



ARSON CONTROL FORUM

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4

Social Exclusion and the Risk of Fire

Foreword

Over the last decade the number of arson incidents attended by the fire rescue services has more than doubled. In April 2001 the Arson Control Forum was established to provide the strategic direction to the government led action to address the problem of arson.

At its worst, deliberate firesetting can lead to loss of life and significant financial damage. But persistent and pervasive arson, even when it is of a relatively minor nature, sets a strongly detrimental and visually harmful tone to communities, especially those that are poorer and experience high levels of other forms of anti-social behaviour and crime. There is a strong need for government to take action to address this inequality and to minimise the social and economic cost arising from deliberate firesetting.

Not all communities face the same risk of becoming targets of deliberate firesetting. As with other anti-social behaviour, those living in poorer communities are often perceived as being at greater risk of having their lives effected by deliberate firesetting, either as a direct victim through their own property being attacked or through their neighbourhood being blighted by, for example, burnt out abandoned vehicles. This can lead to a downward spiral where anti-social behaviour is increasingly common, further degrading the environment.

Reducing the impact of social exclusion, including health inequalities, is a major part of government policy. This report, "*Social Exclusion and the Risk of Fire*" provides a valuable insight into the differing levels of arson risk for different groups of society. The report also discusses methods whereby the performance of government and the fire and rescue service in reducing health inequalities can be measured more effectively. The report will also assist the Forum in targeting its resources appropriately. I welcome this report.



Phil Hope MP,
Parliamentary Under Secretary of State
Office of the Deputy Prime Minister



Introduction

Previous studies have recognised that not all communities face the same risk of accidental or deliberate fires. Those living in poorer areas tend to have a greater risk of fire-related incidents, and are more likely to be killed or injured, than those living in more prosperous areas.

Ecotec Research and Consulting Limited were commissioned by the Office of the Deputy Minister to carry out a short review of the data currently available in the United Kingdom.

The research investigated the relationship between fire and social exclusion using three separate but linked approaches:-

- A literature review of previous studies investigating the relationship between social exclusion¹ and the incidence of fire and fire-related injuries.
- An analysis of existing administrative data-sets in the UK to explore the relationship between social exclusion and fire-related morbidity and mortality.
- An analysis of existing fire service incident data to explore the link between the risk of fire and social exclusion.

This report discusses the key messages from the national and international literature, and explores findings from an analysis of UK data. The final section focuses on the implications of the findings for future research.

Literature review

The literature review draws on 25 individual studies, including the most significant from the UK, North America and Australia & New Zealand².

The studies found that social deprivation is either directly or indirectly related to an increased risk from fire. Subsequently, the frequency of fire-related injury or deaths is higher among lower socio-economic groups. This inequality is particularly marked among children and older people.

The research highlights some areas that have not been fully explored in the UK. These can be broken down into three distinct but not unrelated areas:

- Influences of location (e.g. rural/urban differences in the number of fire incidents and casualty rates, and regional differences in the risk of fire and injury).
- Socio-economic characteristics of a community (e.g. quality of housing, the role of household composition, local poverty levels).
- Prevention – the important role of smoke detectors in reducing fire risk and the ability of households to afford them; and the effectiveness of different types of publicity campaign especially among the less educated.

Some of these issues have been explored in the most recent British Crime Survey³. The survey identified those households that were associated with both an increased risk of experiencing a fire and a lesser likelihood of owning a working smoke alarm:

- Housing containing a smoker.
- Financially unstable households.
- Households located in areas of high physical disorder.
- Properties in poor physical condition.

Such households are particularly vulnerable and may therefore warrant more attention. The BCS does not include detailed information on injuries and none on deaths, but it is intuitive that those at a higher risk of having a fire are more like to be killed or injured.

Overall, the literature shows that multiple factors interact to influence the risk of fire, ranging from the housing conditions, family structure, the environment in which a house is located, poverty, unemployment, education and behavioural factors such as smoking.

Statistical analysis of UK administrative and fire data

Relationships between fire risk and social exclusion were explored using the following data⁴:

1 'Social exclusion' is a relatively new concept that can be defined as "a combination of linked problems such as unemployment, low skills, poor housing, family breakdown, high crime rates that lead people of places to be excluded from the mainstream". In this report the Indices of Multiple Deprivation are used as a proxy measure for social exclusion, although it is recognised that the indices cannot capture all aspects of social exclusion.

2 The web version of this report, available www.odpm.gov.uk, contains the full literature review and contains detailed references for the 25 studies.

3 "Fires in the Home: findings from the 2002/3 British Crime Survey", ODPM, 1994. The report is at www.odpm.gov.uk/stellent/groups/odpm_fire/documents/page/odpm_fire_027486.pdf.

4 The technical annex, available at [web address] provides a full description of the data in the study, detailed of the bivariate and multivariate models used, and the detailed results from the multivariate analysis.

