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An exploration of alcohol and drug related fire injuries

Abstract

In this paper we examine alcohol and drug related accidental dwelling fire injuries during 2006 to 2016 in the county of Merseyside in England. Overall, it appeared that deprivation was a significant factor in alcohol and drug related fire injuries over the period studied, with 70% of such injuries occurring in areas with the highest level of deprivation. In addition, males appeared roughly twice as likely to be injured in an alcohol and drug related fire incident than females. The majority of those injured were in the age range 35 to 59. An understanding of those vulnerable to alcohol and drug related fire risks can support more targeted fire prevention strategies and aid fire and rescue service referrals to partner health agencies to help to reduce underlying alcohol and drug misuse issues.

Key words Fire Injury Alcohol Drugs Analysis

1. Introduction

Alcohol consumption and drug consumption are known causal factors in accidental dwelling fires (SFRS, 2020; Jordan et al, 1999; Baker et al, 2013; Xiong et al, 2015; Purcell et al, 2020). The presence of alcohol and drugs in the body can increase the severity of injuries from fire accidents (LEFRS, 2021). In the UK, alcohol is now more available than ever before with the balance between on-premises sales and off-premises sales moving to off-premises sales. On-premises sales allows consumption of alcohol only on the business premises, off-premises sales allows the sale of unopened bottles/cans of alcohol for customers to take away from the business premises to consume elsewhere (ECPF, 2021). This influences home drinking where there can be unlimited alcohol servings with unlimited measures (NFCC, 2016).

Jordan et al. (1999) had identified alcohol intoxication as a significant factor in unintentional dwelling fire incidents. Baker et al (2013) stated that individuals with addictions to alcohol and drugs have a higher risk of accidental dwelling fires. Clark et al (2015) commented that some social situations may promote alcohol use that can increase dwelling fire risk.

In England the rate of serious fire injuries was four times higher where drugs or alcohol was a contributory factor than where alcohol or drugs was not a factor, and the average fire fatality rate where alcohol or drug impairment was suspected to be an influencing factor was three times more compared to where alcohol or drug impairment was not an influencing factor (DCLG, 2012). In addition, more than half of casualties in accidental dwelling fires where impairment due to alcohol or drugs was a contributory factor were themselves not suspected to be under the influence of alcohol or drugs (DCLG, 2012).

In this paper we examine the circumstances of alcohol and drug related fire injuries that occurred during accidental dwelling fire incidents. Previous research had mainly focused on alcohol related fire fatalities (Taylor et al, 2021; Jonsson et al, 2017; Bruck et al, 2011), rather than injuries. The data and statistics used were based upon the subjective opinion of the most senior officer at the scene regarding the consumption of alcohol or drugs at an unintentional dwelling fire, which could have included the possibility of unintentional bias in judgements relating to different socioeconomic households. This indicates a potential issue of unconscious bias in the current methodology used for collecting some UK fire statistics. In studies of fire fatalities, blood alcohol readings are a more objective and preferable test.

An understanding of those vulnerable to alcohol and drug related fire risks can aid fire and rescue services working in partnership with other agencies to identify vulnerable people at risk of causing accidental fires in the home due to drug or alcohol misuse. Home visits can then be arranged to make individuals safer in case of an accidental dwelling fire, and the individuals can be referred to partner

agencies in order that such agencies can assist with reducing the underlying alcohol and drug misuse issues (DRFS, 2021; NWFRS, 2021, NHS Alcohol Support, 2021; NHS Drug Support, 2021; FRANK, 2021). Relevant data analysis can pinpoint precisely which residents are most at risk of accidental dwelling fires and in need of appropriate intervention (CFRS, 2021).

In this paper we examine fire injuries in alcohol and drug related accidental dwelling fire incidents during the period 2006 to 2016 in the Merseyside region of the UK. In the 2011 UK Census (the mid-point of the period studied), Merseyside had a population of 602,087 people, and covers an area of 645 square kilometres. The relationship between alcohol and drug use and unintentional dwelling fire injuries was chosen for examination by the fire and rescue service concerned, since alcohol and drug use had been identified as a factor in a significant proportion of fire injuries (Baker et al, 2013), and Merseyside has some of the highest alcohol consumption levels in the UK (PHE, 2020). The aim of the paper is to examine the circumstances of alcohol and drug related fire injuries in order to better understand those individuals and groups that are most at risk of alcohol and drug related fire injuries in order to support more targeted fire injury prevention measures. The new knowledge presented in this paper concerns the detailed analysis of trends and patterns in alcohol and drug related accidental dwelling injuries, in particular, in terms of how alcohol related fire injury risk differs between different groups of individuals. This is an important area of research given the budgetary constraints affecting UK fire and rescue services that necessitate more targeted fire education and prevention activities.

2. Literature review

2.1 Alcohol and drug consumption fire risks

Following a period of falls between 1995 and 2013, there was a change in the trend of drug use by residents of England. Between 2013 and 2020, the proportion of adults reporting any drug use in the last year increased by 15% (16 to 59 year-olds) and 28% (16 to 24 year-olds) respectively (ONSDM, 2021).

In the UK there has been overall a downward trend in alcohol consumption, however, the higher the level of income, typically the higher the level of alcohol consumption (ONS, 2017; Taylor, et al 2021). Although alcohol use may be declining in the UK, drug use appears to be increasing, and both are significant factors in unintentional dwelling fires, fire injuries, and fire fatalities (Taylor et al, 2021; Eggert and Huss, 2017; Jonsson et al, 2017; Bruck et al, 2011).

