

SFPE EUROPE



Q1 2022 ISSUE 25



AN OFFICIAL PUBLICATION OF SFPE

Elderly at Home and Fire Safety: The Spanish Case

By: María Fernández-Vigil, School of Architecture, University of Navarra, Spain
Juan B. Echeverría Trueva, School of Architecture, University of Navarra, Spain

This is a short version of the article published in Fire Technology “Elderly at Home: A Case for the Systematic Collection and Analysis of Fire Statistics in Spain”

The use of a homogeneous and regulated system for the collection of fire data has demonstrated to be an essential tool to understand the fire problem and the identification of the key risk factors underlying major accidents. Several countries, such as the US, UK, New Zealand, Australia or Japan, have already developed a systematic collection of fire incident data [1–5].

In Spain, 77% of fatal fires from 2010 to 2016 were residential fires, and 60.1% of fatal victims were people over 65 years old [6–11]. Unfortunately, there is not a comprehensive national fire incident which allows the identification of the risk factors for residential fires in dwellings occupied by elderly people, and previous research is sparse and incomplete.

Therefore, the first step for the characterization of the fire problem, and specifically residential fires involving elderly people, is necessarily the creation and assessment of a fire database.

1. Current Situation in Spain

At the present time, there is no nation-wide, systematic approach to collecting, analyzing and presenting fire loss data in Spain. The statistic treatment of the fire departments interventions in Spain is poorly regulated, and it does not have homogeneity: since 1994, official statistics have not been published.

Currently in Spain, the only existent documents about fire victims are those annually published by Mapfre Foundation in collaboration with “Asociación Profesional de Técnicos de Bomberos”¹ (APTB) since 2010 [6–12]. These reports show information about fatal victims in structural fires and are developed from data detailed by fire departments, who voluntarily fill out a form answering some questions.

¹ Asociación Profesional de Técnicos de Bomberos, APTB, could be translated as “Professional Association of Firefighters”

However, researchers do not have access to the original database used for the development of the reports, which prevent the analysis of the key risk factors for specific population groups.

Through a new database, it will be possible to collect incident data of all residential fire incidents, injured victims and deaths and to link the collected parameters and the age of the victim.

2. Justification of the research

The focus on the elderly population is necessary considering the Spanish demographic predictions: the Spanish National Statistical Office (*Instituto Nacional de Estadística, INE*) estimates that by 2064 adults aged 65 or older will comprise 38,7 percent of Spain; that is, they will be more than the third part of the Spanish population.

In addition, previous analysis of fire data indicated that there are certain groups, such as the elderly, that have a higher risk of mortality per residential fire [13]. The reasons why elderly people are more vulnerable in a fire than the general population have been investigated in different countries [14–21], and are related to several factors such as: the decline in physical health [3, 14, 22–24]; the onset of some mental illness [15]; their vulnerability to burn injuries [16]; the prevalence of a low socio-economic status and pre-existing diseases; the use of old and under-standard electric appliances [18]; the social isolation; or the necessity of heating the household for more hours per day [25].

The combination of all these circumstances makes the elderly people a vulnerable group in case of fire.

3. Methodology

As first steps to overcome the lack of a nationally populated and managed fire incident database, a methodology for collecting fire data based on information extracted from the media was developed.

For the development of the database, the tool MyNews Hemeroteca [26] was used, and the search was done with two keywords: “Fire, dwelling”. The collected data included variables about fire incidents, injured victims and fatal victims in residential fires in Spain in 2016. The results of the statistical analysis were used to assess fire risk to the elderly population living in their dwellings.

4. Results and discussion

4.1. Overall trends

Home fires cause more than three out of four fire deaths in that type of accidents [7–12]. This means that dwellings are the most common place where fatal fires happen, far away from the next one, exterior fires, which account for 12% of deaths.

Residential fires are also the main scenario where casualties occur in other countries, such as the US, the UK, China, New Zealand or Sweden [4, 25, 27–31]. However, these events are not distributed evenly through society, but there are certain sectors that experience disproportionate numbers of incidents.

