GAS-FUELED APPLIANCES

The following analysis of hazards associated with gas-fueled appliances is the product of original analysis and previous analysis provided by epidemiology personnel on the Fire and Thermal Burn Team. Of the several sources of fire incident data used for this analysis, data from the U.S. Fire Administration is, perhaps, the most comprehensive. The most recent data from the Fire Administration is for calendar year 1979. For consistency, data from other sources were selected for the same time period even though more recent information is available.

To provide a perspective for hazards associated with gas-fueled appliances, a comparison to products fueled by other means was made. For this comparison, fire incident data on heating equipment was used.

Incident/Frequency of Injury

Despite indications that gas-fueled heating equipment is involved in less than half the number of fires that wood- or coal-fueled equipment is, gas-fueled heating appliances appear to present the most serious risk of injury. According to the U.S. Fire Administration data from 15 states, fires involving wood- or coal-fueled heating equipment had a higher frequency of occurrence in 1979 than heating equipment using any other fuels, increasing by over 15 percent over the previous year (see Figure 1). However, gas-fueled products were involved in almost 450 reported casualities in 1979 (an increase of 2 percent from the previous year) while wood-or coal-fueled products were cited in less than 300 casualties (a 7 percent decrease from 1978, see Figure 2).

For an examination of the number of injuries and types of hazards associated with gas-fueled appliances, several products and product groups were examined. They are heating equipment, cooking equipment, gas distribution systems and clothes dryers. Table 1 presents the number of fires, injuries, deaths and losses attributed to products in each of these categories for 1979. Some anomalies in the table are due to the use of different data sources. Although Fire Administration data is designed specifically for reporting fires and, therefore, contains more relevant data elements for fires, it does not serve all of our purposes for product definition. CPSC data (NEISS and Death Certificates) were used for products not classified in Fire Administration data. These data do not report the total number of fires or the value of losses associated with fires. For Fire Administration data, casualties were not reported because they often include fire fighting personnel.

Of the products examined, fixed surface cooking equipment has the largest number of deaths associated with it, followed by water heaters, space heaters, fixed heating units, and central furnaces, respectively. (It may be observed that the number of deaths is the only variable in common for all products reviewed.) Among those products

FIGURE 1

TWO YEAR COMPARISON OF FIRES INVOLVING HEATING EQUIPMENT

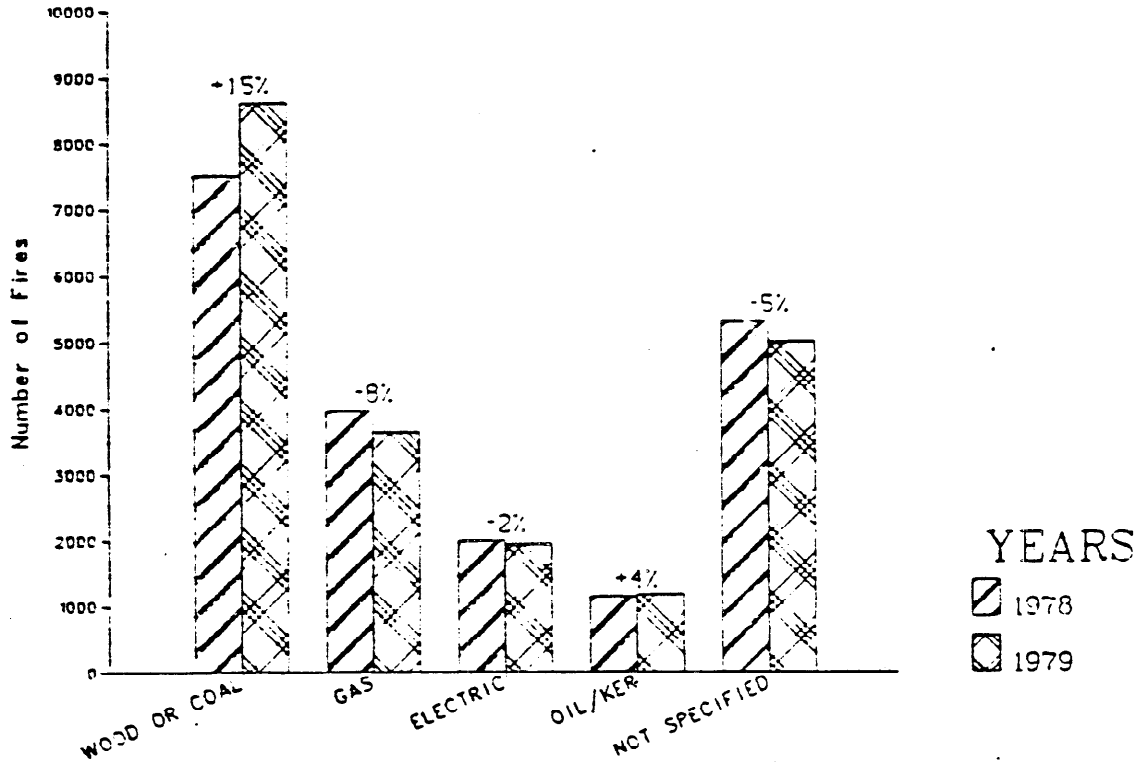
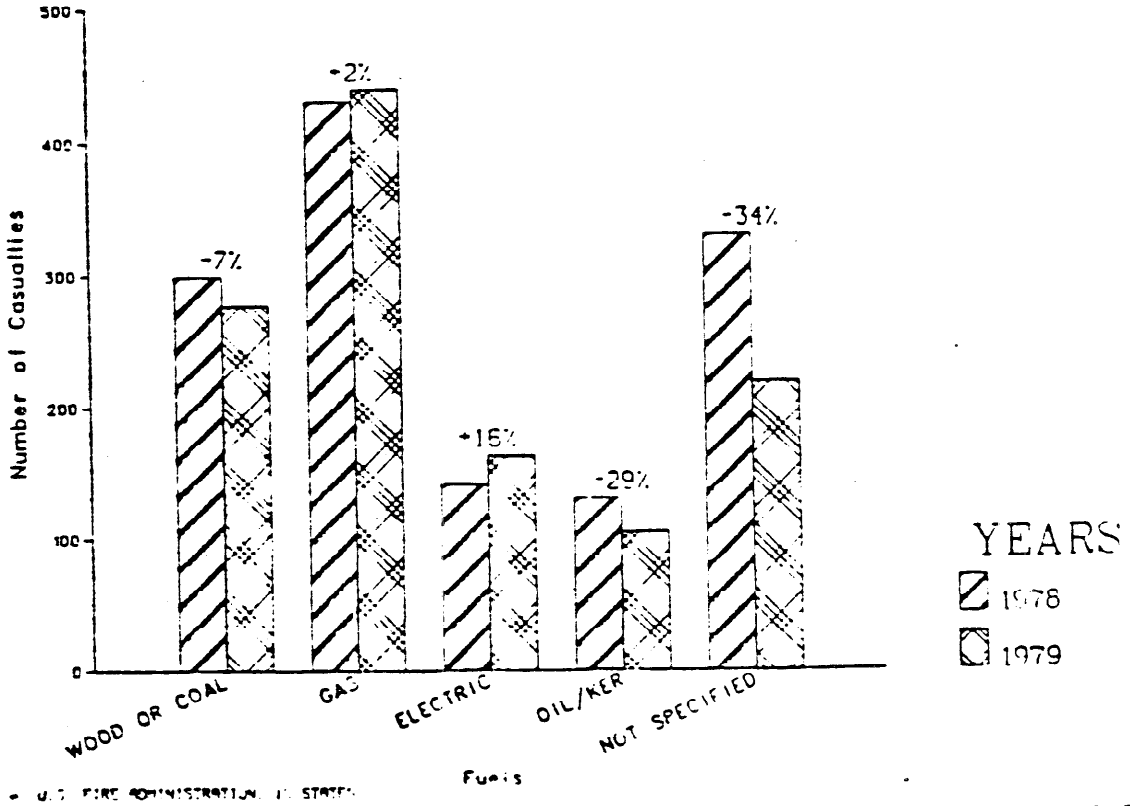


