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Short communication

Statistical analysis of intervention reports for fires resulting in casualties deceased on the spot in Paris area

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ABSTRACT

This short communication analyses the data collected by the Laboratoire central de la Police Prefecture concerning fires which caused casualties deceased on the spot for the years 2012, 2013 & 2014. The geographic sector includes Paris and its surrounding counties (Hauts de Seine, Seine Saint-Denis, Val de Marne), namely more than 10% of the French population.

Fire statistics are a relatively poorly studied area in France. This is mostly due to the extreme diversity of sources, the wide range of organizations that collect and issue information, the inaccuracy of some of the elements published, etc. Fire statistics and their exploitation are nevertheless essential to understand fires, to analyse a specific risk, to work out and implement regulations that are adapted to identified and prioritised stakes, together with an adequate policy targeting the population's education [1].

The Laboratoire Central de la Prefecture (LCPP) is the scientific and technical support department of Paris's Prefecture de Police, which may be viewed as a sort of metropolitan authority for Paris and its surrounding counties (Hauts de Seine, Seine Saint-Denis, Val de Marne). A team of LCPP, namely the *permanence générale, 'PG'* (General purpose technical support unit) is dedicated to the police and fire department for the Paris area as well as the surrounding counties, for technical investigation after fire and explosions (and some other missions on specific risks out of the scope of the present paper). It is active 24 h a day. It enables to feed in a specific database over this geographical region that encompasses more than 6.7 million inhabitants, namely more than 10% of the French population [2].

The purpose of this article is to analyse some of the data extracted from this database for the years 2012, 2013 and 2014. We have chosen to focus on fires with casualties deceased on the spot, as it guarantees the data are complete, knowing that in such cases, the PG unit is systematically involved. The previous statistical analysis with the same database was done in 1998 for data covering 1997 but was rather succinct and unpublished. The main conclusion was that for 1997, out of the 45 deaths having an unintentional origin in this geographical sector, 14, namely 31%, had been caused by the careless behaviour of smokers.

In the course of the analysis, we will compare with data from UK [4,5] and USA [6]. Concerning the whole of France, the statistics published on a national level are poorly detailed, yet enable to establish that the number of victims deceased on the spot compared to the whole population, which was 6 deaths per million inhabitants in 2008, was 5 deaths per million inhabitants in 2013 [1–3]. The analysis [1] shows that the multi-year trend of that ratio has been steadily declining. Figures derived from the French Institut National de la Santé et de la Recherche Médicale (INSERM) data are higher (a ratio of 9 deaths per million inhabitants in 2008) as they take into account not only the victims deceased on the spot, but also those who died in hospital. However, in the present research covering Paris and surrounding counties, the criteria designating victims deceased on the spot are maintained as the database we use is not fed when people who have been declared injured on the spot die as a consequence of their wounds after having been admitted in hospital.

Over the above-mentioned three years, the PG unit carried out 2700 interventions, i.e. an average of 900 per year, 2372 of which on fires, which therefore accounts for 88% of the interventions. The PG unit is not called systematically for fires with no serious consequences or when the police or fire department consider it unnecessary. It is therefore risky to draw general statistical conclusions. Besides it can be noticed that the number of yearly interventions by the Paris Fire Department for fires is about 15,000 and the PG unit is called for one fire out of 19 only. Yet, the PG unit is called systematically when a fire causes one or several casualties, which guarantees statistical exhaustiveness in that case. Over that period of 3 years, there were 108 fires with victims dead on the spot (two cases have been excluded from the analysis as they in fact were

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assassinations committed by other means where the murderer burnt the body). These fires claimed 124 casualties who died on the spot, i.e. a rate of 6.2 deaths per million inhabitants, slightly above the national average as stated above and the UK 5.2 death per million inhabitant [4]. The region considered is divided into 4 administrative areas, Paris, Hauts de Seine, Seine Saint Denis and Val de Marne, each with 1.5–2.6 million inhabitant. The death rate per million inhabitants on these areas is rather inhomogeneous, from 3.7 in Val de Marne, to 6.2 in Hauts de Seine, 6.9 in Paris and 7.1 in Seine Saint Denis. There is no simple correlation with the average income of these areas, as the richest is Hauts de Seine while Paris and Val de Marne are of the same order of average income and Seine Saint Denis the least rich (see Ref. [2]). An explanation of this fact is out of the scope of the present study and would deserve a specific study.

Ten fires, i.e. more than 9% of the total number of fires, have caused multiple victims, leading to 26 deaths (near 21% of the total number of deaths). Some fires with numerous deaths are hard to include in a statistical analysis. For example, the 2005 fire of the "Paris Opera" hotel alone caused 24 deaths, to be compared with the annual average over the 3 years concerned here, i.e. 41.3 deceased. In the period considered here, 2012, 2013 and 2014, the absence of a very large fire justifies a statistical study of all data: out of the ten fires with multiple deaths studied here, six fires caused two deaths, three fires caused three deaths and one fire caused 5 deaths.

Concerning the location of fires having caused deaths on the spot, only one victim was discovered in a motor vehicle i.e. less than 1% (besides, it was not used as a vehicle but as a makeshift accommodation). This number is significantly lower than Great Britain's and the United States' nationwide, which are of order of 10% of death. This may come from a statistical bias in the data, as people killed in car accident which then catch fire are not counted in Paris area whereas they may be counted in the US and UK, and also from the very different type of road network in the Paris conurbation.