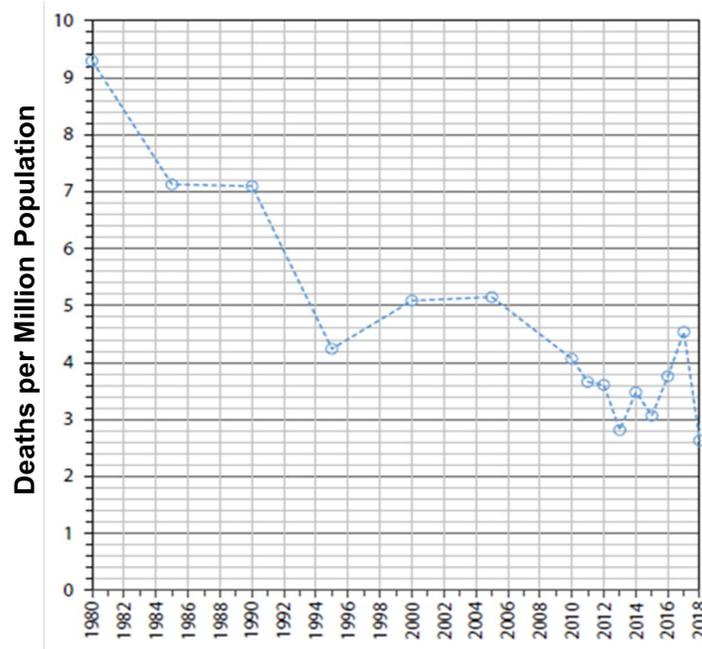


Figure 1 Fire Death Rate pmp in fires in Spain, by year. 1980-2018. Source: Mapfre Reports [6–12, 32].

Fire death rates per million population (pmp) have fallen a 48% since 1980. However, this descending trend suffered a turning point in 2013, and since then the number of fatalities has increased by 61% (Figure 1). The first quarter of 2019 closed as the worst since Fundación Mapfre prepares these reports [32].

4.2 Age and gender

In 2016, home fires killed 80 people 65 or older. While this age group accounted for only 18,9% of the general population [33], they accounted for 60,6% of fire deaths. This means that adults 65 and over were 3,2 times as likely as the general population to die in fires and for those individuals aged 85 or older, the risk was 8,5 times as high.

Males have a higher risk of fire death and injury in home structure fires, in all age groups. Although Spanish Statistics Office (INE) figures show that 51% of the population is female [33], 58% of fatal home fire victims in 2016 were male.

Therefore, as it happens in other countries, the group that experiences the highest risk of fatal fire is men over 65 years-old, and it increases with age [14, 15, 37–40, 16, 19, 29–31, 34–36].

4.3 Fatal Fire Profile: Average Income in the location, age of the building, month, and leading causes

Almost 60% of injuries and 70% of deaths were in locations where the gross income was lower than the national average. In 2016, the risk was multiplied by 2,7 for people living in locations with the lowest incomes in Spain.

That year, homes built in the last 5 years had a low risk of being the origin of a fire with victims, and those with more than 45 years had higher risk of both deaths and injuries (Figure 2).

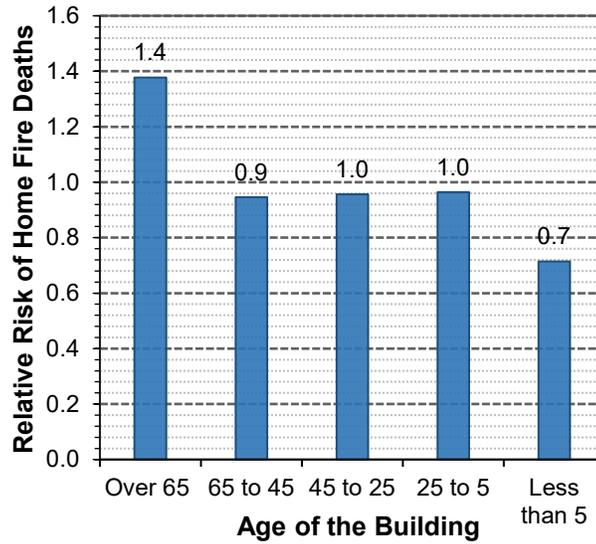


Figure 2: Relative Risk of home fire deaths by the antiquity of the building, 2016. Sources: Media database and *INE* [33].

