

# Comparison of Injuries and Accidents Globally and in Finland

R. Pääkkönen, L. Korpinen

**Abstract**—We tried statistically to determine the biggest risks for accidents and injuries in Finland compared to other countries. We have a very high incidence of domestic falls and accidental poisoning compared to other European countries. On the other side, we have a relatively low number of accidents in traffic or at work globally, and in European scale, because we have worked hard to diminish these forms of accidents. In Finland, there is work to be done to improve attitudes and actions against domestic accidents.

**Keywords**—Injuries, accident, comparison, Finland.

## I. INTRODUCTION

THE global population is 7.4 billion (January 2016). About 2.2 million people (0.03%) die from work-related accidents and diseases each year, according to the International Labour Office (ILO) [1]–[3]. Injuries—resulting from traffic collisions, drowning, poisoning, falls, or burns—and from violence—such as assault, self-inflicted violence, or acts of war—kill more than five million people worldwide annually and cause harm to millions more. They account for 9% of global mortality and are a threat to health in every country of the world. For every death, it is estimated that there are dozens of hospitalizations, hundreds of emergency department visits, and thousands of doctors' appointments. A large proportion of people surviving their injuries incur temporary or permanent disabilities [4].

Injuries and violence can be studied and documented, and their causes understood and acted upon. Research has provided clear evidence that certain interventions can prevent injuries and violence, including for example seat-belts, helmets and enforced blood alcohol limits to prevent road traffic injuries; child-resistant containers to prevent poisonings; home hazard modification to prevent falls among the elderly; pool fencing to reduce the risk of drowning; treatment of depression to prevent suicide; school-based educational programs to prevent intimate partner violence, and home visitation programs to reduce child maltreatment [4]. WHO works to prevent injuries and violence, mitigate their consequences, and enhance the quality of life for disabled people.

Occupationally in Europe in 2012, there were just under 2.5 million non-fatal occupational accidents that resulted in at least four calendar days of absence from work and 3,515 fatal accidents in the EU. These numbers marked a substantial reduction compared to 2009, when there had been approximately 313,000 more non-fatal occupational accidents

and 310 more fatal accidents. Men are considerably more likely than women to have accidents (non-fatal) or to die at work. In the EU-28, almost four out of every five (78.5 %) non-fatal accidents at work and 19 out of every 20 (95.6 %) fatal accidents at work involved men. [5]

Sas & Stang [9] performed a cross-sectional telephone survey from 2003 to 2004 of the resident adult population of Germany, which included 7,341 subjects (response rate: 32.6 to 39.4%). The interview included 13 questions about injuries caused by accidents that happened in the 12 months preceding the interview. They estimated one-year cumulative incidences of injuries by gender, age, and educational level. Overall, 10.3% of the subjects reported an unintentional injury requiring medical treatment in the previous 12 months. The age-standardized incidence of injuries was higher among men than women (men: 11.3%, women: 8.9%). Generally, accidents at home were the most frequently reported (27.4%). Men and women aged 18 to 29 years suffered accident-related injuries (and also repeat injuries) the most often during the preceding 12 months. Although the overall incidence of injuries caused by accidents did not differ by educational level, the incidences of accidents at different places differed by educational level. The incidence of work-related injuries was higher among people with a low educational level. They concluded that the age- and gender-specific results provided detailed insight into specific patterns of accident-related injuries in Germany. Like in many other reports, young men are especially at high risk of injuries. This information is valuable because a nationwide comprehensive recording of injuries caused by accidents does not exist in Germany. Their collected data also highlighted the target groups for injury prevention measures.

Keall et al. [10] combined exposure estimates from existing surveys and scenarios with estimates of the exposure risk relationship obtained from a structured review of the literature on injury in the home and housing conditions. Their resulting attributable fractions were applied to burden of injury data for the WHO European Region. Their analysis estimated that two specific hazards, the lack of window guards at the second level and higher, and the lack of domestic smoke detectors resulted in an estimated 7,500 deaths and 200,000 disability adjusted life years (DALYs) per year. They estimated the environmental burden of injury associated with housing and realized important deficiencies in injury surveillance data and related limitations in studies of injury risk attributable to the home environment.