FIGURE 2

TWO YEAR COMPARISON OF FIRE CASUALTIES RESULTING FROM HEATING EQUIPMENT FIRES



Source: U.S. FIRE ADMINISTRATION, FIRE STATE

285

for which the number of fires is provided, fixed heating units also have the highest frequency. In terms of monetary loss, fires associated with water heaters, fixed heating equipment, and central furnaces were the most costly.

A comparison of the relative magnitude of fire hazards presented by natural gas-fueled equipment to LP gas-fueled equipment is not readily available. There is some suggestion, however, that LP gas-fueled appliances may present special problems due to the "pooling" characteristics of heavier than air LP gases. As can be seen from Table 1, the number of injuries associated with LP gas distribution systems was about twice that for natural gas distribution systems; however, these systems are not strictly comparable.

Another major hazard associated with gas-fueled products is carbon monoxide poisoning which occurs in the absence of a conflagration. It is estimated that there were about 350 carbon monoxide deaths of this type in 1977 (see Table 1, Attachment 1). Almost half of these deaths involved gas space heaters. Further research has indicated that among space heaters, a greater risk of injury may be associated with vented space heaters (see Attachment 2).

Hazard Patterns

In order to determine some of the major hazard patterns for the products reviewed, in-depth investigations of incidents occurring in 1979 which involved those products, were reviewed. Because selection of these cases for investigation was not always done on a systematic basis, their distribution may not be indicative of the actual injury situation.

Heating Equipment

Central Furnaces. There were three dominant hazards associated with these products, the most common of which involved a malfunction of the furnace or one of its components. This resulted in carbon monoxide poisoning, fire or a gas leak. Another dominant injury scenario involves manual ignition of the furnace or its pilot light. In these cases, there was a flashback burn when accumulated gas suddenly ignited. A third major hazard results from a defeating of the furnace's venting mechanism. In those cases, carbon monoxide poisoning was the result.

Water Heaters. Two major hazards were found involving water heaters: they shall be called heater malfunction and flashback. Heater malfunction describes incidents where a house fire was allegedly caused by the water heater. Flashbacks usually occurred while the pilot light was being relighted. Often these incidents were precipitated by a failure of a water heater component such as a valve or a gas control device.

Gas or LP Heaters. Incidents investigated for these products (primarily space heaters) usually resulted in carbon monoxide poisoning. These were often the result of component malfunction or improper installation. Two incidents involved unvented gas space heaters.

Table 1. Estimated Fires, Injuries, Deaths and Economic Losses for Selected Gas-Fueled Products for Calendar Year 1979.