Figure 3 shows that winter is the season with the highest percentage of deaths, while there is an important decrease of victims during summer, especially fatalities.

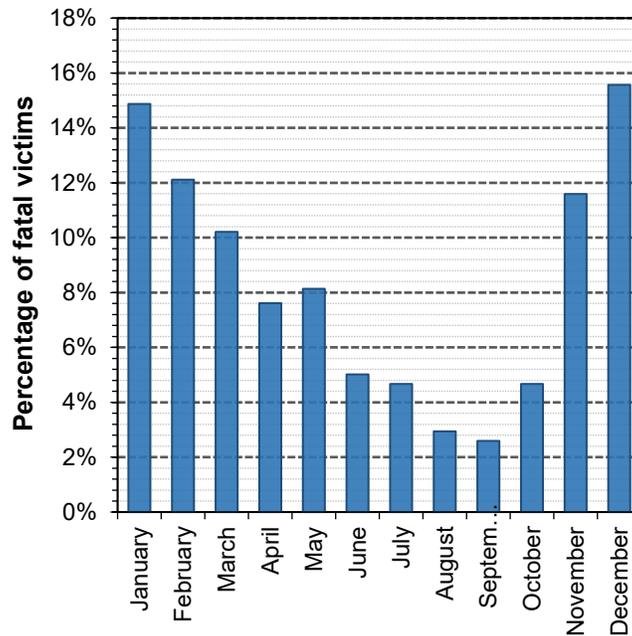


Figure 3: Percentage of fatal victims in residential fires by month, 2012-2016. Compilation based on Reports [6–11]

During 2016, the main cause of home fire deaths was heating equipment (fixed or portable space heaters). The second leading cause was electrical distribution and lighting equipment, followed by smoking materials and, in the fourth position, fireplaces (Figure 4). It could be affirmed that the risk of fire death or injury in the event of fire varies considerably by fire cause.

More than one-third (39%) of the older adult victims died in fires started by heating equipment, and they accounted for 71% of fatal victims in this type of fires.

