Range Fires

Characteristics Reported in National Fire Data and a CPSC Special Study

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National Estimates Based on NFIRS and NFPA Data

Executive Summary

This report provides information on the magnitude of the residential range fire problem and the characteristics related to those fires.[1] National estimates of fire losses are based on data from the National Fire Incident Reporting System (NFIRS)[2] and the National Fire Protection Association. Between October 1994 and July 1995, the U.S. Consumer Product Safety Commission (CPSC) conducted a special study of fires associated with ranges to provide additional detail about the characteristics of the fire scenarios involved. CPSC investigations were conducted on 289 residential fires reported by fire departments throughout the country. Highlights from both sources are presented below:

- Range fires were the leading cause of residential fires from 1990 to 1996.

- An estimated average 86,000 residential fires involving ranges (including both rangetops and ovens) were attended annually by fire departments during 1994-1996. These fires resulted in an average of 245 deaths, 4,160 injuries, and $292.9 million in property loss annually.

- Fires originating on the rangetop, versus the oven, accounted for 71,600 fires annually (83 percent of all rangetop and oven fires), and resulted in 215 deaths, 3,700 injuries, and $262.1 million in property loss annually (1994-1996).

- Fire deaths from range fires occurred disproportionately at night. Thirty-four percent of the fire deaths, but only 8 percent of the fires, occurred at night.

- Fires involving electric ranges occurred at a higher annual rate than fires involving gas ranges, 995 fires per million electric ranges in use versus 693 fires per million gas ranges. Fire deaths, however, occurred at higher annual rates for gas ranges, 3.8 deaths per million gas ranges in use versus 1.7 deaths per million electric ranges (1994-1996).

- Cooking material ignitions were the leading cause of range fires (71 percent), deaths (42 percent), and injuries (71 percent), in the NFIRS data (1994-1996). Among fires on rangetops alone, ignition of cooking material accounted for 52,500 fires (73 percent), 95 deaths (44 percent), 2,700 injuries (73 percent) and $152.8 million in property loss (58 percent) annually (1994-1996). Based on the CPSC special study data, cooking material

[1] The term range fire includes fires involving both fixed surface cooking appliances and fixed ovens, which may be installed as combination units or as separate appliances.

[2] NFIRS data were provided by the U.S. Fire Administration.

ignitions primarily involved cooking oil alone, meat or fish, or a combination of the two.

- Unattended use was involved in 54 percent of all range fires in NFIRS data (1994-1996), 58 percent of rangetop fires, and 32 percent of oven fires. Among cooking material fires that occurred on the rangetop, unattended use accounted for 69 percent. Among fires that involved food ignition in the CPSC study, 85 percent of the incidents occurred when the cook was not in the kitchen.

- About two-thirds of the cooking fires in the CPSC study, including both rangetop and oven fires, were said to have occurred during the first 15 minutes of cooking.

- Frying was involved in 63 percent of the cooking fires in the CPSC study.

- Mechanical and electrical failures were reported in 12 percent of rangetop and oven fires reported in NFIRS (1994-1996). The CPSC study identified malfunctions involving rangetop burner or control panel failures, wiring failures, and piping failures in 26 fires.

- CPSC study data indicated that a disproportionate number of rangetop and oven fires occurred in rental housing. The study also indicated the involvement of a disproportionate number of households with low incomes.

In summary, most fires involving ranges resulted from ignition of cooking materials on the rangetop.

I. Introduction

National fire data indicate that ranges have been a leading cause of residential fires for many years. Cooking fires, defined as fires in which cooking material ignited first, are a major component of those fires.

To address the cooking fire hazard associated with ranges, CPSC began work on ranges in Fiscal Year 1995. CPSC staff conducted a special study from 10/94 to 7/95, which entailed follow-up investigations of range fires attended by the fire service, to obtain more detail about the characteristics involved in range fires in general and cooking fires in particular. In addition, CPSC initiated laboratory testing in 1995 to explore the feasibility of a sensing and control system to prevent cooking fires. Voluntary standards exist for both electric and gas ranges, but they do not include provisions to prevent cooking fires.

This report presents the results of an analysis of national fire data along with the results of the CPSC study. Its purpose is to provide estimates of the magnitude of the cooking fire problem and to provide information about cooking situations to guide further work.

II. Methodology

National Data

National estimates of range fires and fire casualties were derived from data provided by the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association (NFPA). NFIRS is a compilation of reports completed by U.S. fire departments on fires they attend. NFIRS is not a random sample but contains data on an average 1 of every 2.3 estimated U.S. residential structure fires, 1 of every 2.4 non-firefighter deaths, and 1 of every 2.0 non-fire fighter injuries that occurred during the period 1994 – 1996, the most recent years for which NFIRS data are available. It is believed that the distribution of participating fire departments is reasonably representative of all fire departments in the U.S. NFIRS includes several coded variables that describe fire cause and product involvement.

The NFPA develops annual national estimates of residential structure fires in the U.S. based on their annual survey.[3] That survey is based on a stratified random sample of fire departments in the U.S., weighted by size of the community protected by the department. The survey does not include details on causes of fire ignition or product involvement.

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[3] Karter, Michael J.,Jr.,"1996 U.S. Fire Loss," NFPA Journal, September/October 1997. Survey results for previous years are published in the September/October issues of the NFPA Journal.

Estimates of rangetop and oven fire losses were developed using the following procedure:

1) Range incidents in NFIRS were defined as follows:

NFIRS Variable	NFIRS Code	Code Description
Type of Situation	11	Structure Fire
Fixed Property Use	4	Residential
Equipment Involved in Ignition	21, 22	Fixed Cooking Surface, Fixed Oven
Affiliation (of injured person)	0, 2, 3	Non-fire fighter

NFIRS includes two equipment codes that apply to ranges, "fixed surface cooking" and "fixed oven." These codes identify the location of the fire and indicate that the equipment is not portable. The codes do not describe the configuration of the product, so that it is not possible to tell, for example, whether the cooking surface is a separate counter-mounted product or is part of a range that includes an oven. For simplicity of nomenclature, the combination of NFIRS equipment codes 21 and 22 will be referred to here as "ranges," while the fixed surface cooking and oven locations will be referred to as "rangetops" and "ovens" respectively when considered separately.

2) For each year, percentages of NFIRS residential structure fires that involved ranges (tops and ovens combined), tops, and ovens were calculated separately (among those that reported specified equipment). The process was repeated for injuries, deaths, and property loss, and resulted in different percentages (and weighting factors) for each loss measure each year. This procedure allocated fire losses in which equipment was involved but the type of equipment was not specified.

3) These percentages were then applied to NFPA estimates of U.S. residential structure fire losses: fires, deaths, injuries, and property loss, to provide national estimates of U.S. residential structure fire losses that involved ranges.

Average annual estimates are presented for ranges (tops and ovens combined), and for tops and ovens separately, along with distributions of leading fire characteristics reported for 1994 -1996. Fire estimates were rounded to the nearest hundred, injury estimates to the nearest ten, death estimates to the nearest five, and property damage estimates to the nearest tenth of a million dollars. The distribution of unknown values of variables were assumed to follow the distribution of known values.
NFIRS estimates include arson fires, which constitute one percent of all range fires, three percent of range fire deaths, and 2 percent of range fire injuries.

It should be noted that fire death and fire injury estimates fluctuate from year-to-year and that a small increase or decrease in any one year is not sufficient to denote a trend. As indicated, NFIRS is not a sample of known probability. Nevertheless, it is a sample of roughly 200,000 residential structure fires annually, about 37,000 of which involve ranges, and is believed to be representative of U.S. residential fires. On that basis, tests of linear regression were conducted on range fires, deaths, and injuries for the ten-year period 1987 – 1996 to test for a trend over time.

CPSC Special Study

The CPSC's Directorate for Epidemiology and Health Sciences conducted a special study of range fires for the period of October 1994 to July 1995. CPSC field staff requested notification of range fires from the fire services near them. When fire services reported range fires, CPSC field staff conducted follow-up investigations. Field investigations were conducted on 289 fires. Since CPSC's focus is on preventing cooking fires through the use of technology to modify heat production of the range, no investigations were conducted on fires involving wood and coal-fired stoves, which were not considered amenable to rapid modification of heat production. Data collection focused on fire causes and provided useful details on the factors involved. The investigations do not constitute a sample with a known probability of selection and are not necessarily representative of all range fires.

III. NFIRS/NFPA Estimates

A. Ranges (Tops and Ovens Combined)

1. Trends

Fires:

NFIRS and NFPA data indicate that estimated residential fires associated with ranges generally have decreased over the past ten years, 1987 - 1996, with some periods of fluctuation in the interim years (Figure 1). Range fires decreased from 99,800 in 1987 to 85,000 in 1996, a 15 percent decrease.[4] During the same period, residential fires from other causes decreased by 24 percent, resulting in a slight increase in the proportion of all residential fires due to ranges from 18 percent in 1987 to 20 percent in 1996. [5] Ranges are the leading cause of residential fires among all products covered by CPSC's jurisdiction, as they have been since 1990, and were involved in an estimated annual average 86,000 residential fires during the most recent three years for which NFIRS data are available, 1994 – 1996.

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[4] A linear regression test for trend indicated that the estimates observed represent a significant decrease in range fires during this time period (p=.01).

[5] Based on NFPA annual estimates of residential fires, referenced in Methodology.

Property Loss:

Estimated property loss in fires associated with ranges showed an apparent increase during the most recent ten years, from $264.2 million in 1987 to $400.6 million in 1996, with some higher annual losses in interim years (Figure 2).[6] However, this change does not represent a significant increase.[7] Range fires resulted in an estimated annual average property loss of $292.9 million during 1994 -1996, an average of $3,400 property loss per fire (unadjusted for inflation). Range fires were relatively low damage fires compared to residential fires from other causes that resulted in an average $12,200 per fire for the same time period.

Deaths:

In spite of year-to-year fluctuations over the past ten years, the number of estimated range fire deaths were at about the same level in 1996 as in 1987, 300 and 310 deaths respectively (Figure 3). During this period, residential fire deaths from other causes decreased by 13 percent. Range fires resulted in an estimated annual average 245 residential fire deaths during 1994-1996, 2.8 deaths per 1,000 fires.

Injuries:

As with range fire deaths, estimated range fire injuries fluctuated during the most recent ten years, rising somewhat and then falling so that estimated injuries in 1996 were at nearly the same level as ten years earlier, 4,410 in 1987 compared to 4,170 in 1996 (Figure 4). This difference represents a reduction of 5 percent, similar to the 6 percent reduction for residential fire injuries from other causes, but does not represent a significant decrease. [8] Range fires resulted in an estimated annual average 4,160 residential fire injuries during 1994 – 1996, 48.4 injuries per 1,000 fires.

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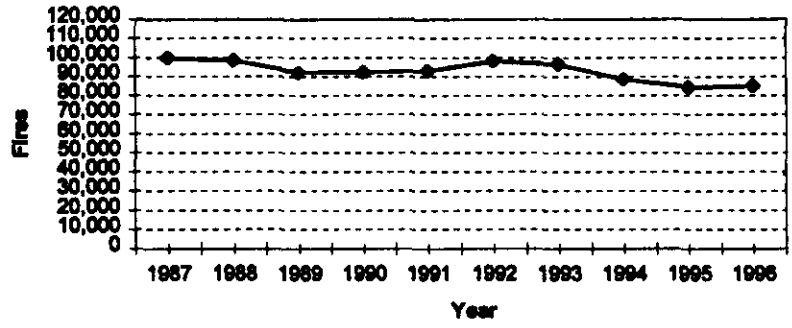
[6] Adjusted for inflation using 1987 as the base year. Inflation adjusted property loss estimates derived from the 1995 U.S. Statistical Abstract, Shelter Maintenance and Repair Index, U.S. Bureau of the Census.

[7] A linear regression test for trend indicated that the adjusted property losses do not represent a significant increase (p=.11) during this time period.

