Mortality from Ischaemic Heart Disease in the Armed Forces 1973-1984

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SUMMARY: This study investigates mortality from ischaemic heart disease during 1973-1984 in males under 55 years of age in the three Armed Services. Comparisons are drawn within and between each service and with ischaemic heart disease (IHD) mortality in the UK male population.

Evidence of a significant decline in the Army death rate over this 12 year period has been found. Officers in each Service are seen to have a much higher rate of mortality, ie death rate per 100,000 at risk, than other ranks but a much lower rate when age distribution relative to the UK population is taken into account as indicated by the Standardised Mortality Ratios. The Army other ranks in the 25-39 age range are identified as a particularly high risk group for IHD.

The wide ranging effects of social habits and the peculiarities of military life style may go part way to explaining the diversity between officers and other ranks and between the services and the general UK male population.

Introduction

The number of male deaths from ischaemic heart disease (IHD) in the three Armed Services is of major concern. This study looks at mortality in each Service during 1973-1984, drawing comparisons between individual Services, and between the Services and the UK male population.

Data

The study covers all Regular serving males (excluding Gurkhas) who died from IHD (coded 410-414 in the eighth and ninth editions of the International Classification of Diseases) during 1973-1984. The information was obtained from the Tri-Service Medical Statistics Branch of the Ministry of Defence. The cause of death was confirmed by post mortem records in 75% of the cases.

The population of personnel aged over 54 in each Service is small, making meaningful analysis of the deaths in this age group difficult. In view of this, the nine Army and four RAF cases have been excluded from the analyses.

The UK male population data were obtained from the Office of Population Censuses and Surveys, the General Register Office of Scotland and the Registrar General of Northern Ireland.

Results

In the 12 year period there were 605 male deaths in all three Services from IHD, and a further 41 deaths where IHD was implicated as a secondary cause of death.

The figures in Table 1 summarise all male deaths in the Services over the period. IHD can be seen to account for approximately one third of all the disease deaths in each Service.

Table 2 summarises the IHD deaths by Service and year for all ranks, officers and other ranks separately. The inclusion of the death rate per 100,000 strength provides a broad comparison of the incidence of death within and between the Services, but it does not allow for differences in the age distributions.

The Spearman rank correlation coefficient trend analysis technique was used to test the hypothesis that there is evidence of a favourable (decreasing) trend in the death rates over time. The results are given in Table 3. All nine results indicate evidence of a favourable trend. High negative values indicate a very strong trend and low negative values indicate a weak trend. Of the three Services the Army can be seen to have the strongest evidence of a decline in the death rate over time, particularly evident amongst the officers and all ranks groupings.

Table 1

Summary of Male Mortality all ages(a) 1973-1984

	Total	Disease Deaths		Deaths from Neoplasms			Deaths from IHD			Injury Deaths (b)	
	Male Deaths (b)	Total	% of all Deaths	Total	% of all Deaths	% of Disease Deaths	Total	% of all Deaths	% of Disease Deaths	Total	% of all Deaths
Tri-Service	4,678	1,689	36.1	641	13.7	37.9	605	13.0	35.8	2,989	63.9
Navy	824	291	35.3	117	14.2	40.2	86	10.4	29.6	533	64.7
Army	2,615	813	31.1	258	9.9	31.7	313	12.0	38.5	1,802	68.9
RAF	1,239	585	47.2	266	21.5	45.5	206	16.6	35.2	654	52.8

NOTE: (a) all subsequent tables exclude those aged 55 and over

(b) these figures exclude Falklands Campaign fatalities.

