

Final Report

Australian Firefighters’

Health Study

Summary

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Summary

Background

In 2011, Monash was commissioned by the Australasian Fire and Emergency Service Authorities Council (AFAC) to carry out a national retrospective study of firefighters' mortality and cancer incidence known as the Australian Firefighters' Health Study. This study was prompted, in part, by the results of several overseas studies which had identified excesses of several types of cancers in firefighters. The aims of the study were to examine mortality and cancer among firefighters and investigate different subgroups, based on type of employment, duration of firefighting service, era of first employment/service, serving before/including or only after 1985, by the number of incidents attended and whether an individual was identified as having been a trainer.

Ethics approval for the study was granted by the Human Research Ethics Committees of Monash University, the State and Territory Cancer Registries, the Australian Institute for Health and Welfare (AIHW) and the National Coronial Information Service.

This study had an Advisory Committee whose membership was drawn from AFAC, fire agencies, trade unions and volunteer firefighter associations. The Advisory Committee provided support for, and information to, the researchers and a Technical Reference Group provided technical guidance to the researchers on the conduct of the study and on the draft report.

The agencies that contributed records of career full-time and part-time paid and/or volunteer firefighters to the study were: Australian Capital Territory Fire and Rescue, Air Services Australia, Country Fire Authority Victoria, Department of Fire and Emergency Services Western Australia, Fire and Rescue New South Wales, Metropolitan Fire and Emergency Services Board Victoria, New South Wales Rural Fire Service, Northern Territory Fire and Rescue Service, and Queensland Fire and Emergency Services.

Methods

Participating fire agencies supplied records of individual firefighters including their job histories. The start dates of the personnel records which were provided varied with agency, ranging from 1976 to 2003. Incident records were also supplied by most agencies which were attached to individual firefighters using their personnel number. The incident data also had varying start dates between 1990 and 2011. The supplied records were loaded into a secure database and checked for quality and completeness. Individuals were followed up from the date of first employment or volunteer record, or from when they joined the agency,

or the date from which the human resources agency data was complete, whichever was the later. Firefighters were grouped into tertiles duration of service and of all incidents, all fires, and number of structural, landscape and vehicle fires attended.

Each firefighter was assigned to one of the following three analysis groups: career full-time, part-time paid or volunteer firefighters. Analyses were carried out separately for these three groups because of the differing criteria to become a firefighter, differing workload, occupational histories and other possible lifestyle differences. The considerable differences in number of incidents attended and in the cancer and mortality findings between these groups showed that this was an appropriate and necessary grouping. Separate analyses were performed for male and female firefighters within these groups.

Separate analyses by agency or state were not carried out as in most cases the numbers would have been too small.

Results

To obtain mortality and cancer outcomes, the cohort was linked to the National Death Index and the Australian Cancer Database both held by the AIHW. Among men, there were 5,713 deaths and 8,750 incident cancers matched to cohort members, of which 780 deaths and 1,208 cancers were among the 17,394 career full-time firefighters, 286 deaths and 485 cancers were among the 12,663 part-time paid firefighters and 4,647 deaths and 7,057 cancers were among the 163,159 volunteer firefighters. For women, there were 536 deaths and 1,055 incident cancers, of which three deaths and eight cancers were among the 641 career full-time firefighters, seven deaths and 20 cancers were among the 1,041 part-time paid firefighters and 526 deaths and 1,027 cancers were among the 37,973 volunteer firefighters.

Australian population data were used to calculate the expected numbers of deaths and cancers for each firefighter group based on its age distribution. When compared internally, within the firefighters' analysis group for duration and incidents attended, the analyses were adjusted for age and calendar year.

There are many analyses in this report and it is important to look at the overall patterns of results, rather than focus on a single isolated result when interpreting the findings.

Overall Mortality

The overall risk of mortality was significantly decreased and almost all major causes of death were significantly reduced for male paid firefighters and for male and female volunteer firefighters. This is likely to be a result of a strong healthy worker effect and the likely lower smoking rates among firefighters compared with the Australian population. This is a common finding in such studies, whereby working populations tend to be healthier than the population from which they are drawn and this effect may be more pronounced in paid firefighters who need to meet strict fitness standards at the time of recruitment.

There was no evidence of an increase in cardiovascular or respiratory mortality for firefighters compared to the Australian population or of cardiovascular mortality from internal analyses examining risk by duration of service or number of incidents attended.