Alcohol and drug related accidental dwelling fires are typically caused by people drinking alcohol or consuming drugs and then falling asleep whilst cooking or smoking (DFRS, 2021). Cooking and smoking materials are the largest ignition categories for accidental dwelling fires (HO, 2020). When a dwelling fire is discovered, alcohol or drugs can increase disorientation, making it more difficult for the person to escape (Dean et al 2018). If an individual has been drinking alcohol or consuming drugs they might not wake up when a fire takes hold, particularly if there is no working smoke alarm in the dwelling (DFRS, 2021). Typically, those under the influence of alcohol or drugs would be less likely to follow simple home fire safety guidelines such as closing inside doors at night to stop a fire from spreading, turning off and unplugging electrical appliances (unless they are designed to be left on), checking the cooker is turned off, and putting candles and cigarettes out properly (UKGOV, 2015). Tannous et al (2018) stated that factors affecting fire injury risk include community acceptance of fire prevention measures and willingness amongst high-risk individuals to consider ongoing behavioural change in order to reduce risk. The two main types of accidental dwelling fire injuries are smoke inhalation and burns (HO, 2020). The risk of injury in a residential fire from smoke inhalation or burns is increased for those impaired by alcohol or other drugs (Eggert and Huss, 2017). Jonsson et al (2017) in a study in Sweden found that 43% of those fatally injured in dwelling fires exhibited blood alcohol levels that exceeded the drink driving limit in Sweden (blood alcohol content of 0.02 per cent or more, or a breath alcohol content of 0.10 milligrams per litre or more). Bruck et al (2011) in study in Australia found that 58% of dwelling fire fatalities had a positive blood alcohol concentration (the test differed between Australian states at the time of the study, but was a higher level in all states than the Swedish level).

Taylor et al (2021) in a study in England found that 40% of dwelling fire fatalities involved alcohol consumption. However, in the UK, official fire statistics relating to alcohol use are based upon the subjective opinion of the most senior officer at the scene.

2.2 Alcohol and drug related accidental dwelling fires

Runefors (2017) identified that people suffering from substance abuse are a high risk group in terms of dwelling fire injuries. Xiong et al (2015) and Purcell et al (2020) commented that drug and alcohol consumption were significant factors in accidental dwelling fire injuries and fatalities. In the UK more than 50% of fire fatalities within the home involve drink or drug-related behaviour (DFRS, 2021; LEFRS, 2021; LFRS, 2021; NWFRS, 2021). Hulse et al (2020) commented that dwelling fire injuries and fatalities are more likely when the occupants are unaware of the fire and / or less capable of removing themselves from harm's way when intoxicated.

Dean et al (2018) identified that alcohol consumption is a factor in a significant proportion of accidental dwelling fires, particularly in areas that have higher alcohol consumption levels. Shokouhi et al (2019) conducted a detailed literature review in the field of influencing factors in residential building fires, and concluded that most accidental dwelling fires are typically caused by people's behaviour. Alcohol and drug related accidental dwelling fire incidents are usually caused by people consuming alcohol or drugs and then falling asleep whilst cooking or smoking (DFRS, 2021). In the most severe instances, even where the alarm has been raised and firefighters have been called, drugs and alcohol could prevent an individual from exiting the dwelling safely before fire and rescue services arrive. A loss of consciousness through smoke inhalation during an accidental dwelling fire can lead to serious injuries or death (NWFRS, 2021).

There can be different alcohol consumption patterns and related fire injury risks between different community groups within an area (Dean et al, 2016). The UK drinking habits amongst adults analysis performed by the UK Office for National Statistics (ONS, 2017) indicated that young people aged 16 to 24 years were less likely to drink alcohol than any other age group, however, when they do drink alcohol, consumption on their heaviest drinking day tends to be higher than other age groups. Binge drinking was more common in the North West of England, and individuals in managerial and professional occupations (and the highest earners) were most likely to drink alcohol. There can be different drug misuse patterns and related fire injury risks between different community groups in an area (NHS, 2018). In England and Wales 2.1% of adults aged 16 to 59 years and 4.3% of adults aged 16 to 24 years were classed as "frequent" drug users (those who had taken a drug more than once a month in the last year), however only 1% of 60 to 74 year-olds had taken a drug in the last year (ONSDM, 2021). There are various support avenues for people seeking help with alcohol consumption and drug problems to which individuals may be referred by fire safety officers (NHS Alcohol Support, 2021; NHS Drug Support, 2021; FRANK, 2021).

Previous research had identified that alcohol and drug consumption present an increased risk of accidental dwelling fire injury. The originality of the research reported in this paper is the detailed statistical analysis of alcohol and drug related accidental dwelling fire injury data over a 10 year period in a UK fire and rescue service in order to support targeted fire prevention activities, and appropriate referrals to partner agencies.

3. Research method

Data that was recorded for alcohol and drug related accidental dwelling fire injuries during the period 2006 to 2016 in the Merseyside region of the UK was analysed in order to identify trends and patterns in order to attempt to understand the circumstances relating to such fire incidents and injuries. An alcohol / drug related accidental dwelling fire injury recorded by the fire and rescue service concerned referred to an accidental dwelling fire incident where an injured individual was suspected by the fire officers present to be under influence of alcohol or drugs. Data was not recorded with regard to any

drugs present being legal or illegal. Other than where there is a fatality (when post-mortem measurement levels of alcohol are a more precise and accurate measurement) in all other UK fire statistics, the subjective opinion of the most senior officer at the scene is the source of the data, and their use is appropriate for high level comparisons and long-term comparative trends.

The research questions addressed by the research reported in this paper were:

- How are alcohol and drug related accidental dwelling fire injuries distributed between different age groups and genders?
- How are alcohol and drug related accidental dwelling fire injuries distributed between different housing types and levels of deprivation?
- What types of fire injuries occur in alcohol and drug related accidental dwelling fires and when do they occur?