Table 2
Mortality rates for IHD per 100,000 male strength at risk
in each Service aged under 55 for 1973–1984

	All Ranks		Officers		Other Ranks	
	IHD Deaths	Death Rate per 100,000	IHD Deaths	Death Rate per 100,000	IHD Deaths	Death Rate per 100,000
NAVY						
1973	9	11.6	3	29.6	6	8.9
1974	9	12.1	2	19.9	7	10.9
1975	10	13.9	3	30.3	7	11.2
1976	7	9.7	1	10.2	6	9.6
1977	9	12.5	4	41.3	5	8.1
1978	3	4.3	0	0.0	3	4.9
1979	5	7.3	3	31.6	2	3.4
1980	7	10.3	3	31.1	4	6.8
1981	7	10.0	1	10.1	6	10.0
1982	4	5.9	2	20.5	2	3.4
1983	10	14.8	1	10.6	9	15.5
1984	6	9.0	1	10.7	5	8.7
TOTAL	86		24		62	
ARMY						
1973	29	17.0	9	51.6	20	13.0
1974	27	16.4	9	51.8	18	12.2
1975	33	20.5	8	45.9	25	17.4
1976	34	20.7	7	40.4	27	18.4
1977	26	16.3	8	46.9	18	12.6
1978	20	13.0	7	42.8	13	9.4
1979	29	19.3	12	75.4	17	12.6
1980	24	15.5	7	43.8	17	12.2
1981	23	14.3	5	30.8	18	12.5
1982	22	14.1	5	30.9	17	12.1
1983	19	12.4	6	37.7	13	9.4
1984	18	11.6	2	12.5	16	11.5
TOTAL	304		85		219	
RAF						
1973	21	21.4	5	27.3	16	20.0
1974	21	22.6	10	57.3	11	14.6
1975	21	23.7	3	18.0	18	25.0
1976	19	22.5	6	39.0	13	18.8
1977	20	24.6	4	27.5	16	24.0
1978	14	17.6	3	21.6	11	16.7
1979	12	14.8	3	22.1	9	13.4
1980	10	11.9	1	7.3	9	12.8
1981	14	16.3	5	36.0	9	12.5
1982	13	15.4	5	36.0	8	11.4
1983	19	22.5	1	7.2	18	25.4
1984	18	20.8	4	28.8	14	19.2
TOTAL	202		50		152	

Table 3

Service	All Ranks	Officers	Other Ranks
Navy	-0.286	-0.230	-0.206
Army	-0.776	-0.741	-0.664
RAF	-0.486	-0.185	-0.230

NOTE: The values for Army Officers and all ranks were found to be significant at the 1% level and the other ranks value at the 5% level.

Figure 1 compares death rates for all ranks by Service and five year age groups. In the 30-34 and 35-39 age groups the Army death rate is approximately twice that of the Navy and RAF. All the Services can be seen to show a sharply increasing death rate with age.

Analysis of the all ranks, officers and other ranks groupings by age (see Table 4) reveals a number of similarities and differences. The vast majority of all officer deaths in each Service occurred in the 40-54 age-band. By comparison 66% of the Army other ranks deaths occurred in the 15-39 age range, more than half of which were in the 35-39 age group. In the Navy and RAF only 48% and 26% of the other ranks deaths respectively were in the 15-39 age range.

Table 4 compares the mortality from IHD in each Service with that of the UK male population on a basis adjusted to allow for differences in age distributions. The Standardised Mortality Ratio (SMR) measures the difference between the observed number of Service deaths and the expected number based on age specific UK mortality rates. An SMR of 100% equates to the UK mortality rate, whilst higher values indicate a greater than expected number of Service deaths and lower values a lower number than would be expected.

It can be seen that the overall SMR's for all ranks, i.e., for the whole 15-54 age band, are all less than 100% for each Service. Closer examination of the deaths by age group reveals SMR's which vary considerably. Deaths in excess of the expected number occurred in the 20-24 (Navy and RAF) and 25-29 (RAF) age groups, though the number of actual deaths were small. The Army age groups between 15 and 39 stand out as having an especially high number of excess deaths.