The cancer mortality risk for paid firefighters was comparatively higher than the risk for other major causes of death although still reduced compared to that of the Australian population.

Male Career Full-time Firefighters

For male career full-time firefighters compared to the Australian population, overall cancer incidence was significantly raised for the group as a whole and for those who had worked for longer than 20 years. There was no trend of overall cancer incidence increasing with duration of service when longer serving firefighters were compared to those who had served for less than 10 years, in internal analyses. There was a trend of increasing overall cancer incidence with increasing attendance at vehicle fires. The internal analyses by duration and incidents have been adjusted for age findings are unlikely to be age-related effects.

There was a statistically significant increase in prostate cancer incidence for career full-time firefighters overall, and particularly for those employed for more than 20 years. There was a significant trend with employment duration and the number of incidents attended and some significantly increased risks for higher tertiles of incidents attended.

The risk of melanoma was significantly increased for career full-time firefighters, and for both of the employment duration groups who were employed for more than 10 years. It was not related to duration of service or number or type of incidents attended in internal analyses however. Melanoma was significantly increased for all eras of first employment (pre-1970, 1970-1994, 1995 and later). When compared to state rates (melanoma varies widely throughout the country), the risk of melanoma was significantly increased for the whole group of career full-time firefighters and for those from New South Wales, Victoria and Western Australia.

Compared to the Australian population, kidney cancer was elevated for those who had been employed for 10-20 years and was significantly higher for those career full-time firefighters who worked more than 20 years compared to those who worked between three months and 10 years, and there was a positive trend with employment duration. This last finding is based on only one case in the comparison group, so it needs to be treated with caution. There were no significant elevations or trends for incident categories in respect of kidney cancer.

Lympho-haematopoetic (LH) cancer occurred at the same rate as the Australian population for the career full-time firefighters as a group but was significantly elevated for those who had worked for more than 10 years, when compared to those who had worked for less than 10 years. There was a consistent increase in LH cancer with duration of service found in internal analyses among all paid male firefighters but the trend was only statistically significant for career full-time firefighters. There were no significant elevations or trends for incident categories.

When compared to the Australian population, male breast cancer was elevated but did not reach statistical significance, it was however, statistically significantly increased among those employed for more than 20 years.

There were more cases of testicular cancer in career full-time firefighters than expected, but the numbers were small and the finding was not statistically significant. Risk was not related to duration of service or incidents attended, but the subgroups were very small.

When compared to the Australian population, stomach cancer was not increased but it was significantly raised for those firefighters who worked before 1985 but not for those employed after this date. There was no relationship with employment duration or number or type of incidents attended in internal analyses.

Compared to the Australian population, mesothelioma was statistically significantly increased for those male career full-time firefighters who had been employed for less than 10 years, but not for those in longer employment duration groups, but these analyses were based on small numbers.

Lung cancer incidence was not increased compared to the Australian population, nor did it increase with employment duration in external or internal analyses, nor with number or type of incidents attended. Definitive conclusions about the work-relatedness of lung cancer are difficult to draw in the absence of individual smoking data.

When compared to the Australian population, suicide rates were statistically significantly reduced for career full-time firefighters overall, but were elevated for those firefighters whose employment was complete before 1985 but not for those still employed after 1985. In

internal analyses, the risk of suicide was significantly reduced for the post-1985 group compared to the pre-1985 group.

Attendance at fires was associated with an increased risk of death from circulatory causes when compared to those who had attended fewest fires but the association was not statistically significant for the highest attendance group.

There was no evidence of an increased risk of overall mortality or cancer incidence among career full-time firefighters who were trainers, but the numbers were small.

Male Part-time Paid Firefighters

For male part-time paid firefighters, cancer incidence, specifically prostate cancer and melanoma incidence, were significantly raised compared to the Australian population. The prostate cancer risk was significantly associated with more than 10 years of employment both in internal and external analyses and there was a significant trend with duration but not number of incidents in internal analyses.

Melanoma risk was significantly associated with more than 20 years of employment when compared to the Australian population. When compared to state rates, melanoma risk was increased nationally and for firefighters from NSW. There was no significant trend for melanoma with duration or incidents in internal analyses.

Cancer of the digestive organs was similar to population rates for part-time paid firefighters overall but was significantly raised for firefighters with more than 20 years employment compared to those with less than 10 years employment, with a significant trend. There was however, no relationship with number or type of incidents attended.