Product	Fires[a]	Injuries[b]	Deaths	$ Loss (thousands)[a]
Heating Equipment				
Central Furnaces	8,000	--	79[a]	51,200
Fixed Heaters	7,500	--	88[a]	64,200
Water Heaters	12,300	--	114[a]	62,900
Portable LP Heaters	--	100	6[c]	--
Cooking Equipment				
Gas Ranges	36,100	--	176[a]	37,600
Fixed Oven Unit	8,900	--	0	3,500
Portable Cooking Unit	200	--	0	1,000
Fixed Open Grills	300	--	0	200
Gas/LP Grills or Stoves	--	1,900	6[c]	--
Gas Distribution Systems				
Gas Pipes or Fittings	--	750	12[c]	--
LP Tanks or Fittings	--	1,500	18[c]	--
Gas Clothes Dryers	9,900	--	17[a]	7,800

[a] Source: U.S. Fire Administration fire incident data.

[b] Source: U.S. Consumer Product Safety Commission, NEISS. May include injuries not associated with fires.

[c] Source: U.S. Consumer Product Safety Commission, Death Certificates. May include deaths not associated with fires.

Cooking Equipment

Fixed Surface (Gas Ranges with Ovens). One major hazard found to be associated with these products was flashback while lighting the oven, stove top or a pilot light for the range. Often, no product malfunction was cited. Another dominant hazard was contact burn occurring when the victim inadvertently touched a hot surface of the range or when a child contacted the stove.

Fixed Oven Unit. These scenarios were very similar to injuries associated with fixed surface units, the primary hazards being flashback while lighting the oven and contact burn.

Butane/Propane Grills and Stoves. A majority of the incidents investigated which involved these products dealt with a fire resulting from a component malfunction of the appliance. Components specifically cited were the gas valve and regulator.

Gas Distribution Systems

Gas Pipes, Fittings and Distribution Systems. Only a few investigations of these incidents are on file. Most of them reported leaks in gas line connectors—both flexible and rigid. Some of the deaths involved crushing or explosion injuries.

Butane/Propane Tanks, Pipes, Fittings, and Distribution Systems. Incidents investigated for these products were disparate and could not be logically fitted into major hazard groups. In general, these incidents differed from the investigations for natural gas systems inasmuch as there was one investigated incident of a tank explosion and gas leaks were more weakly represented. Here, too, some death certificates reported explosions and crushing incidents with heavy equipment.

Gas Clothes Dryers

There were several clothes dryer incidents investigated in which the dryer malfunctionedin some way and caused a fire, smoke or an explosion inside the dryer. A few of these malfunctions were cases where overheating of the dryer was reported. As is the case for so many gas-fueled appliances, a major scenario for injuries associated with clothes dryers is flashback while attempting to ignite the pilot light of the dryer.

Summary

Gas-fueled appliances appear to be a major source of fire incidents. Products frequently involved are heating equipment, including water heaters, and cooking equipment—primarily fixed natural gas surface units. To a lesser extent, gas distribution systems and clothes dryers are involved. The major hazards were fires and burns from product failures and flashbacks and carbon monoxide poisoning from product malfunction, inadvertent misuse or improper installation.

ATTACHMENT 1

12 JUL 1980

Stan Morrow, E/(signed) Joann E. Langston
Through: Joann Langston, AED, HIA; Dr. Robert Verhalen, DAED, HIE; Robert D. Verhalen, Dr.PH (Signed)
Robert Frye, Director, HIEA
Bea Harwood, HIEA

Preliminary 1978 Estimate of Deaths from Unvented Gas Space Heaters

HIEA estimates that during 1978 approximately 50 deaths were attributed to carbon monoxide poisoning from unvented gas-fired space heaters. This preliminary estimate was derived in the same manner as the 1977 estimate. (See HIEA report of October 1979, "Carbon Monoxide Deaths from Unvented Gas Space Heaters".) That is, the proportion of carbon monoxide deaths identified in the Commission's death certificate files as associated with various consumer products was extrapolated to the national estimate of carbon monoxide deaths published by the National Center for Health Statistics. Thus an estimate was derived for the total number of CO deaths from gas space heaters. To determine the proportion of these deaths that were from vented heaters and the proportion that were from unvented heaters HIEA applied the proportions found in the in-depth investigation file, specific for geographic region, to the estimate for all gas space heaters, and then summed over all geographic regions.

The preliminary 1978 estimate of carbon monoxide deaths from all consumer products is shown in Table 1. The extrapolation of the 1978 death certificates to national mortality uses 1977 mortality data as a base because 1978 mortality data is not yet available from the National Center for Health Statistics. About 170 carbon monoxide deaths were estimated to have involved gas space heaters.

Table 2 shows how the regional distribution of vented and unvented space heaters as identified from in-depth investigations was applied to the regional distribution of space heater deaths to arrive at a national estimate of deaths involving unvented gas space heaters.

The preliminary estimate of carbon monoxide deaths from unvented gas heaters derived in this manner comes to about 50. Although the estimate is somewhat lower than the 1977 estimate of 70 deaths it continues to demonstrate the existence of a significant risk of injury.

Attachments

bcc:
G. Anikis
S. Morrow
W. Mathers
J. Clones
R. Sommarco
J. Langston
R. Verhalen
R. Frye
C. Nicholls
Bea Harwood

HIEA/BHarwood/cap 7/1/80

Table I.

