

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH AND FIRE OFFICES' COMMITTEE
JOINT FIRE RESEARCH ORGANIZATION

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FIRE CASUALTIES IN DWELLINGS IN GREAT BRITAIN DURING 1956

by

J. M. Firth

Summary

Since almost one half the number of casualties due to fire in Great Britain occur in dwellings, the opportunity was taken to study this question from a special survey of fires in dwellings during 1956, so as to examine possible means of reducing the toll.

More deaths due to burning are recorded by the Registrar-General than by the Fire Brigades as there are burning accidents (such as clothing catching fire) to which the Fire Brigade is not always called.

The note emphasises the dangers of clothing becoming ignited, as over half the fatalities resulted from this situation, and the importance of providing guards where flames are exposed.

Over 90 per cent of the casualty incidents had two or less casualties, and 97 per cent of the fatal incidents had only one victim, so multiple casualty fires in dwellings are few. The fires involving casualties are usually small - almost 90 per cent of them were confined to the room of origin.

There was a significant difference between the types of dwellings in which casualties occurred as detached houses had a lower rate than houses converted into flats.

September, 1961.

Fire Research Station,
Boreham Wood,
Herts.

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Introduction

Fire Brigades in Great Britain report some 3500-4000 casualties in fires annually of which 400-500 (some 10-15 per cent) die of their injuries. Approximately one half of the casualties occurs in dwellings, so the opportunity was taken to study this question from a special survey of fires in dwellings in Great Britain during 1956. The object of the present work is to examine possible means of reducing the future toll due to fire.

During 1956 there was a total of 4014 casualties (including 524 fatal) in fires in Great Britain; of these, 2060 (including 419 fatal) occurred in dwellings. In the same year the Registrar-General recorded 850 deaths from burns. The difference between the two fatality figures arises because, although Fire Brigades probably attend all fires where persons die as a result of being trapped in burning buildings, they may not be called to many of the much larger number of incidents where only persons and their clothing are burned. This note is based on Local Authority Fire Brigade reports and therefore deals only with those incidents attended by the Brigades.

Casualty rates

Table 1 gives details of casualties according to sex and age group (a child has been regarded as a person aged up to 15 years) together with incidence rates related to the national population.

Incidence rates are higher for females than for males presumably because the clothing worn is more prone to ignition. Total casualty rates are higher for children than adults, but the fatal rates are lower for children - evidence of both the greater need for care of children and their greater resilience and recovery power.

Material first ignited

"Clothing on the person" was the largest single item of the material first ignited for both classes of casualty (Table 2). Of fatal casualty fires 214 (approximately 54 per cent) started when clothing on the person was ignited; similarly 443 (32 per cent) of the incidents with non-fatal casualties started in this manner. Out of 657 incidents when clothing became ignited there were only twenty without a casualty. This emphasises the need for the adequate provision of guards where naked flames or elements are exposed. The dangers of wearing loose or trailing apparel by women are also evident.

Causes of fire

Table 2 also presents details of the occurrences which ultimately caused the fires. Eighty-two per cent of the fatal incidents and 83 per cent of the non-fatal incidents were caused by some act of the occupant of the dwelling, compared with 50 per cent of all fires in dwellings.

An analysis of causes is given in Table 3 together with casualty rates per 100 incidents. Space heating accounted for slightly over half of both the fatal and the non-fatal fires. Smoking materials were the next most common cause of casualty fires - 19 per cent of fatal incidents and 16 per cent of non-fatal incidents - followed by fires involving cooking appliances with 7 per cent and 14 per cent respectively. The proportion of fires causing casualties varies considerably from cause to cause, with town gas the highest in both the space heater and

cooker group. In the latter group this is probably due to the fact that the flame of a gas cooker can ignite clothing on the person more readily than, for example, the hotplate or even the radiant ring of an electric cooker. This is borne out by table 3A which suggests that although electric cookers have a fire incidence rate about three times that of gas cookers (taking numbers at risk into account), a gas cooker is more likely to ignite clothing on the person.