Analysis of the deaths between officers and other ranks highlights some striking differences. With the exception of the 20-24 age group in the Army all the officer SMR's are well below 100%. In the other ranks category, whilst the overall Navy and RAF mortality below the UK rate, this is not the case in the Army. Breakdown by age reveals excess deaths to have

Fig. 1. IHD Death Rates All Ranks 1973-1984

Table 4
Mortality from IHD for male officers and other ranks for each Service
compared with the UK male civilian population 1973– 1984

	Civilian		All Ranks			Officers				Other Ranks			
	Mortality per 1000	Strength	Obs. Dths in 12 yrs	Exp. Dths in 12 yrs	SMR %	Strength	Obs. Dths in 12 yrs	Exp. Dths in 12 yrs	SMR %	Strength	Obs. Dths in 12 yrs	Exp. Dths in 12 yrs	SMR %
Tri Serv													
15–19	0.002	688,686	2	1.4	143	10,479	0	0.0	0	678,215	2	1.4	143
20–24	0.007	1,075,646	13	7.5	173	61,545	1	0.4	(250)	1,014,180	12	7.1	169
25–29	0.024	734,358	30	17.6	170	77,449	0	1.9	0	656,960	30	15.8	190
30–34	0.094	497,772	56	46.8	120	79,322	1	7.5	13	418,400	55	39.3	140
35–39	0.302	410,332	129	123.9	104	83,192	13	25.1	52	327,100	116	98.8	117
40–44	0.844	200,442	117	169.2	69	75,442	28	63.7	44	125,000	89	105.5	84
45–49	1.890	110,255	133	208.4	64	65,413	57	123.6	46	44,800	76	84.8	90
50–54	3.541	65,679	112	232.6	48	41,955	59	148.6	40	23,700	53	84.0	63
Total		3,783,170	592	807.4		494,797	159	370.8		3,288,330	433	436.7	
SMR 15–54					73				43				99
Navy													
15–19	0.002	168,678	0	0.3	0	3,081	0	0.0	0	165,597	0	0.3	0
20–24	0.007	246,923	3	1.7	176	17,204	0	0.1	0	229,719	3	1.6	187
25–29	0.024	160,073	3	3.8	79	19,988	0	0.5	0	140,085	3	3.4	88
30–34	0.094	111,531	7	10.5	67	20,463	0	1.9	0	91,068	7	8.6	81
35–39	0.302	95,137	21	28.7	73	20,175	4	6.1	66	74,962	17	22.6	75
40–44	0.844	35,902	21	30.3	69	15,391	2	13.0	15	20,511	19	17.3	110
45–49	1.890	20,084	20	38.0	53	13,967	12	26.4	45	6,117	8	11.6	70
50–54	3.541	8,399	11	29.7	37	6,498	6	23.0	26	1,901	5	6.7	75
Total		846,727	86	143.0		116,767	24	71.0		729,960	62	72.2	
SMR 15–54					60				34				86
Army													
15–19	0.002	398,694	2	0.8	(250)	5,402	0	0.0	0	393,292	2	0.8	(250)
20–24	0.007	577,799	7	4.0	175	26,916	1	0.2	(500)	550,883	6	3.9	154
25–29	0.024	368,652	21	8.8	239	28,442	0	0.7	0	340,210	21	8.2	256
30–34	0.094	235,178	41	22.1	185	25,784	1	2.4	42	209,394	40	19.7	203
35–39	0.302	179,351	82	54.2	151	30,724	6	9.3	64	148,627	76	44.9	169
40–44	0.844	84,017	54	70.9	76	34,113	15	28.8	52	49,904	39	42.1	93
45–49	1.890	40,138	56	75.9	74	29,315	28	55.4	50	10,823	28	20.5	137
50–54	3.541	21,615	41	76.5	54	18,395	34	65.1	52	3,220	7	11.4	61
Total		1,905,444	304	313.2		199,091	85	161.9		1,706,353	219	151.5	
SMR 15–54					97				52				145
RAF													
15–19	0.002	121,314	0	0.2	0	1,996	0	0.0	0	119,318	0	0.2	0
20–24	0.007	250,924	3	1.8	167	17,425	0	0.1	0	233,499	3	1.6	187
25–29	0.024	205,633	6	4.9	122	29,019	0	0.7	0	176,614	6	4.2	143
30–34	0.094	151,063	8	14.2	56	33,075	0	3.1	0	117,988	8	11.1	72
35–39	0.302	135,844	26	41.0	63	32,293	3	9.8	31	103,551	23	31.3	73
40–44	0.844	80,523	42	68.0	62	25,938	11	21.9	50	54,585	31	46.1	67
45–49	1.890	50,033	57	94.6	60	22,131	17	41.8	41	27,902	40	52.7	76
50–54	3.541	35,665	60	126.3	47	17,062	19	60.4	31	18,603	41	65.9	62
Total		1,030,999	202	351.0		178,939	50	137.8		852,060	152	213.1	
SMR 15–54					58				36				71

