

BMJ Open Total and cause-specific mortality of Finnish military personnel following service in international peacekeeping operations 1990–2010: a comprehensive register-based cohort study

T Laukkala,¹ K Parkkola,² M Henriksson,^{3,4} S Pirkola,⁵ N Kaikkonen,⁴ E Pukkala,⁶ P Jousilahti⁷

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EP and PJ contributed equally.

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For numbered affiliations see end of article.

Correspondence to
Dr Tanja Laukkala;
tanja.laukkala@kela.fi

ABSTRACT

Objectives: To estimate total and cause-specific mortality after international peacekeeping deployments among the Finnish military peacekeeping personnel in comparison to the general population of similar age and sex.

Design: A register-based study of a cohort of military peacekeeping personnel in 1990–2010 followed for mortality until the end of 2013. Causes of death were obtained from the national Causes of Death Register. The standardised mortality ratio (SMR) for total and cause-specific mortality was calculated as the ratio of observed and expected number of deaths.

Setting: Finland (peacekeeping operations in different countries in Africa, Asia and in an area of former Yugoslavia in Europe).

Participants: 14 584 men and 418 women who had participated in international military peacekeeping operations ending between 1990 and 2010.

Interventions: Participation in military peacekeeping operations.

Main outcome: Total and cause-specific mortality.

Results: 209 men and 3 women died after their peacekeeping service. The SMR for all-cause mortality was 0.55 (95% CI 0.48 to 0.62). For the male peacekeeping personnel, the SMR for all diseases was 0.44 (95% CI 0.35 to 0.53) and for accidental and violent deaths 0.69 (95% CI 0.57 to 0.82). The SMR for suicides was 0.71 (95% CI 0.53 to 0.92).

Conclusions: Even though military peacekeeping personnel are working in unique and often stressful conditions, their mortality after their service is lower compared with the general population. Military peacekeeping personnel appear to be a selected population group with low general mortality and no excess risk of any cause of death after peacekeeping service.

INTRODUCTION

Military peacekeeping personnel are working under unique and often stressful conditions

Strengths and limitations of this study

- A large cohort including all Finnish peacekeepers who served in international operations during a more than 20-year period.
- Register-based comprehensive follow-up and practically complete data on cause-specific mortality.
- Insufficient data to separate those who are repatriated early from those who serve full-time deployment.
- Insufficient descriptive data on service lengths and places, as operations vary in their stressors.

that may affect their physical and mental health after the service. A heightened prevalence of mental distress has been reported in the literature concerning the postdeployment phase, though generally differences with the general population diminish over time.¹

In the UK, armed forces personnel, symptoms of common mental disorders and alcohol misuse remain the most frequently reported mental disorders, whereas the prevalence of probable post-traumatic stress disorder was low² and the results were comparable to Finnish data.³ In Canada rates of certain mental disorders have increased among the military over the period 2002–2013, 4 and are higher than rates of sociodemographically comparable individuals in the general population.^{4 5} In a cross-sectional UK military reservists study, deployment was associated with a double risk for risky driving and smoking, and an over three times higher risk for physical violence.⁶ A self-reported cross-sectional survey of Australian military personnel suggested that both unit cohesion and traumatic exposure are independently

associated with poor mental health.⁷ During recent years, a lot of research has focused on the subject of military suicide, especially after the increased suicide rates reported in the US army. Military suicides have been independently associated with mental disorders and male gender, but not with military-specific variables,⁸ though there has been debate on the possible role of prolonged combat and associated stress.^{9 10 11} Nordic studies on suicide mortality after peacekeeping service have reported both lower and higher rates than the general population.^{1 12} In Finland, deployments for military peacekeeping service are voluntary for military personnel as well as for reservists, and all international missions are applied for. Before deployment, all personnel participate in a health evaluation and are fit to serve. Most of those participating in international military operations are repatriated without problems. Finnish peacekeepers can take part in military crisis management operations approved by the United Nations (UN) or the Organization for Security and Cooperation in Europe (OSCE). The Finnish Defence Forces are active in international cooperation that is mostly coordinated by the following international organisations: the UN; European Union; OSCE or NATO. Finland may participate in peace and security building or humanitarian operations and operations tasked to protect civilian populations. Such operations have the approval of the UN or the OSCE. Since 1990, the Finnish peacekeeping personnel have served in international operations, for instance, in the area of the former Yugoslavia, in several countries in Africa, in Cyprus, Israel and Lebanon, and in Iraq, Kuwait, Pakistan, India and Afghanistan.