Carbon Monoxide Deaths from Use of Domestic Fuels, 1978
(Excluding Motor Vehicle Exhaust Fumes)

Consumer Product Identified	1978 CPSC Death Certificates	Extrapolated U.S. Estimate
Total	238	
Unknown	55	
Total Known	183	348 [a]
Gas Heater	90	171
Camper Heater	6	11
Kerosene Heater	1	2
Furnace	35	67
Charcoal Grill	26	49
Fireplace	4	8
Other	21	40

[a] Based on 1977 mortality data from the National Center for Health Statistics (NCHS). 1978 data is not yet available. Proportions from death certificate file were applied to the NCHS estimate. E.g.[90] 183 X 348 = 171.

Source: CPSC Death Ciertificate file, 1978 and mortality estimates from the National Center for Health Statistics (NCHS).

U.S. Consumer Product Safety Commission/HIEA

ATTACHMENT 2

1 NOV 1979

George Anikis, OPM

Bea Harwood, HIEA

Carbon Monoxide Poisoning Deaths from Sources other than Unvented Gas Space Heaters

A recent evaluation of the number of carbon monoxide deaths from unvented gas space heaters brought to light the fact that a serious risk of carbon monoxide poisoning also exists with vented gas space heaters. In fact, of the 348 CO-deaths that were reported in 1977 from the use of domestic fuels (excluding actual fires), about 110 were estimated to have been associated with vented type heaters and 70 with unvented heaters.

The Gas Appliance Manufacturers Association (GAMA) estimated that in 1975 there were about 5,000,000 vented type heaters in use and about 8,000,000 unvented heaters. If these estimates are accurate, then the absolute risk of carbon monoxide poisoning death is greater with vented heaters than with unvented heaters.

When the Commission determined earlier that regulatory action was unnecessary for vented space heaters, it was on the basis that adequate voluntary standards existed for their design and manufacture. The accident data provided no basis for doubting this finding. Intrinsically vented heaters are probably safer than unvented heaters; however, an examination of in-depth investigations of accidents involving vented heaters reveals that the problem is not related to design and manufacture but rather to installation and maintenance of the venting system. Most of the accidents involved improper venting in the first place or inadequate maintenance of a venting system during normal use. Many of the victims in these accidents had apparently been unaware of or unwilling to acknowledge the dangers involved in failing to provide adequate venting. One woman, for example, had placed an empty tuna fish can over the vent pipe of her heater. Another man, who already owned three unvented-type heaters, purchased a fourth heater, this one designed to be vented. Unwilling to pay the $50 estimated to install a vent pipe, the man began to use the heater unvented despite warnings that this was dangerous. A few weeks later, he and his wife were dead.

Multiple deaths were more frequent in vented heater accidents than in unvented heater accidents. In-depth investigations report 44 deaths in 25 incidents involving vented heaters, or an average of 1.8 deaths per incident, compared with 14 deaths in 12 incidents involving unvented heaters, or an average of 1.2 deaths per incident.

Although improved labeling and consumer education efforts could reduce the risk associated with vented heaters, Commission consideration of regulatory activity may also be appropriate. If an oxygen depletion sensor (ODS) is feasible, its use is obviously indicated by the data.

Finally, it is worth noting that about 20 percent of the 348 carbon monoxide deaths associated with the use of residential fuels in 1977 involved central heating furnaces, about 8 percent were charcoal grills used in enclosed areas, and about 7 percent were other kinds of heaters, primarily small "camper" type heaters. See table attached. These sources of accidental death demand a watchful eye as well. As energy costs, in general, and home heating oil costs, in paricular, continue to soar, consumers are likely to seek various means of reducing these costs, and some of the alternatives that they choose may be inherently unsafe.

Attachment

bcc:
Official
Reading
Chron
OPM
J. Langston
R. Verhalen
R. Frye
C. Nicholls
J. Clones
W. Mathers
B. Harwood

Clearinghouse

HIEA:BHarwood:pd 11/1/79

ATTACHMENT 3

Carbon Monoxide Deaths from

Unvented Gas-Fired Space Heaters

1977

Beatrice Harwood
Hazard Identification & Analysis
Division of Program Analysis
October 1979

Carbon Monoxide Deaths From Unvented Gas Space Heaters

The risk of carbon monoxide poisoning from unvented gas space heaters has been recognized for some time. A hazard analysis published in May 1978 included findings from a review of the Commission's death certificate file. These data indicated that during the years from 1973 to 1978, 72 carbon monoxide deaths were reported as involving unvented gas space heaters, and 64 additional deaths were judged from the circumstances given as probably involving unvented gas heaters. (At that time few in-depth investigations existed to identify more precisely exactly what kinds of heaters might have been involved in these fatalaties.) In order to provide additional information on the role of space heaters in carbon monoxide poisoning, particularly in terms of deriving an annual estimate of such deaths, HIEA examined the problem from a slightly different point of view. Instead of looking just for unvented gas space heater deaths, the death certificate data were examined from a diagnostic viewpoint, to determine the major domestic sources of carbon monoxide poisoning deaths.

DEATH CERTIFICATE FILES

As before, the source of these data was the Commission's death certificate files, which include death certificates collected from the 50 states and 4 U.S. territories for causes of death most likely to involve a consumer product.

Taken as a whole, data collected from this program do not reflect the true number of product-related deaths that occurred, primarily because many death certificates fail to provide enough information to identify the product(s) involved.

In the case of carbon monoxide poisoning from the use of domestic fuels, however, the Commission's death certificate file has, since 1974, identified an associated product for about 75 percent of the total number of such deaths reported to the National Center for Health Statistics (NCHS), the source of our national mortality data.