NOTE: The SMRs in brackets are based on less than one expected death over the 12 year period.

occurred in certain age groups in each Service, the greatest number being in the Army 25-29 age group where the observed number of deaths is more than 2½ times the expected number.

Figures for 1973-1977 were published in an earlier study on coronary heart disease¹. Table 5 compares the SMR's for 1973-1977 and 1978-1984 by Service and rank. The figures for 1973-1977 have been updated in line with changes in the UK population estimates for that period, leading to only minor changes in the values of the SMR's.

Table 5
Comparison of SMR's by Service and rank for 1973-1977 and 1978-1984

	All Ranks		Officers SMRs		Other Ranks	
	73-77	78-84	73-77	78-84	73-77	78-84
Tri-Service	76	70	47	39	100	97
Navy	71	52	41	30	101	75
Army	101	93	55	50	149	140
RAF	57	57	40	32	68	74

Examination of the SMR's indicates an improvement in Service mortality relative to the UK population between the two periods. The most significant decrease being in the Navy other ranks. The RAF other ranks is the only category for which the SMR has increased.

Discussion

The findings of the analysis raise a number of questions. Has the death rate improved because the age structure of the Service population has changed over the years, or is it due, perhaps, to a different mix of regional recruitment from high to low risk areas? Have there been improvements in screening and medical treatment? Why do the officer and other ranks SMR's of each Service differ so markedly? In particular what factors are peculiar to the Army other ranks to cause such an excessive number of deaths in the under 40's compared with the UK population? Why has the SMR for RAF other ranks increased between the two periods 1973-1977 and 1978-1984?

There are no simple answers to these questions. However it is possible to examine factors which may be a source of variation and thus account in part for the differences between the individual Services and between the Services and the UK population.

A previous study into heart disease¹ has already highlighted factors associated with mortality in the Army. These included social class of recruits, medical care, cigarette smoking and diet. It is reasonable to assume that these factors will also have a bearing on the incidence of IHD in the Navy and RAF.

Medical guidelines for the screening of new recruits and for the periodic assessment of Service personnel

(PULHEEMS) are set down as a Joint Service Policy. But are there differences in the policies of each Service in dealing with IHD?

Occupation is a source of variation between the Services. Analysis of the deaths by occupation might prove useful in highlighting specific high risk groups, to explain some of the differences not only between the Services, but between the officers and other ranks. However in practice, it has proved difficult to undertake a worthwhile analysis based on the existing data.

Figure 2 compares the geographical recruitment of

servicemen (other ranks) by Service from each of the UK standard regions during 1973-1984. The pattern of recruitment can be seen to be similar for each Service with one or two minor variations. The regional UK male IHD SMR's for the period 1973-1984 have been used to highlight those areas of a lower or higher risk of mortality from IHD. Of the total number of males recruited in each Service, 44% Navy and over 50% in the Army and RAF were recruited from high risk areas, i.e., Northern Ireland, Scotland, Wales, and the northern regions of England. By comparison only 43% of the UK male population aged 15-34 lived in high risk areas.