Our aim is to estimate the total and cause-specific mortality after service among the Finnish military peacekeeping personnel who participated in international peacekeeping operations between 1990 and 2010 in comparison to the general population of similar age and sex. This study is based on a large cohort and a comprehensive register-based follow-up. It adds knowledge on the mortality of military personnel after peacekeeping operations during the past decades.

METHODS

The study cohort included all persons who had finalised a peacekeeping mission in the Finnish Defence Forces between 1 January 1990 and 31 December 2010. Follow-up started on the date of the end of the peacekeeping service (if several deployments, the date of the end of the latest peacekeeping service) and ended at death or 31 December 2013. Of 15 007 persons finalising the service during the period, 5 did not have complete data for calculation of follow-up time, and therefore 15 002 (14 584 men and 418 women) persons were included in the mortality calculations.

The dates and causes of death of the cohort members until 31 December 2013 were achieved from the

national Causes of Death Register of Statistics Finland. The underlying cause of death as given in the death certificate was categorised into 53 main categories.¹³ In Finland, determination of the case of death is based on medical or forensic evidence, and forensic determination may be necessary if the death is not the result of an illness, if it is accidental or violent or if it is caused by a treatment procedure or an occupational disease. A total of 209 men and 3 women died during the follow-up period. In two cases, a cause of death was missing. These two deaths were only included in the analysis of all-cause mortality.

The standardised mortality ratio (SMR) in each cause-of-death category was calculated as the ratio of an observed number and expected number of deaths. The cause-of-death specific expected number of deaths in each gender, age (5-year age categories) and calendar time (1990–1993, 1994–1997, 1998–2001, 2002–2005, 2006–2009, 2010–2013) specific stratum was calculated by multiplying the number of person-years in that stratum by the cause-of-death specific mortality rate in the general population in the respective stratum. The reference mortality rates were achieved from Statistics Finland.¹³ The 95% CIs were defined assuming a Poisson distribution of the observed number of deaths.

The study database was anonymised in Statistics Finland so that researchers did not have access to personal identity codes.

RESULTS

The all-cause mortality of Finnish peacekeepers is presented in [table 1](#). For the total cohort, irrespective of sex or age at follow-up, the observed number of deaths was 212 (SMR 0.55, 95% CI 0.48 to 0.62). For women, the observed number of all deaths was 3 (SMR 0.77, 95% CI 0.16 to 2.25). The SMR for all-cause mortality among

Table 1 Observed (Obs) and expected (Exp) numbers of death (all-cause mortality), and SMR with 95% CIs among Finnish peacekeepers 1990–2010, followed until 2013, by sex, age and time since ending the peacekeeping period (follow-up)

Category	Obs	Exp	SMR	95% CI
Total	212	386.1	0.55	0.48 to 0.62
Sex				
Male	209	382.2	0.55	0.48 to 0.62
Female	3	3.9	0.77	0.16 to 2.25
Age at follow-up (years)				
20–29	23	40.8	0.56	0.36 to 0.84
30–39	75	134.3	0.56	0.44 to 0.70
40–49	72	132.0	0.55	0.43 to 0.68
50–59	31	59.4	0.52	0.35 to 0.74
60–79	11	19.6	0.56	0.30 to 0.98
Follow-up				
<5 years	63	116.5	0.54	0.42 to 0.69
5+ years	149	269.6	0.55	0.47 to 0.64

SMR, standardised mortality ratio.

Table 2 Cause-specific observed (Obs) and expected (Exp) numbers of death and SMR among Finnish male peacekeepers, 1990–2010, followed until 2013*

Cause of death (ICD-10 codes†)	Obs	Exp	SMR	95% CI
All diseases (A00–R99, X45)	94	215.5	0.44	0.35 to 0.53
All accidents and violence, excluding accidental poisoning by alcohol (V01–X44, X46–Y89)	113	163.8	0.69	0.57 to 0.82
All accidents, excluding accidental poisoning by alcohol (V01–X44, X46–X59, Y85–Y86)	50	74.5	0.67	0.50 to 0.88
Age at follow-up (years)				
20–29	7	12.0	0.59	0.24 to 1.20
30–39	20	32.1	0.62	0.38 to 0.96
40–49	14	22.5	0.62	0.34 to 1.04
50–79	9	7.9	1.14	0.56 to 2.09
All accidents, excluding accidental poisoning by alcohol (V01–X44, X46–X59, Y85–Y86)				
Traffic accidents‡	19	16.0	1.19	0.72 to 1.85
Accidental falls W00–W19	10	10.2	0.98	0.47 to 1.79
Drowning W65–W74	4	6.2	0.65	0.18 to 1.66
Accidental poisonings (non-alcohol) X40–X44, X46–X49, Y10–Y15	6	22.6	0.27	0.10 to 0.57
Other accidents and late effects of accidental injuries W20–W64, W75–X39, X50–X59, Y85–Y86	9	13.6	0.66	0.30 to 1.25
Suicides (X60–X84, Y870)	53	74.8	0.71	0.53 to 0.92
Age at follow-up (years)				
20–29	7	15.2	0.46	0.18 to 0.94
30–39	21	34.9	0.60	0.37 to 0.91
40–49	23	19.7	1.17	0.74 to 1.75
50–79	2	5.1	0.39	0.07 to 1.30
Assaults (X85–Y09, Y871)	5	8.8	0.57	0.19 to 1.33
Events of undetermined intent (Y16–Y34, Y872)	5	5.6	0.90	0.29 to 2.09