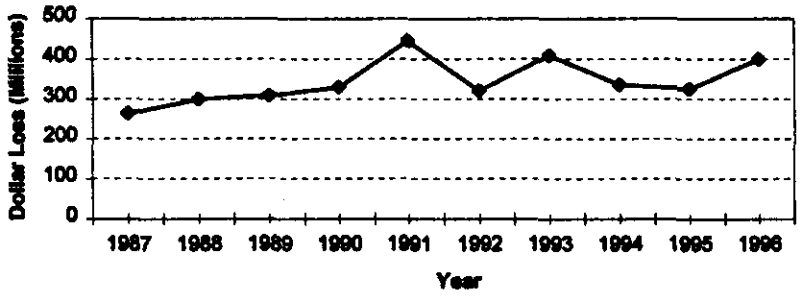
[8] Linear regression tests for trend indicated that neither death nor injury estimates represent significant changes over this time period (p=.09 and p=.39 respectively).

Figure 1: Estimated Residential Range Fires 1987-1996



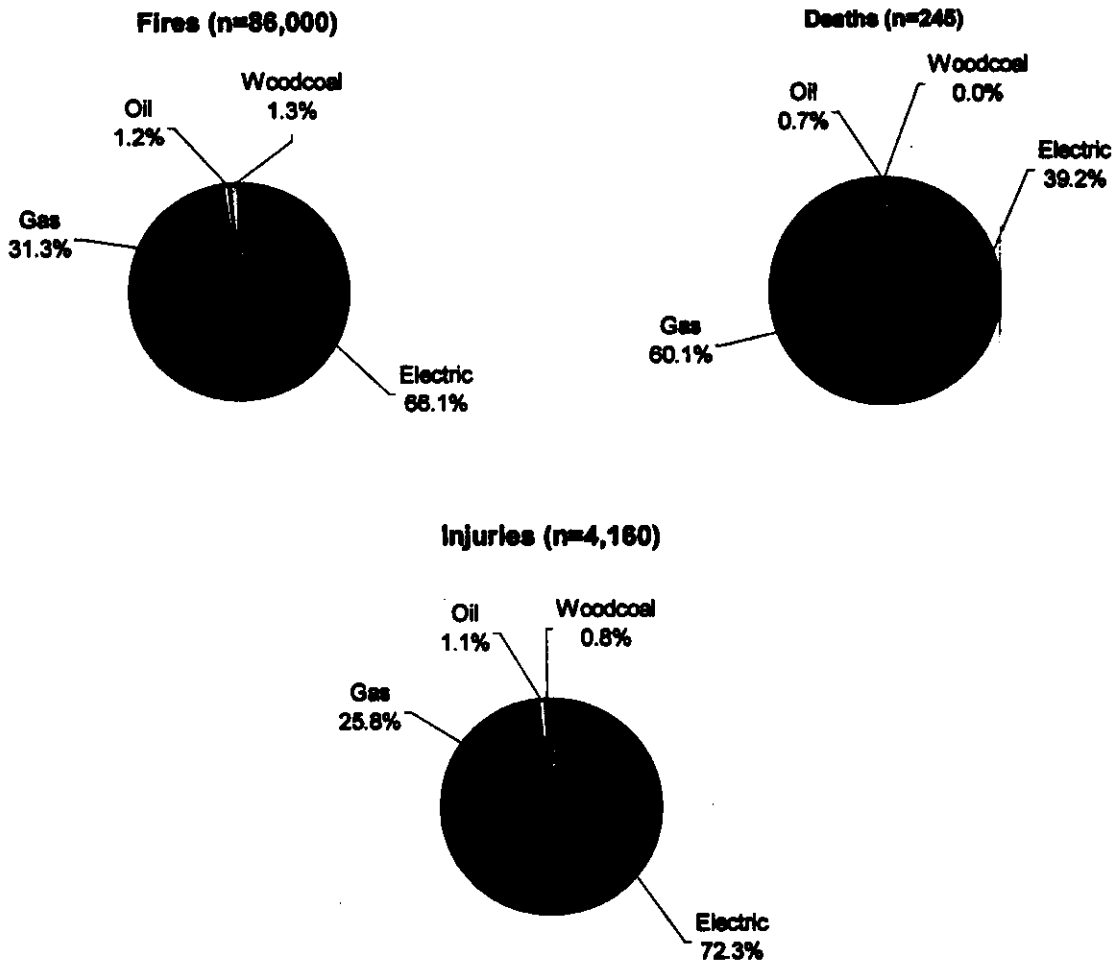
Source: U.S. Consumer Product Safety Commission/EHHA: Data obtained from NFIRS and NFPA.

Figure 2: Estimated Residential Range Fire Property Loss 1987-1996



Source: U.S. Consumer Product Safety Commission/EHHA: Data obtained from NFIRS and NFPA. Adjusted for inflation, base year=1987.

Figure 7. Residential Range Fires, Injuries, and Deaths, by Type of Fuel, Based on Estimated Annual Averages: 1994-1996



Source: U.S. Consumer Product Safety Commission/EHHA: Data obtained from NFIRS and NFPA.
Note: Unknown and other types of fuel were allocated proportionally among fuels cited. Annual averages (shown as n) were rounded to the nearest hundred (fires), nearest ten (injuries) and nearest five (deaths). Totals may not add due to rounding.

4. Material First Ignited

Fire departments identify the material that was first ignited in a fire by both form and type of material. In general, "form" categories specify materials in a manner similar to product designations, e.g., cooking materials, cabinets, etc.

Among fires caused by ranges, cooking materials were cited most frequently as the first item (form of material) ignited, accounting for 61,400 fires annually (71 percent) (Figure 8). Cooking material ignitions accounted for 2,960 fire injuries (71 percent) and 105 fire deaths (42 percent) annually.

Cabinets and wall coverings were the second most common group of items ignited, accounting for 4,500 fires (5 percent). These fires resulted in 250 fire injuries (6 percent) and 25 fire deaths (10 percent).

Textile ignition was less frequently involved in range fires but was the second ranked contributor to fire deaths. Textile ignition accounted for an estimated 2,100 fires (2 percent), 170 fire injuries (4 percent), and 60 fire deaths (25 percent).

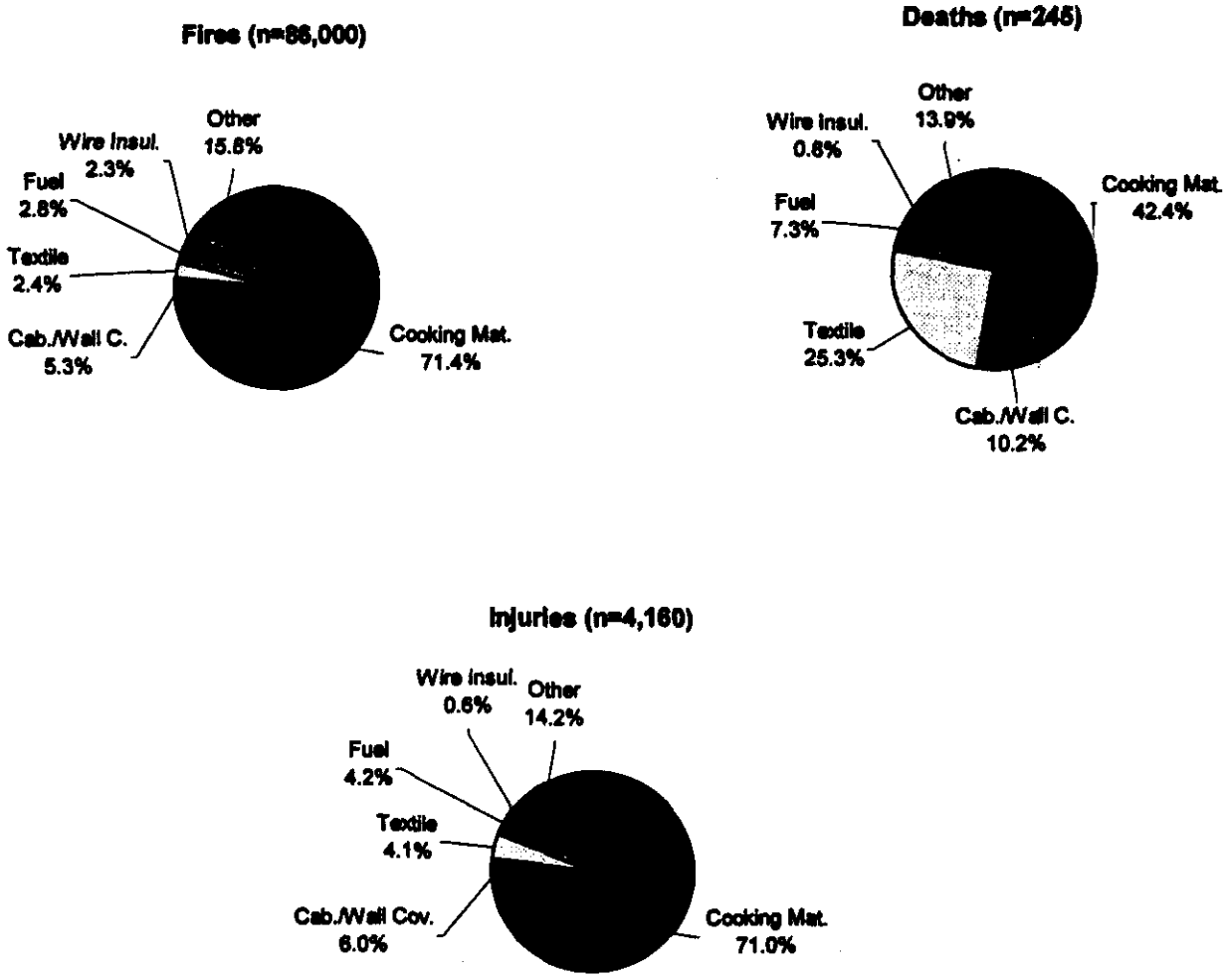
Other materials ignited included fuel, 2,400 fires (3 percent) and wire insulation, 2,000 fires (2 percent).

Deaths and injuries occurred in range fires at overall rates of 2.8 and 48.4 per 1,000 fires, respectively (Table 3). Although ignition of cooking materials accounted for the largest numbers of deaths and injuries, the rates of death and injury were lower, 1.7 and 48.2 per 1,000 fires, respectively, than in other types of fires.

The risk of both death and injury was highest when textiles were ignited. Textile ignition-related deaths occurred at a rate of 28.6 per 1,000 fires, about 10 times the average death rate. Textile ignition-related injuries occurred at a rate of 81.0 per 1,000 fires. Textile ignition-related deaths occurred at higher rates in fires involving gas ranges than in fires involving electric ranges, rates of 44.3 and 19.3 deaths per 1,000 fires for gas and electric ranges respectively. This difference is thought to be related to the presence of the open flame on gas ranges that results in higher temperatures over a larger area compared to electric ranges. About three-quarters of the textile-related deaths and about one-third of the injuries involved ignition of clothing that was being worn.

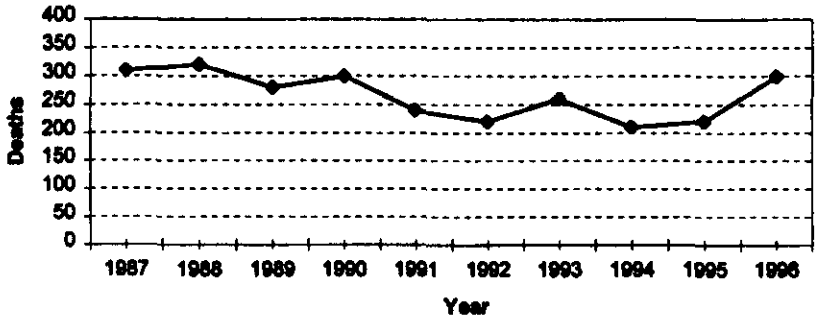
Ignition of fuel, which would include any incidents of fuel gas explosions that were followed by a fire, also resulted in relatively high rates of both death and injury, 8.3 and 70.8 per 1,000 fires, respectively.

