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Economic burden of fire-related deaths in Finland, 2000–2010: Indirect costs using a human capital approach



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ARTICLE INFO

Article history:

Received 21 August 2015

Received in revised form

14 October 2015

Accepted 19 October 2015

Keywords:

Fire

Burn

Carbon monoxide poisoning

Economic burden

Cost

Human capital

Productivity loss

ABSTRACT

Background: The aim of this study was to examine the indirect economic burden of fire-related deaths in Finland in the period 2000–2010.

Methods: The Human Capital (HC) approach was the main method used to estimate productivity losses due to fire-related deaths. Additionally, Potential Years of Life Lost (PYLL) due to deaths were reported.

Results: A total of 1090 fire-related deaths occurred in the period 2000–2010 within a population of some 5.4 million. The majority were male (76% vs 24%), with a mean age of 52 (CI: 51.0–53.2) years for males and 57 (CI: 54.6–59.6) for females; 24% (CI: 21.1–26.2%) of victims were over the retirement age. Most of the victims died of combustion gas poisoning (65%, CI: 61.8–67.6%), followed by burns (33%, CI: 30.6–36.3%). Alcohol was often involved and victims were often socially disadvantaged, with socioeconomic features significantly deviating from those of the general population.

Annual PYLL ranged from 2094 (CI: 1861–2326) to 3299 (CI: 3008–3594), with an annual average PYLL of 2763 (CI: 2675–2851). PYLL per death fell in the study period from 34.3 (2000, CI: 31.0–37.7) to 24.6 (2010, CI: 21.8–27.6). The reduction is attributable to a decreasing fraction of young victims and an increase in average ages.

Conclusions: Total productivity loss in the period 2000–2010 was c.a. EUR 342 million (CI: 330–354 million), giving an annual average of EUR 31.1 million (CI: 30.0–32.2 million), with the mean for a victim being EUR 0.315 million (CI: 0.30–0.33 million).

The economic burden of deaths is considerable and this study remedies the lack of academic knowledge about the burden of fire-related deaths.

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<http://dx.doi.org/10.1016/j.burns.2015.10.015>

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1. Background

Injury is a major part of causes of death worldwide. Fire-related injuries in particular cause great suffering and a number of premature deaths. The incidence of fire-related deaths in Finland has been mostly higher than in other Nordic countries. During the past decade the range of fire-related deaths per million inhabitants per year was 14.5–20.6 in Finland, while in Sweden it was 7.2–15.5, in Denmark 12.7–17.1, and in Norway 12–17.3 [1]. In Finland (population of some 5.4 million) the average annual number of fire-related deaths was 99 in the period 2000–2010 [2]. In addition there are approximately 300 “severe” fire-related injuries leading to inpatient care annually [3].

Circumstances behind fire-related deaths in Finland in the period 2007–2010 have been reported thoroughly by Kokki [4]. Smoking has been identified as a significant factor in deaths due to fire. Preventive measures—such as the legislation of April 2010—made fire-safe cigarettes mandatory in Finland. This resulted in a one-third reduction in deaths in 2010 compared to the period 2007–2009. However, the number of victims on low income increased in the period. The number of deliberately ignited fires leading to death also increased in the low income group. It has been hypothesized that fire and rescue services alone may not have an answer to the problem posed by increased deaths related to deliberately caused fires in the low income group. Kokki [4] suggests that “the risk of fire-related death in this group could be reduced with successful social work and policies”.

In the USA, reports based on the WISQARS™ database [5] estimated the cost of work loss from fire/flame death in 2010 to be USD 2 520 357 000 in total for 3127 deaths, which averages some USD 810 000 per death. In general, the limited amount of information available on the economic burden of fire-related deaths warrants more research targeted at this issue specifically.

This study is part of a larger study in which the costs and consequences of fire-related injuries are studied. The aim of this study was to assess the indirect economic burden of fire-related deaths, given the lack of empirically based information on this topic.

2. Methods

2.1. Source of data

Data on fire-related deaths in Finland in the period 2000–2010, as recorded in the Causes of Death statistics, were delivered to researchers by Statistics Finland (SF). All deaths with an external cause code of X00–X09 (Exposure to smoke, fire and flames), X76 (Intentional self-harm by smoke, fire and flames), X97 (Assault by smoke, fire and flames) or Y26 (Exposure to smoke, fire and flames, undetermined intent) as per the 10th revision of the International Classification of Diseases and Related Health Problems [6] were extracted from the statistics for the period 2000–2010. These data were then linked to personal register data (SF) that included information on gender, age, marital status, occupational status and income

for the year preceding the death. Additionally, gender- and age-specific life expectancy data were obtained from SF.

2.2. General assumptions

Several assumptions were necessary in order to carry out the analyses. It was assumed that the labor force cost distribution as derived from registered individual income was a reasonable proxy for estimating productivity losses according to the Human Capital method (as Present Value of Lifetime Earnings (PVLE), taking income and household work into account). The value of forgone household work was calculated using data from a time-use survey by SF combined with the mean salary of a service worker (Table 1). The procedure can thus account for income and household work differences according to gender and age. A cross-sectional image (2000–2010) of occupational/socioeconomic status was assumed to prevail during time. Age-specific employment participation rates (derived from the data) were used to adjust for labour activity; 18–30:34%, 31–40:35%, 41–50:35%, 51–65:16%. Age groups 0–17 and 66+ were omitted from labor productivity having virtually no participation. It is plausible for a person’s status to change from unemployed to employed. Nevertheless, vice versa may apply as well. Though upward economic trends might improve the rate of participation in the labor force, downturns may occur as well [7]. We find it reasonable to assume prevailing cross-sectional image as there is no evident reason for drastic change in socioeconomic parameters concerning fire victims. It was assumed to resemble a “zero sum game” in which there may be transitions from a status to another but the “big picture” prevails. Therefore, the results may not be applicable to a victim in individual level; for example, some could be working practically throughout his/her whole life span and the other would spend time mostly outside of labor force. However, aggregate level results in a sense of averages should apply.

2.3. Analysis

Basic epidemiological information on fire-related deaths was reported so as to characterize victims of fire in Finland.

Table 1 – Age- and gender-specific distribution of labor force cost (euro) and household productivity per year.

Age	Male	Female
Mean labor force cost by age group		
0–17	–	–
18–30	38430	21430
31–40	38560	29560
41–50	41720	37390
51–65	44640	31480
66+	–	–
Mean household productivity by age group		
0–9	–	–
10–14	2030	2842
15–24	3898	4467
25–44	9908	17704
45–64	8446	14781
65+	8365	14456

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