*The cause-specific mortality of accidents and suicides is presented also by age groups.

†Finland has used the WHO ICD-10 since 1 January 1996 and 1987–1995 ICD-9. The respective ICD-9 codes are available at the Statistics Finland website (http://www.stat.fi/til/ksyyt/2005/ksyyt_2005_2006-10-31_luo_002_en.html, accessed 08.12.2015).

‡Traffic accidents (1996–1997: V01–V06 (0.1), V09 (0.2–0.3, 0.9), V19.9, V29.9, V39.9, V49.9, V59.9, V69.9, V79.9, V81–V83.3, V84–V86 (0.3) 1998: V01–V06 (0.1), V09.2–V09.3, V10–V18 (0.4–0.9), V19 (0.4–0.6, 0.9), V20–V28 (0.4–0.9), V29 (0.4–0.6, 0.9), V30–V38 (0.5–0.9), V39 (0.4–0.6, 0.9), V40–V48 (0.5–0.9), V49 (0.4–0.6, 0.9), V50–V58 (0.5–0.9), V59 (0.4–0.6, 0.9), V60–V68 (0.5–0.9), V69 (0.4–0.6, 0.9), V70–V78 (0.5–0.9), V79 (0.4–0.6, 0.9), V81.1, V82.1, V83–V86 (0.0–0.3), V87, V89.2–V89.3. ICD-9, International Classification of Diseases Ninth Edition; SMR, standardised mortality ratio.

male peacekeepers was 0.55 (95% CI 0.48 to 0.62). In table 2, assessment of the cause-specific mortality comprises male peacekeepers only. The SMR for all diseases was 0.44 (95% CI 0.35 to 0.53) for all accidents and violence, excluding accidental poisoning for alcohol 0.69 (95% CI 0.57 to 0.82) and for suicides 0.71 (95% CI 0.53 to 0.92). A slightly increased (statistically non-significant) mortality was observed only for traffic accidents, SMR 1.19 (95% CI 0.72 to 1.85).

Three main disease categories of death were malignant neoplasms (SMR 0.75, 95% CI 0.51 to 1.04), diseases of the circulatory system (SMR 0.45, 95% CI 0.30 to 0.65) and alcohol-related diseases and accidental poisoning by alcohol (SMR 0.38, 95% CI 0.25 to 0.56).

DISCUSSION

Principal findings

Peacekeeping personnel had lower all-cause mortality than the respective general population. This was observed in all age groups. A statistically significant decreased cause-specific SMR was found in all

disease-related deaths, deaths due to accidents and violence, diseases of the circulatory system, alcohol-related diseases and accidental alcohol poisonings, and suicides. In addition, a decreased but not statistically significant SMR was found in malignant neoplasms. None of the cause-specific SMRs were significantly above 1.0.

Comparison with other studies

There are differences in the selection procedure of peacekeepers, potentially traumatic and other stressful events during deployments, postdeployment care and the presence of combat exposure, for example, between and during deployments among militaries in the NATO and Partnership for Peace countries,^{1 2 6 8 9 10 14 15} which complicates straight comparison of the SMRs published from different countries. Previous studies on mortality after peacekeeping service are mainly concentrated on total mortality, psychiatric conditions in relation to suicides, intoxications, accidents and in the disease-related deaths cancer, acute myocardial infarction, heart failure and pneumonia.^{1 4 5 8–10 12 14–19} The SMR for all-cause

mortality was 0.44 for Gulf War veterans in a study with a large sample but a short follow-up of 2–3 years.^{20 21}