These are important research questions, because there are both social and economic costs associated with accidental dwelling fire injuries, and it is important for fire and rescue services to be able to effectively target fire education and prevention activities to vulnerable members of society.

The analysis of alcohol and drug related fire injuries was undertaken by examining the different circumstances recorded for alcohol and drug related fire injuries during 2006 to 2016 in the county of Merseyside in England, and deprivation data from the UK Office for National Statistics. In the UK deprivation is measured by the Index of multiple deprivation which is compiled by the Ministry of Housing, Communities and Local Government (MHCLG, 2021). It is an overall measure of deprivation that is based on seven domains of deprivation that includes: Income deprivation, Employment deprivation, Education, skills and training deprivation, Health deprivation and disability, Crime, Barriers to housing and services, and Living environment deprivation. This involved analysing the overall pattern of alcohol and drug related fire injuries, and analysis of the distribution of alcohol and drug related fire injuries by age group, gender, and level of deprivation, and the types of housing in which such injuries occurred, and also the distribution of the types of injuries sustained during alcohol and drug related accidental dwelling fire incidents.

The originality of the research project discussed in this paper is the detailed analysis of the circumstances associated with alcohol and drug related accidental dwelling fires injuries over a ten year period within the area covered by a UK fire and rescue service.

4. Research results

The pattern of alcohol and drug related fire injuries in the county of Merseyside, England between 2006 and 2016 is shown in Figure 1.

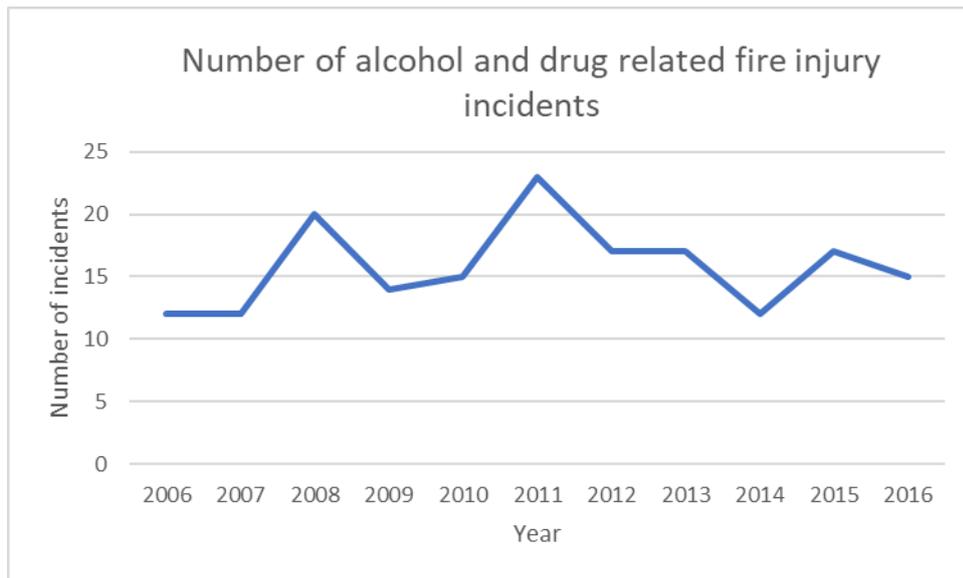


Figure 1. Number of alcohol and drug related accidental dwelling fire injury incidents in Merseyside, UK between 2006 and 2016.

There were 174 alcohol and drug related accidental dwelling fire injury incidents in the Merseyside county of England over the period 2006 to 2016, which constituted 13% of the 1309 accidental dwelling fire injury incidents over that time period. Previous research (Taylor et al, 2021; Jonsson et al, 2017; Bruck et al, 2011) had indicated that in comparison, alcohol related fire fatalities form a much larger proportion of overall fire fatalities (between 40% to 58%).

The number of alcohol and drug related accidental dwelling fire injury incidents per year varied between 12 and 23, with an average number of 16. To put this in an operational context, over the period studied, unintentional dwelling fire fatalities (whatever the cause) varied between 3 and 15 per year, and were a small proportion of overall unintentional dwelling fire injuries which varied between 98 and 146 per year, and were an even smaller number in relation to overall unintentional dwelling fire incidents which varied between 1023 and 1384 per year,

4.1 Distribution of alcohol and drug related fire injuries by age and gender

The age profile of those injured in alcohol and drug related accidental dwelling fires in Merseyside, UK between 2006 and 2016 is shown in Figure 2.

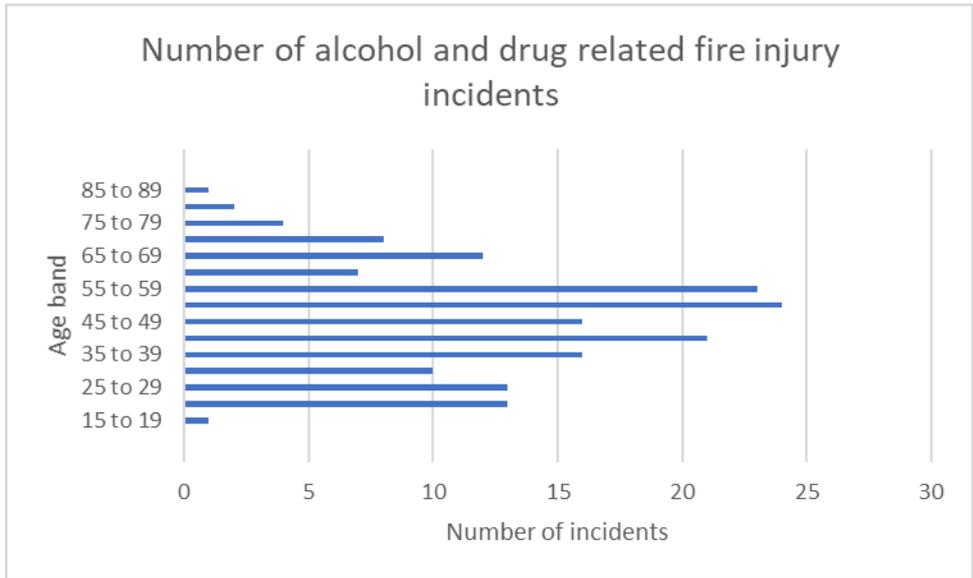


Figure 2. Age profile of those injured in alcohol and drug related accidental dwelling fire in Merseyside, UK between 2006 and 2016.