Figure 8. Residential Range Fires, Injuries, and Deaths, by Form of Material First Ignited, Based on Estimated Annual Averages: 1994-1996



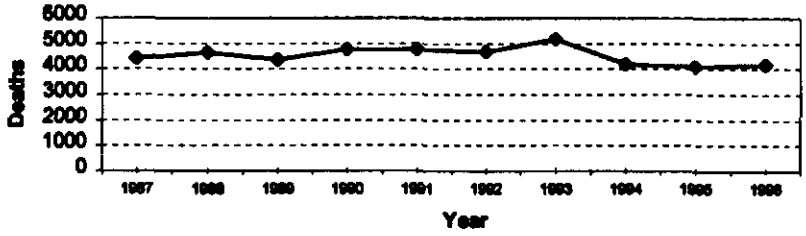
Source: U.S. Consumer Product Safety Commission/EHHA: Data obtained from NFIRS and NFPA.
Note: Unknown forms of material ignited were allocated proportionally among known forms of material ignited. Annual averages (shown as n) were rounded to the nearest hundred (fires), nearest ten(injuries, and nearest five (deaths). Totals may not add due to rounding.

Figure 3: Estimated Residential Range Fire Deaths, 1987-1996



Source: U.S. Consumer Product Safety Commission/EHHA: Data obtained from NFIRS and NFPA.

Figure 4: Estimated Residential Range Fire Injuries, 1987-1996



Source: U.S. Consumer Product Safety Commission/EHHA: Data obtained from NFIRS and NFPA.

2. Injury and Death – Related Characteristics

Injury and Death Rates by Age Group

Table 1 presents the estimated annual average death and injury rates, by age group, per million people in the U.S. For all age groups combined, range fires resulted in .9 deaths and 15.8 injuries per million people annually during 1994 - 1996. Death rates were highest among individuals age 75 years and older, 3.7 deaths per million, more than 4 times the population average. The highest injury rate also occurred in this age group, 24.3 per million, followed closely by injuries in the age group of 15-24 years, 21.9 injuries per million. For children under age 5, the death rate, 1.3 per million, was slightly higher than the population average, while their injury rate was among the lowest of all age groups, 7.7 per million.

Table 1

Annual Average Death and Injury Rates by Age Group
Residential Range Fires: 1994-1996

Age of Victim (Years)	Resident Population (millions)	Estimated Deaths	Deaths per Million Pop.	Estimated Injuries	Injuries per Million Pop.
Totals	262.8	245	0.9	4,160	15.8
Less than 5	19.5	25	1.3	150	7.7
5 to 14	38.1	15	0.4	290	7.6
15 to 24	36.0	25	0.7	790	21.9
25 to 44	83.4	65	0.8	1,640	19.7
45 to 64	52.3	30	0.6	690	13.2
65 to 74	18.7	30	1.6	240	12.8
75 & older	14.8	55	3.7	360	24.3

Note: Unknown ages were allocated. Estimated deaths were rounded to the nearest five, estimated injuries were rounded to the nearest ten. Death and injury rates were rounded to the nearest tenth. Source: U.S. Consumer Product Safety Commission. Fire data obtained from NFIRS and NFPA data for 1994-1996. Population rates based on 1994-1996 U.S. Resident Population Estimates by Age and Sex, U.S. Bureau of the Census. Totals may not add due to rounding.

Time of Day of Death or Injury

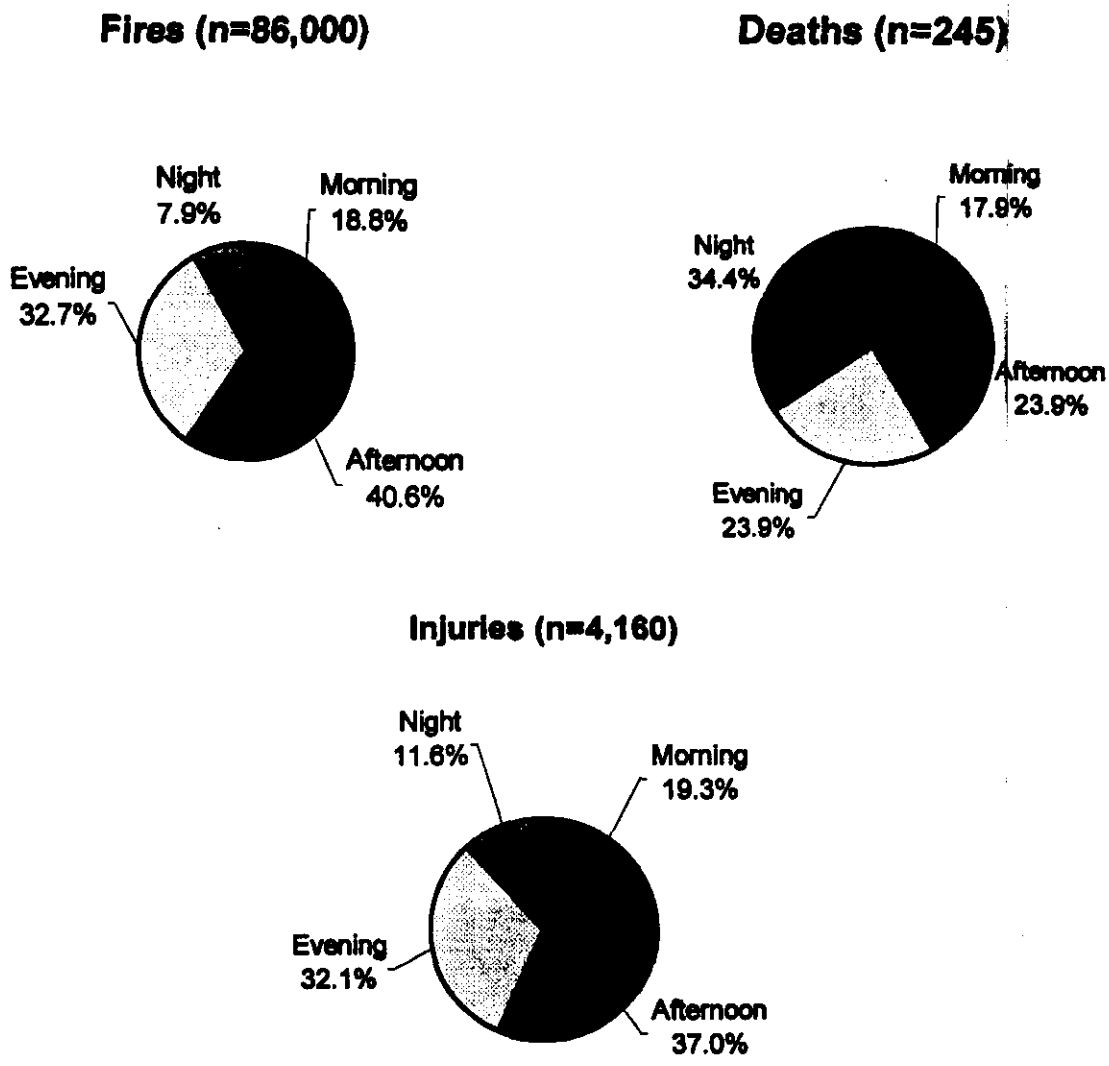
Most range fires occurred during the afternoon and evening (41 and 33 percent respectively).[9] The smallest proportion (8 percent) occurred at night (Figure 5). Among fire deaths, however, the greatest proportion occurred at night (34 percent), followed by afternoon and evening. Range fire injuries were highest in the afternoon (37 percent) and evening (32 percent).

Activity At Time of Death or Injury

When a death or injury occurs in a fire, NFIRS data report what the person was doing at the time of the death or injury. Excluding the "other" category, which includes a wide variety of activities, the largest proportion of fatalities (35 percent) involved people who were sleeping at the time of the fire (Figure 6), consistent with the proportion of deaths that occurred at night. About 21 percent were trying to escape at the time of death, while about 7 percent were trying to control or extinguish the fire. In contrast, among those who were injured in range fires, over half the injuries (54 percent) occurred while the person was trying to control the fire. About 12 percent of those injured were asleep. NFIRS does not identify the activity of the person who was involved in ignition (e.g., the person cooking), so it is not possible to determine if the person cooking was the person who died or was injured.

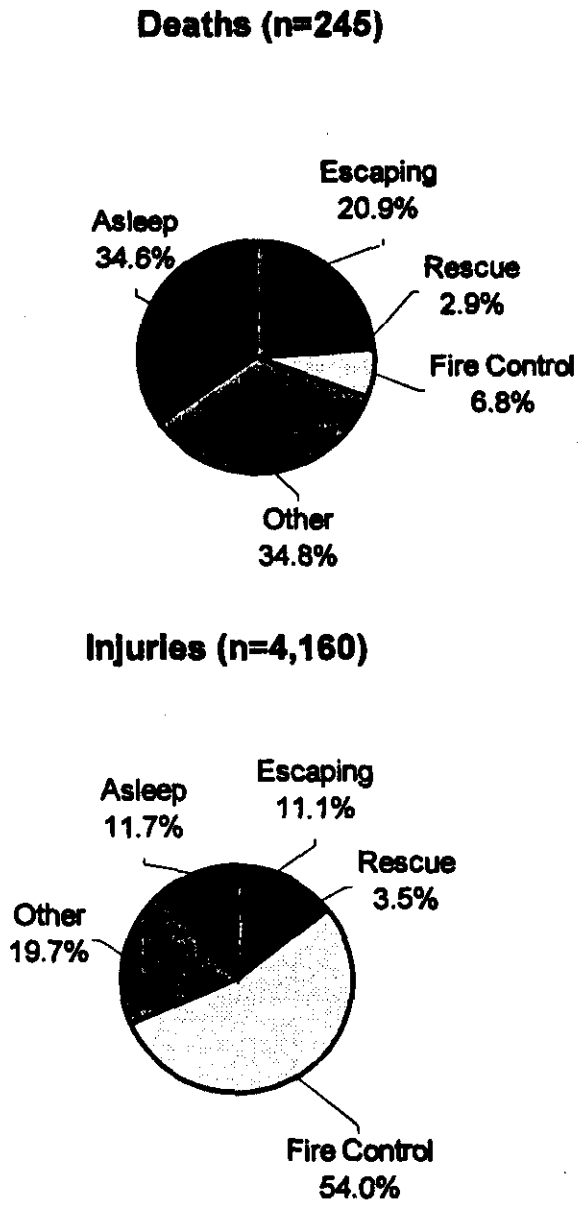
[9] Time intervals are defined as morning (6am- 11:59 am), afternoon (12pm- 5:59 pm), evening (6pm -11:59 pm) and night (12am - 5:59 am) hours.

Figure 5. Residential Range Fires, Injuries, and Deaths by Time of Fire, Based on Estimated Annual Averages: 1994-1996



Source: U.S. Consumer Product Safety Commission/EHHA: Data obtained from NFIRS and NFPA.
Note: Annual averages (shown as n) are rounded to the nearest hundred (fires), nearest ten (injuries), and nearest five (deaths). Totals may not add due to rounding.

Figure 6. Residential Range Fire Deaths and Injuries, by Activity at Time of Injury, Based on Estimated Annual Averages: 1994-1996



Source: U.S. Consumer Product Safety Commission/EHHA: Data obtained from NFIRS and NFPA.
Note: Unknown activities were allocated proportionally among known activities. Annual averages (shown as n) were rounded to the nearest ten (injuries) and nearest five(deaths).

3. Equipment Fuel Type

Electric- and gas- powered units were estimated to be involved in over 97 percent of range fires, based on 1994 – 1996 NFIRS data (Figure 7). Electric units accounted for 56,900 fires annually (66 percent) while gas units accounted for 26,900 fires (31 percent). Oil-fired units and wood/coal-fired units each were involved in 1 percent of the fires. Among fire injuries and deaths, electric units contributed a majority of fire injuries (72 percent) but a markedly lower percentage of fire deaths (39 percent). Gas-fired units were involved in the majority of deaths (60 percent).