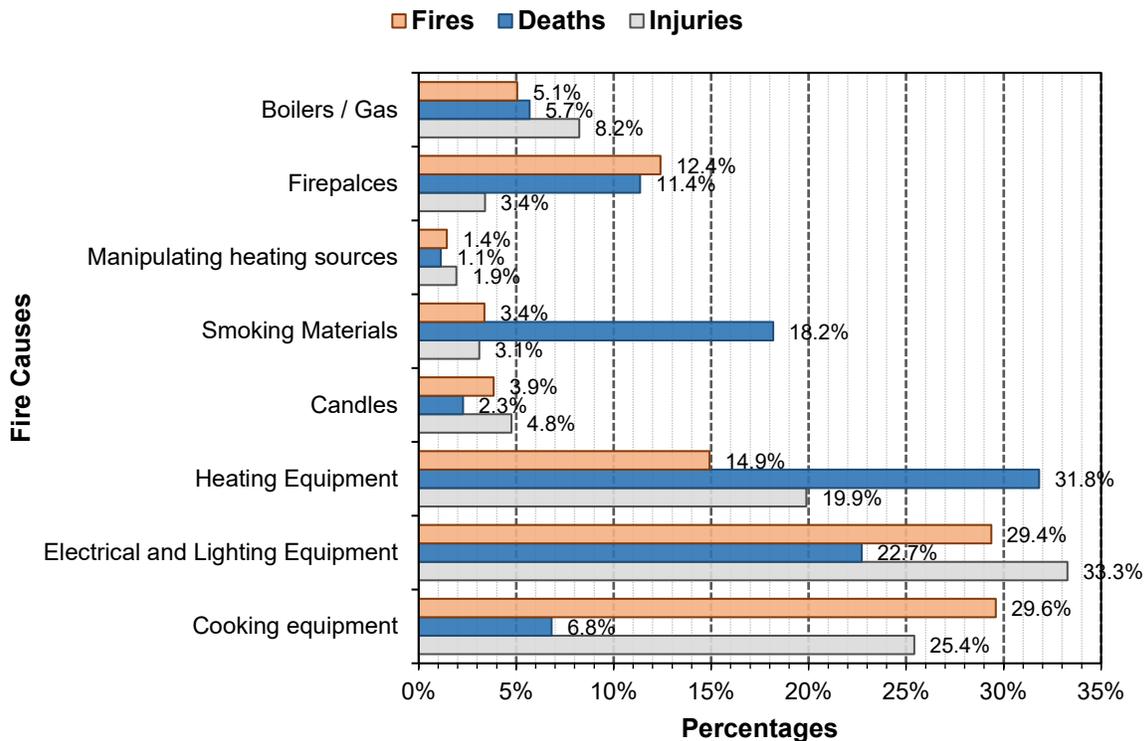


Figure 4: Percentage of fires, deaths and injuries in residential buildings, according to the fire cause. Year 2016.

Source: Media database

The influence that lower incomes have in the risk of home fire has been widely studied [3, 4, 42–45, 15, 22, 25, 29, 30, 35, 38, 41]. Deprivation in basic needs, as well as living on fixed income—a typical situation among elderly people—usually lead to a bad state of the dwelling, especially if it is old, since the necessary home arrangements cannot be afforded. In addition, some studies suggest that poverty may be related to a low educational level [14, 25], which can interfere with an older adult’s ability to understand the details regarding fire prevention and safety.

During the coldest months, the influence of low incomes and the antiquity of the building create a typical scenario of fatal home fires in Spain: if the central heating source of the dwelling does not work properly, the occupants cannot afford the cost of it or even it does not exist; people use to rely on temporary sources of heat, such as portable space heaters or fireplaces, to keep their homes warm. This situation makes heating systems the first cause of home fire deaths in Spain, representing an elevated fire danger to older adults.

However, in other countries such as the US, Sweden, Australia, or the UK the first cause are smoking materials [14, 16, 19, 25, 29, 34, 36, 38, 43].

4.4 Victim’s factor

During 2016, being asleep was a factor in, at least, 28% of the home fire deaths. More than one out of four of those killed had a physical or mental disability, 85% of them were over 65 years-old. The most frequent disability was low mobility: two thirds of fatal elderly victims were mobility impaired. 48% of the fatal victims were vulnerable people (elderly, children or disabled) who were unattended or unsupervised when the fire started, and almost one half were alone at home.

Results about the role played by disabilities in the fatality of a fire are consistent with different studies [14, 15, 46, 16, 19, 22, 29–31, 34, 35]. In fact, the presence of people with disabilities may affect the evacuation dynamics of the building [24] and it is expected that total evacuation times will increase as populations age [23], since they will be more likely to experiment physical or cognitive changes that can reduce their abilities to prevent, detect, or respond to fires.

Moreover, many older adults suffer mobility impairments, which make their ability to successfully escape from fires more difficult, particularly when combined with living alone. Some studies demonstrate that substance-induced impairments, such as those caused by the side effects of prescription medication, can result in a wide range of impairments that increase older adults' risks of fire, fire fatality, and fire injury [14, 34].

The combination of all these factors is very frequent in elderly people living in their own dwelling, making them a frail group in case of fire, without appropriate safety or evacuation measures.