Table 3B shows the number of casualties in relation to the estimated number of space heating appliances at risk using various fuels. Unfortunately it was not possible to obtain accurate estimates of numbers of solid fuel appliances, hence casualty rates have been computed in two possible estimates assuming either one or two heaters per dwelling. Both solid fuel and oil have a markedly higher total casualty rate than gas and electricity; the fatal casualty rate is highest with solid fuel whichever estimate of the numbers of appliances is used.

Casualties per fire

Numbers of casualties per incident are recorded in Table 4. Fatal and non-fatal incidents are considered separately and some adjustment was necessary to allow for incidents involving both types of casualty when considering total casualties. One person only was involved in 86 per cent of the total number of incidents and two in a further 10 per cent. At the other end of the scale there were, however, six persons involved in each of four incidents.

Extent of fire

The extent of fires and the effect on casualties are indicated in Table 5. Some 93 per cent of all fires were confined to the room of origin; 89 per cent where non-fatal casualties occurred and 86 per cent where there were fatalities. It appears that some connection exists between fire spread and casualty rate, but even so most casualty fires are small.

Type of dwelling

The types of dwelling in which casualties occurred are given in Table 6. Assuming that the large category in which the type of dwelling is unknown is not biased towards any particular type, there is a significant difference between types - detached houses have a low casualty rate per 100 fires whilst the rates for converted flats and maisonettes are high. It is possible that overcrowding or other social conditions may have some bearing on this situation.

Time of occurrence

The hourly incidence rates for casualty incidents are shown in Table 7 and Fig. 1. It appears that both the total incidence of fire and the frequency of casualty fires are highest between 9.00 a.m. and 9.00 p.m., but the casualty rate measured as the number of casualties per 100 fires, is higher at night than in the day. In other words there are fewer fires at night, but they are more likely to cause casualties, the greatest chance of a fatal casualty resulting from fire being between 4.00 a.m. to 6.00 a.m.

Conclusions

This analysis indicates the situations in which persons may become fire casualties. The emphasis is firstly on "clothing on the person" becoming ignited, since 54 per cent of the fatal and 32 per cent of the non-fatal casualties are attributable to this cause. The high female casualty rate presumably results from the fact that feminine apparel is lighter, more trailing, and more flammable than that of men. Secondly, the note stresses the high proportion of fires caused by space heaters and gas cookers which result in casualties, underlining the need for adequate guards and greater care in the use of naked flames.

Multiple casualty fires in dwellings are fortunately few in number. The analysis of the extent of fire and number of casualties shows that only 14 per cent of casualty fires caused more than one casualty and 4 per cent more than two. Analysis of fatal casualties makes this point even more evident since 97 per cent of these involved only one fatality.

The fire spread beyond the room of origin in 14 per cent of the fatal incidents and in 11 per cent of the non-fatal; this is only little more than the 9 per cent for all dwelling fires. It is evident that, at least in the case of normally active adults, persons are rarely trapped by fire in dwellings. The above figures are specially important as the survey covers only the fires attended by Fire Brigades and so, presumably, includes all the large fires in which people were likely to have been trapped, but may exclude many smaller ones. It is possible that some people could have been saved by earlier or better organized and equipped rescue attempts, but since almost 90 per cent of the fatalities occurred in fires which were confined to the rooms in which they originated, the number is probably quite small.

