



Llywodraeth Cymru
Welsh Government

Electrical Fires in Wales

A Review of the Evidence



July 2018

Mae'r ddogfen yma hefyd ar gael yn Gymraeg.
This document is also available in Welsh.

Contents

| | |
|---|----|
| 1. INTRODUCTION | 2 |
| 2. BACKGROUND | 2 |
| 3. ELECTRICAL DISTRIBUTION | 3 |
| 4. THE POSITION OUTSIDE WALES | 4 |
| 5. COMPARISON WITH ENGLISH FRAs | 6 |
| 6. ELECTRICAL DISTRIBUTION FIRES IN WALES | 6 |
| 7. HOW SIGNIFICANT IS THE RISK | 7 |
| 8. DETAILED EVIDENCE ABOUT ELECTRICAL FIRES | 8 |
| Domestic appliances | 8 |
| Mobile devices and chargers | 9 |
| Ageing..... | 10 |
| Electrical installations..... | 10 |
| 9. FURTHER AREAS FOR EXPLORATION BY FRAS | 11 |
| Deprivation..... | 11 |
| Age of housing | 12 |
| Housing tenure..... | 12 |
| 10. CONCLUSION | 12 |
| 11. RECOMMENDATIONS | 14 |

1. INTRODUCTION

1.1 The number of accidental dwelling fires has been in sustained decline for the last 15 years at least with almost all sources (from smoking to cooking) reducing consistently during this period. The exception to this decline is fires where the source is identified as “electrical”. These have shown a marked and concerning increase during the same period.

1.2 The Welsh Government has reviewed available data for Wales, the wider UK, and elsewhere to ascertain whether the reason for this can be identified, and to establish the mitigating action that should be taken by Fire and Rescue Authorities (FRAs) to minimise the risks to residents in Wales. FRAs are, of course, not responsible for dwelling fires occurring and the trends we analyse in this report do not reflect any performance shortcoming on their part. FRAs do, though, have a clear role in supporting the prevention of such incidents, and minimising the impact of incidents when they do occur. They do this by identifying risk, providing relevant, targeted advice on home safety based on this risk, and by responding effectively to fires when they do occur. That process includes analysing and responding to new evidence about risks and trends in dwelling fire occurrence, and this report makes several recommendations in that area.

1.3 We have found that the increase relates to electrical distribution fires rather than electrical appliances or mobile devices, and more specifically to fires in wires, cabling and plugs. The trend mostly relates to fires in the South Wales geographical area and is not consistently replicated elsewhere in the UK. We have been unable to identify the cause of the increase, although around a third of the electrical distribution fires in South Wales relate to fuse boxes/consumer units, and it is reasonable to assume that the causes of these and other fires in electrical distribution systems might include old, damaged or defective wiring, use of inappropriately rated or improvised fuses, and overloading of sockets.

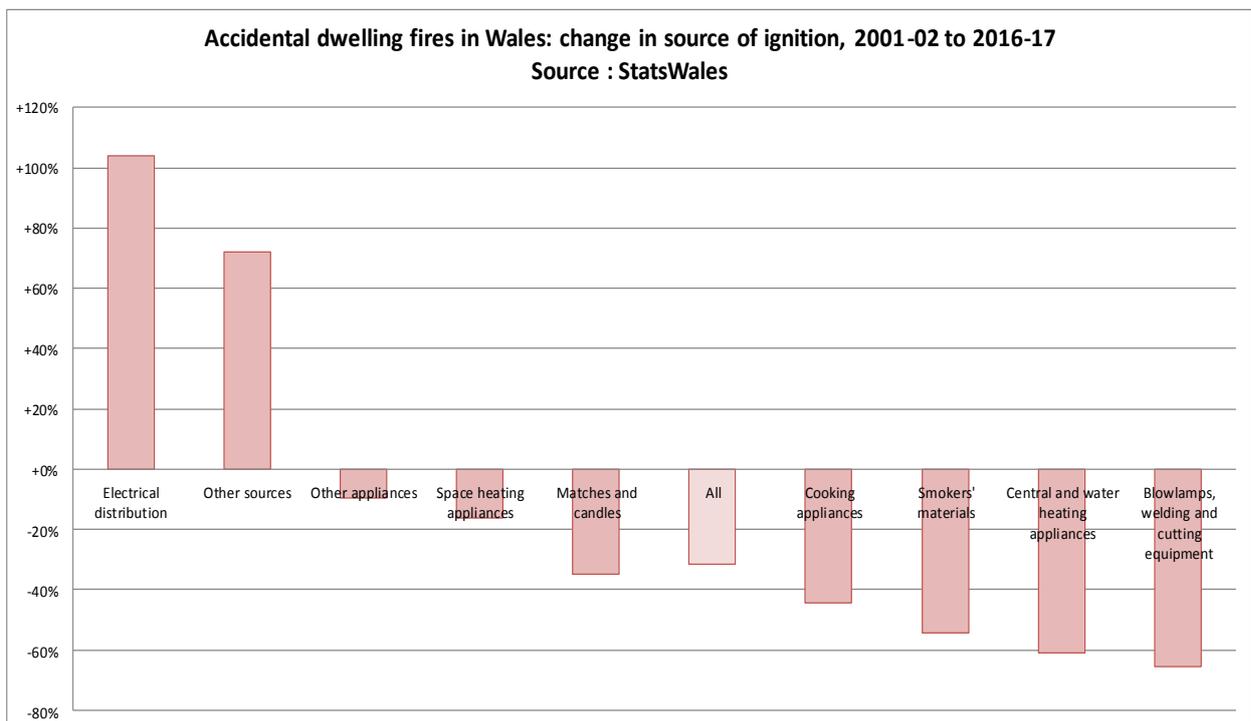
1.4 The evidence we have examined does not suggest that there is any greater risk of injury from electrical distribution fires than from any other accidental dwelling fire, although there is some evidence suggesting that damage to property may be greater from such fires. However, we still recommend further action from FRAs to undertake more detailed investigation of these fires in future, and to review and reinvigorate their community safety advice and activity in this area (see recommendations at para 11).