Compared to the Australian population, brain and thyroid cancer were not significantly raised for part-time paid firefighters as a whole, but were significantly raised for those first employed before 1970 but not with other eras of first employment.

Male Volunteer Firefighters

Male volunteer firefighters did not have an overall increased risk of cancer compared to the Australian population and there was no trend of overall cancer increasing with duration of service in internal analyses, but there was a trend of increased cancer risk with the number or type of incidents attended.

Male volunteer firefighters had a significantly increased risk of prostate cancer compared to the Australian population and this was mainly associated with firefighters who had served for more than 10 years in external analyses and more than 20 years in internal analyses. The

internal analyses showed a statistically significant trend for increasing prostate cancer risk with duration of service but not with tertile of incidents.

Testicular cancer was not increased for male volunteer firefighters overall compared to the Australian population but was significantly increased for those volunteers who have attended fires compared to those who had not attended fires. It was also significantly increased for those volunteers who served for more than 20 years when compared to volunteer firefighters who served for less than 10 years (with a significant trend) and raised but not significantly so when the 20 years+ group were compared to the Australian population. There were also significantly elevated risks for some incident tertiles but there was no trend of increasing risk with increasing number or type of incidents.

Kidney cancer was not elevated when compared to the Australian population or when examined internally by service duration but there were some significant trends of increased risk with the number of incidents attended, although no individual incident tertile was significantly elevated.

Compared to the Australian population, cancer of the lip was significantly raised for volunteers who had served for more than 20 years and for those who first served before 1970. Internal analyses did not show an association with duration or number or type of incidents attended.

Melanoma risk did not appear to be related to volunteering as a firefighter with no increased risk compared to the Australian population, and no increased risk with internal analysis based on duration or number and type of incidents.

There was no increase in digestive cancers compared to the Australian population, although there were some significant trends when examined in relation to number and type of incidents, but no incident tertile was significantly elevated.

Lung cancer risk was significantly reduced when compared to the Australian population and did not show an increasing trend with duration or number or type of incidents attended. This reduction is likely to be related to the probable lower smoking rate among male volunteer firefighters.

Male volunteer firefighters had a significantly increased risk of dying in a fire, which was most likely related to two major bush fire events in the past but the mortality data does not identify whether or not the deaths were in the line of duty. Increasing duration of service was related to a significantly decreased risk of a traumatic death but increasing attendance at structural and car fires showed a significant positive trend although were no risks higher than for those who had not attended incidents.

For volunteer firefighters who attended incidents, increasing numbers of incidents appeared to be associated with trends of increases in overall deaths, of cancer incidence, of death from cancer and from circulatory disease but the mortality of the group as a whole was still significantly less than that of the Australian population.

Female Firefighters

For female career full-time firefighters there were too few deaths or cancer cases for meaningful analyses. The limited data suggested that their risks were not higher than that of the comparable members of the Australian population. For female part-time paid firefighters there were also too few deaths for meaningful analyses but there was no observed overall increased risk. For part-time paid female firefighters, there was a statistically significant increase in brain cancer, which was based on only three cases.

Female volunteer firefighters had an increased risk of accidental death compared to the Australian population for those who commenced after 1994, but it is not known whether this increase was associated with service as a firefighter. There was no association between number of incidents attended and increased mortality from accidents.

Overall cancer incidence for female volunteers was similar to that of the Australian female population but there were statistically significantly more melanomas, particularly for firefighters recruited after 1994 but the excess did not appear related to service duration or number or type of incidents in internal analyses.

There was a borderline significant result for increased colorectal cancers for those women who first volunteered after 1994. There were statistically significantly increased risks of colorectal cancer for those who had attended the most structural fires, and of female reproductive cancers for those who had attended the most landscape fires but there were no significant trends by incident or duration of service.

Other Matters

There was no evidence in male firefighters of an increase in bladder cancer, multiple myeloma or leukaemia, which were all cancers of prior interest based on previous studies. There was some evidence for an increase in digestive system cancers. However, there was limited statistical power to investigate most of the rarer types of cancers such as mesothelioma. In women, there was no evidence of an increase in cervical cancer, thyroid cancer or breast cancer but numbers were limited for paid female firefighters.

Mesothelioma has a long latent period of 30-40 years, so occupationally-related cases may not have had time to arise in this fairly recent cohort.