L. Korpinen is with Department of Electronics and Communications Engineering, Tampere University of Technology, P.O. Box 692, 33101 Tampere, Finland (Phone: +358 3 3115 11; fax: +358 3 364 1385; e-mail: leena.korpinen@tut.fi).

R. Pääkkönen is with Tampere University of Technology, P.O. Box 692, 33101 Tampere, Finland, (e-mail: rauno.paakkonen@gmail.com).

The ability to attribute proportions of the home injury burden to features of the home was correspondingly limited, leading to probable severe underestimates of the burden. The burden of injury from modifiable home injury exposures is substantial. Estimating this burden in a comprehensive and accurate manner requires improvements to the scope of injury surveillance data and the evidence regarding the effectiveness of interventions.

The purpose of this study was to statistically determine the locations of the biggest risks for accidents and injuries in Finland compared to other countries.

## II. MATERIAL AND METHODS

There are many relatively reliable statistics about Finnish domestic and occupational accidents and injuries given by the Ministry of Social Affairs and Health, National Institute for Health and Welfare (THL), Finnish Institute of Occupational Health, Centre of Statistics in Finland, Center of Insurance companies and so on. Therefore, we performed a statistical comparison and evaluation on Finland to be able to compare that data to foreign material—if available.

## III. RESULTS

### A. Injuries and Accidents in Finland

The Finnish population is 5.5 million. In 2014, about 2,220 fatalities (0.04%) occurred in Finnish home and leisure time accidents, about 230 fatalities in road accidents, and 26 persons died at their places of work. Most accidental injuries take place at home or during leisure time. Finnish national program against home and leisure time accidents has set a target to reduce serious and fatal injuries by 25% by 2025. There is also a goal to reduce road accidents by 50% by 2020. Annually, 320,000 physical injuries occur for those older than 15, which is 29% of all accidents.

Domestic accidents occur annually for about 270,000 persons (6.4%) for the persons aged over 15 years. Domestic accidents have almost doubled in the last 25 years in Finland. Activities in relation to domestic accidents are cooking 20%, service, construction and maintenance outdoors 17%, indoor repair and maintenance 9%, cleaning and laundry work 7%, and hobbies 6%. Finland has been able to reduce occupational accidents to Nordic levels, but Finland is 20th in Europe in domestic and leisure time accidents [6].

The most common fatal accident for both males and females is falling or dropping, annually killing about 1,200 persons. More than one third of fatal accidents were caused by falling or dropping [7]. Physical injuries for the Finnish population over 15 years old is shown in Table I.

Haikonen and Lounamaa [11] conducted a survey in Finland, on the Finnish population aged 15 and over, and they experienced nearly 1.2 million accidents or assaults that resulted in physical injury. Accidents at home totaled about 320,000, sports accidents totaled about 348,000, and other leisure-time accidents totaled approximately 123,000. In addition, there were about 74,000 traffic accidents and nearly 230 000 accidents at work. Almost three out of four accidents were leisure-time accidents or accidents at home (32% sports

accidents, 29% accidents at home, and 11% other leisure time accidents).

TABLE I  
PHYSICAL INJURIES FOR OVER 15 YEARS OLD POPULATION IN FINLAND [11]

Accident type	Number of accidents
Exercise and sports	348,000
Domestic	321,000
Occupational accidents	230,000
Other accidents	123,000
Traffic accidents	74,000
Violence	100,000
Sum	<b>1,196,000</b>

Altogether the costs of domestic and leisure time accidents were estimated to be about 1-4 billion Euros annually, which is about 1% of the Finnish domestic gross product (205 billion Euros). The most expensive costs came from hospital periods and surgery. The costs from adverse effects of alcohol were evaluated to be 1.2-1.4 billion Euros, and the costs of drug abuse about 330-380 million Euros in Finland in 2010. These numbers also include accident causes.