2. BACKGROUND

2.1 The number of fires attended by the Fire and Rescue Authorities (FRAs) in Wales has reduced considerably in the last fifteen years (by almost 70% overall). Whilst Accidental Dwelling Fires (ADFs) have reduced somewhat less during this period we have also seen a significant reduction of 31% (from 2,490 in 2001-02 to 1,719 in 2016-17). By far the most significant source of such fires are cooking appliances. Other common sources of fires in the home include electrical distribution, space heating appliances, central and water heating appliances, other appliances, matches and candles, and smokers’ materials.

2.2 Although the overall number of accidental dwelling fires in Wales is in sustained decline, fires with electrical distribution identified as their source have shown the opposite trend with a continued rise in the last 15 years. Electrical distribution is now one of the commonest sources of accidental fires in the home, whereas 15 years ago it was relatively insignificant.

2.3 The chart below illustrates this point – only electrical distribution fires and fires from “other sources” have increased since 2001-02. (“Other sources” are made up of a wide range of incidents including chimney fires, naked flames, natural occurrences, and spread from secondary (outdoor) fires.)



3. ELECTRICAL DISTRIBUTION

3.1 Electrical distribution fires originate in the electricity supply in homes from the point at which it enters the property. This includes fires in electricity meters, fuse boxes and consumer units, wiring for both lights and plug sockets, and the wiring to appliances (both hardwired for fixed appliances such as cookers and showers and also leads and plugs attached to other appliances). These are distinct from fires which start in electrical appliances themselves such as washing machines, tumble driers and fridges.

3.2 All FRAs in the UK use a standard Incident Recording System (IRS) to capture data about the fires they attend. IRS breaks down electrical distribution fires into three distinct categories:

- Electrical Supply – apparatus, batteries and generators (including meter, fuse and junction boxes).

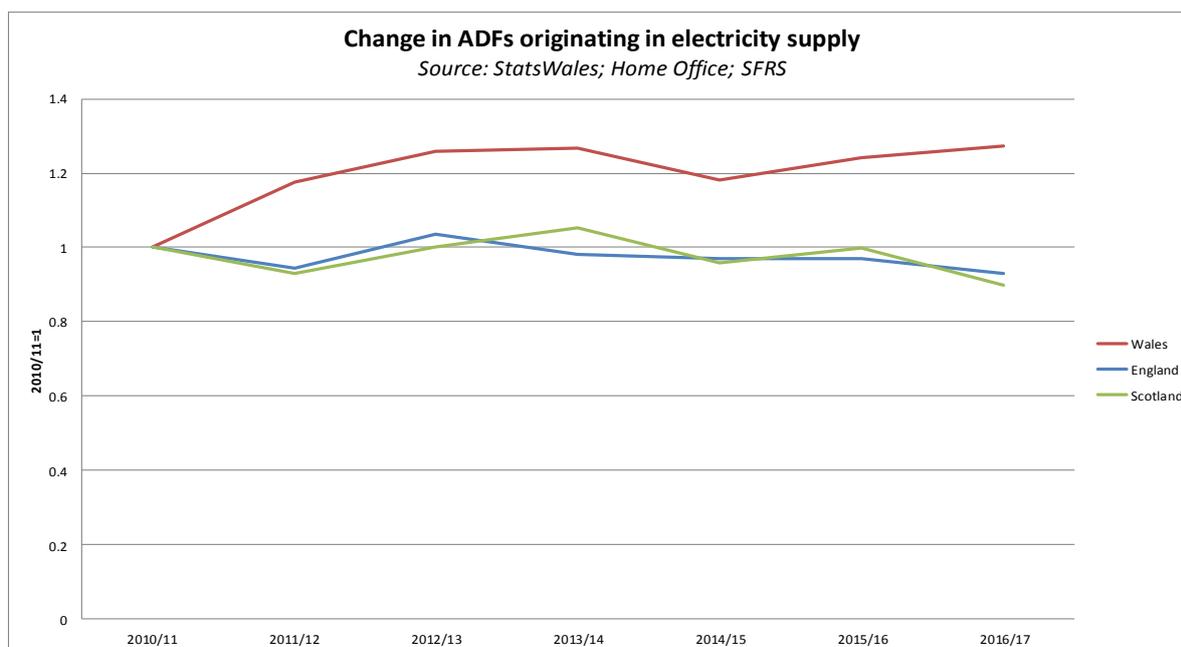
- Electrical Supply – wiring, cabling and plugs (including cables and plugs attached to electrical appliances)
- Heating Equipment – power source.