Tobacco consumption, regular and excessive alcohol intake and obesity are all factors of concern in the Forces. The earlier study² identified the very high prevalence of cigarette smoking in soldiers as a definite risk factor for heart disease.

Although obesity and excessive alcohol consumption have not been identified as high risk factors for IHD, they may play a contributory role. Analysis of the 21 Army other ranks deaths aged 25-29 revealed the bodily condition of over 60% as being obese. Information on alcohol consumption was only available in 8 cases, of which half were considered to have a drink problem.

Tobacco, and in particular cigarette, consumption is not easily controlled. The socialising aspect of life in the Forces and the provision of cheaper alcohol and tobacco may well go to making drinking and smoking an acceptable way of life. Closer monitoring of these social habits in the Services must be given consideration. The compulsory inclusion of this information on medical records would go a long way to aiding further research.

Fig. 2. Regional Recruitment of Servicemen 73–84

Table 6
Summary of Service invalidings from IHD aged 15-54 during 1973-1984

	Invalidings		Rates per 100,000	
	Officers	Other Ranks	Officers	Other Ranks
Tri Service	88	221	17.8	6.7
Navy	16	29	13.7	4.0
Army	17	65	9.0	3.8
RAF	55	127	30.7	14.9

Physical fitness is another important aspect of Service life, perhaps under the premise that a fitter Force is a healthier Force. In 1977 the Army introduced the Basic Fitness Test as a compulsory part of training. A very recent study³ has shown that since the introduction of this test the incidence of sudden deaths in the Army has not significantly changed. There is no equivalent test in the Navy or RAF.

Stress is also a factor associated with IHD. The main characteristics of the nature of 'employment' in the Forces are markedly different from those in civilian employment. Military discipline, job security, separation from family, deployment overseas and possible involvement in hostile warfare are some of the differences which may have a bearing.

where all the personnel would have died from IHD had they remained in the Service, the SMR's increase appreciably. (Table 7).

In the unlikely event of this extreme situation the officer mortality would still be well below that of the UK population but the mortality of other ranks would increase markedly, giving rise to an excess number of deaths in each Service. This still does not take into account those personnel who were invalided out for other medical reasons but who might have died from IHD if they had remained in the Services.

To endorse or refute the implications of the points mentioned, further research is needed. Ideally this should take the form of a detailed analysis of the medical and Service history of each individual. This would then

Table 7
Comparison of the Observed Deaths SMR's with the Observed Deaths plus Invalidings SMR's for 1973-1984

	Observed Dths SMR's			Observed Dths + Invalidings SMR's		
	All Ranks	Officers	Other Ranks	All Ranks	Officers	Other Ranks
Tri-Service	73	43	99	112	67	150
Navy	60	34	86	92	56	126
Army	97	52	145	123	63	187
RAF	58	36	71	109	76	131

To what extent the factors peculiar to military life differ between each of the Services is difficult to assess. However, for example 42% of the Army's total male strength for 1973-1984 was deployed overseas compared with less than 20% in the Navy and RAF.

The process of medical discharge from the Services is an important source of bias. Table 6 summarises the invalidings from IHD over the period 1973-1984. Personnel are medically discharged in accordance with a Joint Service Policy, although the figures indicate a much higher rate of RAF invalidings.

The effect of invalidings on the Service death rates is difficult to calculate without following up each individual. However by considering the 'worst case'

enable factors like length of full time Service, occupation, rank and command to be examined in more detail.

REFERENCES

1. LYNCH P and OELMAN B J. Mortality from coronary heart disease in the British Army compared with the civil population. *Br Med J* 1981; **283**: 405-7.
2. LYNCH P. Coronary risk profile of young soldiers with coronary heart disease. *J R Army Med Corps* 1985; **131**: 38-41.
3. LYNCH P et al. Sudden death in sport before and after introduction of the Basic Fitness Test. *J R Army Med Corps* 1985; **131**: 42-46.