According to Haikonen and Lounamaa [11], accidents that occurred in the population aged 15 and over during the course of one year led to more than 400,000 visits to physicians, tens of thousands of treatment cycles in hospitals, and a great deal of other care needs. In addition to requiring urgent medical attention, interviewees also reported many cases of longer-term harm caused by accidents. Nearly 280,000 accidents led to sick leave and 663,000 accidents to difficulties in coping with daily activities. Likewise, domestic accidents also substantially harm productivity at work.

Accidents cause a significant amount of fatalities for work aged and younger persons. Accidents and violence is the fourth most common cause of death for persons aged less than 70 years in Finland. Only tumors and circulatory diseases are more common fatal causes. [7].

When it was asked what kinds of risks worried participants the most between domestic and leisure time, traffic, or occupational injuries, typically traffic was clearly the most prominent subjective worry (55%), then domestic and leisure time (25%), and occupational (20%). This also describes that our risk perception is not relevant when compared to realized risks and consequences.

### B. Comparing Finland to Other Countries

Table II illustrates comparison between Finland and other countries [12]. In Finland, we have a very high incidence of falls and accidental poisoning compared to other European countries (Fig. 1), thus placing Finland in the group of countries with the most domestic and leisure time accidents in Europe [12]-[14]. It was very difficult to get a realistic understanding of the amount of physical injuries in different countries. Therefore, comparison between EU-28 and Finland is lacking, and it is not reliable.

TABLE II  
COMPARISON OF GLOBAL, EUROPEAN, AND FINNISH STATISTICS ON INJURIES

Area	Population	Fatal accidents	Physical injuries
Global statistics	7.5 billion	5 million (0.07%)	
Europe EU-28	510 million	152 000 (0.03%)	38 million (7%)
Germany	82,5 million	19 000 (0.02%)	8 million (10%)
UK	64 million	14 000 (0.02%)	
Finland	5.5 million	<b>2220 (0.04%)</b>	320 000 (29% of all accidents)

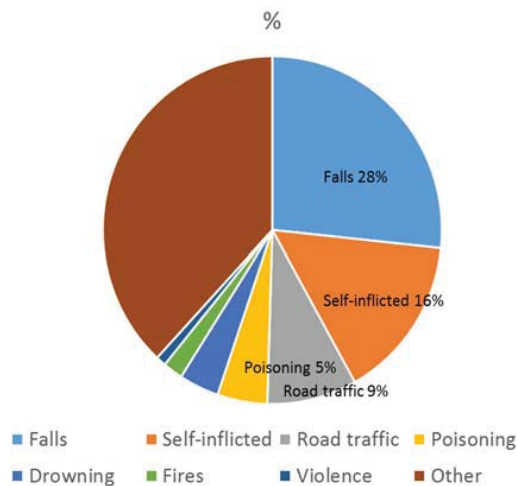


Fig. 1 Fatal injuries amongst older persons (60+ years) by causes of death in Europe [12]



Fig. 2 Ladder work is risky

TABLE III  
COMPARISON OF GLOBAL, EUROPEAN AND FINNISH STATISTICS ON FATAL OCCUPATIONAL AND ROAD TRAFFIC INJURIES

Area	Population	Fatal	Fatal
		Occupational accidents	Road accidents
Global statistics	7.5 billion	2.2 million	1.25 million (167/million)
Europe EU-28	510 million	3,515	26000 (51/million)
Germany	82,5 million	473	3 300 (41/million)
UK	64 million	149	1 800 (28/million)
Finland	5.5 million	26	230 (42/million)

If fatal occupational and road traffic accidents are compared, we get Table III. In this respect, Finland is in line with other European countries.