Table 2 presents a comparison of range fire, death, and injury rates per million units in use. Fires and injuries associated with electric-powered units occurred at higher rates per product in use than with gas-powered units. Fires with electric units occurred at an estimated rate of 1.4 times that of gas units; fire injuries occurred at a rate more than twice (2.1) that of gas units. In contrast, the estimated death rate for electric units was less than half that of gas units (0.4). These findings are consistent with the relative distributions of fires, deaths, and injuries by fuel presented in Figure 7. Although it is not possible in NFIRS to determine whether a fire followed an explosion, this may have occurred in some gas range fires.

Table 2

Estimated Residential Range Fires, Deaths, and Injuries per Million Units in Use,1994-1996

Type of Unit	Units in Use (Millions)	Fires	Deaths	Injuries
Electric	57.2	994.7	1.7	57.2
Gas	38.9	692.6	3.8	27.6
Relative rate: Electric/Gas	1.5	1.4	0.4	2.1

Source: U.S. Consumer Product Safety Commission. Fire loss data obtained from NFIRS and NFPA. Population estimates of in-use rangetop and oven appliances furnished from the American Housing Survey 1994-1995, Department of Housing and Urban Development.

Table 3

Average Annual Injury and Death Rates per 1,000 Residential Range Fires, by Material First Ignited, 1994-1996

Form of Material	Fires	Deaths	Deaths per Thousand Fires	Injuries	Injuries per Thousand Fires
Total	86,000	245	2.8	4,160	48.4
Cooking Materials	61,400	105	1.7	2,960	48.2
Cabinet, Wall Covering	4,500	25	5.6	250	55.6
Textiles	2,100	60	28.6	170	81.0
Fuel	2,400	20	8.3	170	70.8
Wire Insulation	2,000	*	**	20	10.0
Other	13,600	35	2.6	590	43.4

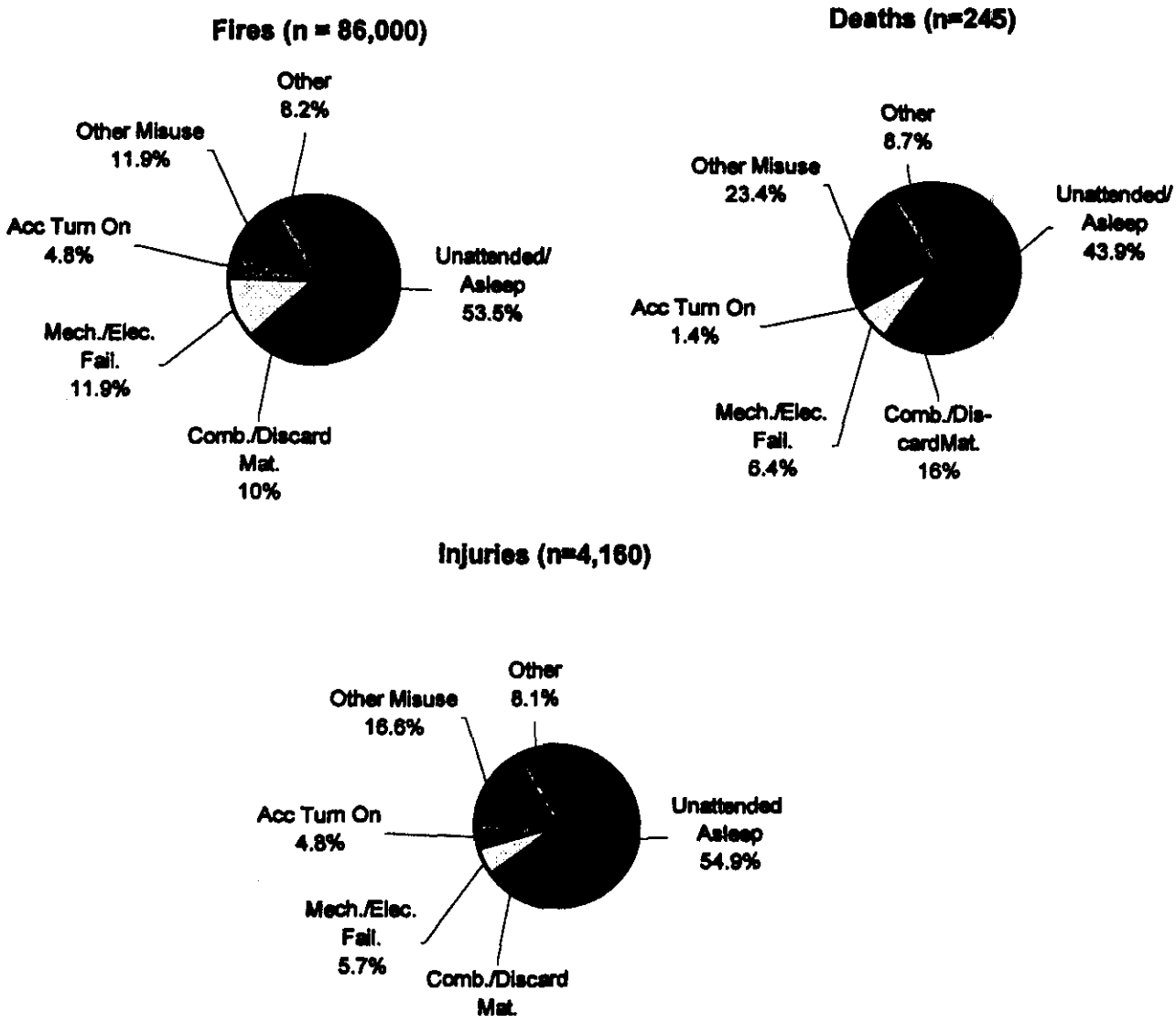
*Estimate less than 5
**Less than 5/2000
Note: Unknown forms of material ignited were allocated proportionally among known forms of material.
Source: U.S. Consumer Product Safety Commission/EHHA. Estimates based on data obtained from NFIRS and NFPA.

5. Ignition Factor

Fire services report ignition factors which describe the event or condition that allowed the heat source (e.g. rangetop) and material ignited (e.g. food) to combine and start a fire. The largest grouped ignition factor (54 percent) involved fires that occurred when the range was unattended or the person cooking fell asleep, 50 percent and 4 percent respectively (Figure 9). Mechanical or electrical failures (12 percent) involved events such as part or control failures or electrical faults. The group of other misuse factors (12 percent) included attended situations and a variety of events such as inadequate control of fire, spilled fuel, children playing, medical or physical impairments, or improper storage of the item that ignited.[10] Ignitions of combustibles or discarded materials where materials were too close to the heat were almost as frequent (10 percent). Other fires occurred when the appliance was turned on accidentally (5 percent).

[10] The term "misuse" reflects NFIRS nomenclature for fire reporting.

Figure 9. Residential Range Fires, Injuries and Deaths, by Ignition Factor, Based on Estimated Annual Averages: 1994-1996



Source: U. S. Consumer Product Safety Commission/ EHHA: Data obtained from NFIRS and NFPA.
Note: Unknown ignition factors were allocated proportionally among known ignition factors. Annual averages (shown as n) were rounded to the nearest hundred (fires), nearest ten (injuries) and nearest five (deaths).

B. Rangetops

National fire loss estimates presented in the previous section combined rangetop and oven fires. However, rangetops contributed most of these fires and fire losses; 71,600 fires (83 percent), 215 deaths (89 percent), 3,700 injuries (89 percent) and $262.1 million in property loss (90 percent) annually (Table 4).

Table 4
Estimated Rangetop and Oven Fire Losses
Annual Average, 1994 – 1996

Loss Measure	Equipment Involved				
	Total	Rangetop		Oven	
		No.	%	No.	%
Fires	86,000	71,600	83	14,400	17
Deaths	245	215	89	30	11
Injuries	4,160	3,700	89	460	11
Property Loss($mill)	$292.9	$262.1	90	$30.7	10

Source: U.S. Consumer Product Safety Commission. Based on NFIRS and NFPA data.

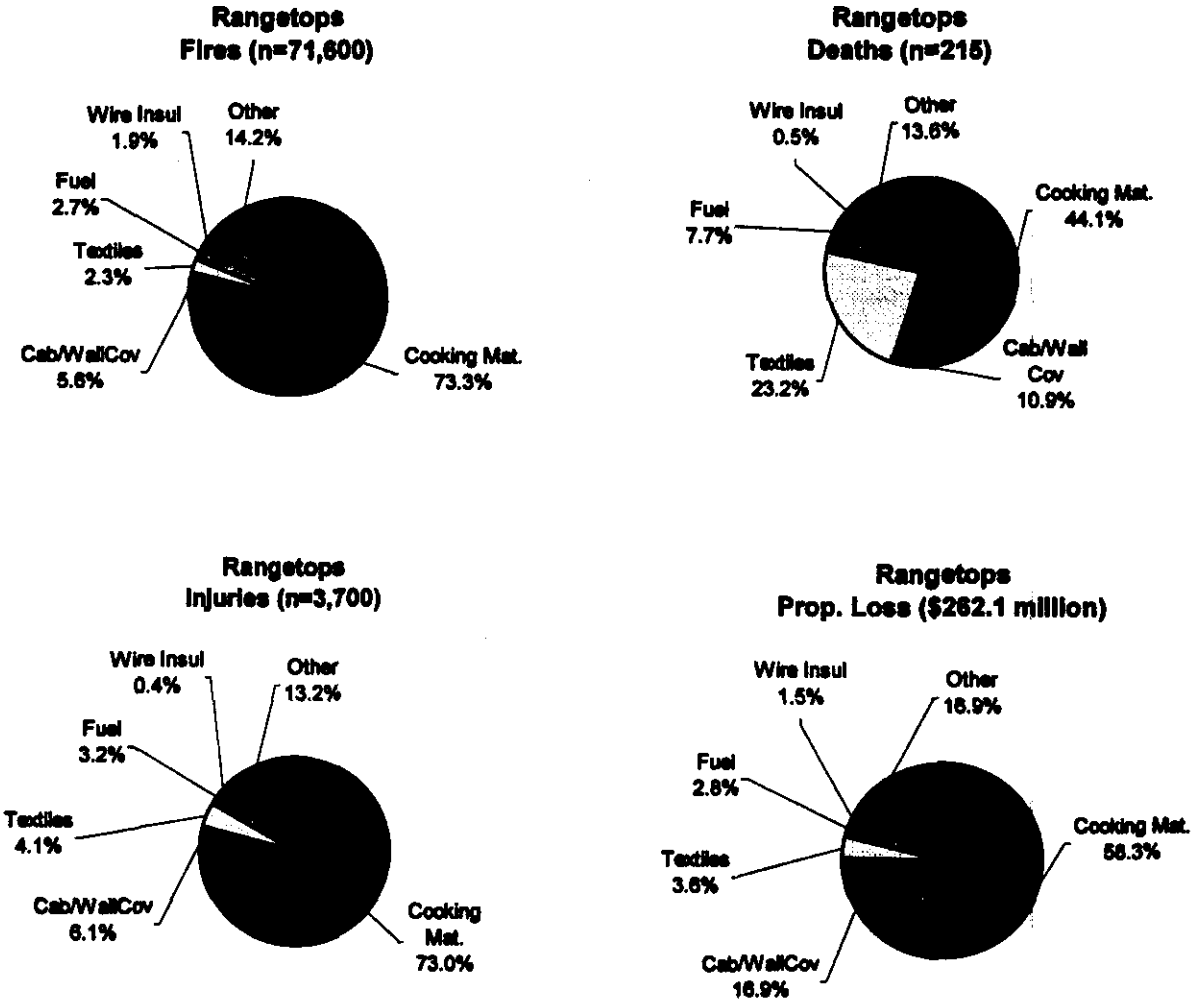
1. Material First Ignited

The distribution of material ignited in rangetop fires was similar to that for ranges overall. Among rangetop fires, cooking materials were by far the most frequent materials ignited (Figure 10), accounting for 52,500 fires (73 percent), 95 deaths (44 percent), 2,700 injuries (73 percent), and $152.8 million in property loss (58 percent). Ignition of cabinets and wall coverings occurred relatively infrequently, but still were involved in about 4,000 fires (6 percent). Ignition of fuel and textiles accounted for about 3 percent and 2 percent of rangetop fires, respectively.