In 1977, the most recent year for which NCHS mortality data are available, 348 carbon monoxide poisonings were reported to have occurred from the use of residential fuels, excluding those from motor vehicle exhaust fumes or associated with an actual fire. CPSC death certificate files include 289 of these deaths, or 83 percent.

A distribution of these 289 deaths by the associated product involved, and an extrapolation of these numbers to the NCHS estimate is shown in Table 1. About one-half, or 176, involved gas heaters, 22 percent involved furnaces, 8 percent were from charcoal grills and 7 percent from kerosene heaters or portable camp-type heaters.

The identification of the kind of heater involved in these deaths was difficult. While 30 of the heaters were specified as "unvented" the majority did not specifically identify the kind of heater that was involved. Therefore, other data sources were sought to provide this specificity.

IN-DEPTH INVESTIGATIONS

In-depth investigations are intended to provide details about product identification that are unavailable from other data sources.

Examination of 41 investigations of space heater carbon monoxide poisoning yielded the results shown in Table 2. About 29 percent of the incidents and 22 percent of the deaths were from unvented type heaters while 61 percent of the incidents and 70 percent of the deaths were from vented heaters.

Before the proportions observed in Table 2 can be used to impute estimates to the universe of space heater carbon monoxide deaths, possible sources of bias in the assignment of these investigations must be considered. The 41 investigations cannot be said to represent a randomly drawn sample of the space heater deaths represented in the death certificate file. The majority, about 60 percent, were identified originally from newspaper clippings, 15 percent from NEISS, 5 percent from consumer complaints and the remaining 20 percent from other and unspecified sources.

One might have assumed a possible bias toward assigning known unvented heater accidents for investigation, since these have been of particular interest to the Commission. However, a review of the newspaper clippings file, from which a majority of the cases were selected for assignment, did not indicate any particular bias of this sort, primarily because most of these accounts did not identify the kind of heater involved.

Since unvented heaters are more common in certain areas of the country than in others, a comparison of the regional distribution of the death certificates and of the in-depth investigations became of interest. Table 3 shows this comparison. The deaths from unvented space heaters, as represented in the in-depth investigations, are drawn primarily from the Southern areas of the country. These areas are known to rely heavily on unvented gas space heaters as a source of heat, and they do appear to be somewhat under-represented in the IDI file, compared with the distribution drawn from the death certificate file. In-depth investigations of vented heaters come from almost every region, but appear to be somewhat overrepresented in the Pacific states, primarily California, where a total ban on unvented space heaters is in effect.

Adjustment for these differences appeared to be in order. Therefore, for each of the nine regions, the proportion of each heater type, as identified through in-depth investigations, was applied to the total of 176 extrapolated space heater deaths estimated from the death certificate file. The sum of these estimates over all regions yields a regionally-adjusted estimate of the expected number of both vented and unvented space heater deaths. These calculations result in an estimate of 61 deaths from unvented heaters and 101 from vented heaters. If the unknown type heater deaths are distributed on a pro-rata basis, the overall estimate translates to about 70 for unvented heaters and 110 for vented heaters.

Although information on the age of the heaters involved in these accidents was often not available, the relatively small number of cases in which this information was given indicates that about one-third were less than 5 years old, one-third were between 5 and 20 years old, and on-third were older than 20 years. A distribution is shown in Table 4.

It should be noted that the overall death estimates from carbon monoxide are probably conservative. According to medical testimony presented during public hearings related to unvented gas space heaters, the effects of carbon monoxide poisoning on the cardiovascular and neurolgical systems are similar to those for other pathological conditions and may thus cause such deaths to be misdiagnosed and attributed to other physiological causes.

In summary, CPSC's estimate of about 180 (176 rounded) carbon monoxide deaths in 1977 associated with gas space heaters is almost certainly a firm minimum number. Further, it is important to note that this number represents about one-half of all reported carbon monoxide deaths associated with the use of residential fuels. While we are somewhat less confident about the estimated number of those 180 deaths that involve unvented heaters, 70, we believe that this proportion is prudent, reasonable and is supported by the best available data. Certainly it demonstrates the existence of a significant risk of injury.

The number of deaths that were found to involve vented heaters would seem to indicate that Commission consideration of regulatory activity for these heaters is also appropriate. Additional information about this hazard will be the subject of a later memo.

Table 1

Carbon Monoxide Poisoning Deaths From Use of Domestic Fuels, 1977
(Excluding Motor Vehicle Exhaust Fumes)

Product Involved	DCRT Data		Extrapolated U.S. Estimate[a]	
	Number	Percent	Number	Percent
TOTAL	289	100%	348	100%
Gas Heater	123	44%	176	51%
Other Heater	17	6%	25	7%
"Camper"[b]	14		21	
Kerosene	3		4	
Furnace	55	19%	80	22%
Charcoal Grill	20	7%	28	8%
Fireplace	6	2%	8	2%
Other	22	8%	31	9%
Unknown	36	15%		

[a] The estimate of 348 annual CO deaths from use of domestic fuels was derived from mortality data from the National Center for Health Statistics.

[b] May include some camper cook stoves.