5. Conclusions

This research is focused on the identification of the key risk factors for fires in dwellings occupied by elderly people. Most fatal fires have their origin in residential buildings; with elderly people being the most vulnerable group. Although the death and injuries rates per million population in Spain is much lower than the rates in other countries [47], the number of fire fatalities among the elderly is not decreasing, it is even increasing for those adults over 85 years-old [6–11]. In addition, this group is also increasing day by day [33], so we can expect that the number of fires continue growing in Spain.

The present research confirms, as several studies did before [14, 34], that elderly fatalities differ from general population fatalities in fire. These differences may suggest that preventive strategies for the elderly population require a different emphasis from those for younger people [16, 34, 37]. In addition, there are some factors that are different in Spain than in other countries which have more experience in the fire statistical work. Both reasons support the importance of fire data collection and analysis, as an essential task to understand how home fire incidents are and the consequent development of efficient fire safety measures and Building Codes and Regulations, which will lead the reduction of casualties.

6. References

1. United States Fire Administration (2011) National Fire Incident Reporting System Version 5.0 Fire Data Analysis Guidelines and Issues.
2. UK Department for Communities and Local Government (2009) Incident Recording System-Questions and Lists. London
3. Zhang G, Lee AH, Lee HC, Clinton M (2006) Fire safety among the elderly in Western Australia. *Fire Safety Journal* 41:57–61.
4. Duncanson M, Woodward A, Reid P (2002) Socioeconomic deprivation and fatal unintentional domestic fire incidents in New Zealand 1993–1998. *Fire Safety Journal* 37:165–179
5. Sekizawa A (2012) Necessity of Fire Statistics and Analysis Using Fire Incident Database-Japanese Case. *Fire Science and Technology* 31:67–75
6. Fundación Mapfre, APTB (2010) Víctimas de incendios en España 2010
7. Fundación Mapfre, APTB (2011) Víctimas de Incendios en España 2011
8. Fundación Mapfre, APTB (2014) Víctimas de incendios en España 2012 y 2013
9. Fundación Mapfre, APTB (2015) Víctimas de incendios en España en 2014
10. Fundación Mapfre, APTB (2016) Víctimas de incendios en España en 2015
11. Fundación Mapfre, APTB (2017) Víctimas de Incendios en España en 2016
12. Fundación Mapfre, APTB (2018) Estudio de víctimas de incendios en España en 2017
13. Nilson F, Bonander C, Jonsson A (2015) Differences in Determinants Amongst Individuals Reporting Residential Fires in Sweden: Results from a Cross-Sectional Study. *Fire Technology* 51:615–626.