Table 1
CASUALTY FIRES IN DWELLINGS
Great Britain 1956
Age and sex of casualties

	Adult male			Adult female			Child male			Child female			All persons		
	No. of casualties	Population (000)'s	Incidence per 100000 population	No. of casualties	Population (000)'s	Incidence per 100000 population	No. of casualties	Population (000)'s	Incidence per 100000 population	No. of casualties	Population (000)'s	Incidence per 100000 population	No. of casualties	Population (000)'s	Incidence per 100000 population
NON-FATAL CASUALTIES															
England and Wales	430	16047	2.68	635	17928	3.54	164	5470	3.05	280	5222	5.36	1509	44667	3.38
Scotland	45	1767	2.55	58	2015	2.88	14	696	2.01	15	667	2.25	132	5145	2.56
Great Britain	475	17814	2.67	693	19943	3.47	178	6166	2.89	295	5889	5.01	1641	49812	3.29
FATAL CASUALTIES															
England and Wales	89	16047	0.55	206	17928	1.15	17	5470	0.31	57	5222	1.09	369	44667	0.74
Scotland	16	1767	0.90	22	2015	1.09	5	696	0.72	7	667	1.05	50	5145	0.97
Great Britain	105	17814	0.59	228	19943	1.14	22	6166	0.36	64	5889	1.09	419	49812	0.84

TABLE 2

CASUALTY FIRES IN DWELLINGS

GREAT BRITAIN 1956

Material first ignited and act or defect associated with cause of fire

Numbers of incidents

Material first ignited	Non-fatal casualties							Fatal casualties						
	Fire ultimately due to							Fire ultimately due to						
	Act of occupant	Failure of removable equipment	Failure of fixed equipment	Spread from other hazard	Other	Unknown	Total	Act of occupant	Failure of removable equipment	Failure of fixed equipment	Spread from other hazard	Other	Unknown	Total
Roof	6	-	2	1	3	-	12	-	-	-	-	-	-	-
Roofing felt or lining	3	-	-	-	-	-	3	-	-	-	-	-	-	-
Ceiling	-	-	-	2	-	-	2	-	-	-	-	-	-	-
Partitions, walls, wall linings	-	-	-	1	1	-	2	1	-	-	-	-	-	1
Floorboards, flooring	5	1	2	1	-	-	9	6	-	-	-	1	-	7
Timber under hearth	-	-	2	-	-	-	2	-	-	-	-	-	-	-
Wooden fireplace surround	-	1	1	-	-	-	2	-	-	-	-	-	-	-
Timber in chimney	-	-	1	-	-	-	1	-	-	-	-	-	-	-
Built in cupboards	-	-	1	-	-	-	1	-	-	-	-	-	-	-
Other wooden fittings	5	1	1	2	1	1	11	-	-	-	-	-	-	-
Pipe and tank laggings	8	-	-	-	-	-	8	1	-	-	-	-	-	1
Flue casings	-	-	-	-	1	-	1	-	-	-	-	-	-	-
Electrical insulation	4	-	10	-	2	-	16	-	-	1	-	-	-	1
Airing linen	39	-	-	-	-	-	39	5	-	-	-	-	-	5
Apparatus through fault in apparatus	2	17	-	-	-	-	19	-	3	-	-	-	-	3
Contents of airing cupboard	1	-	-	-	-	1	2	-	-	-	-	-	-	-
Clothing on person	424	-	-	-	2	17	443	204	-	-	-	3	7	214
Flammable liquids	167	13	-	-	3	-	183	16	-	-	-	-	-	16
Food	92	1	-	-	-	-	93	2	-	-	-	-	-	2
Furniture, furnishing	146	3	6	-	11	4	170	32	-	-	-	6	-	38
Bedding	80	3	-	-	9	1	93	35	-	-	-	1	2	38
Floor covering, not carpets	4	1	-	-	2	-	7	-	-	-	-	-	3	3
Other contents	87	6	2	2	15	4	116	14	-	-	-	2	-	16
Burns to person only	4	-	-	-	1	-	5	1	-	-	-	-	-	1
Town gas	54	6	11	-	-	-	71	6	2	-	-	-	-	8
Rubbish	9	-	1	1	-	-	11	2	-	-	-	-	1	3
Unknown	4	1	-	-	1	57	63	1	-	-	2	-	39	42
Total	1144	54	40	10	52	85	1385	327	5	1	2	13	52	400