Figure 3 shows the population age bands in Merseyside in 2016.

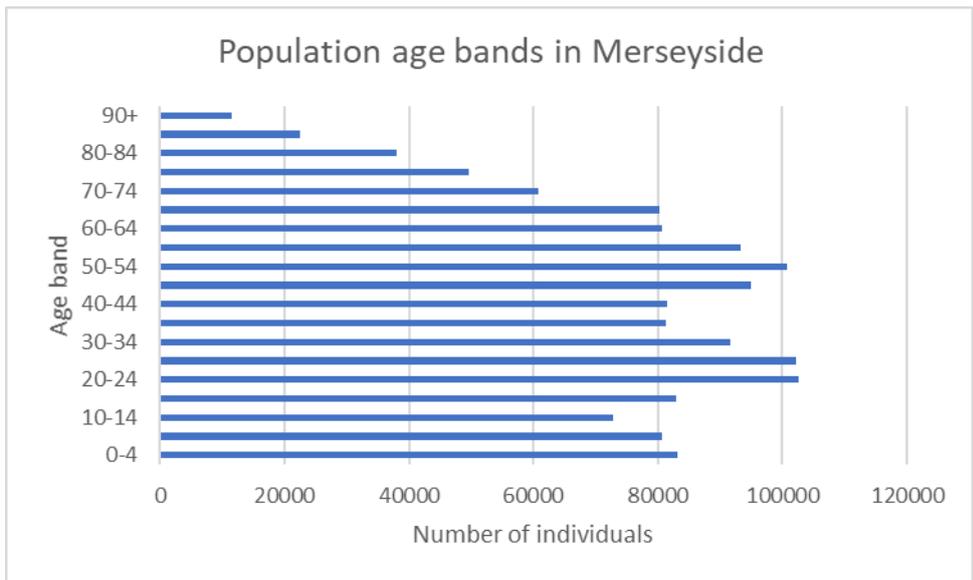


Figure 3 Population age bands in Merseyside

It appeared that over the period studied the main age group injured in alcohol and drug related accidental dwelling fires incidents were residents in the range 35 to 59, constituting 58% of the fire injury incidents, and this age group had the highest rate of fire injury.

The gender of those injured in alcohol and drug related accidental dwelling fires in Merseyside, UK between 2006 and 2016 is shown in Figure 4.

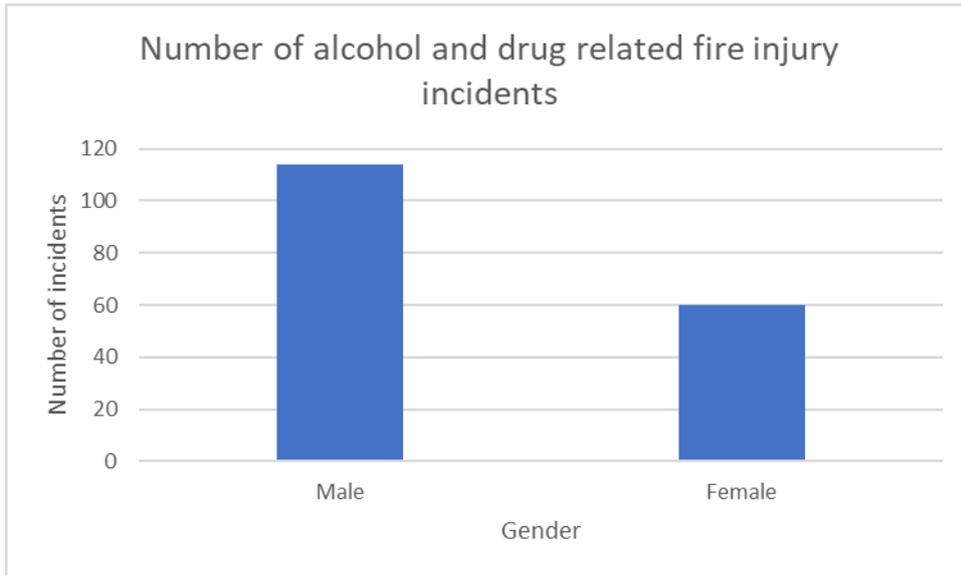


Figure 4. Gender of those injured in alcohol and drug related accidental dwelling fire in Merseyside, UK between 2006 and 2016.

Overall, over the period studied there were 114 alcohol and drug related accidental dwelling fire injury incidents involving males, compared to 60 alcohol and drug related accidental dwelling fire injury incidents involving females, giving a ratio of 1.9 to 1. Over the period studied, in terms of overall number of accidental dwelling fire injuries, the ratio of male to female fire injuries was 1.1 to 1. In Merseyside in 2016 the ratio of males to females was 0.96 to 1.

The distribution of male and female alcohol and drug related fire injury incidents by age band is shown in Figure 5.