3.3 By far the greatest number of electrical distribution fires are associated with wiring, cabling and plugs – 85% in 2016-17. Consequently, this is also where the largest increase in electrical distribution fires occurs.

3.4 Of the 166 electrical distribution fires in 2016-17 related to wiring, cabling and plugs, 118 were reported as being caused by “faulty fuel supply”, 26 by faulty leads or appliances, 3 by misuse of equipment, and the remaining 19 for other reasons (including unknown).

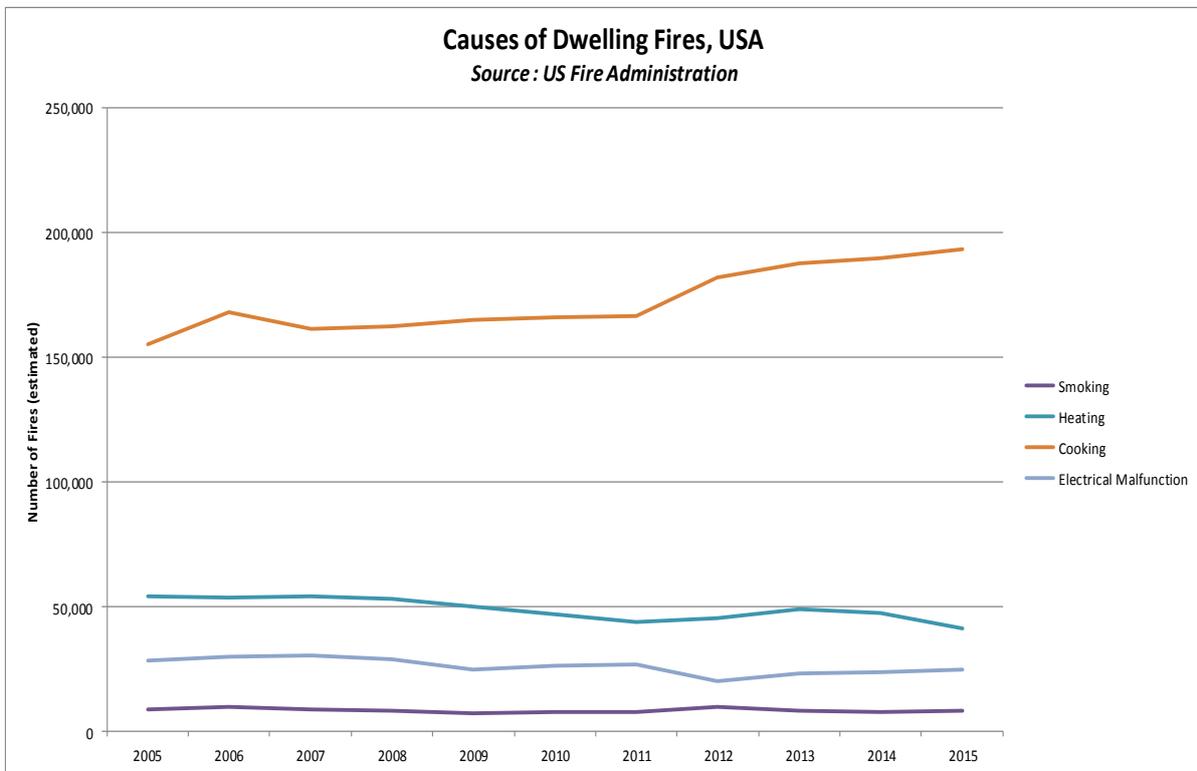
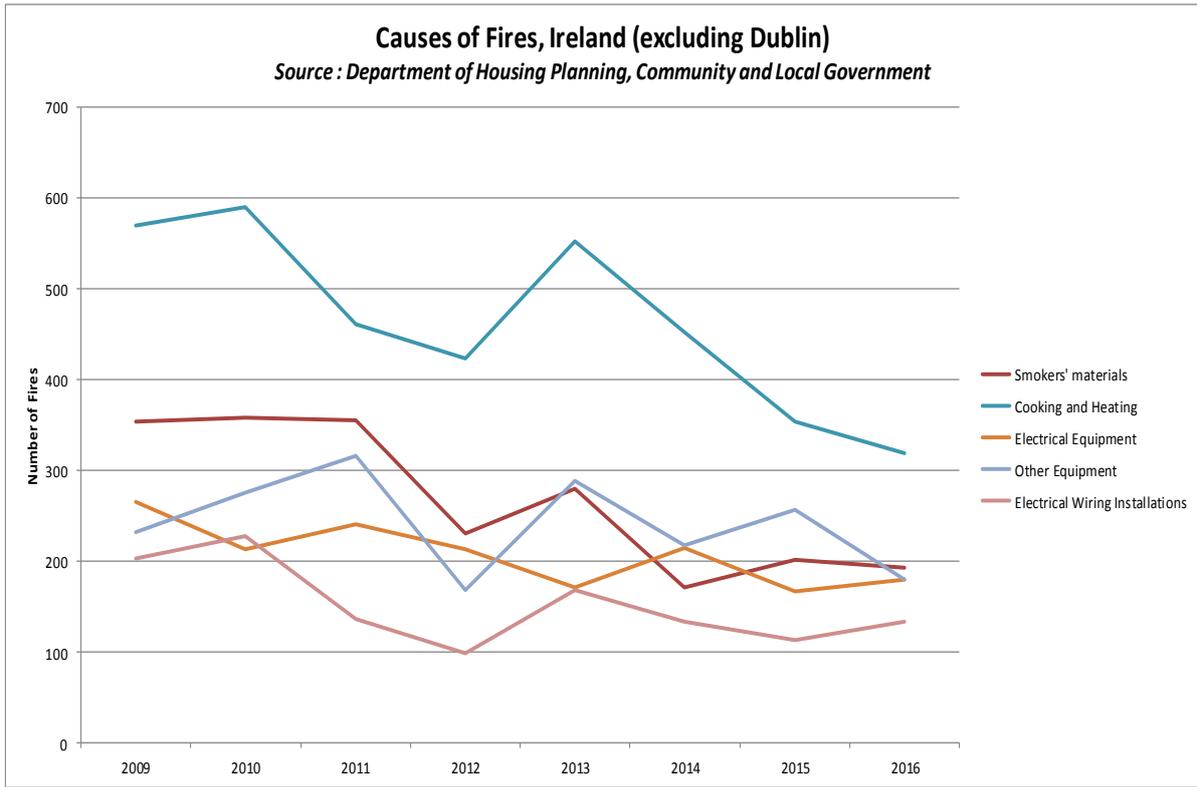
4. THE POSITION OUTSIDE WALES