TABLE 3
FIRES IN DWELLINGS
GREAT BRITAIN 1956

Cause	All fires in dwellings		Fires with non-fatal casualties			Fires with fatal casualties		
	Number of incidents	% of total	Number of incidents	% of non-fatal fires	Rate per 100 incidents	Number of incidents	% of fatal fires	Rate per 100 incidents
Space heaters								
Electricity	949	3.9	84	6.1	8.8	37	9.2	3.9
Town gas	143	0.6	26	1.9	18.2	13	3.2	9.1
Oil	1075	4.5	103	7.4	9.6	23	5.8	2.1
Solid fuel	9701	40.4	492	35.5	5.1	136	34.0	1.4
Unstated	9	-	-	-	-	-	-	-
Total	11877	49.5	705	50.9	5.9	209	52.2	1.8
Domestic cookers								
Electricity	1058	4.4	37	2.7	3.5	1	0.2	0.1
Town gas	1354	5.6	149	10.8	11.0	23	5.8	1.7
Oil	34	0.1	2	0.1	5.9	1	0.2	2.9
Solid fuel	148	0.6	2	0.1	1.3	2	0.5	1.4
Unstated	171	0.7	10	0.7	5.8	1	0.2	0.6
Total	2765	11.5	200	14.4	7.2	28	7.0	1.0
Other domestic appliances								
Electric	1498	6.2	28	2.0	1.9	4	1.0	0.3
Town gas	207	0.9	8	0.6	3.9	4	1.0	1.9
Oil	75	0.3	8	0.6	10.7	7	1.8	9.3
Others	5	-	-	-	-	-	-	-
Total	1785	7.4	44	3.2	2.5	15	3.8	0.8
Fixed installations	1306	5.4	21	1.5	1.6	1	0.2	0.1
Sundry								
Smoking materials etc.	2771	11.5	216	15.6	7.8	77	19.2	2.8
Children with matches	528	2.2	29	2.1	5.5	12	3.0	2.3
Spread from other buildings	730	3.0	10	0.7	1.4	2	0.5	0.3
Other causes	1344	5.6	70	5.1	5.2	6	1.5	0.4
Unknown	889	3.7	90	6.5	10.1	50	12.5	5.6
Grand Total	23995	100.0	1385	100.0	5.8	400	100.0	1.7

TABLE 3A

CASUALTY FIRES IN DWELLINGS

GREAT BRITAIN 1956

Fires associated with domestic cookers

Type of cooker	Number of fires				
	Total	Food first ignited		Clothing on person first ignited	
		No.	%	No.	%
Gas	1147	723	63	37	3.2
Electric	980	843	86	2	0.2
Electric/Gas relative hazard (scaled on basis of No. at risk)	Approx. 3	Approx. 4		Approx. 0.2	-

TABLE 3B

CASUALTY FIRES IN DWELLINGS

GREAT BRITAIN 1956

Fires associated with space heaters

Fuel in use	No. of appliances million	Fatal casualties	Non-fatal casualties	Total casualties	Rate per million appliances		
					Fatal	Non-fatal	Total
Electricity	16.25	37	96	133	2.3	5.9	8.2
Gas	3.75	14	26	40	3.7	6.9	10.7
Oil	7	24	121	145	3.4	17.3	20.7
Solid	16.5)* 33.0)	141	568	709	(8.5 (4.3	34.4 17.2	43.0 21.5

*Assuming one or two appliances per dwelling

TABLE 4

CASUALTY FIRES IN DWELLINGS

GREAT BRITAIN 1956

Number of casualties per fire

Non-fatal casualties

x	Numbers of incidents in which x persons were injured						Total number of incidents	Total number of persons injured
	1	2	3	4	5	6		
England & Wales	1108	141	22	5	3	3	1282	1509
Scotland	85	10	6	1	1	-	103	132
	1193	151	28	6	4	3	1385	1641

Fatal casualties

x	Numbers of incidents in which x persons died						Total number of incidents	Total number of persons
	1	2	3	4	5	6		
England & Wales	345	5	3	-	1	-	354	369
Scotland	43	2	1	-	-	-	46	50
	388	7	4	-	1	-	400	419

Included in the above tables are 54 incidents which involved both fatal and non-fatal casualties in the same incident, 45 in England and Wales and 9 in Scotland.