Source: U.S. CONSUMER PRODUCT SAFETY COMMISSION
Death Certificate File, 1977

Table 2

In-Depth Investigation of Carbon Monoxide Poisonings
Associated With Space Heaters, 1973-1979

Kind of Heater/Malfunction	Incidents		Deaths	
	Number	Percent	Number	Percent
TOTAL	41	100%	63	100%
Unvented Type Heater	12	29%	14	22%
Vented Heater:	25	61%	44	70%
No Vent Installed	5		6	
Improper Vent Installed	2		2	
Cracked or Blocked Vent	10		27	
Improper Conversion*	2		4	
Apparent Heater Malfunction	6		5	
Unknown Type Heater	4	10%	5	8%

* Conversion from bottled to natural gas or vice versa.

Source: U.S. CONSUMER PRODUCT SAFETY COMMISSION
In-Depth Investigations

Table 3

Estimated Deaths From Space Heater Carbon Monoxide Poisoning

Geographic Area	In-Depth Investigations: Number of Deaths: Unvented	Vented	Unknown	Total	Percent	Estimated Deaths: Number	Percent	Estimated Deaths*: Unvented	Vented	Unknown
TOTAL	14	44	5	63	100.0	176	100.0	61	101	14
New England	-	-	-	-	-	1	0.6	-	-	1
Mid Atlantic	-	10	-	10	15.9	20	11.4	-	20	-
East North Central	-	1	-	1	1.6	11	6.2	-	11	-
West North Central	1	4	-	5	7.9	20	11.3	4	16	-
South Atlantic	5	1	-	6	9.5	42	23.8	35	7	-
East South Central	2	2	3	7	11.1	17	9.7	5	5	7
West South Central	6	4	1	11	17.5	32	18.2	17	12	3
Mountain	-	5	1	6	9.5	14	8.0	-	11	3
Pacific	-	17	-	17	27.0	19	10.8	-	19	-

* Estimated by applying the proportion found in the IDI file to the extrapolated estimate of 176 space heater deaths derived from the death certificate file, 1977.

Source: U.S. CONSUMER PRODUCT SAFETY COMMISSION
Division of Program Analysis

Table 4

In-Depth Investigations Involving Carbon Monoxide Poisonings, by Age of Heater

Age of Heater	Vented	Unvented	Unknown	Total	Percent* Vented	Percent* Unvented
< 1 yr.	5	-	-	5	29%	-
1- 4	1	1	-	2	6%	17%
5- 9	1	2	-	3	6%	33%
10-14	3	1	-	4	18%	17%
15-19	2	-	-	2	12%	-
20+	5	2	-	7	29%	33%
Unknown	8	6	-	14		
TOTAL	25	12	4	41		
Median Age	12.5	10.0	-			

* Excluding heaters of unknown age.

Source: U.S. CONSUMER PRODUCT SAFETY COMMISSION

300

ATTACHMENT 4

HAZARDS ASSOCIATED WITH THE USE OF WOOD OR COAL-BURNING STOVES OR FREE-STANDING FIREPLACES

Beatrice Harwood
Paul Kluge

February 1980

U.S. CONSUMER PRODUCT SAFETY COMMISSION
Directorate for Hazard Identification and Analysis
Division of Program Analysis

WOOD OR COAL STOVES, FREE STANDING FIREPLACES

Executive Summary

The energy shortage and attendant high heating oil prices have forced consumers to search for cheaper kinds of fuel. Wood, both as a primary and a supplemental fuel, has enjoyed a particular revival. Sales of wood-burning stoves have tripled since 1974. Free-standing fireplaces and fireplace inserts are widely advertised as supplemental heat sources. Combination wood-oil or wood-gas furnaces are being introduced at trade shows as devices that will reduce heating bills appreciably.

Accompanying this revival, however, has been a concern about the safety of these devices. Reports of an increasing number of fires in wood-burning stoves and free-standing fireplaces prompted the Commission, in June 1979, to grant a petition to develop a rule requiring labeling and instructions as to the proper installation and maintenance of these appliances.

This report is intended to describe the nature and extent of hazards associated with these solid fueled devices.

Since 1974 the number of hospital emergency room-treated burn injuries arising from the use of wood-burning stoves and free-standing fireplaces has risen sharply, from about 600 to 4,600 in 1979. From 1978 to 1979 alone the number doubled. Although most of these injuries appear to be the result of falling against or accidentally contacting the hot surface of the stove, estimates of injuries resulting from an actual fire have also increased, from about 40 in 1974 to 400 in 1979.

According to 1978 data from fire departments in 15 states that report to the U.S. Fire Administration, fires in heating equipment account for roughly 20 percent of all residential fires. The largest proportion of these fires, but the smallest proportion of deaths and injuries, was from fires in chimneys, flues and chimney connectors. Most of these were reported to have been connected to devices burning solid fuel, but whether these were fireplaces or stoves is not generally known. The second largest source of heating equipment fires was fixed. local heaters or stoves: within this category gas-fired heaters and wood or coal stoves accounted for the largest number of fires. See charts on page 3 for an overview

National estimates derived from extrapolating these data to national fire estimates published by the National Fire Protection Association result in estimates of about 8,000-9,000 fires nationally, from wood or coal stoves, resulting in about 100-130 deaths. An additional 23,000-28,000 fires and 60-80 deaths are estimated from chimneys or flues and 6,000-7,5000 fires and 15-20 deaths from chimney connectors. The latter are assumed to connect to stoves or free-standing fireplaces, since ordinary masonry fireplaces do not have chimney connectors. Thus, at least 14,000 fires and 115 deaths in 1978 are estimated to have occurred from the use of wood or coal-burning stoves, plus an unknown proportion of the minimum estimate of 23,000 fires and 60 deaths associated with chimneys or flues.