4.1 Directly comparable data for England and Scotland show that, while electrical distribution accidental dwelling fires are relatively common, their incidence actually shows a slow decline in recent years.



4.2 Readily accessible data about sources of fire in other countries are not widespread, and are in any event not directly comparable, as different categories and definitions apply. For instance, the data below for Ireland¹ relate to all fires, not just dwelling fires, and the data for the United States relate to all residential buildings, not just dwellings. However, there is no evidence of any increase in electrical distribution fires in either Ireland or the United States.

¹ Note : Data on the cause of fires for the Dublin area are not published by the Irish Department for Housing Planning, Community and Local Government Website. The data in the “Causes of Fires, Ireland (excluding Dublin)” chart below for Electrical Equipment fires in 2014 and Other Equipment fires in 2015 do not match the published data source. This is because there appear to be inconsistencies in the original data.



5. COMPARISON WITH ENGLISH FRAs

5.1 As noted above, accidental dwelling fires where the source is electrical distribution have, overall, fallen slightly in England since 2010. Data for English FRAs are directly comparable with Welsh FRAs.

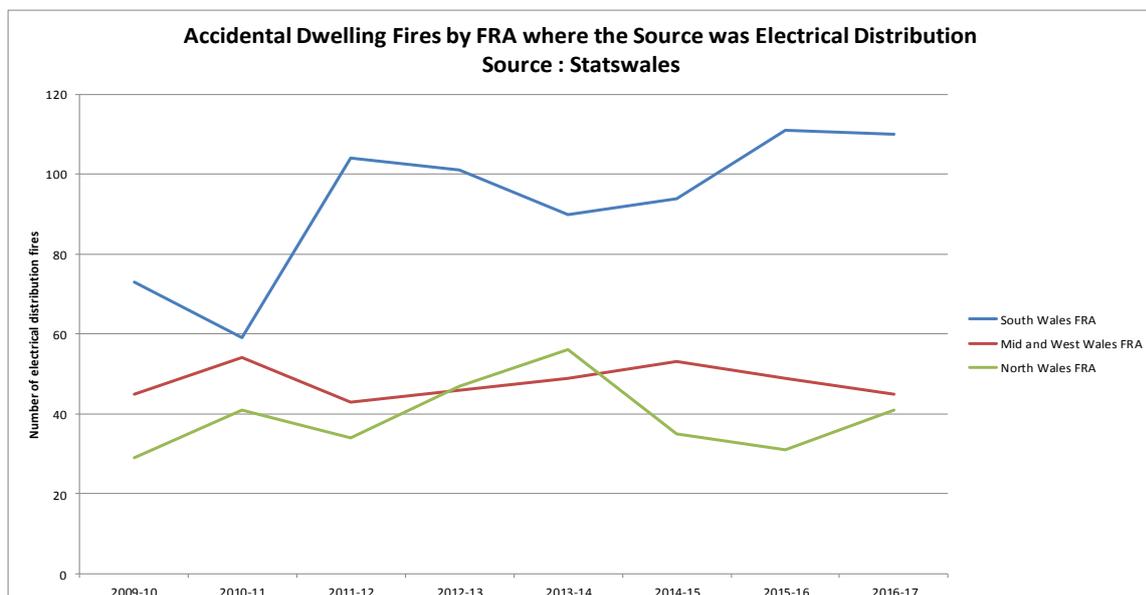
5.2 For most FRAs, the overall trend for accidental dwelling fires has been downward, whilst the sources of ignition have been prone to fluctuation. In all, 19 of the 48 English and Welsh FRAs saw increases in electrical distribution fires between 2010-11 and 2016-17 with 7 having an increase of 50% or more. Whilst 19 of the English FRAs have also seen increases over this time period, their data are generally much more volatile, with little or no evidence of a sustained trend.