The number of deaths varies according to the season. During a period of six months from November to April, over 61% of deaths were registered, with an average of 4.2 deaths per month. During the other six other months from May to October, the average was about 2.6 deaths per month.

The average number of deaths on a three-hour basis was also computed. It shows that a significant number of death occurs during the day, when people are not usually asleep, with 44% of death from 9am to 9pm. Knowing that 94% of the victims were found in their homes and that the home occupation rate is much lower in the daytime, this goes against general opinion that fires kill in majority when people are asleep.

The age of the deceased is generally unknown when entering information in the database; the gender of the deceased is unknown for 8 victims. Males represent 58% of the deceased of known gender, females 42%. A similar trend is to be found in several other countries [3.4, and 6]: it is often related to behavioural differences. Yet this study does not intend to analyse the causes of this trend.

Out of the 108 fires examined here, the fire broke out in a building on 101 occasions, causing 117 victims; 3 fires developed in a makeshift accommodation (vehicle, makeshift camp, shanties) causing 3 victims while 4 fires took place outdoors causing 4 victims. French regulations classify buildings as residential, offices, industrial activity and open to public (so-called *Etablissement recevant du public*, ERP); high rise building may be of either type and have specific regulations. Five deaths occurred in ERP during that specific period, among which 3 were hotel guests who died in their bedrooms, one was a retirement home resident who also died in his bedroom, one was the customer of a tanning salon.

Fires occured in residential buildings in 93 cases, causing 107 death. If we include the aforementioned four victims in ERP classified as "for sleeping" (retirement home residents, hotel customers), the three victims in a makeshift accommodation, and the two victims in a squat, we reach a total of 116 deaths in accommodations of any type. It accounts for almost 94% of deaths, which compares well with UK and US figures [5–7].

With regard to residential buildings strictly speaking, 92 of the 107 deceased (i.e. 86%) actually lived where the origin of the fire was found. Studying the causes and circumstances of the fires that led to the death of the other 15 people teaches a lot. In one case, five victims died in an apartment situated above the initial seat of the fire that spread outside on a balcony. In four of the fires causing the death of five victims (including the resident of an apartment initially damaged, who walked up the stairs to warn the other residents), the fire spread through an open staircase as the landing door of the apartment in fire had been left open by the resident when escaping. Among these five victims, one of them threw himself out of the window, as the fire was raging in the staircase. In two fires having caused a total of four victims, the source of the fire was not in an apartment, but at the foot of an open staircase (one fire was intentionally set to two baby strollers stored at the bottom of the staircase; the other fire was set to a garbage container at the foot of the staircase); among these victims, two threw themselves out of the window. Last, a fire spread out from a parking lot onto an apartment through ventilation shafts and ducts causing one death.

The origin of the fire was intentional for 19 deaths out of 124 (i.e. 15% of cases). In this case, they might be suicides (4 cases) or unintentional fire victims of an intentional fire. Out of the 108 fires that were analysed, the origin of the fire could be determined in 90 cases out of 108 (i.e. 83%), see Table 1.

One should specify that in residential buildings, 30 fires having caused the death of 34 victims, i.e. 31.8% of the total figure, are the consequence of a smoker's act. Indeed 27% of the victims died because of smokers' carelessness. If these deaths are related to deaths caused by non-intentional fires only, this rate reaches 32%, which is quite similar to 1997 data and also to Great Britain's rate [4].

In residential buildings, for 88 fires having caused 100 deaths, the occurrence or non- occurrence of a flashover was registered. For 26 fires having caused 37 deaths, i.e. 35% of the recorded deaths, the living quarters were affected by a flashover. In four of the fires having caused 7 deaths, the flashover also reached the building staircase.

In 43 fires having caused 44 deaths, i.e. 41% of the total number of deaths registered, the fire was limited to the room where the fire started:

- most often in a bedroom (20 fires having caused 20 deaths),
- then the living room and the lounge (10 fires having caused 10 deaths),
- last in the kitchen (9 fires having caused 9 deaths).

In 18 other fires having caused 18 deaths, i.e. 16.8% of the total deaths registered in the dwelling, the fire was limited to the couch, the bed or the bed mattress. Finally, in a fire having caused one death, the fire was limited to the victim's clothes only.

The origin of the alarm was registered for 92% of the fires analysed:

- the alert was given by someone who neither was a victim nor lived on the premises in 90% of the cases registered;
- it was given by a victim or a resident in 7% of cases;
- smoke detectors gave the alarm in only 3% of the cases.

One should specify that over the period we are dealing with, self-

Table 1
Origin of fires having caused deaths on the spot, over the 2010–2013 period.

Origin of the fire	Number of victims	%
Carelessness of smokers	38	30.7
Fall of a halogen lamp	4	3.2
Electrical malfunction	2	1.6
Recklessness or carelessness of the victim	20	16
Accidental	12	9.6
Use of candles	8	6.4
Intentional fire	19	15.3
undefined	21	17.2
Total	124	100

contained smoke detectors in dwellings were not compulsory (this regulation was not implemented until March 8, 2015). We can thus anticipate that in the next few years this type of alarm, which hopefully will mean a lower number of victims, will send more and more alarms.

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