#### IV. DISCUSSION

There has been contradictory discussion on the correlation of the fatal injuries, minor injuries, near misses, and risk behavior. [8]. However, there is some correlation between these parameters; for example, for every fatality there are 300 recordable injuries, 3000 near misses, and 300,000 risk behaviors. This means that if we know fatal injuries to be, for example, 2000 in Finland, this means that we have 6 million near misses and 60 billion risk situations every year. This kind of approach could be also applied to Table II, which suggests that there is more than one near miss and more than 10,000 risk behaviors for each individual in Finland. If we want to reduce domestic and leisure time injuries in Finland, we have to attempt to make an impact on those 6 million near misses and 60 billion risk situations. This means that we have to improve national attitudes against accidents and their consequences.

There could be better analytical solutions to domestic and leisure time accidents (Figs. 1-3). This launches a discussion where privacy, helping devices, and attitudes play a main part. In Finland, most of the domestic and leisure time accidents happen to older persons and senior citizens, where very often diseases, sense of balance, and disabled moving can increase the risk of accidents. It is possible to develop tools for the risk assessment and management of domestic and leisure time activities.

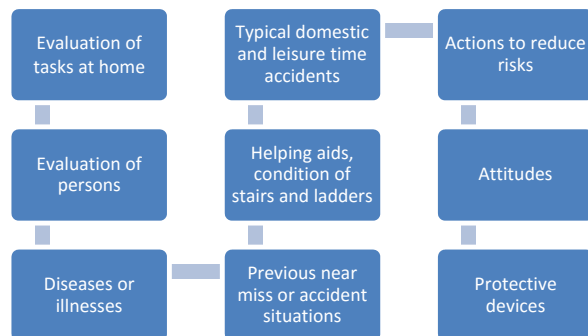


Fig. 3. Path to reducing domestic and leisure time risks

Risk perception in Finland among senior citizens needs better understanding because it is not relevant when compared to realized risks and consequences. Home and leisure time can be dangerous; we can so easily fall or slip, which can cause older, disabled, and obese individuals injuries. This means that there is a need to improve attitudes, training, and precautionary principles. Another important issue is accidents affecting those aged 10-25 years. They also need better training, for example, at school and at home. Young, risk-seeking males are at focus.

Occupational accidents and diseases are much better estimated and evaluated than domestic or leisure injuries in Finland and globally (Tables II and III). One reason for this is insurance policies and legal responsibilities of employers.

However, like in Finland, domestic and leisure time activities cause a hundred-fold number of fatalities and also injuries. Therefore, there is a vital need to improve leisure time attitudes against injuries. This means campaigns and activities in social media, radio and TV; moreover, there is work to be done in education on all levels.

We have not analyzed violence or suicides because they are not the most important issues in Finland at the moment. The number of suicides has declined over the last 20 years (about 900 cases in 2014), but it was twofold earlier. However, our suicide numbers are high from a European perspective. So far violence has not been a big issue, but this could change.

Domestic and leisure time accidents should also be evaluated better globally because according to this analysis, domestic accidents are the most common and the least analyzed. Even exercise and sports accidents have been analyzed much more. We understand that statistics are very hard to collect, but there are many possibilities to reduce domestic accident risk after analysis. However, these actions differ in different countries and continents; some may focus on fire safety, whereas others concentrate on habits of service and maintenance activities, how we watch our children, and accident prevention.

#### V.CONCLUSION

We conclude that there has been a lot of effort in ascertaining the prevalence of injuries with respect to occupational and traffic accidents. We should better prevent domestic injuries both for human suffering, but also for national economy reasons.