Recent Norwegian studies have reported low all-cause mortality of Norwegian male peacekeepers (SMR 0.49; 95% CI 0.35 to 0.67),^{17 18} which is comparable to the SMR of 0.55 in our study. The rate of suicide is a severe measure of any population's mental health. In the Nordic countries of Finland, Norway, Denmark and Sweden, each nation systematically registers national and military suicide rates.^{12 17 18 21–24} An increased SMR of 1.4 was reported earlier among the former Norwegian peacekeepers,¹⁵ but peacekeeping-associated causes leading to suicide were not found among 43 investigated suicides and 41 investigated fatal accidents.²³ More recently, lower than expected all-cause mortality rates (SMR of 0.83 and SMR of 0.49) have been reported from Norwegian cohorts.^{17 18} The Swedish peacekeepers had a lower rate of suicide than the general population.²⁴

Alcohol misuse has been suggested to be associated with increased suicidal intentions among the military and veterans,^{8 10} as well as with comorbid psychiatric disorders such as PTSD.²⁵ An earlier study on Finnish peacekeepers reported some kind of contribution of alcohol to approximately half of all the deaths and all intoxications.¹² Lower than expected mortality for alcohol-related diseases and accidental poisoning by alcohol after peacekeeping is an interesting positive finding. Lower rates of alcohol use disorder as compared to sociodemographically matched individuals in the general population have earlier been observed in Canadian military.⁵

Decreased all-cause mortality among the Finnish peacekeeping personnel, as compared to that among the general population, may be due to many reasons. Peacekeepers are in many ways a selected population. All deployed personnel, whether Finnish Defence Forces personnel or civilians with a conscript background, apply for deployment, and a physician familiar with the operation's needs performs a predeployment health check. During operations, healthcare is arranged, preferably by a team led by a Finnish physician and after deployment there is a postdeployment health check. In addition, multiprofessional support (social workers, chaplains) is provided if needed. Particular attention has been paid to screening for psychiatric symptoms as well as offering easily accessible ways to receive psychosocial support and care after deployment by healthcare and also by a non-governmental organisation of former peacekeepers. In the field of mental health services, the possibility to use one's own language makes communication easier and peer support has value. Therefore, the physical and mental health and stress resilience of the peacekeepers is likely to be generally at a relatively high level.

In comparison with international studies, the commissions can be considered to be selected, as the Finnish deployed personnel may participate in peace-building and security-building or humanitarian operations, as well as

operations tasked to protect civilian populations. The presence of combat exposure, for instance, varies considerably between deployments in a war zone as compared to humanitarian operations. In a US study, there was an association between combat and subsequent post-traumatic stress disorder, while peacekeeping or relief work without combat was not associated with mental illness.²⁶ At an individual level, personal qualities such as age, gender, socio-economic status as well as personality, previous life experiences and training can affect the individual's ability to withstand both psychological and physical stress.¹

Strengths and limitations

The main strengths of our study include a large cohort including all Finnish peacekeepers who served in international operations during a more than 20-year period, a register-based comprehensive follow-up, practically complete data on cause-specific mortality and ability to calculate SMRs in comparison with a similar background population. Limitations of the study include insufficient data to separate those who are repatriated early from those who serve full-time deployment, the repatriated ones being a possible risk group.¹² Another limitation is insufficient data on service lengths and places, as operations vary in their stressors.

CONCLUSIONS

Even though military peacekeeping personnel are working in unique and sometimes stressful conditions, their mortality after the service is lower compared to the general population. Military peacekeeping personnel appear to be a selected population group with low general mortality and no excess risk of any cause of death after peacekeeping service.

Author affiliations

¹Centre for Military Medicine, Finnish Defence Forces, Helsinki, Finland

²School of Medicine, University of Tampere, Tampere, Finland

³National Supervisory Authority for Welfare and Health, Helsinki, Finland

⁴Centre for Military Medicine, Finnish Defence Forces, Helsinki, Finland

⁵School of Health Sciences, University of Tampere, and Tampere University Hospital, Tampere, Finland

⁶School of Health Sciences, University of Tampere, Tampere Finland and the Finnish Cancer Registry, Helsinki, Finland

⁷National Institute for Health and Welfare, Helsinki, Finland

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Contributors TL planned the study design, participated in the data collection, interpreted the results and wrote the manuscript. KP, MH, SP and NK participated in the study planning and read and critically commented on the manuscript. KP and MH provided organisation support. EP participated in the design of the study, performed the statistical analysis and read and critically commented on the manuscript. PJ participated in study planning, interpreting the results, manuscript writing and critical assessment of the results.

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