14. United States Fire Administration, National Fire Data Center (2006) Fire and the Older Adult. In: FA-300.
15. United States Fire Administration (2013) Fire Risk to Older Adults in 2010. Topical Fire Report Series 14:1–8
16. Harpur AP, Boyce KE, McConnell NC (2014) An Investigation into the Circumstances Surrounding Elderly Dwelling Fire Fatalities and the Barriers to Implementing Fire Safety Strategies among this Group. In: Fire Safety Science-Proceedings of the Eleventh International Symposium. pp 1144–1159
17. Warda L, Tenenbein M, Moffatt MEK (1999) House fire injury prevention update. Part I. A review of risk factors for fatal and non-fatal house fire injury. *Injury Prevention* 5:145–50
18. Fire Analysis and Research Division (2010) Demographic and other characteristics related to fire deaths or injuries. National Fire Protection Association, Quincy, MA
19. United States Fire Administration (2001) Older Adults and Fire. Topical Fire Report Series 1:1–5
20. Marshall SW, Runyan CW, Bangdiwala SI, et al (1998) Fatal Residential Fires: Who dies and who survives? *Journal of the American Medical Association* 279:1633–1637.
21. Sekizawa A (2015) Challenges in Fire Safety in a Society Facing a Rapidly Aging Population. *Fire Protection Engineering* 1:31–38
22. Holborn PG, Nolan PF, Golt J (2003) An analysis of fatal unintentional dwelling fires investigated by London Fire Brigade between 1996 and 2000. *Fire Safety Journal* 38:1–42
23. Spearpoint M, MacLennan HA (2012) The effect of an ageing and less fit population on the ability of people to egress buildings. *Safety Science* 50:1675–1684.
24. Ronchi E, Nilsson D (2013) Fire evacuation in high-rise buildings: a review of human behaviour and modelling research. *Fire Sciences Reviews* 2
25. Mulvaney C, Kendrick D, Towner E, et al (2009) Fatal and non-fatal fire injuries in England 1995–2004: time trends and inequalities by age, sex and area deprivation. *Journal of public health* 31:154–161.
26. MyNews Hemeroteca. <http://hemeroteca.mynews.es/>. Accessed 15 Feb 2019
27. Committee on Injury and Poison Prevention (2000) Reducing the Number of Deaths and Injuries From Residential Fires. *Pediatrics* 105:1355–1357.
28. Runefors M, Johansson N, Van Hees P (2016) How could the fire fatalities have been prevented? An analysis of 144 cases during 2011–2014 in Sweden. *Journal of Fire Sciences* 34:515–527.
29. Jonsson A, Bonander C, Nilson F, Huss F (2017) The state of the residential fire fatality problem in Sweden: Epidemiology, risk factors, and event typologies. *Journal of Safety Research* 62:89–100.
30. Wang F, Lu S, Li C (2005) Analysis of Fire Statistics of China: Fire Frequency and Fatalities in Fires. In: Fire Safety Science-Proceedings of the Eighth International Symposium. pp 353–362
31. Jennings CR (2013) Social and economic characteristics as determinants of residential fire risk in urban neighborhoods: A review of the literature. *Fire Safety Journal* 62:13–19.
32. Fundación Mapfre; APTB (2019) Estudio de víctimas de incendios en España en 2018
33. Instituto Nacional de Estadística (2011) Censos de Población y Viviendas 2011. In: Cifras población y censos demográficos.
34. Elder AT, Squires T, Busuttill A (1996) Fire fatalities in elderly people. *Age and ageing* 25:214–216.
35. Ahrens M (2014) Home Fire Deaths and Injuries: Overall Trends and Patterns by Age, Gender and Race Fact Sheet. Quincy, MA
36. Runyan CW, Bangdiwala SI, Linzer MA, et al (1992) Risk factors for fatal residential fires. *The New England Journal of Medicine* 327:859–863.
37. DiGuseppi C, Edwards P, Godward C, et al (2000) Urban residential fire and flame injuries: a population based study. *Injury Prevention* 6:250–254.
38. Xiong L, Bruck D, Ball M (2015) Comparative investigation of “survival” and fatality factors in accidental residential fires. *Fire Safety Journal* 73:37–47.
39. Jonsson A, Nilson F, Runefors M, et al (2016) Fire-Related Mortality in Sweden: Temporal Trends 1952 to 2013. *Fire Technology* 52:1697–1707.
40. Jennings CR (1999) Socioeconomic Characteristics and Their Relationship to Fire Incidence: A

- Review of the literature. *Fire Technology* 35:7–34
41. Hastie C, Searle R (2016) Socio-economic and demographic predictors of accidental dwelling fire rates. *Fire Safety Journal* 84:50–56.
 42. Shai D (2006) Income, housing, and fire injuries: a census tract analysis. *Public health reports* 121:149–54
 43. Ahrens M (2014) Characteristics of Home Fire Victims. National Fire Protection Association, Quincy MA, USA
 44. Guldåker N, Hallin P-O (2014) Spatio-temporal patterns of intentional fires, social stress and socio-economic determinants: A case study of Malmö, Sweden. *Fire Safety Journal* 70:71–80.
 45. Flynn JD (2010) Characteristics of home fire victims. Quincy, MA
 46. Ahrens M (2014) Physical Disability as a factor in home fire deaths. Quincy, MA
 47. United States Fire Administration (2011) Fire Death Rate Trends: An International Perspective. *Topical Fire Report Series* 12:1–8