6. ELECTRICAL DISTRIBUTION FIRES IN WALES

6.1 Electrical distribution fires in Mid and West Wales have remained at relatively the same level since 2009-10 (albeit with some minor spikes in the intervening years). In 2016-17 there were 45 electrical distribution fires in dwellings. Numbers in North Wales have increased by 41% since 2009-10 but this is only an increase of 12 incidents (from 29 in 2009-10 to 41 in 2016-17). A note of caution is required here as such small numbers can cause considerable percentage increases (and decreases) year on year without these representing genuine long-term trends.

6.2 As identified in the chart below, the greatest increase is in South Wales. In 2016-17 South Wales FRA attended 51% more incidents (an increase from 73 to 110) attributable to electrical distribution than in 2009-10.

6.3 The research also considered data for each local authority area in Wales. However, there were no discernible patterns in the occurrence of electrical distribution fires, whether in terms of their incidence per 100,000 population or per 100,000 dwellings. This is because there were too few such fires in most local authority areas to sustain meaningful conclusions about patterns and trends.



7. HOW SIGNIFICANT IS THE RISK

7.1 Whilst the number of these fires has doubled they still remain relatively low (under 200 incidents a year, or around 11% of all accidental dwelling fires). As part of our analysis we have reviewed the scale and impact of electrical distribution fires compared with accidental dwelling fires more generally to assess whether there is a greater risk to life and property where one of these types of fires occurs. As is the case throughout the analysis, further breaking down a dataset that is already relatively small means that the risk of chance variation increases and this needs to be borne in mind throughout.

7.2 We examined data for all accidental dwelling fires and accidental dwelling fires where the source was electrical distribution. For these fires we explored the spread of fire, i.e. the number of fires that were not contained to the item first ignited or to the room in which the fire originated. The number of injuries resulting from these fires was also reviewed.

7.3 Between 2009-10 and 2016-17, 57% of all accidental dwelling fires did not spread beyond the room in which they occurred. Over that period, electrical distribution fires were slightly but consistently less likely (51%) to be contained to the room of origin – suggesting that such fires tend to pose a marginally greater risk to property than dwelling fires generally. This may be because electrical distribution fires which break out in hidden wiring may be hard to detect until they are well-established, although there is no direct evidence for this. Conversely, injury rates² for the same period indicate that individuals are slightly less likely to be injured in an electrical distribution fire (6.7 injuries per 100 fires) than accidental dwelling fires generally (9.6 injuries per 100 fires). This may be because some *non*-electrical fires, in particular those started by smokers' materials, have very high casualty rates which skew the overall average.

7.4 In summary, we have identified that:

- In Wales, there is a sustained rise in the overall number dwelling fires originating in electrical distribution.
- Within Wales, the problem is particularly prevalent in the South Wales Fire and Rescue Authority area.
- This is counter to wider trends in the incidence of dwelling fires and their sources, which are in steady decline.
- There is no such overall trend in England or Scotland; and data from Ireland and the United States, although not directly comparable, also tend to indicate no similar trend there.
- Electrical distribution fires may pose a slightly greater risk to property than dwelling fires generally, but do not appear to pose a greater risk to life.

7.5 This is plainly a significant issue. But it is also an unusual one, in that the trends in electrical distribution fires are not mirrored in other sources of dwelling fires, and in that it is apparently confined to Wales (and in particular South Wales), with no similar

² Injuries include fatalities and injuries where an individual was taken to hospital both when their injuries appeared to be serious or slight. Precautionary checks and first aid given at scene are excluded.

overall trend in other jurisdictions. It therefore calls for careful and wide-ranging analysis. The next section discusses several possible causes for the trend.

8. DETAILED EVIDENCE ABOUT ELECTRICAL FIRES

8.1 The evidence we have already presented in this report draws largely on published overall statistics about fires. To understand the problem in more depth, we have used the far more detailed data in the UK-wide Incident Recording System (IRS) for FRAs, which has been in place since 2009. It collects detailed information on every incident attended by FRAs. There are nearly 200 questions within the IRS. Whilst no individual incident would require all of them to be completed, in general the more serious the incident the more questions that are asked. The system is maintained by the Home Office and information is entered by FRAs, using information collected by both automatic systems, and by personnel present at the time of the incident.

Domestic appliances

8.2 Most fires in the home originate in domestic appliances, with cooking appliances alone accounting for nearly half of accidental dwelling fires. Although such fires are declining overall, the dangers of them have been highlighted by some high-profile recalls of appliances which posed a fire risk; and because a domestic appliance seems likely to have been the original source of the Grenfell Tower fire. It is important to note though that the vast majority of fires originating in cooking or other appliances are caused by unsafe behaviours, such as distraction while cooking, using open chip pans or placing objects too close to heat – not by unsafe electrical appliances or installations.