#### REFERENCES

- [1] P. Hämäläinen, "Global estimates of occupational accidents and fatal work-related diseases," Dissertation. Publications 917, Tampere University of Technology, Tampere 2011.
- [2] J. Takala, "Global estimates of occupational accidents," *Epidemiology*, vol. 10, no. 5, pp. 640–646, 1999.
- [3] World Health Organization (WHO), World health statistics 2015, WHO, Geneva, printed in Luxembourg, WHO 2015.
- [4] World Health Organization (WHO), Injury pages 2015, <http://www.who.int/topics/injuries/en/> Read 10 January 2016.
- [5] Eurostat, [http://ec.europa.eu/eurostat/statistics-explained/index.php/Accidents\\_at\\_work\\_statistics](http://ec.europa.eu/eurostat/statistics-explained/index.php/Accidents_at_work_statistics)
- [6] Ministry of Social Affairs and Health Finland, 2015, <http://stm.fi/tapaturmat>
- [7] Suomen virallinen tilasto (SVT): Kuolemansyyt (verkkajulkaisu). ISSN=1799-5051. Helsinki: Tilastokeskus (viitattu: 10.1.2016). Saantitapa: <http://www.stat.fi/til/ksyyt/>
- [8] K. Nichol, Safety 101. The safety triangle explained. <http://crp-safety101.blogspot.fi/2012/07/>, read 10 January 2016.
- [9] A-C, Sas A-C, and C. Stang, Population-based incidences of non-fatal injuries—results of the German-wide telephone survey 2004, *BMC Public Health*, vol. 13, no. 376, 2013, <http://www.biomedcentral.com/1471-2458/13/376>
- [10] M. Keall, D. Ormandy, and M. Baker, Injuries associated with housing conditions in Europe: a burden of disease study based on 2004 injury data," *Environmental Health*, vol. 10, no. 98, 2011, <http://www.ehjournal.net/content/10/1/98>
- [11] K. Haikonen, A. Lounamaa (Eds.), Suomalaiset tapaturmien uhreina 2009, kansallisen uhritutkimuksen tuloksia (Victims of accidents in Finland 2009. Results from the national victimisation survey)," National Institute for Health and Welfare (THL), Report 13/2010, p. 77. Helsinki 2010.
- [12] EuroSafe, Injuries in the European Union, Report on injury statistics 2008-2010," Amsterdam, 2013.
- [13] Eurostat Statistics, Standardised death rates — accidents and assault, 2012 (per 100 000 male female inhabitants)," Read [http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Standardised\\_death\\_rates\\_%E2%80%94\\_accidents\\_and\\_assault\\_2012\\_\(per\\_100\\_000\\_male\\_female\\_inhabitants\)\\_Health2015B.png](http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Standardised_death_rates_%E2%80%94_accidents_and_assault_2012_(per_100_000_male_female_inhabitants)_Health2015B.png)
- [14] A-C, Sass A-C, "Accidents in Germany," *Dtsch Arztebl Int*, vol. 105, no. 36, 604–608.

**Rauno Pääkkönen** is an Adj. Professor, DSc at Tampere University of Technology and the CEO of his own company. He also works as a Counsellor in Environmental Issues at the Finnish Supreme Administrative Court. His research has focused on work environmental factors and well-being. He has contributed to more than 370 scientific texts and 170 popular articles. He retired in 2015 as a Director of the theme that included all kinds of well-being solutions at work at the Finnish Institute of Occupational Health.

**Professor Leena Korpinen** is a multidisciplinary scientist: a Doctor of Medicine and a Doctor of Technology and also a licensed doctor in medicine. Her doctorate handles electric power engineering, more precisely the employee health effects of exposure to low frequency EMF. In 1998, she was awarded a professorship in electric power engineering. From 2001-2007, Dr Korpinen led the Laboratory of Electrical Engineering and Health at TUT. From 2008 due to the structural changes at TUT, her professorship has been in environmental health, more specifically "the environmental effects of energy production and distribution, and of traffic." She is also a member of the Bioelectromagnetics Society (BEMS), European BioElectromagnetics Association (EBEA), the Conseil International des Grands Réseaux Electriques (CIGRE), and is the Secretary of the Scientific Committee on Radiation and Work of the International Commission on Occupational Health (ICOH).