As shown in the U.S. Fire Administration data, the major cause of fires in wood or coal stoves and in chimney connectors to solid-fueled equipment, was improper installation, primarily installing the devices too close to combustibles. This contrasts with fires in gas or electric space heaters, most of which were attributed to putting a combustible too close to the heater or to a mechanical failure during operation. Other causes of fires in wood stoves included: an operational deficiency such as overfiring; a failure related to poor maintenance; leaving a combustible too close; or using an improper fueling technique.

The Commission's in-depth investigations of fires from wood and coal stoves and free-standing fireplaces suggest that installation deficiencies most frequently involve the chimney connector (or stovepipe) particularly its installation through a combustible wall or ceiling.

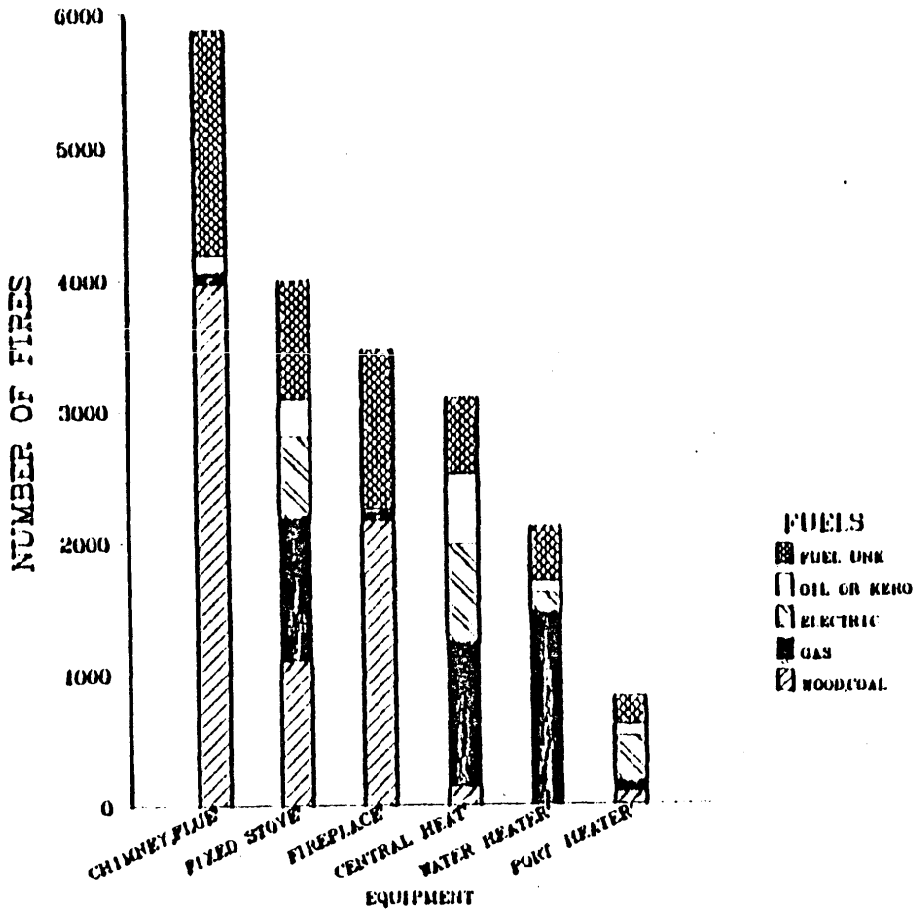
These major ignition factors are consistent with findings from a variety of other data sources, including reports from such widely dispersed states as Massachusetts and Oregon, and anecdotal data collected from personal communications with fire and insurance officials from several states.

In summary all data sources indicate that the improper installation and maintenance of wood and coal stoves and of free-standing fireplaces contribute significantly to the increasing number of fires reported from these appliances. The major areas that appear to need addressing on labels and instructions aimed at preventing fires in these heaters include the following:

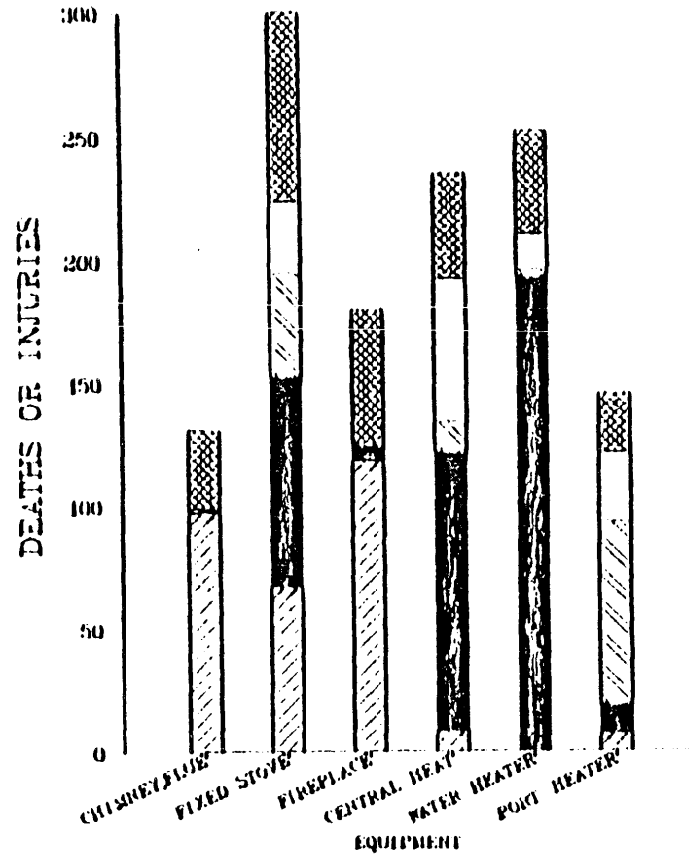
> Maintenance of proper clearance between the stove and combustibles and even more important, proper clearance between the chimney connector (stovepipe) and combustibles.
>
> Proper installation of the chimney connector where it passes through a combustible wall, including the appropriate "thimble" or collar to protect the wall.
>
> Choice of an appropriate chimney connector and chimney for the kind of stove that is used.
>
> Proper maintenance of the stove and connectors to prevent excessive creosote build-up that can cause a fire.
>
> Prudent operation of the stove, including cautions against using flammable liquids to kindle a fire and against overfiring.