Appliance fires are and should be recorded as originating in the type of appliance concerned, not as “electrical distribution”. However, whether a fire originated in the appliance or in its power supply may not always be obvious; and it is hypothetically possible that some appliance fires have been incorrectly recorded as electrical distribution fires. That could in turn account for the apparent increase we have seen.

8.3 To examine this, we used more detailed data as follows:

- All Wales IRS data where the source of the fire has been identified as “electrical distribution – wires, cabling and plugs”, but the *cause*³ of the fire has been identified as faulty leads or appliances, suggesting the problem could potentially lie with the appliance rather than electrical distribution.
- A sample of FRA “stop messages” for individual incidents which provide additional information regarding the incident. Where electrical distribution was identified as the source in IRS, “stop messages” included a range of references, including some fires relating to appliances. There are also isolated examples of fires in this category which did not involve electricity at all.

³ All fires have both a source (where a fire broke out, for instance a cooker or a gas fire) and a cause (why it broke out, for instance that the cooker was faulty, or that someone placed combustible material too close to the gas fire). IRS collects data for both sources and causes.

8.4 This suggests that there is some complexity in the definition of “wiring, cabling and plugs”, which IRS coding might exacerbate rather than eliminate. Such confusion may well have led some appliance fires to be recorded as electrical distribution fires instead.

8.5 This, however, is not the cause of the continued increase in electrical distribution fires. The trend continues to appear even when fires involving faulty leads or appliances are disregarded.

8.6 There are other reasons for doubting this explanation:

- All FRAs in the UK use IRS, and should be equally liable to record appliance fires as electrical distribution fires in this way. Yet as we have seen, electrical distribution fires have changed at very different rates in different FRAs, and have generally decreased in FRAs outside Wales.
- It would be unreasonable to expect those responsible for recording fires on IRS never to make mistakes. Indeed, our analysis of “stop messages” shows that a small number of fires probably have been misrecorded. But it is very unlikely that all those mistakes made by all those responsible would be the same, i.e. that they would consistently record appliance fires as electrical distribution fires rather than vice versa.
- There is no reason why the practice of recording appliance fires in this way should increase over time.

Mobile devices and chargers

8.7 The fire risks posed by rechargeable mobile devices (such as phones, laptop computers, e-readers and e-cigarettes) and their chargers are well-known. In particular, cheap unbranded or counterfeit chargers can easily overheat and ignite, or cause the devices they are charging to do so, especially if left connected to the mains supply for too long.

8.8 Therefore, it is unsurprising that some have ascribed the growth in electrical fires to such devices and chargers. Certainly the timing of the trend broadly coincides with the growth in ownership of such devices.

8.9 However, the evidence does not substantiate such claims. There are two reasons why:

- While the IRS does not have a distinct category for mobile devices or their chargers, there is no reason to record fires originating in such devices as relating to electrical distribution. Other IRS categories such as “battery charger”, “computer equipment”, “telephone” or “other appliance” would be more obviously appropriate.
- The growth in ownership of mobile devices is, of course, a worldwide phenomenon. If it led to an increase in electrical fires in Wales, we would expect to see that elsewhere too. Yet data for England, Scotland, Ireland and the United States show no evidence of this.

8.10 As above, it is possible that some fires which originated in mobile devices and chargers were incorrectly recorded as electrical distribution fires. But again as

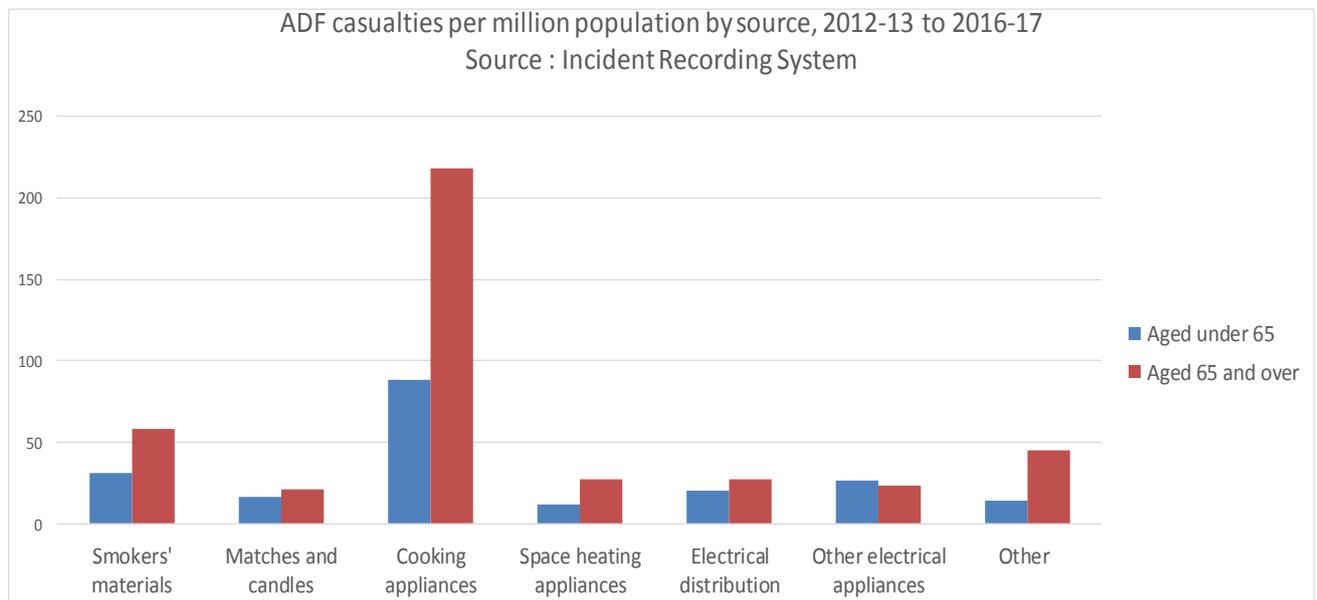
above, it does not appear at all likely that such errors can account for a sustained trend in Wales alone.