In addition to coding "form" of material first ignited, which is similar to a product designation, fire departments also identify the "type" of material. "Type" categories specify a material's chemical or physical characteristics, e.g. oils, food, wood, paper, etc. Among rangetop fires that involved ignition of cooking material, cooking oils, food fats and starches accounted for about 95 percent of those where a type of material was specified (Table 5).[11] Among fires that ignited cabinets or wall coverings, fires most often involved the two groups "oils, fats, and starches" and "wood, paper, or fabric," which occurred in about equal numbers. The former group presumably involved fires in which the "oils, fats, and starches" adhered to the cabinets and wallcoverings.

[11] Forms of material totals in Table 5 are not the same as those cited in other places because Table 5 does not allocate fires where form of material was not specified.

Figure 10. Residential Rangetop Fires, Deaths, Injuries, and Property Loss, by Form of Material First Ignited, Based on Estimated Annual Averages: 1994-1996



Source: U.S. Consumer Product Safety Commission/EHHA: Data obtained from NFIRS and NFPA. Note: Unknown forms of material ignited were allocated proportionally among known forms of material. Annual averages (shown as n) were rounded to the nearest hundred (fires), nearest five (deaths), nearest ten (injuries)and nearest tenth of a million (property loss).

Table 5
Estimated Residential Rangetop Fires, Form of Material by Type of Material, Annual Averages 1994-1996

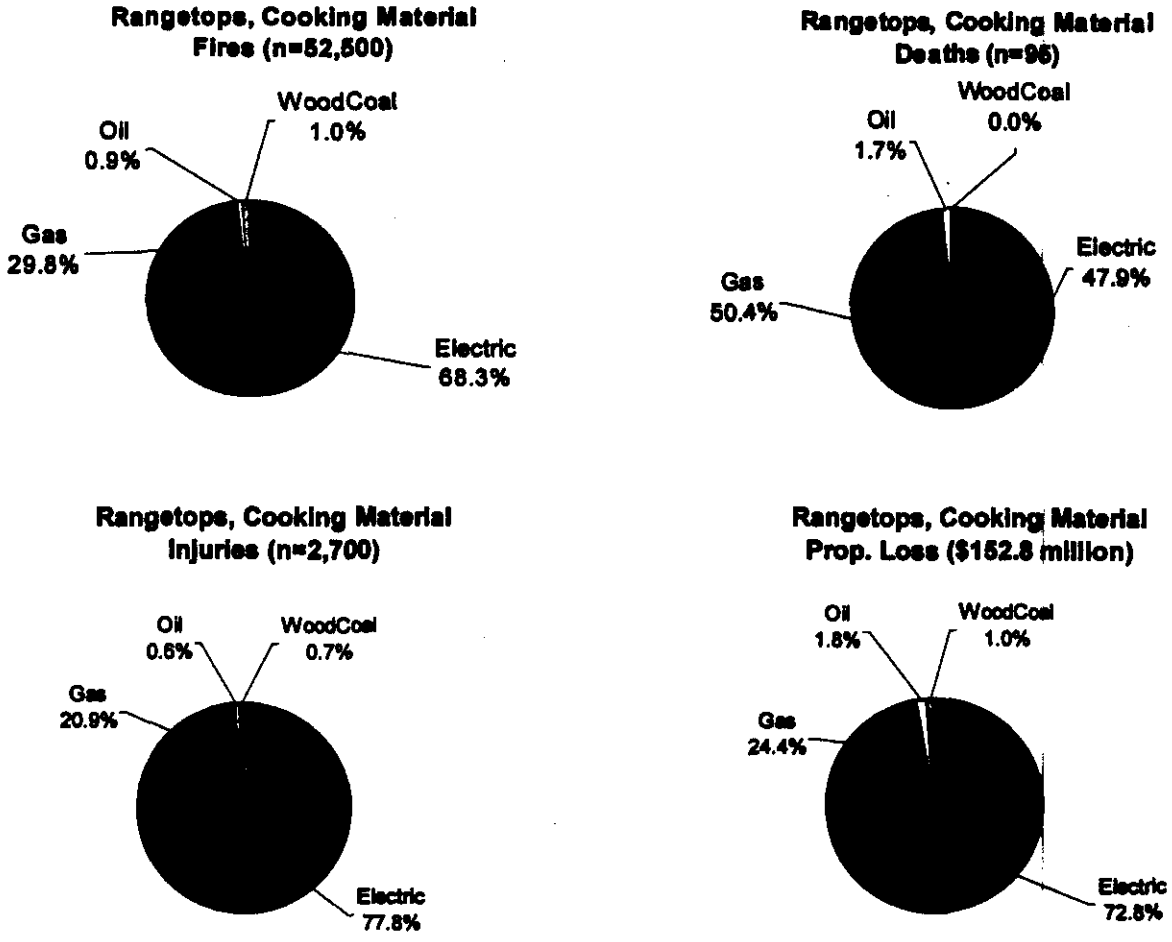
Form of Material	Type of Material					
	Total	Oil/Fats/ Starch	Wood/Paper/ Fabric	Fuel	Other	Unknown
Total	71,600	52,800	5,500	2,800	8,300	2,300
Cooking Material	50,500	47,800	200	400	1,900	200
Cabinet/Wall Covering	3,900	1,700	1,600	200	300	100
Textiles	1,600	100	1,200	*	200	*
Fuel	1,900	100	*	1,600	*	*
Wire Insulation	1,300	*	*	*	1,200	*
Other	9,700	2,600	2,300	500	4,100	200
Unknown	2,800	400	100	100	500	1,600

* Estimates less than 50
Note: Estimates of forms of material ignited do not include allocated fires for which form of material was unknown. Estimates have been rounded to nearest 100. Column or row detail may not add due to rounding.
Source: U.S. Consumer Product Safety Commission/EHHA. Data obtained from NFIRS and NFPA.

2. Cooking Material and Equipment Fuel Type

The distribution of fuel (power) type involved in rangetop fires was the same as that presented for ranges overall; 66 percent electric, 31 percent gas and 1 percent each for oil and wood/coal (previously shown in Figure 7). Among rangetop fires that involved ignition of cooking materials, 68 percent involved electric products (Figure 11), while 30 percent involved gas products. Among deaths, injuries and property loss that resulted from rangetop cooking material ignitions, electric products were involved in 48 percent, 78 percent and 73 percent respectively. The relatively lower proportion of electric products involved in deaths is similar to findings presented earlier for rangetops and ovens combined.

Figure 11. Residential Rangetop Cooking Material Fires, Deaths, Injuries, and Property Loss, by Fuel, Based on Estimated Annual Averages 1994 – 1996



Source: U.S. Consumer Product Safety Commission/EHHA: Data obtained from NFIRS and NFPA.
Note: Unknown and other fuels were allocated proportionally among known fuels. Annual averages (shown as n) were rounded to the nearest hundred (fires), nearest five (deaths), nearest ten (injuries), and nearest tenth of a million (property loss).

3. Ignition Factor

Ignition factors coded by the fire service specify the scenario that caused the heat and the material ignited to combine, causing a fire to start. Figure 12 presents data on ignition factors for all rangetop fires, and for rangetop fires caused by ignition of cooking material. For all rangetop ignitions, unattended situations were cited most frequently, accounting for 41,300 fires annually, (58 percent of all rangetop fires). The second most common ignition factor involved a variety of other misuse situations that included fuel spills, accounting for 7,700 fires annually (11 percent). Mechanical and electrical failures were cited in 7,200 fires (10 percent) and combustibles too close or discarded materials in 6,700 fires (9 percent). About 3,600 fires (5 percent) involved situations where a burner was accidentally turned on.

The distribution of ignition factors was somewhat different among the 52,500 rangetop fires involving ignition of cooking material. The ranking, however, was similar. Unattended situations contributed a somewhat larger proportion of rangetop cooking material ignition fires, accounting for 36,300 fires (69 percent). About 4,900 (9 percent) cooking material ignition fires involved a variety of other misuse situations, while 3,500 fires (7 percent) involved ignition of combustibles that were too close or discarded material. Mechanical and electrical failures and burners accidentally turned on each accounted for 5 percent or less of these cooking material fires.

C. Ovens

1. Material First Ignited

Like rangetops, oven fires primarily involved ignition of cooking material, accounting for 8,900 of 14,400 fires annually during 1994-1996 (62 percent) (Figure 13). Ignition of cooking materials in ovens also resulted in 10 deaths (30 percent), 250 injuries (55 percent), and $12.7 million in property loss annually (42 percent). Other materials ignited by rangetops, such as cabinets, textiles and wire insulation, were ignited infrequently by ovens. Each was involved in 600, or fewer, oven fires annually. Most of the remaining 3,500 oven fires (24 percent) involved ignition of a wide variety of other materials.

Among oven fires in which cooking materials were the first form of material ignited, the type of material ignited was cited as being "oils, fats, starches" in about 90 percent of the fires (Table 6). [12] Fires igniting cabinets or wall coverings most often ignited "wood/paper/fabric."

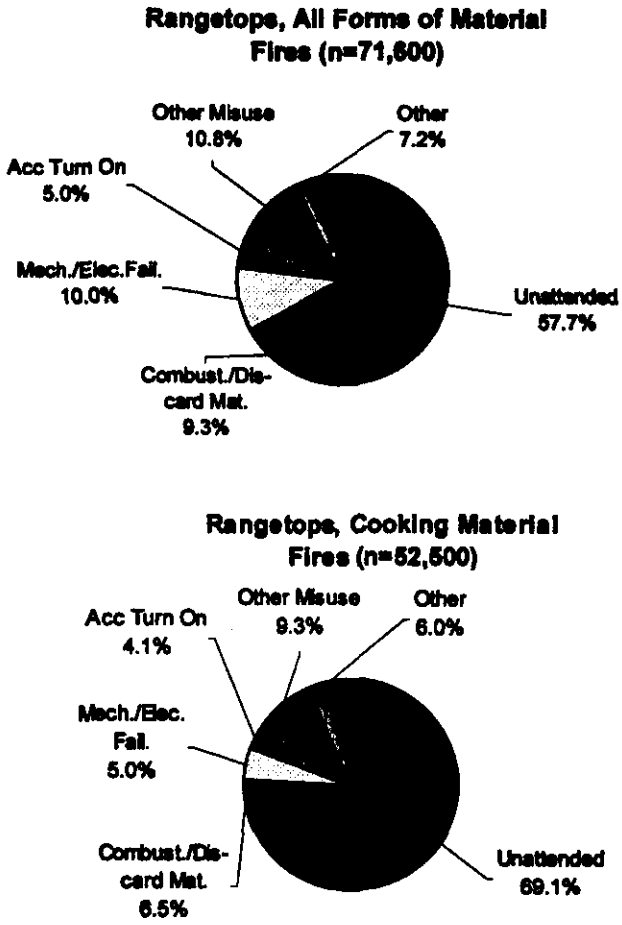
Table 6
Estimated Residential Oven Fires, Form of Material by Type of Material, Annual Averages 1994-1996

Form of Material	Type of Material					
	Total	Oil/Fats/ Starch	Wood/Paper/ Fabric	Fuel	Other	Unknown
Total	14,400	8,600	1,600	700	2,800	700
Cooking Material	8,400	7,600	100	100	600	*
Cabinet/Wall Covering	500	100	300	*	*	*
Textiles	400	*	300	*	100	*
Fuel	400	*	0	400	*	*
Wire Insulation	600	*	*	*	500	*
Other	3,300	800	900	200	1,400	100
Unknown	800	100	*	*	200	500