- **Fire incident data:** data on fires, including deaths and injuries, collected from a sample of 24 brigades in England and Wales for 2001/02.
- **Fire injuries:** in addition to the fire brigade casualty data: the Home Accident Surveillance System (HASS) for England; and Hospital Episode Statistics for England, Wales, Scotland and Northern Ireland.
- **Social deprivation:** the most comprehensive source is the Indices of Multiple Deprivation (IMD). Based on electoral wards, the score comprises six domains: **income, education, access to services, employment, housing and wealth**. The wards are ranked according to deprivation. The individual domains can be analysed separately.

The data were initially analysed using simple bivariate models, comparing, separately, fire incidents, injuries and deaths with the overall IMD scores. More complex multivariate analysis was then carried out on fire brigade casualty data and its relationship with social deprivation.

Bivariate analysis

Hospital episode statistics

The table below shows the number of hospital admissions for fire-related injury per 100,000 of the population for each level of deprivation for the four constituent UK countries.

For England, the analysis reveals a strong link between the incidence of fire-related morbidity and social exclusion. **People living in the 20% most deprived wards are four times more likely to**

suffer an injury as a result of a fire (8.1 per 100,000) compared with people living in the 20% least deprived wards (2.0 people per 100,000). The contrast is even starker between the most and least deprived 10% – 9.5 per 100,000 for the most deprived, five times that of the least deprived (1.8). It is also noticeable that in England the most deprived fifth (8.1 per 100,000) are at a significantly greater risk than the 2nd most deprived quintile (4.6 per 100,000).

A separate analysis was undertaken for the 88 local authorities that are the focus of the Neighbourhood Renewal Fund⁵. **Residents in NRF areas are twice as likely (6.7 fire related admissions per 100,000 people) to experience a fire-related injury than residents in non-NRF areas (3.3 fire related injuries per 100,000 people).**

A similar relationship between social deprivation and fire-related morbidity was apparent for Wales, Scotland and Northern Ireland. Those in the 20% most deprived areas in Wales and Scotland were almost twice as likely to experience fire-related morbidity than those living in the 20% least deprived areas, and 6.5 times more likely in Northern Ireland. Northern Ireland exhibited the strongest relationship between social deprivation and fire-related morbidity.

Table 1 also shows differing rates of fire-related morbidity across the four UK countries. England experienced the lowest overall rate at 4.7 per 100,000 people, while Northern Ireland experienced the highest rates at 10.7 per 100,000 people.

Table 1
Frequency of hospital admissions for fire-related injuries, by social deprivation, United Kingdom countries (no. per 100,000 people)

Quintile	England	Wales	Scotland	Northern Ireland
1 (Most deprived)	8.1	8.7	12.6	17.9
2	4.6	7.4	9.1	12.6
3	3.3	5.1	9.7	12.8
4	3.0	6.3	7.5	8.7
5 (Least deprived)	2.0	4.6	6.5	2.7
Total	4.7	6.5	9.3	10.7

⁵ The Neighbourhood Renewal Fund (NRF) is a government initiative that aims to enable the 88 most deprived authorities, in collaboration with their Local Strategic Partnership (LSP), to improve services, narrowing the gap between deprived areas and the rest of England.

Table 2
Frequency of Fire incidents, fire injuries and fire deaths by level of social deprivation, per 1,000 dwellings, 2000 and 2001

Quintile	England			Wales		
	Incidents	Injuries	Deaths	Incidents	Injuries	Deaths
1 (Most deprived)	11.2	0.52	0.023	14.4	0.49	0.012
2	7.8	0.36	0.013	10.0	0.36	0.017
3	6.6	0.31	0.020	8.0	0.35	0.041
4	5.9	0.24	0.019	7.25	0.30	0.026
5 (Least deprived)	5.2	0.24	0.017	7.0	0.25	0.011

Fire related accidents in the home

The Home Accident Surveillance System, administered by the Department for Trade and Industry between 1997 and 1999, contains information of accidents within the home, derived from information collected from 18 Accident and Emergency departments across the UK. The HASS data sets contained information on 385 fire-related incidents in England, which could be matched to ward and to IMD scores.

The results demonstrate a link between fire-related morbidity and social deprivation. **Admissions for fire-related home accidents occurred 3 times more often to people resident in the 20% most deprived wards than those in the 20% least deprived.** The likelihood of a fire-related injury declines with social deprivation.

Overall, the link between fire injury and social deprivation holds for both serious injuries (i.e. the hospital episode statistics) and for less serious injuries sustained in home accidents (based on less serious admissions to casualty departments).

Brigade fire incident data and social deprivation

A similar analysis of the link between social deprivation and the incidence of fire incidents, injuries and deaths was carried out for twenty-one English fire and rescue services and the three Welsh fire and rescue services (Table 2).

For England, **there were 11.2 fire incidents per 1,000 dwellings in the most 20% of deprived English wards, falling by more than a half to 5.2 for the most deprived quintile. There is a similar pattern in Wales, although the number**

of incidents in each quintile is higher than the corresponding English quintile.

The relationship between fire injuries and social deprivation is similarly clear in England, with the injury rate increasing with increasing levels of deprivation. In Wales, the basic relationship is less stark but is still evident.