Ageing

8.11 The population of Wales is becoming significantly older as life expectancy increases. Old age is in general associated with a higher risk of fire, and it is possible that the increase we have seen may in part reflect the increased prevalence of this risk.

8.12 IRS only records the age of fire casualties, not the ages of those who experience a dwelling fire but escape uninjured. The data show that people over 65 are slightly more likely to be injured in an electrical distribution fire than people under that age. That in turn may mean they are more likely to experience such a fire; and that an ageing population may lead to an increase in the number of such fires.

8.13 However, older people are generally more likely to be injured in most kinds of dwelling fire, often because they may find it harder to escape: a higher casualty rate does not necessarily mean more fires. Furthermore, older people are much more likely to be injured by fires with other sources, such as cooking or smokers' materials; yet the overall incidence of such fires has fallen. And ageing is again a widespread phenomenon, not one which is confined to Wales or uniquely prominent here. Therefore, ageing cannot account for the increase in electrical distribution fires in Wales.



Electrical installations

8.14 An “installation” is the electrical infrastructure in a dwelling: the meter, consumer unit (fuse box), cabling, light fittings and sockets. Much of a typical installation is hidden from view – behind walls and under floors – and/or taken for granted. However, it is prone to deteriorate slowly over time, and should receive periodic checks and maintenance to avoid creating a risk of fire. Such risks can also

arise if the installation is overloaded or subjected to ill-planned or low-standard adaptations.

8.15 There is some evidence that electrical installations have been the source of many if not most of the fires we have reviewed. Detailed analysis of individual reports and “stop messages” reveal that the following are frequently cited as the causes of electrical distribution fires:

- Faults in consumer units (the most frequently cited cause)
- Faults in the electrical supply to the property (i.e., before it reaches the meter)
- Short circuits and other defects in cabling
- Overloading of sockets
- Poor workmanship and maintenance

8.16 There were very few examples of fires being caused by deliberate misuse of the electricity supply (for instance, attempting to bypass the electricity meter), although there were several instances of fires started through the domestic cultivation of cannabis. This requires high amounts of electrical power in a confined space, and can easily overload the installation.

8.17 Additionally, analysis by South Wales FRA indicated that the second commonest location of domestic electrical distribution fires was the hallway. It is unlikely that there are any significant sources of fire in most domestic hallways besides an electricity meter and/or consumer unit, so this corroborates the wider pattern.

8.18 These findings are not conclusive. There is no standard format or content for “stop messages” – they include only what the attending firefighters decide should be recorded – so it would be wrong to analyse these causes quantitatively. Nor do they provide any explanation about why the number of fires might have increased. But they do provide the best evidence available so far about why such fires might occur.

9. FURTHER AREAS FOR EXPLORATION BY FRAS

9.1 Overall, the evidence has shown that the increase in electrical fires probably represents fires originating in electrical installations, and caused largely by faults in them rather than by misuse. That does not explain why the increase occurred, which appears to be beyond the limitations of the data which are currently available. There are, though, further lines of inquiry which FRAs should consider pursuing.

Deprivation

9.2 Deprivation in general is associated with a higher risk of fire. In this instance, households living in poverty might be less able to afford the necessary maintenance of their property. There appears to be nothing in the Wales and England data which suggest any connection with deprivation at an FRA level. Most English FRAs which have experienced the highest increases in electrical fires are not particularly deprived; indeed some (like North Yorkshire, Cambridgeshire and Hertfordshire) are relatively wealthy. However, this does not necessarily rule out such an explanation,

as fires could still be concentrated in deprived areas within each FRA. In South Wales the highest number of incidents occurred in Cardiff and Rhondda Cynon Taff, in Mid and West Wales FRA the highest were in Carmarthenshire and then Swansea, and in North Wales FRA the highest numbers were in Gwynedd and Wrexham. However, when population or number of dwellings are factored in the picture is far less clear. FRAs in Wales could undertake further work to map these incidents against areas of high deprivation to see whether a pattern emerges, although we believe that the volatility identified in the breakdown by local authority area may make that unlikely.