* Estimates less than 50
Note: Estimates of forms of material ignited do not include allocated fires for which form of material was unknown. Estimates have been rounded to nearest 100. Column or row detail may not add due to rounding.
Source: U.S. Consumer Product Safety Commission/EHHA. Data obtained from NFIRS and NFPA

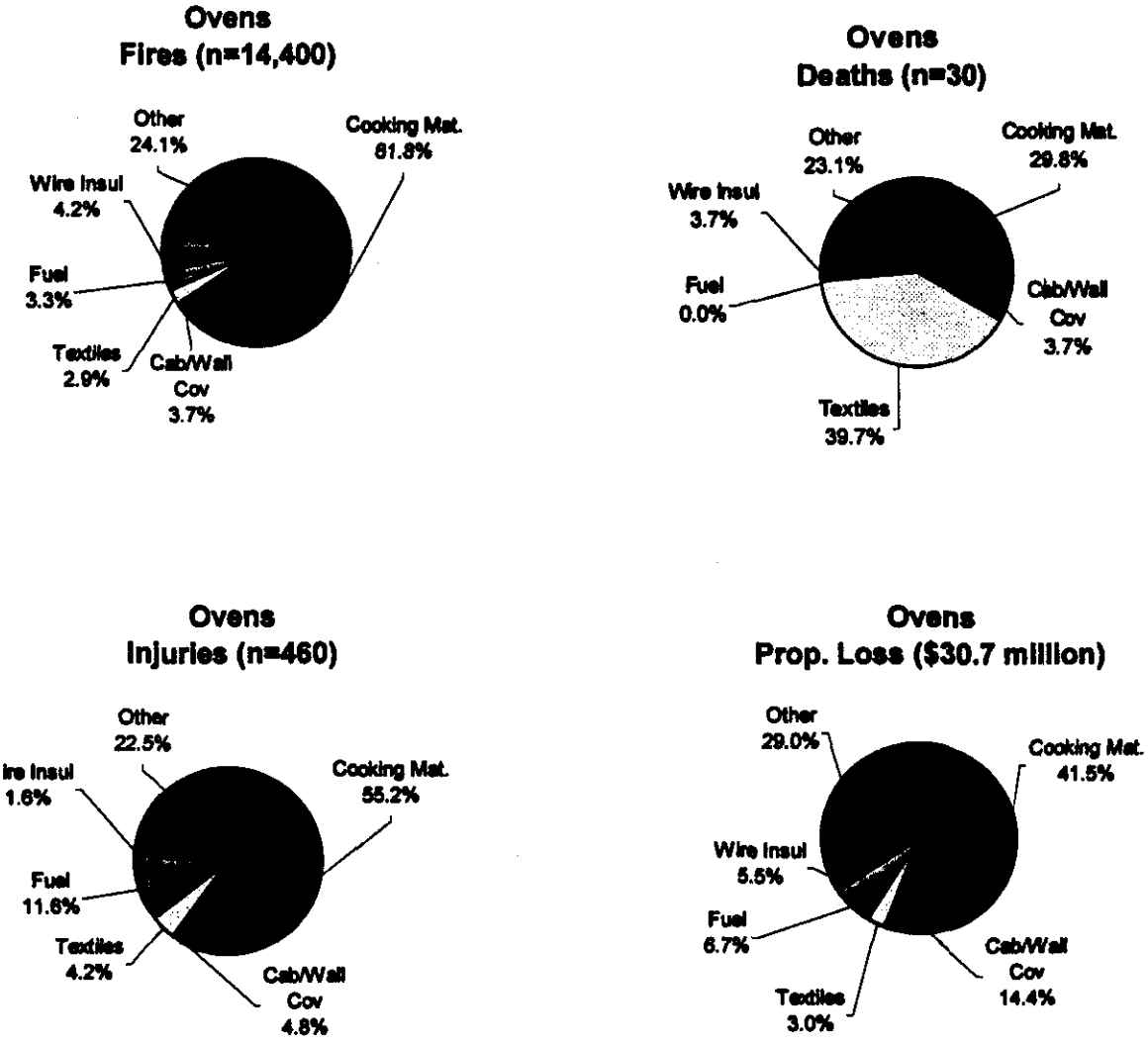
[12] Form of material totals in Table 6 are not the same as those cited in other places because Table 6 does not allocate fires in which form of material was not specified.

Figure 12. Residential Rangetop Fires by Ignition Factor, All Materials and Cooking Materials Only, Based on Estimated Annual Averages: 1994 – 1996



Source: U.S. Consumer Product Safety Commission/EHHA: Based on NFIRS and NFPA data.
Note: Unknown forms of material and unknown ignition factors were allocated proportionally among known forms of material and ignition factor, respectively. Annual averages (shown as n) were rounded to the nearest hundred (fires).

Figure 13. Residential Oven Fires, Deaths, Injuries, and Property Loss, by Form of Material First Ignited, based on Estimated Annual Averages: 1994-1996



Source: U.S. Consumer Product Safety Commission/EHHA: Based on data from NFIRS and NFPA. Note: Unknown forms of material ignited were allocated proportionally among known forms of material. Annual averages (shown as n) were rounded to the nearest hundred (fires), nearest five (deaths), and nearest ten (injuries), and nearest tenth of a million (property loss).

2. Cooking Material and Equipment Fuel Type

Among the 8,900 annual oven fires that involved ignition of cooking material 5,800 (66 percent) involved electric equipment, while 2,900 (32 percent) involved gas (Figure 14). Oil-fired and wood/coal-fired ovens each were involved in about 100 fires (1 percent each). Fuel distributions were the same among all oven fires. [13]

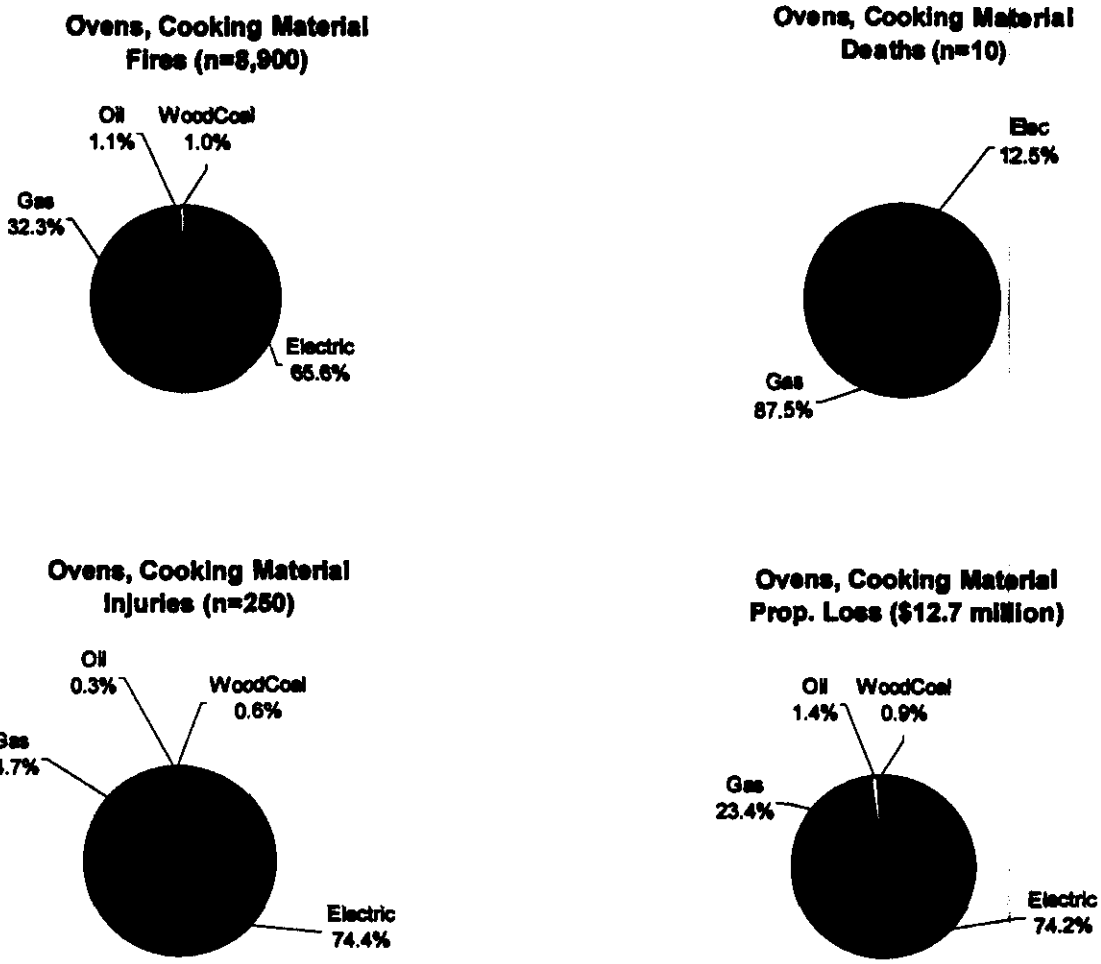
3. Ignition Factor

As in rangetop fires, the predominant ignition factor in oven fires was reported to be unattended situations, accounting for 4,700 fires (32 percent). Since ovens are designed for unattended baking, this category may indicate that the oven was being used for a process considered to require attendance, such as broiling, but information on cooking process is not available from NFIRS. The second most common ignition factor cited in oven fires was mechanical or electrical failure or malfunction, accounting for 3,100 fires (22 percent).

Among oven cooking material ignitions, unattended situations accounted for 4,000 fires (45 percent). Mechanical failure also was cited among fires involving cooking material ignition, accounting for 1,400 fires (15 percent).

[13] Although the equipment fuel distribution is presented for oven deaths as well as fires, the size of the death estimate is too small to support conclusions about the underlying causes.

Figure 14. Residential Oven Cooking Material Fires, Deaths, Injuries, and Property Loss, by Fuel, Based on Estimated Annual Averages: 1994 – 1996



Source: U.S. Consumer Product Safety Commission/EHHA: Based on NFIRS and NFPA data.
Note: Unknown and other fuels were allocated proportionally among known fuels. Annual averages (shown as n) were rounded to the nearest hundred (fires), nearest five (deaths), nearest ten (injuries), and nearest tenth of a million (property loss). Totals may not add due to rounding.

IV. CPSC Field Investigations

This section presents the results of a CPSC study conducted to provide detailed information about the circumstances of range fires that are not available from national fire data. While range fires from all causes were included, CPSC interest focused on the circumstances surrounding cooking fires. CPSC investigators conducted follow-up investigations of 289 range fires attended by the fire service between October 1994 and July 1995. These fires resulted in 19 deaths and 23 injuries. The process used to identify the incidents was described in the Methodology section. The CPSC Investigation Guideline is available upon request. As indicated earlier, these incidents were not from a sample with a known probability of selection and are not necessarily representative of all range fires. Nevertheless, there is no known bias in incident selection.

A. Product Description

Cooktops and ovens may be installed separately or incorporated into a combination unit commonly termed a range. Among the 289 investigated fires, 268 (93 percent) involved combination units, 14 involved surface-only units and 5 involved separately installed ovens (Table 7).

Electric-powered units were by far the most common in the CPSC study, accounting for 224 (78 percent) fires, compared to 54 natural gas units and 6 liquid petroleum (LP) gas units. Fires with wood- or coal-fired stoves were excluded from this study because they were not considered amenable to rapid changes of heat, the process that may be used to prevent cooking fires.

Table 7
Energy Type by Product Description
CPSC Range Fire Study

Energy Type	Total	Product Description			
		Combination	Surface Only	Oven Only	Unknown
Total	289	268	14	5	2
Electric	224	206	12	5	1
Natural Gas	54	52	2	-	-
LP Gas	6	6	-	-	-
Unknown	5	4	-	-	1

Source: U.S. Consumer Product Safety Commission\ EHHA. Based on fires investigated between 10/94 and 7/95.