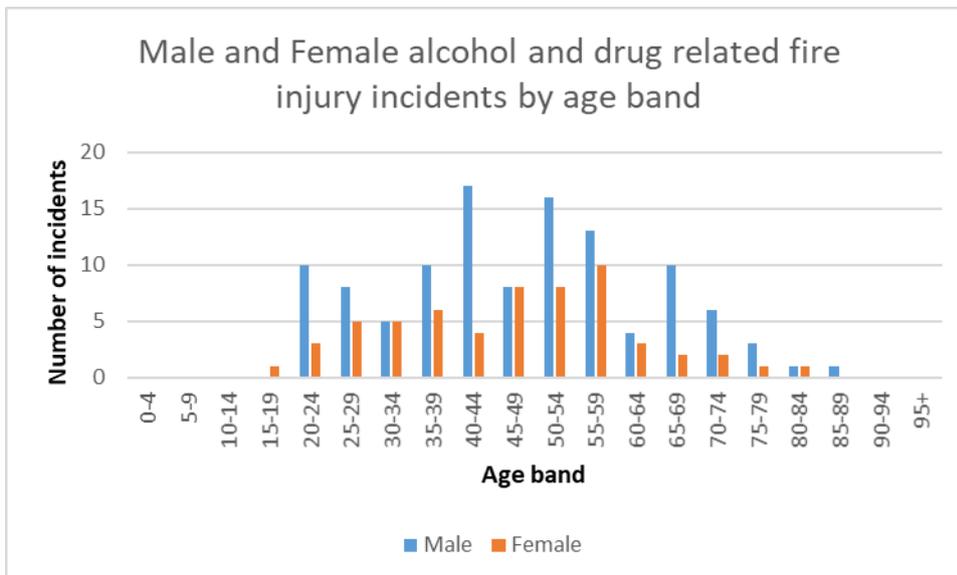


Figure 5. Distribution of male and female alcohol and drug related fire injury incidents by age band

The distribution of male and female alcohol and drug related fire injury incidents by age band indicated that although the overall ratio of male to female alcohol and drug related fire injury incidents was 1.9 to 1, there was considerable variation between the different age bands, varying from a ratio of 1 to 1 for

those aged 30 to 34, 45 to 49, and 80 to 84, to 3.3 to 1 for those aged 20 to 24, and 4.3 to 1 for those aged 40 to 44.

4.2 Distribution of alcohol and drug related fire injuries by housing type and level of deprivation

The type of housing in which alcohol and drug related accidental dwelling fire injury incidents occurred in the county of Merseyside, England between 2006 and 2016 is shown in Figure 6.

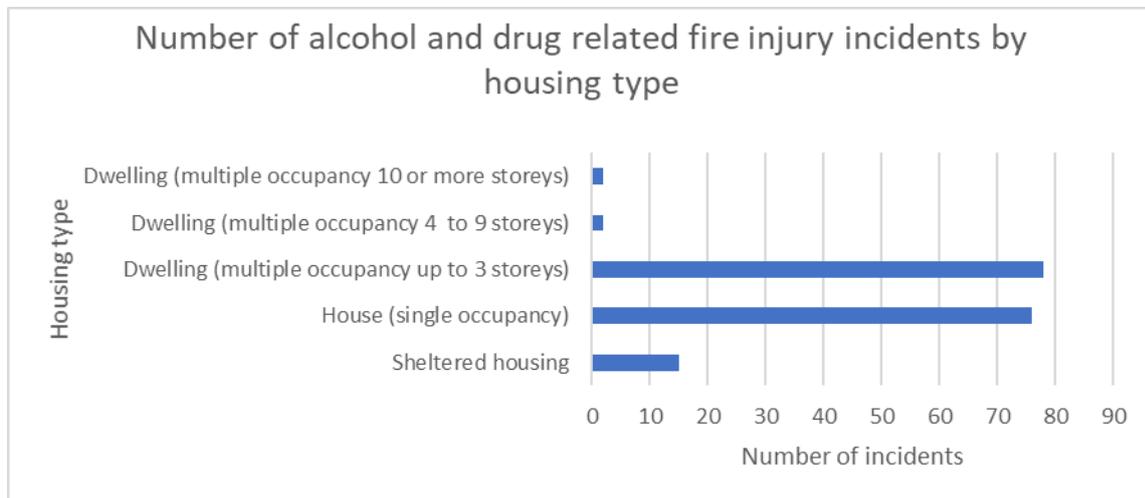


Figure 6. Number of alcohol and drug related accidental dwelling fire injury incidents in different housing types in Merseyside, UK between 2006 and 2016.

It appeared that the majority of alcohol and drug related accidental dwelling fire injury incidents occurred in single occupancy housing, and multiple occupancy housing up to 3 storeys.

The distribution of alcohol and drug related fire injuries by the level of deprivation of the Lower Layer Super Output Area (LSOA, 2021) in which the fire incident occurred is shown in Figure 7. LSOAs (Lower layer Super Output Areas) are small areas of a similar population size, with an average of approximately 1,500 residents or 650 households. There are 32,844 Lower-layer Super Output Areas (LSOAs) in England (UKGOV, 2018). The UK Office for National Statistics Indices of Multiple Deprivation (IMD, 2021) decile was used to determine the relative level of deprivation. The Index of Multiple Deprivation decile scale ranges from 1 to 10, where 1 equals the most deprived 10% of LSOAs in England.