All casualties

x	Numbers of incidents in which x persons were involved						Total number of incidents	Total number of persons
	1	2	3	4	5	6		
England & Wales	1379	169	24	9	7	3	1591	1878
Scotland	118	10	7	3	1	1	140	182
	1497	179	31	12	8	4	1731	2060

TABLE 5
CASUALTY FIRES IN DWELLINGS
GREAT BRITAIN 1956

EXTENT OF FIRE

	Non-fatal incidents				Fatal incidents			
	Confined to room of origin		Spread beyond room of origin		Confined to room of origin		Spread beyond room of origin	
	No.	%	No.	%	No.	%	No.	%
Great Britain all houses								
No. of casualty incidents	1229	88.7	156	11.3	343	85.8	57	14.2
Total incidents	22275	92.8	1720	7.2	22275	92.8	1720	7.2
Casualty incidents per 100 incidents	5.5	-	9.1	-	1.5	-	3.1	-

TABLE 6
CASUALTY FIRES IN DWELLINGS
GREAT BRITAIN 1956

Type of dwelling involved

Type of dwelling	Total number of fires	Casualty incidents		Casualty incidents per 100 fires	
		With fatal casualties	With non-fatal casualties	Fatal	Non-fatal
Detached house	2518	36	92	1.4	3.6
Semi-detached house	951	25	54	2.6	5.7
Terraced house	1321	31	77	2.4	5.8
Flat reported built as a flat	2612	38	145	1.4	5.6
Flat converted	840	17	80	2.0	10.0
Flat one of a block	2261	33	124	1.5	5.5
Maisonettes	36	1	4	2.8	11.1
House (unspecified)	13456	219	809	1.6	6.0
Total	23995	400	1385	1.7	5.8

TABLE 7

CASUALTY FIRES IN DWELLINGS

GREAT BRITAIN 1956

HOURLY INCIDENCE

	Total number of fires	Casualty incidents		Casualty incidents per 100 fires	
		With fatal casualties	With non-fatal casualties	Fatal	Non-fatal
Midnight to 1 a.m.	545	10	34	1.8	6.2
1 a.m. " 2 "	522	10	48	1.9	9.2
2 " " 3 "	483	10	41	2.1	8.5
3 " " 4 "	405	13	29	3.2	7.1
4 " " 5 "	330	13	14	3.9	4.2
5 " " 6 "	363	15	18	4.1	4.9
6 " " 7 "	397	9	24	2.2	6.0
7 " " 8 "	640	15	44	2.3	6.9
8 " " 9 "	818	23	64	2.8	7.8
9 " " 10 "	1035	30	85	2.9	8.2
10 " " 11 "	1186	32	90	2.7	7.6
11 " " 12 noon	1498	25	86	1.7	5.7
12 noon " 1 p.m.	1507	15	76	1.0	5.0
1 p.m. " 2 "	1292	20	75	1.5	5.8
2 " " 3 "	1337	13	60	1.0	4.5
3 " " 4 "	1425	19	73	1.3	5.1
4 " " 5 "	1595	18	81	1.1	5.1
5 " " 6 "	1530	17	84	1.1	5.5
6 " " 7 "	1440	20	89	1.4	6.2
7 " " 8 "	1294	18	63	1.4	4.9
8 " " 9 "	1253	16	70	1.3	5.6
9 " " 10 "	1181	12	51	1.0	4.3
10 " " 11 "	1080	14	52	1.3	4.8
11 " " 12 midnight	795	7	27	0.9	3.4
Not stated	44	6	7
TOTAL	23995	400	1385	1.7	5.8