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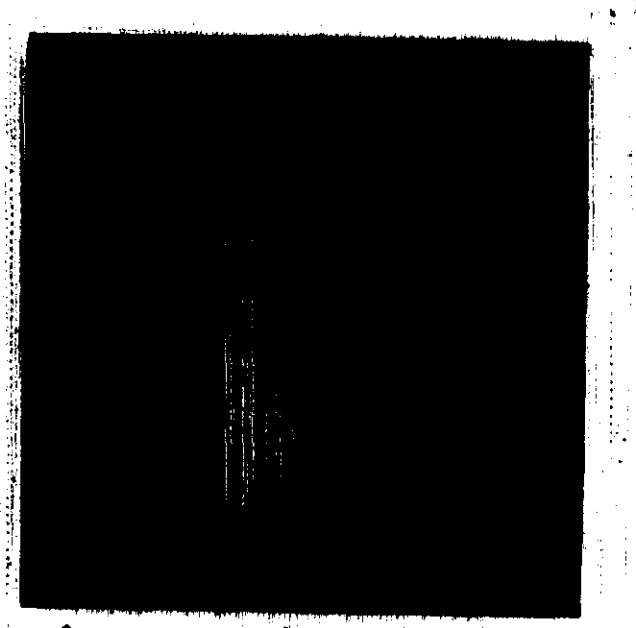
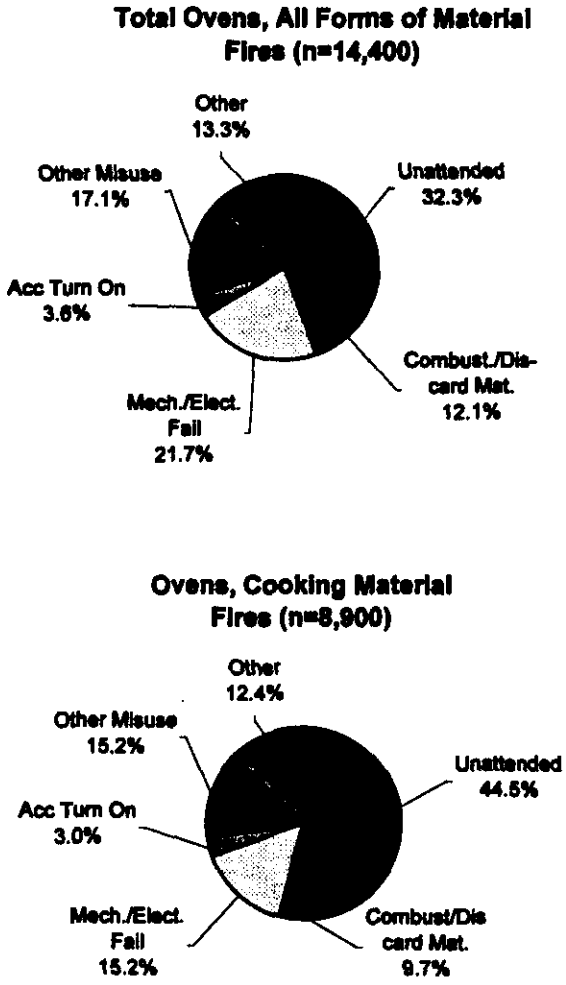
CIGARETTE LIGHTER PROGRAM



A view of the cigarette lighter involved in this incident. According to the fire marshal, the brand name is BIC.

The only Number
on the Lighter was
on the bottom, 45
This is a Bic
Lighter

Figure 15. Residential Oven Fires by Ignition Factor, All Forms of Material and Cooking Material Ignitions Only, Based on Estimated Annual Averages: 1994-1996



Source: U.S. Consumer Product Safety Commission/EHHA: Based on NFIRS and NFPA data.
Note: Unknown ignition factors were allocated proportionally among known ignition factors. Annual averages (shown as n) were rounded to the nearest hundred (fires). Totals may not add due to rounding.

Virtually all the electric-powered ranges had coil-type surface cooking elements, 150 of 153 where electric surface element type was specified. Two units had disk-type surface elements and one unit had smooth-top surface elements.

Age of Product and Owned/Rented Status

CPSC investigations cited the age of the product in 190 fires (Table 8). Among the fires where age of the appliance was reported, 113 (59 percent) were said to be less than five years old. However, the age distribution may be skewed toward newer appliances, since people may be less likely to know the age of older appliances, especially when fires occur in rental housing. Based on information obtained from Appliance Magazine, the average life of an electric range is estimated at 16 years and a gas range at 19 years.[14]

In terms of ownership of the appliance, 222 of the 289 investigations indicated whether the appliance was owned or rented. Over half (130) indicated that the appliance was rented (most of these were in rental property). Among those that were owned, 67 appliances (73 percent) were purchased new, 25 were purchased used. [15]

Table 8
Range Age and Ownership Status
CPSC Range Fire Study

Age of Range (Years)	Total	Range Ownership Status				
		Owned			Rented	Unknown
		Total	New at Purchase	Used at Purchase		
Total	289	92	67	25	130	67
Less than 5	113	53	40	13	51	9
5 to 10	42	21	15	6	17	4
More than 10	35	16	12	4	14	5
Unknown	99	2	-	2	48	49

Source: U.S. Consumer Product Safety Commission\EHHA. Based on fires investigated between 10/94 and 7/95.

Among the 289 investigations, 37 indicated that the appliances were in poor working condition. Among these, 23 fires occurred in rental property.

[14] Appliance Magazine, Vol. 55, No. 9, September 1998, p. 71.

[15] Some of the owned appliances were in rental property.

B. Fire Scenarios

Among the 289 investigated fires, 277 reports specified the part of the product involved. Of these, 212 fires (77 percent) originated at the cooking surface or its controls, 45 (16 percent) originated in the oven or its controls, and 20 (7 percent) occurred in other locations such as wiring where the failure point was not precisely stated.

Table 9 presents a distribution of the scenarios involved in the CPSC-investigated fires. Food ignitions (218) were involved in three-quarters of the fires. Product malfunctions (26) such as gas leak-related flare-ups and wiring failures, that may have caused short circuits or arcing, were other reported causes. Ignitions due to operational errors by the users (15), included five fires that occurred when the occupant accidentally turned on the wrong burner. Four fires involved ignition of materials left near the range (4).

Table 9
Fire Scenarios
CPSC Range Fire Study

Fire Scenario	Number	Percent
Total	289	100
Food Ignitions	218	75
Product Malfunctions	26	9
Operational Errors	15	5
Nearby Materials	4	1
Other, Unspecified	26	9

Note: Column detail may not add due to rounding.
Source: U.S. Consumer Product Safety Commission\EHHA.
Based on fires investigated between 10/94 and 7/95.

C. Food Ignition Scenarios

Table 10 presents a distribution of food type ignited and cooking location involved among the 218 food ignitions. Among these 218 fires, 192 (88 percent) involved rangetop cooking as opposed to oven cooking.

Among food ignition fires, cooking oil was the most common food ignited (93), followed by meats and fish (71). Together, these fires accounted for 75 percent of all food ignitions. Cooking oil fires often overheated before other foods were added. Yet, 37 of the 93 cooking oil fire reports stated that food simmering in oil or grease was involved. Many oven cooking fires (11 of 26) were caused by overcooked meats or fish.

Table 10
Foods Ignited in Cooking Fires, by Cooking Location
CPSC Range Fire Study

Food Type	Total	Cooking Location	
		Rangetop	Oven
Total	218	192	26
Cooking Oil	93	88	5
Meats, Fish	71	60	11
Vegetables	28	23	5
Other Foods[16]	15	13	2
Pasta	11	8	3

Source: U.S. Consumer Product Safety Commission\EHHA.
Based on fires investigated between 10/94 and 7/95

Table 11 presents a breakdown of food ignition incidents by cooking process and elapsed cooking time before ignition, as estimated by the occupant. Frying and boiling incidents generally involved rangetop fires while baking incidents generally involved ovens. Frying fires (138, 63 percent) were most common and generally involved meats and fish, vegetables, or cooking oil ignitions. Among these fires, oil or grease may have been used in combination with the food. The amount of oil used was not well reported in the study. Boiling (40) and baking (21) were involved in smaller numbers of cooking fires.

Among the 167 fires in which the elapsed cooking time was reported, 111 (66 percent) were said to have started within the first 15 minutes. Most fires that occurred within this time period involved the frying process, and included fires that occurred while the cook was waiting for the oil to heat. Boiled foods appeared to take more time to ignite and involved some foods that boiled dry. More than half (22) of the fires that involved the boiling process occurred after 30 minutes, or more, of cooking time.

[16] This category included eggs and other foods not uniquely identified in this study.

Table 11
Elapsed Cooking Time Before Ignition, by Cooking Process
CPSC Range Fire Study

Cooking Time	Total	Cooking Process			
		Frying	Boiling	Baking	Other[17]
Total	218	138	40	21	19
Up to 15 min.	111	81	2	15	13
15 to 29 min.	16	5	11	–	–
30 min. to 1 hr.	22	12	7	1	2
More than 1 hr.	18	–	15	1	2
Unknown	51	40	5	4	2

Source: U.S. Consumer Product Safety Commission\EHHA. Based on fires investigated between 10/94 and 7/95

When a cooking fire occurred, investigations reported the presence or absence of an exhaust fan and its operation in 147 of the 218 incidents. Twenty-one of these reports (14 percent of those reporting operation) stated that an exhaust fan was in use at the time of the fire. One hundred twenty-six reports (86 percent) stated that an exhaust fan was either not present or not in operation at the time of the fire.

A smoke detector was present in the dwelling in 165 (85 percent) of the 195 food ignition fires for which detector presence was reported (Table 12). Of these, the detector operated in 112 fires, 76 percent of the 148 fires that indicated whether or not the detector alarmed. These findings are similar to the results of a 1994 CPSC survey of smoke detector operability in U.S. households, which found that 88 percent of U.S. households had one or more detectors and that 75 percent of detectors alarmed in response to tests of operability.[18]

[17] These cooking processes included grilling, broiling and other specified methods.

[18] Smith, Charles L., Smoke Detector Operability Survey: Report on Findings, October 1994, CPSC

Table 12
Detector Presence and Operation in Cooking Fires
CPSC Range Fire Study

Detector Presence	Total	Detector Operation		
		Operated	Did not Operate	Unknown
Total	218	112	36	70
Present	165	112	36	17
Not Present	30	0	0	0
Unknown	23	0	0	53

Source: U.S. Consumer Product Safety Commission\EHHA. Based on fires investigated between 10/94 and 7/95.

D. Cook-Related Characteristics

The location of the cook at the time of the food ignition fire was categorized into four groups in the CPSC study: present in the kitchen at the time of the fire, outside the kitchen in an unspecified location, interrupted by activities elsewhere in the home, or not at home. This information indicated that 32 cooking fires (15 percent) started when the cook was in the kitchen (Table 13). Household interruptions were involved in 50 fires. In these incidents, the cook was interrupted by events such as answering the phone, attending to a child, or by unintentionally falling asleep while watching television and waiting for the food to cook. Other range fires occurred when the cook left the house to visit a neighbor, or follow-up on chores outside the home (36). However, the largest group of cooking fires (100) started when the cook was outside the kitchen at an upspecified location. Overall, these data indicated that 186 (85 percent) of the cooking-related fires started when food was left cooking without someone in the kitchen.

Table 13
Location of the Cook at Time of the Cooking Fire
CPSC Range Fire Study

Cook's Location	No. of Incidents
Total	218
Outside Kitchen –unspecified	100
Outside Kitchen-Household Interruptions	50
Not at Home	36
In Kitchen	32

Source: U.S. Consumer Product Safety Commission\EHHA.
Based on fires investigated between 10/94 and 7/94.