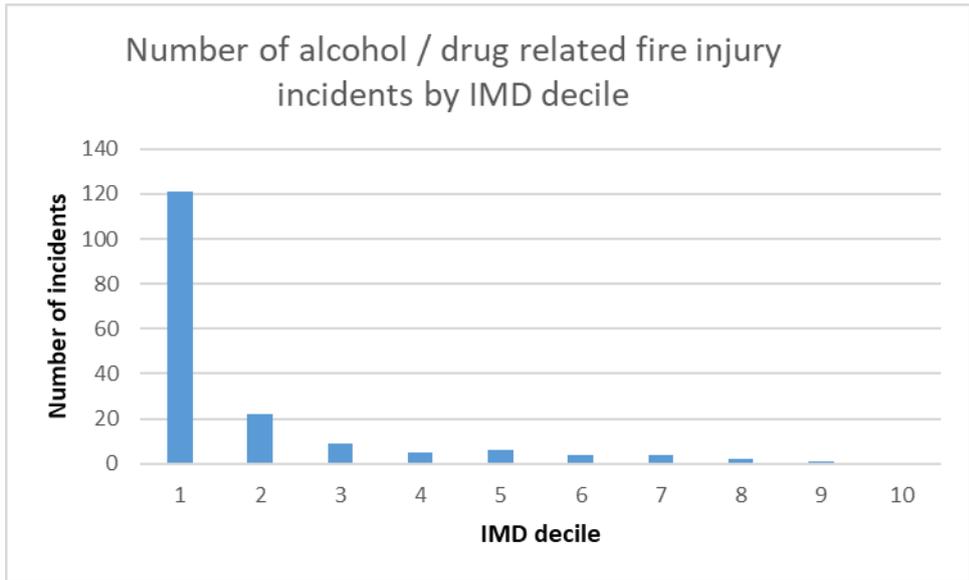


Figure 7. Number of alcohol and drug related fire incidents where injuries occurred by IMD decile.

The number of alcohol and drug related fire injury incidents was strongly linked to the level of deprivation, with the vast majority of injuries occurring in Lower Level Super Output Areas (LSOAs) that were in the most deprived 10% of Lower Layer Super Output Areas (LSOAs) in England. Overall, over the period studied 70% of alcohol and drug related fire injuries occurred in areas with the highest level of deprivation. However, it is not deprivation itself that cause fires, rather that deprived areas tend to have greater concentrations of those who are more vulnerable to dwelling fires (Thompson and Wales, 2015). The distribution of IMD decile levels in the LSOAs within Merseyside is shown in Figure 8 for comparison.

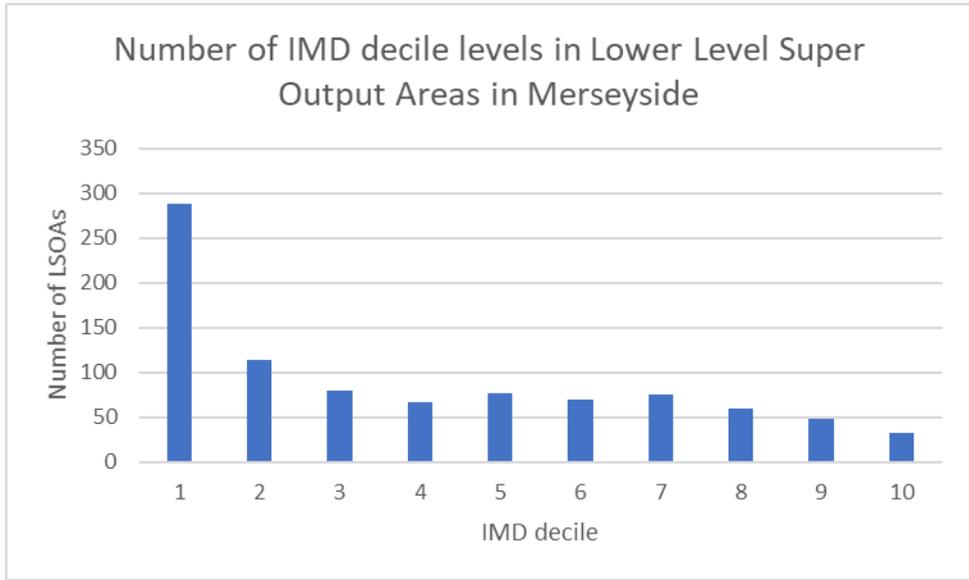


Figure 8. Number of IMD decile levels in Lower Level Super Output Areas in Merseyside.

Figure 8 shows counts of the number of Lower Level Super Output Areas (LSOAs) within the Merseyside area identified as being in a given IMD decile.

Figure 9 shows the distribution of alcohol and drug related fire injury incidents by age band and IMD decile.

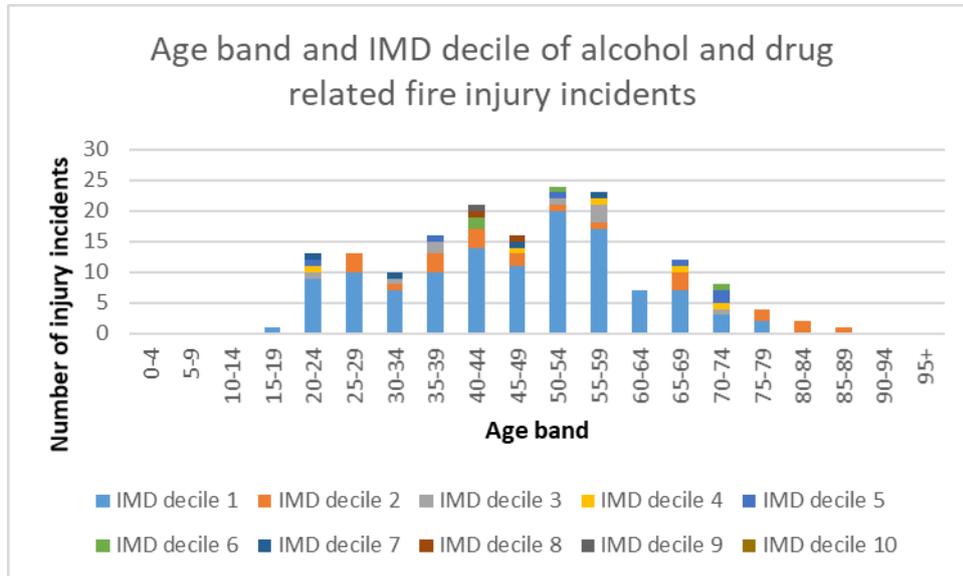


Figure 9 Alcohol and drug related fire injury incidents by age band and IMD decile.

