic), Iraq (current operations against I.S), Northern Ireland, Bosnia, Afghanistan (Herrick), UK Independent Nuclear Deterrent? Please provide the number of unique individuals deployed to each Theatre. (If someone deployed to NI, Granby, Bosnia, Iraq and Afghanistan, please could you count them as 1. Likewise, in the incidence of multiple tours to the same theatre, please just count the first deployment.)”</i></p>	FOI2015/06422

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