All the information needed will not fit on a permanently attached label. Appropriate detailed instructions must also accompany the stove. In view of the apparent importance of proper installation of the chimney connector and chimney, the Commission may also wish to consider a labeling rule for these components, when they are sold separately from the stove itself.

RESIDENTIAL FIRES ASSOCIATED WITH HEATING EQUIPMENT
BY KIND OF FUEL
DATA FROM 15 STATES,1978



DEATHS OR INJURIES FROM FIRES IN HEATING
EQUIPMENT BY KIND OF EQUIPMENT AND KIND OF FUEL
DATA FROM 15 STATES, 1978.



Source: Data obtained from the U.S. Fire Administration, 1978
U.S. Consumer Product Safety Commission, Hazard Identification
and Analysis

304

WOOD OR COAL STOVES, FREE STANDING FIREPLACES

Introduction:

Before the oil embargo of 1973-74 fewer than 50,000 cords of wood were burned each year in New Hampshire. This year, 10 times that much wood will be used to heat New Hampshire homes.1/ All over the country, sales of wood-burning stoves have increased sharply as consumers search for ways to circumvent the rising cost of energy in general, and of heating oil in particular. According to our economists' estimates, the domestic production and importation of wood and coal-burning stoves rose from an estimated 310,000 units in 1974 to 1,100,000 units in 1978. Free-standing fireplaces and fireplace inserts are widely advertised as supplemental heat sources. Combination wood-oil or wood-gas furnaces are being introduced at trade shows.

Concurrently, the Commission has had reason to become concerned about the number of residential fires associated with these appliances, in particular, fires resulting from improper installation and maintenance of wood and coal stoves or free-standing fireplaces. On June 9, 1979, the Commission instructed the staff to develop a labeling rule, under Section 27(a) of the Consumer Product Safety Act, requiring each manufacturer of wood or coal stoves or free-standing fireplaces:

> to specify minimum clearances to combustibles and the type of chimney required.
>
> to maintain records supporting the appropriateness of labeling information.

In addition, the staff was instructed to develop options as needed for other types of installation and maintenance information.

In support of this effort, the following report outlines the nature and extent of risk associated with wood or coal appliances, as these risks are defined by various data sources available to the Commission. The data sources include:

> U.S. Fire Administration data
> NEISS (hospital emergency room reports)
> Death Certificates
> Newspaper Clipping and Consumer Complaint File
> Other reports and anecdotal sources.

1/ Lee Lescaze, "Wood-Burning Blooms in New England as Oil Prices Rise." The Washington Post, December 15, 1979

Overview:

The U.S. Fire Administration is engaged in a major effort to establish a national fire incident reporting system. Currently, more than 20 states have agreed to report fire data in a chain that starts with the completion of a standardized form by a local fire department within a state and continues until computerized tapes from these reports are forwarded from each state's fire marshal's office to the U.S. Fire Administration.

The most recent year for which computerized data are available is 1978, when 15 states[1/] were reporting. CPSC has obtained a copy of these tapes. The data they contain should not be considered definitive as to fire cause. They derive from incident reports completed by local fire departments, including small rural and volunteer departments. They do not necessarily represent the results of in-depth investigations by trained fire investigators. Southern states from the so called "burn belt" are under represented. On the other hand, they do represent the department's best information as to ignition sources, materials ignited, equipment involved, etc. Taken as a whole, they can provide valuable and unique information about the most common sources of fire.

Table 1 provides an overview of the 1978 U.S. Fire Administration's data about heating equipment fires. Overall, almost 20,000 heating equipment fires were reported in the 15 states, resulting in about 1,200 injuries and 130 deaths (civilian and fire fighter). Heating equipment fires accounted for 20-23 percent of all residential structural fires, for 14-18 percent of reported injuries, for 15-20 percent of reported deaths. In each range, the higher percentage assumes a pro-rata distribution of fire reports for which equipment involved was not specified, while the lower percentage does not assume such a distribution.

Chimneys, flues or chimney connectors accounted for the largest number of fires but for the smallest number of deaths or injuries. About three-fourths (4,684) of these fires were from chimneys/flues and about one-fourth (1,191) from chimney connectors. (Chimney connectors connect the firebox to the chimney; they are also called stovepipes.) Most were connected to solid

---

1/ Alaska, California, Illinois, Maryland, Michigan, Minnesota, Missouri, Montana, New York, Ohio, Oregon, Rhode Island, South Dakota, Utah and Wisconsin.