The distribution of alcohol and drug related fire injury incidents by age band and IMD decile appeared to indicate, that for most age bands, the highest level of deprivation (IMD decile 1) was strongly linked to the number of alcohol and drug related fire injury incidents, with only the small number of fire injuries in the 75+ age bands being indicated more by IMD decile 2. The small number of fire injuries in the 70 to 74 age band showed the largest spread of fire injury incidents across the IMD deciles.

Figure 10 shows the distribution of alcohol and drug related fire injury incidents by gender and IMD decile.

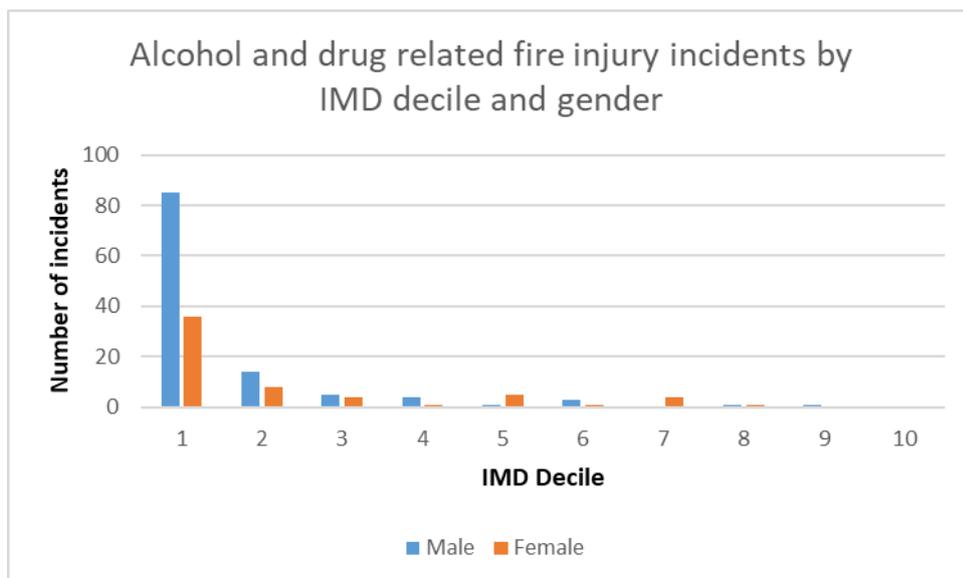


Figure 10. Alcohol and drug related fire injury incidents by gender and IMD decile.

The distribution of alcohol and drug related fire injury incidents by gender and IMD decile appeared to indicate that the proportion of male to female alcohol and drug related injuries across the IMD deciles was mainly similar to the overall ratio of 1.9 to 1, apart from slightly higher female ratios in the less deprived Lower Level Super Output areas.

4.3 Distribution of type of alcohol and drug related fire injuries and incidence times

The type of injuries sustained in alcohol and drug related accidental dwelling fire incidents in the county of Merseyside, England between 2006 and 2016 is shown in Figure 11.

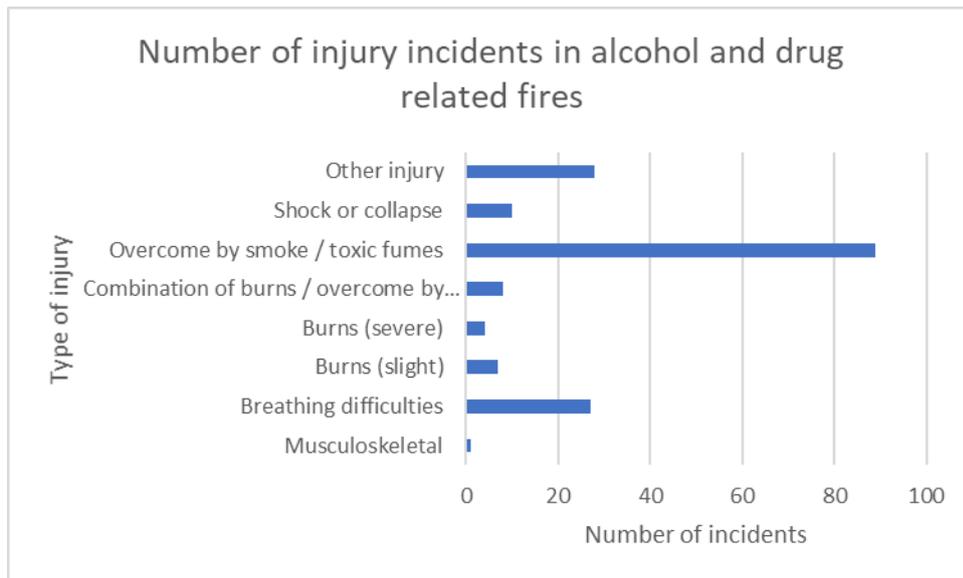


Figure 11. Number of types of injury incidents in alcohol and drug related accidental dwelling fires in Merseyside, UK between 2006 and 2016.

Overall being overcome by smoke and toxic fumes and breathing difficulties were the main types of injuries sustained during alcohol and drug related accidental dwelling fires over the period studied. The injuries sustained during alcohol and drug related accidental dwelling fires closely matched the pattern of overall accidental dwelling fire injuries over the period studied. Breathing difficulties referred to breathing difficulties other than being overcome by gas/smoke or toxic fumes, or asphyxiation, meaning that the individual had difficulty breathing but was not overcome with breathing difficulties, that is, was conscious.