Age of housing

9.3 The evidence so far suggests that electrical distribution fires occur predominantly in electrical installations rather than appliances. Such installations deteriorate over time; the older a house is, the more likely it is to have defects which need repair and are a possible fire risk. If and to the extent that such defects are not repaired, electrical distribution fires may well be more likely in older properties. However, IRS does not record the age of properties in which fires occur, so there is no means of testing this theory using IRS data.

9.4 Of the 23 properties experiencing an electrical distribution fire sampled in the North Wales analysis, the age of the properties tended to be older with the majority having an estimated build date of between 1900 and 1979. However, this was very much an approximation based on an image of the property. Further investigation would be required to establish if this was definitely the case, or whether this simply reflected the age of housing stock more generally.

Housing tenure

9.5 More speculatively, certain types of housing – such as student accommodation or houses in multiple occupation – may contain more electrical fire risks than houses generally. Any increase in such housing might thus lead to more electrical fires.

9.6 There is no evidence at all about this; IRS does not record housing tenure, and the geographical analysis above did not, for instance, reveal any greater incidence of electrical fires in areas with high student populations. Again, though, this may be masked by the wider population, and a more focussed or qualitative analysis may reveal something, as may, the Housing Condition Survey – the results of which are due for publication later in 2018.

10. CONCLUSION

10.1 Overall, examination of this further data has confirmed that:

- the increase in fires due to electrical supply is significant and sustained. The greatest increase relates to those where the source is identified as cabling, wiring and plugs;

- there has been no parallel increase at a whole-country level in other jurisdictions for which data are available;
- the increase in Wales appears largely to have occurred in South Wales;
- while some FRAs in England have seen large increases, they are the exception – and there is little or no evidence of a sustained increase anywhere. Most FRAs in England have seen a small decline in electrical distribution fires, with a similar trend in Scotland;
- the data suggest that electrical distribution fires may carry a slightly higher risk of damage to property than dwelling fires generally, but do not pose a higher threat to life;
- the increase in electrical distribution fires is almost certainly **not** due to fires originating in domestic appliances, or mobile devices and their chargers. Some fires may have been misrecorded in IRS, but that does not account for the increase;
- the increase has no connection to the ageing of the population;
- most domestic electrical distribution fires originate in electrical installations, with faulty consumer units being a notable but not predominant cause. While such fires also account for most of the increase in electrical distribution fires, there is no obvious reason why this should be so;
- there is no significant evidence of the increase being due to deliberate misuse of the electricity supply;
- there is no apparent link to deprivation at an FRA level in Wales and England. Although a more detailed examination using the Welsh Index of Multiple Deprivation could be undertaken, the relatively low numbers of fires in each area make it unlikely that a meaningful pattern would emerge. However, South Wales FRA in particular should consider undertaking such an exercise to establish whether this is the case;
- there is some tenuous evidence of a link to housing age, although a much more detailed local review would need to be undertaken to establish this definitively.

10.2 It would be difficult to establish any further clarity within the limitations of the data currently available. Despite the increase, the number of electrical dwelling fires remains relatively low, meaning the dataset is volatile and trends within it (eg for local areas, or specific causes of fire) are hard to identify. And while “stop messages” are useful for gaining a basic understanding of each fire, the information they contain is necessarily very limited.

10.3 Those data limitations have meant this study has made only limited progress in analysing this concerning trend. However, it has ruled out some commonly-asserted causes, and focussed attention on others. To improve understanding and, more

importantly, to combat the increase in electrical distribution fires, we make the following recommendations.

11. RECOMMENDATIONS

- FRAs should review and reinvigorate their general electrical fire safety messaging, ensuring that this focusses on electrical supply as well as electrical appliances. FRAs should consider engaging with Electrical Safety First in this context.
- FRAs should include advice on the need for electrical safety checks in all of their Safe and Well visits as a matter of course. Firefighters are not electricians so should not be expected to provide any technical electrical advice or services. But they ought to be able to identify obviously old (and potentially dangerous) consumer units and other visible elements of electrical installations. Where this is so, they should suggest the householder seeks further checks. This should be included as a prompt in the All Wales Safe and Well form.
- All householders experiencing an electrical distribution fire should receive a follow up Safe and Well visit.
- FRAs should consider whether, as part of follow up Safe and Well Visits, additional questions could be asked of the householder to establish whether they have established any further information on the source/cause of fire either from insurers or from qualified professionals who have undertaken post fire repairs. Alternatively such information could be sought in South Wales FRA as part of any post-fire interviews undertaken.
- FRAs should consider whether it is appropriate to target more formal fire investigation processes at some of these incidents for a period of time to develop clearer evidence.
- FRAs should continue to review new data and information to try to establish further clarity on the problem, including any information gained as a result of the recommendations below. In doing so FRAs should review their current guidance to firefighters on completion of IRS, and consider whether internal arrangements could be introduced to quality assure entries where the cause is identified as “unknown”.
- FRAs should raise categorisation issues as part of any review or replacement of IRS. Any new system should be capable of clearly distinguishing electrical distribution fires from appliance fires; and of recording fires originating in mobile devices and chargers.
- FRAs should review the outcomes of the Housing Condition Survey to be published later in 2018, which will include data regarding the status of electrical wiring at the properties surveyed.