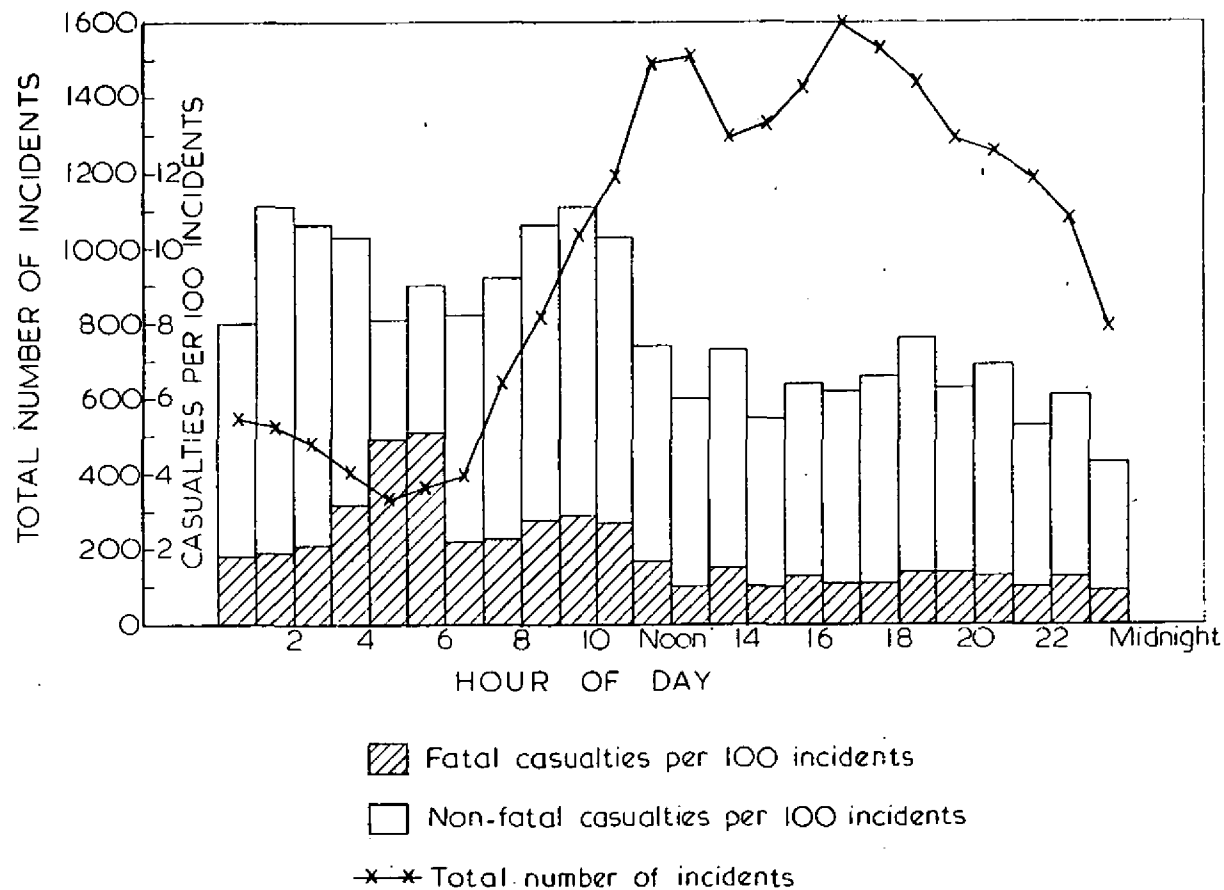


FIG. 1. FIRES IN DWELLINGS - GREAT BRITAIN 1956 - HOURLY INCIDENCE AND CASUALTY RATE

Table 1
CASUALTY FIRES IN DWELLINGS
Great Britain 1956
Age and sex of casualties

	Adult male			Adult female			Child male			Child female			All persons		
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