Table 14 presents a distribution of age and sex of the cook involved in cooking fires. Among the 165 fires where age of the cook was reported, adults between the ages of 25-64 were associated with almost two-thirds of the fires (61 percent). In nine fires, the cook was a child between 5 and 14 years old, seven of whom were unsupervised while cooking. Roughly two-thirds of the cooks in the CPSC study were females (143).

Table 14
Age of the Cook by Sex
CPSC Range Fire Study

Age of Cook (Years)	Total	Sex	
		Male	Female
Total	218	75	143
Less than 5	–	–	–
5 to 14	9	2	7
15 to 24	37	14	23
25 to 44	72	23	49
45 to 64	29	4	25
65 to 74	15	5	10
75 and older	3	2	1
Unknown	53	25	28

Source: U.S. Consumer Product Safety Commission\EHHA.
Fires investigated between 10/94 and 7/95.

E. Errors Not Involving Food Ignition

Fifteen CPSC investigations stated that ignitions involved operational errors. These included incidents when the cook inadvertently turned on the self-cleaning oven feature or a burner on the rangetop. Some self-cleaning oven fires occurred when excess grease or food accumulated in the appliance from previous use. Four incidents indicated that a fire occurred when textiles, towels, or clothing were left near the rangetop or inside the oven.

F. Product Malfunction

Twenty-six range fires were said to have occurred as a result of a malfunction in the rangetop or oven (Table 15). Fourteen malfunctions were reportedly due to problems with the piping or wiring systems, which may have caused gas leak-related flare-ups, short circuits, or arcing. Other malfunctions involved rangetop burner or control panel failures (9), and oven cleaning fires (3).

Table 15
Product Malfunction Fires
CPSC Range Fire Study

Type of Malfunction	Total	Type of Failure	
		Electrical Failures	Mechanical Failures
Total	26	19	7
Wiring/Piping	14	11	3
Control Panel	9	8	1
Oven Cleaning	3	–	3

Source: U.S. Consumer Product Safety Commission\EHHA.
Based on fires investigated between 10/94 and 7/95.

Product malfunction fires included both electrical (19) and mechanical (7) failures. Among the 19 electrical fires identified, 11 cases indicated that a wiring failure occurred. No explosions were associated with gas-powered range malfunctions in the CPSC study.

G. Deaths and Injuries

The 289 investigated fires resulted in 19 deaths and 23 injuries (Table 16). Casualties were distributed throughout the population except that few involved children. One injury involved a child under age 15, but there were no deaths in this age group.

Table 16
Deaths and Injuries by Age Group
CPSC Range Fire Study

Age Group (Years)	Deaths	Injuries
Total	19	23
Less than 5	–	–
5 to 14	–	1
15 to 24	4	5
25 to 44	1	3
45 to 64	2	5
65 to 74	1	1
75 and older	2	1
Unknown	9	7

Source: U.S. Consumer Product Safety Commission\EHHA.
Based on fires investigated between 10/94 and 7/95.

Cooking-related fires accounted for 17 deaths and 20 injuries (Table 17). One cooking fire resulted in the death of nine people. The fire started in the middle of the night, filled the house with smoke, and engulfed the house in flames. All 17 of the deaths that involved cooking material ignitions resulted from smoke inhalation. Fabric ignitions caused the remaining two deaths, which occurred when the cooks' garments caught fire while preparing food. Twelve injuries occurred from direct flame, injuring faces, legs, arms, and hands.

Table 17
Deaths and Injuries by Fire Incident Type
CPSC Range Fire Study

Type of Fire	Deaths	Injuries
Total	19	23
Cooking Fires	17	20
Fabric Ignitions	2	1
Other	–	2

Source: U.S. Consumer Product Safety Commission/EHHA.
Fires investigated between 10/94 and 7/95.

H. Property Loss

Table 18 compares estimated property loss that occurred in the CPSC study fires, distributed by property ownership status (owned versus rented). Among the 266 fires for which property loss was reported, 208 (78 percent) resulted in either no damage or damage less than $5,000. Twenty-seven households incurred property loss of over $25,000. In comparison, national estimates of range fire property loss indicated an average $3,400 property loss per fire. More fires occurred in rented properties (149) than owned properties (103). Nationally, about 35 percent of U.S. households lived in rental housing in 1995.[19]

Table 18
Estimated Property Loss by Property Ownership Status
CPSC Range Fire Study

Property Loss	Total	Property Ownership Status		
		Owned	Rented	Unknown
Total	289	103	149	37
No Damage	77	26	45	6
Less than $5,000	131	47	66	18
$5,000 to $25,000	31	9	15	7
More than $25,000	27	10	13	4
Unknown	23	11	10	2

Source: U.S. Consumer Product Safety Commission\ EHHA.
Fires investigated between 10/94 and 7/95.

I. Demographic Data

Education level of the head of the household was reported for 115 of the range fires in the CPSC study (Table 19). Among these, 43 percent had either completed college or taken some college coursework and 40 percent finished high school. Similarly, among the U.S. population, 43 percent of U.S. adults have completed some college coursework, while 37 percent have finished high school only.[20]

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[19] Source: Statistical Abstract of the United States

[20] Estimates obtained from the 1995 Statistical Abstract of the United States, Educational Attainment by Selected Criteria, U.S. Bureau of the Census .

Table 19
Percent Distribution of Education Level of Head of Household
CPSC Range Fire Study

Education Level	CPSC Study (n=115)	U.S. Population
College Education[21]	43%	43%
High School Diploma Only	40%	37%
Less than High School Education	17%	20%

Source: U.S. Consumer Product Safety Commission\EHHA.
Fires investigated between 10/94 and 7/95.

Annual household income, specified by 149 households in the CPSC study, was categorized as less than $15,000, $15,000-$34,999, or $35,000 and over (Table 20). About 28 percent (42) of fires in the CPSC study occurred in households with incomes below $15,000 annually. About 47 percent (70) occurred in households with annual incomes of $15,000-$34,999 annually. In comparison, national income data for 1995 indicate that 21 percent of U.S. households earn less than $15,000 annually, while 30 percent earn between $15,000 and $34,999 annually.

Table 20
Percent Distribution of Household Income
CPSC Range Fire Study

Household Income	CPSC Study (n=149)	U.S. Population[22]
Less than $15,000	28%	21%
$15,000-$34,999	47%	30%
$35,000 or more	25%	49%

Source: U.S. Consumer Product Safety Commission\EHHA
Fires investigated between 10/94 and 7/95.

[21] This category includes individuals who either finished a four-year college degree, or completed some coursework on a college level.

[22] Estimates obtained from the 1995 Statistical Abstract of the United States, Money Income of Households, U.S. Bureau of the Census

V. Discussion

The two data bases cited in this report complement each other. NFIRS data included about 37,000 reports of rangetop and oven fires annually in recent years (unweighted). However, NFIRS data are confined to coded variables and may provide limited detail about specific causes and characteristics that are needed to address particular issues. In the case of range fires, NFIRS data provide no information on the specific foods that were being cooked, how they were being cooked, or who was doing the cooking.

The CPSC study was conducted to gather more detailed information on the fires than exists in NFIRS data. The study covers a data collection period of less than a year and contains 289 fire incidents. Its findings provide valuable insight into characteristics that are relevant to addressing range fires in general and the cooking fire problem in particular. While neither data source constitutes a sample with a known probability of selection, we are not aware of known sources of bias in either data source.

While the findings from the two data sources usually were not identical in terms of the proportions of specific events reported, the rankings of events were usually the same. In some cases, the differing amount of detail available in the two data sources was a factor in explaining differences. Some comparisons follow:

1) Both data sources indicated that range fires primarily involved events that originated with the rangetop rather than the oven. In NFIRS, there are only two equipment choices that refer to the ignition location of the fire—a fixed surface unit, or a fixed oven. NFIRS data indicated that 83 percent of rangetop and oven fires involved fixed surface units. In the CPSC study, fires originated at surface locations in 77 percent of the fires. However, this may be an underestimate of surface locations, since an additional 7 percent of fires in the CPSC study occurred in wiring and did not specify a surface versus oven location.

2) Both sources documented the more frequent involvement of electric products compared to gas. Electric-powered units were involved in 66 percent of the fires reported in NFIRS and 78 percent of fires in the CPSC study.

3) Both sources documented the prevalence of cooking fires. The percentages of all range fires that involved ignition of cooking material were similar in the two data sources, 71 percent in NFIRS and 75 percent in the CPSC study.

4) Both sources documented the prevalence of fires in which the cook was not nearby when cooking materials ignited. In NFIRS, such fires constituted 69 percent of rangetop cooking material fires and 45 percent of oven cooking material fires. In the CPSC study, 85 percent of all cooking fires were categorized as uattended. As indicated earlier, NFIRS provides no definition

of the term "unattended." In the CPSC study, the term was applied to anyone not in the kitchen at the time of the fire.

5) Both sources indicated that product failures were a relatively small part of the overall range fire problem, accounting for 12 percent in the NFIRS data and 9 percent in the CPSC study.

It is, unfortunately, the nature of fire investigation that details of fire cause, such as occupant activities prior to the fire, commonly are least often available for high damage fires. Even when the occupants have survived the fire, they often have been forced to move, even if only temporarily. In such cases, locating them to schedule follow-up interviews is often not possible. As a result, it is common that incidents with the most detail often are those with relatively minor amounts of damage.

As indicated above, both NFIRS data and the CPSC special study documented the involvement of unattended cooking. However, it is important to note that, by itself, the term "unattended" does not indicate what was going on at the time of the fire. For example, while NFIRS includes a code for people falling asleep, one form of an "unattended" situation, in most situations the fire service did not capture the details of why someone was not in the kitchen. Those incidents then are coded "unattended." The CPSC study data provided additional information, and documented situations where the consumer was called away to attend to family members or other unexpected events, where the cook fell asleep without intending to do so, or turned on the wrong burner (documented in both NFIRS and the CPSC special study). These events are common enough situations that they should be considered anticipated human behavior, regardless of whether cooking is going on. To the extent that it is possible to make technological changes to ranges to prevent cooking situations from escalating into fires, regardless of the location of the cook, an increase in public safety could be achieved.

VI. Conclusions

Based on NFIRS and NFPA data, an estimated 86,000 residential fires annually originated with ranges during 1994 – 1996. These fires resulted in 245 deaths, 4,160 injuries, and $292.9 million in property loss annually. Although range-related fires have shown a general decrease over the past 10 years, they are the primary cause of residential fires and injuries, although not the primary cause of fire death. Range fire deaths reported in NFIRS occurred disproportionately at night (34%), while injuries were most common in the afternoon or evening. Range fire deaths also disproportionately involved gas ranges, occurring at a rate twice that of electric ranges per numbers of units in use.

Most fires originated on the rangetop, as opposed to the oven, accounting for 83 percent of all range fires, as well as 89 percent of range fire deaths and injuries, and 90 percent of range fire property loss. Ignition of cooking material was the major cause of rangetop fires, accounting for 52,500 fires (73 percent), 95 deaths (44 percent), 2,700 injuries (73 percent), and $152.8 million (58 percent) in property loss annually. Ignition of cooking material in ovens accounted for an additional 8,900 fires, 10 deaths, 250 injuries, and $12.7 million in property loss annually.

NFIRS reported the cooking materials ignited as cooking oil, food fats and food starches. The CPSC study found that most cooking fires involved cooking oil alone, meats or fish alone, or the two groups in combination, accounting for 75 percent of range cooking fires. Frying was the most frequently reported cooking process to cause a fire among the CPSC cases, accounting for 63 percent of range cooking fires. Frying fires were also the quickest to ignite, predominantly occurring within the first 15 minutes. Most cooking fires occurred when the cook was not in the kitchen.

The CPSC study indicated that a disproportionately large number of range fires occurred in rental housing. This finding is consistent with the disproportionately large percentage of households in the CPSC study that were low income, providing yet another example for the growing body of work documenting the importance of socioeconomic factors in the U.S. fire problem.[23]

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[23] Socioeconomic Factors and the Incidence of Fire, Federal Emergency Management Agency, U.S. Fire Administration, FA170, June 1997.