The evidence between fire fatalities and social deprivation is mixed. There is a clear but weak relationship between social deprivation, as measured by the IMD, and fatalities in England. In contrast, for Wales there is no discernible trend. These findings can be explained for several reasons. First, the small number of fatalities recorded in the sample may give rise to statistically unreliable results. Secondly, the IMD does not capture all the demographic or behavioural that are important in establishing whether a fire has fatal consequences, such as whether the household has a functioning smoke alarm or whether persons are intoxicated or have been smoking.

Multivariate analysis

Multivariate techniques were used to further explore the relationship between fire incidents, injuries and deaths and social exclusion. These more powerful approaches can be used to see if the overall IMD score (and each individual IMD component, e.g. health, education, housing and so on) can be used to predict the level of fire incidence, and the likelihood of fire injury or death once a fire has occurred. The full results are detailed in the main report. The key findings are summarised below.

Regression analysis of fire incidents and social deprivation

Summary of results

- The overall IMD score had a small association with the number of accidental dwelling fires in England and Wales. Individual IMD components, such as education, housing and health, were found to have a larger effect on the number of dwelling fires in England. In contrast only the housing and education domains had any significant influence on the number of dwelling fires in Wales.
- The housing deprivation domain was significant in 19 English fire services (out of 21) and for all three Welsh fire services, **implying that a high level of housing deprivation will lead to a higher number of dwelling fires.**
- The IMD was more successful in explaining the variation in deliberate vehicle fires between areas. For English and Welsh fire services, the influence of the IMD composite indicator on the number of deliberate vehicle fires was small. Individually, the access, housing and health and in particular the education domain had a significant influence on the number of fires in both England and Wales. The influence of education is also quite strong and significant when tested for a number of individual English and Welsh fire service areas.

That housing deprivation impacts on accidental dwelling fires and education on malicious vehicle fires is unsurprising. The former ties in with what is known from the literature (e.g. the 2002/03 British Crime Survey). For deliberate vehicle fires, evidence suggests that young people commit a disproportionate amount of vehicle crime (Canter & Almond, 2003⁶). Research has indicated that young people involved in anti-social behaviour are more likely to have poor education. The results therefore demonstrate the long-term benefit of improving education.

Logistic regression analysis of fire casualties

Multivariate analysis techniques were also used to explore the influence of deprivation on fire-related casualties.

Summary

The results from the analysis need to be treated with a degree of caution, as none of the estimates

using the different components of the IMD produced any strong predictable models due to their low explanatory power. One possible reason for the model's lack of predictive power might be caused by the absence of other strong influential variables such as household composition and behaviour. However, the analysis still produced some noteworthy results, in particular:

- The greater the level of education and health deprivation, the greater the risk of a fire resulting in a non-fatal casualty.
- For fatal fires, the model suggested that difficulties with regard to 'geographical access to services' had the strongest influence on the likelihood of a fatality occurring, but the relationship is weak.

Future research

The analysis of the UK administrative data sets and the IMD confirmed a link between fire casualties and social deprivation. The analysis of English and Welsh fire service data and the IMD gave further support for these findings. This analysis also found a link between the risk of fire and social deprivation. More complex, multivariate analysis was used to explore these links in detail. The study found that individual IMD components partially explained the risk of an accidental dwelling to deliberate vehicle fire, but were less successful at explaining the risk of injury and fatalities.

The following areas been highlighted for further research:

- **Health and education:** Both were found to have a significant influence on the number of fires in an area and the likelihood of being a casualty in a fire incident. The findings for health were expected as this measure relates to poor health and disability that are contributing factors to the risk of fire and the odds of being a fire casualty. Likewise the education measure includes deprivation in qualification attainment, full-time education attendance post-16 and absenteeism at primary level, and would also have been expected to exert an influence on these risks.
- **Access:** As measured by the IMD, it is difficult to understand what influence access has on the likelihood of a fire being fatal. This variable acts as a proxy measure for "access to emergency services". Further research is required to explore the relationship between access and fire fatality rates.

6 'The Burning issue: research and strategies for reducing arson', David Canter & Louise Almond. ODPM: 2002, www.odpm.gov.uk/stellent/groups/odpm_fire/documents/page/odpm_fire_601431.pdf

- **Qualitative studies:** In many instances the link between social deprivation indicators and fire incident rates and accident rates may mask more important contributing factors. The literature review identified a combination of factors which interact to contribute to these risks, much of which is absent from the IMD. Possible research includes:
 - **Education:** Further research needs to be done to assess the impact of fire prevention and reaction education in reducing the risk of fire and injury.
 - **Age:** Research indicates that the old or young are more likely to become a fire casualty than other age groups. However, in the context of the UK, it is unclear whether this increased risk stems from an increased risk of fire among these age groups, or problems of escaping from fire once it has occurred, or a combination of both factors.
- **Smoke detectors:** Initiatives are ongoing to supply low-income households with smoke detectors to reduce the risk of injury from fire. Further research is required to establish exactly how high-risk factors such as substance abuse, old age and poor education interact to reduce the effectiveness of such initiatives.

The research was carried out by ECOTEC Research and Consulting Limited. This report was edited by Darren Sugg, Office of the Deputy Prime Minister.

The views expressed in this report are those of the author, not necessarily those of the Office of the Deputy Prime Minister (nor do they reflect Government policy).

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