The time of day of injuries sustained in alcohol and drug related accidental dwelling fire incidents in the county of Merseyside, England between 2006 and 2016 is shown in Figure 12.

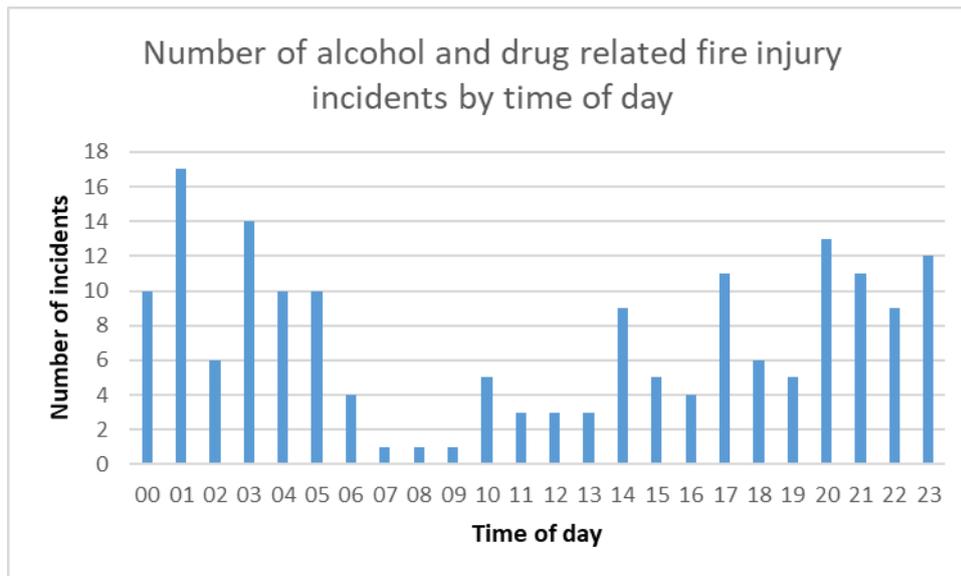


Figure 12. Time of day of injuries sustained in alcohol and drug related accidental dwelling fire incidents

The distribution of the time of day of injuries sustained in alcohol and drug related accidental dwelling fire incidents during the period studied appeared to indicate that most alcohol and drug related accidental dwelling fire injuries occurred late at night, with smaller peaks at 14:00 and 17:00 corresponding to typical meal times.

Discussion

The analyses of alcohol and drug related accidental dwelling fire injury data indicated that there are not necessarily clear causation patterns within alcohol and drug consumption and fire injury incidence, and it is important not to fall into ecological fallacy whereby statistical data is interpreted to infer the nature of individual's fire injury risk from the group to which such individuals belong. Rather the results of the of alcohol and drug related accidental dwelling fire injury data analyses indicated that in general any individual is at risk of fire injury from alcohol or drug intoxication, and that some groups of individuals are more likely to be at risk of fire injury from alcohol and drug related behaviours, such as males, and those living in areas with a higher level of deprivation.

In addition to fire and rescue service referrals to alcohol and drug NHS services reducing the risk of accidental dwelling fire injury, there are also long term health and social benefits for the individuals concerned. There are particular concerns about the relationship between alcohol and drug use and mental health problems. Those who regularly consume alcohol or drugs are more likely to encounter mental health problems including suicide and depression (NHS, 2018; NHS, 2021).

The main drawback to the analysis approach utilized was potential limitations on the generalizability of the research findings to other fire and rescue services, especially since Merseyside has some of the highest levels of alcohol consumption and deprivation in in UK. In addition, descriptive statistics can only present summations regarding the individuals and circumstances that were recorded, which reduces the ability to generalize to other individuals and circumstances in other fire and rescue services. Future research could analyse patterns concerning multiple fire and rescue services. The unintentional dwelling fire injury data used was based upon the subjective opinion of the most senior fire officer at the scene regarding the consumption of alcohol or drugs, which could have included the possibility of unintentional bias.

Conclusion

The originality of the research project discussed in this paper is the detailed analysis of the circumstances associated with alcohol and drug related accidental dwelling fires injuries over a ten year period within the area covered by a UK fire and rescue service. Alcohol and drug related accidental dwelling fire injury incidents constituted 13% of the accidental dwelling fire injuries in the Merseyside county of England over the period studied. The number of alcohol and drug related accidental dwelling fire injury incidents per year varied between 12 and 23, with an average number of 16. Overall, it appeared that alcohol and drug related fire injuries affected mainly middle aged males living in high levels of deprivation. Deprivation appeared to be a significant factor in alcohol and drug related fire injuries over the period studied, with 70% of such injuries occurring in areas with the highest level of deprivation. Over the period studied, males appeared to be roughly twice as likely to be injured in an alcohol and drug related fire incident than females. In terms of the age profile of those injured in alcohol and drug related fires, the majority of those injured were in the age range 35 to 59. Although this research indicated that 13% of accidental dwelling fire injuries involved alcohol or drugs, previous research (Jonsson et al 2017; Bruck et al, 2011; Taylor et al, 2021) had indicated that accidental dwelling fire fatalities that involved alcohol constituted a much larger percentage of accidental dwelling fire fatalities.

It is hoped that the research undertaken into alcohol and drug related fire injuries may be of use to other UK Fire and Rescue Services, and to other Fire and Rescue Services worldwide, in terms of understanding the circumstances associated with such injuries. The analyses presented could be used to inform fire prevention and public awareness strategies used by fire and rescue services, and to inform referral strategies to NHS alcohol and drug management programmes in order to attempt to reduce the frequency of such injuries, and the underlying factors associated with such injuries.

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